Appendix 35

Meadowbank and Whale Tail 2019 CREMP Report

2019 Core Receiving Environment Monitoring Program

Meadowbank Mine and Whale Tail Project

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EXECUTIVE SUMMARY

The CREMP focuses on identifying changes in water quality, sediment chemistry, and aquatic producers—both primary producers (phytoplankton) and secondary producers (benthic invertebrate community)—that may be associated with mine development activities. Changes are identified using a temporal/spatial trend assessment that includes applying quantitative decision criteria (i.e., early warning *triggers* and action *thresholds*) to facilitate making timely and objective management decisions and taking action. CREMP results are integrated annually into the Aquatic Ecosystem Monitoring Program (AEMP) for holistic environmental management and decision making.

Meadowbank

The 2019 CREMP results for the Meadowbank study area are presented below and summarized in **Table ES-1**.

Water Quality

Full water quality monitoring (i.e., limnology and water chemistry) was completed in March, May, July, August, and September according to the monitoring strategy for the program. Limnology profiles were taken at the Near-Field (NF) areas—Third Portage Lake sampling areas, (TPN, TPE), Second Portage Lake (SP), and Wally Lake (WAL)—in the winter months when ice conditions were safe (January, February, November, and December), to verify the absence of anomalous changes in water quality (e.g., conductivity) attributable to site-related activities.

Similar to previous years, statistically significant mine-related changes continue to be detected relative to baseline/reference conditions at one or more NF areas for alkalinity (TPE, SP); conductivity (TPN, TPE, SP, WAL); hardness (TPN, TPE, SP, WAL); major cations (i.e., calcium, potassium, magnesium, and sodium [TPN, TPE, SP, WAL]); silicon (SP); and total dissolved solids (TDS) (TPN, TPE, SP, WAL). In the absence of effects-based thresholds (e.g., CCME water quality criteria) for these parameters, their triggers were set at the 95th percentile of baseline data[1]. While these changes to water quality are mine-related, the observed concentrations are still relatively low and there is no evidence to suggest concentrations are increasing year-over-year or that the observed concentrations would result in adverse ecological effects. Consistent with previous reporting cycles, there were no trigger exceedances in 2019 for any water quality parameters with CCME water quality guidelines, including metals. In the context of the

[1] Note the trigger for Silicon was newly derived in 2019.

assessment framework outlined in the Final Environmental Impact Statement (FEIS), the magnitude of potential effect on water quality in each of the near-field lakes in 2019 was considered low (i.e., less than 1x the CCME WQGs) and consistent with the original predictions. **Routine water quality monitoring is recommended for 2020,** to continue tracking the changes noted above.

Phytoplankton Community

Phytoplankton community sampling was completed at the same time as the water chemistry sampling program in 2019. Based on before-after-control-impact (BACI) statistical analysis of the data, phytoplankton biomass was statistically significantly ($p<0.1$) higher at SP (80% increase) and WAL (57% increase) relative to reference/baseline conditions. The apparent increases appear to have more to do with lower biomass at INUG than higher biomass at SP or WAL. This is corroborated by nutrient concentrations in both lakes remaining well below levels associated with increased primary productivity. Further, the absolute biomass values at the NF are in line with their historical values. Considering these lines of evidence, there is no indication that mining operations are systematically increasing primary productivity in the NF areas. Phytoplankton richness was similar to previous monitoring cycles. **The trends in phytoplankton biomass and richness will be reviewed again in 2020.**

Sediment Chemistry

The 2019 program consisted of the routine grab sampling (particle size and total organic carbon [TOC]), metals, and organics analysis on the top 3–5 cm of sediment) and a follow-up targeted coring study on chromium at TPE; the next full sediment coring program, which is used to formally test for temporal changes, is scheduled for August 2020.

Grab sampling results, with the exception of chromium at TPE (see below), showed no mining-related temporal or spatial patterns.

Investigation of temporal trends in sediment chromium concentrations at TPE continued in 2019. Sediment chemistry from the 2017 coring program indicated chromium concentrations were trending higher, which prompted additional sediment coring investigations in 2018 and 2019. Natural sedimentation rates in these lakes are low, and the variability of reported chromium concentrations over the last few years suggests chromium concentrations can vary significantly over a small area. There is conclusive evidence that chromium has increased in the sediments at TPE relative to the baseline period; however, high annual variability in chromium concentrations observed between 2017 and 2019 suggests concentrations have stabilized. The ecological significance of these changes are discussed below in the *Sediment Metals Bioavailability* section of the Executive Summary.

Sediment coring is scheduled for 2020 and will further support interpretation of the temporal trends in chromium concentrations in TPE.

Benthos Community

The only statistically significant change to the benthic invertebrate community at Meadowbank identified by the 2019 BACI assessment was an apparent reduction in total abundance for the four-year (2016 to 2019 [42%; p = 0.07]) time period at TPE relative to baseline/reference conditions. That result, however, appears to be due mainly to particularly high abundance at INUG in recent years relative to its baseline years, rather than due to actual reductions at TPE. Absolute total abundance at TPE in 2019 (~2,500 organisms/m^2) was stable relative to the range of values dating back to 2012 (2,220–3,100 organisms/m^2) and was well within its baseline range. The regional increase in abundance assumed by the BACI model, based on the pattern at INUG, is not apparent at reference area PDL. Furthermore, there were no statistically significant changes in taxa richness. Richness at TPE has remained consistent throughout the monitoring period, indicating that mining activities are not adversely affecting the structure of the benthic invertebrate community. Collectively, these results suggest that the apparent reduction in total abundance at TPE is most likely an artefact of the BACI model, rather than a real ecological change to the benthic community.

Sediment Metals Bioavailability

The targeted study assessing the ecological significance of chromium increases in TPE continued in 2019. While the 2018 results showed limited toxicological effects midge larvae (*Chironomus dilutus*), which are the dominant invertebrates in the Meadowbank study lakes, they also showed substantial effects to amphipod (*Hyalella azteca*) survival and growth. While amphipods are not present in the Meadowbank study lakes, there are other taxa that could respond similarly. As the cause of the observed toxicity in 2018 could not be determined, further studies were conducted in 2019 to verify the toxicity results and to better characterize metals bioavailability. Bioavailability was assessed by measuring metals concentrations in sediment porewater to help determine if porewater chemistry is the probable cause of lower survival and growth for *H. azteca*. Key findings of these targeted bioavailability studies are:

1. *H. azteca* exposed to sediment from TPE for 14-d show reduced survival and growth compared to INUG and PDL field control groups. There was no evidence of corresponding effects to survival in the 10-d toxicity test with *C. dilutus*. Growth was statistically significant lower for chironomids exposed to sediment from TPE compared to the field control.

2. Chromium concentrations have increased in sediment at TPE, but there is no plausible evidence to suggest that chromium is the cause of effects to *H. azteca* survival. Sequential extraction test results in 2015 indicated chromium associated with sediment matrix (inorganic and organic particles) is non-bioavailable; follow-up testing in 2018 was deemed unreliable due to data quality issues, which led to conducting the porewater analysis in 2019. Porewater chromium concentrations were less than concentrations reported at the reference area PDL.
3. Dissolved manganese in porewater is the likely cause of effects in the *Hyalella* tests in 2015, 2018, and 2019. Sediment manganese concentrations are naturally elevated and highly variable throughout the TPE study area. It's likely that porewater manganese is elevated in small discrete areas of TPE as a result of localized reducing conditions that favor dissociation of manganese oxides (MnO_2) in sediment to dissolved manganese in porewater.
4. The *H. azteca* toxicity test data provide important information about effects to sensitive aquatic invertebrate taxa, but the chironomid toxicity test results from 2015, 2018, and 2019 are more ecologically relevant for assessing potential risks to the benthos community at TPE. Over the three years of testing, chironomid sediment toxicity test results have substantiated the conclusions presented in the CREMP, namely, that there is no evidence to suggest the benthos community at TPE is being adversely affected by activities at the mine. The benthos community present in TPE has adapted to either tolerate elevated porewater manganese or avoid areas where manganese is elevated in porewater.

Results of the benthos community assessment and the targeted bioavailability studies at TPE clearly demonstrate that the increase in sediment chromium at TPE is not adversely affecting the benthos at TPE. **No further targeted studies are recommended at this time other than annual monitoring of the benthos community as part of the routine CREMP**.

Habitat Compensation Monitoring: Periphyton Community

The Habitat Compensation Monitoring Program (HCMP) has tracked the development of attached algal communities (periphyton) on the faces of the East Dike habitat compensation feature (HCF; since 2009) and Bay-Goose Dike HCF (since 2011). From a community perspective, early-stage colonization was dominated by diatoms, followed by a shift to a more heterogeneous mix of cyanobacteria, diatoms, and to a lesser extent, chlorophyte taxa over the years to become more similar to local reference areas. The general trend in community biomass at the East Dike HCF has been increasing over the years, but it still approximately only a third of that seen at the reference area. Biomass accumulation is much slower at the Bay-Goose Dike HCF, with little increase observed since 2015. The next HCMP event is scheduled for 2021.

Whale Tail

The 2019 CREMP results for the Whale Tail study area are presented below and summarized in **Table ES-2**.

Overview of the 2019 Whale Tail Pit CREMP

The Whale Tail Project was merged with the Meadowbank and Baker Lake CREMP reporting framework in 2018. Data analysis for Whale Tail study areas follows the same methods and framework as Meadowbank. Below are some of the important changes that occurred for the Whale Tail CREMP in 2019:

- WTS and MAM transitioned from *control* to *impact* in 2018 after the onset of construction activities on the Whale Tail Dike. The status of Lake A20, Lake A76, Lake DS1 switched to *impact* in January 2019, while Nemo Lake (NEM) transitioned in July 2019. Therefore, 2019 represents the first full year where most Whale Tail study area lakes were fully under an *impact* designation and potentially under the influence of mine activities.
- With the generation of a year of *after* data, 2019 was the first year that formal statistical analysis using the Before/After Control/Impact (BACI) framework at the Whale Tail study lakes. As usual, the statistical analyses were complemented with time-series plots to facilitate the visual exploration of temporal and spatial trends in chemistry parameters and biological metrics.
- Early warning triggers specific to the Whale Tail study lakes were derived in 2019 for water chemistry and sediment chemistry parameters.
- Water chemistry data (annual mean concentrations for each parameter) from Mammoth Lake were compared to water quality predictions in the Whale Tail FEIS.

Water Quality

The water quality monitoring program was completed with the Meadowbank water quality monitoring. Full water quality monitoring (i.e., limnology and water chemistry) was completed in March, May, July, August, and September according to the monitoring strategy for the program. Limnology profiles were taken at the NF areas (WTS, MAM, NEM) when ice conditions were safe in the winter months (January, February, November, and December), to verify there were no anomalous changes in water quality (e.g., conductivity) attributable to site-related activities.

Changes to baseline conditions were expected following the onset of construction activities for the project. The ultra-oligotrophic Whale Tail study lakes have a long ice cover season and tended to exhibit fairly stable conditions over the baseline sampling period. Consequently, the *signal* of development-related inputs was expected to be easily observed relative to the low *noise* levels of the baseline period in the time series plots used to characterize spatial-temporal trends in water quality.

Trigger and threshold values were developed for the Whale Tail study lakes in 2019 to help identify meaningful changes in water quality parameters. Changes were assessed by screening the yearly mean concentrations at each monitoring area against the newly developed trigger values; parameter/area combinations exceeding their respective trigger value were subject to formal BACI analysis to determine if the changes were statistically significant. Key results, including some parameters that increased but remained below their triggers, were as follows:

- *Nutrients* – increases in ammonia and TKN appeared to be related to regional trends, with elevated concentrations also occurring at the reference areas INUG and PDL. Nitrate and nitrite showed increases at MAM, WTS and NEM but remained below their triggers. Total phosphorous (TP), total organic carbon (TOC) and dissolved organic carbon (DOC) showed a statistically significant increases at WTS, likely the result of inputs from flooded terrestrial habitats following impoundment.
- *Ionic Compounds* – statistically significant increases above trigger values were observed at NF areas WTS and/or MAM for total alkalinity, conductivity, hardness, calcium, potassium, magnesium, sodium, and TDS. The statistically significant increases extended to MF area Lake A76 for calcium, potassium and magnesium.
- *Metals/metalloids* – statistically significant increases above trigger values were observed at NF areas WTS and/or MAM for total and dissolved lithium and for total titanium.

Similar to the results seen over the years at the Meadowbank study lakes, the trends identified above represent increases above baseline/reference conditions only; none of the analytes with statistically significant increases exceeding trigger values in 2019 have CCME effects-based guidelines for the protection of aquatic life. FEIS predictions for MAM were exceeded for TDS, lithium, and the ionic compounds calcium and magnesium. Despite early warning triggers and FEIS predictions being exceeded in 2019, the absolute concentrations of these parameters remain low and far lower than concentrations associated with adverse to aquatic life.

Routine water quality monitoring will continue in 2020 to track emerging spatial and temporal trends. Furthermore, additional monitoring targeting spatial-temporal trends in MAM will be initiated in early 2020 to better characterize ongoing changes in water quality in Mammoth Lake.

Phytoplankton Community

Phytoplankton taxonomy analyses were carried out with the water chemistry sampling program in 2019. Phytoplankton communities vary naturally throughout the year in total biomass (and density) and community composition (taxa richness). The primary, site-related stressors that have the potential to affect the phytoplankton community included nutrient loading and increased concentrations of metals. Nutrient loading can manifest as an increase in total biomass or a change in community structure, while increasing metals would be expected to cause lower biomass and taxa diversity.

Results for 2019 did not indicate a change to community structure (e.g., richness), which is a good indicator that there was no significant increase in the concentrations of metals at WTS and MAM (the lakes most likely to be impacted by mine activities). There was, however, a statistically significant apparent increase in biomass in WTS and a notable, but not statistically significant, increase in MAM. While biomass at WTS (peaked at 1,117 mg/m^3 in August) and MAM (peaked at 660 mg/m^3 in September) were higher than seen during baseline monitoring, the apparent increases were also driven by lower biomass at the reference area INUG relative to previous years. Thus, the biomass results for 2019 appear due to the combined influence of natural variability and mining-related activities.

Increased nutrient loading is the most likely explanation for increased primary productivity at WTS and MAM. The changes in primary productivity at WTS were likely caused by nutrients (e.g., total phosphorous) in flooded soil leaching into the water column as the water level increased in the south basin of Whale Tail Lake as a result of the impoundment of the north basin and the subsequent disruption in flow regime. Interestingly, these changes did not extent to Lake A20 although it too was flooded and connected to Whale Tail Lake. The spike in phytoplankton biomass seen in August at WTS had diminished substantially by September. In addition, the increases seen at MAM did not appear to extend down the watershed to Lake A76.

Trends in phytoplankton biomass and richness will continue to be assessed using the BACI framework in 2020.

Sediment Chemistry

Trigger values were derived for the Whale Tail study area lakes in 2019. Lakes in the Whale Tail study area have naturally high concentrations of some metals. During baseline period, arsenic, cadmium, chromium, copper, and zinc exceeded the CCME interim sediment quality guideline in at least one sample collected. Of these five metals, arsenic is particularly enriched in sediments throughout the study area lakes, with most samples exceeding the CCME probable effect level sediment quality guideline. The newly derived trigger values were provided as lake-specific triggers to acknowledge the natural, between-lake variability in some metals.

Changes in sediment chemistry data are evaluated on a three-year cycle as part of the sediment coring program (timing coincides with the EEM cycle). Coring is scheduled for August 2020. No statistical analysis was completed on sediment chemistry in 2019; however, sediment chemistry data from grab samples were screened against trigger values and, where applicable, threshold values. Concentrations measured in the various lakes in 2019 were comparable to results reported in previous annual monitoring reports. Furthermore, there was no evidence of upwards trends for metals with effects-based thresholds.

Routine sediment grab sampling for TOC, grain size, and hydrocarbons is recommended in 2020 to support the benthos community assessment. Sediment coring is planned for 2020 to assess potential changes in sediment metals concentrations.

Benthos Community

Benthic invertebrate (benthos) community structure (taxa richness) and function (abundance) in the Whale Tail study area lakes is typical of northern headwaters lakes in the region (i.e., relatively low abundance and few taxa). Benthos communities in these lakes have, by virtue of their presence, adapted to the naturally elevated concentrations of some metals in sediment. Although total abundance tends to be low, within-area variability can be substantial. Taxa richness, unlike abundance, is considerably less variable, both temporally (i.e., inter-annually) and spatially (i.e., among the different lakes). The typical number of taxa identified among the various study areas is 10 to 15. The range observed in 2019 was slightly lower in WTS than 2018 but within the range of baseline conditions. All other study areas were also comparable with baseline conditions. The comparatively high taxa richness, combined with no apparent change in abundance, demonstrates that mine activities did not alter the structure or function of the benthos community in 2019.

Routine monitoring of the benthos community is recommended in 2020.

Baker Lake

CREMP monitoring at Baker Lake started in 2008. Important mine-related activities in Baker Lake include barge/shipping traffic and general land-based activities associated with the tank farm area. Approximately double the usual number of barge shipments arrived at BPJ in 2018 to support construction activities for the Whale Tail Project. The number of barge shipments remained high in 2019. No spills of fuel or any other materials were reported in the vicinity of the barge dock or jetty in 2019.

Chemistry

Sampling was conducted at two near-field (BBD, BPJ) and one (BAP; water) or two (BAP, BES; sediment) areas situated along the north shore of Baker Lake in July, August, and September. The mean concentrations for ammonia (as N) and TKN exceeded their respective triggers at BBD and BPJ in 2019 compared with 2018 when no water quality parameters exceeded the triggers. The results from 2019 from the Meadowbank and Whale Tail study areas, including reference areas, indicated a region-wide increase in ammonia. The results from Baker Lake appear to support a natural increase, likely related to higher than normal precipitation in June and July 2019. Metals concentrations in sediment grab samples collected to support the benthos assessment were well within previously reported concentrations at the four locations. There was no evidence of any barge-related impacts to water quality or sediment chemistry at *impact* areas in Baker Lake. **The trends in water and sediment chemistry will be monitored in 2020.**

Biological Communities

The phytoplankton and benthos communities in Baker Lake have not exhibited any changes attributable to Agnico Eagle's activities in Baker Lake. **No follow-up management actions are required for 2020 beyond routine monitoring.**

Table ES-1. Summary of key findings from the 2019 Meadowbank CREMP.

Notes
1. Temporal and spatial trends are outlined for Monitoring Components and Variables that exceeded trigger or thresholds (i.e., apparent change from baseline)
2. Spatial scale ratings are: localized = small area within the lake/area; wide-spread = basin to whole lake
3. Causality ratings are: low = no evidence of a mine-related source; moderate = some likelihood of a mine-related source; high = the source of the change is likely mine-related.

Monitoring Component (and report section)	**Variable**	**Summary**	**Temporal and Spatial Trend Assessment**[1, 2]	**Annual CREMP Results Compared to FEIS Predictions** (Cumberland, 2005)
Limnology Section 4.2	Oxygen and Temperature	The limnology profiles collected in 2019 indicated dissolved oxygen and temperature readings are consistent with range of conditions typical of previous monitoring cycles.	There is no evidence to suggest seasonal fluctuation in dissolved oxygen and temperature among the NF study area lakes is attributed to mining site-related activities.	No predictions in the FEIS
	Conductivity	The observations of minor stratification in early year monitoring events followed the pattern from previous years of being well mixed and unstratified by July. The observations of minor stratification in early year monitoring events followed the pattern from previous years of being well mixed and unstratified by July.	**Spatial scale – not relevant;** **Temporal trend – none;** **Causality – none;**	No predictions in the FEIS
Water Chemistry Section 4.3	Conventional Parameters and Major Ions	Alkalinity, conductivity, hardness, major cations and TDS exceed their trigger values at one or more NF areas in 2019. These results are consistent with recent years. The trigger values for these parameters is set at the 95th percentile of concentrations measured during the baseline period. There are no thresholds (i.e., CCME water quality guidelines) for these parameters.	**Spatial scale – widespread**; concentrations have increased lake-wide in Third Portage from TPE to TPN and between lakes (SP and WAL). **Temporal trend – stable**; concentrations are elevated relative to the baseline period according to the BACI analysis, no evidence of-year-over-year increases (i.e., concentrations in 2019 are similar to 2018, 2017, 2016, …). **Causality – high**; the spatial pattern and temporal trend of increasing concentrations in the 'after' period is plausibly attributed to activities at the mine.	Water quality constituents without effects-based CCME thresholds were not incorporated in the magnitude ratings for assigning effects in the FEIS; however, following the intent of the FEIS magnitude ratings, constituents exceeding baseline but below concentrations associated with adverse effects were considered consistent with a "low" magnitude rating.
	Nutrients	No trigger exceedance (i.e., concentrations = baseline)	Ammonia-N was high in 2019 at all study areas and reference lakes. Otherwise nutrient concentrations are similar to baseline as evidenced by no trigger exceedances in 2019.	Low (i.e., < CCME water quality guidelines)
	Metals	Metals concentrations (total and dissolved) were consistently low or below their respective MDLs at the NF, MF, and FF locations in 2019. The only exception was the metalloid silicon where the yearly mean at SP exceeded the trigger value. The trigger for silicon was derived in 2019. There are no *before* data to use in the BACI statistical analysis of changes over time, but concentrations appear stable throughout the monitoring period (**Figure 4-45**).	**Spatial scale - localized**; Silicon is elevated at SP **Temporal trend - stable**; 2019 silicon concentrations appear to be unchanged over all sample years in SP since 2011 (statistical BACI analysis unavailable because there are no *before* data). **Causality - low**; The long-term stability and the monthly stability in 2019 of silicon concentrations in SP suggest conditions are stable and natural (i.e., not mine related).	Recent temporal water quality analysis for stations in Third Portage Lake (TPE and TPN), Second Portage Lake, and Wally Lake indicates the results conform with the low effect rating predicted in the FEIS. This conclusion is corroborated by the phytoplankton and benthos community results, which shows relatively diverse, abundant, and stable communities at the NF areas relative to baseline / reference conditions.
Phytoplankton Section 4.4	Chlorophyll-a	There is no trigger for chlorophyll-a for the CREMP.	Concentrations in the reference area samples typically range between 0.2 and 0.7 µg/L in summer months, reflecting the oligotrophic, nutrient poor condition of these lakes; a trend that has not changed over time.	No predictions in the FEIS

Monitoring Component (and report section)	Variable	Summary	Temporal and Spatial Trend Assessment[1, 2]	Annual CREMP Results Compared to FEIS Predictions (Cumberland, 2005)
Phytoplankton Section 4.4	Total Biomass	Increases in phytoplankton biomass were detected at NF areas in 2019 relative to baseline/reference conditions but was not confirmed by the time-series plots. The magnitude of the BACI analysis increase ranged up to 80% at SP. The only statistically significant changes (i.e., increase) was at WAL (p<0.1) and SP(p<0.1). There was no discharge to WAL in 2018 or 2019 and nutrient concentrations (i.e., nitrogen and phosphorus) were similar to baseline (**Section 4.3**). The discharge into SP was similar to 2018.	**Spatial scale – widespread**; phytoplankton biomass was elevated in the BACI analysis at all NF areas relative to baseline/reference conditions in 2019. **Temporal trend** – stable; historical biomass for the NF areas (**Figure 4-59**) do not show obvious visual signs of temporal increases for individual NF study areas. **Causality – low**; SP was the only NF area that received effluent discharge in 2019. The magnitude of the change in biomass at the other NF areas suggests the observed pattern of increase in phytoplankton biomass is likely annual variability in the community rather than mine-related.	The absolute biomass values at the NF are in line with their historical values. Taking into consideration all the lines of evidence (BACI and absolute values plotted over time), there is no evidence to suggest mining operations are increasing primary productivity in the NF areas.
	Taxa Richness	A statistically significant increase (17%; p=0.03) in taxa richness was noted at SP in 2019 relative to baseline/reference conditions; however, this is below the 20% trigger level (**Table 4-7**).	**Spatial scale – localized**; increased taxa richness relative to reference/baseline conditions was only evident at SP. **Temporal trend – sporadic**; richness has remained stable during the 'after' period. The apparent increases richness at SP in 2019 relative to baseline/reference conditions is likely an artefact of natural fluctuation in the community composition rather than a decrease. **Causality – low**; there is no indication that mine activities are influencing taxa richness.	Taxa richness for the phytoplankton communities has been stable throughout the 'after' period (i.e., no apparent loss of community diversity).
Sediment Chemistry Section 4.5	Metals	Grab sample chemistry was similar to other years for most analytes at most stations. Zinc exceeded the trigger and threshold at SP in 2019 and exceeded the trigger and threshold for one or more replicates in TPE. Grab sample results are used to support benthic invertebrate interpretation. Core chemistry results were only collected in TPE in 2019 as part of a targeted study. These results were compared to site-specific triggers/thresholds. Parameters with mean concentrations exceeding the trigger value are formally tested using a before-after (BA) statistical model to assess whether concentrations are increasing over time.Targeted coring was completed at TPE in 2019 to verify concentrations of chromium at TPE. **TPE Sediment Chemistry Results** - Chromium concentrations continue to exceed the trigger in core samples collected in 2019. There was a slight increase between 2018 and 2019 but a decrease between 2017 and 2019 study events.	**Spatial scale – localized**; temporal increases in chromium are limited to TPE. Other areas (SP and TPN) are not showing similar trends of increasing chromium in sediment. No statistical analysis to assess potential increase in zinc in SP as observed in the grab samples. 2020 is a coring year when this analyte will be assessed in more detail. **Temporal trend– stable (TPE)**; Chromium concentrations at TPE consistently trended higher between the onset of the mine development in TPE in 2009 (i.e., change in status from before to after) and 2013 (**Figure 4-67**), The pattern since 2013 has been variable. Chromium concentrations were lower in 2018 (150 mg/kg) compared to 2017 (200 mg/kg) but higher again in 2019 (190 mg/kg; still below 2017 concentrations), demonstrating that concentrations are not likely increasing year-over-year. **Causality – high (TPE)**; increasing concentrations of chromium in sediment at TPE were likely related to use of ultramafic rock for dike construction.	The FEIS noted that release of effluent (i.e., settling of TSS and altered sediment chemistry) *may impact benthos.*
	Organics (PAHs)	Sediment hydrocarbon concentrations were below detection for all NF area grab samples in 2018.	Hydrocarbons are not contaminants of potential concern for the CREMP based on recent and historical results. There have been no instances of measured concentrations attributable to site-related activities during the monitoring period.	No predictions in the FEIS

Monitoring Component (and report section)	**Variable**	**Summary**	**Temporal and Spatial Trend Assessment**[1, 2]	**Annual CREMP Results Compared to FEIS Predictions** (Cumberland, 2005)
Benthos Section 4.6	Total Abundance	Benthic invertebrate communities at the NF areas were monitored in 2019. Decreased abundance at TPE relative to INUG in the past four years relative to reference/baseline conditions. Statistically significant differences were noted for the 4 after period (2016-2019). The apparent trend does not appear to be supported in the time-series plots. The differences are primarily driven by increased abundance at INUG during the monitoring program while abundance at TPE has been relatively stable and consistent with baseline sampling results.	**Spatial scale – localized (TPE)**; lower abundance (based on the BACI analysis) observed only at TPE. **Temporal trend – stable (TPE)**; abundance (absolute values) at TPE show stable or improving results over the last six years and consistent with the range observed in baseline. Absolute total abundance at TPE in 2019 (~3,800 organisms/m2) was stable relative to the range of values dating back to 2012 (2,220 to 3,100 organisms/m^2) and was well within its baseline range. **Causality – low (TPE)**; the 'apparent' reduction in abundance at TPE in the BACI analysis is partly an artefact of slightly increasing abundance at the reference area INUG while TPE has remained stable during the operation phase.	As mentioned above, the FEIS predicted altered sediment chemistry *may impact benthos*. The identification of potential mine-related impacts generally involves visually examining the data for spatial/temporal patterns that matched mine-related events. An apparent reduction in total abundance was identified in the BACI analyses at TPE in 2019 but the results were considered a BACI *artefact* as abundance has been consistently trending within the baseline range (**Figure 4-73**).
	Total Richness	No changes observed in taxa richness in 2019 at the NF areas compared to reference/baseline conditions.	Richness continues to track higher for most stations. The benthic communities are dominated by chironomids, and the relative proportion of major taxa remains stable at all stations.	No predictions in the FEIS
	Sediment Metals Bioavailability	Sediment toxicity tests and porewater chemistry analyses were completed to assess the bioavailability of sediment metals to 2 benthic invertebrate species (*Chironomus dilutus* and *Hyalella azteca*). **TPE Sediment Toxicity Test Results** - effects to *H. azteca* survival and growth compared to PDL. - minor reduction in growth for *C. dilutus* (ecologically-relevant), but chromium concentrations in sediment were not correlated with reduced chironomid growth (see **Section 4.6.3**). **Porewater Chemistry Analysis** - Porewater chromium concentrations were less than concentrations reported at the reference area PDL. - Dissolved manganese exceeded the CCME acute WQG in porewater samples collected from the TPE sediment toxicity test replicates (**Table 4-14**)	**Spatial scale – localized (TPE);** sediments from TPE are naturally-elevated in porewater manganese in discrete areas. The concentrations are highly variable over small-spatial scale, indicating the partitioning of manganese between dissolved and particulate phases is highly dependent on the local sediment conditions (e.g., redox). **Temporal trend – stable (TPE);** sediment manganese concentrations are stable. There is no evidence to suggest activities at the mine have contributed to elevated porewater manganese. **Causality – low (TPE)**; natural (baseline) conditions in the sediment have the potential to affect sensitive taxa. The benthos community at TPE is adapted to naturally-elevated manganese concentrations.	TPE was the focus of the effects assessment to determine if sediment metals concentrations were impacting benthos. Key lines of evidence in the weight of evidence assessment were (in order from highest to lowest weighting): **1)** benthos community - stable or improving results for total abundance and taxa richness over the last six years that were consistent with the baseline range (see below). **2)** toxicity tests - low bioavailability of sediment metals for *C. dilutus*. Effects to survival were noted for the more sensitive amphipod species *H. azteca*, related to naturally-elevated concentrations of manganese in porewater. **3)** chemistry - Chromium concentrations at TPE, while exceeding the trigger, appear to have stabilized relative to the recent increasing temporal trend. Concentrations of chromium have increased relative to the baseline period, but current concentrations of chromium in sediment and porewater do not pose risks to the benthos at TPE.

Table ES-2. Summary of key findings from the 2019 Whale Tail CREMP.

Notes
1. Temporal and spatial trends are outlined for Monitoring Components and Variables that exceeded trigger or thresholds (i.e., apparent change from baseline)
2. Spatial scale ratings are: localized = small area within the lake/area; wide-spread = basin to whole lake
3. Causality ratings are: low = no evidence of a mine-related source; moderate = some likelihood of a mine-related source; high = the source of the change is likely mine-related.

Monitoring Component (and report Section)	**Variable**	**Summary**	**Temporal and Spatial Trend Assessment**	**Monitoring Results Compared to FEIS Predictions (Agnico Eagle, 2016)**
Limnology Section 5.2	Oxygen and Temperature	The limnology profiles collected in 2019 show dissolved oxygen and temperature readings are consistent with range of conditions observed in previous monitoring cycles (2015 to 2018).	Spatial and temporal trends were stable in 2019	No predictions in the FEIS
	Conductivity	There was a slight increase in field conductivity in WTS between March and May; however, conductivity returned levels comparable with baseline by August. The conductivity in MAM indicated a spatial trend where the east basin was elevated over the west basin. Conductivity readings in MAM increased to > 150 µS/cm from the baseline of approximately 60 µS/cm. Conductivity within the other Whale Tail study area lakes was similar to baseline. Conductivity in NEM increased over the last two sampling events in 2019.	**Spatial Trends: localized -** No spatial trends within WTS and observed changes did not extend to Lake A20. Spatial trend observed within Mammoth Lake (east basin elevated compared to west basin) and did not extent to downstream stations. NEM is within a separate watershed and there is no spatial trend to review. **Temporal Trends: variable (WTS); stable (MAM)-** Conductivity in WTS appeared to trend upwards in May but declined to levels similar to baseline for the remainder of the year. Apparent increase in conductivity observed in MAM since late 2018 has remained higher than baseline but relatively stable. NEM may be increasing but more results are required to verify results. **Causality: moderate (WTS); high (MAM)-** Short duration spike in WTS followed by a return to conditions similar to baseline. The spike may be associated with mine activities but no direct cause was evident (e.g., construction activity). Spatial and temporal trend at MAM suggests mine activities are influencing conductivity; however, the limited "after" data means assigning causality to one activity is not possible. Dewatering and construction were potentially impacting MAM in 2019. NEM may have been influenced by dewatering activities.	No predictions in the FEIS. The apparent spatial and temporal trend in Mammoth will be assessed in 2020 through additional monitoring to attempt to identify potential sources.
Water Chemistry Section 5.3	Conventional Parameters and Major Ions	Changes observed in WTS and MAM for conductivity, hardness, and some major ions. Minor changes observed for some major ions in A76 and NEM. TOC and DOC apparently increased at WTS and DS (the BACI analysis indicted that the change at DS1 was statistically significant).	**Spatial Trends: localized** – The 2019 results indicated changes to WTS and MAM and to a lesser extent A76. Although in a separate watershed, Nemo Lake also exhibited some changes late in 2019. **Temporal Trends: increasing** – Calcium, magnesium, potassium, and sodium may be trending upwards in NF lakes. Evidence of increases in WTS and MAM and later in 2019 in NEM; however, a longer time interval is required for confirmation. **Causality: high** - These ionic compounds have increased in the Meadowbank study area lakes and it seems likely that the apparent increase observed in the Whale Tail study area lakes in 2019 follows a similar trend; however, the limited *after* period makes it difficult to assign causality.	2019 was a transition year for most Whale Tail study area lakes changing from "control" to "impact". Mine influence is likely for some water quality parameters. FEIS predictions are for Mammoth Lake only. Yearly mean concentrations for calcium and magnesium did not meet the FEIS predictions. Conditions in WTS spiked in May before stabilizing near to the trigger. Mammoth results were more variable and exhibited a within lake spatial trend for conventional parameters and major ions. The relatively short *after* period (i.e., approximately 7 sample events) in these stations limits the temporal trend confirmation. Primary producer indices do not indicate declining abundance or richness. These parameters will be assessed closely in 2020.

Monitoring Component (and report Section)	Variable	Summary	Temporal and Spatial Trend Assessment	Monitoring Results Compared to FEIS Predictions (Agnico Eagle, 2016)
Water Chemistry Section 5.3	Nutrients	High variability in the nutrient results observed in 2019. This variability is regional and was observed at the Whale Tail study area lakes but also at the Meadowbank study area lakes, Baker Lake, and the reference lakes. High precipitation in June and July may have impacted nutrient concentrations. Total phosphorous change was statistically significant in WTS in 2019. Ammonia concentrations increased significantly in INUG (reference) in 2019 indicating that some of the increases were natural.	**Spatial Trends: widespread** - Ammonia and other nutrients appeared to increase in most study area lakes including reference in 2019. **Temporal Trend: variable** - No temporal trend was observed except potentially and increase for total phosphorous in WTS. **Causality: low** - the widespread variability in nutrient concentrations in 2019 suggests that mine activities did not adversely impact nutrient concentrations in the Whale Tail study area lakes.	The yearly mean for ammonia (as N) did not meet FEIS predictions for Mammoth Lake; however, the increased ammonia concentrations appeared to be widespread in 2019 and likely related to natural variability.
	TOC and DOC	The yearly mean for TOC and DOC exceeded the trigger (TOC trigger = 2.42 mg/L and DOC trigger = 2.43 mg/L) in WTS (mean TOC = 2.9 mg/L; mean DOC = 3.0 mg/L) and DS1 (mean TOC = 2.9 mg/L; mean DOC = 2.8 mg/L) in 2019. The mean concentrations in MAM or A76 did not exceed the trigger; therefore, the apparent increase observed at DS1 may be associated with natural variability.	**Spatial Trends: localized** - TOC and DOC were slightly over the trigger in WTS. The results from DS1 are potentially related to natural variability as these parameters were below the trigger values in lakes upstream (closer to the mine activities). **Temporal Trend: increasing** - WTS appeared to be increasing in 2019. The increase may be associated with the flooding of WTS after the impoundment of WTN. However, there was also an apparent increase in DS1. **Causality: moderate** - The increased TOC and DOC in WTS may be associated with mine activity or increased flooding. However, conditions at A20 (also flooded) were comparable to baseline and the increase in DS1 is likely related to natural sources.	No predictions in the FEIS.It was unclear if the increase in TOC and DOC observed in WTS in 2019 was related to mine activities. Trend analysis is challenging with just over one year of *after* data and when natural variability is evident. These parameters will be closely monitored in 2020.
	TDS	In 2019, TDS concentrations in MAM were marginally elevated over the previous sample years, but the yearly mean was above the trigger (mean = 87.1 mg/L). The yearly mean at WTS also exceeded the trigger in 2019 (mean = 73.7 mg/L). Both results were statistically significant in the BACI analysis of proportional change. Lake A76 and Nemo Lake also exceeded the trigger in one or more sample in 2019; however, the yearly mean was below the trigger.	**Spatial Trends: localized -** TDS concentrations were elevated in WTS and MAM but to a lesser extent in A76 and NEM and did not extend to A20 or DS1. **Temporal Trend: increasing** - TDS trended upwards in 2019 particularly in MAM but also in WTS. However, conditions were fairly stable for the 2019 season. **Causality: high** - Increased dissolved solids in MAM and WTS is likely related to construction and dewatering activities.	TDS did not meet FEIS predictions in MAM in 2019. The increase in TDS observed in 2019 is likely related to mine activities. This parameter will be monitored closely in 2020.
	Metals	The yearly mean concentrations for lithium exceeded trigger values in WTS and MAM. Total titanium also exceeded the trigger in WTS.	**Spatial Trends: localized** - Mean lithium concentrations exceeded the trigger value in WTS and MAM but did not extend to Lakes A20 or A76. **Temporal Trend: variable** - The apparent 2019 increase for lithium appeared to stabilize later in the year. There was no temporal trend in WTS for total titanium. **Causality: low** - Causality cannot be determined based on the limited *after* data and no evidence of a temporal trend.	Aluminum, barium, and strontium did not meet FEIS predictions in Mammoth Lake in 2019; however, the yearly mean concentrations for these metals were all below their respective triggers. Lithium also did not meet FEIS predictions and was over the trigger value in both WTS and MAM. These metals will be monitored closely in 2020.
Phytoplankton Section 5.4	Chlorophyll-a	There is no trigger for chlorophyll-a for the CREMP. Chlorophyll-a concentrations varied in 2019 but appeared higher in WTS and MAM. Early season lows for MAM were around 0.11 µg/L in March and in WTS were 0.89 µg/L. By August WTS had risen to 4.5 µg/L and by September MAM was up to 4.0 µg/L. All other area lakes were generally around baseline levels (~1.0 µg/L).	**Spatial Trends: localized** - Chlorophyll-a appeared to increase in WTS and MAM compared with other lakes in 2019. There was no formal BACI analysis on this parameter. **Temporal Trend: variable** - A notable increase in August in WTS was followed by a notable decline in September. MAM increased in August and September. **Causality: moderate** – A potential spatial trend was not supported by a temporal trend in WTS. Conditions in MAM may have been increasing at the end of the year.	No predictions in the FEIS. Chlorophyll-a appears to have increased in WTS and MAM in 2019. An increase in productivity is normally indicative of an increase in nutrient concentrations. Both nutrients and primary productivity in the water column will be closely monitored in 2020. Nutrient are discussed above and increases may have been partly driven by natural variability in 2019.

Monitoring Component (and report Section)	**Variable**	**Summary**	**Temporal and Spatial Trend Assessment**	**Monitoring Results Compared to FEIS Predictions (Agnico Eagle, 2016)**
Phytoplankton Section 5.4	Total Biomass	Total biomass results were highly variable in 2019. MAM results were generally comparable with baseline but increased to 660mg/m^3 by September. WTS increased in August to 1117 mg/m^3 but decreased to comparable with baseline conditions in September. These maximum values were notable higher than those observed in 2018. The BACI analysis indicated a statistically significant increase for WTS and non-significant statistical increases for all other study area lakes.	**Spatial Trends: widespread** - Phytoplankton biomass appeared to increase in all study area lakes in 2019. **Temporal Trend: variable (WTS); increasing (MAM)** - Statistical analysis indicated an increase in WTS over baseline/control; however, time-series plots of biomass show biomass falling in September compared to August. MAM appeared to be increasing above baseline in the latter half of 2019 but change was not statistically significant. **Causality: moderate** - The potential increase in biomass is widespread. Natural variability in nutrients (e.g., a region wide increase in ammonia) may have influenced phytoplankton growth.	No predictions in the FEIS. The lack of temporal trend uniformity and the magnitude of phytoplankton biomass increase between lakes is suggestive of mine site influence on Mammoth Lake and the south basin of Whale Tail Lake. Total biomass will be monitored closely in 2020 to assess if the 2019 results indicate a temporary spike in productivity or a long-term trend shift.
	Taxa Richness	The Whale Tail study area lakes tend to have higher biomass/abundance and greater taxa richness than the Meadowbank study area lakes. In 2019 taxa richness in the Whale Tail study area lakes was comparable with previous years.	**Spatial Trends: None** **Temporal Trends: None** **Causality: Not Applicable**	No predictions in the FEIS.
Sediment Chemistry Section 5.5	Metals	2019 was not a coring year at the Whale Tail study area. Grab sample chemistry was screened against triggers to assess for the potential early warning of change and to provide context for potential changes to benthic invertebrate indices. There was no evidence of change over 2018 results.	**Spatial Trends: None** **Temporal Trends: None** **Causality: Not Applicable**	No predictions in the FEIS for grab sample chemistry.
	Organics (PAHs)	There was no evidence of change from 2018 results.	**Spatial Trends: None** **Temporal Trends: None** **Causality: Not Applicable**	No predictions in the FEIS for grab sample chemistry.
Benthos Section 5.6	Total Abundance	Benthic abundance was highly variable between replicates and was variable between stations. Statistical testing indicated an apparent but not statistically significant increase in abundance in MAM and NEM, and to a lesser extent in WTS. Overall, 2019 results are similar to baseline years for all stations.	**Spatial Trends: None** **Temporal Trends: None** **Causality: Not Applicable**	No predictions in the FEIS.
	Total Richness	Taxa richness was comparable with baseline years.	**Spatial Trends: None** **Temporal Trends: None** **Causality: Not Applicable**	No predictions in the FEIS.

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ACRONYMS

AEMP	Aquatic Effects Monitoring Program
ANOVA	Analysis of variance
AWAR	All weather access road
BACI	Before/after control/impact
BACIP	Before/after control/impact Paired
BAER	Baseline Aquatic Ecosystem Report (for Meadowbank)
BAP	Baker Lake – Akilahaarjuk Point
BBD	Baker Lake – barge dock
BES	Baker Lake – east shore
BPJ	Baker Lake – proposed jetty
CCME	Canadian Council of Ministers of the Environment
COC	Chain of custody
CREMP	Core Receiving Environment Monitoring Program
CRM	Certified reference material
DFO	Department of Fisheries and Oceans
DI	Deionized blank
DOC	Dissolved organic carbon
DQO	Data quality objective
EAS	Effects assessment strategy
EEM	Environmental effects monitoring
EB	Equipment blank
EIA	Environmental impact assessment
FEIS	Final Environmental Impact Statement
FF	Far-field
GPS	Global positioning system
HCF	Habitat compensation feature
HCMP	Habitat Compensation Monitoring Program
HEPH	Heavy extractable petroleum hydrocarbons
ICP-MS	Inductively coupled plasma mass spectrometry
INUG	Inuggugayualik Lake
ISQG	Interim sediment Quality Guidelines
LCS	Laboratory control sample
LEPH	Light Extractable Petroleum Hydrocarbons

MAM	Mammoth Lake
MDL	Method detection limit
MDMER	Metal and Diamond Mining Effluent Regulations
MMP	Mercury Monitoring Program
NEM	Nemo Lake
MF	Mid-field area
NF	Near-field
NWB	Nunavut Water Board
PAG	Potentially acid Generating
PAHs	Polycyclic aromatic hydrocarbons
PDL	Pipedream Lake
PEL	Probable effect level
QA/QC	Quality assurance / quality control
REF	Reference
RPD	Relative percent difference
SEP	Sequential extraction procedure
SOP	Standard operating procedure
SQG	Sediment quality guidelines
SP	Second Portage Lake
SSD	Species sensitive distribution
TDS	Total dissolved solids
TE	Tehek Lake
TEFF	Tehek Lake Far-field
TIA	Tailings impoundment area
TKN	Total Kjeldahl nitrogen
TOC	Total organic carbon
TSF	Tailings Storage Facility (North and South Cells)
TSS	Total suspended solids
TP	Total phosphorus
TPE, TPN, TPS	Third Portage Lake sampling areas
UTM	Universal Transverse Mercator
WAL	Wally Lake
WOE	Weight of evidence
WQG	Water quality guideline
WRSF	Waste rock storage facility

WTN, WTS	Whale Tail Lake – North and South Basins

REPORT ORGANIZATION

The 2019 Core Receiving Environment Monitoring Program (CREMP) report is organized into a main document and 8 appendices (A through H). The document underwent a significant restructuring in 2018 with the integration of the Whale Tail Project into the annual CREMP report. An overview of the various sections of the report is provided to help guide the reader as they navigate the document.

Executive Summary provides a high-level summary of the 2018 monitoring results by study area (Meadowbank, Whale Tail, and Baker Lake).

Section 1 introduces the CREMP with overview of the environmental setting for the project. The pace and scope of mining development is also outlined to catalogue how the CREMP has been implemented to monitor changes in the aquatic receiving environment.

Section 2 outlines elements of the CREMP study design including sampling areas, a description of the routine monitoring components, details regarding any targeted studies conducted for a given cycle, and the statistical framework used to assess spatial and temporal changes in chemistry (water and sediment) and biological communities (phytoplankton and benthic invertebrates).

Section 3 summarizes results of the detailed quality assurance and quality control assessment (QA/QC) presented in Appendix A.

Section 4 (Meadowbank), **Section 5** (Whale Tail Pit) and **Section 6** (Baker Lake) are stand-alone chapters detailing the results of the spatial and temporal trends in water quality, sediment chemistry, and biological community health (phytoplankton and benthos) specific to each study area. Figures and Tables are included at the end of each section.

Section 7 provides recommendations for the scope of the 2020 CREMP for Meadowbank, Whale Tail, and Baker Lake study areas.

1 INTRODUCTION

1.1 Development of the Aquatic Monitoring Program

Agnico Eagle Mines Ltd.'s (Agnico Eagle) Meadowbank Mine is situated approximately 75 km north of the hamlet of Baker Lake, Nunavut. The aquatic monitoring program has evolved since its inception in 2005; terms and acronyms used to describe the aquatic monitoring programs for the Meadowbank Mine are described below:

AEMP

AEMP was first used in the 2005 report *(Aquatic Effects Management Program*[2]; Azimuth, 2005a). The AEMP was developed to address issues identified during the Environmental Impact Assessment (EIA) process that could potentially impact the aquatic receiving environments surrounding the development. The scope of the original AEMP described the rationale, framework, strategy, methods, and scope of receiving environment monitoring for the Meadowbank Mine. Receiving environment monitoring conducted in 2006 and 2007 use the term *AEMP* in the annual report titles[3].

Agnico Eagle has several monitoring programs (e.g., effluent monitoring, ground water monitoring, air quality monitoring) relevant to tracking potential changes to the aquatic receiving environment surrounding the Meadowbank Mine. A restructuring of the AEMP was completed in 2012 (Azimuth, 2012c) to broaden the scope of the AEMP to serve as the overarching 'umbrella' strategy that provides an opportunity to integrate results of individual, but related, monitoring programs (e.g., construction, groundwater, water quality and flow, air quality) in accordance with the original Nunavut Water Board (NWB) Type A water license requirements. On an annual basis, the restructured AEMP brings in the results of the individual monitoring programs, assesses them using a site-specific conceptual model framework and recommends specific management actions to address potential issues. Previously, the term *AEMP* was essentially synonymous with receiving environment monitoring. Given the AEMP's broadened scope, more specific terminology (i.e., CREMP; see below for more details) was developed when referring to aquatic receiving environment monitoring for the Meadowbank mine.

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[2] The 2005 AEMP refers to the original AEMP document that served as the blueprint for the CREMP until the CREMP Design Document 2012 (Azimuth, 2012d) was completed.

[3] The Nunavut Water Board Type A License, issued in 2008 and renewed in 2015, defines the "AEMP" as the *Aquatic Effects Monitoring Program*; annual receiving environment monitoring reports since 2008 reflect this subtle change.

CREMP

CREMP is the acronym for *Core Receiving Environment Monitoring Program*. This term, which is synonymous with *core monitoring program* was first used for the 2009 annual report. It encompasses the core receiving environment monitoring program dating back to 2006. The study design for the CREMP was completed in 2012 (*Core Receiving Environment Monitoring Program (CREMP): Design Document 2012*; Azimuth, 2012d). The 2012 design document reviewed all historic monitoring CREMP data, presented the trigger/threshold derivation process (see **Section 1.5** for description of triggers/thresholds), determined trigger/threshold values for individual parameters, and established the experimental design to optimize the program. The resulting triggers/thresholds and experimental design changes have been integrated into the CREMP since 2012.

Details for the CREMP study design were recently updated in the *CREMP: 2015 Plan Update* (Azimuth, 2015b), which now includes an addendum (Azimuth 2018b) that outlines aspects of the CREMP that are unique to the Whale Tail Pit Project (hereafter referred to as Whale Tail).

The 2019 CREMP report documents the methods and results of aquatic receiving environment monitoring activities completed at Meadowbank, Whale Tail, and Baker Lake study areas in 2019. As in previous years, this report integrates historical data to identify changes in limnology or water chemistry parameters, sediment chemistry, phytoplankton biomass and benthic community structure associated with mine-related activities at Meadowbank Mine or in Baker Lake (since 2006) or in Baker Lake (since 2008). With the onset of in-water construction activities for Whale Tail Lake in August 2018, this study area has been brought into the CREMP.

1.2 Environmental Setting

1.2.1 Meadowbank and Whale Tail Study Areas

The Meadowbank and Whale Tail Projects are situated in the barren-ground central Arctic region of Nunavut within an area of continuous permafrost known as the Wager Bay Plateau (Campbell et al. 2012). These are headwater, ultra-oligotrophic/oligotrophic (nutrient poor and unproductive) lakes, situated on the watershed boundary that separates two main drainages – the Arctic and Hudson Bay drainages. Only a few hundred meters to the north of Second and Third Portage lakes is the divide between water that flows north to the Arctic Ocean (via the Meadowbank and Back River system) or to Chesterfield Inlet and Hudson Bay (via the Quoich River system). Lakes near the Meadowbank project (i.e., Third Portage, Second Portage, and Tehek) flow into the Quoich River system, while CREMP reference lakes (Tasirjuaraajuk Lake; aka Pipedream Lake [PDL] and Inuggugayualik [INUG]) and lakes in the vicinity of Whale Tail flow north via the Meadowbank and Back River system (**Figure 1-1**).

The local landscape around Meadowbank and Whale Tail Pit consists of rolling hills and relief with low-growing vegetative cover and poor soil development. Numerous lakes are interspersed among boulder fields, eskers and bedrock outcrops, with indistinct and complex drainages. As is common of headwater lakes, all of the project lakes have small drainage areas relative to the surface area of the lakes themselves. Local inflow from surrounding terrain is the predominant influence on water movement within the system. Small channels connect the project area lakes, although there is little flow between lakes except during freshet and possibly none during winter months. Movement by fish between lakes is also rare, as populations remain quite isolated from one another. The ice-free season on these lakes is short, with ice break-up in late-June to mid-July and ice-up beginning in late September or early October. Maximum ice thickness is often 2 m thick or more by March or April.

The Meadowbank and Whale Tail project lakes support healthy communities of plankton, benthos and fish that are typical of oligotrophic Arctic lakes (Azimuth, 2005b). Biological productivity of the lakes is limited by nutrient availability, cold water and a short growing season.

1.2.2 Baker Lake

Baker Lake receives drainage from three major river systems that drain much of the central Arctic: the Thelon River, the Kazan River, and the Dubawnt River (Hutchinson et al., 2018). Baker Lake is the 5th largest lake in Nunavut with a surface area of approximately 1,900 km^2 and 90 km from the mouth of the Thelon River to the narrows at the eastern end of the lake (Nunami, 2007). Water quality in Baker Lake is indicative of a nutrient poor, low alkalinity, soft water Arctic Lake (Hutchinson et al., 2018). Analysis of surface water for metals analysis indicate dilute concentrations throughout Baker Lake with no reported exceedances of human health or freshwater quality guidelines. Water quality in Baker Lake is strongly influenced by freshwater inputs during freshet; results from the lake-wide survey completed by Hutchinson et al. (2018) show only weak spatial and seasonal patterns in water quality with the exception of conductivity.

Specific conductivity measurements collected throughout the monitoring period occasionally detect the influence of the deep marine-water influence in Baker Lake. A report by Johnson (1965) suggested three scenarios to explain saline conditions in Baker Lake: 1) ancient seawater trapped during isostatic rebound following glacial retreat, 2) seawater seeping into Baker Lake near the outlet, and 3) seawater entering Baker Lake driven by tides and storm events. Data generated from a more recent 3-year limnological study in Baker Lake between 2015 and 2017 suggest scenario 3 is the most likely explanation for saline water in Baker Lake. The channel or *sill* separating Baker Lake from marine influence is shallow and strong tidal currents and higher tidal amplitude at Chesterfield Inlet compared to other regions in Hudson Bay could contribute salt water to Baker Lake (Hutchinson et al., 2018). Conductivity readings over 1,000 µS/cm were recorded at depths between 10 and 20 m at locations further away from the influence of freshwater from the Thelon River (Hutchinson et al., 2018). Spring freshet is postulate as a key factor that prevents saline water from accumulating in Baker Lake year-over-year.

1.3 Mine Development and Operation

An overview of the mine development for the Meadowbank and Whale Tail Projects is provided below. A list of within-year site activities and a summary of previous CREMP results dating back to 2008 are provided in **Table 1-1**. In addition, a general description of mining-related activities at Baker Lake is provided for that location.

1.3.1 Meadowbank

The construction phase of the Meadowbank Mine officially started in June 2008, upon receipt of the NWB A Water License (2AM-MEA0815; renewed to 2AM-MEA1525 in 2015 and amended to 2AM-MEA1526 in 2018) for the project. The Fisheries and Oceans Canada (DFO) Fisheries Act Authorization (NU-03-0191) for the project was issued on July 30, 2008, thus allowing the start of in-water construction activities. Dike construction at Second Portage (East Dike) and Third Portage Lake (Bay-Goose Dike) between 2008 and 2010 allowed development of the open pit deposits. The mine officially opened on February 27, 2010, marking the start of the operations period. Five deposits were mined in the 10 years since the start of operations: North Portage, South Portage, Bay-Goose, Vault, and Phaser.

1.3.2 Baker Lake

The hamlet of Qamani'tuaq located on the northwest shore of Baker Lake is point of entry for fuel, equipment and goods arriving by barge. Open water access to the hamlet from Chesterfield Inlet on Hudson Bay is limited to approximately 2.5 months from the end of July through to mid-October, depending on annual ice conditions. Goods and fuel typically travel from Quebec, around Labrador, and through Hudson Straight. Cargo and fuel tanker vessels moor in Chesterfield Inlet and shallow draft ships or barges pulled by tugs are used to navigate the channel that connecting Baker Lake with Chesterfield Inlet (Agnico Eagle, 2018). Dry goods are transferred at a floating dock facility to the east of the hamlet (CREMP area BPJ is the closest sampling area). Fuel is transferred from the barges to a 70-million-liter capacity tank farm located upgradient from the floating dock. Equipment, goods, and fuel are trucked year-round from the hamlet to Meadowbank via 110 km all-weather access road (AWAR) completed by Agnico Eagle in 2008.

Monitoring at Baker Lake began in 2008, coinciding with the first barge season. The number of barge trips for fuel and goods dating back to 2008 are shown in **Figure 6-2**.

1.3.3 Whale Tail

The Whale Tail Pit Project (Whale Tail) is situated within the Amaruq property, a 408 km^2 exploration area on Inuit and federal crown land. The Project is located approximately 50 km northwest of the Meadowbank mine and is connected by a 64 km all-weather access road that was completed in 2018. The Project is permitted under a separate NWB license, 2AM-WTP1826, with ore being trucked to Meadowbank to take advantage of the existing infrastructure (e.g., mill, tailings storage, air strip). The first phase of the Project is a conventional open pit currently being developed at the Whale Tail satellite deposit. Major in-water construction activities started in 2018 with dike construction in Whale Tail Lake, fishout of the isolated north Basin of Whale Tail Lake, development of two quarries, road construction between the Whale Tail dike and the waste rock storage facility (WRSF) north of Mammoth Lake, and expansion of the camp infrastructure. Construction activities for 2019 included dike and road construction around Mammoth Lake and the start of the diversion channel between WTS and MAM late in the year. Other site activities included dewatering and surface water management which expanded to include dewatering into the Nemo Lake watershed necessitating the change of status of NEM to *impact* for August 2019.

1.4 CREMP Objectives

The CREMP focuses on identifying changes in limnological parameters, water and sediment chemistry, and in primary (phytoplankton) and secondary (benthic invertebrate community) aquatic producers that may be associated with mine development activities. This is accomplished through the application of a temporal/spatial trend assessment that includes application of quantitative decision criteria (i.e., early warning *triggers* and action *thresholds*) to facilitate immediate and objective decision-making regarding appropriate management actions. This information is integrated annually into the Aquatic Ecosystem Monitoring Program (AEMP) for holistic environmental management and decision making.

The 2005 AEMP framework (Azimuth, 2005a) presented a receiving environment monitoring strategy consisting of two components:

Core Receiving Environment Monitoring Program – was designed based on our understanding of mine construction, operation and infrastructure (e.g., dikes, effluents, stream crossings, roads, etc.) and has been developed to detect mine-related effects at temporal and spatial scales that are ecologically relevant. The program was expanded to include Baker Lake in 2008 and Whale Tail in 2018. The program was updated based on the recommendations of the

CREMP: Design Document 2012 (Azimuth, 2012d) and more recently, described in detail in the *CREMP: 2015 Plan Update* (Azimuth, 2015b) and Whale Tail Pit Addendum (Azimuth 2018b). The study design is based on a before-after-control-impact (BACI) approach, but has also incorporated the concept of gradients in exposure (e.g., by incorporating near-field, mid-field and far-field areas in addition to reference areas).

Targeted Studies – targeted studies are designed to address specific questions related to mine development during construction or operation and typically have narrower temporal or spatial bounds. These results are integrated with and complementary to the routine CREMP. Examples include dike construction monitoring (e.g., Azimuth, 2009a) and the total suspended solids (TSS) effects assessment studies (EAS) (e.g., Azimuth, 2009b). Recently, targeted studies have been carried out to determine the toxicity and bioavailability of metals in sediments at TPE (Azimuth, 2016; this report).

1.5 CREMP Strategy

CREMP reporting for the Meadowbank and Baker Lake study areas changed substantially starting in 2011 with a stronger focus on assessing potential temporal and spatial trends in the data related to mining activity. Greater emphasis is now placed on identifying changes to support the AEMP (**Section 1.1**) and ultimately the environmental management process, rather than on providing a detailed description of the annual results in isolation. To that end, this CREMP report applies numerical decision criteria (i.e., triggers and thresholds) to assess the magnitude of change in CREMP monitoring variables (e.g., water quality, sediment chemistry, lower trophic level communities [i.e., phytoplankton and benthos]). The same approach has been applied at the Whale Tail study area in 2019 with the transition from the baseline 'before' period to the 'after' period.

The 2012 AEMP (Azimuth, 2012c) described a two-tiered approach (**Figure 2-2**) for evaluating changes in the monitoring components (e.g., water quality, benthos community) based on 'trigger' and 'threshold' level changes:

- **Trigger values** are typically lower or more conservative than threshold values. They serve sass early warning criteria that might lead to action. Exceedance of a trigger value does not necessarily imply that an adverse effect may be expected. The triggers may be based on absolute numbers (e.g., an increase half-way from baseline to an identified effect threshold) or statistical criteria (e.g., statistically significant trend that predicts exceedances of a threshold within 3 years).
- **Thresholds** are legal requirements, regulatory guidelines (e.g., CCME), or other discrete benchmarks, below which unacceptable adverse effects are not expected and above

which adverse effects may occur. If effects-based thresholds do not exist or are not warranted for a variable, then early warning triggers will be developed without thresholds. In such cases, if triggers are exceeded then the implications of such exceedances can only be understood through the integration of results from other AEMP monitoring programs, or, if important information gaps still exist, through focused studies (e.g., risk assessment).

Comparison of the data to trigger values is the initial analytical focus. If trigger values are exceeded, the data are then compared to the applicable thresholds (if available[4]). Details regarding the derivation of trigger and threshold values for the CREMP are presented in the *CREMP: Design Document 2012* (Azimuth, 2012d).

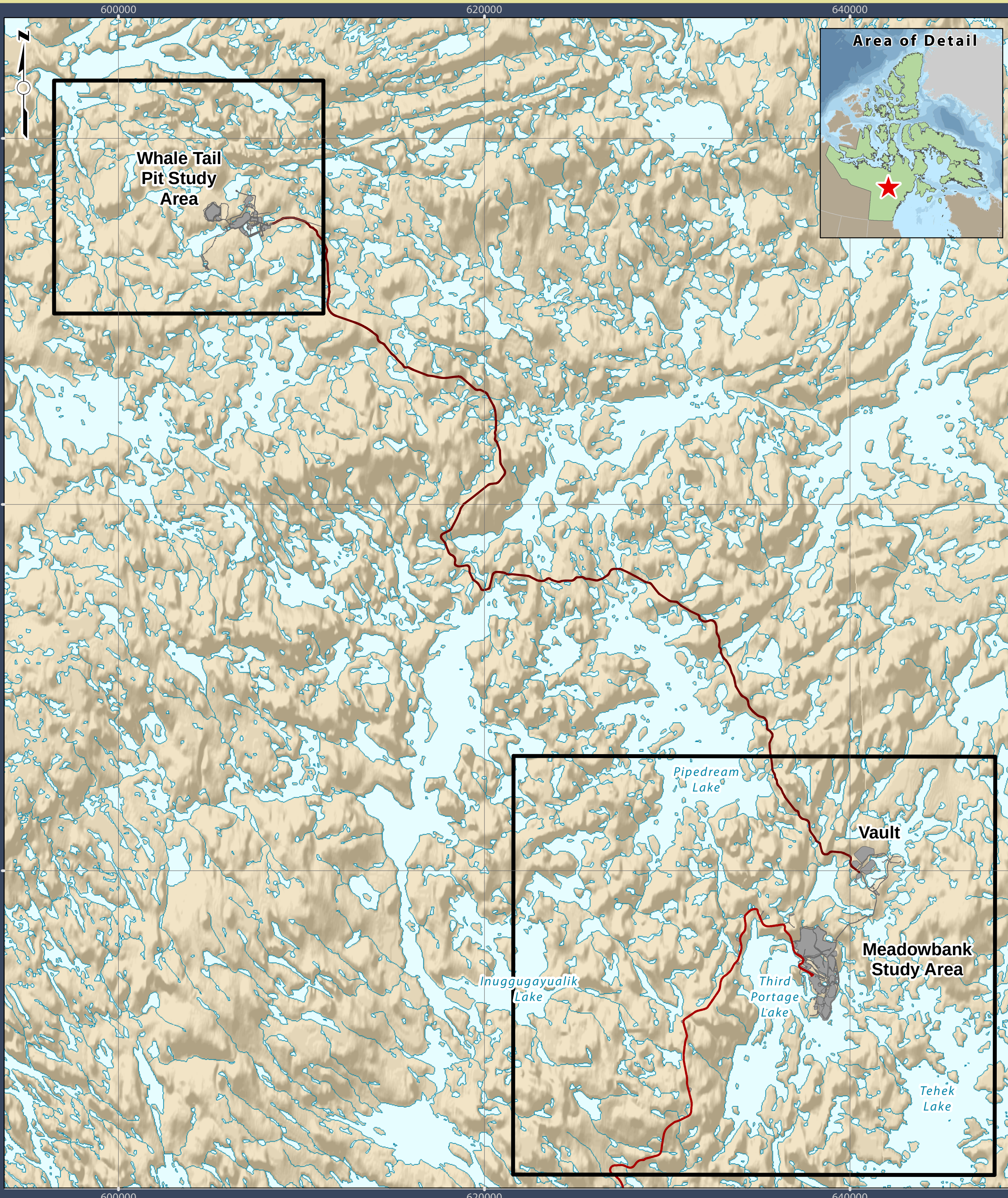
The application of trigger and threshold values complements the spatial-temporal trends assessment initiated in the 2011 CREMP (Azimuth, 2012a), which used trend plots (each showing monitoring results since 2006) to identify patterns of change consistent with one or more of the mining activities described in **Section 1.3**.

The general rationale for conducting the trend assessment followed these principles:

- **Establish Expected Conditions** – Control data (i.e., combination of baseline [i.e., pre-mining] data from impact areas and data from remote reference or control areas; see **Table 2-3**) were examined to set expectations for a parameter (e.g., water or sediment metal concentration, etc.) in the absence of mining activity. Baseline data were used to infer relative spatial differences (e.g., between a NF and Ref area) and reference data were used to infer regional temporal changes (e.g., the regional decrease in benthic community abundance between 2009 and 2010).
- **Compare Patterns of Change** – With expected conditions in mind, impact data (i.e., data collected at NF and MF areas after the onset of mining-related activity in proximity to an area; see **Table 1-1**) were assessed visually for spatial-temporal patterns (e.g., short-term [in any year] spikes [rapid rises that return to baseline] or longer-term trends [gradual or rapid increases that persist]) matching mining activity (e.g., rise in TSS concentrations at SP in August 2008). Where observed, the spatial and temporal extent and magnitude of the changes were characterized (i.e., do they extend to MF or FF areas, and if so, at what magnitude/duration?).

[4] For water and sediment quality, thresholds were generally set to existing environmental quality guidelines. Thresholds were not derived in cases where guidelines were unavailable or when baseline concentrations naturally exceeded existing guidelines (e.g., some metals in sediment).

- **Provide Context for Magnitude of Change** – As discussed above, site-specific triggers and thresholds were used to provide some context for observed changes to CREMP monitoring parameters. In addition, where applicable and available, results of target studies (e.g., TSS EAS studies) were used to help interpret changes in biological parameters and endpoints.
- **Identify Parameters for Management** – Identify parameters requiring management action on one of two levels: continued trend monitoring (i.e., to follow low magnitude or weak trends), or active follow-up with more detailed quantitative assessment (i.e., a targeted study to address a potential concern). This process will emphasize issues or concerns present in this year's CREMP results.



Legend

- Mine Sites
- All-Weather Access Road
- Whale Tail Haul Road
- River
- Lake

0 2 4 6 8
Kilometres

Projection: UTM Zone 14 NAD83

Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.

Figure 1-1. Meadowbank – Whale Tail Pit Expansion Project Study Area Overview

Meadowbank Gold Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

January 2020

Table 1-1. Chronology of mine development, operational activities, and receiving environment findings (2008 – 2019).

Note: The summary provided here pertains to Meadowbank study areas (2008-2019) and Whale Tail areas (2018-2019). Baker Lake is not considered a receiving environment for the CREMP (annual results are not summarized in this table).

Year	Major Mine-Related Activities	Receiving Environment Overview1
2008	• Major in-water construction activities included the East Dike (located in Second Portage Lake) and the Western Channel Dike (located between Third Portage Lake and Second Portage Lake); the closest CREMP sampling area to these activities was the Second Portage Lake area (SP). • Other site-related activities included rock crushing, road building, pit blasting, ground preparation, and infrastructure construction. • Barge traffic increases in Baker Lake to support construction.	• As described in detail elsewhere (Azimuth, 2009a; 2009b), East Dike construction led to a sedimentation event that extended through Second Portage Lake (SP) to Tehek Lake (TE). The potential impact of construction-related sediment releases to the aquatic environment was the focus of the four-year EAS study (Azimuth, 2009b, 2010d, 2011a, 2012c).
2009	• Dewatering discharges (i.e., impounded Second Portage Lake water with TSS) were directed primarily into the north basin of Third Portage Lake (TPN), but also into Second Portage Lake (March to July and Oct to Dec, 2009). • Bay-Goose Dike construction started in late July 2009. • Most of the site preparation and road infrastructure was completed in 2009. • North Portage Pit was the primary focus of blasting and mine operations. • Barge traffic increases in Baker Lake.	• Despite a number of precautions, storm winds broke the Bay-Goose Dike turbidity barrier containment system, leading to another sedimentation event in late August. • Elevated TSS (and other parameters) was primarily restricted to east basin of Third Portage Lake (TPE) and to a minor extent into SP and TE. The implications of the release were assessed in the EAS study (see above).
2010	• Bay-Goose Dike construction completed using additional mitigation measures. • Mine officially opened on 27 Feb 2010, marking the start of the operations period. • Pit development focused on North Portage and South Portage pits • Waste rock to rock storage facility (RSF). Tailings to impoundment area (TIA). Contact water from operations not discharged to receiving environment. • Dewatering of SP impoundment to TPN continued, with discharge now subject to MMER • Barge traffic increases in Baker Lake.	• Bay-Goose Dike construction leads to less-pronounced sedimentation event in TPE and extends through SP to TE; EAS studies continue. • TPN (dewatering) TSS concentrations generally consistent with baseline conditions.
2011	• Mining operations focus on North Portage and South Portage pits. • Waste rock to rock storage facility (RSF). Tailings to impoundment area (TIA). • Construction activities limited to mine footprint. • Dewatering of SP and TPE to TPN continued, with treatment added to reduce fine sediment and turbidity. • Barge traffic stabilizes in Baker Lake.	• TPN focus of routine EEM study - no mine-related effects detected (Azimuth, 2012e). • TPN TSS concentrations consistent with baseline. • The TSS EAS targeting dike construction sedimentation events completed.
2012	• SP and TPE dewatering discharges to TPN finished by spring. Diffuser installed and effluent (mix of residual Bay-Goose water, contact water, East Dike seepage and run-off) discharge to TPN commences; treatment (for fine sediment, turbidity) continues. • North cell non-contact water diversion ditches completed in August (intercepting run-off prior to the tailings and waste rock areas and diverting to NP2 and Dogleg ponds). • Vault access road constructed and site preparation activities for the Vault Pit and Vault Dike commence. • Barge traffic remains stable in Baker Lake; 200-L diesel spill occurs, but cleaned up successfully.	• TPN TSS concentrations generally consistent with baseline. • Minor mine-related trends identified for a number of water chemistry parameters at near-field areas: conductivity, sulphate and total dissolved solids. • Spill-related monitoring show no traces of hydrocarbons in Baker Lake.
2013	• Effluent discharge to TPN continued. • Fishout activity in Vault lake was completed. • Vault lake was dewatered into Wally Lake (ongoing) and did not require TSS treatment. • Minor construction modifications to north cell diversion ditches completed. • Completion of the Airstrip extension (18m) into Third Portage Lake in March. • Seepage from Rock Storage Facility (ST-16) through the road into NP2 identified (additional monitoring in NP2 to evaluate near-shore water quality).	• TPN TSS concentrations consistent with baseline. • Minor mine-related trends identified for a number of water chemistry parameters at near-field areas: alkalinity, conductivity, calcium and total dissolved solids. • TPE sediment chromium concentrations were elevated above trigger value; better spatial coverage needed to reduce uncertainty in 2014.

Year	Major Mine-Related Activities	Receiving Environment Overview1
2014	• Effluent discharge to TPN from the Portage Attenuation Pond occurred only from June 10 to July 5. Discharge to TPN is now complete. The former Portage Attenuation Pond has now become the South Cell for tailings deposition. • EEM Cycle 2 Study Design was conducted at the end of August through the beginning of September (no TPN discharge at this time). • Vault Dewatering into Wally Lake from June 20 to 29 (now complete); discharge from Vault Attenuation Pond into Wally Lake from July 24 to August 14. No TSS treatment for Vault Discharge. • New discharge into Second Portage Lake during all of 2014 (except from May 3 to July 28): two seepage collection points (North and South) are situated on west side of the East Dike to collect seepage through dike from SP. Water is pumped from both collection points, which are connected together before discharging back into Second Portage Lake through a diffuser. No TSS treatment for East Dike Discharge. • No seepage water from Rock Storage Facility (ST-16) reaching the NP2 Lake in 2014. • Commercial mining in Vault Pit started at the beginning of 2014. No major construction or modifications in 2014.	• Minor mine-related trends identified for a number of water chemistry parameters at near-field areas: conductivity, hardness, Ca/Mg/K/Na and total dissolved solids. • Temporal trend in TPE sediment chromium confirmed in coring study; targeted study recommended for 2015.
2015	• No discharge to TPN in 2015 • Vault discharge to Wally from July 7th to September 10th. No TSS treatment needed. • East dike (North-South) discharge to SP all year except from June 16th to August 10th. Discharge was stopped for increasing TSS levels as no treatment is available for this location. The discharge from East Dike that was not directed to 2PL was discharged in the Portage Pit and then pumped to the South Cell TSF (Tailings Storage Facility). • No seepage water from Rock Storage Facility to NP-2. Monitoring ongoing. • HCMP work completed for TP, SP and Dogleg lakes and at water crossing R02 along the AWAR. • One incident of elevated TSS from Vault road culverts to NP-1, early June, during freshet. Barriers installed. No impacts observed to Dogleg Lake.	• Minor mine-related trends identified for a number of water chemistry parameters at near-field areas: conductivity, hardness, Ca/Mg/K/Na and total dissolved solids. Parameters with effects-based thresholds (e.g., CCME water quality criteria) were below their respective trigger values in 2016. • Targeted sediment bioavailability and toxicity testing was completed at TPE. Toxicity test results on *Chironomus dilutus* and *Hyalella azteca*, combined with sequential extraction tests on the sediment, indicated current chromium concentrations at TPE are unlike to adversely affect the benthic invertebrate community. Continued monitoring was recommended for 2016, but addition target studies were not recommended for 2016. Phytoplankton and benthic invertebrate community results for the impact areas were within the range of reference/baseline conditions.
2016	• Vault discharge to Wally from June to September. No TSS treatment needed. • East dike (North-South) discharge to SP all year. • No seepage water from Rock Storage Facility to NP-2. Monitoring ongoing. • Phaser lake dewatering - August 26th to September 10th and September 15th to October 4th • Phaser Lake fishout from August 13th to 31st and September 10th to 25th • No Goose Pit reflooding activities • Pit E and pushback assessment • Mining focused on Vault Pit and Pit A • Amaruq exploration road construction (km 25 at end of 2016)	• Minor mine-related trends identified for a number of water chemistry parameters at near-field areas: conductivity, hardness, Ca/Mg/K/Na and total dissolved solids. • Similar trend of elevated chromium in sediment grab samples from TPE, but the concentrations appear stable relative to those measured in 2015. • Phytoplankton and benthic invertebrate community results for the impact areas were within the range of reference/baseline conditions.
2017	• Vault discharge to Wally from June to October. No TSS treatment needed • East dike (North-South) discharge to SP all year except from May 12th to September 5. Discharge was also stopped from September 23 to October 29th. Discharge was stopped for increasing TSS levels as no treatment is available for this location. The discharge from East Dike that was not directed to SP was discharged in the Portage Pit and then pumped to the South Cell TSF (Tailings Storage Facility). • No seepage water from Rock Storage Facility to NP-2. Monitoring ongoing • No Goose Pit reflooding activities • Mining focused on Vault Pit and Pit A, Pit E and Phaser Pit • Amaruq exploration road completed • Phaser Pit started in November • HCMP work completed for TP, SP and Dogleg lakes and at water crossing R02 along the AWAR • One incident of elevated TSS from Vault road to NP-1, early June, during freshet. Barriers installed. No impacts observed to Dogleg Lake.	• Minor mine-related trends identified for a number of water chemistry parameters at near-field areas: conductivity, hardness, Ca/Mg/K/Na and total dissolved solids. Parameters with effects-based thresholds (e.g., CCME water quality criteria) were below their respective trigger values in 2017. • Phytoplankton and benthic invertebrate community results for the impact areas were within the range of reference/baseline conditions. • Core chemistry was analyzed for all study areas in 2017. Chromium in TPE and Arsenic in WAL were flagged for follow-up assessment in 2018 based on BACI results.

Year	Major Mine-Related Activities	Receiving Environment Overview1
2018	*Meadowbank* • East dike (North-South) discharge to SP all year except from June 4th to August 21st. Discharge was stopped for increasing • SS levels as no treatment is available for this location. The discharge from East Dike that was not directed to SP was discharged in the Portage Pit and then pumped to the South Cell TSF (Tailings Storage Facility). • No seepage water from Rock Storage Facility to NP-2; monitoring ongoing • No Goose Pit reflooding activities • Mining focused on Vault Pit and Pit A, Pit E and Phaser Pit • No discharge to Wally in 2018	• See Section 4 for a discussion of the 2018 CREMP results for the Meadowbank study area lakes.
	Whale Tail Pit Expansion Project • Whale Tail Dike Construction began on July 27 • Whale Tail Pit commencement of Quarry 2 began in September • Freshwater intake from NEMO Lake started on Oct 28 • Whale Tail North fishout Aug 13 - Sept 28 • Newterra Wastewater treatment system at AMQ operational in March • Crusher activities started on the waste rock storage facility (WRSF) on Oct 21 • Quarry 2 overburden stripping • Snow removal in preparation of dike construction near Mammoth Lake (WRSF dike and Mammoth Dike)	• 2018 was a transition year for the Whale Tail Pit study area. Only WTS was considered *impact* from August onwards and impacts to water quality, sediments, and biota are considered unlikely for 2018. • See Section 5 for a discussion of the 2018 CREMP results for the Whale Tail study area lakes.
2019	*Meadowbank* • East dike (North-South) discharge to SP was stopped on March 30. Restarted on November 13. • No seepage water from Rock Storage Facility to NP-2; monitoring ongoing. • Goose Pit water transfer from South Cell to Goose started on June 11. • In-pit disposal started at Bay-Goose in July. • End of mine production at Phaser Pit and Vault (Q1), Pit E (Q4). • No discharge to Wally in 2019. • Addition of tank infrastructure at Baker Lake (1 tank, containment for 2).	• Study focused on monitoring changes in the near field study areas in TPE, SP and WAL. • Targeted bioavailability studies conducted at TPE. • Limnology results were consistent with previous years. • Minor mine-related trends identified for a number of water chemistry parameters at near-field areas: conductivity, hardness, Ca/Mg/K/Na, total silicon and total dissolved solids. • Phytoplankton community results for the impact stations showed an increase in biomass and taxa richness in 2019 compared to 2018. • Benthic invertebrate community results for the impact stations were within the range of reference/baseline conditions. • Core chemistry was collected for TPE to follow-up on 2018 results. Results were comparable to 2018 with concentrations of Chromium in TPE still slightly above background concentrations. In 2019, concentrations of zinc in one core sample exceeded the trigger and threshold values.

Year	Major Mine-Related Activities	Receiving Environment Overview1
2019	*Whale Tail Pit Expansion Project* • Whale Tail Pit activities ongoing for all of 2019. • Dewatering/Diversion pumping into Whale Tail Lake South Basin started April 1 is ongoing. • Dewatering of Whale Tail North to Whale Tail South occurred from April 1 to April 9, May 3 to May 17 and again from May 24 to May 29. • Dewatering/Diversion pumping into Mammoth Lake started June 22 and ended November 18. • Higher than expected precipitation in June and July required additional water management. • NE Dike impoundment pumped to AP5 and through to Nemo Water shed June 21 to September 27. • Dewatering of Whale Tail North to Mammoth occurred from June 22 to June 30 and August 1 to October 26. • Water transfer from Quarry 1 pond to Mammoth Lake August 26 to October 23. • Water seep from WTS through dike pumped back into WTS from October 4 to November 2, and November 7 to 16. • Dewatering of Whale Tail North to Whale Tail South through WTP November 7 is ongoing. • Whale Tail Dike Grouting project started on November 14 is ongoing. • Pumping from Whale Tail South to Mammoth occurred October 24 to December 9. • Lake A45 dewatering to the tundra near Mammoth shoreline occurred from November 25 to November 27. • Construction and drilling in the South Whale Tail diversion channel between A20 and Mammoth began around December 1.	● 2019 was a transition year for the Whale Tail study area when most lakes switched designation from *control* to *impact*. ● Minor mine-related trends identified for 16 water chemistry parameters at Whale Tail south basin. ● Phytoplankton community results for WTS and MAM showed an increase in biomass in 2019 compared to 2018. ● Benthic invertebrate community results for the impact stations were within the range of baseline conditions. ● Sediment chemistry results for 2019 were generally consistent with previous years and showed no indications of construction-related changes.

2 CREMP STUDY DESIGN

2.1 Overview

The *CREMP: 2015 Plan Update* (Azimuth, 2015b) describes the CREMP study design and methods, and integrates a number of changes from the previous CREMP plan (Azimuth, 2010d), including those stemming from the NWB Type A Water License renewal process. The *Whale Tail Pit Addendum* (Azimuth 2018b) mirrors the CREMP study design in the monitoring components, approach to sampling (SOPs), QA/QC program, and data evaluation[5].

To streamline the annual report and reduce redundancy, aspects of the CREMP study design presented in the *CREMP: 2015 Plan Update* are not repeated herein. Readers looking for detailed information on the aspects of the study design such as sampling methods, QA/QC protocols and procedures, and data evaluation criteria are referred to Azimuth (2015b). A summary of the CREMP study design is included to guide the reader.

2.2 Routine CREMP Sampling

2.2.1 Sampling Areas

The CREMP is intended to detect changes at a basin or lake scale to help define the extent (both spatially and temporally) of any changes in water quality, sediment chemistry, or biological communities (phytoplankton and benthos). A common element for the Meadowbank and Whale Tail Pit study designs is the use of near-field (NF), mid-field (MF), and far-field (FF) areas to provide spatial context when interpreting potential changes year-over-year. Near-field areas provide the first line of early-warning for introductions of stressors into the receiving environment. These areas are situated closest to the development near dikes, dewatering discharge points, and proposed effluent sources. MF and FF areas are located farther downstream from the NF monitoring areas and provide insights into the spatial extent of any observed changes in chemistry or biological communities closer to the source. A detailed description of the Meadowbank and Baker Lake study areas is included in the *CREMP: 2015 Plan Update* (Azimuth, 2015b); the Whale Tail Pit study areas are described in the addendum to the *CREMP: 2015 Plan Update* (Azimuth, 2018b). A brief description of the sampling areas is provided below.

[5] New triggers will be developed for evaluating water and sediment quality for lakes within the Whale Tail study area.

Meadowbank Sampling Areas

There are 9 sampling areas included in the Meadowbank CREMP. Third Portage Lake East Basin and North Basin (TPE and TPN), Second Portage Lake (SP), and Wally Lake (WAL) are the NF areas monitored annually for changes related to operations at the Meadowbank mine and mill. Tehek (TE) the South Basin of Third Portage Lake (TPS) and Tehek far-field (TEFF) are monitored only if changes are detected upstream at the NF locations consistent with the strategy outline in **Section 2.2.3.** Two reference areas are shared for the Meadowbank and Whale Tail Pit programs: Inuggugayualik Lake (INUG) and Tasirjuaraajuk Lake (aka Pipedream Lake [PDL]). INUG has been the core reference area since formal monitoring began in 2006. PDL was added to the Meadowbank CREMP in 2009; while the absence of data at this area from 2006 to 2008 make it of limited utility in the BACI statistical analyses, it provides insights into the strength of regional patterns (i.e., how well it matches INUG).

The 2019 sampling areas for the Meadowbank CREMP are shown in **Figure 4-1** (water and phytoplankton) and **Figure 4-2** (sediment and benthos).

Whale Tail Sampling Areas

There are 6 lakes currently included in the Whale Tail Pit CREMP study design. Whale Tail Lake South Basin (WTS) and Mammoth Lake (MAM) are NF areas designed to detect changes related to dike construction in Whale Tail Lake and Mammoth Lake and eventual discharge of treated water during operations. Nemo Lake (NEM) is also considered a NF area because of its proximity to the site, even though it is situated in a different watershed. MF areas are Lake A20 (upstream from WTS, but joined to WTS after flooding) and Lake A76 (downstream from MAM). Lake A76 is situated at the junction of the two flow paths leading to Lake DS1. Given its morphology and location, it represents an ideal MF exposure area for both flow paths. Lake DS1 is the FF location to provide additional context for characterizing spatial extent of effects.

The 2019 sampling areas for the Whale Tail Pit CREMP are shown in **Figure 5-1** (water and phytoplankton) and **Figure 5-2** (sediment and benthos).

Baker Lake Sampling Areas

There are two NF areas for the Baker Lake CREMP, one targeting the hamlet's barge landing area (Baker Barge Dock [BBD]) and the other AEM's fuel storage facility (Baker Proposed Jetty[6] [BPJ]). The primary reference area for Baker Lake is located approximately 10 kilometers to the east of the hamlet along the north shore of the lake (Baker Akilahaarjuk Point [BAP]). A second

[6] Note that while a jetty was initially considered, the idea was abandoned in favour of continued use of the existing barge landing.

reference area on the East Shore of Baker Lake (BES) between BAP and BPJ was added in 2011 to provide additional context for interpretation of sediment chemistry and benthic invertebrate data.

The 2019 sampling areas for the Baker Lake CREMP are shown in **Figure 6-1.**

2.2.2 Monitoring Components

Water quality, sediment quality, phytoplankton community, and benthic invertebrate community were monitored in the core 2019 program. Sampling was undertaken according to established SOPs included in the *CREMP: 2015 Plan Update* (Azimuth, 2015b). Locations for water, limnology, and phytoplankton were selected randomly for the Meadowbank and Baker lakes areas from within their respective lake basins. The Whale Tail Pit study area lakes are smaller and more variable in depth compared to the Meadowbank project lakes. To avoid selecting locations in less than 5 m of water, a number of fixed water quality monitoring locations were established in each lake. Two locations were randomly selected for water quality monitoring (i.e., limnology, chemistry, and phytoplankton, in each full event. In 2019 these events occurred in March, May, July, August, and September. A single location is selected for limnology profiles (without paired chemistry or phytoplankton). In 2019, limnology only monitoring occurred in January, February, April, November, and December[7]. No water sampling occurs in June or October when ice conditions are unsafe. Sediment for chemistry and benthic invertebrate community analyses were collected from the established areas (i.e., depositional zones between 6.5 m and 9 m) in each basin/lake. 2019 was a supplemental coring year, with follow-up sampling conducted at TPE to verify results from the 2018 CREMP (Azimuth, 2019a).

Table 2-1 lists the monitoring components sampled at the various study areas in 2019. Global Positioning System (GPS) Universal Transverse Mercator (UTM) coordinates (in NAD 83) are shown in **Table 2-2** for the all CREMP study areas.

Samples from the 2019 CREMP were sent to the laboratories listed below for analysis:

- Water and bulk sediment chemistry – ALS Laboratories (Burnaby, BC)
- Phytoplankton taxonomy – Plankton R Us Inc. (Winnipeg, MB)
- Benthic invertebrate taxonomy – ZEAS Inc. (Nobleton, ON)

[7] Limnology only profiles are collected at a subset of the areas.

2.2.3 Sampling Effort

A results-driven sampling strategy for the Meadowbank study lakes was developed as part of the *CREMP: 2015 Plan Update* (Azimuth, 2015b). The objective of this strategy is to increase the overall efficiency of the CREMP by maintaining monitoring intensity in the areas most likely to be affected by mining-related activities (i.e., NF areas), while potentially reducing monitoring intensity at MF and FF areas depending on the water quality results observed at up-gradient areas. The annual decision framework presented in the *CREMP: 2015 Plan Update* (Azimuth, 2015b; **Figure 2-1** [below]) applies to MF and FF areas at Meadowbank (i.e., MF area TE (which is paired with upstream NF areas TPE, SP, and WAL), MF area TPS (which is paired with NF area TPN), and to FF area TEFF (paired with upstream MF area TE). The same strategy may eventually be implemented at Whale Tail as more years of 'after' data become available. For the time being, monitoring at Whale Tail MF and FF areas will continue at the same frequency as the NF areas (i.e., there were five water chemistry/phytoplankton sampling events in 2019).

As per the normal Meadowbank CREMP data analysis process, NF results are evaluated on an annual basis (i.e., with CREMP reporting due at the end of March following each monitoring year), with the NF results (i.e., for *Year*) dictating the monitoring requirements for the MF area in the subsequent year (i.e., *Year +1*). The Year +1 NF and MF results are used as the basis to determine the MF and FF monitoring requirements for Year +2, and so on. While the full CREMP program will be conducted at each NF area each year, the specific monitoring requirements for the MF and FF areas vary based on the NF and MF results, respectively. Below are the various outcomes of the CREMP data analysis and associated program requirements for MF and FF areas in the following year (see Azimuth, 2015b for more details, including a worked example of the strategy):

- No changes identified – no statistical changes above any trigger values. No further sampling required.
- Minor changes identified – statistically significant changes exceeding the early warning trigger values for parameters without effects-based threshold values (i.e., trigger values are based on the 95th percentile of the baseline distribution). Spot sampling through-ice is required to determine if changes extend to MF area (or to FF if such changes are seen at an MF area), but no further sampling is needed that year at the MF or FF areas unless moderate changes (see below) are identified at those areas.
- Moderate changes identified – statistically significant changes exceeding the early warning trigger values for parameters with effects-based thresholds (e.g., CCME water quality guidelines for water chemistry parameters). Full CREMP water sampling (all

events) is required to determine if changes extend to MF area (or to FF if such changes are seen at an MF area).

- Major changes identified – statistically significant changes exceeding the effects-based threshold values. Full CREMP program (i.e., including sediment and biological components) is required to determine if changes extend to MF area (or to FF if such changes are seen at an MF area).

Minor changes to water quality parameters without toxicologically-derived effects-based thresholds were identified in the 2018 CREMP (Azimuth, 2019a). Following the strategy outlined above, these results warranted a pared-down monitoring program at MF (TPS and TE) and FF (TEFF) areas in 2019. Water sampling through-ice was completed (at NF, MF and FF areas) in March 2019, but further water sampling at MF or FF areas during the open-water season was not completed.

Table 2-1. CREMP sampling summary, 2019.

Sampling Month	Sampling Crew	Conditions	Components	Meadowbank Areas									Baker Areas				Whale Tail Pit Areas					
				INUG	PDL	TPN	SP	TPE	WAL	TPS	TE	TEFF	BAP	BES	BBD	BPJ	WTS	MAM	NEM	A20	A76	DS1
				REF	REF	NF	NF	NF	NF	MF	MF	FF	REF	REF	NF	NF	NF	NF	NF	MF	MF	FF
January	Agnico	Ice	L			✓	✓	✓	✓								✓	✓	✓			
February	Agnico	Ice	L			✓	✓	✓	✓								✓	✓	✓			
March	Agnico	Ice	L,W,P	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓	✓
April	Agnico	Ice	L			✓	✓	✓	✓								✓	✓	✓			
May	Agnico	Ice	L,W,P	✓	✓	✓	✓	✓	✓								✓	✓	✓	✓	✓	✓
June	***Ice not safe***																					
July	Agnico	Open-water	L,W,P	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓	✓	✓	✓	✓
August	Azimuth	Open-water	L,W,P	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓	✓	✓	✓	✓
			B,S	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
			C					✓														
September	Agnico	Open-water	L,W,P	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓	✓	✓	✓	✓
October	***Ice not safe***																					
November	Agnico	Ice	L,W,P	✓	✓	✓	✓	✓	✓								✓	✓	✓	✓	✓	✓
December	Agnico	Ice	L			✓	✓	✓	✓								✓	✓	✓			

Notes:
Components: L=Limnology; W=Water chemistry; P=Phytoplankton; B=Benthic invertebrates; S=Sediment grab chemistry; C=Sediment coring chemistry.
✓ = monitoring components were collected.
Area designations: C=Control; I=Impact; REF=reference (in grey shading); NF=near-field (in blue shading); MF=mid-field (in pink shading); FF=far-field (in teal shading)
Area IDs:
Meadowbank and Whale Tail Pit Reference areas: INUG = Inuggugayualik Lake; PDL = Pipedream Lake
Meadowbank areas: TPN, TPE, TPS = Third Portage Lake – North, East, South basins; SP = Second Portage Lake; WAL = Wally Lake; TE, TEFF = Tehek Lake (Mid-field and Far-field)

Baker Lake areas: BAP, BES, BBD, BPJ=Baker Lake – Akilahaarjuk Point, East Shore, Barge Dock, Proposed Jetty.
Whale Tail Pit areas: WTS = Whale Tail Lake South Basin; MAM = Mammoth Lake; NEM = Nemo Lake; A20 = Lake A20; A76 = Lake A76; DS1 = Lake DS1

Table 2-2. CREMP sampling coordinates for Meadowbank and Baker Lake study areas, 2019.

Area[1]	Area Type[2]	Area-Replicate	Water & Phytoplankton (monthly)				Benthos & Sediment Chemistry (August)				
			Month	Depth (m)	Zone & Easting	Northing	Area-Replicate	Sample Type[3]	Depth (m)[4]	Zone & Easting	Northing
Meadowbank Areas											
TPE	NF	TPE-limno	January	24.0	14W 639157	7211415	TPE-1	B & C	8.8	14W 639051	7211503
		TPE-limno	February	10.0	14W 637794	7211735	TPE-2	B & C	7.2	14W 639083	7211551
		TPE-limno	April	16.0	14W 637969	7210205	TPE-3	B & C	7.5	14W 639112	7211560
		TPE Limno	November	16.7	14W 639029	7211365	TPE-4	B & C	6.5	14W 639150	7211696
		TPE Limno	December	12.2	14W 636194	7214914	TPE-5	B & C	7.3	14W 639135	7211748
		TPE-120	March	7.5	14W 638969	7211487	TPE-COMP	C			
		TPE-121	March	7.9	14W 637282	7212026	TPE-SC-1	C	8.6	14W 639055	7211500
		TPE-122	May	11.6	14W 639341	7211297	TPE-SC-2	C	8.7	14W 639050	7211488
		TPE-123	May	14.7	14W 639346	7212579	TPE-SC-3	C	7.3	14W 639085	7211552
		TPE-124	July	10.0	14W 639327	7212747	TPE-SC-4	C	6.6	14W 639074	7211542
		TPE-125	July	7.5	14W 639033	7211517	TPE-SC-5	C	7.5	14W 639109	7211562
		TPE-126	August	7.3	14W 639088	7212521	TPE-SC-6	C	8.1	14W 639109	7211548
		TPE-127	August	16.0	14W 639569	7210471	TPE-SC-7	C	7.6	14W 639151	7211691
		TPE-128	September	6.3	14W 638278	7211367	TPE-SC-8	C	8.3	14W 639153	7211680
		TPE-129	September	11.7	14W 639626	7211729	TPE-SC-9	C	7.7	14W 639136	7211747
							TPE-SC-10	C	8.7	14W 639144	7211744
TPN	NF	TPN-limno	January	9.5	14W 636814	7214945	TPN-1	B & C	7.5	14W 636405	7215534
		TPN-limno	February	14.0	14W 635149	7212737	TPN-2	B & C	7.7	14W 636366	7215539
		TPN-limno	April	25.0	14W 635899	7215137	TPN-3	B & C	8.8	14W 636346	7215521
		TPN-limno	November	24.0	14W 636456	7213962	TPN-4	B & C	8.1	14W 636432	7215512
		TPN-limno	December	24.0	14W 638041	7210108	TPN-5	B & C	8.3	14W 636454	7215483
		TPN-120	March	12.5	14W 636658	7214370	TPN-COMP	C			
		TPN-121	March	12.9	14W 634919	7213954					
		TPN-122	May	10.4	14W 635389	7212917					
		TPN-123	May	14.3	14W 634710	7216091					
		TPN-124	July	6.2	14W 636958	7212174					
		TPN-125	July	12.2	14W 635454	7215501					
		TPN-126	August	10.1	14w 636309	7214389					
		TPN-127	August	14.7	14W 635568	7216056					
		TPN-128	September	19.0	14W 635528	7214208					
		TPN-129	September	18.0	14W 636540	7214965					

Area[1]	Area Type[2]	Area-Replicate	Water & Phytoplankton (monthly)				Benthos & Sediment Chemistry (August)				
			Month	Depth (m)	Zone & Easting	Northing	Area-Replicate	Sample Type[3]	Depth (m)[4]	Zone & Easting	Northing
TPS	MF	TPS-61	March	9.4	14W 635700	7209458					
		TPS-62	March	15.7	14W 633467	7208427					
SP	NF	SP-limno	January	8.8	14W 639734	7214120	SP-1	B & C	8	14W 639992	7214078
		SP-limno	February	9.8	14W 639669	7214588	SP-2	B & C	7.9	14W 640028	7214111
		SP-limno	April	11.0	14W 640080	7214080	SP-3	B & C	8.3	14W 640050	7214132
		SP-limno	November	16.7	14W 639819	7213985	SP-4	B & C	7.6	14W 640060	7214161
		SP-limno	December	19.2	14W 639488	7213898	SP-5	B & C	7.3	14W 640071	7214196
		SP-120	March	11.3	14W 639936	7213808	SP-COMP	C			
		SP-121	March	5.1	14W 639589	7213886					
		SP-122	May	12.0	14W 640537	7212857					
		SP-123	May	6.0	14W 640103	7210448					
		SP-124	July	6.8	14W 640332	7213475					
		SP-125	July	7.2	14W 640121	7213919					
		SP-126	August	7.0	14W 639972	7213665					
		SP-127	August	7.7	14W 640599	7213413					
		SP-128	September	8.4	14W 640407	7213746					
		SP-129	September	9.7	14W 640664	7213045					
TE	MF	TE-96	March	10.7	15W 360143	7212302					
		TE-97	March	13.9	15W 360937	7212444					
TEFF	FF	TEFF-48	March	10.2	15W 362460	7208990					
		TEFF-49	March	10.5	15W 363949	7210013					
Wally	NF	WAL-limno	January	6.5	15W 360872	7211498	WAL-1	B & C	8.0	15W 360949	7220404
		WAL-limno	February	12.5	15W 360835	7220722	WAL-2	B & C	7.7	15W 360919	7220434
		WAL-limno	April	5.5	15W 361805	7222824	WAL-3	B & C	7.6	15W 360890	7220470
		WAL Limno	November	9.3	15W 361757	7222628	WAL-4	B & C	8.5	15W 360916	7220473
		WAL Limno	December	5.9	15W 362431	7221417	WAL-5	B & C	8.5	15W 360912	7220493
		WAL-89	March	8.1	15W 360997	7221932	WAL-COMP	C			
		WAL-90	March	7.4	15W 360862	7220520					
		WAL-91	May	13.0	15W 361932	7222655					
		WAL-92	May	5.5	15W 361425	7222234					
		WAL-93	July	6.3	15W 361752	7221412					
		WAL-94	July	7.0	15W 361546	7221570					
		WAL-95	August	6.8	15W 360993	7221919					
		WAL-97	September	5.2	15W 360443	7221214					
		WAL-98	September	9.8	15W 361804	7222670					
		WAL-88	November	10.5	15W 360716	7222032					

Area[1]	Area Type[2]	Area-Replicate	Water & Phytoplankton (monthly)				Benthos & Sediment Chemistry (August)				
			Month	Depth (m)	Zone & Easting	Northing	Area-Replicate	Sample Type[3]	Depth (m)[4]	Zone & Easting	Northing
Reference Areas (Meadowbank and Whale Tail)											
INUG	Ref	INUG-108	March	6.3	14W 622826	7216839	INUG-1	B & C	7.0	14W 622821	7216852
		INUG-109	March	14.7	14W 622413	7215739	INUG-2	B & C	7	14W 622781	7216859
		INUG-110	May	8.0	14W 622672	7214948	INUG-3	B & C	8	14W 622743	7216831
		INUG-111	May	11.0	14W 622715	7216489	INUG-4	B & C	8.7	14W 622706	7216784
		INUG-112	July	5.2	14W 622716	7216899	INUG-5	B & C	9.4	14W 633680	7216779
		INUG-113	July	10.2	14W 622463	7215544	INUG-COMP	C			
		INUG-114	August	10.9	14W 622565	7215133					
		INUG-115	August	5.3	14W 622366	7216336					
		INUG-116	September	7.6	14W 622177	7216033					
		INUG-117	September	7.1	14W 622609	7215451					
PDL	Ref	PDL-73	March	20.0	14W 631625	7224861	PDL-1	B & C	6.7	14W 630570	7222989
		PDL-74	March	14.2	14W 632451	7225354	PDL-2	B & C	7	14W 630603	7223035
		PDL-75	May	5.3	14W 630635	7222999	PDL-3	B & C	6.8	14W 630728	7222731
		PDL-76	May	15.0	14W 629784	7224749	PDL-4	B & C	7.4	14W 630671	7223047
		PDL-77	July	7.3	14W 629713	7224760	PDL-5	B & C	6.6	14W 630594	7223007
		PDL-78	July	7.2	14W 630752	7223098	PDL-COMP	C			
		PDL-79	August	27.0	14W 631488	7224214					
		PDL-80	August	7.0	14W 631876	7223965					
		PDL-81	September	14.0	14W 630457	7223629					
		PDL-82	September	12.0	14W 630201	7222713					
Baker Lake Stations											
BBD	NF	BBD-63	August	13.1	14W 644694	7135113	BBD-1	B & C	8.4	14W 644534	7135312
		BBD-64	August	9.6	14W 643975	7135329	BBD-2	B & C	9.2	14W 644588	7135276
		BBD-65	September	10.0	14W 644260	7135291	BBD-3	B & C	8.3	14W 644429	7135351
		BBD-66	September	6.1	14W 644731	7135230	BBD-4	B & C	8.6	14W 644491	7135320
		BBD-61	July	12.6	14W 644586	7135194	BBD-5	B & C	8.2	14W 644567	7135298
		BBD-62	July	6.4	14W 644485	7135375	BBD-COMP	C			
BPJ	NF	BPJ-61	July	24.0	15W 356995	7134082	BPJ-1	B & C	7.3	15W 357295	7134109
		BPJ-62	July	15.6	15W 357104	7134072	BPJ-2	B & C	9.1	15W 357223	7134119
		BPJ-63	August	11.0	15W 357218	7134078	BPJ-3	B & C	8.4	15W 357191	7134156
		BPJ-64	August	15.0	15W 356709	7134281	BPJ-4	B & C	8.4	15W 357076	7134216
		BPJ-65	September	0.0	15W 357320	7133874	BPJ-5	B & C	8	15W 357035	7134222
		BPJ-66	September	17.6	15W 356923	7134114	BPJ-COMP	C			

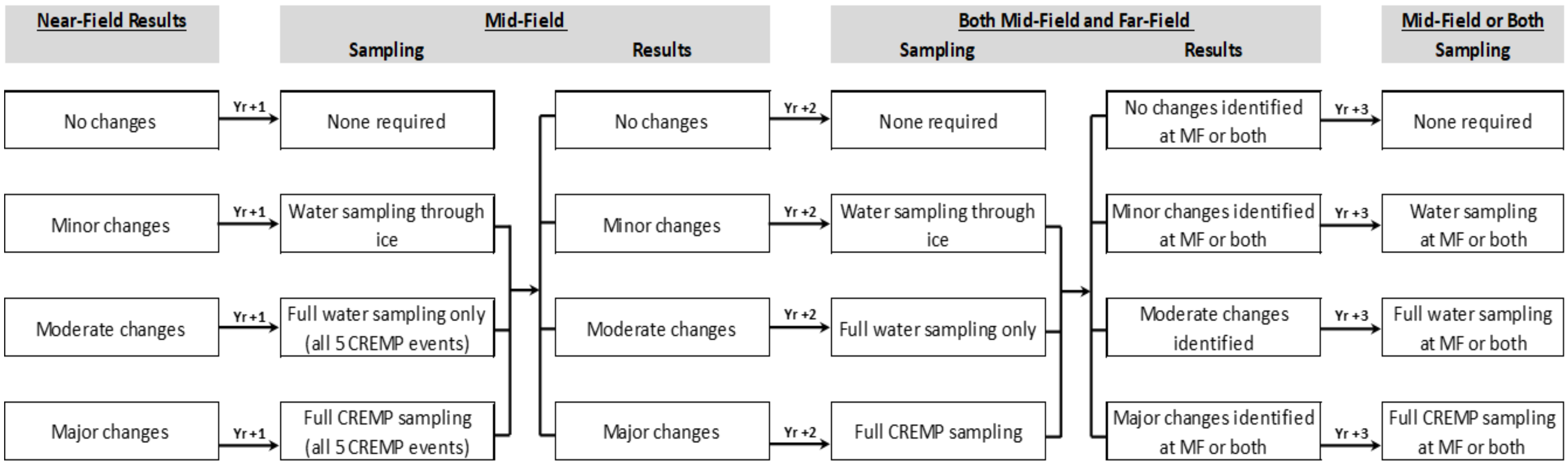
Area[1]	Area Type[2]	Area-Replicate	Water & Phytoplankton (monthly)				Benthos & Sediment Chemistry (August)				
			Month	Depth (m)	Zone & Easting	Northing	Area-Replicate	Sample Type[3]	Depth (m)[4]	Zone & Easting	Northing
BES	Ref						BES-1	B & C	9.1	15W 361230	7132385
							BES-2	B & C	8.7	15W 361266	7132374
							BES-3	B & C	9.4	15W 361305	7132349
							BES-4	B & C	8.4	15W 361374	7132327
							BES-5	B & C	9	15W 361413	7132304
							BES-COMP	C			
BAP	Ref	BAP-61	July	24.0	15W 362925	7131047	BAP-1	B & C	7	15W 363988	7131225
		BAP-62	July	15.7	15W 363938	7131074	BAP-2	B & C	9.3	15W 364023	7131179
		BAP-63	August	33.4	15W 363015	7131130	BAP-3	B & C	8.8	15W 364073	7131152
		BAP-64	August	10.4	15W 363816	7131188	BAP-4	B & C	7.8	15W 364133	7131140
		BAP-65	September	0.0	15W 364105	7130677	BAP-5	B & C	9.1	15W 364147	7131050
		BAP-66	September	9.5	15W 363626	7131222	BAP-COMP	C			
Whale Tail Lake Stations											
WTS	NF	WTS-limno	January	6.9	14W 607565	7254178	WTS-1	B & C	9.9	14W 607140	7253545
		WTS-limno	February	6.1	14W 607479	7252757	WTS-2	B & C	11.9	14W 607176	7253533
		WTS-limno	November	6.4	14W 607646	7254594	WTS-3	B & C	10.9	14W 607109	7253579
		WTS-limno	December	6.8	14W 607648	7254052	WTS-4	B & C	10.6	14W 607102	7253651
		WTS-37	March	15.6	14W 607376	7253849	WTS-5	B & C	10.5	14W 607157	7253648
		WTS-38	March	5.9	14W 607519	7254193	WTS-COMP	C			
		WTS-39	May	8.0	14W 607574	7254084					
		WTS-40	May	10.0	14W 607163	7253609					
		WTS-41	July	15.9	14W 607269	7253659					
		WTS-42	July	12.1	14W 607488	7254336					
		WTS-43	August	9.6	14W 607696	7254008					
		WTS-44	August	17.0	14W 607232	7253566					
		WTS-45	September	7.2	14W 607571	7254136					
		WTS-46	September	6.9	14W 607263	7253518					
MAM	NF	MAM-limno	January	0.0	14W 605412	7255062	MAM-1	B & C	8.6	14W 605065	7254872
		MAM-limno	February	6.9	14W 604984	7254747	MAM-2	B & C	7.6	14W 605051	7254891
		MAM-limno	April	8.2	14W 605074	7254852	MAM-3	B & C	8.3	14W 605021	7254885
		MAM-limno	November	14.4	14W 604084	7254456	MAM-4	B & C	8.5	14W 604983	7254889
		MAM-limno	December	14.6	14W 604084	7254456	MAM-5	B & C	8.2	14W 605006	7254868
		MAM-37	March	8.7	14W 605359	7255129	MAM-COMP	C			

Area[1]	Area Type[2]	Area-Replicate	Water & Phytoplankton (monthly)				Benthos & Sediment Chemistry (August)				
			Month	Depth (m)	Zone & Easting	Northing	Area-Replicate	Sample Type[3]	Depth (m)[4]	Zone & Easting	Northing
MAM	NF	MAM-38	March	6.3	14W 604059	7254491					
		MAM-39	May	9.5	14W 605354	7255109					
		MAM-40	May	13.2	14W 604068	7254478					
		MAM-41	July	8.6	14W 607269	7253659					
		MAM-42	July	5.1	14W 605285	7254940					
		MAM-43	August	8.3	14W 605393	7255097					
		MAM-44	August	6.0	14W 604145	7253925					
		MAM-45	September	9.7	14W 605355	7255089					
		MAM-46	September	8.1	14W 604389	7254398					
NEM	NF	NEM-limno	January	6.9	14W 606546	7257303	NEM-1	B & C	9.2	14W 606557	7257380
		NEM-limno	February	10.1	14W 606551	7257468	NEM-2	B & C	9	14W 606543	7257365
		NEM-limno	April	6.3	14W 606661	7257463	NEM-3	B & C	9.3	14W 606520	7257314
		NEM-limno	November	16.6	14W 606669	7257708	NEM-4	B & C	8.9	14W 606542	7257328
		NEM-limno	December	9.3	14W 606542	7257427	NEM-5	B & C	8.2	14W 606553	7257349
		NEM-37	March	9.3	14W 606220	7257398	NEM-COMP	C			
		NEM-38	March	5.4	14W 606559	7257303					
		NEM-39	May	10.5	14W 606617	7257602					
		NEM-40	May	15.8	14W 606571	7257957					
		NEM-41	July	11.9	14W 606131	7257409					
		NEM-42	July	10.3	14W 606634	7257813					
		NEM-43	August	14.2	14W 606234	7257496					
		NEM-44	August	13.8	14W 606987	7257841					
		NEM-45	September	16.6	14W 606671	7257916					
		NEM-46	September	13.2	14W 606152	7257527					
Lake A20	MF	A20-31	March	5.9	14W 604684	7252483	A20-1	B & C	7.9	14W 604599	7252538
		A20-32	March	0.0	14W 604265	7252647	A20-2	B & C	8.4	14W 604666	7252545
		A20-33	May	5.6	14W 605204	7252788	A20-3	B & C	8.9	14W 604635	7252489
		A20-34	May	20.0	14W 604383	7252617	A20-4	B & C	9.2	14W 604669	7252519
		A20-35	July	11.0	14W 604524	7252545	A20-5	B & C	9.1	14W 604614	7252571
		A20-36	July	5.5	14W 605157	7252791	A20-COMP	C			
		A20-37	August	5.9	14W 604657	7252410					
		A20-38	August	10.8	14W 604136	7252591					
		A20-39	September	5.9	14W 605263	7252781					
		A20-40	September	15.0	14W 604520	7252584					
Lake A76	MF	A76-31	March	7.1	14W 601744	7256971	A76-1	B & C	9.1	14W 602267	7256917

Area[1]	Area Type[2]	Area-Replicate	Water & Phytoplankton (monthly)				Benthos & Sediment Chemistry (August)				
			Month	Depth (m)	Zone & Easting	Northing	Area-Replicate	Sample Type[3]	Depth (m)[4]	Zone & Easting	Northing
Lake A76	MF	A76-32	March	8.7	14W 601682	7256840	A76-2	B & C	9	14W 602247	7256917
		A76-33	May	13.9	14W 602554	7257152	A76-3	B & C	8.4	14W 602275	7256942
		A76-34	May	11.4	14W 604383	7252617	A76-4	B & C	8.3	14W 602293	7256965
		A76-35	July	14.0	14W 601939	7256732	A76-5	B & C	8.2	14W 602226	7256932
		A76-36	July	5.2	14W 602129	7256983	A76-COMP	C			
		A76-37	August	13.5	14W 601738	7256860					
		A76-38	August	10.2	14W 602656	7257095					
		A76-39	September	7.2	14W 602420	7257014					
		A76-40	September	11.5	14W 601716	7256892					
Lake DS1	FF	DS1-29	March	20.0	14W 597501	7260997	DS1-1	B & C	9.3	14W 598025	7262021
		DS1-30	March	7.7	14W 598028	7258241	DS1-2	B & C	8.8	14W 598078	7262020
		DS1-31	May	12.1	14W 597517	7260741	DS1-3	B & C	9.1	14W 598090	7262060
		DS1-32	May	9.2	14W 602554	7257152	DS1-4	B & C	9.3	14W 598118	7262015
		DS1-33	July	16.0	14W 597504	7260925	DS1-5	B & C	6.5	14W 598115	7261986
		DS1-34	July	10.1	14W 597332	7259597	DS1-COMP	C			
		DS1-35	August	11.4	14W 597622	7261052					
		DS1-36	August	7.9	14W 597755	7258637					
		DS1-37	September	12.9	14W 597748	7258536					
		DS1-38	September	19.0	14W 597176	7262183					

Notes**:**
1. Area IDs are as follows:
TPE, TPN, TPS=Third Portage Lake - East, North, South basins; SP=Second Portage Lake; TE, TEFF=Tehek Lake - Farfield; INUG=Inuggugayualik Lake; WAL=Wally Lake; PDL=Pipedream Lake;
BBD, BPJ, BES, BAP=Baker Lake - Barge Dock, Proposed Jetty, East Shore, Akilahaarjuk Point.
WTS = Whale Tail Lake – South Basin; MAM = Mammoth Lake; NEM = Nemo Lake.
2. Area types: NF=near-field; MF=mid-field; FF=far-field; Ref=reference.
3. Sample types: B=Benthos; C=chemistry.
4. Comp = composite sample of all 5 replicate samples from each area (no coordinates).
Note that water sampling at BES and sediment/benthic invertebrate sampling at TPS, TE, or TEFF was not completed as per the study design (Azimuth, 2015b).
N/R = depth not recorded (no limnology data for this sample).

Figure 2-1. Annual results-based sampling strategy rules for mid-field and far-field sampling areas.



2.3 Targeted Studies: TPE Sediment Bioavailability (2015 to 2019)

2.3.1 Overview

Chromium concentrations in sediment at TPE have been followed closely since 2012 when the first evidence of an increasing trend was observed in the basin (Azimuth, 2013). In 2014, a targeted coring study confirmed chromium was increasing in concentration over time (Azimuth, 2015b). Subsequently, two targeted studies were completed in 2015 and 2018 using laboratory sediment toxicity tests with *Chironomus dilutus* and *Hyalella azteca* to determine if the increase in sediment chromium was adversely affecting growth and survival for these two species. The 2015 study also included sequential extraction analyses of the sediment to quantify the fraction of chromium in the sediment matrix available for uptake (and toxicity) to benthic invertebrates. Below is a summary of the conclusions from the 2015 and 2018 targeted studies at TPE:

- **Chironomid Tests** – Survival in the 10-d tests has typically been high (generally above 90% in most replicates from TPE), with only slight reductions in growth relative to the field control groups. In 2018, the apparent minor reduction in chironomids from the TPE treatment was considered to have *low* ecological significance to the community composition[8]
- **Amphipod Tests** – Significant lower survival and growth were observed in 2015 and 2018. As a taxonomic group, *Hyalella* (or amphipods), are not represented in the assemblage of benthic invertebrates in the Meadowbank project lake study areas. Furthermore, this species is among the more sensitive invertebrate taxa to the effects of metals.
- **Sequential Extraction Test Results** – As a complement to the sediment toxicity testing in 2015, sequential extraction analysis was conducted on sediment from exposure and reference areas used in the toxicity tests. Result from this geochemical analysis showed that most of the chromium at TPE is found in the 'residual' fraction, which is less mobile and bioavailable than chromium associated with carbonates, iron and manganese hydroxides, and organic material. Importantly, the total concentration of chromium in the more bioavailable fractions was well below the CCME interim sediment quality guideline (ISQG). This line of evidence demonstrated that concentrations of chromium in the sediment were unlikely to adversely affect the structure or function of the benthic community at TPE.

[8] *Low* level effect size = 10 to 20% reduction in mean growth compared to the field control group (PDL and INUG in 2018).

- **Weight-of-Evidence Conclusions (2018)** – Toxicity test results were integrated with the benthic invertebrate taxonomy and sediment chemistry results in weight of evidence (WOE) framework to determine the health of the benthic invertebrate community at TPE. The WOE assessment in 2018 confirmed the low bioavailability of sediment chromium (i.e., low risk to the benthic invertebrate community), but recommended follow-up studies in 2019 to determine the underlying cause of the effect to *Hyalella* survival and growth observed in the 2018 toxicity tests.

2.3.2 2019 Study Design

The objectives of the 2019 test were to 1) confirm the effect to *H. azteca* survival and growth when exposed to sediment from TPE, and 2) determine, if possible, the contaminant causing the effect and whether it's plausibly linked to activities at the mine. In 2018, *H. azteca* and *C. dilutus* survival and growth were similar between INUG and PDL, and one reference area was considered adequate for comparing with the TPE. PDL is the more suitable lake to compare with TPE because chromium concentrations are similar to sediment at TPE[9].

2.3.3 Methods

Sediment Collection

Five replicate sediment samples were collected from each area (i.e., discrete field replicates). Each replicate was a composite of the top 3-5 cm from enough ponar grabs to fill two 1-L HDPE plastic jars. Sediments were collected according to the SOP used to sample sediment for bulk chemistry (Azimuth, 2015a). The top 3-5 cm was homogenized in the field and before transferring to the two 1-L HDPE plastic jars. The samples were refrigerated and shipped to Nautilus Environmental (Burnaby, BC) for sediment toxicity testing.

Sediment Toxicity Tests

Toxicity tests were run at Nautilus Environmental in Burnaby, BC. Testing was done on *C. dilutus* and *H. azteca* according to the standardized test methods used in 2015 and 2018. The endpoints for both species were survival and growth.

- The *Hyalella* test is a static test using juvenile (7-9 days old) amphipods, exposed to whole sediment for 14-days. This test was conducted at 23°C, using the five replicates per treatment including a laboratory control, with 10 organisms per replicate.

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[9] Average chromium concentration in bulk sediment collected in 2019 were INUG = 111 mg/kg; PDL = 134 mg/kg; TPE = 142 mg/kg.

- The *Chironomus* test is a static, non-renewal test using 3rd instar midge larvae exposed to whole sediment for 10-days. This test was conducted at 23°C, using the five replicates per treatment including a laboratory control, with 10 organisms per replicate.

Details of the 2019 test conditions are provided in **Appendix G**.

Of the two test species, *C. dilutus* is the more ecologically relevant species for the Meadowbank study area because of the dominance of chironomids in the benthos community throughout the region. Amphipods are not reflected in the benthos community in the Meadowbank project lakes, and the toxicity testing results for this species were weighted lower than results from the chironomid test when assessing their ecological significance. Notwithstanding the absence of amphipods in these lakes, *H. azteca* is generally more sensitive to the effects of sediment contamination than *C. dilutus* and therefore provides a more conservative level of assessment of the potential for contaminant-related effects to benthos. From a site management perspective, the *H. azteca* test results serve as the equivalent of an *early warning trigger* for detecting changes in sediment chemistry before more ecologically significant effects to *C. dilutus* are detected.

Porewater Metals Analysis

Sediment porewater was collected in conjunction with the *H. azteca* tests. Porewater is a better predictor of toxicity to benthic invertebrates compared to bulk sediment, as dissolved metals are typically more bioavailable compared to metals associated with organic and inorganic sediment matrices (Doig and Liber, 2000).

Porewater sampling was done using *in-situ* mini-peepers, which are designed to passively collect porewater from sediments used in standardized laboratory toxicity tests (Doig and Liber 2000). One mini-peeper was placed in a sacrificial test jar for each field replicate from PDL and TPE at the initiation of the test and allowed to equilibrate for the duration of the 14-d *H. azteca* test. 2.9 mL of sample were removed from each peeper at the end of the test and preserved with one drop of nitric acid. Samples were sent to Brooks Applied Labs (Bothell, WA) for analysis.

Chromium, as well as arsenic, iron, manganese, lead, uranium, and zinc were identified as *priority COPCs* for analysis in the porewater samples. Chromium was included because of temporal increases at TPE. Arsenic, lead, uranium, and zinc were carried forward because concentrations are naturally higher at TPE compared to PDL, indicating the potential for porewater concentrations to also be elevated at TPE. Manganese and iron, which are not site-related COPCs, were selected for analysis because of the potential for naturally-elevated concentrations to cause effects to benthos (Doyle et al. 2003).

2.3.4 Weight-of-Evidence Evaluation

Toxicity test results and porewater chemistry data were used as lines of evidence along with sediment chemistry data and long-term benthic invertebrate community data, to determine if current concentrations of metals at TPE pose unacceptable risks to the benthic invertebrate community. Steps involved in the analysis of the toxicity test results and porewater chemistry data are discussed below. Details regarding the sediment chemistry and benthic invertebrate community data evaluation are discussed below in **Sections 2.4.2**, and **2.4.3**, respectively.

Sediment Toxicity Tests

A two-step process was used to determine the ecological significance of the sediment toxicity tests. First, survival and growth data were compared to determine if there were significant differences ($\alpha = 0.05$) between TPE and control groups (lab and PDL). If the null hypothesis was rejected (i.e., significant difference detected between control and exposure treatment), then the analysis proceeded to step 2 to classify the ecological significance of the change relative to PDL as the control group:

- **Negligible effect**: < 10% reduction in mean growth or survival
- **Low effect**: 10 to 20% reduction in mean growth or survival
- **Moderate effect**: 20 to 50% reduction in mean growth or survival
- **High (severe) effect**: > 50% reduction in mean growth or survival

Results for each test species were integrated in a weight of evidence assessment along with sediment chemistry, porewater chemistry, and benthic invertebrate community survey results to determine if current concentrations of metals at TPE pose unacceptable risks to the benthic invertebrate community.

Porewater Chemistry

Porewater samples from all five replicates from TPE and three replicates in PDL were submitted for analysis of dissolved arsenic, chromium, iron, manganese, lead, uranium, and zinc. Replicates 1, 3 and 4 from PDL were selected for analysis because sediment chromium concentrations were similar to TPE. The following 3-part data evaluation was used to identify the probable cause of effects to *H. azteca* survival and growth:

1. **Reference vs Exposure Assessment** – A short-list of candidate COPCs in porewater was identified by comparing the maximum concentrations measured at TPE and PDL.
2. **Correlation Analysis** – the second step in the investigation involved correlation analyses between *H. azteca* survival and metals concentrations in sediment and porewater. R

software (version 3.6.1) and data analysis package *ggcorrplot* was used to identify metals that were significantly correlated with lower amphipod survival in 2019.

3. **Screening Assessment** – compare porewater metals concentrations against available water quality guidelines for acute effects to aquatic invertebrates.

This WOE approach to assessing the porewater chemistry data helped identify the probable causal of lower survival and growth for *H. azteca*. Ultimately, these data were used as one of the LOEs in the full WOE assessment for the benthic

2.4 Data Evaluation Criteria

The specific methods used to apply triggers/thresholds in the evaluation of CREMP monitoring parameters varied by study component; details are presented in the following sections. The evaluation process focused on comparisons to early warning triggers; only when triggers were exceeded were monitoring results compared to thresholds. Consequently, methods for applying numerical decision criteria focus on triggers only, but apply equally to threshold values.

2.4.1 Water Chemistry

Water quality data collected in 2019 were evaluated against triggers and thresholds consistent with the existing framework outlined in the *CREMP: 2015 Plan Update* (Azimuth 2015b). Formal comparison of the water quality data for decision-making purposes was done by comparing the yearly mean[10] parameter concentrations to the trigger values developed separately for the Meadowbank projects lakes, Wally Lake, Baker Lake areas[11] and, in 2019, the Whale Tail lakes.

Water chemistry triggers were updated for Meadowbank and Baker Lake study areas and new triggers were derived for the Whale Tail study areas in 2019. Triggers were updated/derived according to the following methods described in Azimuth (2012d):

- *When a threshold (e.g., SSWQO or CCME water quality guideline) is established, the trigger was set as the maximum of either (a) the value halfway between the baseline median and the threshold (*Method A*), or (b) the 95th percentile of the baseline data (*Method B*).*
- *When a threshold is not established, the trigger was set equal to the 95th percentile of the baseline data* (Method B)*, except in cases where less than 5% of the data exceeded the*

[10] Yearly means were calculated by first calculating the monthly mean for each parameter per area, then calculating the yearly mean on an area-specific basis. Values that were less than the MDL were conservatively set to the MDL.

[11] Separate water quality triggers were developed for Wally Lake from the other Meadowbank areas when mining activities transitioned from the North and South Portage Pits (discharge to TPN) to the Vault Lake area (discharge to WAL) in 2013.

current detection limit (MDL) – in the latter case, the trigger was set equal to two times the MDL (Method C).

Thresholds are available for 22 parameters. In most cases, the threshold was equal to a given guideline, but there were exceptions for a few variables that warranted special considerations. There are also some cases where baseline data already exceed the guidelines for > 5% of cases and it is possible for triggers to equal or exceed the guideline. For these cases, the guideline is the threshold but it is not used as a criterion for action. Furthermore, for these cases the trigger is the criterion for action as it is for instances where there is no water quality guideline to derive a threshold value. For total copper, lead, and nickel, hardness determines the guideline and, in turn, the threshold. The baseline samples for all systems indicated low hardness and this was used to establish the thresholds for those analytes.

The derivation process is explained in more detail below and the 2019 update to triggers and thresholds is provided in **Appendix I**.

Meadowbank Project Lakes and Wally Lake

Parameters where the yearly mean was equal to or exceeded the trigger value were formally tested using a one-tailed test of the null hypothesis[12] (significance level of p=0.05) using the Before-After-Control-Impact (BACI) statistical model. The BACI model is *paired* (i.e., BACIP) when multiple *before* and *after* events are available. In the BACI model, INUG is used as the reference (*control*) area[13], and the other areas are tested as exposure (*impact*) areas. True *pre-impact* data (i.e., when both INUG and the test area had *control* ("C") status; see **Table 2-3**) were used for the *before* data. Only events when both INUG and the test area were sampled in 2019 were used as the *after* data.

In addition to the trigger/threshold BACI evaluation, annual Meadowbank CREMP water chemistry data were also compared to the maximum whole-lake average water quality modelling predictions for Third Portage, Second Portage, and Wally Lakes made during the environmental assessment process (Cumberland 2005). While direct comparisons were made, the difference in spatial focus (i.e., the CREMP at the basin scale and the water quality model at the whole-lake scale) warrants caution interpreting any differences. To that end, the assessment criteria outlined in the Final Environmental Impact Statement (FEIS; Cumberland 2005) for

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[12] The null hypothesis is that "test" area concentrations either did not change or decreased. The alternative hypothesis is that they increased.

[13] PDL and TEFF are excluded as control areas in the BACI analysis because neither area was sampled in the before period between 2006 and 2008 (i.e., limiting their utility as reference areas in the BACI model, but both providing valuable context for interpreting the strength and consistency of regional trends seen at INUG).

defining the predicted magnitude of impacts to water quality will be used to provide the appropriate context for interpreting the screening results as follows:

- **Negligible**: water quality concentrations are similar to baseline
- **Low**: concentrations are < 1x the CCME Water quality guideline (WQG)
- **Medium**: concentrations are between 1 and 10-times the CCME guidelines
- **High**: concentrations are less than MDMER but greater than 10-times the CCME guidelines
- **Very High**: concentrations exceed MDMER standards

Baker Lake

Baker Lake areas were designated as *control* (BAP) or *impact* (BPJ and BBD) when sampling started in 2008 (i.e., there was no detailed baseline sampling conducted for Baker Lake; see **Table 2-3**), so there are no true *pre-impact* or *before* data. While a spatial "CI" design could be used to test for differences between reference *control* and exposure *impact* areas, the design does not allow for distinguishing natural differences between areas from development-related changes. Given that no development-related changes had been identified to date, all years of data up to and including 2018 were considered in the *before* period while the 2019 results were considered *after* period data (i.e., allowing the more robust BACI analysis). The BACI analyses specifically looked at changes in 2019 at the two *impact* areas relative to previous years.

Whale Tail

The 2019 CREMP study year was the first year to include formal statistical BACI analysis of the water quality results at Whale Tail. In 2018, this was deferred because there wasn't a full year of *after* data available for the impact areas (**Table 2-3**).Triggers for the Whale Tail Pit lakes are included in the water quality screening tables and in the analysis and interpretation of water quality data for 2019 (see **Section 5.3**).

The water quality assessment for the Whale Tail study areas followed the framework described above for Meadowbank: 1) yearly-mean concentrations in each area were compared to Whale Tail-specific trigger values, 2) formal BACI analysis of temporal changes for those parameters that exceeded their triggers (i.e., were higher relative to baseline/reference conditions), and 3) compared the annual water quality data for Mammoth Lake against applicable water quality predictions presented in the FEIS for the Approved Project (Appendix 6-H, Agnico Eagle 2016).

2.4.2 Sediment Chemistry

Sediment grab samples are collected annually with the benthic invertebrate samples. In addition to characterizing physical conditions (e.g., grain size and organic carbon content), they provide additional information on temporal changes in concentrations of metals in sediment.

Sediment chemistry core sampling for the CREMP is completed every three years at the same time as Environmental Effects Monitoring (EEM) sampling. The intent of the coring program is to monitor long term trends in metals concentrations in the top layer of sediment (1.5 cm [approximately]). The next full coring program is scheduled for 2020 (coinciding with the EEM program), but follow-up coring at TPE was recommended for 2019 to verify the temporal trends of increasing chromium at TPE in the 2018 CREMP report.

Trends in sediment chemistry are evaluated by comparing the yearly mean parameter concentrations in the core samples to the trigger[14] values applicable to the Meadowbank study area lakes, Wally Lake, and the Whale Tail study area lakes (see discussion below). Those parameters where the yearly mean was equal to or exceeded triggers were formally tested using a before-after (BA) statistical model[15]. Sediment chemistry can be quite variable over a small spatial scale within a given basin, but natural seasonal variability in sediment chemistry is assumed to be low given the low rates of natural sediment deposition in Arctic lakes (Azimuth, 2012d). The BA statistical model assumes that, in absence of mining-related inputs, annual variability in sediment chemistry is negligible.

The naturally high sediment concentrations in the Whale Tail study area lakes necessitated triggers that were lake specific, similar to the approach that was used to develop triggers for Wally Lake. The derivation of these triggers was completed in 2019 and included in the analysis of grab sediment chemistry. The statistical analysis of sediment in the Whale Tail study areas will be implemented for the next sediment coring program scheduled for August 2020 (3-year cycle). Evaluation of the data will follow the same approach used for Meadowbank by comparing the yearly mean concentrations to new trigger values and BA statistical analysis of temporal changes for parameters that exceeded their respective triggers. Triggers were developed using the baseline sediment core chemistry data collected in 2017 and the statistical approach described in Azimuth (2012d). CCME sediment quality guidelines were set as the thresholds when applicable (i.e., for those parameters with CCME sediment quality guidelines). Triggers were set to the maximum of one of three methods for the Whale Tail study area lakes:

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[14] The trigger values for the Meadowbank project lakes were updated in the 2017 CREMP report.

[15] One-tailed test of the null hypothesis that concentrations are not different (or lower) in the after period relative to the before period (significance level of p=0.05); the alternate hypothesis is that concentrations have increased in relation to mining.

- Method A: the value halfway between the baseline median and the threshold (CCME ISQG),
- Method B: the 90th percentile of the baseline data, or
- Method C: the value corresponding to a 20% increase above the median value

2.4.3 Phytoplankton and Benthos Community Variables

Trigger and threshold value development for phytoplankton and benthos communities was presented in detail in the original CREMP Design Document (Azimuth, 2012d). Unlike water or sediment, where environmental quality guidelines can be used to develop thresholds or triggers, there are no universal benchmarks for biological variables such as abundance, biomass or diversity. Rather, the magnitude of change or difference relative to expected conditions must be used to establish *critical effect sizes* (CES) for biological variables. Effect sizes of 20% and 50% were established as the *trigge*r and *threshold* for assessing changes in biological variables. Importantly, the terms *threshold* and *trigge*r for biological variables are not used as strictly as for water and sediment chemistry parameters for two reasons:

1. Statistical Power - For most biological variables, natural variability can make it difficult to statistically detect effect sizes as low as 20%. It is more realistic to detect larger effect sizes such as 50%.
2. Causality – Even if statistically-significant changes are documented (at whatever effect size), the cause of the change needs to be understood in order to effectively manage the situation. For the Meadowbank biological data, effect sizes exceeding 50% have been observed due to natural variability in the baseline data.

The BACI framework developed for the phytoplankton and benthos community assessments at Meadowbank will be implemented at Whale Tail because the Project transitioned from the *before* to the *after* period in 2019.

Phytoplankton Taxonomy

Total phytoplankton biomass and taxa richness were selected as the metrics to assess changes in the phytoplankton community using the BACI framework[16]. Phytoplankton triggers and thresholds are set to relative changes of 20% and 50%, respectively. The evaluation procedure was analogous to that used for water chemistry, except that area means for 2019 were not directly comparable to triggers (i.e., since the triggers/thresholds are based on the relative

[16] BACI framework involves paired monthly sampling events at "control" [INUG or BAP] and *impact* [i.e., NF or MF areas] areas over two periods [*before* and *after*], with "months" as the unit for temporal replication).

change over time in a parameter rather than on a finite value), so the process started with the BACI testing. Two-tailed tests of the null hypothesis (i.e., that test areas experienced no relative change up or down) were conducted with a significance level of p=0.1.

Benthos Taxonomy

Trigger and threshold values for the benthos are set at reductions of 20% and 50%, respectively for abundance and taxa richness. The CREMP uses percent change rather than standard deviations which are used in EEM, to maintain a transparent (fixed) effect size that is more likely to be ecologically relevant. Statistical power increases with consideration of more *after* period years; consequently, BACI analyses for the Meadowbank area were conducted on four *after* data period lengths: one year (2019 only), two years (2018-2019), three years (2017-2019), and four years (2016-2019) and for the Whale Tail area for either one year (2019 only) or for WTS and MAM both one year and two year (2018-2019). One-tailed tests of the null hypothesis were conducted with a significance level of p=0.1. Failure to reject the null hypothesis implies the endpoint (i.e., total abundance or species richness) either did not change or increased. The alternative hypothesis is that the endpoint decreased. Despite this BACI being conducted as a one-tailed test, the p value was left at 0.1 to help improve statistical power for the benthic invertebrate endpoints.

No baseline benthic community data are available for Baker Lake, so there is no true *pre-impact* or *before* data. While a spatial “CI” design could be used to test for differences between reference *control* and exposure *impact* areas, the design does not allow for distinguishing natural differences between areas from development-related changes. Rather, since no development-related changes had been identified to date, BACI analyses for Baker Lake benthos were conducted using a series of four temporal scenarios using all 12 years of data. (i.e., 2019 was compared to 2008-2018; 2018/2019 was compared to 2008-2017 and so on). This series of comparisons provides a more robust means to identify temporal changes due to mining-related activities in Baker Lake without needing to assume that sampling areas should have identical communities (i.e., like the CI design).

Figure 2-2. Management response plan for the Meadowbank Mine Aquatic Environment Monitoring Program (AEMP).

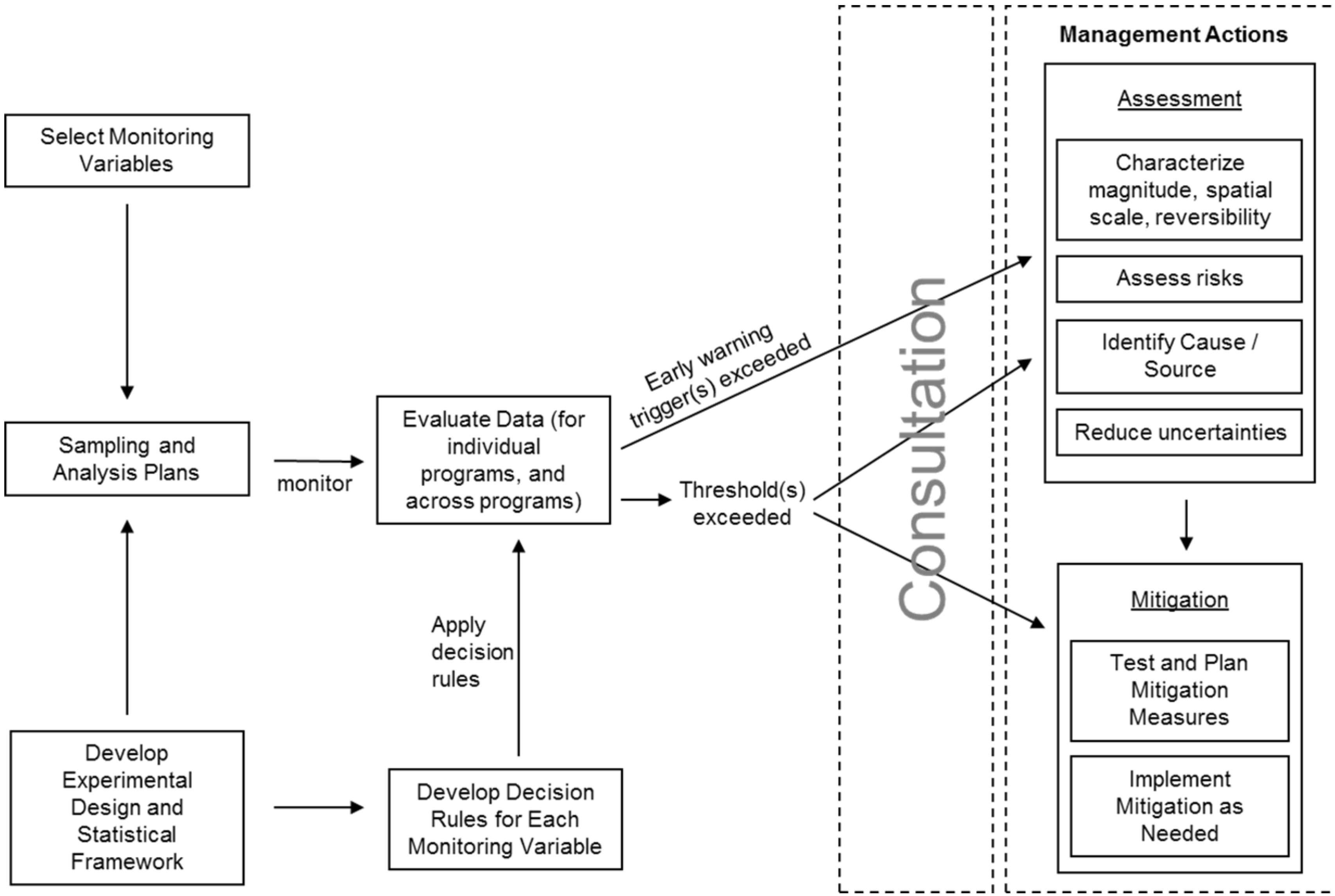

Table 2-3. Status of all CREMP sampling areas since the beginning of monitoring.

	Meadowbank Areas									Baker Lake Areas				Whale Tail Pit Areas					
Designation	**REF**	**REF**	**NF**	**NF**	**NF**	**NF**	**MF**	**MF**	**FF**	**REF**	**REF**	**NF**	**NF**	**NF**	**NF**	**NF**	**MF**	**MF**	**FF**
Area	**INUG**	**PDL**	**TPN**	**SP**	**TPE**	**WAL**	**TPS**	**TE**	**TEFF**	**BAP**	**BES**	**BBD**	**BPJ**	**WTS**	**MAM**	**NEM**	**A20**	**A76**	**DS1**
2006	C		C	C	C	C	C	C											
2007	C		C	C	C	C	C	C											
2008	C		C	I (Aug)	C	C	C	I (Aug)		C		I	I						
2009	C	C	I (Mar)	I	I (Aug)	C	C	I	C	C		I	I						
2010	C	C	I	I	I	C	C	I	C	C		I	I						
2011	C	C	I	I	I	C	C	I	C	C	C	I	I						
2012	C	C	I	I	I	C	C	I	C	C	C	I	I						
2013	C	C	I	I	I	I (Jul)	C	I	C	C	C	I	I						
2014	C	C	I	I	I	I	C	I	C	C	C	I	I	C	C	C			
2015	C	C	I	I	I	I	C	I	C	C	C	I	I	C	C	C			
2016	C	C	I	I	I	I	C	I	C	C	C	I	I	C	C	C	C	C	C
2017	C	C	I	I	I	I	C	I	C	C	C	I	I	C	C	C	C	C	C
2018	C	C	I	I	I	I	C	I	C	C	C	I	I	I (Aug)	I (Nov)	C	C	C	C
2019	C	C	I	I	I	I	C	I	C	C	C	I	I	I	I	I (Aug)	I	I	I

Notes:

<u>Area designations:</u>

C=Control; I=Impact; REF=reference (in grey shading); NF=near-field (in blue shading); MF=mid-field (in pink shading); FF=far-field (in teal shading).

Blank cells indicate the area was not part of the monitoring program that year.

<u>Area IDs:</u>

Meadowbank and Whale Tail Pit Reference areas: INUG = Inuggugayualik Lake; PDL = Pipedream Lake.

Meadowbank: TPN, TPE, TPS = Third Portage Lake - North, East, South basins; SP = Second Portage Lake; WAL = Wally Lake; TE, TEFF = Tehek Lake (Mid-and Far-field).

Baker Lake areas: BAP, BES, BBD, BPJ=Baker Lake - Akilahaarjuk Point, East Shore, Barge Dock, Proposed Jetty.

Whale Tail Pit areas: WTS = Whale Tail Lake South Basin; MAM = Mammoth Lake; NEM = Nemo Lake; A20 = Lake A20; A76 = Lake A76; DS1 = Lake DS1.

3 QUALITY ASSURANCE / QUALITY CONTROL

3.1 Overview of CREMP QA/QC

The objective of quality assurance and quality control (QA/QC) is to assure that the chemical and biological data collected are representative of the material or populations being sampled, are of known quality, have sufficient laboratory precision to be highly repeatable, are properly documented, and are scientifically defensible. Data quality was assured throughout the collection and analysis of samples using specified standardized procedures, by the employment of laboratories that have been certified for all applicable methods, and by staffing the program with experienced technicians.

The framework of the QA/QC program is outlined in *CREMP: 2015 Design Document* (Azimuth 2015b). The Design Document is the foundation for assessing data quality in for each routine component of the CREMP (e.g., water, sediment, etc.) and was adopted for the Whale Tail Pit baseline sampling program (Azimuth 2018b). QA/QC assessments for the Meadowbank / Baker Lake CREMP and Whale Tail Pit baseline CREMP were harmonized in 2019 into one overarching QA/QC program. Detailed analysis of the data quality for each component of the CREMP is provided in **Appendix A**. A summary of the key messages from the 2019 QA/QC program is provided in the subsections below.

3.2 Sample Shipping and Handling

Sample shipping and handling concerns document in previous CREMP reports have largely been rectified in recent years. The ALS laboratory report QA/QC summaries are integrated into **Appendix A**.

The sample shipping and handling QA/QC for 2019 was comparable or better than 2018 as fewer samples were lost. There were a few discrepancies between samples submitted and the CoCs but most were rectified without impacting the analytical results. The logistics, distances, and general challenges of collecting and shipping samples from a remote mine in Nunavut meant that hold times were exceeded for several parameters/analytes but the impact on results is considered negligible. Bringing the Meadowbank/Baker CREMP program and the Amaruq program together under one umbrella has likely contributed to the overall improvement seen in 2019. Logistic efficiencies, increased familiarity with the CREMP program, and attention to detail are also likely contributing factors.

3.3 Water Chemistry

Briefly, the standard QA procedures for the water chemistry program include thoroughly flushing the flexible tubing and pump to prevent cross-contamination between areas. Field QC procedures include collection and/or analysis of field duplicates and blanks (travel, equipment, and deionized water blanks). The laboratory QC program includes duplicate analysis, blanks, and analysis of spike samples and reference material to verify the accuracy and precision of the analytical method.

The objectives and methods for surface water QA/QC are outlined in detail in **Appendix A**. The field and laboratory QA/QC results for water chemistry for 2019 were very good and met or exceeded the results from the 2018 sample year:

1. Sample integrity was very good in 2019. There were fewer lost samples from breakage or mislabeling than in 2018. Sample temperatures received at the laboratory were variable depending on season and reflect the challenges with shipping from a remote mine site. Likewise, hold time exceedances for parameters and analytes with short hold times are unavoidable but are not considered likely to impact data analysis and interpretation.
2. Travel, DI, and EB blank results for 2019 were generally better than for 2018 and indicated reliable sample handling and that cross-contamination related to sampling equipment is unlikely. The DI blanks and travel blanks did not warrant flagging any parameters as cautionary or unreliable in the 2019 analyses. Several analytes were detected in the September sample but very few or none were detected in other months (see summary discussion next bullet).
3. The implication of possible cross-contamination on interpretation of the 2019 water quality data was evaluated by comparing the sample concentrations with the equipment blank results from the same event. Sample results in the complete datasets were given a cautionary flag using underlining (e.g., 0.001) to indicate that the measured concentration was less than 5-times the concentration detected in the equipment blank. Sample results in **Appendix B1** (Meadowbank), **Appendix B2** (Whale Tail), and **Appendix B3** (Baker Lake) were given a cautionary flag using underlining (e.g., 0.001) to indicate that the measured concentration was less than 5-times the concentration detected in the equipment blank. Of the analytes detected in the equipment blanks, total ammonia, and TKN were routinely given a *cautionary* flag. Several other analytes were given cautionary flags in September including lead, manganese, and dissolved aluminum. Total chromium received a cautionary flag for some sample locations in August; however, the blank results for chromium in August are potentially unreliable because chromium was detected in all three blanks including the travel blank which was not opened onsite. In

May at station SP-122 the silicate (as SiO_2) results exceeded the trigger and were also given a cautionary flag. In 2019, the total ammonia and TKN results for July collected at TPN-122 exceeded the trigger results and were given a cautionary flag because both analytes were detected in the equipment blank for that month. Also, in July, the TKN results at all three Baker Lake areas exceeded the trigger and were given a cautionary flag.

4. It should be noted that isolated instances of trigger exceedances for individual parameters do not necessarily indicate a trend or even real conditions. The QA/QC program provides an added layer of context to data interpretation by highlighting those variables that may be influenced by external factors and not water quality. Overall, potential cross-contamination is considered unlikely to bias interpretation of the 2019 water quality analysis.
5. The 2019 field duplicate results were very good with only 3% of the calculated RPDs not meeting DQOs.
6. Laboratory QA/QC for water chemistry was also very good in 2019 with very few laboratory data quality qualifiers and none that were likely to impact data interpretation.
7. There was only one reported water quality result that was flagged as anomalous in 2019 and removed from the analysis as an outlier. For transparency, the results are shown in the water quality tables provided in **Appendix B**, but they are excluded from the formal BACI analysis and plots. One result for dissolved zinc in DS1-30 was also likely an outlier but was retained in the analysis of results.

Except for the four measurements that were flagged as unreliable, the water quality data passed the QA/QC assessment and are reliable for data analysis and interpretation of spatial and temporal trends.

3.4 Sediment Chemistry

The sediment chemistry QA/QC assessment is comprised of field and laboratory duplicates, filter swipes for cross-contamination, and the QC report from ALS for sediment grab and core samples submitted in 2019. Key results of the sediment chemistry QA/QC presented in **Appendix A** are as follows:

- There were no sample integrity concerns in 2019.
- Filter swipe results were on par with 2018, and although small concentrations of several analytes were detected in one or more filters, the concentrations represent a very low portion of the overall sediment sample size. There are no QA/QC concerns related to filter swipes in 2019.

- Field duplicate results were better in 2019 than 2018 and there were very few instances of field duplicates not meeting DQOs. Field duplicate results indicate good field collection methods and a high degree of replicability in sampling.
- One laboratory duplicate for bismuth did not meet the DQOs due to sample heterogeneity; however, the results show a high degree of precision for the laboratory analysis and laboratory processing and analytical methods were consistent between sub-samples.

3.5 Phytoplankton Taxonomy

Field duplicates are collected for phytoplankton during each sampling event in coordination with water sample duplicates and are taken in order to assess sampling variability and sample homogeneity. An RPD of 50% for density and biomass concentrations is considered acceptable. As a measure of laboratory QA/QC on the enumeration method, replicate counts are performed on 10% of the samples. Replicate samples are chosen at random and processed at different times from the original analysis to reduce biases.

Detailed analysis of the phytoplankton data quality is included in **Appendix A**. Phytoplankton QA/QC for both field and laboratory components in 2019 was excellent and overall results of the QA/QC analysis were slightly better than in 2018. This indicates very good replicability and sample handling in the field and in the laboratory.

Phytoplankton taxonomy results passed the QA/QC assessment and are reliable for data analysis and interpretation of spatial and temporal trends.

3.6 Benthos Taxonomy

Quality assurance measures in the field involved adherence to the standardized method for collecting, sieving, and preserving samples for taxonomic identification (see Appendix B in Azimuth, 2015b). The laboratory (ZEAS) QA/QC procedures include re-sorting and re-counting 10% of the samples targeting > 90% recovery. Detailed analysis of the benthos taxonomy data quality is included in **Appendix A**. Percent recovery was above 95% in all re-sorted samples, with an average percent recovery of approximately 98.1%.

The benthos taxonomy data collected in 2019 passed the QA/QC assessment and are reliable for data analysis and interpretation of spatial and temporal trends.

3.7 Sediment Toxicity Testing

Sediment toxicity tests for the targeted studies in 2019 were carried out according to standardized test methods published by Environment Canada (1997 [*Chironomus dilutus*]; 2013

[*Hyalella azteca*]). The tests methods prescribe how the tests are conducted, including ambient temperature, light intensity, photo period, and feeding regimen. Test acceptability was assessed by evaluating:

- Daily water quality monitoring for routine parameters (temperature, dissolved oxygen, pH, specific conductivity, ammonia concentrations in the overlying water, use of reference toxicant tests to confirm test organism survival is within the reported range, minimum survival and dry weight in the laboratory control treatments.

Detailed test conditions for the *H. azteca* and *C. dilutus* sediment toxicity tests are provided in **Appendix G**. The sediment toxicity test results passed the QA/QC assessment for data acceptability. Results of the QA/QC assessment are:

- Temperature, dissolved oxygen, conductivity, and pH were within the range of acceptability specified in the Environment Canada test protocols. Conductivity measured in the overlying water of the *H. azteca* control sediment treatment was between approximately 250 and 370 µS/cm during the 14-d test period. By comparison, the range in conductivity reported for TPE was approximately 350 and 400 µS/cm.
- Total ammonia concentrations at the start and end of the tests were below concentrations associated with effects to either species. Un-ionized ammonia measured in the reference sediment (i.e., lab control) were below 0.2 mg/L throughout the *H. azteca* test; no overlying water changes were required.
- Reference toxicant tests for *H. azteca* (NaCl) and *C. dilutus* (KCl) were within the historical range, verifying that the batch of organisms were appropriately sensitive for the sediment toxicity tests.

3.8 Porewater Chemistry

Porewater chemistry results from Brooks Applied Labs were sent to Nautilus and included in the sediment toxicity test report (**Appendix G**). Standard QC for porewater chemistry analysis included sample blanks, reference material, and duplicate analyses. Limited sample volume (2.9 mL) meant intermittent QC was performed. Results met acceptance criteria set by the lab, meaning Brooks Applied considers the data reliable for interpretation. The following QC flags were noted, but do not affect interpretation of the data:

- **Blank**: zinc was detected above the method reporting limit.
- **Detection limits**: lead, uranium, and zinc were consistently detected by the instrument (method *detection* limit), but results were less than the method *reporting* limit. In these instances, the reported result is considered an estimate.

4 MEADOWBANK

4.1 Overview of the 2019 Meadowbank CREMP

This section summarizes the CREMP results for monitoring water quality, sediment chemistry, phytoplankton community, and benthic invertebrate communities at Meadowbank in 2019. Relevant figures and tables s are included at the end of the section.

The 2019 CREMP focused on monitoring changes in the NF study areas in Third Portage Lake (East Basin [TPE] and North Basin [TPN]), Second Portage Lake (SP) and Wally Lake (WAL). Reference area sampling at INUG and PDL was completed concurrently with sampling at the NF areas. Water quality at TE, TEFF, and TPS was monitored once during the early season sampling event in March, but deferred for the rest of the year based on results of the 2018 CREMP[17]. In addition to routine CREMP sampling at the NF areas, targeted bioavailability studies were conducted at TPE in 2019. Water quality sampling locations for the 2019 CREMP are shown in **Figure 4-1**. The sediment and benthos sampling areas are shown in **Figure 4-2.**

4.2 Limnology

Limnology data, when compared to previous monitoring data, provide an initial assessment of whether conditions are changing within a sampling area and may require additional investigation. At least one depth profile was conducted monthly for temperature, dissolved oxygen, and conductivity from NF areas except when ice conditions were unsafe in June and October[18]. Two profiles were conducted each event during the open water period, occurring simultaneously with water chemistry and phytoplankton sampling in March, May, July, August, and September. Limnology profiles, without paired water chemistry or phytoplankton sampling, were also collected in January, February, April, November, and December. This follows the assessments conducted in routine years (i.e., when analysis from the previous monitoring year does not flag potential concerns that may warrant greater sampling resolution)[19]. **Section 2.2** outlines the CREMP monitoring plan for routine CREMP sampling years. Qualitative evaluation of the limnology data was done using plots of the deepest sample within each lake for a given

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[17] There were no trigger exceedances for parameters with effects-based thresholds at the NF areas in 20187. Consistent with the new monitoring strategy implemented in 2015, sediment chemistry or benthic invertebrate community sampling was not required at MF and FF areas in 2019.

[18] April was not sampled in 2019.

[19] Note that in 2018 the March sampling was not completed due to mechanical issues with the tundra buggy and November was added instead.

event. Limnology profiles were recorded monthly in 2019 except for June and October. **Table 4-1** specifies which samples were used to plot and interpret the limnology data for 2019. Raw limnology data for 2019 are included in **Appendix H**.

Table 4-1. Samples included in the limnology profiles in 2019.

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
INUG			INUG-109		INUG-111	Not sampled	INUG-113	INUG-114	INUG-116	Not sampled		
PDL			PDL-73		PDL-76		PDL-77	PDL-79	PDL-81			
TPN	☑	☑	TPN-120	☑	TPN-123		TPN-125	TPN-127	TPN-129		☑	☑
TPE	☑	☑	TPE-120	☑	TPE-122		TPE-124	TPE-127	TPE-129		☑	☑
SP	☑	☑	SP-120	☑	SP-122		SP-124	SP-126	SP-129		☑	☑
WAL	☑	☑	WAL-89	☑	WAL-91		WAL-93	WAL-98	WAL-98		☑	☑
TPS			TPS-62									
TE			TE-97									
TEFF			TEFF-48									

Notes:
Empty cells indicate no limnology profiles were collected, consistent with the study design.
☑ = One profile is collected from the near-field areas in months where water sampling is not completed.

4.2.1 General Observations

The ice-free season on the Meadowbank study lakes is very short. Ice break-up usually occurs during mid- to late-June, and ice begins to form again beginning in late September or early October, with complete ice cover by late October. Maximum ice thickness is about 2 m and occurs in March/April, increasing the concentration of some ions, such as chloride, in the water near the ice-water interface. This occurs due to cryo-concentration, where ice formation excludes certain ions and increases their concentration in the water column (Wetzel, 1983). Because the lakes are ice-covered for most of the year, gas exchange with the atmosphere is limited, although oxygen concentrations usually remain high under the ice because of the low rates of biological activity and organic decomposition (processes that consume oxygen from the water). Historically, there is typically a slight negative thermal stratification in the winter with water temperatures of 0°C near the ice-water interface and increasing to 3°C to 5 °C at depth.

During open water conditions, maximum water temperatures may reach 15°C in summer (in 2019 the maximum temperature measured was 13.2°C at INUG in August) with little evidence of thermal stratification, except for brief periods (days) when there is typically only a 4°C to 5°C temperature difference. High winds maintain uniform temperature and high oxygen profiles in the water column due to vertical mixing.

4.2.2 Temporal and Spatial Trends

Temperature and Dissolved Oxygen

In 2019, water temperatures in the Meadowbank project lakes followed similar patterns of seasonal change compared to previous monitoring cycles. **Figure 4-3** shows water temperatures at a depth of 3 m for these lakes, since 2006.

The 2019 vertical temperature profiles are characteristic of the typical thermal regime of these lakes (**Figure 4-4** through **Figure 4-13**). Winter temperature profiles for the through-ice sampling events show a slight negative thermal stratification with water temperatures near 0°C at the ice-water interface, typically increasing to between 2°C and 3.5°C at depth. Oxygen concentrations in winter generally decrease slightly with increasing depth, with occasional values measured above theoretical limits of air saturation[20] (14.6 mg/L at 0°C). Oxygen concentrations in all basins are greater than 5 mg/L, and usually greater than 10 mg/L at even the lowest depths, despite nearly nine months of ice cover.

The project lakes typically turn over by mid-July, leading to a well-mixed water column with uniform temperature and high oxygen concentrations. Water temperatures warm rapidly to reach maximum temperatures of around 15°C by late July and into August. Deeper lakes and basins, such as TPN and INUG, are typically 2°C to 3°C colder than the shallower locations, Wally Lake (WAL) and Second Portage Lake (SP). Temperatures in 2019 were moderate and typical of historical temperature patterns (**Figure 4-3**). There was no evidence of vertical stratification in 2018 or 2019 from July through November in all lakes. In September, water temperatures cooled to below 5°C but remained un-stratified. With vertical mixing, oxygen concentrations are high, and the water is fully saturated (**Figure 4-10**). While the values jumped around slightly, no vertical stratification was observed. The November and December profiles indicated the water column was still generally well mixed and largely un-stratified; however, the beginning of stratification was evident, particularly in the dissolved oxygen results (**Figure 4-12** and **Figure 4-13**).

In general, temperature and oxygen concentrations in 2019 were consistent with previous years, and the seasonal patterns were typical of this Arctic area. There were no differences in these patterns between the control lakes (INUG and PDL) and the NF and MF monitoring areas.

[20] Photosynthesis occurring under ice can lead to DO results exceeding theoretical air saturation limits. This is due to photosynthesis producing pure oxygen, as opposed to the approximate oxygen content of 21% in air.

Conductivity

Field conductivity[21] is an indicator of stratification in the water column and may be used as an early indicator of changing conditions. From a monitoring perspective, uniform conductivity provides confidence that the water column is well-mixed and that a water chemistry sample will be representative of general conditions. In contrast, variable conductivity may indicate the presence of water with different chemical properties (e.g., mining effluent), so profiling is useful to identify these situations and adjust sample collection, if necessary, to ensure that the different water masses are properly characterized. Conductivity of oligotrophic systems with low dissolved solids and ions (Ca, Na, Cl, Mg, etc.) is typically less than 50 µS/cm. At both impact and reference lakes conductivity is usually uniform from top to bottom in any given month, with minor seasonal fluctuations. While the overall range in conductivity is similar between ice-on (10 – 50 µS/cm) and ice-off (10 – 40 µS/cm) months, the conductivities in ice-off months are generally lower, which is consistent with cryo-concentration during progressive ice formation in winter.

In 2019, field conductivity was generally uniform through the water columns of the areas sampled. Minor vertical differences due to cryo-concentration were observed during winter sampling events (e.g., January, February and December [**Figure 4-4**, **Figure 4-5** and **Figure 4-13**, respectively]), with no apparent differences between reference and near-field areas, and fairly uniform profiles during the open water period.

Effluent discharge occurred only into Second Portage Lake in 2019. Seep water from the East Dike was collected and diverted back via the diffuser. The discharge was stopped between March 30 and November 13 and Agnico Eagle was in full compliance with discharge limits specified in their Water License and under MDMER. There was no discharge into Wally in 2018 or 2019. With the completion of mine production in Phaser Pit and Vault Quarry 1 and Pit E, there are, overall, fewer mine activities that may influence water quality in the Meadowbank study area.

A review of the conductivity values dating back to 2009 showed 2019 conductivity results at SP were generally within the range reported in previous monitoring cycles. Historically, field collected conductivity at SP was typically between 20 µS/cm and 30 µS/cm. More recent results from 2015–2019 have trended towards 30 µS/cm to 40 µS/cm in most months. The change in laboratory reported conductivity at SP was identified previously in the water chemistry BACI

[21] Throughout this report, any discussion of "conductivity" refers to specific conductance, which is conductivity normalized to 25°C.

analysis (see **Section 4.3** and **Figure 4-15** for more details), but has not been linked to any adverse effects to the biological community.

The highest field conductivity measurements of 2019 occurred at WAL, despite direct discharges from Vault being discontinued in 2017. In 2019, conductivity at WAL was higher from January through May (~ 60 µS/cm), and then stabilized for the rest of the year (July through December) at around 40 µS/cm. This pattern may be related to WAL having a higher ice:water ratio due to its shallower depth, making it more susceptible to cryo-concentration. Low surface conductivity shown in **Figure 4-8** for WAL in May was likely related to the ice layer. Overall, the results from 2019 indicate similar conductivity to 2018.

4.3 Water Chemistry

Tabulated water quality data for 2019 are presented in **Appendix B1**. Water chemistry samples were collected simultaneously with limnology samples in March, May, July, August, and September (see **Section 4.2** for limnology results).

4.3.1 General Observations

The general conditions affecting water quality in this region were described in **Section 4.2**. Key points are:

- The Meadowbank study lakes are generally nutrient-poor, thermally un-stratified, and well-mixed (uniform temperature and oxygen profiles), with no winter anoxia beneath an ice cover.
- The Meadowbank study lakes are headwater lakes, so no significant natural sources of nutrients or sediment are introduced, except from local runoff that contributes little nutrient enrichment, but sustains the aquatic ecosystems. Many chemicals in the water have typically been below laboratory detection limits (MDLs) since formal baseline monitoring started in 2006[22].

4.3.2 Temporal and Spatial Trends

The Meadowbank project lakes (NF locations only) were screened against site-specific trigger and threshold values developed for the project area lakes in general and also for Wally Lake specifically. Given the number of parameters routinely below laboratory MDLs (i.e., thus providing little insight for assessing mine-related changes to water quality), a conservative

[22] While formal baseline water quality monitoring started in 2006, reconnaissance baseline monitoring started in the mid-1990s and served as the foundation for designing the formal monitoring program.

three-step screening process was used to identify parameters to include in the formal trend assessment to streamline the interpretation process (the results are summarized in **Table 4-2**):

- **Overall Detection Frequency** – Only those water quality parameters that exceeded MDLs in at least 10% of the samples are included for this discussion. Because the project lakes are ultra-oligotrophic, it is normal for many parameters to be below MDLs. The temporal (and spatial) trend assessment includes data from all study years and is updated to include the 2019 data. In 2019, just over half (54%) the parameters exceeded MDLs at least 10% of the time. These parameters are included in this discussion. Overall, there were no changes in detection frequency between 2018 and 2019, although fluoride and total and dissolved silicon were added to the screening for 2019 after trigger/threshold values were derived for these parameters.
- **Control-Impact Detection Frequency Comparison** – To avoid screening out infrequently detected parameters that were detected more often in association with mining activities, the proportion of samples exceeding MDLs between *control* and *impact* samples was compared. The intent was to identify parameters with <10% detection frequency (i.e., those screened out above) for which the proportion of detected values increased by 0.1 or more. Based on this second screening, no parameters were added back into the trend assessment.
- **Apparent Detection Pattern Matching Mining Activity** – As a further step to avoid screening out potentially important parameters, trend plots for infrequently detected parameters were used to visually identify parameters with measured values associated with periods/locations of known mining activities (see **Table 1-1**). Where such patterns were observed or where parameters were measured at greater than five times the MDL at near-field sampling areas in at least one event, these parameters were added back into the trend assessment process. Not surprisingly, given the minimal mine activities in the Meadowbank study area in 2019, no such patterns were observed so no parameters were added back into the trend assessment process based on this screen.

Water chemistry parameters that were retained in the analysis are shown in **Table 4-2**. Monitoring results showing spatial (all NF, MF, FF, and REF areas) and temporal (all monitoring years) trends for surface water (samples collected from a depth of 3 meters) for retained parameters are shown in **Figure 4-15** to **Figure 4-57**. The red dashed line is the trigger value specific to the parameter and area. Blue dashed lines have been added in 2019 for TPN, TPE, SP, and WAL (where appropriate) for parameters that have Final Environmental Impact Statement (FEIS) screening predictions (see **Section 2.4.1**). Parameters with no spatial or temporal trends related to mining activities or natural variability were excluded from further consideration (see

Table 4-2); for completeness and transparency, plots for these parameters are included in **Appendix B1**.

Each parameter/area that exceeded the trigger in 2019 was assessed in the BACI model (one-tailed; looking for uni-directional changes [i.e., increases]). In this analysis, the model interaction term (or BACI effect term) represents the change at the test area in 2019 (*after* period) relative to baseline (*before* period) after accounting for natural temporal changes (i.e., temporal changes at the reference area that account for regional factors expected to influence all the lakes). For simplicity, changes are noted *relative to baseline/reference* conditions.

Parameters where the yearly mean in 2019 exceeded the trigger values at the NF areas are shown in **Table 4-3**. Despite the triggers being revised in 2019, there were no changes for parameter/area combinations compared to 2018, except for silicon, which exceeded the new 2019 trigger in SP. Results of the BACI analysis for parameter/area combinations where the 2019 results were statistically different ($p < 0.05$) are provided in **Table 4-4**. Note that it was not possible to complete a BACI analysis on silicon due to a lack of *control* data. BACI analysis results for 2019 were largely the same as last year, with elevated conductivity, major ions, and other non-threshold parameters in the NF lakes relative to baseline/reference conditions. A thorough effects assessment of those parameters that have routinely exceeded their respective trigger values was completed in 2019 and has been provided in **Appendix J**.

2019 Trigger Exceedances and Effects Assessment

Context for the 2019 results from an aquatic ecosystem perspective is described below for each parameter (or parameter group):

Laboratory Conductivity/Hardness – TPN, TPE, SP, and WAL were all elevated in 2019 relative to baseline/reference conditions. This list of analytes and areas is identical to 2018 and consistent with previous reporting cycles. Conductivity is a composite variable that responds positively to increasing concentrations of ionic compounds (e.g., chlorides, sulphates, carbonates, sodium, magnesium, calcium, potassium and metallic ions). The observed change, therefore, is indicative of changes in its underlying compounds (e.g., see ionic compounds below for additional context).

Ionic Compounds (Calcium, Magnesium, Potassium, Sodium) – TPN, TPE, SP, and WAL had elevated concentrations of one or more of these major ions relative to baseline/reference conditions. These results are similar to those from 2018. In 2019, mean concentrations at these NF areas were <5.5 mg/L (calcium), <1.5 mg/L (magnesium), <1.3 mg/L (sodium), and <0.75 mg/L (potassium). Slight increases of these ionic compounds in the Meadowbank study lakes in the *after* period are unlikely to adversely affect biota. These major cations are essential elements, and all species of aquatic life, from algae to fish, have evolved to actively regulate their osmotic, ionic, and acid-base balance by taking up ions from their surrounding environment (Martemyanov and Mavrin, 2012). Furthermore, adverse effects on primary producers and secondary consumers (e.g., zooplankton) are more commonly associated with deficiency rather than enrichment of major cations in oligotrophic freshwater lake environments (Alstad, et al., 1999). Calcium deficient waters are defined for some species of algae at concentrations <10 mg Ca/L (Wetzel, 1983) and effects on zooplankton communities are more common in freshwater lakes that are calcium-depleted as a result of acidification and logging (Arnott et al., 2017).

Total Dissolved Solids (TDS) – TPN, TPE, SP, and WAL all had elevated TDS concentrations relative to baseline/reference conditions. The maximum reported concentration in 2019 was 52.2 mg/L at WAL in March, consistent with the concentration reported in 2018. Weber-Scannell and Duffy (2007) reviewed TDS toxicity to aquatic life. While they recommend deriving ion-specific limits for aquatic life (i.e., rather than for TDS), none of the literature studies they compiled showed effects at TDS concentrations less than 250 mg/L and they reported the average TDS in the world's rivers was approximately 120 mg/L. There are no federal water quality guidelines for TDS in Canada. In Alaska, TDS may not exceed 500 mg/L without a special permit and 1,000 mg/L at any time (ADEC, 2012). A site-specific TDS aquatic receiving environment benchmark of 500 mg/L was adopted at Diavik (WLWB, 2013). The changes measured at TPN, TPE, SP, and WAL with TDS concentrations in the order of 15 to 50 mg/L are, therefore, very low and do not pose risks to aquatic receptors.

Alkalinity – SP and TPE had elevated bicarbonate and total alkalinity in 2019 relative to baseline/reference conditions. Bicarbonate (HCO_3-) comprised 100% of the total alkalinity fraction, typical of surface water with pH in the range of 6.5 to 9. Bicarbonate alkalinity at SP has consistently exceeded the trigger since 2011, and in 2019 the mean concentration was 12.85 mg/L (as $CaCO_3$), similar to the 2018 concentration of 12.46mg/L and to the 2016 concentrations of 11.15 mg/L. The trigger value for both bicarbonate and total alkalinity is 8.5 mg/L. TPE exceeded the bicarbonate trigger in 2019 with a mean concentration of 8.74 mg/L, which is just over the trigger value. The results for TPE in 2019 were very similar to those reported for 2018 when bicarbonate values were just over the trigger values in the May samples before stabilizing below the triggers in later sampling events. From a potential-effects perspective, alkalinity measures the buffering capacity of water (i.e., how much acid can be added without changing pH) and low values are typically of concern for aquatic life. For example, the working water quality guidelines for British Columbia (BC ENV, 2017) have three categories of sensitivity to acid inputs based on alkalinity: highly sensitive (<10 mg/L), moderately sensitive (10 to 20 mg/L) and low sensitivity (>20 mg/L). Consequently, the temporal trend of slightly increasing alkalinity relative to baseline/reference conditions is unlikely to adversely affect biota at TPE or SP and would decrease their potential sensitivity to acidic inputs (e.g., low pH snow melt and rain).

Silicon –in 2019 an early warning trigger was derived for the Meadowbank area lakes for this *non-threshold* parameter. The trigger was exceeded at SP in 2019. Since collection started in 2011, SP has always had relatively high concentrations of silicon relative to the trigger. The lack of *control* data means that statistical BACI analysis cannot be completed. There is no evidence of temporal trends for silicon in SP, either yearly since 2011 or monthly in 2019, suggesting that the silicon concentrations are stable and unlikely to be related to mine activity (see **Figure 4-45**).

In the absence of available effects-based thresholds, CREMP trigger values for these substances were set at the 95th percentile of baseline data (Azimuth, 2015b). While occasional threshold exceedances are expected (i.e., in the absence of any mine-related inputs, 5% of the samples would be expected to exceed the trigger), with the exception of silicon, the trends described are clearly mine-related. However, the BACI model results reported above only indicate that statistically significant changes have been detected relative to baseline/reference conditions. Furthermore, while these conditions have been observed for years, it is important to note that they have been fairly stable over the last few years. As discussed above, available information suggests that the observed concentrations of these parameters are well below levels of concern related to effects in the aquatic environment (see **Appendix J** for more details).

Metals concentrations (total and dissolved) were consistently low or below their respective MDLs at the NF, MF, and FF locations in 2019 (**Appendix B1**). The exception is the metalloid silicon at SP in 2019, discussed above. None of these parameters have ever exceeded trigger or threshold values in the formal BACI analysis. In 2019, the same metals were measured above laboratory detection limits (MDLs) as in previous years. This is important to note in relation to ongoing discharge from dike seepage from the East Dike to Second Portage Lake.

Current Water Quality Compared to FEIS Model Predictions

The CREMP continues to detect changes in some general water quality parameters that appear to be related to mining activity. These changes are also reflected in higher concentrations of some parameters when compared to the model predictions in FEIS (Cumberland, 2005). The FEIS water quality predictions are estimates of water quality changes in Third Portage Lake, Second Portage Lake, and Wally Lake, assuming different mixing scenarios and loading estimates from water releases and dike leaching:

Third Portage Lake – the model for Third Portage Lake includes treated water released from the project in years 1 to 4 and long-term loading of metals from the Bay-Goose dike material. Two mixing scenarios (upper range [169 Mm^3] and mid-range [92 Mm^3] mixing) are evaluated for Third Portage Lake with and without dike leaching.

Second Portage Lake – The Second Portage Lake water quality model includes loading of parameters from the Third Portage and East dikes and inflow from Third Portage and Wally lakes. Changes in water quality in Second Portage Lake were modelled for the two different mixing scenarios for water released into Third Portage Lake listed above.

Wally Lake – The water quality model for Wally incorporates long-term loadings from the Vault dike and effluent releases from the Vault Attenuation Pond.

Future assessments of Meadowbank water chemistry results against FEIS predictions will only include comparison to mean concentrations. In 2019 the FEIS prediction screening followed the methods outlined in **Section 2.4.1** and used in 2018. The full screening results are for Third Portage Lake, Second Portage Lake, and Wally Lake and summarized in **Appendix B1**. For perspective, the screening results against mean concentrations are provided in **Table 4-6**.

Overall, the same list of parameters that exceed the Meadowbank trigger values typically exceed the concentrations predicted in the FEIS, namely ionic compounds (calcium and magnesium), hardness, and total alkalinity. Ammonia, chloride, fluoride, nitrate, and sulphate also exceed the FEIS predictions for Third Portage Lake, Second Portage Lake, and Wally Lake in at least one sample. Most metals are below the predicted concentrations for Third Portage Lake, Second Portage Lake, and Wally Lake, except for silicon (all three lakes), strontium (Third Portage Lake) and isolated instances of aluminum, copper, manganese, and one instance each for iron and chromium in TPE in the September sampling event (TPE-129; **Appendix B1**).

Golder was consulted regarding the accuracy of the FEIS predictions for silicon and strontium given that current concentrations in Third Portage Lake, Second Portage Lake, and Wally Lake consistently exceed the predicted concentration. The Phase 1 model assumed initial water quality in each Lake was representative of concentrations reported in Azimuth (2003). Parameters with concentrations less than the detection limit were assumed to be present at the detection limit, whereas constituents such as silicon and strontium that were not reported in the 2003 baseline dataset were assumed to be zero (V. Bertrand, pers comm, March 30, 2020). The full suite of analytes currently included in the CREMP water quality analysis weren't available in the early stages of the program, hence, the absence of concentration data for silicon and strontium during the baseline phase. The predicted silicon and strontium concentrations are, therefore, an underestimate of the actual baseline concentrations. Silicon and strontium are not suitable for evaluating the accuracy of the FEIS predictions, and moving forward, both parameters will be excluded from the FEIS assessment.

At the time the FEIS was issued in 2005, the freshwater aquatic life guideline for cadmium was lower than the MDL for the baseline data. A thorough review of the ecological significance of the predicted cadmium concentrations was presented in the FEIS, and the probability of cadmium causing toxicity was considered *extremely low* (Cumberland, 2005). Arsenic was also predicted to exceed the freshwater aquatic life guideline in Wally Lake (0.006 mg/L in the FEIS). Similar to cadmium, the MDL for arsenic was equal to the guideline (i.e., 0.005 mg/L) in 2005. The models were considered conservative because the MDLs were used as the baseline concentrations. The MDLs for arsenic and cadmium in the 2019 data are 0.0001 mg/L and 0.000005 mg/L, respectively. All of the samples collected in 2019 from Third Portage, Second Portage, and Wally Lakes were below the MDL for cadmium, as they were in 2018 (**Appendix B1**). In the case of arsenic, the concentrations are below the trigger values for Meadowbank project lakes and WAL, and more than an order of magnitude lower than the CCME water quality guideline of 0.005 mg/L in all samples. Overall, the FEIS predicted the magnitude of potential effect on water quality in each of the lakes as *low* (see **Section 2.4.1** for more details on the decision criteria for effect magnitude). It is important to note that none of parameters that exceeded trigger values or FEIS model predictions in 2019 (with the exception of chromium which only exceeded the FEIS predictions in sample TPE-129[23]) had trigger values set in the context of effects-based threshold values (e.g., CCME water quality guidelines). Thus, CREMP water quality results are consistent with the *low* significance (i.e., <1x CCME WQG) rating applied to model predictions in the FEIS (Cumberland, 2005).

Implications for 2020 Sampling Program

Following the new assessment strategy for MF and FF areas outlined in the *CREMP: 2015 Plan Update* (Azimuth, 2015b), the 2019 trigger/threshold exceedances were formally analyzed and applied to the decision criteria outlined in **Section 2.2.3** to determine the effort level and sampling frequency required at the MF and FF areas in 2019. The assessment strategy uses the water quality assessment results from current year (in this case 2019) to inform sampling at MF and FF areas the following year (i.e., 2020). The data were analyzed starting from the *Year +1* step of the flow chart where results from the NF areas are used to inform sampling at both MF and FF locations in 2019 (**Figure 4-14**).

Trigger/threshold screening results are presented in **Table 4-5** according to their corresponding degree of change (i.e., no trigger exceedance, minor changes, moderate changes, and major

[23] The total chromium results for TPE-129 are potentially anomalous or are related to laboratory or field error as the dissolved chromium results for the same station were below detection. The other east basin sample for September (TPE-128) was below detection (i.e., <0.0005 mg/L). Furthermore, it is also important to note that the concentrations were below the threshold.

changes). The outcome of the assessment for sampling at NF, MF, and FF areas in 2019 is summarized below.

Reference Areas (INUG, PDL)

- Trigger exceedances were documented for ammonia and TKN at INUG and for hardness and calcium at PDL.
- TKN, INUG, and PDL are reference areas and outside any potential mine related influence.
- The sampling strategy for 2020 is to complete a full CREMP program for reference areas.

Near-field (TPE, TPN, SP, and WAL)

- Trigger exceedances were documented for parameters without effects-based thresholds (e.g., conductivity, hardness, and cations).
- The mean silicon concentrations exceeded the trigger in SP.
- There were isolated instances where one or more metal/parameter exceeded the trigger but not the yearly mean; an example is chromium in Third Portage East Basin (TPE-129) in September[24].
- Ammonia exceeded the trigger in some samples collected in 2019. It also periodically exceeded the FEIS predictions, and in some instances the threshold, at TPE, TPN, and SP. The 2019 results were highly variable at all study areas (e.g., Meadowbank, Whale Tail, and Baker); however, the yearly mean ammonia concentrations were below the trigger value at all Meadowbank NF areas. Interestingly, the ammonia concentrations at INUG and PDL also exceeded the trigger and threshold values on one or more occasions in 2019 and INUG had higher observed concentrations of ammonia in 2019 than the Meadowbank NF lakes. The results from INUG suggest there were other regional factors influencing ammonia concentrations throughout the watershed. Overall, there is no trend or pattern for ammonia associated with mine related influences in 2019.
- The full program will be completed at the NF locations in 2020.

Mid-field and Far-field (TE, TPS, and TEFF)

- One through-ice sampling event was completed at the MF and FF areas in 2019.

[24] The total chromium results for TPE-129 are potentially anomalous or are related to laboratory or field error as the dissolved chromium results for the same area were below detection. The other east basin sample for September (TPE-128) was below detection (i.e., <0.0005 mg/L). Furthermore, it is also important to note that the concentrations were below the threshold.

- Some parameters without effects-based thresholds exceeded trigger values at TPS and TE in the March 2019 samples.
- All samples for metals were below their respective trigger values in 2019 with the exception of one dissolved copper result at TE-97 and silicon. The dissolved copper concentration was 0.0031 mg/L which is over the trigger value of 0.00119 mg/L and the threshold value of 0.002 mg/L; however, the total copper values were below the MDLs for both Tehek Lake samples. These results suggest possible cross-contamination and are unlikely to be representative of lake conditions.
- Any potential exceedance of trigger values observed at the mid-field and far-field areas are a snapshot of potential conditions at that moment. Samples collected in March confirm that concentrations are relatively stable at the MF and FF areas compared to previous years.
- Additional sampling during the open water period in 2019 was deemed unnecessary. Formal BACI analysis of the results was not completed, given the new sampling and analysis framework.
- Given there were no trigger exceedances for parameters with effects-based thresholds at the NF areas in 2019, a minimum of one (but ideally two) through-ice sampling events at the MF and FF areas are recommended in 2020 to verify there are no exceedances of effects-based thresholds. No other sampling (e.g., sediment chemistry or benthic invertebrate community) is required at MF and FF areas in 2020.

4.4 Phytoplankton Community

4.4.1 General Observations

The diversity in types and sizes of phytoplankton is large and their abundance is great. They typically exceed 1 million individuals per liter with a total biomass of approximately 200 mg/m^3 in summer. Six major taxonomic groups of phytoplankton are present in the study lakes, namely blue-green algae (Cyanophyta), green algae (Chlorophyta), golden-brown algae (Chrysophyta), Diatoms, Cryptophytes and Dinoflagellates.

Chrysophytes (golden-brown algae) are small, usually unicellular phytoplankton that are consistently the most abundant taxonomic group in the Meadowbank area lakes. Chrysophytes also dominate phytoplankton biomass in all project lakes, typically representing 65% or more of total phytoplankton biomass in summer samples, with smaller proportions (usually <10% each) from the other five major groups. The dominant chrysophyte genera for the Meadowbank lakes are *Chrysococcus, Kephyrion, Chrysochromulina, Dinobryon,* and *Chrysolkos*. Dominant genera for the other groups are *Oocystis* for chlorophytes, *Planktolyngbya* for cyanophytes, *Cyclotella* for diatoms, *Rhodomonas* and *Cryptomonas* for cryptophytes, and *Gymnodinium* and *Peridinium* for dinoflagellates (Azimuth, 2012a, 2011b, 2010a, 2009c, 2008a, and 2008b).

Mean phytoplankton biomass in the Meadowbank area lakes typically ranges from 100 to 250 mg/m^3 during summer with diminishing biomass in fall through winter. This range in biomass is typical for oligotrophic, central Arctic Canadian lakes. Biomass estimates from lakes sampled in the 1980s in the Kiggavik area generally ranged between 100 and 300 mg/m^3 (McKee et al., 1989). Other studies on arctic lake phytoplankton communities have reported similar ranges of phytoplankton biomass at Snap Lake (266 mg/m^3; De Beers, 2002), Char Lake (166 mg/m^3, Kalff et al., 1975), and Spring Lake (120 mg/m^3, Welch et al., 1989).

4.4.2 Temporal and Spatial Trend Interpretation

The approach for identifying potential mine-related impacts involved visually searching for temporal-spatial patterns that might be associated with mine-related activities (see **Table 1-1** for details), augmented by statistical analyses of 2019 data to test for changes relative to baseline/reference conditions using the BACI model (see **Section 2.4.3** for details).

The primary metrics used in the assessment were chlorophyll-a concentration (a surrogate for overall primary productivity), total biomass (mg/m^3), relative biomass of major taxonomic groups, and species richness (total # species). Biomass, not abundance, was examined because biomass and abundance tend to be reasonably well correlated and, ultimately, biomass is a much better approximation of actual lake productivity or food availability for zooplankton. The BACI statistical testing focused on total biomass and species richness because these reflect ecologically relevant information about the phytoplankton community (i.e., total mass of community and community composition, respectively); trigger and threshold effect sizes are 20% and 50%, respectively.

The expected response patterns in phytoplankton biomass and species richness are dictated by the nature of the physical and/or chemical changes caused by mine-related activities. For example, dike construction or dewatering may introduce turbidity, leading to a reduction in phytoplankton biomass/diversity. In contrast, introducing other substances such as nitrogen associated with blasting by-products could increase primary production. We therefore look for both reductions and increases (i.e., two-tailed statistical tests) in phytoplankton-related metrics coinciding with mining activities (i.e., focusing primarily on data for SP, TPE, TPN, and WAL).

One consideration when working with phytoplankton data is the naturally high variability of control data. This potentially confounding *noise* effect can make it difficult to identify mining-related influences or *signals* at impact areas, unless the signals are quite large.

Density and biomass results for phytoplankton samples collected from the Meadowbank study lakes are provided in **Appendix D1**. The 2012 CREMP (Azimuth, 2013) provides a detailed description of historical trends in phytoplankton-related metrics. The current report emphasizes results for 2019, but retains the historical context by showing the results of all monitoring years. Trend data for chlorophyll-a, total biomass, major taxa composition, and species richness are presented from **Figure 4-58** to **Figure 4-62**. Plots for all other phytoplankton metrics are presented in **Appendix D1**. The results for the BACI model statistical tests of the 2019 results against baseline/reference conditions for total biomass and species richness are provided in **Table 4-7**; key results are described below.

Key Results for the 2019 BACI Model Statistical Tests

Chlorophyll-a

Concentrations in the reference area samples typically ranged between 0.145 and 1.96 µg/L in summer months, reflecting the oligotrophic, nutrient poor condition of these lakes. This trend has not changed over time.

- TPN and TPE – The seasonal pattern of chlorophyll-a concentrations among reference and exposure areas in 2019 was similar to 2018. In both years, higher concentrations were observed at all locations during the late-summer event in September relative to July and August open-water events, and to March and May through-ice events.
- SP, WAL, and INUG – While these areas also showed higher concentrations in September 2018 compared to July and August, in 2019 an early season increase in chlorophyll-a concentrations was observed in both SP and WAL, thereby offsetting any apparent increase in later months. The highest chlorophyll-a concentrations among exposure areas in 2019 were at WAL, where they reached 1.96 µg/L in the May event. WAL also had the highest concentrations in 2018, although these were observed in October. By July 2019, concentrations in WAL and SP had returned to 2018 levels. The high concentrations of chlorophyll-a in INUG were also observed in May.
- Slightly higher chlorophyll-a levels observed at TPE and TPN in August and September sampling events is consistent with results reported in the past 4 years of monitoring. The relatively high concentrations observed at WAL, SP, and INUG in March and May 2019 were also observed in 2011 at several areas. There is no evidence to suggest that the relatively early-season increase in productivity at those lakes is related to mine activity, rather it is more likely related to inter-season variability.

- Overall, despite some variability in timing and magnitude of peak concentrations, chlorophyll-a concentrations have typically remained less than 1 µg/L since 2006 (**Figure 4-58**), which is consistent with oligotrophic conditions (Kasprzak et al. 2008).

Total Biomass

The total phytoplankton biomass results for 2019 were very similar to 2017 and 2018. Biomass results followed the same seasonal trends, with higher biomass reported in the summer months (July to September) compared to early spring. Winter under-ice biomass has been naturally very low at most locations in all the years it has been measured, and, generally, the same pattern was noted in 2019.

- The exceptions to the trend were SP and one of two WAL samples where productivity increased earlier in the year (e.g., in May; **Figure 4-59**). Biomass at NF areas in 2019 peaked in May at SP and WAL (188 mg/m^3 and 181 m/m^3 respectively). These results are similar to the chlorophyll-a results reported above and likely reflect natural variability. While these results are a slight departure from previous sampling events, a similar pattern was seen in some of the Whale Tail study area lakes (reported in **Section 5.4**).
- Peak summer biomass estimates at INUG in 2019 were between 163 and 199 mg/m^3, less than 2018, but higher than 2017. PDL peak biomass was around 157 mg/m^3 in July, which was higher than 2018 but lower than 2017. Overall, these results point to the expected seasonal variability and are consistent with the range observed in previous years for the reference areas (**Figure 4-59**).
- The relatively high total biomass for the May event in SP is related to an increase of chrysophytes from less than 10 mg/m^3 in March to between 93 and 159 mg/m^3 in May. An increase in chrysophyte biomass was also responsible for the overall increase observed in WAL. However, because total biomass was still within the historical range for both SP and WAL, the higher biomass in May is likely related to seasonal variability.
- In general, the results for 2019 for NF areas were relatively low compared to 2018; 188 mg/m^3 was the highest result in 2019 versus 259 mg/m^3 in 2018. The peak biomass in 2017 was upwards of 500 mg/m^3.
- The BACI analysis shows apparent increases ranging from 4% to 80% at the NF areas in 2019 relative to baseline/reference (INUG) conditions. The apparent increases were statistically significant ($p<0.1$) at SP (80% increase) and WAL (57% increase) (**Table 4-7**). The apparent increase in 2019 was primarily due to divergent patterns of lower biomass at INUG and slightly elevated biomass at SP and WAL, particularly during the May sampling event. Furthermore, INUG declined more rapidly at the end of the summer than

did any of the NF areas; INUG total biomass was between 41 and 44 mg/m^3 in September compared to between 127 and 136 mg/m^3 at SP during the same event.

The BACI model assumes that trends occurring at the reference area also occur at the exposure area (e.g., because they are responses due to regional climatic conditions), so the opposite response observed in 2019 contributed to a large apparent effect. Unlike some water quality parameters that have clearly increased due to mining activity in the NF areas (**Section 4.3**), the historical results for the phytoplankton biomass in NF areas (**Figure 4-59**) do not show obvious patterns of temporal increases. While changes in phytoplankton biomass in 2019 exceeded trigger (>20% effect; SP and WAL) and threshold (>50% effect; SP and WAL) values, it is hard to determine in a single year whether these changes are related to mining. For example, while the apparent response at SP (80% higher than baseline/reference conditions) is coincident with mining-related discharges, WAL's 57% higher biomass in 2019—also very similar to 2018 (56% higher)—occurred despite discharge to WAL ending in 2017. This suggests that natural variability may be an important driver of the observed trends.

Major Taxa Composition

Chrysophytes tend to dominate in all open-water months, a pattern that has been consistent since monitoring began in 2006 (**Figure 4-60**). The continued dominance of chrysophytes provides an additional line of evidence suggesting any *potential* incremental increase in nutrients or changes in water quality has not resulted in major structural changes to the community. Among the major taxa, chlorophytes are typically the first to response to nutrient enrichment in freshwater systems (Holmgren 1984). The direct positive effect of nutrient enrichment on chlorophytes has been shown to have an indirect negative effect on chrysophytes, which compete with chlorophytes for nutrients (Klug and Cottingham, 2001). In the same study by Klug and Cottingham, chrysophytes were among the dominant taxa prior to artificial fertilization of the study lakes. These observations from the primary literature substantiate findings from the CREMP that the structure of the phytoplankton community is consistent with pre-development oligotrophic conditions.

Taxa Richness

Seasonal profiles for all areas were as expected, with a general increase from low diversity in under-ice months to peak diversity of approximately 30 to 40 taxa during the open water season (**Appendix D1**). The seasonal pattern of taxa richness at the exposure areas was similar to the reference areas and consistent with previous years (**Figure 4-62**). There was a statistically significant increase (17%; p=0.05) in taxa richness at SP in 2019 relative to baseline/reference conditions; however, the effect size was below the 20% trigger level (**Table 4-7**).

The phytoplankton community taxa biomass and taxa richness data from 2019 are generally similar to previous years and largely appear within the range of historical baseline/reference conditions. However, statistically significant ($P<0.1$) changes were detected above thresholds (SP: +80% in total biomass and WAL: +57% in total biomass), but ascribing causality for these statistically significant effects from the BACI model is difficult. In 2018, there was a similar-sized increase in total biomass observed in WAL, but not in SP. There was also a significant increase in richness observed in TPN in 2018 that was not observed in 2019.

As discussed above, there is evidence that natural variability might drive these effects. WAL did not receive mine-related discharged in 2018 or 2019. Many of the apparent changes at these NF areas can be attributed to lower results in 2019 at INUG, rather than to absolute gains at the individual areas. For some areas, (e.g., SP and WAL) total biomass also increased more quickly early in the year than in INUG and stayed high for longer. While the gradual changes in water quality observed over the years could have stimulated phytoplankton productivity, they do not explain the increases in biomass, and to a lesser extent taxa richness, seen in 2019 relative to previous years. Natural variability is the most plausible explanation for apparent increased biomass (relative to baseline years) at the NF areas in both years. Notwithstanding, this trend will continue to be watched closely in 2020 to verify whether future patterns are consistent with this conclusion or whether they provide stronger evidence of mine-related causality.

4.5 Sediment Chemistry

4.5.1 General Observations

Natural sedimentation rates in the Meadowbank study lakes are considered low, due to the headwater nature of the watersheds and the lack of any substantial riverine or tributary inflow. Thus, very little sediment is carried into the lakes other than what erodes off the nearby tundra during spring run-off or heavy rain events, or from dust deposition. The only site discharge in 2019 was from relatively short duration dike seepage into Second Portage Lake. There are, however, mine-site activities that can generate dust and potentially increase the net deposition into project lakes.

Based on historical bulk sampling of sediment using grab samples, we have observed reasonably large, within-basin or within-lake differences in surface sediment (i.e., top 3–5 cm) concentrations for various metals, indicating natural spatial heterogeneity driven by localized mineralization. Several processes can affect the pattern of metals distribution to sediments, including differential deposition of different grain size materials according to wind direction and speed, water depth, water currents, basin morphometry, bioturbation (i.e., vertical mixing of sediment by burrowing insect larvae), and patchy, heterogeneous distribution of metals in mineralized areas. Metals concentrations are highly dependent on grain size, with coarse grain size (i.e., sandier) typically correlating with lower metals concentrations. Therefore, our sediment programs target low energy, depositional areas that are dominated by silt/clay sediment in areas of similar depth (6–10 m), where grain size tends to be finer and more consistent.

Sediment chemistry samples are collected using grab samplers (targeting top 3–5 cm) or coring devices (targeting top 1.5 cm). Grab samples are used to characterize the chemical and physical conditions of sediments paired with the benthic invertebrate community samples. While grab samples can provide insights into temporal changes in sediment chemistry, core samples are more sensitive and are used in the CREMP to formally test for changes in sediment chemistry related to mining. Core samples are collected every three years to match the timing of EEM studies required under the Metal and Diamond Mining Effluent Regulations. Below is an overview of the various sediment sampling programs at Meadowbank dating back to baseline sampling in 2008:

- **2008** – Baseline coring was conducted in July 2008 prior to onset of East Dike construction to characterize baseline surface metals concentrations at all monitoring areas.
- **2009** – The 2009 coring program was implemented to monitor potential changes to surface sediment chemistry that may have occurred as a result of the East Dike sedimentation event in August 2008. The 2009 study was conducted only at SP, TE, TPE, and INUG. TPE and INUG were used as the reference areas for SP and TE.
- **2010 to 2013** – The 2010 to 2013 sediment grab sampling programs covered all NF, MF, and FF Meadowbank study lakes as well as the reference areas INUG and PDL. Sediment coring was completed as part of the 2012 program.
- **2014** – The 2014 program was advanced a year ahead to align with EEM program. It covered all Meadowbank study lakes, sampling areas, and reference areas. Additional sampling was completed at TPE in 2014 to help assess whether the apparent changes in sediment chromium concentrations were related to spatially biased sampling or were a real temporal trend. Two zones in TPE were targeted for coring: the zone sampled initially in 2008 and 2009 (prior to dike construction; TPE-B) and the zone sampled in 2010 (TPE). Results from this analysis helped inform the design of the targeted chromium bioavailability study conducted at TPE in 2015.
- **2015** – The routine 2015 sediment sampling program was limited to the NF study lakes in accordance with the new approach outlined in the *CREMP: 2015 Plan Update* (Azimuth, 2015b). In addition to routine sampling, a targeted bioavailability and toxicity testing

program was completed on TPE sediments to provide help determine whether the apparent increase in chromium concentrations adversely affects the benthic invertebrate community. Sediment grab samples were collected from two zones in TPE and from the reference areas. Samples were analyzed for total metals and other conventional parameters, as per the routine CREMP program, and sequential extraction testing was performed to determine the bioavailability of sediment chromium. Bulk sediment was sent to a toxicity testing laboratory where two tests were run using *Chironomus dilutus* and *Hyalella azteca.*

- **2016** – Sediment sampling in 2016 was limited to grab sampling at the Meadowbank study lakes.
- **2017** – Sediment grab and core sampling was completed at all Meadowbank project lakes. Samples were spaced throughout each basin. Grabs for chemistry and benthic invertebrates were collected at the same location. Core samples were opportunistically collected from some of the grab sampling locations. The remaining replicates were spaced throughout the basin in areas with the targeted depth and substrate composition.
- **2018** – Sediment grab sampling at the Meadowbank study lakes was conducted concurrently with the benthic invertebrate community sampling locations. Targeted studies were conducted at TPE and WAL to follow up on recommendations in the 2017 CREMP (Azimuth, 2018c). The 2017 CREMP study found that chromium concentrations in the sediments at TPE and the arsenic concentrations at WAL appeared elevated compared to pre-development baseline concentrations. Sediment coring (10 replicates per location[25]) was conducted to verify the 2017 results, and toxicity testing (**Section 4.6.3**) was conducted following the method used in 2018.
- **2019** – Sediment grab sampling was completed at the Meadowbank study lakes concurrently with benthic invertebrate community sampling. The targeted bioavailability study completed in 2018 indicated lower mean chromium concentrations at TPE than were observed in 2017 but appeared to confirm that concentrations were higher than before-impact concentrations. Another year of coring was completed at TPE to provide three consecutive years of chemistry data to evaluated temporal changes in sediment chromium concentrations. Sediment coring at WAL in 2018 confirmed there are no temporal changes in sediment metals at WAL attributable to activities at the mine; no follow-up was completed in 2019.

[25] A “replicate” is a discrete core sample following the standard operating procedure (SOP) in Azimuth 2015b.

4.5.2 Temporal and Spatial Trend Interpretation

Tabulated 2019 sediment chemistry results for the grab and core samples are presented in **Appendix C**. Concentrations of individual metals have been plotted in **Figure 4-64** to **Figure 4-72**[26]. Metals concentrations are shown by area/basin for the different sampling methods (grab [data points] vs core samples [box and whisker plots]). The red dashed line in each of sediment metals figure is the trigger value specific to the parameter and area (i.e., Meadowbank lakes and Wally Lake each have their own trigger values as of 2017). The box and whisker plots illustrate the statistical distribution of core samples within each area. Data interpretation for the box and whisker plots is as follows:

- The horizontal line inside the box represents the median concentration.
- The upper and lower margins of the box represent the upper (75th) and lower (25th) percentile concentrations, respectively (the *interquartile* range).
- The vertical lines represent maximum and/or minimum concentrations (provided at least one value falls outside the box but within 1.5 times the interquartile range).
- 'x's that occur beyond the maximum or minimum lines represent concentrations that are greater than 1.5 times the interquartile distance and indicate *outlier* concentrations that are real, but do not fit within the distribution of the rest of the data, for whatever reason.

Grab samples for sediment chemistry were collected with benthos community samples at TPE, TPN, SP, WAL, INUG, and PDL and were screened against the trigger and threshold values (**Appendix C** and **Figure 4-64** to **Figure 4-72**). Those results are discussed in the following section of the report. Coring results for TPE, which were the focus of a targeted sediment coring study, are discussed in a separate subsection below.

Meadowbank Sediment Grab Chemistry Results for 2019

In the 2019 grab chemistry samples, the only threshold exceedance was for zinc (SP and TPE) and there were one or more trigger exceedances for arsenic, cadmium, chromium, copper, lead and zinc at one or more NF areas. With the exception of chromium at TPE (see further discussion in next subsection), the trigger exceedances were generally reflective of natural spatial variability rather than mining-related changes; this is supported by the lack of temporal changes relative to baseline conditions, the lack of a corresponding change in water quality, and by the

[26] The detection limit for mercury was adjusted in 2019 from 0.005 mg/L to 0.05 mg/L. These changes are notably on the mercury plots for all study areas if mercury concentrations are below 0.05 mg/L. This adjustment does not impact trigger screening.

lack of co-located mine discharges (except the SP). The threshold exceedances are discussed further below.

The threshold exceedances were limited to zinc at SP and TPE (**Figure 4-72**). At SP, zinc concentrations ranged from 130–151 mg/kg in 2019, exceeding the threshold at all replicates (threshold = 123 mg/kg). In TPE, zinc exceeded the threshold at one replicate (TPE-5 = 130 mg/kg) and exceeded the trigger at three of the remaining four replicates (trigger = 114.2 mg/kg). While there is an apparent increasing trend in zinc at both SP and TPE over the last few years, the 2019 concentrations remain within or close to the range of baseline zinc concentrations. Coupled with the evidence that zinc concentrations (both total and dissolved) in water are rarely above laboratory detection limits (i.e., no causal link to mine discharge to water), it would appear that the observed patterns at SP and TPE are due to natural spatial heterogeneity. This explanation is corroborated by the 2019 coring results at TPE, which showed that of the 10 core samples collected, only one exceeded the threshold and one exceeded the trigger.

TPE Sediment Chromium Assessment

Coring was completed in 2019 at TPE to follow up on potentially elevated chromium noted in 2017 and also observed in 2018 (Azimuth, 2018c; 2019). Comparison to triggers and statistical analysis (before-after assessment) of concentration changes over time are presented in **Table 4-8**. Chromium has been the focus of targeted studies over the past three years related to the upward trend in sediment concentrations between 2009 and 2013. A primary concern was that increased chromium concentrations in sediments may adversely impact benthic invertebrates. Sediment metals bioavailability and toxicity testing results are reported in **Section 4.6.3**.

The following is a summary of the 2019 sediment chemistry results for TPE.

- Mean sediment chromium concentrations at TPE exceeded the trigger value in 2019 (mean value = 193 mg/kg; trigger value = 135 mg/kg; **Table 4-8**). This is higher than the 2018 mean of 150 mg/kg but lower than 2017 results (204 mg/kg). The 2019 analytical results for each core (10 replicates) are provided in **Appendix C**.
- Chromium ranged from 120 mg/kg (below the trigger) to 389 mg/kg. The coring replicates are collected within approximately 100 m, so the range of chromium concentrations indicates that sediments are fairly heterogeneous, even over a small area.
- The grab sample concentrations exceeded the trigger in four out of five replicates, ranging from 126–157 mg/kg in 2019, and yet there were no concentrations above the trigger in 2018.

- Chromium concentrations at TPE have consistently trended higher since the onset of the mine development in TPE in 2009 (i.e., change in status from *before* to *after*) and 2013 (**Figure 4-67**), likely related to use of ultramafic rock for dike construction. The pattern since 2013 has been variable, suggesting that spatial heterogeneity may be impacting the interpretation of results, making it difficult to be conclusive about the *temporal* variability observed since 2013. **Figure 4-67** shows the chromium concentrations over time (the core sample results with mean values are provided as boxes and the grab sample concentrations are represented as individual data points).
- Although there was an increase in the mean core concentration for chromium in 2019 and evidence that more grab sample replicates exceeded the trigger than in 2018, the data remain consistent with the stabilization in chromium observed at TPE since 2013 (**Figure 4-67**

Verification of the observed trends using sediment coring will be conducted again in 2020 (coring is paired with the EEM program), which is a full coring year across all areas.

4.6 Benthos Community

4.6.1 General Observations

The abundance and species composition of benthic invertebrates are influenced by water depth, substrate size, and organic carbon. Other physical factors, such as water temperature, can influence larval development rates and, ultimately, timing of hatching for insect larvae. Consequently, even if sampling can be conducted simultaneously in all lakes (which is not practical), this would still not overcome differential timing of hatching of particular species between lakes. This is partly overcome in the CREMP by sampling during August, after most groups have emerged, but it is still a source of some variability.

Benthic invertebrate communities in the Meadowbank study lakes are characterized by relatively few taxa and low abundance. Abundance is generally less than 2,000 organisms/m^2 and is often less than 1,000 organisms/m^2 at reference and exposure areas (e.g., **Table 4-9** and **Figure 4-73**). Despite abundance generally being low at the study lakes, values above 5,000 organisms/m^2 are not uncommon, and on occasion abundance has exceeded 10,000 organisms/m^2. Relatively large total benthic invertebrate abundance values were periodically observed in samples collected prior to mine development (e.g., one replicate had 26,000 organism/m^2 at WAL in 2006) and in more recent sampling events (e.g., one replicate had 31,000 organism/m^2 at WAL in 2016). The high variability in total abundance within an area has also recently been observed at lakes sampled for the Whale Tail Pit project during the baseline period (i.e., the *before* period). Total abundance at Lake A76 in 2017 was between 3,000 and

>24,000 organisms/m^2 (Azimuth 2018a). Whale Tail Lake – South Basin also showed comparatively large variance in abundance in 2017, ranging from 1,800 to over 10,000 organisms/m^2. Abundance data for the Meadowbank study lakes between 2006 and 2019, as well as more recent baseline data from the Whale Tail Pit program, demonstrates that benthos abundance is naturally variable, both spatially (i.e., among areas) and temporally (i.e., between years).

Taxa richness typically ranged from 8–12 for most area-year combinations (**Figure 4-77**). Typical of most Arctic lakes, the benthic invertebrate community has been dominated by the aquatic larval stages of insects, especially chironomids (Family Chironomidae), both in terms of abundance and taxa richness (e.g., **Figure 4-74** and **Figure 4-77**). The next most abundant group was Mollusca (clams), particularly *Cyclocalyx* / *Neopisidium* genera of the family Sphaeriidae (fingernail clams). Oligochaete worms were also relatively common in the lake sediments; generally, at least one oligochaete taxon was present at most area-year combinations.

4.6.2 Temporal and Spatial Trend Interpretation

Benthic invertebrate abundance and richness results from the reference (INUG and PDL) and NF (TPE, TPN, SP, and WAL) Meadowbank study lakes in 2019 are provided in **Appendix E1,** by major taxonomic group (i.e., Insecta, Mollusca, Oligochaeta, and other taxa). Geometric means of total abundance and total richness for the entire data set dating back to 2006 are provided in **Table 4-9**.

Time-series plots showing abundance and richness endpoints are presented in **Figure 4-73** to **Figure 4-78**. Below are descriptions of the endpoints, based on Environment Canada EEM guidance (2012):

- Total abundance – the number of individual organisms per m^2. This metric is a measure of community density.
- Total richness – the number of different taxa (identified to the lowest practical taxonomic level, usually species) per grab.
- Abundance of major taxa (absolute and relative abundance of each major taxon).
- Richness of major taxa (absolute and proportional richness of each major taxon).

Other benthic invertebrate community results presented in **Appendix E1** but not discussed in detail include time-series plots of abundance and richness within each major taxon, Simpson's Diversity, and Bray-Curtis Index values.

Identifying potential mine-related impacts generally involved visually examining the data for spatial/temporal patterns that matched mine-related events. This was followed up with formal statistical analyses of the data to test for changes relative to baseline/reference conditions using the BACI model (see **Section 2.4.3** for details). The BACI comparisons involved testing for single-year (i.e., 2019) and multi-year (i.e., up to four years) trends and focused on benthic invertebrate total abundance and taxa richness. Details regarding historical trends (e.g., related to sedimentation events) were discussed in the 2011 CREMP (Azimuth, 2012a) and the 2011 EAS (Azimuth, 2012b). This report focuses on the 2019 results and discuses temporal and spatial trends over the last four years (i.e., dating back to 2016). As discussed in **Section 2.2.3**, MF (TPS and TE) and FF (TEFF) areas were not sampled in 2019. BACI model results for benthic invertebrate abundance and richness are presented in **Table 4-10** and **Table 4-11**, respectively. Key results are described below.

Total Abundance

Benthos abundance at INUG in 2019 was similar to 2018. PDL increased marginally, largely due to an increase in insects. INUG is the main reference area used for the BACI comparisons, so it is noteworthy that total abundance has been relatively high (for INUG) over the last five years compared to earlier years (**Table 4-9**). However, absolute abundance is generally lower at INUG relative to the NF areas, with maximum abundance of 2,100 organisms/m^2 (2016) relative to SP (2,796 in 2014), TPN (3,025 in 2015), TPE (5,556 in 2008), and WAL (14,253 in 2016).

Yearly total abundance is plotted in **Figure 4-73**. Visually, the plots suggest a downward trend in abundance at WAL, SP, and TPN between 2018 and 2019. The BACI analysis also suggests a reduction in abundances in 2019 compared to baseline/reference conditions, but these results were not statistically significant, except at TPE over the period of 2016–2019 ($p<0.1$). Overall, the BACI results in **Table 4-10** show negative effect size (i.e., reduction) for all Meadowbank sampling areas when compared to INUG in 2019. As noted above, these results are strongly influenced by the higher results at INUG in 2019 relative to the baseline years. In general, we expect to see variability between years for all areas and note that both WAL and TPN had positive effect sizes in 2018 (WAL was 245% compared to -48% in 2019 [effect sizes were not statistically significant for either 2018 or 2019]).

Interpreting the BACI analysis results can be challenging for three reasons: 1) because natural variability exists between years and areas, 2) because abundance at the control area INUG has increased above baseline over the past few years, and 3) because there is heterogeneity within areas. The plot in **Figure 4-73** indicates that total abundance at TPE was fairly stable with relatively minor variability between years. However, the BACI assessment of total abundance at TPE over the past four years shows a statistically significant reduction of 42% compared to INUG. In contrast, the trend over the past four years for SP appears to be generally downwards in the time-series plot; however, this trend is not supported by the BACI analysis, partly because baseline total abundance at SP (e.g., pre-2008) was relatively low and because total abundance in SP increased markedly after 2010. The 2018 BACI assessment indicated that the effect size in SP was positive (ES = 1.1% not statistically significant) compared to 2019 when the effect size for SP was an apparent reduction of 32% (also not statistically significant).

A further challenge is accounting for heterogeneity within sites and the influence that differing abundance in replicates can have on the yearly mean for an area. For example, in 2019, abundance at replicate TPN-5 had a low total abundance of 130 organisms/m^2 compared to replicate TPN-1 had a high abundance of 1,913 organisms/m^2.

The only statistically significant decrease in abundance observed in recent years has been in TPE. In 2019, and for all *after* periods (i.e., up to four years), the effect size was negative (i.e., reduced abundance, see **Table 4-10**). In 2019 the effect size was an apparent reduction of 22% (not statistically significant); however, over the period of 2016–2019 the apparent reduction was 42% ($p = 0.07$). As discussed, the apparent reduction in abundance is not supported by the temporal trends for total benthic abundance for TPE shown in **Figure 4-73**. The time-series plots highlight that abundance at TPE has remained fairly constant over the last six years of operations and is consistent with baseline results. The apparent reduction in abundance at TPE in the BACI analysis is related to the combined effect of two factors: 1) high abundance at TPE during the baseline period and 2) increased abundance at INUG in recent years (relative to baseline). Regarding the first factor, abundance measured at TPE during the baseline period (2006 and 2008) was particularly high (two of the three highest abundances measured at TPE occurred during baseline; **Figure 4-73**), making mean abundance for the baseline period higher compared to more recent data from the 2016–2019 monitoring period. Second, as described above, abundance at INUG has increased slightly compared to TPE over the past four years and compared to the INUG abundance during baseline years (i.e., pre-2008; **Figure 4-73**). Combined, these two factors led to the detection of an apparent reduction in benthic invertebrate abundance at TPE. In this context, the BACI results for TPE are interpreted strictly as a *relative* reduction in abundance compared to INUG rather than an absolute reduction in benthos abundance. The BACI results, while important for identifying potential temporal changes in benthos metrics, need to be interpreted in the broader context of the absolute change in the benthos community over time. Overall, the abundance data do not suggest there are changes to benthos abundance in the NF areas that are attributable to mining activity.

Abundance of Major Taxa

Insects were the dominant taxon (generally over 60% relative abundance) followed by molluscs (roughly between 10–20% relative abundance) (**Figure 4-74** and **Figure 4-75**). While there were no apparent trends in composition changes related to mining, it is notable that most peaks (or valleys) in total abundance over the years appear to be driven by changes in abundance of insects (predominantly chironomids). Notable examples are WAL in 2006 and 2016, TPE in 2008, or TPS in 2015.

Richness of Taxa

Taxa richness in 2019 was generally similar to other sampling years (**Figure 4-76**). Taxa numbers averaged between 8 (PDL) and 15 taxa (TPE) in 2019 (**Appendix E1**). There were no statistically significant changes in taxa richness in 2019 or for the periods 2018–2019, 2017–2019, and 2016–2019. Apparent effect sizes (**Table 4-11**) showed either no change or a slight increase, with the exception of one apparent decrease of 8% at WAL in 2019. Overall, taxa richness was within range of richness observed over the duration of sampling years. Despite some within-year variability in taxa richness, the NF areas show either stable or slightly increasing taxa richness.

Richness of Major Taxa

Insects were dominant in terms of absolute and proportional richness (generally between five to ten taxa), followed by molluscs (~one to three taxa) (**Figure 4-77** and **Figure 4-78**). There were no apparent trends in composition related to mining.

Summary

The benthic invertebrate metrics (total abundance and taxa richness) for the NF and reference areas were generally within the range reported for previous years. While the BACI analysis detected a significant decrease in abundance at TPE relative to INUG in the past four years, the differences are primarily driven by increased abundance at INUG, while abundance at TPE has been relatively stable. Importantly, the diversity of the benthic invertebrate community at TPE is consistent with previous CREMP years, indicating the benthic community at TPE remains functionally diverse. In summary, the apparent changes in benthic community observed in 2019 are likely due to natural variability rather than to mining activities.

4.6.3 Sediment Metals Bioavailability Study Results

The toxicity test methods and results from Nautilus and porewater chemistry data from Brooks Applied Labs are provided in **Appendix G**.

Sediment Toxicity Test Results

Chironomus. Survival and growth results from the 2015, 2018, and 2019 tests with *Chironomus* are shown in **Figure 4-79**. Summary statistics and effects size estimates for the 2019 test are presented in **Table 4-12**. No difference was observed in chironomid survival at TPE compared to the lab or PDL field control in 2019. Survival was above 80% in all five replicates from TPE, similar to the results from 2015 and 2018. Chironomids exposed to sediment from TPE had significantly lower growth compared to PDL over the 10-d test, but there was no difference in growth compared to the lab control.

Hyalella. Survival and growth for the *H. azteca* test is shown in **Figure 4-80** and **Table 4-13**. Survival and growth were significantly lower for *H. azteca* in 2019 after 14-d exposure to sediment from TPE compared to the laboratory and PDL control treatments. Of the five replicate samples tested, replicates 1, 2, and, 3 had zero survival at the end of the 14-d test. Survival in the other two replicates was 50% and 100%. These results are consistent with test results from 2018, where survival among the five replicates was 0% in three replicates and 40% and 100% in the remaining two. The wide range in amphipod survival from TPE suggests that whatever stressor is causing the effect to *Hyalella* is highly variable in the TPE sediment.

Porewater Chemistry

Porewater chemistry results from 2019 are presented in **Table 4-14**. Among the seven metals analyzed, arsenic, chromium, lead, uranium, and zinc were all higher in samples from the reference area PDL than the exposure area TPE. The maximum porewater chromium concentration at PDL was 23.4 µg/L, six-fold higher than the maximum concentration recorded at TPE (4.1 µg/L). These metals were excluded from further investigation into the underlying cause of lower amphipod survival.

Iron and manganese were carried forward for closer investigation because the maximum porewater concentration at TPE was higher than PDL. In the case of iron, porewater iron at TPE was approximately two-fold higher than PDL; however, there was considerable variability in porewater iron among the five replicates at TPE. The lowest concentration was 440 µg/L, which is an order of magnitude lower than the lowest concentration measured at PDL (4,900 µg/L). Porewater iron did not correlate well with lower amphipod survival and was not considered the likely cause of effects to *Hyalella*.

Dissolved manganese was clearly elevated at TPE relative to PDL and was the only parameter that correlated with lower amphipod survival in 2019 (Spearman correlation = -0.85; p=0.007, **Figure 4-81**). Porewater concentrations were between 2,570 and 24,700 µg/L in samples from TPE, while concentrations at PDL were between 200 and 550 µg/L. Except for TPE replicate 3, manganese concentrations exceeded the short-term benchmark for acute effects to aquatic organisms of 3,600 µg/L (CCME 2019).

Integrated Conclusions

The goal of the targeted bioavailability study was to determine whether the mine has, or is, causing changes to sediment quality in TPE that may adversely affect the health of the benthic invertebrate community. The impetus for this study was the observation that chromium concentrations have increased at TPE since 2012 compared to the baseline period. It is important reiterate that the increase in chromium has not coincided with observed effects to the structure or function of the benthic invertebrate community at TPE.

The following sections summarize the sediment bioavailability study results, including the toxicological cause of the observed effect, the spatial extent of the effect in TPE, and whether the effect can plausibly be attributed to activities at Meadowbank.

Toxicity

Effects to Hyalella survival in the TPE sediment toxicity tests are caused by elevated concentrations of manganese in porewater.

The 2019 porewater chemistry data and results from long-term sediment chemistry monitoring provide a strong case that chromium is not a COPC for benthic invertebrates. First, the porewater chemistry data from 2019 shows concentrations at TPE are lower than PDL. Porewater metals concentrations are more bioavailable than metals associated with the particulate fraction, and amphipods from PDL exposed to concentrations as high as 23 µg/L showed no effects to survival or growth. Furthermore, the sequential extraction testing done in 2015 confirmed that the bioavailable fraction of chromium within the sediment matrix represented a small fraction of the total chromium present in the sediment. This *bioavailable* particulate fraction was well below the CCME ISQG, providing further evidence that chromium at TPE was not the cause of lower amphipod survival and growth seen in the sediment toxicity tests.

Porewater chemistry data from the 2019 sediment toxicity tests provided compelling evidence that high dissolved manganese is the cause of lower amphipod survival and growth observed in some replicates from 2015, 2018, and 2019. None of the other metals in porewater or sediment were significantly correlated with lower survival. The dose-response relationship between *H. azteca* survival and porewater manganese clearly showed that concentrations of manganese at TPE naturally exceed concentrations associated with effects to benthos. The manganese guideline is based on dissolved concentrations and was developed using the species sensitivity distribution (SSD) method of developing WQGs. Of the organisms included in the short-term benchmark, *Hyalella* was the most sensitive aquatic invertebrate with a 96-hr LC50 equal to 5,148 µg/L. By comparison, the 96-h LC50 for *Chironomus* is 17,386 µg/L. As seen in **Figure 4-82**, the 96-h LC50 for *Hyalella* used to derive the acute CCME WQG is similar to the porewater concentration measured at TPE-5 (4,400 µg/L) where survival was 50% in 2019. The correlation between survival and porewater manganese, combined with the screening data, provide conclusive evidence than manganese is the cause of toxicity to *Hyalella* at TPE.

Spatial Extent

Effects to Hyalella are localized to a small area in TPE.

Hyalella survival results from 2015, 2018, and 2019 were plotted relative to their location to help visualize the spatial extent of the effect on amphipod survival. **Figure 4-83** shows the spatial extent of effects on *Hyalella* survival are clustered in a relatively small area (approximately 100 m in diameter) southeast of the Bay-Goose dike. Exposure to sediment collected from this area caused effects to *Hyalella* survival in the lab toxicity tests, and was also the area with the highest reported porewater manganese concentrations in 2019. Within this 100 m sub-area, there were two sediment sampling locations where *Hyalella* survival was > 80%. Both locations were less than 20 m from sediment that caused complete mortality. These data clearly show that sediment from TPE can cause effects to survival for sensitive taxa, such as *Hyalella*, but the spatial extent of the effect is highly variable and appears localized to areas where manganese is elevated in porewater.

Causality

Manganese occurs naturally at high concentrations in TPE. There is no evidence to suggest the mine is causing increases in porewater manganese, either directly or indirectly.

The sediment toxicity test and porewater chemistry results, combined with sediment chemistry data dating back to 2009, provide evidence that manganese is naturally elevated in the basin. Evidence supporting this conclusion is discussed below. To help determine if observed effects to amphipod survival are attributable to the mine, the following key aspects of manganese in freshwater environments need to be considered:

- Manganese is found naturally in freshwater sediments, and concentrations vary substantially within a relatively small area. Baseline sediment sampling completed in the north basin of Whale Tail Lake for the FEIS in 2015 measured between 750 mg/kg and 23,500 mg/kg. Approximately 700 m separated the farthest sampling locations.
- Manganese occurs in various oxidation states that differ in their solubility, mobility, and potential to cause toxicity. Mn(II) is the most soluble and bioavailable form of manganese in aquatic environments (Lasier et al., 2000). Manganese partitioning between solid and dissolved phases is mediated by bacteria and depends on the localized environmental conditions in water or sediment, such as pH and oxidation-reduction potential (De Schamphelaire et al., 2007). In sediments where oxygen is abundant, for instance near the sediment-water interface, manganese occurs primarily as insoluble oxyhydroxides through the oxidation of Mn(II) to MnO_2 (CCME, 2019). In sediments where reducing

conditions are prevalent, manganese is reduced to dissolved Mn(II) (Calvert and Pedersen, 1996).

- Spatially, porewater manganese concentrations can be highly variable over a small scale, both vertically in the sediment profile and horizontally between locations. High-resolution spatial sampling devices (diffusive equilibration in thin films) showed distinct dissolved manganese profiles at the scale of mm to cm (Shuttleworth et al., 1999). Small-scale differences in organic carbon, bioturbation by benthic-dwelling organisms, and natural heterogeneity in the sediment composition contribute to *microenvironments* with highly variable porewater manganese concentrations.

Sediment chemistry data for manganese and iron were plotted to assess whether concentrations have increased as a result of Bay-Goose dike construction (2009-2010), dike seepage, or other site-related activities (e.g., dust). pH and TOC data were also examined, because changes in pH and redox potential influence manganese speciation (CCME, 2019). **Figure 4-84** shows manganese concentrations are highly variable within TPE, but between years, the concentrations are less variable. The greatest variability in sediment manganese was measured in the expanded 2014 coring program. Concentrations ranged from under 500 mg/kg to over 10,000 mg/kg in 20 core samples collected throughout the basin.

Input of organic carbon to freshwater systems, either through natural or anthropogenic activities (e.g., eutrophication) also has the potential to indirectly increase porewater manganese, by promoting reducing conditions in sediment and enhancing reduction of manganese oxides from MnO_2 to Mn(II) (Calvert and Pedersen, 1996; De Schamphelaire et al., 2007). However, **Figure 4-84** clearly shows TOC has remained consistently within the range reported during the baseline period (< 5 mg/kg). There is no evidence to suggest inputs of organic carbon have increased at TPE and contributed to reducing conditions that favor the reduction of manganese oxyhydroxides to Mn(II).

Summary

Key findings of the sediment bioavailability studies are:

1. Sediment manganese is naturally-elevated and highly variable between sampling locations. Sampling locations within 10 m of each other can differ over four-fold in sediment manganese. Concentrations have remained stable throughout the monitoring period, indicating the mine is not contributing to higher sediment manganese.
2. Dissolved manganese in porewater is the likely cause of effects in the *Hyalella* tests in 2015, 2018, and 2019. Factors such as organic carbon and pH that can influence the bioavailability and toxicity of manganese to aquatic invertebrates appear stable,

indicating the mine is not indirectly contributing to changing redox conditions that favor formation of Mn(II).

3. The amphipod toxicity test data provide important information about effects to sensitive aquatic invertebrate taxa, but the chironomid toxicity test results from 2015, 2018, and 2019 are more ecologically relevant for assessing potential risks to the benthos community at TPE. Over the three years of testing, chironomid sediment toxicity test results have substantiated the conclusions presented in the CREMP, namely, that there is no evidence to suggest the benthos community at TPE is being adversely affected by activities at the mine.

No additional targeted studies are recommended for TPE at this time.

4.7 Meadowbank Tables and Figures

The tables and figures for the Meadowbank CREMP are provided in this section, except for the large tabulated datasets and figures for parameters not included in the detailed analysis (see in-text references to appropriate Appendices). Subsections are provided for each of the CREMP components (e.g., limnology, water chemistry, phytoplankton, sediment chemistry, and benthos).

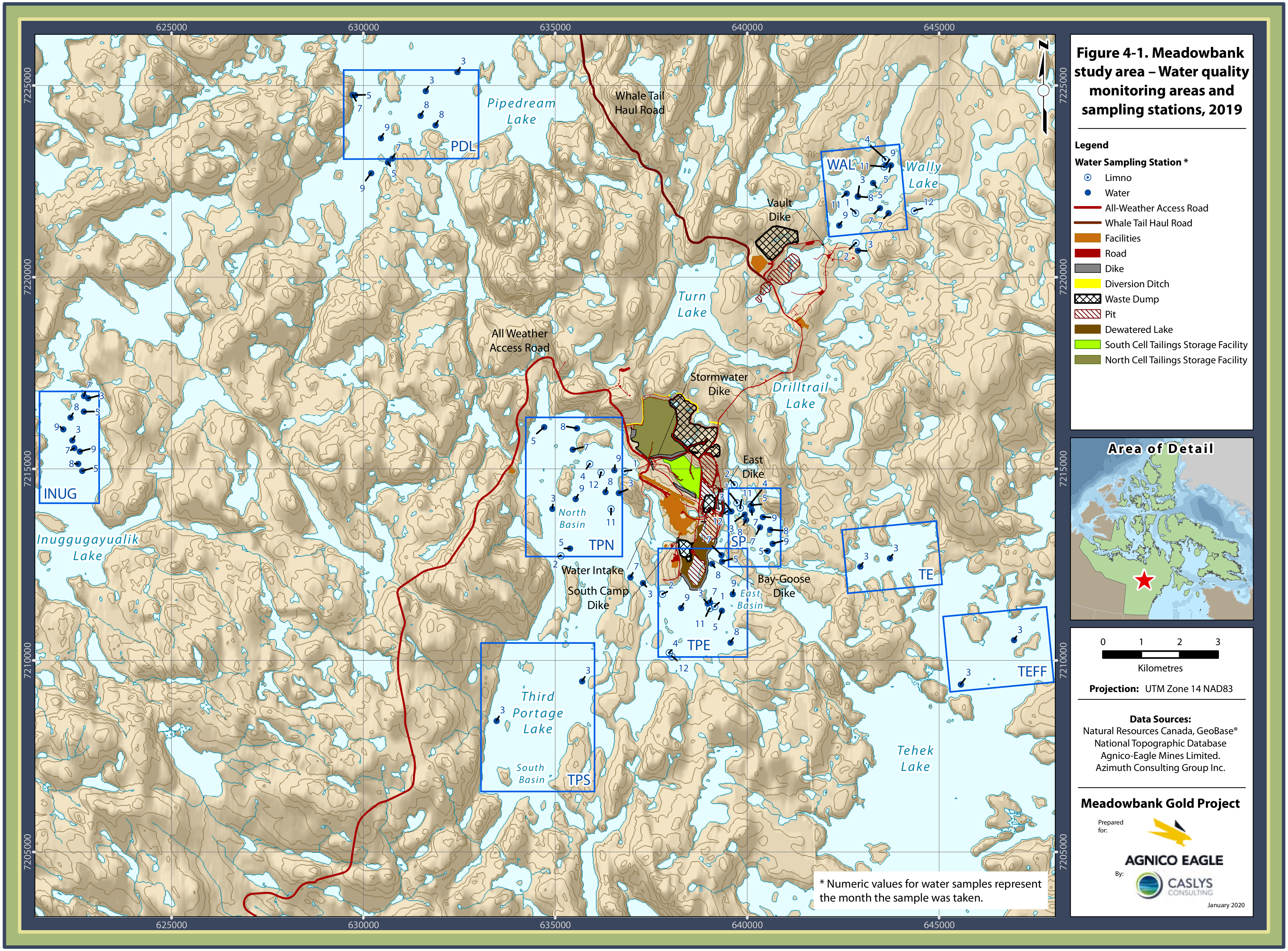


Figure 4-1. Meadowbank study area – Water quality monitoring areas and sampling stations, 2019

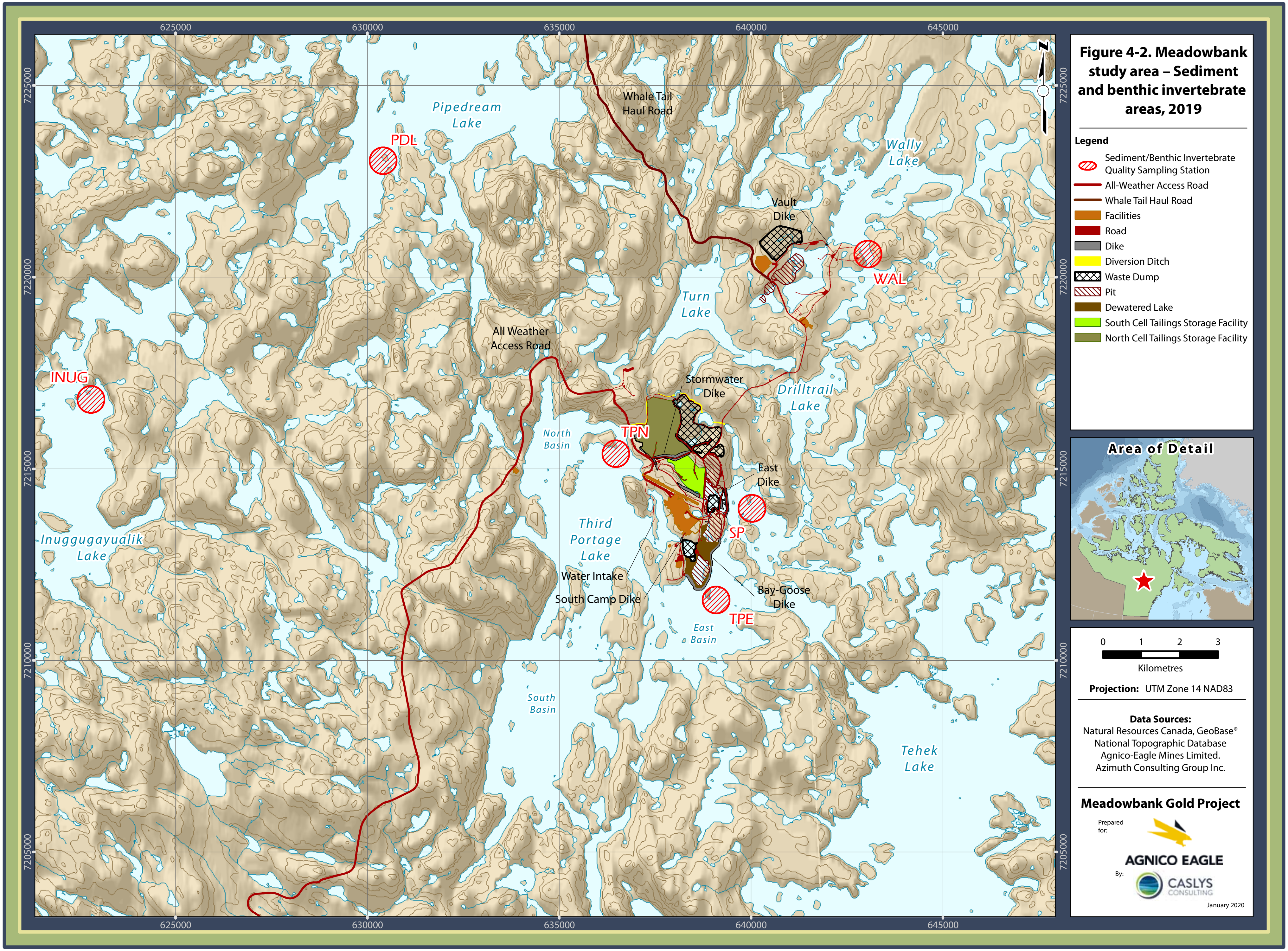


Figure 4-2. Meadowbank study area – Sediment and benthic invertebrate areas, 2019
Legend
Sediment/Benthic Invertebrate Quality Sampling Station
All-Weather Access Road
Whale Tail Haul Road
Facilities
Road
Dike
Diversion Ditch
Waste Dump
Pit
Dewatered Lake
South Cell Tailings Storage Facility
North Cell Tailings Storage Facility
Area of Detail
0 1 2 3
Kilometres
Projection: UTM Zone 14 NAD83
Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.
Meadowbank Gold Project
Prepared for:
AGNICO EAGLE
By:
CASLYS CONSULTING
January 2020
625000
630000
635000
640000
645000
7225000
7220000
7215000
7210000
7205000
N
Pipedream Lake
PDL
Whale Tail Haul Road
Wally Lake
Vault Dike
WAL
Turn Lake
All Weather Access Road
INUG
Stormwater Dike
Drilltrail Lake
North Basin
TPN
East Dike
SP
Third Portage Lake
Inuggugayualik Lake
Water Intake
South Camp Dike
Bay-Goose Dike
TPE
East Basin
South Basin
Tehek Lake

Limnology Tables and Figures

Figure 4-3. Mean monthly field-measured temperature (°C) at 3 m depth from 2006 – 2019, Meadowbank project area lakes.

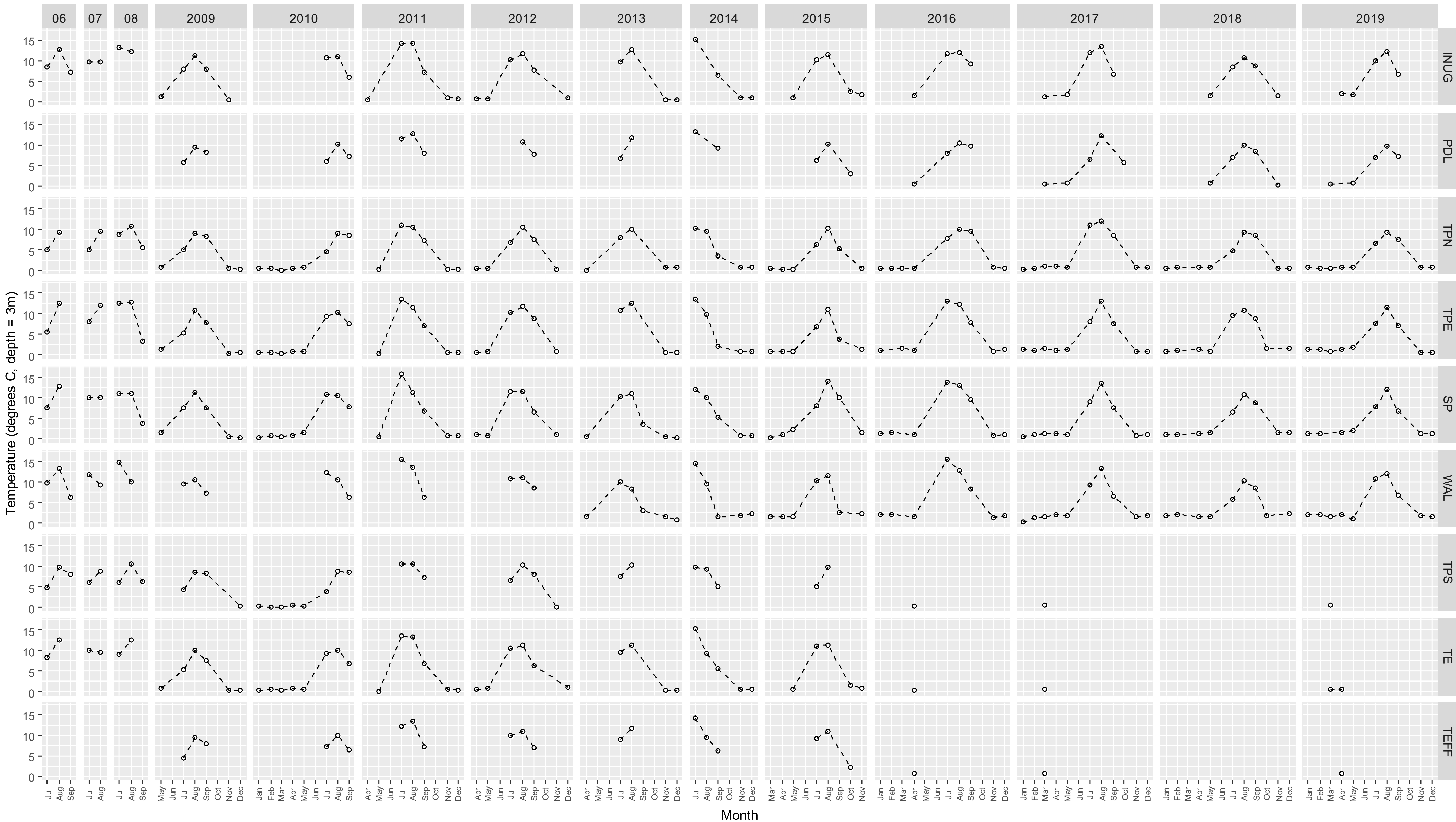


Figure 4-4. Meadowbank – Field-measured temperature, conductivity, and dissolved oxygen profiles, January 2019.

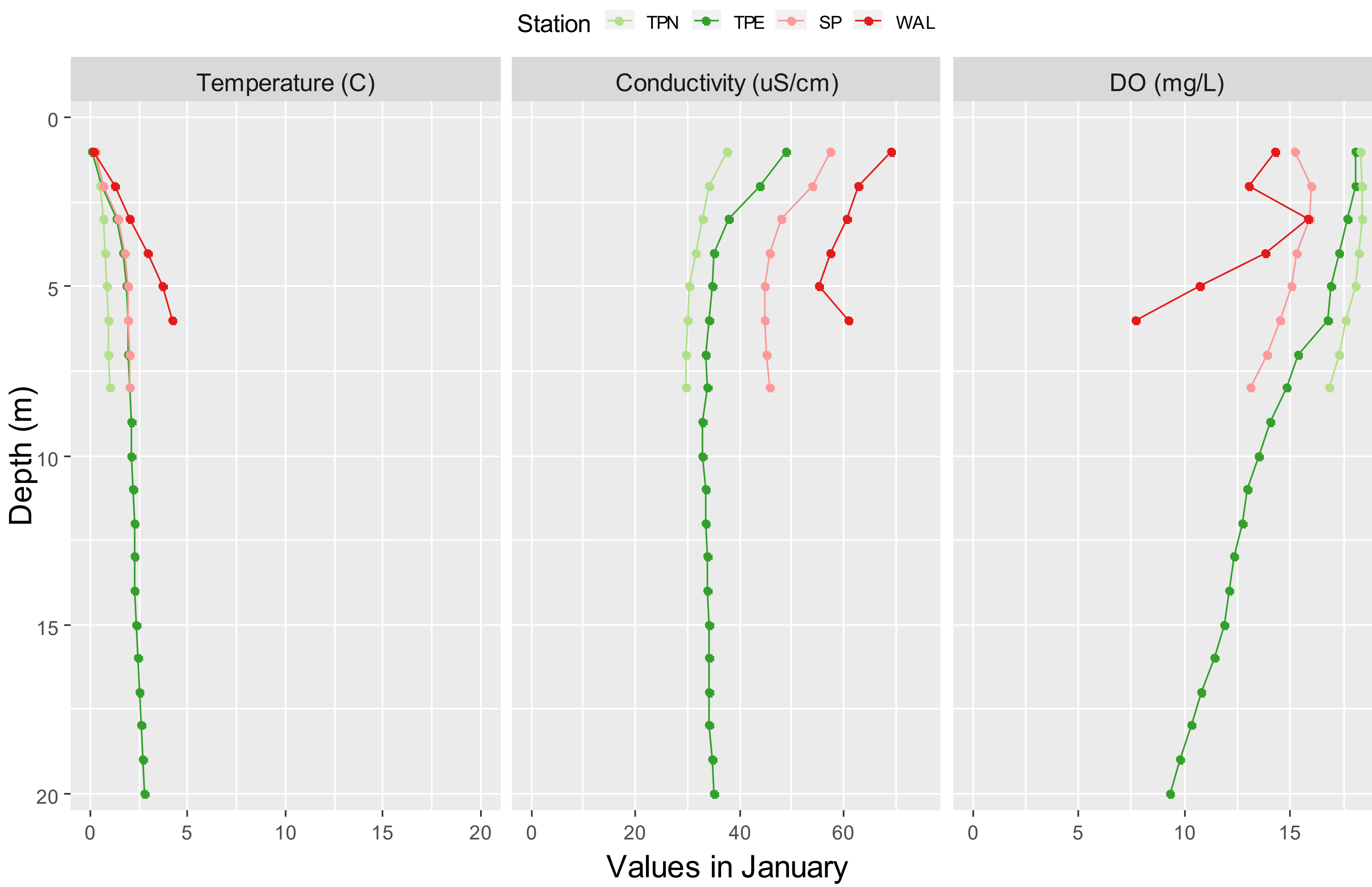


Figure 4-5. Meadowbank – Field-measured temperature, conductivity, and dissolved oxygen profiles, February 2019.

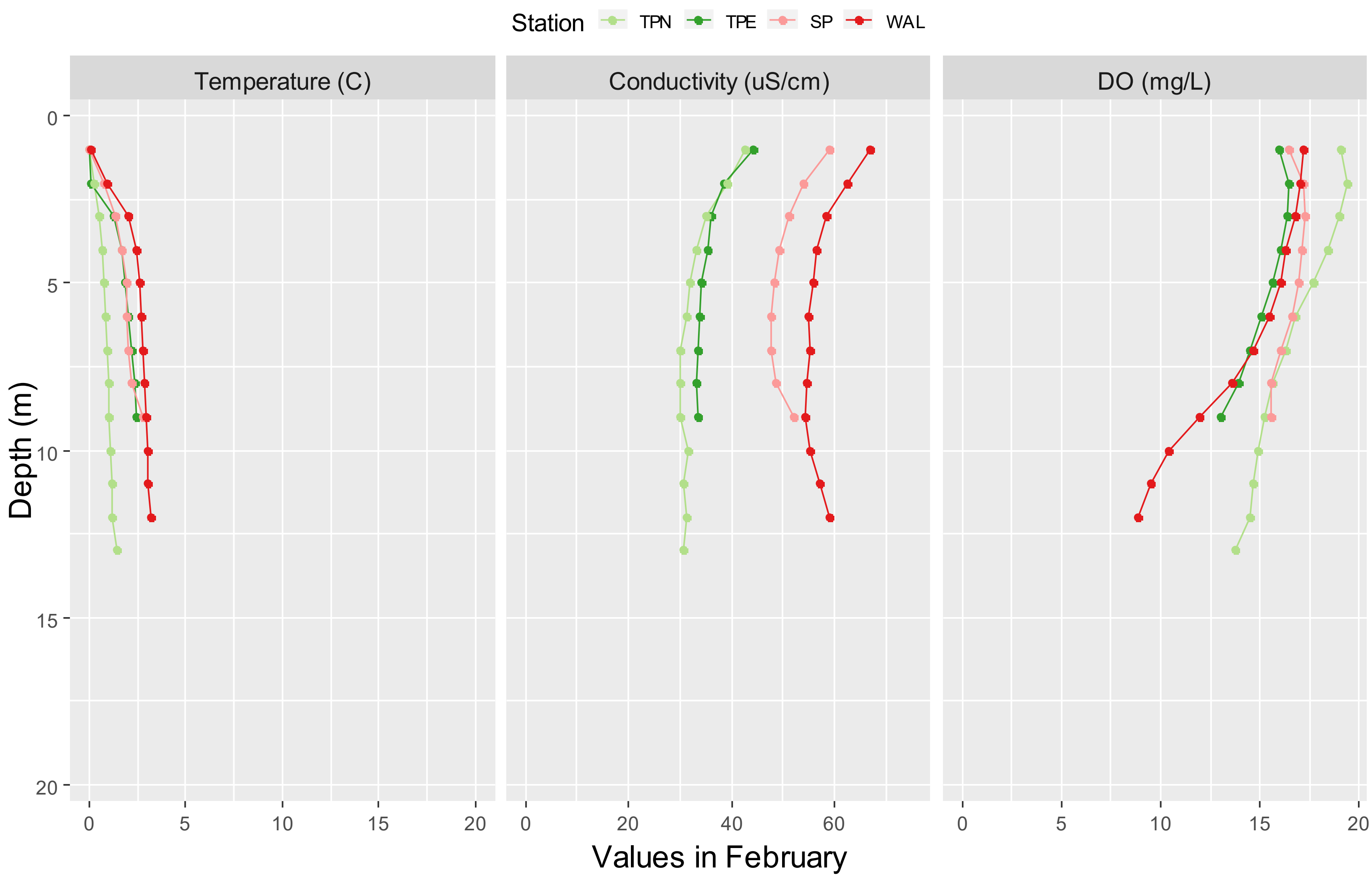


Figure 4-6. Meadowbank – Field-measured temperature, conductivity, and dissolved oxygen profiles, March 2019.

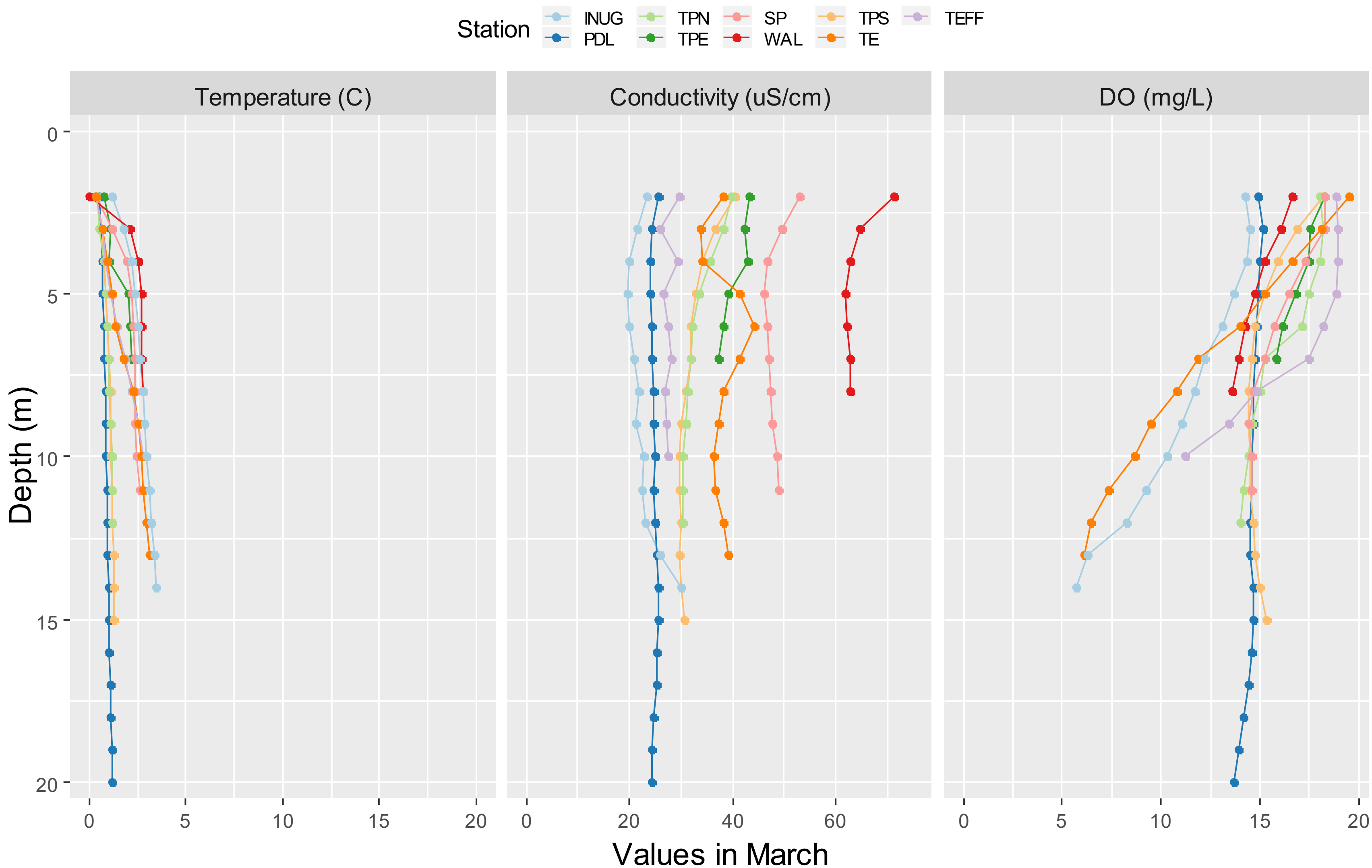


Figure 4-7. Meadowbank – Field-measured temperature, conductivity, and dissolved oxygen profiles, April 2019

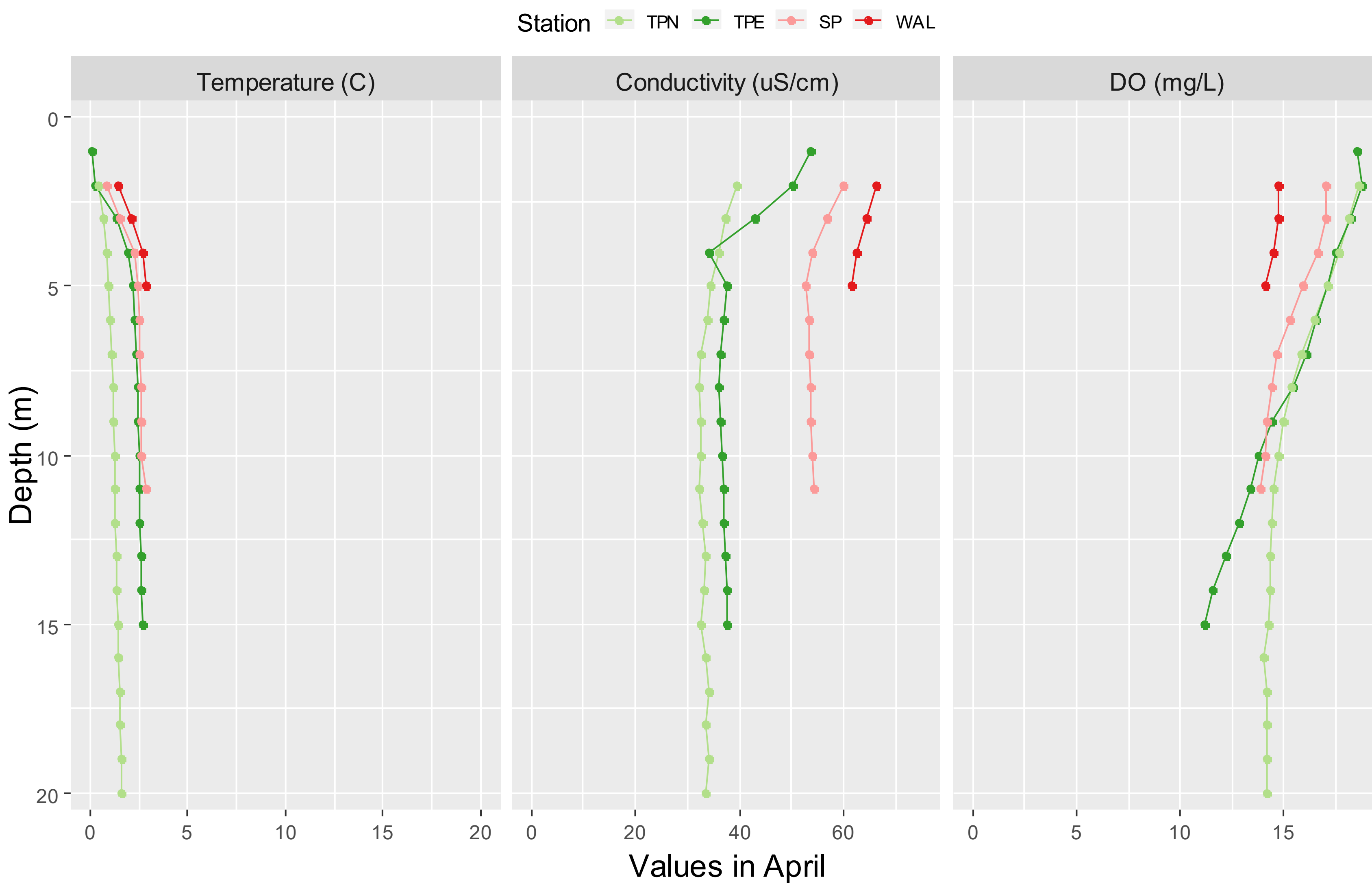


Figure 4-8. Meadowbank – Field-measured temperature, conductivity, and dissolved oxygen profiles, May 2019.

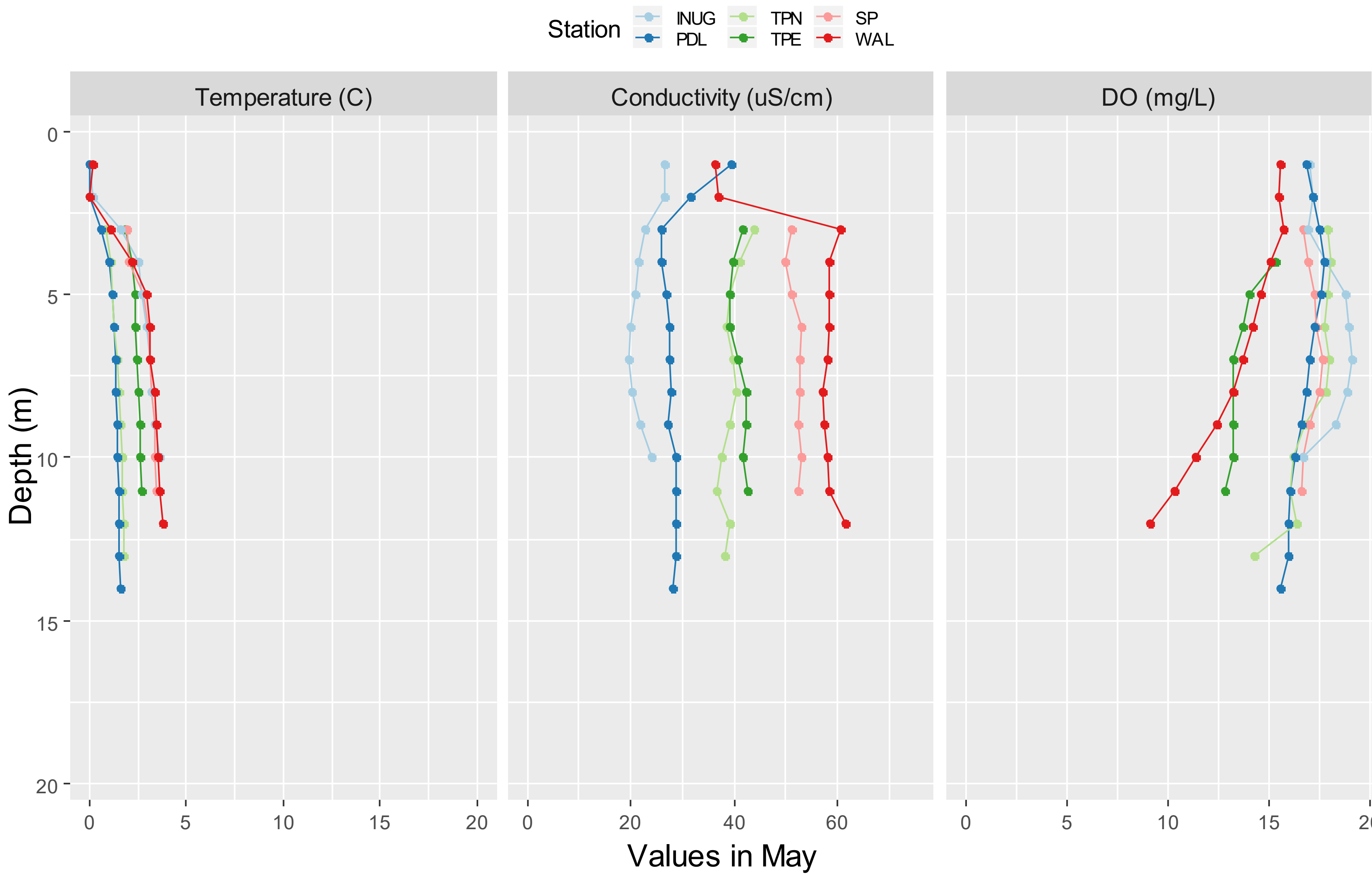


Figure 4-9. Meadowbank – Field-measured temperature, conductivity, and dissolved oxygen profiles, July 2019.

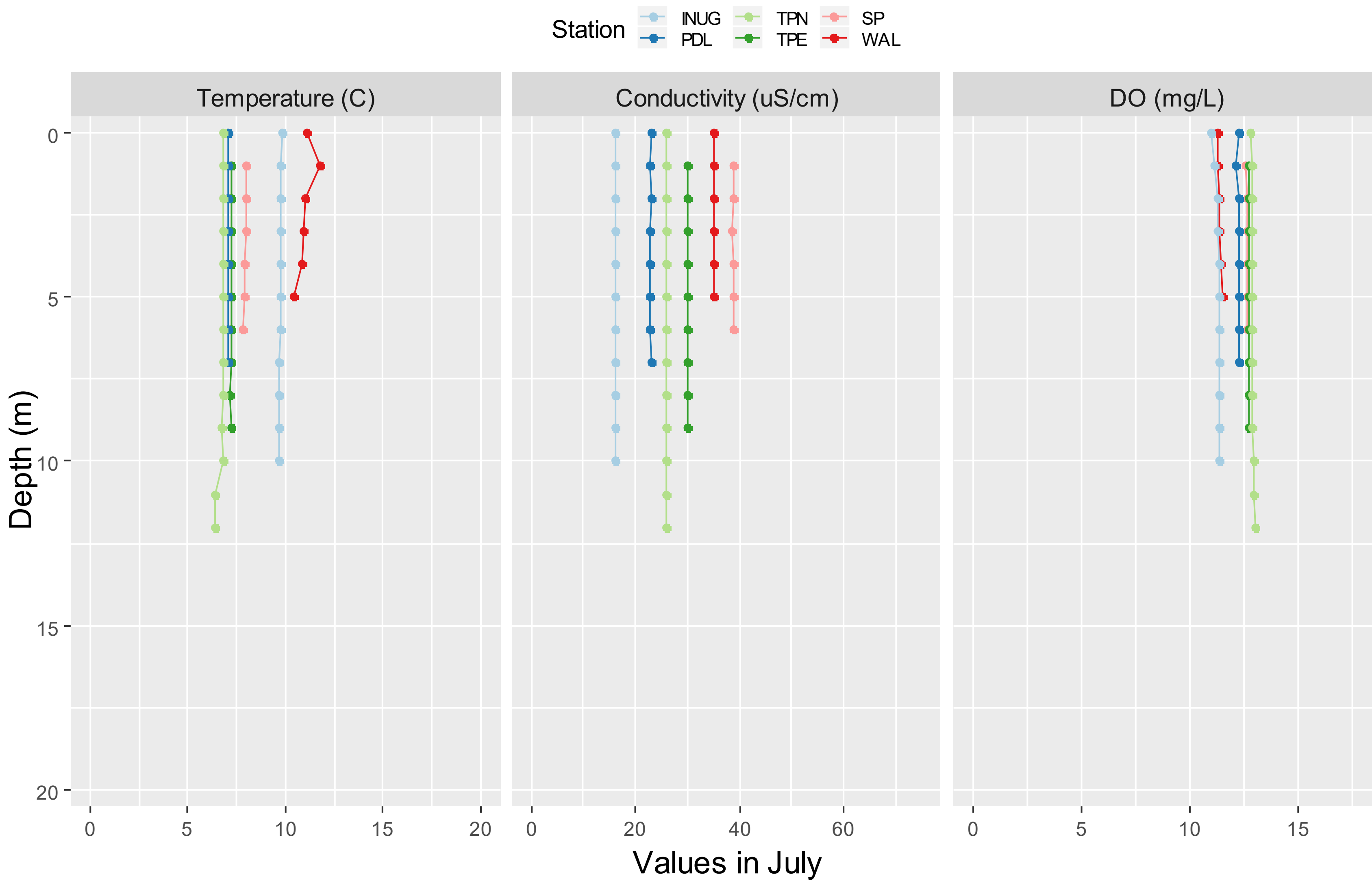


Figure 4-10. Meadowbank – Field-measured temperature, conductivity, and dissolved oxygen profiles, August 2019.

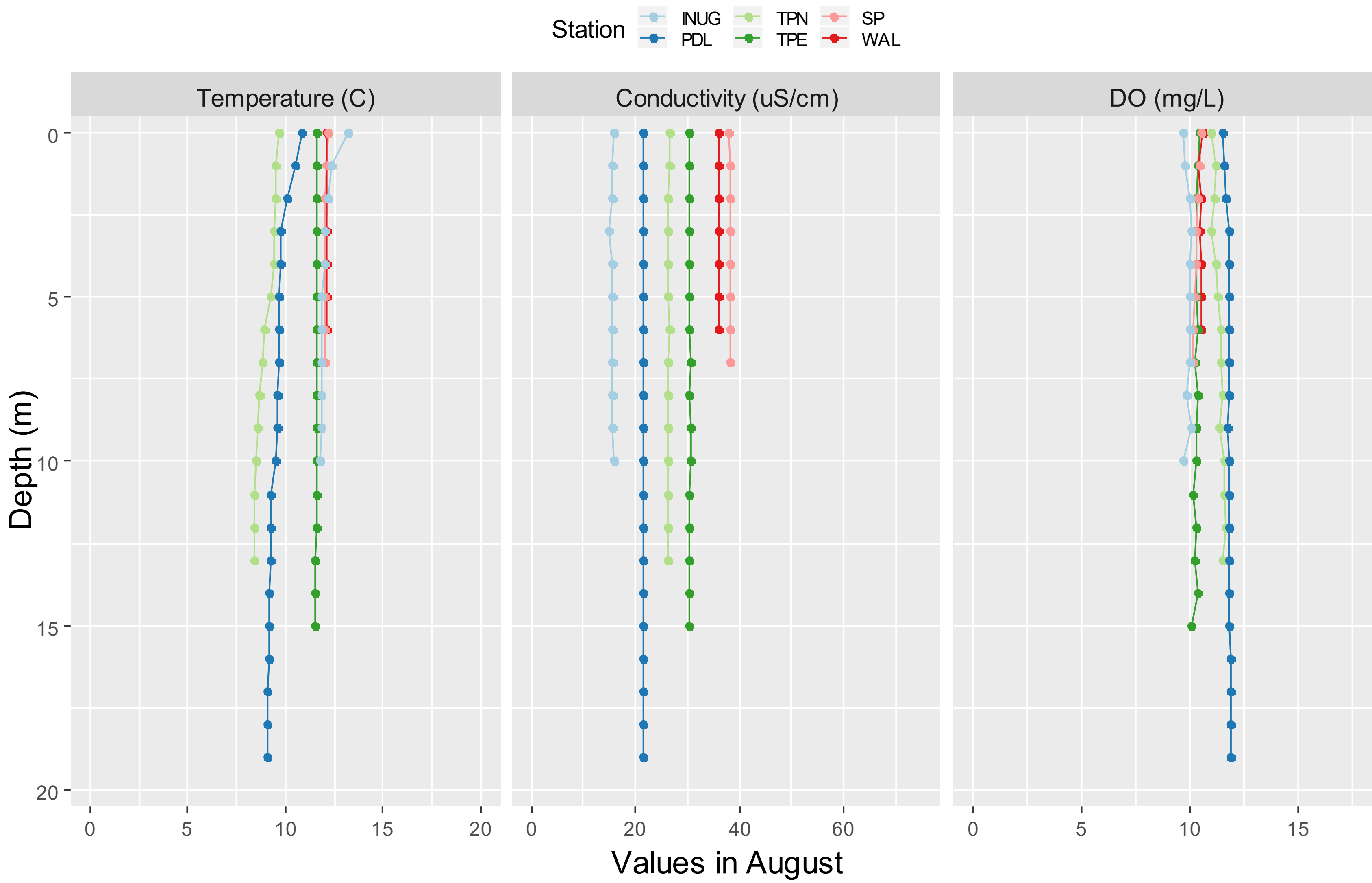


Figure 4-11. Meadowbank – Field-measured temperature, conductivity, and dissolved oxygen profiles, September 2019.

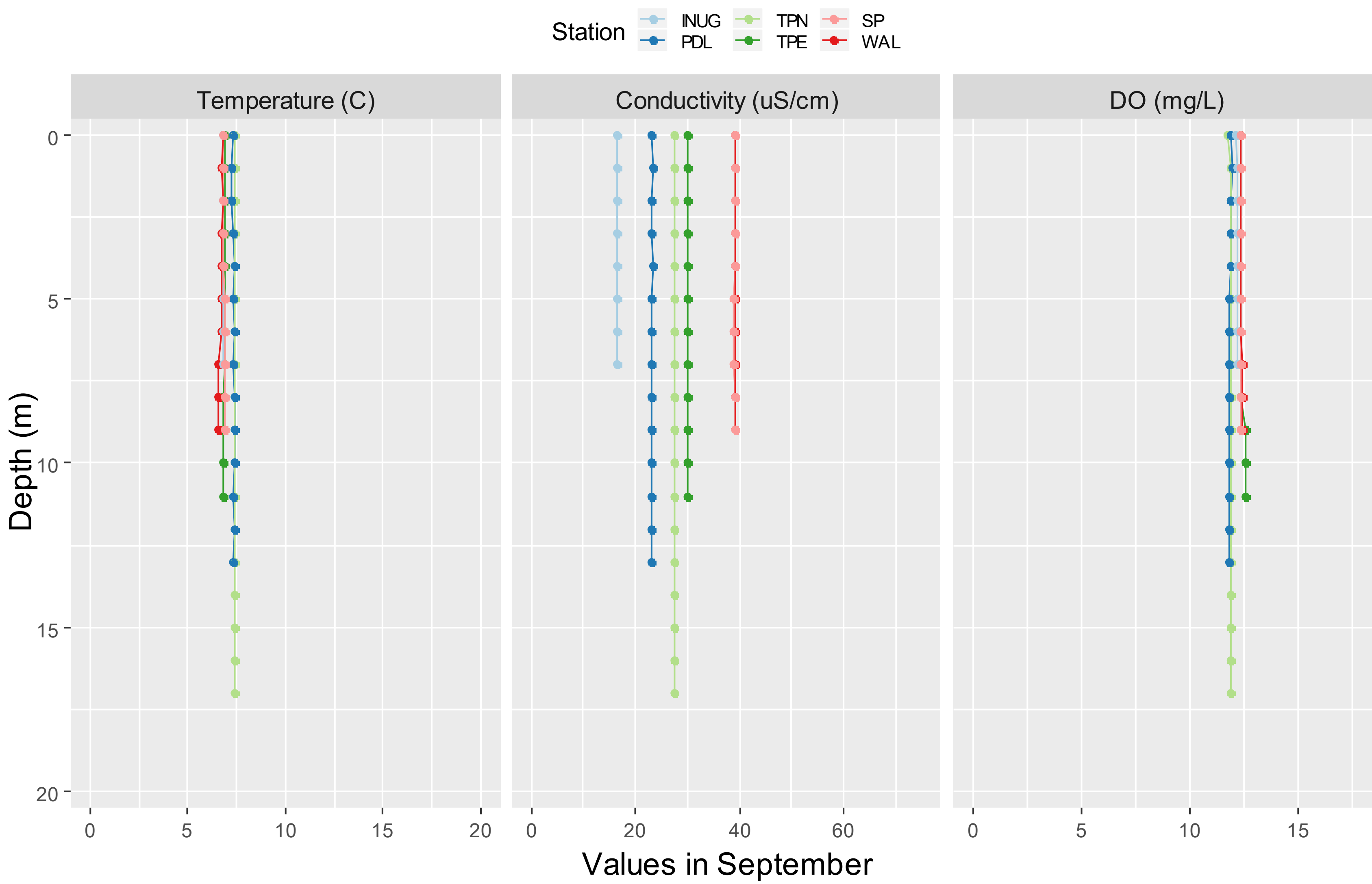


Figure 4-12. Meadowbank – Field-measured temperature, conductivity, and dissolved oxygen profiles, November 2019.

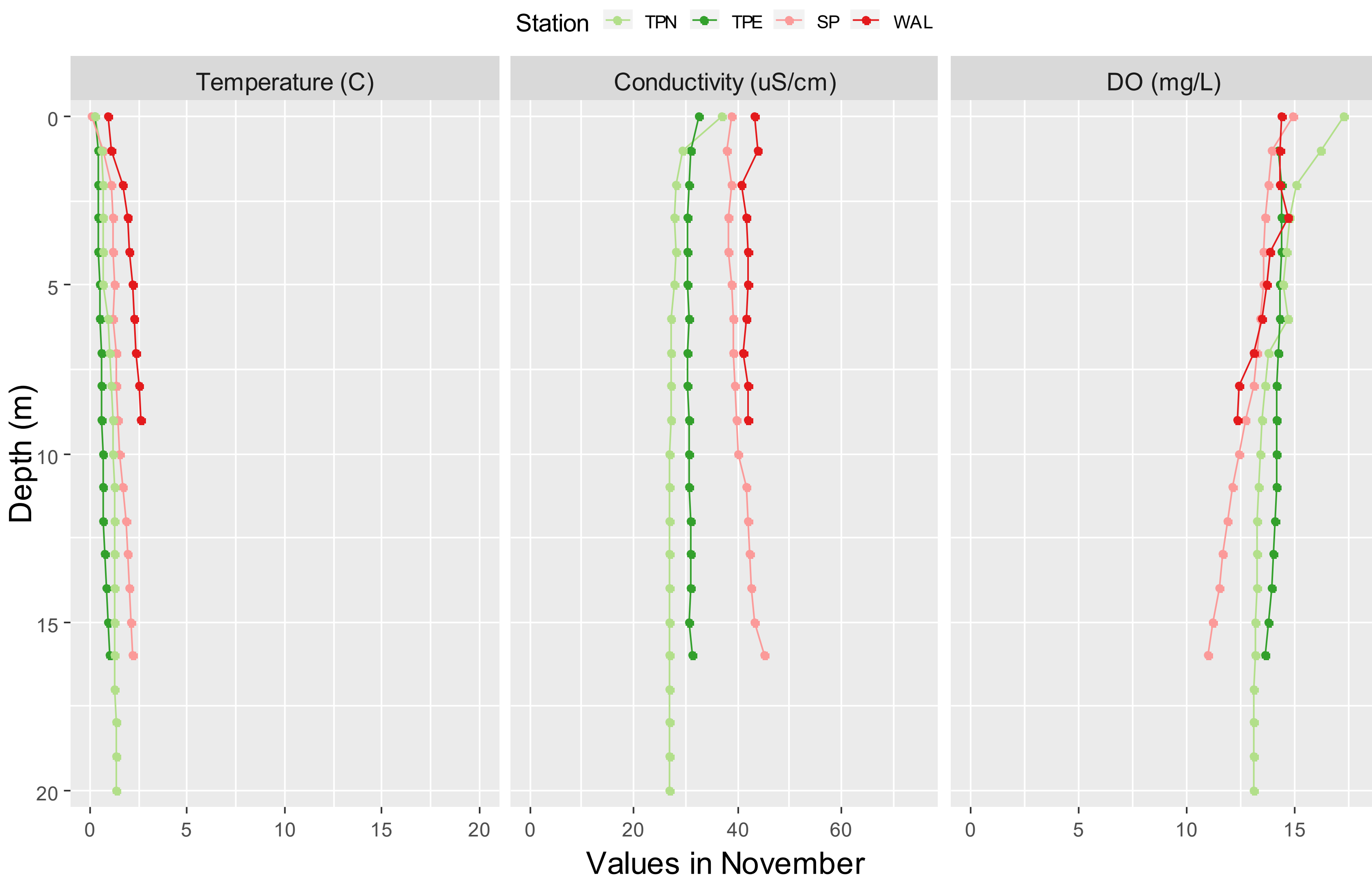
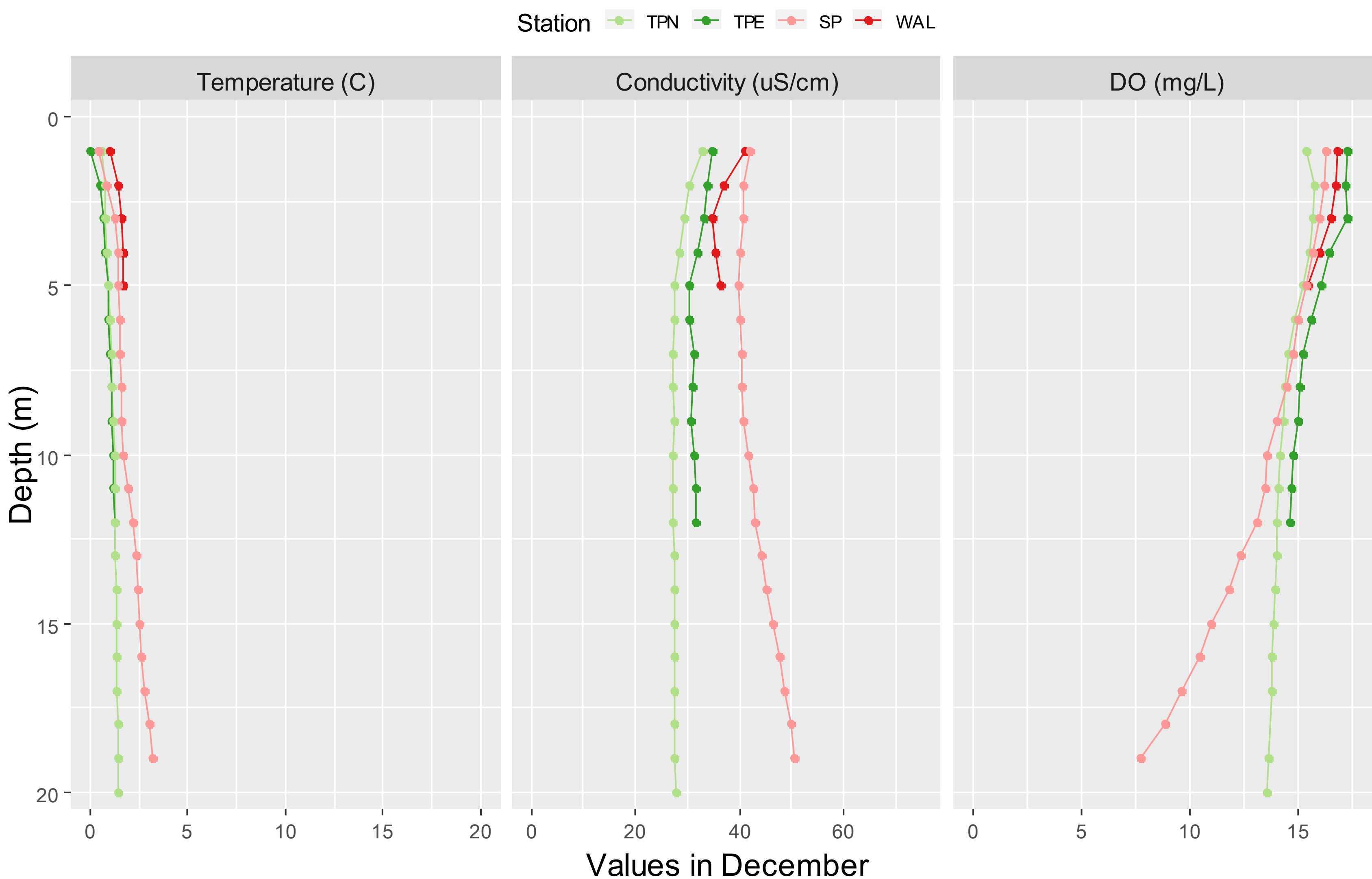


Figure 4-13. Meadowbank – Field-measured temperature, conductivity, and dissolved oxygen profiles, December 2019.



Water Chemistry Tables and Figures

Table 4-2. Screening process for water quality parameters, Meadowbank study lakes, 2019.

CONVENTIONALS, MAJOR IONS & NUTRIENTS			
Screening Level	1	2	3
Screening Rule[1]	>MDL ≥ 10% frequency	C-I > 0.1 frequency	Pattern = Activity
Conductivity	Figure 4-15		
Hardness	Figure 4-16		
pH -Field	Figure 4-17		
pH -Lab	Figure 4-18		
TSS	Figure 4-19		
TDS	Figure 4-20		
B-Alkalinity	Figure 4-21		
C-Alkalinity*	No	No	No
T-Alkalinity	Figure 4-22		
Ammonia-N	Figure 4-23		
Chloride	Figure 4-24		
Fluoride	Figure 4-25		
Nitrate-N	Figure 4-26		
Nitrite-N*	No	No	No
TKN	Figure 4-27		
T-phosphorous	Figure 4-28		
Ortho-phosphate*	No	No	No
Reactive silica	Figure 4-29		
Sulphate	Figure 4-30		
DOC	Figure 4-31		
TOC	Figure 4-32		
T-Cyanide*	No	No	No
Free Cyanide*	No	No	No

TOTAL METALS			
Screening Level	1	2	3
Screening Rule[1]	>MDL ≥ 10% frequency	C-I > 0.1 frequency	Pattern = Activity
Aluminum	33		
Antimony*	No	No	No
Arsenic	Figure 4-34		
Barium	Figure 4-35		
Beryllium*	No	No	No
Boron*	No	No	No
Cadmium*	No	No	No
Calcium	Figure 4-36		
Chromium	Figure 4-37		
Copper	Figure 4-38		
Iron	Figure 4-39		
Lead*	No	No	No
Lithium*	No	No	No
Magnesium	Figure 4-40		
Manganese	Figure 4-41		
Mercury*	No	No	No
Molybdenum	Figure 4-42		
Nickel	Figure 4-43		
Potassium	Figure 4-44		
Selenium*	No	No	No
Silicon	Figure 4-45		
Silver*	No	No	No
Sodium	Figure 4-46		
Strontium	Figure 4-47		
Thallium*	No	No	No
Tin*	No	No	No
Titanium*	No	No	No
Uranium	Figure 4-48		
Vanadium*	No	No	No
Zinc*	No	No	No

DISSOLVED METALS			
Screening Level	1	2	3
Screening Rule[1]	>MDL ≥ 10% frequency	C-I > 0.1 frequency	Pattern = Activity
Aluminum	Figure 4-49		
Antimony*	No	No	No
Arsenic	Figure 4-50		
Barium	Figure 4-51		
Beryllium*	No	No	No
Boron*	No	No	No
Cadmium*	No	No	No
Chromium*	No	No	No
Copper	Figure 4-52		
Iron*	No	No	No
Lead*	No	No	No
Lithium*	No	No	No
Manganese	Figure 4-53		
Mercury*	No	No	No
Molybdenum	Figure 4-54		
Nickel*	No	No	No
Selenium*	No	No	No
Silicon	Figure 4-55		
Strontium	Figure 4-56		
Thallium*	No	No	No
Tin*	No	No	No
Titanium*	No	No	No
Uranium	Figure 4-57		
Vanadium*	No	No	No
Zinc*	No	No	No

Notes:
"*" indicates plots for these parameters are presented in **Appendix B1**.
1. See **Section 3.3** for information on the screening process for deciding which parameters are carried forward in the temporal and spatial trend assessment.

Table 4-3. Water quality variables at the Meadowbank areas for which 2019 mean concentration exceeded the trigger.

Meadowbank Study Areas

Parameter	Trigger	2019 Mean		
		TPN	TPE	SP
		NF	NF	NF
Ammonia (as N)	0.07	-	-	-
TKN	0.17	-	-	-
Total alkalinity	8.7	-	8.74	12.9
Bicarbonate alkalinity	8.7	-	8.74	12.9
Conductivity	27.4	31.1	33.67	44.6
Hardness	9.50	10.5	11.74	17.4
Calcium	2.39	2.56	2.88	4.50
Potassium	0.58	-	-	0.62
Magnesium	0.93	1.01	1.12	1.45
Sodium	1.16	1.26	1.25	-
T. Silicon	0.20	-	-	0.21
TDS	18.98	19.6	21.4	30.2

Wally Lake

Parameter	Trigger	2019 Mean
Conductivity	36.6	47.1
Hardness	16.7	20.2
Calcium	4.89	5.48
Magnesium	1.36	1.54
Sodium	0.72	0.73
TDS	25.3	32.5

Notes:
"-" indicates mean annual concentration was < the trigger value.
Reported mean values are all in units of mg/L with the exception of conductivity (µS/cm).

Table 4-4. Results of BACI tests for selected water variables at Meadowbank areas in 2019.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	F	DF	P-value	Proportional change		
									exp(Est)	LCI	UCI
Total Alkalinity	TPE	7	5	0.42	0.07	32.2	10	**< 0.001**	1.5	1.3	1.8
	SP	5	5	0.36	0.06	38.1	8	**< 0.001**	1.4	1.3	1.6
Conductivity	TPN	6	5	0.54	0.05	132.	9	**< 0.001**	1.7	1.5	1.9
	TPE	8	5	0.60	0.05	146	11	**< 0.001**	1.8	1.6	2.0
	SP	5	5	0.48	0.05	79.5	8	**< 0.001**	1.6	1.4	1.8
Hardness	TPN	6	5	0.45	0.06	64.4	9	**< 0.001**	1.6	1.4	1.8
	TPE	8	5	0.55	0.05	102	11	**< 0.001**	1.7	1.5	2.0
	SP	5	5	0.43	0.06	49.8	8	**< 0.001**	1.5	1.3	1.8
Calcium	TPN	6	5	0.52	0.04	148	9	**< 0.001**	1.7	1.5	1.8
	TPE	8	5	0.60	0.05	138	11	**< 0.001**	1.8	1.6	2.0
	SP	5	5	0.45	0.04	101	8	**< 0.001**	1.6	1.4	1.7
Potassium	SP	5	5	0.35	0.05	52.6	8	**< 0.001**	1.4	1.3	1.6
Magnesium	TPN	6	5	0.43	0.06	54.8	9	**< 0.001**	1.5	1.3	1.7
	TPE	8	5	0.52	0.05	104	11	**< 0.001**	1.7	1.5	1.9
	SP	5	5	0.43	0.05	64.3	8	**< 0.001**	1.5	1.4	1.7
Sodium	TPN	6	5	0.64	0.04	227	9	**< 0.001**	1.9	1.7	2.1
	TPE	8	5	0.64	0.03	438	11	**< 0.001**	1.9	1.8	2.0
TDS	TPN	6	5	0.24	0.11	4.63	9	**0.03**	1.3	0.99	1.6
	TPE	8	5	0.38	0.08	22.5	11	**< 0.001**	1.5	1.2	1.7
	SP	5	5	0.63	0.16	16.1	8	**0.00**	1.9	1.3	2.7

Notes:
Bolded P-values are statistically significant < 0.05
Test area = area compared to control (INUG)
n(B) = number of paired months in the *before* period
n(A) = number of paired months in the *after* period (i.e., in 2019)
Estimate = BACI model estimate of the 2019 change in mean for log-transformed data
SE = standard error of the estimate
P-value = one-tailed test of the null hypothesis (no change or a decrease in mean [opposite for lower pH trigger])
Exp(Est.) = estimated proportional change
LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Table 4-5. **Sampling effort and frequency assessment results for the 2019 Meadowbank area lakes.**

Areas	Area Designation	Triggers Exceeded?	Minor Changes [1]		Moderate Changes [2]		Major Changes [3]		Plan for 2020
		Yes/No	Yes/No	Parameters	Yes/No	Parameters	Yes/No	Parameters	
Sampling Strategy for Reference Areas									
INUG	Ref	Yes	Yes	Ammonia, TKN	No	-	No	-	Full CREMP (reference area)
PDL	Ref	Yes	Yes	Hardness, Calcium	No	-	No	-	Full CREMP (reference area)
Sampling Strategy for Near-field Areas									
TPE	NF	Yes	Yes	Alkalinity (HCO_3 & Total), Cond., Hard., Ca, Mg, Na, TDS	No	-	No	-	Full CREMP (near-field area)
TPN	NF	Yes	Yes	Cond., Hard., Ca, Mg, Na, TDS	No	-	No	-	Full CREMP (near-field area)
SP	NF	Yes	Yes	Alkalinity (HCO_3 & Total), Cond., Hard., Ca, K, Mg, TDS, T. Silicon	No	-	No	-	Full CREMP (near-field area)
WAL	NF	Yes	Yes	Cond., Hard., Ca, Mg, Na, TDS	No	-	No	-	Full CREMP (near-field area)
Sampling Strategy for Mid-field and Far-field Areas									
TE	MF	NA	NA	-	No	-	No	-	Winter through-ice sampling
TEFF	FF	NA	NA	-	No	-	No	-	Winter through-ice sampling
TPS	MF	NA	NA	-	No	-	No	-	Winter through-ice sampling

Notes:
1. Minor = exceedance of the early warning trigger values for parameters without effects-based threshold values
2. Moderate = exceedance of the early warning trigger values for parameters with effects-based thresholds
3. Major = exceedance of the effects-based threshold values

NA = MF and/or FF areas were not assessed using the formal BACI analysis in the current CREMP year

Table 4-6. Meadowbank Study Area FEIS screening predictions compared to 2019 mean concentrations.

Parameter	Meadowbank Study Area							
	FEIS Screening Prediction				2019 Annual Mean			
	TPN	TPE	SP	WAL	TPN	TPE	SP	WAL
Ammonia-N	0.033	0.033	0.025	NA	0.04	0.03	0.03	NA
Chloride	0.8	0.8	0.7	0.70	0.91	0.87	1.05	0.88
Fluoride	0.07	0.07	0.07	0.05	0.08	0.08	0.08	0.06
Hardness	5.7	5.7	8.9	17.2	10.5	11.7	17.4	20.2
Calcium	1.3	1.3	2.3	4.70	2.56	2.88	4.50	5.48
Magnesium	0.6	0.6	0.8	1.30	1.01	1.12	1.45	1.54
Sulphate	1.7	1.7	2.8	5.30	5.37	5.32	6.28	5.39
Total Alkalinity	4.13	4.13	7	13.24	7.36	8.74	12.9	17.1
Silicon (T) **	0.01	0.01	0.01	0.04	0.10	0.11	0.21	0.39
Strontium (T) **	0.002	0.002	NA	NA	0.012	0.013	NA	NA

Notes:
Concentrations reported in mg/L.
** Silicon and strontium were not included in the suite of analyses in the baseline dataset used to derive model predictions for Third Portage Lake, Second Portage Lake, and Wally Lake. In the absence of measured concentrations, baseline silicon and strontium concentrations in each lake were set to zero (0 mg/L). The FEIS predictions significantly underestimate future water quality and are not suitable for assessing the accuracy of the water quality model.

Figure 4-14. Flow chart showing sampling effort and frequency assessment results for mid-field and far-field sampling in 2019.

Note: Blue-shaded cells show the linkage between 2019 CREMP results and the sampling effort and frequency for mid-field and far-field sampling in 2020. *Minor changes* refer to statistically significant increased concentrations for parameters without effects-based threshold values that exceed the early warning trigger values. Refer to **Section 2.2.3** for more information.

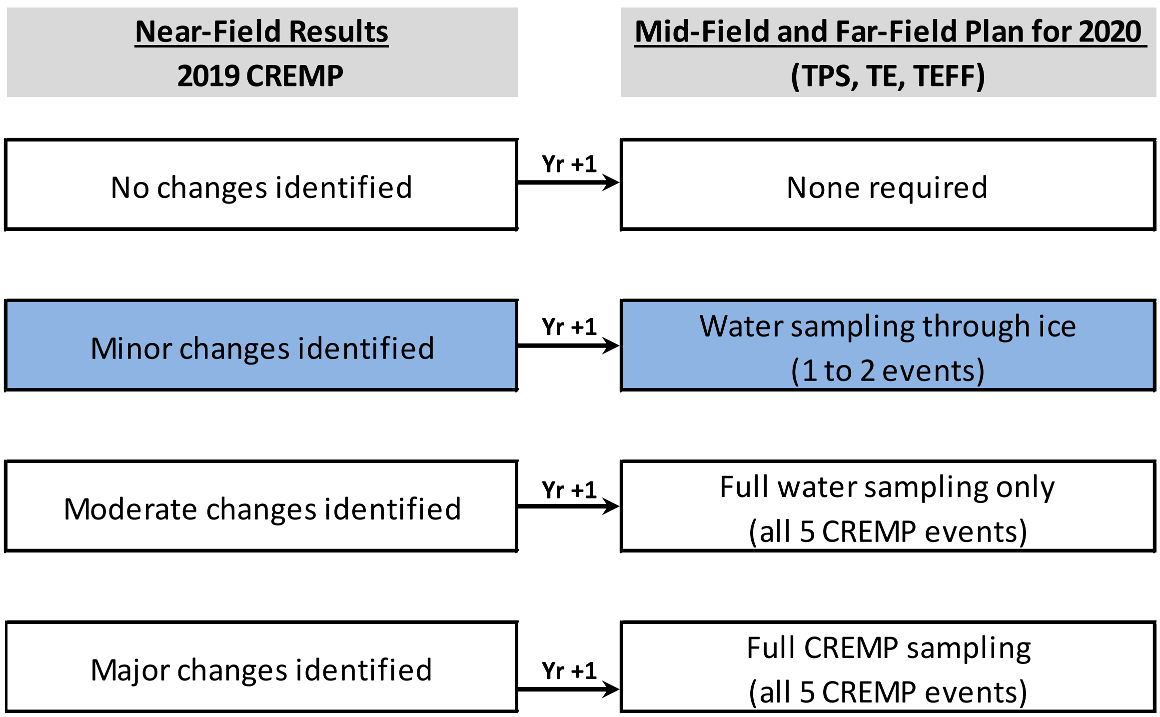


Figure 4-15. Laboratory-measured conductivity (µS/cm) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value. Conductivity data from 2014 should be interpreted with caution (See Azimuth [2015c] for more details).

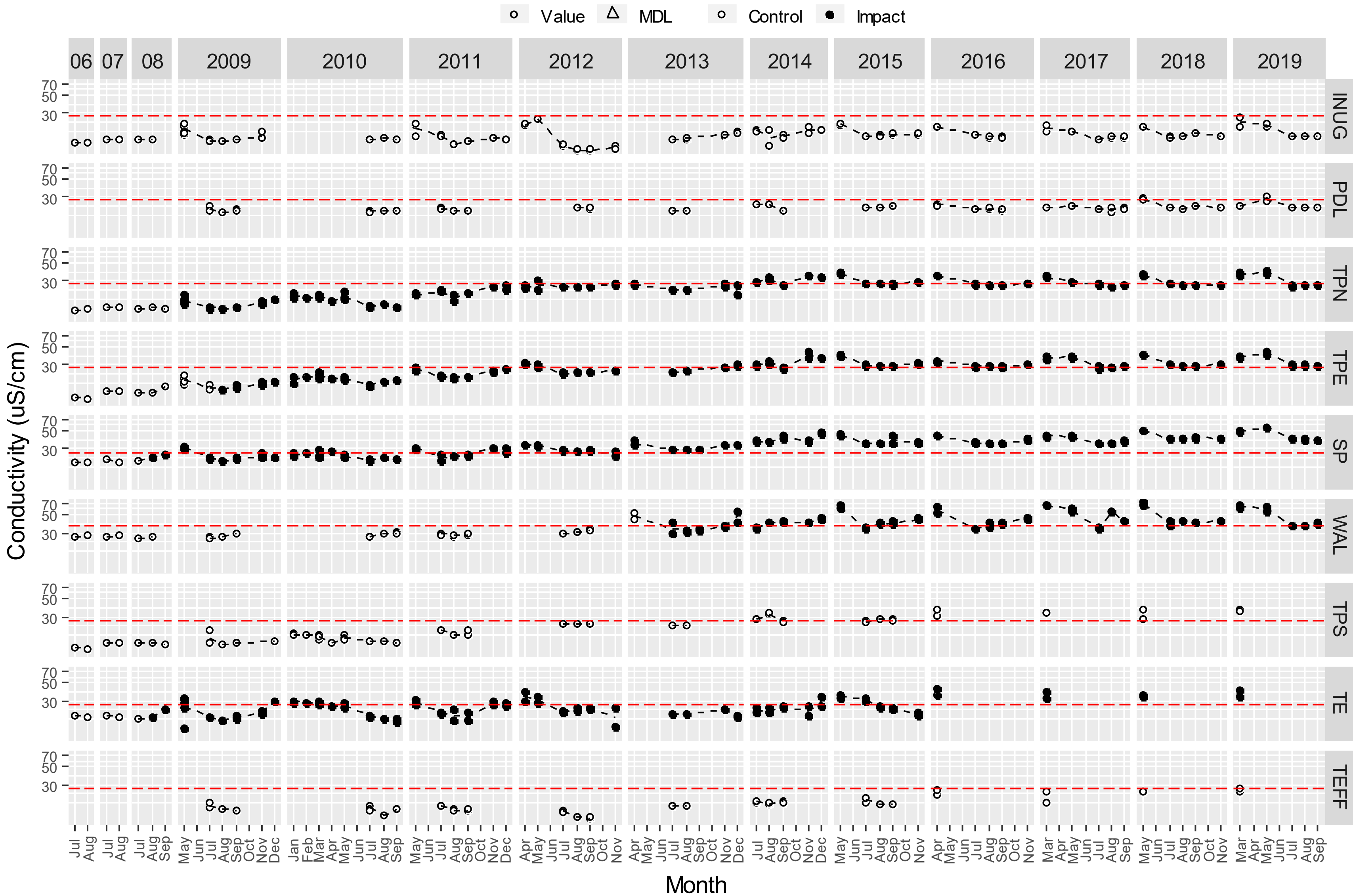


Figure 4-16. Laboratory-measured hardness (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.

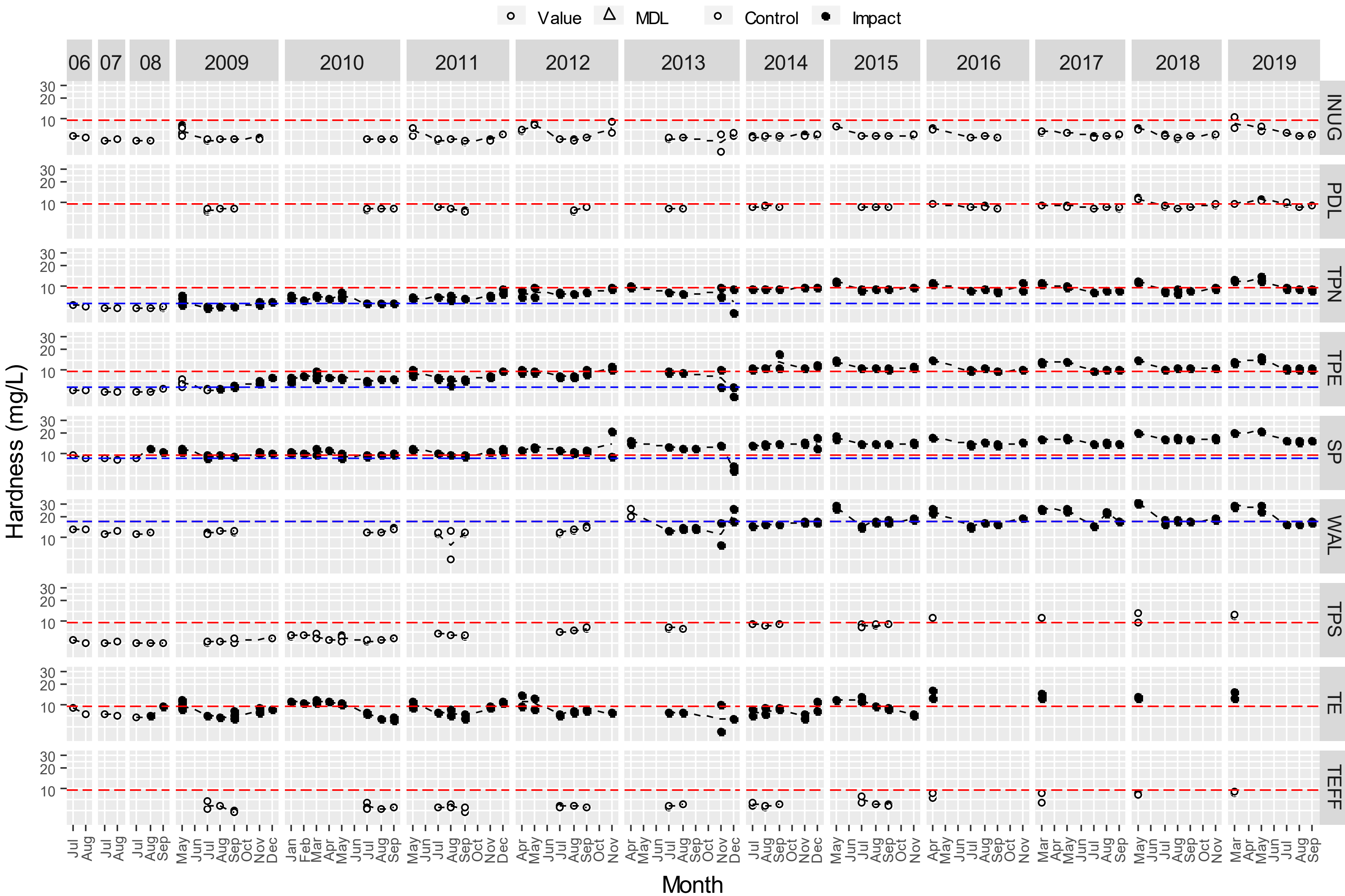


Figure 4-17. Field-measured pH in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

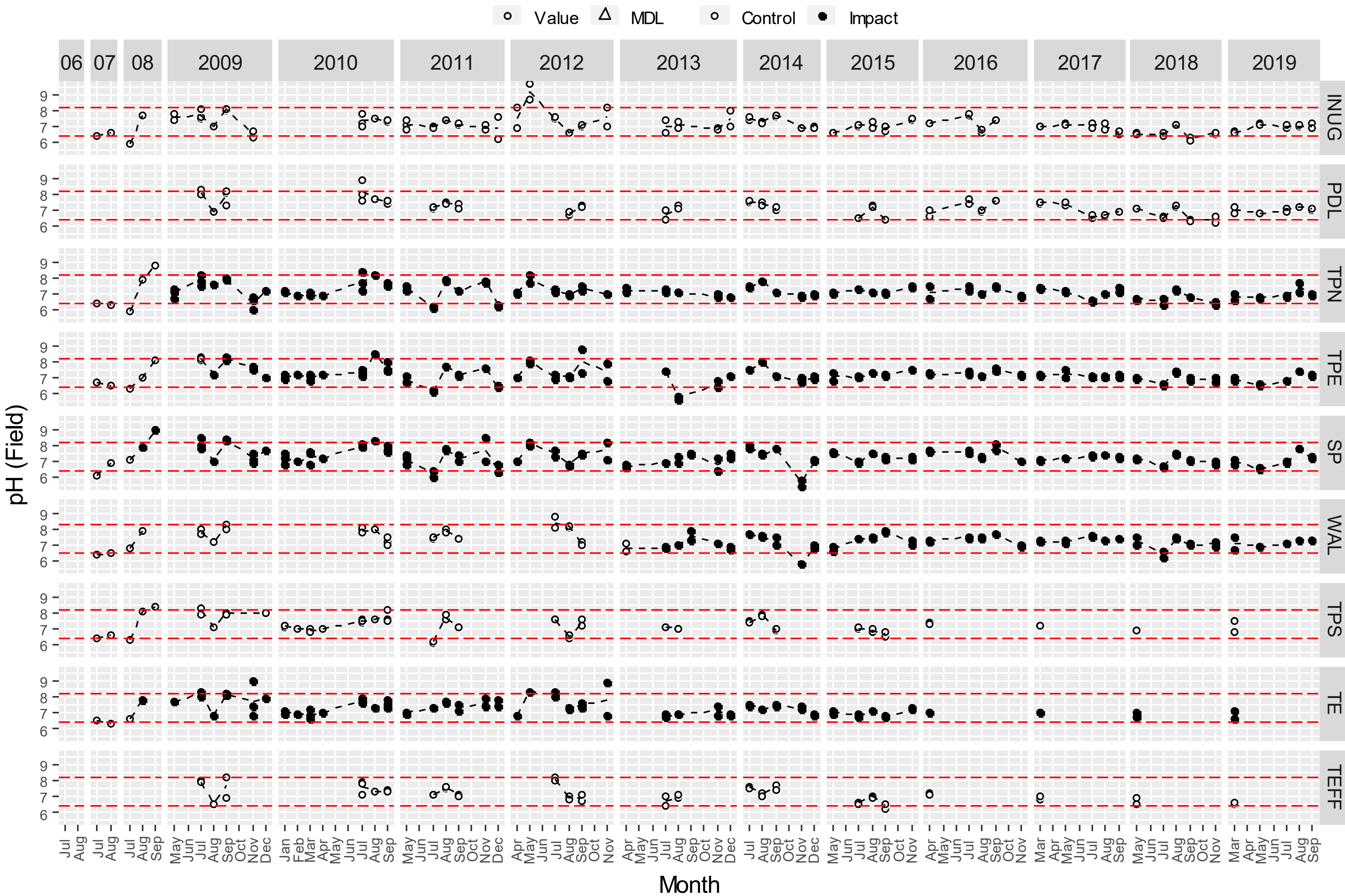


Figure 4-18. Laboratory-measured pH in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

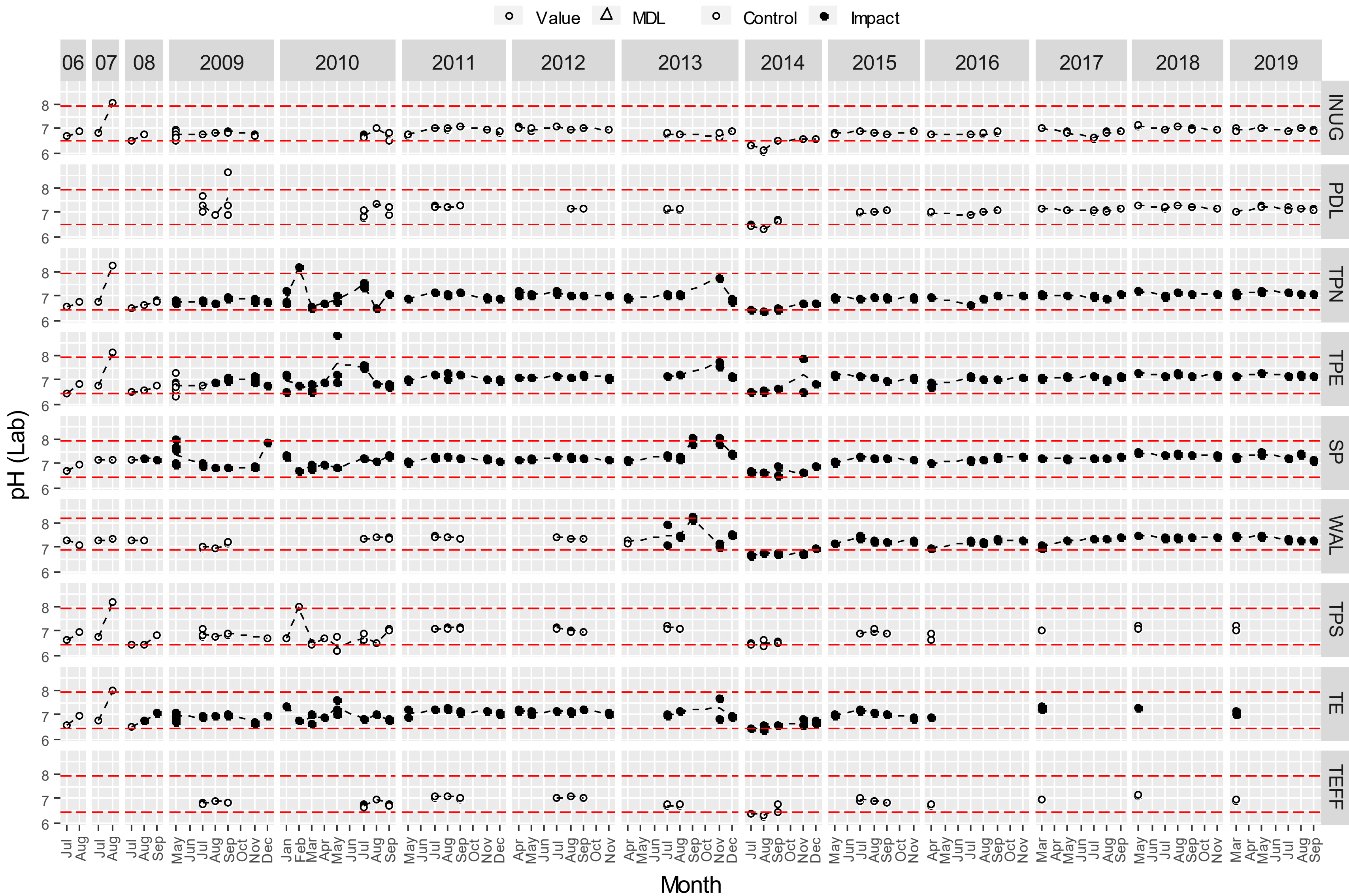


Figure 4-19. Total Suspended Solids (TSS; mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

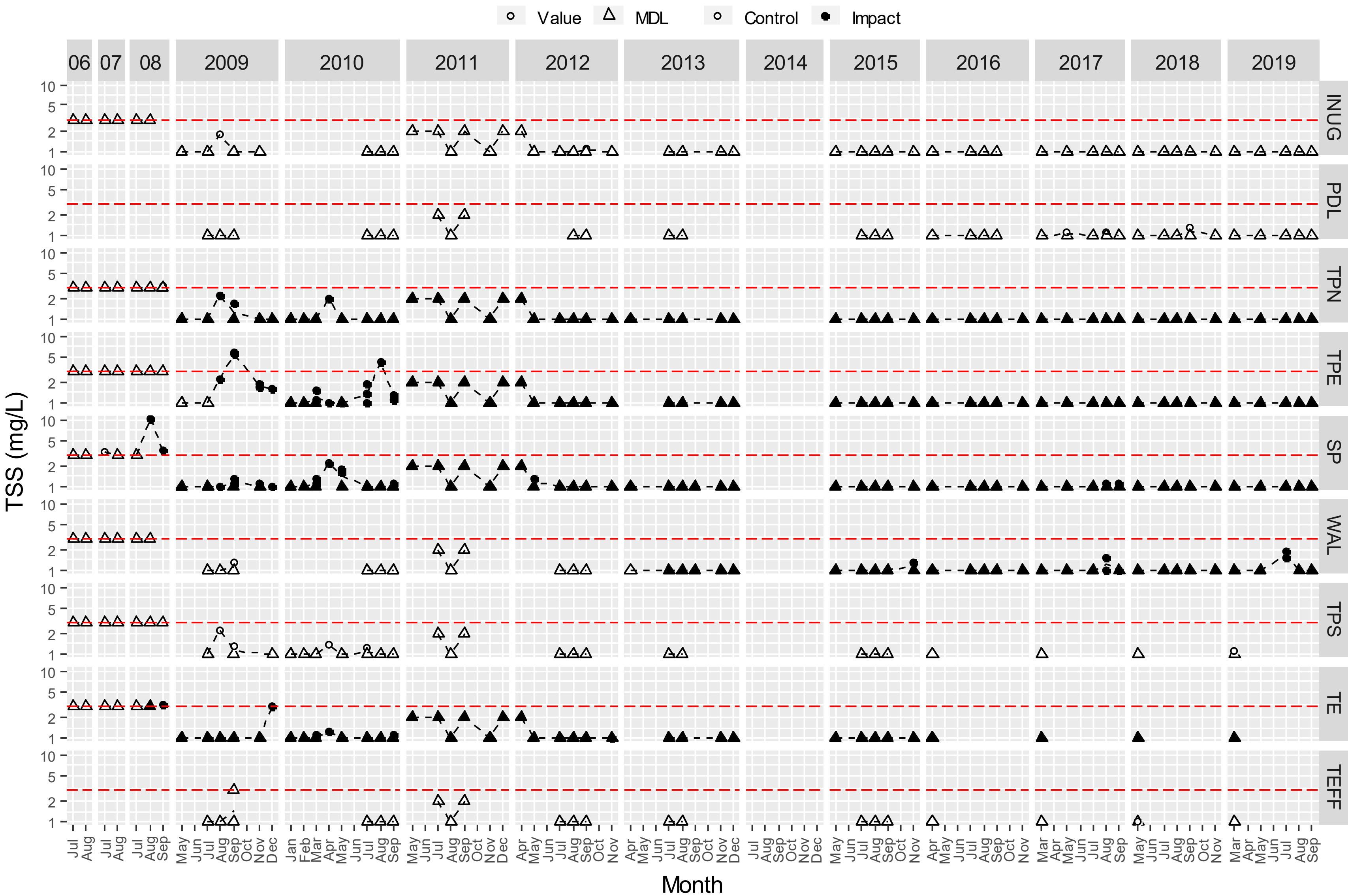


Figure 4-20. Total Dissolved Solids (TDS; mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

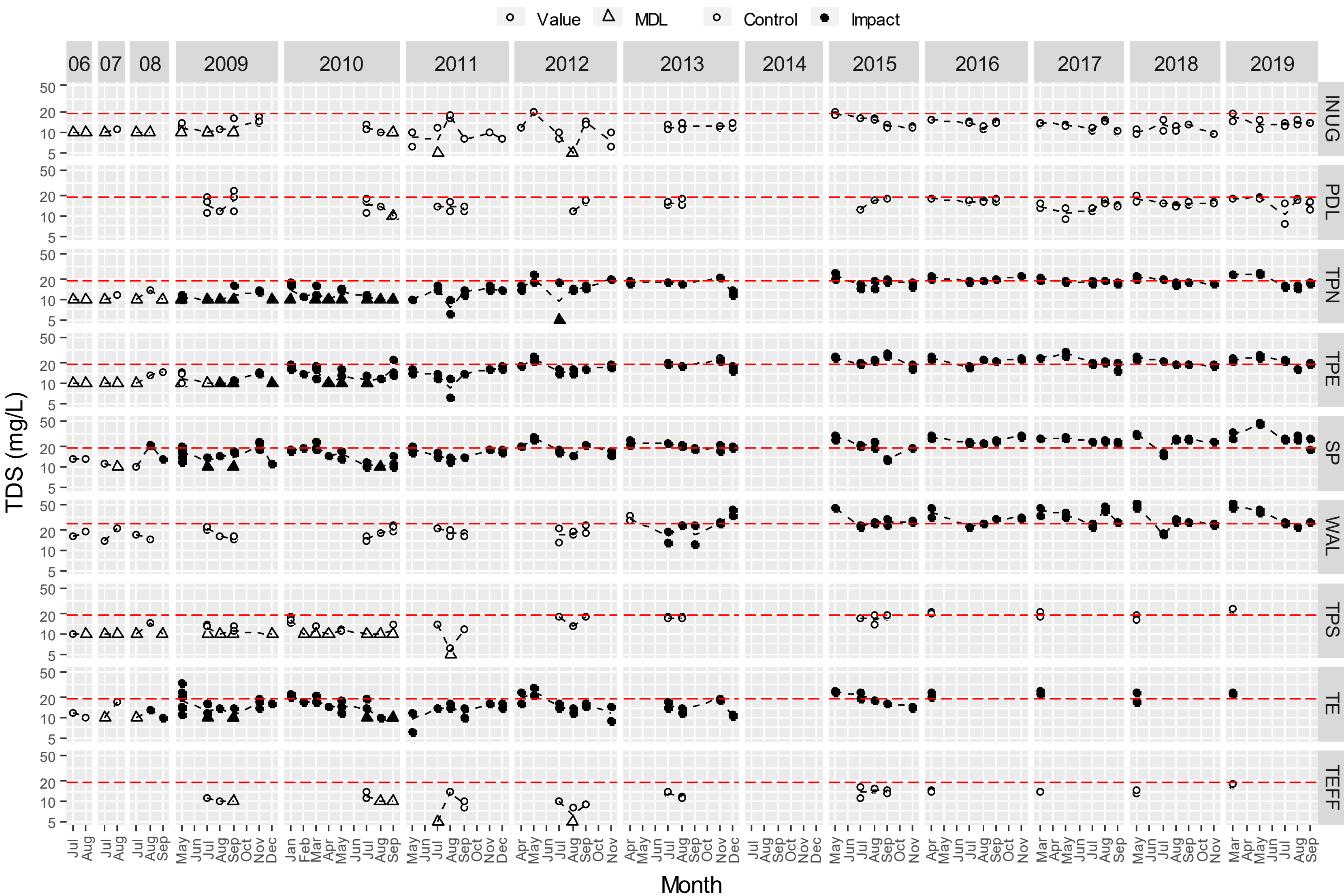


Figure 4-21. Bicarbonate alkalinity (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

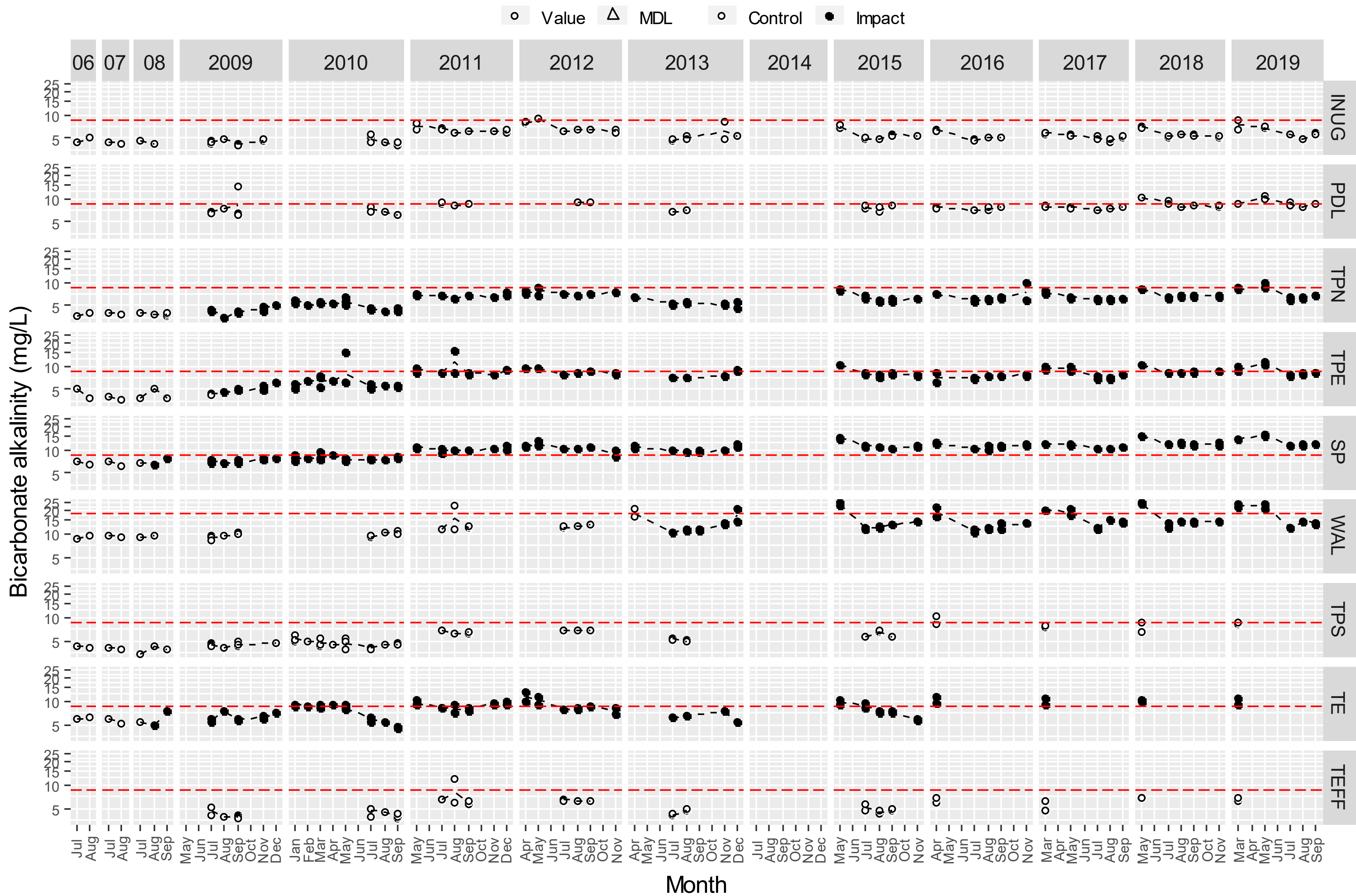


Figure 4-22. Total alkalinity (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.

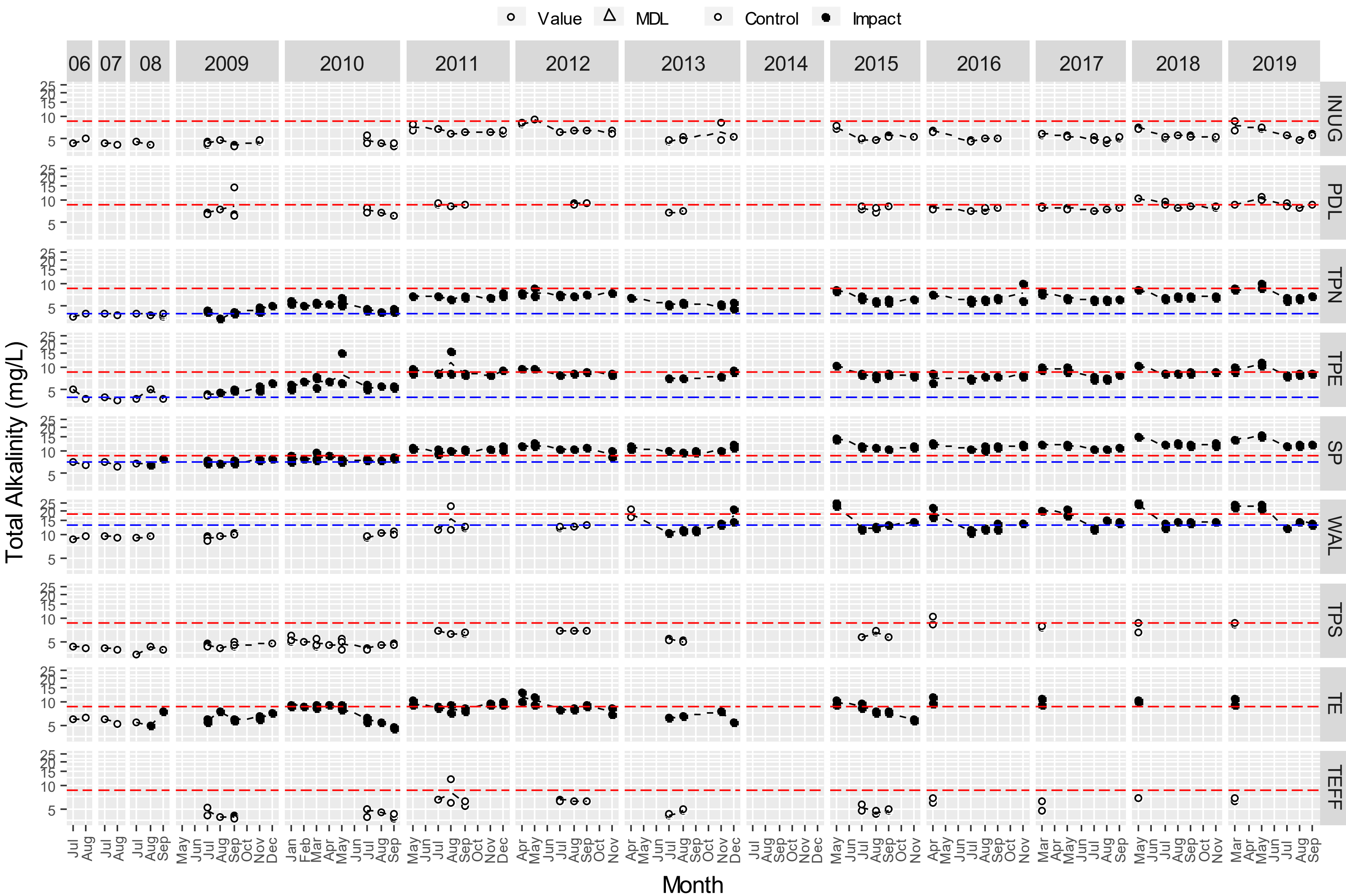


Figure 4-23. Ammonia-N (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.

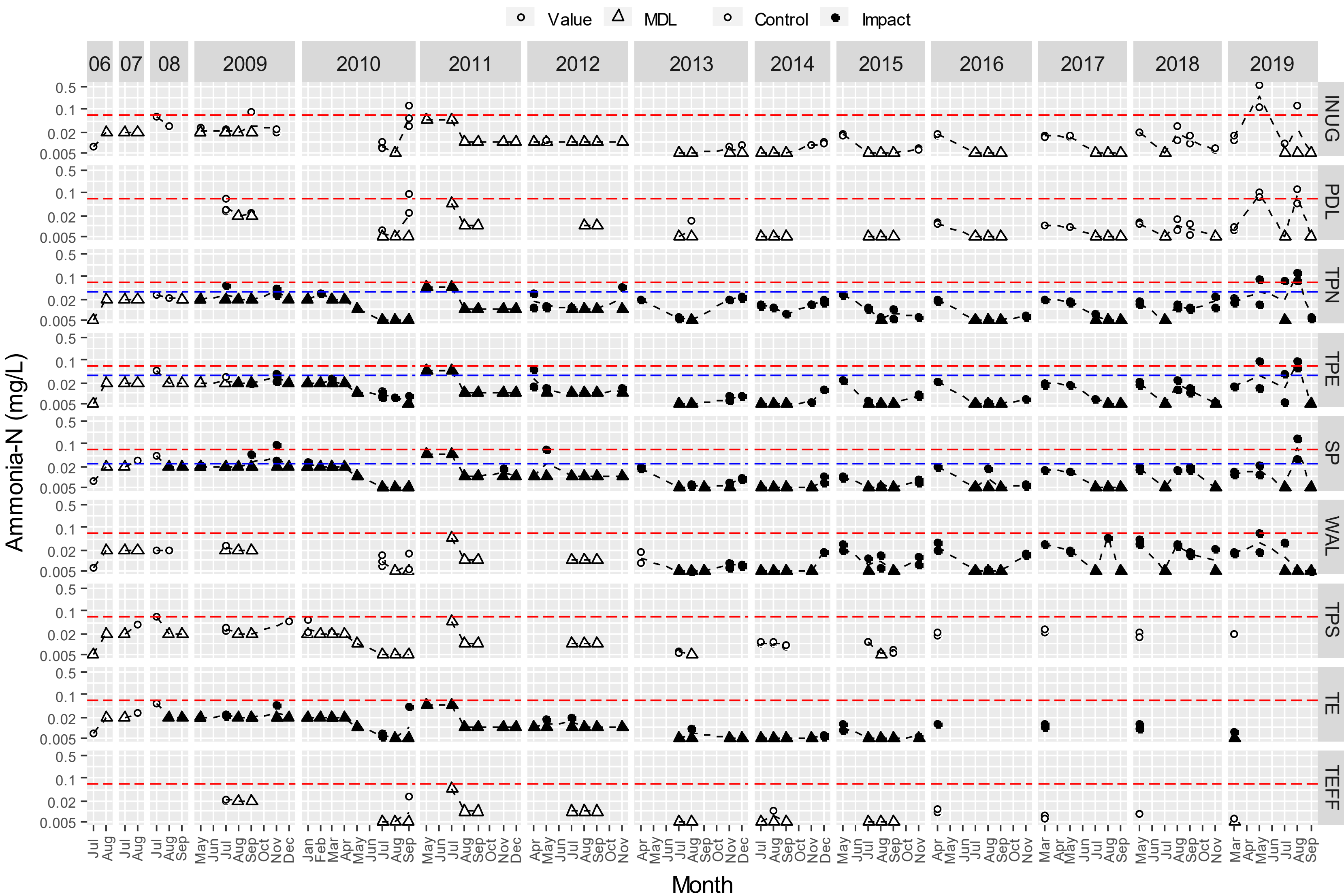


Figure 4-24. Chloride (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.

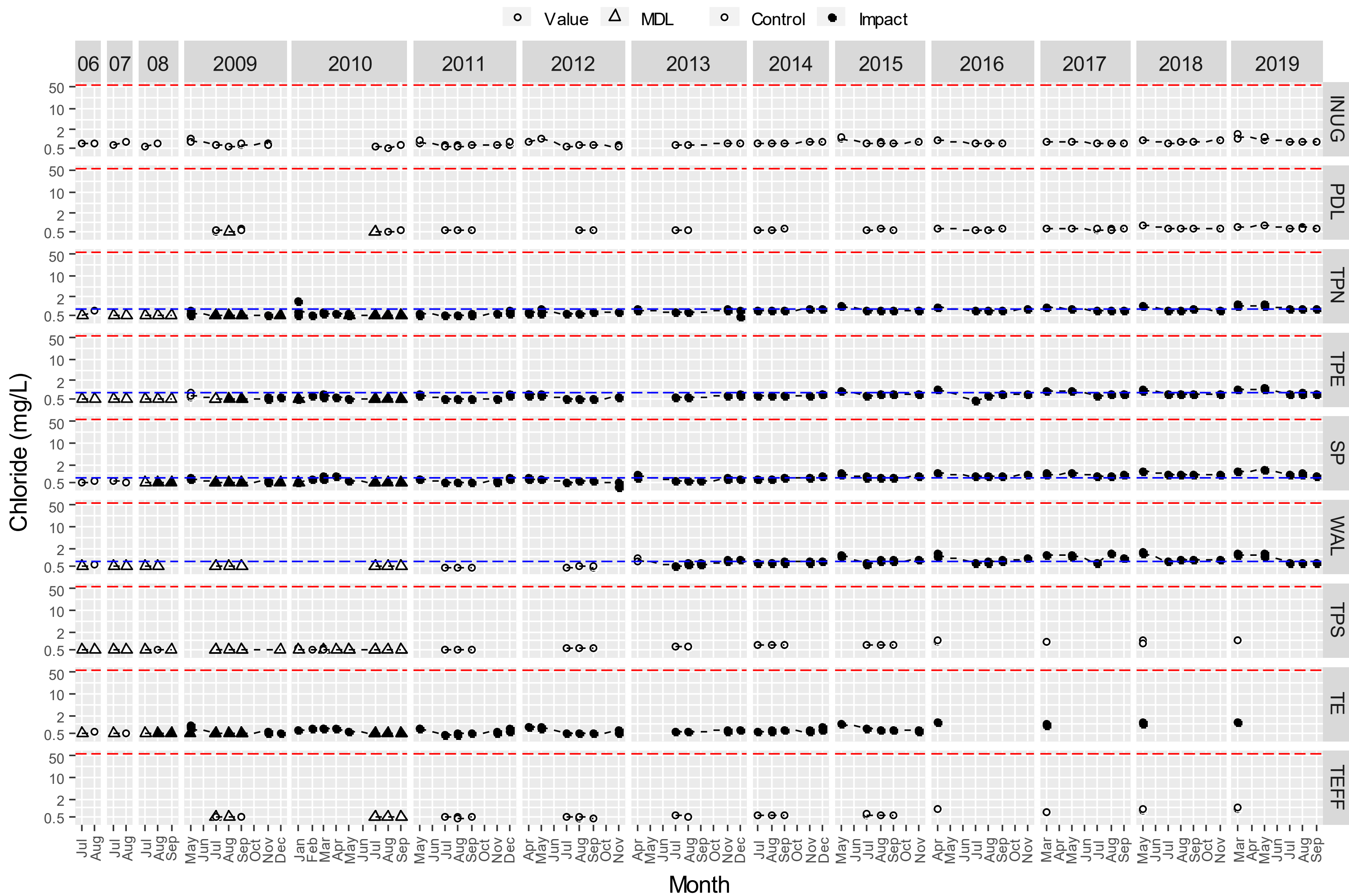


Figure 4-25. Fluoride (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.

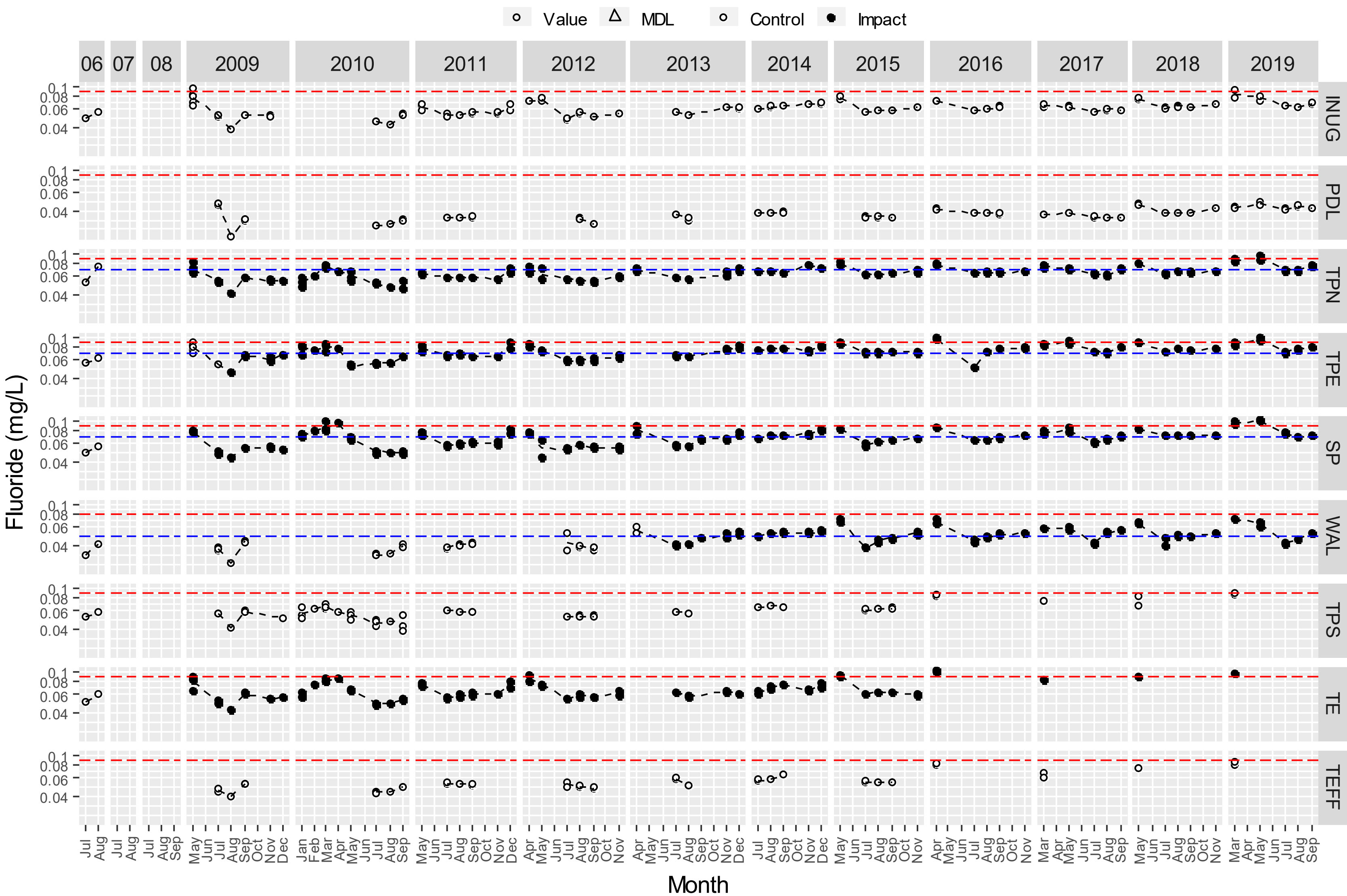


Figure 4-26. Nitrate-N (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

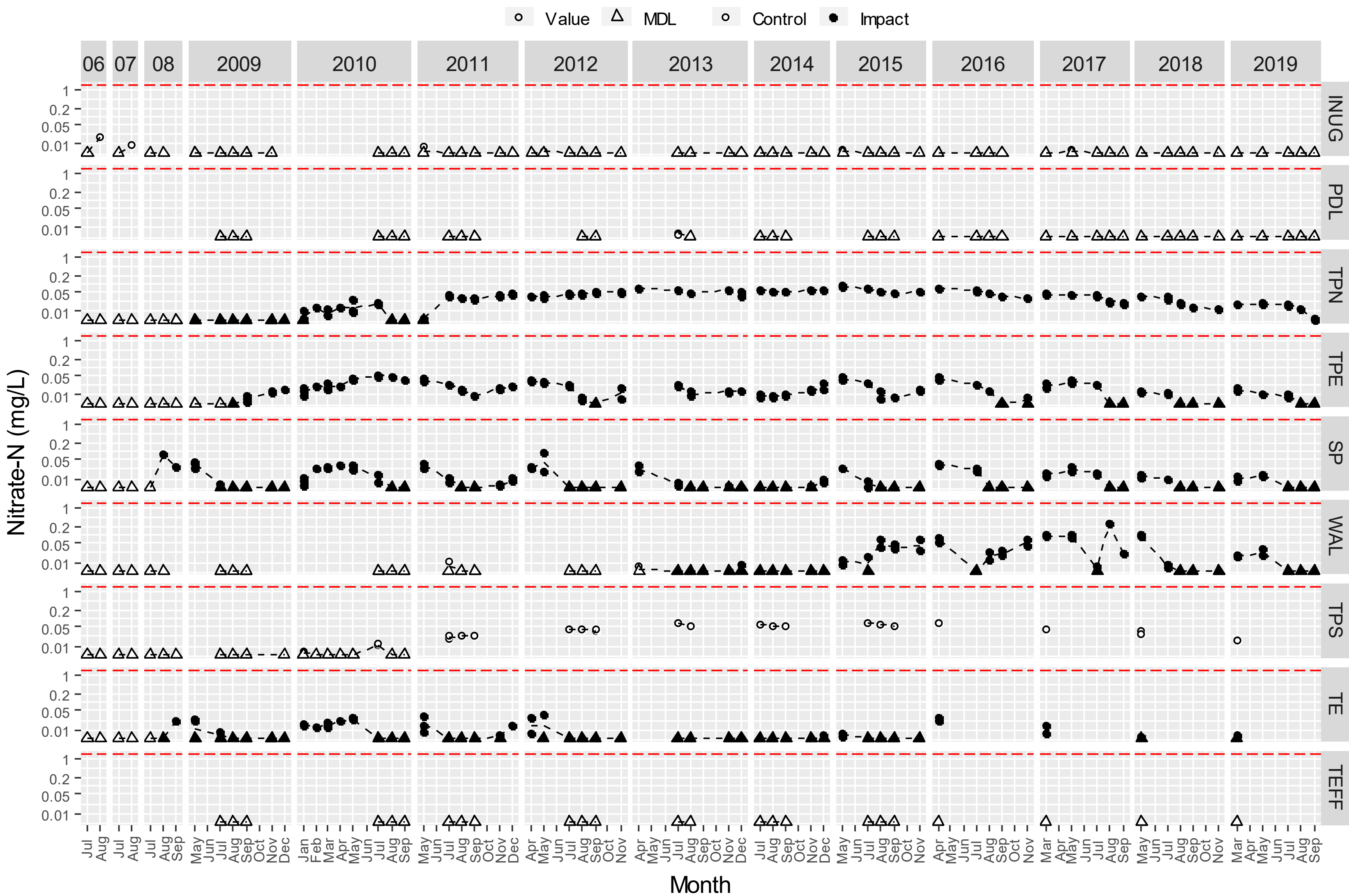


Figure 4-27. Total Kjeldahl Nitrogen (TKN; mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

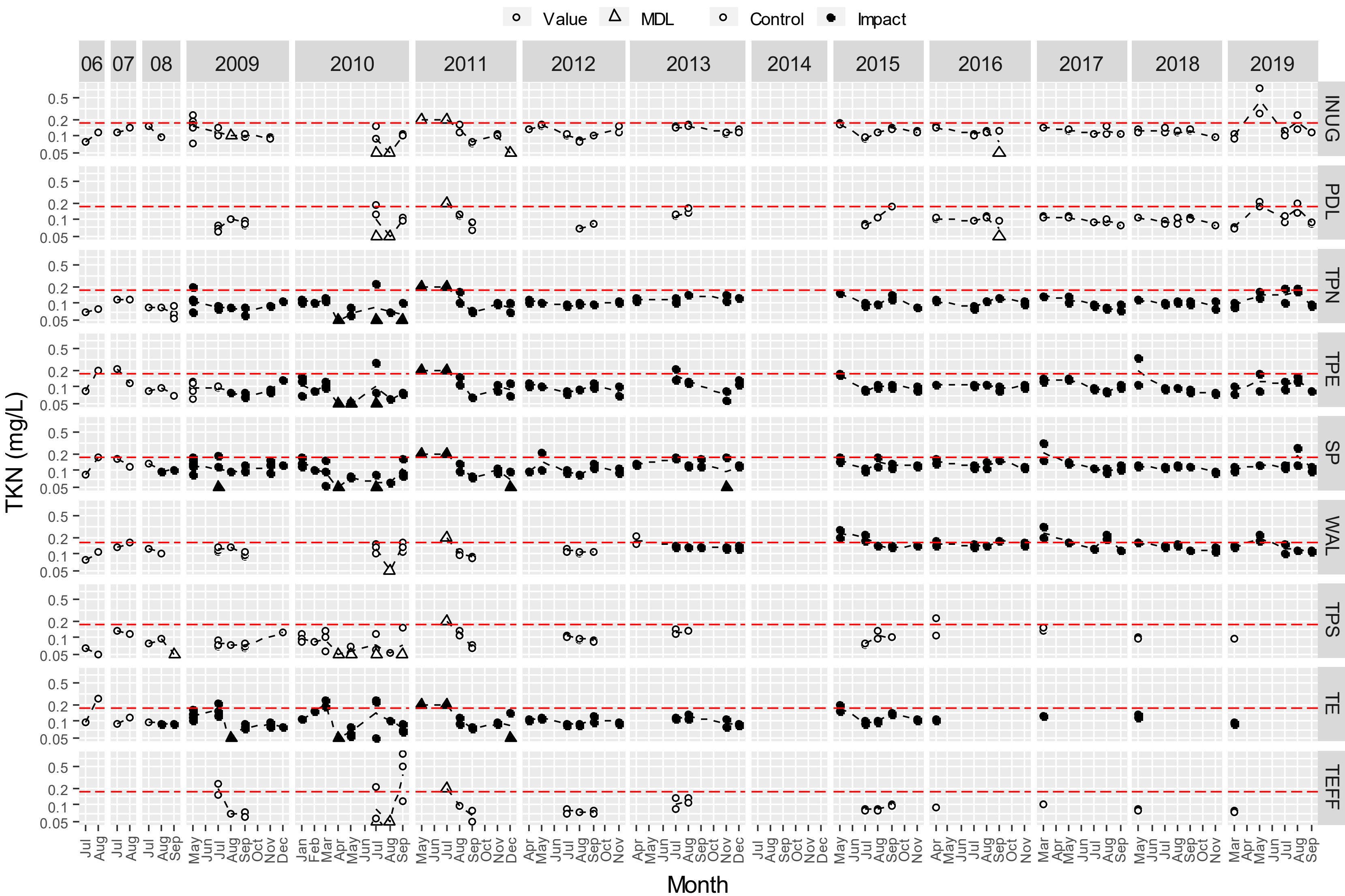


Figure 4-28. Total phosphorus (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

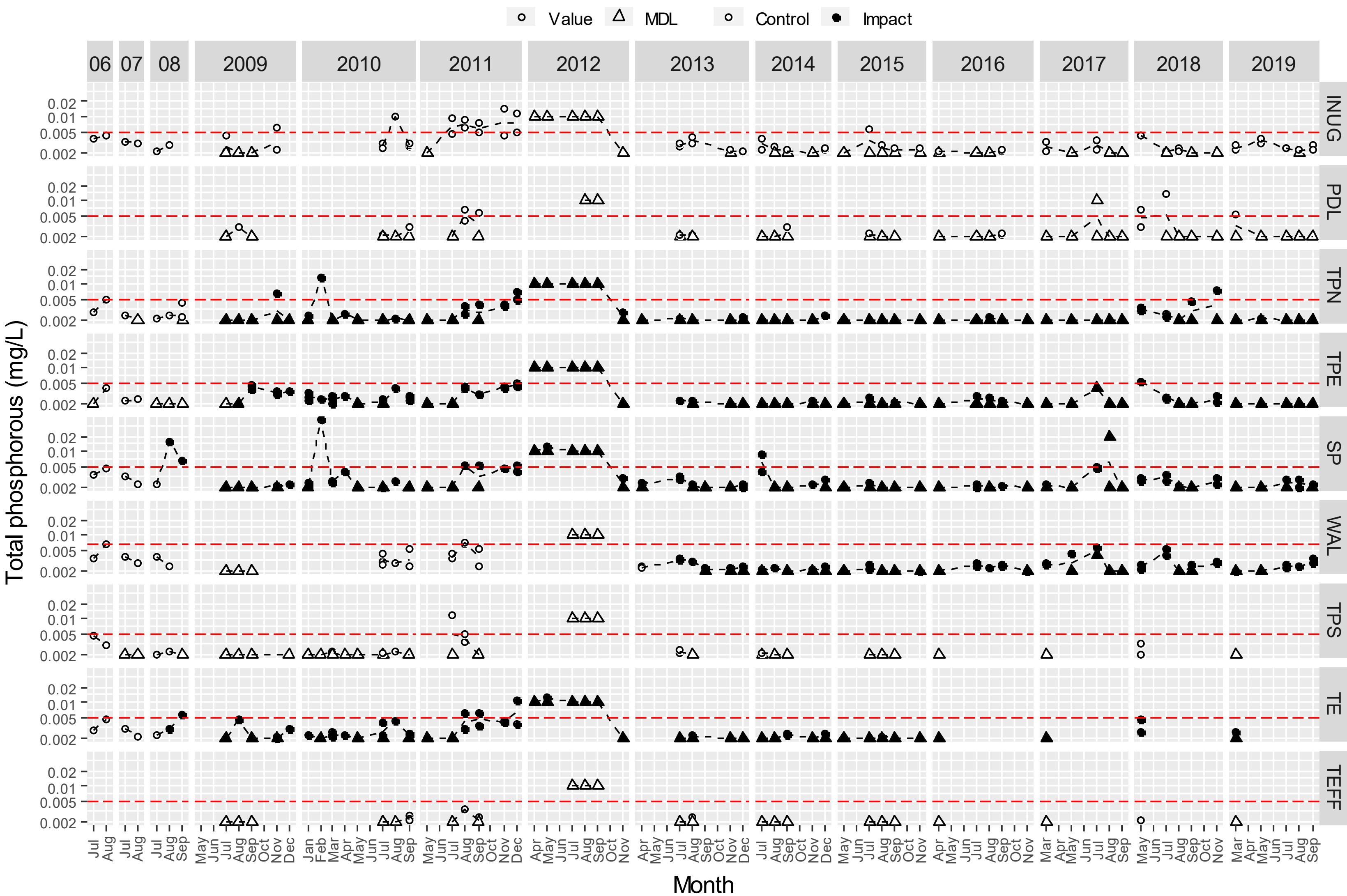


Figure 4-29. Reactive silica (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

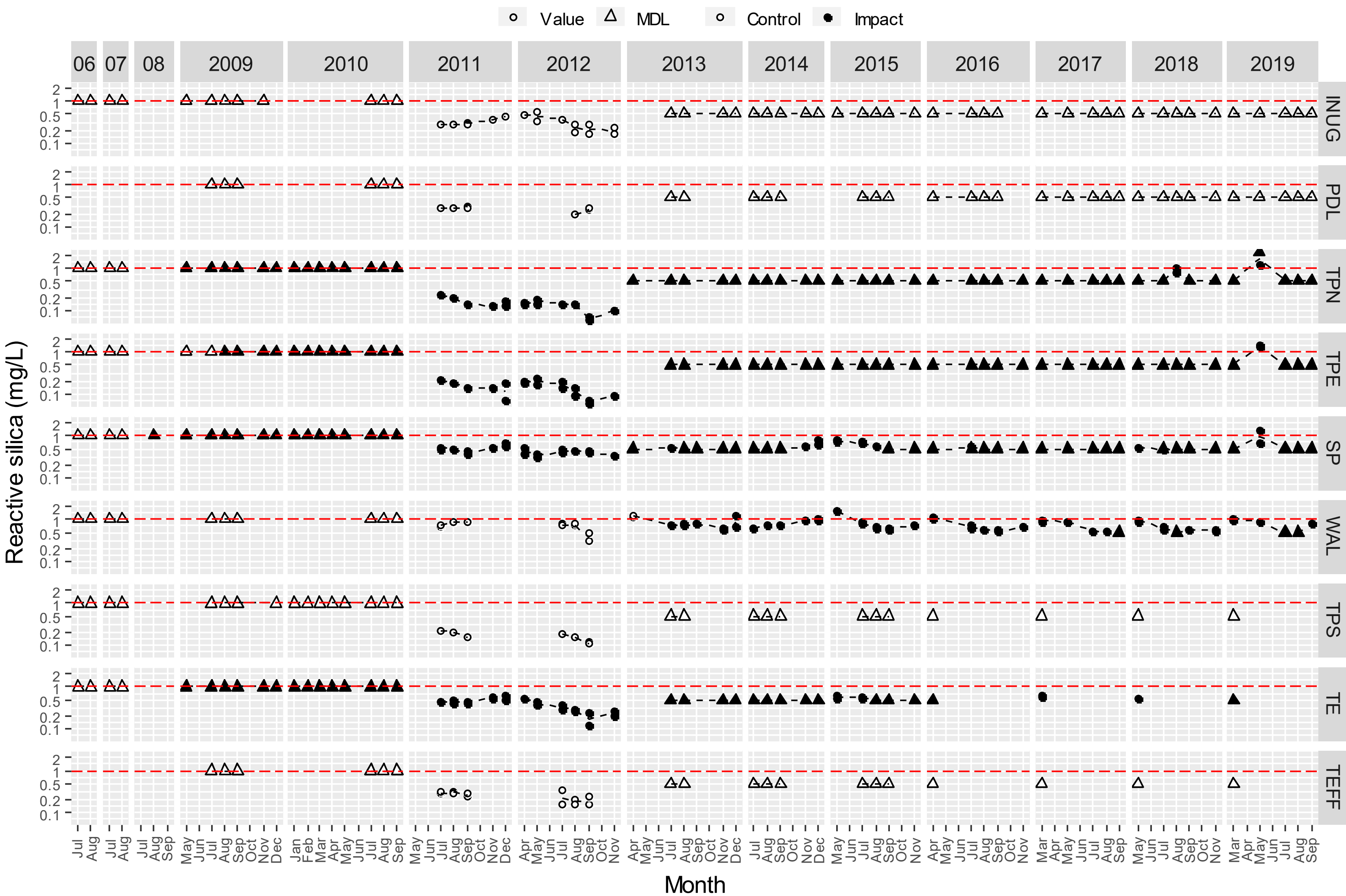


Figure 4-30. Sulphate (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.

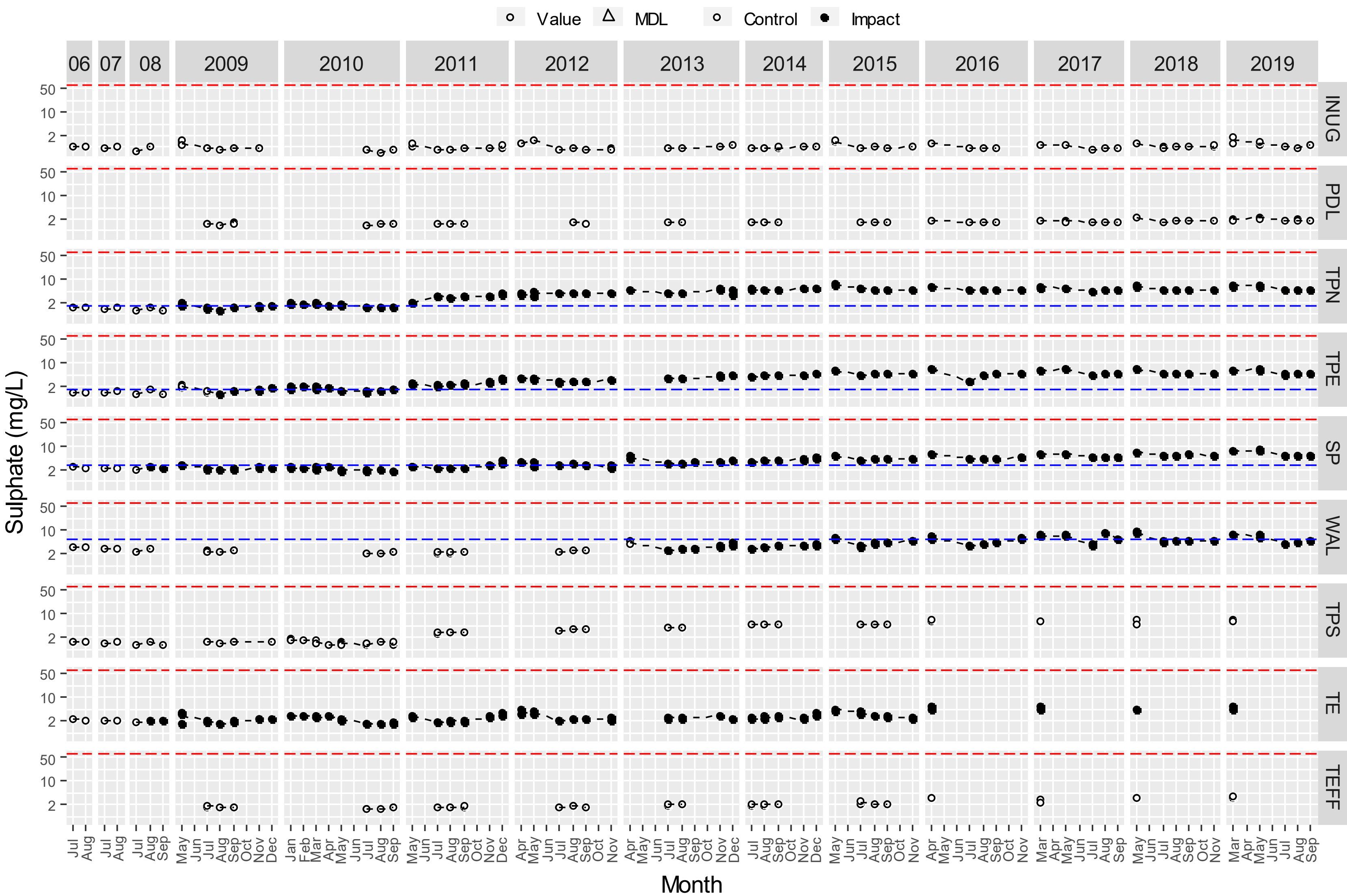


Figure 4-31. Dissolved Organic Carbon (DOC; mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

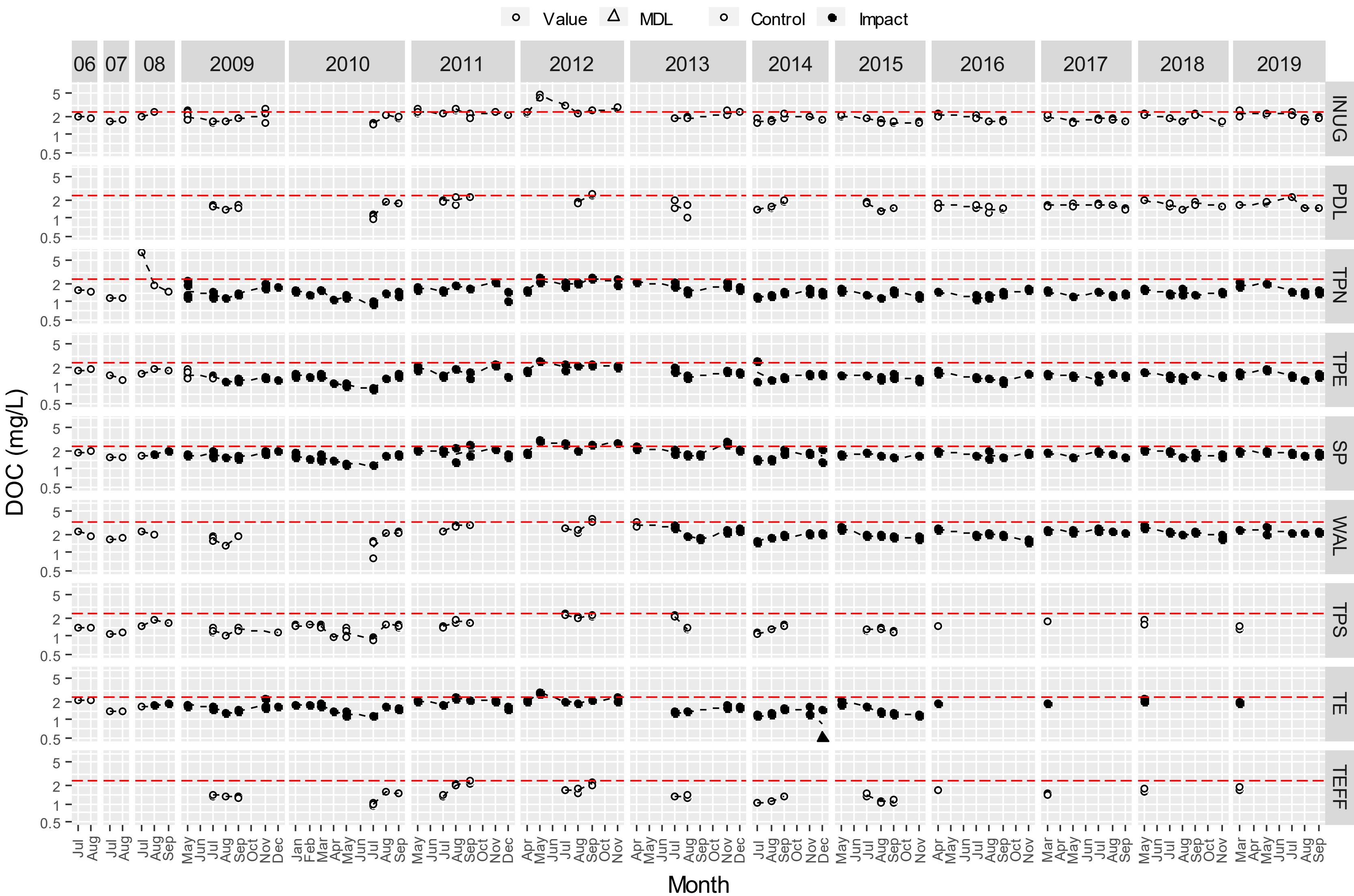


Figure 4-32. Total Organic Carbon (TOC; mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

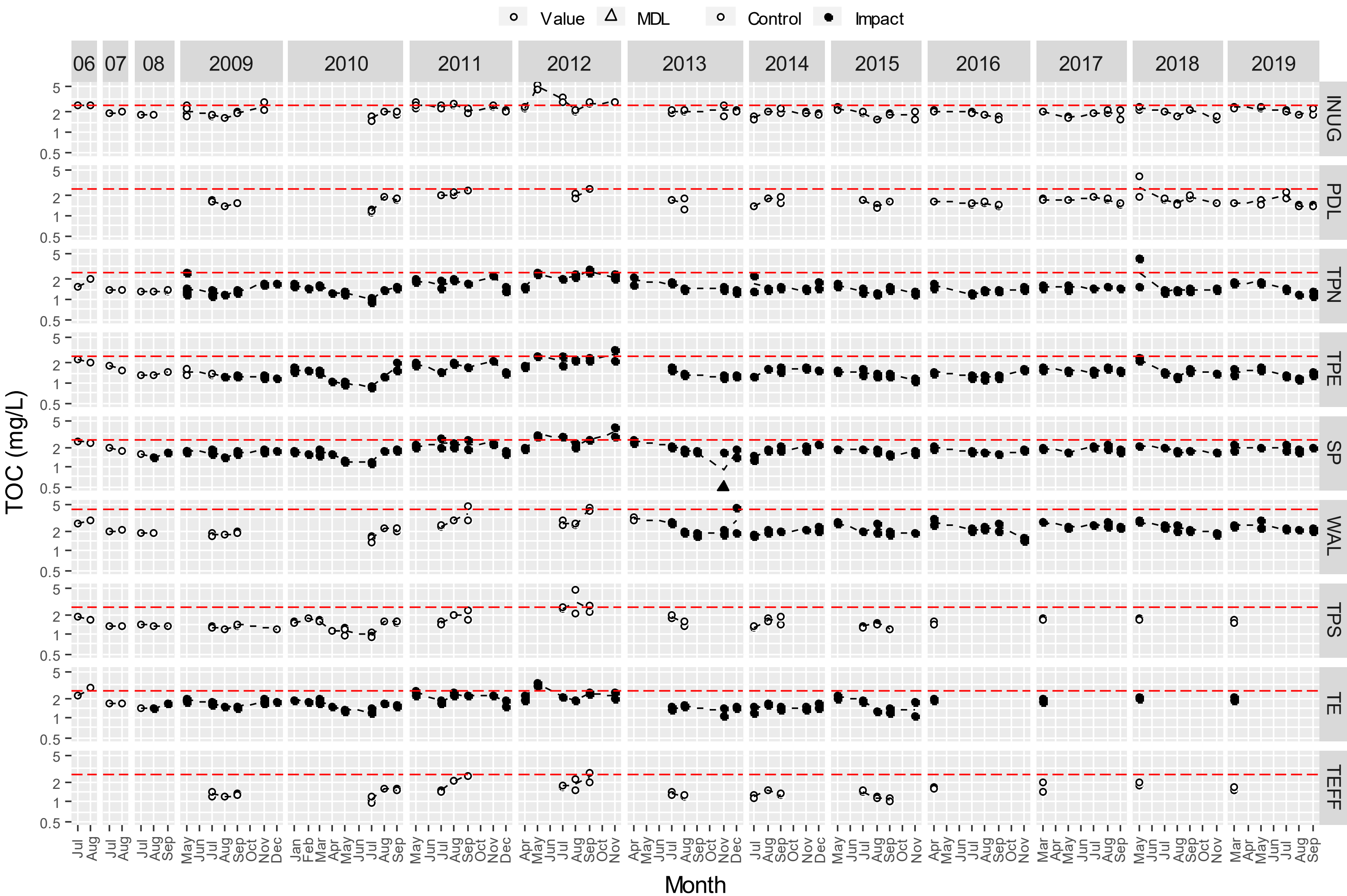


Figure 4-33. Total aluminum (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

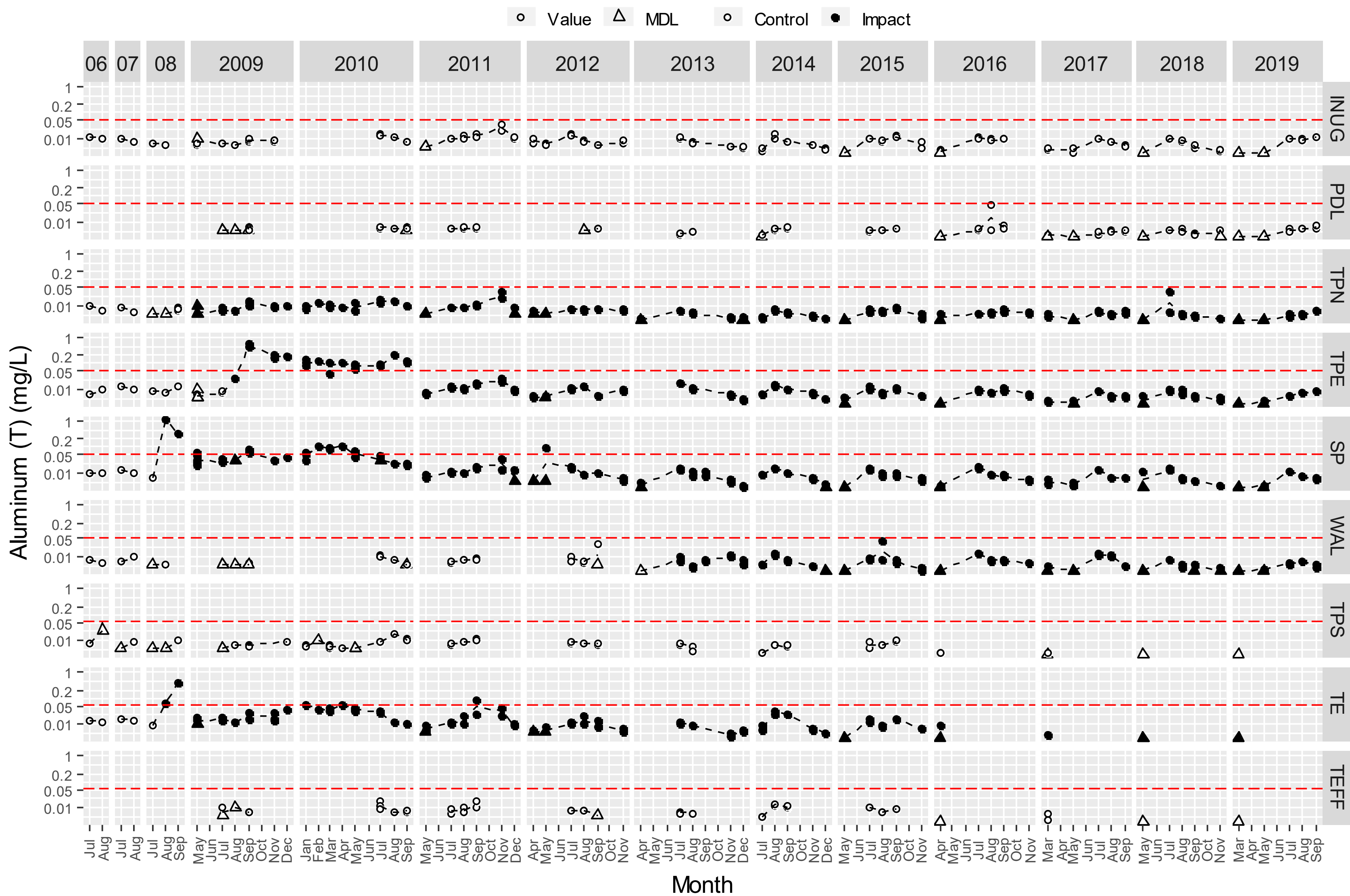


Figure 4-34. Total arsenic (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

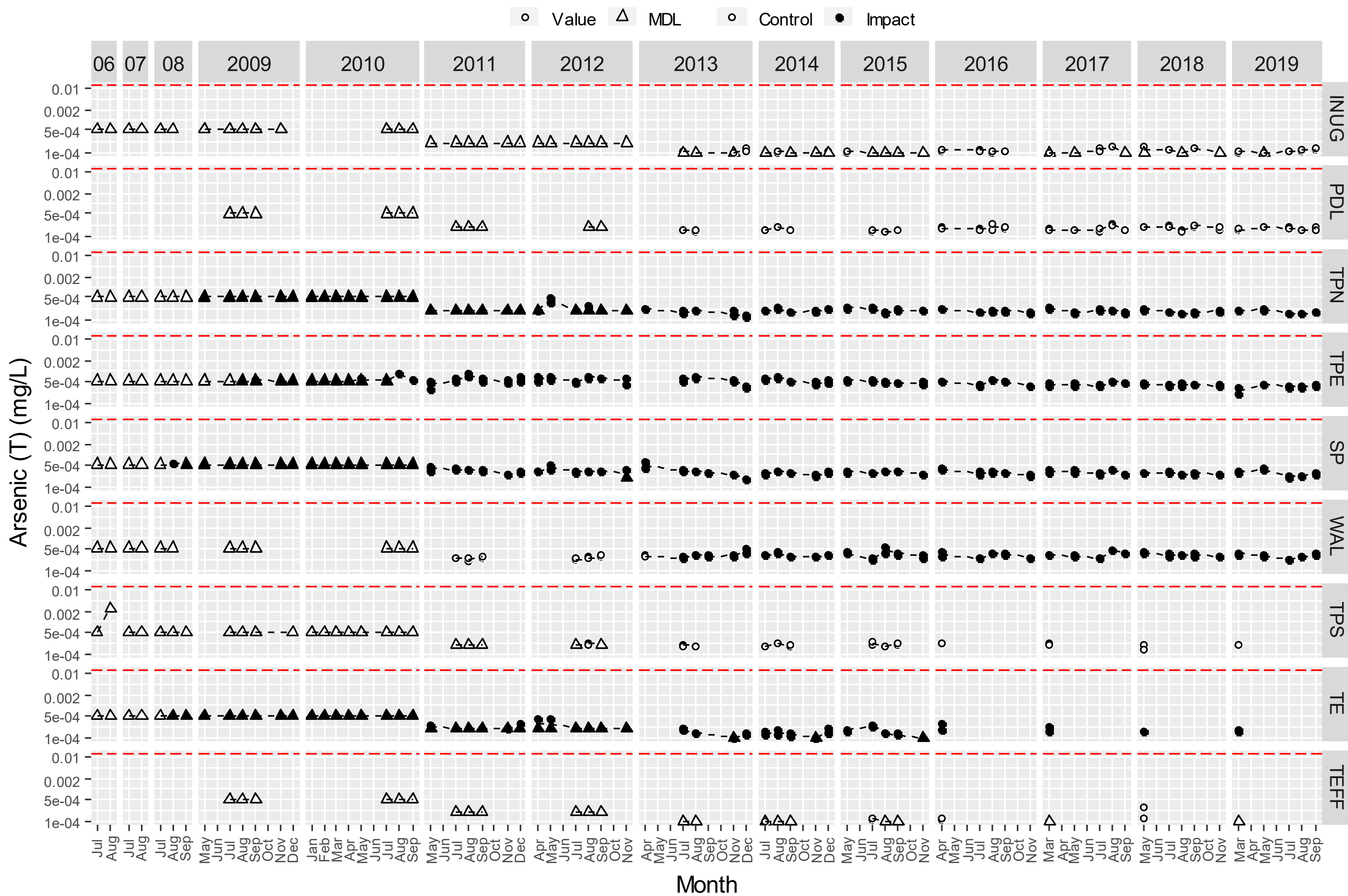


Figure 4-35. Total barium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

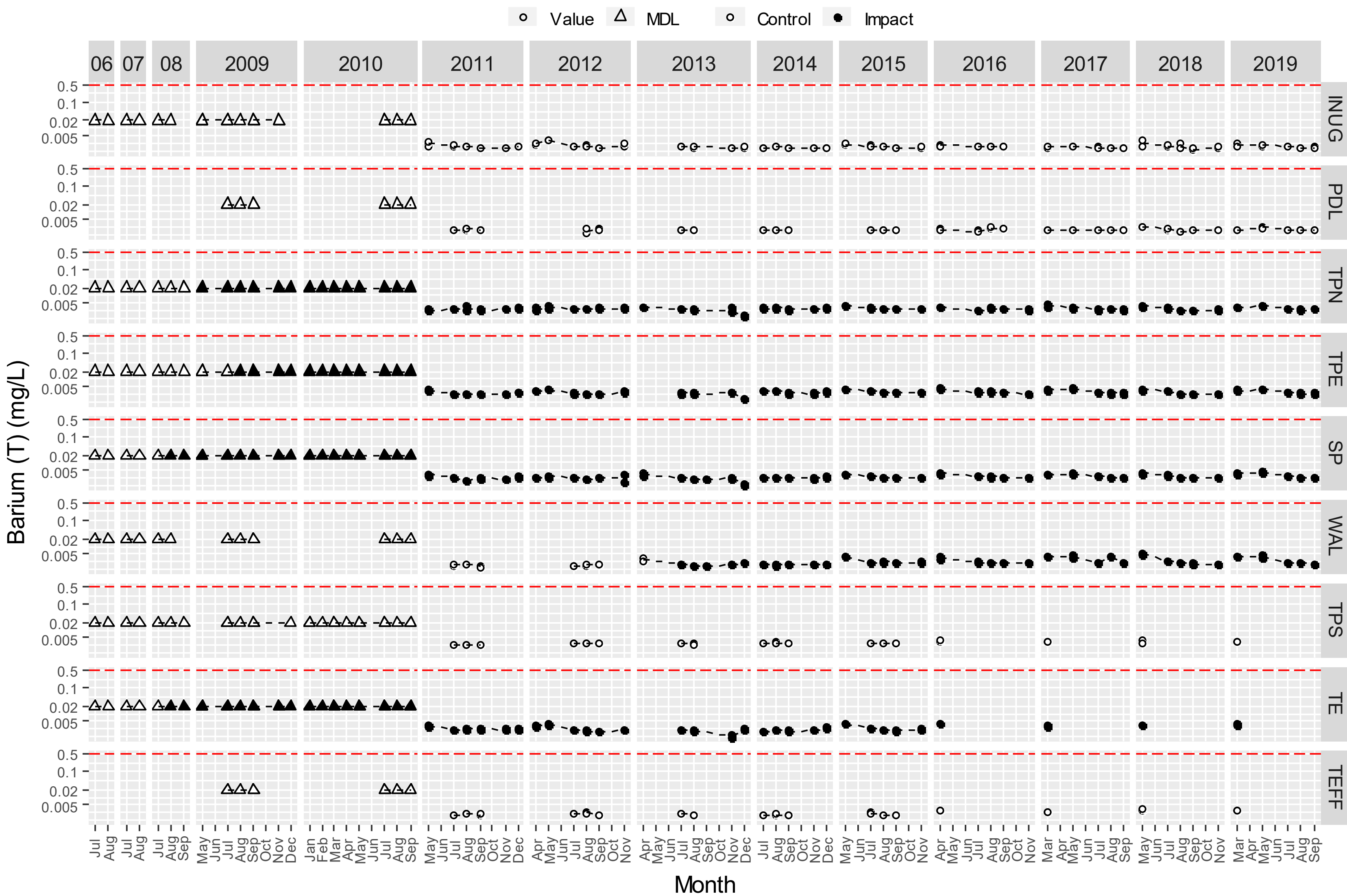


Figure 4-36. Total calcium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.

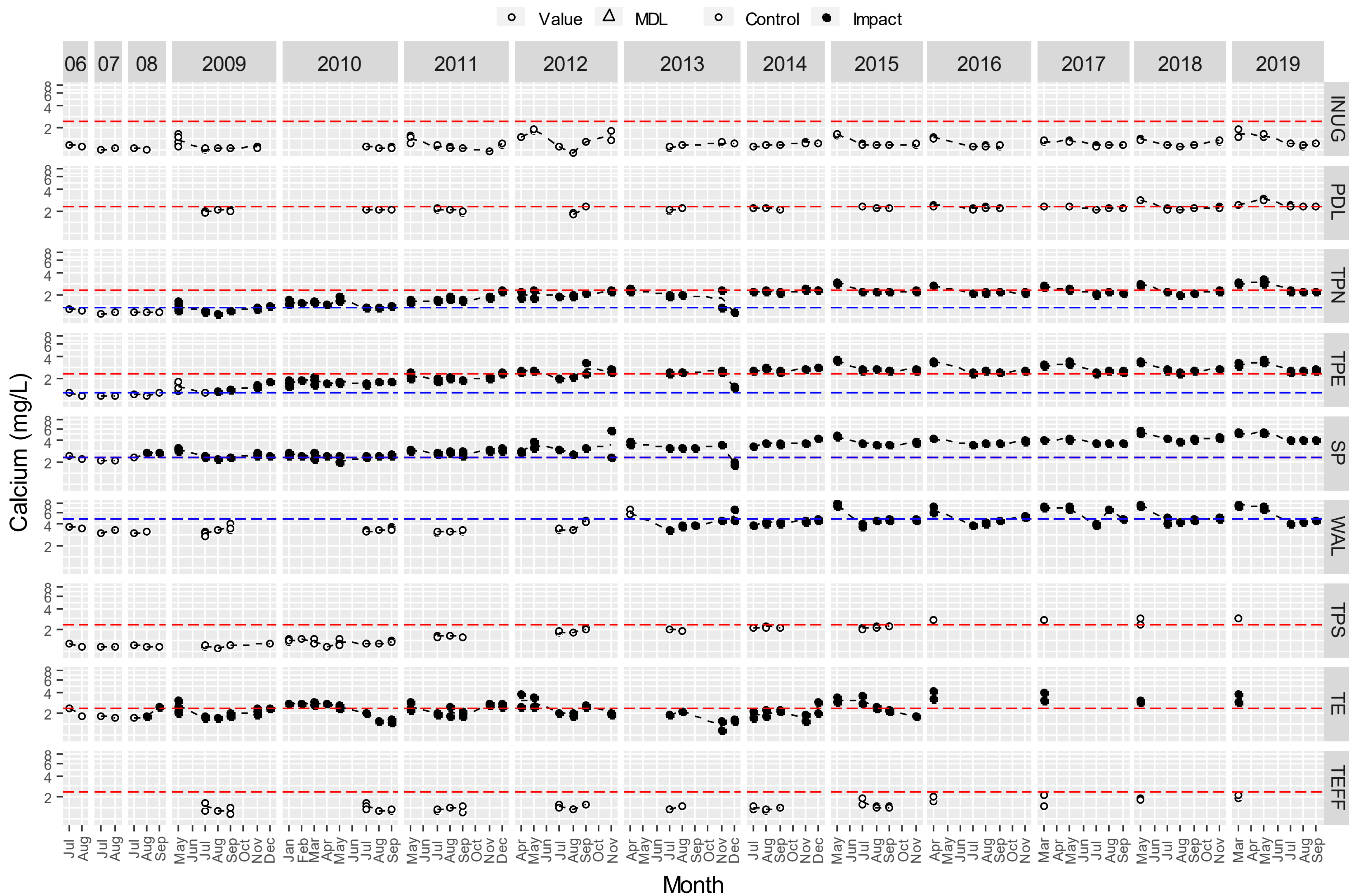


Figure 4-37. Total chromium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

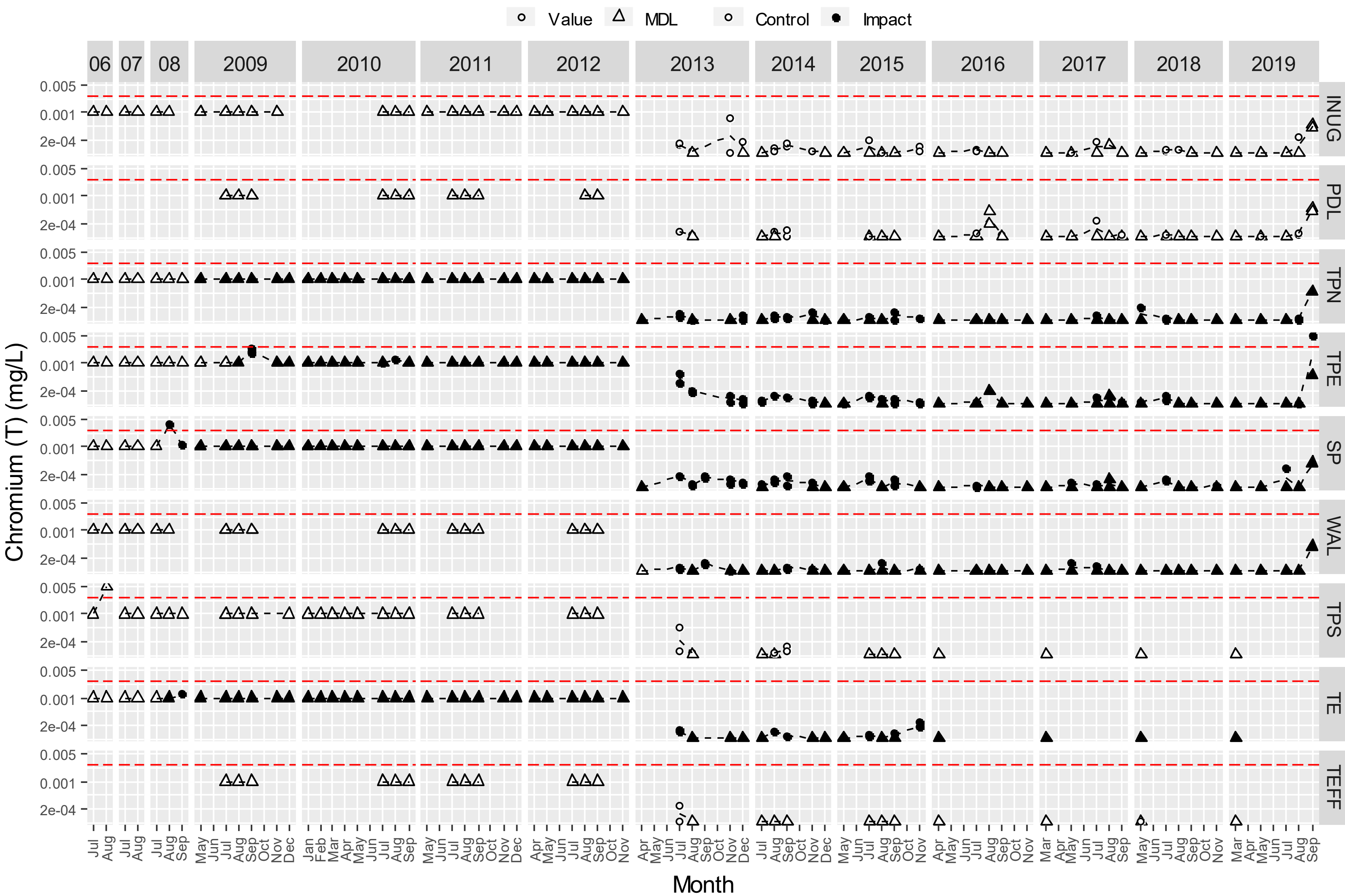


Figure 4-38. Total copper (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

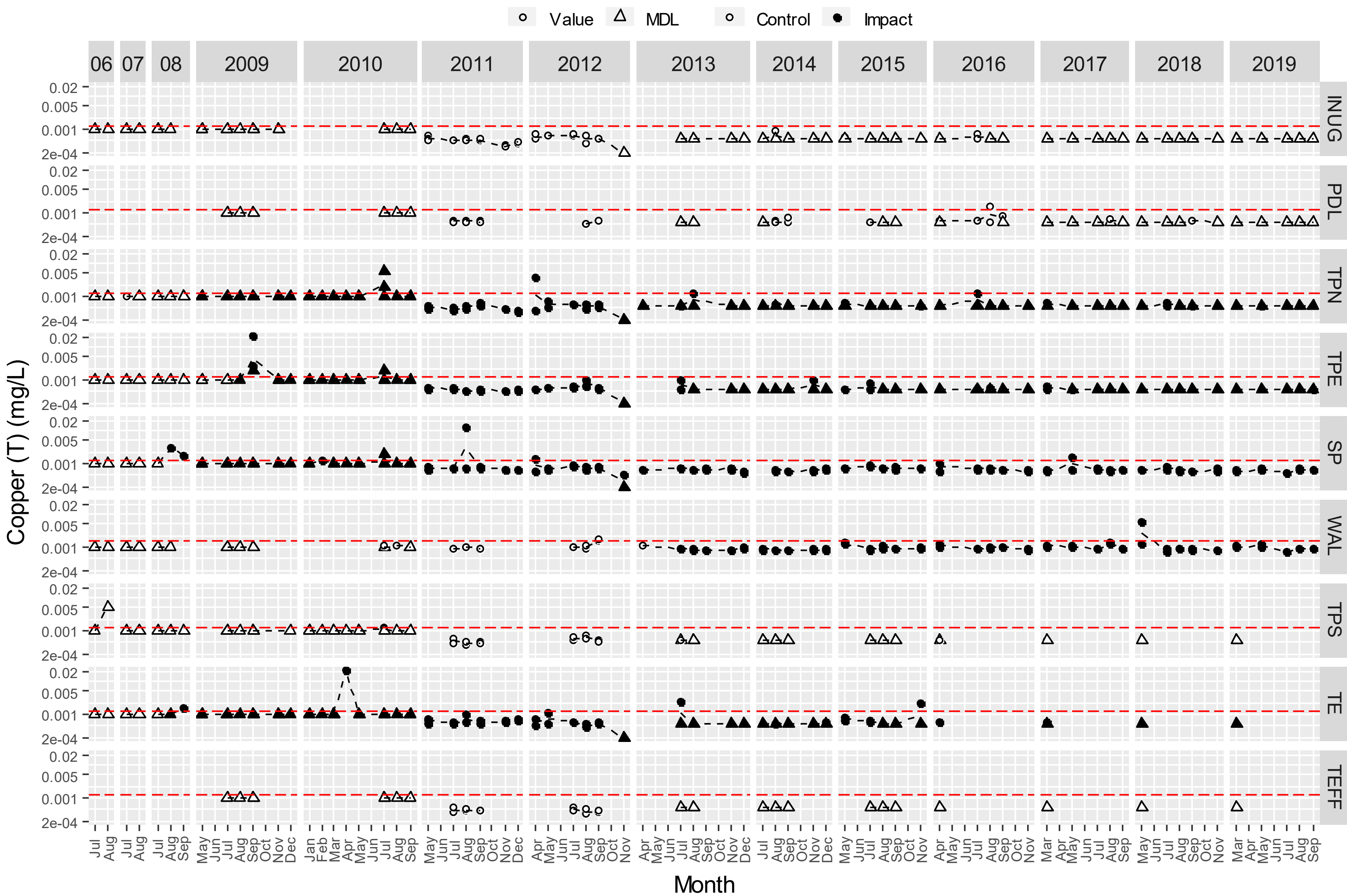


Figure 4-39. Total iron (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

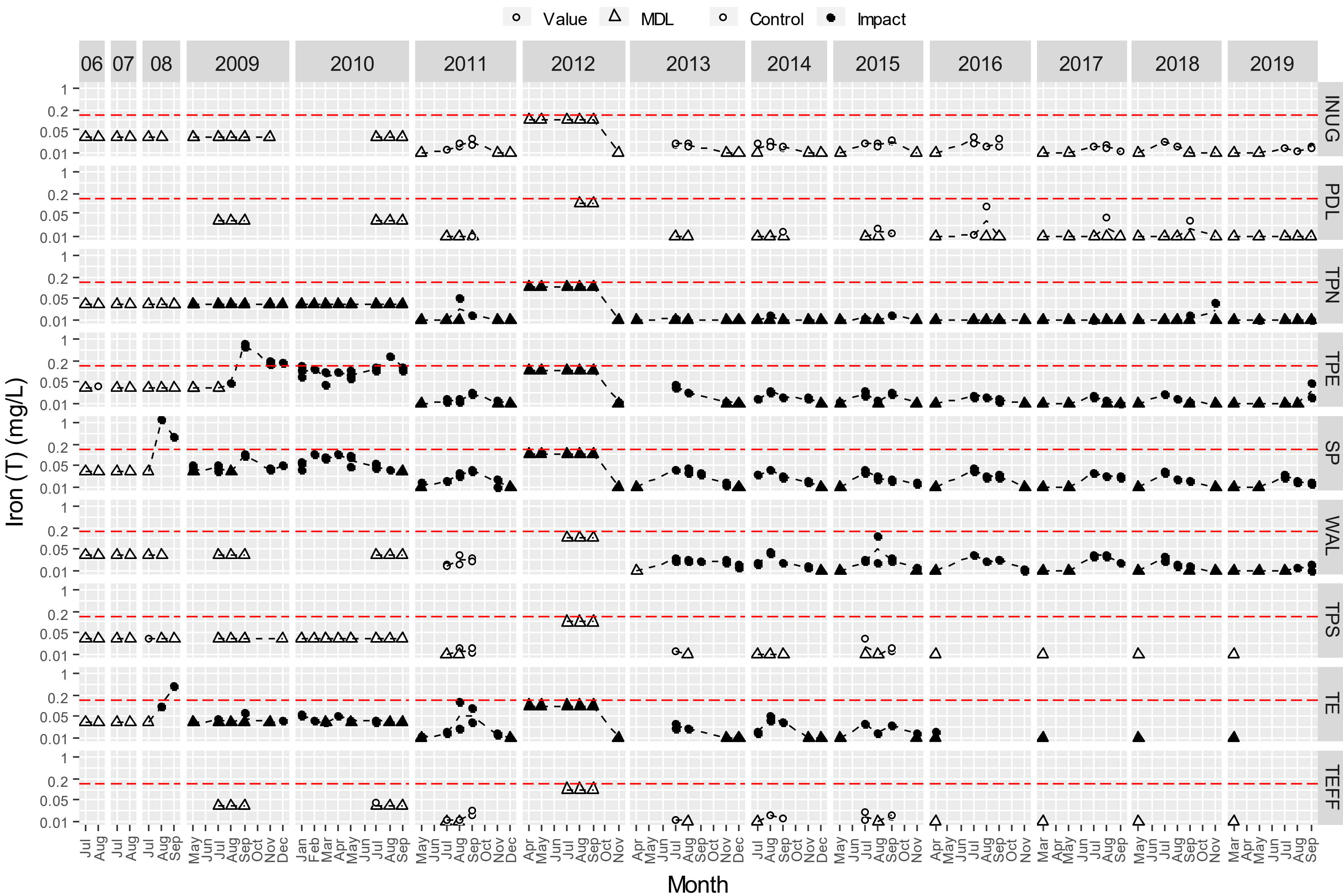


Figure 4-40. Total magnesium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.

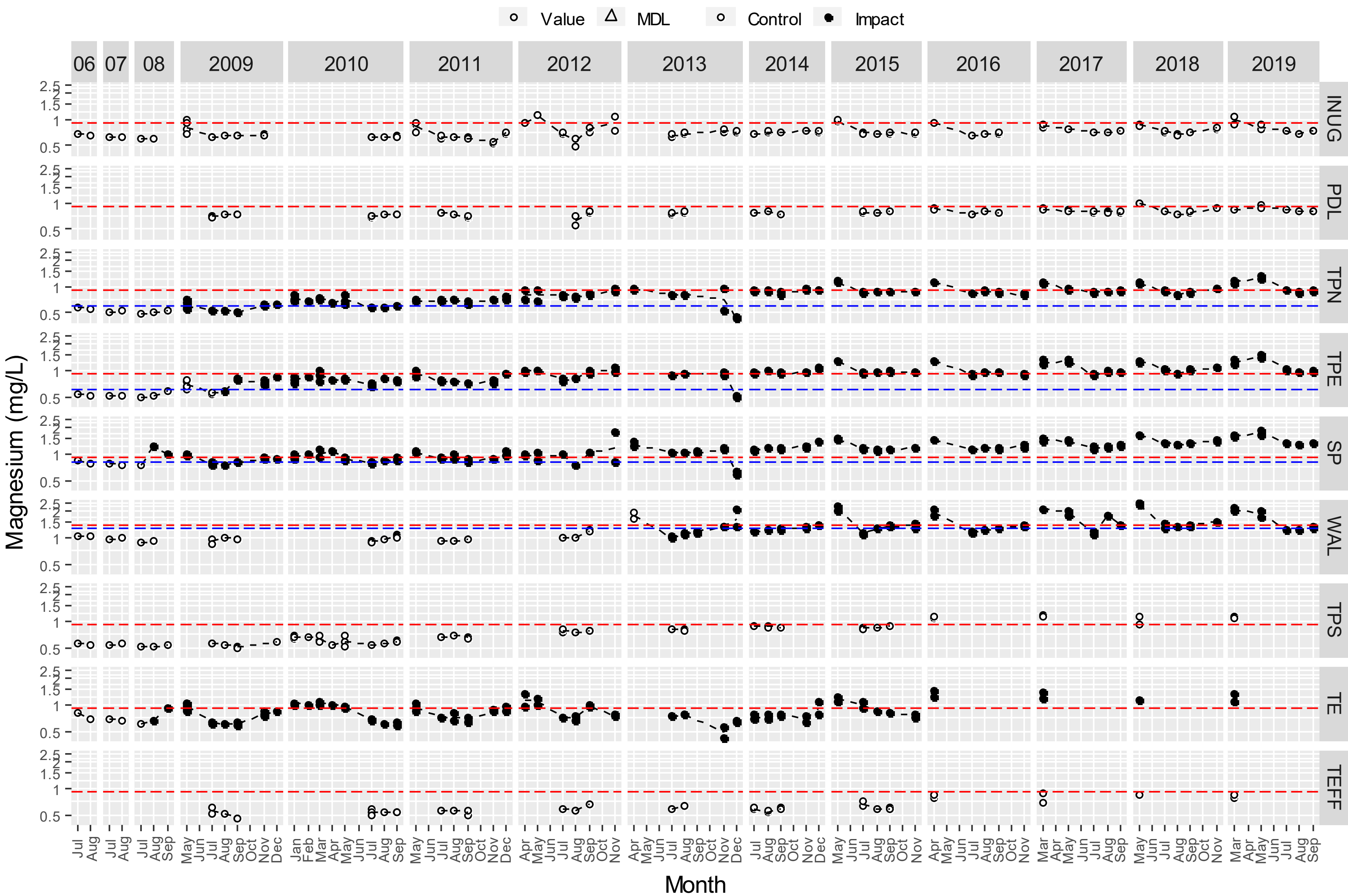


Figure 4-41. Total manganese (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

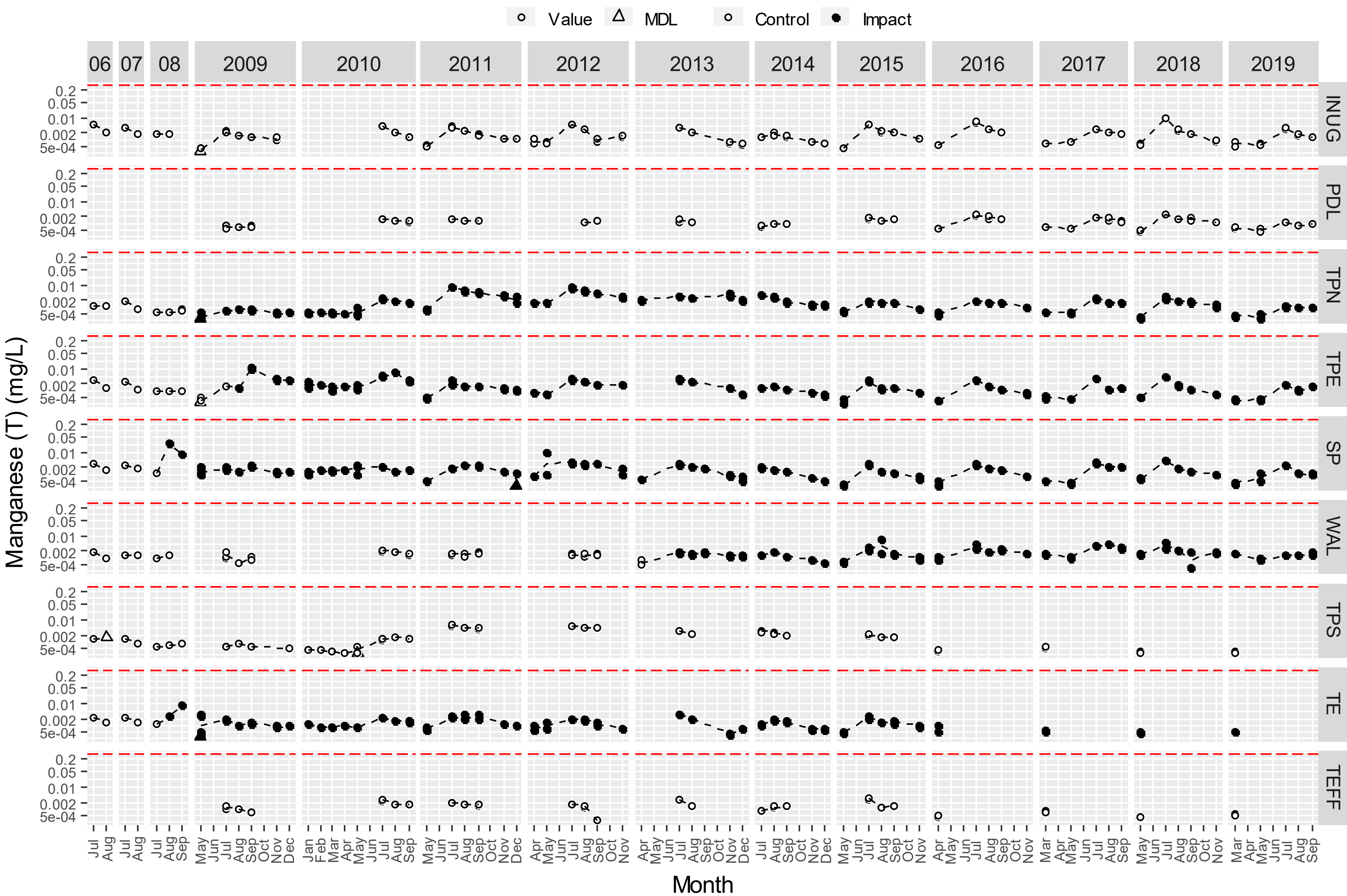


Figure 4-42. Total molybdenum (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

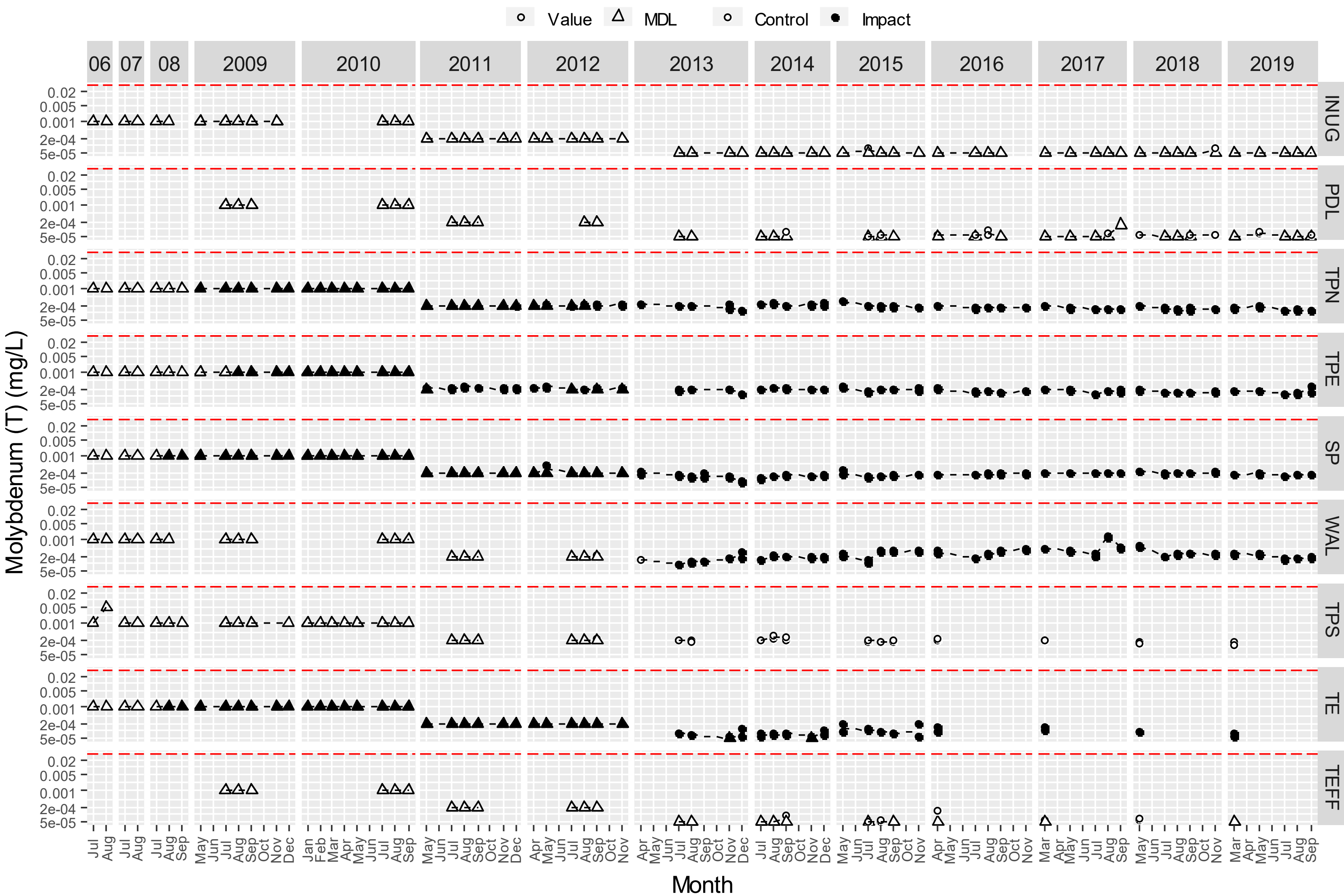


Figure 4-43. Total nickel (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

Figure 4-44. Total potassium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

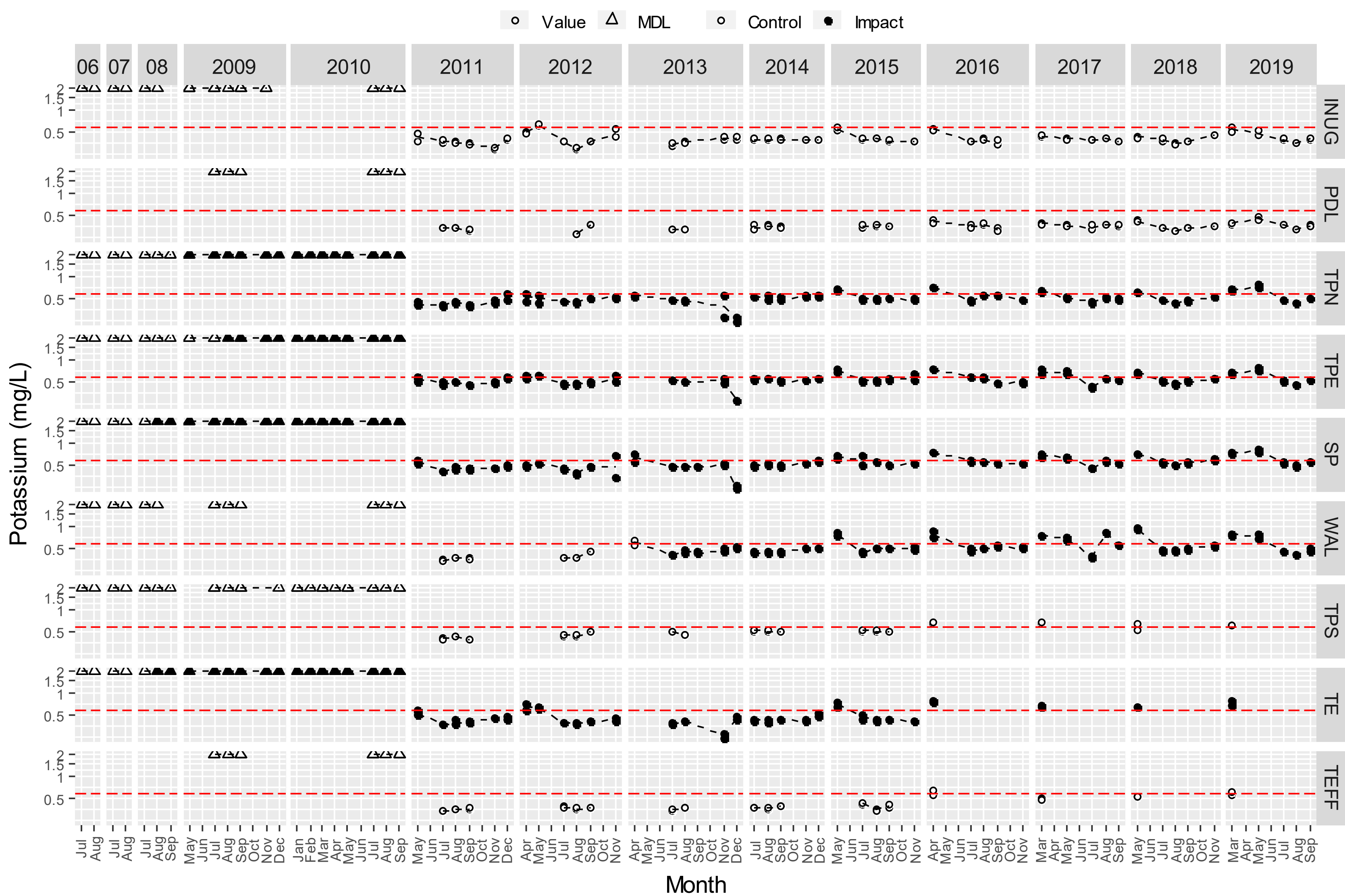


Figure 4-45. Total silicon (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction (0.01 mg/L).

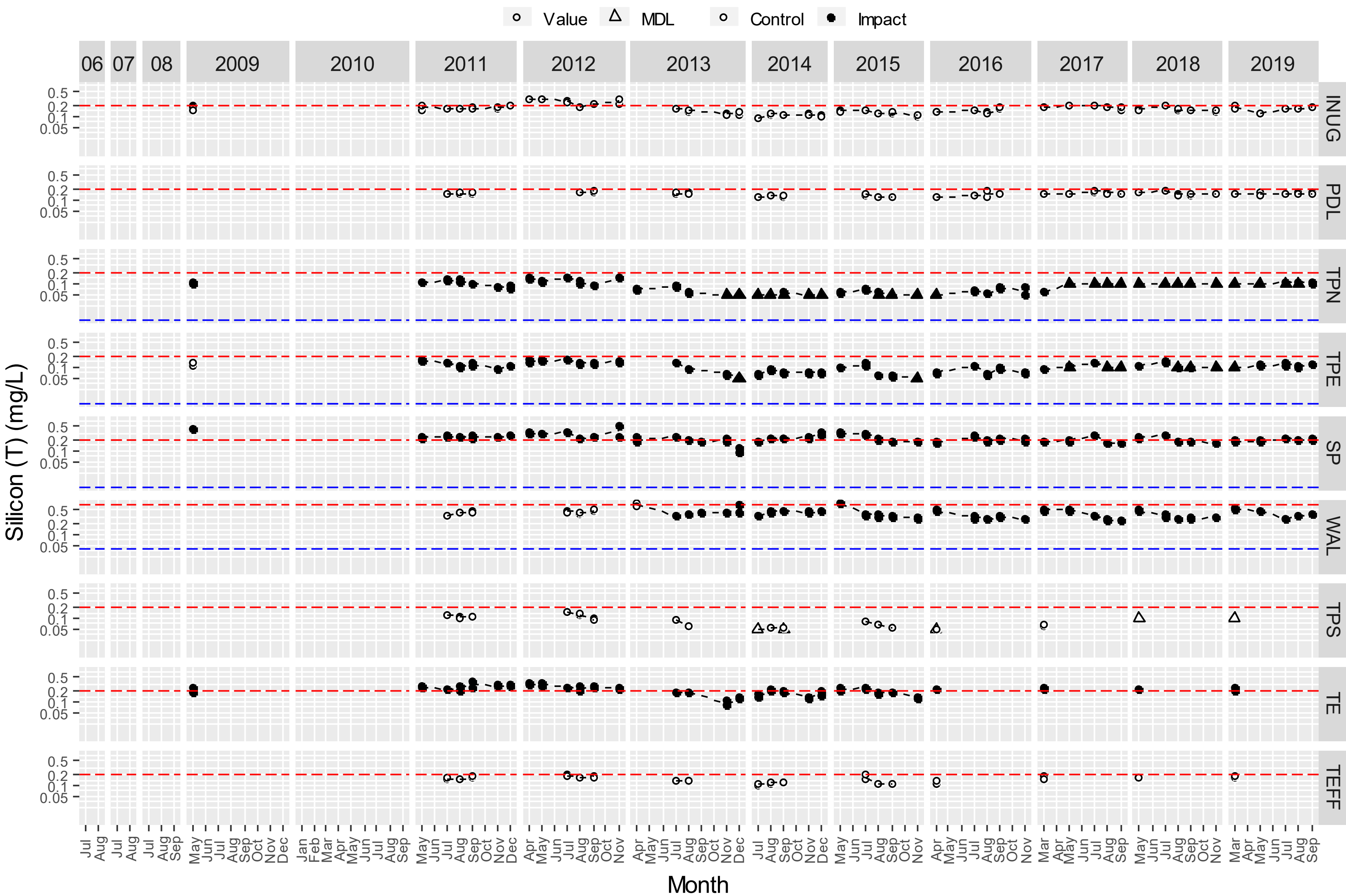


Figure 4-46.Total sodium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

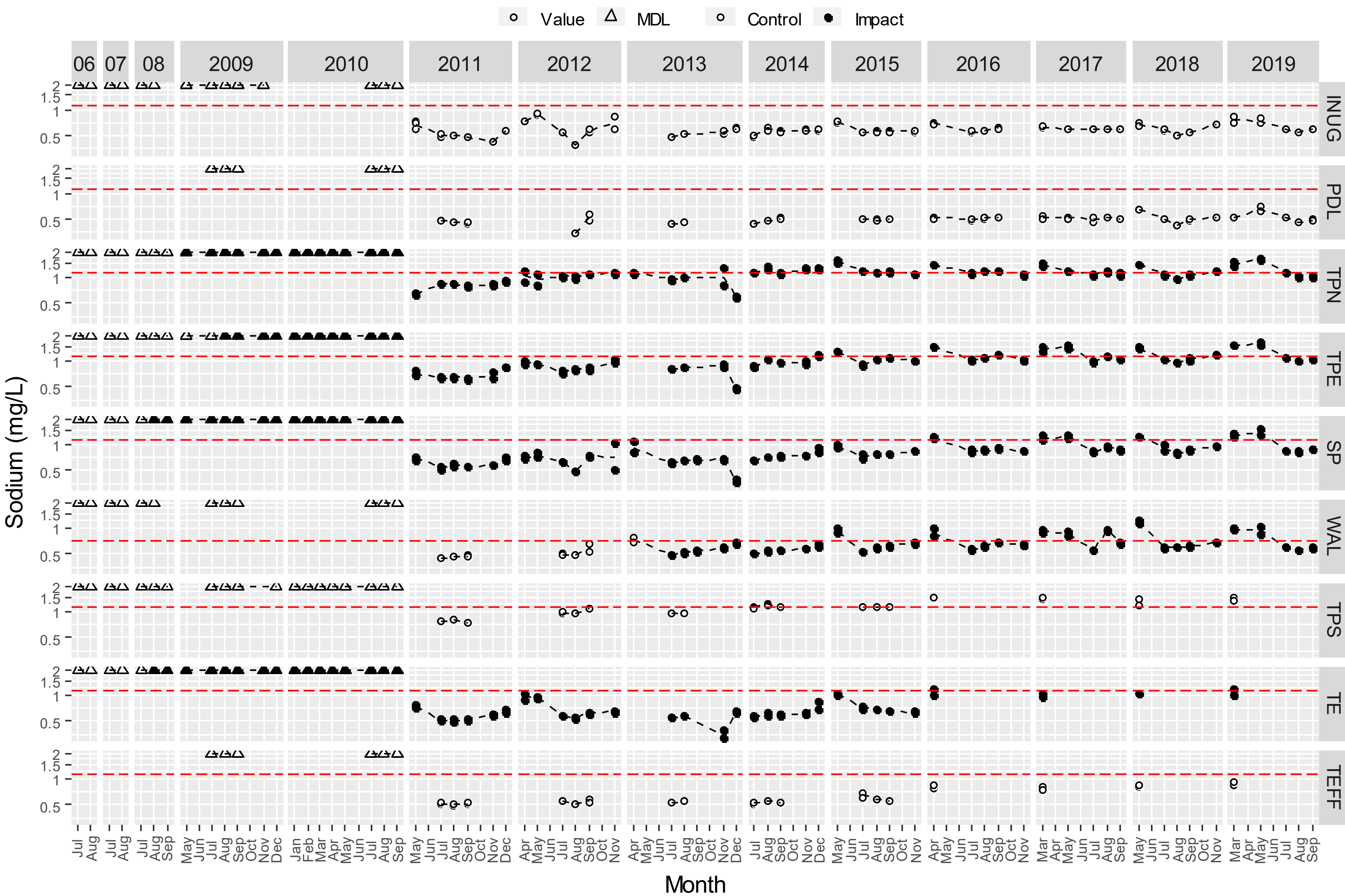


Figure 4-47. Total strontium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.

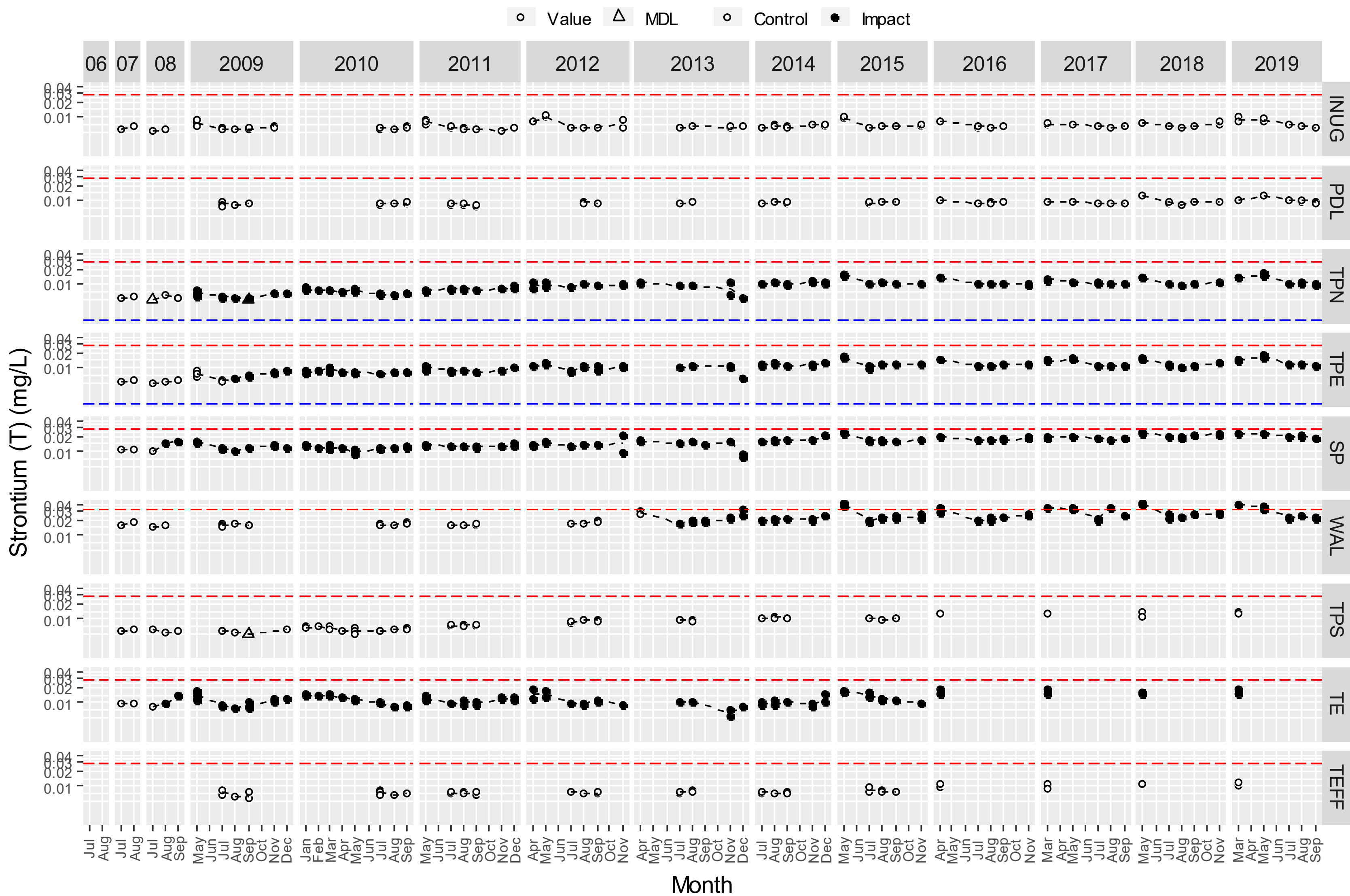


Figure 4-48. Total uranium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

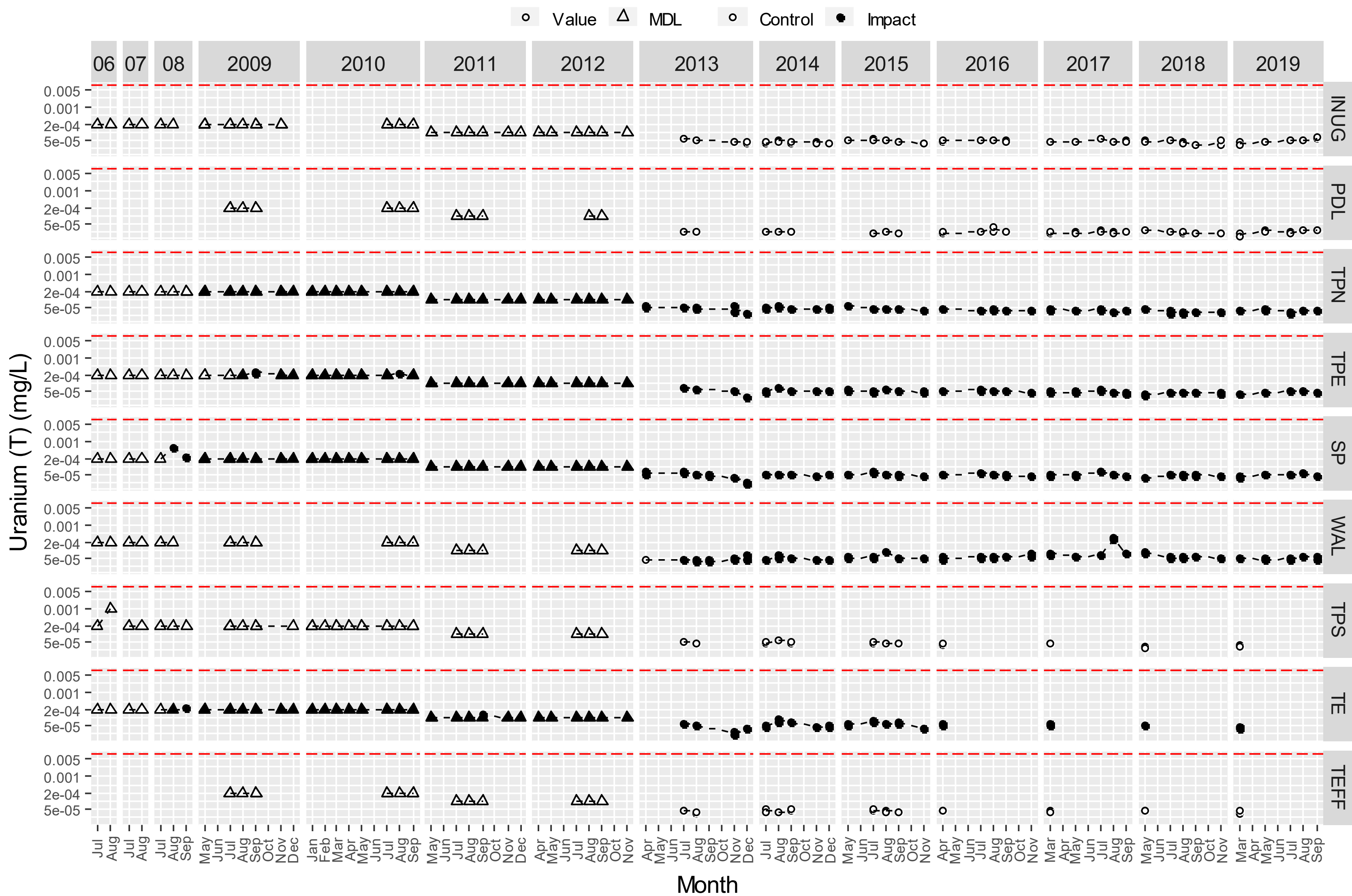


Figure 4-49. Dissolved aluminum (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

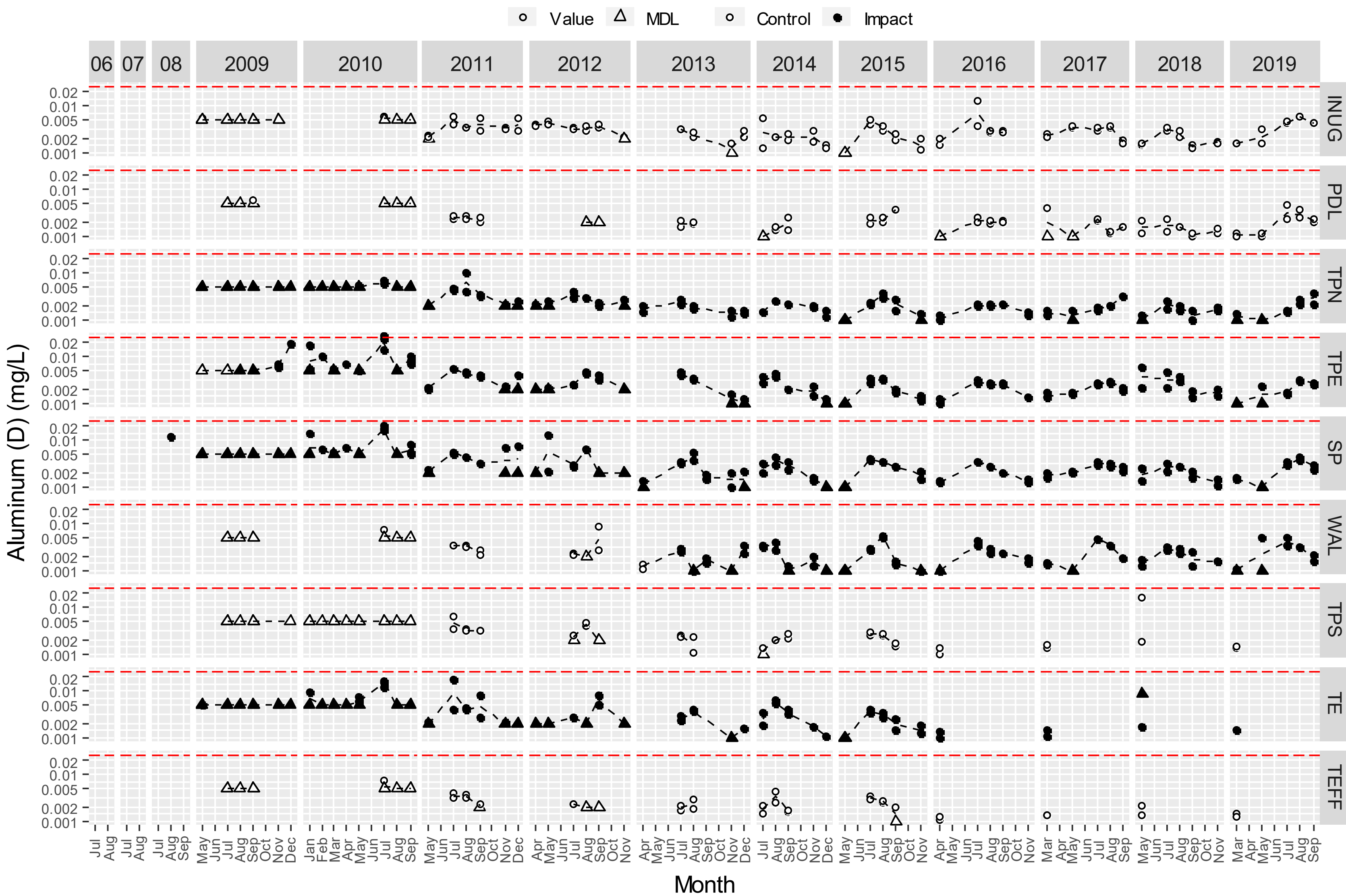


Figure 4-50. Dissolved arsenic (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

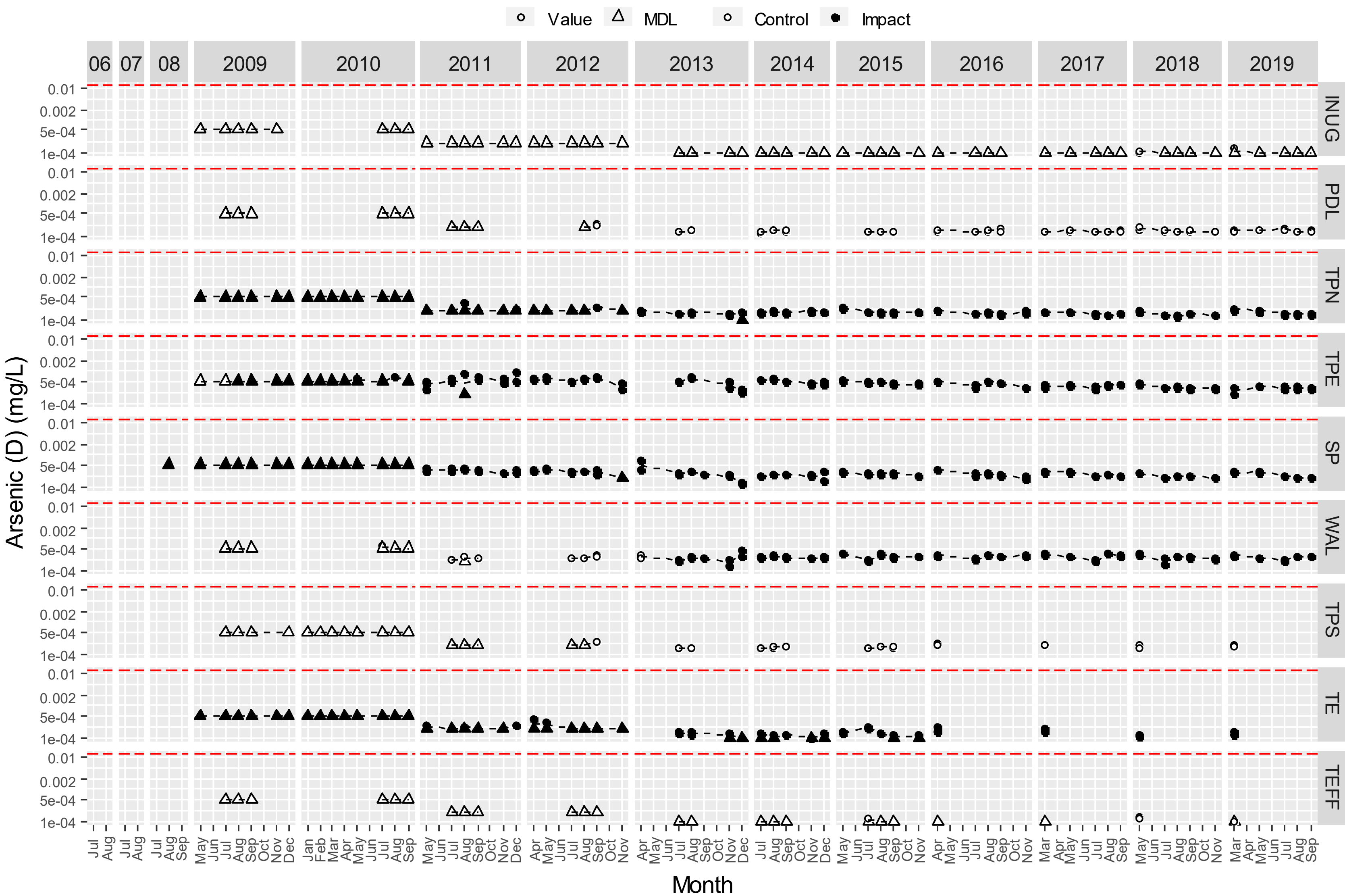


Figure 4-51. Dissolved barium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

Figure 4-52. Dissolved copper (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

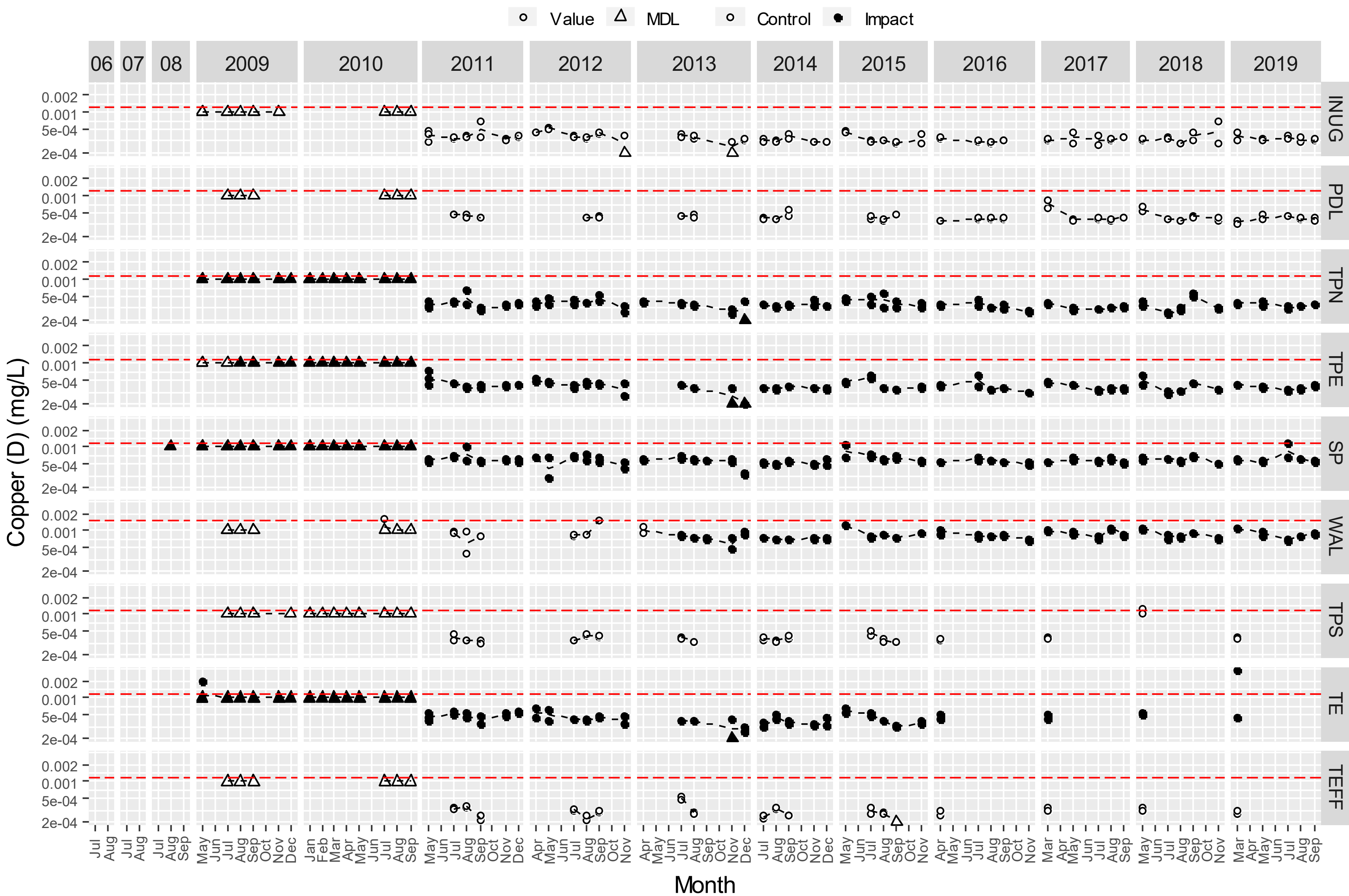


Figure 4-53. Dissolved manganese (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

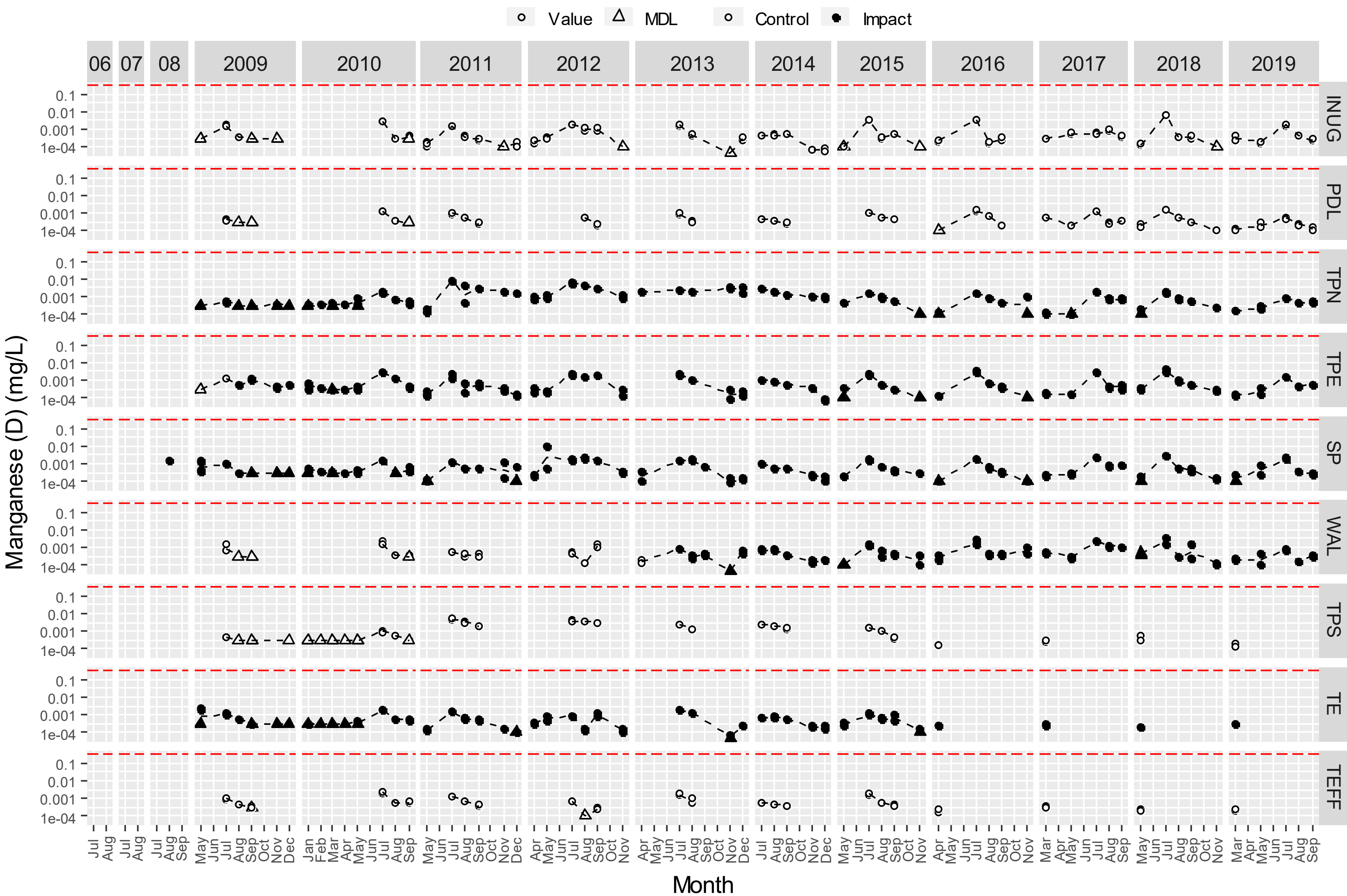


Figure 4-54. Dissolved molybdenum (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

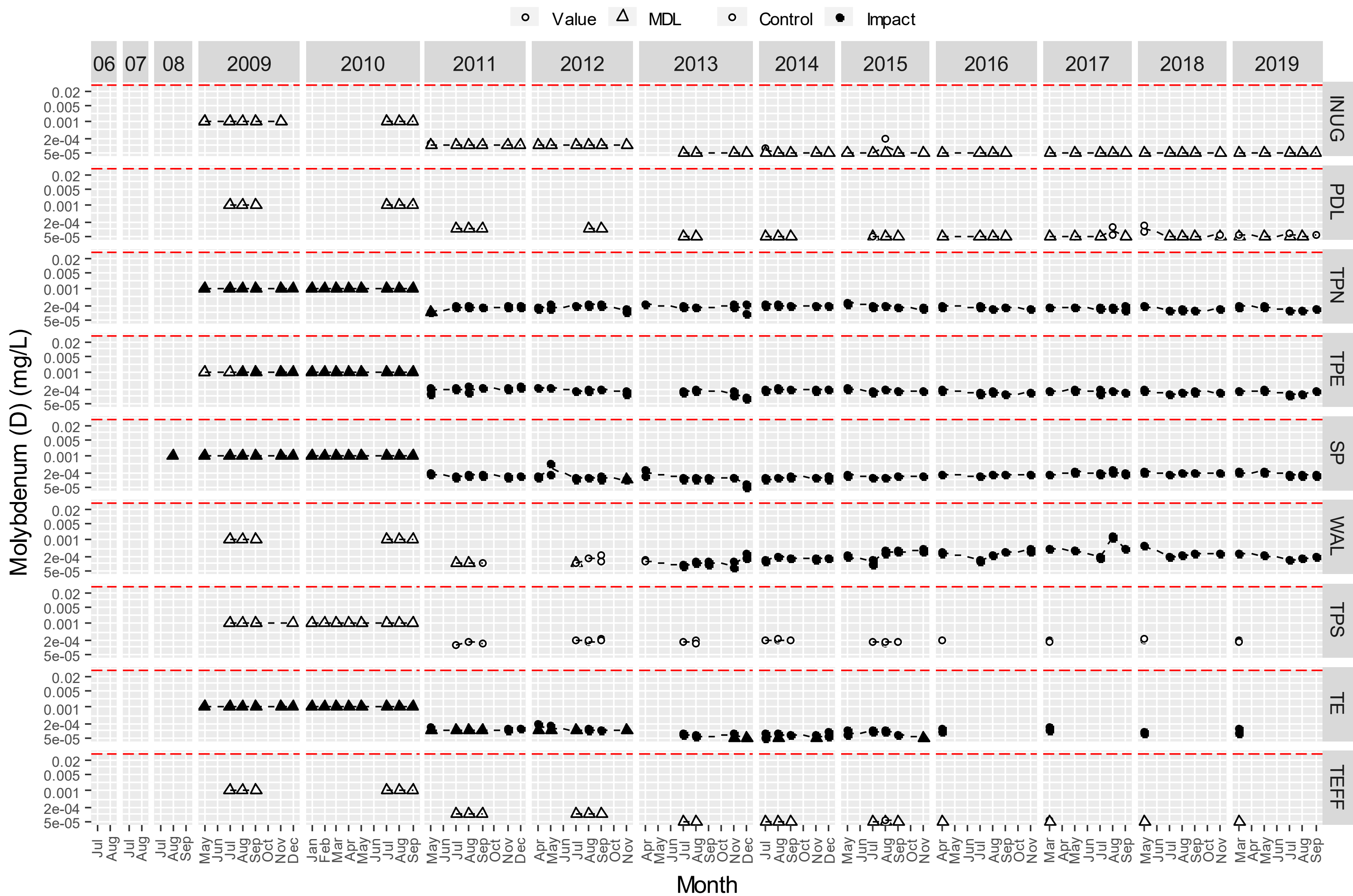


Figure 4-55. Dissolved silicon (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

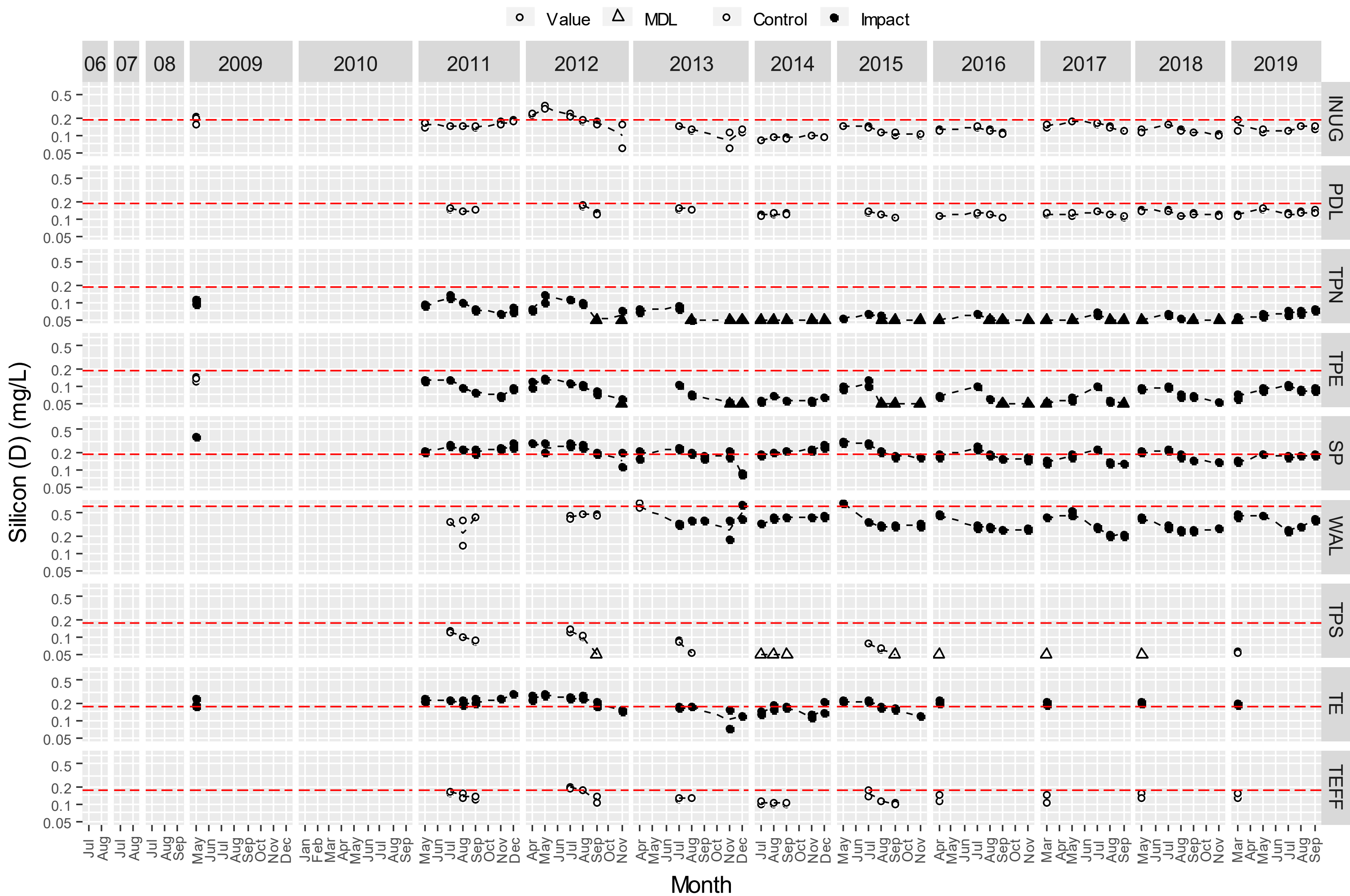


Figure 4-56. Dissolved strontium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.

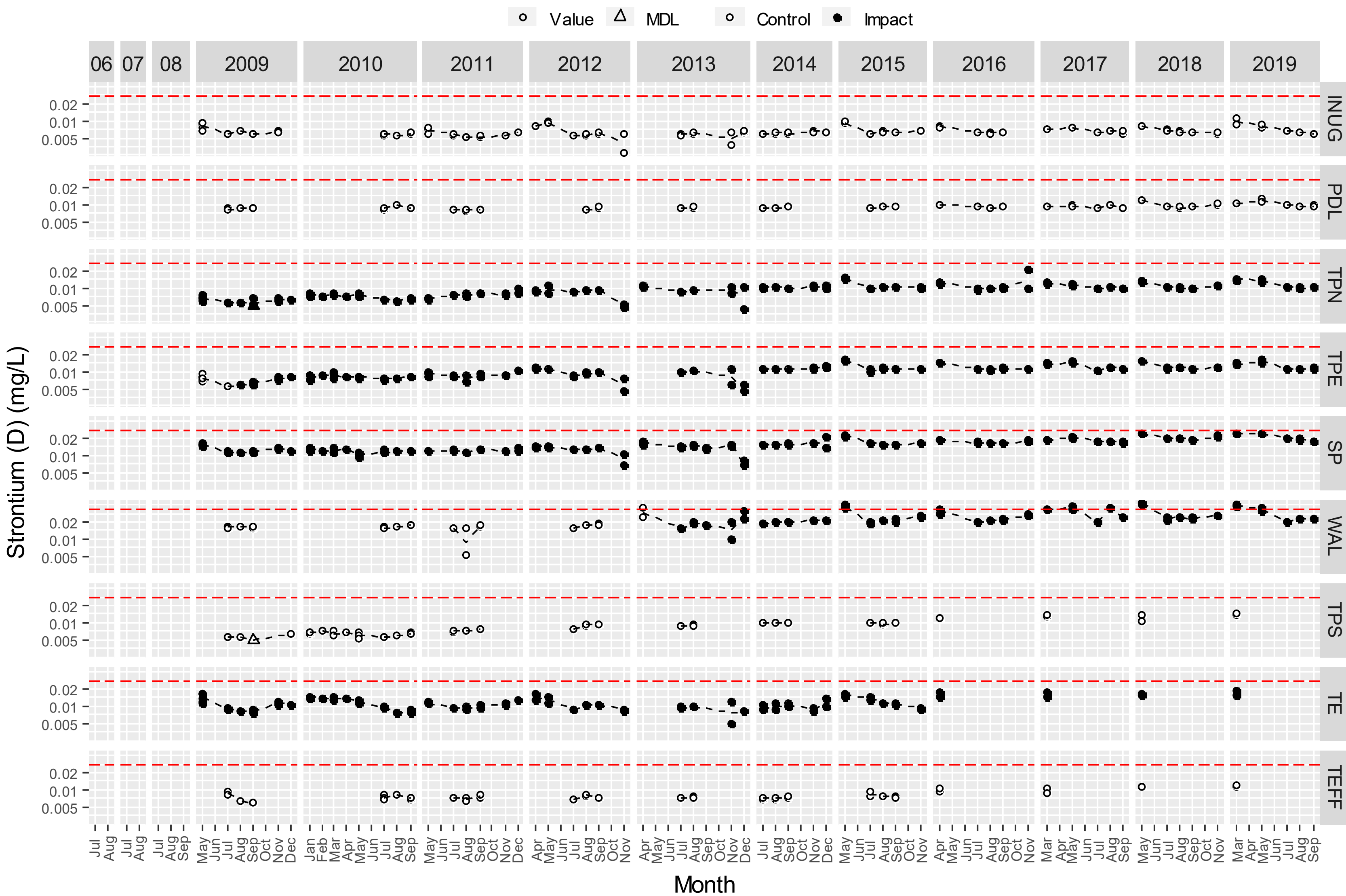
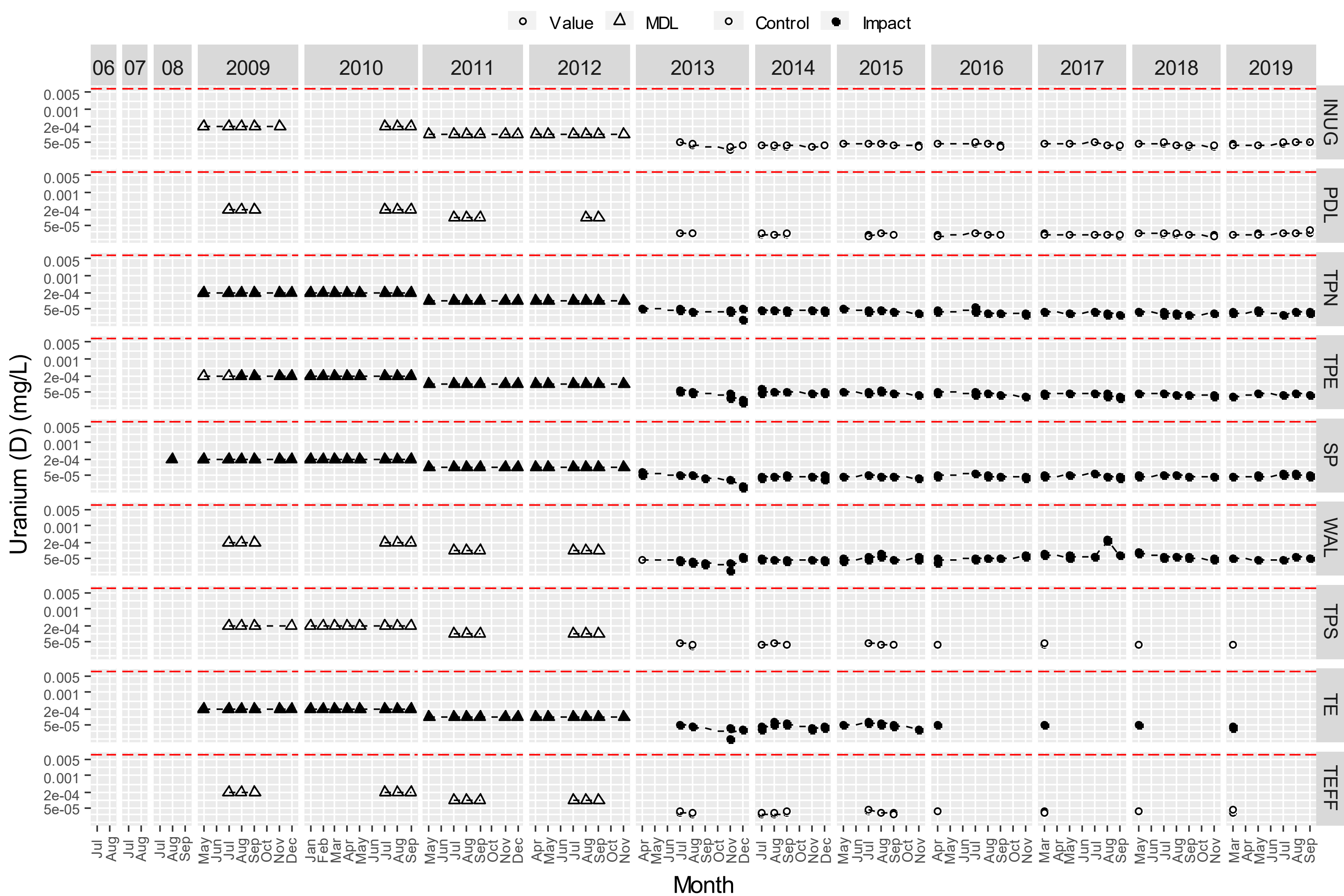


Figure 4-57. Dissolved uranium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line = trigger value.



Phytoplankton Tables and Figures

Table 4-7. Results of the BACI test for phytoplankton variables at Meadowbank areas, 2019.

Parameter Measured	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
Total Biomass	TPN	7	5	0.16	0.33	0.63	18	-43	144
	TPE	8	5	0.04	0.37	0.92	4	-54	134
	SP	6	5	0.59	0.24	**0.04**	80	4	210
	WAL	19	5	0.45	0.22	**0.049**	57	0	146
Taxa Richness	TPN	7	5	0.03	0.08	0.69	3	-14	24
	TPE	8	5	-0.08	0.08	0.33	-8	-23	10
	SP	6	5	0.15	0.07	**0.05**	17	0	36
	WAL	19	5	0.08	0.07	0.28	8	-6	24

Notes:

* **Bolded** values are P-values < 0.1

Shaded cells indicate positive (increases) or negative (reduced) effect sizes of 20% or more

Test area = area compared to control (INUG)

n(B) = number of months in the *before* period

n(A) = number of months in the *after* period (i.e., in 2019)

Estimate = BACI model estimate of the 2019 change in mean for log-transformed data

SE = standard error of the estimate

P-value = two-tailed test of the null hypothesis of no change

ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 4-58. Chlorophyll-a (µg/L) in water samples from Meadowbank study lakes since 2006.

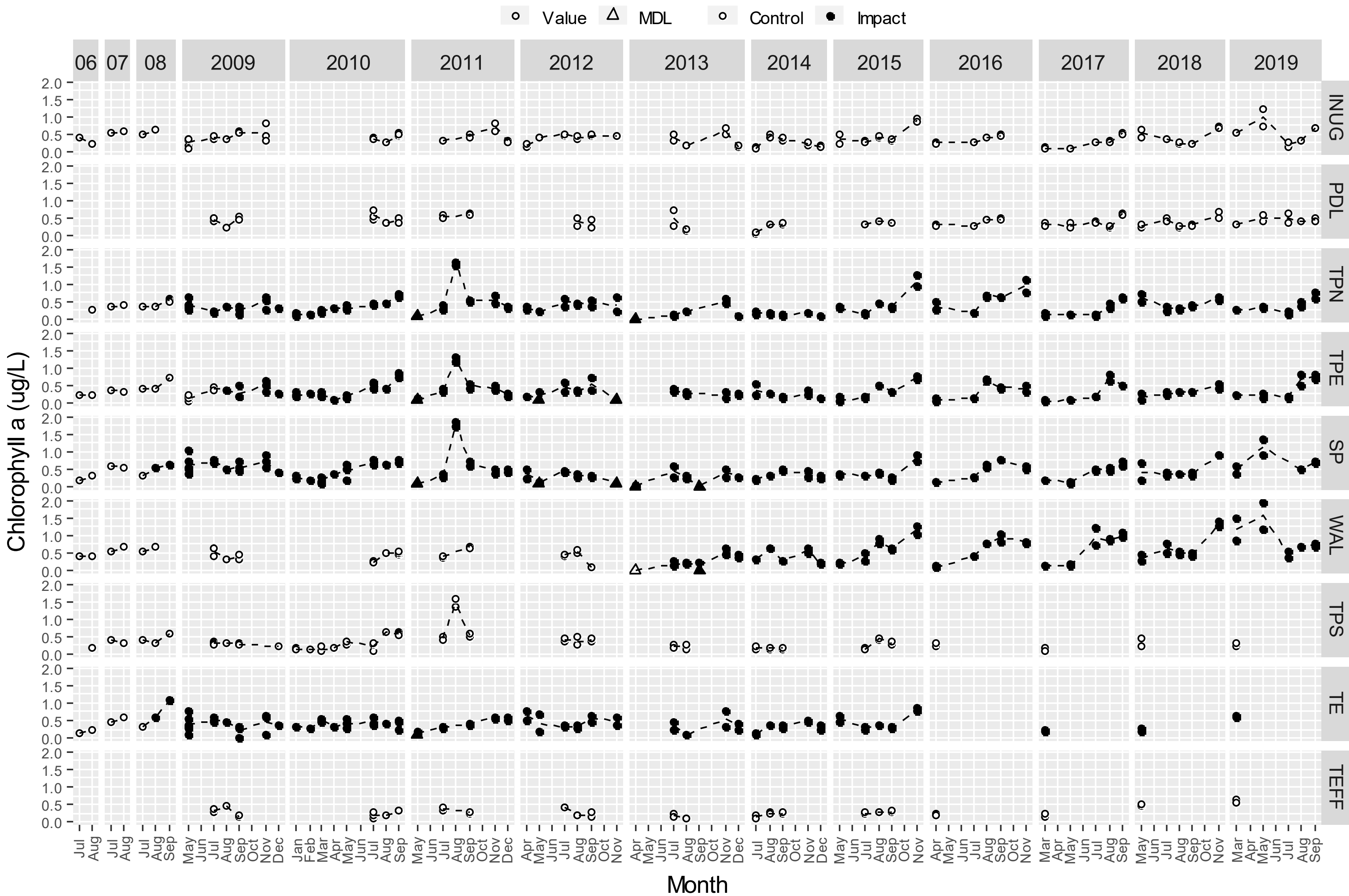


Figure 4-59. Total phytoplankton biomass (mg/m³) from Meadowbank study lakes since 2006.

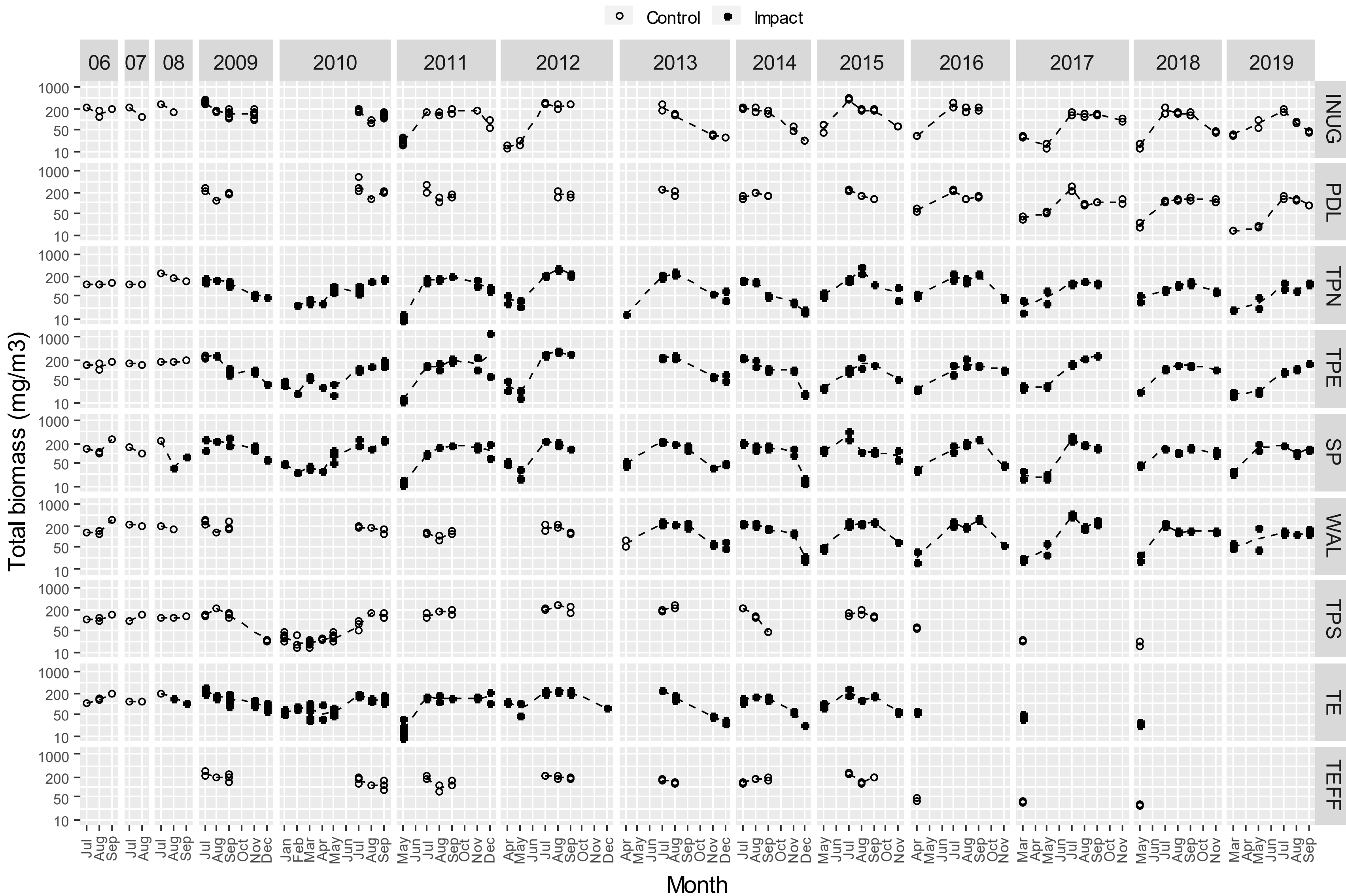


Figure 4-60. Phytoplankton biomass (mg/m³) by major taxa from Meadowbank study lakes since 2006.

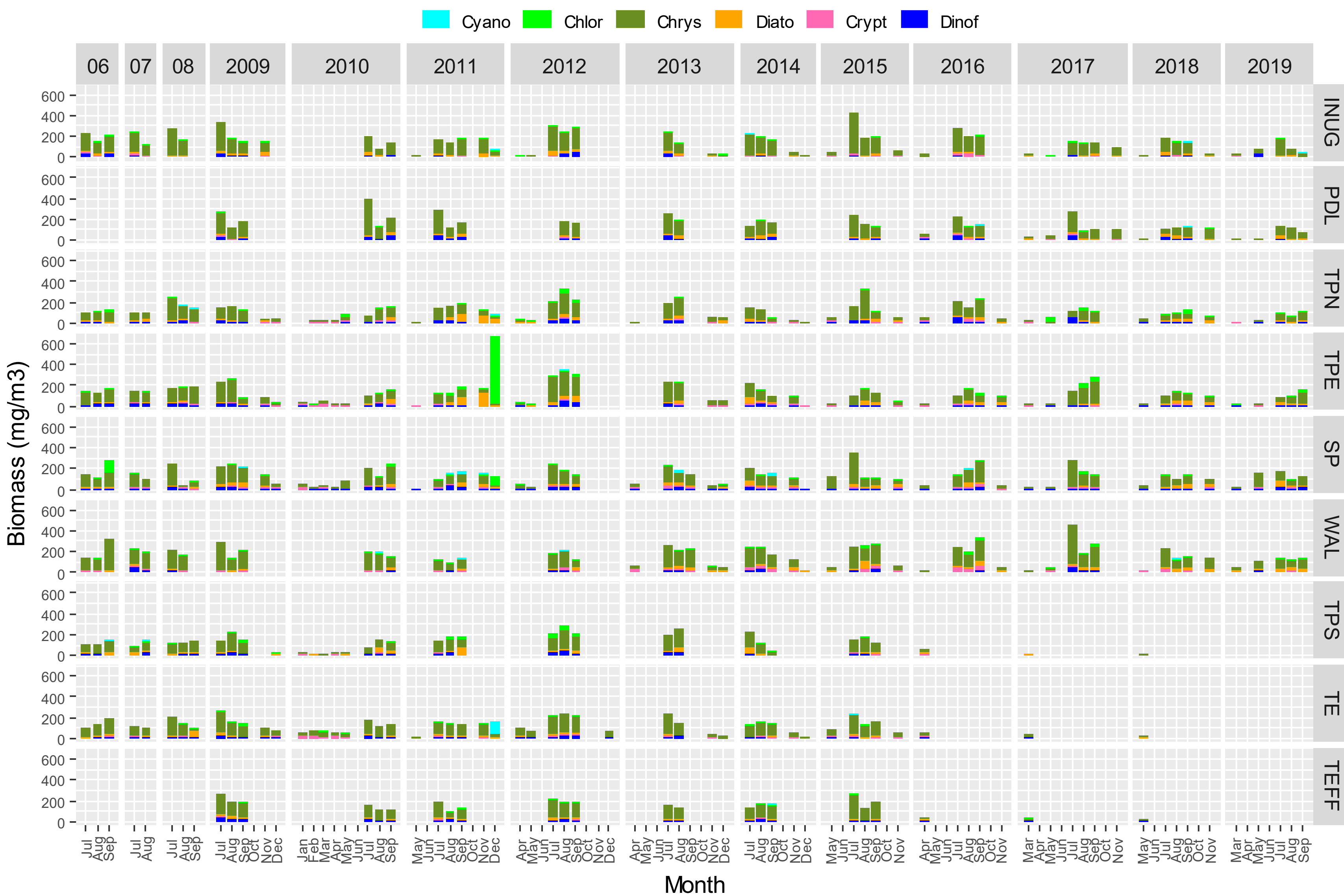


Figure 4-61. Relative phytoplankton biomass by major taxa group from Meadowbank study lakes since 2006.

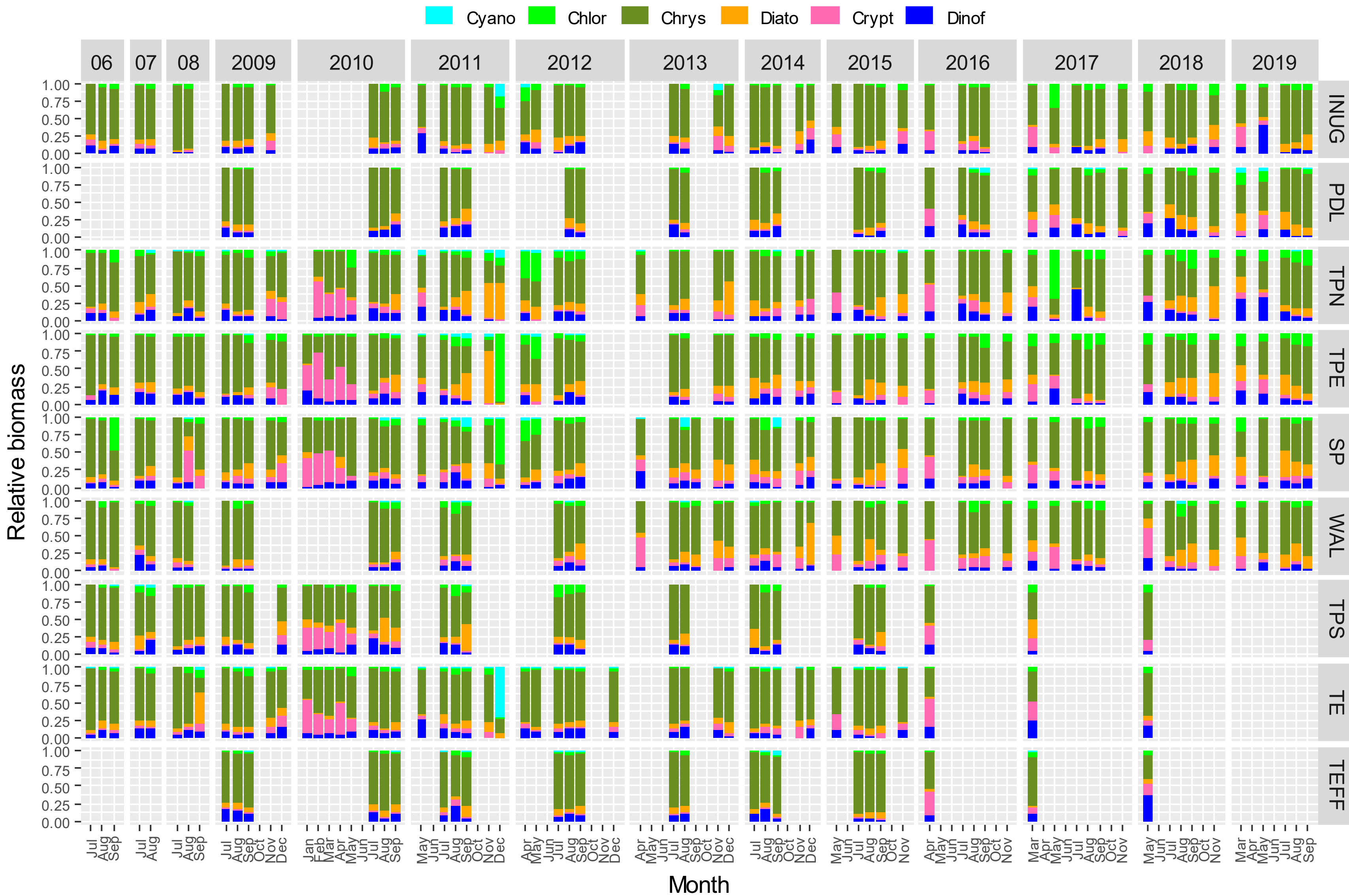
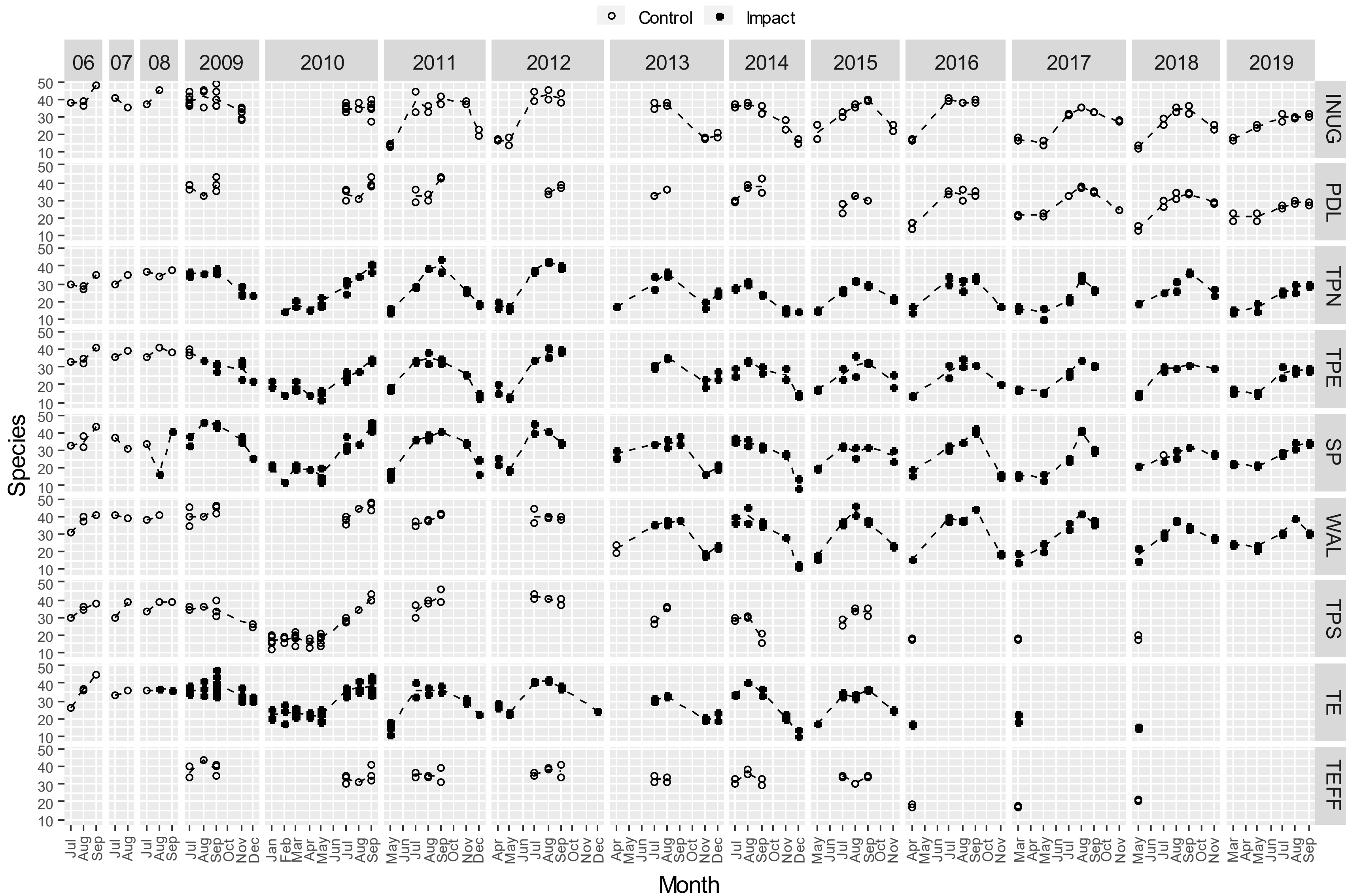


Figure 4-62. Phytoplankton species richness from Meadowbank study lakes since 2006.



Sediment Chemistry Tables and Figures

Table 4-8. Mean TPE sediment chromium concentrations from the coring program compared to the trigger value since 2014.

Parameter	Trigger	2014	2014	2017	2018	2019
		TPE-B	TPE	TPE	TPE	TPE
Chromium	135	111	122	205	150	193

Notes
TPE-B is located within the study area, but away from the established sampling area in TPE. A wider spatial area was sampled in 2014 to better understand spatial vs temporal changes in sediment chromium concentrations in TPE.
Mean concentration (mg/kg dw) of 10 replicate sediment core samples.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	P-value[1]	DF	Proportional change		
								exp(Est)	LCI	UCI
Chromium	TPE	30	10	0.799	0.074	<0.001	38	2.22	1.91	2.59

Notes
Mean concentration (mg/kg dw) of 10 replicate sediment core samples.
1. **Bolded** values are p-values < 0.05
Test area in 2019 compared to the *before* period
n(B) = number of paired months in the *before* period
n(A) = number of paired months in the *after* period (i.e., in 2019)
Estimate = BA model estimate of the 2019 change in mean for log-transformed data
SE = standard error of the estimate
P-value = one-tailed test of the null hypothesis of no change or a decrease in mean concentration
Exp(Est.) = estimated proportional change in 2019 relative to the *before* period.
LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 4-63. Sediment grain size in sediment samples from Meadowbank study lakes since 2007.

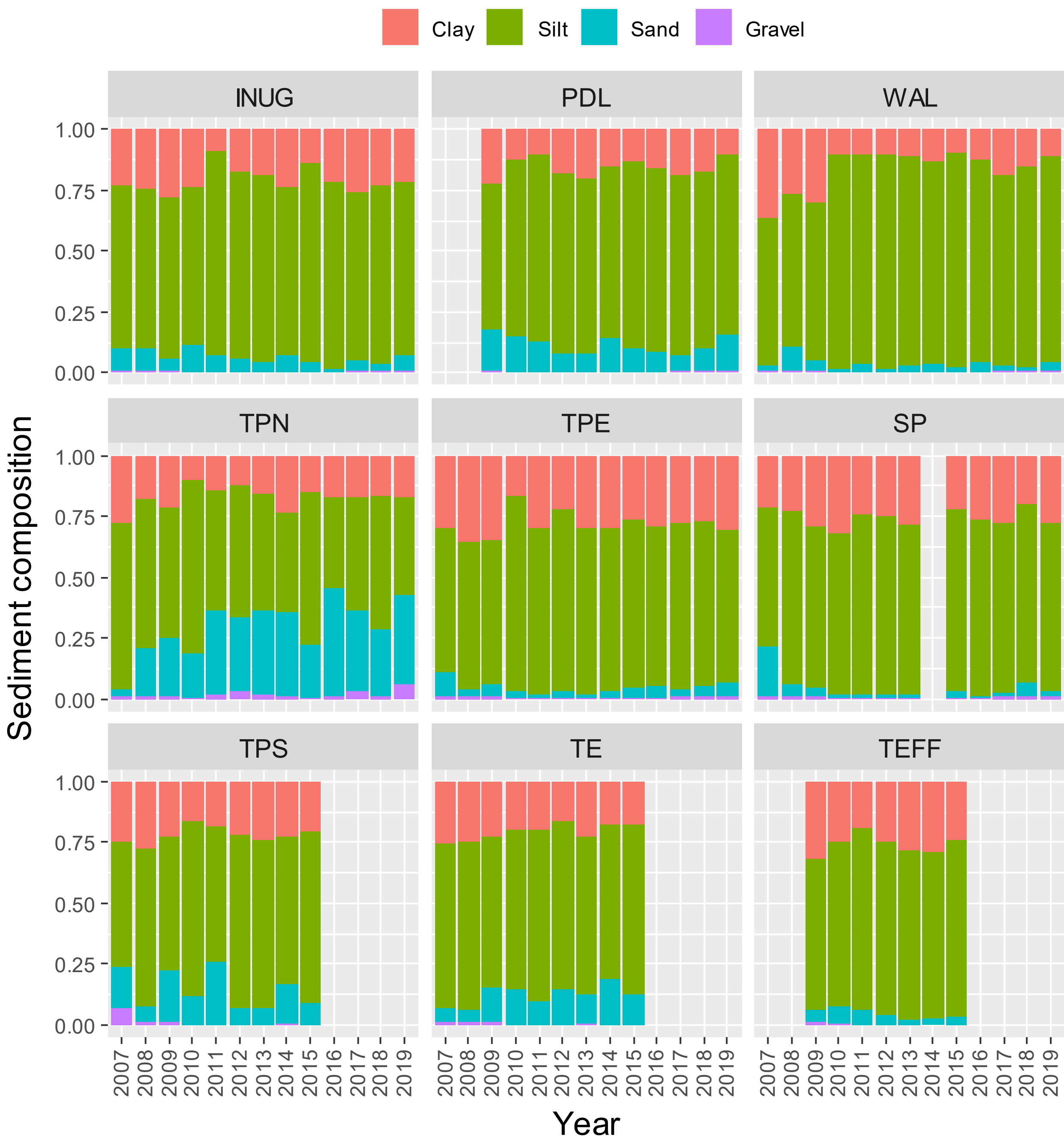


Figure 4-64. Total aluminum (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

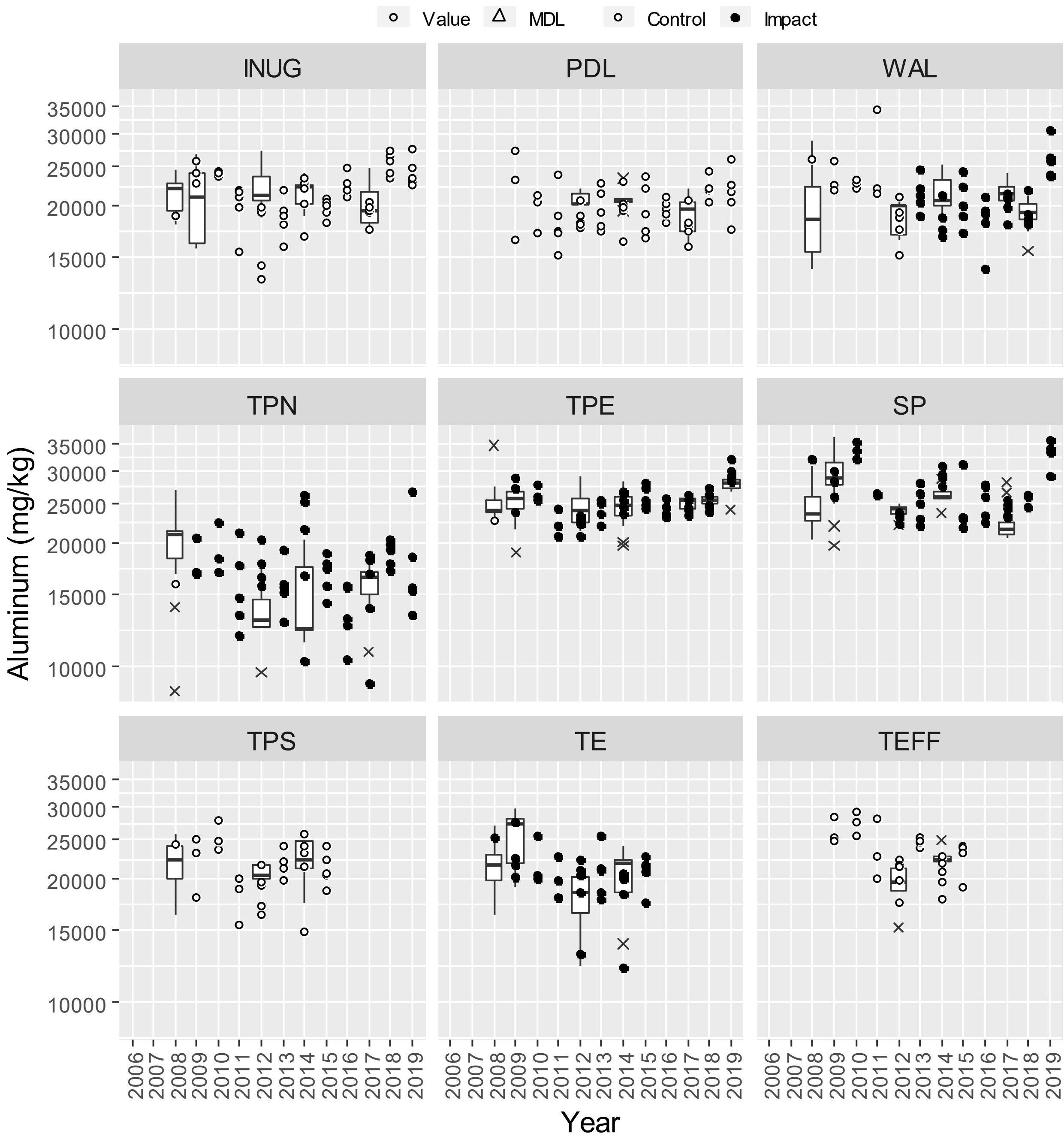


Figure 4-65. Total arsenic (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line = trigger value.

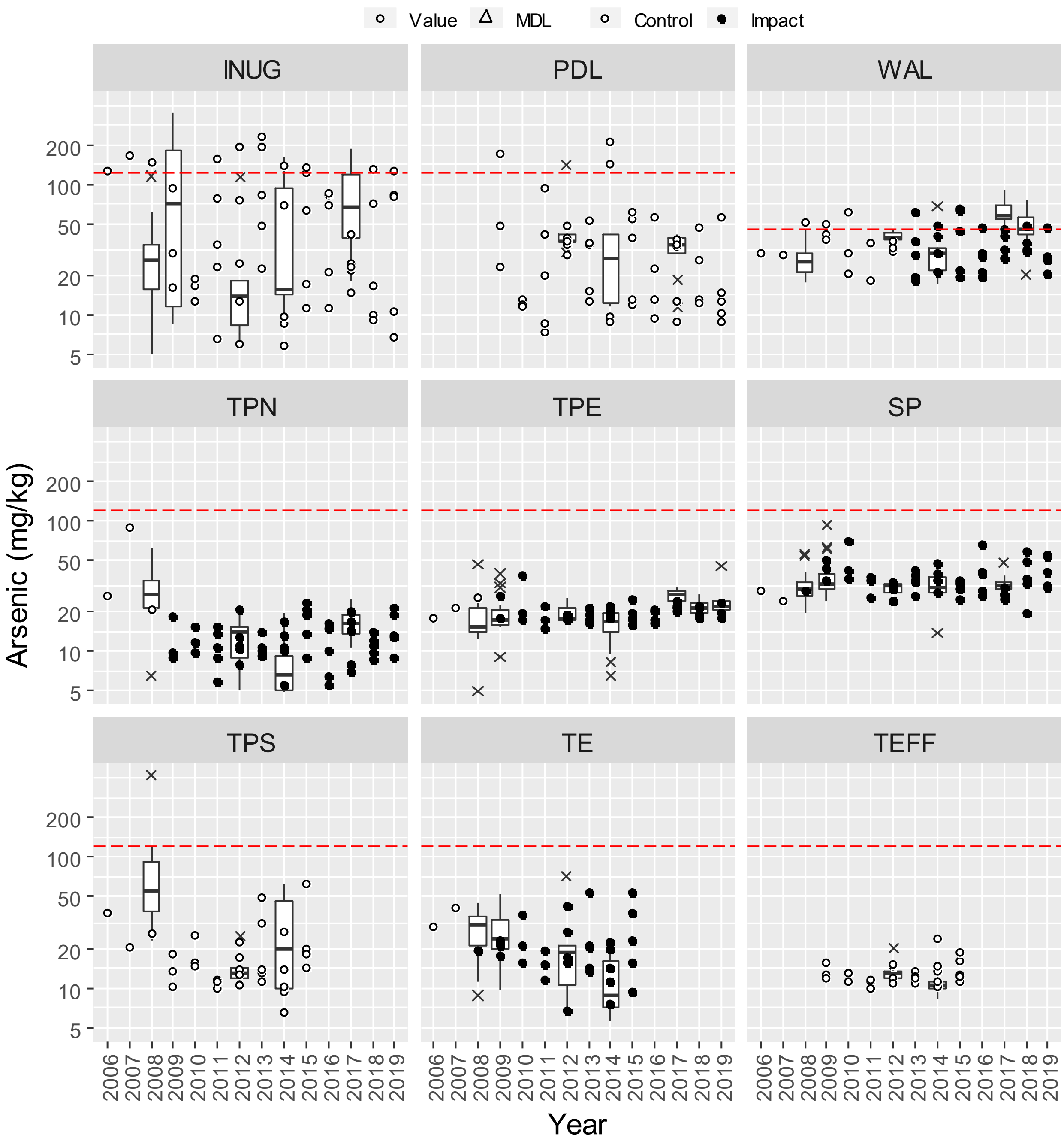


Figure 4-66. Total cadmium (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line = trigger value.

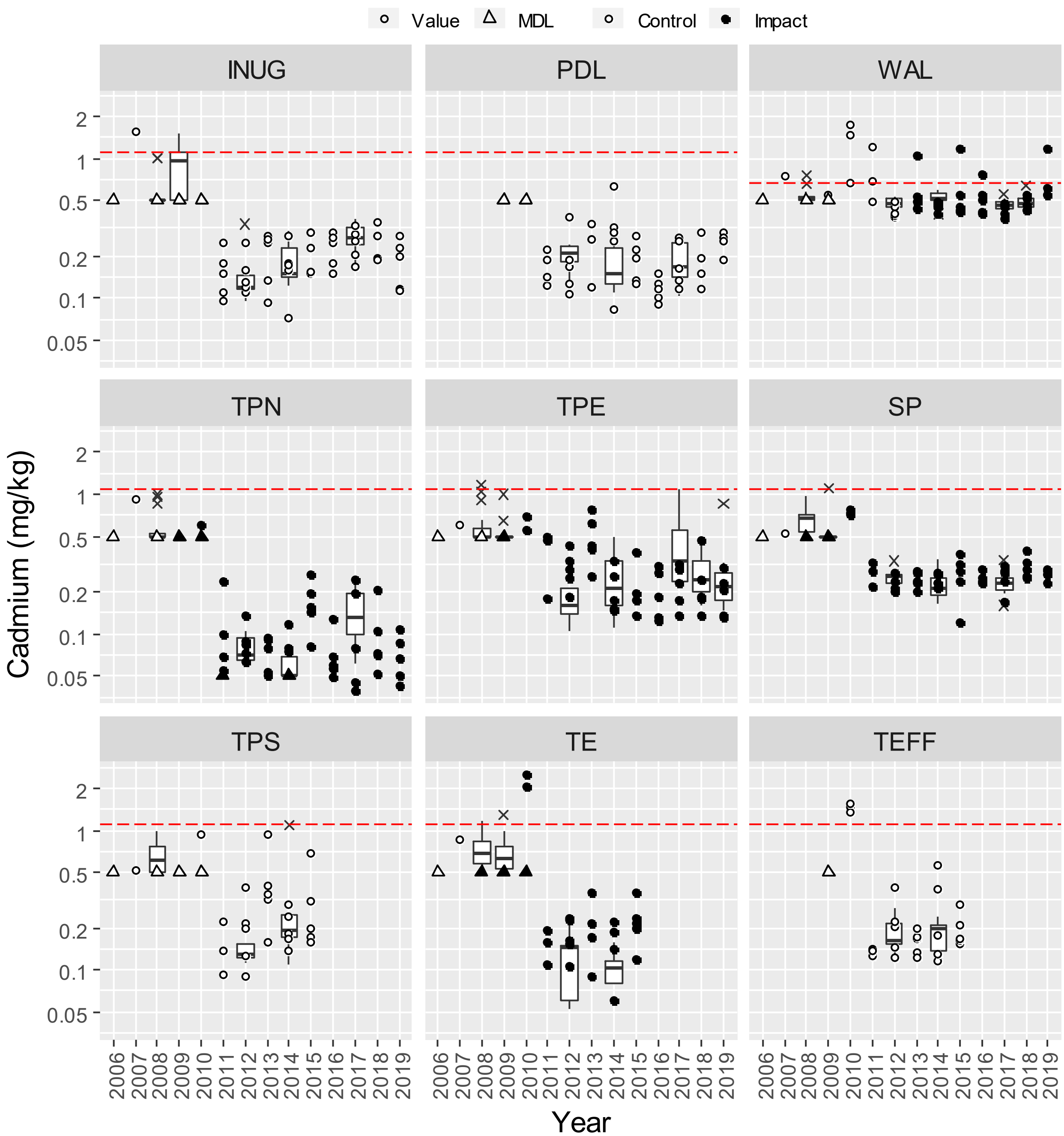


Figure 4-67. Total chromium (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line = trigger value.

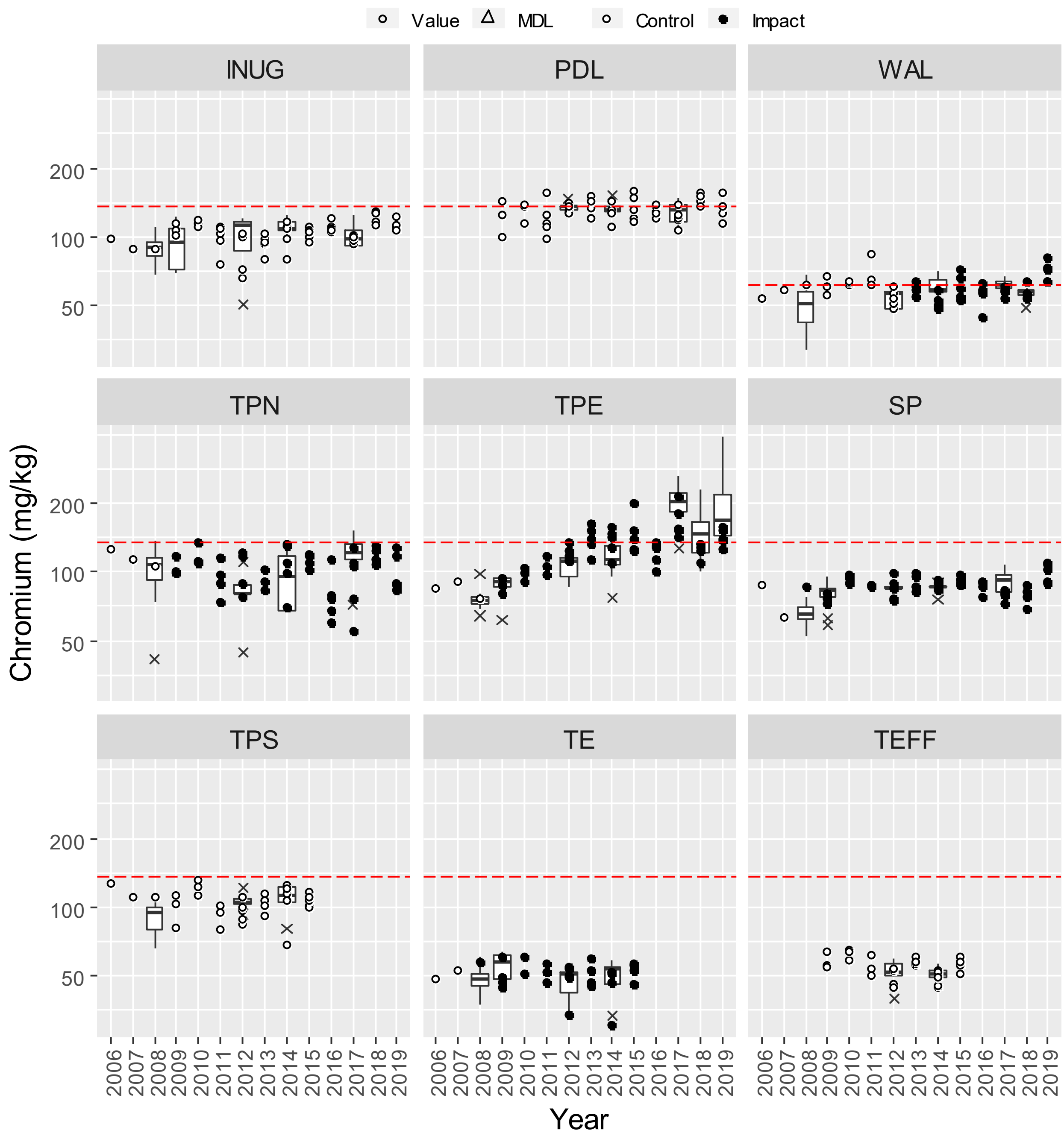


Figure 4-68. Total copper (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line = trigger value.

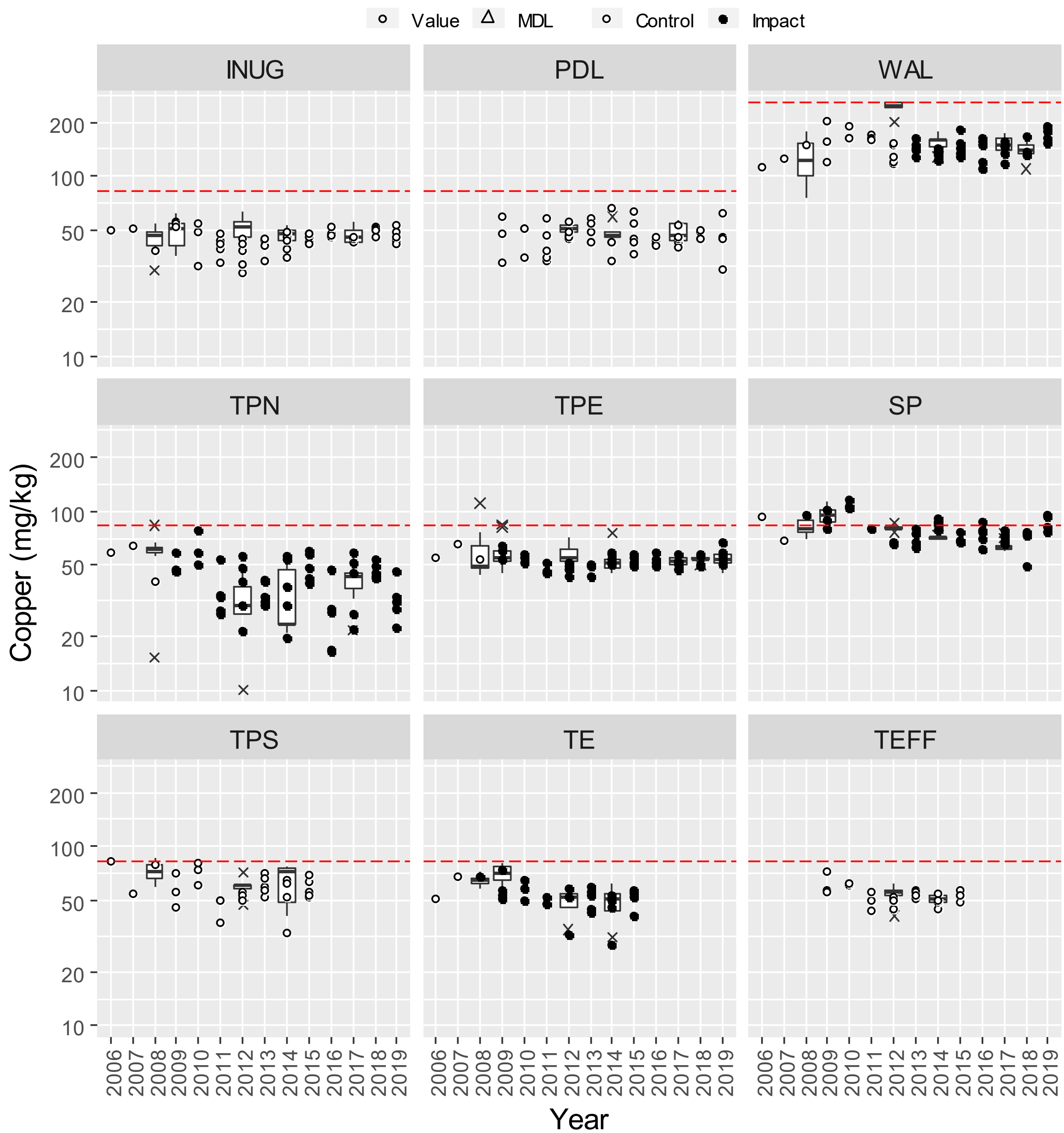


Figure 4-69. Total lead (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

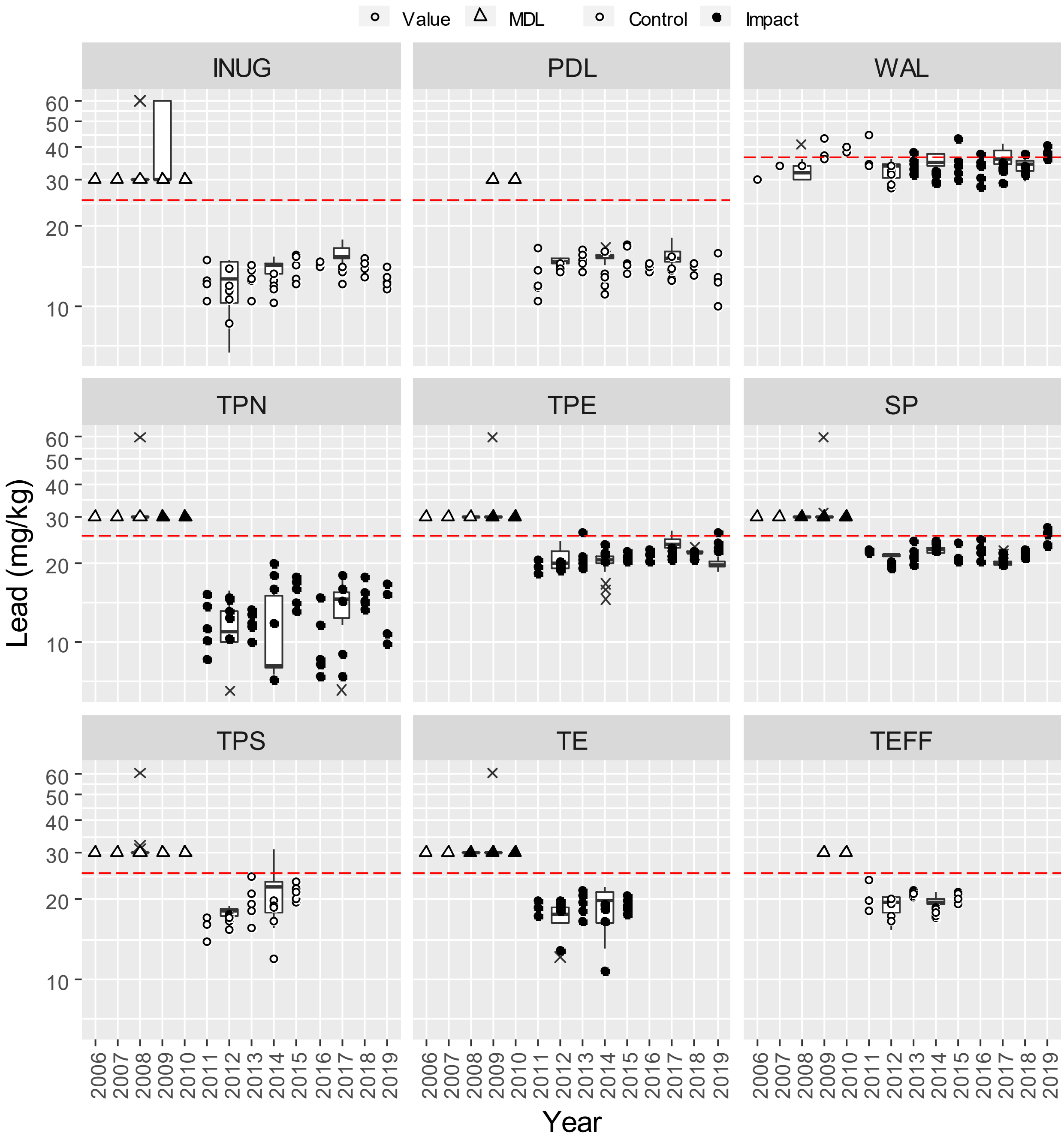


Figure 4-70. Total manganese (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2009.

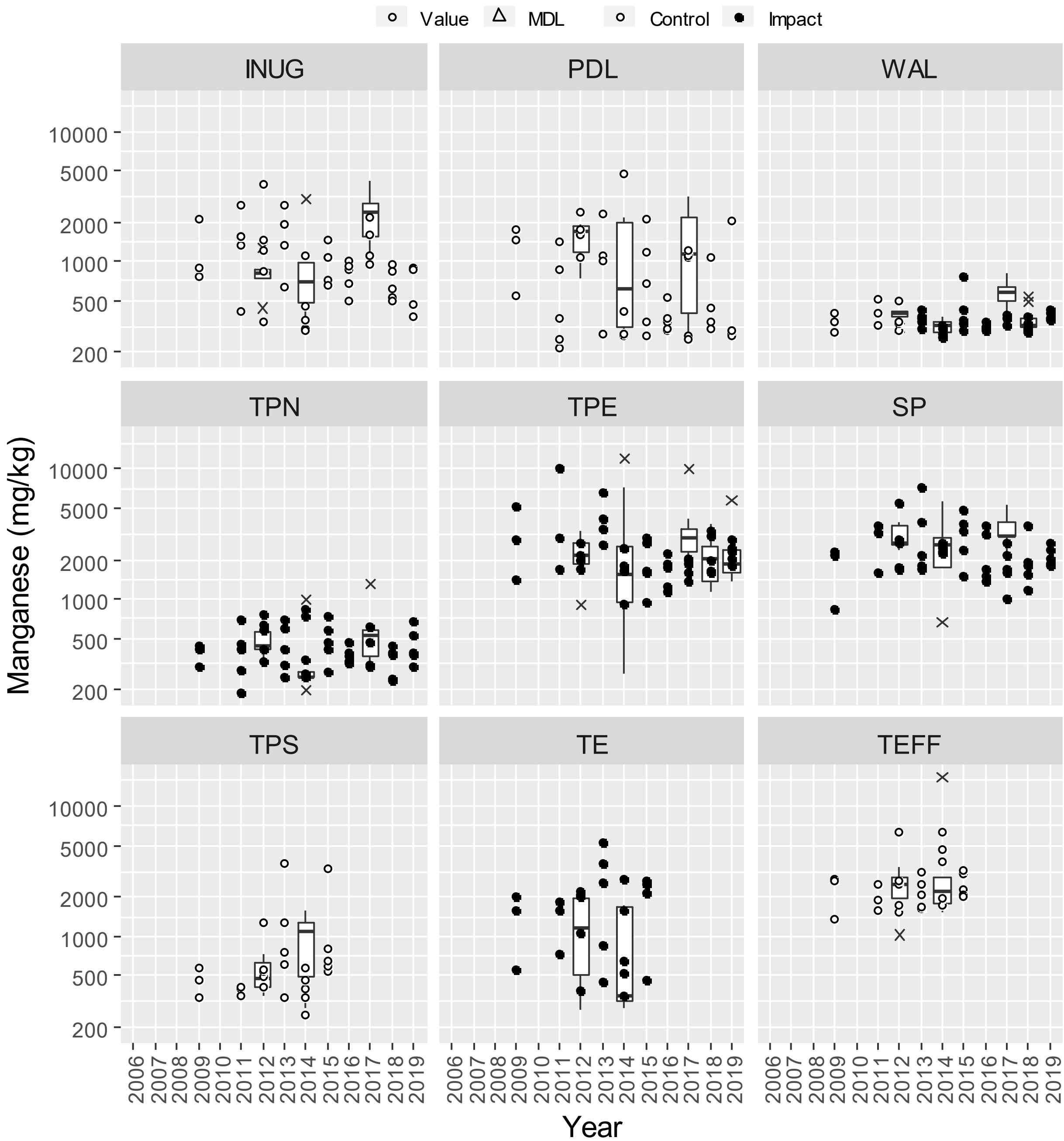


Figure 4-71. Total mercury (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line = trigger value.

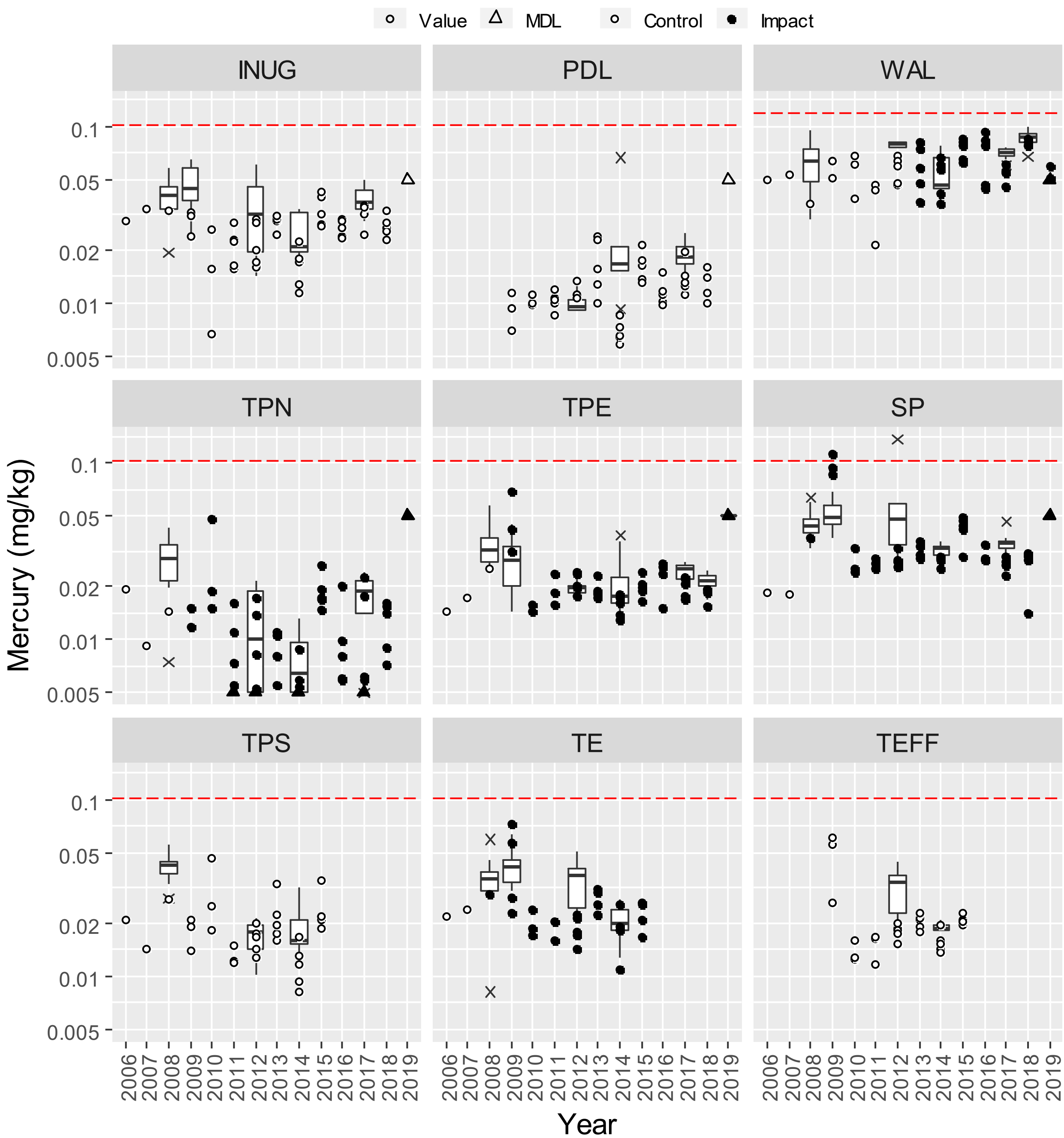
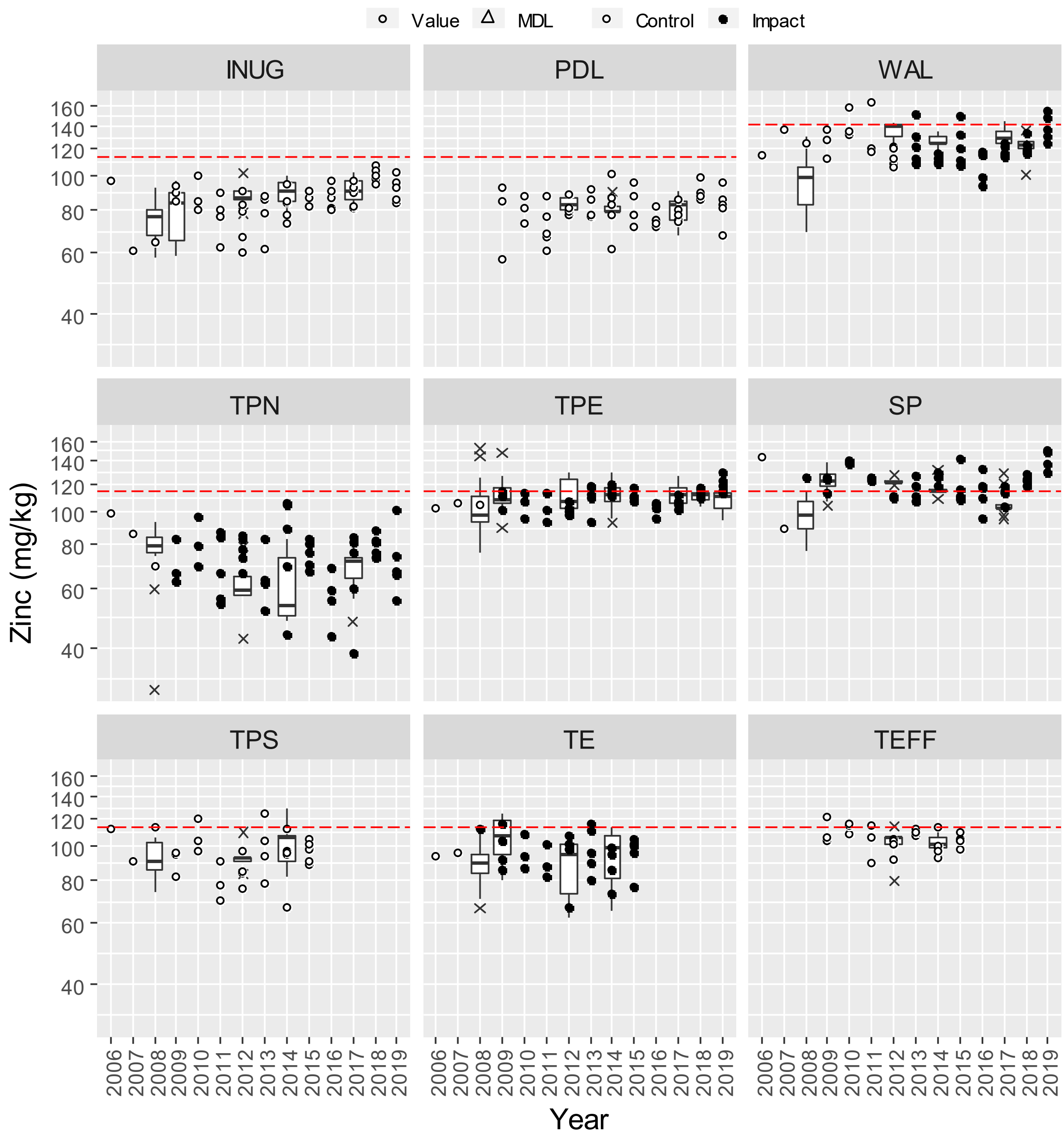


Figure 4-72. Total zinc (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line = trigger value.



Benthic Invertebrate Tables and Figures

Table 4-9. Geometric means for total abundance and total richness, Meadowbank study lakes.

Geometric means for Total abundance[1]														
Station	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
INUG	731 (12)	975 (10)	1300 (7)	1129 (8)	628 (13)	881 (11)	1042 (9)	1975 (2)	621 (14)	1648 (4)	2100 (1)	1712 (3)	1497 (5)	1452 (6)
PDL	NA	NA	NA	1522 (1)	776 (9)	927 (7)	942 (6)	1279 (3)	473 (11)	1127 (4)	1373 (2)	748 (10)	779 (8)	990 (5)
WAL	12894 (2)	4357 (5)	1057 (13)	1834 (8)	1727 (10)	800 (14)	1874 (7)	1445 (12)	2222 (6)	1568 (11)	14253 (1)	4942 (4)	12035 (3)	1761 (9)
TPN	NA	1359 (5)	864 (10)	1214 (7)	1029 (9)	498 (12)	1141 (8)	1407 (4)	373 (13)	3025 (1)	1696 (3)	1309 (6)	2051 (2)	594 (11)
TPE	3220 (4)	1563 (13)	5556 (1)	1663 (11)	1126 (14)	1584 (12)	3915 (2)	2244 (10)	2827 (6)	2765 (8)	2787 (7)	3147 (5)	2485 (9)	3490 (3)
SP	619 (11)	842 (8)	395 (13)	771 (10)	241 (14)	563 (12)	1169 (7)	2279 (2)	2796 (1)	1927 (4)	1420 (5)	2058 (3)	1298 (6)	842 (9)
TPS	935 (9)	1597 (4)	1501 (6)	1714 (3)	1130 (8)	932 (10)	1932 (2)	1581 (5)	1217 (7)	5939 (1)	NA	NA	NA	NA
TE	913 (4)	930 (3)	743 (8)	757 (6)	517 (10)	725 (9)	747 (7)	819 (5)	1158 (2)	1548 (1)	NA	NA	NA	NA
TEFF	NA	NA	NA	1215 (1)	886 (5)	615 (7)	921 (3)	955 (2)	891 (4)	816 (6)	NA	NA	NA	NA

Geometric means for Total richness														
Station	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
INUG	10.1 (12)	12 (9)	13.5 (5)	13.2 (6)	8.1 (14)	10.5 (11)	10.7 (10)	15.4 (2)	9.3 (13)	12.4 (8)	15.7 (1)	13.6 (4)	14.2 (3)	13.1 (7)
PDL	NA	NA	NA	11 (1)	9 (6)	9.3 (5)	7.9 (8)	10.3 (2)	5.6 (11)	8.8 (7)	10.1 (3)	9.7 (4)	5.8 (10)	7.5 (9)
WAL	11.6 (5)	13.1 (3)	7.9 (13)	10.6 (9)	10.4 (11)	6.9 (14)	11.5 (6)	10.5 (10)	10.8 (8)	10.2 (12)	14.5 (2)	13.1 (3)	14.9 (1)	11.1 (7)
TPN	NA	9.3 (8)	7.5 (12)	9.1 (9)	10.3 (6)	7.8 (11)	10.1 (7)	12.4 (2)	5.7 (13)	10.7 (5)	12.4 (2)	12.2 (4)	12.5 (1)	8.6 (10)
TPE	8.2 (14)	10.7 (11)	14.2 (2)	11.3 (9)	9.7 (12)	9.3 (13)	12.5 (7)	14 (4)	10.9 (10)	14.1 (3)	13.7 (5)	12.5 (7)	12.9 (6)	15.4 (1)
SP	6.1 (13)	9.3 (10)	7.1 (12)	7.2 (11)	4.1 (14)	10.2 (9)	12.7 (4)	11.6 (5)	13.3 (2)	12.9 (3)	15.1 (1)	11.2 (6)	10.5 (7)	10.3 (8)
TPS	10.6 (5)	9.4 (8)	10.7 (3)	10.7 (3)	8.1 (9)	7.8 (10)	10.2 (6)	10.1 (7)	10.8 (2)	16.5 (1)	NA	NA	NA	NA
TE	5 (10)	8.7 (5)	9.9 (2)	7.1 (7)	5.8 (9)	5.9 (8)	8.8 (4)	7.7 (6)	9 (3)	12.8 (1)	NA	NA	NA	NA
TEFF	NA	NA	NA	10.3 (3)	10.6 (2)	8.5 (6)	8.3 (7)	9.5 (5)	10.3 (3)	11.4 (1)	NA	NA	NA	NA

Notes:
1. Total abundance in organisms/m^2.
Rank order of abundance and richness shown in parentheses.
Red vertical lines mark the year that area designations switched from *control* to *impact.*
NA = Benthic invertebrate sampling was not completed for the given area/year.

Table 4-10. Results of the BACI tests for benthic invertebrate abundance at Meadowbank study lakes.

After Period	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2019	TPN	2	1	-0.86	0.54	0.18	-58	-100	40,394
	TPE	3	1	-0.24	0.67	0.37	-22	-96	1,281
	SP	2	1	-0.38	0.26	0.19	-32	-97	1,652
	WAL	7	1	-0.66	0.99	0.27	-48	-95	480
2018-2019	TPN	2	2	-0.25	0.68	0.37	-22	-96	1,320
	TPE	3	2	-0.43	0.45	0.21	-35	-84	175
	SP	2	2	-0.19	0.22	0.24	-17	-68	115
	WAL	7	2	0.28	0.81	0.63	33	-80	795
2017-2019	TPN	2	3	-0.24	0.51	0.33	-22	-85	301
	TPE	3	3	-0.45	0.35	0.13	-36	-76	69
	SP	2	3	-0.01	0.29	0.49	-1.0	-60	145
	WAL	7	3	0.26	0.65	0.65	30	-71	479
2016-2019	TPN	2	4	-0.23	0.44	0.31	-20	-76	167
	TPE	3	4	-0.54	0.32	**<u>0.07</u>**	-42	-74	31
	SP	2	4	-0.07	0.25	0.40	-6	-54	89
	WAL	7	4	0.46	0.59	0.77	58	-59	507

Notes:

* **Bolded & underlined** values are P-values < 0.1

Shaded cells indicate negative effect sizes (reductions) of 20% or more

Test area = area compared to control (INUG)

n(B) = number of years in the *before* period

n(A) = number of years in the *after* period

Estimate = BACI model estimate of the after-period change in mean for log-transformed data

SE = standard error of the estimate

P-value = one-tailed test of the null hypothesis of no change or an increase in mean

ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Table 4-11. Results of the BACI tests for benthic invertebrate taxa richness at Meadowbank study area lakes.

After Period	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2019	TPN	2	1	0.00	0.27	0.50	0	-97	2,997
	TPE	3	1	0.25	0.14	0.90	28	-29	131
	SP	2	1	0.17	0.18	0.74	19	-89	1,139
	WAL	7	1	-0.08	0.31	0.40	-8	-57	95
2018-2019	TPN	2	2	0.14	0.22	0.70	15	-56	197
	TPE	3	2	0.12	0.14	0.78	13	-27	76
	SP	2	2	0.12	0.16	0.74	13	-42	121
	WAL	7	2	0.03	0.22	0.54	3	-40	74
2017-2019	TPN	2	3	0.19	0.18	0.82	21	-31	113
	TPE	3	3	0.08	0.12	0.73	8	-22	49
	SP	2	3	0.14	0.13	0.82	15	-24	75
	WAL	7	3	0.03	0.18	0.57	3	-32	57
2016-2019	TPN	2	4	0.18	0.15	0.85	20	-21	83
	TPE	3	4	0.04	0.11	0.65	5	-20	37
	SP	2	4	0.19	0.12	0.91	21	-13	68
	WAL	7	4	0.03	0.16	0.57	3	-28	46

Notes:

* **Bolded & underlined** values are P-values < 0.1

Shaded cells indicate negative effect sizes (reductions) of 20% or more

Test area = area compared to control (INUG)

n(B) = number of years in the *before* period

n(A) = number of years in the *after* period

Estimate = BACI model estimate of the after-period change in mean for log-transformed data

SE = standard error of the estimate

P-value = one-tailed test of the null hypothesis of no change or an increase in mean

ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 4-73. Benthic invertebrate total abundance (#/m²) from Meadowbank project lakes since 2006.

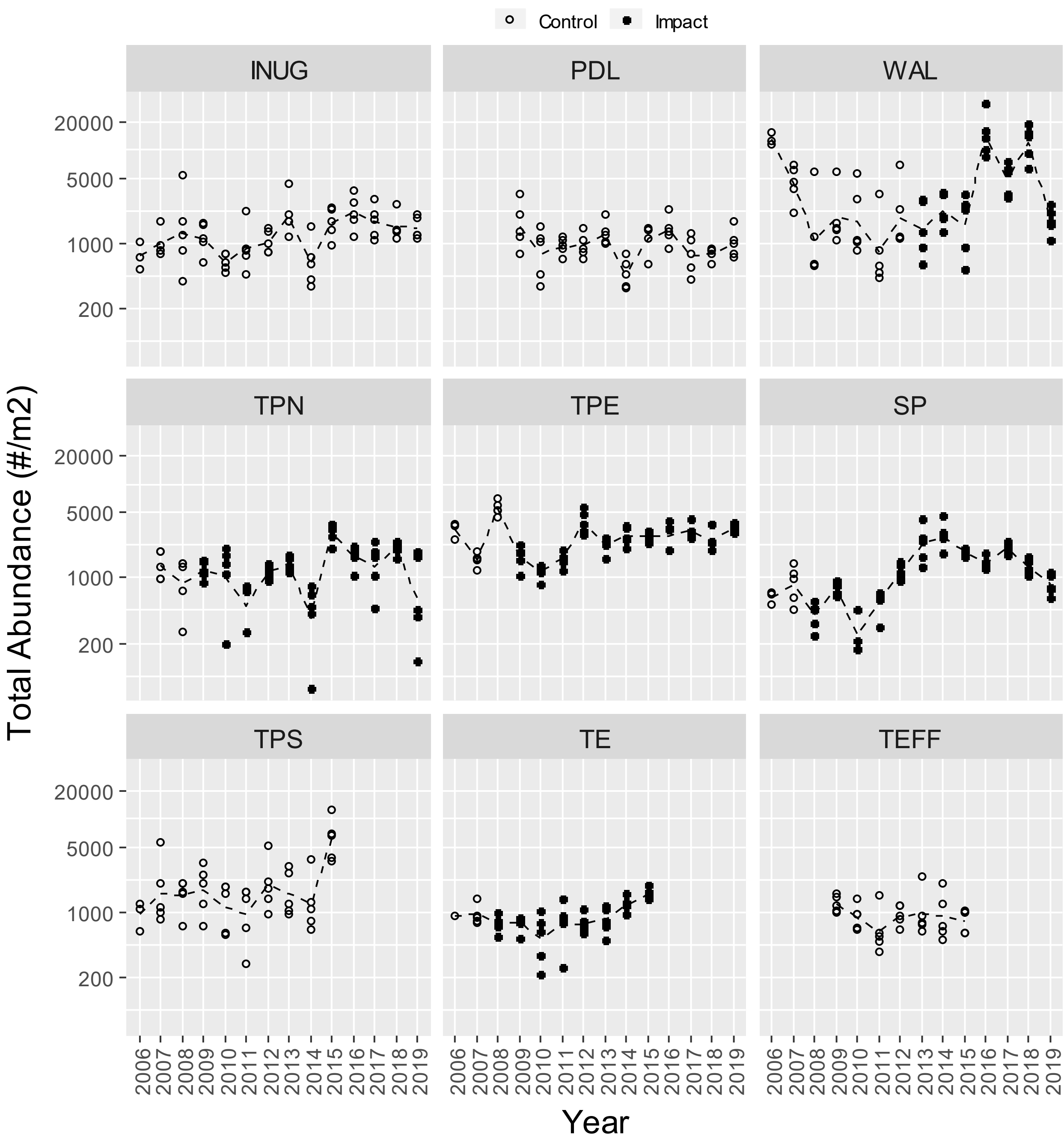


Figure 4-74. Benthic invertebrate abundance (#/m²) by major taxa from Meadowbank project lakes since 2006.

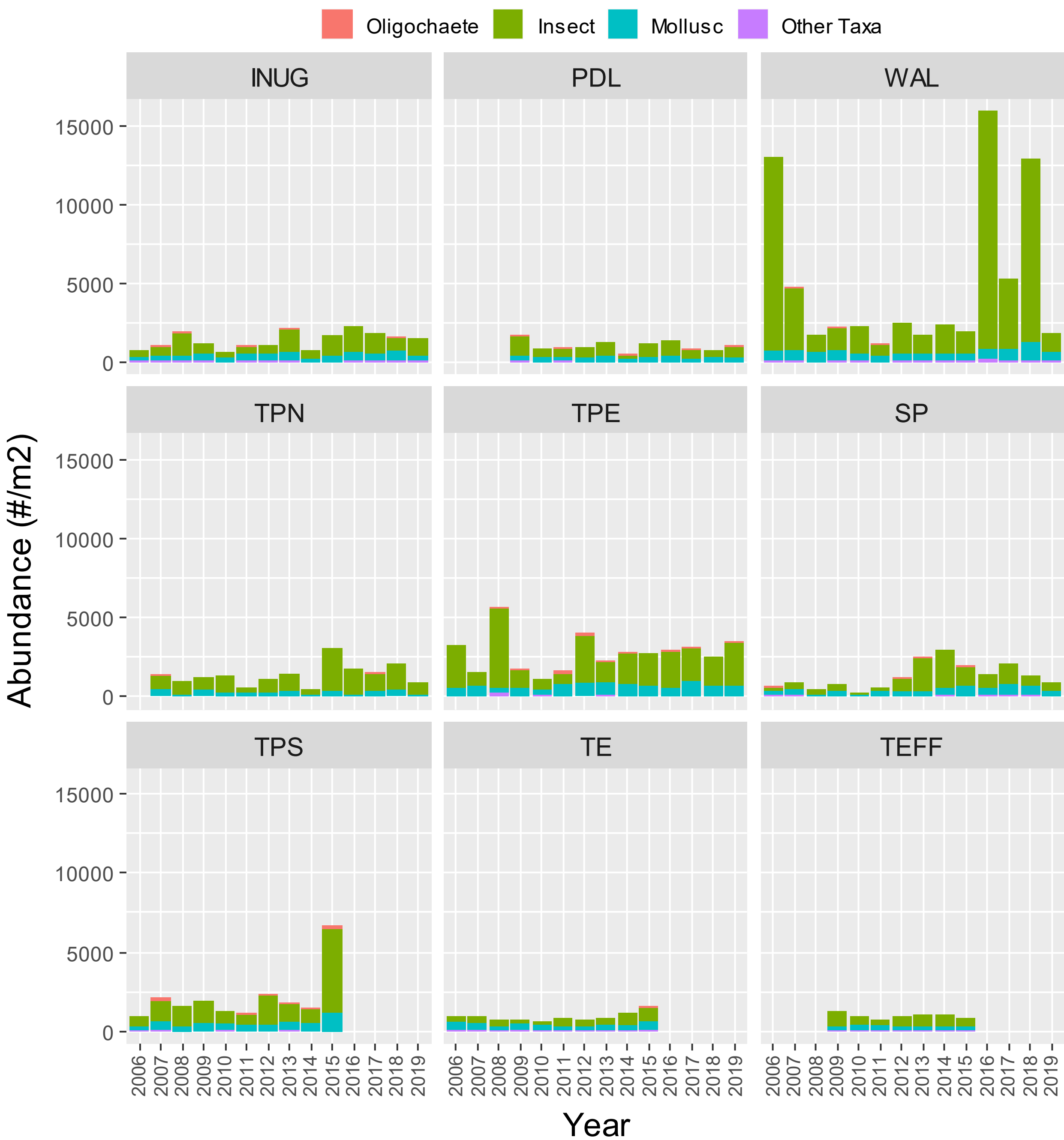


Figure 4-75. Benthic invertebrate relative abundance by major taxa from Meadowbank project lakes since 2006.

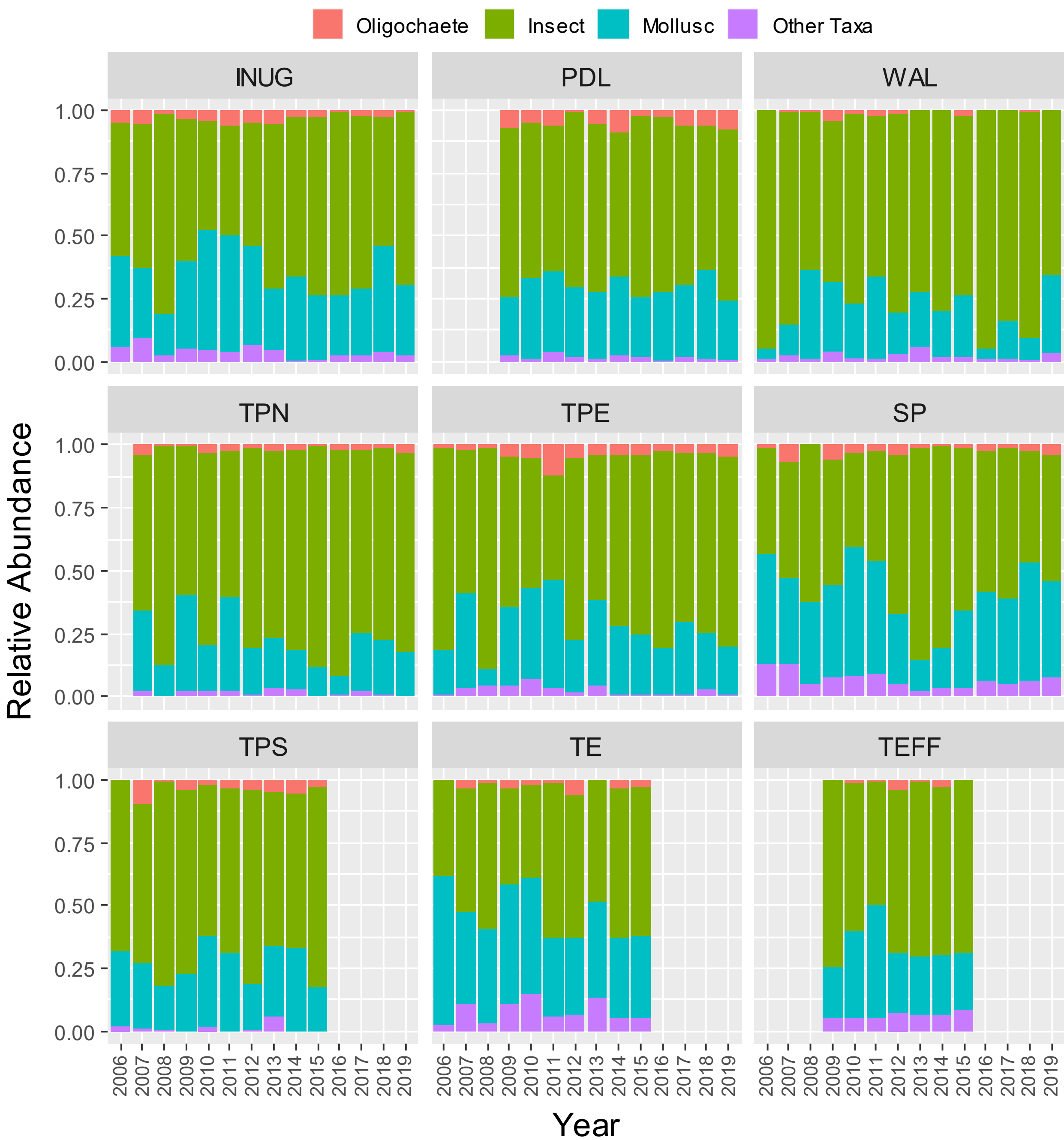


Figure 4-76. Benthic invertebrate total richness (# taxa) from Meadowbank project lakes since 2006.

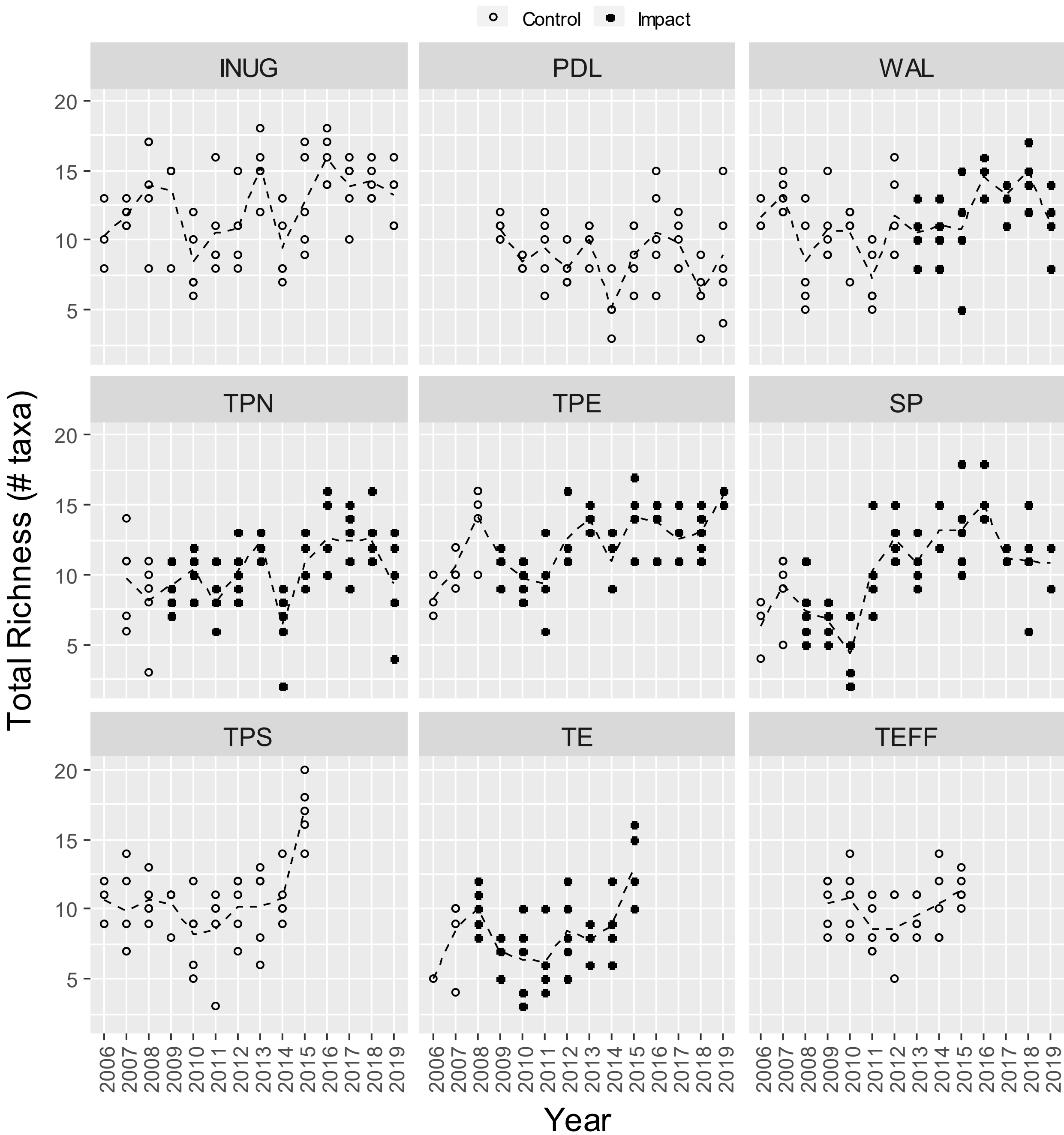


Figure 4-77. Benthic invertebrate richness (# taxa) by major taxa from Meadowbank project lakes since 2006.

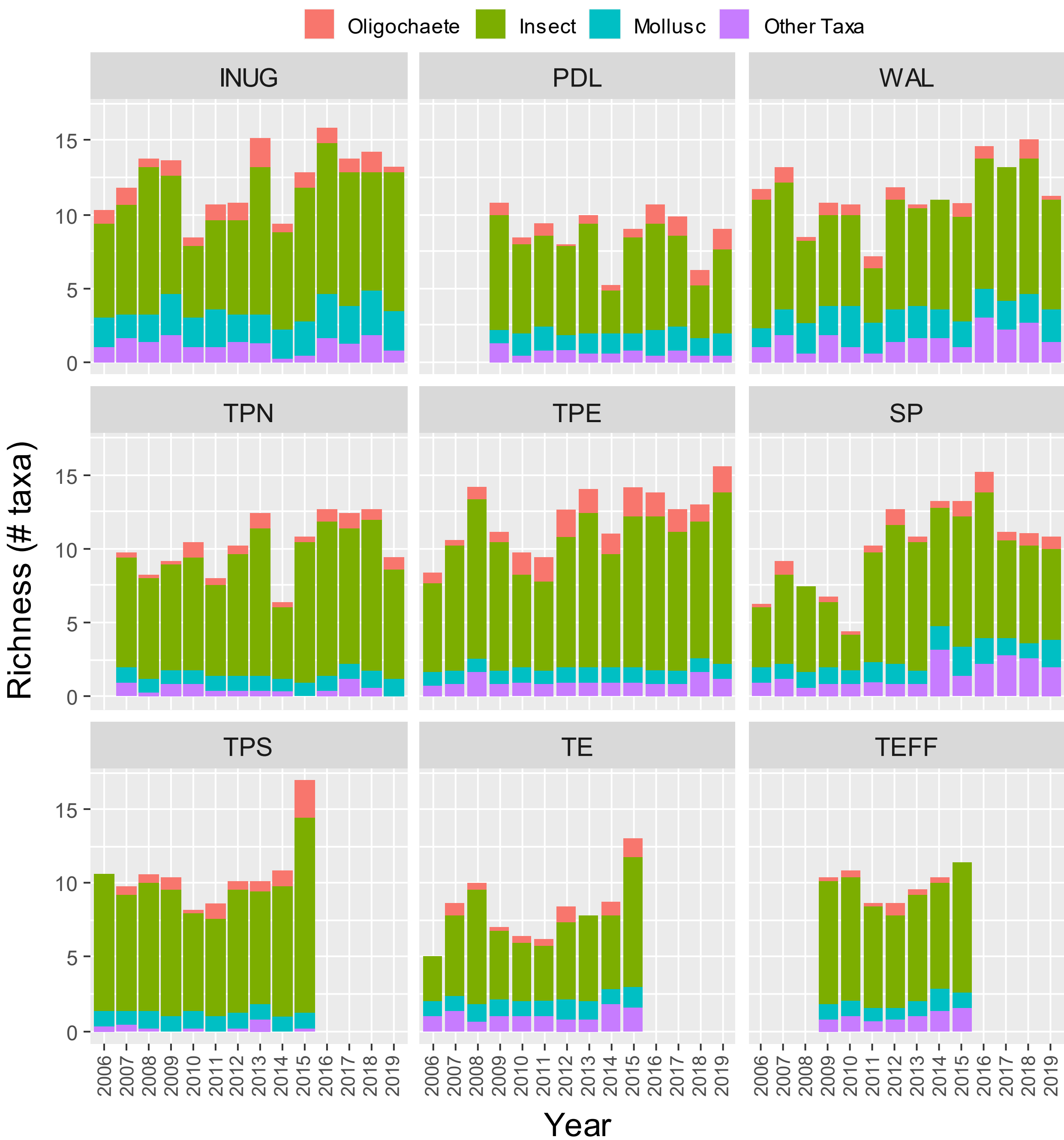
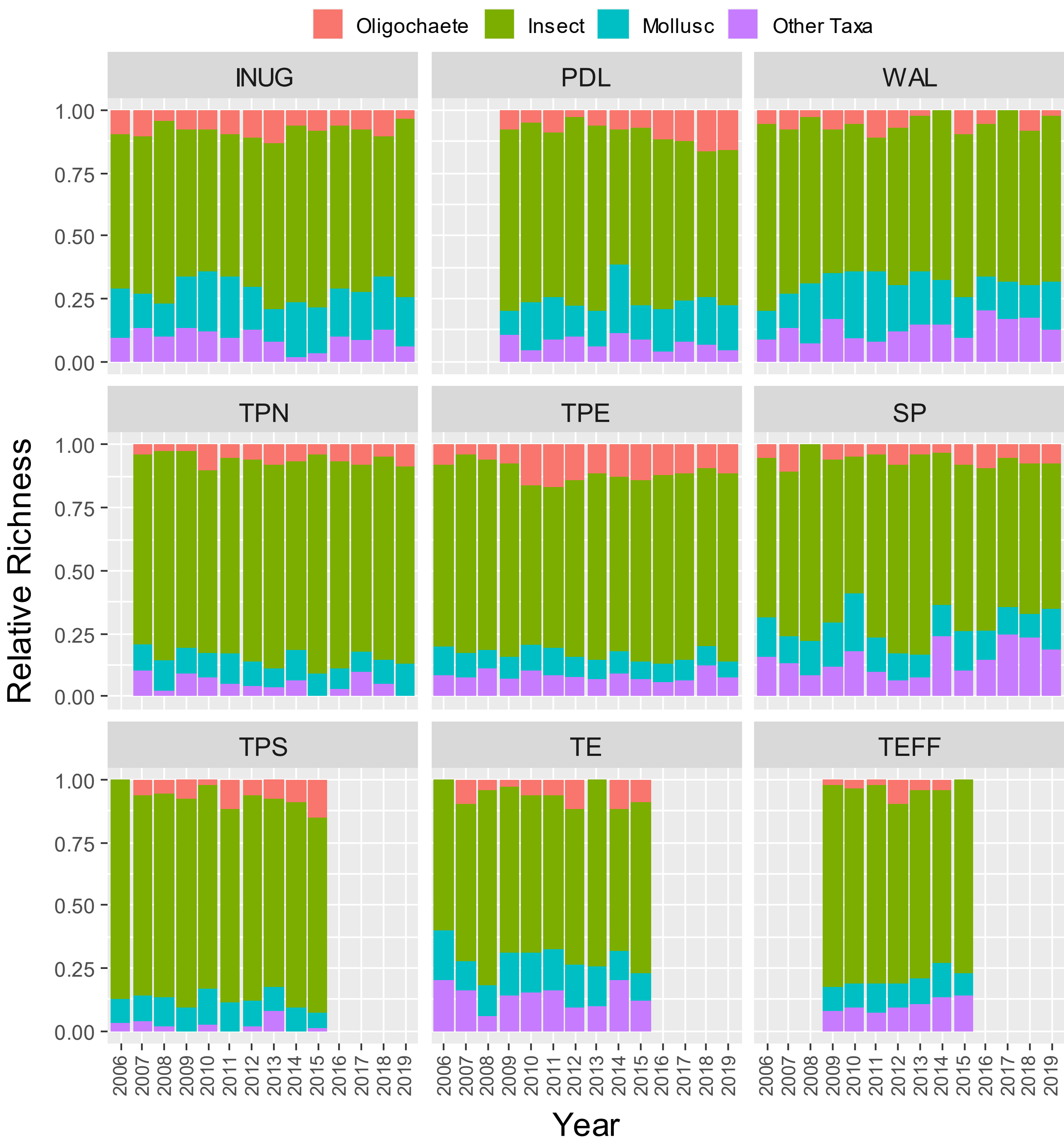


Figure 4-78. Benthic invertebrate relative richness by major taxa from Meadowbank project lakes since 2006.



Sediment Toxicity Testing Tables and Figures

Figure 4-79. Sediment toxicity test results for *Chironomus dilutus*, 2015, 2018, and 2019.

Notes: control = lab control, INUG and PDL = field control groups.

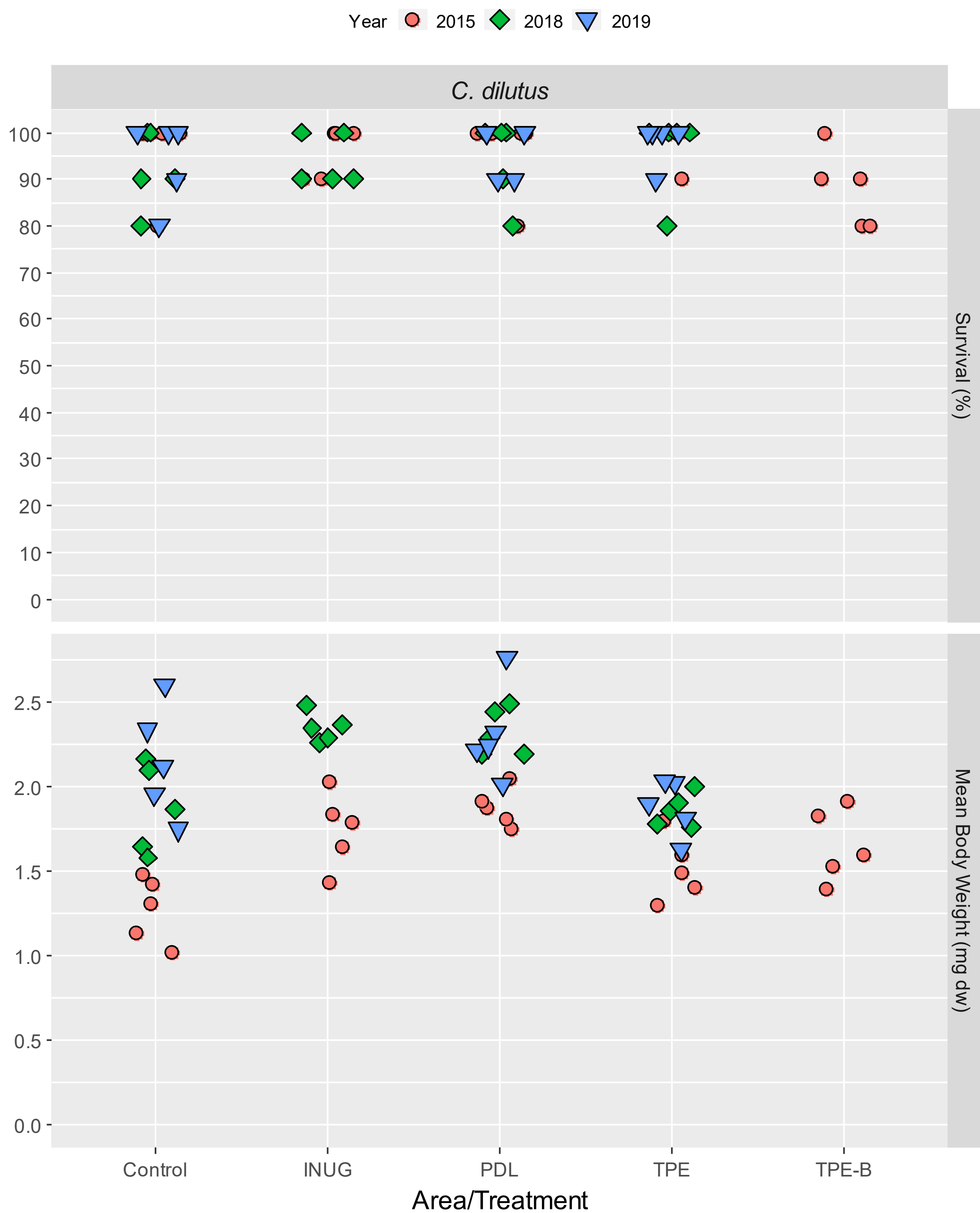


Table 4-12. *Chironomus dilutus* sediment toxicity test results from TPE and PDL in 2019.

Treatment [1]	*C. dilutus* Survival (%)					% Survival mean ± SD	Effect Size[2]
	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
Control	100	100	100	80	90	94 ± 8.9	-
PDL	90	100	100	100	90	96 ± 5.5	-
TPE	100	100	100	90	100	98 ± 4.5	2%

Treatment [1]	Mean wt./organism (mg)					Dry weight mean ± SD	Effect Size[2]
	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
Control	2.60	2.12	1.75	1.96	2.33	2.2 ± 0.33	-
PDL	2.01	2.76	2.21	2.32	2.24	2.3 ± 0.28	-
TPE [b]	1.81	1.89	1.63	2.02	2.03	1.9 ± 0.17	-19%

Notes:

1. Significant differences between TPE and the lab control = superscript "a" and PDL = superscript "b" ($p<0.05$).
2. Mean effect size ratings calculated relative to the mean for PDL

Negligible	<10% reduction in mean survival or growth
Low	10-20% reduction in mean survival or growth
Moderate	20-50 % reduction in mean survival or growth
High	> 50 % reduction in mean survival or growth

Figure 4-80. Sediment toxicity test results for *Hyalella azteca*, 2015, 2018, and 2019.

Notes: control = lab control, INUG and PDL = field control groups.

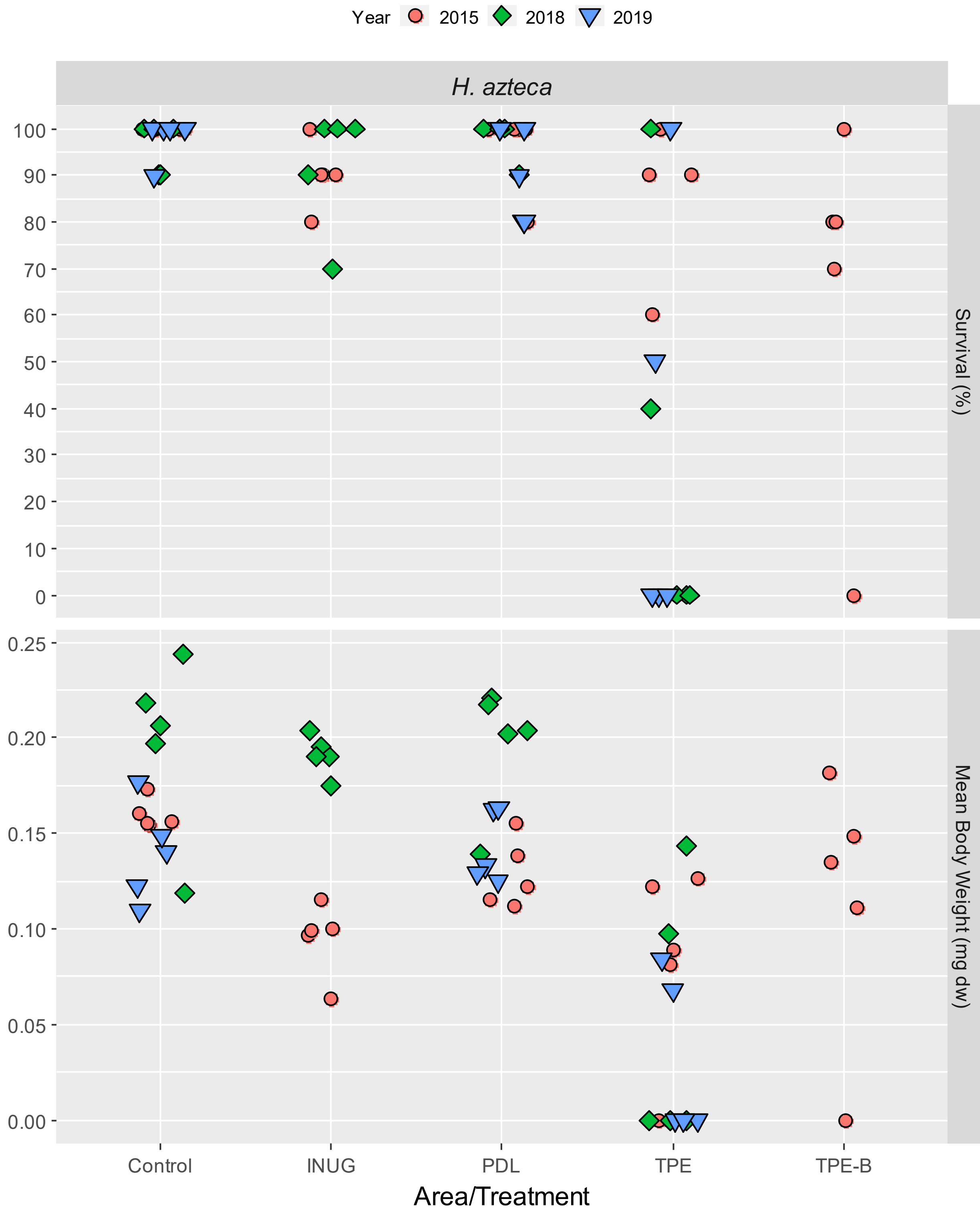


Table 4-13. *Hyalella azteca* sediment toxicity test results from TPE and PDL in 2019.

Treatment [1]	*H. azteca* Survival (%)					% Survival mean ± SD	Effect Size[2]
	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
Control	100	100	90	100	100	98 ± 4.5	-
PDL	100	80	80	100	90	90 ± 10.0	-
TPE[a,b]	0	0	0	100	50	30 ± -	-67%

Treatment [1]	Mean wt./*organism* (mg)					Dry weight mean ± SD	Effect Size[2]
	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
Control	0.14	0.18	0.12	0.11	0.15	0.14 ± 0.03	-
PDL	0.13	0.16	0.13	0.16	0.13	0.14 ± 0.02	-
[3] TPE[a,b]	-	-	-	0.08	0.07	0.08 ± 0.01	-41%
[4] TPE[a,b]	0	0	0	0.08	0.07	0.03 ± 0.04	-79%

Notes:

1. Significant differences between TPE and the lab control = superscript "a" and PDL = superscript "b" ($p<0.05$).
2. Mean effect size ratings calculated relative to the mean for PDL

Negligible	<10% reduction in mean survival or growth
Low	10-20% reduction in mean survival or growth
Moderate	20-50 % reduction in mean survival or growth
High	> 50 % reduction in mean survival or growth

3. Mean dry weight set to the maximum value among the 5 replicates.
4. Mean dry weight calculated including reps with zero survival.

Table 4-14. Porewater chemistry from the 14-d sediment toxicity test with *Hyalella azteca*.

Area	Replicate (survival)[1]	Dissolved Concentration (µg/L)						
		As	Cr	Fe	Mn	Pb	U	Zn
Porewater Metals Concentrations								
PDL	Rep 1 (100%)	6.4	0.25	4,900	192	0.13	0.19	3.9
	Rep 3 (80%)	15.2	3.1	13,300	520	0.94	0.54	10.5
	Rep 4 (100%)	3.9	23.4	9,550	546	5.24	5.37	40.5
	Max	***15.2***	***23.4***	***13,300***	***546***	***5.24***	***5.37***	***40.5***
Third Portage - East Basin	Rep 1 (0%)	3.4	0.25	1,030	23,000	0.09	0.38	2.4
	Rep 2 (0%)	14.3	4.1	25,200	19,900	1.3	2.0	15.2
	Rep 3 (0%)	2.0	1.4	2,070	24,700	0.39	1.3	3.5
	Rep 4 (100%)	0.34	1.0	665	2570	0.40	0.38	7.7
	Rep 5 (50%)	0.26	0.59	433	4,380	0.26	0.34	7.0
	Max	***14.3***	***4.09***	***25,200***	***24,700***	***1.26***	***2.0***	***15.2***
Screening Criteria								
	Acute WQG	*340*	*16*	*350*	*3600*	*3*	*33*	*37*
	Based on total or dissolved?	*T*	*T*	*D*	*D*	*T*	*T*	*D*
	Source[2]	*EPA*	*EPA*	*BC ENV*	*CCME*	*BC ENV*	*CCME*	*CCME*
Porewater Screening Steps[3]								
Assessment	**Question**	**As**	**Cr**	**Fe**	**Mn**	**Pb**	**U**	**Zn**
Ref vs Exposure	TPE > PDL?	No	No	**Yes**	**Yes**	No	No	No
	Magnitude	-	-	2	45	-	-	-
Correlation	Correlation?	-0.09	0.35	-0.16	**-0.95**	0.34	0.15	0.37
	Significant?	No	No	No	**Yes**	No	No	No
WQ Screening	> Acute WQG?	-	-	Yes	**Yes**	-	-	-

Notes:

1. Hyalella azteca survival shown in parentheses.

2. Acute water quality guidelines published by CCME were given priority. If there was no CCME guideline, guidelines published by the BC Ministry of Environment & Climate Change Strategy and the US EPA were used instead.

123 porewater metals concentration > the acute WQG for the protection of aquatic life.

3. Notes on the data evaluation steps:

Step 1	TPE > PDL?	Q: is the maximum porewater concentration at TPE greater than PDL?
	Magnitude	Q: What is the magnitude of the difference in concentration between TPE and PDL?
Step 2	Correlation?	Q: is the porewater concentration correlated with lower amphipod survival?
	Significant?	Is the correlation significant (Spearman Rank, p<0.05)?
Step 3	> acute?	Q: does the measured concentration exceed benchmarks/thresholds for acute effects?

Figure 4-81. Correlation plot showing the relationship between *Hyalella azteca* survival and concentrations metals of potential concern in sediment and porewater at TPE.

Notes: Correlations done on the 2019 data; blue cells are negatively correlated, red cells are positively correlated. "X" indicates the correlation value is not statistically significant (p<0.05).

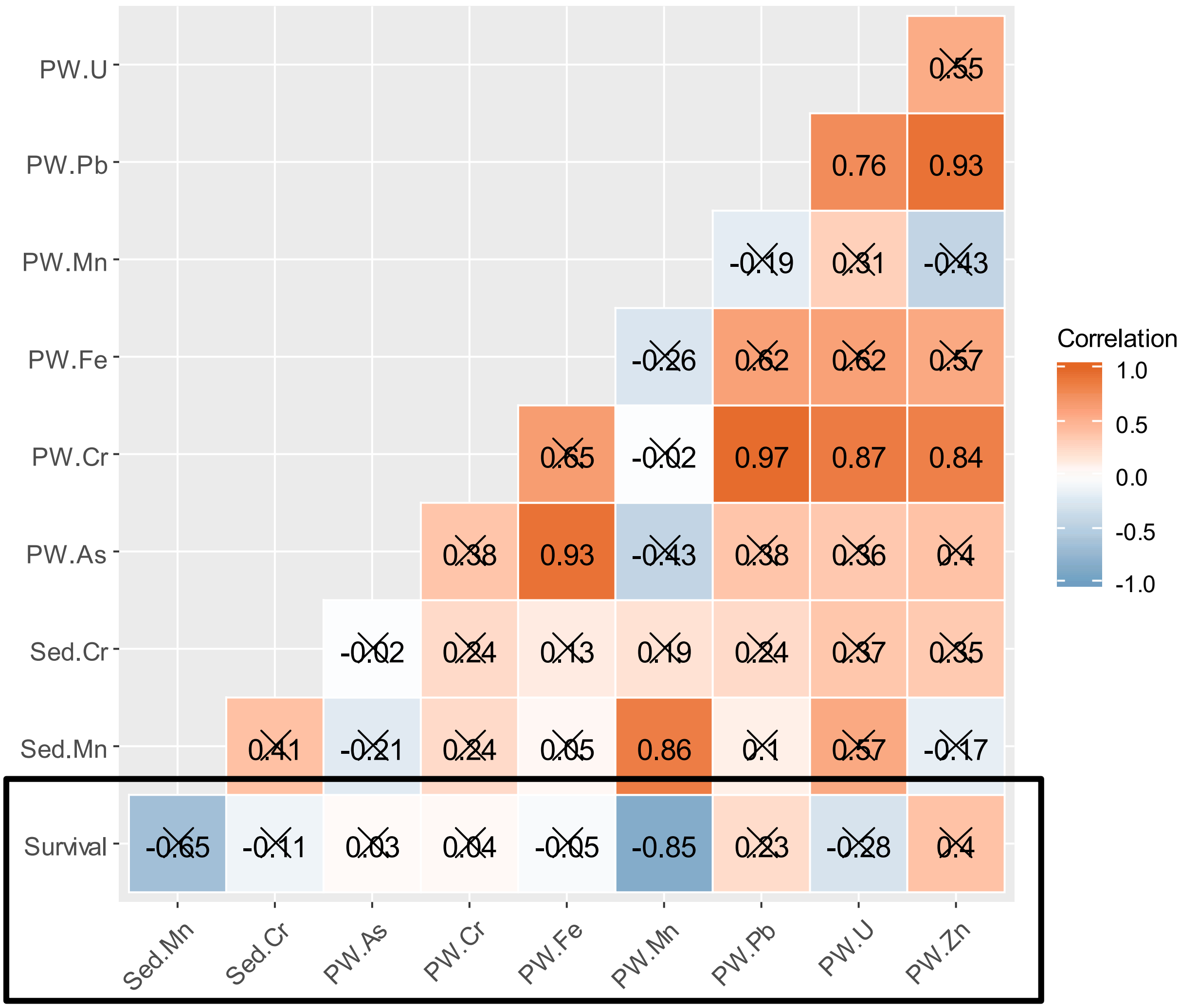
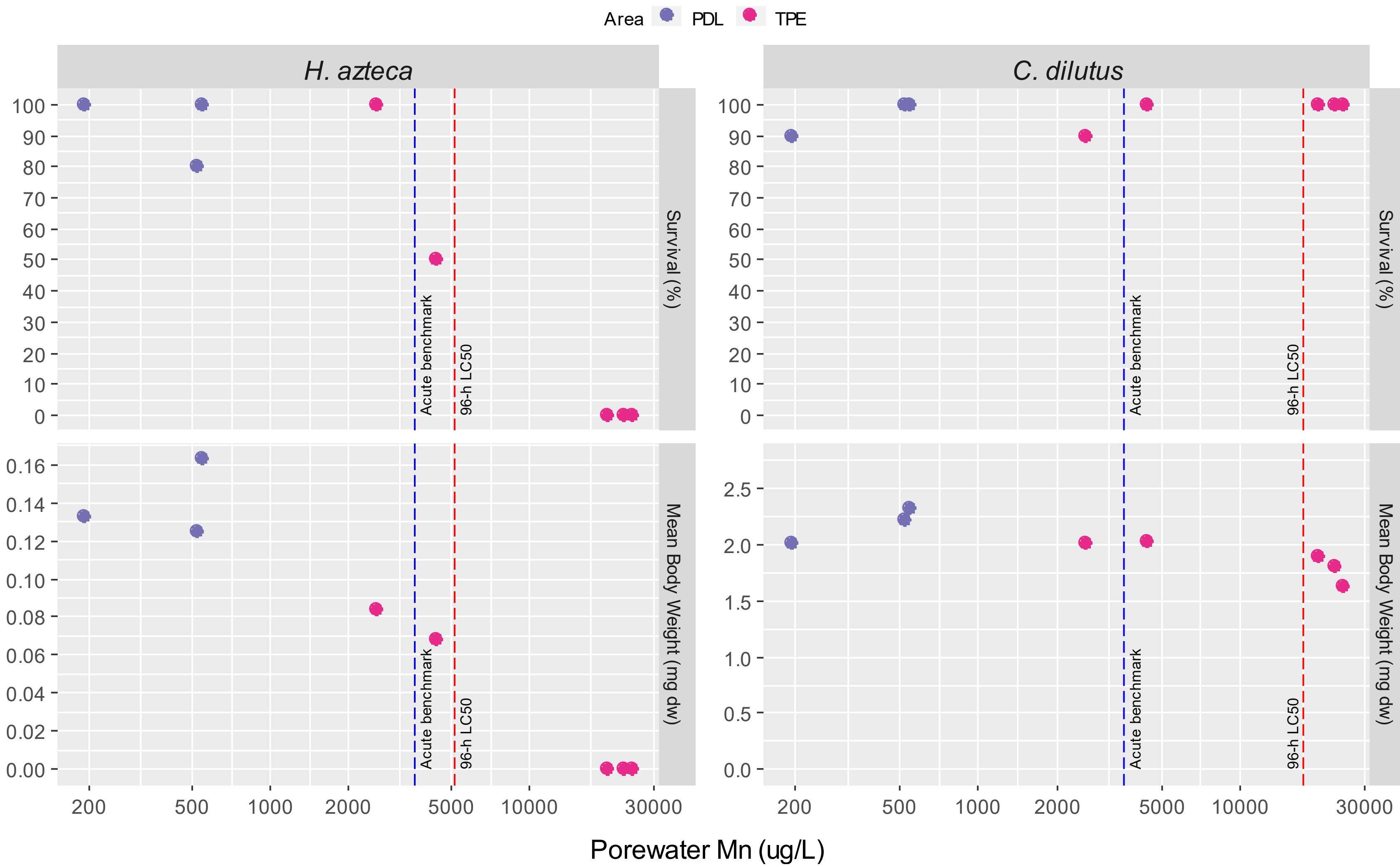
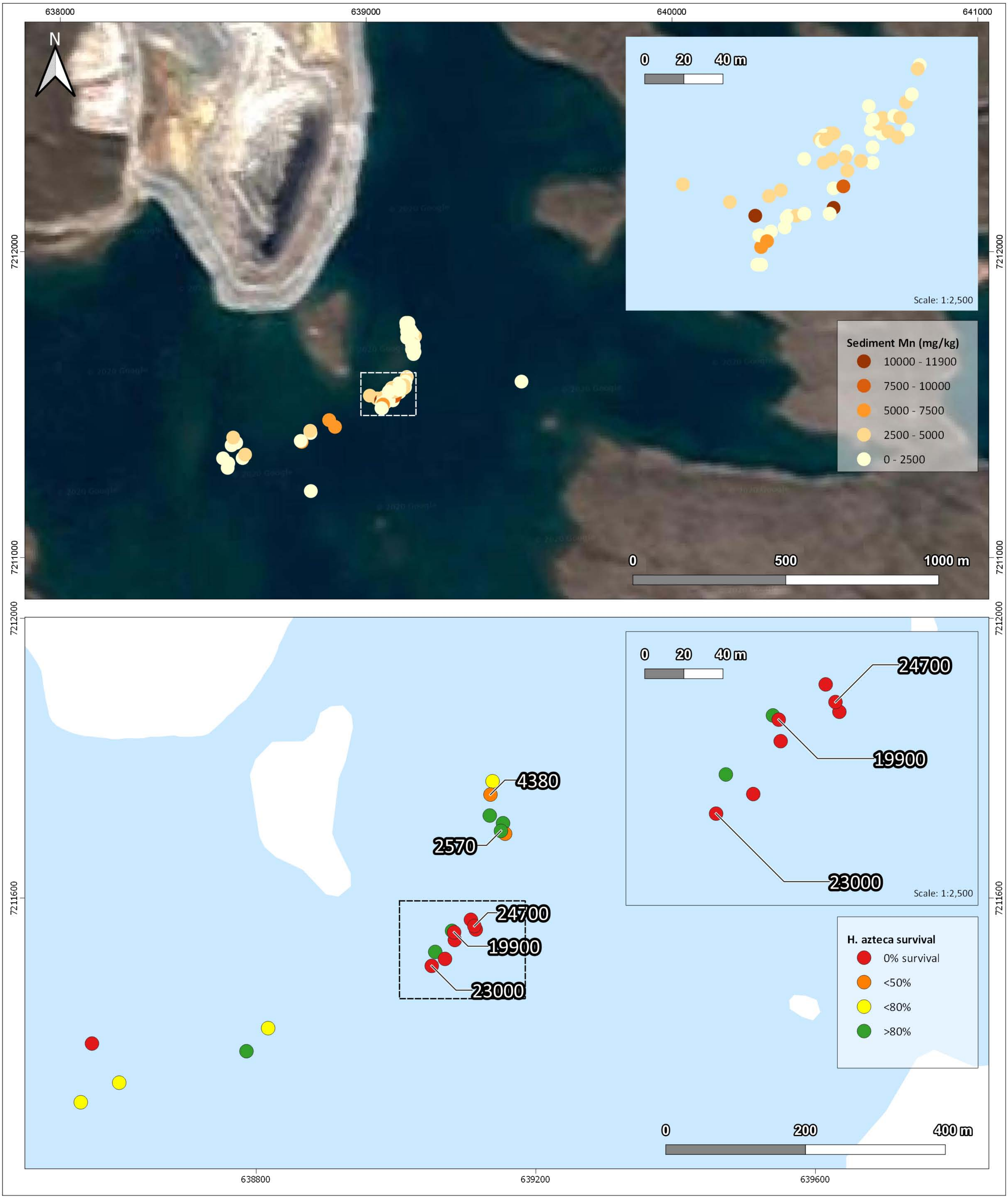


Figure 4-82. Survival and growth endpoints versus porewater manganese concentrations for *H. azteca* and *C. dilutus*.

Note: porewater chemistry data log10 transformed. The blue line = the short-term benchmark; red line = the 96-h LC50 values for each species as reported in CCME (2019).





Notes:
Numbered labels indicate the porewater manganese concentration (ug/L) measured in the 2019 sediment toxicity test replicates for H. azteca.

AZIMUTH

AGNICO EAGLE

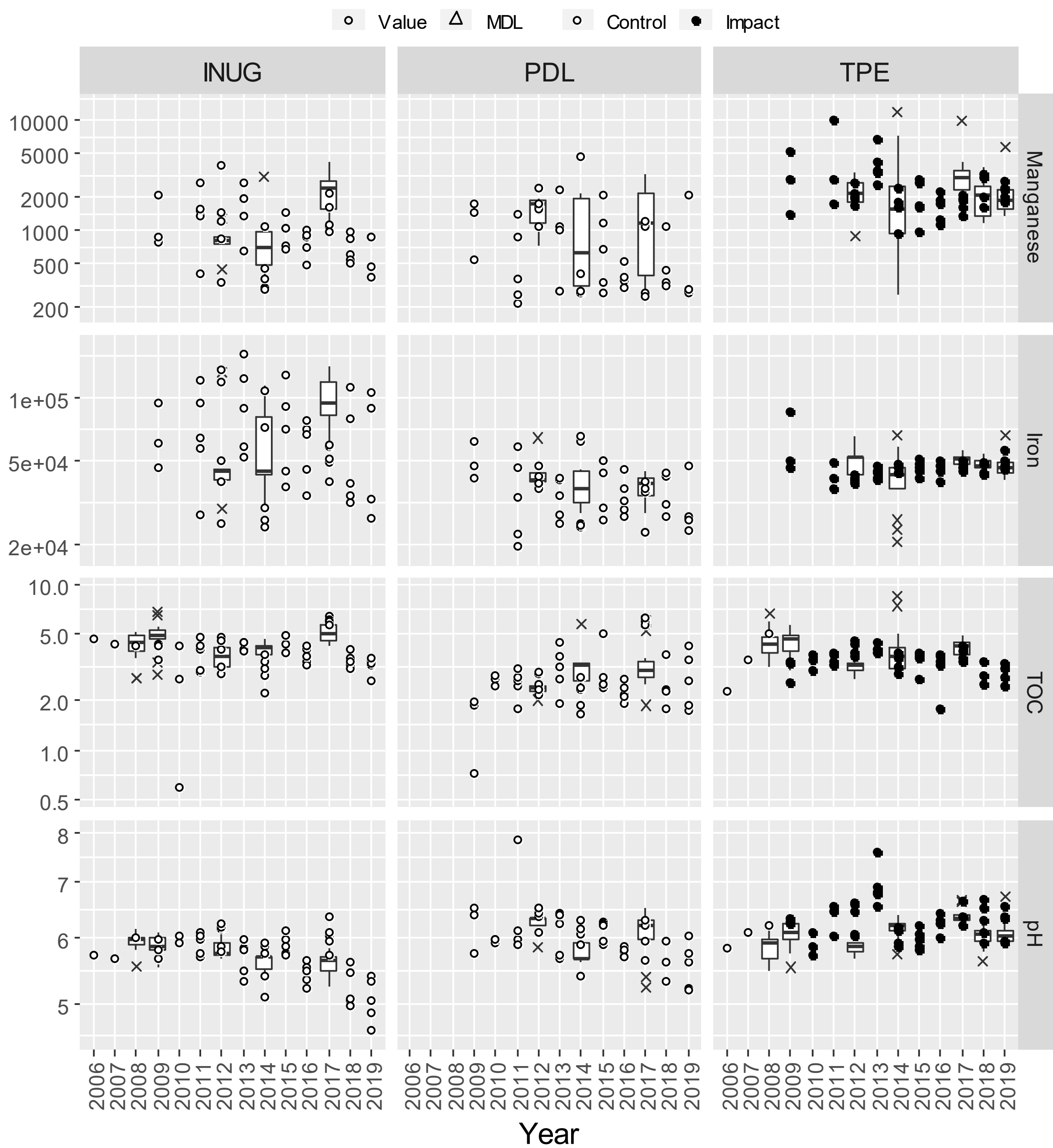
Figure 4-83
Spatial assessment of sediment and porewater manganese concentrations in TPE and effects to Hyalella azteca survival

2019 Core Receiving Environment Monitoring Program

Date:	Feb 11, 2020
Datum:	NAD 83 UTM Zone 14
Scale:	16,00 (Top); 7,000 (Bottom)
Software:	QGIS version 3.4.13-Madeira
Produced by:	E. Franz

REFERENCES:
1. Basemap imagery from ESRI and Natural Resources Canada
2. Waterbodies from Natural Resources Canada
3. Sample locations from Azimuth

Figure 4-84. Sediment manganese, iron, TOC, and pH in measured sediment from INUG, PDL, and TPE during the CREMP.



5 WHALE TAIL

5.1 Overview of the 2019 Whale Tail CREMP

This section summarizes the 2019 results of water quality monitoring and sediment chemistry, phytoplankton community, and benthic invertebrate community studies that support the Whale Tail Project. Figures and tables relevant to the Whale Tail Project are organized at the end of the section, by study component.

The six lakes currently[27] included in the study design for monitoring mining-related changes downstream of the Whale Tail Project are:

- Near-field: Whale Tail Lake – South Basin (WTS), Mammoth Lake (MAM) and Nemo Lake (NEM)
- Mid-field: Lake A20 and Lake A76
- Far-field: Lake DS1

Existing Meadowbank reference areas, INUG and PDL, serve as reference areas for the Whale Tail study area lakes. The locations where water quality sampling took place are shown in **Figure 5-1**. Sediment and benthic invertebrate sampling areas are shown in **Figure 5-2**.

The landscape around the Amaruq property consists of rolling hills and relief with low-growing vegetative cover and poor soil development. Numerous lakes are interspersed among boulder fields, eskers and bedrock outcrops. With the exception of Nemo Lake, all Whale Tail study area lakes are part of the *A* Watershed that flows from SE to NW and drains into Amur Lake (aka DS1). Nemo Lake is located north of Amaruq in Watershed *C* that is separated from Whale Tail and Mammoth Lakes by drainage divide just north of Whale Tail Lake.

In 2018, a dike was constructed dividing the north and south basins of Whale Tail Lake. Prior to Whale Tail Lake being impounded, Lake A20 was a headwater lake. The flow regime was from Lake A20 through Whale Tail Lake, Mammoth Lake, Lake A76, and into Lake DS1. Construction of the dike and the resulting change in flow patterns has flooded the south basin of Whale Tail Lake and Lake A20, enlarging the footprint of both lakes and increasing lake depth. Lake A20 is no longer *upstream*, as the channel between WTS and A20 flooded; however, the connection between WTS and A20 is shallow, and hydrostatic pressure from input sources to Lake A20 likely limits water exchange. The changes to Whale Tail Lake and Lake A20 are shown in **Figure 5-1**.

[27] Additional lakes may be added to the study design to fulfill monitoring requirements in the approved scope of the Project.

Future development activities include re-establishing the connection between the south basin of Whale Tail Lake and Mammoth Lake by constructing a diversion channel.

Area designations changed from *control* to *impact* for WTS and MAM in 2018 as a result of the onset of construction activities and because of the potential for changes in water and sediment quality in each lake to cause changes in the biological communities. The other four lakes were unaffected by construction activities in 2018 and remained in the baseline (*control*) designation. Lakes A20, A76, and DS1 changed to the *impact* designation at the start of 2019 as mine construction and mine activities continued to expand. Nemo Lake was designated *impact* after the July sampling event when heavy precipitation necessitated dewatering Lake AP5 onto the tundra within the Nemo Lake watershed.

A list of important activities in the Whale Tail study area for 2019 are provided in **Table 1-1**.The key construction activities and onsite water management for 2018/2019 are summarized below:

- **Whale Tail Impoundment** – Construction of the Whale Tail dike (**Figure 5-3**) began in July 2018. The impoundment caused water levels to rise in 2018/2019, resulting in Lakes A55, A20, and A18 being fully connected to the south basin of Whale Tail Lake prior to the August 2019 sampling event. Pumping from the north basin to the south was required throughout much of 2019 to address dike seepage. Construction activities (e.g., dike grouting) started late in 2019 to address seepage.
- **Effluent Discharge to Mammoth Lake** – Discharge to Mammoth Lake from a temporary diffuser started on June 17, 2019, and installation of a permanent diffuser was completed on July 27, 2019. Other discharges to Mammoth Lake included water level management from Quarry 1 from August 8 to October 23, 2019, Lake A45 level management to tundra near Mammoth Lake from November 25 to 27, 2019, and pumping from WTS to Mammoth Lake, which started October 24, 2019 before construction of the diversion channel started.
- **Contact Water Discharge to Nemo Lake** – A change to the water management strategy was implemented in summer 2019 to allow temporary discharge of contact water to Nemo Lake. The revised strategy was required as a result of high precipitation in 2019 and was approved by the Nunavut Water Board (NWB) and inspector before it was implemented. Future discharge to Nemo Lake is not anticipated.

5.2 Limnology

Limnology data provide an initial assessment of whether conditions are changing within a sampling area that may require additional investigation. The general timing of the limnology and water sampling program coincided with the Meadowbank CREMP sampling program. Two limnology profiles for temperature, dissolved oxygen, and conductivity were collected with water chemistry and phytoplankton sampling in March, May, July, August, and September. One depth profile was conducted monthly from WTS, MAM, and NEM in January, February, April, and December to monitor for potential changes in NF water quality.

Tabulated limnology data collected in 2019 are included in **Appendix H**. All measurements were taken by Agnico Eagle Environment Department personnel, except for August measurements, which were completed by Azimuth. Limnology profiles were conducted at locations shown in **Figure 5-1**. Each point shown on the map is labelled with a number corresponding to the month the profiles were collected (e.g., 5 = May). Results for each lake focus on the deepest location sampled per event; matching the water chemistry sample IDs (where available) for 2019 are listed in **Table 5-1** for cross-reference.

Table 5-1. Samples plotted in the limnology profiles for the Whale Tail study area lakes.

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WTS	☑	☑	WTS-37	☑	WTS-27	Not sampled	WTS-41	WTS-44	WTS-45	Not sampled	☑	☑
MAM	☑	☑	MAM-37	☑	MAM-40		MAM-41	MAM-43	MAM-45		☑	☑
NEM	☑	☑	NEM-37	☑	NEM-40		NEM-41	NEM-43	NEM-45		☑	☑
A20			A20-32		A20-34		A20-35	A20-38	A20-40			
A76			A76-32		A76-33		A76-35	A76-37	A76-40			
DS1			DS1-29		DS1-31		DS1-33	DS1-35	DS1-38			

Notes:
☑ = One profile is collected from the near-field areas in months where water sampling is not completed.
The samples shown represent the deeper of the two locations sampled each month.

5.2.1 General Observations

The lakes in the Whale Tail study area are, for the most part, shallow and oligotrophic. DS1 is the deepest lake in the study area, with a maximum recorded depth of approximately 33 m. A20, A76, and NEM have areas of steep relief, but most of the surface area is less than 15 m deep.

Like the Meadowbank lakes, the ice-free season is short for lakes within the Whale Tail study area. Ice break-up usually occurs during mid to late June in the region and begins to form again in October. Sampling in June and October is avoided due to safety concerns surrounding ice conditions. Surface water temperatures measured at 3 m typically reach a yearly high between 10°C and 15°C sometime in August (**Figure 5-5**) before cooling in the fall. Temperature, specific conductivity, and dissolved oxygen profiles for each of the 2019 sample events are shown in **Figure 5-6** to **Figure 5-14**. Profiles for INUG and PDL are included in each monthly plot for reference.

5.2.2 Temperature and Dissolved Oxygen

When interpreting spatial and temporal trends in water quality the temperature and dissolved oxygen profile results are discussed together because they produce similar outcomes. Strong winds, combined with the shallow depths, help maintain uniform temperature and high oxygen profiles in the water column during the open-water season. This also ensures that the distribution of phytoplankton, and to a lesser extent, zooplankton is vertically more uniform. Thermal stratification, if any, is brief (days) and water temperatures only differ 4°C to 5°C between surface and bottom during these times when the wind is calm.

The lakes are well oxygenated throughout the year, with DO generally above 10 mg/L. Vertical stratification in DO was evident in deeper basins in months when ice cover is present. In February (**Figure 5-6**) and March (**Figure 5-7**) there was evidence of DO stratification for most areas in 2019. By May (**Figure 5-9**) the stratification started to weaken. The conditions were mostly mixed by July (**Figure 5-10**), and in November (**Figure 5-13**) the transition to DO stratification started again and was fully established by December (**Figure 5-14**).

Conductivity

Whale Tail Lake – South Basin – Specific conductivity is an effective and sensitive measure of changes in water quality due to construction activities, because increases in total dissolved solids result in increased electrical conductance. The onset of dike construction in 2018 in Whale Tail Lake did not result in changes in specific conductivity at WTS. Profiles taken at WTS in July and August 2018 were virtually identical, measuring 35 µS/cm and 38 µS/cm in August and September. In 2019, the conductivity in WTS was stable and similar to NEM for January through March; however, WTS increased from approximately 50 µS/cm in March (**Figure 5-7**) to over 125 µS/cm in May (**Figure 5-9**). In July, the conductivity in WTS dropped to approximately 100 µS/cm (**Figure 5-10**) before stabilizing around 75 µS/cm in August (**Figure 5-11**). Dewatering activities started in April and continued for most of 2019, pumping water from WTN to WTS, mostly to address the relatively high volume of dike seepage. Channel construction between WTS and MAM started later in 2019. Dike grouting started on December 1 to address the seepage.

Mammoth Lake – In the months prior to November 2018, the conductivity in Mammoth Lake was largely unstratified and around 60 µS/cm (Azimuth 2019). In November and December 2018, the conductivity in MAM increased to above 150 µS/cm. The results from 2019 indicate conductivity in MAM remains high, often above 150 µS/cm (**Figure 5-5** through **Figure 5-14**).

The increase in conductivity indicates that mine activity is influencing water quality. Dike construction on the Mammoth Dike started in late 2018 and, not surprisingly, this construction activity coincided with the increase in conductivity. However, when dike construction was completed the conductivity did not return to baseline conditions. The persistent, relatively high conductivity through winter months after dike construction when ice cover was present suggests that potential windblown dust from construction activities was not the source of the increased conductivity. In July 2019, conductivity fell to approximately 75 µS/cm (**Figure 5-10**), possibly related to freshet when the systems are flushed by snow and ice melt. The apparent decline in conductivity occurred despite the start of dewatering using diffusers, on June 22, 2019. However, conductivity appeared to climb after July, reaching a high of nearly 200 µS/cm in December.

Turbidity is a measure of the haziness in water, commonly measured as Nephelometric Turbidity Units (NTU). It may be driven by natural phenomena (e.g., plankton growth or natural sediment inputs) or anthropogenic activities that introduce dust or suspended sediments to the water column. Within the ultra-oligotrophic Whale Tail study area lakes, turbidity tends to be very low, often around 0 NTU. Turbidity is another good indicator of mine induced changes to water quality and is often used as a surrogate for TSS. Monitoring turbidity supports the assessment of potential increases to conductivity by tracking increases of suspended particles. While turbidity is not measured as part of the CREMP study design, after observing a spatial difference in conductivity between basins in Mammoth Lake and potential stratification, the Amaruq Environment Team added turbidity to the May limnology profiles. The turbidity observed at MAM-39 in May 2019 ranged from 13–21 NTU. In contrast, the turbidity observed at MAM-40, the other Mammoth Lake water sampling location used in May 2019 in Mammoth Lake, was 0 NTU. Conductivity tends to increase when suspended particles enter the water column and, in May 2019, conductivity observed at MAM-39 was nearly double the conductivity at MAM-40 (approximately 190 µS/cm compared to 110 µS/cm).

Mammoth Lake is fairly shallow, orientated east to west, and somewhat hourglass shaped. Water chemistry sampling and limnology profiling requires sample depths of more than 5 m and, to meet minimum depth requirements, samples and profiles are generally collected in the east and west basins of the lake. Maximum conductivity readings from each sampling event are provided in **Table 5-2**. Limnology-only profiles are collected from only one location in each area during a sampling event when there are no paired water chemistry samples collected. When water samples are collected, two samples are collected during each event and, historically, one is collected in the east basin and one in the west basin. This practice provides good spatial coverage while meeting minimum depth requirements. For paired samples (i.e., samples taken within the same month or sample event), the conductivity observed in the east basin was distinctly higher than the conductivity in the west basin. The narrow portion in the middle of the Lake is relatively shallow and creates a natural barrier that slows water exchange between the basins, particularly during winter months when ice cover further limits potential water exchange between the basins. Conductivity in the east basin was lower in July and August (see **Table 5-2**), which may be related to two factors: 1) during freshet, systems are flushed by snow and ice melt; and 2) during the open water season, wind facilitates lake mixing, thereby dispersing the elevated conductivity in the east basin. As such, the *apparent* reduction in conductivity observed in July and August may be related to natural phenomena rather than mitigation of potential sources.

The within-lake spatial trend in conductivity and turbidity discussed above further confirms that mine site activities are influencing water quality in Mammoth Lake. While an increase in conductivity within the ranges measured in 2019 is unlikely to have an ecological effect, changes in conductivity and other limnology parameters serve as an early warning to changes in the lake.

Table 5-2. Maximum conductivity readings from each sampling event in Mammoth Lake, 2019.

Month	West Basin of Mammoth Lake		East Basin of Mammoth Lake	
	Sample ID	Maximum Conductivity (µS/cm)	Sample ID	Maximum Conductivity (µS/cm)
January	-	-	Jan – Limno	174.6
February	-	-	Feb – Limno	159
March	MAM-38	107	MAM-37	210
April	-	-	Apr – Limno	177.5
May	MAM-40	115	MAM-39	205.8
July	MAM-41	82.1	MAM-42	108
August	MAM-44	81.5	MAM-43	117.4
September	MAM-46	116.1	MAM-45	154.2
November	Nov Limno	183.1	-	-
December	Dec Limno	196.4	-	-

Notes
"-" not collected as per the study design.

Follow-up action for the apparent spatial trend observed in conductivity in Mammoth Lake in 2019 includes additional limnology profiling from February 2020 through the remainder of the season, if conditions persist. At least one profile will be collected in each of the east and west basins, and additional profiles may be collected to track the spatial extent of elevated conductivity. Limnology profile data will be reviewed shortly after they are collected. Additional water sampling may be added if conditions persist.

Downstream Areas – Conductivity readings indicated very little seasonal variability at NEM from January through to August; however, the field conductivity in NEM shows evidence of an upward trend after August, when the conductivity slowly increased from just over 50 µS/cm to over 100 µS/cm in response to temporary discharge of contact water to NEM. Lakes A20 and A76 were stable and had relatively low conductivity for all sampling events in 2019 (< 50 WTS µS/cm).

Limnology data collected as part of the tributary water quality monitoring completed in August 2019 (Azimuth, 2019b) corroborate findings from the lake limnology profiles in 2019. At A14-A13, the closest monitoring location downstream from Mammoth Lake, field-measured specific conductivity was 61.5 µS/cm in August 2019 compared to 24 and 18 µS/cm measured in 2015. Farther downstream at A76-A75 (the outlet of Lake A76) and A5-A4 (northern flow path towards DS Node2), specific conductivity measured 40 µS/cm at A76-A75 and 35 µS/cm at A5-A4. Overall, the conductivity data for stream A14-A13, A76-A75, and A5-A4 shows a similar spatial and temporal pattern compared to conductivity results from the upstream lakes.

Minor seasonal fluctuations in conductivity are normal between years and seasons, but as of 2019, changes in conductivity observed in Mammoth Lake and nearby tributary station extend downstream to A76. Farther downstream at Lake DS1, conductivity is within the range of baseline conditions.

5.3 Water Chemistry

Baseline monitoring for this project started in 2014[28]. As described in **Section 5.1**, 2018 was a transition year with in-water construction activities starting in Whale Tail Lake in August. Mammoth Lake also transitioned to *impact* in 2018, and in 2019 Lakes A20, A76, and DS1 changed status from *control* to *impact*[29]. Nemo Lake also changed from *control* to *impact* prior to 2019 August sampling when high precipitation in the summer necessitated discharge into the lake watershed. Actual dewatering from Lake AP5 to the Nemo watershed started on June 21; however, this was unlikely to impact July water samples (collected July 5).

Water quality data for the Whale Tail CREMP were evaluated according to methods described in **Section 2.4.1** and followed the framework used for Meadowbank (**Section 4.3.2**) and Baker Lake (**Section 6.3.2**). 2019 is the first year of BACI analysis to assess spatial and temporal changes in

[28] Baseline water quality data collected between 2014 and 2017 in the Whale Tail study area lakes were summarized in the comprehensive baseline CREMP report (Azimuth, 2018b).

[29] The designation *impact* is not meant to signify that water quality conditions have changed, rather that those sites are in a location where mine activities could reasonably be expected to influence conditions. The “control” designation is reserved for sites that reasonably fall outside of the footprint of potential mine influence.

water quality at the Whale Tail study area lakes. BACI analysis was deferred in 2018 because of the limited amount of *after* data for WTS (WTS changed to *impact* in August 2018) and MAM (changed *impact* in November 2018) and the expectation that construction-related changes in water quality would be easy to detect visually. Water quality triggers and thresholds specific to the Whale Tail study area were developed in 2019 and applied in formal analysis. The 2019 water quality in Mammoth Lake was also compared against predicted water quality presented in the Approved Project FEIS (Agnico Eagle, 2016).

5.3.1 General Observations

Water chemistry samples were collected with limnology for the months of March, May, July, August, and September (see **Section 5.2** for limnology results). Water quality data for 2019 were screened against the federal water quality guidelines and the newly derived water quality triggers, are tabulated in **Table B2-1**.

Like the Meadowbank lakes, when interpreting water quality results from the Whale Tail study area, the lakes' general characteristics need to be considered:

- The study lakes are generally nutrient-poor, thermally un-stratified, and well-mixed (uniform temperature and oxygen profiles), with no winter anoxia beneath the ice cover.
- The study lakes are headwater lakes, so no significant natural sources of nutrients or sediment are introduced to these lakes, except for local runoff that contributes little nutrient enrichment but sustains these aquatic ecosystems[30].
- Many parameters have been below laboratory detection limits (MDLs) since baseline monitoring started in 2014.

Water quality in the Whale Tail study area lakes is characteristic of northern headwater lakes. Surface water hardness is soft, typically measuring less than 20 mg/L (as $CaCO_3$) during the baseline period (**Figure 5-17**). The buffering capacity of the surface water is also quite low, as evidenced by alkalinity concentrations (as bicarbonate) typically below 6 mg/L (**Figure 5-22**). Based on total phosphorus, the lakes are ultra-oligotrophic (< 0.004 mg/L; CCME, 2004); productivity is discussed in more detail in **Section 5.4**. Productivity of northern lakes can be limited by low concentration of nitrogen, phosphorus, or both (Ogbego et al., 2009); concentrations of nitrate, nitrite, and phosphorus were frequently below their respective detection limits during the baseline period; however, these parameters have increased

[30] In June and July 2019 there was an apparent increase in precipitation over previous years. AEM made comparisons between yearly precipitation data at Baker Lake which appeared to confirm it. This suggests that run-off in June and July 2019 was likely higher than most of the previous years.

somewhat in NF lakes since late 2018. Despite being situated in a region of mineralized geology, concentrations of metals are generally low or below MDLs; when measurable, most metals are associated with the particulate phase (i.e., total rather than dissolved).

5.3.2 Temporal and Spatial Trends

The summary of parameters included in this discussion are provided in **Table 5-3**. Fifty-four parameters out of 80 (approximately 67%) were retained for further discussion in 2019. Of these, 53 were retained because the frequency of detected concentrations exceeded 10%. Nitrite (as N) detection frequency was less than 10%, but it was retained because the control-impact detection frequency comparison flagged it due to an increase at impact areas compared to control (reference). No additional parameters were retained after comparing water parameter plots to mine site activity.

Parameters retained in the analysis are plotted in **Figure 5-16** through **Figure 5-68**. Trigger values[31] are shown on the time series plots as a red dashed line. For Mammoth Lake, where some parameters also have a FEIS prediction value, these are included as a blue dashed line. Parameters not retained for the trend assessment are excluded from further discuss, but plots and tabulated raw data are included, for transparency and completeness, in **Appendix B2**.

The BACI analyses were only conducted for parameter/area combinations that exceeded the trigger in 2019. For water quality, the BACI model tests for statistically significant increases only (i.e., one-tailed test looking for uni-directional changes [i.e., increases]). In this analysis, the model interaction term (or BACI effect term) represents the change at the test area in 2019 (*after* period) relative to baseline (*before* period) after accounting for natural temporal changes (i.e., temporal changes at the reference area). For simplicity, changes are noted *relative to baseline/reference* conditions.

Parameter/area combinations where the yearly mean exceeded the trigger (**Table 5-4**) were included with the BACI model (**Table 5-5**) and are included in the detailed assessment below. However, because 2019 was an important transition year for the Whale Tail study area lakes, the discussion has been expanded to include parameters that exhibit potential spatial or temporal trends but that don't necessarily exceed triggers. The discussion puts potential changes into an ecological perspective and a spatial context. Based on the mine site activities summarized in **Section 5.1** and **Table 1-1**, the areas most likely to be impacted in 2019 were WTS and MAM, and these areas feature prominently in the discussion. Context for 2019 results from an aquatic ecosystem perspective is described for each parameter (or parameter group):

[31] Refer to **Appendix I** for a description of the methods used to establish triggers for each parameter.

Nutrients

Ammonia – The ammonia-N concentrations in Whale Tail study area lakes, Meadowbank study area lakes, Baker Lake, and reference lakes (e.g., INUG and PDL) were highly variable in 2019 compared to previous study years. The yearly mean concentrations for ammonia in the Whale Tail Pit area only exceeded the trigger (trigger = 0.065 mg/L) for INUG, suggesting that the observed variability was not mine related. **Figure 5-24** shows the ammonia concentrations in Whale Tail study area lakes over time. The ammonia concentrations in all lakes were below the trigger value from 2014 through 2018. In 2019, areas INUG, PDL, and WTS exhibited a sharp increase in total ammonia concentrations between March and May. INUG increased from below 0.02 mg/L to above 0.1 mg/L.; WTS increased from a low of 0.013 mg/L to 0.051 mg/L. The rapid increase was followed by a rapid decrease, and July concentrations were near or below the detection limit of 0.005 mg/L in all sample areas. The low July concentrations were followed by high concentrations observed in August at all areas, except for NEM. Concentrations in both WTS and MAM continued to increase through September.

Determining the fate of ammonia in the environment is extremely complex (CCME 2010); however, ammonia is a water quality parameter with an effects-based threshold which is applied in the screening process. Ammonia-N in lake systems is part of a complex nitrogen cycle (CCME 2010) and variability may be driven in part by natural processes (e.g., algal growth can influence nitrogen levels in lake systems; CCME 2010). The threshold for ammonia depends on temperature and pH. It was 0.126 mg/L for the Whale Tail study area lakes in 2019. Areas INUG, PDL, WTS, MAM, and A20 exceeded the threshold in one or more samples. As mentioned, INUG (control) was the only area to exceed the trigger the yearly mean concentrations. Trigger values and thresholds do not apply to reference lakes; however, screening is included to provide context on natural variability. The high concentrations of ammonia observed in INUG in 2019 suggest that natural variability influenced the ammonia concentrations observed in the NF lakes.

Phosphorous – Phosphorus is another important component of the nutrient cycle in lake systems. It is an essential nutrient for all living organisms, but typically, even in water bodies with low concentrations of phosphorous, aquatic life is typically relatively diverse and abundant (CCME 2004).

The threshold for the Whale Tail area study lakes is 0.004 mg/L (CCME guideline for ultra-oligotrophic lakes), which is slightly lower than the trigger (trigger = 0.0045 mg/L). This means that a result greater than the trigger will also be greater than the threshold. The trigger/threshold was exceeded in all *impact* Whale Tail study lakes at least once in 2019 (**Figure 5-30**). The trigger/threshold was exceeded twice in Nemo Lake while the lake was still designated *control* and once in PDL. It was also exceeded in seven out of 10 samples for WTS and, unsurprisingly, in 2019 the yearly mean total phosphorous concentrations exceeded the trigger/threshold in WTS. The BACI analysis indicated that the observed change was statistically significant.

Nitrate-N and Nitrite-N – There was also a notable increase compared to baseline sampling, and reference lake conditions for both nitrate-N and nitrite-N in WTS and MAM in 2019 (**Figure 5-27** and **Figure 5-28**). However, these analytes did not exceed their respective triggers in any one sample and concentrations for both analytes decreased to near detection limits by the September sample event in WTS.

Laboratory Conductivity and Hardness

Conductivity and hardness parameters trended higher in 2019 in WTS and MAM (**Figure 5-16** and **Figure 5-17**). The trigger for conductivity (trigger = 48.6 µS/cm) was exceeded in all the 2019 samples for both lakes. Not surprisingly, the yearly mean also exceeded the trigger (mean conductivity for WTS was 86.1 µS/cm and for MAM was 112.7 µS/cm). The results for hardness followed an identical pattern for both lakes, with all individual samples and the yearly means exceeding the trigger (trigger = 17.4 mg/L; mean concentration for WTS was 30 mg/L and for MAM was 40.7 mg/L). The BACI analysis indicated that the changes to conductivity and hardness in WTS and MAM were statistically significant.

The results for Mammoth Lake exhibited the same spatial trend as field conductivity and are summarized in **Section 5.2**. Both conductivity and hardness were higher in the east basin of the lake compared to the west basin. It is likely that the increased conductivity and hardness observed in 2019 in MAM is related to mine activity. The spatial patterns observed in MAM confirmed this, because natural phenomena are unlikely to act in a spatially discrete manner in a relatively small lake like Mammoth Lake, especially when ice cover limits water exchange within and between systems. The eastern basin in MAM was also closer to dike construction activities that started at the end of 2018, and it received dewatering discharge from the impounded north basin of Whale Tail Lake and Quarry 1 from June 22, 2019.

The south basin of Whale Tail Lake also received discharge water from the impounded north basin, and it seems likely that these activities, coupled with the flooding caused by the impoundment, would have increased conductivity and hardness in WTS.

The increase in conductivity and hardness observed in 2019 appeared to be limited spatially because these results were not observed (or muted) in Lake A20 or Lake A76—which were either connected or downstream from WTS and MAM. The yearly means for conductivity and hardness did not exceed their respective triggers at any of the downstream areas (i.e., Lakes A76 and DS1) or at Lake A20 and Nemo Lake. No single sampling events exceeded the trigger at Lake

A20, but the triggers for both hardness and conductivity were exceeded in the March and May samples collected at Lake A76. For Nemo Lake samples, both parameters exceeded the triggers in the August and September sampling events, suggesting a potential upwards trend at the end of 2019. No water chemistry samples were collected in Nemo Lake after September 2019; however, limnology profiles continued monthly, except for October when ice conditions are unsafe. The results indicated that field conductivity continued to trend upwards through December.

The apparent upward trend for conductivity and hardness will be monitored closely in 2020. Increased intensity of field limnology profiling is planned for February 2020 and, pending results, may continue in subsequent monthly sampling events. Water chemistry monitoring may also increase. Conductivity is a composite variable that responds positively when concentrations of ionic compounds increase (e.g., chlorides, sulphates, carbonates, sodium, magnesium, calcium, potassium and metallic ions). The observed change, represents an increase in concentration of major ions (e.g., see discussion below).

TDS

The potential impacts of TDS toxicity to aquatic life are discussed in more detail in **Section 4.3.2**. TDS concentrations in MAM have been consistently above or near the trigger value (38.5 mg/L) since 2016 (**Figure 5-21**). In 2019, TDS concentrations in MAM were slightly elevated over the previous sample years, but the yearly mean (mean = 87.1 mg/L) was above both the trigger and the FEIS predictions (concentrations ranged from 54 to 123 mg/L). The yearly mean at WTS also exceeded the trigger in 2019 (mean = 73.7 mg/L). Both results were statistically significant in the BACI analysis of proportional change compared to reference/baseline conditions. Lake A76 and Nemo Lake also exceeded the trigger in one or more samples in 2019; however, the yearly mean was below the trigger.

Ionic Compounds (Calcium, Magnesium, Potassium, Sodium)

These ionic parameters are following an upward trend similar to the trend observed in the Meadowbank NF study lakes (**Section 4.3**). The mean concentrations for calcium, magnesium, potassium, and sodium (**Figure 5-38**, **Figure 5-44**, **Figure 5-48**, and **Figure 5-50**) exceeded their respective triggers in WTS and MAM in 2019. BACI analysis indicated a statistically significant change for these parameters in both WTS and MAM relative to reference/baseline conditions.

The concentrations in MAM samples exhibited the same general spatial pattern noted previously, with higher concentrations observed in the east basin than the west basin. Downstream, the yearly mean for Lake A76 also exceeded the triggers for calcium, potassium, and magnesium but not sodium. The BACI analysis indicated a statistically significant change over baseline for calcium and magnesium in Lake A76. Lake A20 was connected to WTS for 2019 but did not exceed the trigger for calcium, magnesium, or potassium for any single sampling event. Both lakes exceeded the sodium trigger for one or more sampling events but did not exceed the yearly mean, and no temporal or spatial trend was evident. The yearly mean for Nemo Lake also exceeded the trigger for calcium and potassium[32]. These results are summarized in **Table 5-4**. The BACI analysis is summarized in **Table 5-5**, and the potential ecological concerns for these compounds are discussed in more detail in **Section 4.3.2**.

In summary, these major cations are essential elements, and all species of aquatic life, from algae to fish, have evolved to actively regulate their osmotic, ionic, and acid-base balance by take up ions from their environment (Martemyanov and Mavrin, 2012). Furthermore, in oligotrophic freshwater lake environments adverse effects on primary producers and secondary consumers (e.g., zooplankton) are more commonly associated with major cation deficiency than enrichment (Alstad, et al., 1999).

Lithium

The yearly mean concentrations of both total and dissolved lithium exceeded the trigger concentration in both WTS and MAM (total and dissolved lithium trigger = 0.0020 mg/L). The results are provided as concentrations over time in **Figure 5-43**. Lithium concentrations in both lakes were highest in spring when the maximum concentrations for total lithium in May were 0.0079 mg/L (WTS-39) in WTS and 0.0075 mg/L in MAM (MAM-39) for the same event. Mammoth Lake exhibited the same spatial pattern noted previously, where lake's east basin was higher than the west basin. For both lakes, the lithium concentrations trended lower for the remainder of the year to just above the trigger by the last sampling event in September. The apparent down trend in concentrations suggests that the systems are stabilizing; however, 2020 sampling results will be reviewed to confirm. There are no effects-based thresholds for lithium. The BACI analysis indicated that the change compared to INUG was statistically significant for both lakes.

TOC and DOC

The 2019 yearly means for TOC and DOC exceeded the triggers (TOC trigger = 2.42 mg/L and DOC trigger = 2.43 mg/L) in WTS (mean TOC = 2.9 mg/L; mean DOC = 3.0 mg/L) and DS1 (mean

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[32] BACI analysis was not completed on Nemo Lake data in 2019 because discharged to the tundra near NEM started mid-way through the calendar year. If, in future years, AEM continues with authorized discharge to the tundra near NEM, changes in water and sediment chemistry and lower trophic level community metrics will be evaluated using the BACI assessment outlined in **Section 2.4**.

TOC = 2.9 mg/L; mean DOC = 2.8 mg/L). The results for DOC and TOC for the Whale Tail Pit area lakes are provided as time series plots in **Figure 5-33** and **Figure 5-34**, respectively.

The increase in TOC and DOC in WTS was likely related to the flooding of terrestrial habitat with impoundment of the south basin. However, the same results were not evident in Lake A20, which also experienced flooding and was joined to WTS for most of 2019. Interestingly, statistically-significant increases in TOC and DOC were also observed at Lake DS1, which is downstream of the site is considered a far-field lake and, therefore, less likely to be impacted by mining-related activities than Mammoth Lake (near-field) and Lake A76 (mid-field), neither of which had statistically significant increases in TOC and DOC in 2019. Therefore, the apparent increase observed at DS1 may be associated with natural variability.

There is no effects-based threshold for TOC or DOC. While changes in TOC and DOC at WTS were likely due to inputs from flooded terrestrial areas, changes observed at far-field Lake DS1 were likely due to natural inputs (e.g., terrestrial organic matter; BC MOE 1998). These patterns will be tracked closely in 2020.

Alkalinity

Like the Meadowbank area lakes, the total alkalinity fraction for the Whale Tail study area lakes is entirely bicarbonate alkalinity (HCO_3-). The 2019 yearly mean for total alkalinity exceeded the trigger (trigger = 9.6 mg/L) in WTS. The total alkalinity concentrations in WTS were generally below 7 mg/L during *before* sampling. In May 2019, the total alkalinity climbed to 11.3 mg/L (WTS-40) and 13.2 mg/L (WTS-39) before stabilizing close to the trigger for the remaining sampling events. **Figure 5-23** shows the variability of total alkalinity in WTS and the other Whale Tail study area lakes. Most of the other study lakes also exceeded the trigger in one or more sampling events including PDL (*control*) and NEM, while it was still designated *control*. Slight increases in bicarbonate alkalinity help neutralize changes in pH. In this respect, it's important to evaluate whether the increase in concentration constitutes a change of ecological-significance, not just whether an increase has occurred relative to baseline conditions.

Total and Dissolved Metals

Yearly mean concentrations for several metals exceeded their respective triggers in some of the Whale Tail Pit study area lakes in 2019.

Titanium – Mean total titanium concentrations exceeded the trigger (trigger = 0.00060 mg/L) in WTS. Concentrations of total titanium ranged from below detection levels (MDL = 0.00030) to a high of 0.0019 mg/L in September (WTS-45). There was evidence of spatial variability between paired samples from the same sampling events (e.g., in May concentrations ranged from

0.00052 at WTS-40 to 0.0014 mg/L at WTS-39). The concentrations for total titanium over time are provided in **Figure 5-52**. While the increases seen at WTS and MAM appear linked to mining-related activities, the results at far-field DS1 do not. These trends will be monitored closely in 2020 to further explore these patterns.

Zinc – The yearly mean dissolved zinc concentrations exceeded the trigger (trigger = 0.0023 mg/L) in DS1 (**Figure 5-68**). This was driven by one result observed in a March sample, DS1-30, which had a dissolved zinc concentration of 0.038 mg/L. Other samples collected from DS1 in 2019 had total and dissolved zinc concentrations in Lake DS1 that were either not detectable or were below the trigger, suggesting that the concentration observed in sample DS1-30 was an outlier and is not representative of lake conditions. Dissolved zinc was just above the trigger of 0.0023 mg/L in two WTS samples; however, most dissolved zinc concentrations were less than the reported detection limit as were all total zinc concentrations in WTS. Note that detectable dissolved zinc concentrations were also seen at INUG in 2019.

There were several other isolated examples of analytes exceeding their respective triggers in 2019.

- **Aluminum** – Total aluminum exceeded the trigger in one or more sample(s) in WTS and DS1.
- **Silicon** – Total silicon exceeded the trigger (trigger = 0.61mg/L) in one or more samples collected in 2019 in all Whale Tail study area lakes except for Nemo Lake and the reference lakes; however, the yearly mean concentration did not exceed the trigger for any lake. The same lakes also exceeded the dissolved silicon trigger (trigger = 0.57 mg/L) in one or more samples in 2019. Silicon concentrations have historically been close to the trigger value for most Whale Tail study area lakes.
- These isolated instances do not appear to indicate a spatial or temporal trend. Potential trends will be monitored closely in 2020.

A summary of the trigger screening results for the Whale Tail study areas are presented in **Table 5-6** according to their corresponding degree of change:

- no trigger exceedance,
- minor changes = trigger exceeded for parameters without effects-based thresholds,
- moderate changes = trigger exceeded for parameters with effects-based thresholds, or
- major changes = exceedance of the threshold.

Water quality results from 2019 correspond to *minor* changes.

Comparison to FEIS Predictions

Water management in the Whale Tail Pit area and effluent discharge to the downstream environment has the potential to change water quality. The FEIS water quality predictions estimate change to water quality and applied only to Mammoth Lake in 2019. The yearly mean results for water quality parameters were compared to the FEIS predictions for Mammoth Lake and are provided in **Table 5-7**.

Often, parameters that exceed the trigger in one or more sampling events also exceed the FEIS predictions. In 2019, the yearly mean concentrations for TDS, lithium, and the ionic compounds calcium and magnesium exceeded their respective triggers and the FEIS predictions in MAM. These parameters do not have effects-based thresholds. Both TDS and lithium are discussed above, and although both will be monitored closely in 2020, the concentrations were similar to historical *baseline* concentrations or appeared to stabilize close to the trigger level (i.e., the 95th percentile of baseline) for the latter half of 2019. The 2019 yearly mean ammonia concentrations also exceeded the trigger (and threshold) in two samples and did not meet the FIES prediction; however, as discussed above, elevated ammonia concentrations were also observed at the control areas (e.g., INUG and PDL), so the 2019 Mammoth results likely reflect natural variability. The total strontium, aluminum, and barium concentrations observed in MAM in 2019 were well below the trigger and threshold for all samples, despite not meeting FEIS predictions.

Water chemistry summary for the Whale Tail study area 2019

2019 was a transition year for the Whale Tail study area because most lakes switched designation from *control* to *impact*. Changes to baseline conditions were expected for some general water quality parameters. Not surprisingly, for some parameters/analytes, such as the ionic compounds discussed above, the start of construction activities resulted in upward trends in some NF lakes (e.g., WTS and MAM). The ultra-oligotrophic Whale Tail area lakes have a long ice cover season and tend to exhibit long-term stability over the baseline sampling period. As such, the signature of relatively small changes to water quality post-construction were captured by the CREMP program and visually confirmed in the parameter plots over time (e.g., **Figure 5-16** through **Figure 5-68**). The outcome of the assessment presented in **Table 5-6** for sampling at NF, MF, and FF areas in 2019 is summarized below.

Whale Tail Lake – South Basin (WTS)

Some water quality parameters trended higher at WTS in 2019. Of the 76 water quality parameters that have triggers, the yearly mean concentrations of 16 exceeded the trigger (2019 was the first year for screening against triggers and thresholds for the Whale Tail study area lakes; see **Table 5-4**). The BACI analysis indicated that the proportional change was significant for 15 of the 16 parameters.

WTS has been designated *impact* since mid-2018. While the dike was completed in 2018, water was discharged from Whale Tail Lake North Basin into WTS in 2019 (see **Table 1-1**). In addition, rising water levels in WTS (expected with its impoundment) inundated terrestrial habitat, which likely impacted water quality, and joined Lake A20. For most of the parameters where the yearly mean exceeded their respective triggers, the changes were statistically significant. Some of the observed changes to conductivity, nutrients, TOC, DOC, and ionic compounds in 2019, are likely related to a combination of physical-chemical changes to the lake and dewatering activities.

The temporal patterns between the WTS and MAM (the two lakes most likely to be impacted by mine activities) were generally different in 2019. For example, in MAM most ionic compounds followed a similar temporal trend to Lakes A20, A76 and DS1. The compounds increased early (likely due to cryo-concentration as discharges had stopped for the winter), then trended lower through ice-off (diluted with melt water and local runoff), and then increased again at the end of the year (again, likely due to cryo-concentration). In WTS, these compounds increased sharply in May 2019, then gradually decreased over the remainder of the year. The comparable temporal trend between MAM and Lakes A20, A76, and DS1 suggests that while increases occurred due to mining activities, these patterns were also affected seasonally by natural conditions (e.g., influence of cryo-concentration). Changes at WTS seem less affected by natural conditions and more related to mining activity.

It is worth noting that the observed changes to WTS in 2019 appeared to be limited to the south basin of Whale Tail Lake. As discussed, the channel dividing WTS and A20 was flooded in 2019, and this increased water exchange between the two systems. No yearly mean concentrations for any parameter exceeded its respective trigger in Lake A20 in 2019, which suggests limited spatial extent. Notwithstanding, the upwards trend observed for some water quality parameters in WTS in 2019 will be monitored closely in 2020. The time series plots for most parameters that exceeded their respective triggers indicated towards the latter half of 2019 that conditions may be stabilizing.

The CREMP program includes the direct assessment of biological communities in the water column (phytoplankton) and in sediments (benthic invertebrates). These biological metrics are important to help understand potential ecological changes and are discussed in detail in **Section 5.4** (phytoplankton) and **Section 5.6** (benthos) below.

Mammoth Lake (MAM)

Mammoth Lake transition from *control* to *impact* in late 2018 and, as expected, there were changes to water chemistry attributable to activities at the mine. The changes were less pronounced than for WTS. MAM had 10 water quality parameters with yearly mean concentrations exceeding the respective triggers (compared to 16 for WTS). For 9 of 10, the change was statistically significant in the BACI analysis. There were some physical changes to MAM that may have impacted water quality, including the construction of a culvert at the eastern end of the lake and dike work for Whale Tail Pit. However, unlike WTS and Lake A20, water levels did not change substantially as a result of construction activities. Mammoth Lake also received discharge in 2019 from the impounded Whale Tail Lake north basin, Lake A45, Whale Tail Lake south basin, and the Quarry 1 pond.

Nutrient levels (e.g., ammonia-N and total phosphorous) appeared to increase marginally over baseline concentrations and they rarely exceeded their respective trigger values and the yearly mean was below the trigger for both. FEIS predictions were compared to mean concentrations for MAM in 2019 and ammonia did not meet the FEIS predictions. As summarized above, several other parameters did not meet FEIS predictions (i.e., TDS [including Cl, Ca, Mg], Al, Ba, Li, and Sr). Generally, where the yearly mean results exceeded the trigger concentrations the FEIS predictions did, too.

The spatial patterns observed in Mammoth Lake, as discussed, are a strong indicator that mine activity was affecting changes to water quality in 2019. Conductivity, hardness, and most ionic compounds indicated a strong spatial trend, where these parameters were more elevated in the eastern basin of the lake compared to the west. On a broader spatial scale, there were no parameters where the yearly mean exceeded the trigger in Mammoth Lake that did not exceed the trigger in the south basin of Whale Tail Lake, and there were minimal changes to Lakes A76 and DS1 (see last bullet below).

Mid and Far-field Areas (Lakes A20, A76, DS1, and Nemo Lake)

The other Whale Tail area study lakes exhibited very little change over baseline conditions for most water quality parameters in 2019. While all lakes exceeded triggers for some parameters on one or more occasion, most were isolated instances and are likely representative of natural variability.

Even though the depth of Lake A20 increased in 2019, due to impoundment of the northern portion of Whale Tail Lake, yearly mean concentrations did not exceed a trigger for any parameter.

Lake A76 is downstream from Mammoth Lake and therefore further from mine site activities (lake locations are shown in **Figure 5-1**). Several ionic compounds in Lake A76 had yearly mean concentrations above their triggers, and of these the BACI analysis indicated statistically significant changes for calcium and magnesium. Generally, concentrations of major ions stabilized or declined slightly in the open water sampling events compared to winter and spring sampling early in the year.

Lake DS1 was furthest downstream from the mine site, but in the same drainage as Mammoth Lake and Lake A76. Mean yearly concentrations of TKN, TOC, DOC, sodium, and dissolved zinc[33] exceeded their respective triggers in 2019. BACI analysis indicated a statistically significant change for TOC, but not for the other parameters. Historically, TOC concentrations in DS1 have been close to the trigger value, often above it (**Figure 5-34**). Spatially, mine activities that changed water quality in Lake DS1 would have been captured in NF (i.e., upstream) areas. In 2019, the mean concentrations for TOC also exceeded the trigger in WTS (BACI analysis also indicated that this was a statistically significant change); however, the yearly mean concentrations observed in Mammoth Lake and Lake A76 did not. It is therefore highly unlikely that the apparent increased TOC observed in DS1 was related to mine activity.

Formal analysis of the 2019 trigger/threshold exceedances was applied to the decision criteria outlined in **Section 2.2.3** to determine the effort level and sampling frequency required at the MF and FF areas in 2019, following the new assessment strategy for MF and FF areas outlined in the *CREMP: 2015 Plan Update* (Azimuth, 2015b). The assessment strategy uses the water quality assessment results from the current year (in this case 2019) to inform sampling at MF and FF areas the following year (i.e., 2020). The data were analyzed starting from the *Year +1* step of the flow chart, where results from the NF areas are used to inform sampling at both MF and FF locations in 2019 (**Figure 5-15**). The full suite of CREMP water sampling is scheduled for 2020.

5.4 Phytoplankton Community

Baseline phytoplankton taxonomy data for the Whale Tail study area lakes was summarized in Azimuth (2018b). The baseline report focused on describing the dominant species and seasonal variability in taxonomy metrics (e.g., biomass and richness) within and between areas. Areas WTS and MAM have been classified as *impact* areas since mid-2018. Areas A20, A76, and DS1 were also *impact* areas from the beginning of 2019, and NEM switched to *impact* in August 2019.

5.4.1 General Observations

The summary of the phytoplankton taxa provided in **Section 4.4** for the Meadowbank project lakes applies equally to the lakes within the Whale Tail study area. Six major taxonomic groups

[33] A single outlier was responsible for the elevated yearly mean for dissolved zinc concentrations and is not considered representative of actual conditions.

of phytoplankton are present in the study lakes. These are blue green algae (*Cyanophyta*), green algae (*Chlorophyta*), golden-brown algae (*Chrysophyta*), diatoms (*Cryptophyta*), and dinoflagellates (*Dinoflagellata*). Species composition varies throughout the year depending on water temperature, nutrient concentration, time of year, water clarity and amount of sunlight, and predation by zooplankton. The biomass of the phytoplankton community was comprised predominately of chrysophytes (golden-brown algae) at most areas and seasons from 2015 and 2018 (**Figure 5-71**). Seasonally, chrysophyte biomass was highest in the summer months and lowest in spring and late fall/winter during the baseline period (Azimuth 2019). Seasonally, variability was evident among other taxa with chlorophytes more abundant in the summer and crytpophytes and diatoms more dominant in the winter (March–May, November; **Figure 5-71**).

5.4.2 Temporal and Spatial Trends

Tabulated phytoplankton community data from the 2019 CREMP are presented in **Appendix D2**.

Identifying potential mine-related impacts involved visually examining metrics for primary productivity and community composition for evidence of temporal-spatial patterns that might be associated with the mine-related activities outlined in **Section 5.1** and **Table 1-1**. Plots of the phytoplankton metrics were used to interpret seasonal and annual variations in community composition. The metrics used to assess changes in the community were chlorophyll-a (**Figure 5-69**) total phytoplankton biomass (**Figure 5-70** to **Figure 5-72**), and species richness (**Figure 5-73**). Supplemental plots showing major taxa biomass (mg/m^3) and density (mg/L) are included in **Appendix D2**. Key results are discussed below:

Chlorophyll-a – Chlorophyll-a is an indicator of primary productivity. In 2019, concentrations in surface water increased in both WTS and MAM in August. In WTS, concentrations ranged from a low of 0.89 µg/L in March (WTS-37) to a high of 4.5 µg/L in August (WTS-43 and WTS-44). In MAM, concentrations ranged from a low of 0.11 µg/L in March (MAM-37) to a high of 4.0 µg/L in September (MAM-46). Chlorophyll-a concentrations were typically less than 1 µg/L, which is characteristic of oligotrophic systems (Kasprzak et al. 2008) and representative of baseline trophic status in the lakes. Statistical analysis is not completed on chlorophyll-a; however, the time series plots provided in **Figure 5-69** show that chlorophyll-a concentrations in the latter half of 2019 were generally higher at MAM and WTS than in previous baseline samples. In WTS, concentrations declined in September compared to August, but they were still elevated compared to historical measurements. The downstream lakes (i.e., A76, and DS1), Lake A20, and Nemo Lake were in the range of historical baseline concentrations in 2019.

Phytoplankton Biomass – In 2019, there was a large increase in total phytoplankton biomass in WTS and an apparent large increase in MAM. Apparent increases were less pronounced in the other Whale Tail study area lakes. The time series plots for total phytoplankton biomass (mg/m^3) are provided in **Figure 5-70**[34]. As expected, the temporal patterns for phytoplankton biomass are comparable to the chlorophyll-a patterns for each area.

Chlorophyll-a and phytoplankton biomass increased not only through the first sampling months (March through July) in both MAM and WTS but also in INUG and PDL (i.e., the control lakes). These results were likely related, at least in part, to a normal cycle of increased productivity as lakes warm and nutrient levels increase during freshet. After the July sampling event, the results deviated between the reference lakes and WTS and MAM. In WTS there was a rapid increase in total biomass between July and August, followed by a slight decline in September. In contrast, MAM increased at a slower, steady rate over the entire 2019 season. At both areas the total phytoplankton biomass was distinctly higher than at other Whale Tail study area lakes, and was noticeably higher than baseline. WTS increased up to 1,117 mg/m^3 in August and MAM up to 660 mg/m^3 in September. In comparison, during 2018 WTS did not exceed 410 mg/m^3 and MAM did not exceed 355 mg/m^3. The biomass increase in both lakes was mostly attributed to increases in biomass of *Chrysophyta* and diatoms. Over the same period, phytoplankton biomass in the other Whale Tail study area lakes was within the range of baseline. NEM increased slowly throughout 2019, but the total biomass did not exceed 202 mg/m^3. The other study area lakes, including reference, exhibited variability over 2019, and the maximum biomass was below 200 mg/m^3 for all lakes except for DS1 (DS1-32 = 255 mg/m^3; May sample event).

The lack of temporal trend uniformity and the magnitude of phytoplankton biomass increase between lakes and between 2018 and 2019 suggests mine-site influence on Mammoth Lake and the south basin of Whale Tail Lake. These differences indicate that natural phenomena such as temperature changes, precipitation events, or sunlight were not uniformly impacting phytoplankton growth in the Whale Tail study area lakes in 2019.

The BACI analysis for WTS indicated a statistically significant (p-value = 0.009) positive increase for total biomass of 190%. For MAM, the positive increase was 143%, but not statistically significant (p-value = 0.107). As discussed, the model interaction term (or BACI effect term) represents the change at the test area in 2019 (*after* period) relative to baseline (*before* period) after accounting for natural temporal changes (i.e., temporal changes at the reference area). For simplicity, changes are noted *relative to baseline/reference* conditions. INUG is the reference area lake used in the 2019 BACI analysis. Although the BACI analysis (**Table 5-8**) indicated that

[34] The time series plot uses a log-scale for total biomass as mg/m^3. This tends to *mute* the visual increase in total biomass observed in WTS and MAM in 2019.

the effect size was positive for Lake A20, Lake DS1, and Nemo Lake, the results were not statistically significant.

Community Composition – The number of taxa varies by season, with a more diverse community present during the open water season than when ice covers the lakes. The pattern of seasonal variability in species richness observed in 2019 was similar to previous years for the various lakes (**Figure 5-73**). Typically, more than 30 different species of phytoplankton are present during the open water season. At WTS, the richness in August and September 2019 ranged from 34 to 37 taxa, whereas in August 2018 it was 27 and 31. In Mammoth Lake, richness ranged from 33 to 38 in August and September. There were no statistically significant changes to species richness in the BACI analysis to any Whale Tail study area lake in 2019.

Summary of phytoplankton community results for the Whale Tail study area lakes.

There were statistically significant changes in phytoplankton biomass in WTS in 2019 (190%; $p = 0.009$). This change exceeded the 50% effect size threshold for phytoplankton outlined in **Section 2.4.3**. The increase in total biomass over historical baseline data, the lack of trend uniformity with other Whale Tail study area lakes, and the proportionally large and statistically significant increase over INUG strongly suggest that mine activities influenced primary productivity in WTS in 2019. This was likely due to a surge in nutrients associated with inputs from the flooded tundra after impoundment. A sharp drop was seen in the September event, bringing biomass down to levels more consistent with the baseline period. This trend will be tracked closely in 2020.

Phytoplankton biomass at MAM followed a slightly different temporal pattern than WTS (or the two reference areas), with progressive increases seen over the year (September had the highest recorded levels since the start of baseline monitoring). The apparent effect size (143%) of the increase in MAM was close to being statistically significant ($p = 0.107$). Given the magnitude of the apparent increase in biomass and the proximity to mining-related activities, this trend is most likely related to the development.

Both MAM and WTS received discharges in 2019, but at different times and from different sources. As discussed in **Section 5.3**, there was notable flooding in WTS. Nutrient concentrations (e.g., ammonia-N, total phosphorous, nitrite-N, and nitrate-N) in both areas appeared to be elevated in 2019 compared to other Whale Tail study area lakes and compared with baseline sampling periods. However, the BACI analysis results only indicated a statistically significant change for total phosphorous in WTS. Based on the spatial and temporal trend analysis of water chemistry in **Section 5.3**, particularly nutrients, it is likely that mine site activities influenced nutrient concentrations in both WTS and MAM in 2019.

The ecological significance of increased primary productivity at WTS and MAM will depend on how long these trends continue and how far they extend. It is challenging to isolate the drivers of changes to productivity with only one season of *after* data (i.e., 2019). Whether the changes in biomass observed in WTS and MAM in 2019 represent of a short-term spike or a longer-term trend shift will depend on nutrient inputs to the system. Nutrients are generally a limiting factor for phytoplankton growth in oligotrophic systems and any inputs can lead to changes in productivity. Minor changes (e.g., changes in biomass that retain the general structure of the community and are relatively short-lived) are unlikely to be important ecologically, while larger or more extensive changes could start to change food chain dynamics in these typically low-productivity lakes. Phytoplankton biomass and associated patterns in key nutrients will be tracked closely in 2020.

The Whale Tail phytoplankton program will follow the same schedule as the routine water quality monitoring component of the program in 2020.

5.5 Sediment Chemistry

5.5.1 General Observations

Lake sediments in the Project area are generally similar to those described for the Meadowbank lakes in **Section 4.5.1**. Key points are:

- Natural sedimentation rates in these headwater lakes are low. However, there are several development-related activities that can increase sediment loading to the lakes.
- Sediments are generally dominated by silt and clay fractions. Particle size distribution in sediment grab samples (top 3–5 cm of sediment surface) is predominantly silt and clay, characteristic of depositional areas in all the lakes sampled in this region. Nemo Lake, historically, has a higher percentage of sand than the other Whale Tail study area lakes (**Figure 5-74**).
- Lakes within the Project area are naturally enriched in some metals compared to CCME sediment quality guidelines (SQGs). Arsenic, cadmium, chromium, copper, mercury and zinc exceeded the interim sediment quality guideline (ISQG[35]) in at least one sample collected during the baseline period. Lake-specific[36] triggers were developed (due to strong natural spatial trends among the lakes) and applied in 2019. The only baseline

[35] The ISQG is equivalent to the threshold effect level (TEL): calculated as the geometric mean of the lower 15th percentile of the effect data set and the 50th percentile of the no-effect data set (CCME, 1999).

[36] Note that triggers for Meadowbank and Baker Lake were generally applied across all sampling areas; WAL was the only location to have lake-specific triggers.

coring data for the Whale Tail study area lakes was collected in 2017; therefore, there were only 10 replicate samples per area from which to develop triggers. Triggers developed in 2019 used one of three approaches: 1) they were set to a maximum of the value halfway between the baseline median and the threshold; 2) the 90th percentile of the baseline data was used; or, 3) the value corresponding to a 20% increase above the median value was used. The new trigger values are provided as red dashed lines in the relevant figures (**Figure 5-76** to **Figure 5-82**) for arsenic, cadmium, chromium, copper, lead, mercury, and zinc. The full set of tabulated sediment data for 2019 with the screening triggers for each area are included in **Appendix C2**. The high concentrations of certain metals in some of the lakes means that some analytes are above the threshold (e.g., the ISQGs). For those metals and/or areas where the trigger is less than the threshold, the data analysis includes screening against both triggers and thresholds, following the processes outlined in **Section 2.4.**

5.5.2 Temporal and Spatial Trends

Baseline sediment chemistry data collected from 2015 to 2017 were summarized in the comprehensive baseline CREMP report, Azimuth (2018b). Formal statistical analysis of changes in sediment chemistry are done on a 3-year cycle, in years when sediment coring (and EEM) is completed. Baseline coring data were collected in 2017 and the first cycle of before-after (BA) statistical analysis is scheduled for the 2020 CREMP. In years when coring is not completed, sediment concentrations in the grab samples are visually examined for potential changes over time. Sediment grab samples are collected to characterize the habitat (grain size and TOC; **Figure 5-74)** and metals concentrations relevant for assessing the exposure conditions for the benthos community.

Sediment chemistry from 2015 to 2019 is provided in **Figure 5-75** to **Figure 5-82** for the metals with trigger values. Both WTS and MAM were designated *impact* mid-2018. Lakes A20, A76, and DS1 were designated impact for the entirety of 2019, and Nemo Lake was designated impact prior to the start of the August sampling event. Therefore, for the purpose of the 2019 grab sample review, all Whale Tail study area lakes are considered impact.

Conditions in 2019 were comparable to 2018 for all parameters measured (as mentioned, formal statistical analysis is not completed on grab sample results). There were no results in 2019 that indicated an upward trend. Core replicate results from 2017, particularly the mean, were below the trigger; however, baseline grab sample sediment data are not used in the deriving the trigger values and may therefore be above the trigger value during baseline. As an example, the results for arsenic at areas WTS, MAM, and A20 ranged from below the lake specific trigger concentrations to above, over all sample years (i.e., 2015 through 2019).

There was evidence from the limnology (**Section 5.2**), water chemistry (**Section 5.3**), and phytoplankton (**Section 5.4**) results that the south basin of Whale Tail Lake and Mammoth Lake have been impacted by mine activities. There is no evidence in 2019 that these impacts led to changes in sediment chemistry. To coincide with the EEM cycle, the 2020 CREMP program includes a full coring program that will provide better resolution of surficial sediments.

Hydrocarbon concentrations (**Appendix C2**) were less than the detection limits for most analytes measured in the 2019 composite samples. Analytes that had detectable concentrations did not have ISQG or PEL screening values. Elevated detection limits were reported for a number of analytes due to naturally high moisture content in the sediments. In most cases, the lowest reported detection limit was below the ISQG; however, WTS, MAM, A20, and INUG had detection limits for acenaphthene, acenaphthylene, and dibenz(a,h)anthracene that were greater than their respective ISQGs (these results are similar to 2018). The DLs were below the PEL concentration in all instances. High moisture content has periodically resulted in elevated reporting limits for hydrocarbons in the baseline Whale Tail CREMP and annual Meadowbank CREMP.

In summary, sediment chemistry results for 2019 were generally consistent with previous years and showed no indications of construction-related changes. Sediment coring is planned for 2020. Potential increases in key sediment chemistry parameters relative to baseline conditions will be fully assessed using the sediment core chemistry data collected in the 2020 field program.

5.6 Benthos Community

5.6.1 General Observations

Benthos abundance can vary widely for a given lake on an annual basis, and multiple years of baseline data help define the normal range of variability in benthos abundance among the areas. Richness tends to be relatively stable year-over-year. While the relative proportions of various taxa may vary, the number of total taxa was consistent throughout the baseline period and start of construction. Abundance (organisms/m^2) and richness (# unique taxa) of benthic invertebrates is calculated for each replicate and study year. Abundance and richness of benthos during baseline were characteristic of depositional areas in northern lakes with low productivity and nutrient cycling. Insects, primarily chironomids in the subfamilies Chironominae and Tanypodinae, and fingernail clams (Sphaeriidae) were the dominant benthic invertebrate taxa in the Whale Tail study area lakes (Azimuth 2019).

5.6.2 Temporal and Spatial Trends

The methods and approaches to assessing benthic invertebrate (benthos) community metrics described for the Meadowbank CREMP apply for the Whale Tail Program. Changes in benthos total abundance and richness were evaluated in 2019 using the same BACI study design outlined in **Section 2.4.3**. Dike construction started on July 27, 2018, approximately three weeks prior to benthos sampling in the area. While changes in sediment quality or benthic invertebrates at WTS as a result of dike construction were considered unlikely, the area designation was changed from *control* to *impact* in 2018 due to the proximity to construction activities. In contrast, MAM was considered to have changed to *impact* after the 2018 benthos sampling (i.e., thus providing an extra annual event in the baseline period; this decision was supported by an assessment of water quality results from construction monitoring). The remaining Whale Tail area study lakes were designated *impact* prior to the August 2019 benthic sampling; however, Nemo Lake remained in baseline conditions through July 2019.

Summary results for abundance and richness of major taxa in 2019 are presented in **Appendix E2,** along with supplemental plots showing abundance and richness at the major taxonomic group level since the start of baseline sampling. Plots of the key metrics (i.e., total abundance and richness) were used to assess spatial and temporal trends for the Whale Tail study area lakes (**Figure 5-83** to **Figure 5-88**). Key results for 2019 were as follows:

Abundance – Total benthos abundance is highly variable within the lakes and among years. In a very general sense, the normal range in mean total abundance across years among the seven study areas is roughly 2,000 to 5,000 organisms/m^2 (**Table 5-9**); however, the range of abundance between replicates is highly variable. For example, abundance at Lake A20 in 2019 ranged from a low of 1,109 organisms/m^2 in Rep 1 to 11,130 organisms/m^2 in Rep 3. Estimates of total abundance at the high-end of this range were common throughout the baseline phase, but only a few samples had fewer than 1,000 organisms/m^2. In 2019, no replicate sample at any area was less than 1,000 organisms/m^2. Compared to the reference areas INUG and PDL, the Whale Tail study area lakes appear to be more productive and variable—three out of five PDL replicates were below 1,000 organisms/m^2 and only one replicate in INUG exceeded 2,000 organisms/m^2 in 2019.

Benthos abundance reported in the 2019 samples was within the range reported during the baseline period for WTS, A20, A76 and DS1. Both INUG and PDL were also within the range of baseline for the period of 2015 through 2019, but were generally lower than they were in 2015 through 2018 (**Table 5-9**). Thus, the *expected* change from a BACI context, where results are assessed relative to baseline/reference conditions, was a corresponding decrease at the other sampling areas. So, even if abundance was the same at an area, the BACI interaction term would show an increase because the reference area decreased. We refer to those cases as *apparent* increases or changes. Abundance at NEM and MAM was higher in 2019 than in previous years (**Figure 5-83**), although none of the BACI results (MAM 135% increase; NEM 155% increase) were significant (**Table 5-10**). Note that the BACI is run as a one-tailed test, to increase statistical power for detecting decreases in abundance (**Section 2.4.3**).

Nemo Lake was designated as an *impact* area in July 2019 coinciding with the authorized discharge of water to the tundra south of the lake. Benthos data from NEM was excluded from the BACI analysis because of the limited duration that NEM was in the *after* period. If water and sediment chemistry data from NEM indicate conditions have changed relative to baseline, formal BACI analysis of the NEM benthos data will be completed in the 2020 interpretive report.

As noted above, interpreting the total abundance BACI analysis can be challenging when there is an increase or decline (as see here) at the reference areas relative to the test areas (e.g., as seen at INUG in **Figure 5-83**)[37]. One of the BACI assumptions is that variability at the reference areas is due to regional factors that should affect all sampling areas; our experience is that random area-year variability exists that can affect interpretation of BACI results. For example, the time series plot for total abundance provided in **Figure 5-83** indicates that the mean abundance for WTS decreased between 2018 and 2019; however, the BACI analysis indicated that the effect size for WTS was positive (48%) because of the *expected* changes within a BACI framework. Looking at the area-specific temporal trends in addition to the BACI can help to put the results into context. Overall, none of the BACI results were statistically significant and none of the observed changes were attributed to mining activities. That said, continued monitoring should help determine the true nature of the observed spatial-temporal differences in abundance.

Taxa Richness – The same taxa observed at the Meadowbank project lakes were documented during the baseline period for the Whale Tail study area lakes. Unlike abundance, taxa richness was less variable within and among areas on an annual and inter-annual basis (**Figure 5-86**). Taxa richness at the lowest practical level is typically between 10 and 15 taxa in the Whale Tail study area lakes, with insects dominating in both number of taxa (**Figure 5-87**) and proportion of the total sample abundance (**Figure 5-88**). Molluscs were the next most dominant taxonomic group in terms of the number species and total abundance.

Taxa richness at WTS appeared to decline from a high of 13–20 taxa in 2018 to 10–15 taxa in 2019. Replicate 5 in WTS had relatively low total abundance (1,239 organisms/m^2) and 10 taxa; however, the other replicates were within the range of baseline. To limit potential spatial

[37] While mean abundance has decreased slightly in INUG, the abundance appears to be fairly stable and within the range of baseline conditions.

heterogeneity, sample crews attempt to revisit replicate coordinates in subsequent benthos sample events. Benthos sampling targets a depth range of 6.5 to 9.5 m, but with completion of the Whale Tail dike, the total water depth in the benthos study area increased over 2 m from an average of 7.7 m in 2018 to over 10 m in 2019. Altered flow and increased water levels in the south basin of Whale Tail have the potential to favor taxa that are more well adapted to deeper conditions. Notwithstanding the potential for the impoundment to alter the structure of the benthos community, the 2019 results for taxa richness in WTS appear to be broadly within the range reported during baseline monitoring. The apparent differences between 2018 and 2019 taxa numbers shown in **Figure 5-86** are likely related to between-year variability and the natural heterogeneity between replicates. Apart from WTS, which showed a slight decrease in richness relative to baseline/reference conditions, all the other sampling areas had slight increases (**Table** 5-11); none of these BACI results were statistically significant. Overall, these results indicate that mining-activities conducted to date have not altered the structure or function of the benthic invertebrate community in the Whale Tail study lakes.

5.7 Whale Tail Tables and Figures

The tables and figures for the Whale Tail study areas provided in this section follow, except for the large tabulated datasets and figures for parameters that are not included in the detailed analysis (see in-text references to appropriate Appendices). Subsections are provided for each of the CREMP components (e.g., limnology, water chemistry, phytoplankton, sediment chemistry, and benthos).

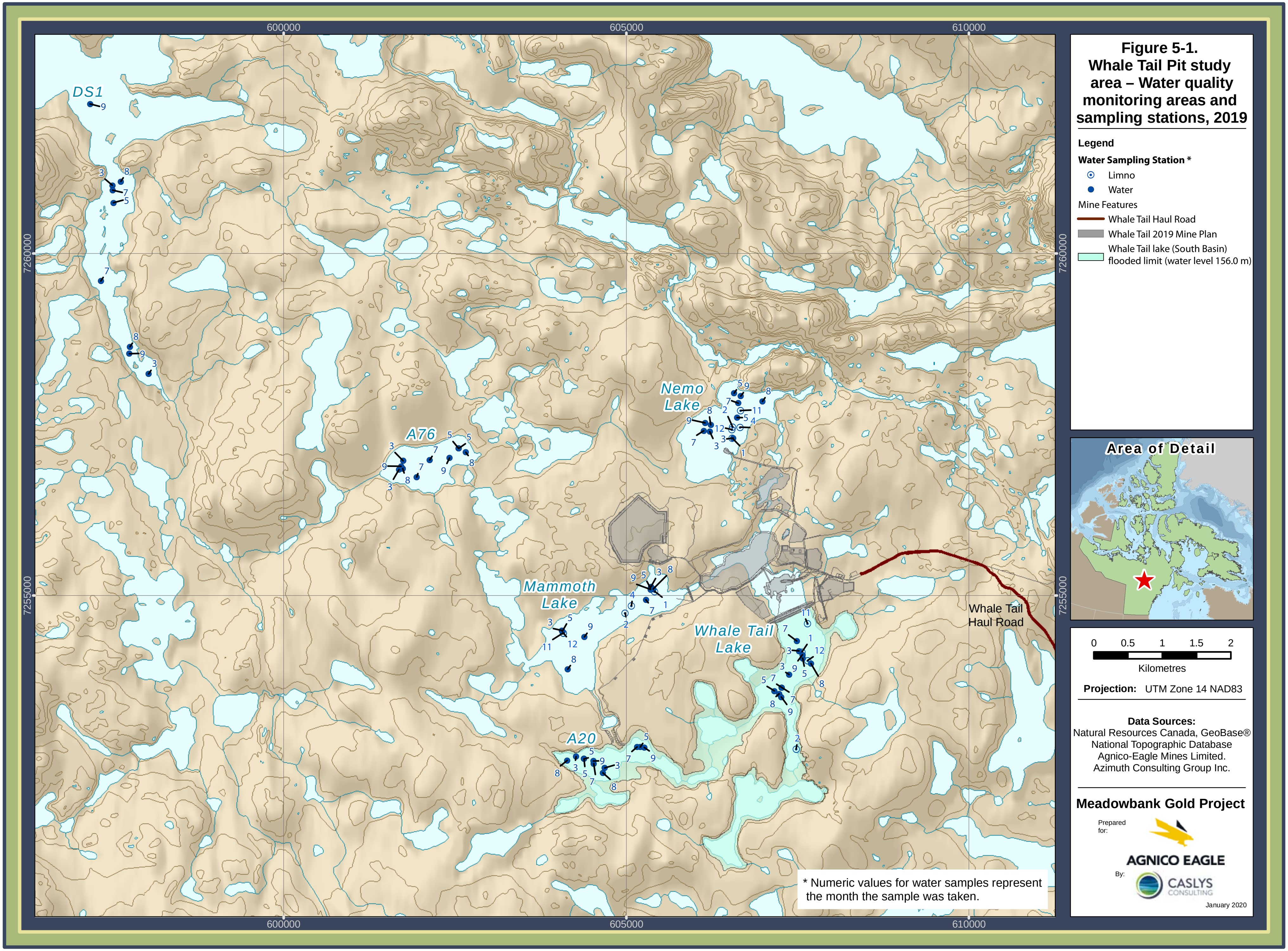


Figure 5-1. Whale Tail Pit study area – Water quality monitoring areas and sampling stations, 2019

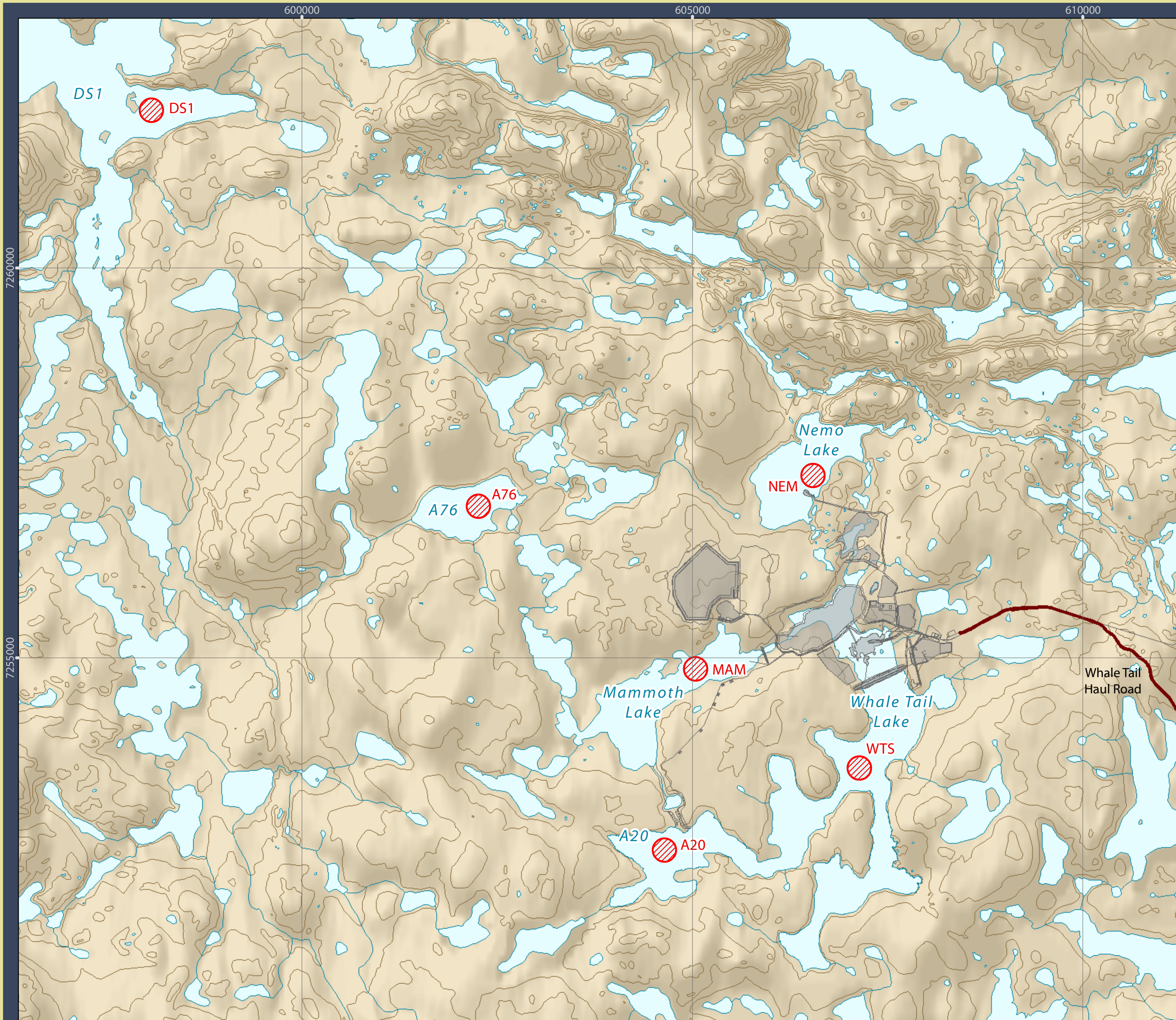


Figure 5-2. Whale Tail Pit study area – Sediment and benthic invertebrate areas, 2019

Legend

Sediment/Benthic Invertebrate Quality Sampling Station

Mine Features

Whale Tail Haul Road

Whale Tail 2019 Mine Plan

Projection: UTM Zone 14 NAD83

Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.

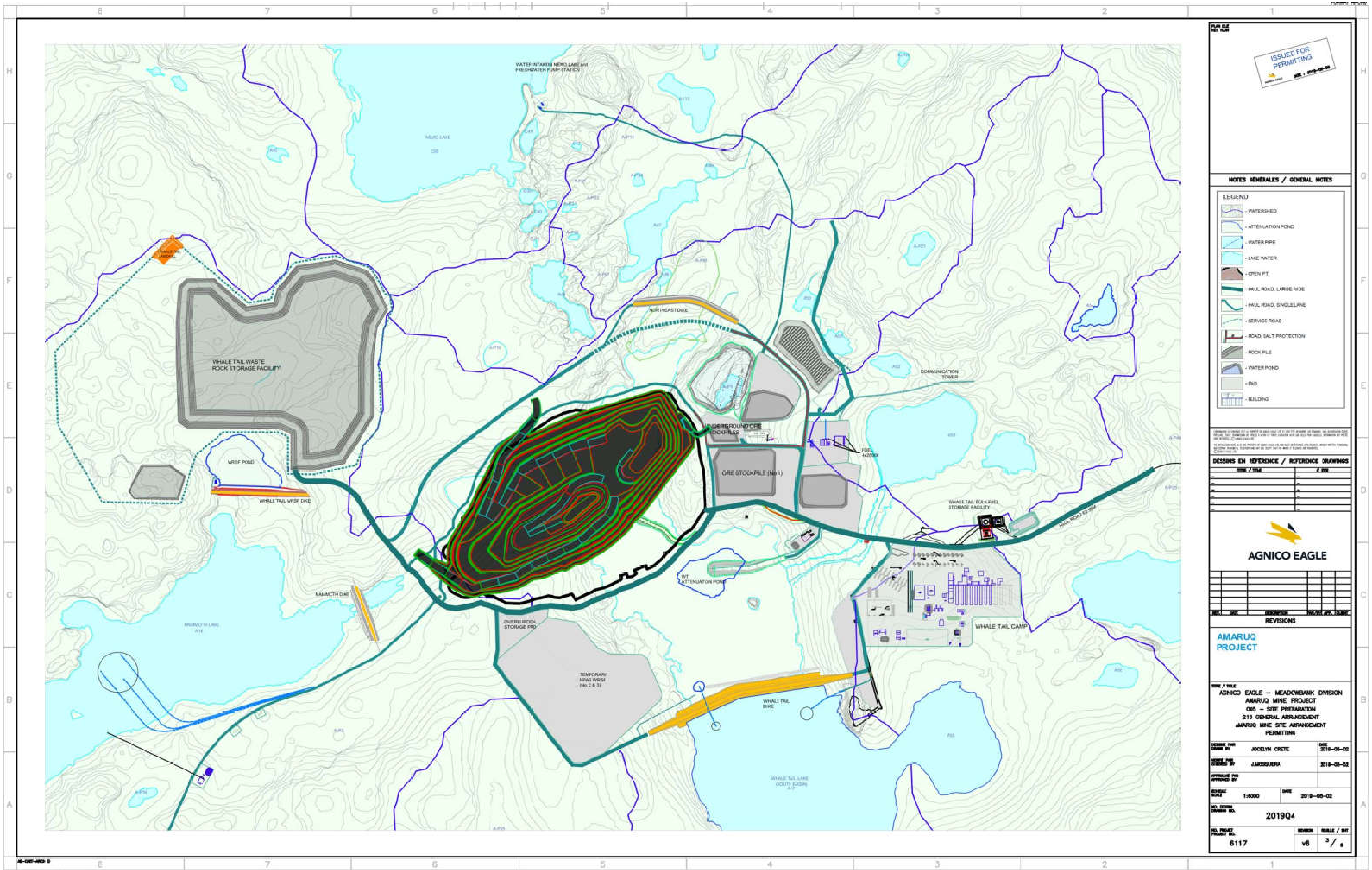
Meadowbank Gold Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

January 2020

Figure 5-3. Amaruq mine plan showing the location of the Whale Tail Dike and other site infrastructure.



Limnology Tables and Figures

Figure 5-4. Mean monthly field-measured temperature (°C) at 3 m depth from 2014 – 2019, Whale Tail study area lakes.

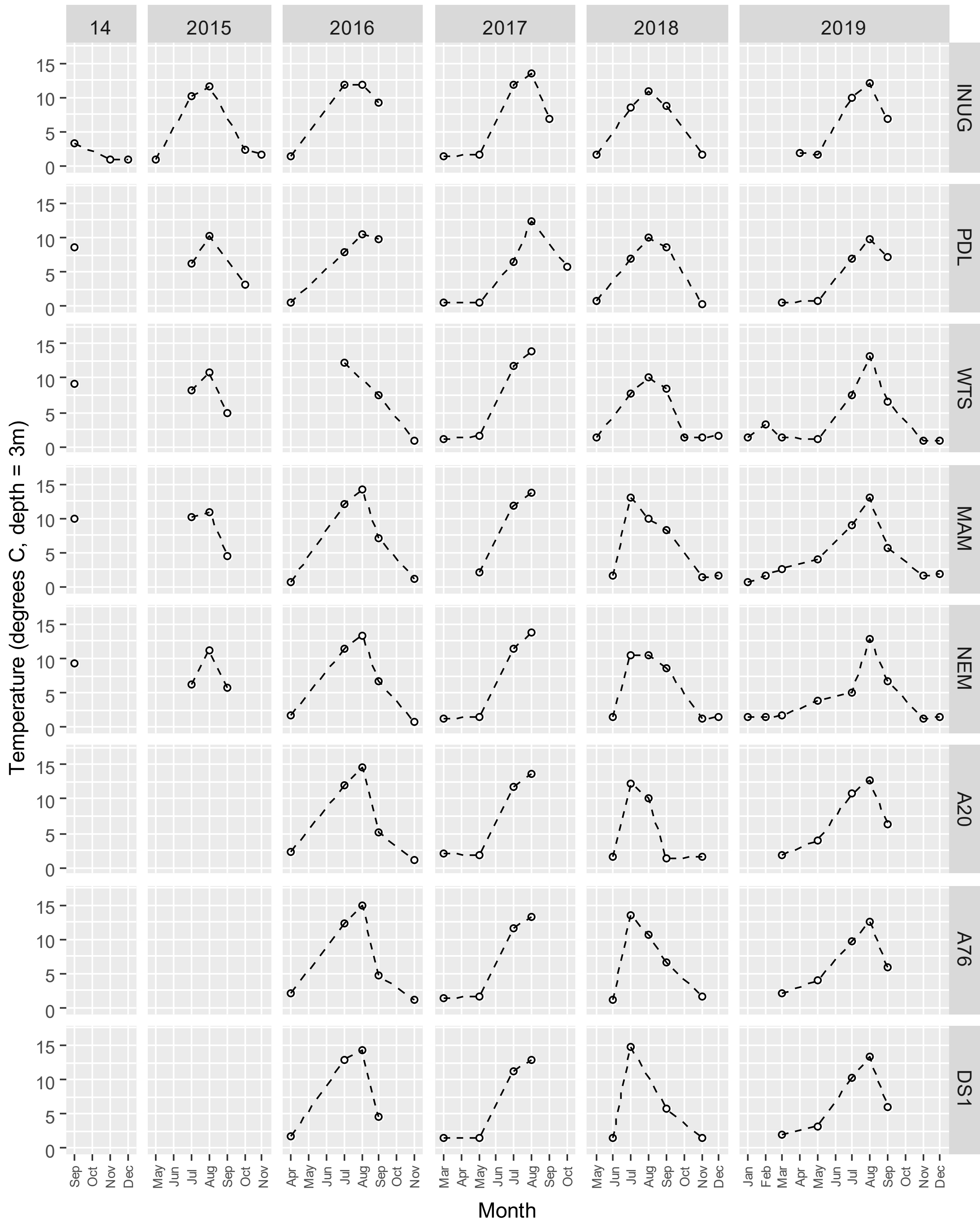


Figure 5-5. Whale Tail – Field-measured temperature, conductivity, and dissolved oxygen profiles, January 2019.

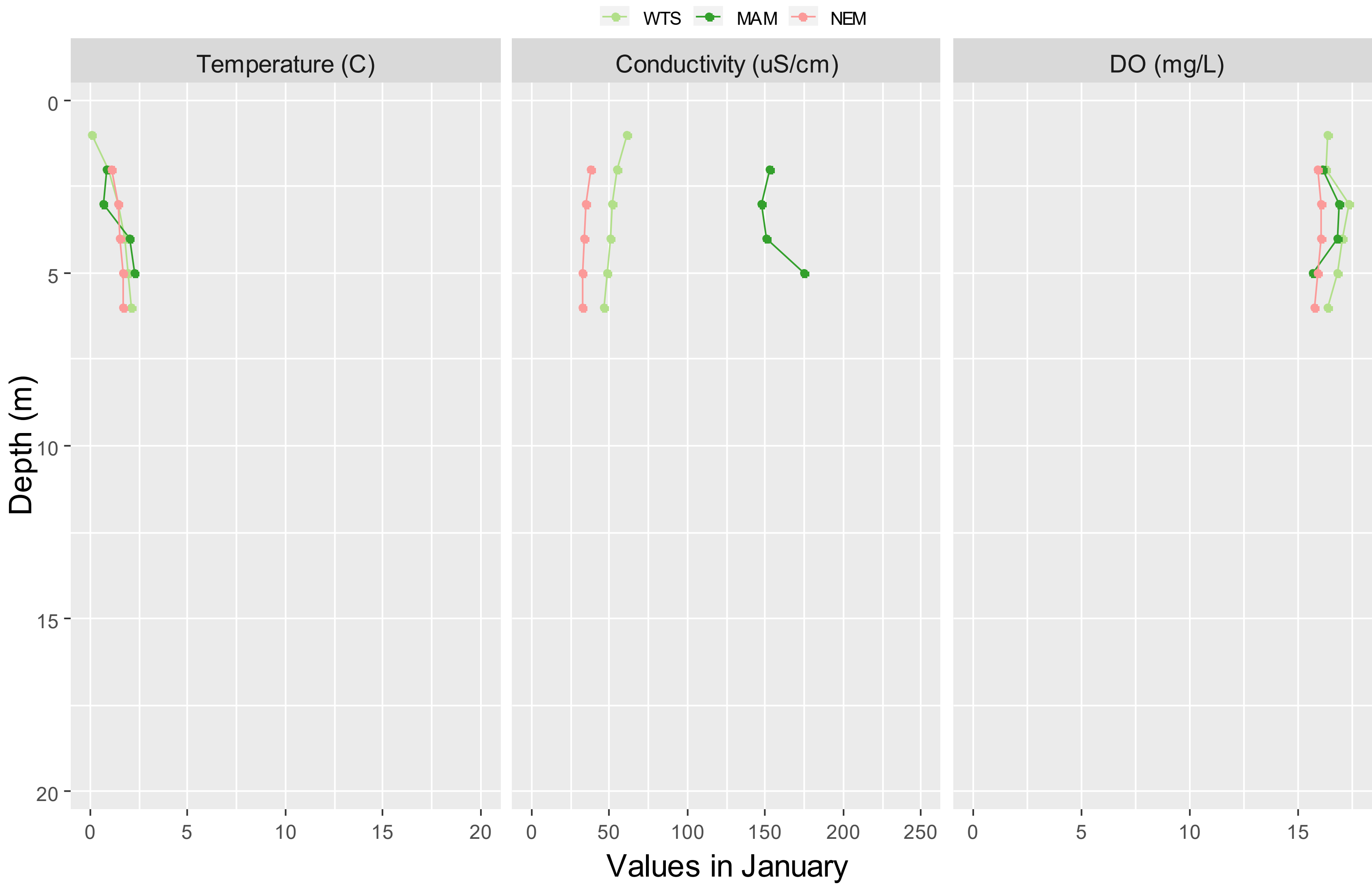


Figure 5-6. Whale Tail – Field-measured temperature, conductivity, and dissolved oxygen profiles, February 2019.

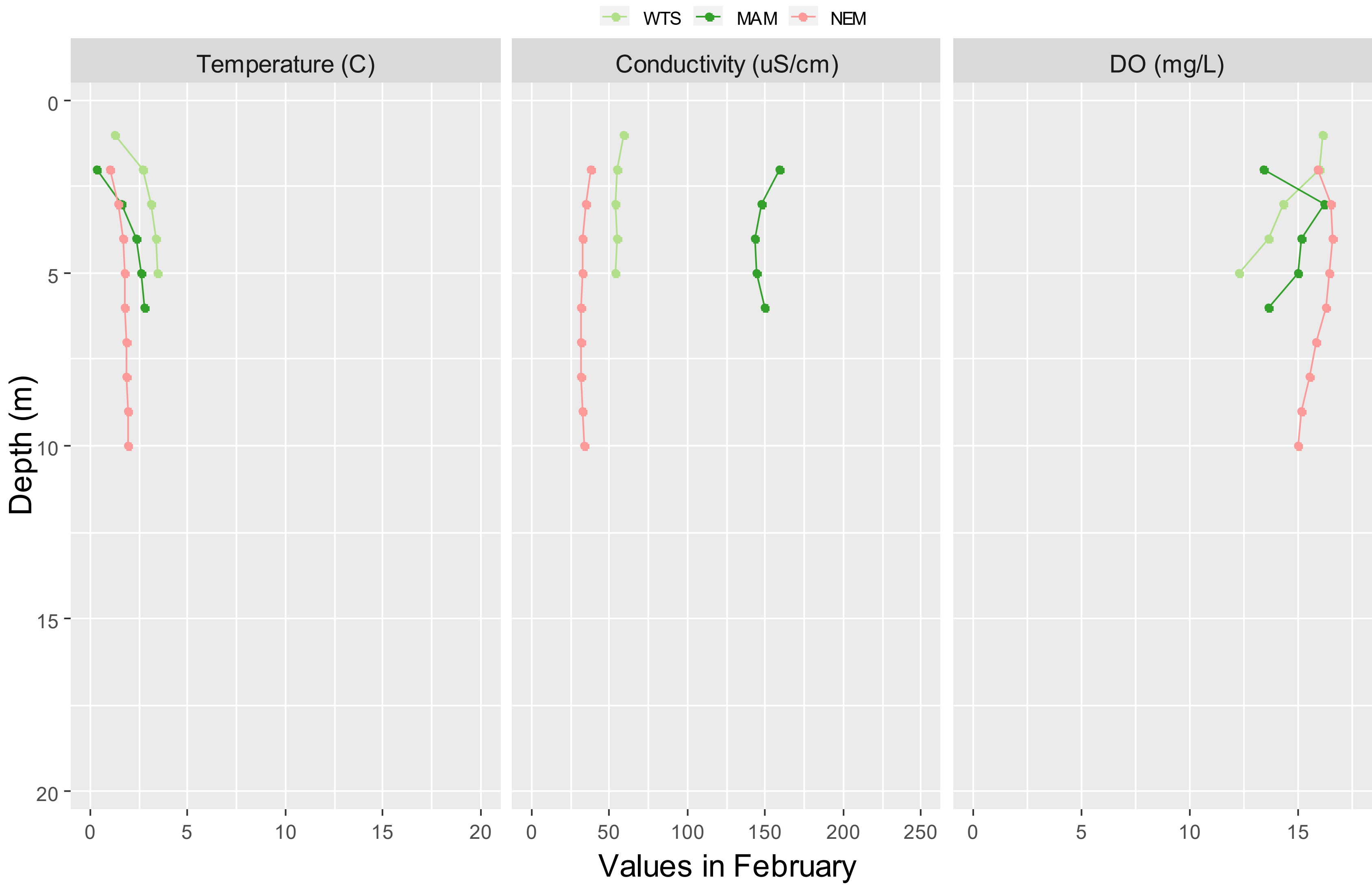


Figure 5-7. Whale Tail – Field-measured temperature, conductivity, and dissolved oxygen profiles, March 2019.

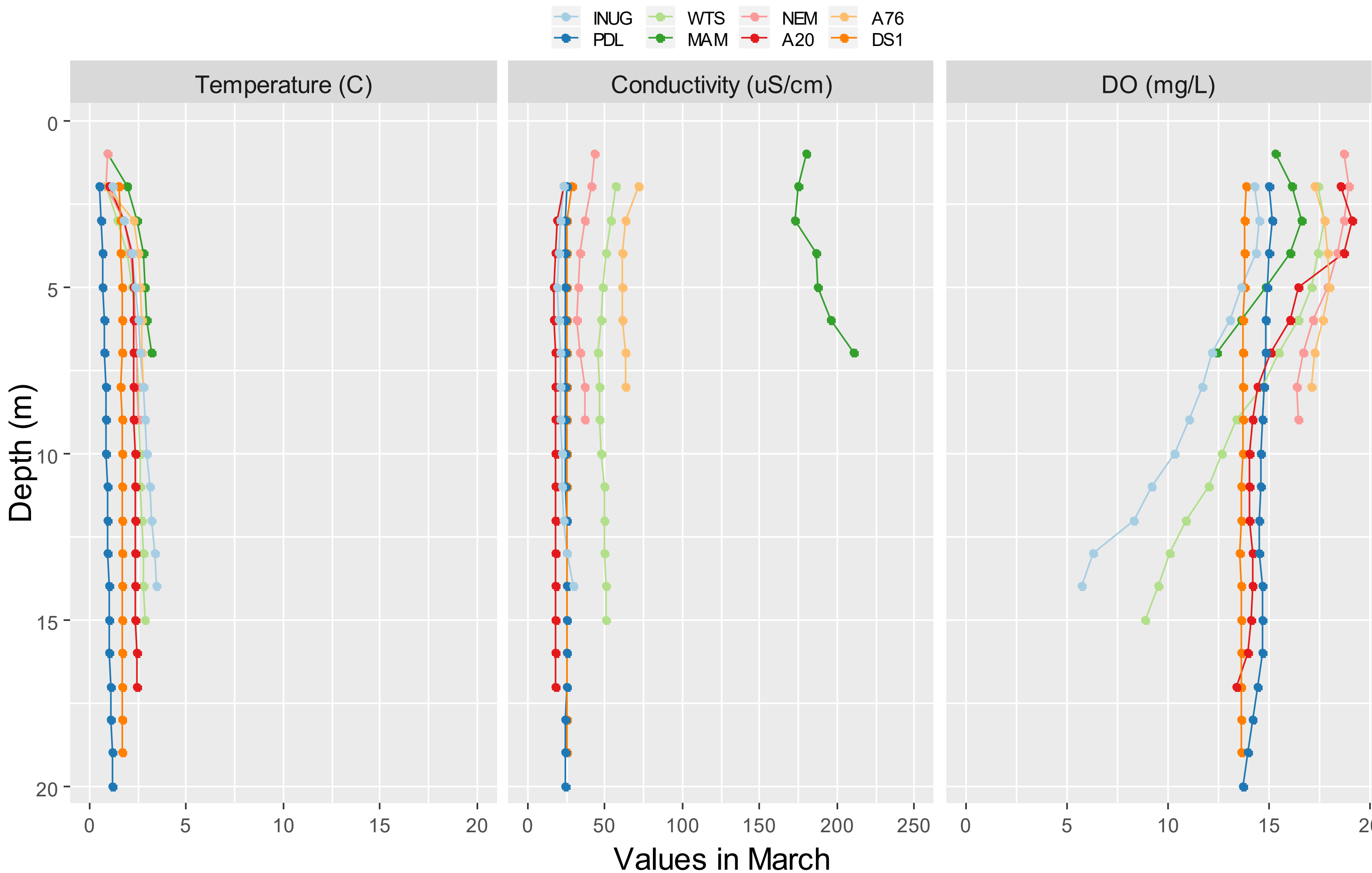


Figure 5-8. Whale Tail – Field-measured temperature, conductivity, and dissolved oxygen profiles, April 2019.

Note: Limnology profiling was not completed at Whale Tail Lake South Basin (WTS) in April due to safety concerns.

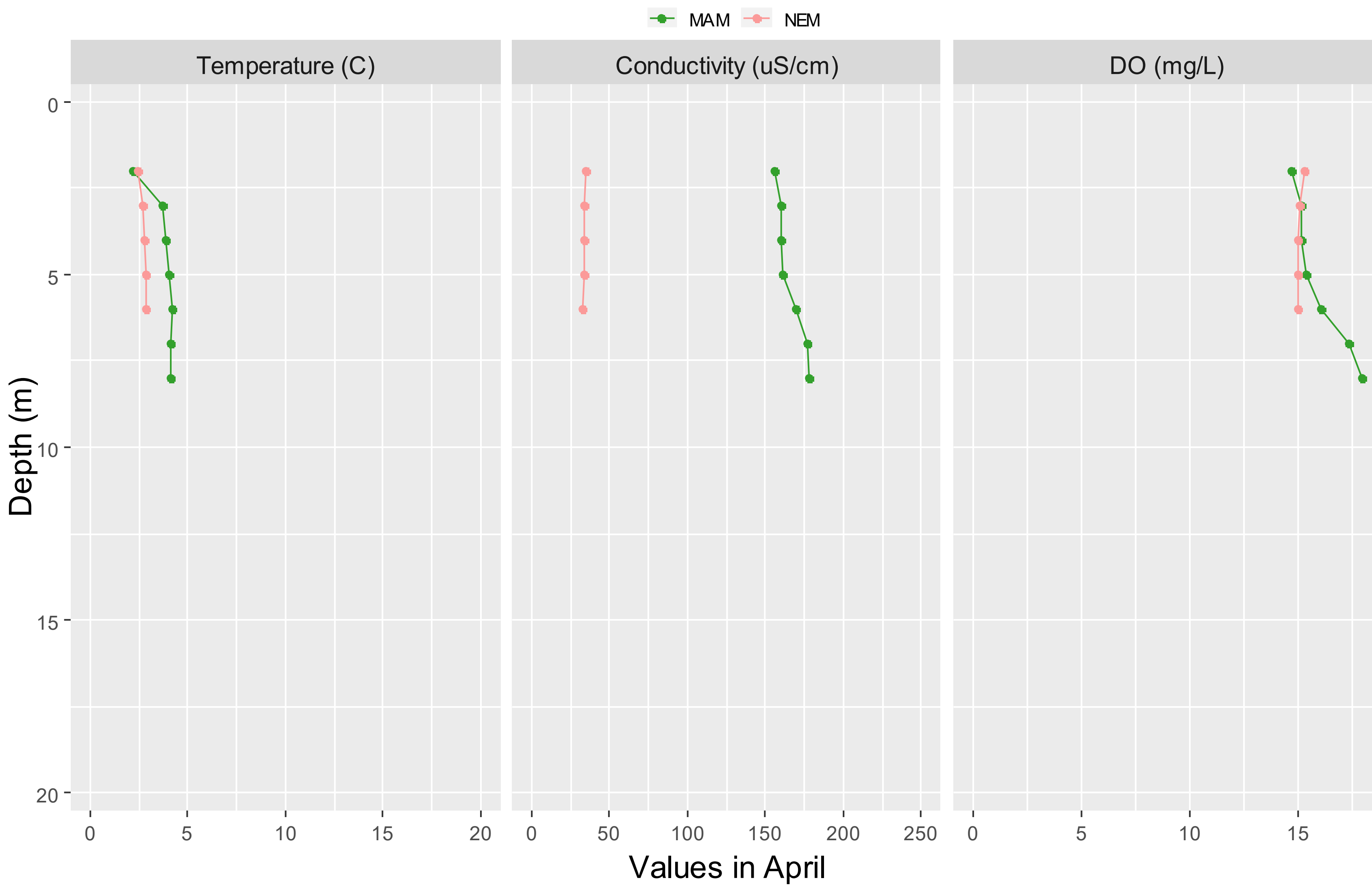


Figure 5-9. Whale Tail – Field-measured temperature, conductivity, and dissolved oxygen profiles, May 2019.

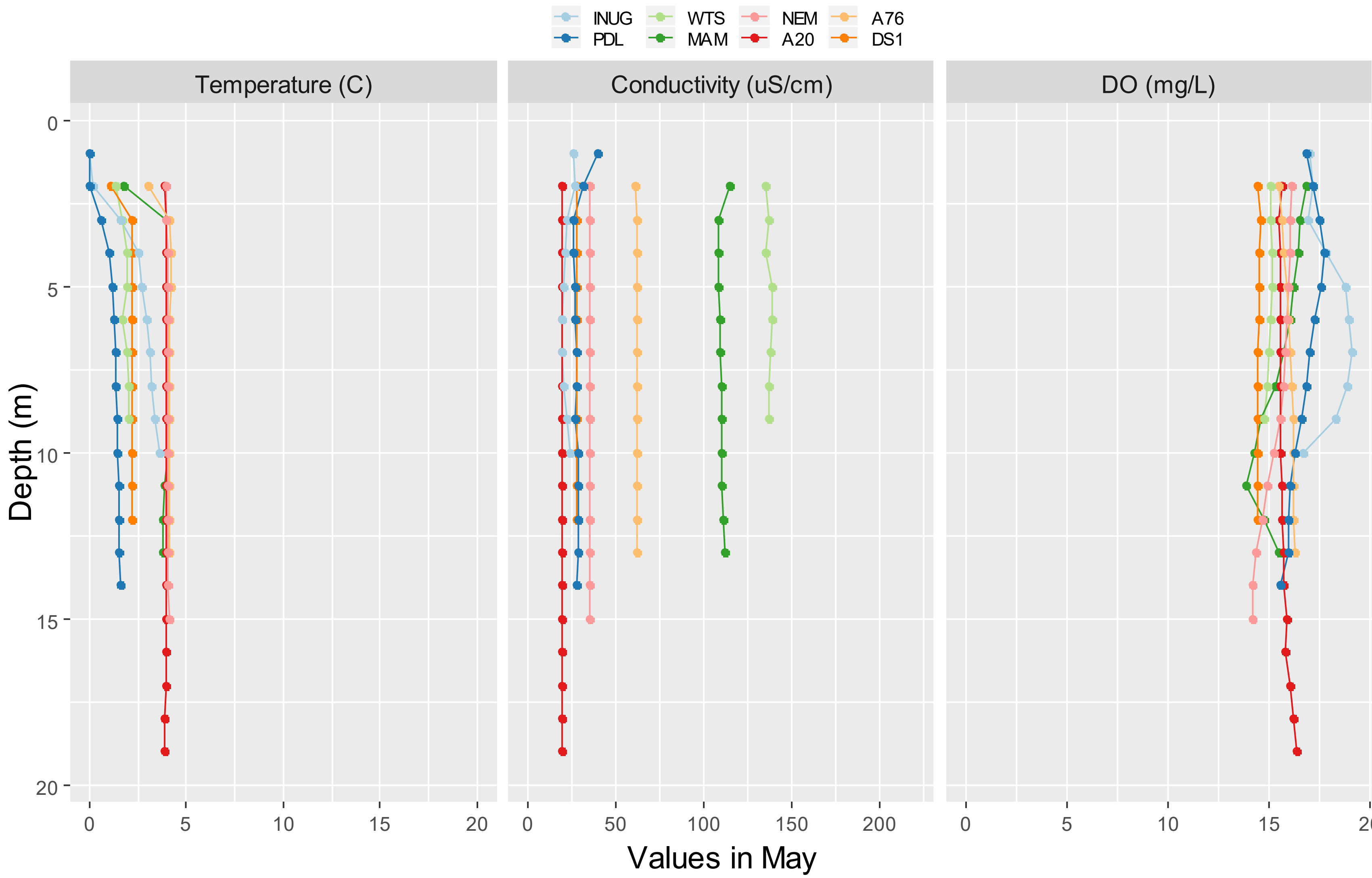


Figure 5-10. Whale Tail – Field-measured temperature, conductivity, and dissolved oxygen profiles, July 2019.

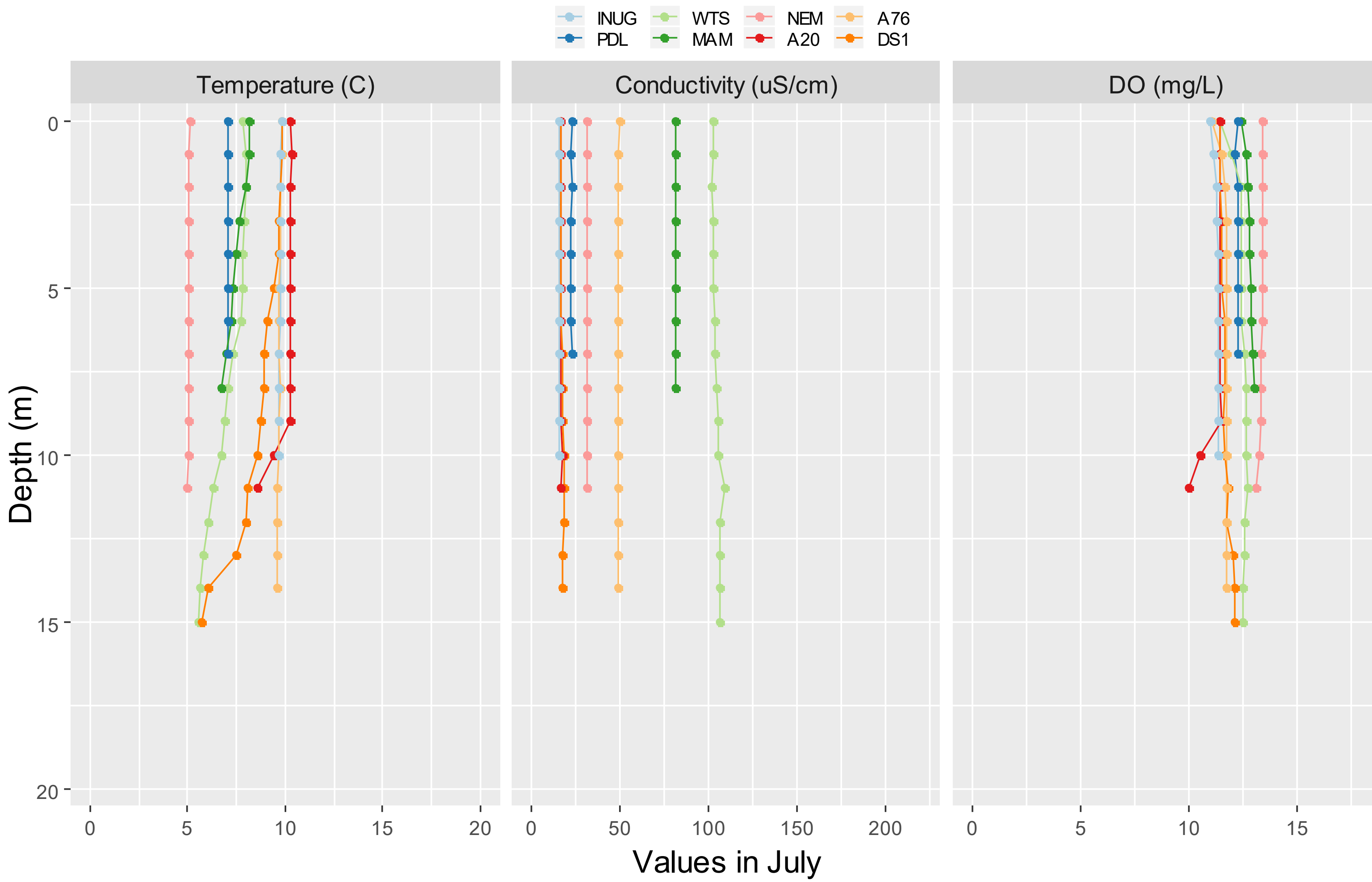


Figure 5-11. Whale Tail – Field-measured temperature, conductivity, and dissolved oxygen profiles, August 2019.

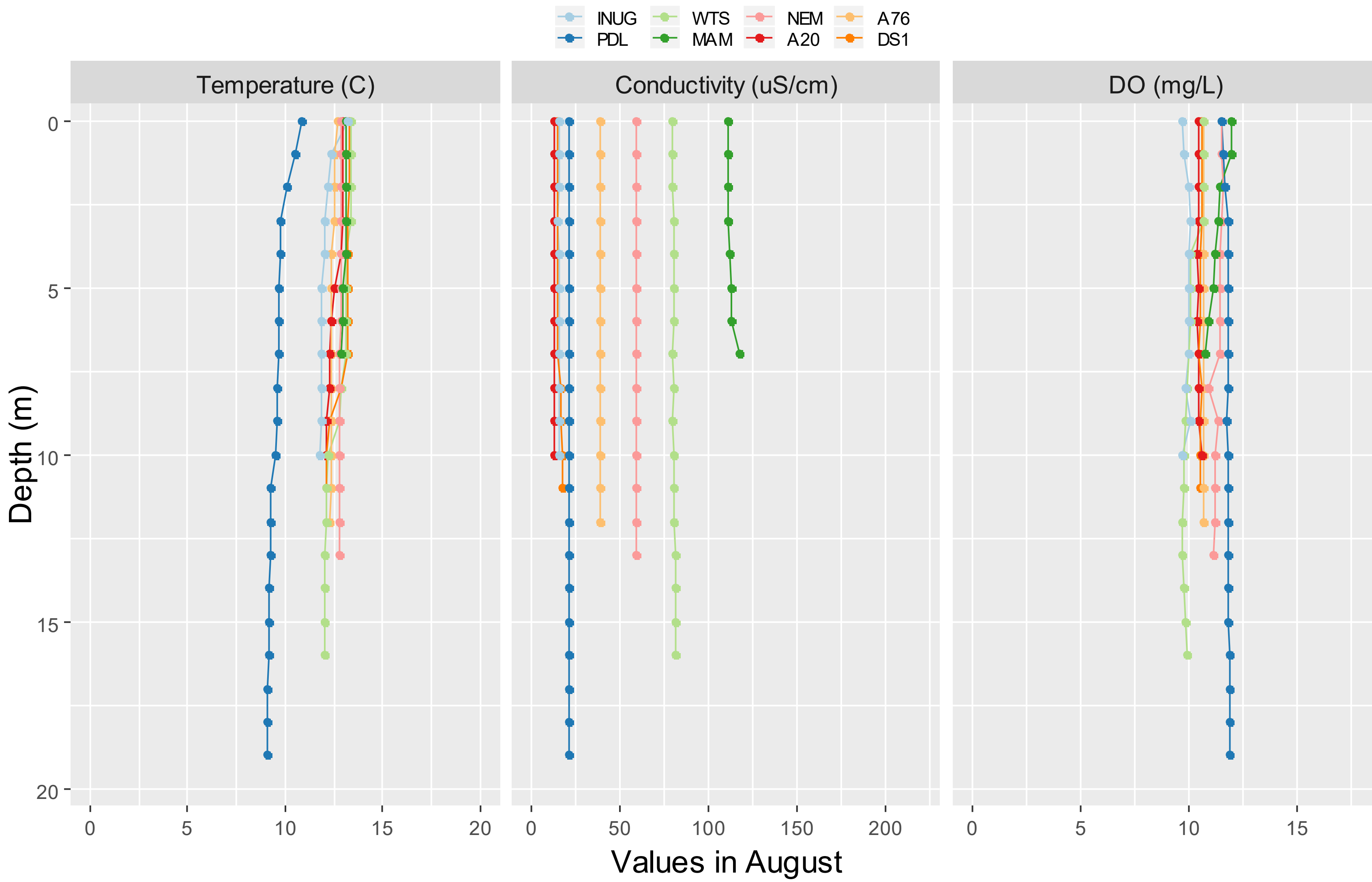


Figure 5-12. Whale Tail – Field-measured temperature, conductivity, and dissolved oxygen profiles, September 2019.

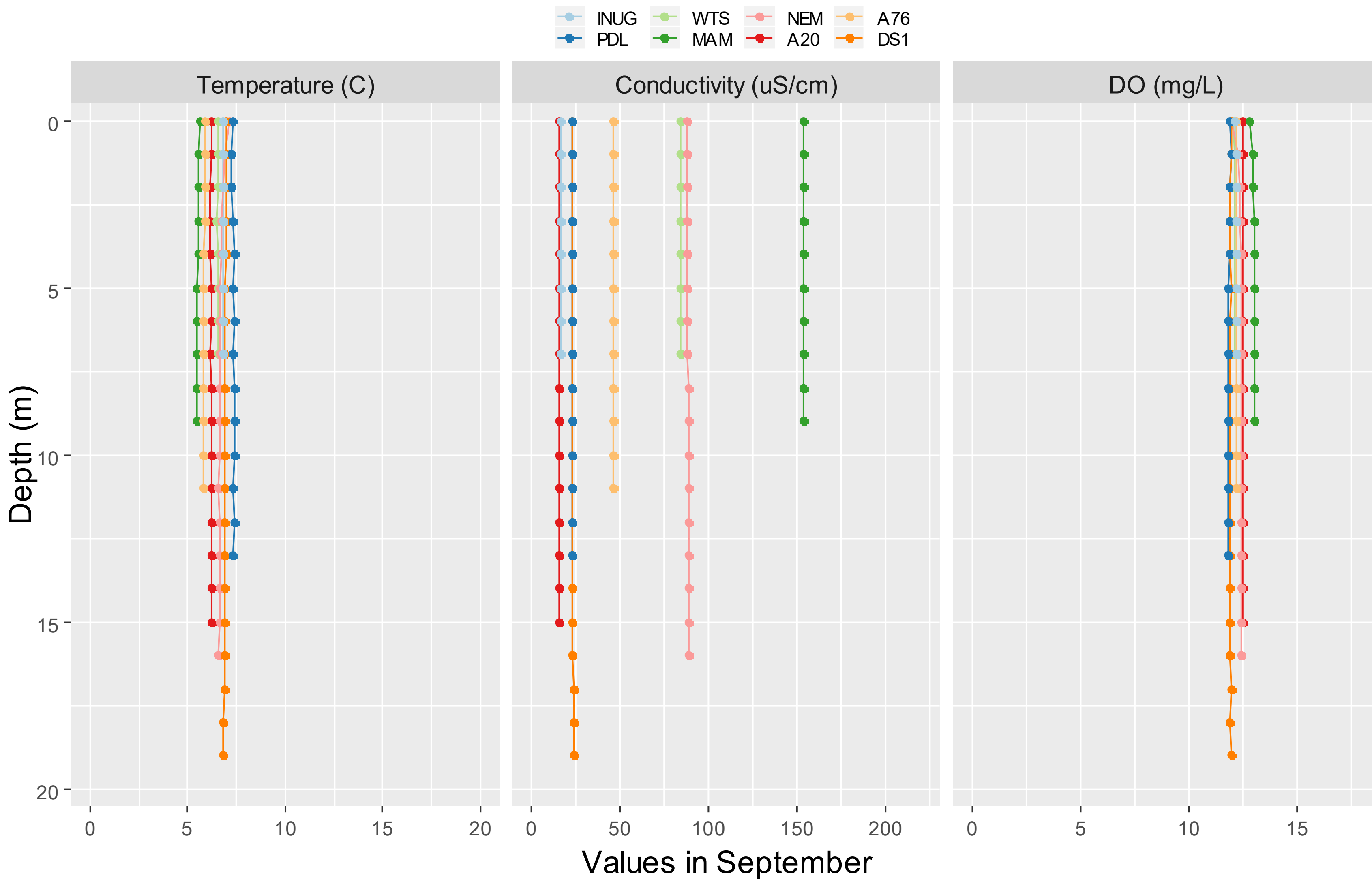


Figure 5-13. Whale Tail – Field-measured temperature, conductivity, and dissolved oxygen profiles, November 2019.

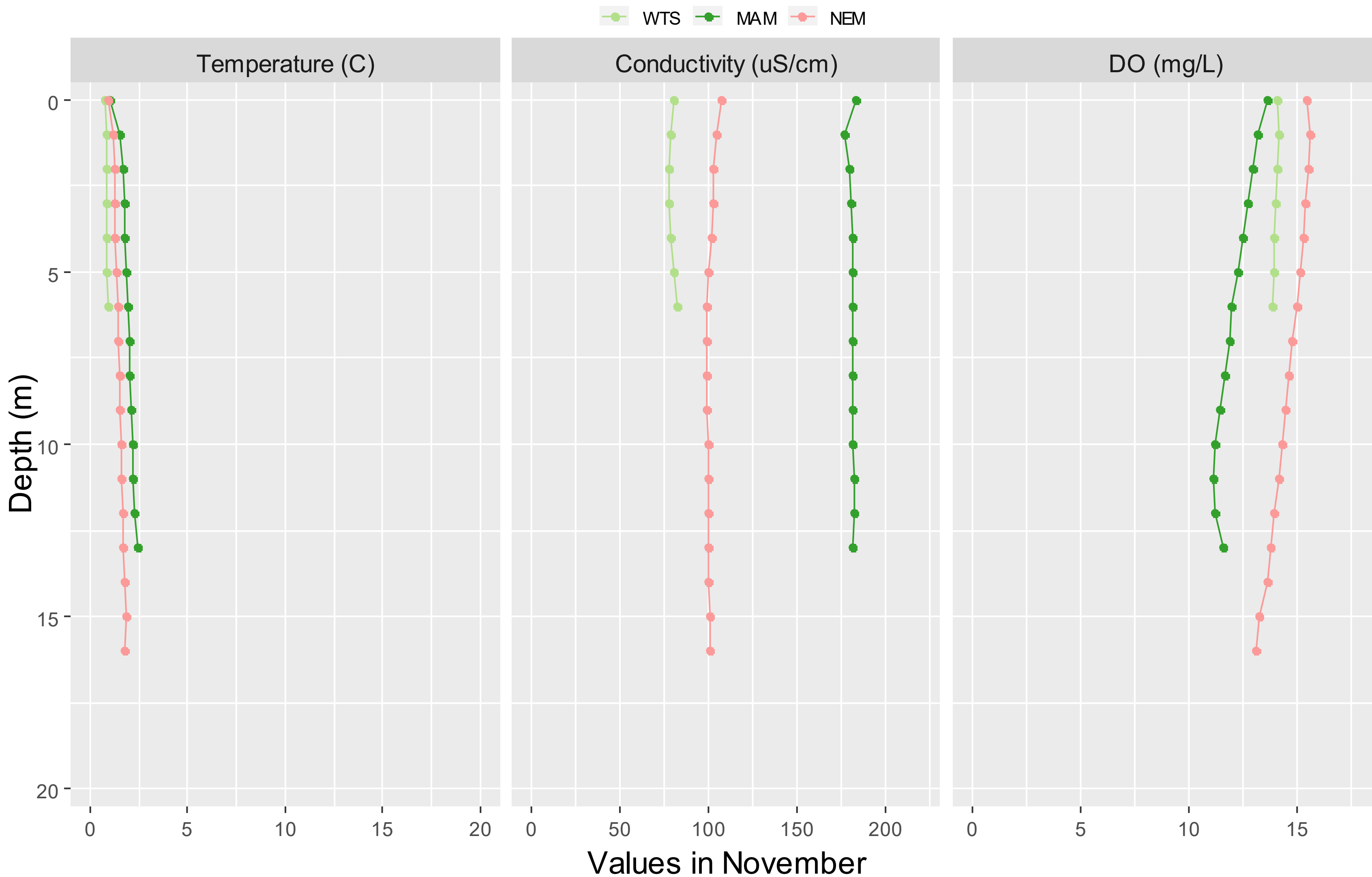
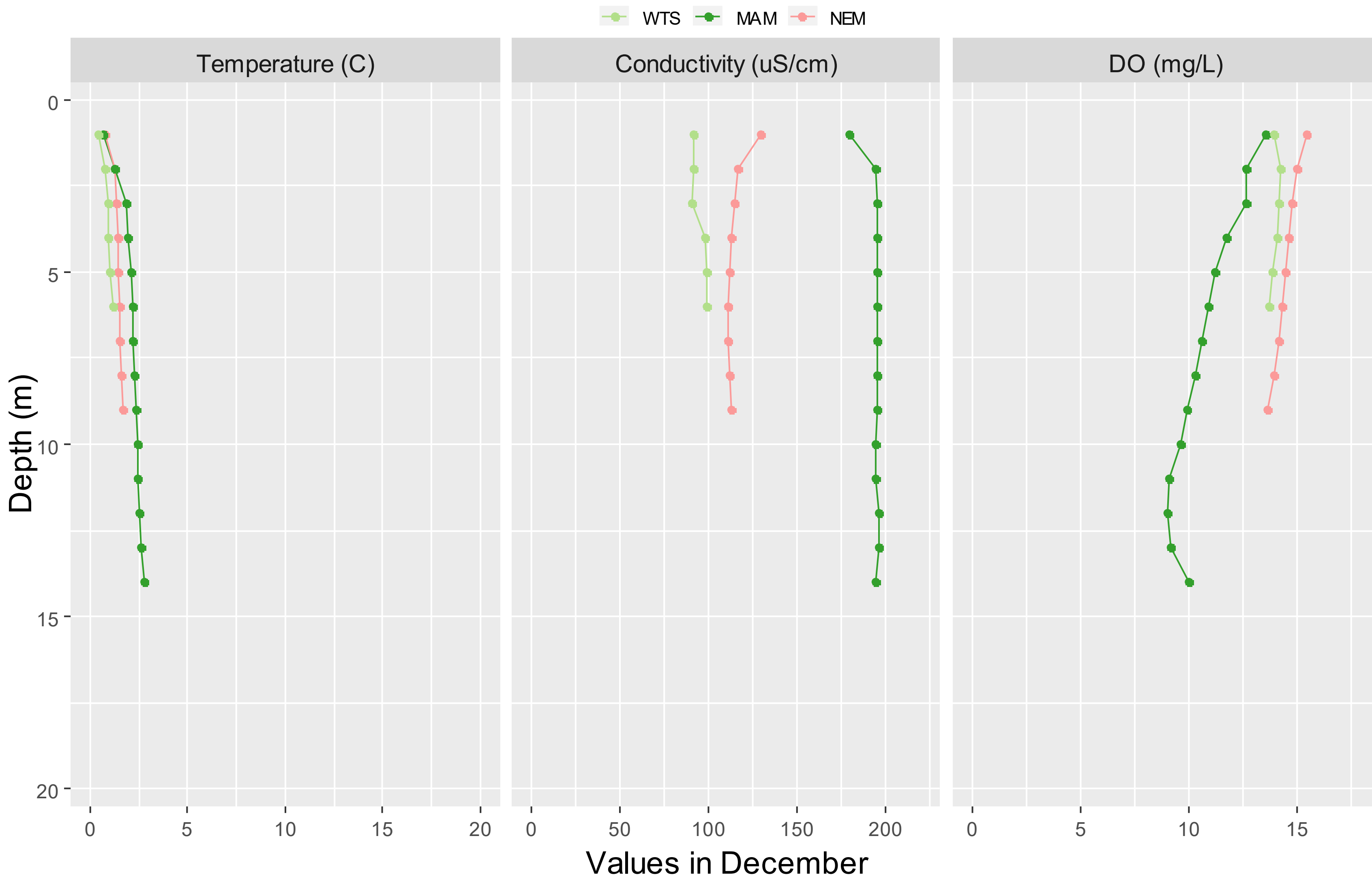


Figure 5-14. Whale Tail – Field-measured temperature, conductivity, and dissolved oxygen profiles, December 2019.



Water Chemistry Tables and Figures

Table 5-3. Screening process for water quality parameters, Whale Tail Pit monitoring areas, 2019.

CONVENTIONALS			
Screening Level	**1**	**2**	**3**
Screening Rule[1]	**>MDL ≥ 10% frequency**	**C-I > 0.1 frequency**	**Pattern = Activity**
Conductivity	Figure 5-16		
Hardness	Figure 5-17		
pH -Field	Figure 5-18		
pH -Lab	Figure 5-19		
TSS	Figure 5-20		
TDS	Figure 5-21		
B-Alkalinity	Figure 5-22		
C-Alkalinity*	No	No	No
T-Alkalinity	Figure 5-23		
Ammonia-N	Figure 5-24		
Chloride	Figure 5-25		
Fluoride	Figure 5-26		
Nitrate-N	Figure 5-27		
Nitrite-N	No	Figure 5-28	No
TKN	Figure 5-29		
T-phosphorous	Figure 5-30		
Ortho-phosphate*	No	No	No
Reactive silica	Figure 5-31		
Sulphate	Figure 5-32		
DOC	Figure 5-33		
TOC	Figure 5-34		
T-Cyanide*	No	No	No
Free Cyanide*	No	No	No

TOTAL METALS			
Screening Level	**1**	**2**	**3**
Screening Rule[1]	**>MDL ≥ 10% frequency**	**C-I > 0.1 frequency**	**Pattern = Activity**
Aluminum	Figure 5-35		
Antimony*	No	No	No
Arsenic	Figure 5-36		
Barium	Figure 5-37		
Beryllium*	No	No	No
Boron*	No	No	No
Cadmium*	No	No	No
Calcium	Figure 5-38		
Chromium	Figure 5-39		
Copper	Figure 5-40		
Iron	Figure 5-41		
Lead	Figure 5-42		
Lithium	Figure 5-43		
Magnesium	Figure 5-44		
Manganese	Figure 5-45		
Mercury*	No	No	No
Molybdenum	Figure 5-46		
Nickel	Figure 5-47		
Potassium	Figure 5-48		
Selenium*	No	No	No
Silicon	Figure 5-49		
Silver*	No	No	No
Sodium	Figure 5-50		
Strontium	Figure 5-51		
Thallium*	No	No	No
Tin*	No	No	No
Titanium	Figure 5-52		
Uranium	Figure 5-53		
Vanadium*	No	No	No
Zinc*	No	No	No

DISSOLVED METALS			
Screening Level	**1**	**2**	**3**
Screening Rule[1]	**>MDL ≥ 10% frequency**	**C-I > 0.1 frequency**	**Pattern = Activity**
Aluminum	Figure 5-54		
Antimony*	No	No	No
Arsenic	Figure 5-55		
Barium	Figure 5-56		
Beryllium*	No	No	No
Boron*	No	No	No
Cadmium*	No	No	No
Chromium	Figure 5-57		
Copper	Figure 5-58		
Iron	Figure 5-59		
Lead	Figure 5-60		
Lithium	Figure 5-61		
Manganese	Figure 5-62		
Mercury*	No	No	No
Molybdenum	Figure 5-63		
Nickel	Figure 5-64		
Selenium*	No	No	No
Silicon	Figure 5-65		
Silver*	No	No	No
Strontium	Figure 5-66		
Thallium*	No	No	No
Tin*	No	No	No
Titanium*	No	No	No
Uranium	Figure 5-67		
Vanadium*	No	No	No
Zinc	Figure 5-68		

Notes:
"*" indicates plots for these parameters are presented in **Appendix B2**.
1. See **Section 3.3** for information on the screening process for deciding which parameters are carried forward in the temporal and spatial trend assessment.

Table 5-4. Water quality variables at the Whale Tail Pit areas for which 2019 mean concentrations exceeded the trigger.

Parameter	Trigger	2019 Mean							
		INUG	PDL	WTS	MAM	A20	A76	DS1	NEM
		Ref	Ref	NF	NF	NF	MF	FF	NF
Ammonia (as N)	0.065	0.08457	-	-	-	-	-	-	-
TKN	0.17	0.2042	-	0.23	0.19	-	-	0.182	0.19
Total phosphorous	0.0045	-	-	0.0048	-	-	-	-	-
TOC	2.4	-	-	2.93	-	-	-	2.868	-
DOC	2.4	-	-	3.01	-	-	-	2.84	-
Total Alkalinity	9.6	-	-	9.6	-	-	-	-	-
Bicarbonate alkalinity	9.6	-	-	9.6	-	-	-	-	-
Conductivity	48.6	-	-	86.1	113	-	-	-	-
Hardness	17.4	-	-	30.0	40.7	-	-	-	-
Calcium	4.6	-	-	9.50	12.7	-	4.69	-	4.69
Potassium	0.84	-	-	1.65	1.91	-	0.85	-	0.84
Magnesium	1.41	-	-	1.76	2.48	-	1.44	-	-
Sodium	0.97	-	-	1.22	1.41	-	-	1.00	-
TDS	38.5	-	-	73.7	87.1	-	-	-	-
Lithium (Total)	0.002	-	-	0.0036	0.0037	-	-	-	-
Lithium (Dissolved)	0.002	-	-	0.0037	0.0036	-	-	-	-
Titanium (Total)	0.0006	-	-	0.00085	-	-	-	-	-
Zinc (Dissolved)	0.0023	-	-	-	-	-	-	0.0047	-

Notes:
"-" indicates mean annual concentration was < the trigger value.
Reported mean values are all in units of mg/L with the exception of conductivity (µS/cm).

Table 5-5. Results of BACI tests for selected water variables at the Whale Tail Pit areas in 2019.

									Proportional change		
Parameter	**Test Area**	**n(B)**	**n(A)**	**Estimate**	**SE**	**F**	**DF**	**P-value[1]**	**exp(Est)**	**LCI**	**UCI**
TKN	WTS	13	5	0.18	0.20	0.79	16	0.19	1.19	0.78	1.83
	MAM	14	5	0.04	0.21	0.037	17	0.43	1.04	0.67	1.61
	DS1	13	5	-0.02	0.20	0.011	16	0.54	0.98	0.64	1.50
Total phosphorous	WTS	14	5	0.49	0.25	3.90	17	**0.032**	1.63	0.97	2.73
TOC	WTS	14	5	0.20	0.09	4.47	17	**0.025**	1.22	1.00	1.48
	DS1	13	5	0.14	0.08	3.56	16	**0.039**	1.15	0.98	1.35
DOC	WTS	14	5	0.20	0.09	5.16	17	**0.018**	1.22	1.01	1.48
	DS1	13	5	0.16	0.09	2.76	16	0.058	1.17	0.96	1.43
Total alkalinity	WTS	13	5	0.56	0.09	38.6	16	**< 0.001**	1.76	1.45	2.13
Conductivity	WTS	14	5	0.97	0.18	28.8	17	**< 0.001**	2.65	1.81	3.89
	MAM	15	5	0.95	0.16	37.0	18	**< 0.001**	2.60	1.87	3.61
Hardness	WTS	14	5	0.93	0.17	29.0	17	**< 0.001**	2.52	1.76	3.63
	MAM	15	5	0.91	0.15	36.7	18	**< 0.001**	2.49	1.82	3.42
Calcium	WTS	14	5	1.07	0.21	26.0	17	**< 0.001**	2.93	1.88	4.57
	MAM	15	5	1.03	0.18	32.8	18	**< 0.001**	2.79	1.92	4.08
	A76	13	5	0.22	0.08	7.38	16	**0.0076**	1.25	1.05	1.48
Potassium	WTS	14	5	1.15	0.15	56.1	17	**< 0.001**	3.16	2.29	4.37
	MAM	15	5	0.91	0.13	47.1	18	**< 0.001**	2.48	1.88	3.27
	A76	13	5	0.11	0.07	2.24	16	0.077	1.11	0.96	1.29
Magnesium	WTS	14	5	0.64	0.12	26.9	17	**< 0.001**	1.89	1.46	2.45
	MAM	15	5	0.74	0.12	36.4	18	**< 0.001**	2.09	1.62	2.70
	A76	13	5	0.20	0.07	7.38	16	**0.0076**	1.22	1.05	1.44
Sodium	WTS	14	5	0.57	0.09	39.1	17	**< 0.001**	1.77	1.46	2.14
	MAM	15	5	0.64	0.10	38.4	18	**< 0.001**	1.90	1.53	2.36
	DS1	13	5	0.03	0.11	0.08	16	0.39	1.03	0.82	1.31

									Proportional change		
Parameter	**Test Area**	**n(B)**	**n(A)**	**Estimate**	**SE**	**F**	**DF**	**P-value[1]**	**exp(Est)**	**LCI**	**UCI**
TDS	WTS	13	5	1.04	0.21	24.6	16	**< 0.001**	2.83	1.81	4.41
	MAM	14	5	0.96	0.20	23.0	17	**< 0.001**	2.61	1.71	3.99
Lithium (Total)	WTS	14	5	1.06	0.17	40.4	17	**< 0.001**	2.88	2.03	4.10
	MAM	15	5	0.96	0.17	30.9	18	**< 0.001**	2.62	1.82	3.77
Lithium (Dissolved)	WTS	14	5	1.16	0.14	65.1	17	**< 0.001**	3.19	2.36	4.32
	MAM	15	5	0.99	0.16	39.2	18	**< 0.001**	2.69	1.93	3.75
Titanium (Total)	WTS	14	5	0.74	0.21	12.8	17	**0.0012**	2.09	1.35	3.24
Zinc (Dissolved)	DS1	13	5	0.36	0.27	1.68	16	0.11	1.43	0.80	2.56

Notes:
1. Bolded values are p-values < 0.05
Test area = area compared to control (INUG)
n(B) = number of paired months in the "before" period
n(A) = number of paired months in the "after" period (i.e., in 2019)
Estimate = BACI model estimate of the 2019 change in mean for log-transformed data
SE = standard error of the estimate
P-value = one-tailed test of the null hypothesis (no change or a decrease in mean [opposite for lower pH trigger])
Exp(Est.) = estimated proportional change
LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Table 5-6. Sampling effort and frequency assessment results for the 2019 Whale Tail Pit area lakes.

Areas	Area Designation	Triggers Exceeded?	Minor Changes [1]		Moderate Changes [2]		Major Changes [3]		Plan for 2020
		Yes/No	Yes/No	Parameters	Yes/No	Parameters	Yes/No	Parameters	
Sampling Strategy for Near-field Stations									
WTS	NF	Yes	Yes	TKN, Alkalinity (HCO_3 & Total), Cond., Hard., major cations, TDS, DOC, TOC, Li, Ti	No	-	No	-	Full CREMP (near-field area)
MAM	NF	Yes	Yes	TKN, Cond., Hard., major cations, TDS, Li	No	-	No	-	Full CREMP (near-field area)
NEM	NF	Yes	Yes	TKN, Ca, K	No	-	No	-	Full CREMP (near-field area)
Sampling Strategy for Mid-field and Far-field Stations									
A20	MF	No	No	-	No	-	No	-	Winter through-ice sampling
A76	MF	Yes	Yes	Major cations	No	-	No	-	Winter through-ice sampling
DS1	FF	Yes	Yes	TKN, DOC, TOC, Na, Zn (D)	No	-	No	-	Winter through-ice sampling

Notes:
1. Minor = exceedance of the early warning trigger values for parameters without effects-based threshold values
2. Moderate = exceedance of the early warning trigger values for parameters with effects-based thresholds
3. Major = exceedance of the effects-based threshold values

Table 5-7. FEIS screening predictions for Mammoth Lake compared to mean concentrations.

Parameter	Prediction (mg/L)	2019 Mean (mg/L)
Ammonia (as N)	0.015	0.046
Chloride	6.73	22.4
Calcium	6.32	12.7
Magnesium	1.93	2.48
TDS	54.3	87.1
Aluminum (Total)	0.0050	0.011
Barium (Total)	0.012	0.022
Lithium (Total)	0.0016	0.0037
Strontium (Total)	0.041	0.11

Notes:
1. Water quality predictions for Mammoth Lake were taken from the Approved FEIS (see Appendix 6-H in Agnico Eagle 2016).

Figure 5-15. Flow chart showing sampling effort and frequency assessment results for near-field, mid-field, and far-field sampling in 2019.

Notes: Blue-shaded cells show the linkage between 2019 CREMP results and the sampling effort and frequency for mid-field and far-field areas for 2020. "Minor changes" refer to statistically significant increased concentrations for parameters without effects-based threshold values that exceed the early warning trigger values Refer to **Section 2.2.3** for more information.

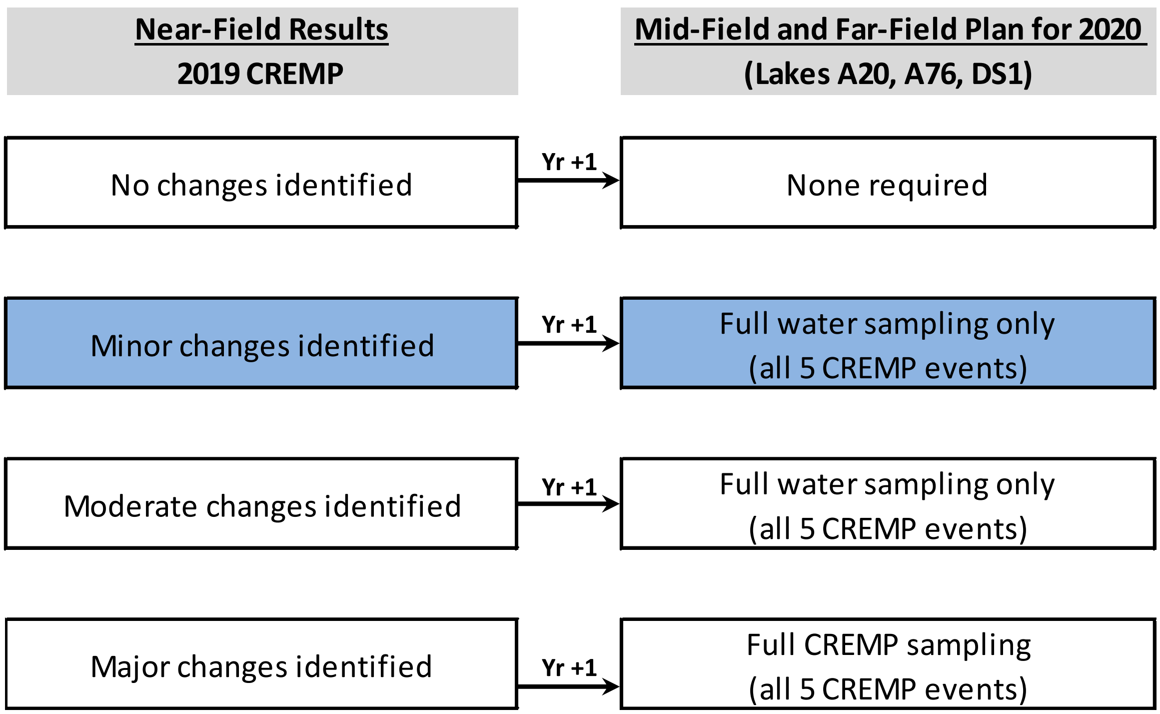


Figure 5-16. Laboratory-measured conductivity (µS/cm) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

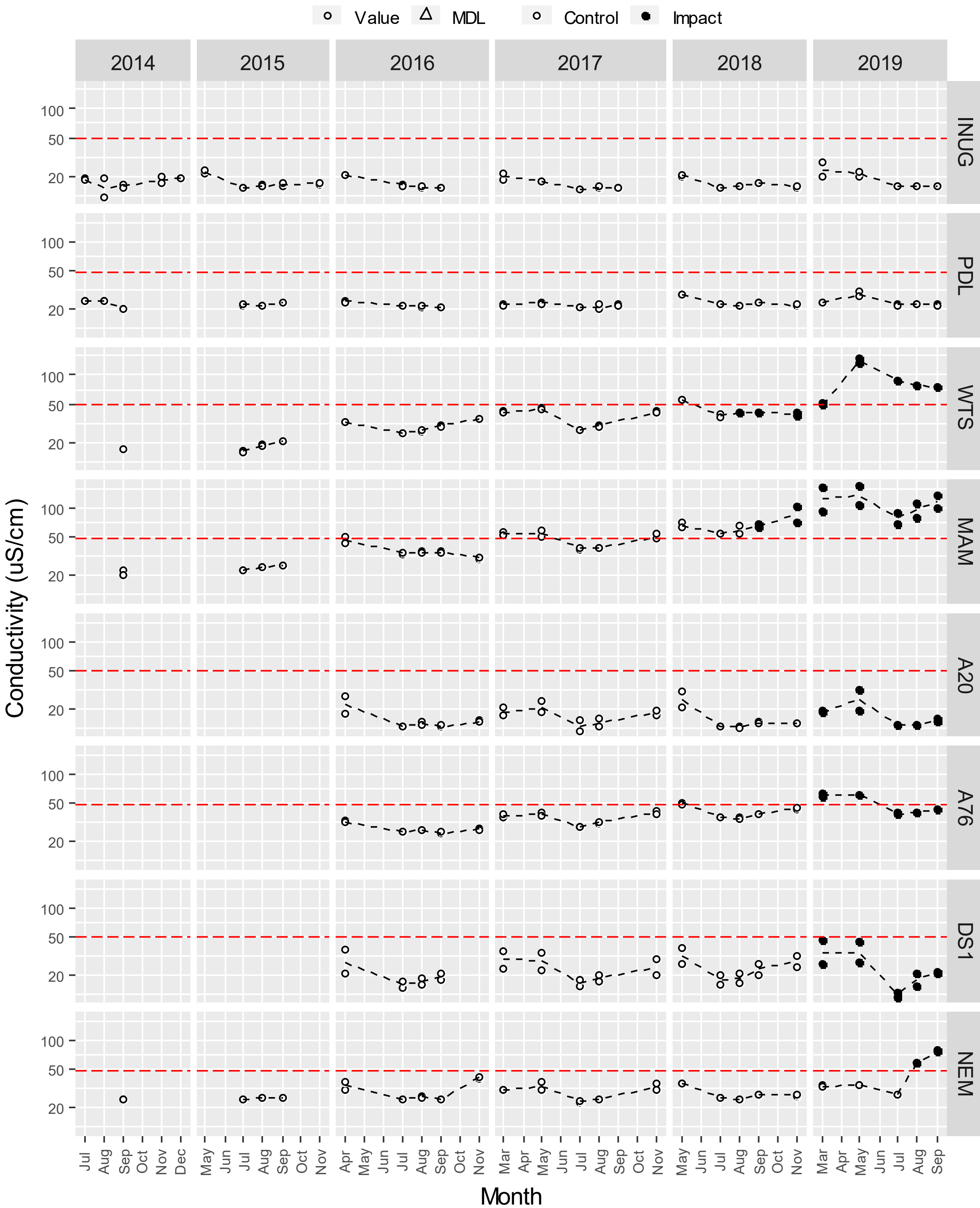


Figure 5-17. Laboratory measured hardness (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

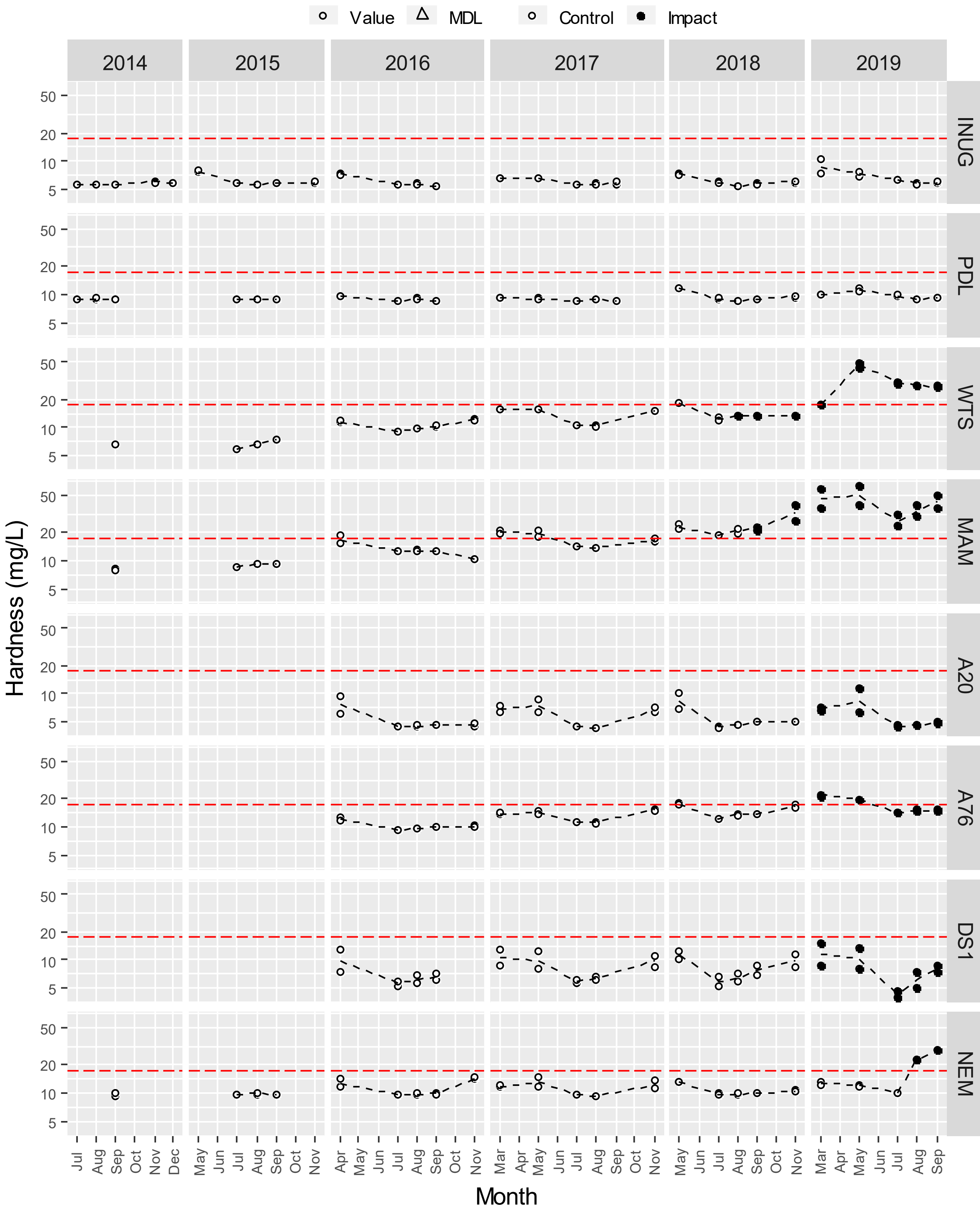


Figure 5-18. Field-measured pH in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

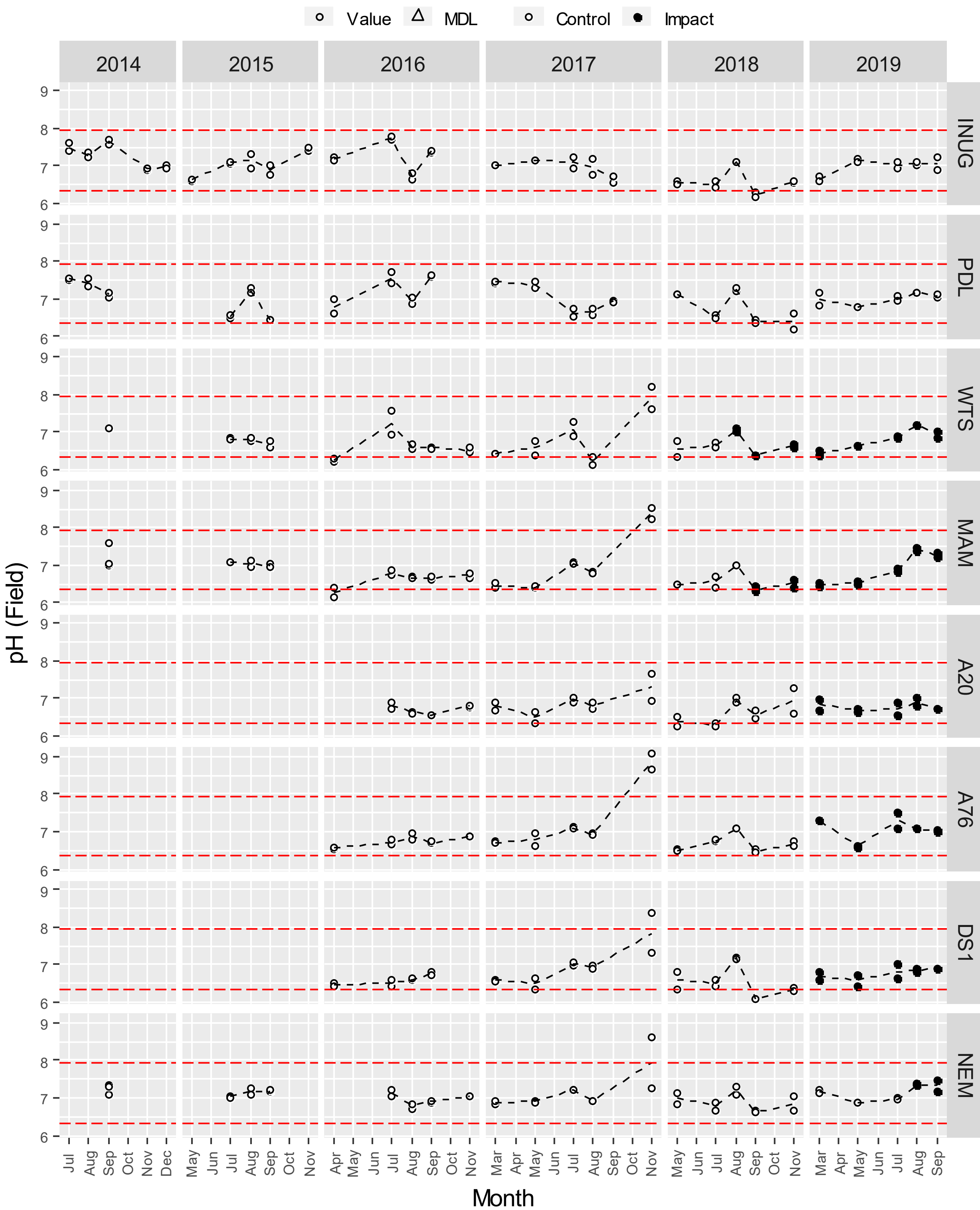


Figure 5-19. Laboratory-measured pH in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

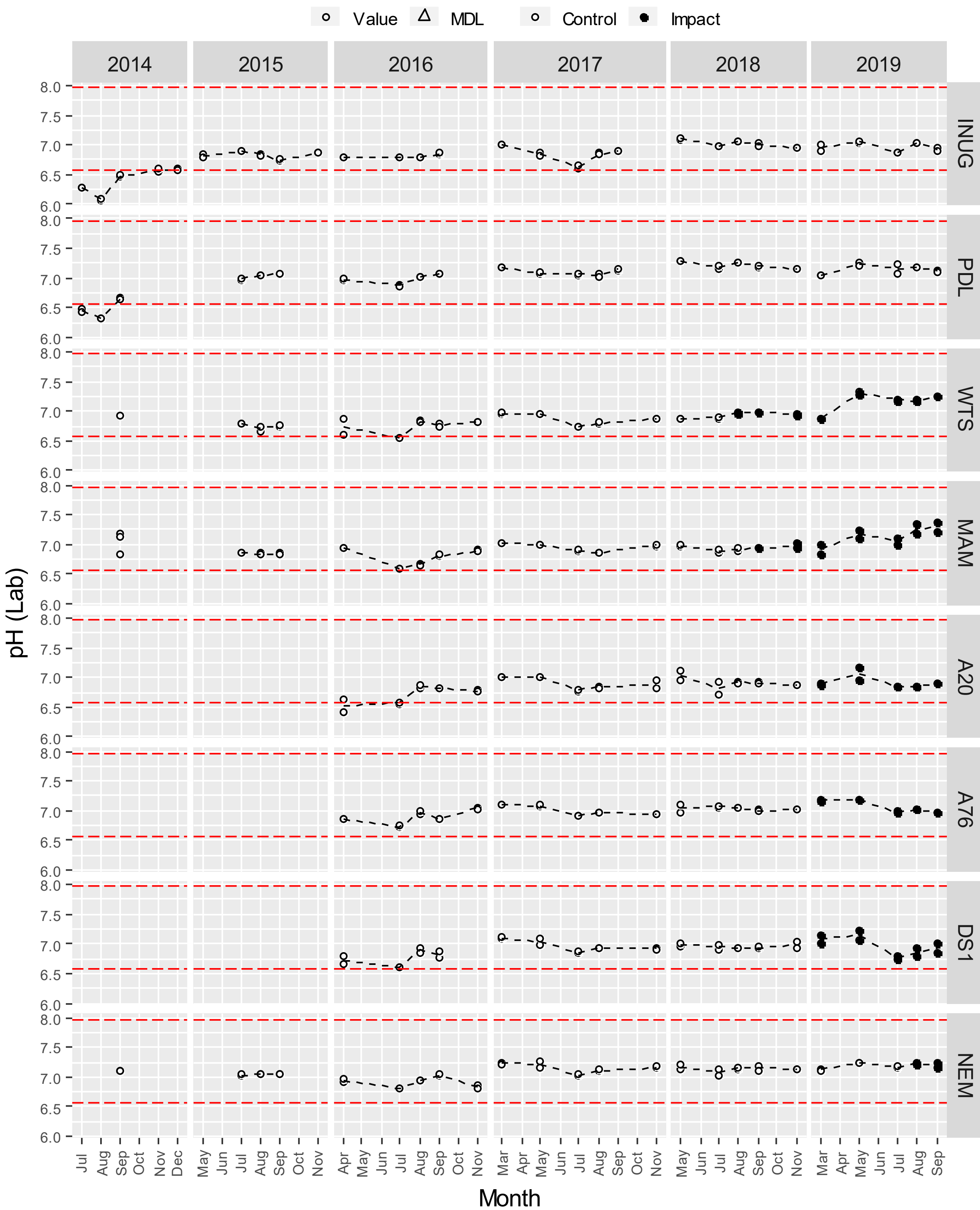


Figure 5-20. Total suspended solids (TSS; mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

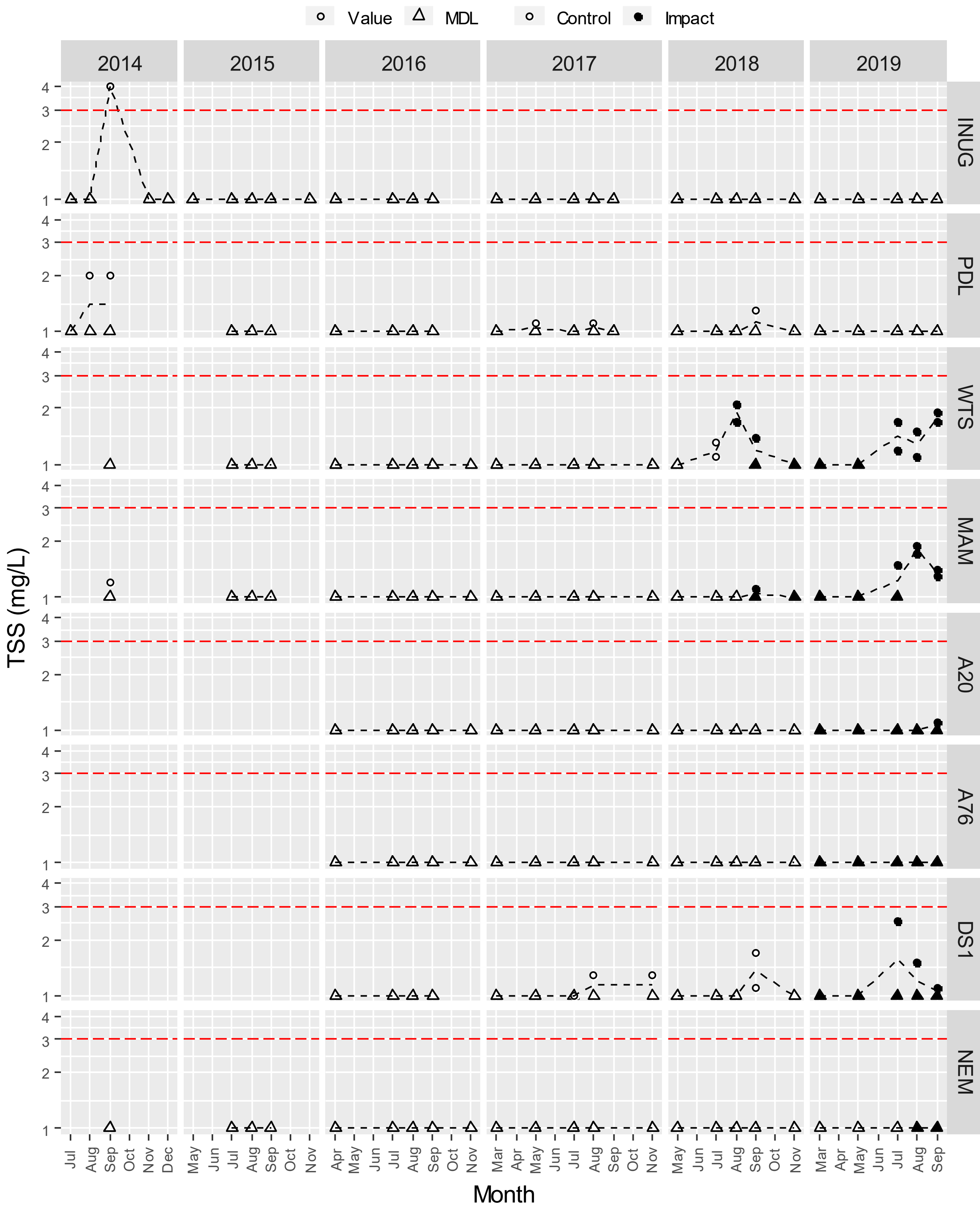


Figure 5-21. Total dissolved solids (TDS; mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes. The blue dashed line = FEIS screening prediction.

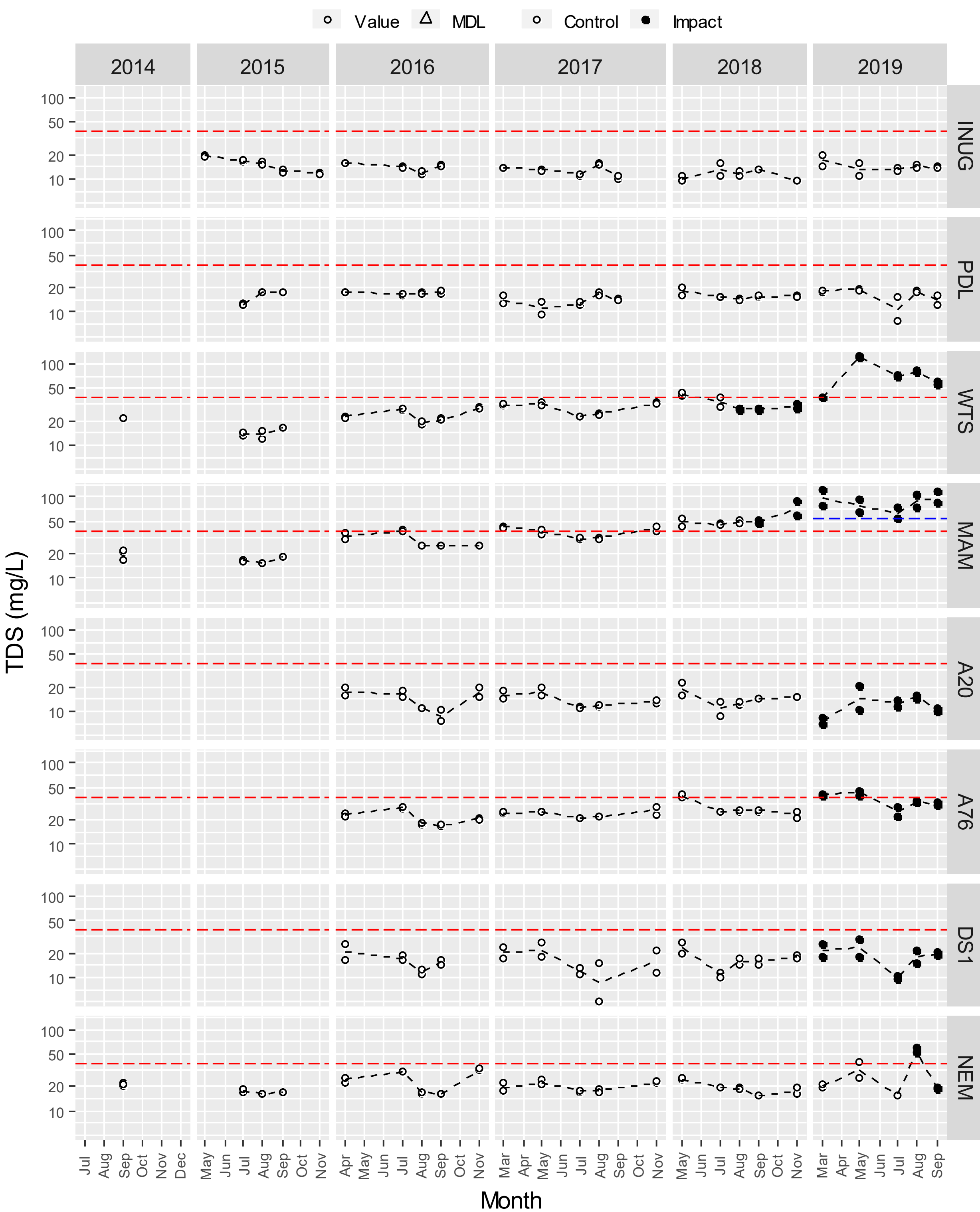


Figure 5-22. Bicarbonate alkalinity (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

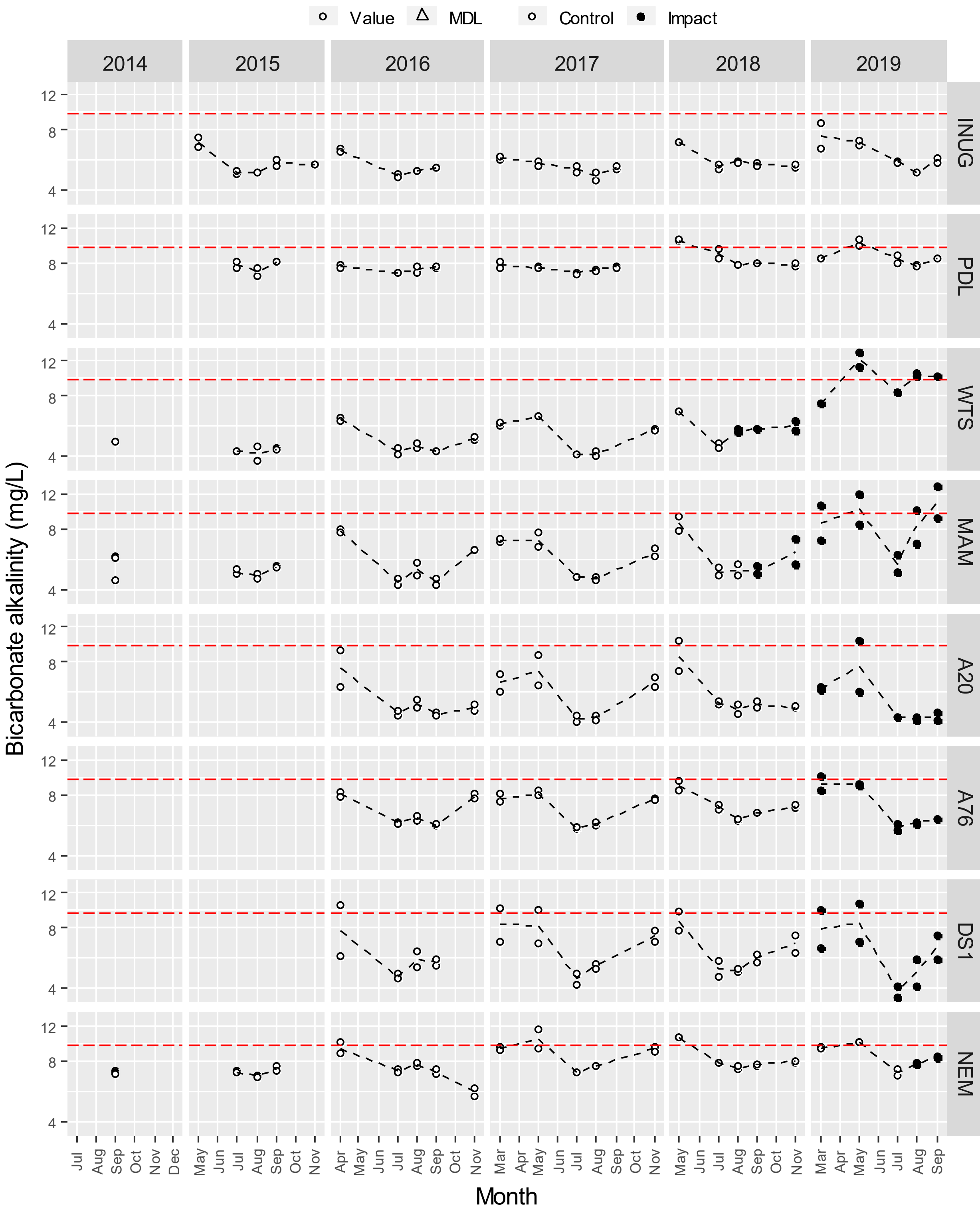


Figure 5-23. Total alkalinity (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

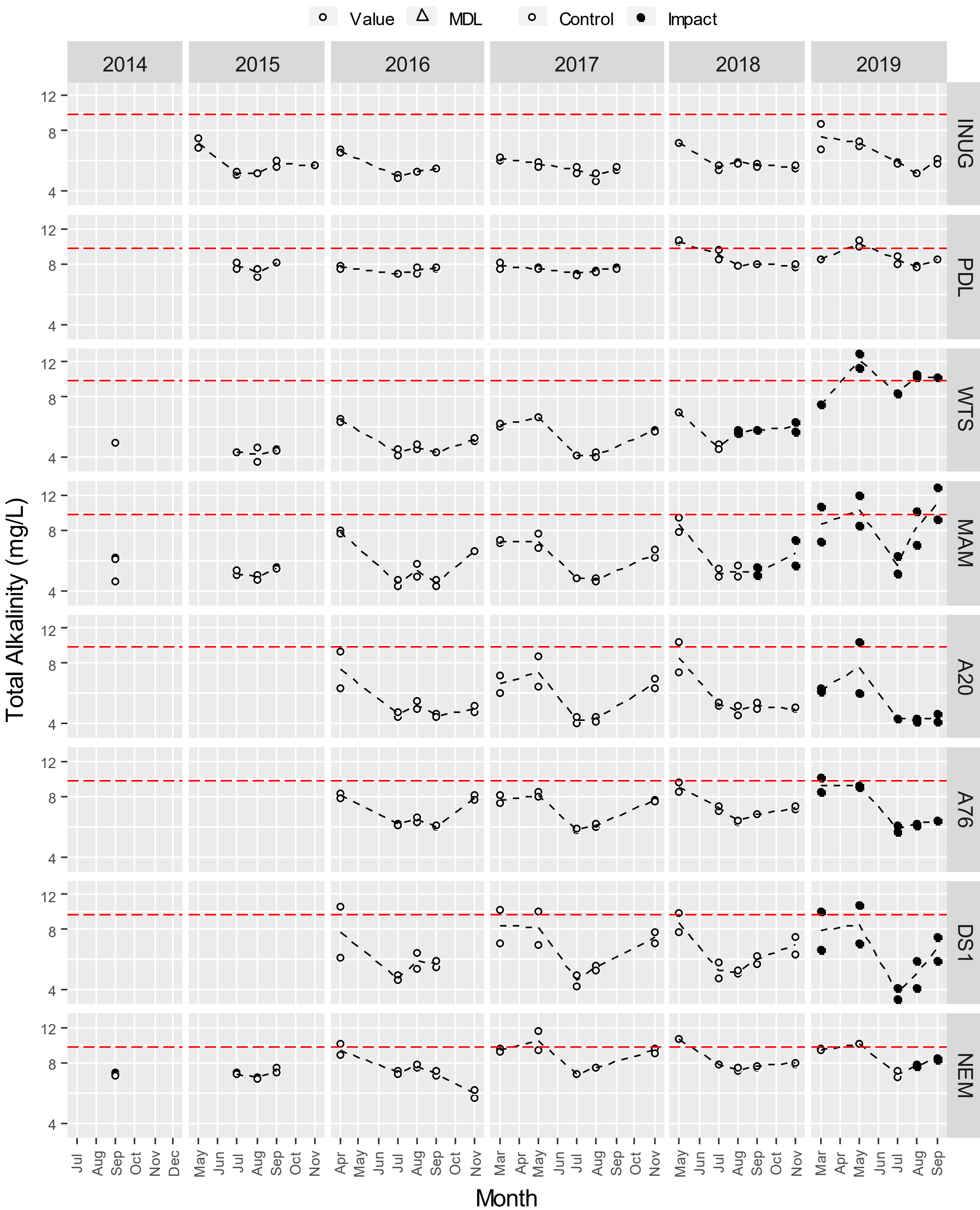


Figure 5-24. Ammonia-N (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes. The blue dashed line = FEIS screening prediction.

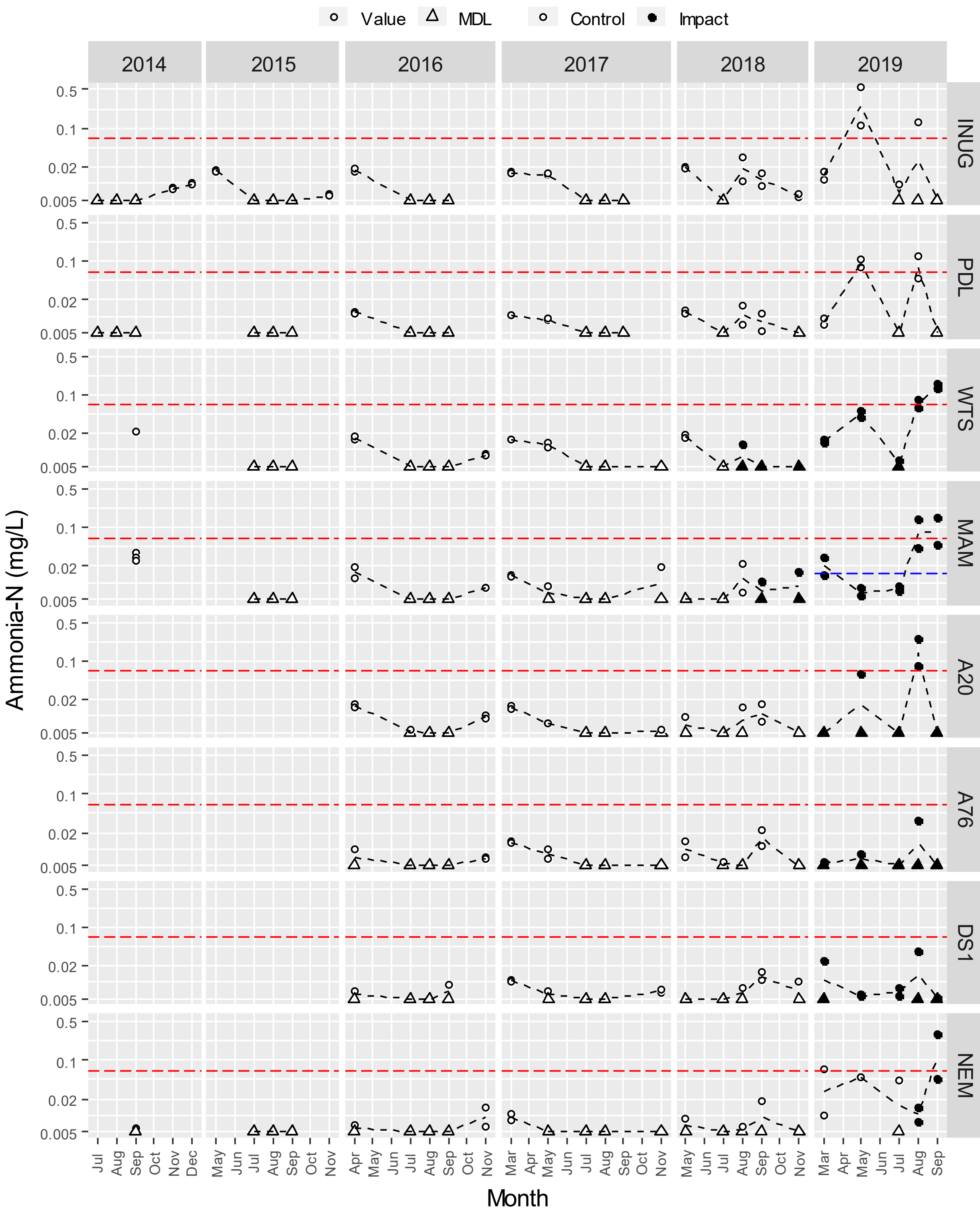


Figure 5-25. Chloride (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes. The blue dashed line = FEIS screening prediction.

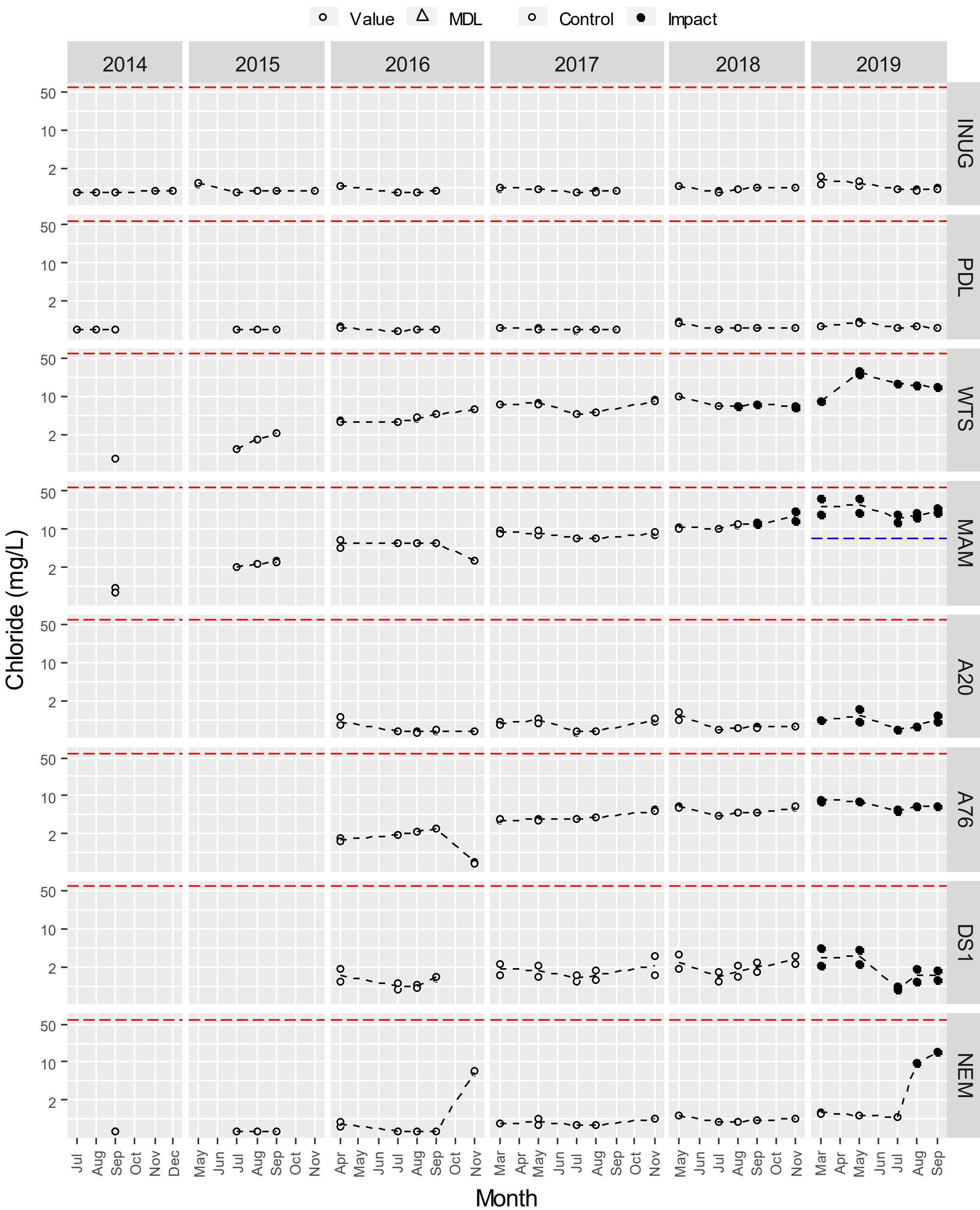


Figure 5-26. Fluoride (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

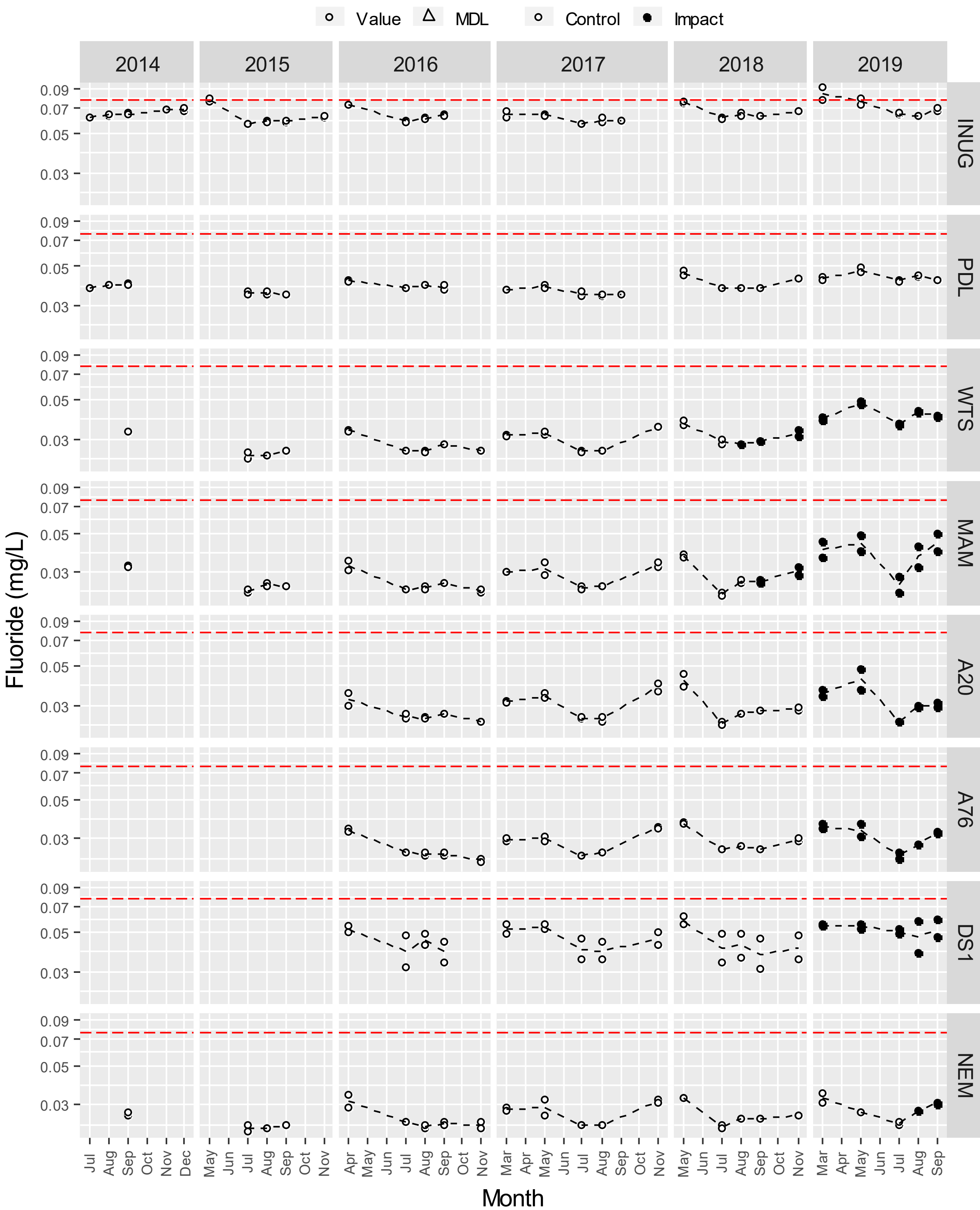


Figure 5-27. Nitrate-N (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

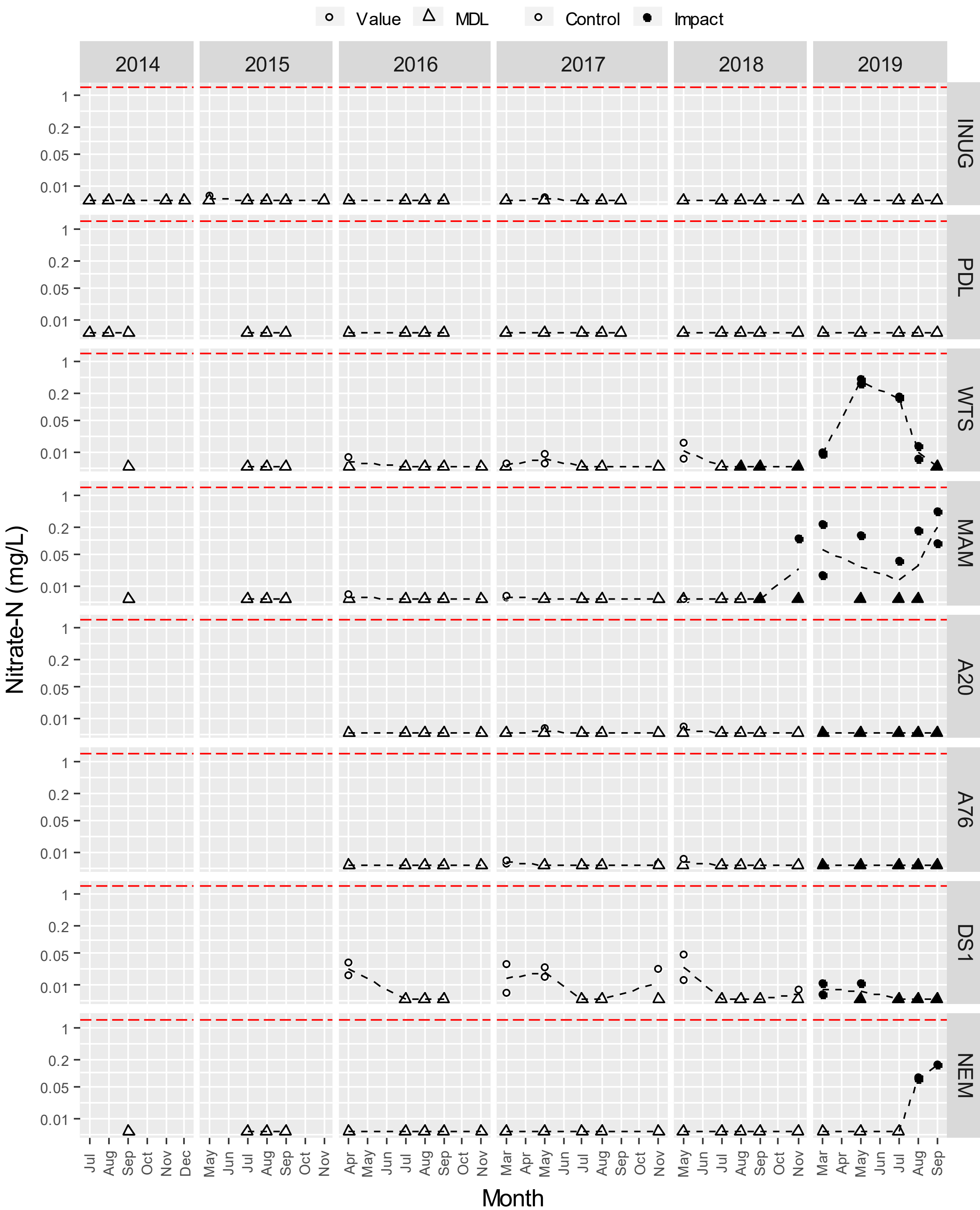


Figure 5-28. Nitrite-N (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

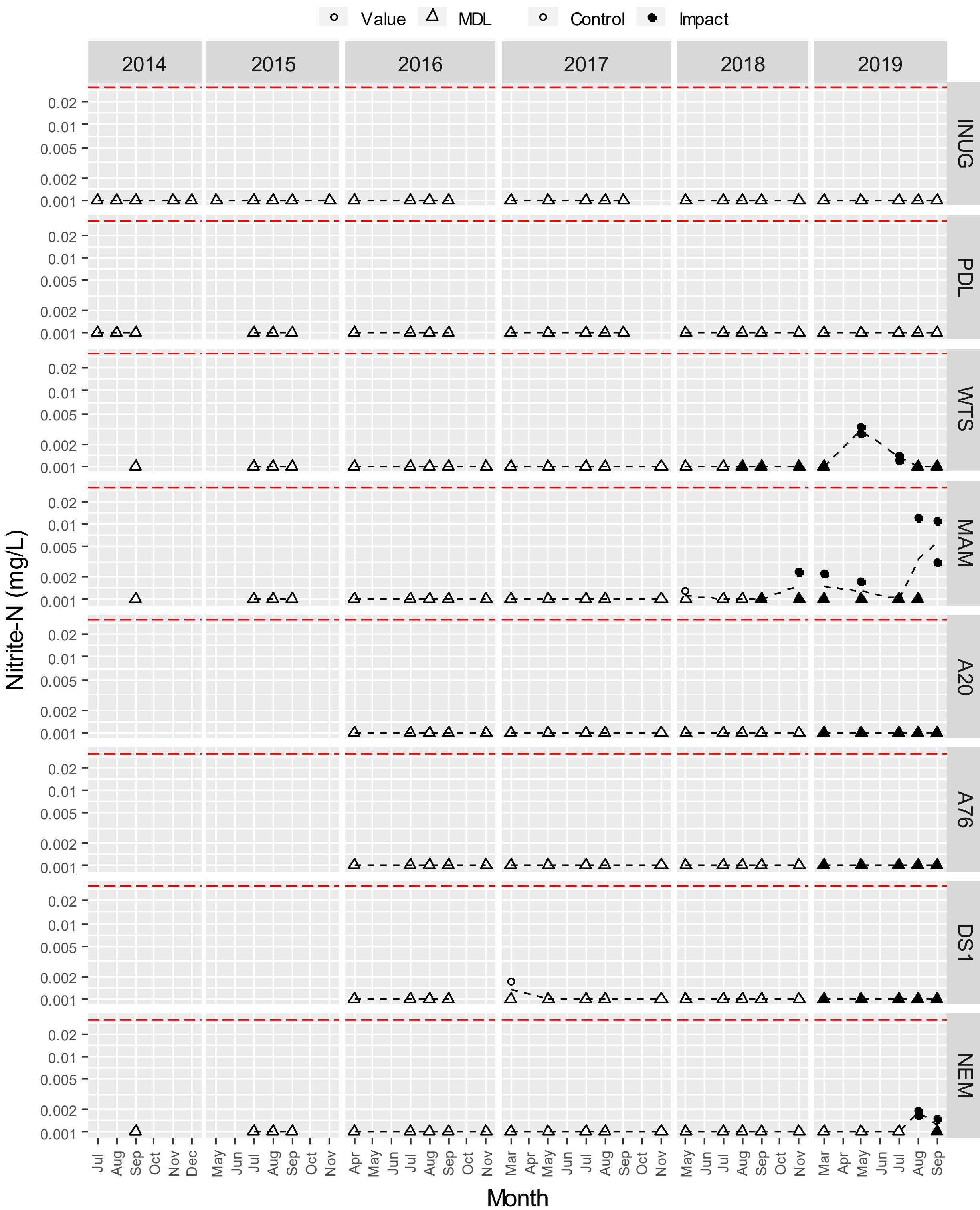


Figure 5-29. Total Kjeldahl Nitrogen (TKN; mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

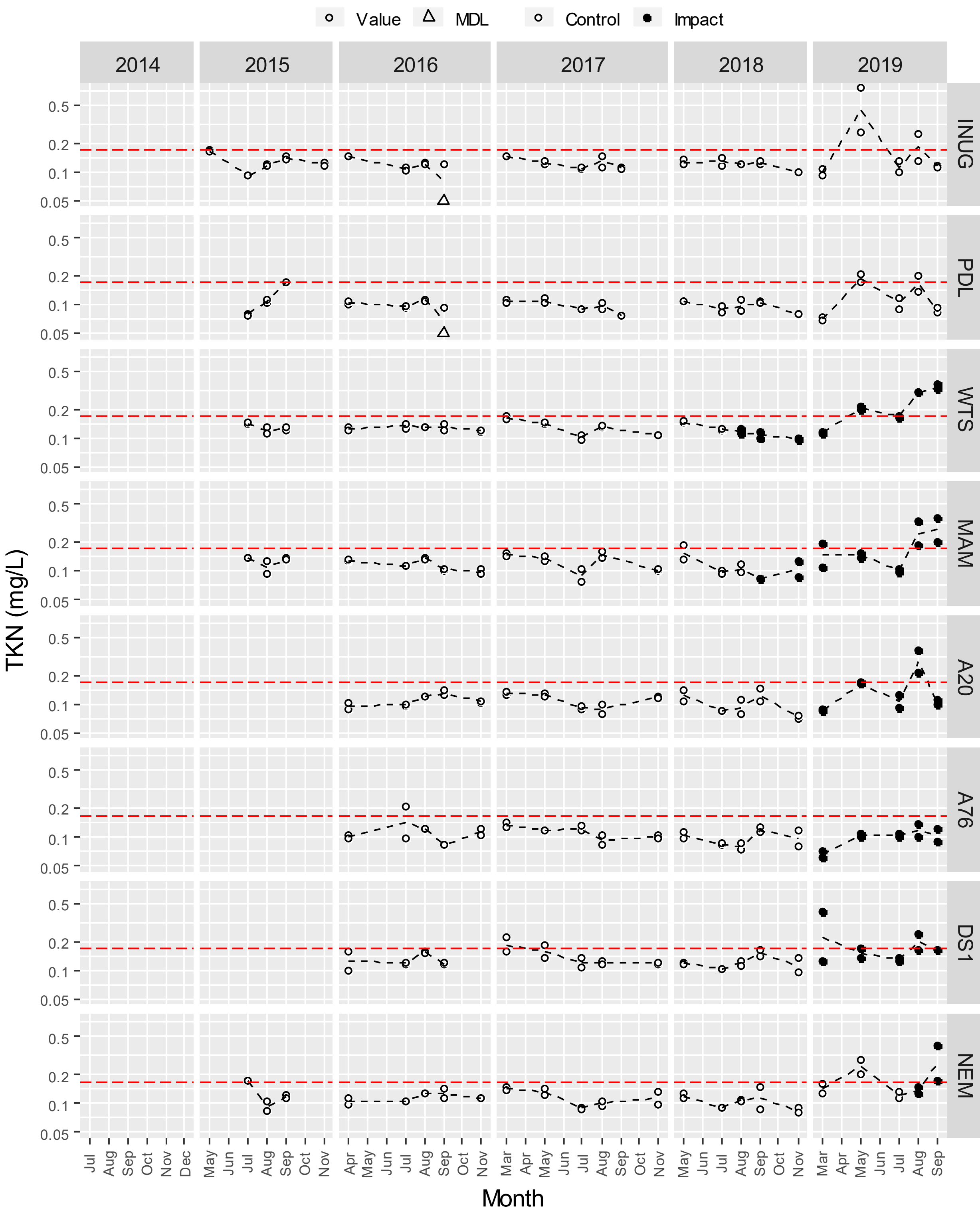


Figure 5-30. Total phosphorus (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

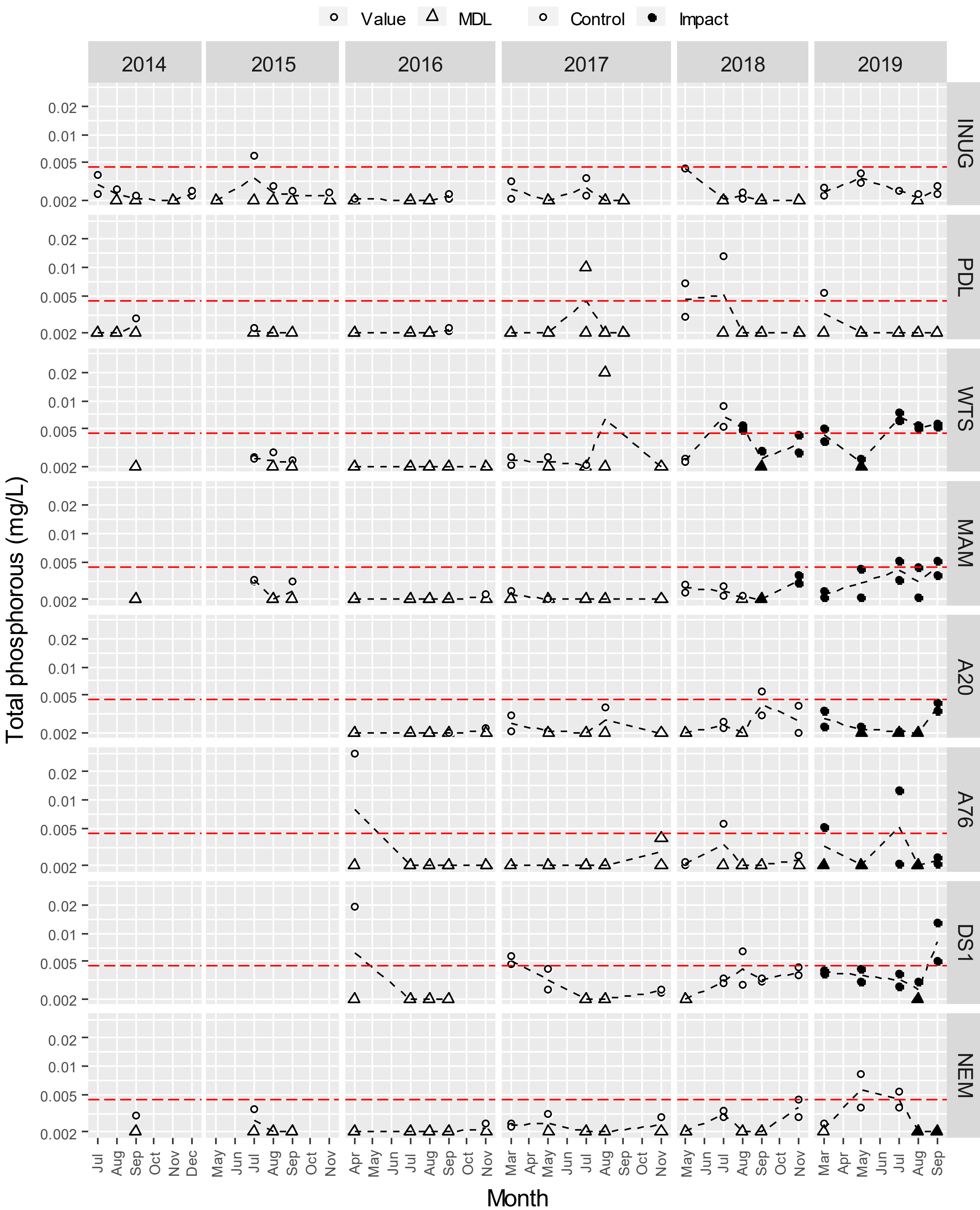


Figure 5-31. Reactive silica (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

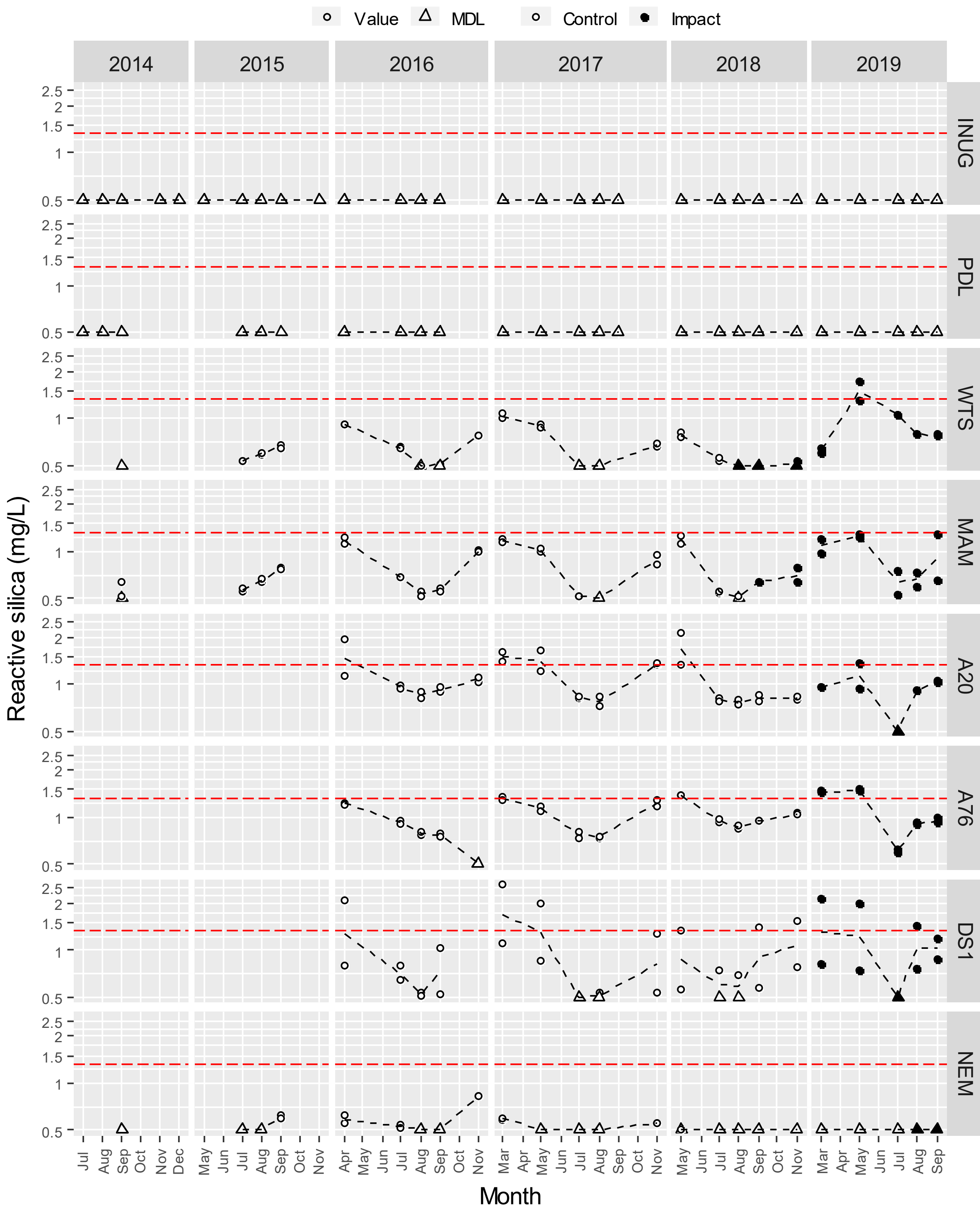


Figure 5-32. Sulphate (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

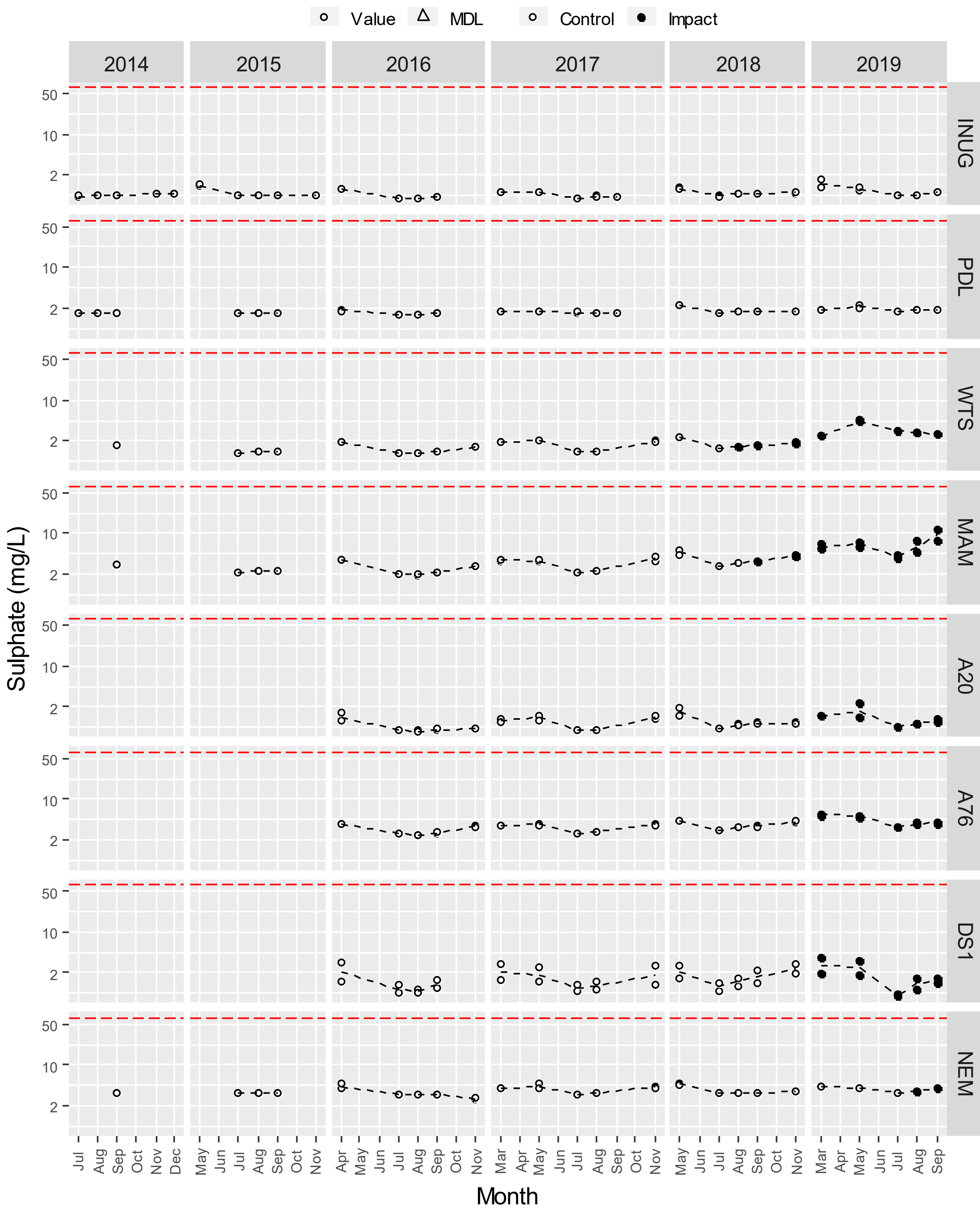


Figure 5-33. Dissolved organic carbon (DOC; mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

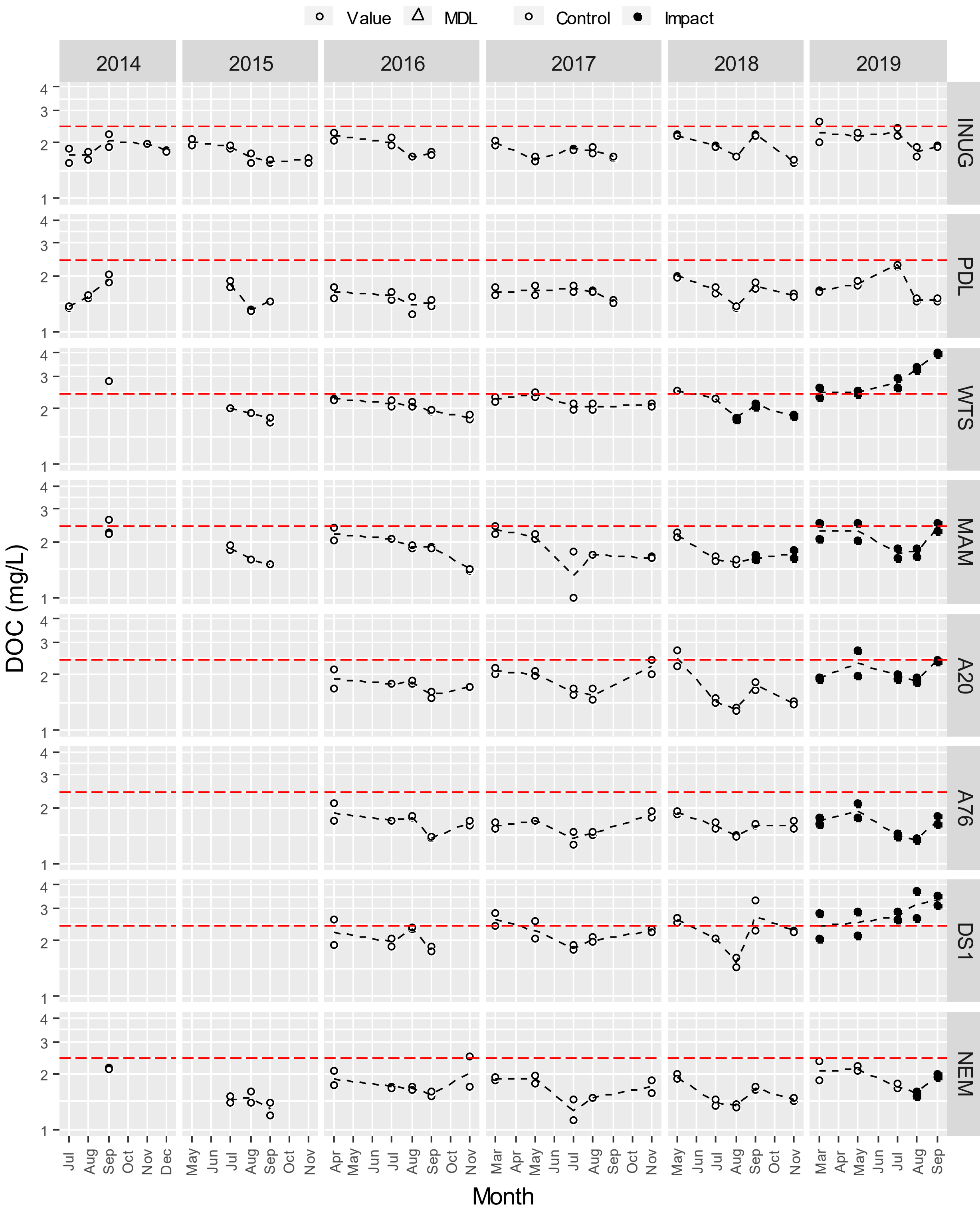


Figure 5-34. Total organic carbon (TOC; mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

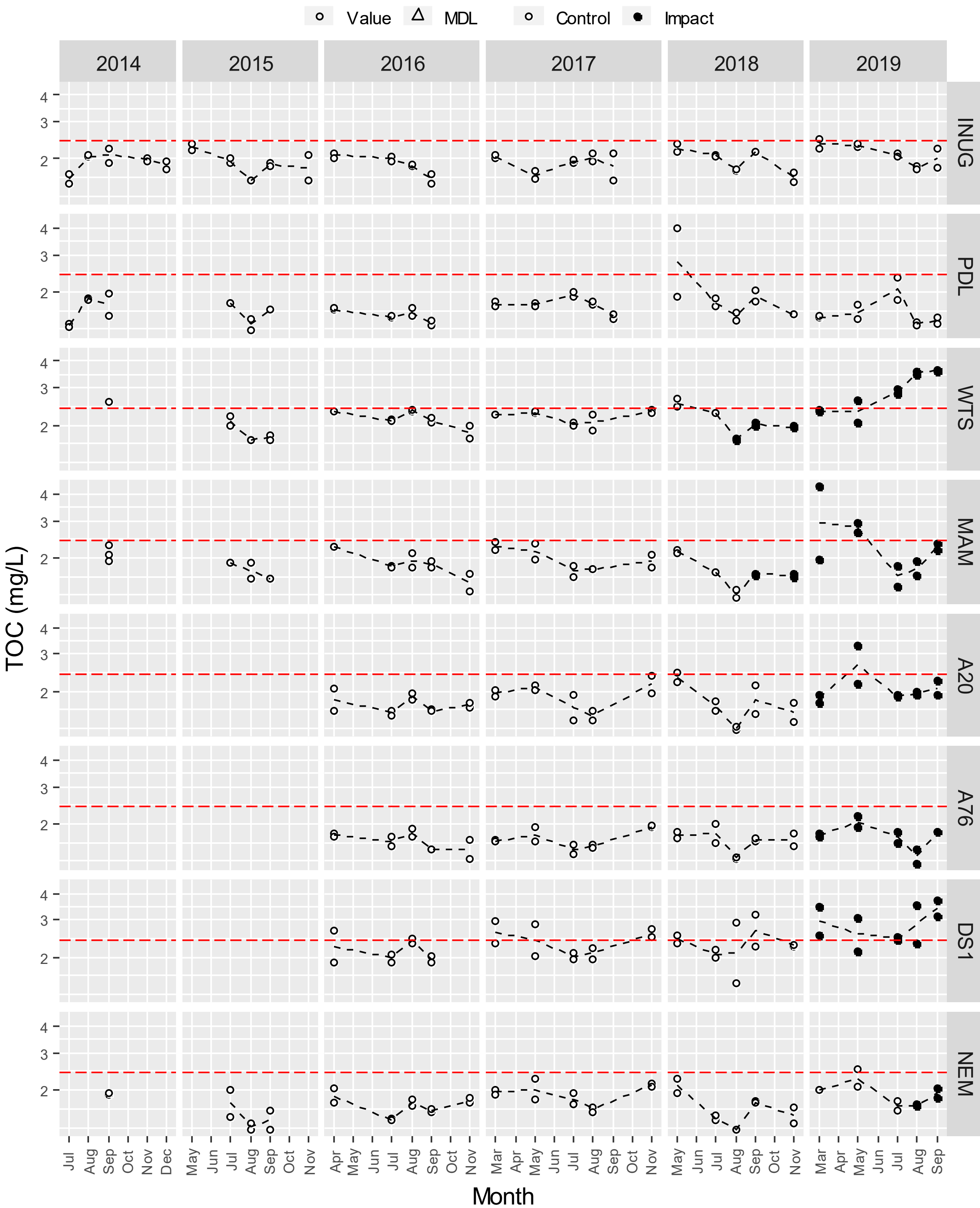


Figure 5-35. Total aluminum (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes. The blue dashed line = FEIS screening prediction.

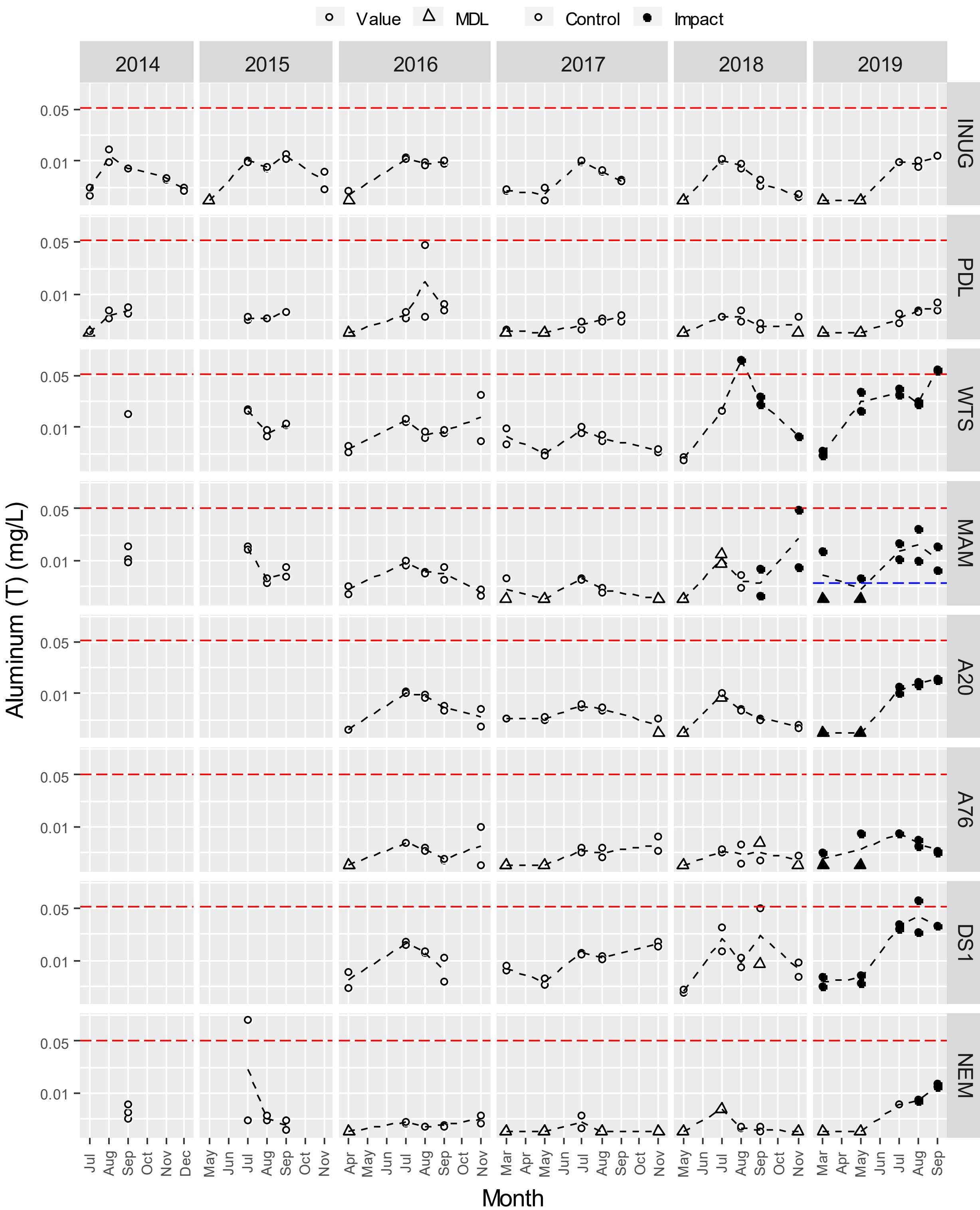


Figure 5-36. Total arsenic (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

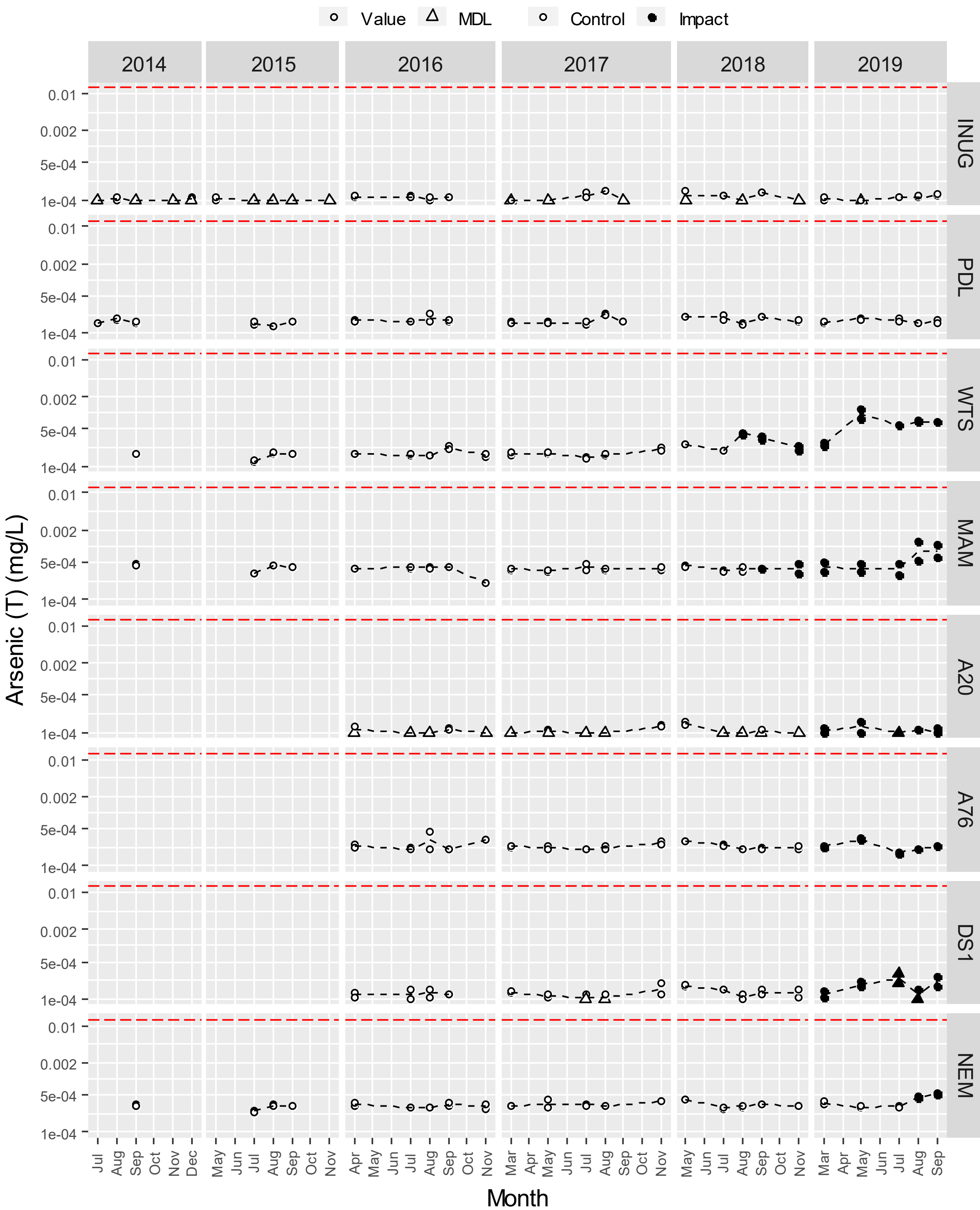


Figure 5-37. Total barium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes. The blue dashed line = FEIS screening prediction.

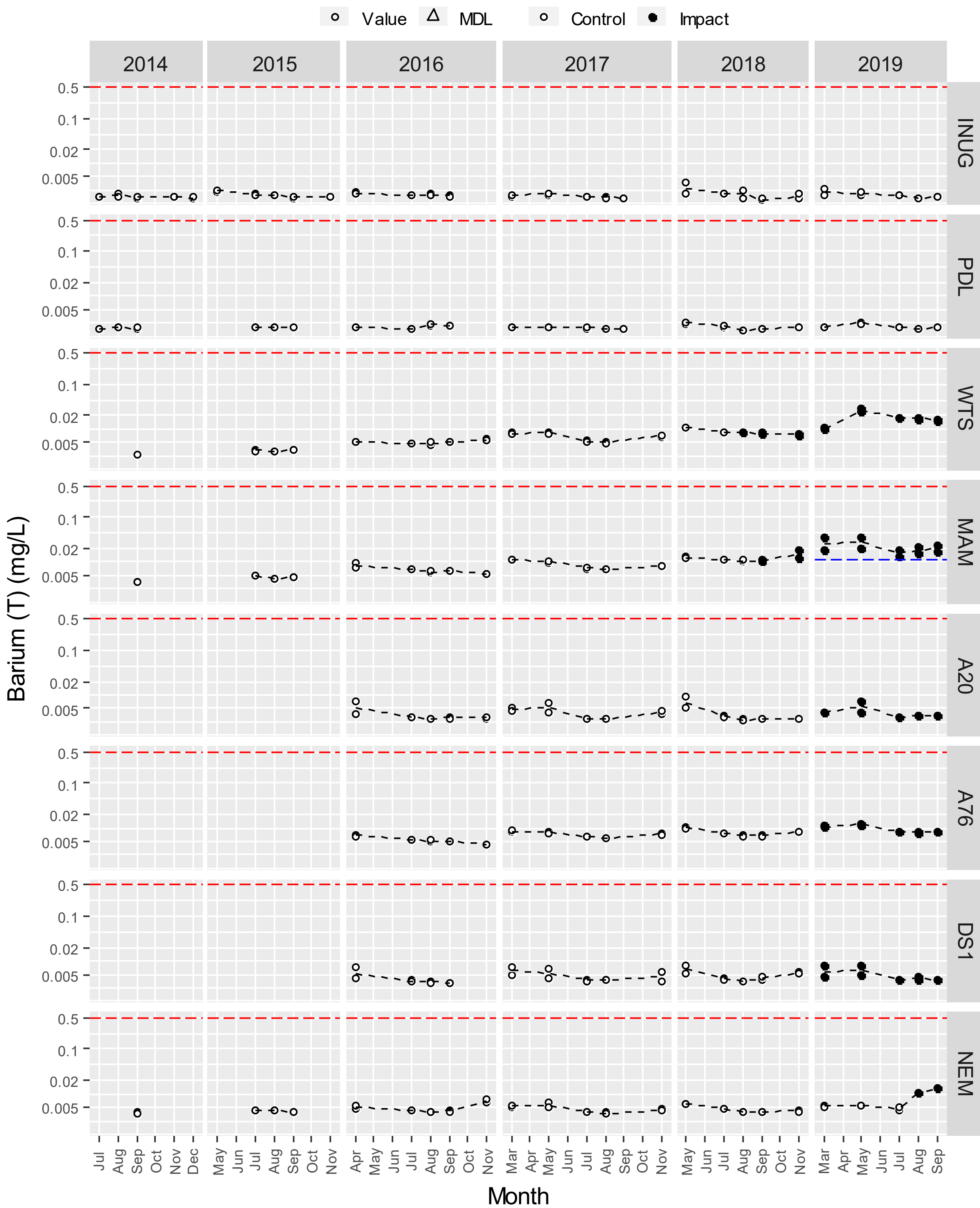


Figure 5-38. Total calcium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes. The blue dashed line = FEIS screening prediction.

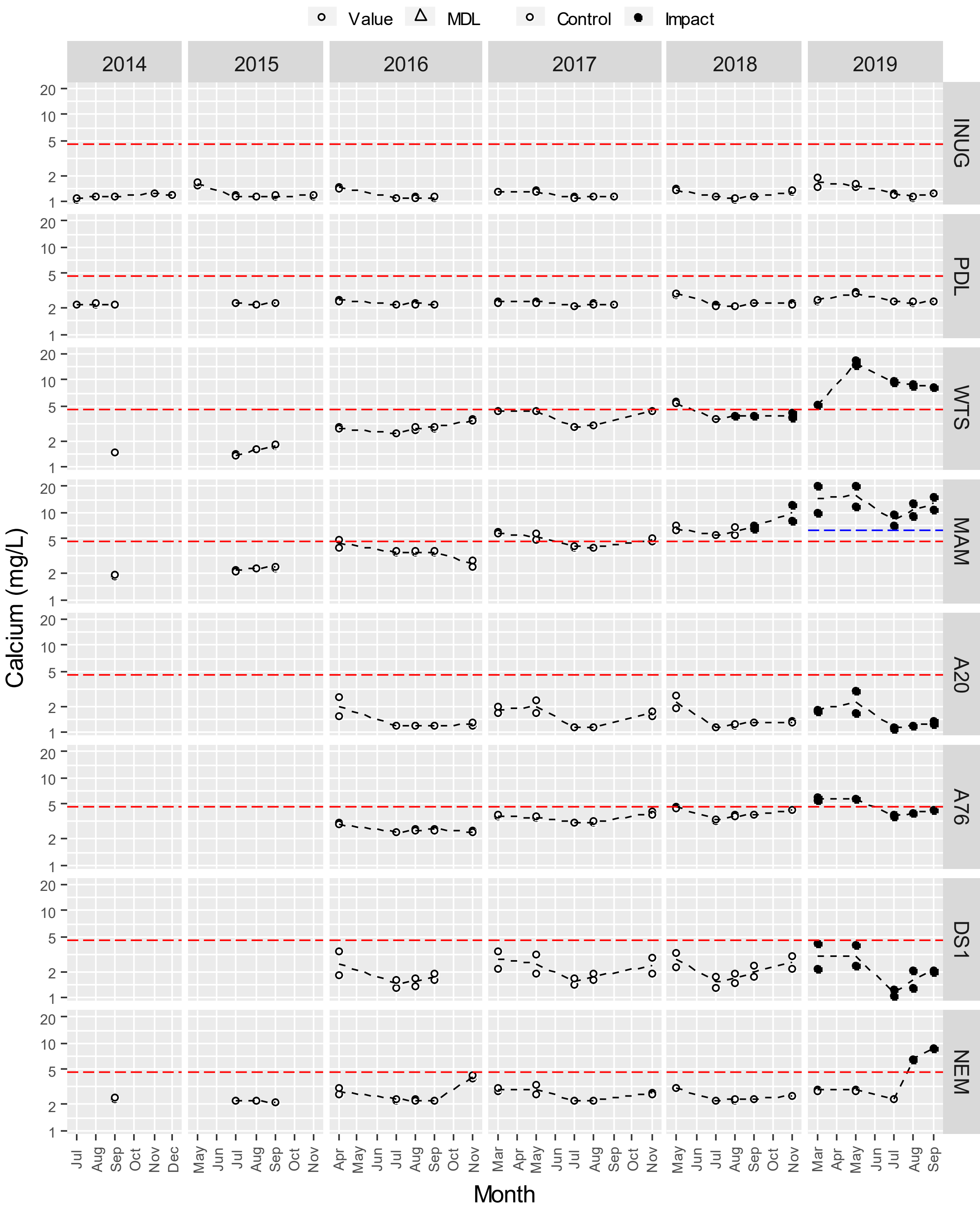


Figure 5-39. Total chromium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

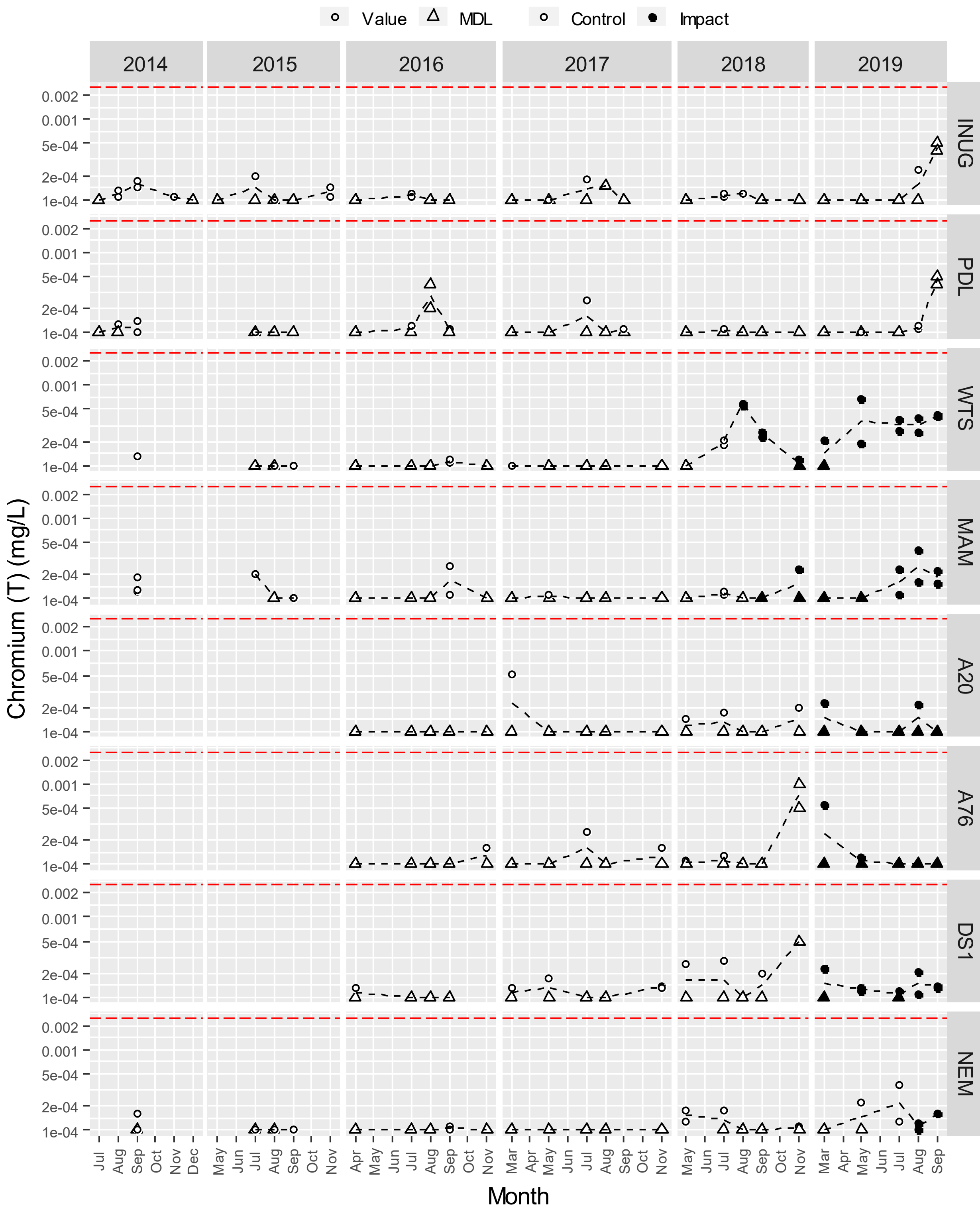


Figure 5-40. Total copper (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

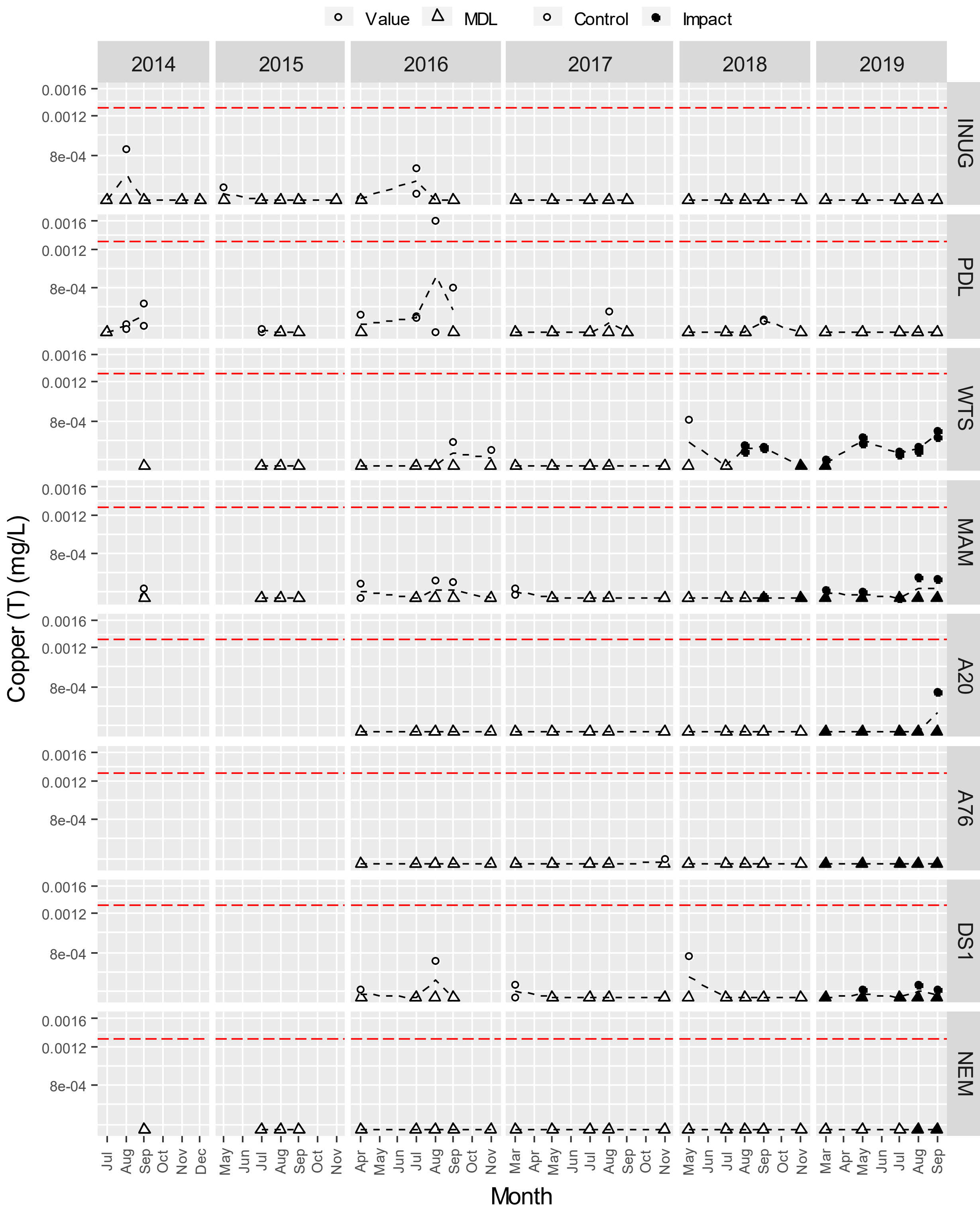


Figure 5-41. Total iron (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

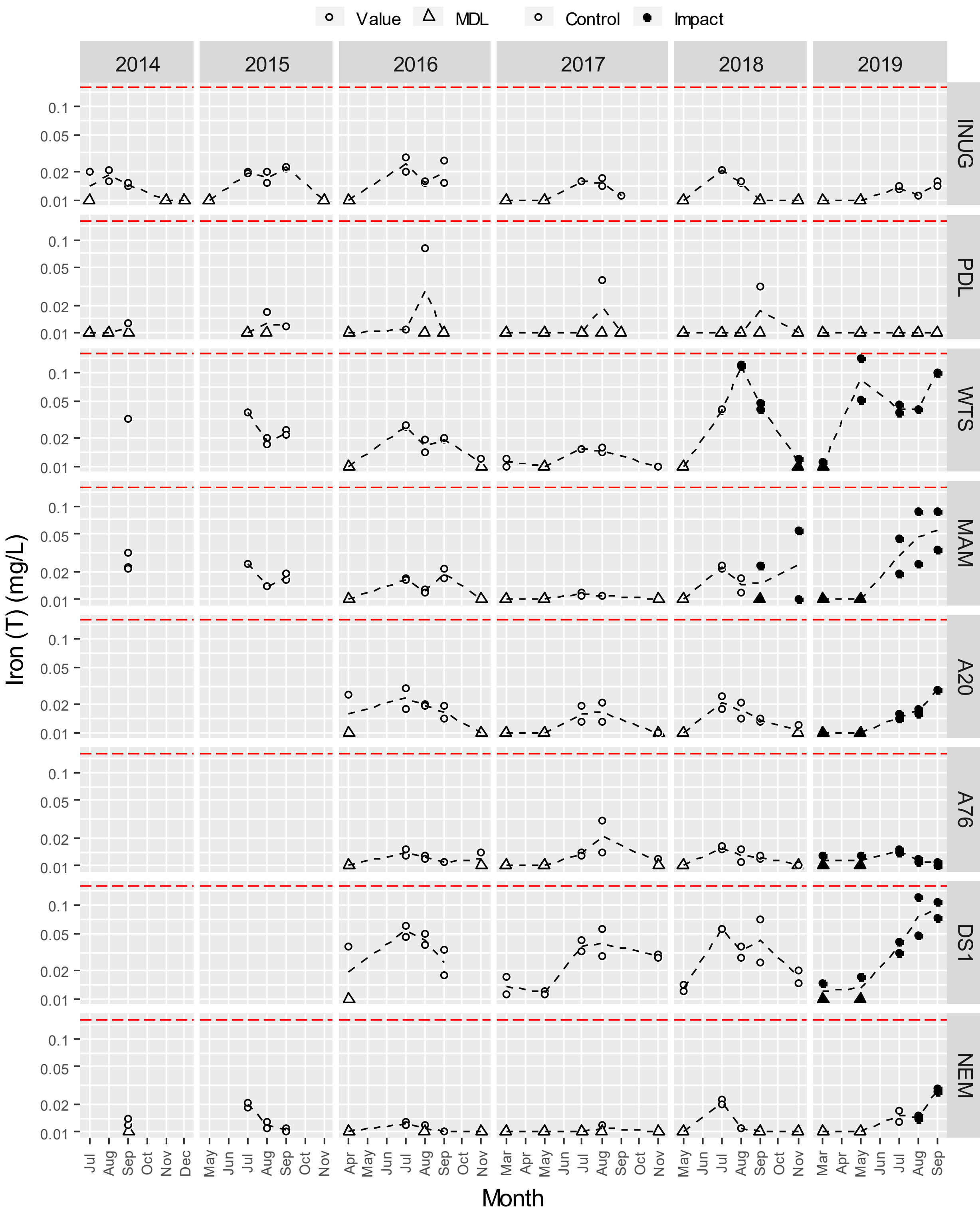


Figure 5-42. Total lead (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

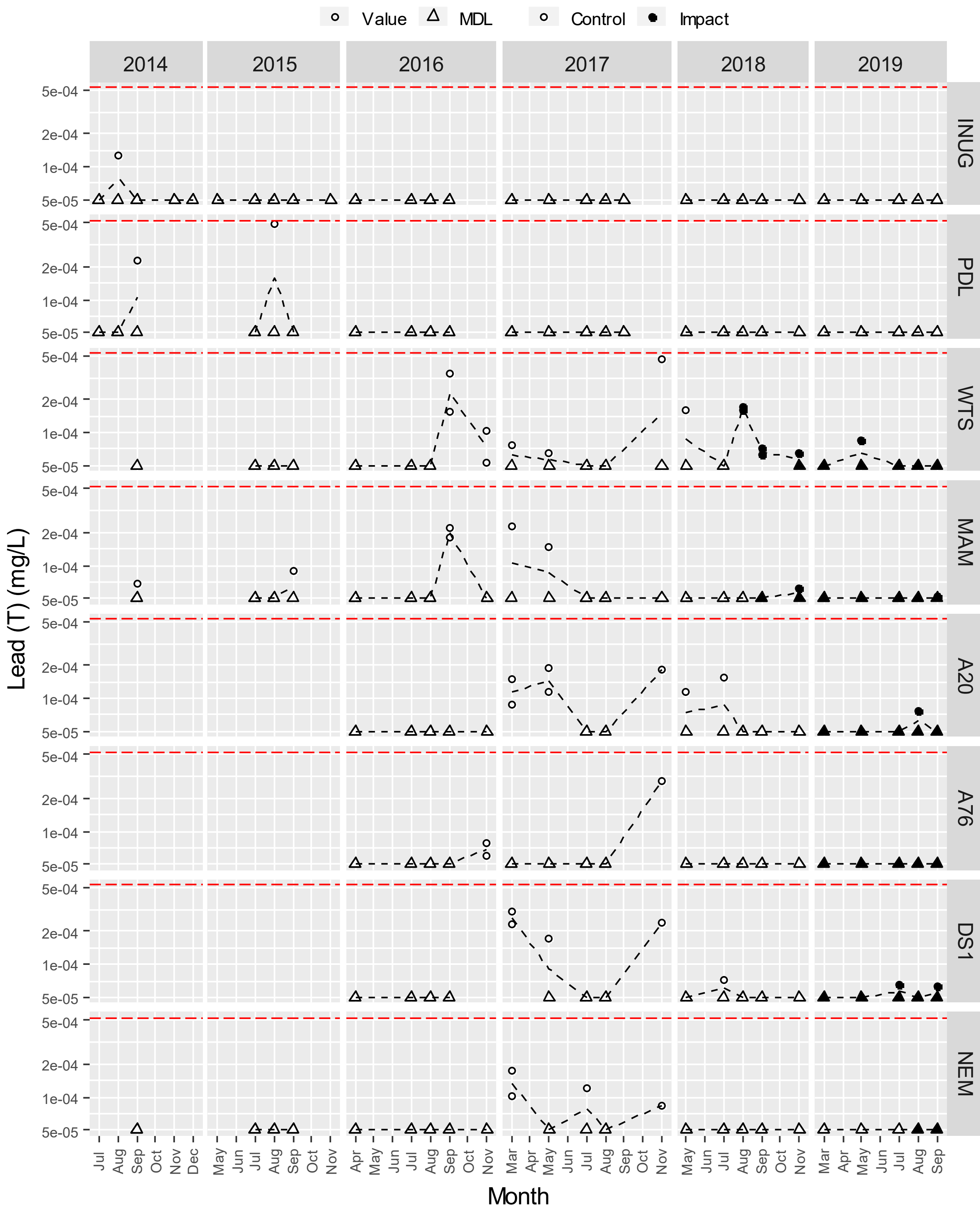


Figure 5-43. Total lithium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes. The blue dashed line = FEIS screening prediction.

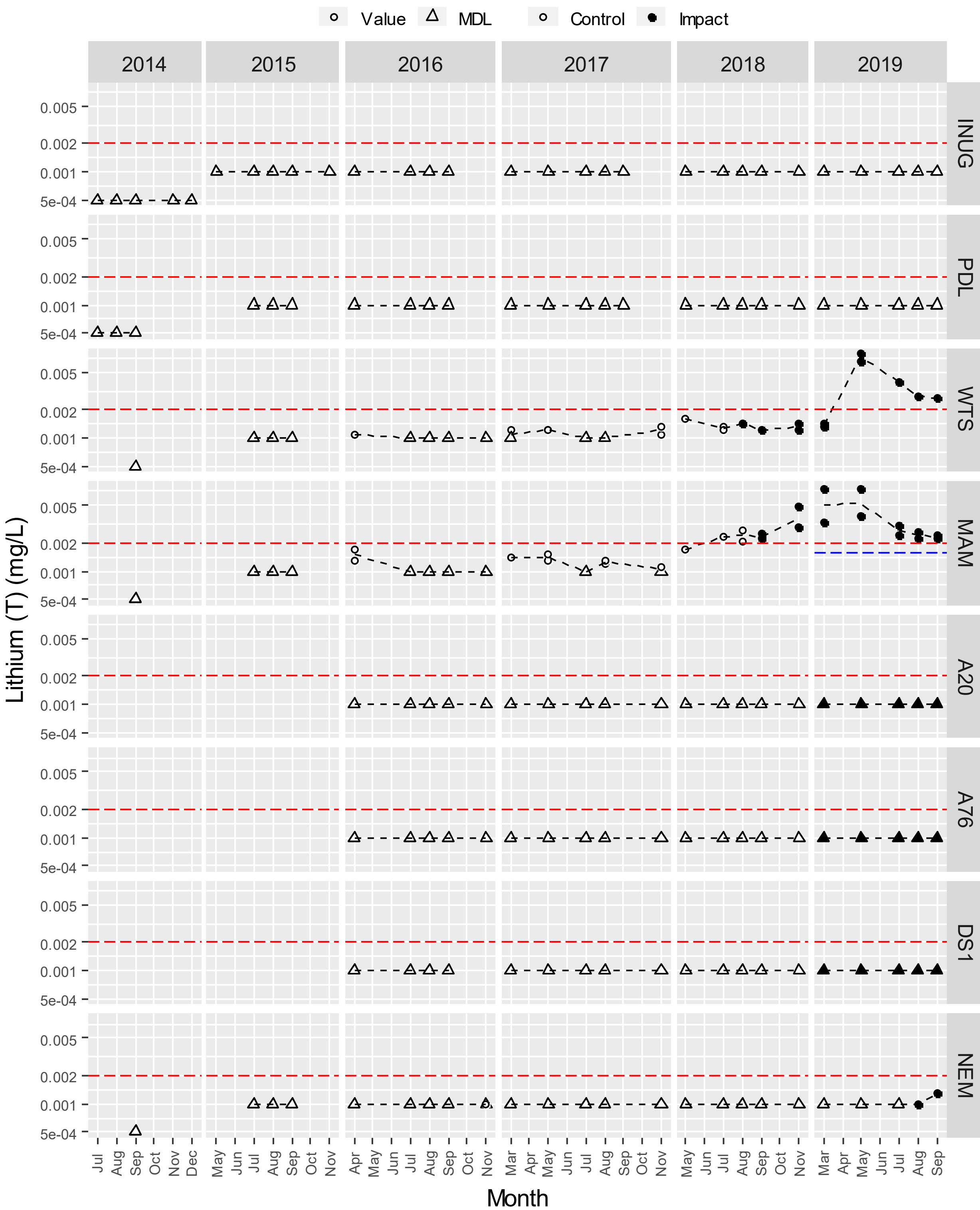


Figure 5-44. Total magnesium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes. The blue dashed line = FEIS screening prediction.

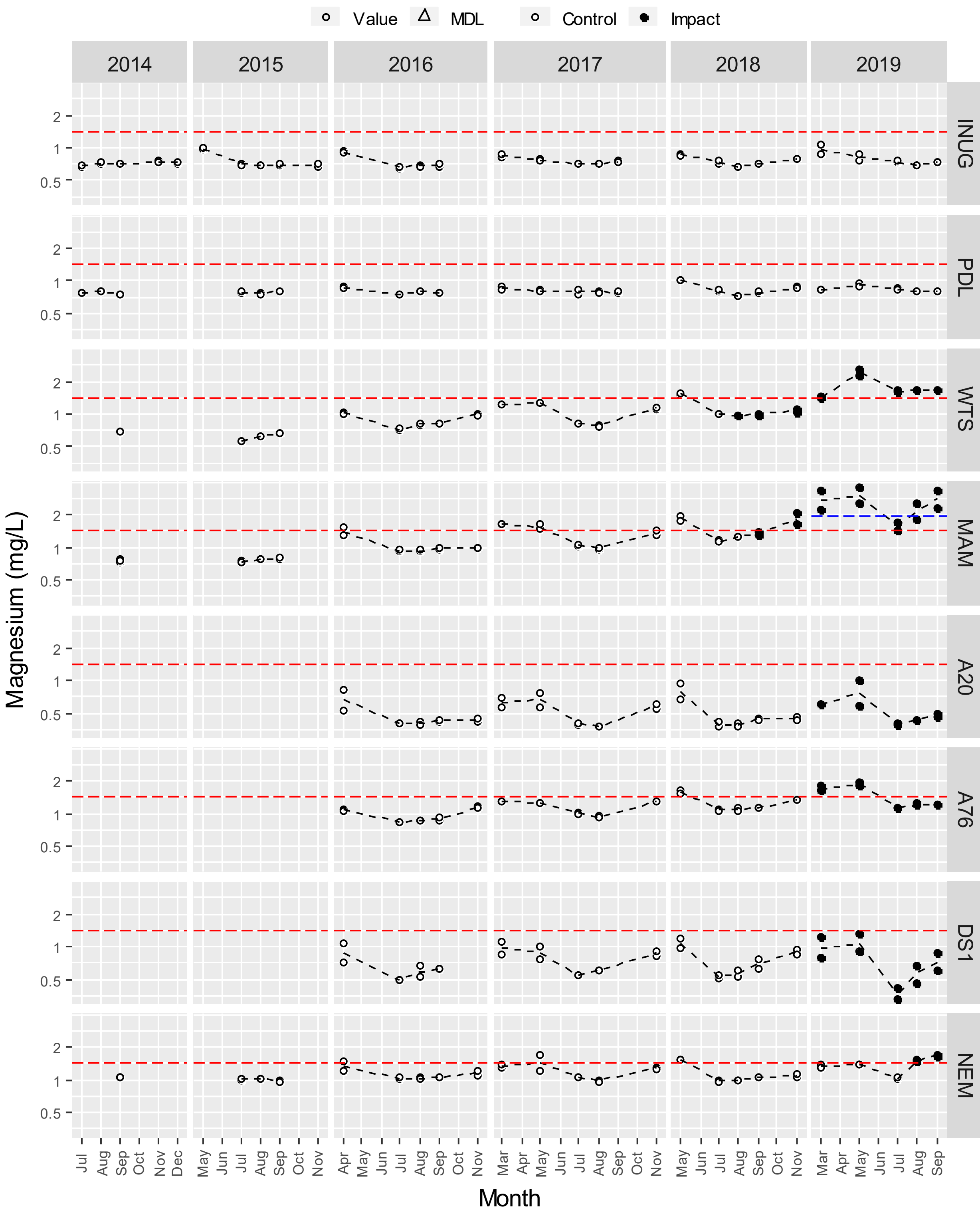


Figure 5-45. Total manganese (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

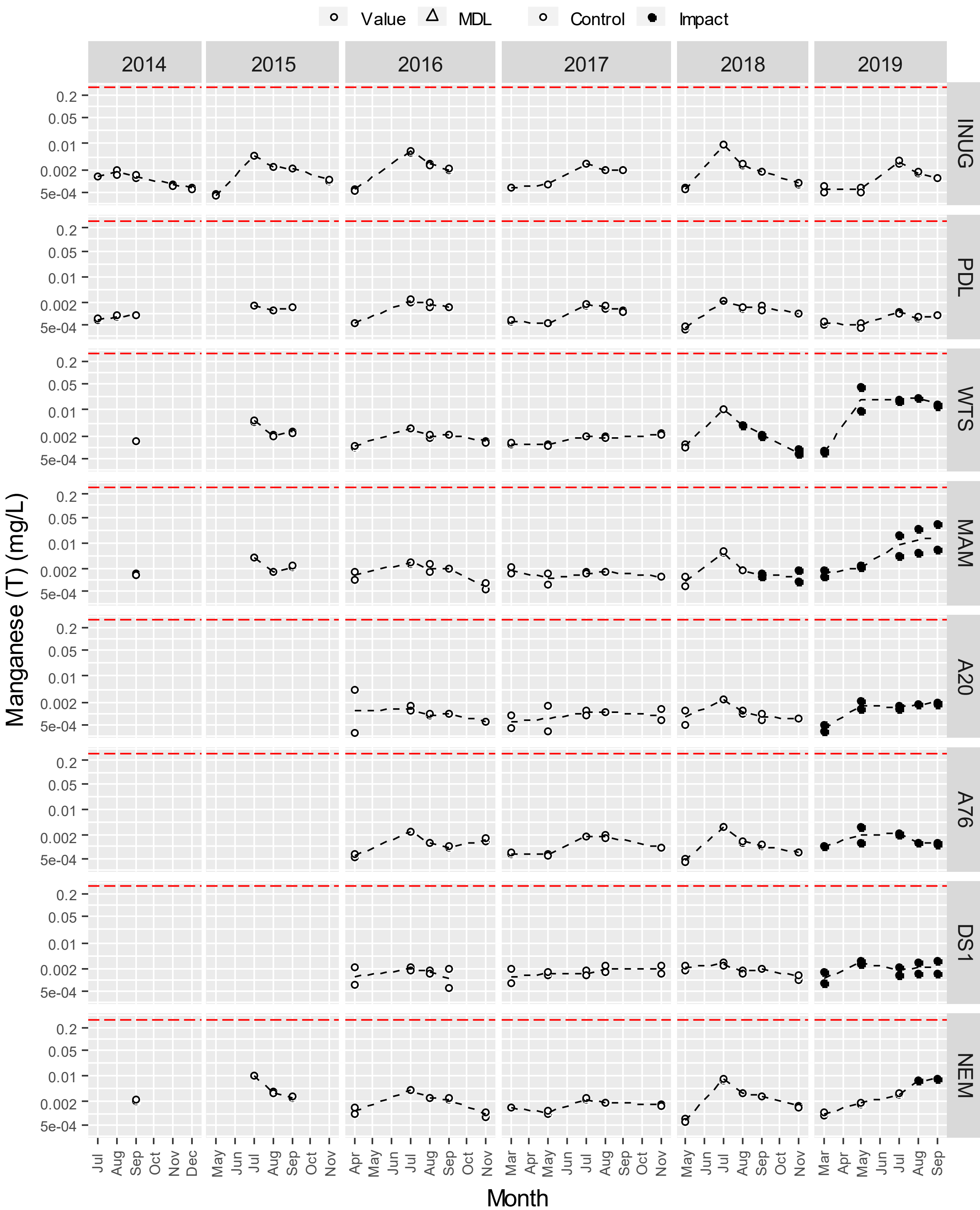


Figure 5-46. Total molybdenum (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

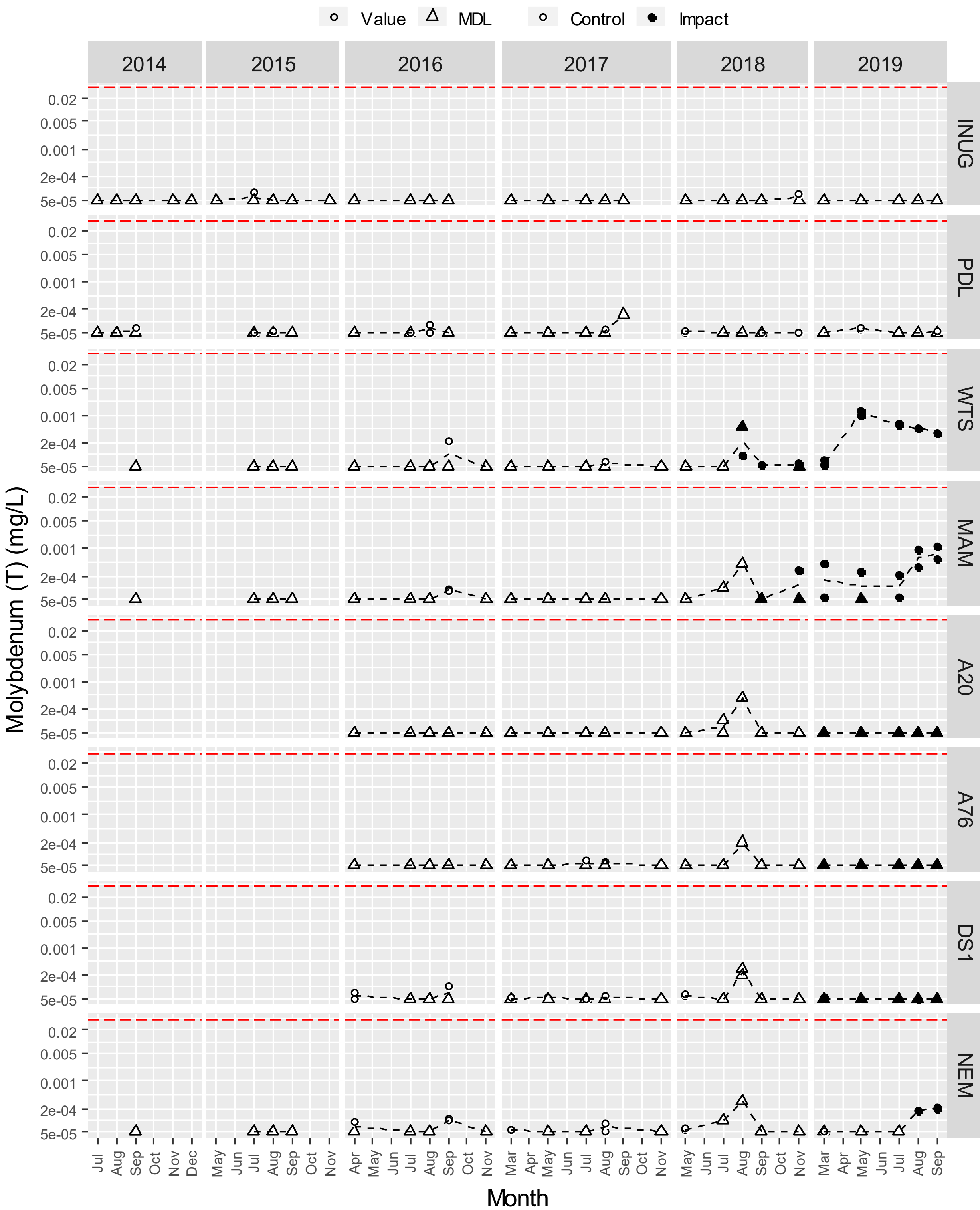


Figure 5-47. Total nickel (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

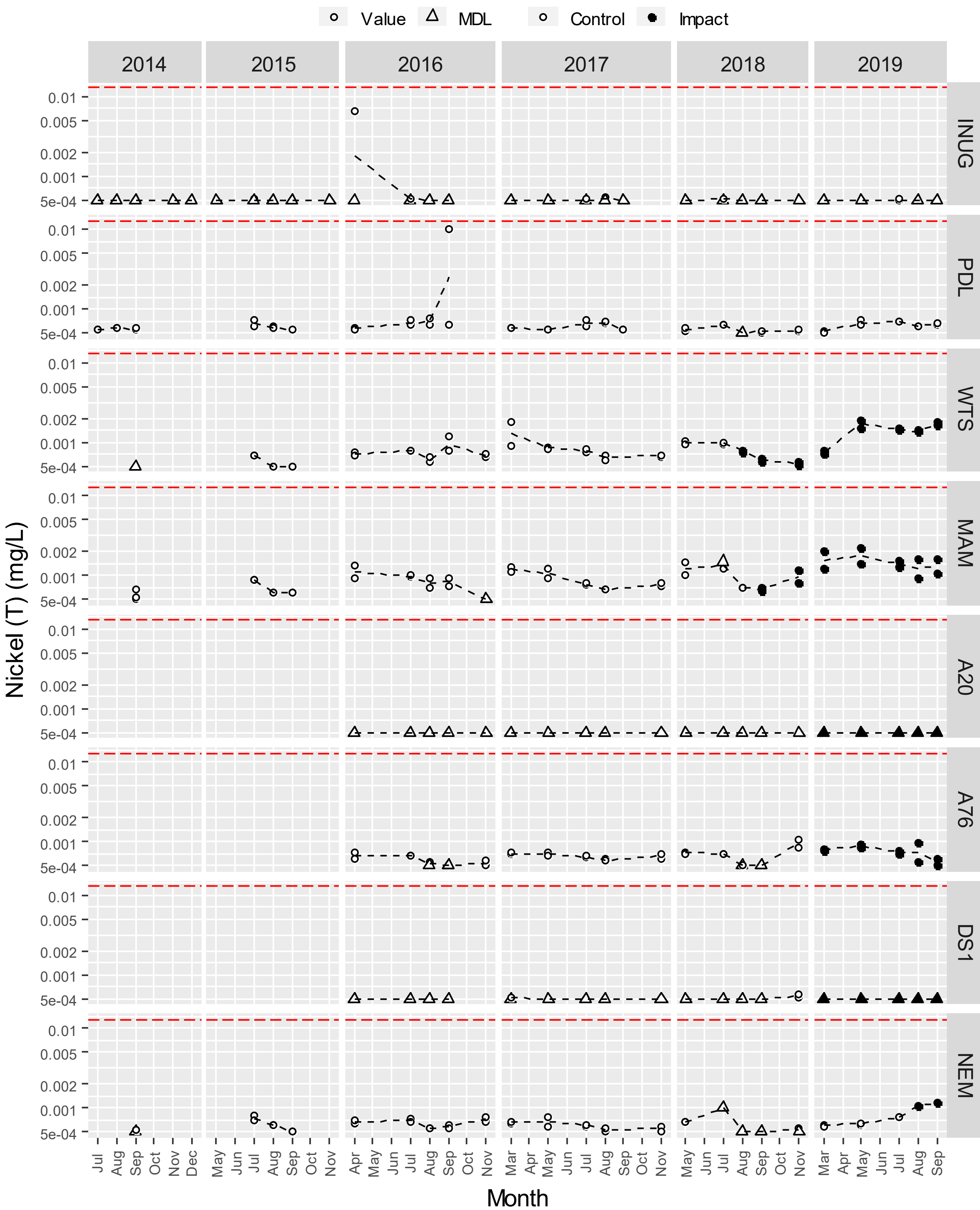


Figure 5-48. Total potassium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

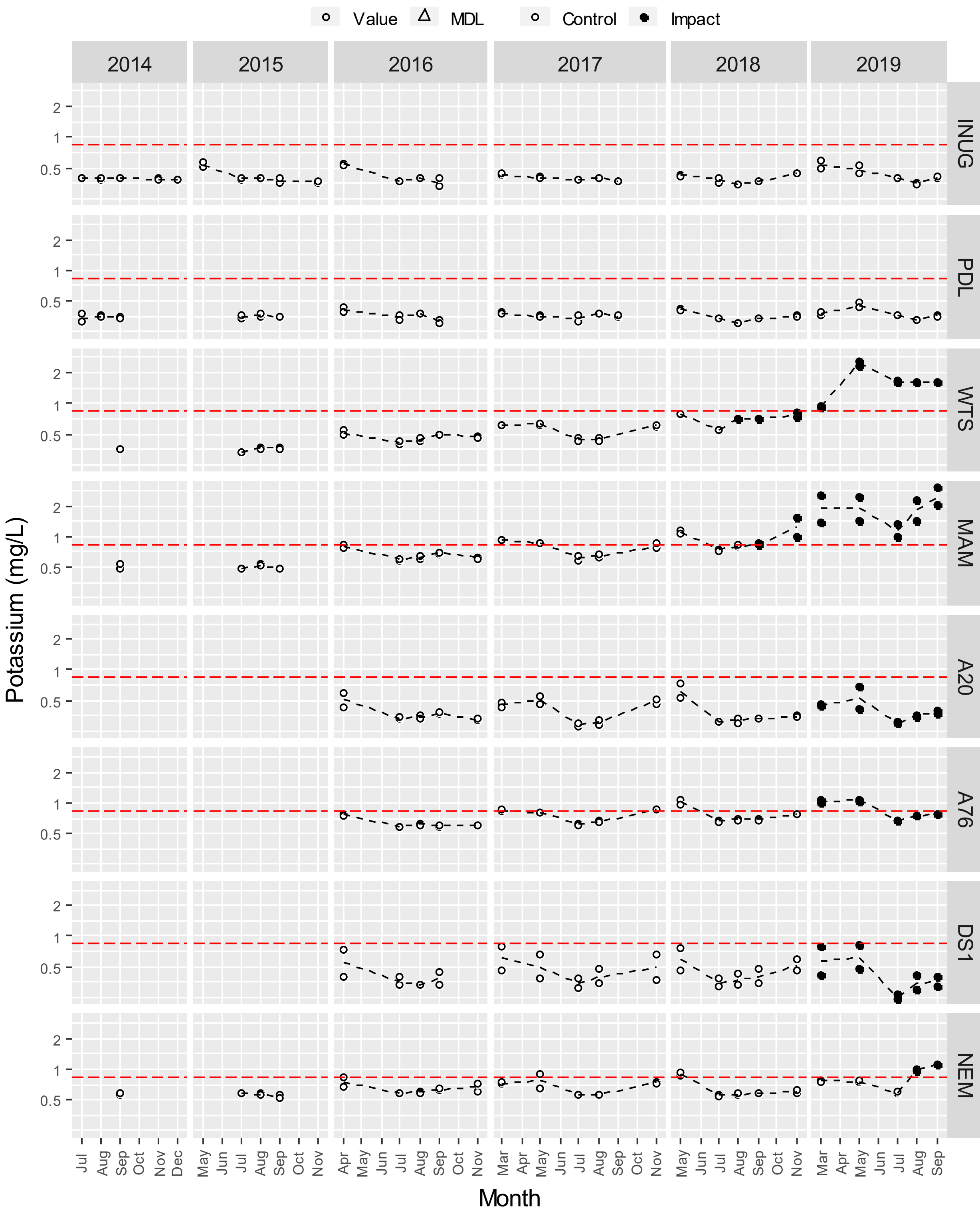


Figure 5-49. Total silicon (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

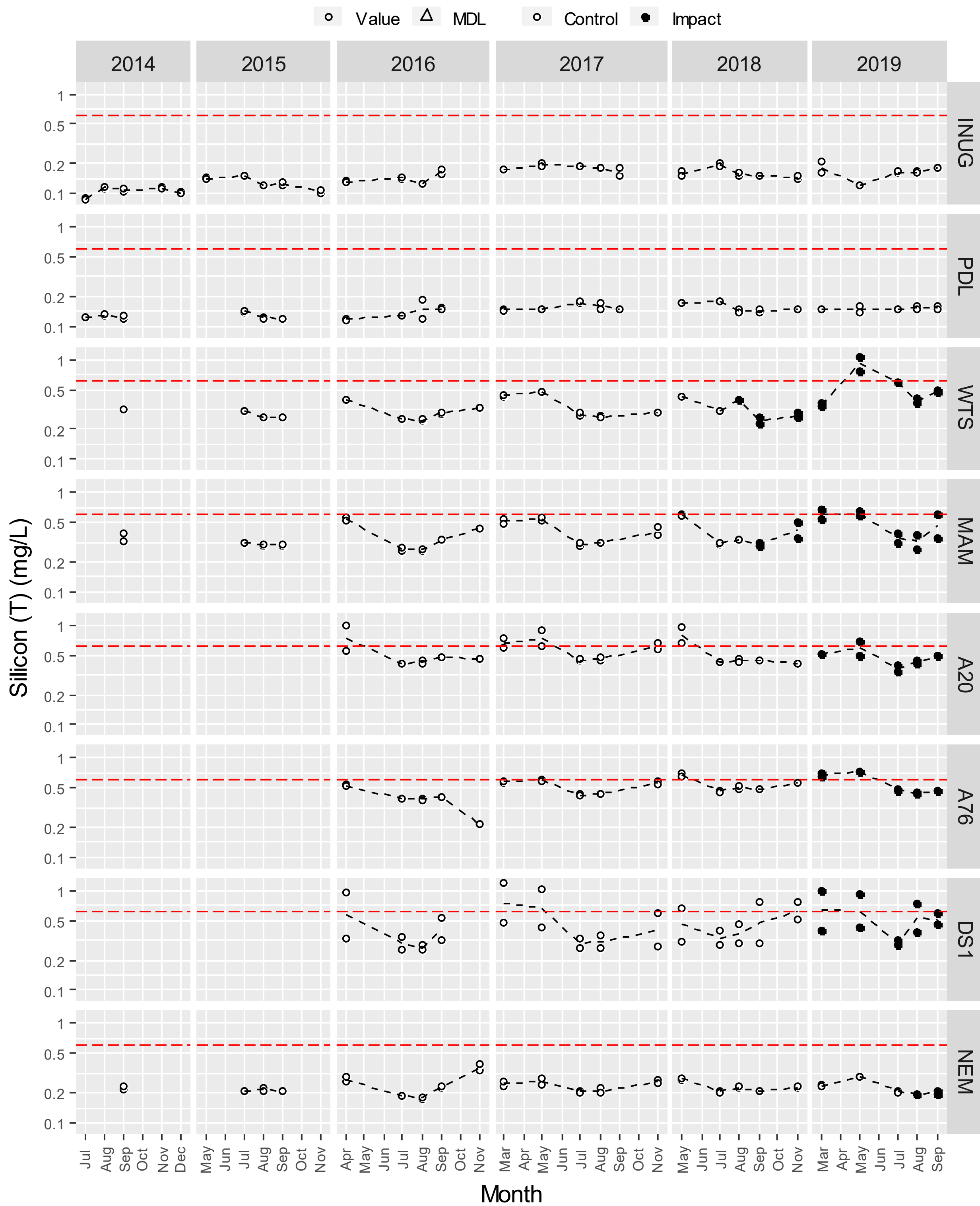


Figure 5-50. Total sodium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

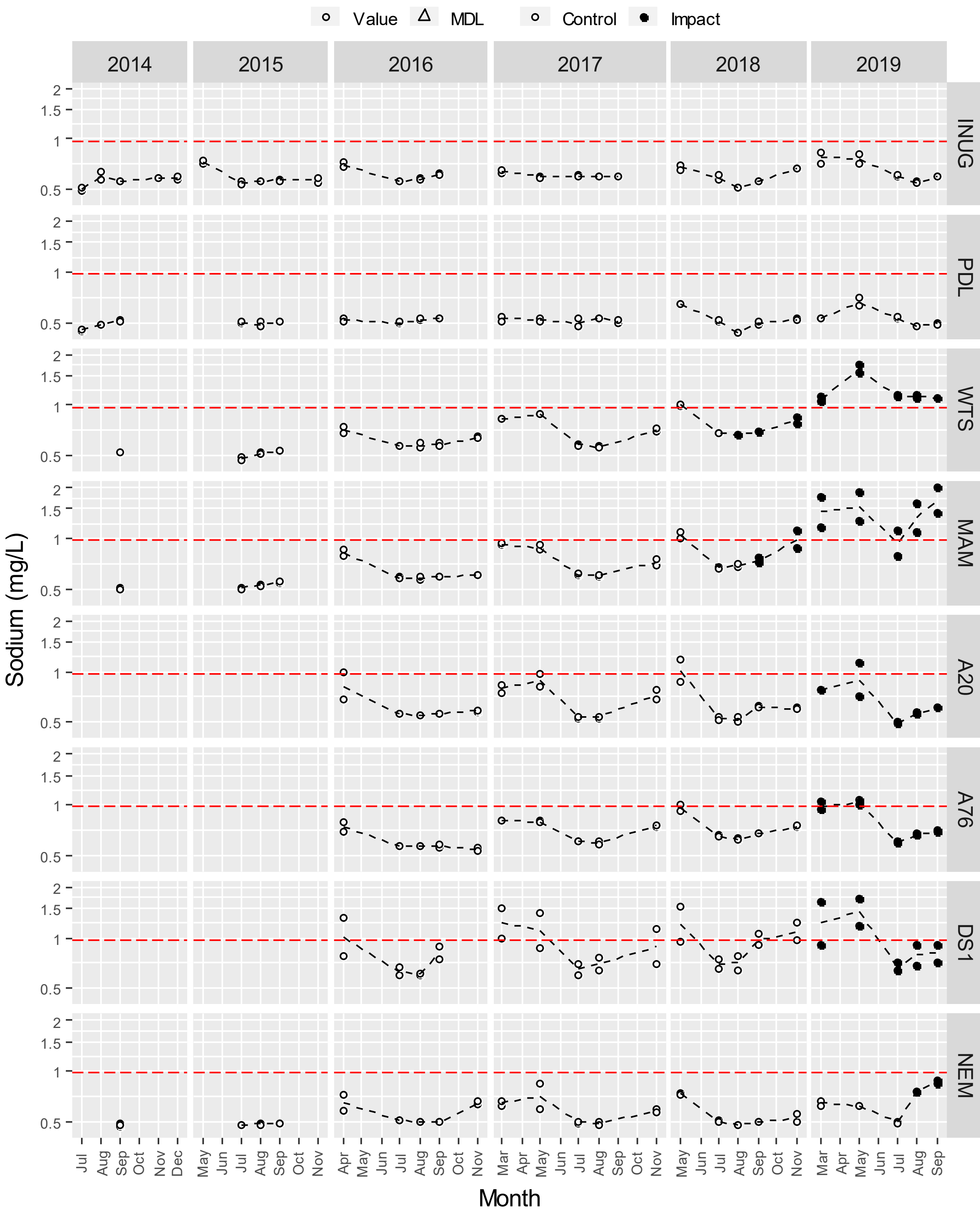


Figure 5-51. Total strontium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes. The blue dashed line = FEIS screening prediction.

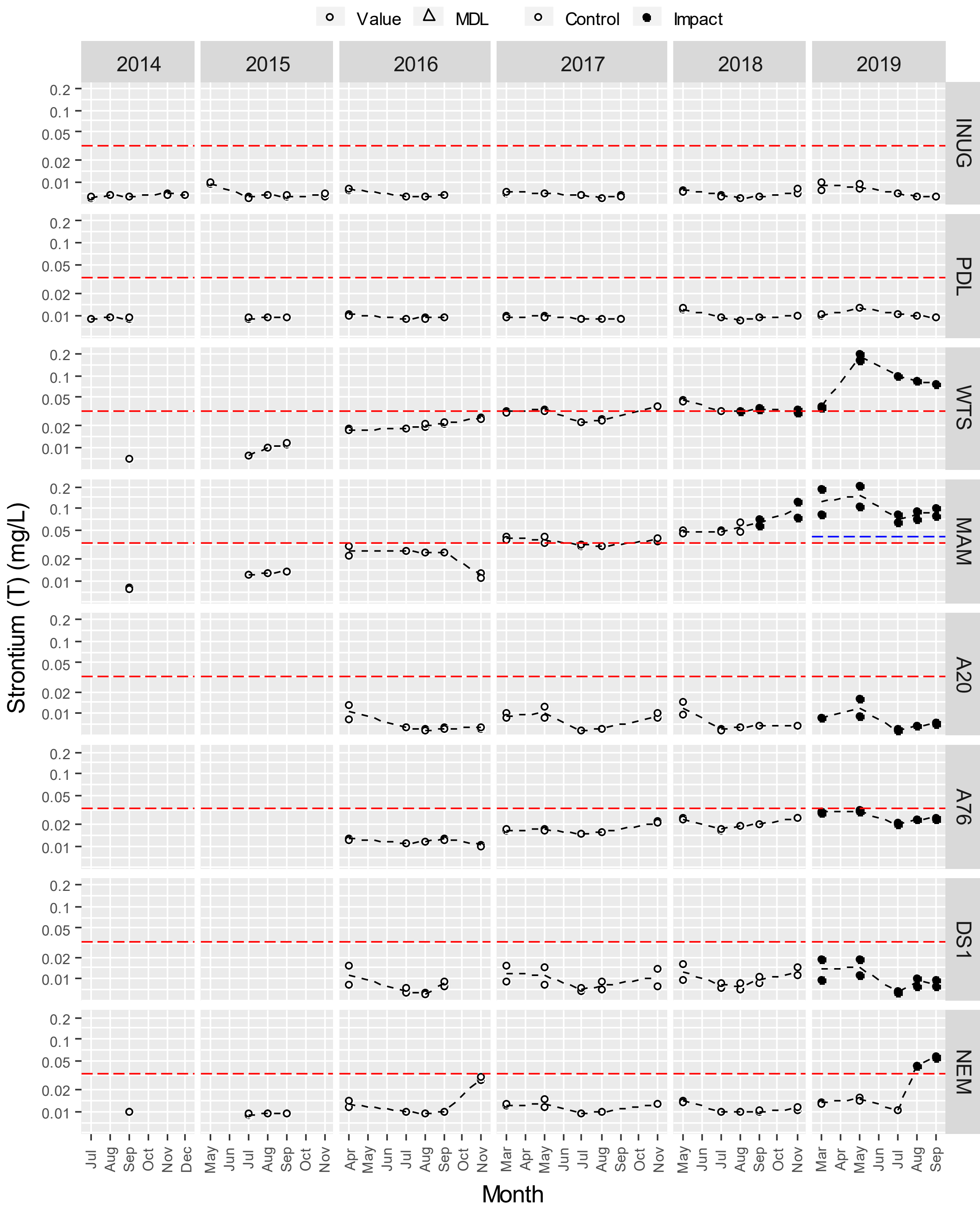


Figure 5-52. Total titanium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

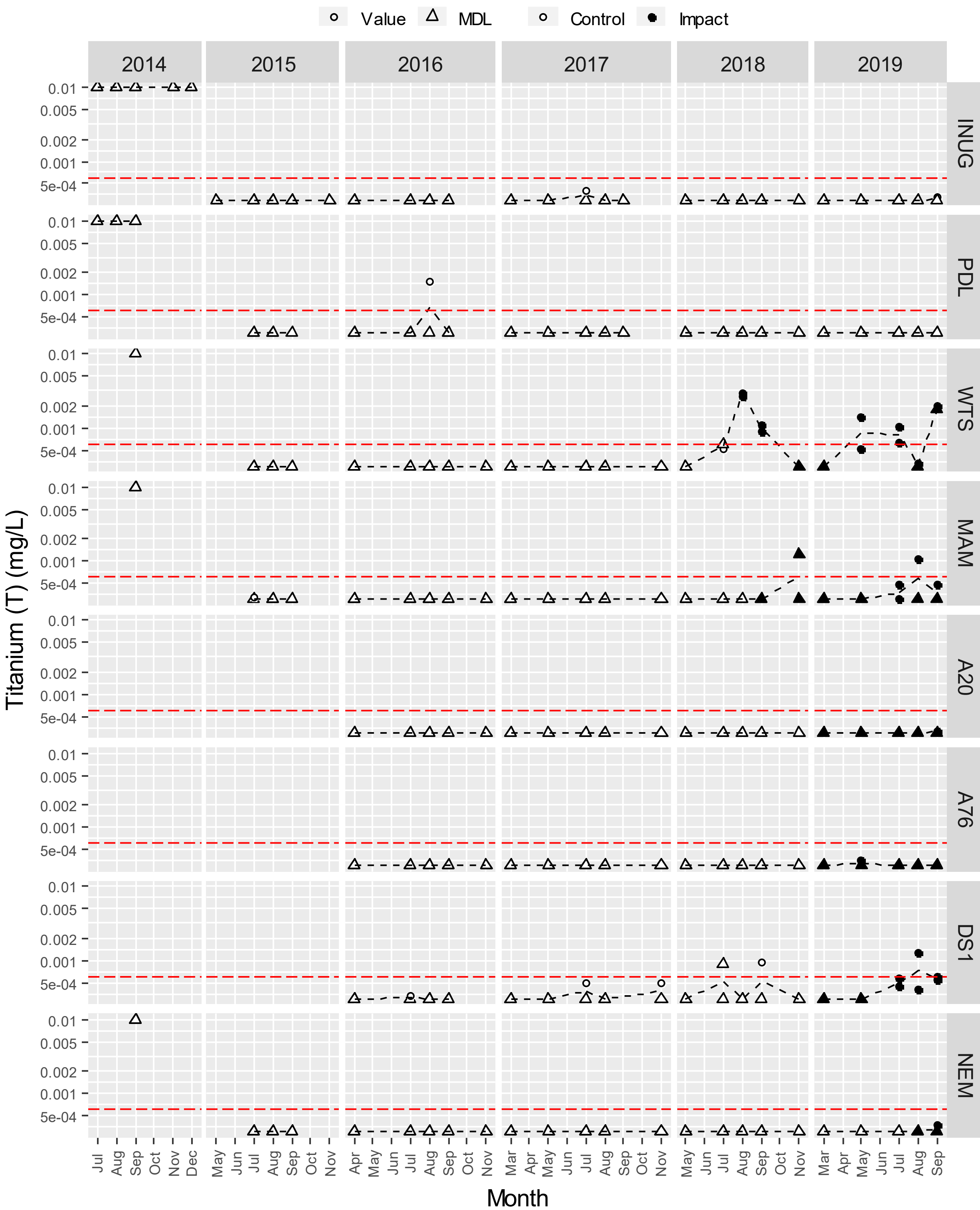


Figure 5-53. Total uranium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

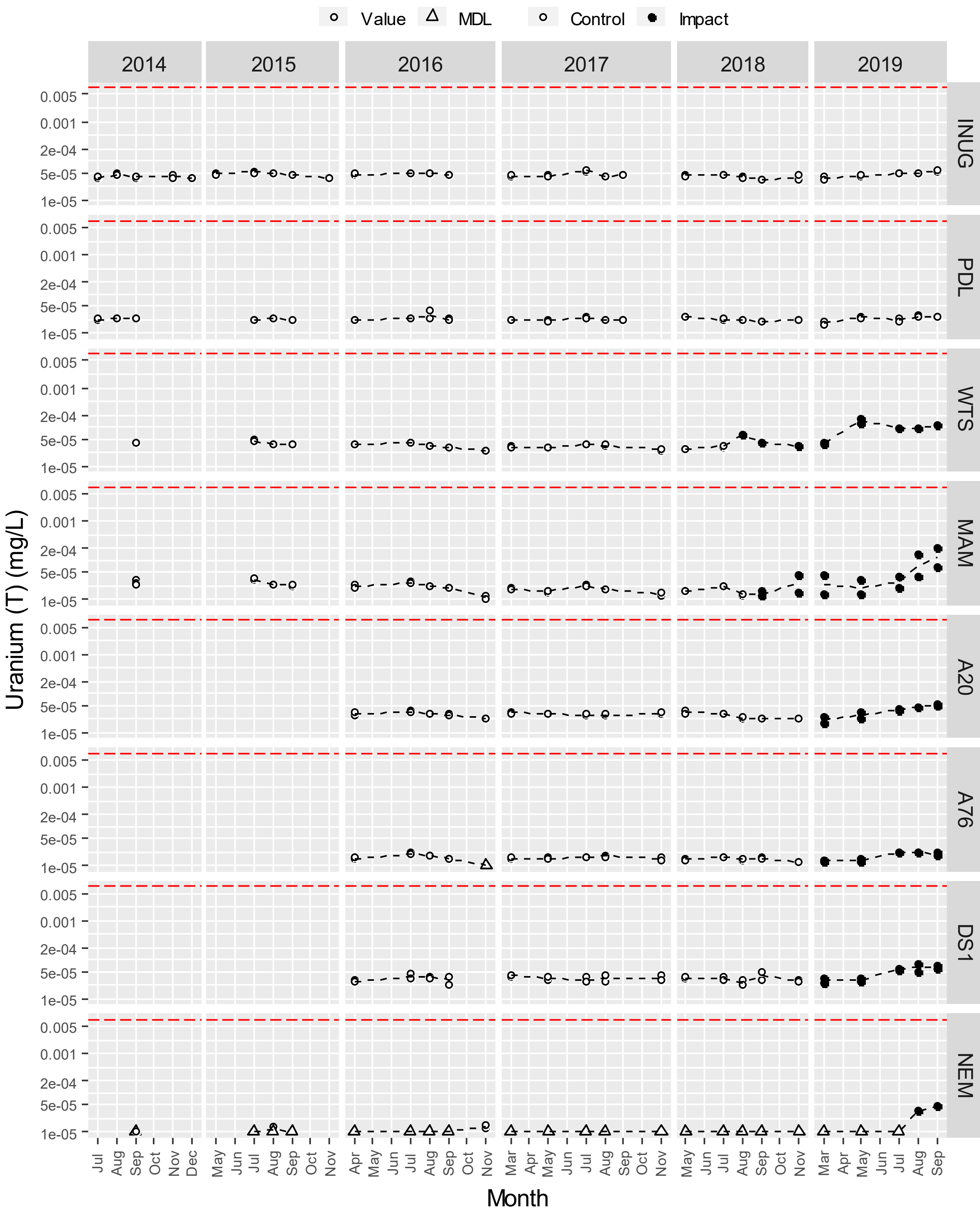


Figure 5-54. Dissolved aluminum (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

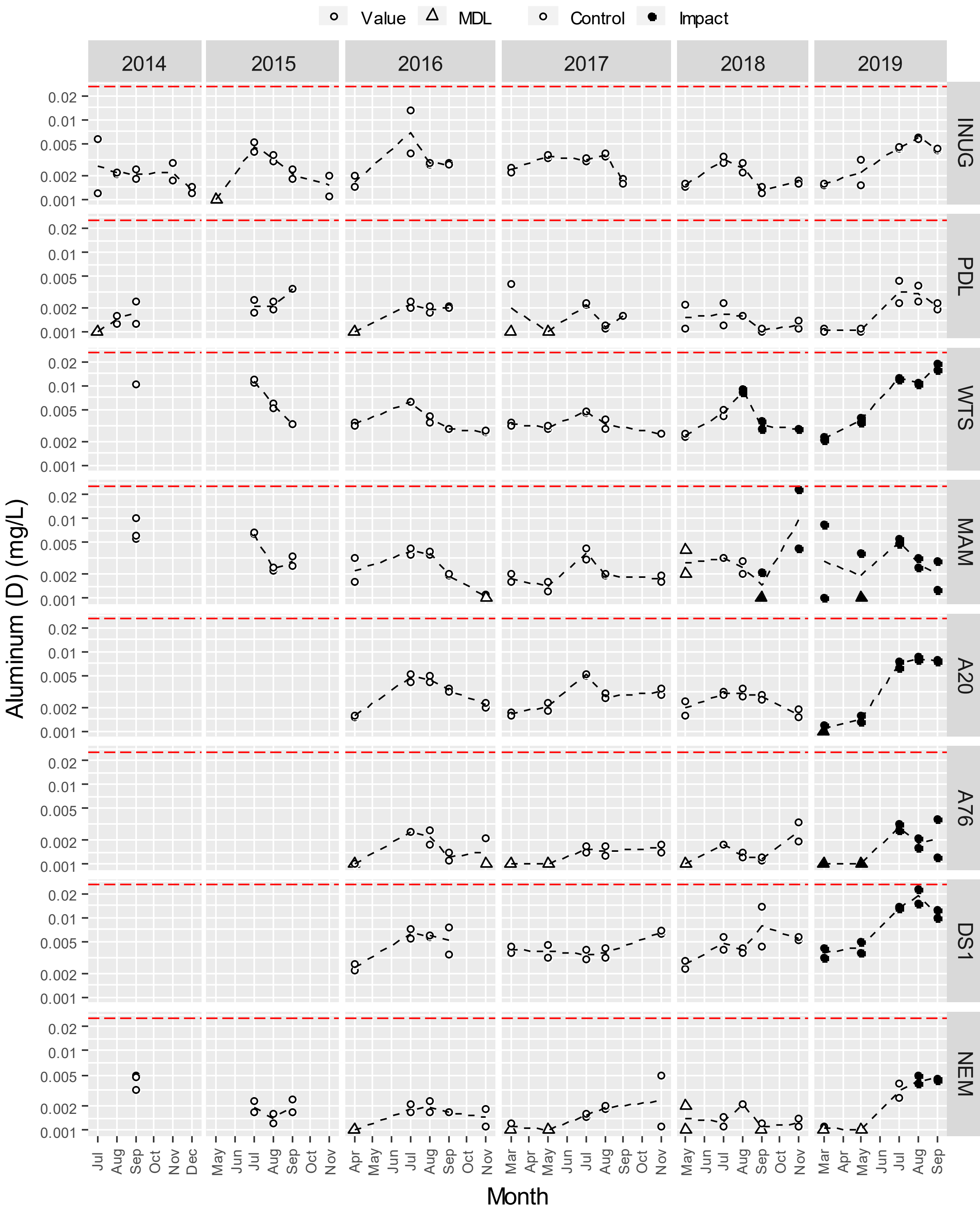


Figure 5-55. Dissolved arsenic (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

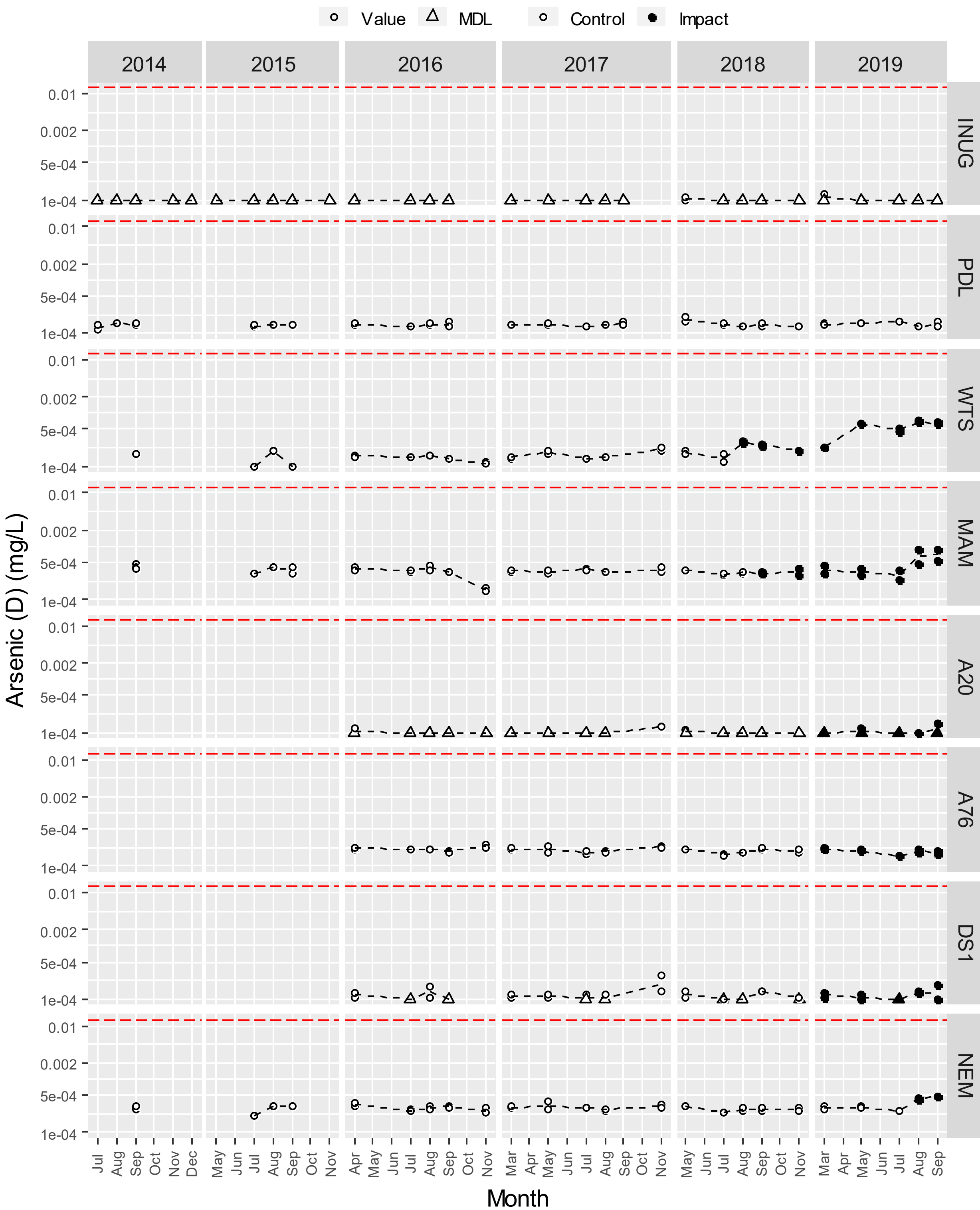


Figure 5-56. Dissolved barium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

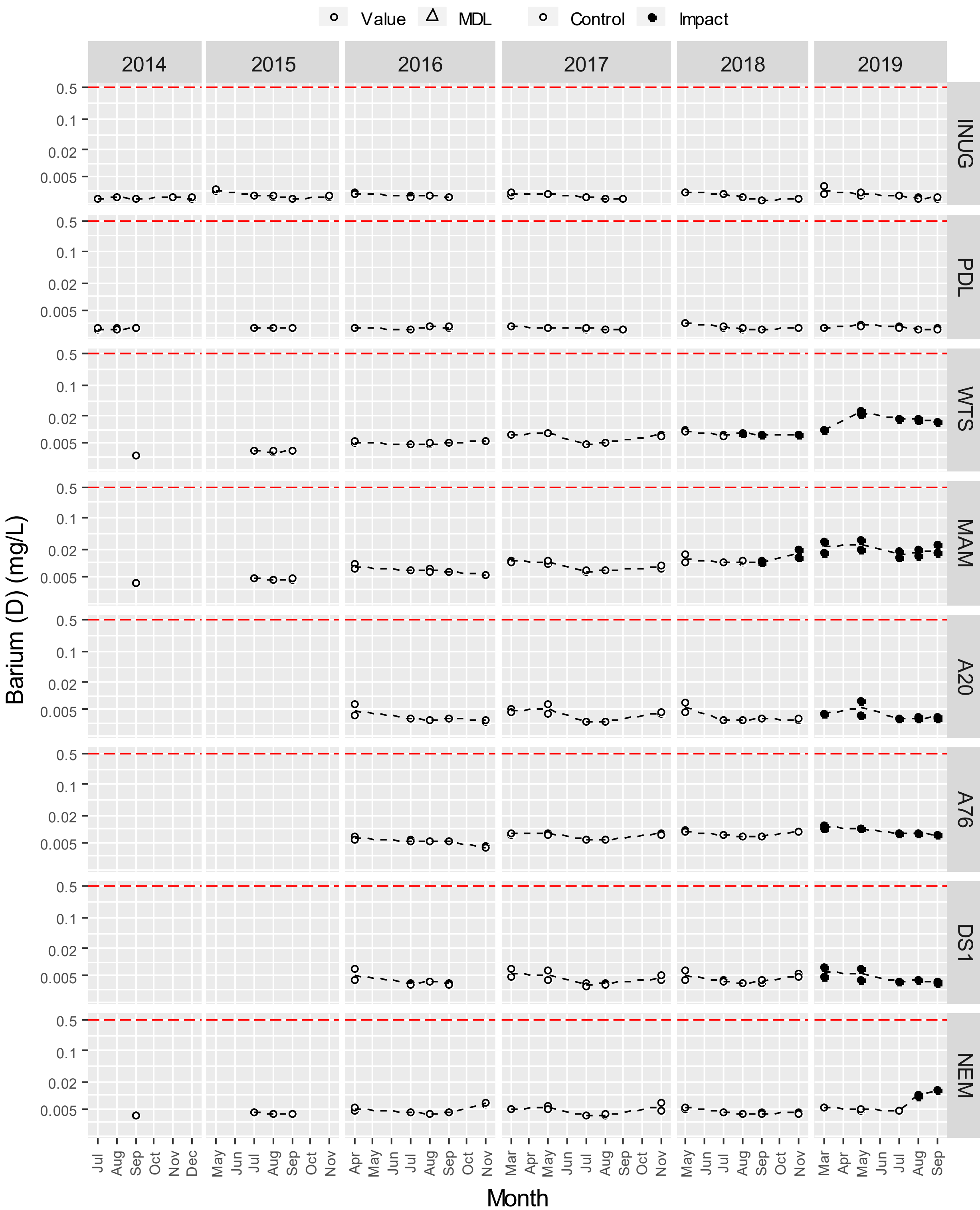


Figure 5-57. Dissolved chromium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

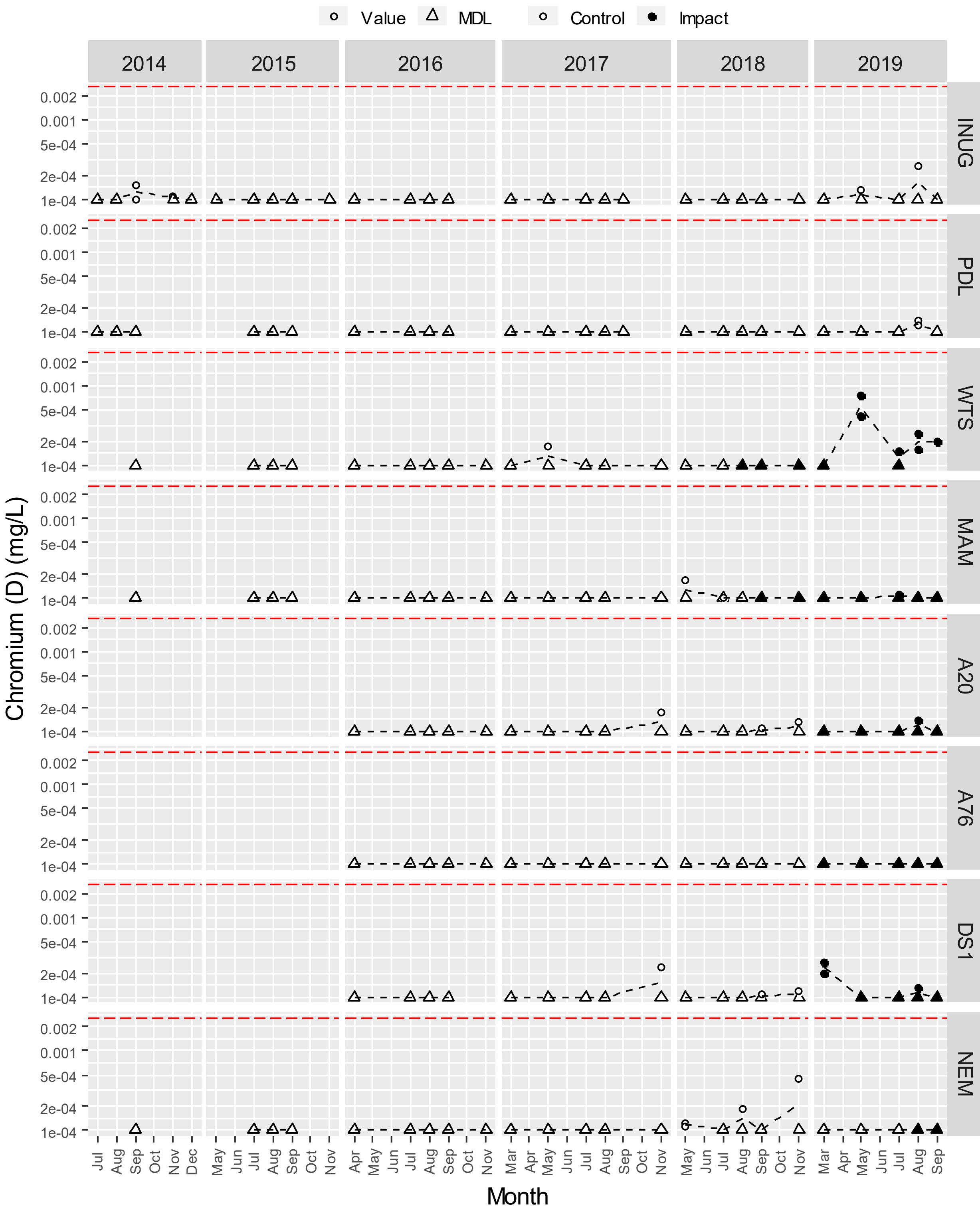


Figure 5-58. Dissolved copper (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

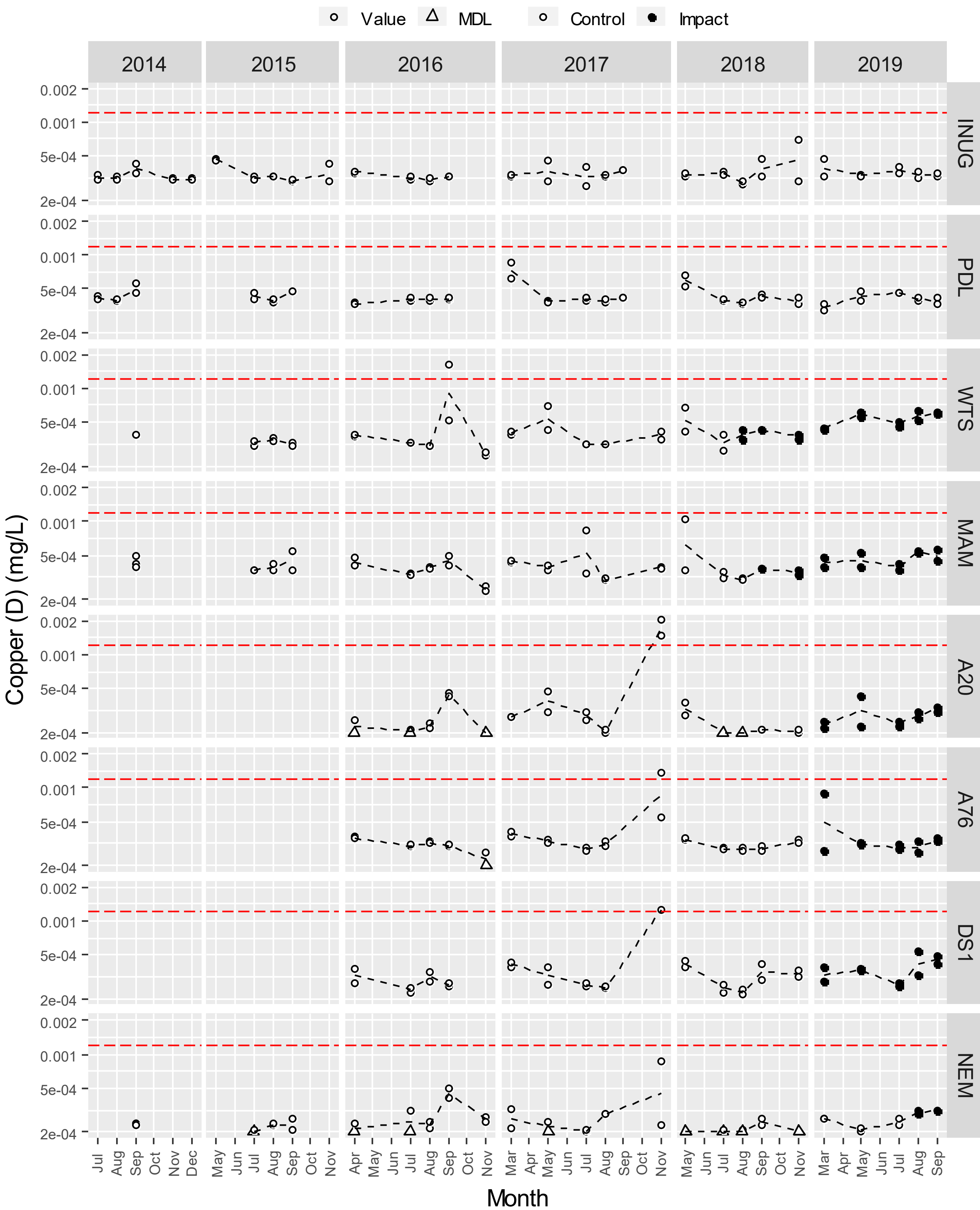


Figure 5-59. Dissolved iron (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

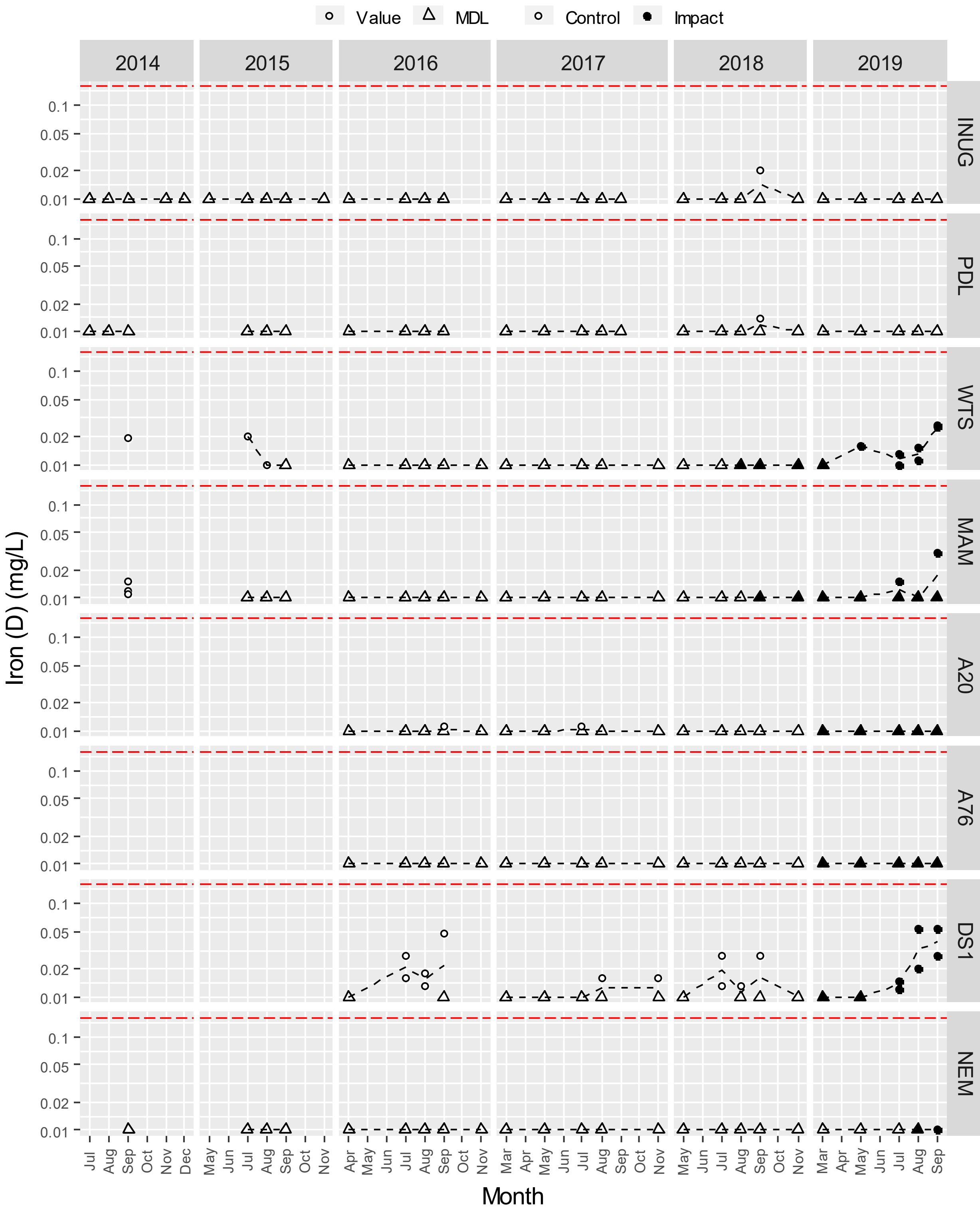


Figure 5-60. Dissolved lead (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

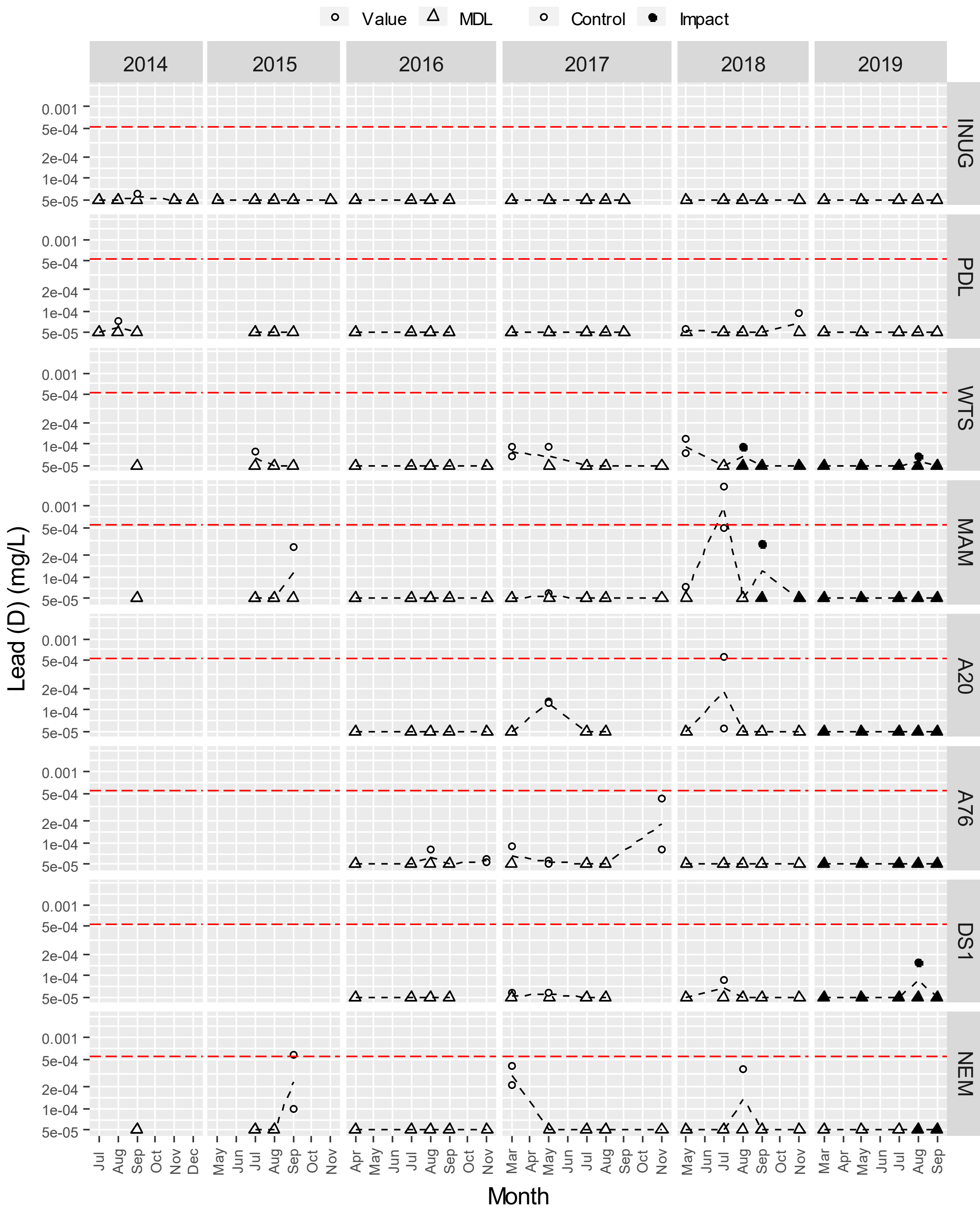


Figure 5-61. Dissolved lithium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

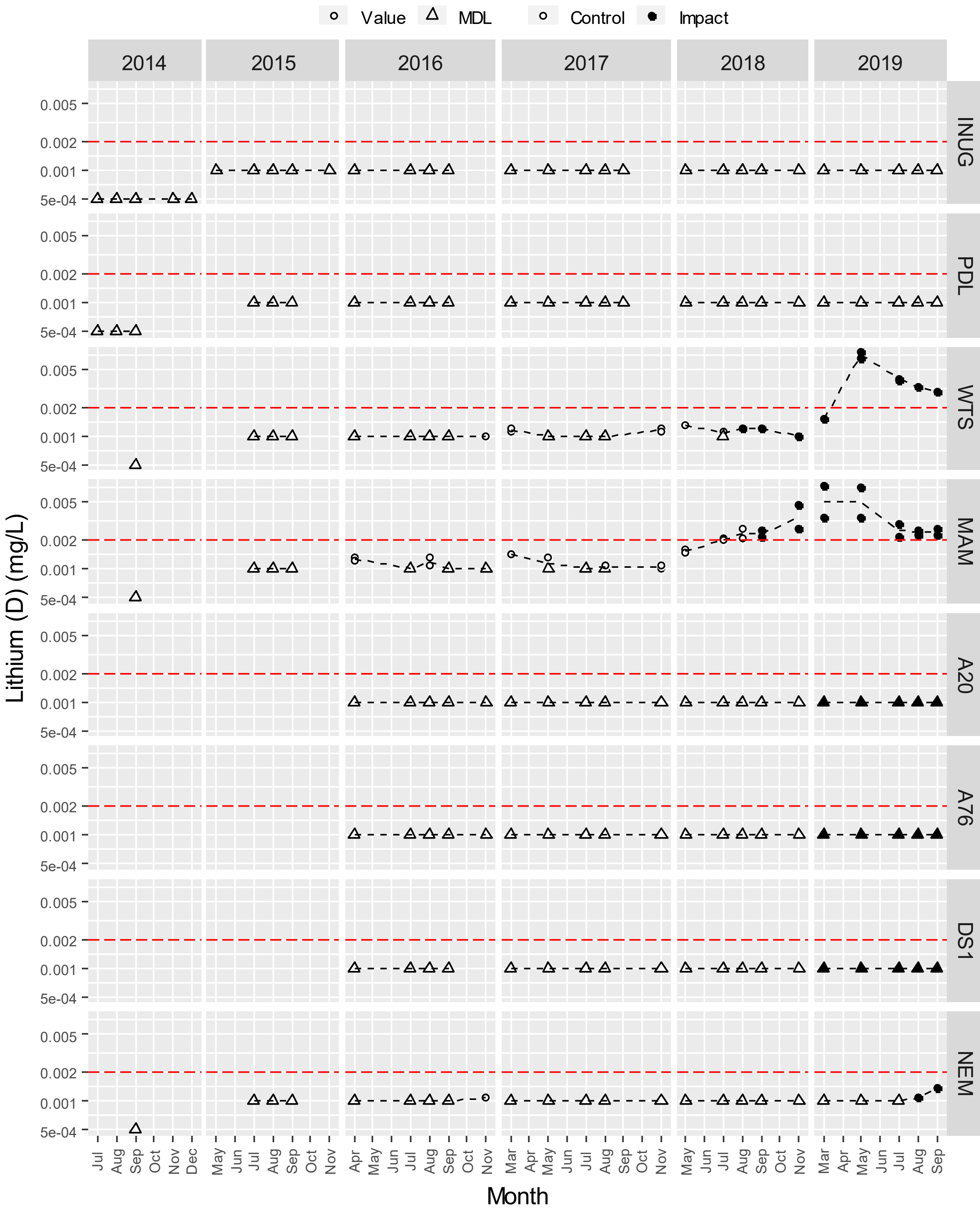


Figure 5-62. Dissolved manganese (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

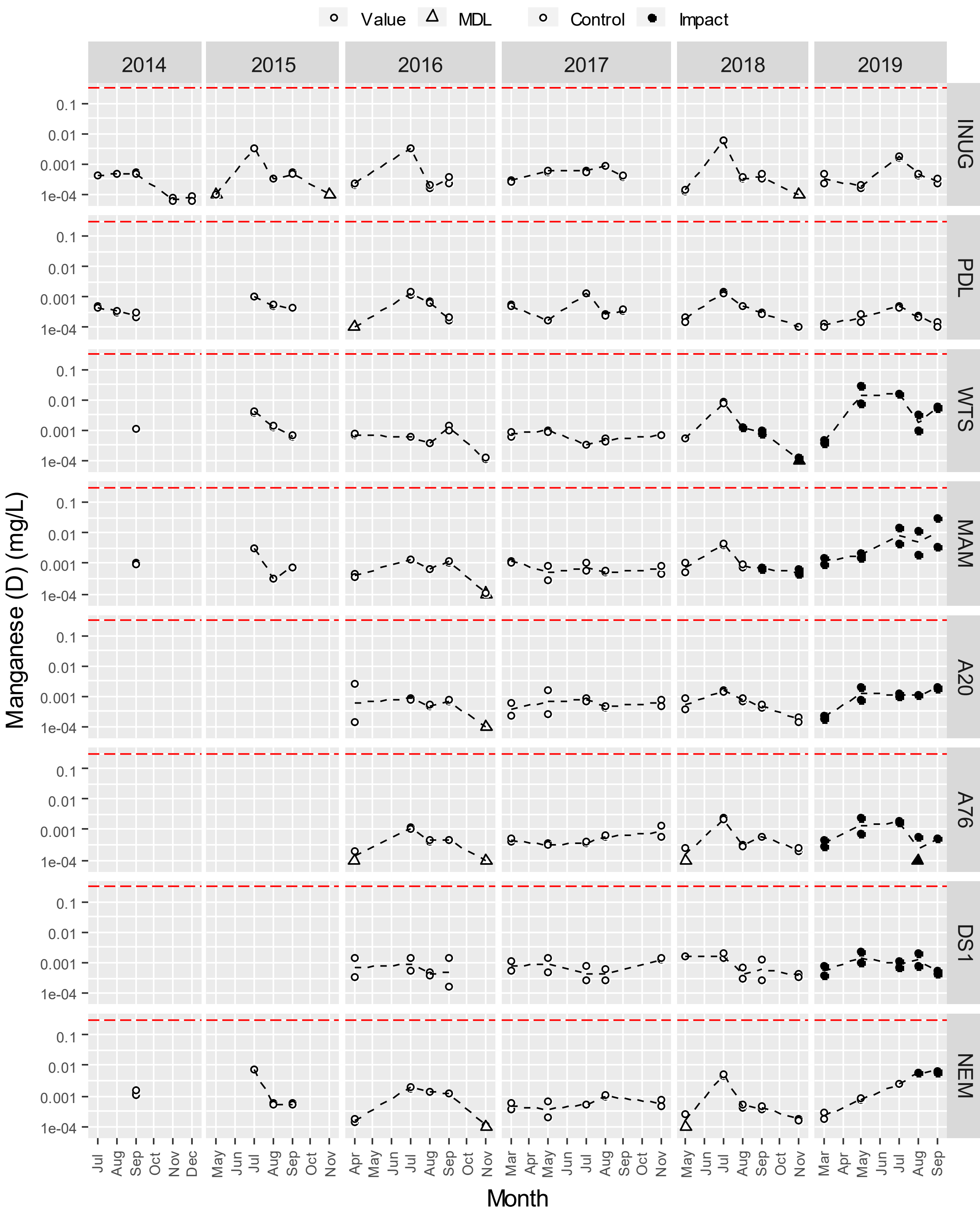


Figure 5-63. Dissolved molybdenum (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

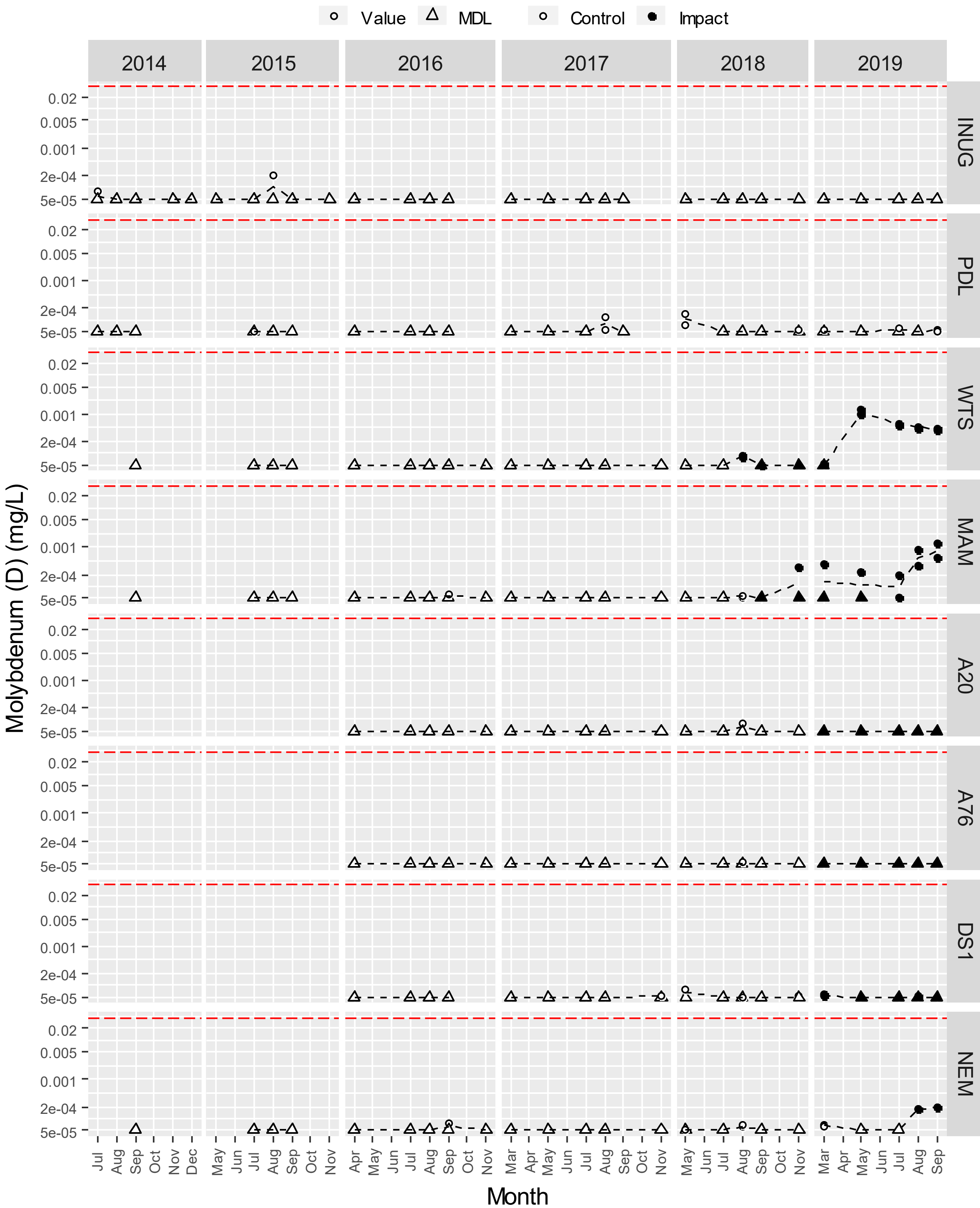


Figure 5-64. Dissolved nickel (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

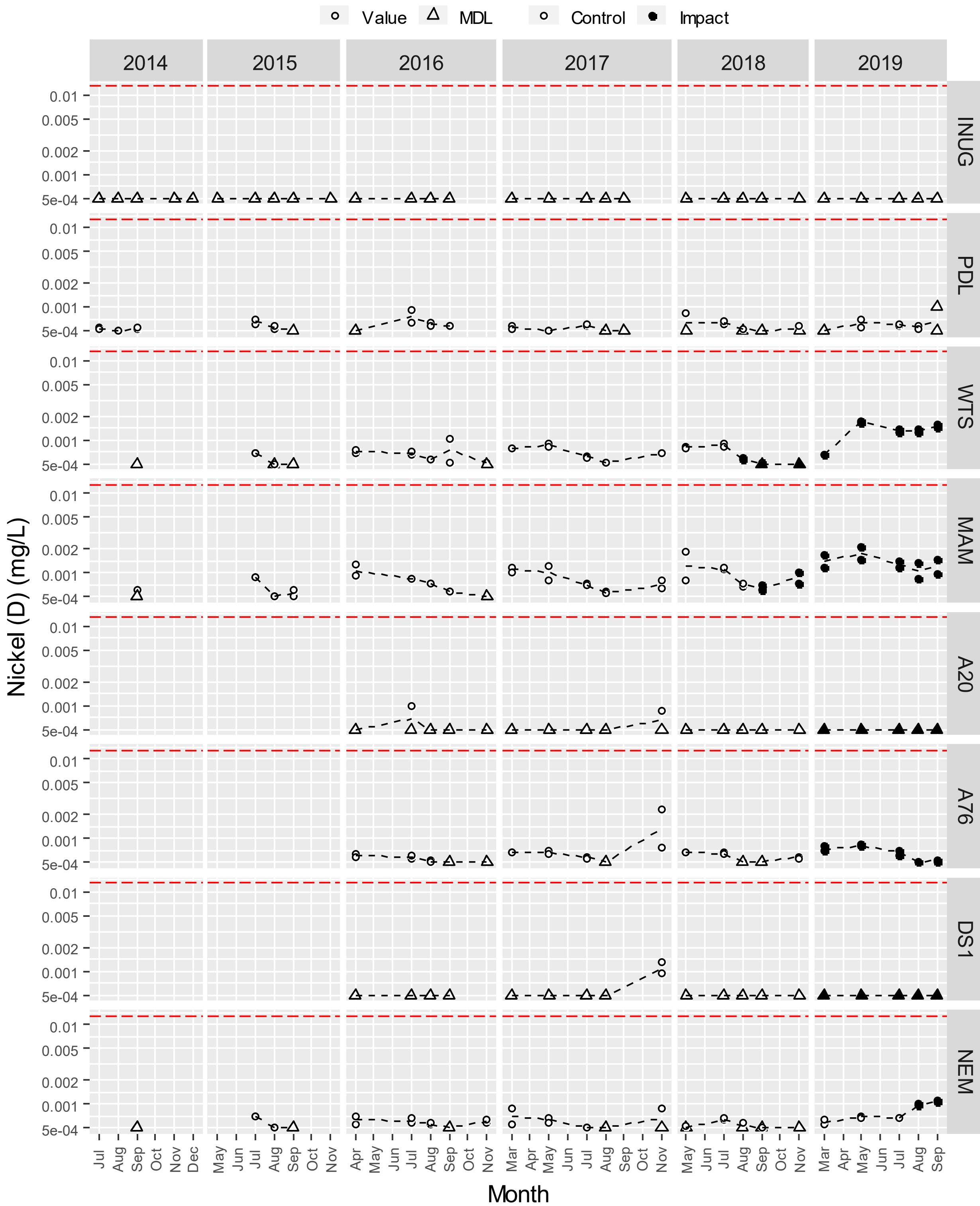


Figure 5-65. Dissolved silicon (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

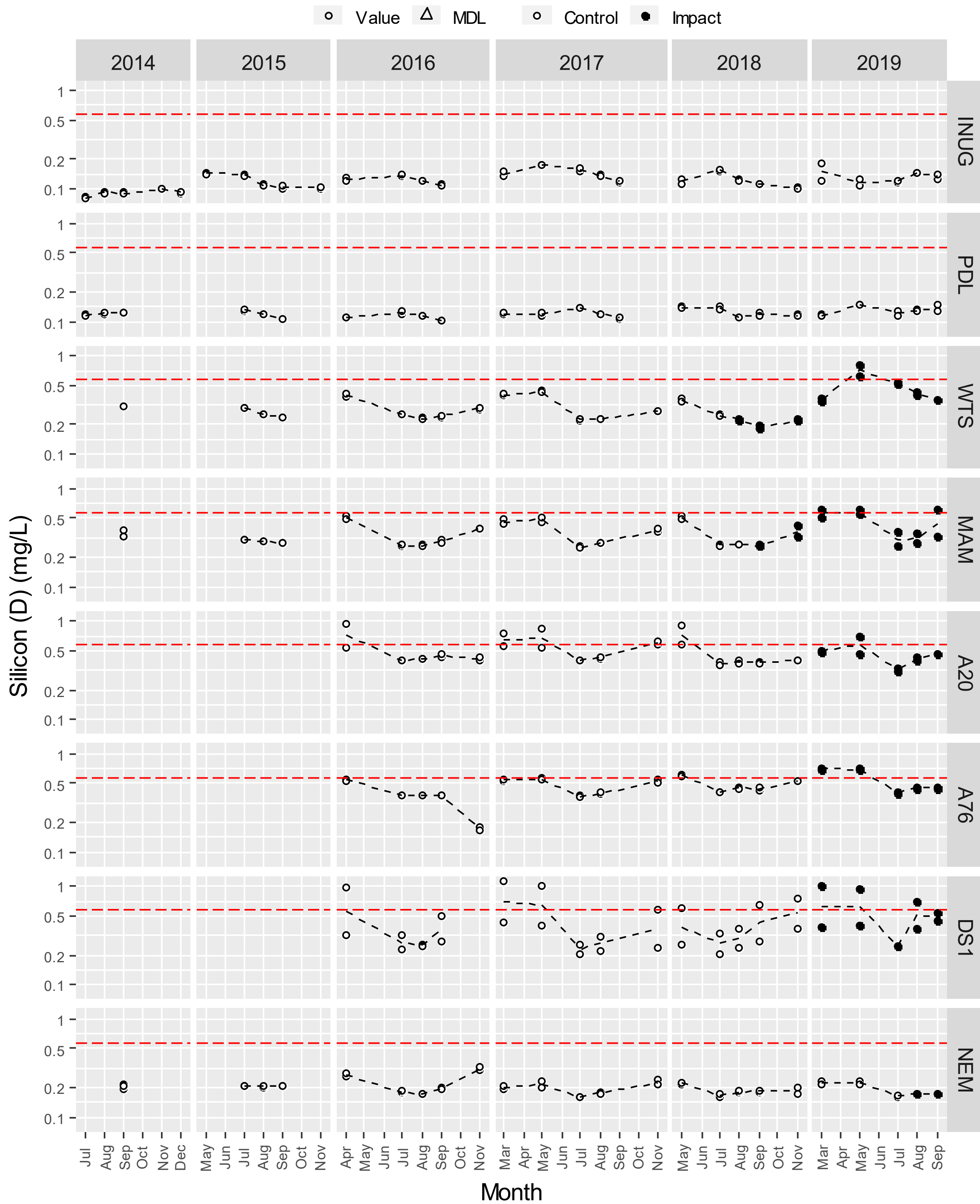


Figure 5-66. Dissolved strontium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

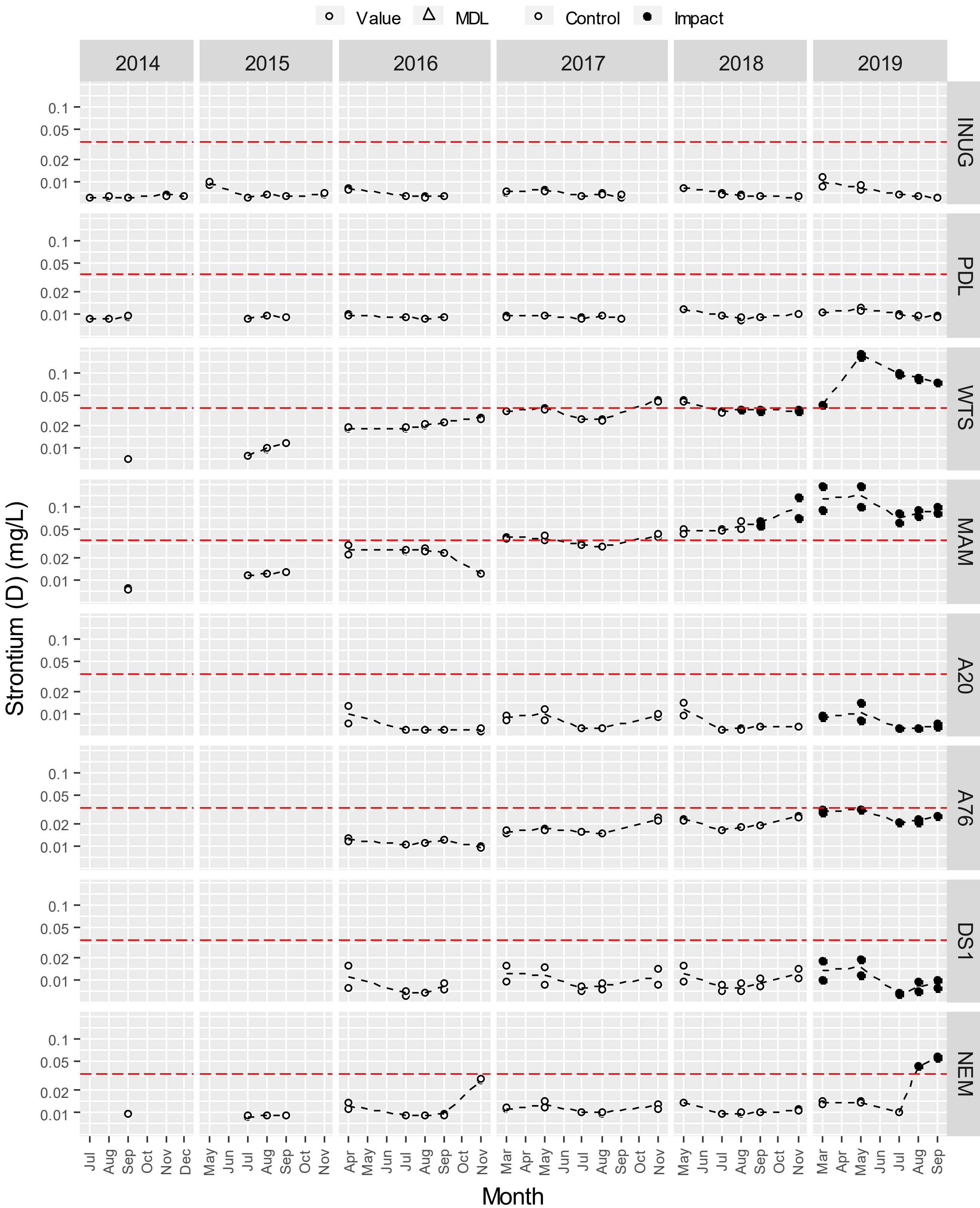


Figure 5-67. Dissolved uranium (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.

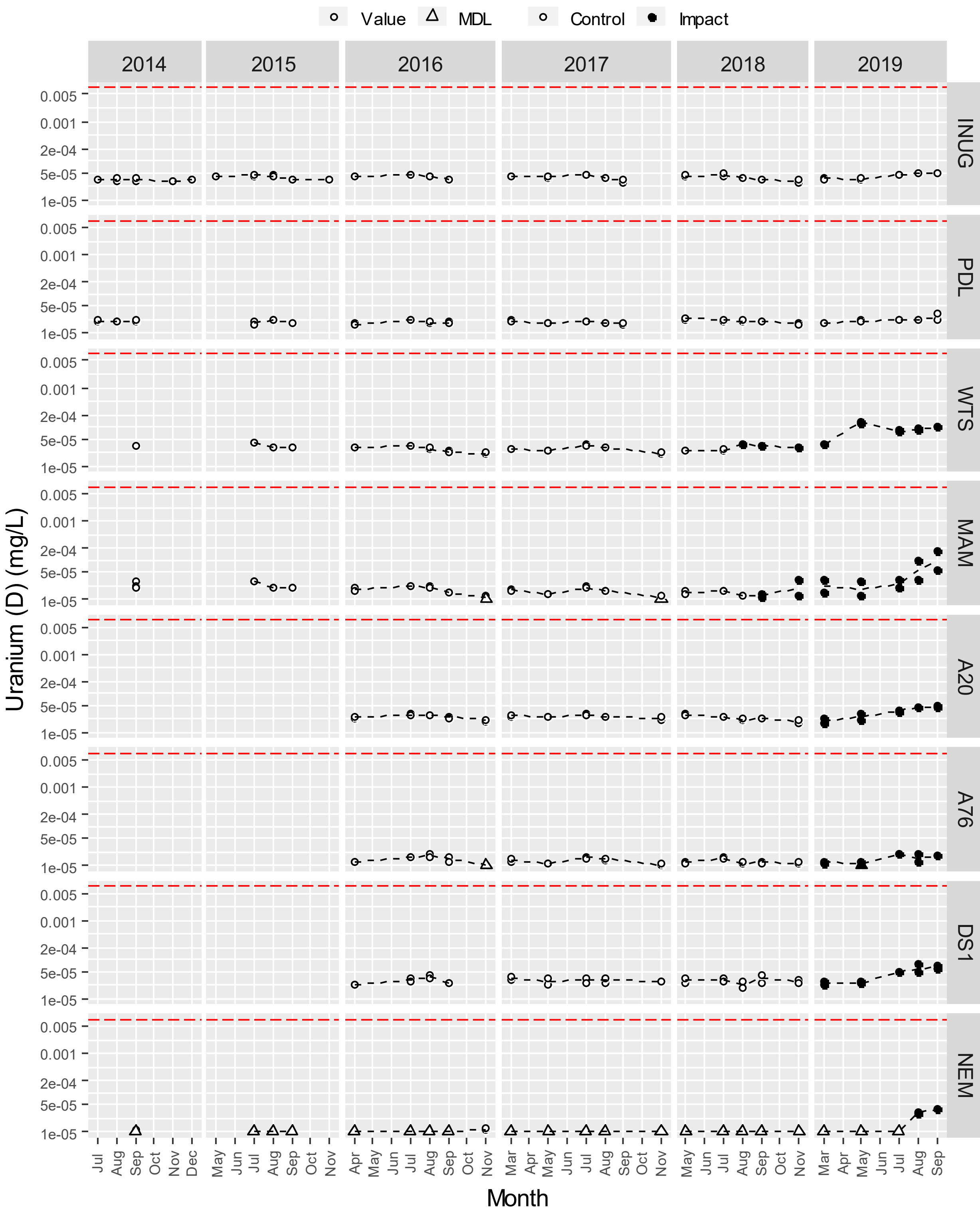
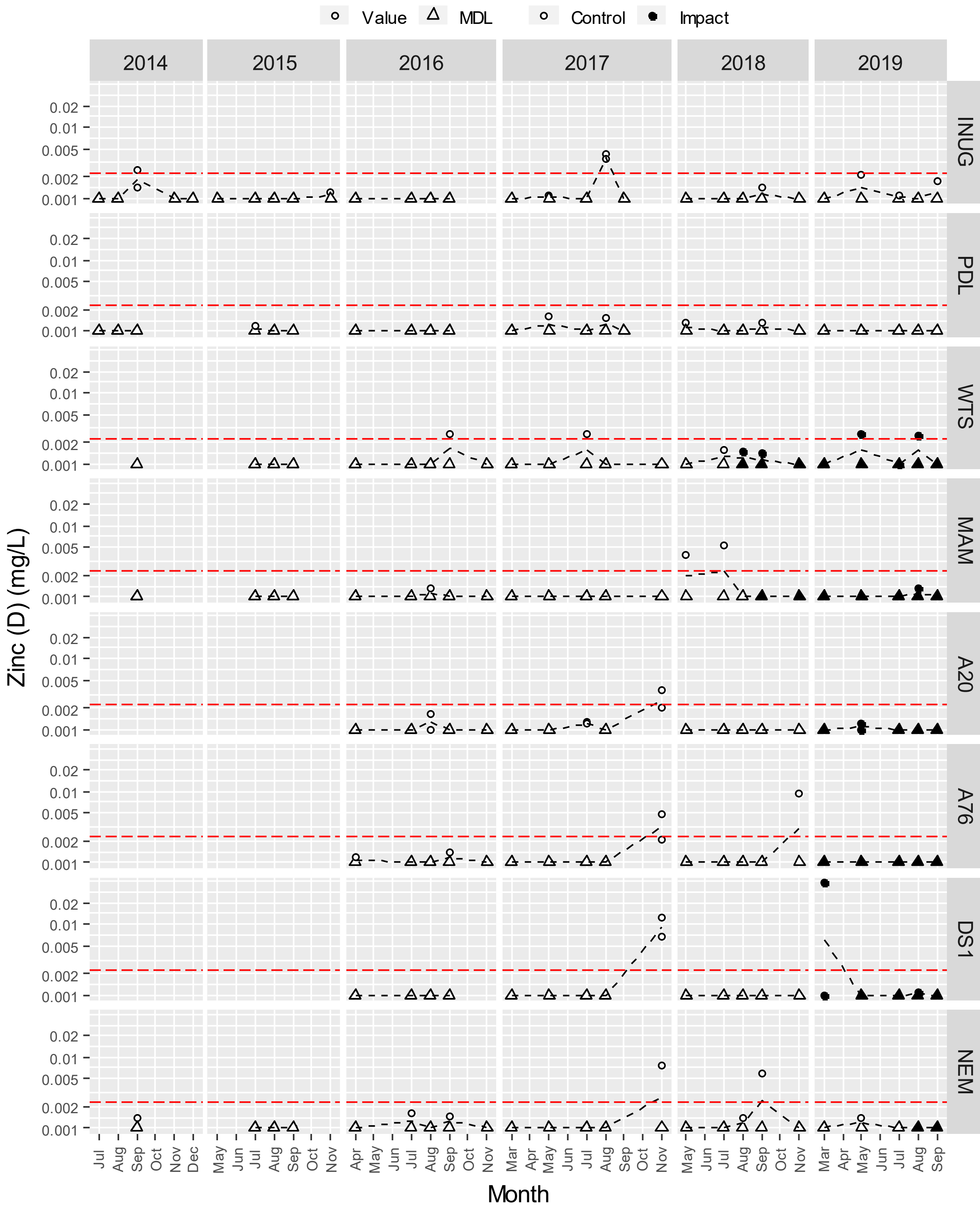


Figure 5-68. Dissolved zinc (mg/L) in water samples from Whale Tail study area lakes since 2014.

Note: The red dashed line is the trigger value specific to Whale Tail study area lakes.



Phytoplankton Tables and Figures

Table 5-8. Results of the BACI test for phytoplankton variables at Whale Tail Pit areas, 2019.

Parameter Measured	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
Total Biomass	WTS	15	5	1.1	0.37	**0.009**	190	35	526
	MAM	16	5	0.89	0.52	0.11	143	-19	629
	A20	14	5	0.47	0.50	0.36	60	-45	365
	A76	14	5	0.07	0.45	0.89	7	-59	177
	DS1	14	5	0.28	0.53	0.60	33	-57	309
	NEM	18	5	0.50	0.43	0.26	65	-33	306
Taxa Richness	WTS	15	5	0.03	0.09	0.75	3	-15	25
	MAM	16	5	0.11	0.17	0.53	11	-22	58
	A20	14	5	0.21	0.17	0.25	23	-15	78
	A76	14	5	0.011	0.16	0.95	1	-27	41
	DS1	14	5	0.14	0.14	0.33	15	-14	54
	NEM	18	5	0.06	0.12	0.63	6	-17	36

Notes:

* **Bolded** values are P-values < 0.1

Shaded cells indicate positive (increases) or negative (reduced) effect sizes of 20% or more

Test area = area compared to control (INUG)

n(B) = number of months in the "before" period

n(A) = number of months in the "after" period (i.e., in 2019)

Estimate = BACI model estimate of the 2019 change in mean for log-transformed data

SE = standard error of the estimate

P-value = two-tailed test of the null hypothesis of no change

ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 5-69. Chlorophyll-a (µg/L) in water samples from Whale Tail Pit study lakes since 2015.

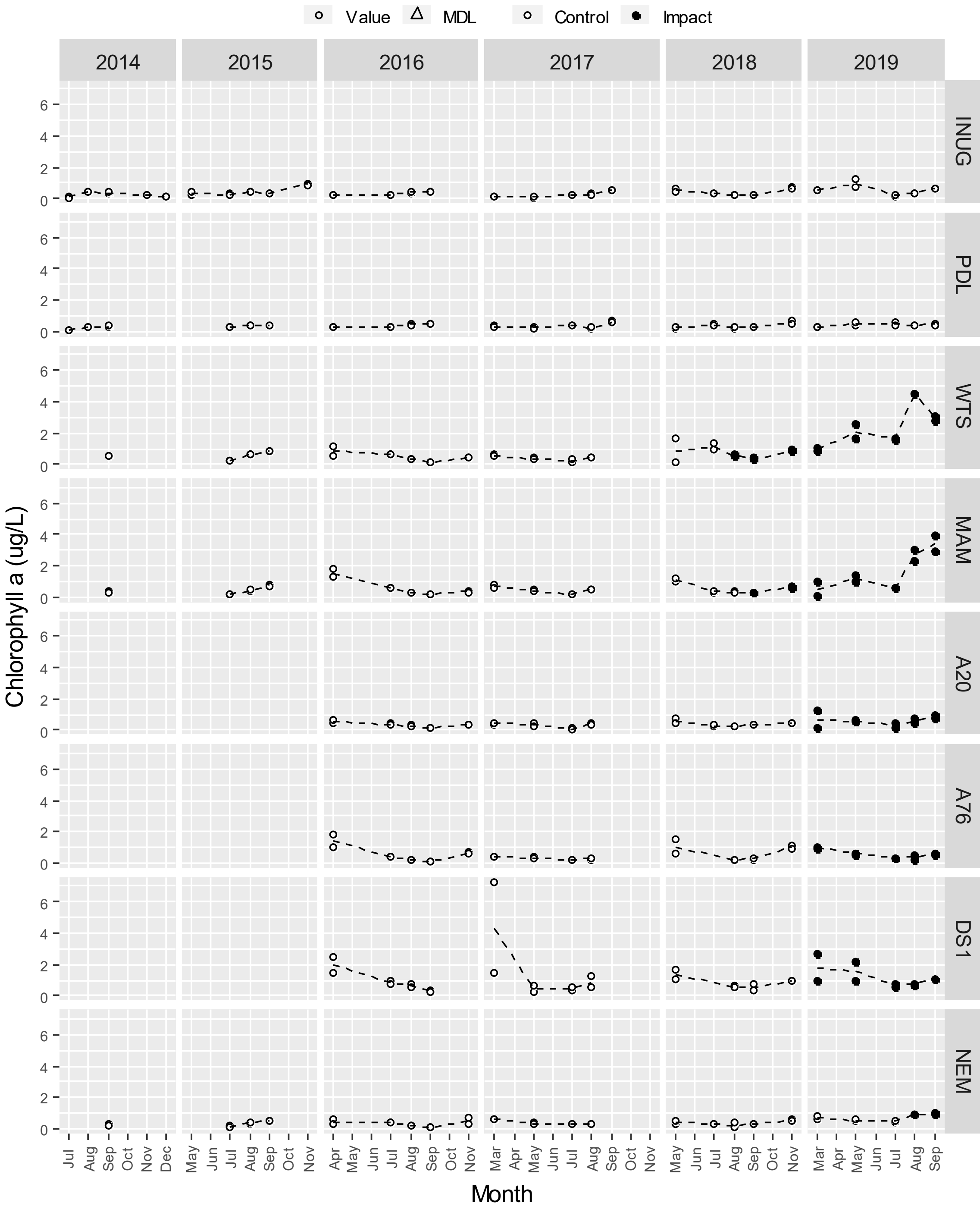


Figure 5-70. Total phytoplankton biomass (mg/m^3) from Whale Tail Pit study lakes since 2015.

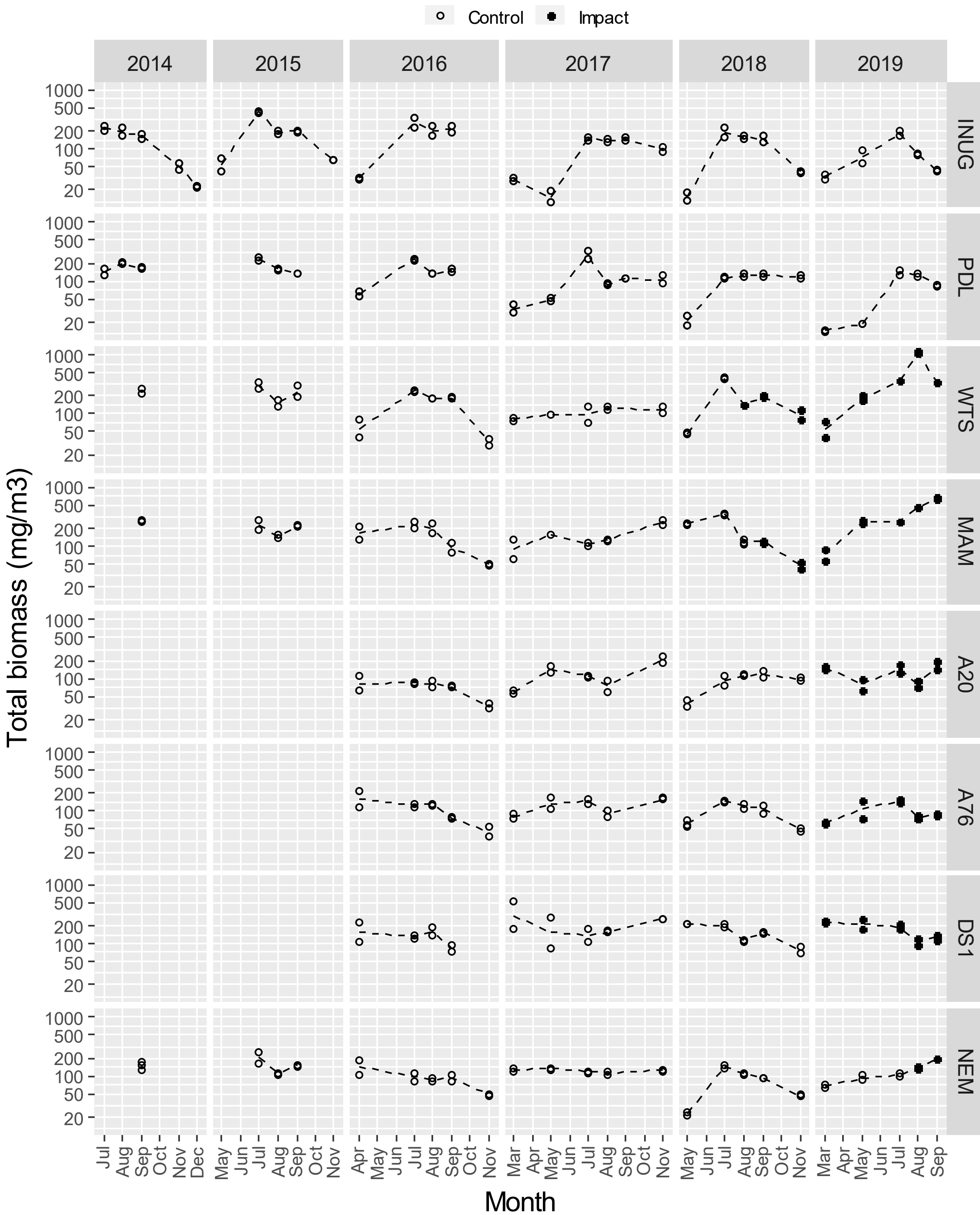


Figure 5-71. Phytoplankton biomass (mg/m³) by major taxa group from Whale Tail Pit study lakes since 2015.

Figure 5-72. Relative phytoplankton biomass by major taxa from Meadowbank study lakes since 2015.

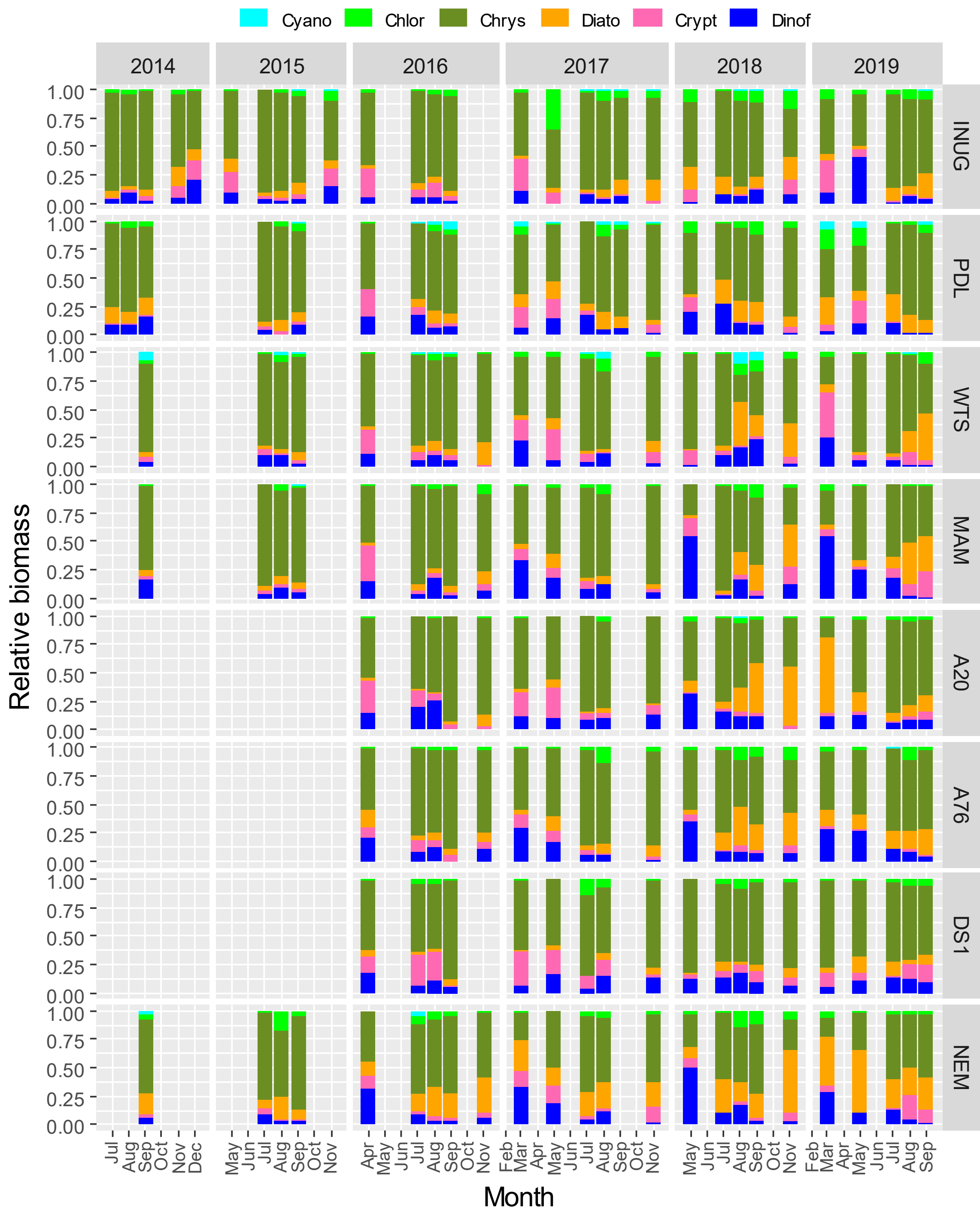
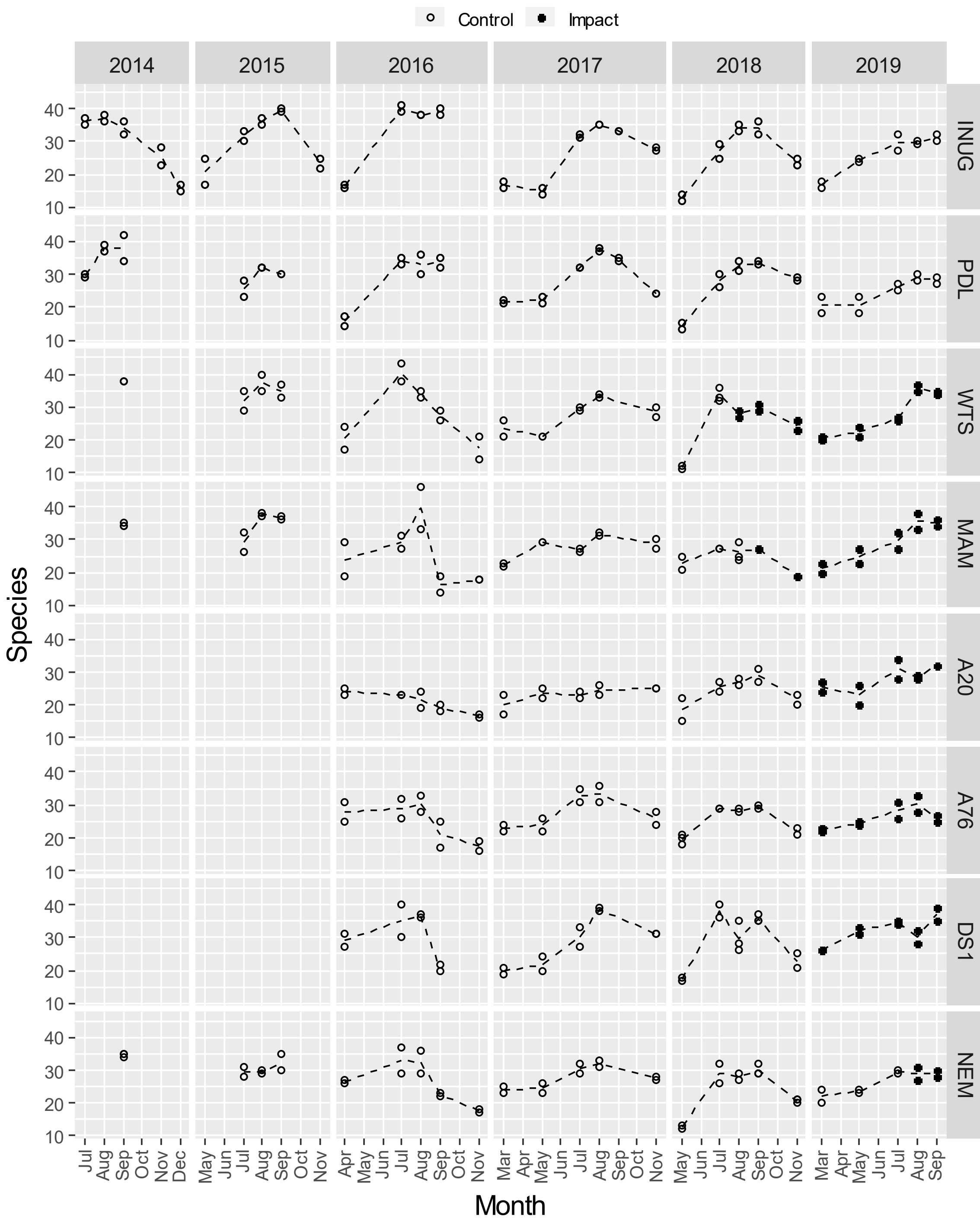


Figure 5-73. Phytoplankton species richness from Whale Tail Pit study lakes since 2015.



Sediment Chemistry Tables and Figures

Figure 5-74. Sediment grain size composition in sediment from the Whale Tail study area lakes.

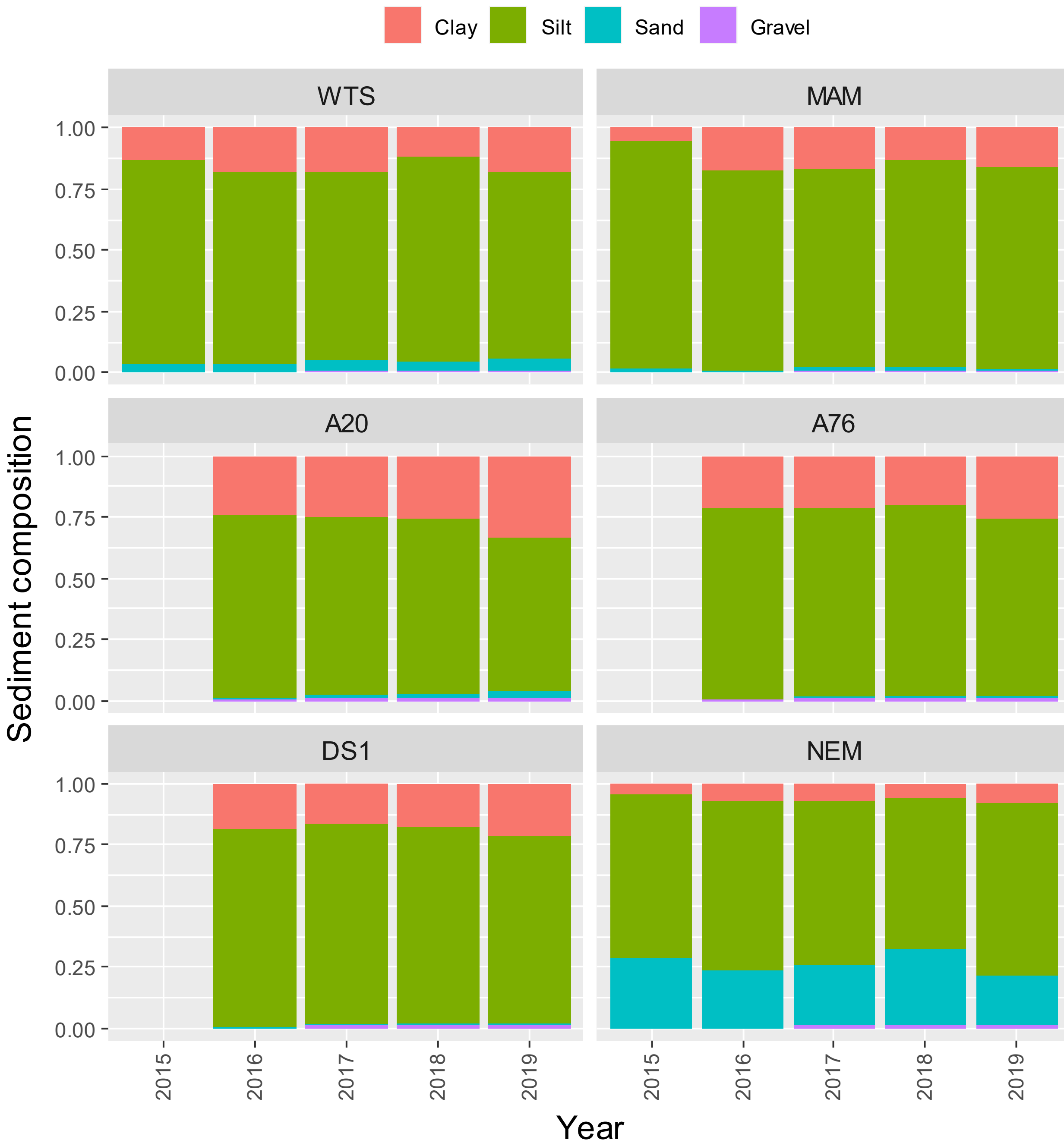


Figure 5-75. Total aluminum (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

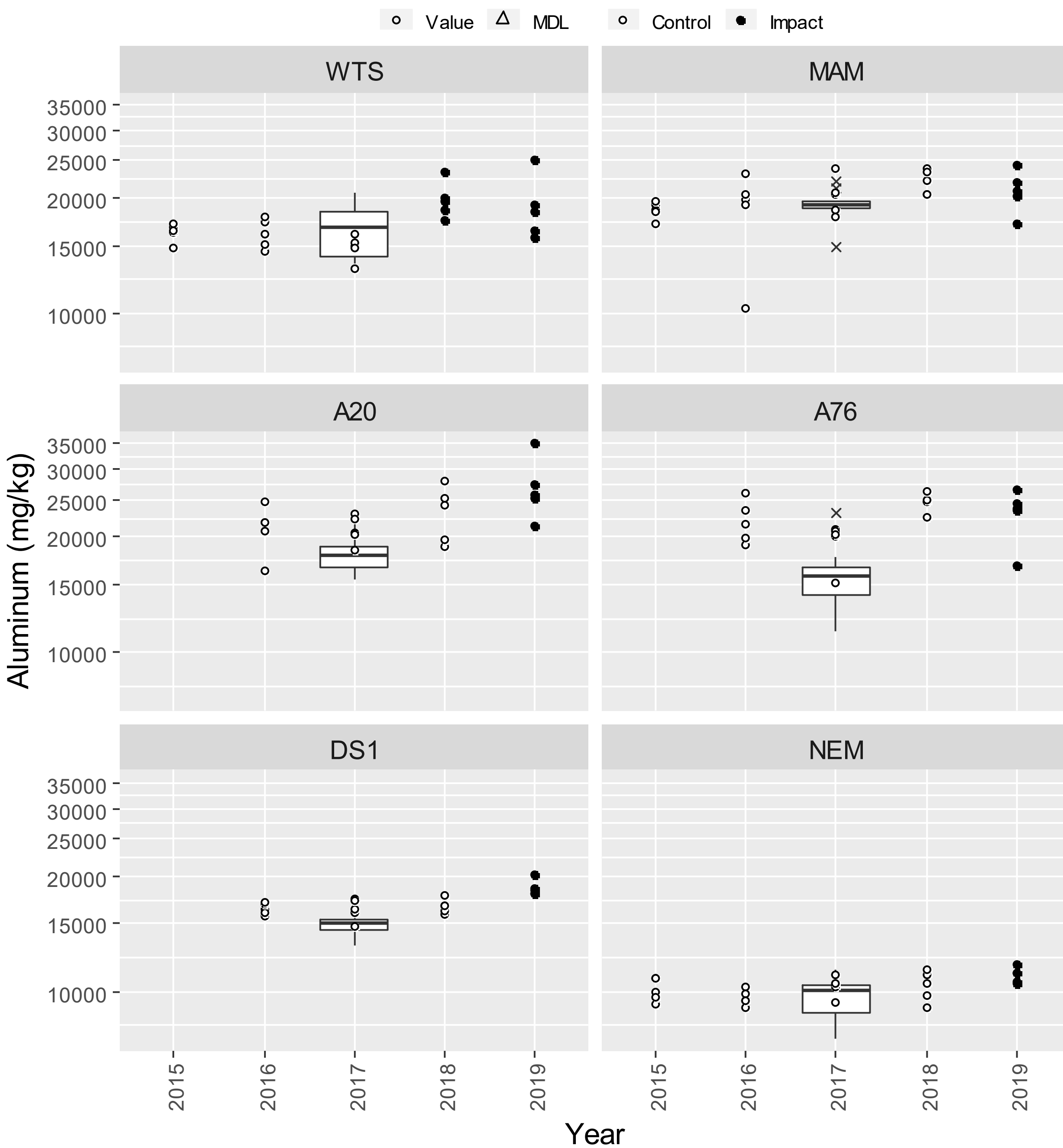


Figure 5-76. Arsenic (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes.

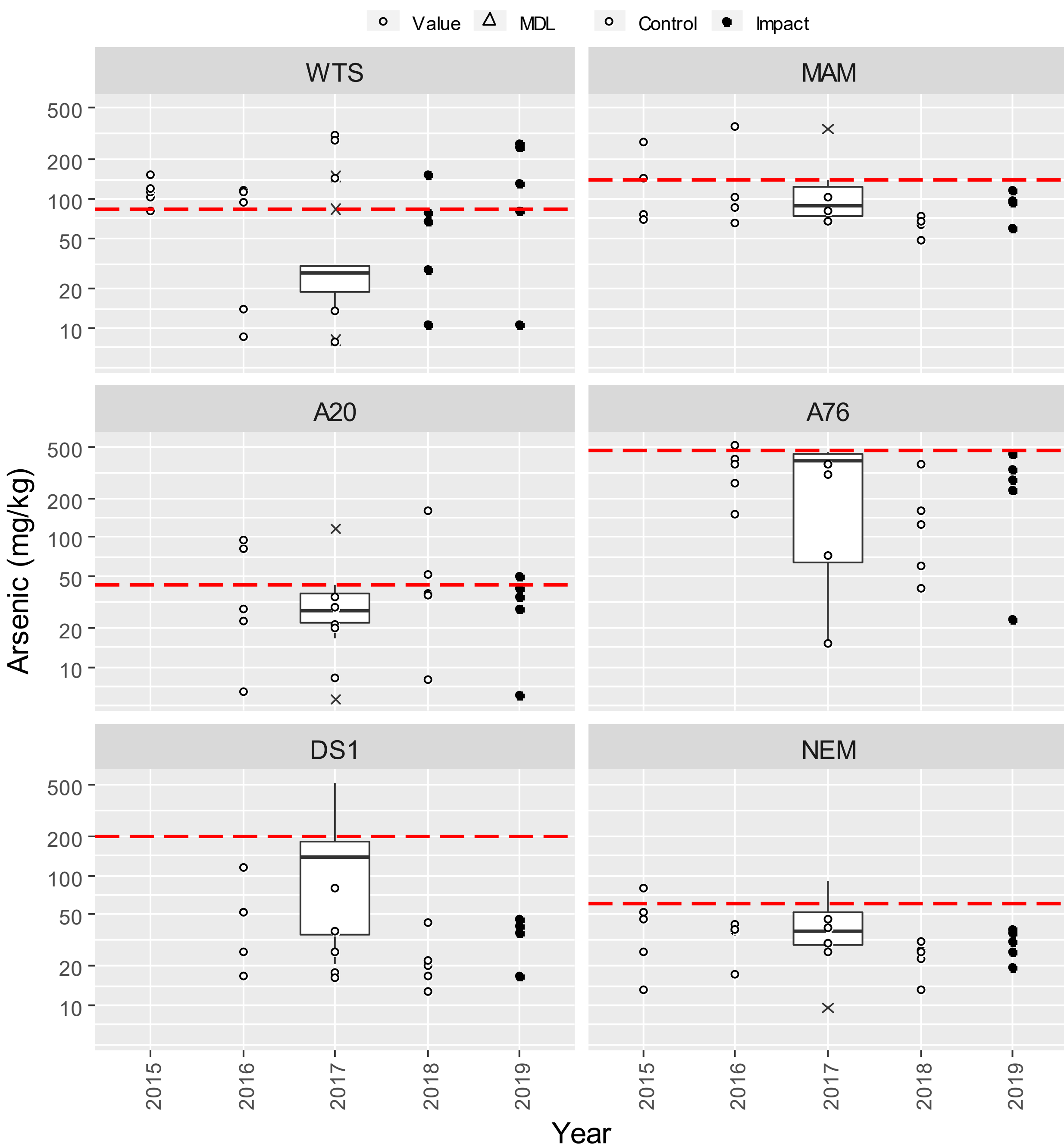


Figure 5-77. Cadmium (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes.

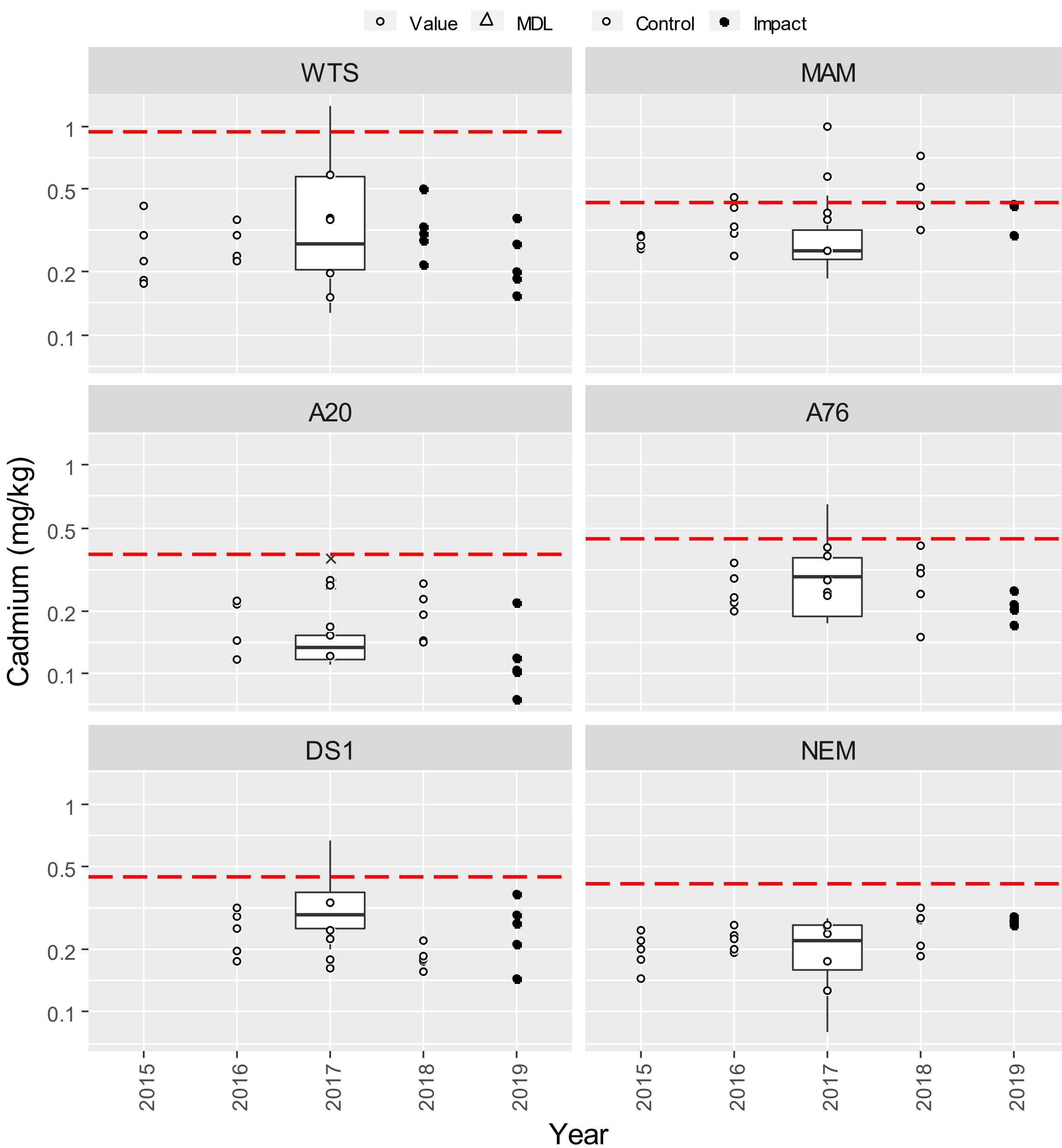


Figure 5-78. Chromium (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes.

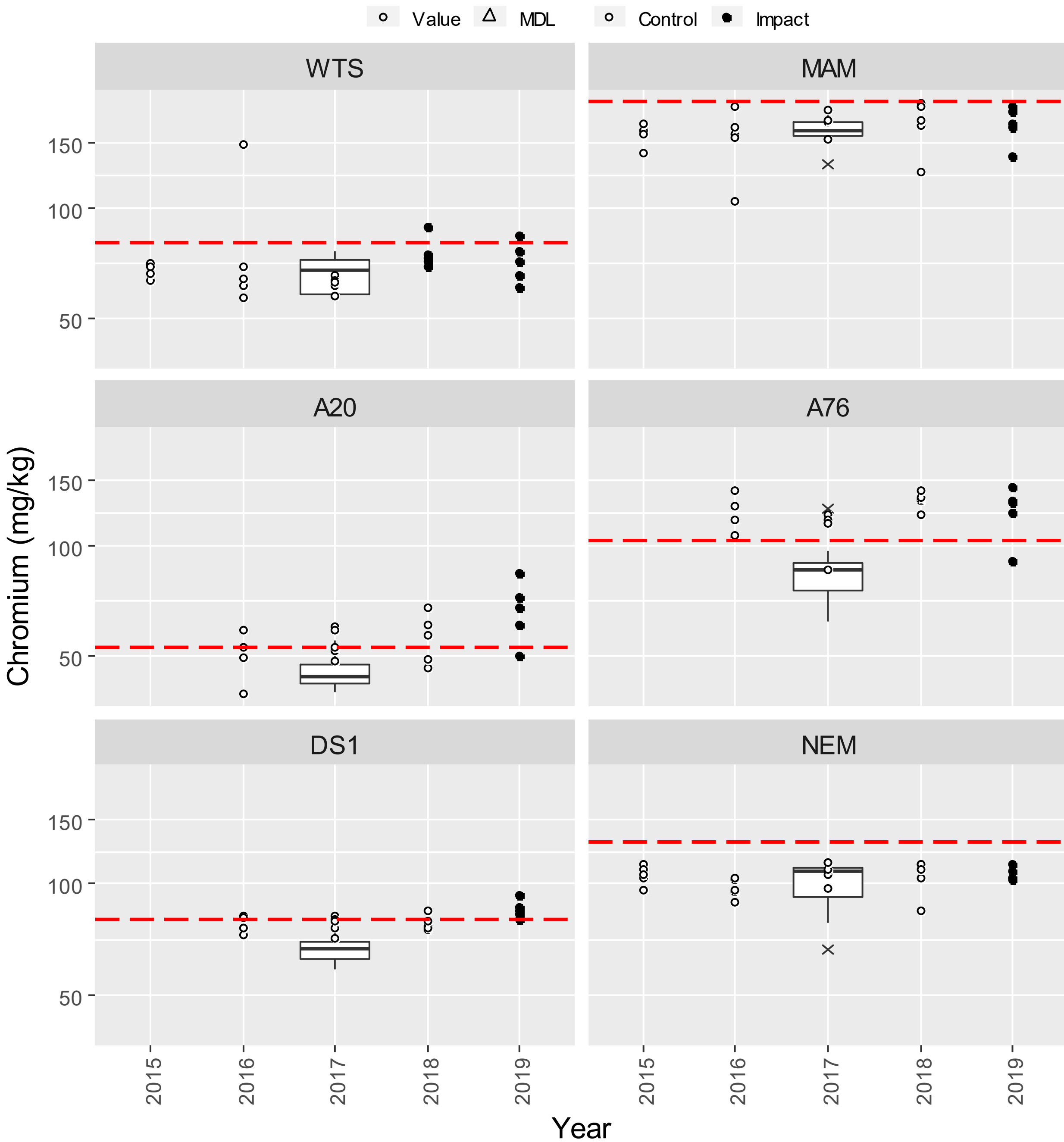


Figure 5-79. Copper (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes.

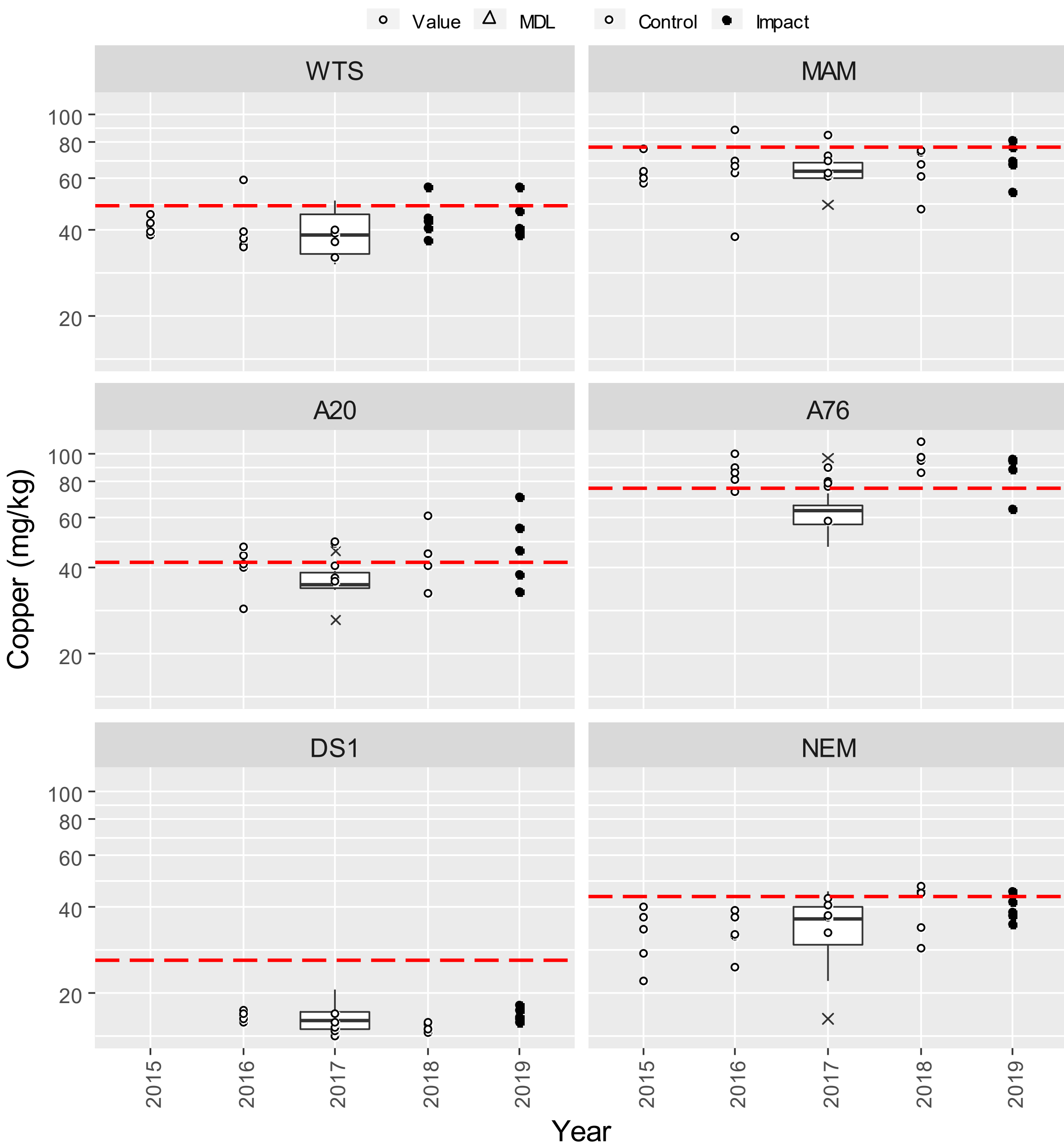


Figure 5-80. Lead (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes.

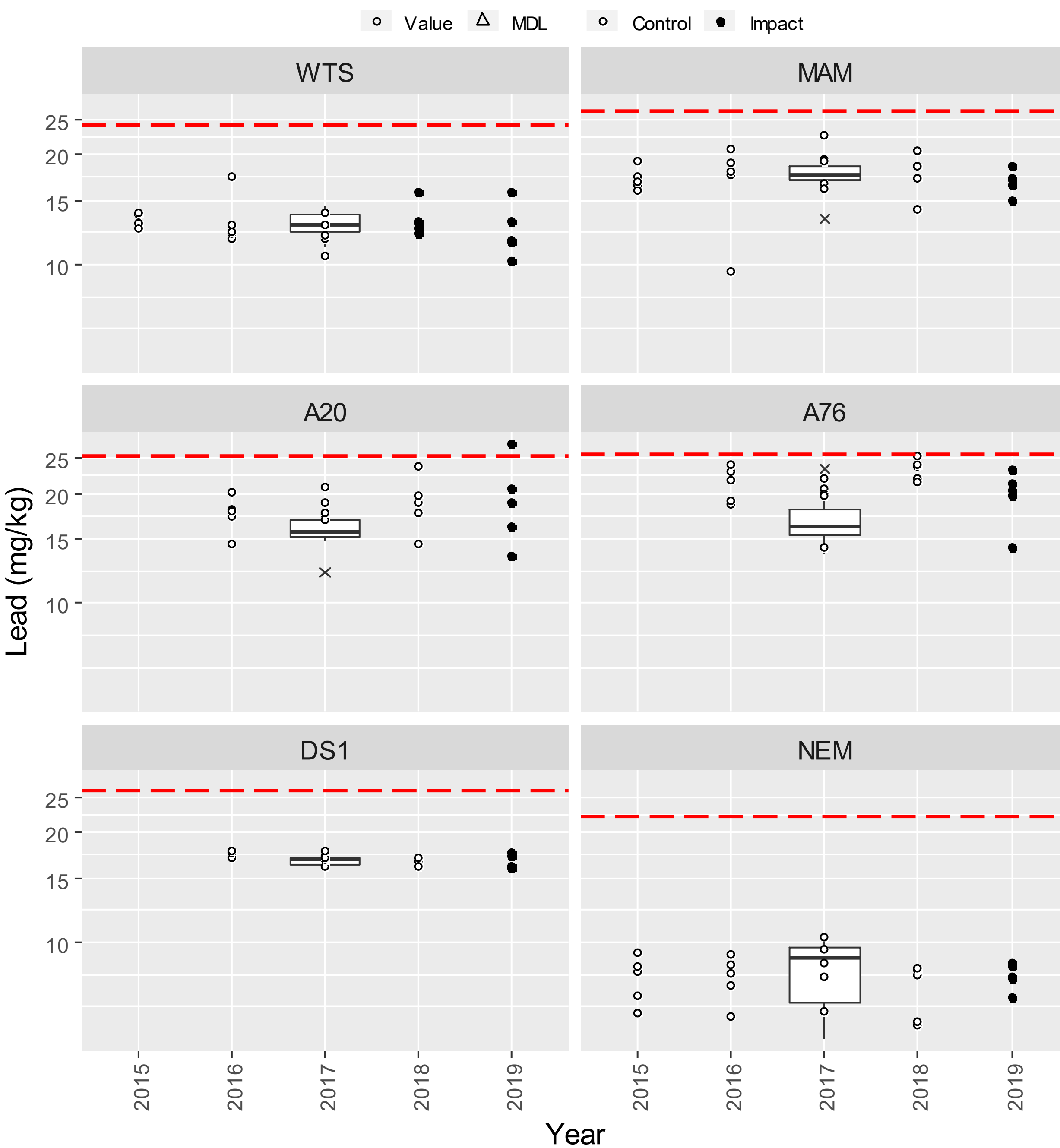


Figure 5-81. Mercury (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes.

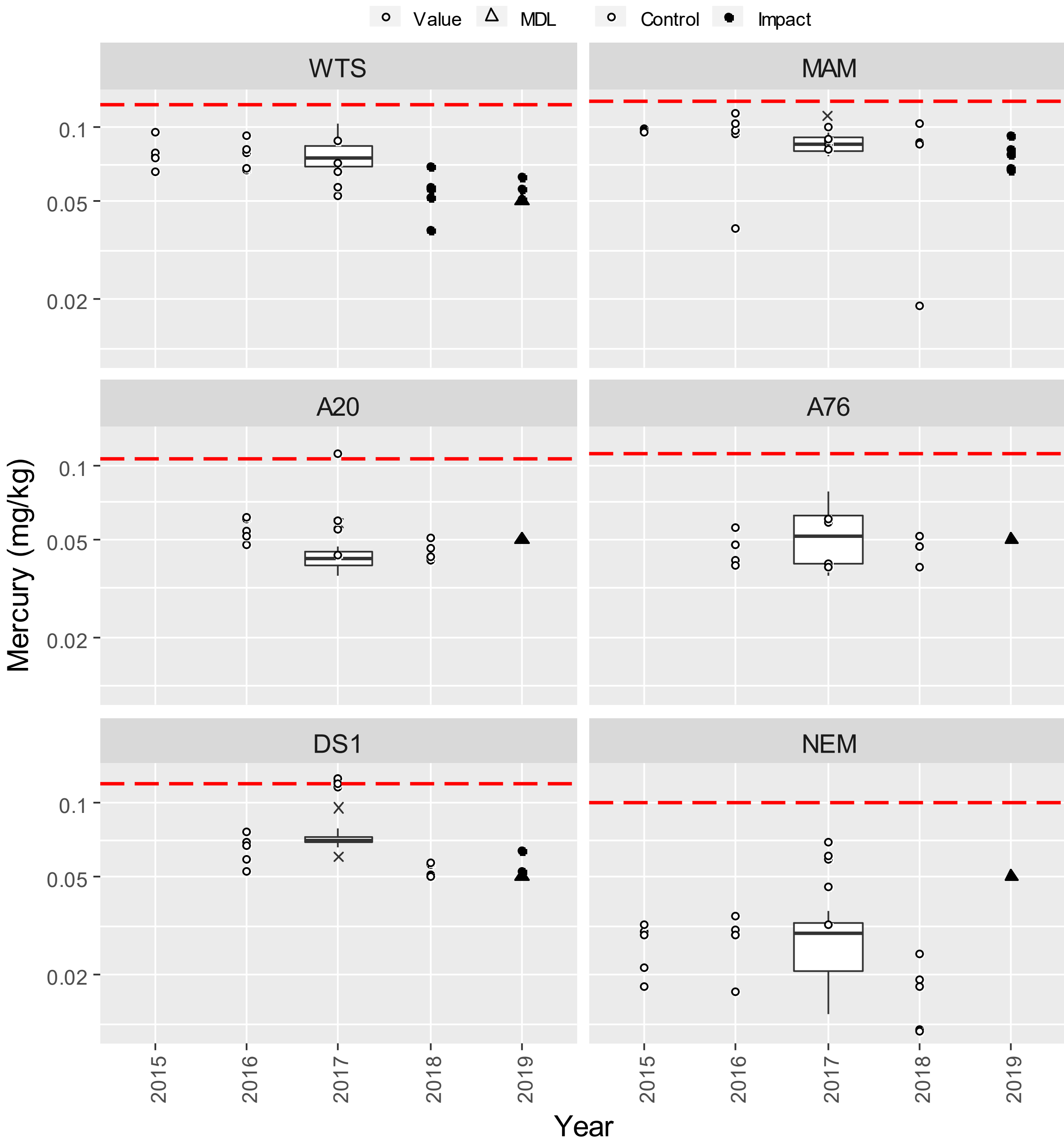
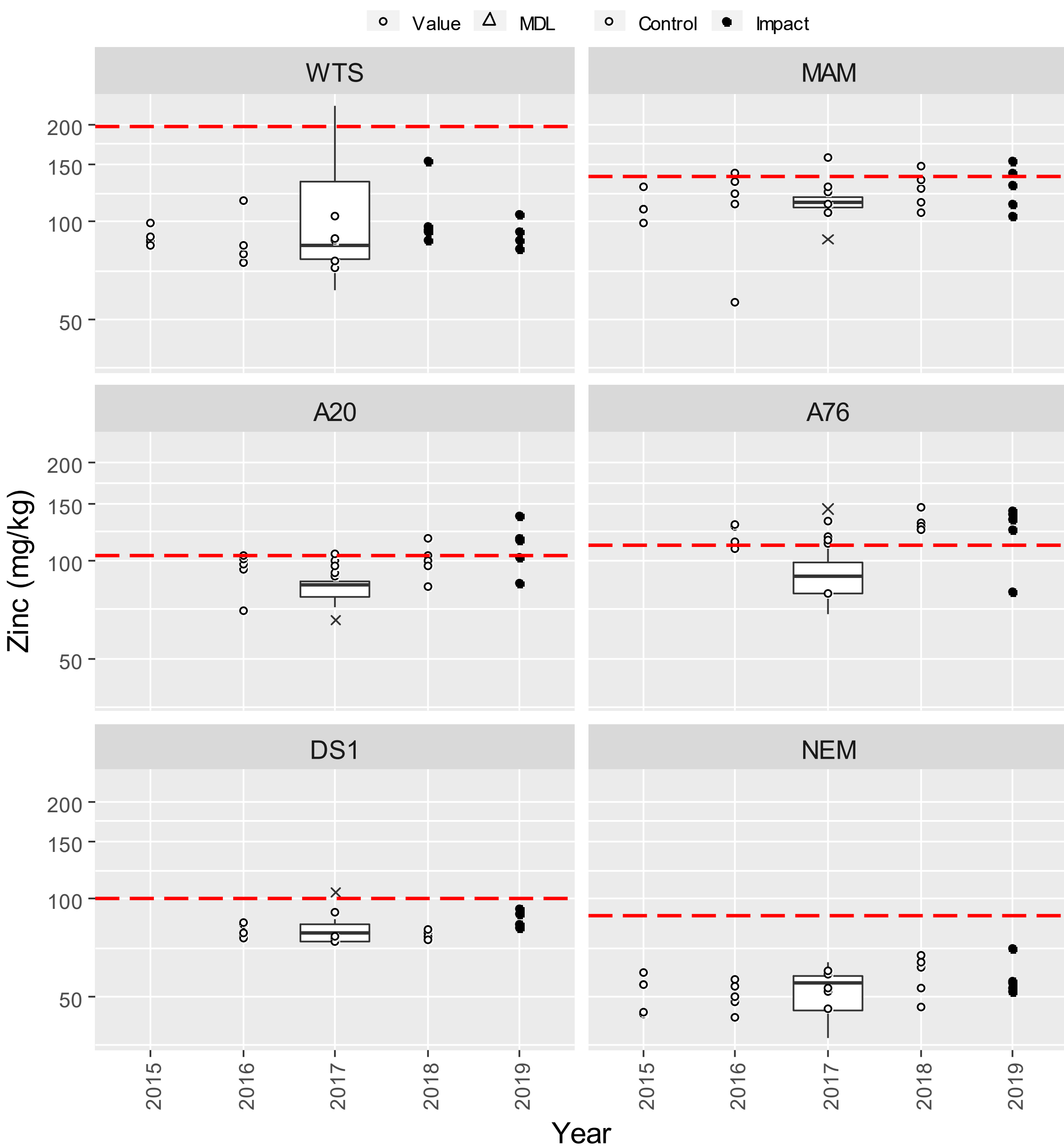


Figure 5-82. Zinc (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes.



Benthic Invertebrate Tables and Figures

Table 5-9. Geometric means for total abundance and total richness, Whale Tail study area lakes.

Geometric means for Total abundance[1]					
Area	2015	2016	2017	2018	2019
INUG	1647.9	2099.9	1711.5	1496.8	1452 (5)
PDL	1126.8	1372.7	748.0	778.6	989 (3)
WTS	1674.1	2101.7	3545.3	4004.7	2756 (3)
MAM	3963.6	3049.7	4235.7	3443.8	7234 (1)
A20	NA	2561.9	4245.1	2792.1	2545 (4)
A76	NA	2524.6	6311.5	3093.7	2823 (3)
DS1	NA	3089.7	1918.9	2563.4	2204 (3)
NEM	2896.8	2743.2	1711.1	2707.1	5278 (1)

Geometric means for Total richness					
Area	2015	2016	2017	2018	2019
INUG	12.4	15.7	13.6	14.2	13.1 (4)
PDL	8.8	10.1	9.7	5.8	8.2 (4)
WTS	14.3	14.3	14.1	17.4	12.5 (5)
MAM	13.0	13.5	15.0	14.4	14.8 (2)
A20	NA	13.9	12.7	14.7	14.2 (2)
A76	NA	15.7	16.9	14.2	14.4 (3)
DS1	NA	11.5	14.7	13.7	13.3 (3)
NEM	11.2	11.8	9.7	10.0	11.8 (2)

Notes:
1. Total abundance in organisms/m^2.
Rank order of abundance and richness shown in parentheses.
Red vertical lines mark the year that area designations switched from *control* to *impact*.
NA = Benthic invertebrate sampling was not completed for the given area/year.

Table 5-10. Results of the BACI tests for benthic invertebrate abundance from Whale Tail study area lakes.

After Period	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2019	WTS	3	1	0.39	0.47	0.75	48	-80	1,015
	MAM	4	1	0.86	0.33	0.96	136	-17	570
	A20	3	1	-0.02	0.37	0.49	-2.0	-80	382
	A76	3	1	-0.07	0.59	0.46	-7.0	-93	1,074
	DS1	3	1	0.07	0.27	0.59	7.0	-66	239
2018-2019	WTS	3	2	0.56	0.33	0.91	76	-39	408

Notes:
* Bolded & underlined values are P-values < 0.1
Shaded cells indicate negative effect sizes (reductions) of 20% or more
Test area = area compared to control (INUG)
n(B) = number of years in the "before" period
n(A) = number of years in the "after" period
Estimate = BACI model estimate of the after-period change in mean for log-transformed data
SE = standard error of the estimate
P-value = one-tailed test of the null hypothesis of no change or an increase in mean
ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))
LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Table 5-11. Results of the BACI tests for benthic invertebrate taxa richness from Whale Tail study area lakes.

After Period	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2019	WTS	3	1	-0.07	0.14	0.33	-7	-48	67
	MAM	4	1	0.12	0.12	0.81	13	-23	66
	A20	3	1	0.14	0.13	0.80	15	-33	98
	A76	3	1	0.02	0.13	0.56	2	-42	80
	DS1	3	1	0.11	0.17	0.71	12	-46	131
2018-2019	WTS	3	2	0.05	0.13	0.65	6	-30	59

Notes:
* Bolded & underlined values are P-values < 0.1
Shaded cells indicate negative effect sizes (reductions) of 20% or more
Test area = area compared to control (INUG)
n(B) = number of years in the "before" period
n(A) = number of years in the "after" period
Estimate = BACI model estimate of the after-period change in mean for log-transformed data
SE = standard error of the estimate
P-value = one-tailed test of the null hypothesis of no change or an increase in mean
ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))
LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 5-83. Benthic invertebrate total abundance (#/m^2) from Whale Tail study area lakes since 2015.

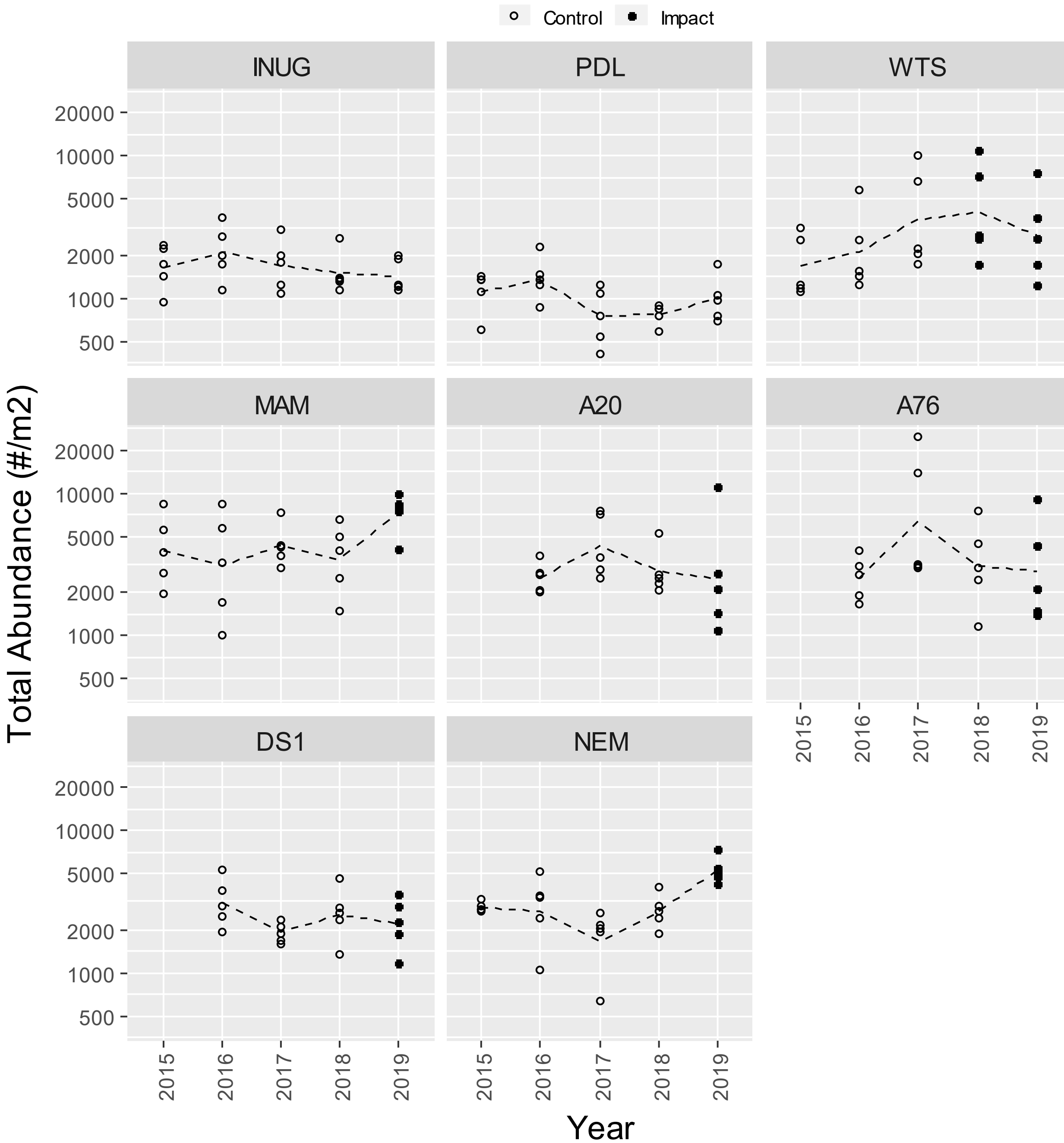


Figure 5-84. Benthic invertebrate abundance (#/m²) by major taxa group from Whale Tail study area lakes since 2015.

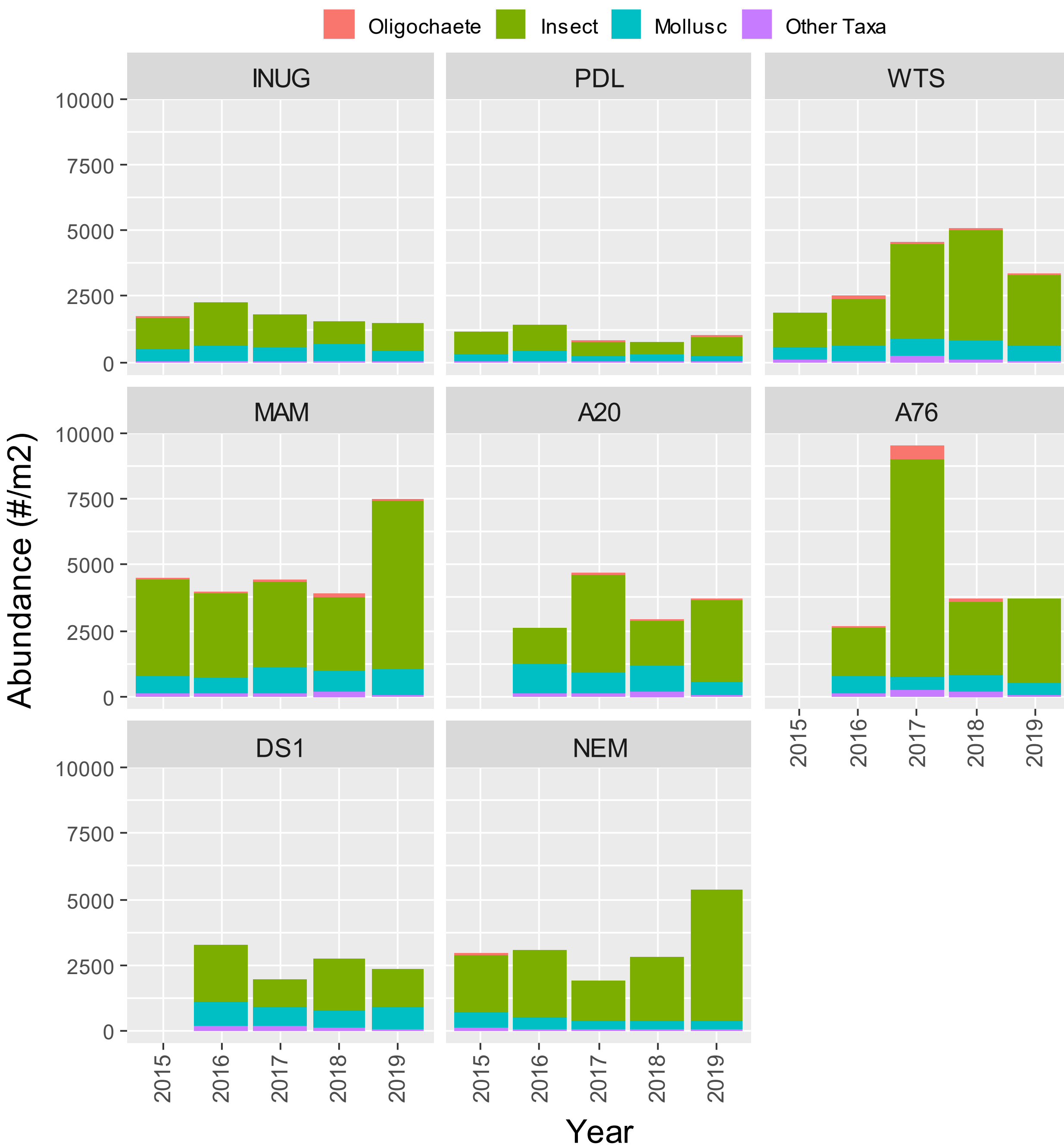


Figure 5-85. Benthic invertebrate relative abundance by major taxa from Whale Tail study area lakes since 2015.

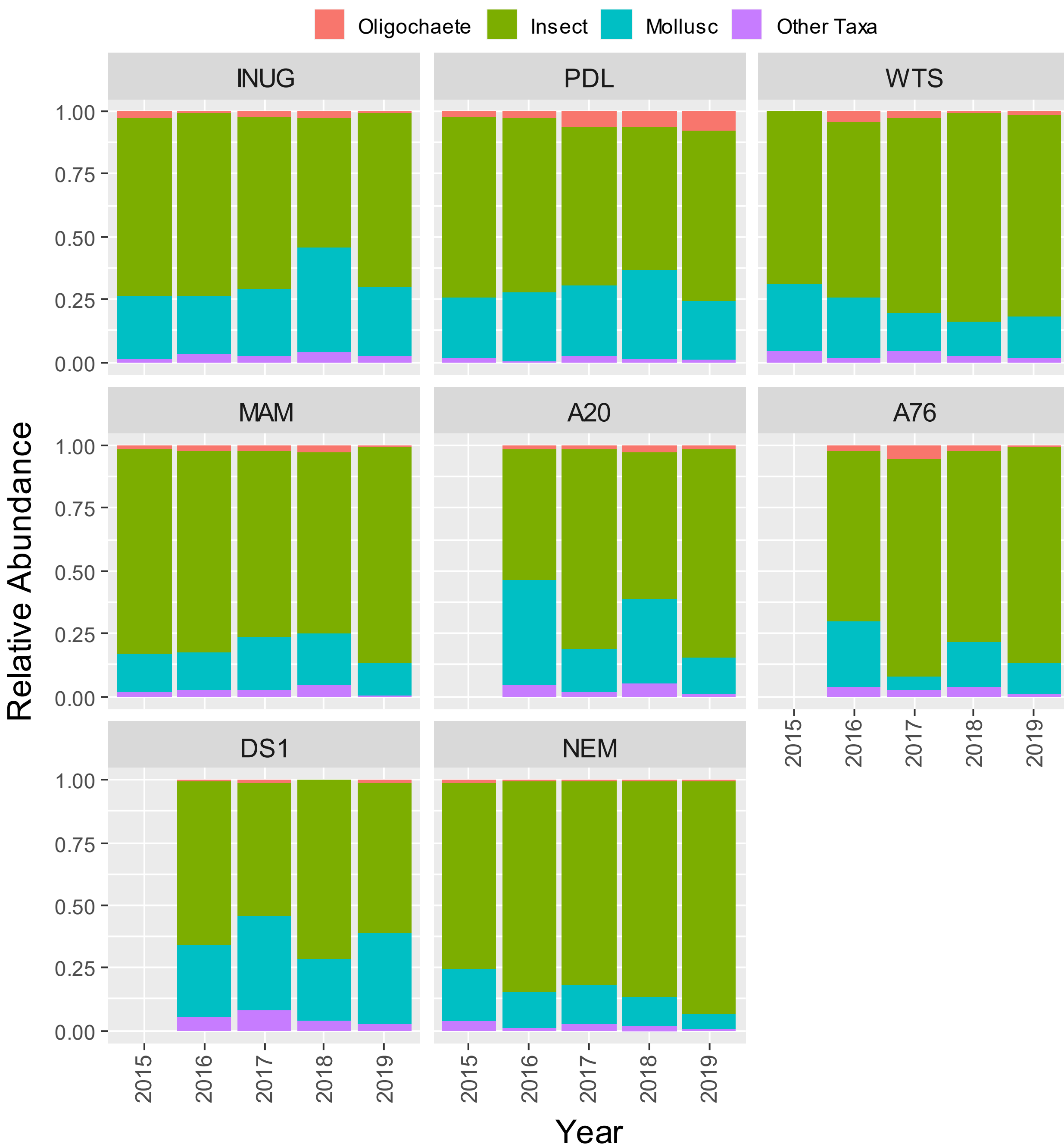


Figure 5-86. Benthic invertebrate total richness (# taxa) from Whale Tail study area lakes since 2015.

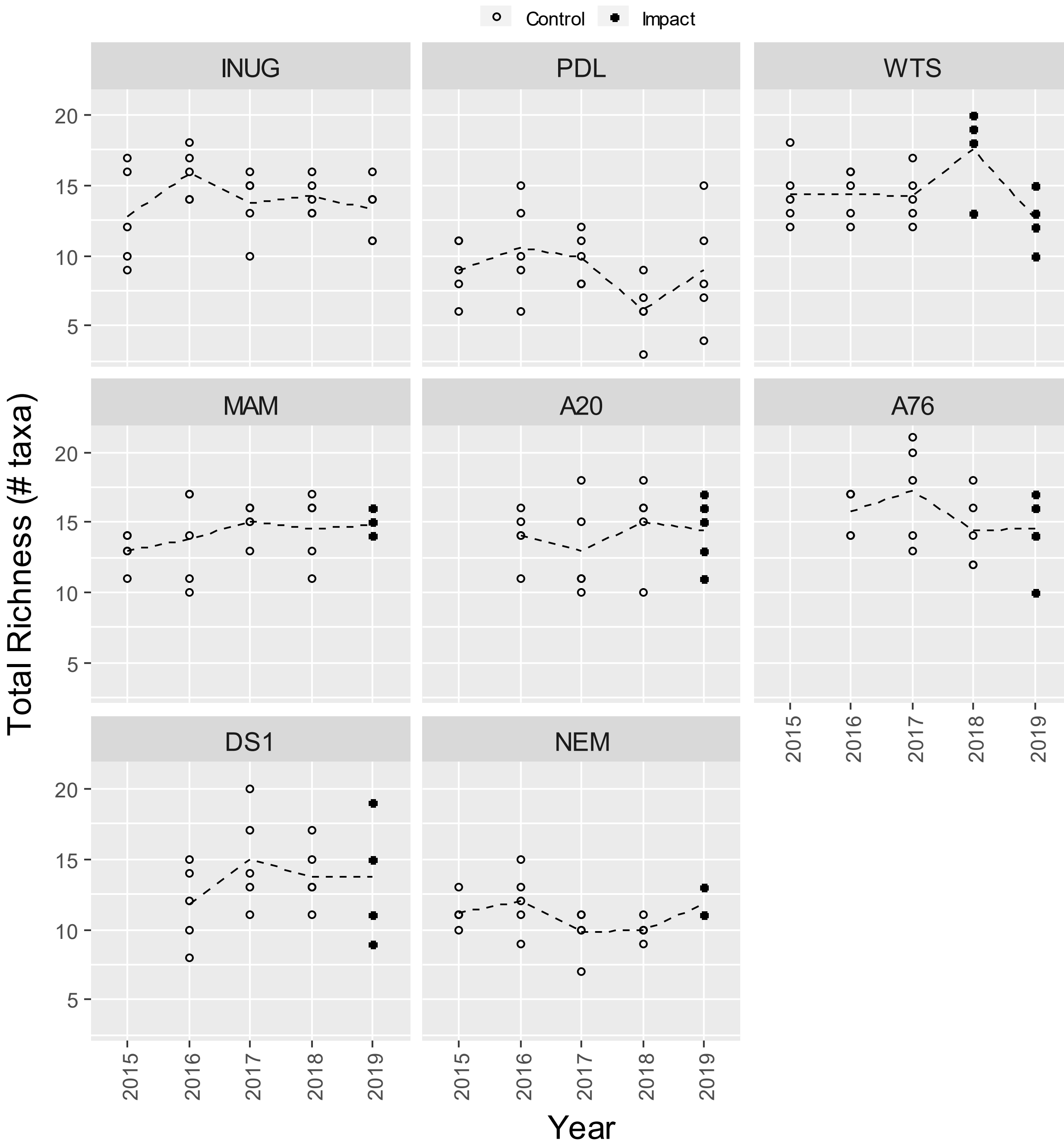


Figure 5-87. Benthic invertebrate richness (# taxa) by major taxa group from Whale Tail study area lakes since 2015.

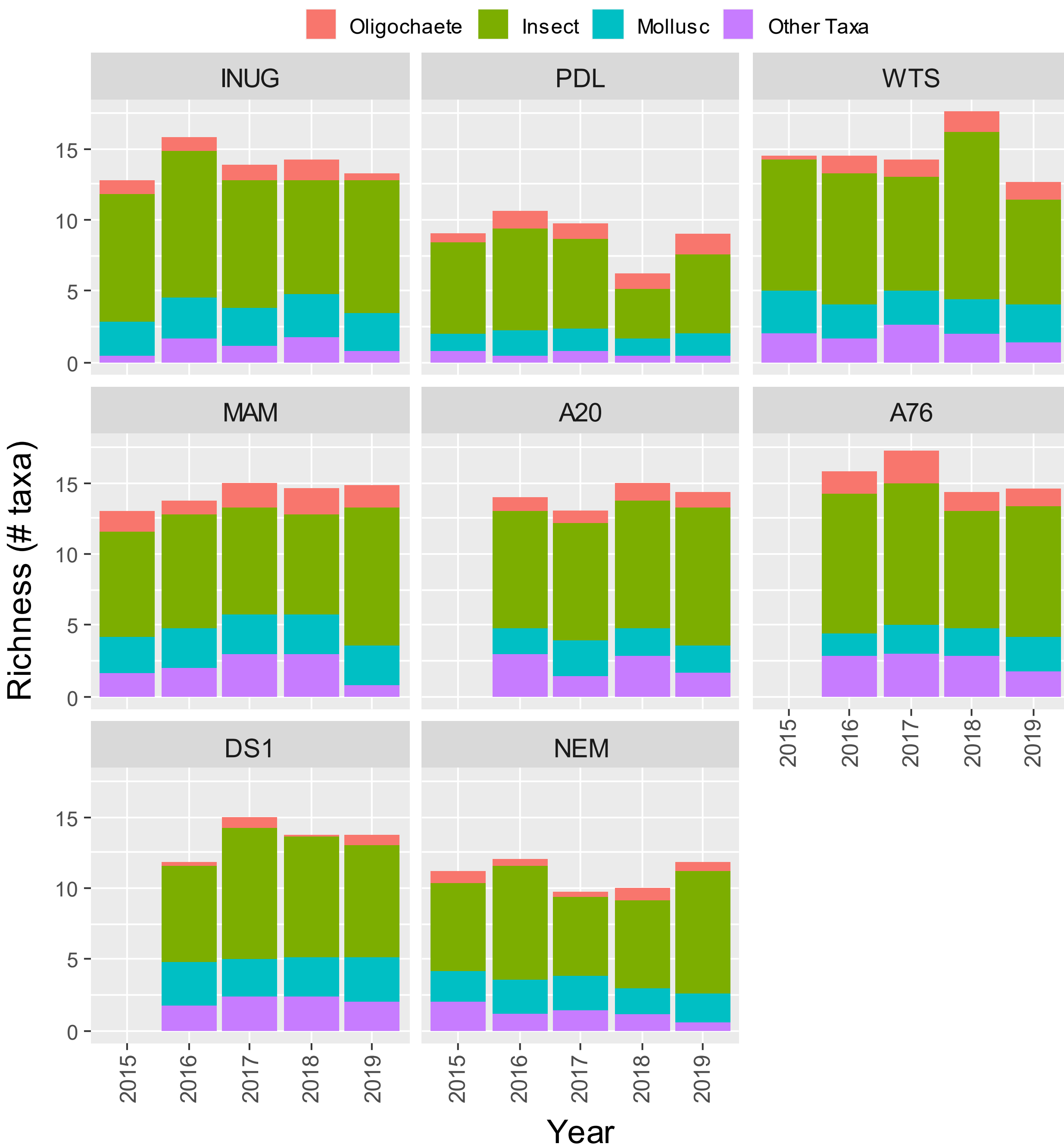
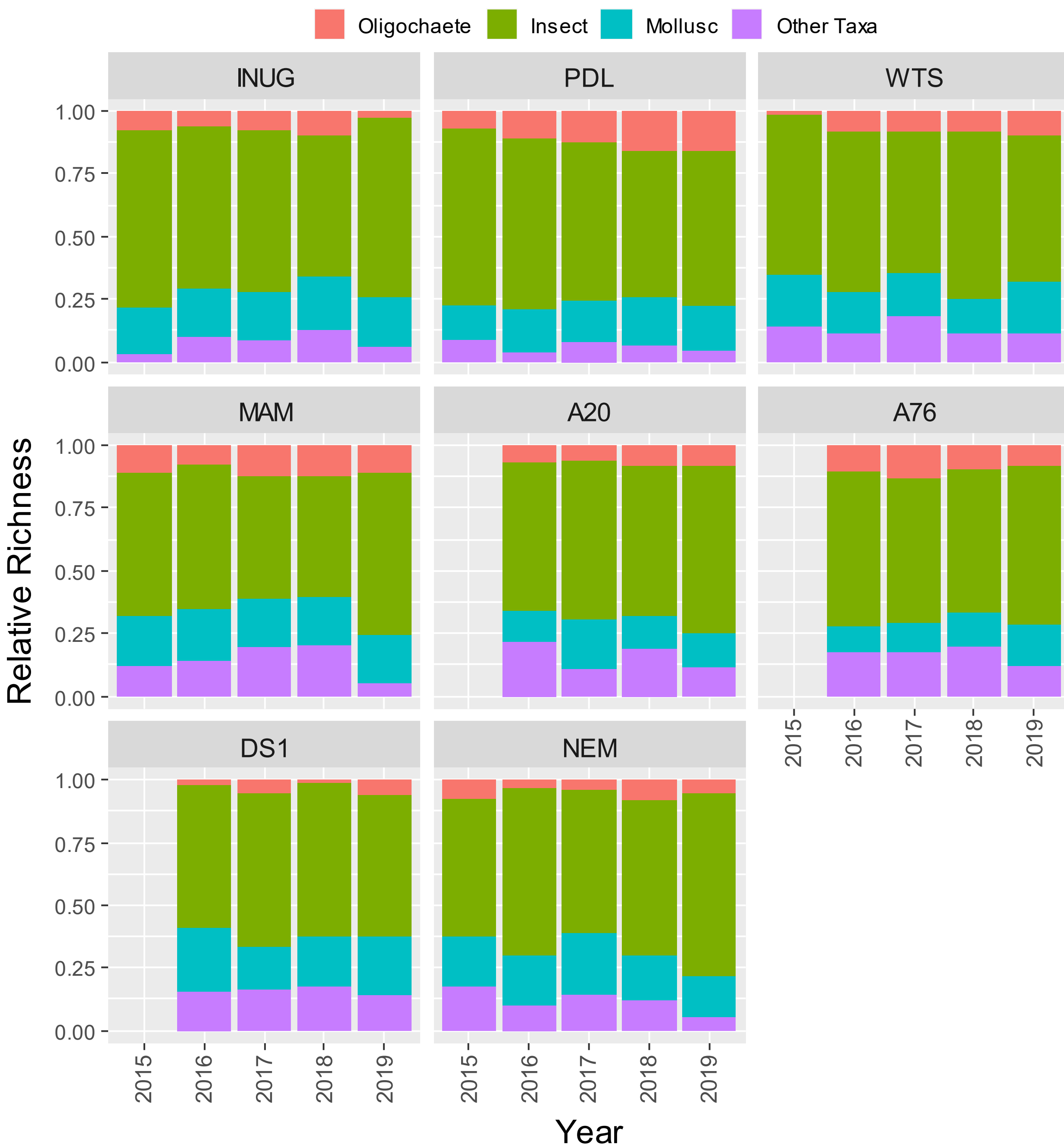


Figure 5-88. Benthic invertebrate relative richness by major taxa from Whale Tail study area lakes since 2015.



6 BAKER LAKE

6.1 Overview of the 2019 Baker Lake CREMP

This section summarizes the 2019 CREMP results for water quality, sediment chemistry, phytoplankton, community, and benthic invertebrate communities in Baker Lake.

Baker Lake monitoring was added to the core program to ensure activities related primarily to barge traffic and shipping in the area were tracked. There are two near-field impact areas, one targeting the hamlet's barge landing area (BBD) and the other Agnico Eagle's fuel storage facility (BPJ). The initial (since 2008) reference area (BAP) is several kilometers to the east of the hamlet along the north shore of the lake. A second reference area (BES) was added in 2011 to provide a broader perspective for temporal patterns in sediment chemistry and benthic community structure (it is not monitored for water quality or phytoplankton community). Sampling locations are shown in **Figure 6-1**.

Barge trips from Chesterfield Inlet in 2019 numbered 34 for general cargo and 24 for fuel (**Figure 6-2**). With the expansion at the Whale Tail site traffic has increased in the last two years. In 2018, the number of fuel trips and goods shipments increased somewhat compared to previous years (e.g., from < 40 in 2016 and 2017 to ~ 55 in 2018), and in 2019 the number of trips was similar, but with a slight increase in fuel trips. Construction started at the Baker Lake barge dock in 2019 to add two more fuel tanks with containment. One tank was completed in 2019, and the second is forecast to be completed in 2020. The new fuel tanks are set to be the same dimensions and type as the existing tanks.

6.2 Limnology

6.2.1 General Observations

Baker Lake is large with much greater wind fetch than the Meadowbank or Whale Tail study lakes and unique limnology. Factors that contribute to the unique limnology include the lake's proximity to the tidally influenced Chesterfield Inlet, the influence of the Thelon River, and deep water that is naturally elevated in dissolved solids. These natural complexities interact, leading to the *competing* influences of Thelon River water, which is less-saline and Baker Lake water, which is more-saline. Freshet on the Thelon River coupled with shifts in north/south wind speed and direction lead to variable degrees of horizontal and vertical mixing of the water column. When sampling near to the north shore, these factors may combine to confound the detection of potential subtle changes in water quality related to barge activity, with the *signal* getting lost in the *noise* of natural variability in this dynamic location.

Parameters associated with more-saline or higher conductivity water that appears to be present in deep water (>10–15 m) and which demonstrate considerable fluctuations within and between years include conductivity, hardness, calcium, chloride, magnesium, sodium, and TDS. Other parameters that have a high level of natural variability and appear to be correlated with these deep-water parameters in Baker Lake include ammonia, nitrate, TKN, total phosphorus, sulphate, and TOC/DOC. A deep limnology survey was conducted in August 2012 to explore this situation specifically. While it provided a single *snapshot* of this dynamic limnological process, all parameters measured (temperature, conductivity, dissolved oxygen, pH, total dissolved solids, and salinity) showed a strong and abrupt stratification from 8–12 m depth at areas BBD 1 and 2, and BPJ. For example, conductivity increased from <20 µS/cm in shallow, near-shore water, to >200 µS/cm between 8 and 12 m, depending on location. Conductivity remained uniformly high to the maximum depth sampled (40 m). The implication of this is that results for any event will reflect the relative influence of the deeper, brackish Baker Lake water and the less-saline Thelon River water on the day of the event.

6.2.2 Temporal and Spatial Trend Interpretation

In addition to the Thelon-Baker influence, several other factors have potential to affect the limnology. Seasonal barge traffic is the major mine-related activity in the area, occurring during the summer months when Baker Lake is ice-free. The Hamlet of Baker Lake's sewage lagoons and landfill are situated in a watershed that discharges seasonally into Baker Lake between BBD and BPJ. And locally, propeller wash may cause vertical mixing in very discrete areas when there is active traffic. Otherwise, except for spills and occasional discharge from commercial vessels etc., no other activities have the potential for altering limnological parameters.

Limnological conditions at Baker Lake are similar to the Meadowbank study lakes, except that water temperatures are cooler, typically reaching no more than 10°C in mid-summer. Mean temperatures at all locations were generally low in 2019, staying between 3.5 and 7.5°C (**Figure 6-3**). Some thermal stratification is often evident in Baker Lake, particularly in July and August. In 2019, weak thermal stratification was only detected in July (**Figure 6-4**). In contrast to recent years (e.g., 2016 and 2017), Baker Lake areas did not show evidence of warming or stratification, even though the August sampling event took place in mid-August when typical seasonal warming may be strongest. The apparent lack of stratification was likely due to wind-driven mixing (see below). By the end of September there was still no evidence of stratification, and temperature and dissolved oxygen concentrations were comparable with August.

As described in **Section 6.2.1**, conductivity can show strong and abrupt stratification in Baker Lake. The July profiles for BAP, BBD, and BPJ (**Figure 6-4**) showed stratification patterns related to the influence of the Thelon River, the saline-influenced deeper water in Baker Lake, and limited mixing. However, the August and September profiles showed no stratification patterns. At BAP and BPJ, conductivity was higher in September than in August, whereas at BBD, conductivity matched well-mixed conditions (i.e., < 40 µS/cm). The differences between the August and September conductivity results suggests a strong Thelon River influence in August at all areas and deep Baker influence in September at BAP and BPJ only (i.e., BBD, which is closest to the Thelon River, did not appear to be affected by the deep Baker Lake water).

The relatively low temperatures are also evidence of a well-mixed water column. Baker Lake is large and open, and winds can generate large waves that promote mixing.

6.3 Water Chemistry

6.3.1 General Observations

As discussed in **Section 6.2**, Baker Lake is very large and is exposed to high wind and wind-generated currents. Adding to the complexity, monitoring areas along the north shore are exposed to two different water masses: the less-saline Thelon River, which discharges into Baker Lake at its western end, and the saline-influenced deeper water in Baker Lake. Depending on wind speed and direction, water from these two sources (e.g., individually or mixed) can strongly influence some surface water chemistry parameters (conductivity, salts, and dissolved solids). Consequently, certain parameters can display pronounced spatial (horizontal and vertical) and temporal variability. This variability is evident mainly in *conventional* parameters (described above); In contrast, concentrations of metals in the Baker Lake samples are typically below laboratory MDLs.

6.3.2 Temporal and Spatial Trend Interpretation

CREMP monitoring results since 2008 were used to assess temporal and spatial trends related to mining activities. The general rationale for assessing these trends discussed in **Section 1.5** was tailored slightly for the water chemistry assessment in Baker Lake, as described below.

Baker Lake water chemistry results for 2019, screened against site-specific triggers and thresholds, are tabulated in **Appendix B3**. Most water quality parameters in Baker Lake, across all years, are routinely below laboratory MDLs, similar to the results for the Meadowbank study lakes. A conservative two-step screening process was used to determine which parameters to include in the formal trend assessment:

1. Overall Detection Frequency – Only water quality parameters that exceeded MDLs in at least 10% of the samples were included. Because this lake is ultra-oligotrophic, it is normal for many parameters to routinely be below MDLs.
2. Control-Impact Detection Frequency Comparison – To avoid screening out infrequently detected parameters that were detected more often in association with barge activities, the proportion of samples exceeding MDLs between *control* and *impact* samples were compared. The intent of this screen was to identify parameters for which detection occurred in less than 10% of samples (i.e., those screened out above) but were potentially associated with Agnico Eagle's activities in Baker Lake (i.e., where the proportion of detected values increased by 0.1 or more).

The screening results for all parameters that were screened into the assessment process[38] are summarized in **Table 6-1** with figure number references (**Figure 6-5** to **Figure 6-52**). The samples were collected from a depth of 3 meters for all areas and events, consistent with the SOP. The red dashed line in each of these figures is the trigger value specific to Baker Lake for that parameter. All parameters not retained for the trend assessment were assumed to have no spatial or temporal trends related to barge activities or to natural variability and were excluded from further consideration (for completeness and transparency, plots for these parameters are included in **Appendix B3**).

While barge traffic in 2019 was consistent with the number of shipments in 2018 (**Figure 6-2**), mean concentrations of ammonia and TKN in the 2019 samples at areas BBD and BPJ exceeded their respective trigger values. There were no reported spills in 2019, although, as mentioned in **Section 6.1**, construction was underway for two additional fuel tanks on Baker Lake.

The sample concentrations in 2019 only exceeded the trigger values in August, and then dropped back below trigger values again in September. Even though similar patterns have been observed in previous years, 2019 was the first time since sampling began in 2008 that ammonia-N and TKN concentrations exceeded their respective trigger values. As discussed in **Section 6.2.1**, these parameters are naturally variable and are generally correlated with higher conductivity and more-saline waters. As such, it is likely that the exceedances for ammonia-N and TKN are transient. This is further corroborated by the observed increase in these parameters at the control area (BAP) and other sites (e.g., Meadowbank study lakes), although at BAP the means were slightly below the trigger values while BBD and BPJ slightly exceeded the triggers (**Table 6-2**). In the BACI analysis (**Table 6-3**), the proportional changes for ammonia and TKN at the two Baker impact areas were weak (TKN) or negative (ammonia); none were significant (all $P > 0.1$). In other words, there were also increases in these variables in 2019 at BAP (the control area), though the means were slightly below the trigger value at BAP and slightly above at BBD and BPJ.

Precipitation data for Whale Tail and Baker Lake were reviewed by AEM staff, and the results suggested notably higher total rainfall through June and July in 2019 compared to recent years (personal communications, 2019). Elevated concentrations of ammonia and other nutrients were also observed in the Meadowbank and Whale Tail area lakes, including the reference areas INUG and PDL. It is likely that the increased ammonia and TKN observed in Baker Lake was related to phenomena that increased concentrations in the Meadowbank and Whale Tail area lakes. The highest Baker Lake TKN and ammonia concentrations were observed at BBD and BPJ, which are closer to the Thelon River outlet. By September, concentrations in Baker Lake were well below their respective triggers. The expanded scope

[38] Fluoride and total and dissolved silicon were added to the discussion in 2019. Trigger values were derived for these parameters in 2019; see **Appendix I** for a more detailed summary.

of the CREMP to include the Whale Tail area provides regional perspective and likely provides additional insight into seasonal changes in water quality.

There are no follow-up measures for management in 2019 beyond routine CREMP water quality sampling during the open water season.

6.4 Phytoplankton Community

6.4.1 General Observations

The phytoplankton community of Baker Lake is relatively similar to the Meadowbank Lakes, despite some seasonal differences in water quality due to the competing influences of less saline water from the Thelon River and more saline water from the deeper portion of Baker Lake (see **Section 6.2**). Taxonomic composition and biomass in Baker Lake were similar to the Meadowbank study lakes, with chrysophytes (golden algae, e.g., *Chrysococcus, Kephyrion, Dinobryon*) having been the dominant taxonomic group since monitoring began in 2008, followed by diatoms and cryptophytes (**Figure 6-55**). Mean summer phytoplankton biomass in Baker Lake is generally similar to the Meadowbank lakes, reaching a maximum between 200 to 300 mg/m^3.

6.4.2 Temporal and Spatial Trend Interpretation

Sampling at the Baker Lake areas is only conducted during the summer open water period, which coincides with barge activity. Because of Baker Lake's large size, it is unlikely that barge traffic (in the absence of a fuel or chemical spill) could influence the phytoplankton community of the whole lake.

The 2019 density and biomass results for phytoplankton are tabulated in **Appendix D3**. The results for the BACI model statistical tests of the 2019 results against baseline/reference conditions are provided in **Table 6-4**. Major findings at Baker Lake areas in 2019 for chlorophyll-a, total biomass, taxa richness, and group composition of major taxa were as follows:

- **Chlorophyll-a** – Concentrations at reference area BAP historically range between 0.4 to 1.5 µg/L (**Figure 6-53**). In 2019, maximum chlorophyll-a concentrations, up to 1.7 µg/L, were measured in August and September. Overall, range and pattern of chlorophyll-a concentrations in 2019 for three Baker Lake areas were similar relative to previous years.
- **Total biomass** – Phytoplankton biomass was comparable to previous years. Annual variation in biomass generally co-varies between the BAP reference area and BPJ. In 2019, biomass at BBD and BPJ were both comparable to biomass at BAP (**Figure 6-54**). In 2019, there was a non-statistically significant, 18% increase in phytoplankton biomass at BBD relative to BAP (P = 0.48; **Table 6-4**). Furthermore, there was a non-statistically significant, 8 % decrease in phytoplankton biomass at BPJ relative to BAP (P =0.63). The slight changes in biomass at BBD and BPJ relative to

the reference area in 2019 were likely attributable to natural variability because they were within the range of recent years (**Figure 6-56**).

- **Major taxa composition** – There were no apparent differences in relative composition of phytoplankton communities between BAP and impact areas BBD and BPJ in 2019 (**Figure 6-56**). Chrysophytes are the dominant taxa in terms of biomass at the reference and exposure areas, making up ~50 to 60% of the total phytoplankton biomass in each area. Diatoms, and cryptophytes make up about 20 to 25% each, and the remainder of the biomass is made up of chlorophytes and dinoflagellates (**Appendix D3**).
- **Taxa richness** – Richness in Baker Lake phytoplankton samples was within the range previously noted for the exposure and reference areas (**Figure 6-57**). As was the case in 2018, there is evidence of seasonal variability in 2019, and different trends appear for different areas. BBD richness, for example, trends slightly lower between July and September, whereas BPJ richness appears to increase over that time. There were no statistically significant changes between control area (BAP) and impact areas (BPJ and BBD) over the 20% trigger (**Table 6-4**).

Phytoplankton biomass will continue to be monitored for potential temporal trends, but no follow-up measures other than routine monitoring are recommended for 2020.

6.5 Sediment Chemistry

6.5.1 General Observations

Baker Lake has multiple confounding influences with potential to affect water quality (including potential inputs from the Hamlet of Baker Lake's sewage lagoons and landfill, which are situated in a watershed that discharges seasonally into Baker Lake between BBD and BPJ). Shipping-related influence on sediment metals concentrations would be limited to ship propeller wash disturbing bottom sediments and possibly from introducing contaminants (e.g., discharges, leaks, or spills). No spills were reported in 2019.

Grab chemistry data were collected from BAP, BES, BPJ, and BBD at the same time the benthic invertebrate samples were taken. Five replicate grab samples were collected at each area. No core samples were collected in 2019 (coring is scheduled for 2020). The sediment sampling areas are depicted in (**Figure 6-1**).

6.5.2 Temporal and Spatial Trend Interpretation

The 2019 sediment chemistry results for Baker Lake, screened relative to the lake-specific trigger values, are presented in **Appendix C3**.

To help interpret long-term temporal and spatial trends, concentrations of individual metals have been plotted in **Figure 6-59** to **Figure 6-66**. Metals concentrations are shown by area for the different sampling methods (grab [data points] vs core samples [box and whisker plots]). As only grabs were collected in 2019, no BA statistical tests were conducted; nonetheless, for completeness core sample results are included for past years. The red dashed line in each sediment metals figure is the Baker Lake trigger value. The box and whisker plots illustrate the statistical distribution of core samples within each area. Data interpretation for the box and whisker plots is as follows:

- The horizontal line inside the box represents the median concentration.
- The upper and lower margins of the box represent the upper (75th) and lower (25th) percentile concentrations, respectively (the *interquartile* range).
- The vertical lines represent maximum and/or minimum concentrations (provided at least one value falls outside the box but is within 1.5 times the interquartile range).
- ‘x’s that occur beyond the maximum or minimum lines represent concentrations greater than 1.5 times the interquartile distance and indicate outlier concentrations that are real, but do not fit within the distribution of the rest of the data.

Baker Lake sediment chemistry results for all metals show no obvious temporal trends since 2008 (**Figure 6-59** to **Figure 6-66**). Aside from one replicate grab sample collected at BES for which copper exceeded the site-specific trigger value, arsenic was the only parameter to exceed the Baker-specific trigger values in 2019. However, the lack of any temporal trend suggests that this reflects an inappropriate trigger value rather than changes to sediment quality. This is corroborated by the results of the BA statistical analysis conducted in 2017 on the core sample results, which confirmed that arsenic concentrations were not trending higher.

As in previous years, concentrations of hydrocarbons and PAHs in the composite sediment samples were below their respective MDLs at the reference and exposure areas (**Appendix C3**).

There continues to be no evidence of any barge-related impacts to sediment metals or organics concentrations at impact areas in Baker Lake. Most of the barge traffic’s influence would be disturbing and re-settling existing sediment particles. Although sediment grain size is inherently different between exposure and reference areas, there was no pattern of change for any metal over time that would suggest metals contamination (e.g., from anti-fouling paint on the barge hulls).

6.6 Benthos Community

6.6.1 General Observations

Benthic invertebrates have been collected from Baker Lake annually in August since 2008. Baker Lake monitoring was added to the core program to ensure that m activities in that area related primarily to barge traffic and shipping were tracked. There are two near-field impact areas, one targeting the hamlet's barge landing area (BBD) and the other Agnico's fuel storage facility (BPJ). The initial (since 2008) reference area (BAP) is several kilometers to the east of the Hamlet along the north shore of the lake, a second reference area (BES) was added in 2011 to provide a broader perspective for temporal patterns in benthic community structure (**Figure 6-1**).

Abundance and species composition of benthic invertebrate communities at Baker Lake are strongly affected by various parameters, including grain size, water depth, and sediment organic content (as discussed for the Meadowbank lakes in **Section 4.6.1**). Investigations in the Meadowbank study lakes and Baker Lake have targeted habitats of similar depth and grain size (i.e., dominated by silt/clay with a small [<5%] sand fraction). Unlike the Meadowbank study lakes, sediment grain size in Baker Lake has tended to be more variable and less predictable at all locations, with consistently coarser grain size (due to more sand) than Meadowbank lakes (see the 2019 results in **Appendix E3** as an example of the variability within and between areas). Higher sand content is typically associated with a lower TOC concentration, which in turn influences the type of benthic community.

Like Meadowbank study lakes, the Baker Lake benthic community is characterized by relatively low abundance and taxa richness, although benthic invertebrate community abundance at Baker Lake often exceeds 2,000 organisms/m^2 (**Figure 6-67**), which is higher than typically-reported abundance at the Meadowbank study area lakes (**Figure 4-73**). Annual variability is sometimes high, as seen at BBD (e.g., from 2008 to 2009). There have also been fairly consistent spatial differences in abundance between areas (e.g., BBD and BPJ have generally had lower abundance than BAP). Taxa richness historically ranged from 5–19 in exposure areas and from 15–22 in reference areas, although considerable within-area variability in taxa richness has been documented, particularly at the exposure areas BBD and BPJ (e.g., **Figure 6-70** and **Figure 6-71**).

The benthic invertebrate community in Baker Lake is dominated by the aquatic larval stages of insects, especially chironomids (Family Chironomidae), both in terms of abundance (**Figure 6-67** and **Figure 6-69**) and taxa richness (**Figure 6-70**). The next most abundant group is typically Mollusca (clams) especially, *Cyclocalyx/Neopisidium*, genera of the family Sphaeriidae (fingernail clams). Oligochaete worms can also be relatively abundant in the lake sediments, possibly because of higher sand content; generally, at least one oligochaete taxon was present at most area/year combinations.

6.6.2 Temporal and Spatial Trend Interpretation

Benthic invertebrate abundance and richness results from 2019 are tabulated in **Appendix E3**. Details regarding historical trends are discussed in the 2011 CREMP (Azimuth, 2012a). The 2019 report focuses on recent results and on trends over the last four years. Statistical test results for abundance and richness are presented in **Table 6-5** and **Table 6-6**, respectively. Note that because sampling started in 2008 after development-related activities started, there is no true *before* period, and a series of BACI tests is run that compares *control* and *impact* areas over a range of *after* periods (see **Section 2.4.3** for more details). Key results are described below:

- **Total abundance** – Mean 2019 abundance decreased slightly or was consistent with 2018 at all Baker Lake areas (**Figure 6-67**). Overall, there are no obvious temporal trends in total abundance at *impact* areas BBD and BPJ, and none of the BACI *after* period groupings showed statistically significant changes had occurred at the *impact* areas (**Table 6-5**). Interestingly, while the results were not statistically significant, the effect sizes for abundance at both BBD and BPJ in 2019 were above 200% relative to *before/reference* conditions (**Table 6-5**), and this trend persists across all four after periods (i.e., up to four years in the *after* period). These results are likely an artefact of natural variability, with the mean abundance in 2019 ranked second and third highest across years and 2018 ranked as the highest at BBD and BPJ. The conclusion that the variability is natural is corroborated by the taxa richness results (**Figure 6-67**), which show a general increase in benthic invertebrate taxa diversity over the past five years (including at reference area BES).
- **Abundance of Major taxa** – As discussed previously, the benthic invertebrate communities at reference and impact areas in Baker Lake are comprised primarily of chironomid larvae. However, the relative proportion of different taxa is markedly different for the impact areas BBD and BPJ compared to reference area BAP (apart from 2008; **Figure 6-68** and **Figure 6-69**). Since 2009, approximately 25 to 60% of individuals at BAP have been oligochaetes, compared to less than 10% at the impact areas and reference area BES (which was added in 2011 to provide a reference area with more similar characteristics to the exposure areas). As was the case in recent years, the dominant oligochaete taxa in terms of density at BAP in 2019 were from the Naididae subfamilies Rhyacodrilinae (*Rhyacodrilus sp*) and Tubificinae (see **Appendix E3**). *Rhyacodrilus sp* were identified in at least three replicate samples from BES, BBD, and BPJ, but at lower abundances. The differences observed in major taxa composition between the two reference areas, and likely both NF areas, appears to be completely natural.
- **Taxa richness** – Mean taxa richness was high across all Baker Lake areas in 2019 (**Figure 6-70**). Geometric means for total richness were the third highest among all years for BAP, BBD, and BPJ. Consequently, the BACI model results showed large, positive, yet uncertain (p>0.1) effects sizes

for total richness in 2019 and the 2-year, 3-year, and 4-year time periods (**Table 6-6**). These trends likely reflect of natural variability in the community.

Insects dominate the benthos the communities at the control and impact areas (**Figure 6-71** and **Figure 6-72**). There were no apparent trends in species composition, indicating the barge operations are not adversely affecting the community.

Monitoring results to date have been variable across the sites. A detailed discussion on early trends is presented in the 2012 CREMP (Azimuth, 2013). At present there is no evidence that shipping and other development-related activities near Baker Lake are adversely affecting the benthic invertebrate community, especially given there are no apparent barge-related effects on water quality and sediment chemistry.

6.7 Baker Lake Tables and Figures

The tables and figures for the Baker Lake CREMP are provided in this section except for the large tabulated datasets and figures for parameters that are not included in the detailed analysis (see in-text references to appropriate Appendices). Subsections are provided for each of the CREMP components (e.g., limnology, water chemistry, phytoplankton, sediment chemistry, and benthos).

Legend

- Water Sampling Point
- Sediment/Benthic Invertebrate Quality Sampling Station
- All-Weather Access Road
- Whale Tail Haul Road

0 5 10 15
Kilometres

Projection: UTM Zone 14 NAD83

Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.

Figure 6-1. Baker Lake study area – Water, sediment, and benthic invertebrate areas, 2019

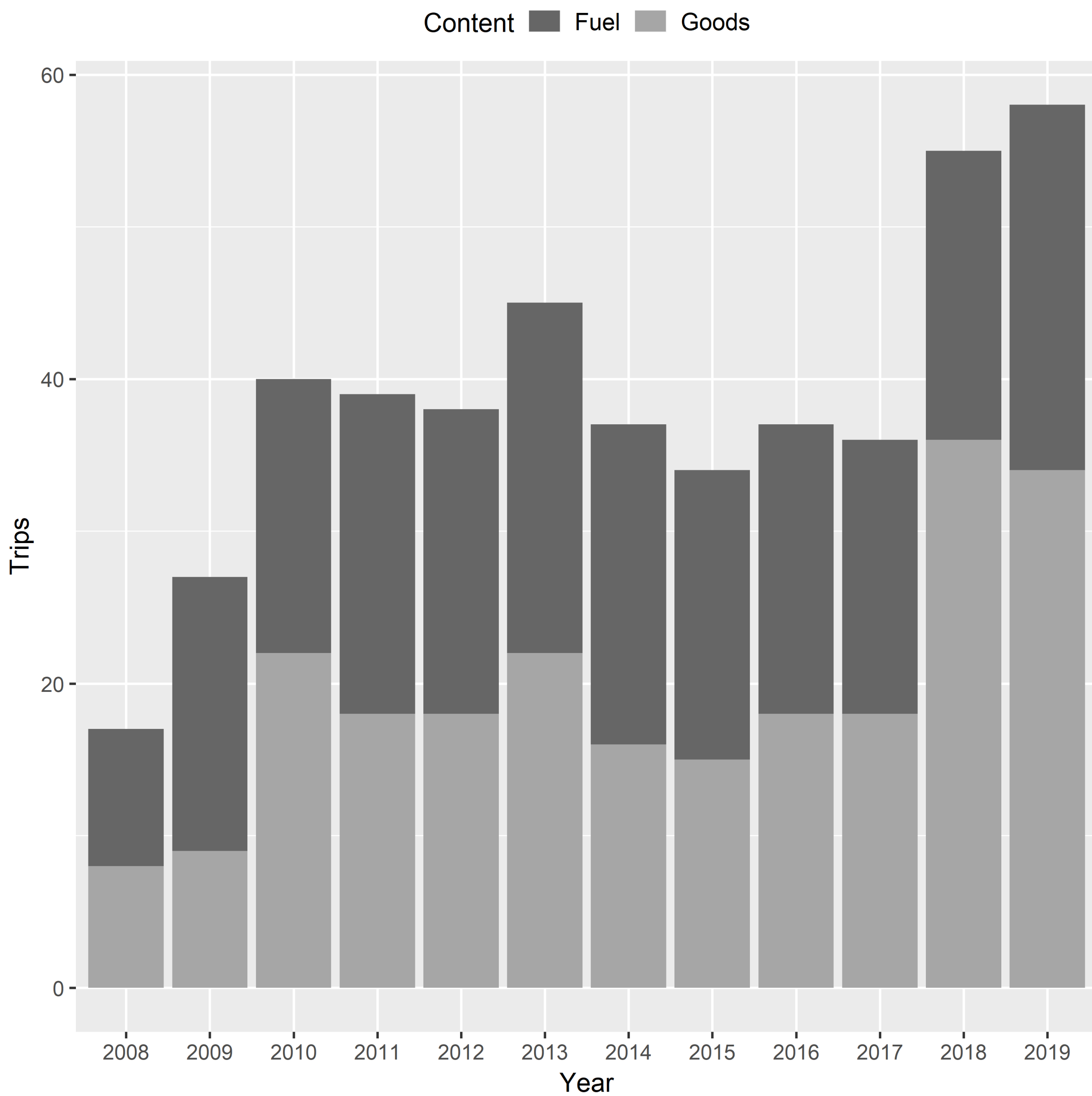
Meadowbank Gold Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

January 2020

Figure 6-2. Baker Lake barge traffic from Chesterfield Inlet, 2008-2019.



Limnology Tables and Figures

Figure 6-3. Mean monthly field-measured temperature (°C) at 3 m depth from 2008 – 2019, Baker Lake.

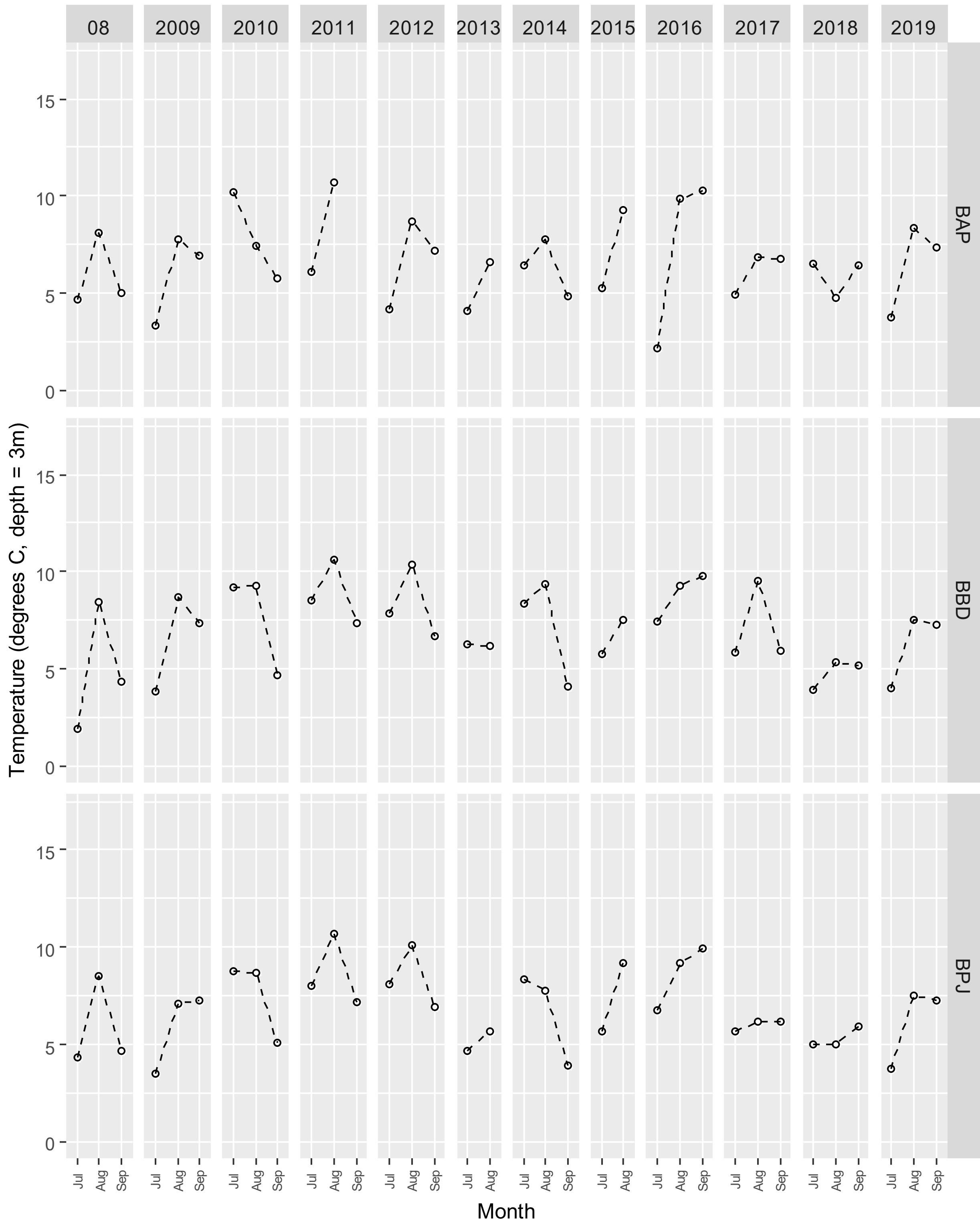
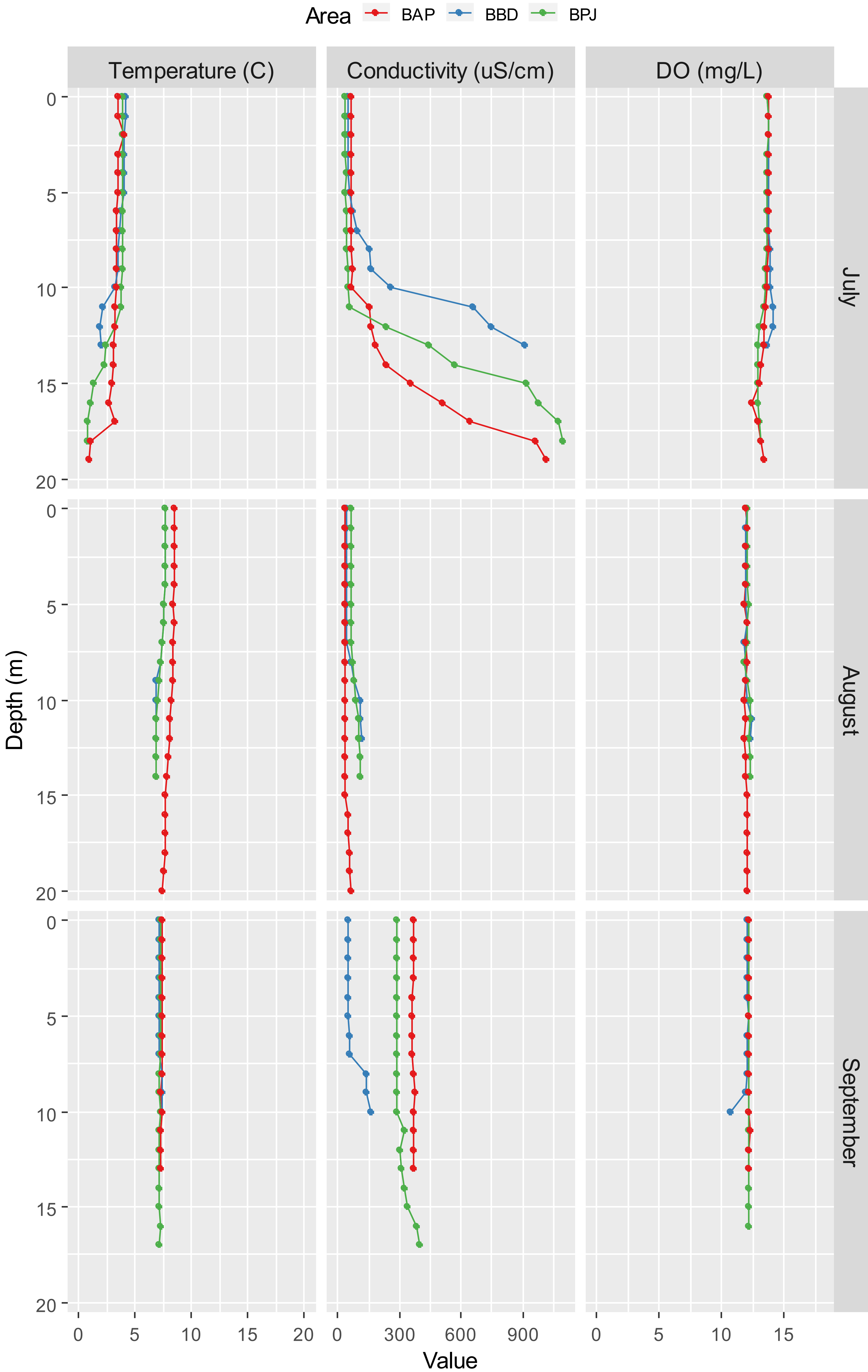


Figure 6-4. Baker Lake – Field-measured temperature, conductivity, and dissolved oxygen profiles, 2019.

Note: Dissolved oxygen concentrations were unstratified and similar among the three areas (values masked).



Water Chemistry Tables and Figures

Table 6-1. Screening process for water quality parameters, Baker Lake, 2019.

CONVENTIONALS			TOTAL METALS			DISSOLVED METALS		
Screening Level	1	2	Screening Level	1	2	Screening Level	1	2
Screening Rule[1]	>MDL ≥ 10% frequency	C-I > 0.05 frequency	Screening Rule[1]	>MDL ≥ 10% frequency	C-I > 0.05 frequency	Screening Rule[1]	>MDL ≥ 10% frequency	C-I > 0.05 frequency
Conductivity	Figure 6-5		Aluminum	Figure 6-24		Aluminum	Figure 6-42	
Hardness	Figure 6-6		Antimony*	No	No	Antimony*	No	No
pH -Field	Figure 6-7		Arsenic	Figure 6-25		Arsenic	Figure 6-43	
pH -Lab	Figure 6-8		Barium	Figure 6-26		Barium	Figure 6-44	
TSS	Figure 6-9		Beryllium*	No	No	Beryllium*	No	No
TDS	Figure 6-10		Boron	Figure 6-27		Boron	Figure 6-45	
B-Alkalinity	Figure 6-11		Cadmium*	No	No	Cadmium*	No	No
C-Alkalinity*	No	No	Calcium	Figure 6-28		Chromium*	No	No
T-Alkalinity	Figure 6-12		Chromium	Figure 6-29		Copper	Figure 6-46	
Ammonia-N	Figure 6-13		Copper	Figure 6-30		Iron*	No	No
Chloride	Figure 6-14		Iron	Figure 6-31		Lead*	No	No
Fluoride	Figure 6-15		Lead*	No	No	Lithium	Figure 6-47	
Nitrate-N	Figure 6-16		Lithium	Figure 6-32		Manganese	Figure 6-48	
Nitrite-N*	No	No	Magnesium	Figure 6-33		Mercury*	No	No
TKN	Figure 6-17		Manganese	Figure 6-34		Molybdenum	Figure 6-49	
T-Phosphorous	Figure 6-18		Mercury*	No	No	Nickel*	No	No
Ortho-phosphate	Figure 6-19		Molybdenum	Figure 6-35		Selenium*	No	No
Reactive Silica	Figure 6-20		Nickel*	No	No	Silicon	Figure 6-50	
Sulphate	Figure 6-21		Potassium	Figure 6-36		Strontium	Figure 6-51	
DOC	Figure 6-22		Selenium*	No	No	Thallium*	No	No
TOC	Figure 6-23		Silicon	Figure 6-37		Tin*	No	No
T-Cyanide*	No	No	Sodium	Figure 6-38		Titanium*	No	No
Free Cyanide*	No	No	Strontium	Figure 6-39		Uranium	Figure 6-52	
			Thallium*	No	No	Vanadium*	No	No
			Tin*	No	No	Zinc*	No	No
			Titanium	Figure 6-40				
			Uranium	Figure 6-41				
			Vanadium*	No	No			
			Zinc*	No	No			

Notes:

"*" Plots for these parameters are presented in **Appendix B3**.

1. See text for further detail.

Table 6-2. Water quality variables at the Bake Lake monitoring areas for which 2019 mean concentration exceeded the trigger.

Parameter	Trigger	2019 Mean		
		BAP	BBD	BPJ
		Ref	NF	NF
Ammonia as N	0.066	-	0.071	0.0802
TKN	0.2224	-	0.231	0.2477

Notes:
"-" indicates mean annual concentration was < the trigger value.

Table 6-3. Results of BACI tests for selected water variables at Baker Lake monitoring areas in 2019.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	F	DF	P-value[1]	Proportional change		
									exp(Est)	LCI	UCI
Ammonia (as N)	BBD	30	3	-0.13	0.23	0.31	31	0.71	0.88	0.54	1.42
	BPJ	30	3	-0.055	0.22	0.062	31	0.60	0.95	0.60	1.49
TKN	BBD	27	3	0.066	0.12	0.28	28	0.30	1.07	0.83	1.37
	BPJ	27	3	0.16	0.12	1.69	28	0.102	1.18	0.91	1.52

Notes:
Bolded P-values are statistically significant < 0.05
Test area = area compared to control (INUG)
n(B) = number of paired months in the "before" period
n(A) = number of paired months in the "after" period (i.e., in 2019)
Estimate = BACI model estimate of the 2019 change in mean for log-transformed data
SE = standard error of the estimate
P-value = one-tailed test of the null hypothesis (no change or a decrease in mean [opposite for lower pH trigger])
Exp(Est.) = estimated proportional change
LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 6-5. Laboratory-measured conductivity (µS/cm) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake. Laboratory-measured conductivity data from 2014 should be interpreted with caution, particularly at low concentrations (see Azimuth, 2015c for details).

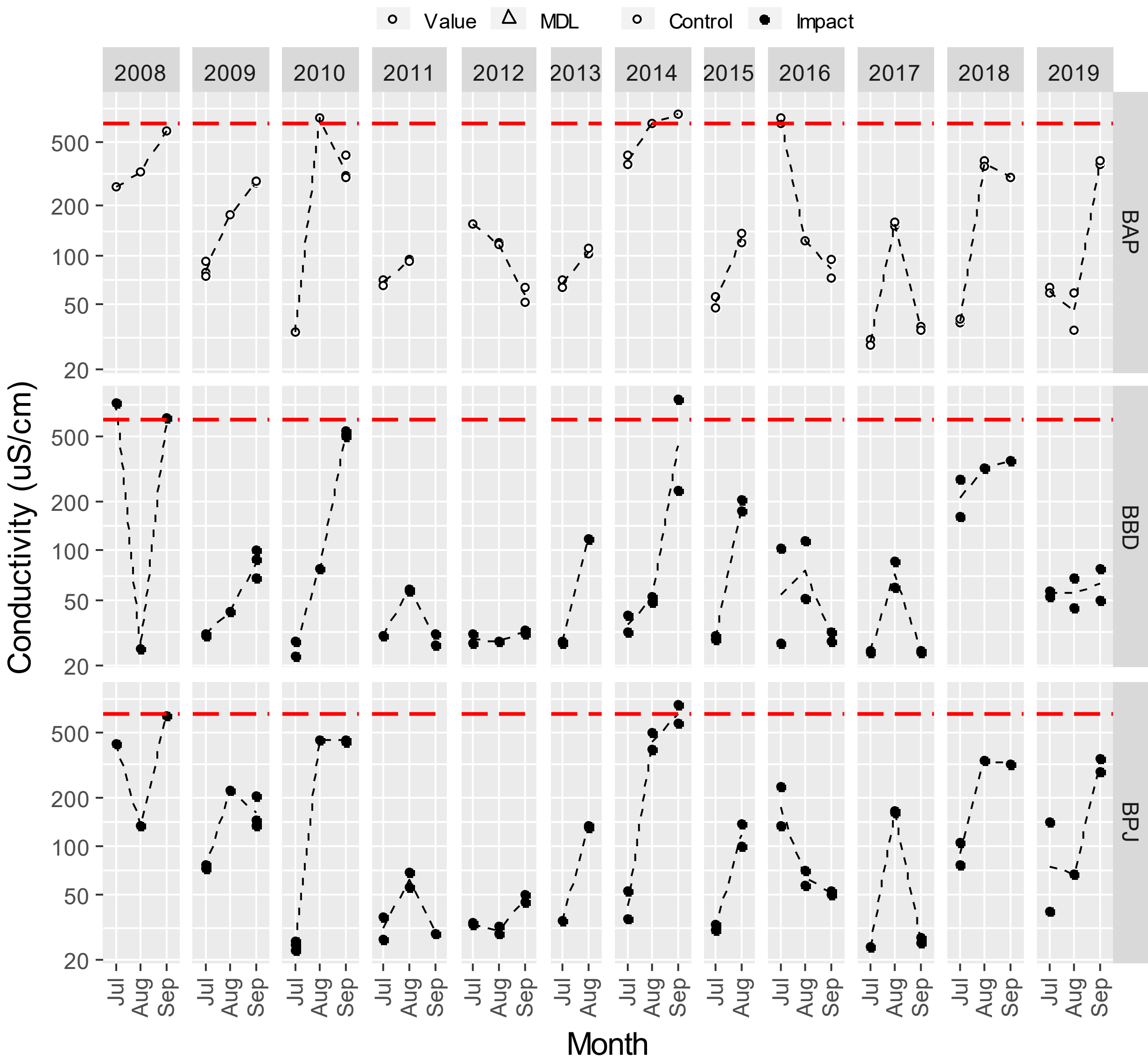


Figure 6-6. Laboratory-measured hardness (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

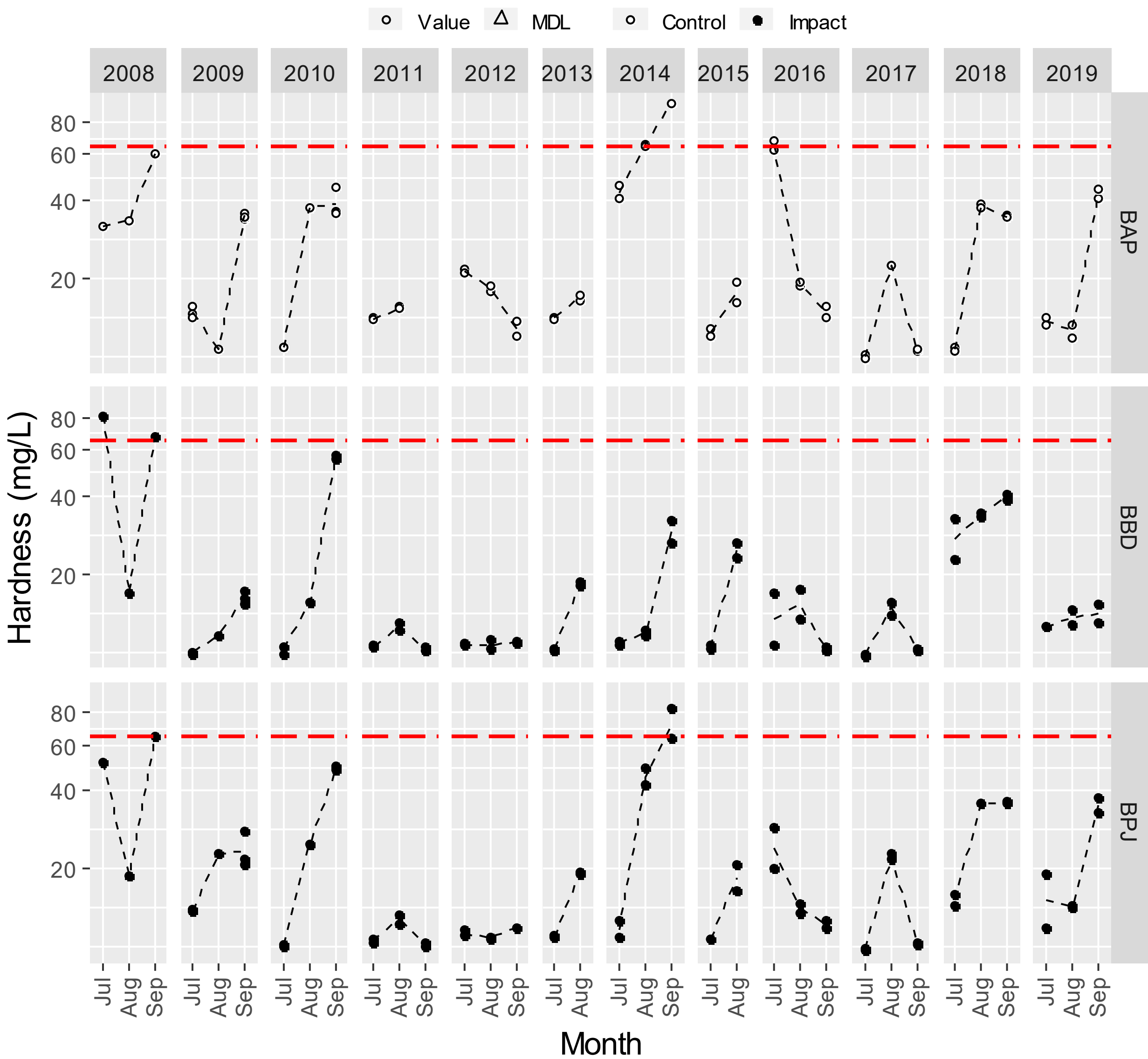


Figure 6-7. Field-measured pH in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

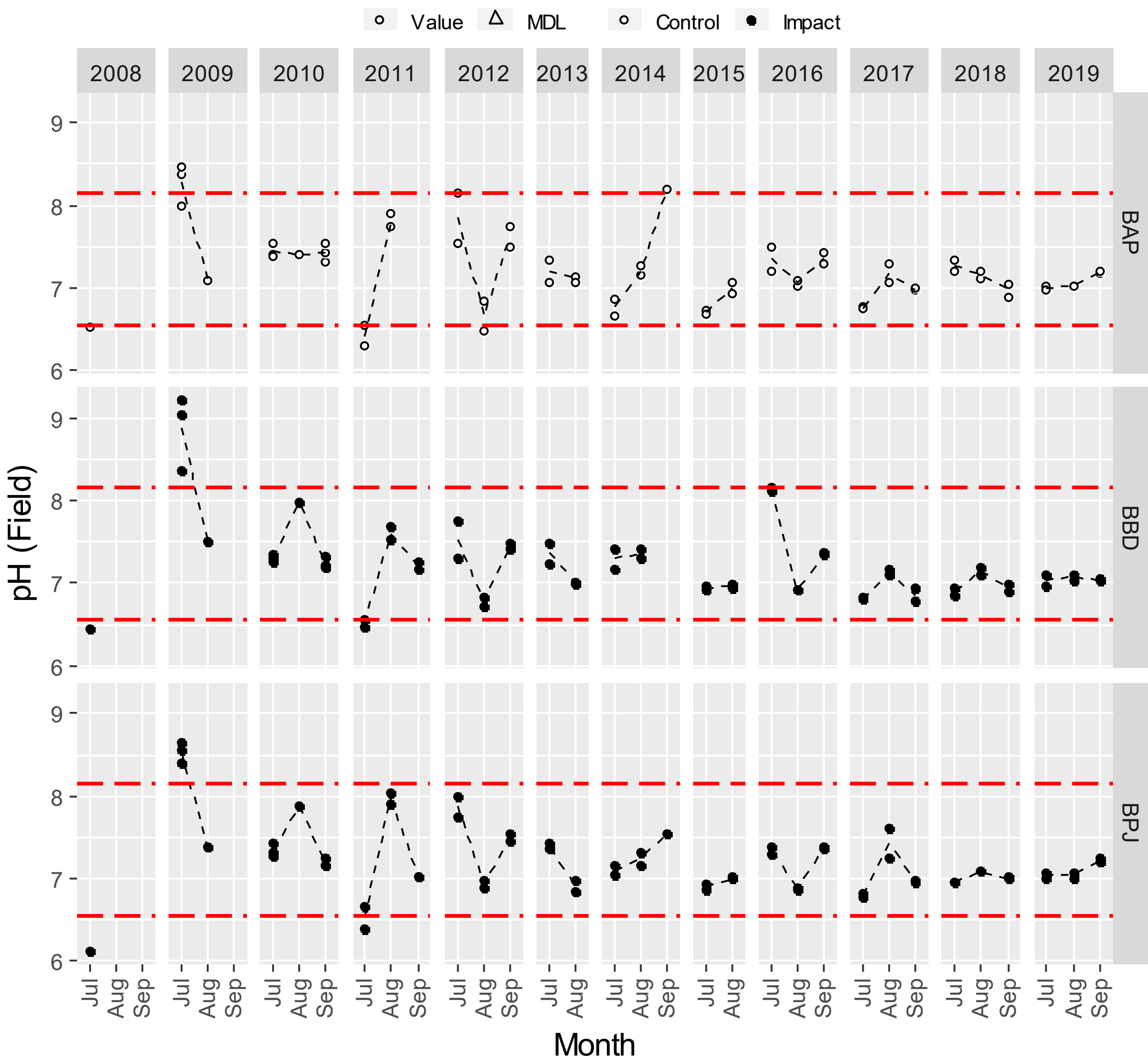


Figure 6-8. Laboratory-measured pH in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

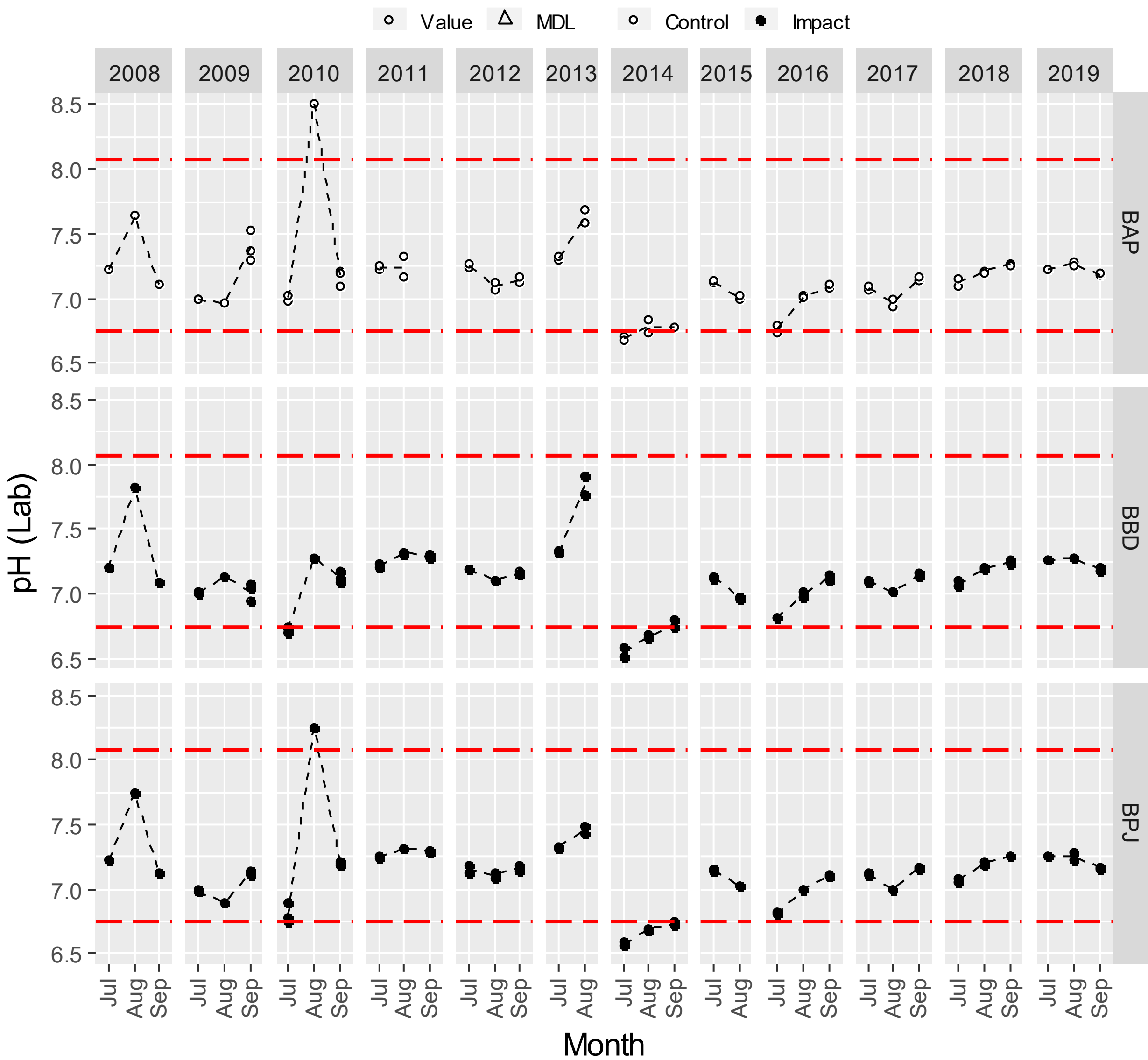


Figure 6-9. Total suspended solids (TSS; mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

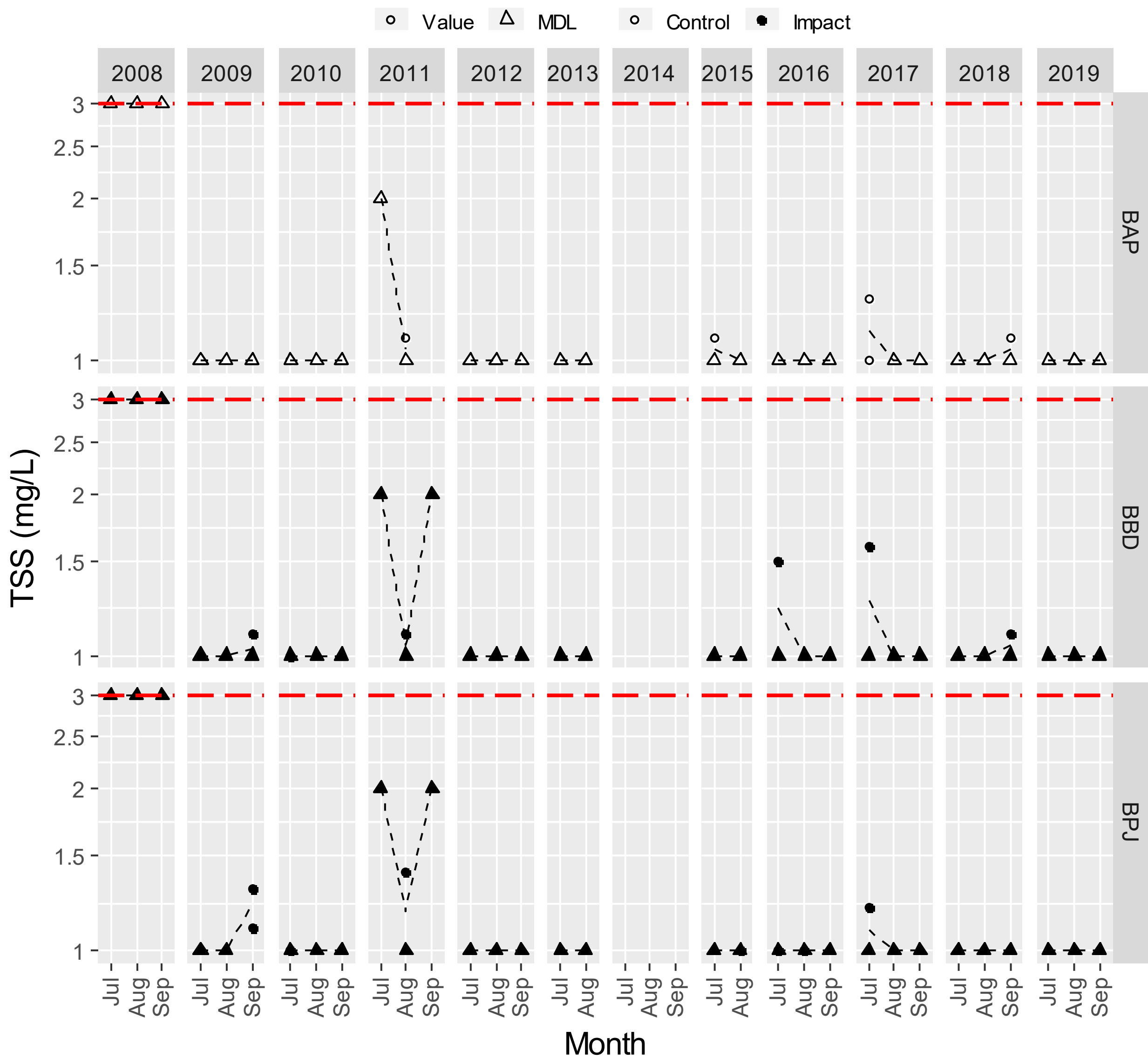


Figure 6-10. Total dissolved solids (TDS; mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

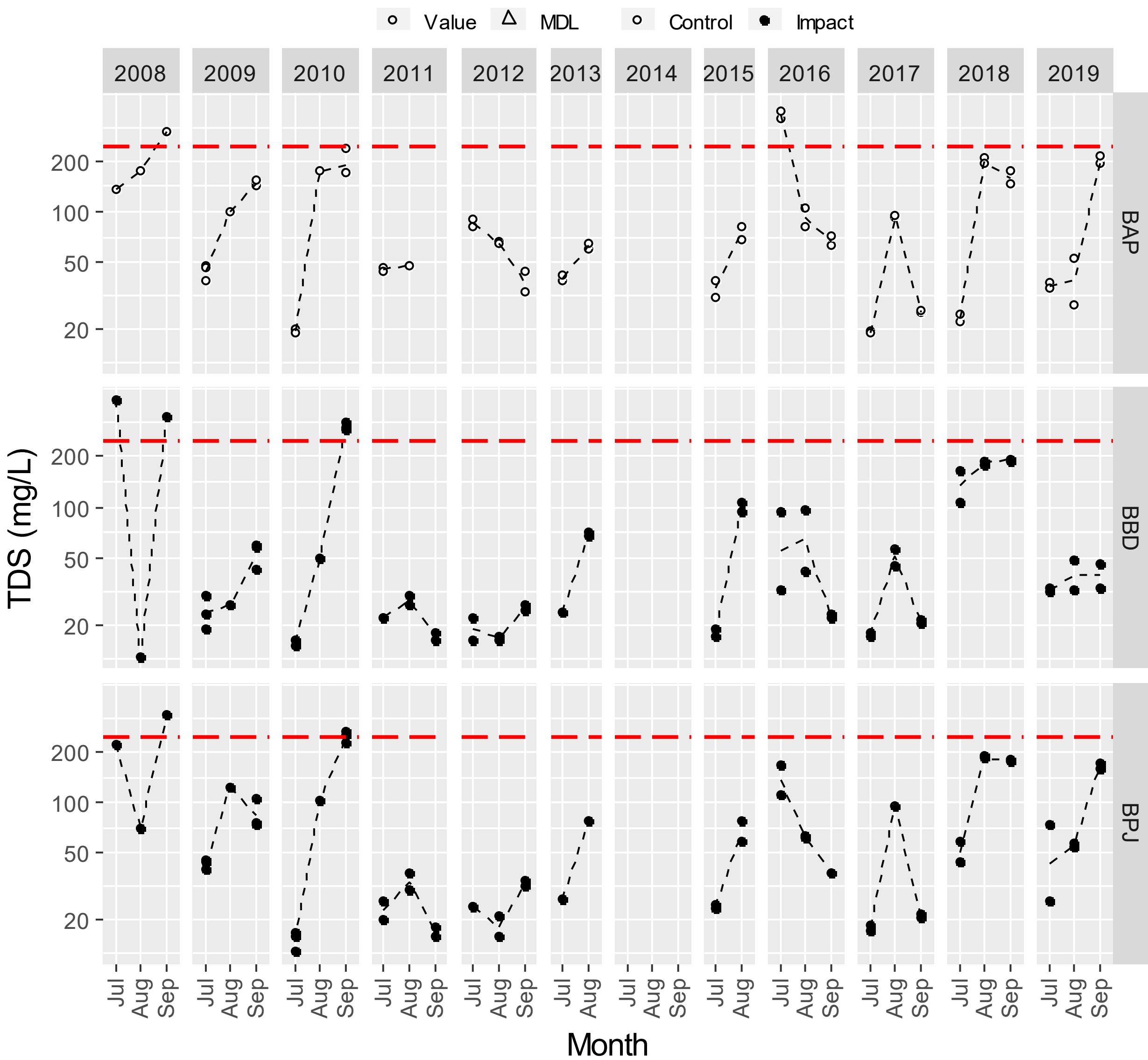


Figure 6-11. Bicarbonate-alkalinity (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

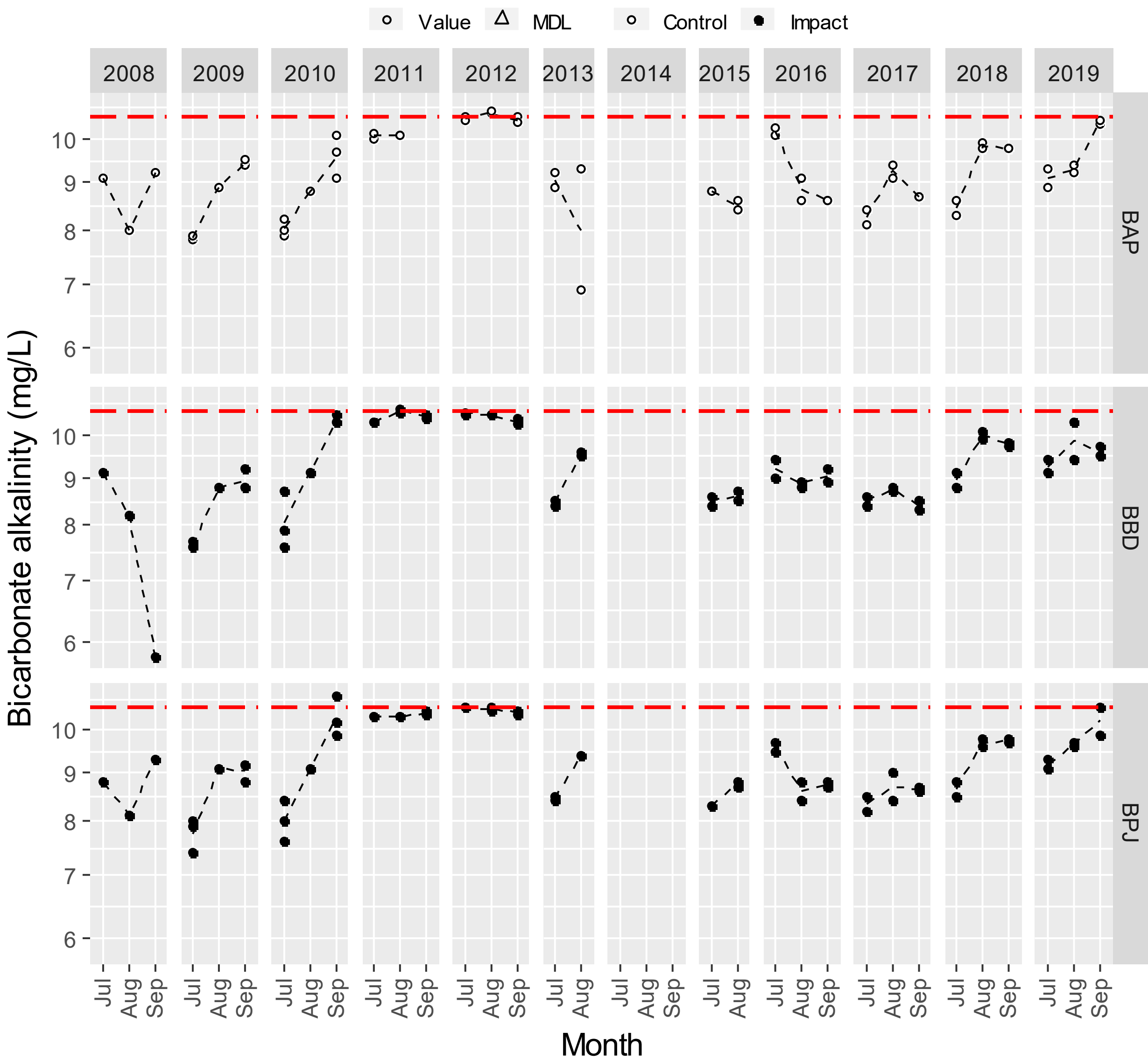


Figure 6-12. Total alkalinity (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

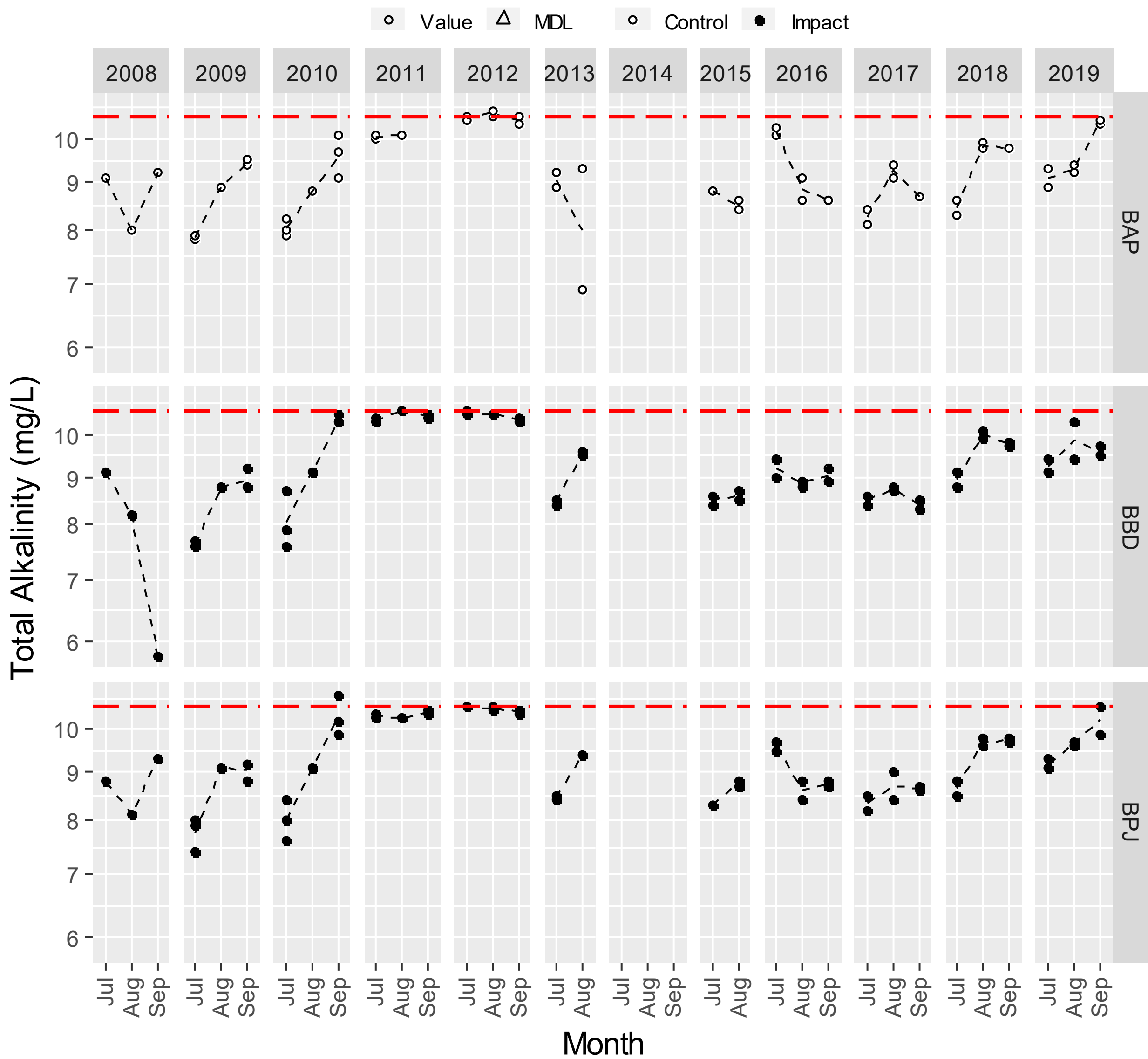


Figure 6-13. Ammonia-N (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

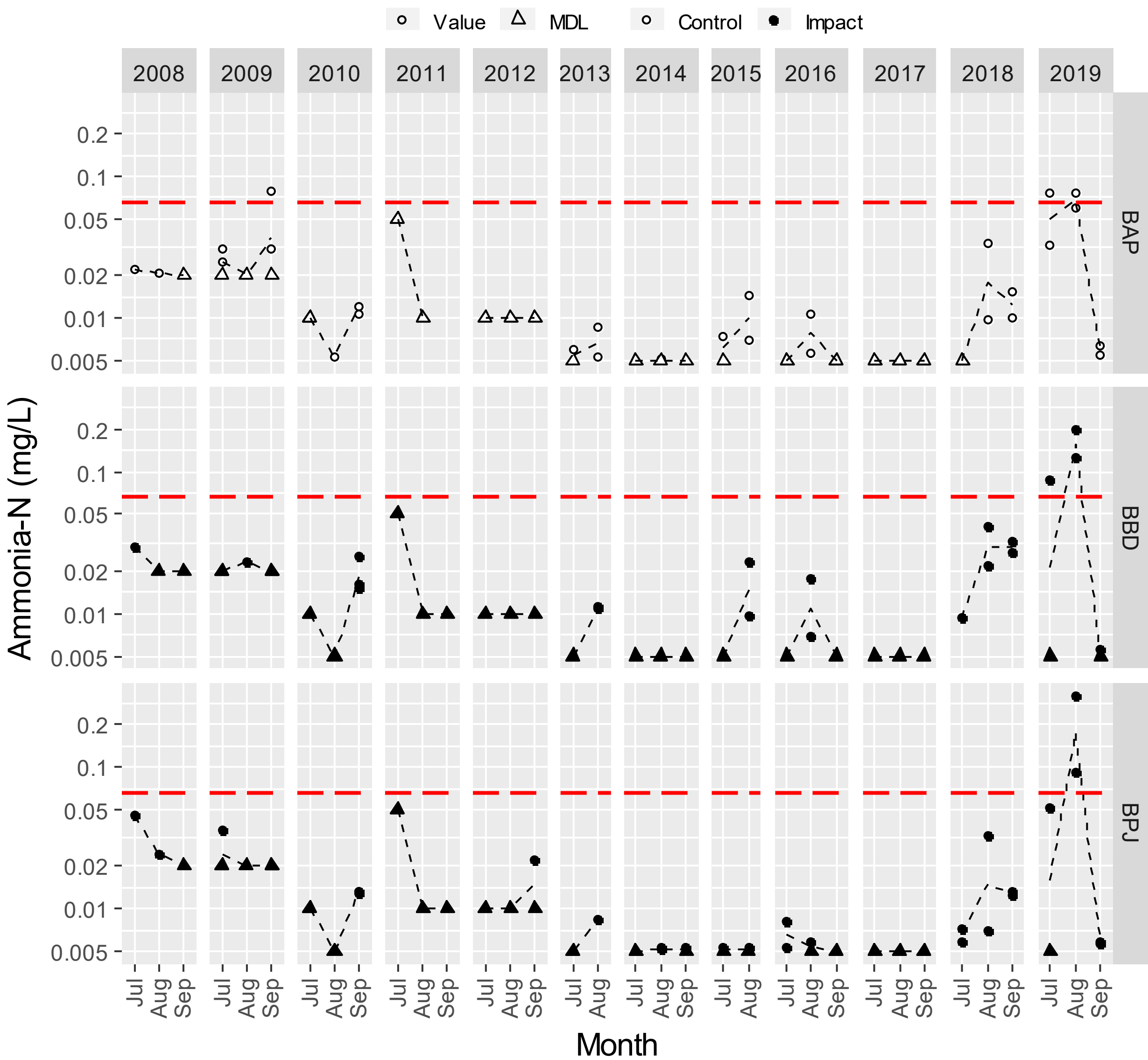


Figure 6-14. Chloride (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

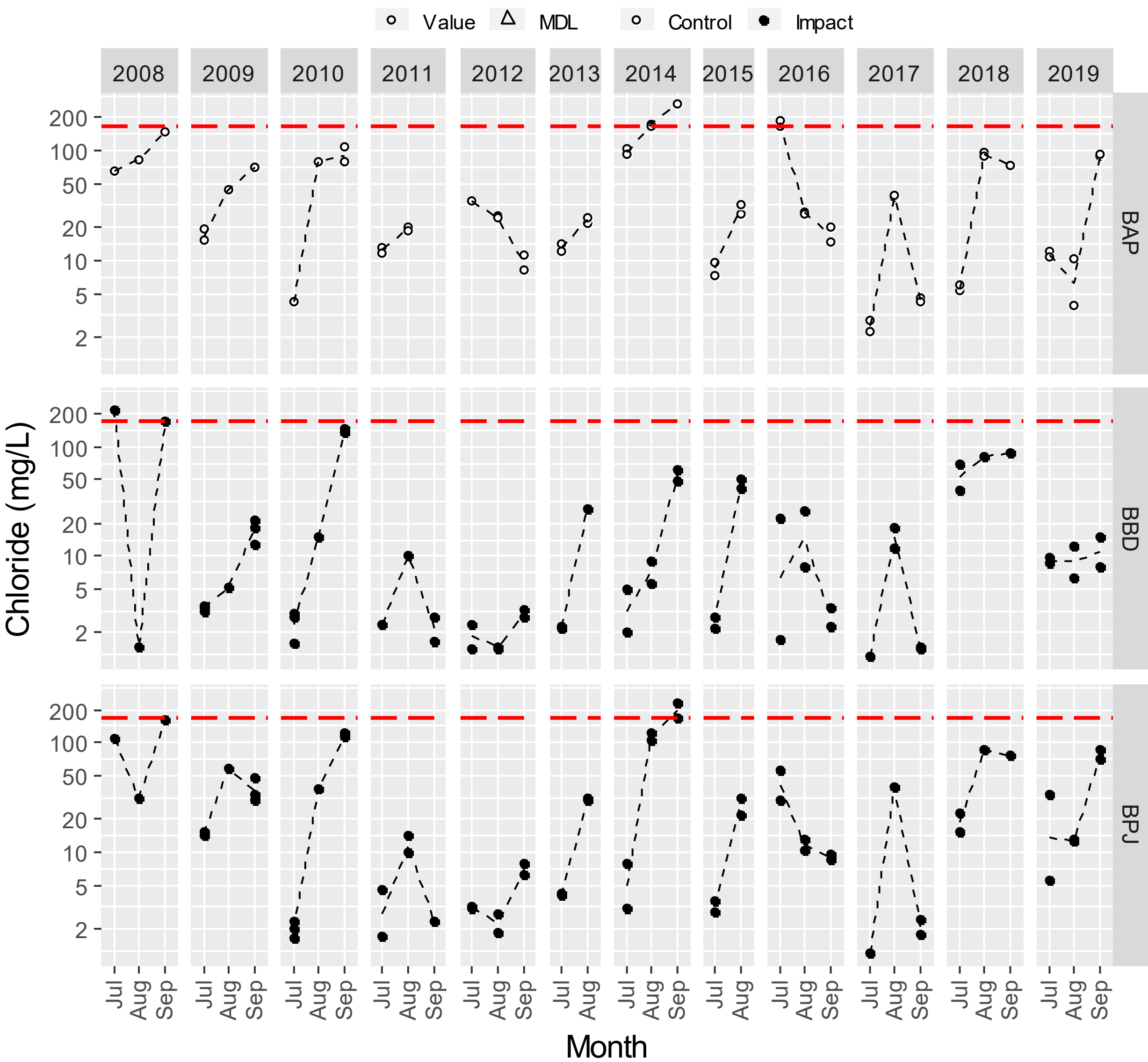


Figure 6-15. Fluoride (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

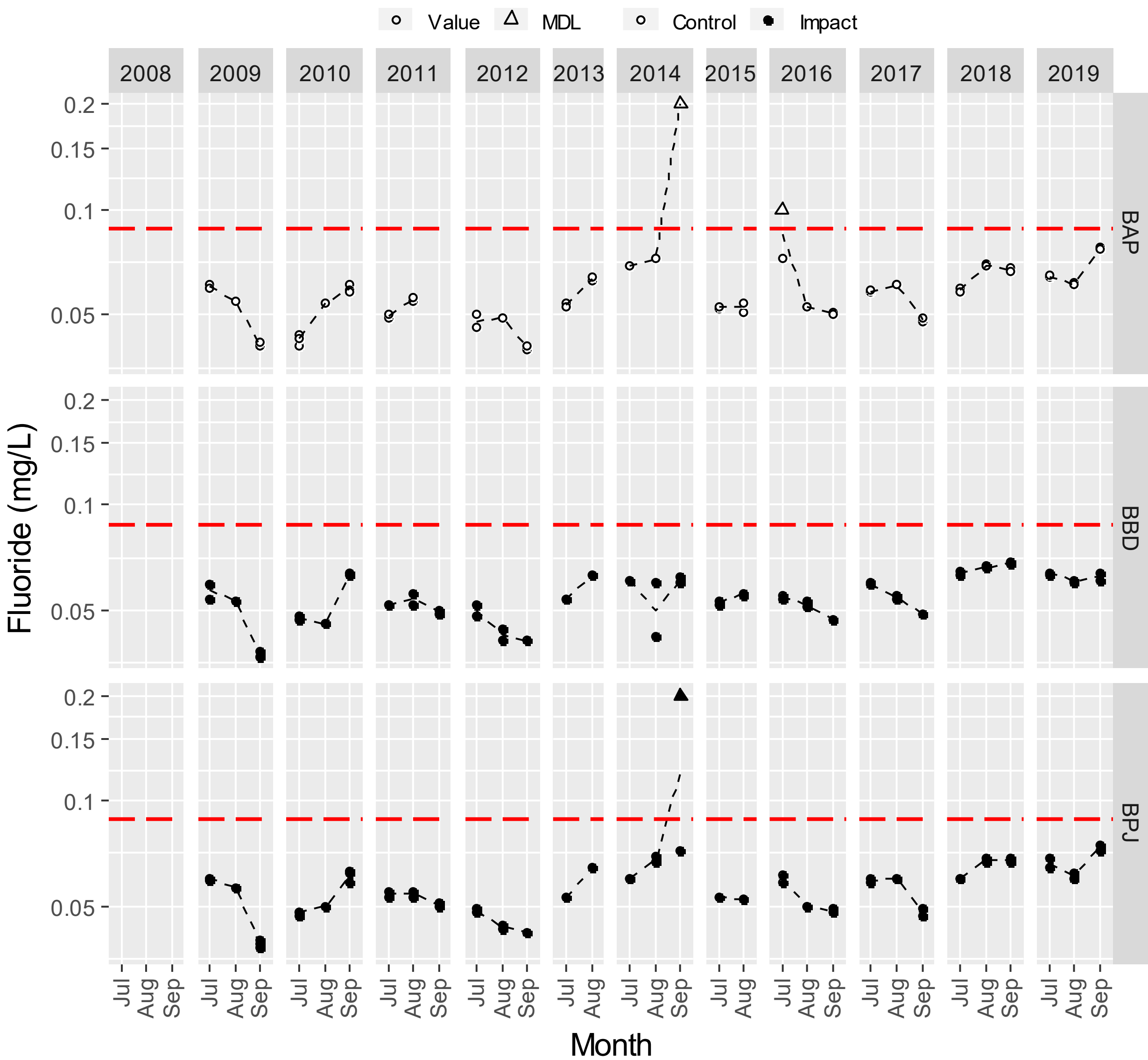


Figure 6-16. Nitrate-N (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

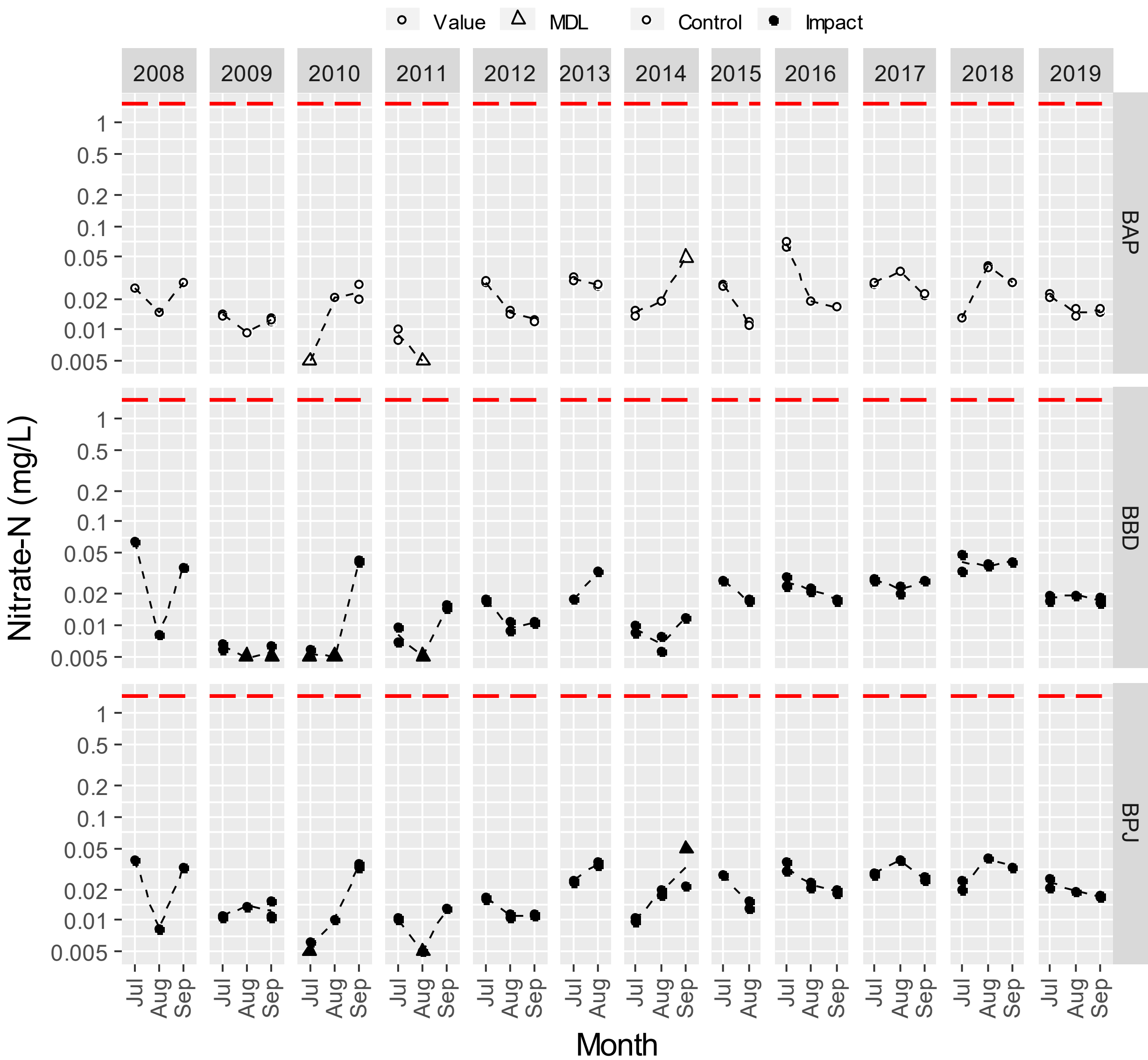


Figure 6-17. Total Kjeldahl Nitrogen (TKN; mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

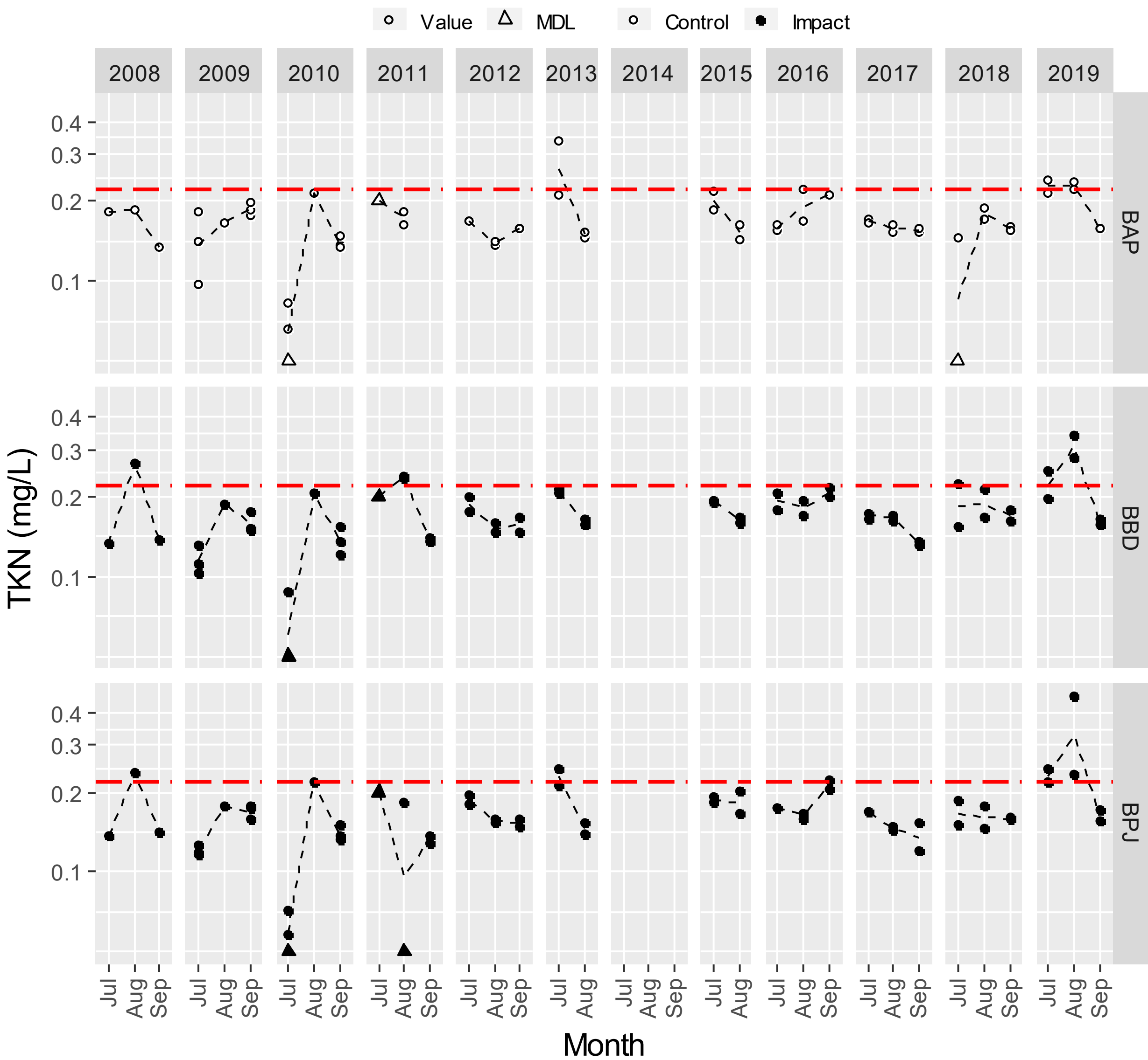


Figure 6-18. Total phosphorus (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

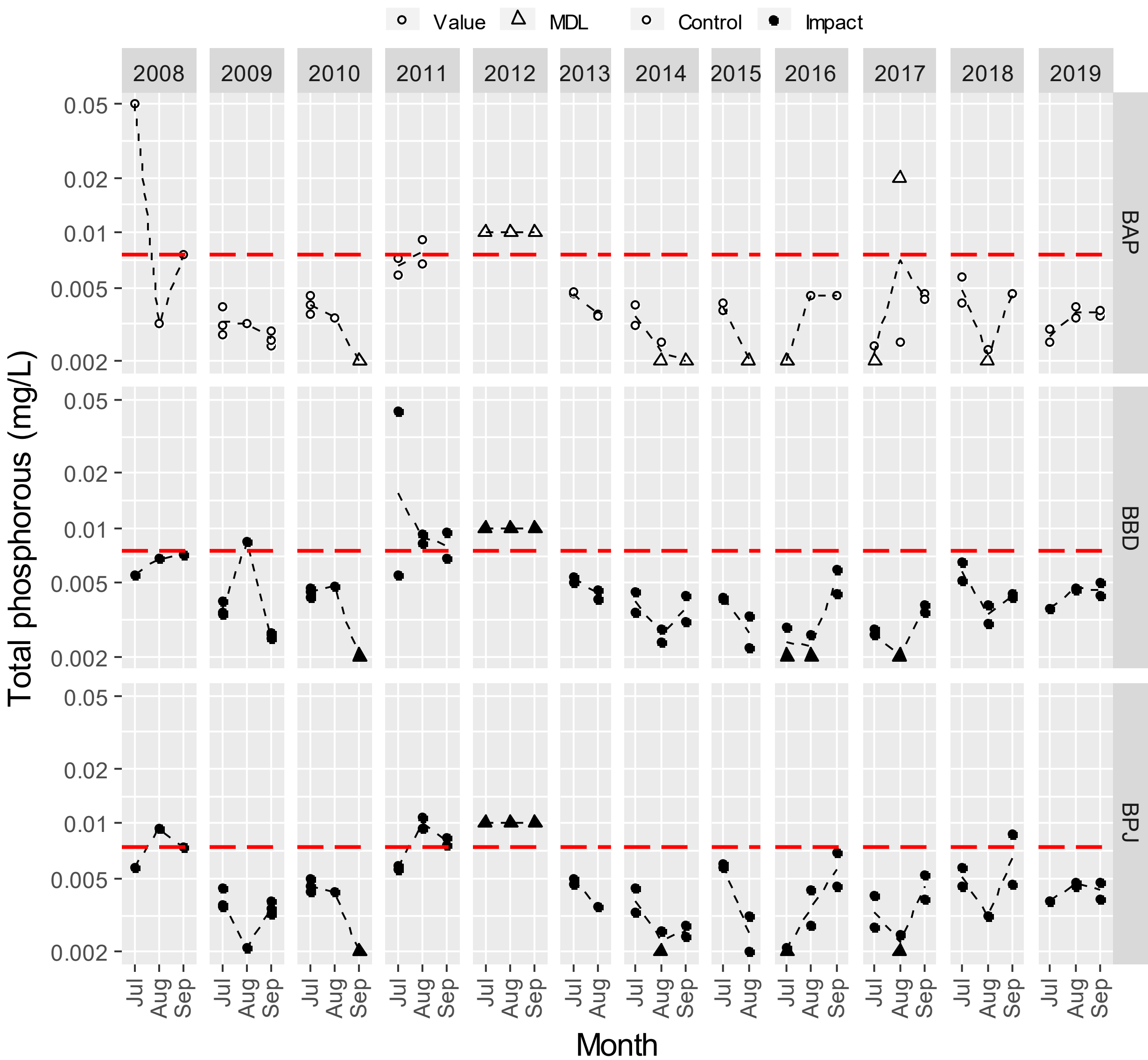


Figure 6-19. Ortho-phosphate (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

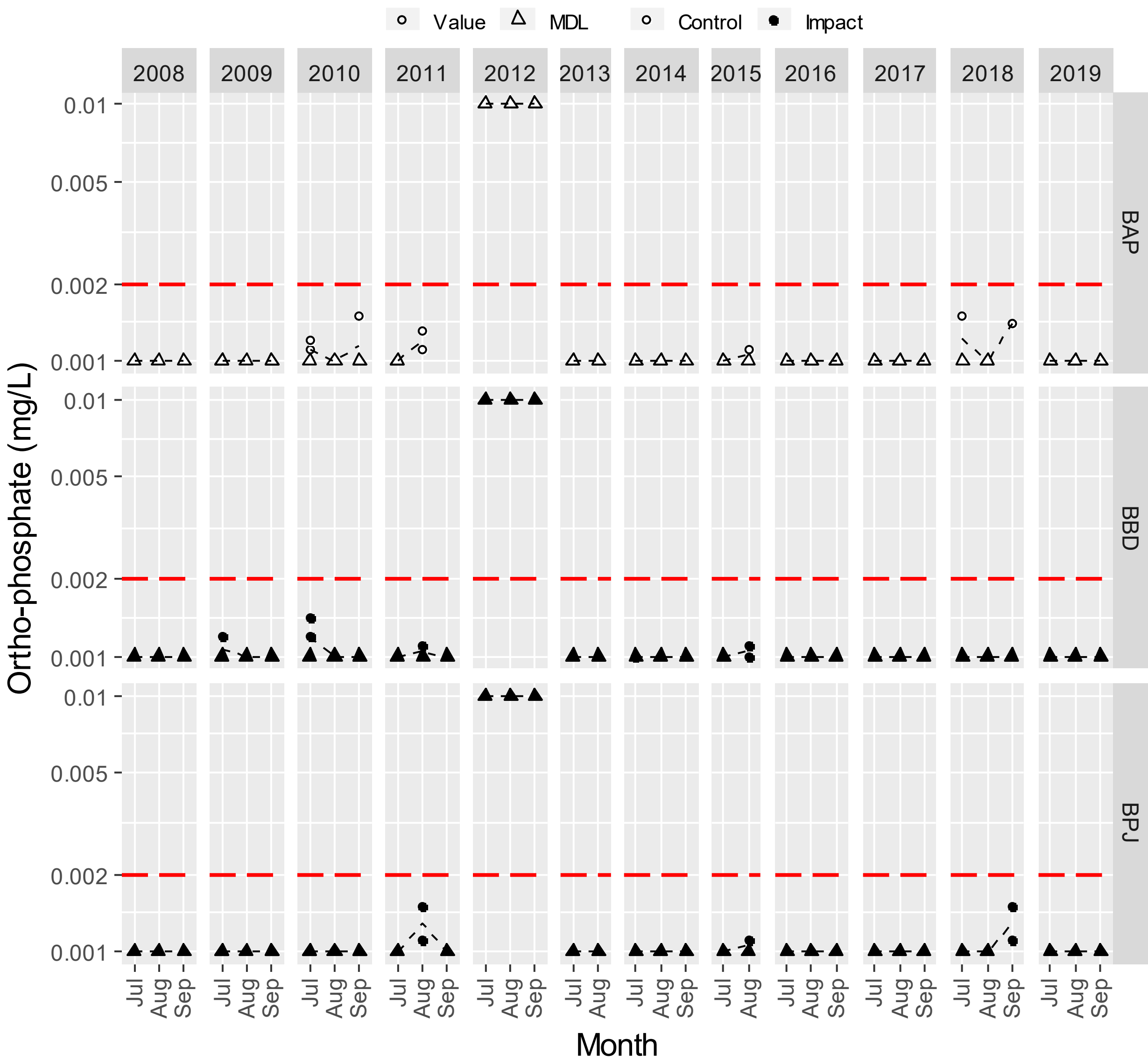


Figure 6-20. Reactive silica (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

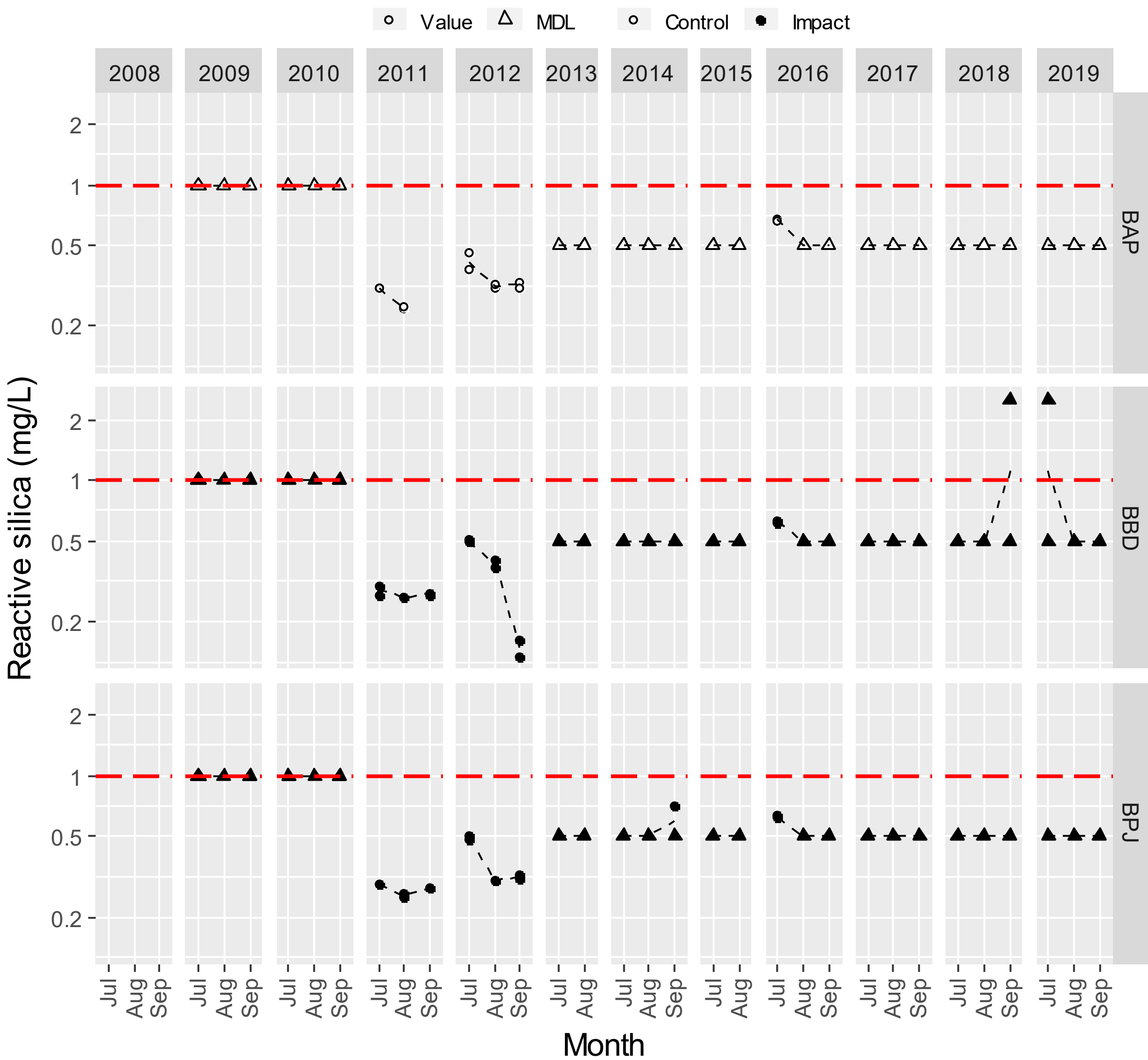


Figure 6-21. Sulphate (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

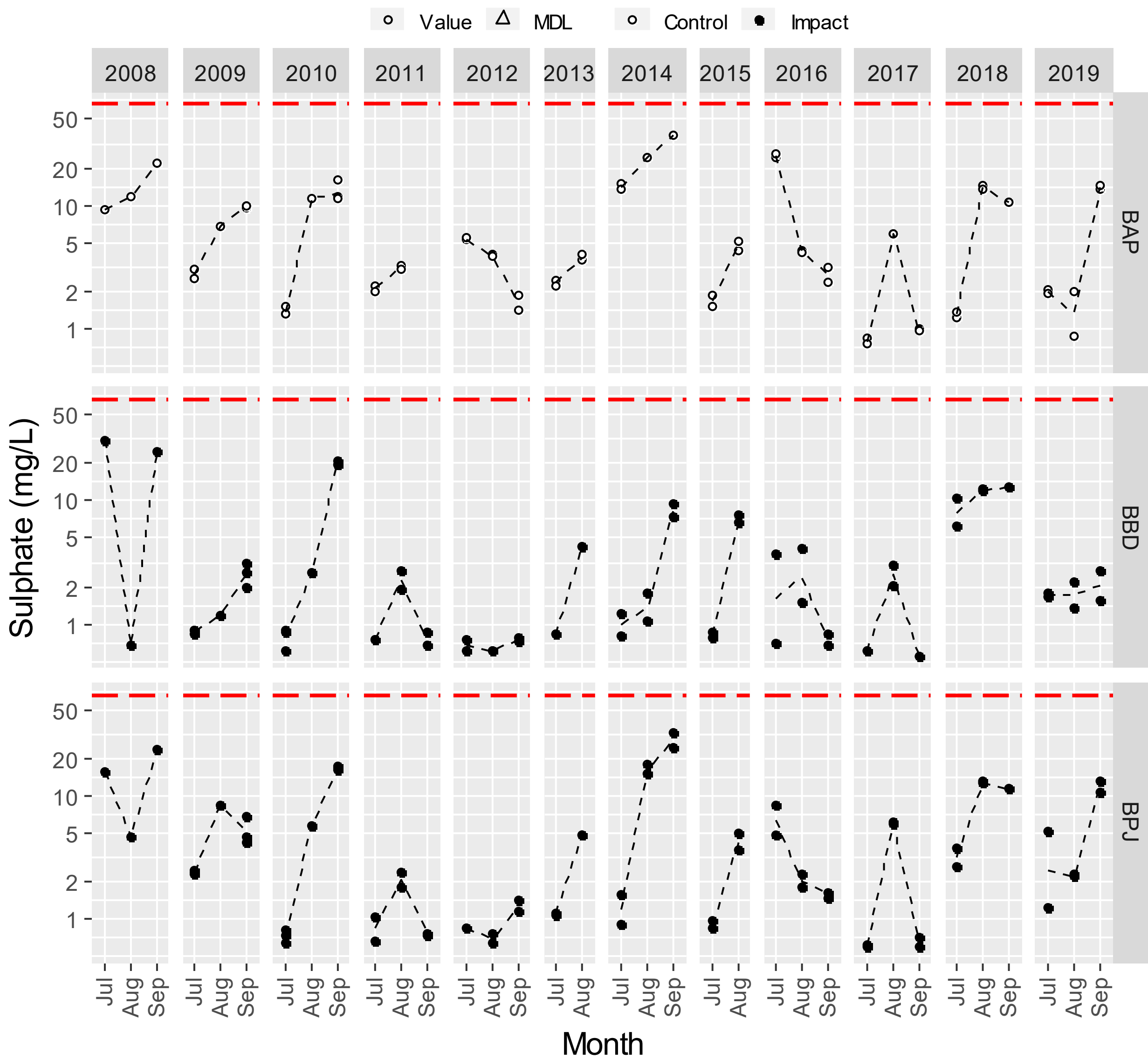


Figure 6-22. Dissolved organic carbon (DOC; mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

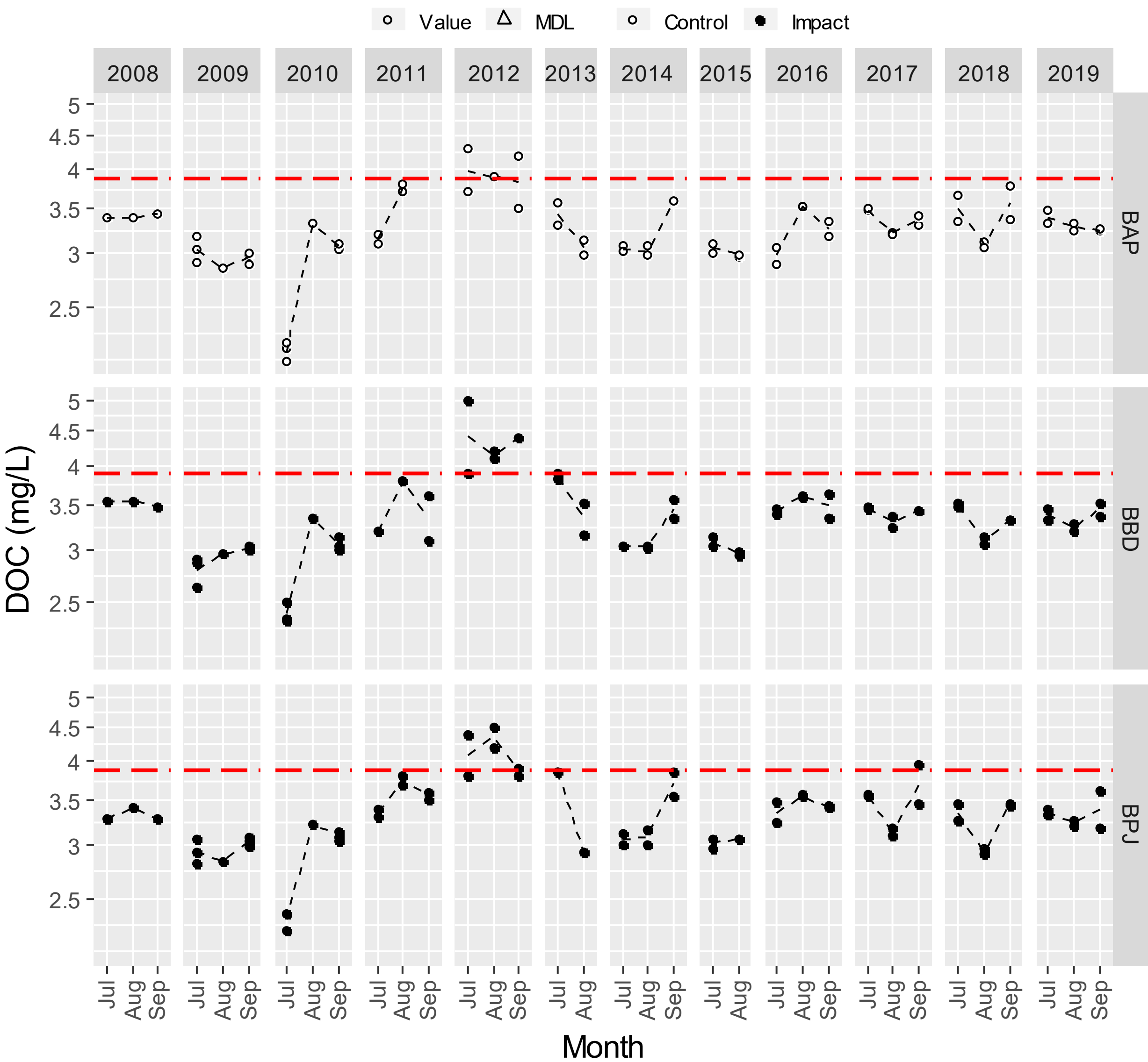


Figure 6-23. Total organic carbon (TOC; mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

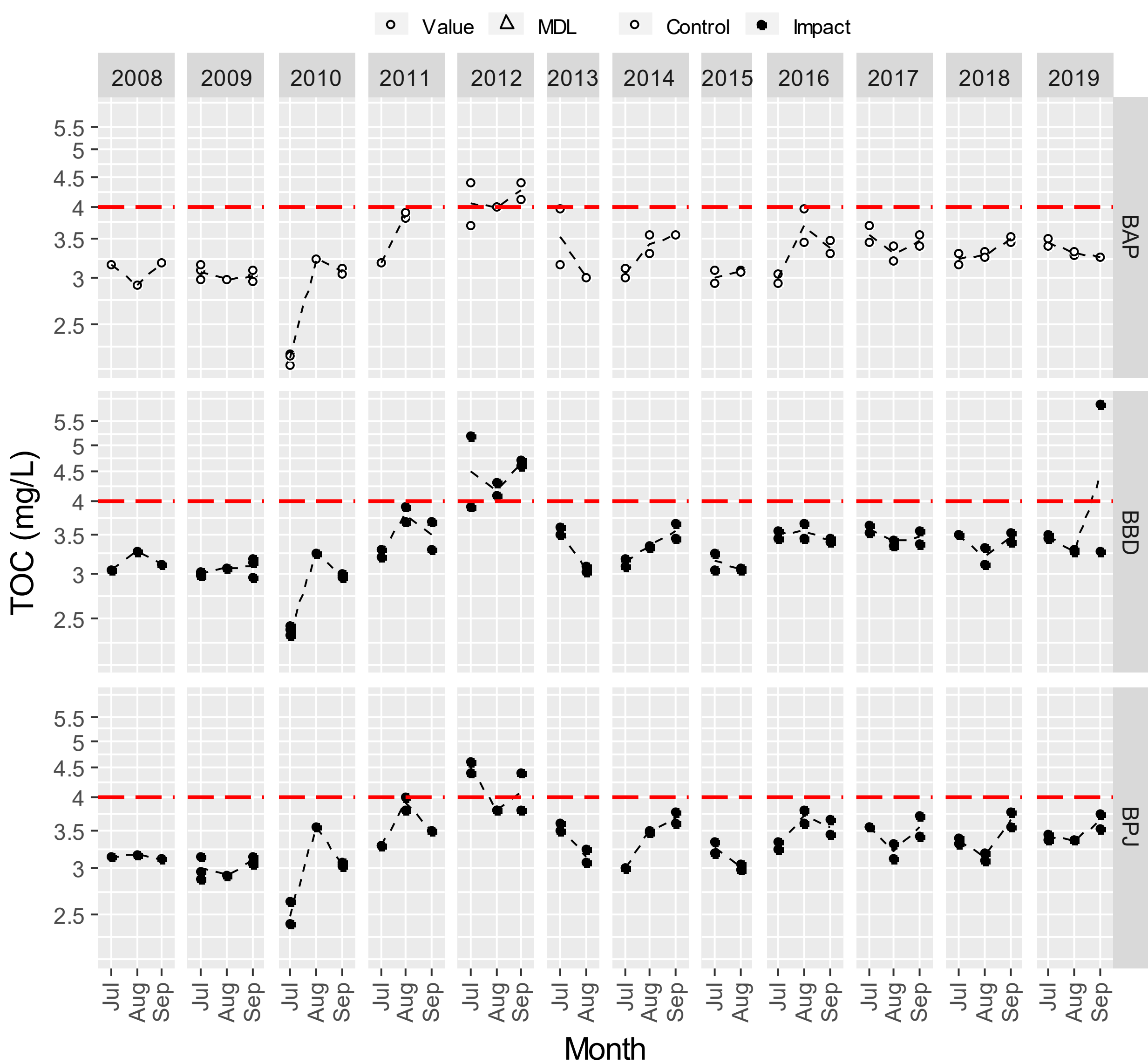


Figure 6-24. Total aluminum (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

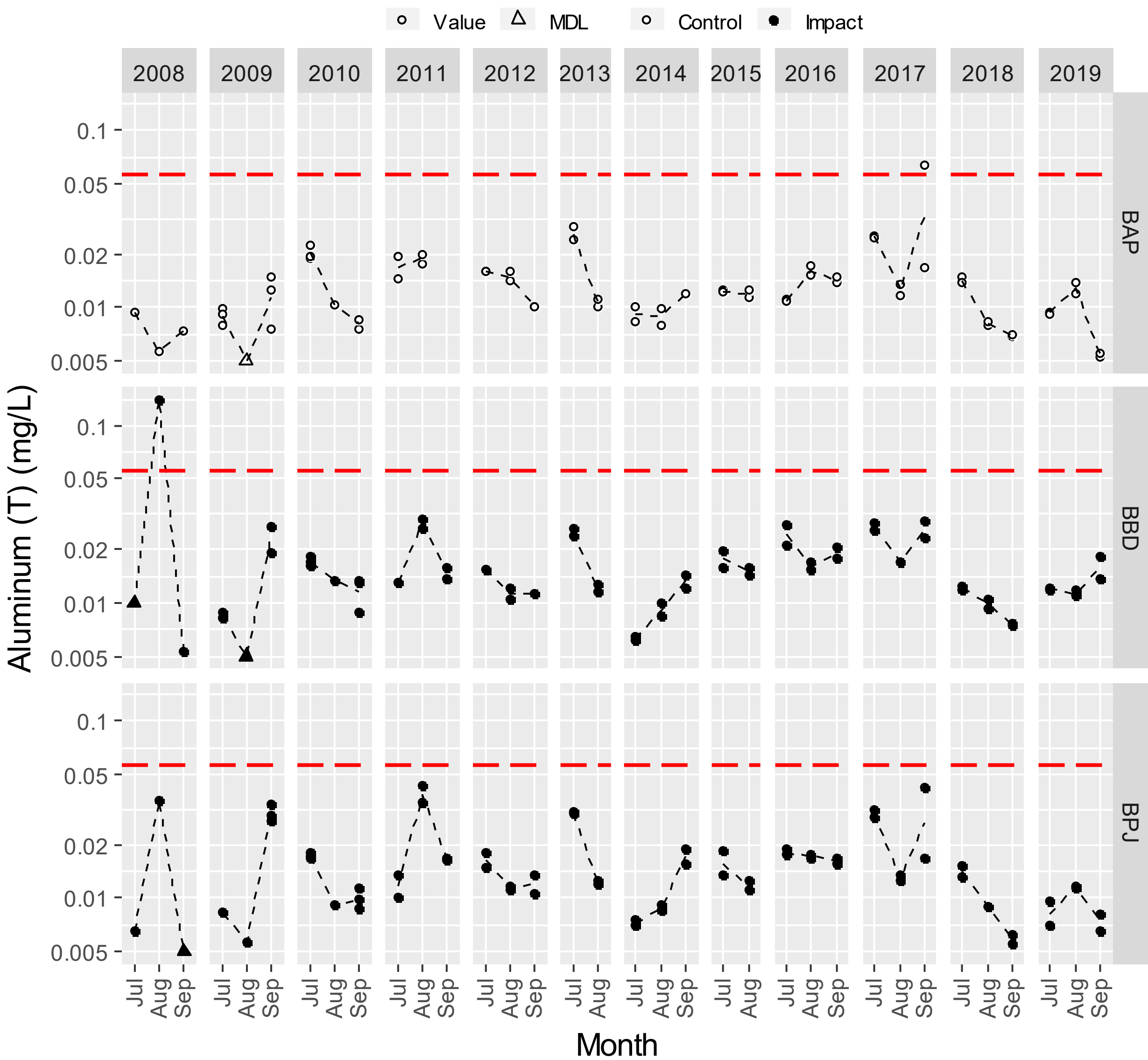


Figure 6-25. Total arsenic (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

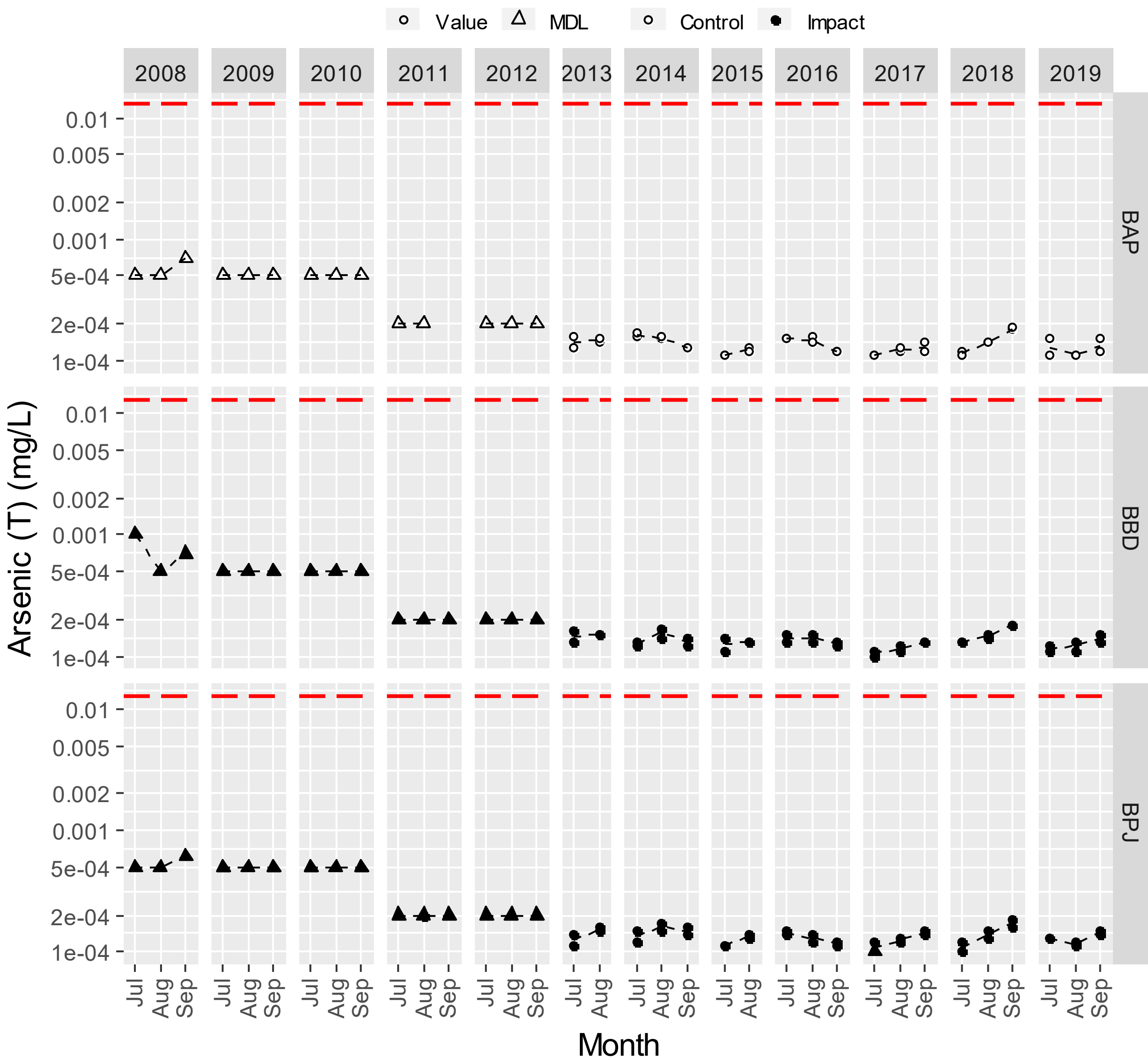


Figure 6-26. Total barium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

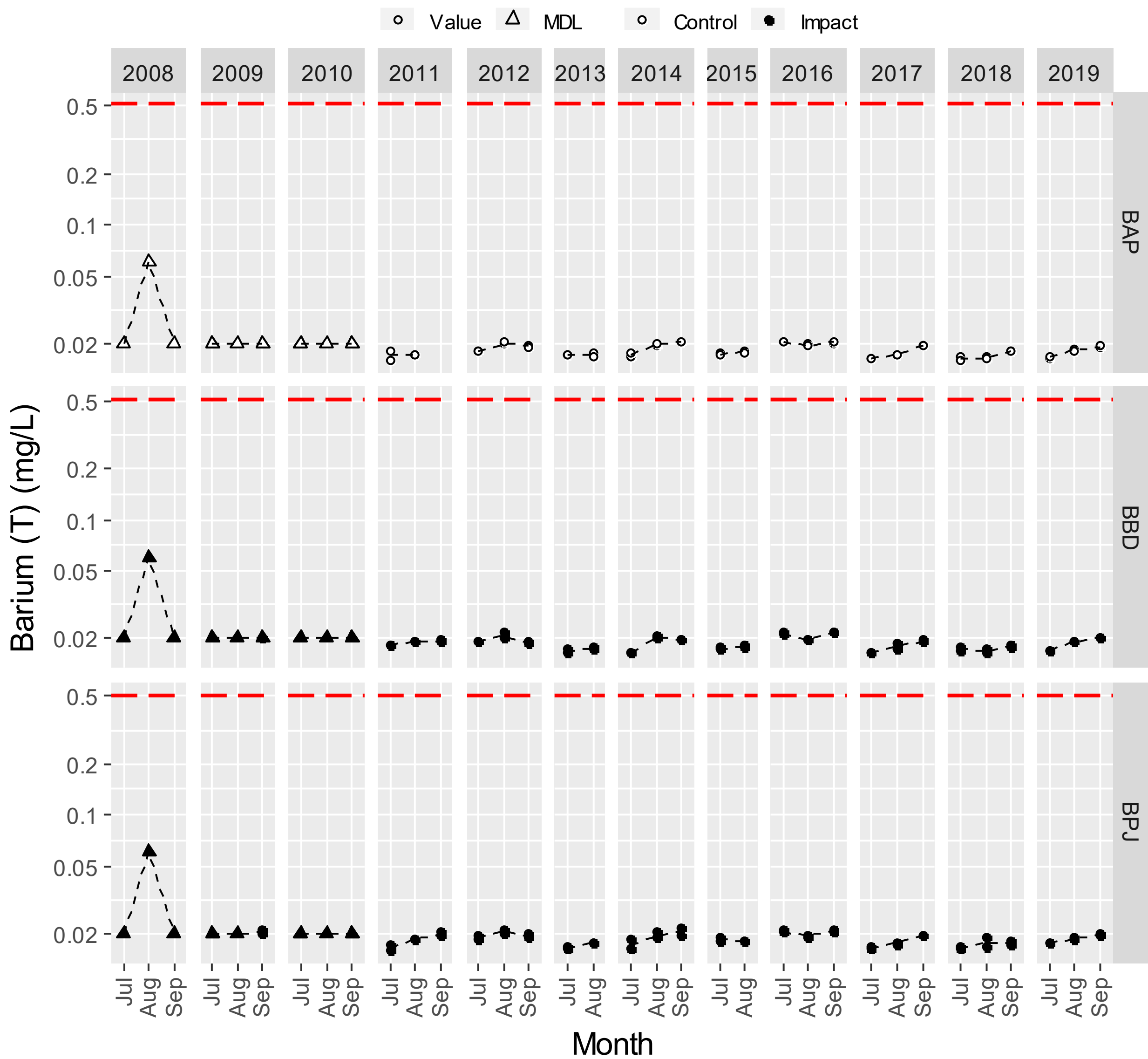


Figure 6-27. Total boron (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

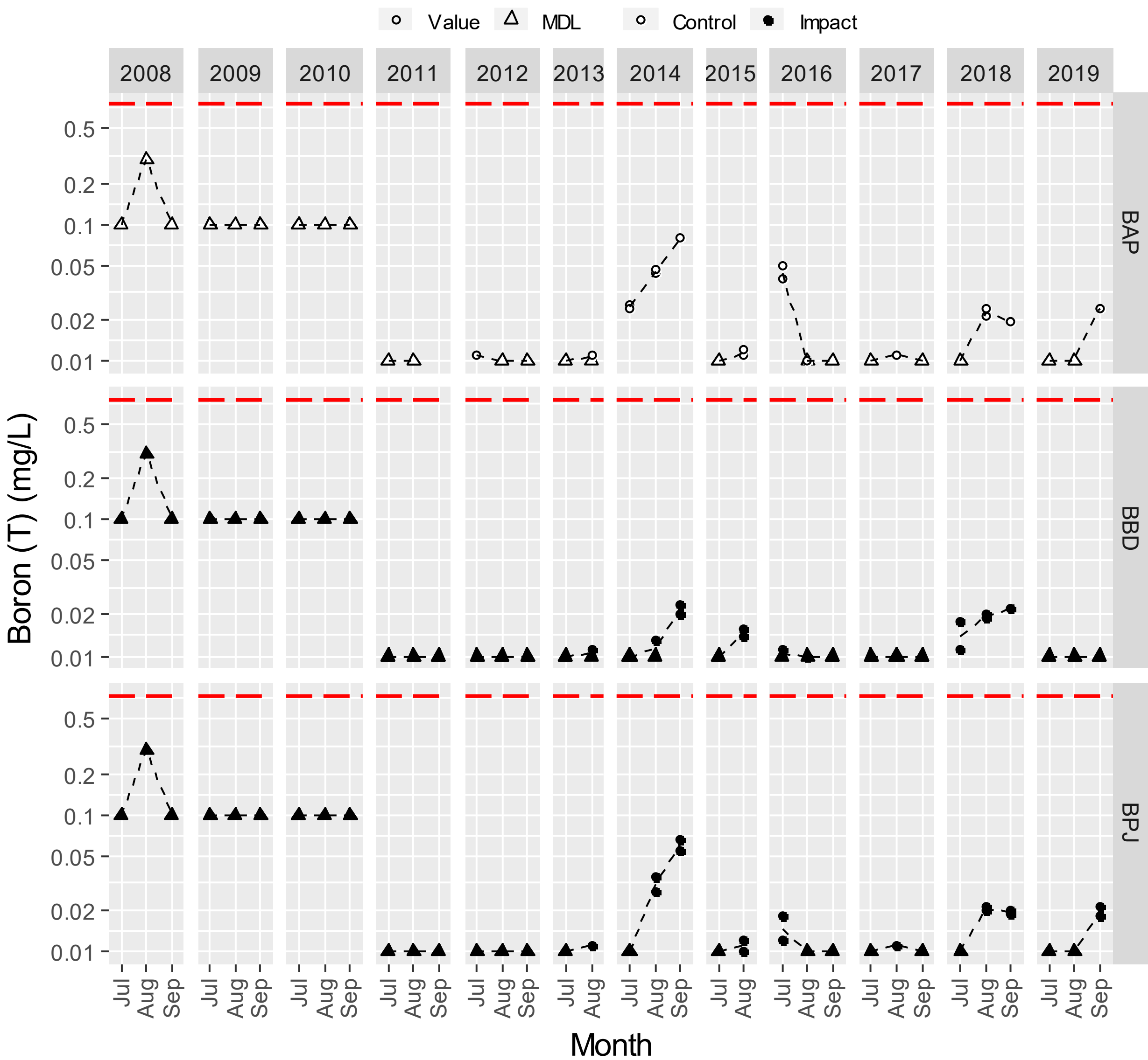


Figure 6-28. Total calcium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

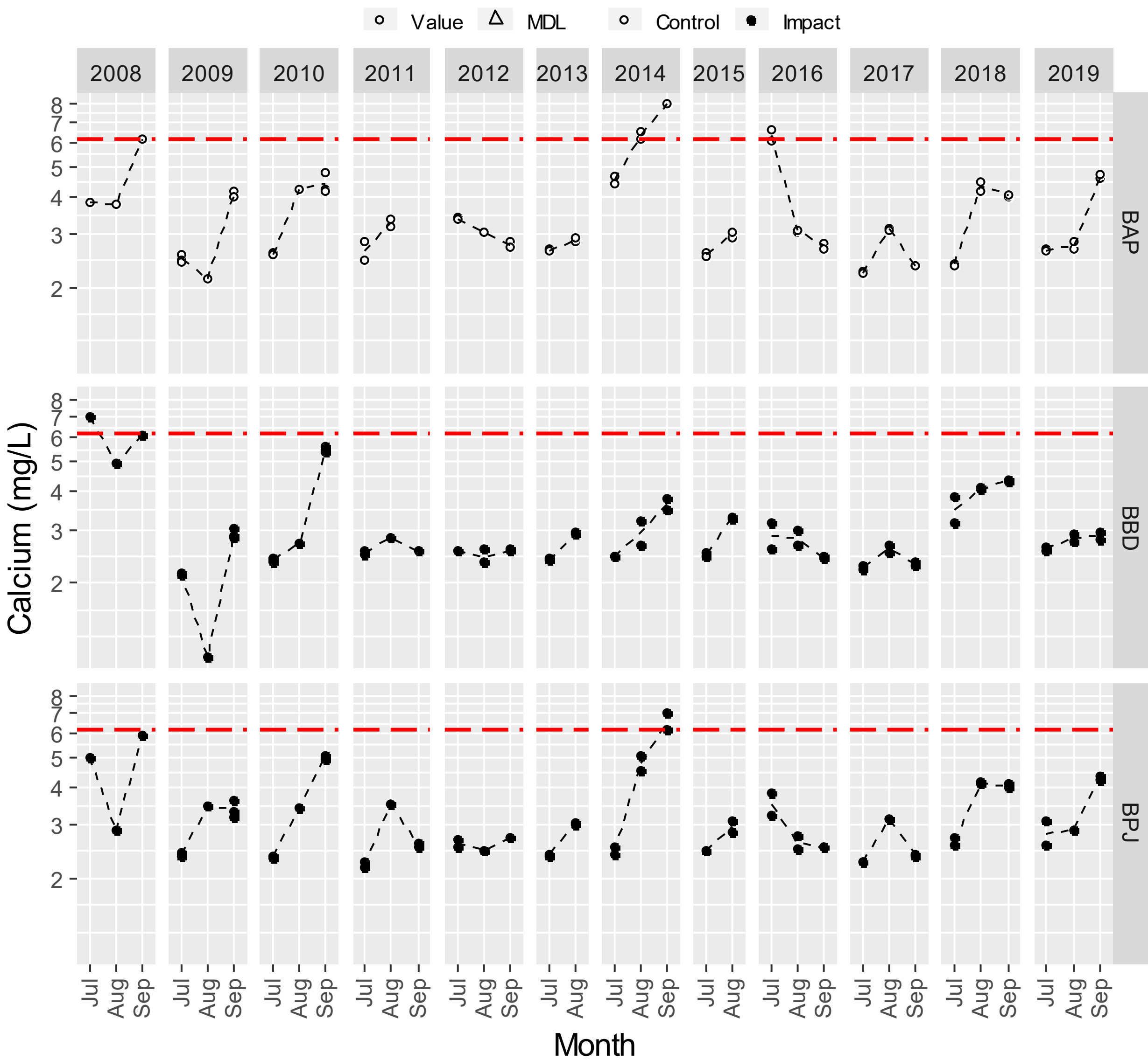


Figure 6-29. Total chromium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

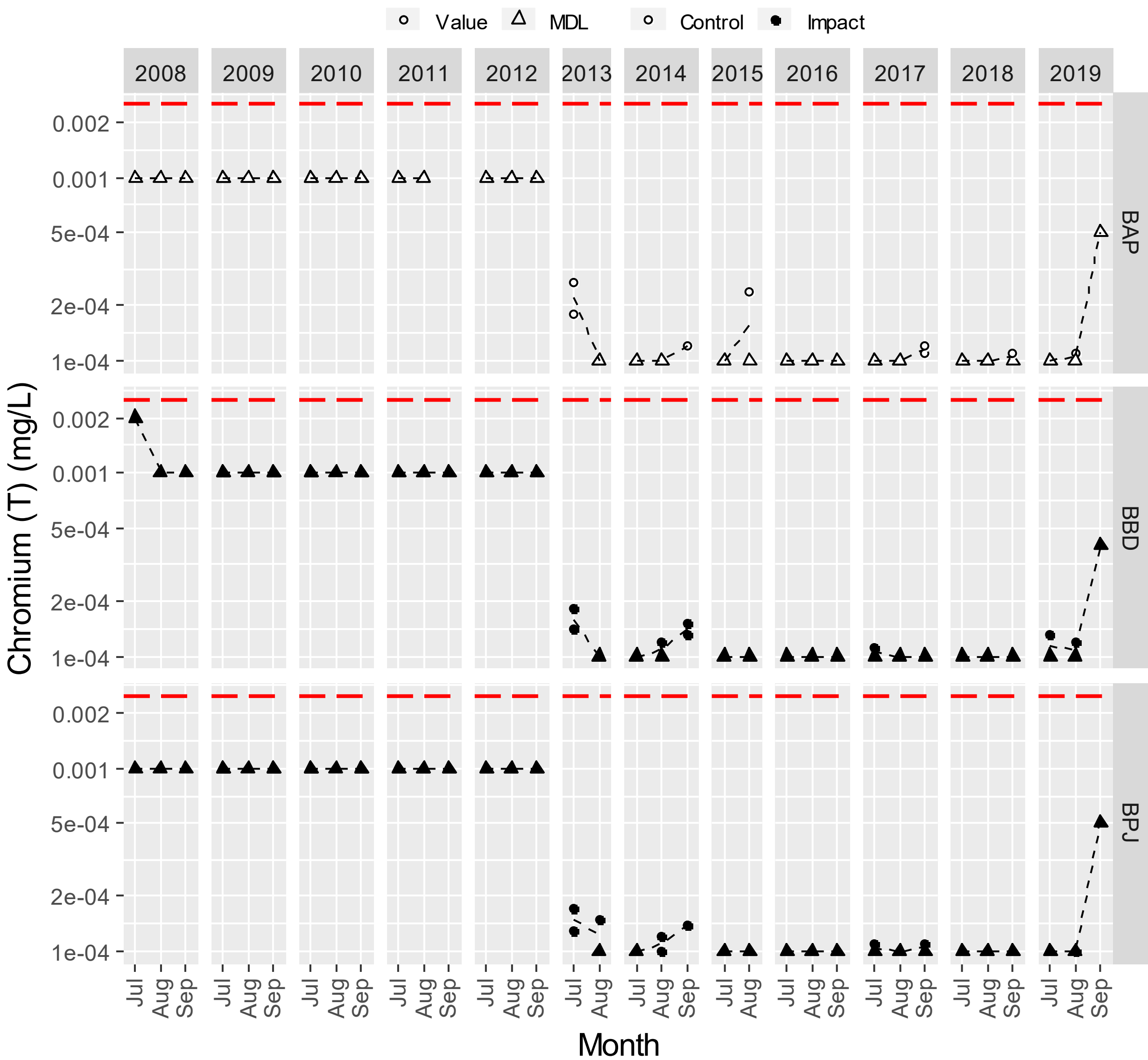


Figure 6-30. Total copper (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

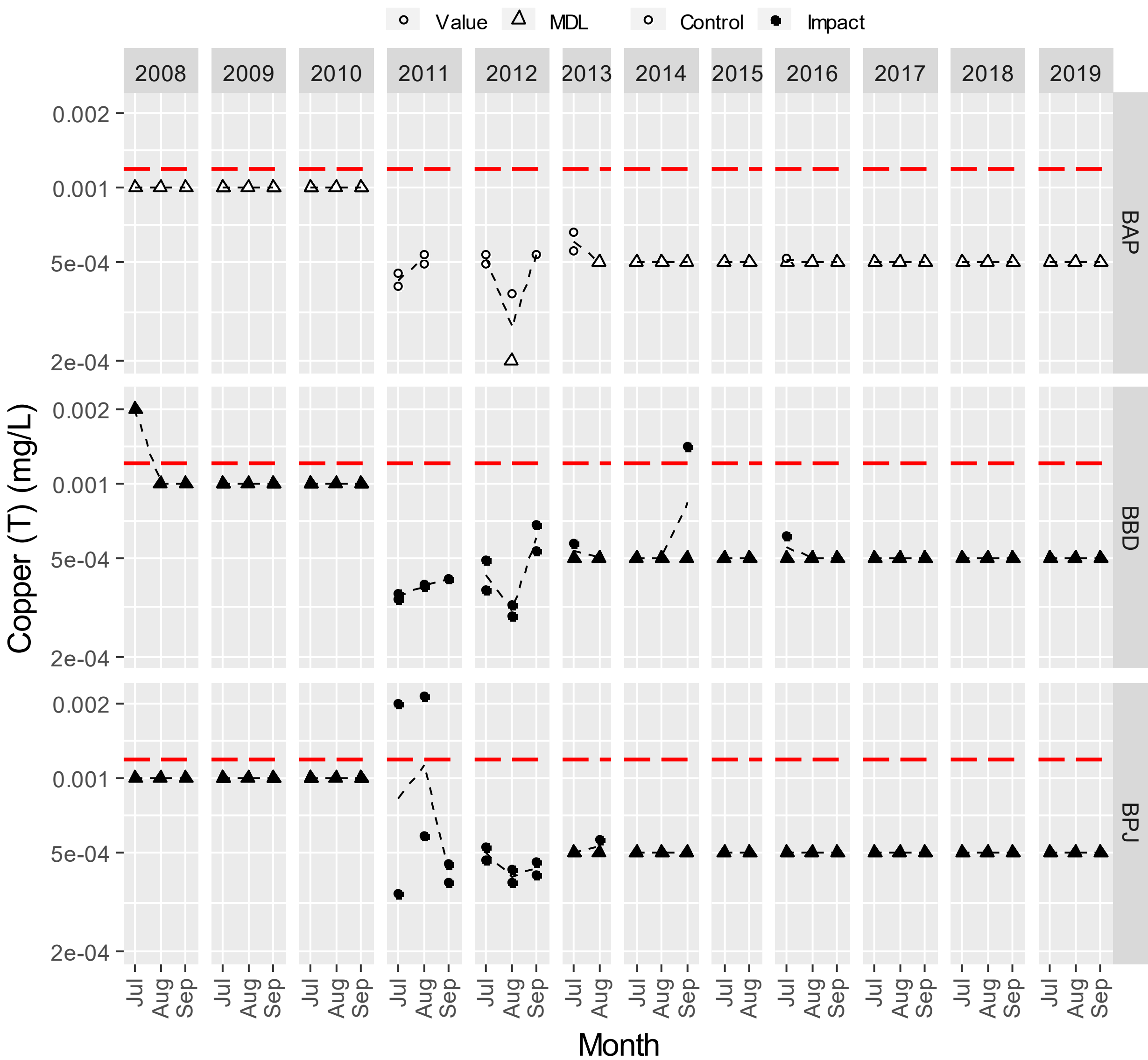


Figure 6-31. Total iron (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

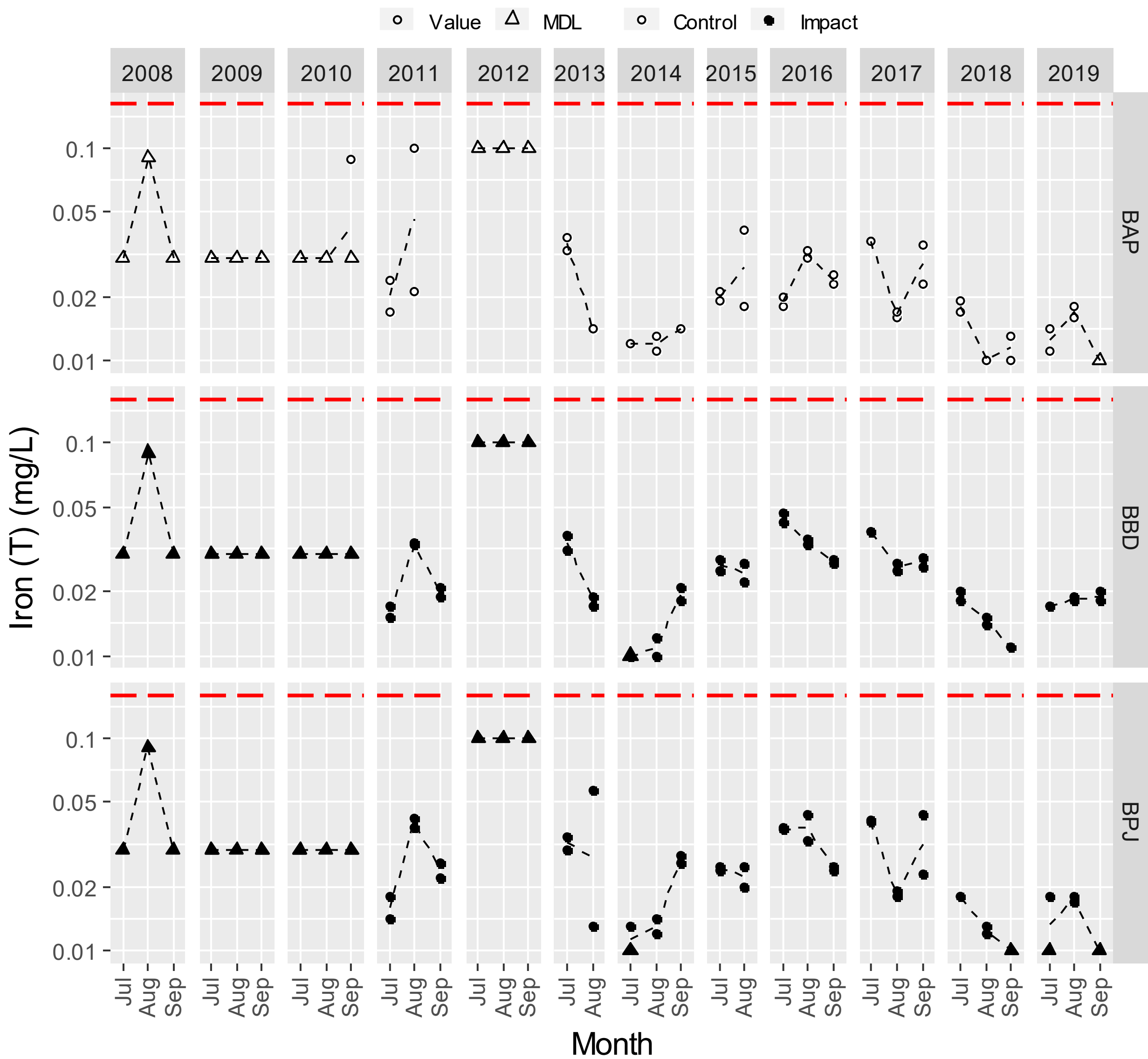


Figure 6-32. Total lithium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

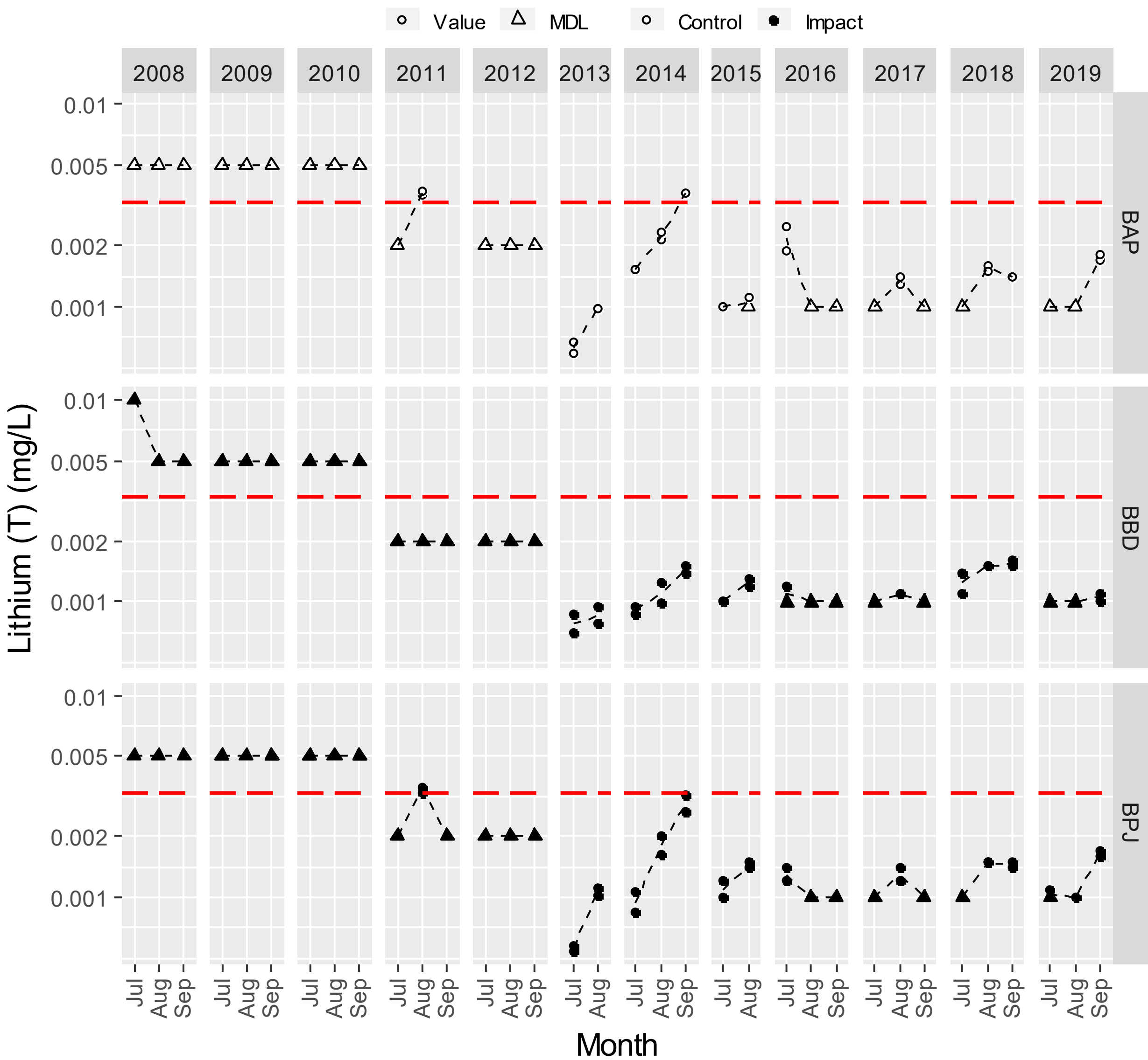


Figure 6-33. Total magnesium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

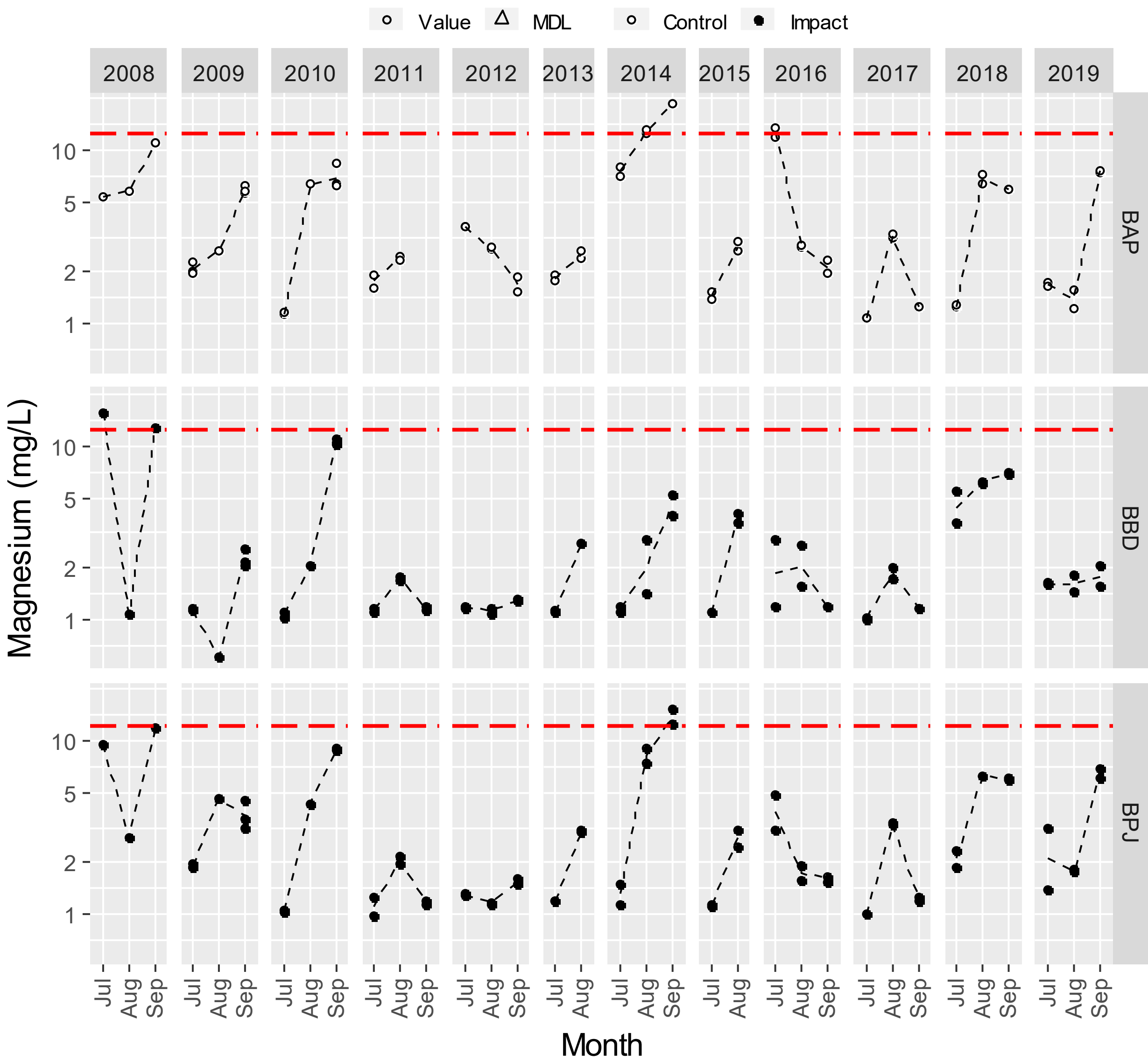


Figure 6-34. Total manganese (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

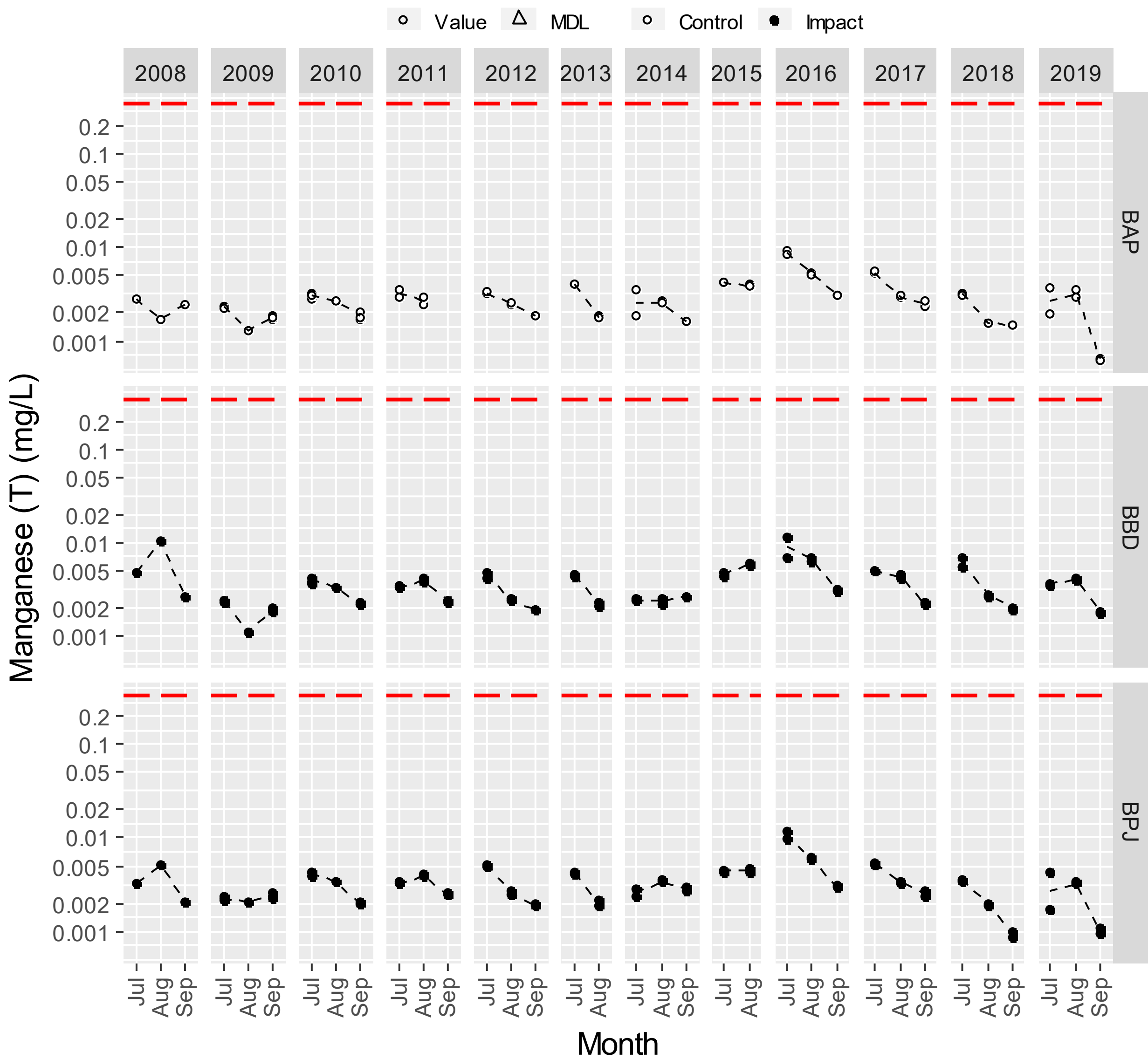


Figure 6-35. Total molybdenum (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

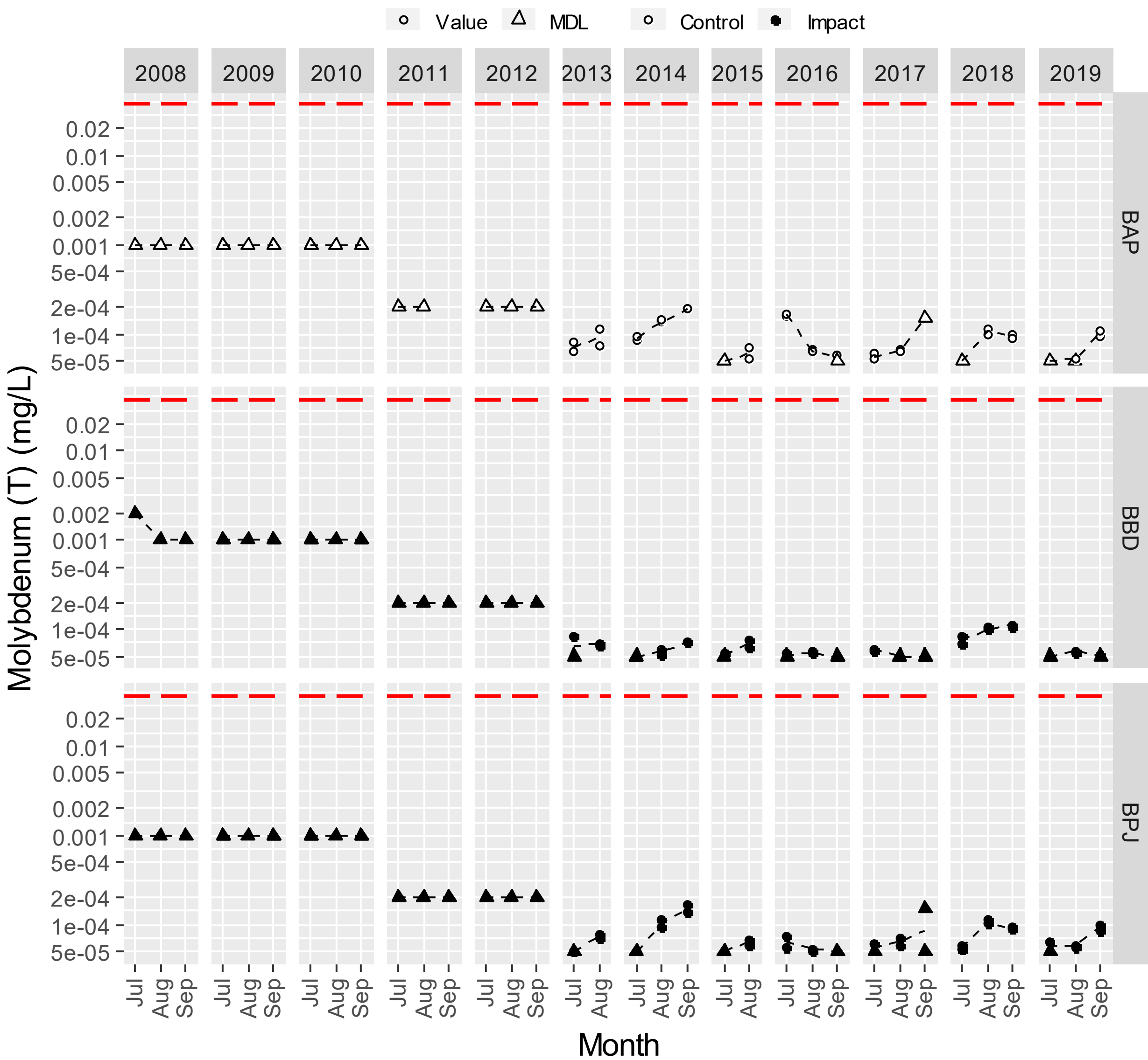


Figure 6-36. Total potassium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

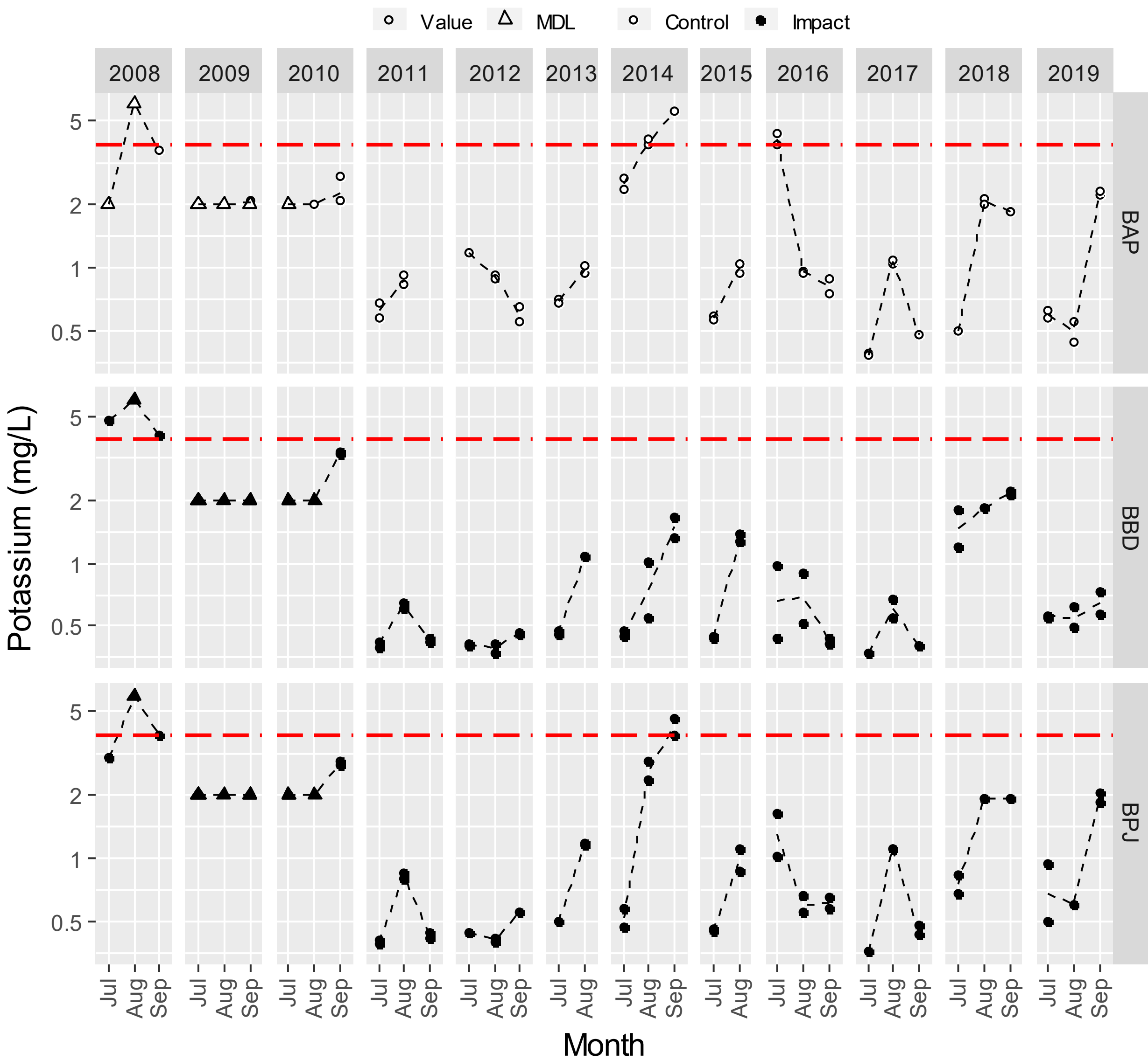


Figure 6-37. Total Silicon (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

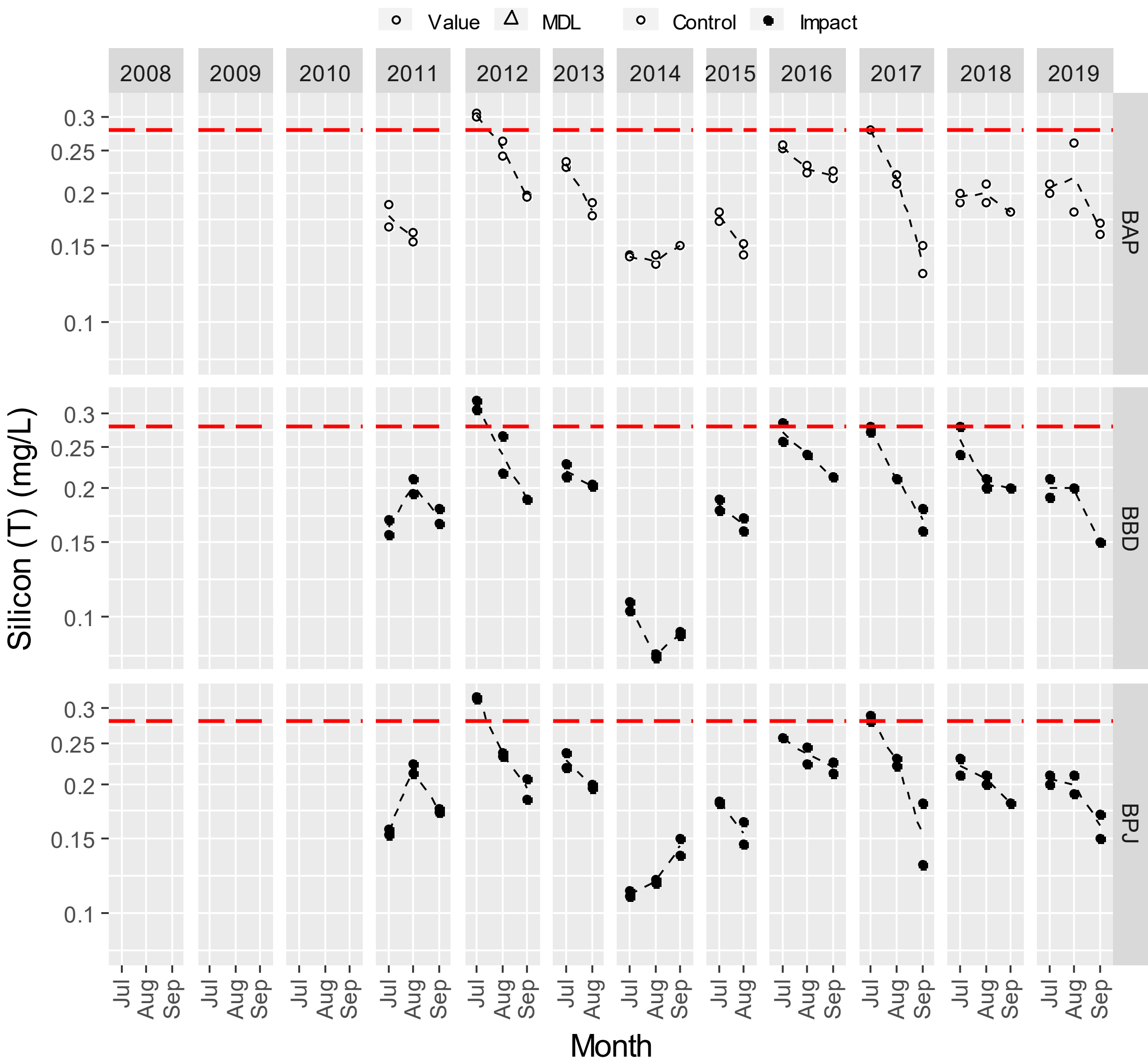


Figure 6-38. Total sodium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

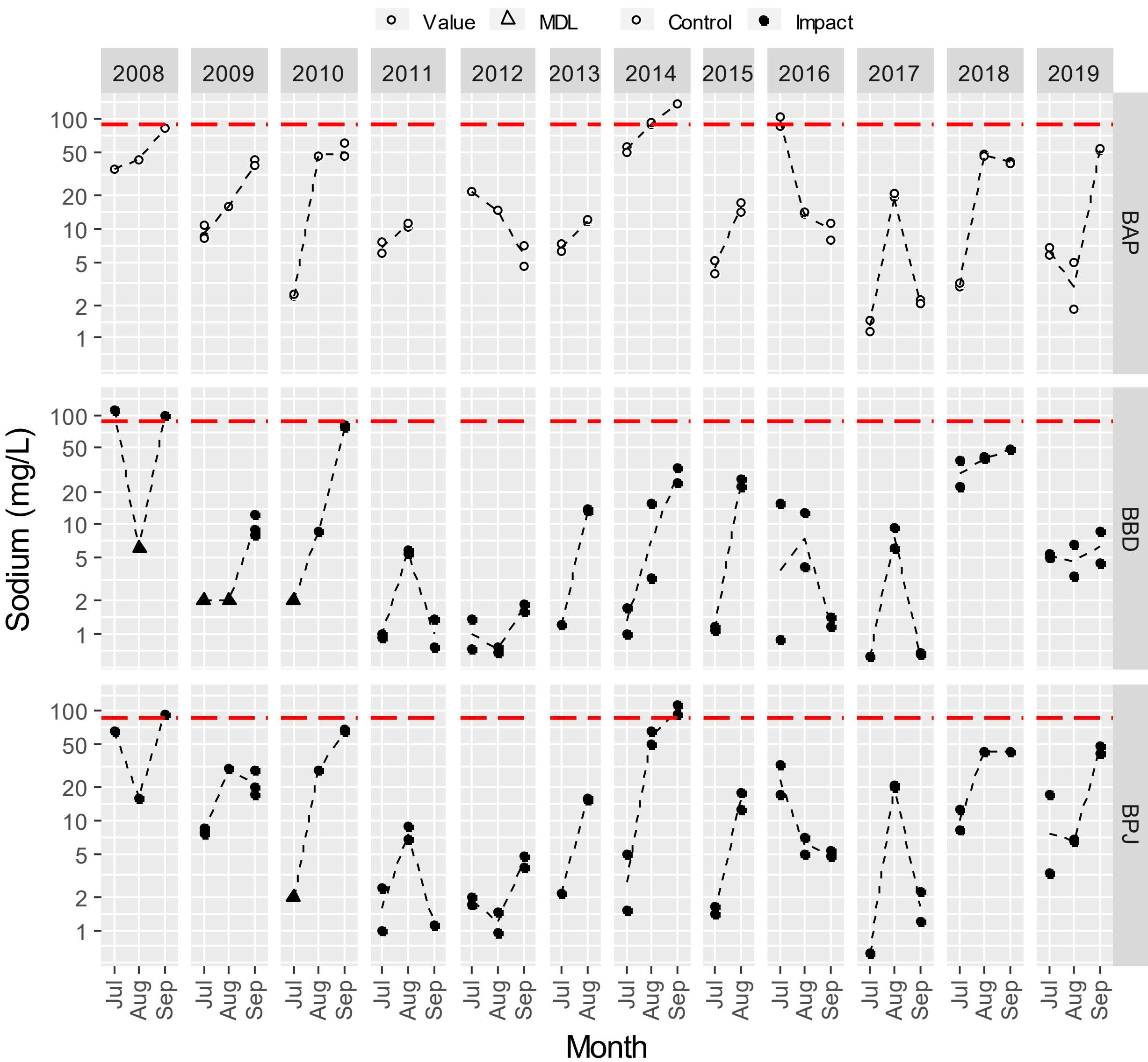


Figure 6-39. Total strontium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

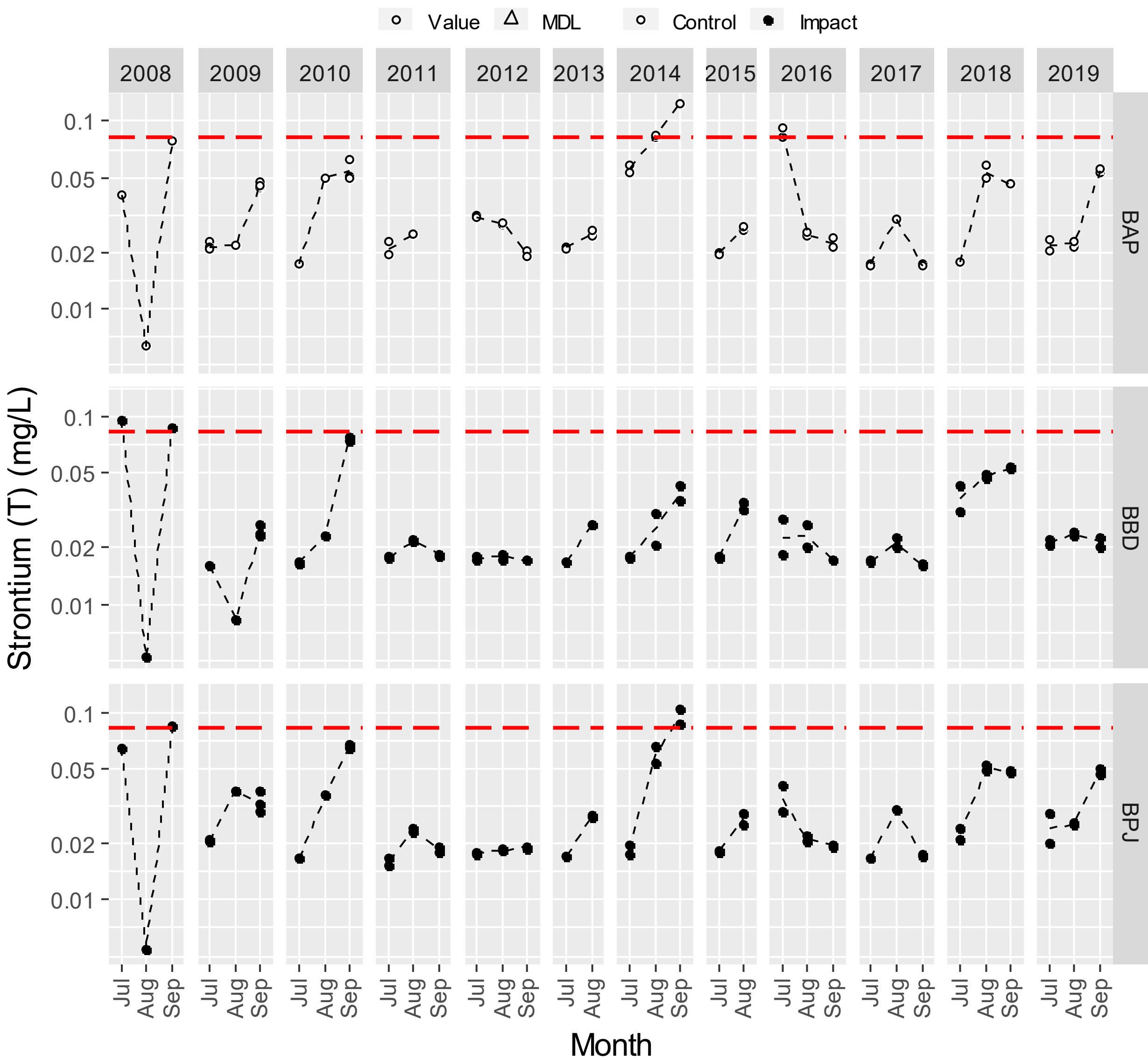


Figure 6-40. Total titanium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

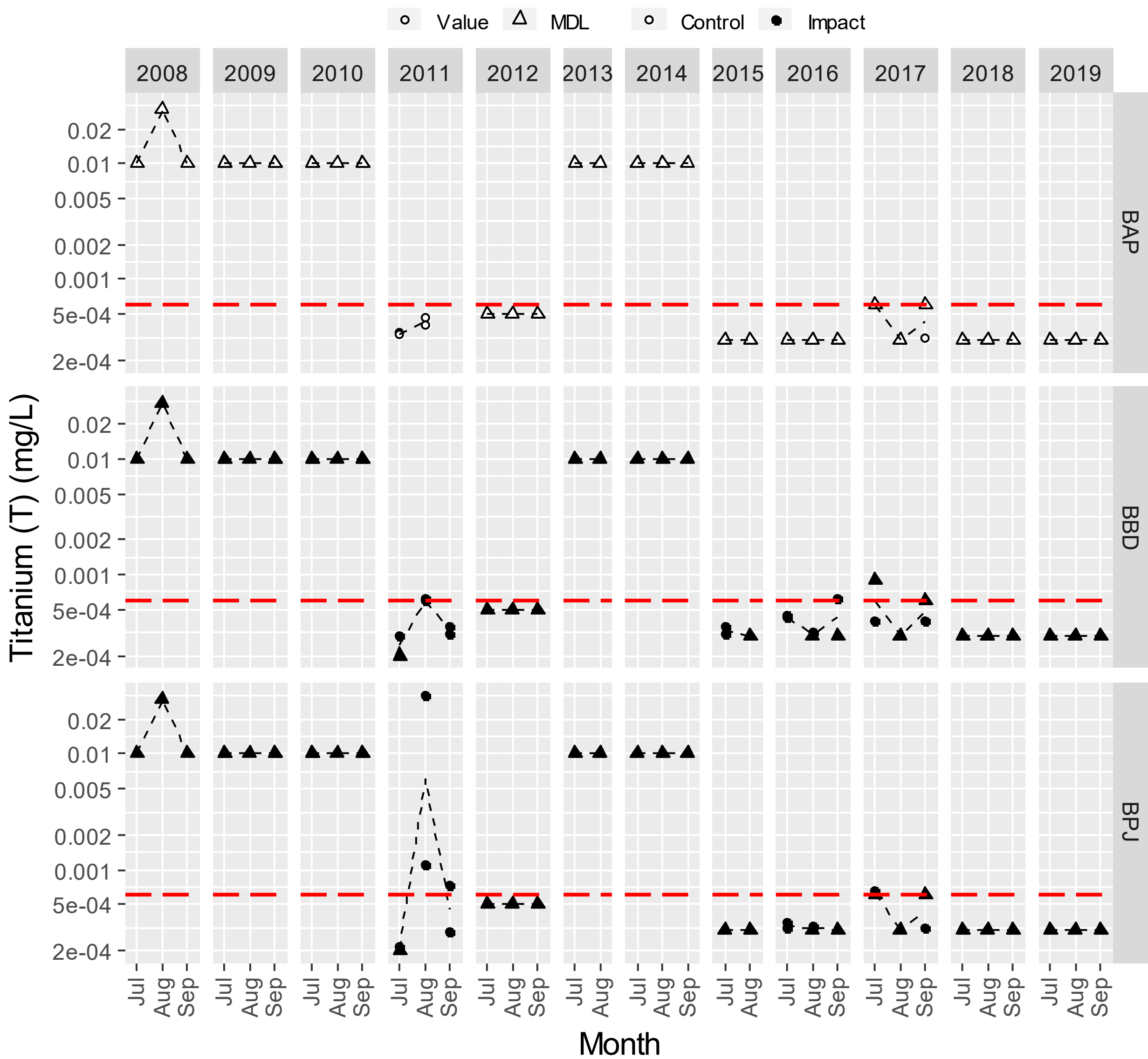


Figure 6-41. Total uranium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

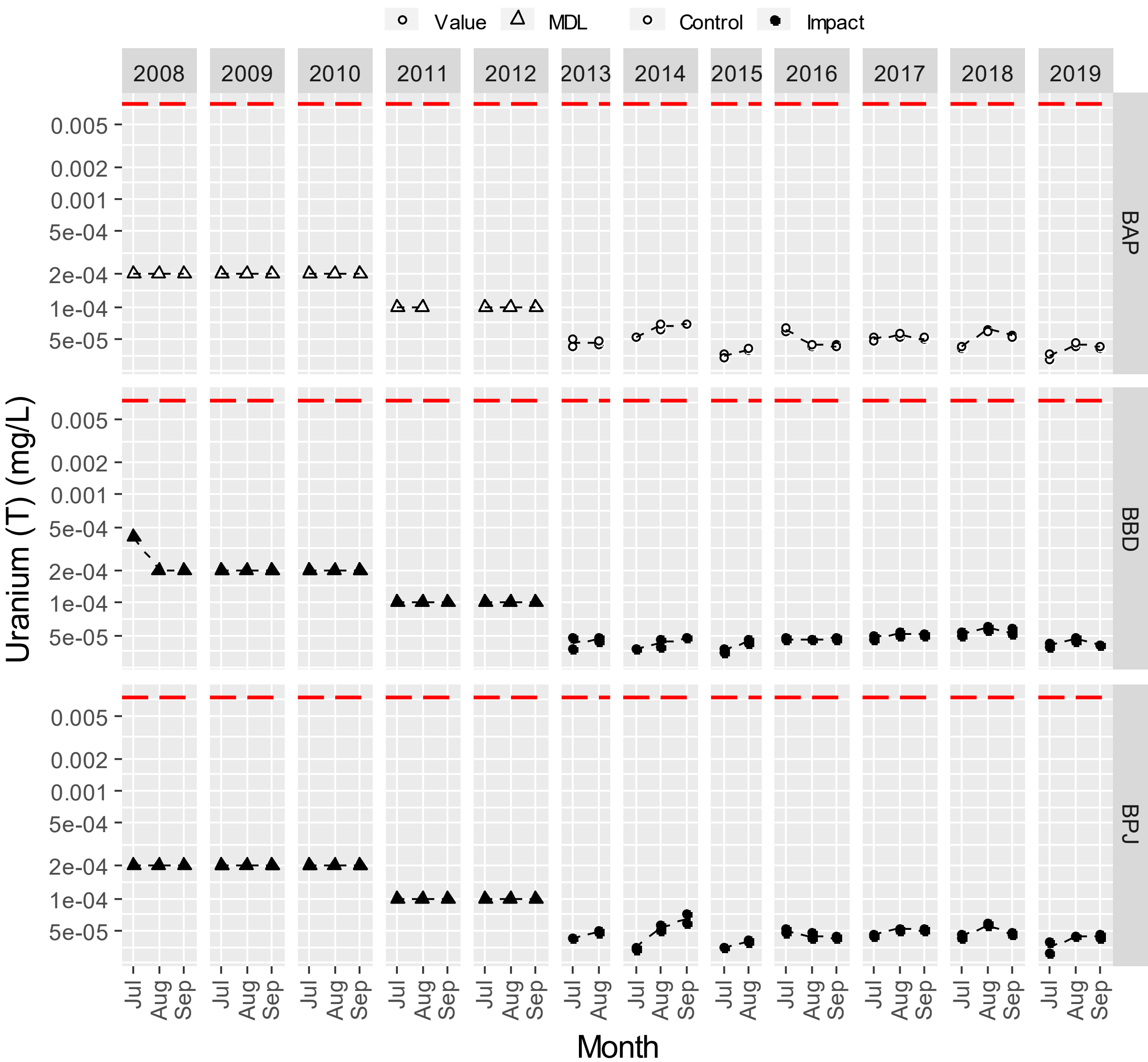


Figure 6-42. Dissolved aluminum (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

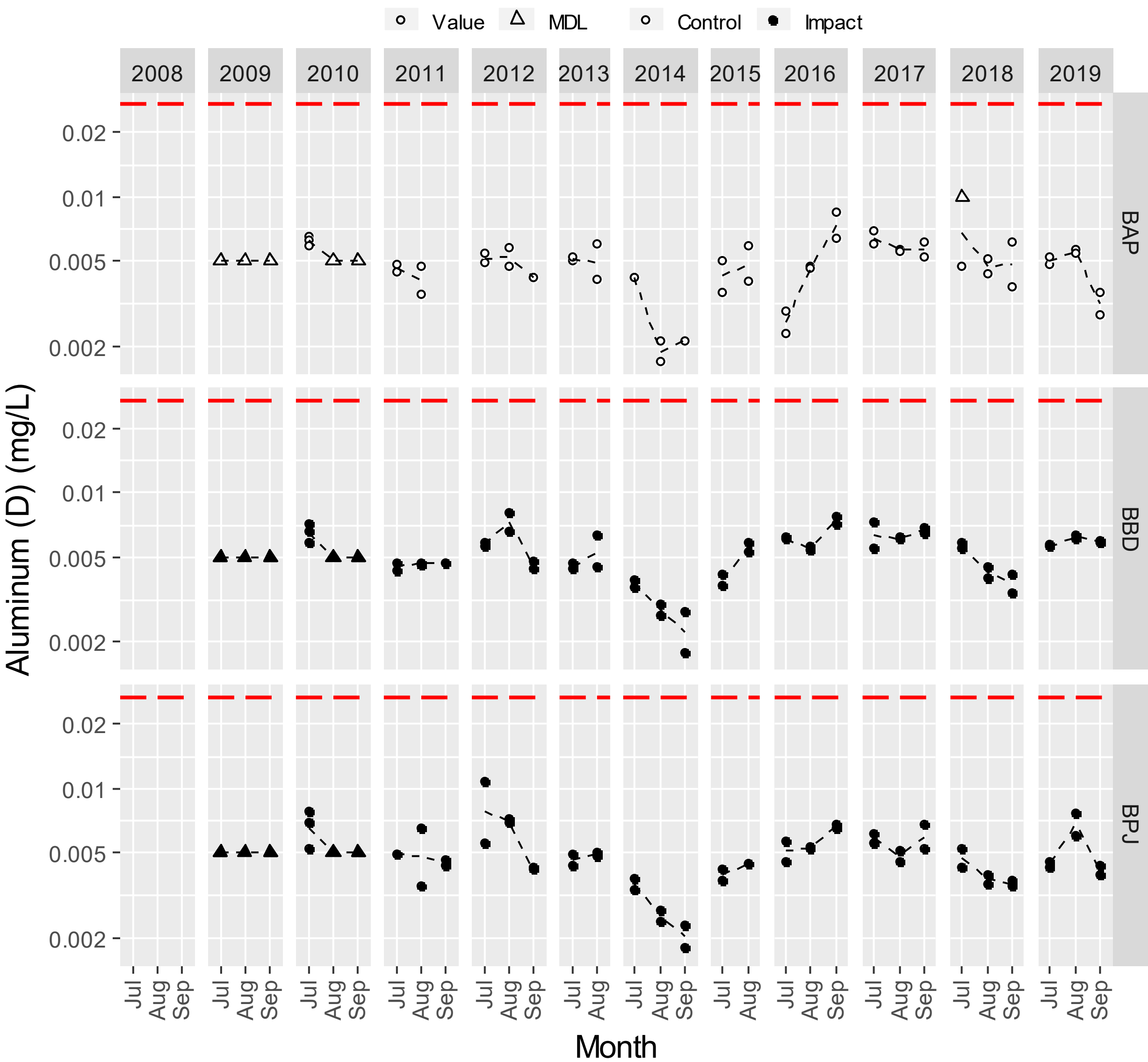


Figure 6-43. Dissolved arsenic (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

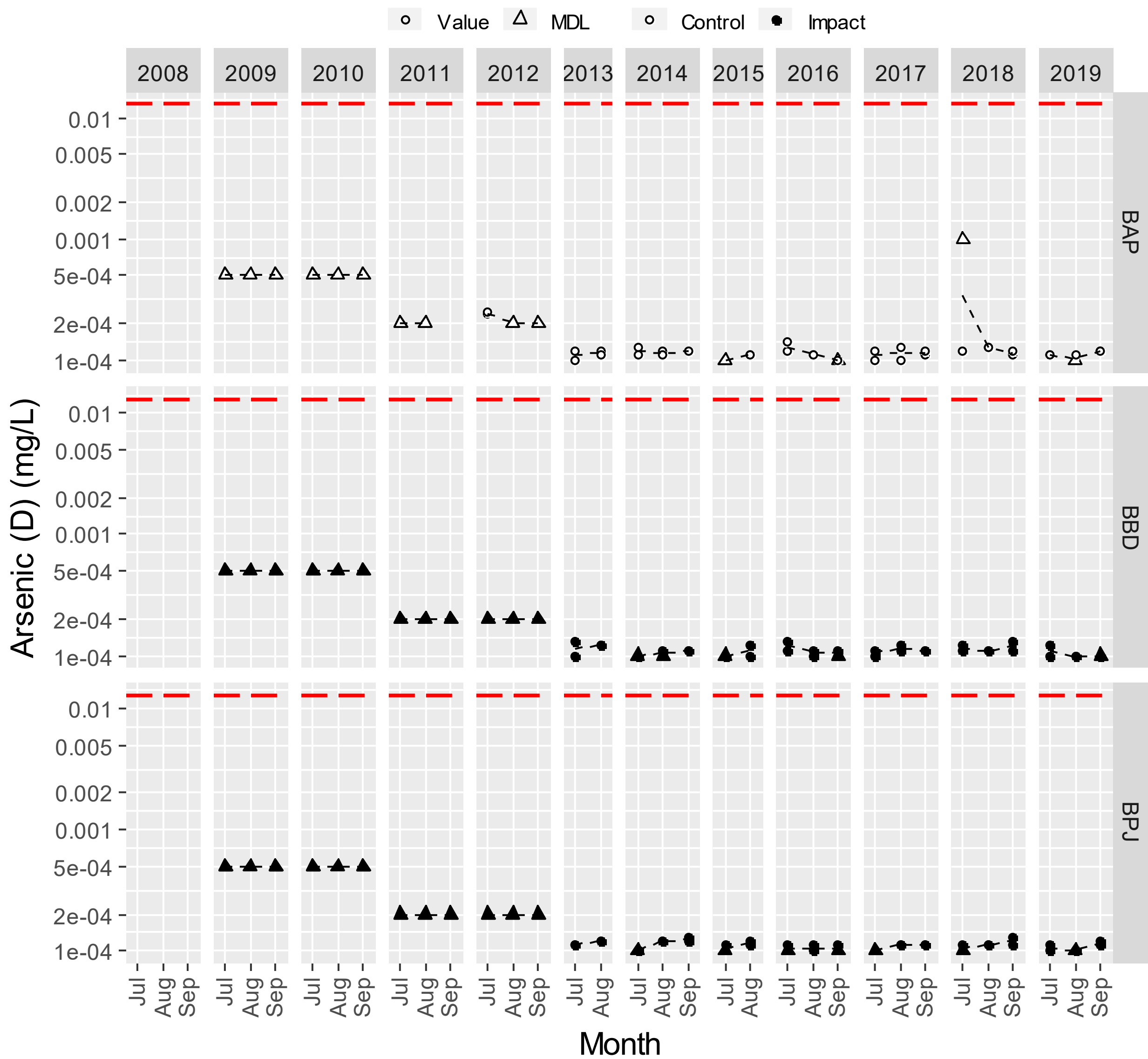


Figure 6-44. Dissolved barium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

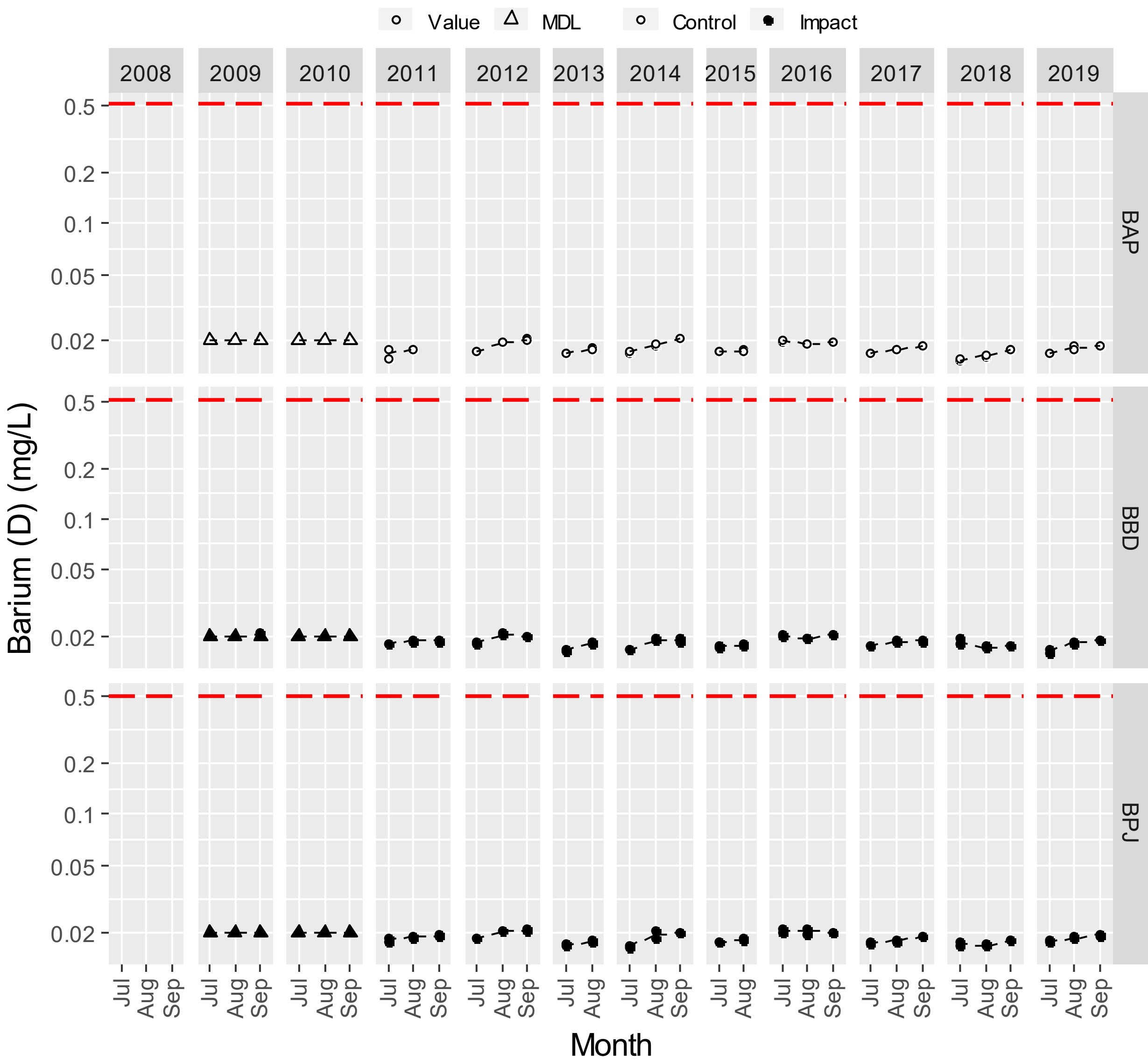


Figure 6-45. Dissolved boron (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

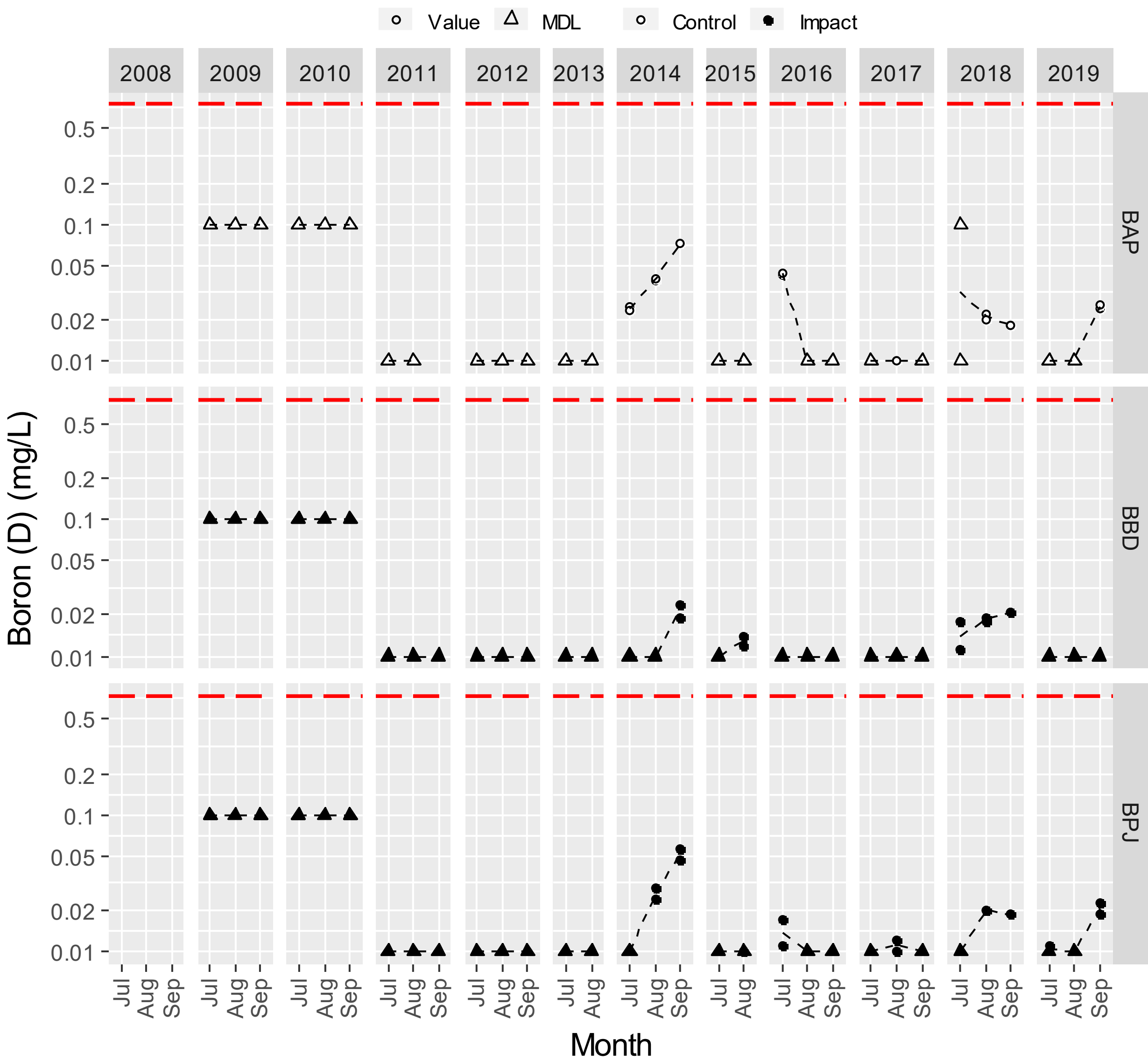


Figure 6-46. Dissolved copper (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

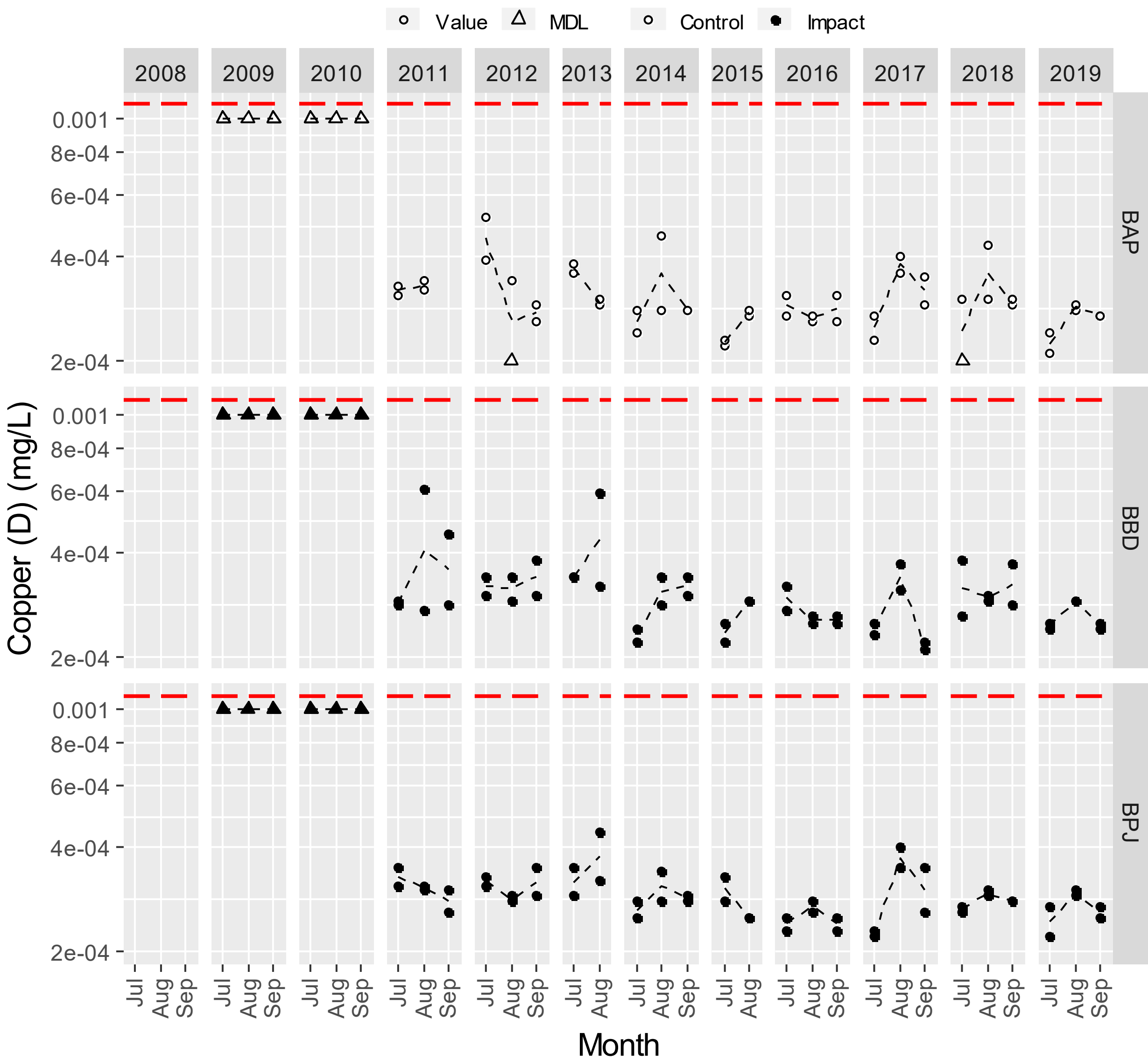


Figure 6-47. Dissolved lithium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

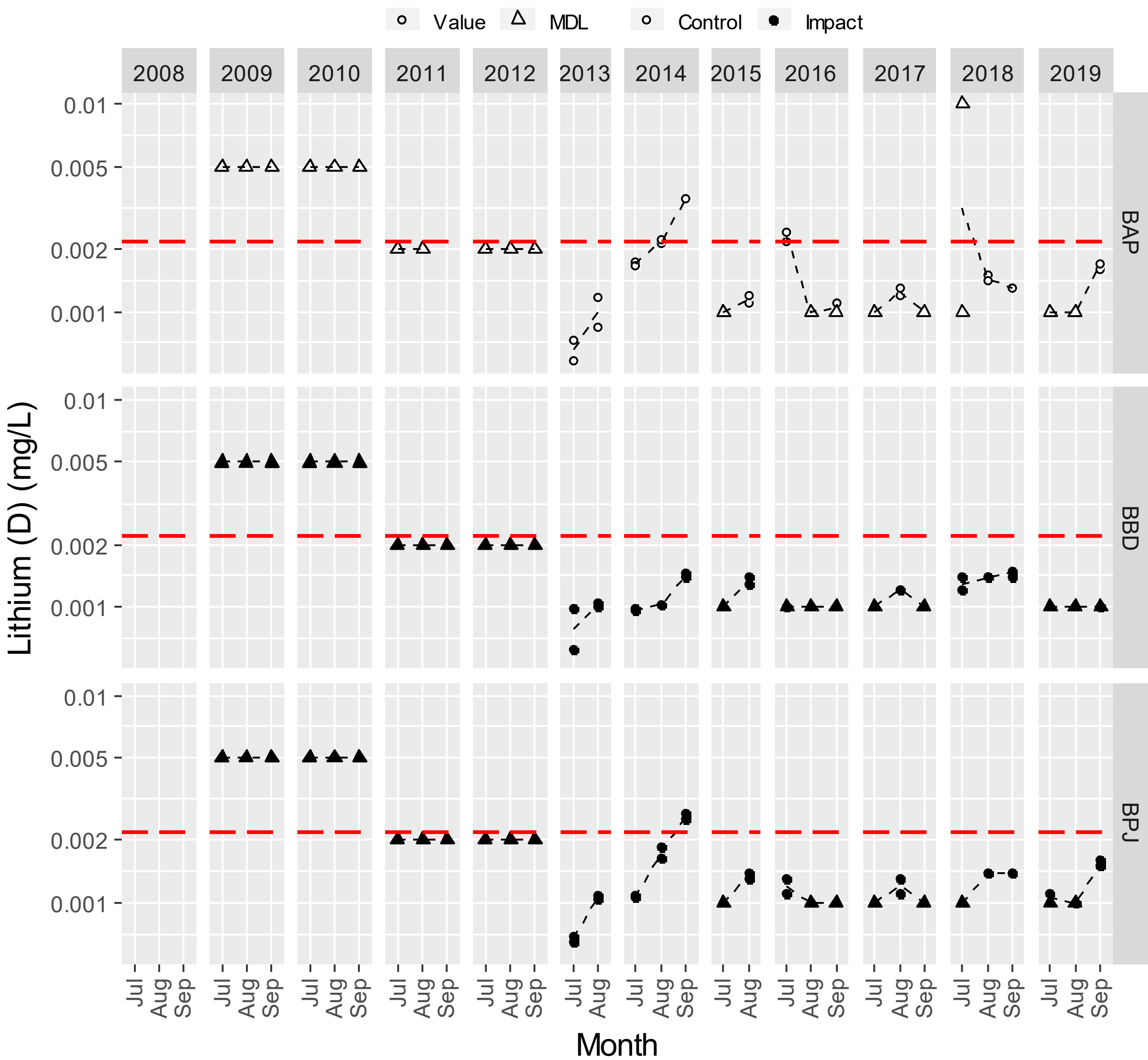


Figure 6-48. Dissolved manganese (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

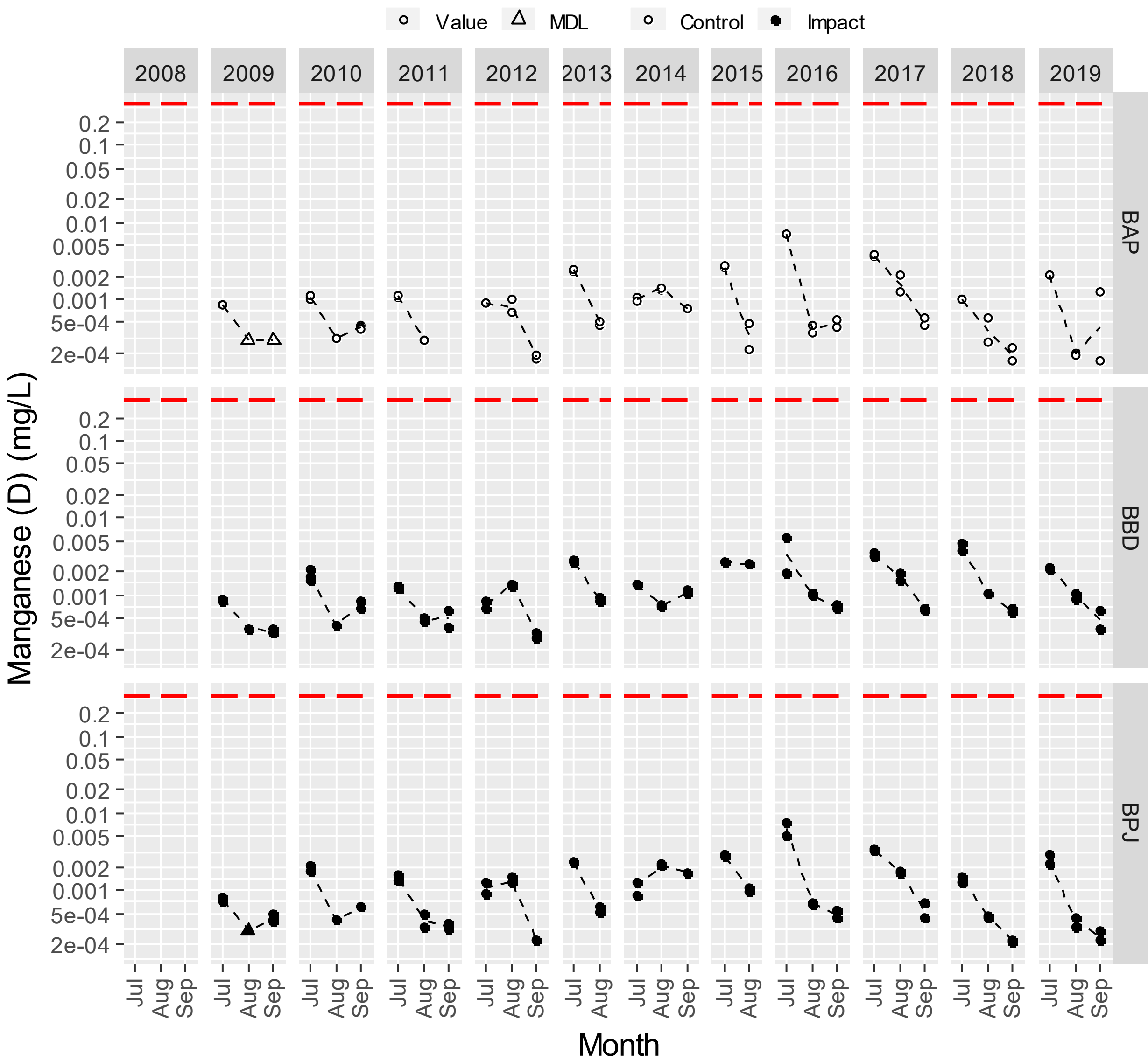


Figure 6-49. Dissolved molybdenum (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

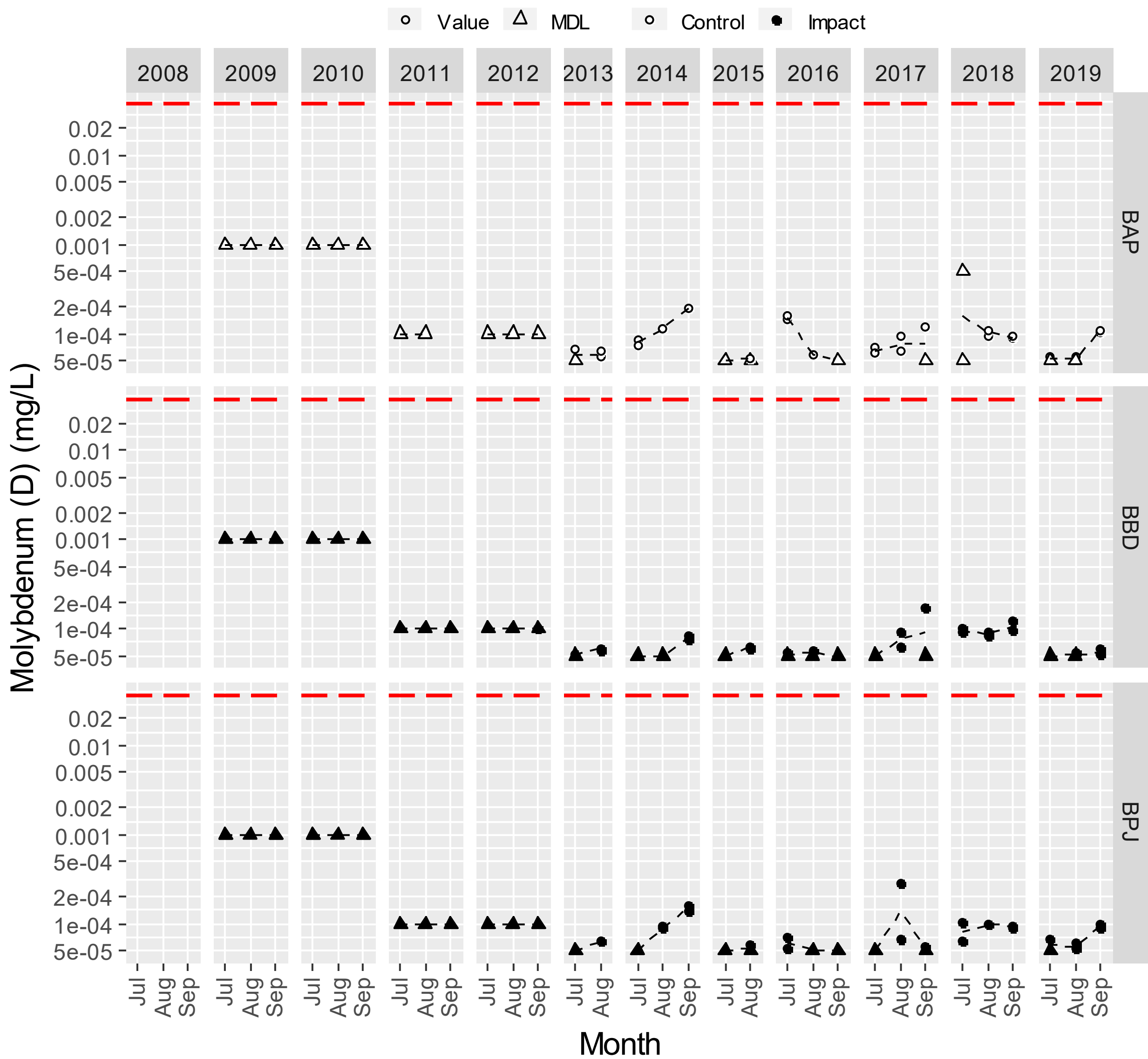


Figure 6-50. Dissolved silicon (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

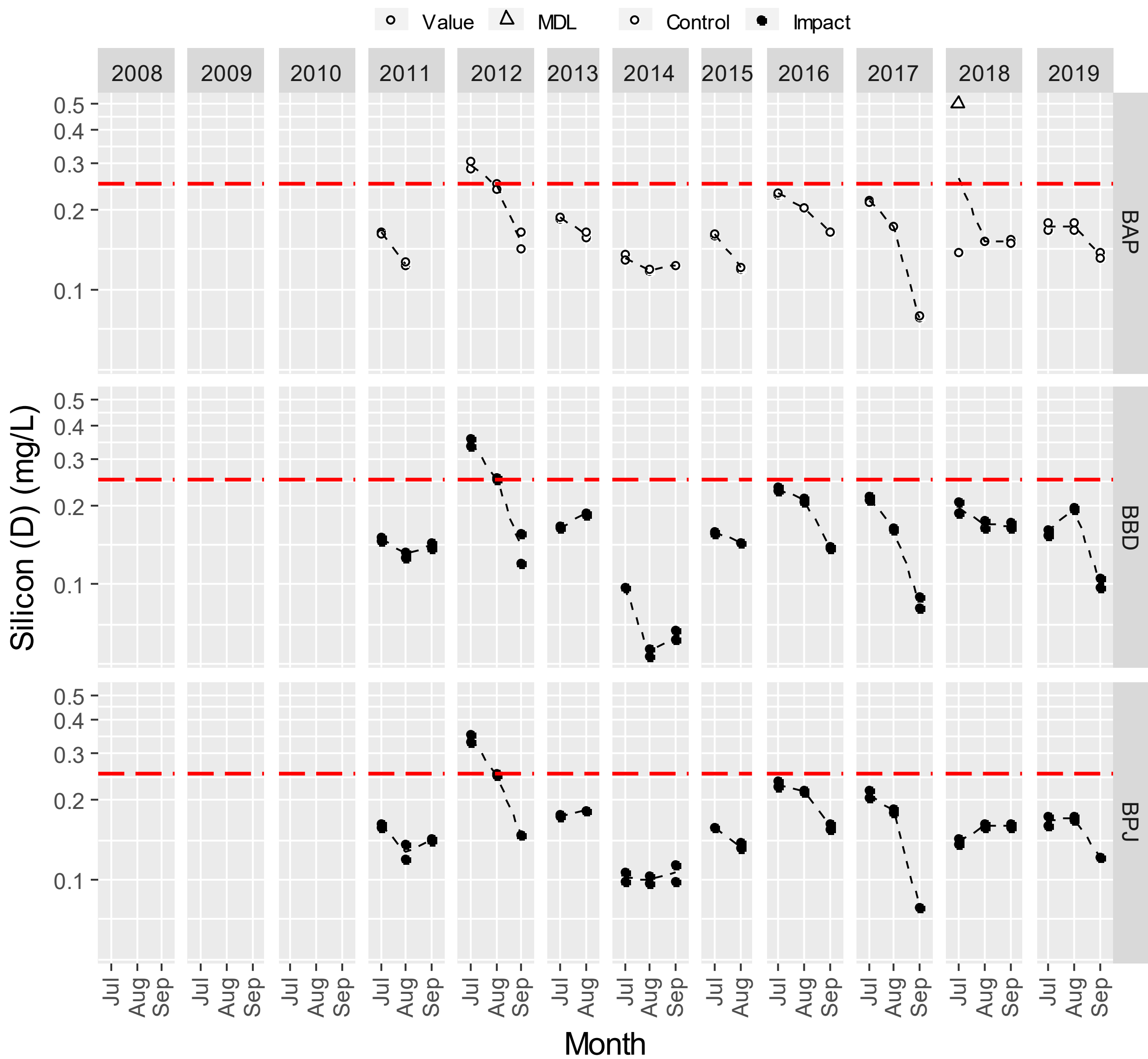


Figure 6-51. Dissolved strontium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

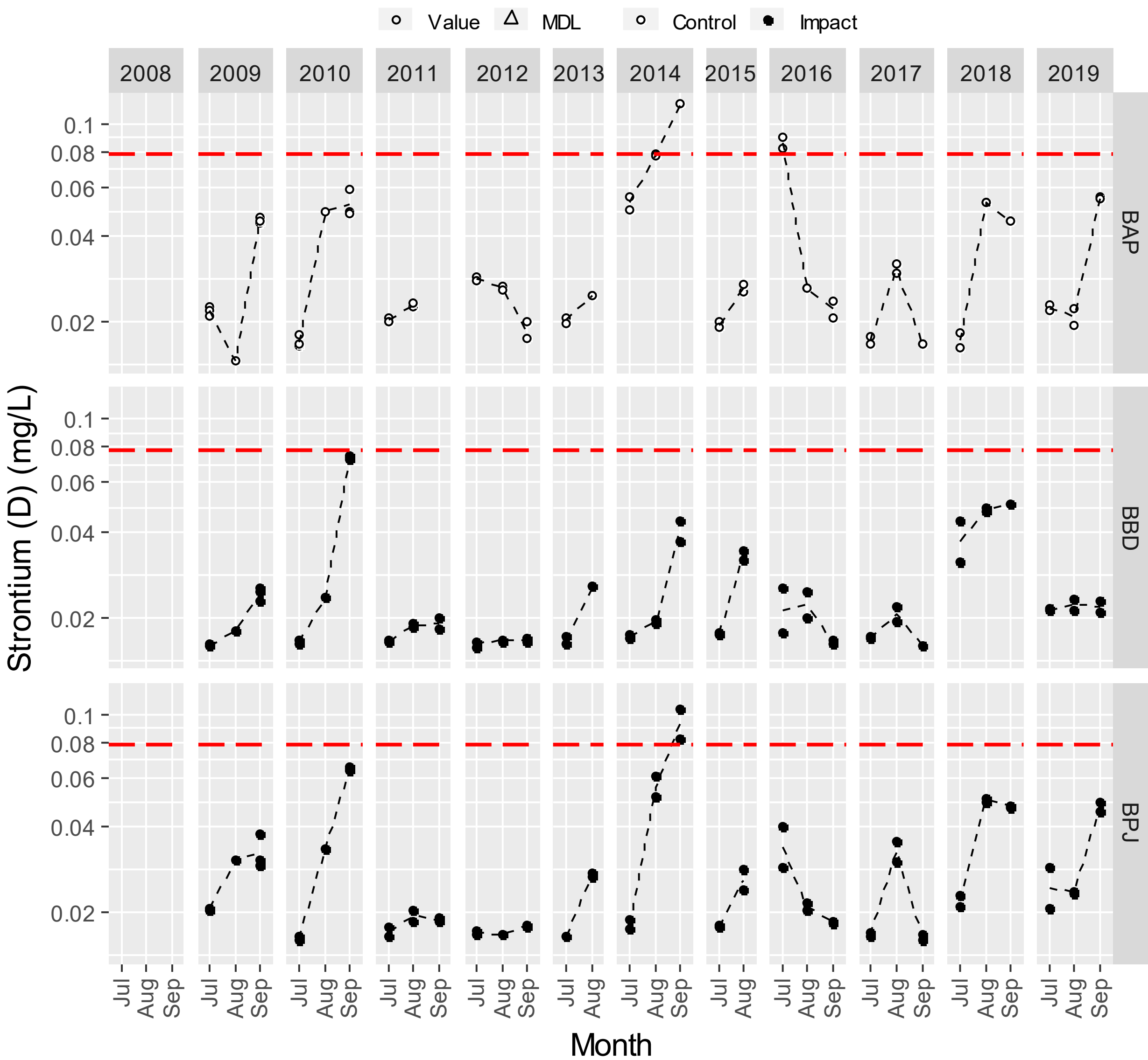
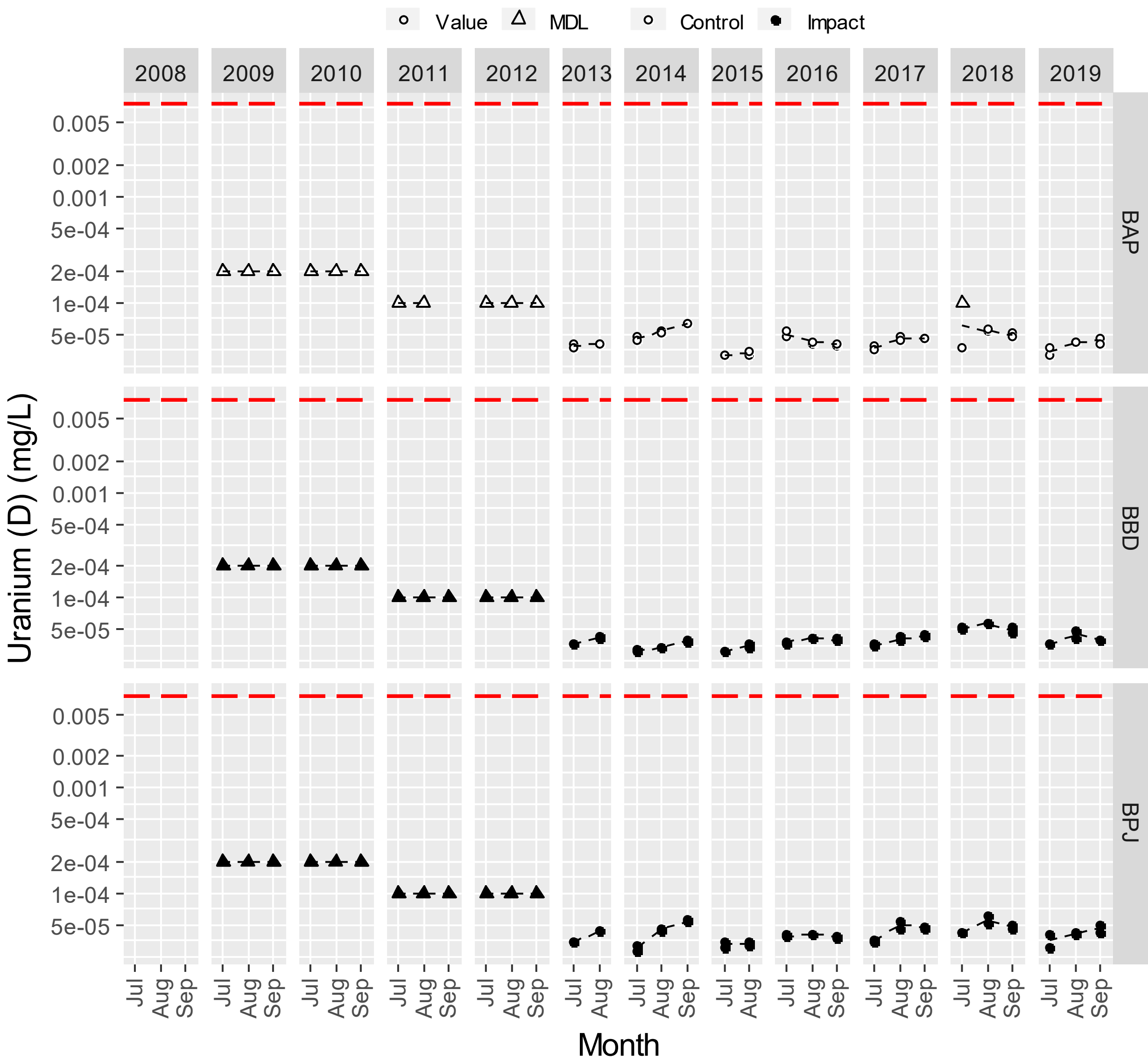


Figure 6-52. Dissolved uranium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.



Phytoplankton Tables and Figures

Table 6-4. Results of the BACI tests for phytoplankton variables at Baker Lake areas.

Parameter Measured	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect Size (%)		
							ES	LCI	UCI
Total Biomass	BBD	30	3	0.17	0.24	0.48	18	-27	92
	BPJ	30	3	-0.08	0.17	0.63	-8	-35	31
Species	BBD	30	3	0.03	0.05	0.59	3	-8	15
	BPJ	30	3	-0.04	0.05	0.44	-4	-13	6

Notes:

* **Bolded** values are P-values < 0.1

Shaded cells indicate positive (increases) or negative (reduced) effect sizes of 20% or more

Test area = area compared to control (BAP)

n(B) = number of months in the "before" period

n(A) = number of months in the "after" period (i.e., in 2019)

Estimate = BACI model estimate of the 2019 change in mean for log-transformed data

SE = standard error of the estimate

P-value = two-tailed test of the null hypothesis of no change

ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 6-53. Chlorophyll-a (µg/L) in water samples from Baker Lake since 2008.

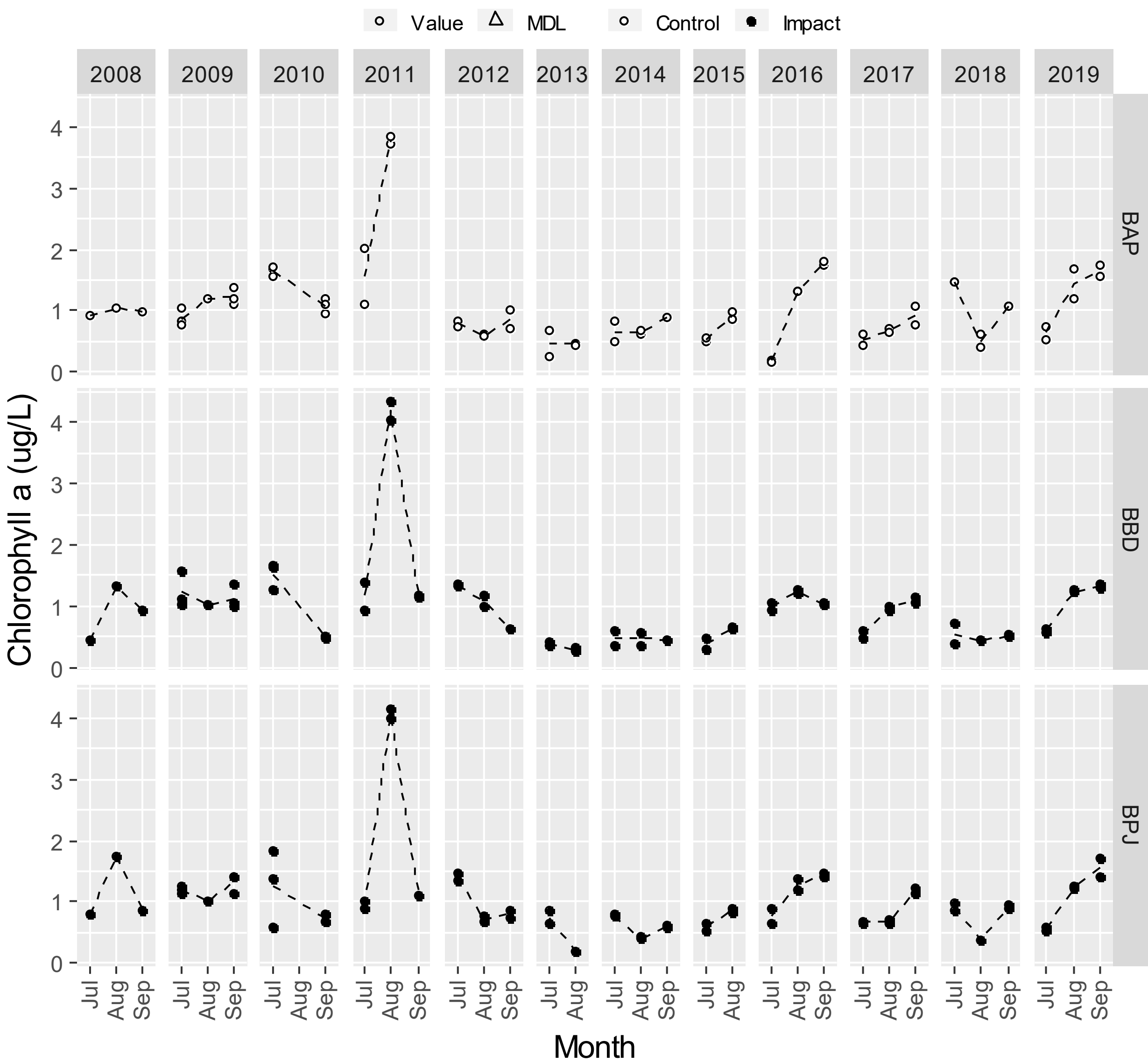


Figure 6-54. Total phytoplankton biomass (mg/m^3) from Baker Lake since 2008.

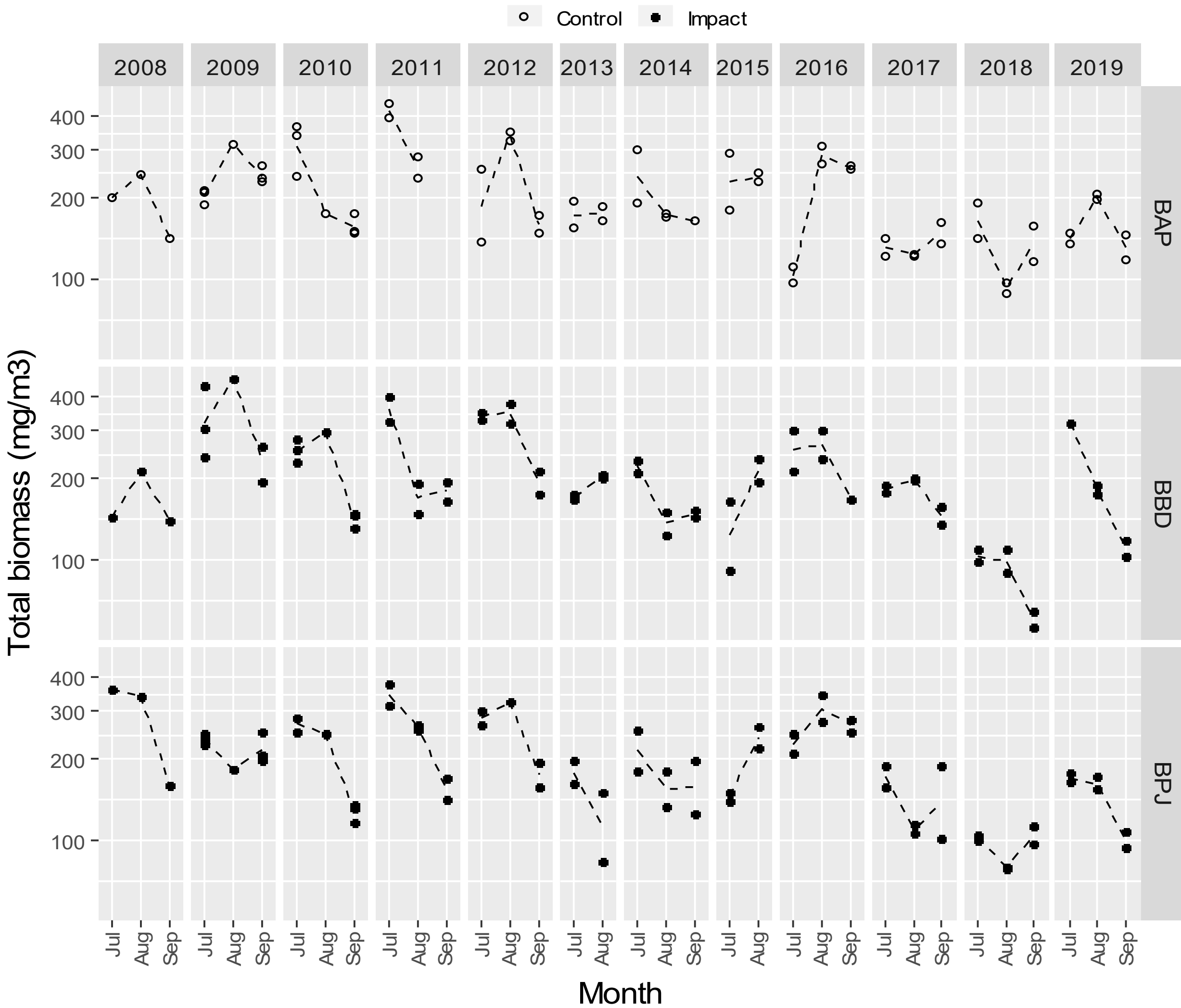


Figure 6-55. Phytoplankton biomass (mg/m^3) by major taxa from Baker Lake since 2008.

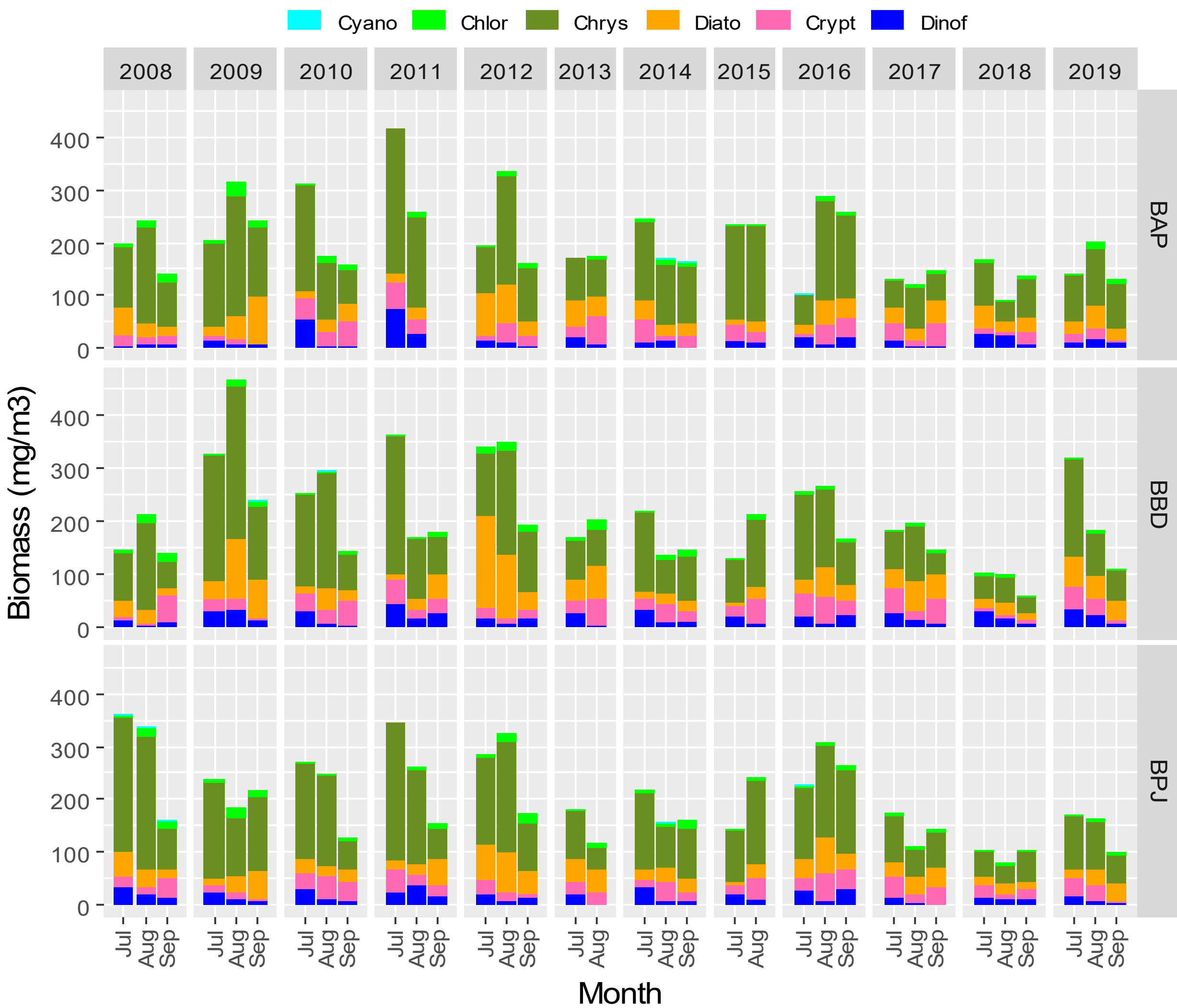


Figure 6-56. Relative phytoplankton biomass by major taxa from Baker Lake since 2008.

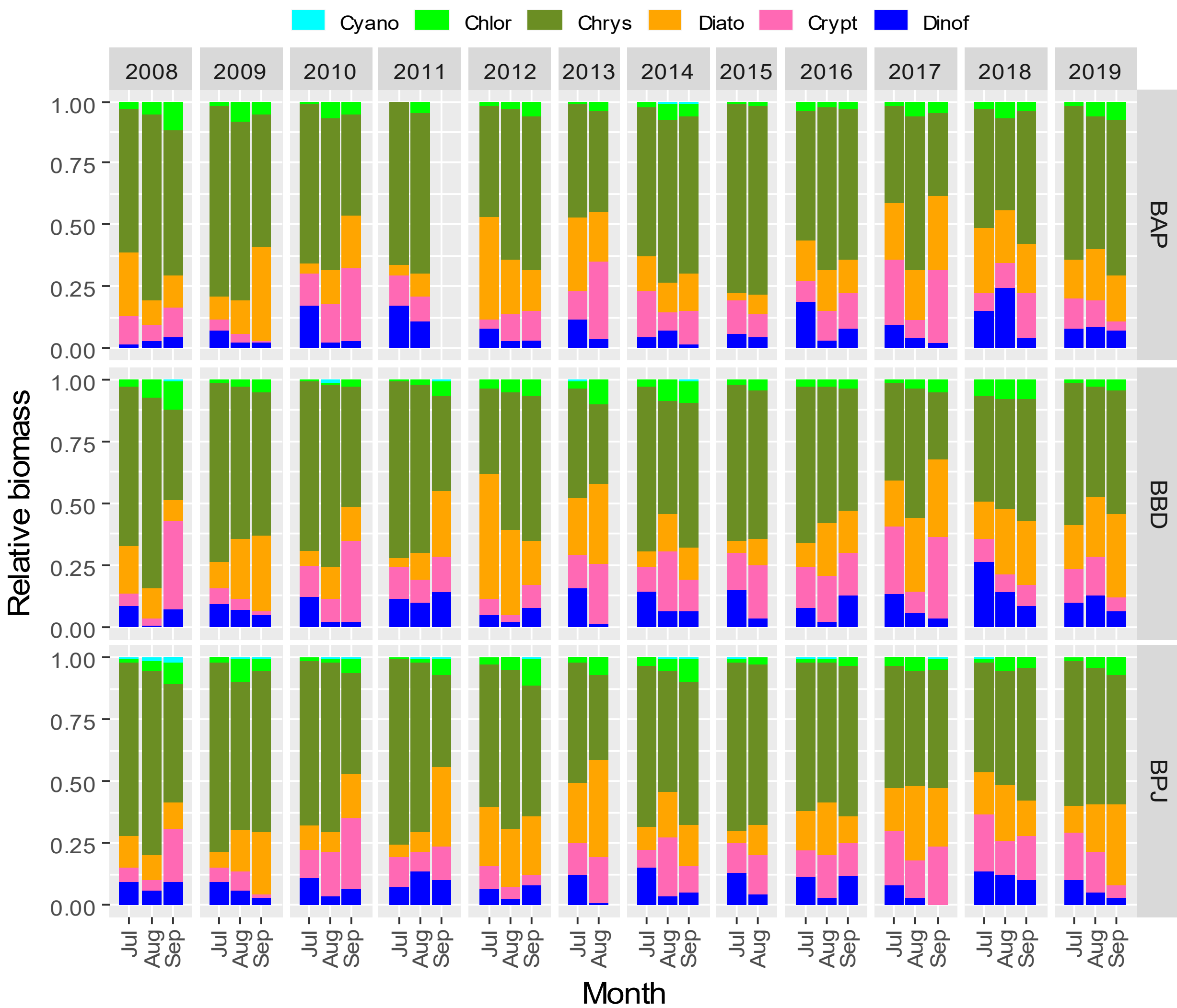
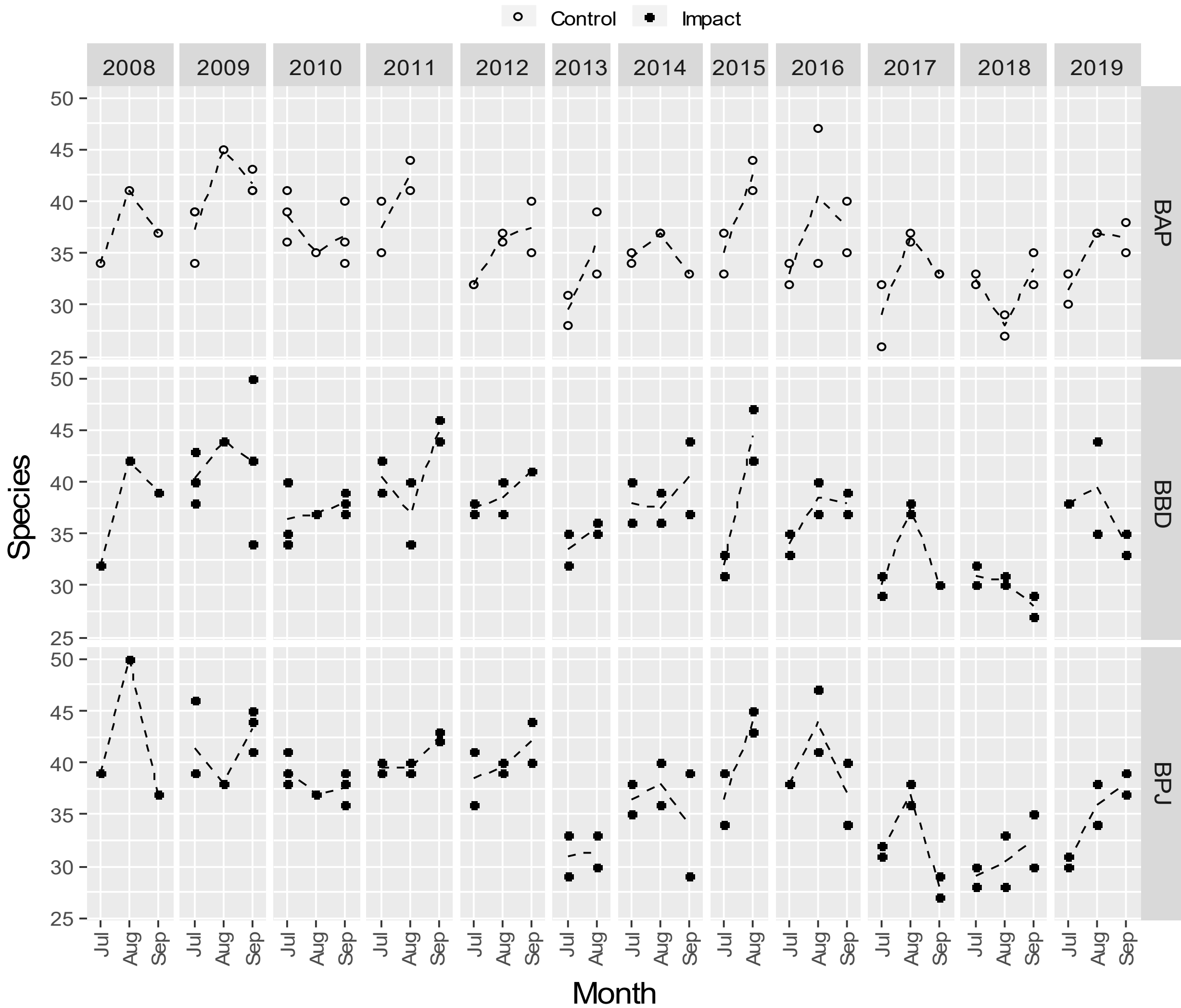


Figure 6-57. Phytoplankton species richness by major taxa from Baker Lake since 2008.



Sediment Chemistry Tables and Figures

Figure 6-58. Sediment grain size composition in sediment samples from Baker Lake since 2008.

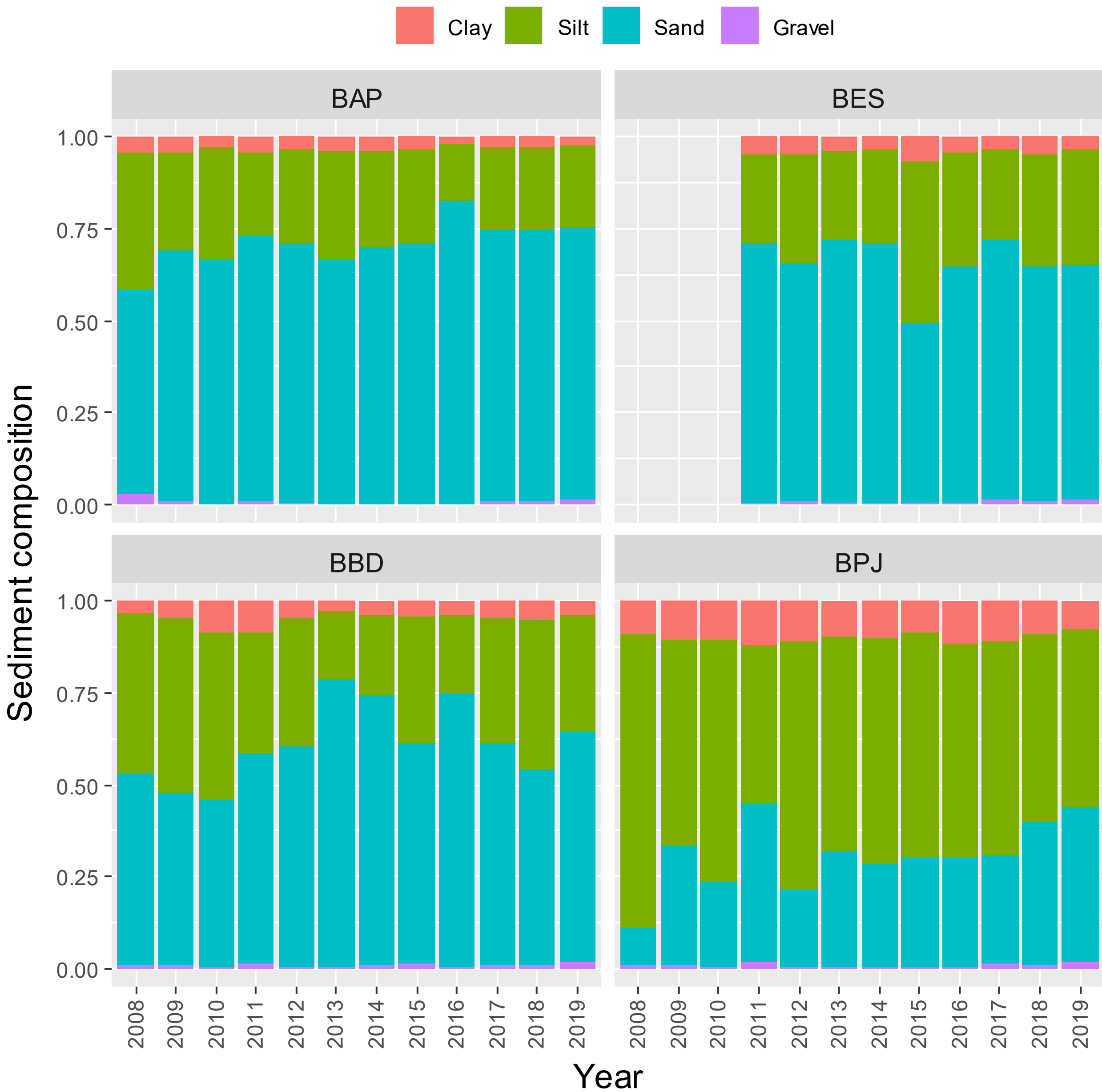


Figure 6-59. Total aluminum (mg/kg) in sediment samples (grabs) from Baker Lake since 2008.

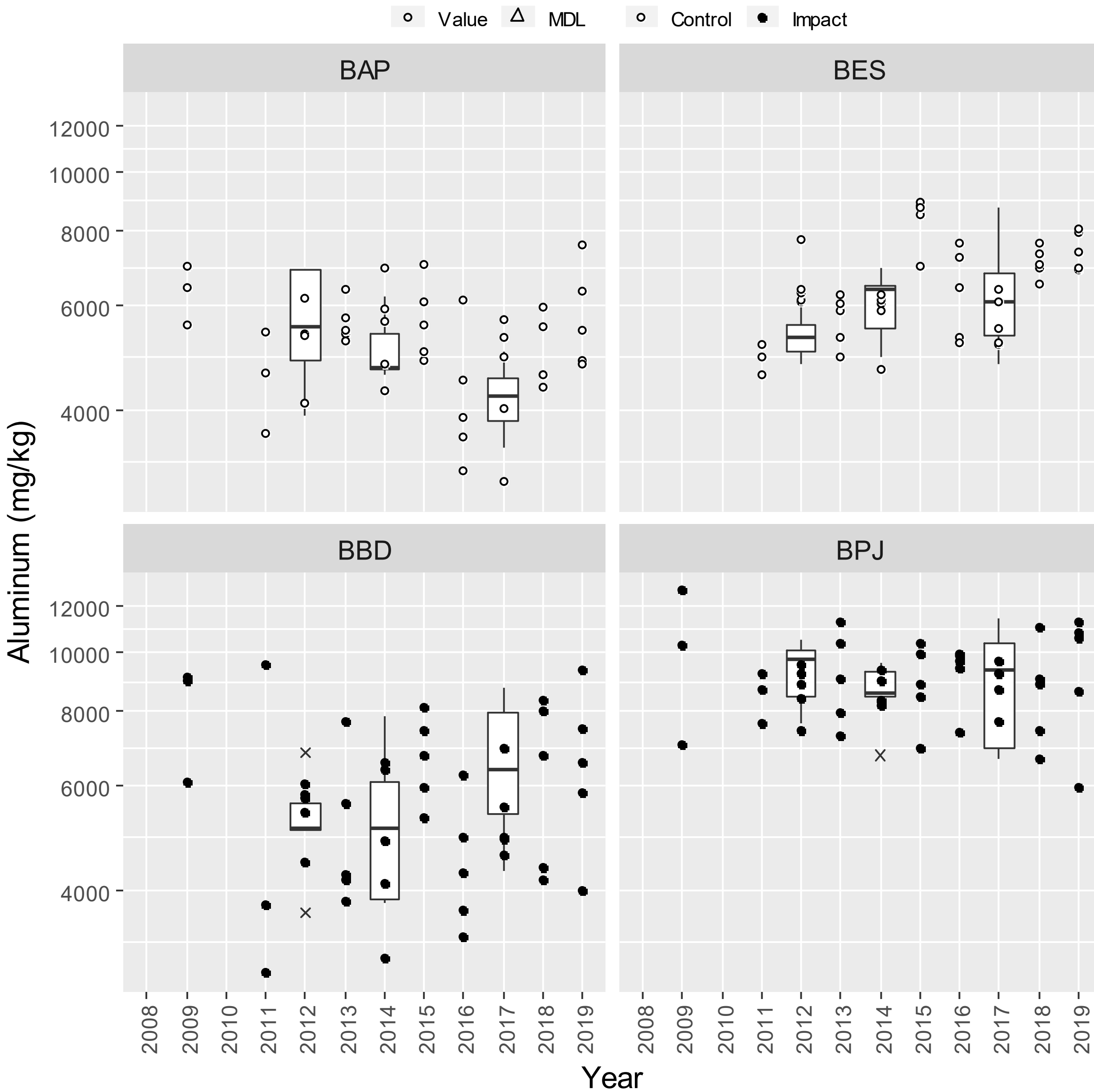


Figure 6-60. Total arsenic (mg/kg) in sediment samples (grabs) from Baker Lake since 2008.

Note: The red dashed line = trigger value.

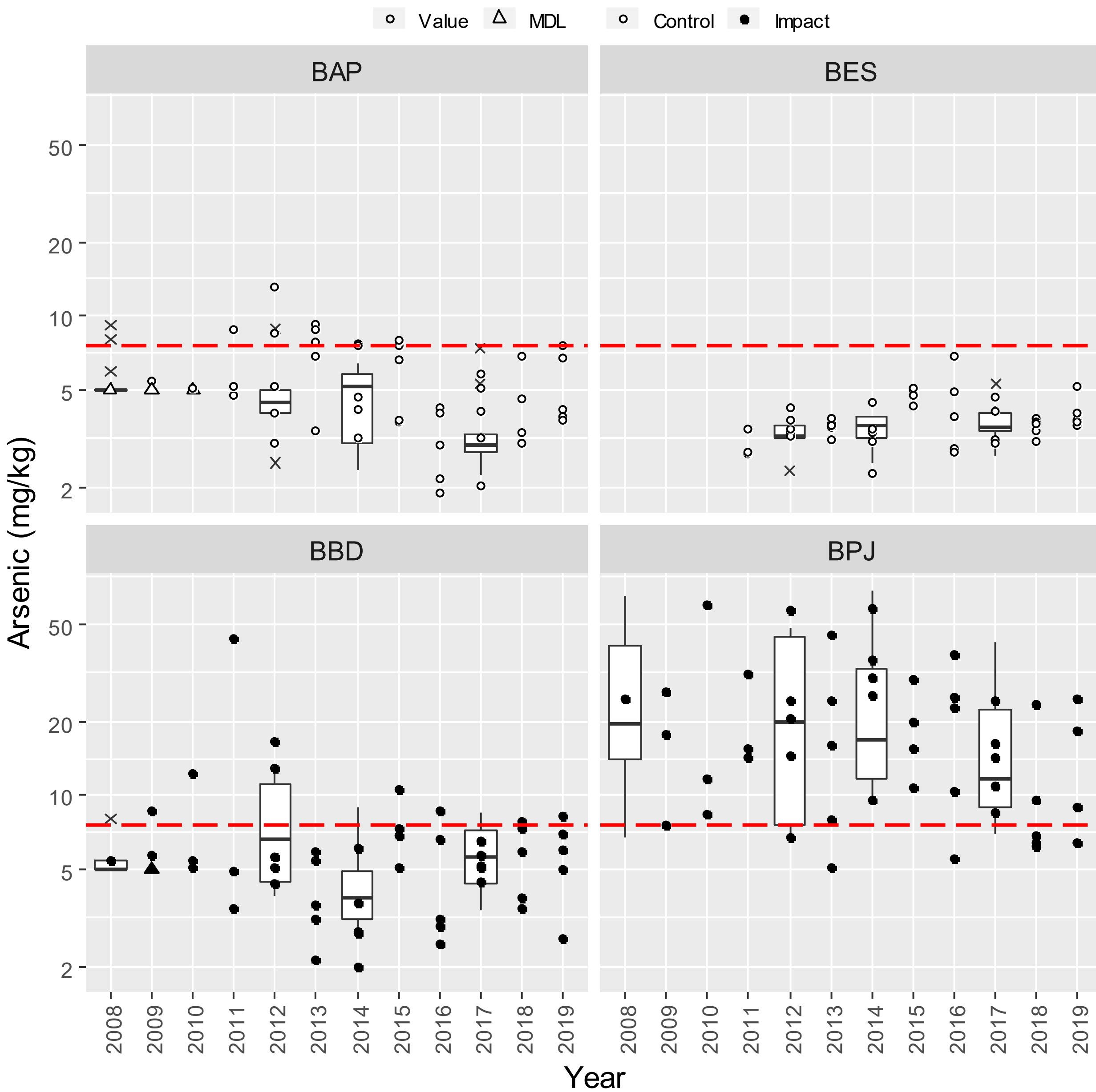


Figure 6-61. Total cadmium (mg/kg) in sediment samples (grabs) from Baker Lake since 2008.

Note: The red dashed line = trigger value.

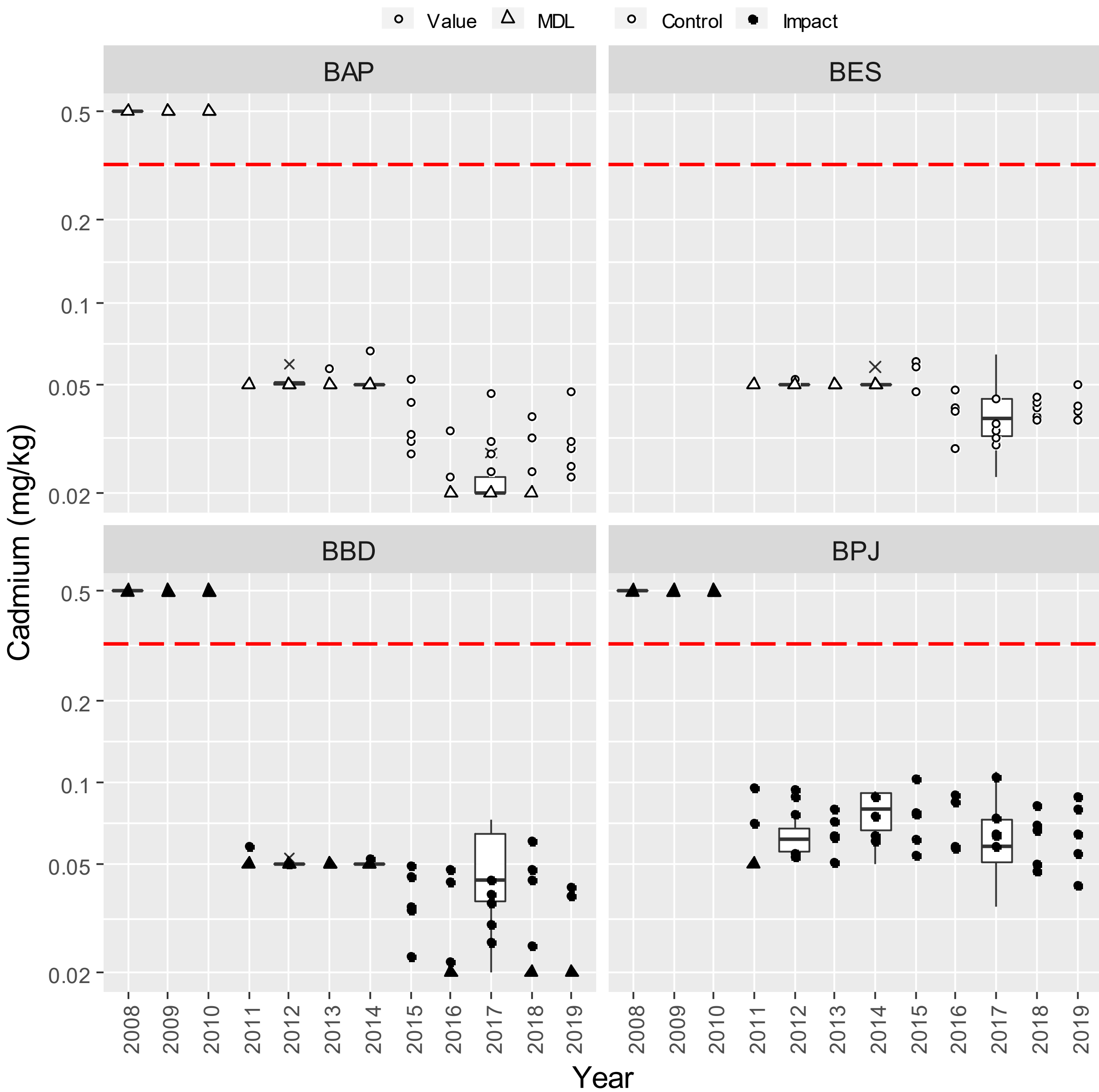


Figure 6-62. Total chromium (mg/kg) in sediment samples (grabs) from Baker Lake since 2008.

Note: The red dashed line = trigger value.

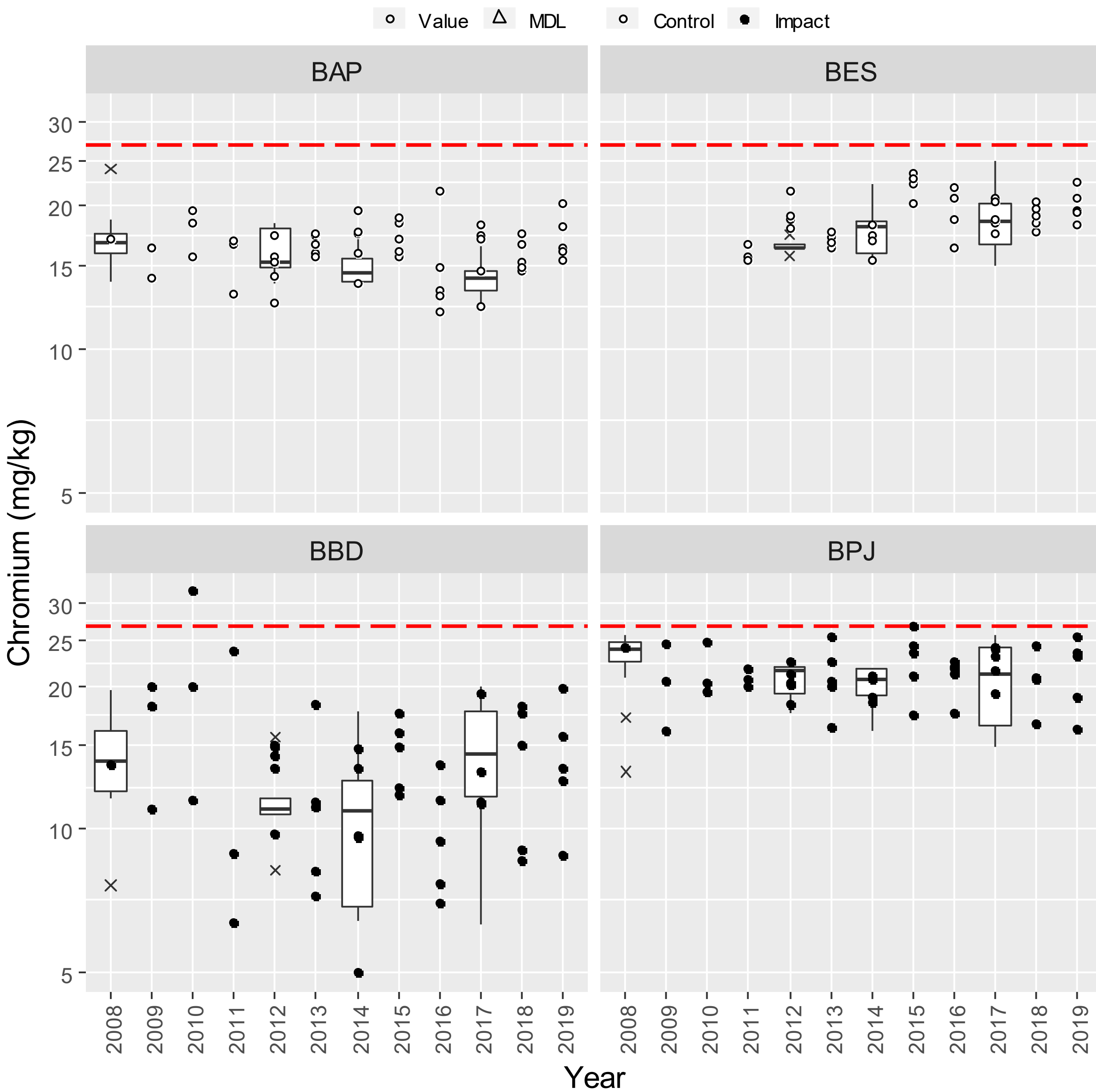


Figure 6-63. Total copper (mg/kg) in sediment samples (grabs) from Baker Lake since 2008.

Note: The red dashed line = trigger value.

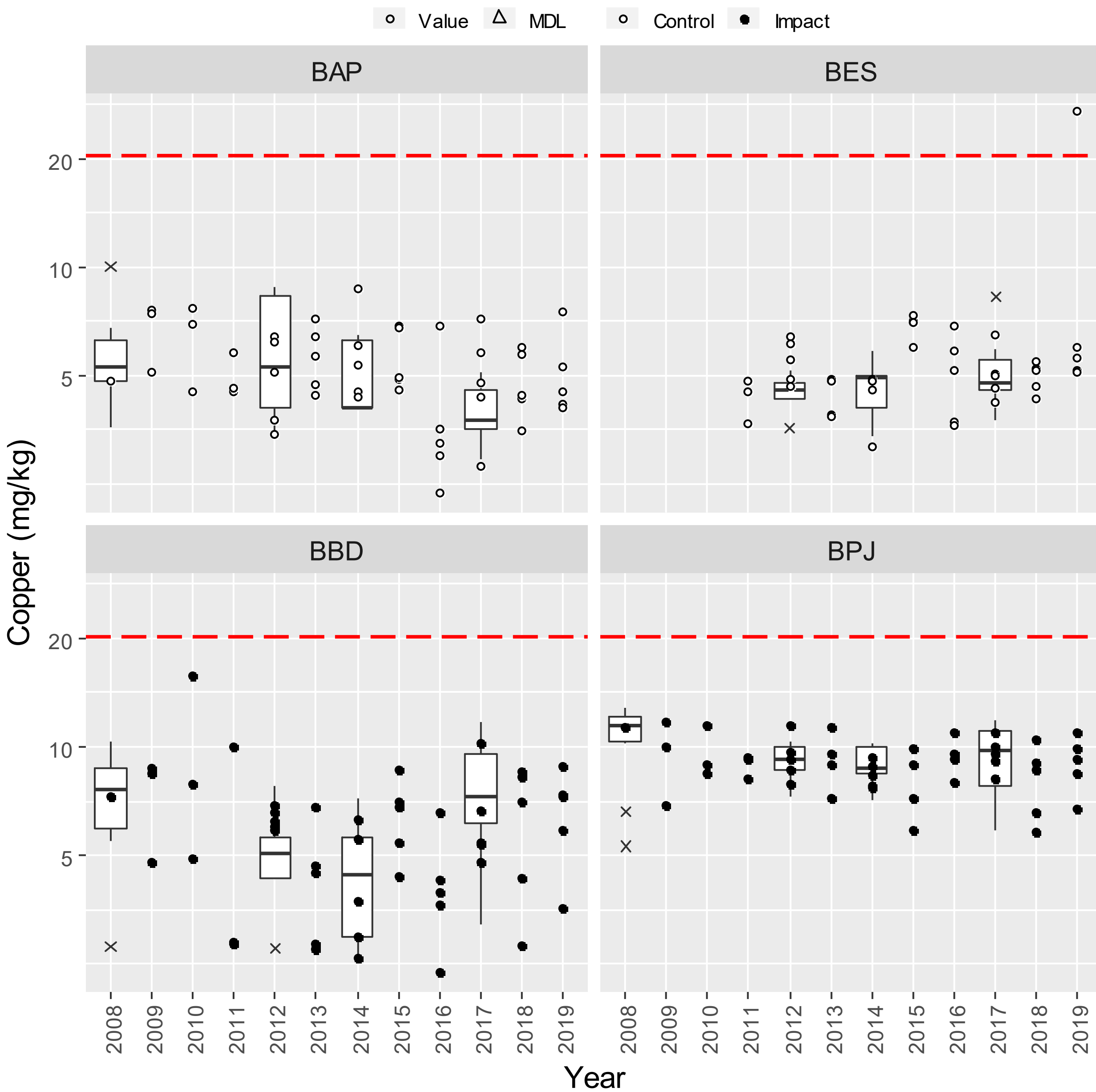


Figure 6-64. Total lead (mg/kg) in sediment samples (grabs) from Baker Lake since 2008.

Note: The red dashed line = trigger value.

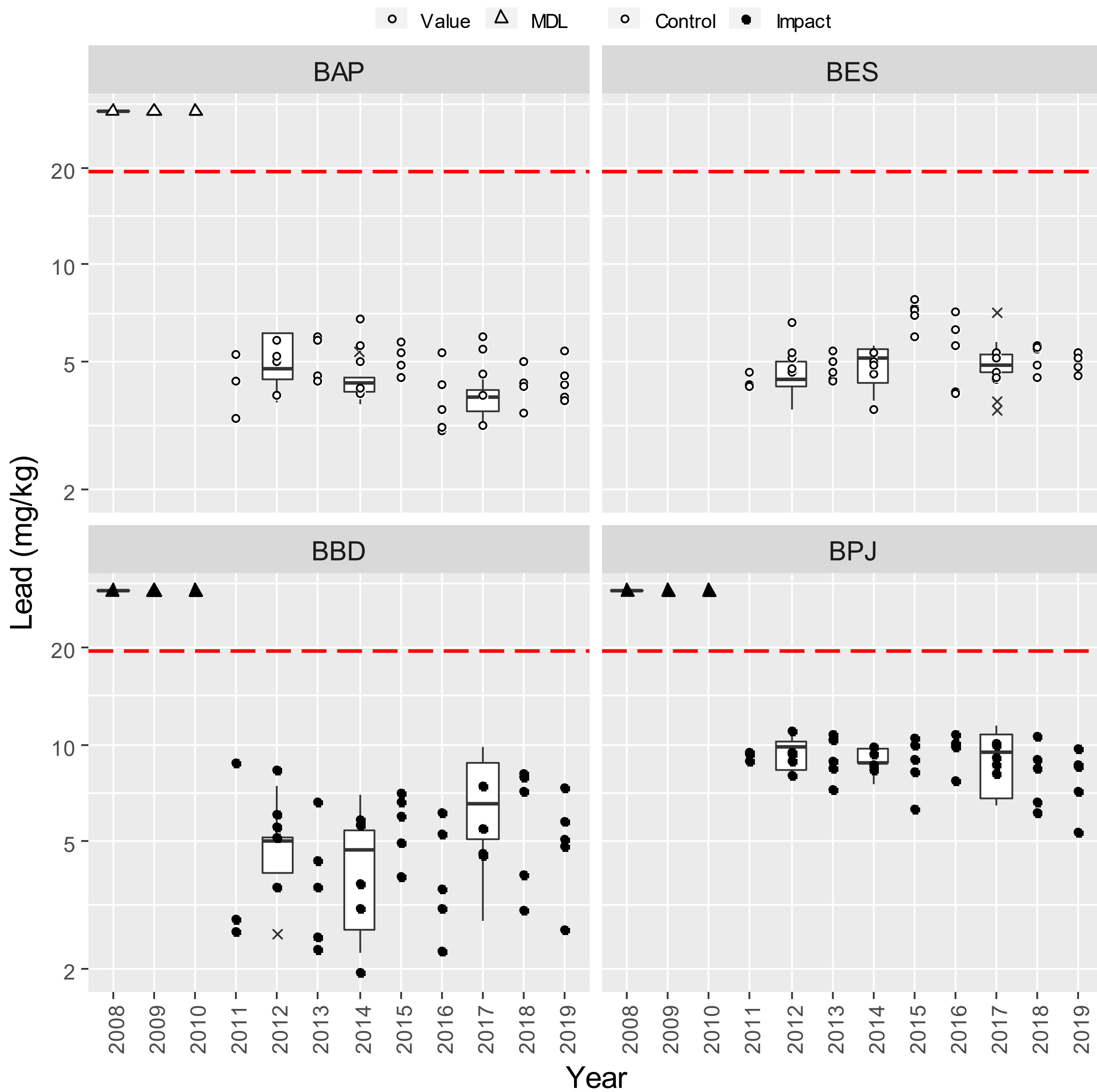


Figure 6-65. Total mercury (mg/kg) in sediment samples (grabs) from Baker Lake since 2008.

Note: The red dashed line = trigger value.

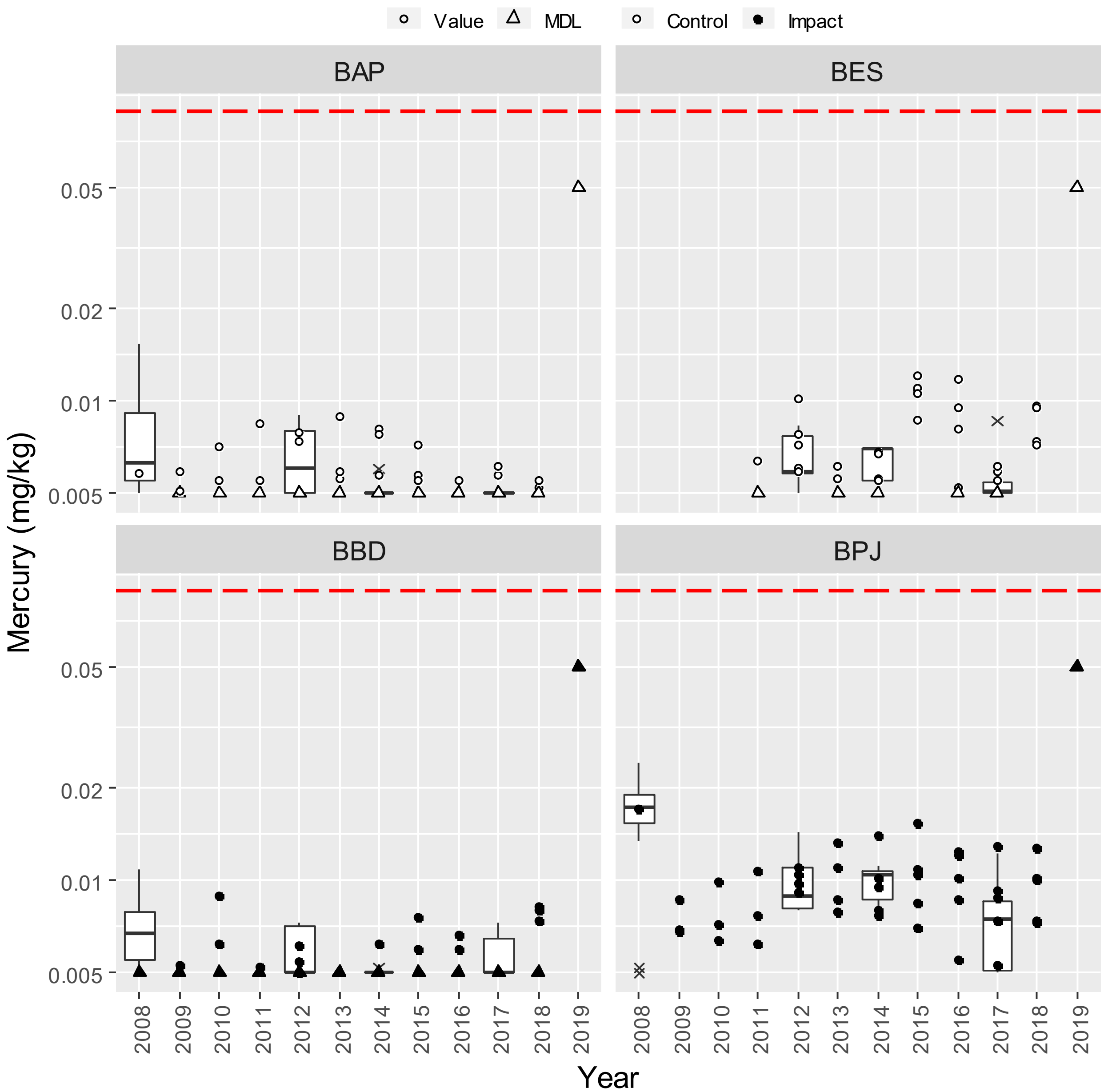
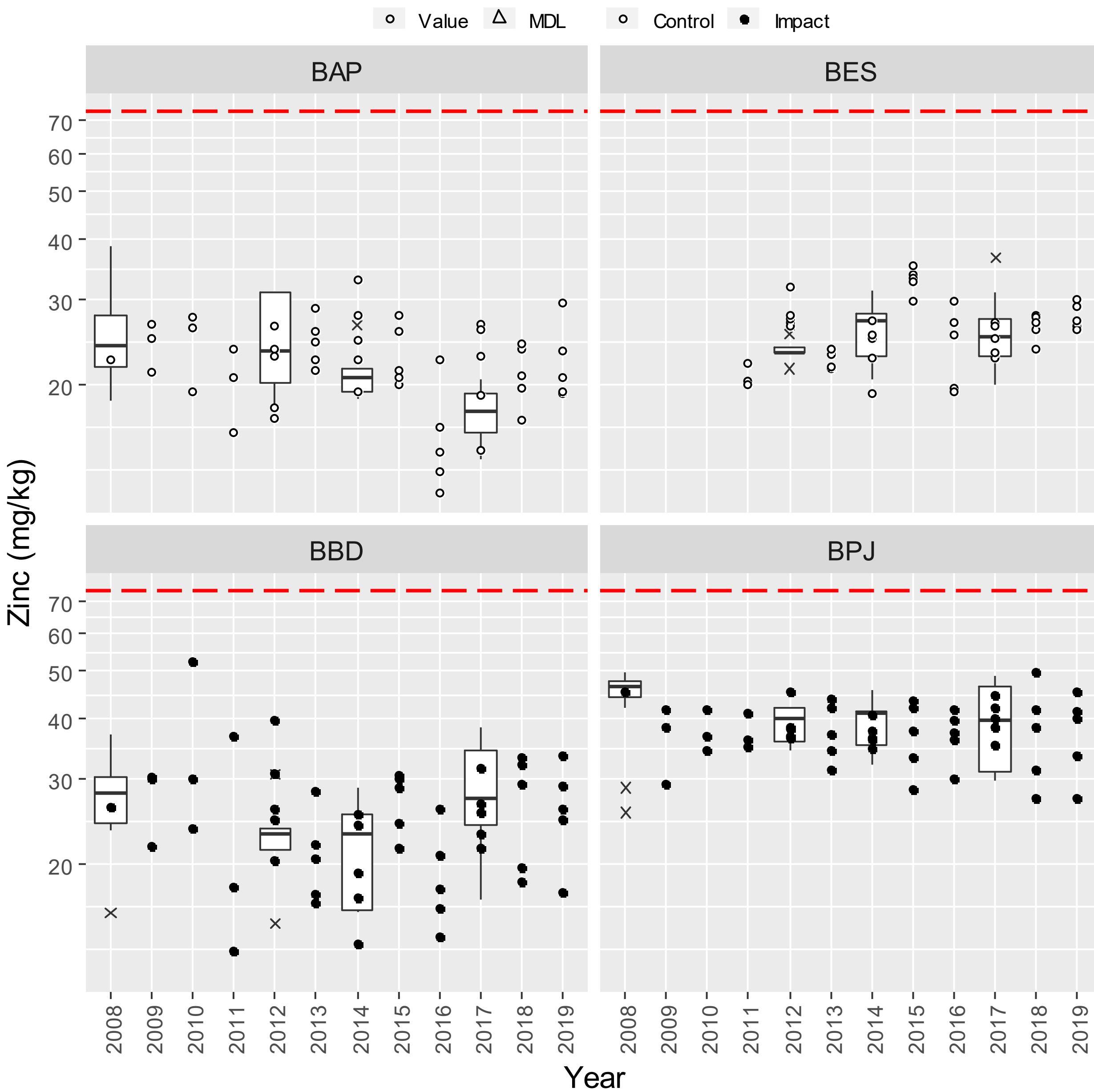


Figure 6-66. Total zinc (mg/kg) in sediment samples (grabs) from Baker Lake since 2008.

Note: The red dashed line = trigger value.



Benthic Invertebrate Tables and Figures

Table 6-5. Results of the BACI tests for benthic invertebrate abundance at Baker Lake areas.

After Period	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2019	BBD	11	1	1.11	1.12	0.83	203	-75	3,558
	BPJ	11	1	1.12	1.06	0.84	206	-71	3,113
2018-19	BBD	10	2	1.31	0.76	0.94	272	-32	1,940
	BPJ	10	2	1.37	0.69	0.96	294	-15	1,737
2017-19	BBD	9	3	1.13	0.65	0.94	211	-27	1,225
	BPJ	9	3	1.21	0.58	0.97	237	-8.0	1,135
2016-19	BBD	8	4	0.86	0.63	0.90	136	-41	852
	BPJ	8	4	1.34	0.49	0.99	281	28.0	1,035

Table 6-6. Results of the BACI tests for benthic invertebrate taxa richness at Baker Lake areas.

After Period	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2019	BBD	11	1	0.18	0.31	0.72	20	-39	137
	BPJ	11	1	0.34	0.41	0.79	40	-44	251
2018-2019	BBD	10	2	0.29	0.21	0.90	33	-17	114
	BPJ	10	2	0.50	0.27	0.95	64	-10.0	199
2017-2019	BBD	9	3	0.30	0.17	0.94	35	-8	99
	BPJ	9	3	0.49	0.22	0.98	64	1.0	165
2016-2019	BBD	8	4	0.26	0.16	0.93	30	-10	86
	BPJ	8	4	0.52	0.18	0.99	69	12.0	154

Notes:
* Bolded values are P-values < 0.1
Shaded cells indicate negative effect sizes (reductions) of 20% or more
Test area = area compared to control (BAP)
n(B) = number of years in the “before” period
n(A) = number of years in the “after” period
Estimate = BACI model estimate of the after-period change in mean for log-transformed data
SE = standard error of the estimate
P-value = one-tailed test of the null hypothesis of no change or an increase in mean
ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))
LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 6-67. Benthic invertebrate total abundance (#/m^2) from Baker Lake since 2008.

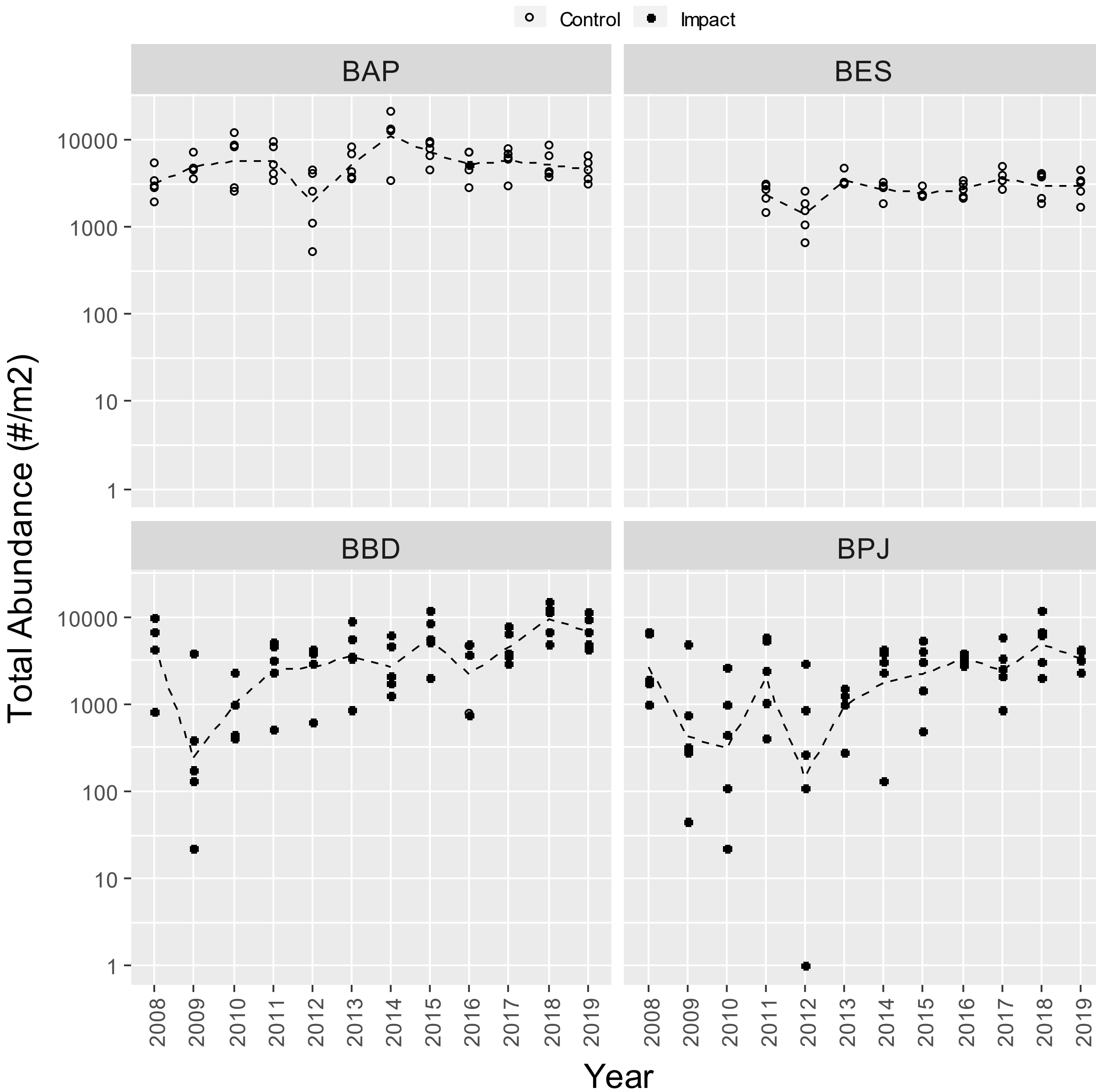


Figure 6-68. Benthic invertebrate total abundance (#/m²) by major taxa from Baker Lake since 2008.

Figure 6-69. Benthic invertebrate relative abundance by major taxa from Baker Lake since 2008.

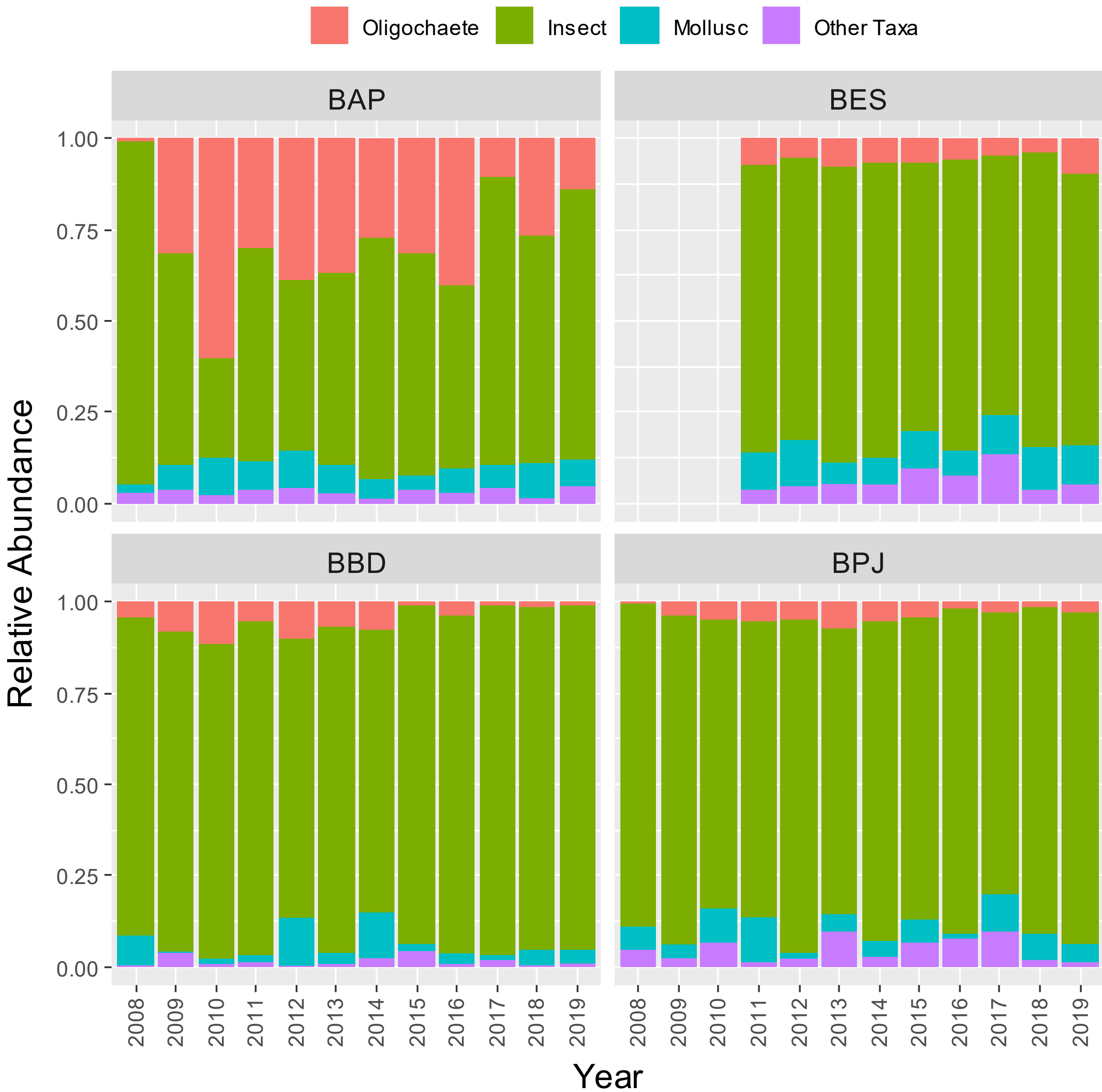


Figure 6-70. Benthic invertebrate total richness (# taxa) from Baker Lake since 2008.

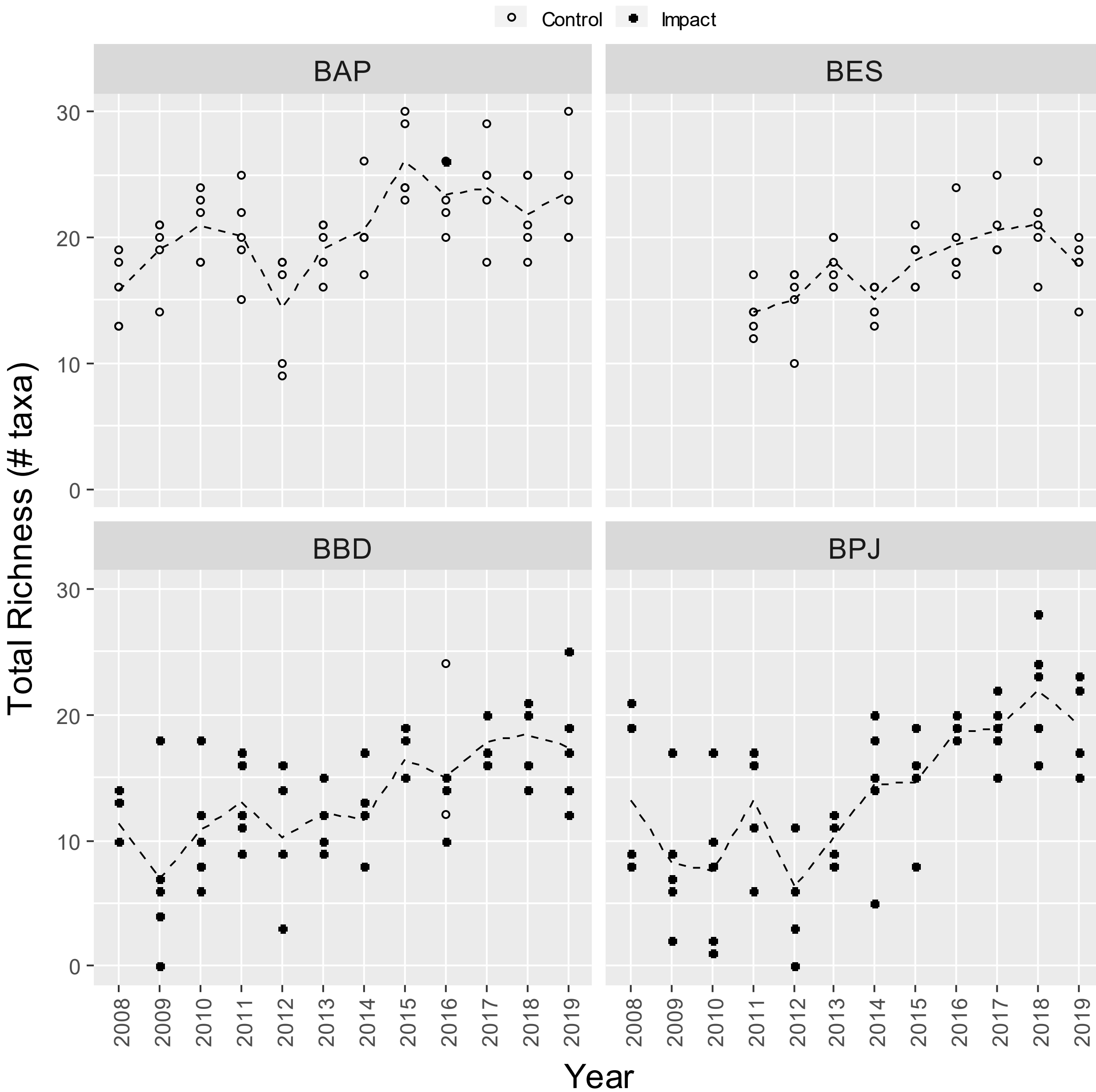


Figure 6-71. Benthic invertebrate total richness (# taxa) by major taxa from Baker Lake since 2008.

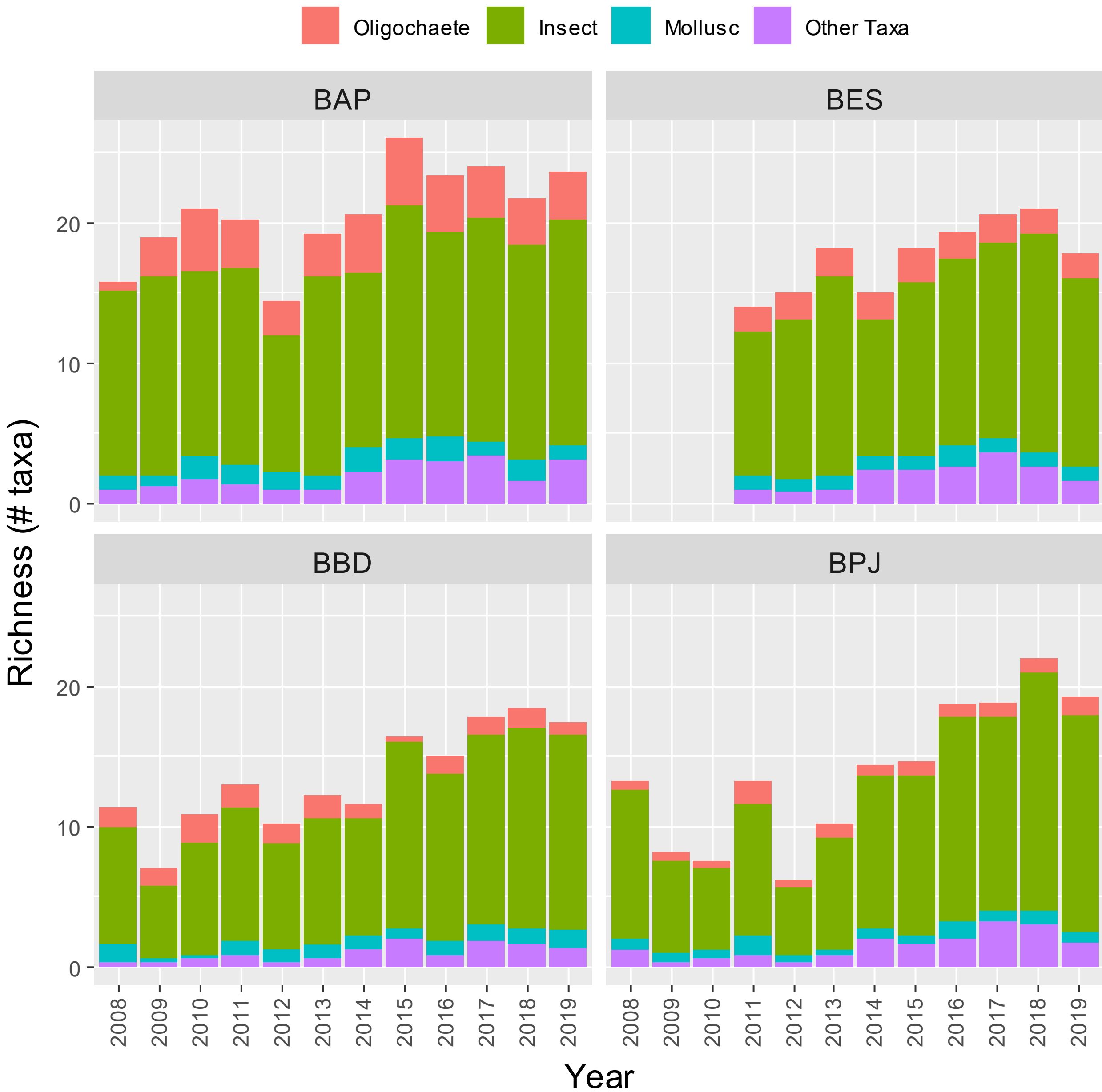
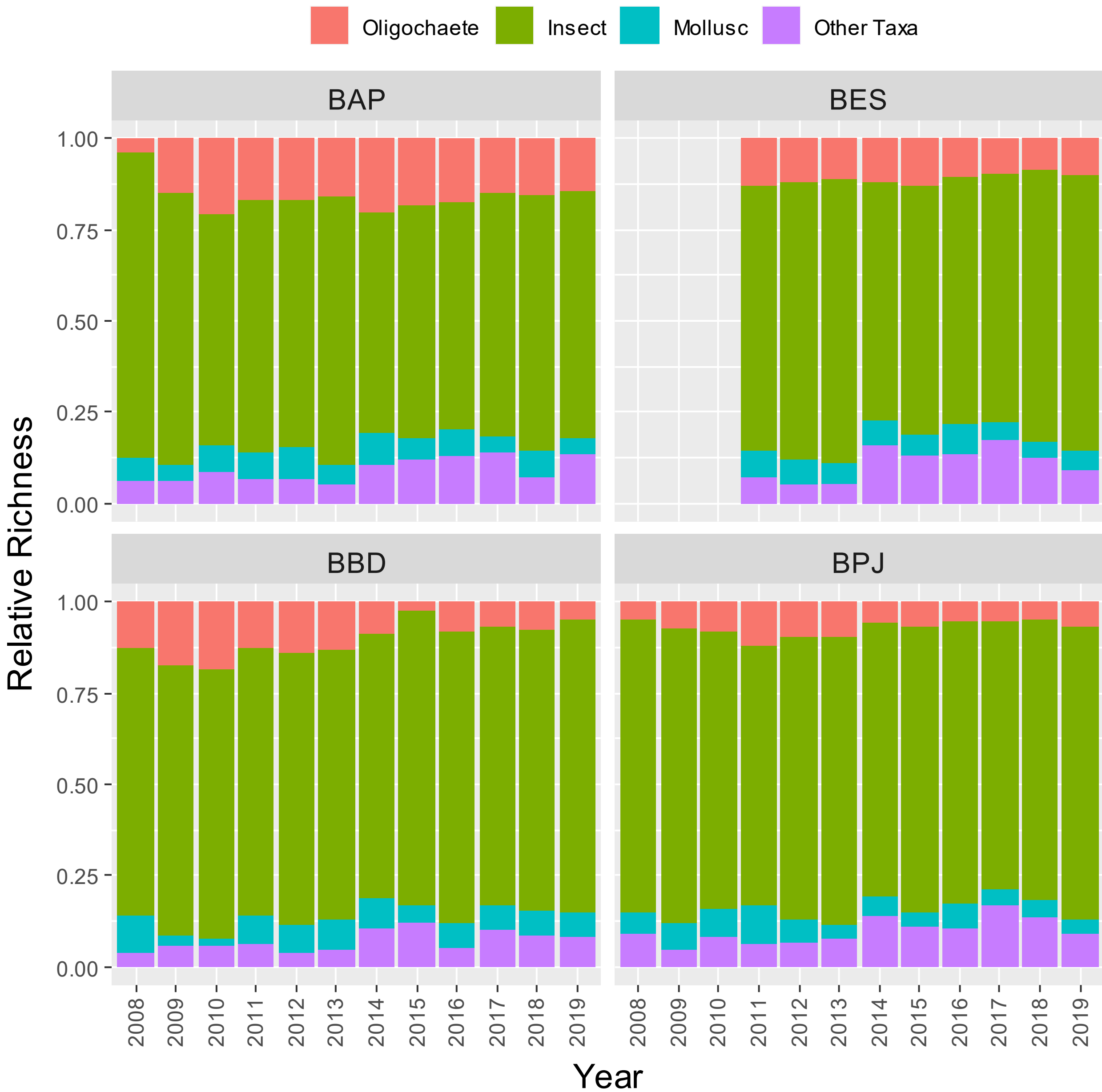


Figure 6-72. Benthic invertebrate relative richness by major taxa from Baker Lake since 2008.



7 SCOPE OF THE 2020 CREMP

The CREMP focuses on identifying changes in limnology, water, and sediment chemistry, and primary (phytoplankton) and secondary (benthic invertebrate community) aquatic producers that may be associated with mine development activities. This is accomplished by applying a temporal/spatial trend assessment that includes applying quantitative decision criteria (i.e., early warning *triggers* and action *thresholds*) to facilitate making immediate and objective decisions about appropriate management actions. CREMP results are integrated annually into the Aquatic Ecosystem Monitoring Program (AEMP) for holistic environmental management and decision making. Recommendations for the scope of the 2020 CREMP are provided for Meadowbank, Whale Tail, and Baker Lake based on the 2019 monitoring results discussed in **Sections 4**, **5**, and **6**, respectively.

7.1 Meadowbank

Based on the 2019 results and the annual decision framework for the sampling strategy (**Section 2.2.3**), the components and schedule for the 2019 CREMP for the Meadowbank study area is summarized in **Table 7-1**. The scope of work proposed for 2020 includes:

- Water quality – Water sampling for three open water and two through-ice sampling events is recommended at the NF areas in 2020. Through-ice limnology and water chemistry sampling at TPS, TE, and TEFF is planned for one event in 2020. In addition, contingency water samples may need to be collected during the limnology-only, through-ice sampling event(s) at the NF areas, if anomalous in-situ limnology results are observed.
- Phytoplankton – Routine sampling at the NF areas, at the same time as the three open water and two through-ice sampling events. Sampling at MF and FF areas is not required.
- Sediment chemistry - Sediment chemistry samples will be collected by grab sampler with benthos samples at all NF areas and reference in 2020. A full coring program will also be completed at NF areas to coincide with EEM monitoring. No further targeted studies of chromium bioavailability at TPE will be conducted (see **Section 4.6.3** for rationale).
- Benthos – Routine sampling at the NF areas in 2020.

7.2 Whale Tail

Timing of the field sampling at the Whale Tail study area lakes matches the schedule for Meadowbank because of share-reference area sampling at INUG and PDL. The frequency of sampling and study components at each area are outlined in **Table 7-2**.

- Water quality – The full CREMP program (through-ice and open water) is recommended at the NF, MF, and FF areas 2020. Through-ice limno profiles are recommended at MAM and WTS in the months when water sampling is not completed. In addition, contingency water samples may need to be collected during the limnology-only, through-ice sampling event(s), if anomalous in-situ limnology results are observed. Additional limnology profiles will be completed in Mammoth Lake in February 2020 to assess the spatial trends observed and discussed in **Section 5.2.2** and **Section 5.3**.
- Phytoplankton – Routine sampling with the full water quality sampling program.
- Sediment chemistry – Routine sediment grab chemistry sampling with the replicate benthos sampling stations in each area. Coring will also be completed at NF areas to coincide with the EEM monitoring program for 2020.
- Benthos – Sampling at NF areas (WTS and MAM) to monitor for changes in the community due to construction and discharge. Sampling at NEM to monitor potential changes related to the temporary authorized discharge into the Nemo Lake watershed in 2019, and sampling at areas A20, A76 and DS1 to provide more information on the range of normal conditions to support future BACI-style analysis.

7.3 Baker Lake

The scope of the 2020 Baker Lake CREMP is presented in **Table 7-3**. Monthly water quality monitoring is planned for July, August, and September consistent with previous years. Sediment chemistry and benthos sampling will be completed in August.

Table 7-1. Monitoring components planned for 2020 Meadowbank CREMP.

Area ID	Through-Ice					Open-Water			Through-Ice	
	Jan	Feb	Mar	April	May	Jul	Aug	Sep	Nov	Dec
Reference Areas										
INUG			WQ		WQ	WQ	WQ	WQ		
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
PDL			WQ		WQ	WQ	WQ	WQ		
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
Near-Field Areas										
TPE	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
TPN	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
SP	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
WAL	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
Mid- and Far-Field Areas [3]										
TPS, TE, and TEFF			WQ							

Notes:
No sampling in June and October due to unsafe ice conditions.
Limno: 1 limno depth profile should be collected at key near-field areas (TPN, TPE, SP, and WAL) to reduce uncertainty regarding the potential occurrence of changes over winter; water chemistry will also be collected if profiling shows unusual results.
WQ: 2 replicate samples from 3m depth and limno profiles at each location.
Phyto: 2 replicate samples from 3m depth; same locations as limno.

Sed: 1 composite for organics (LEPH, HEPH, PAH(low), Mineral Oil and Grease); 5 replicates for grab physical (TOC, Grain Size, Moisture); 10 replicates for core physical (metals, TOC, Moisture).
Benthos: 5 replicate samples (2 grab composite/sample); same locations as sediment.

Table 7-2. Monitoring components planned for 2020 Whale Tail CREMP.

Area ID	Through-Ice					Open-Water			Through-Ice	
	Jan	Feb	Mar	April	May	Jul	Aug	Sep	Nov	Dec
Near-Field Areas										
WTS	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
MAM	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
NEM			WQ		WQ	WQ	WQ	WQ		
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
Mid- and Far-Field Areas [3]										
A20			WQ		WQ	WQ	WQ	WQ		
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
A76			WQ		WQ	WQ	WQ	WQ		
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
DS1			WQ		WQ	WQ	WQ	WQ		
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			

Notes:
No sampling in June and October due to unsafe ice conditions.
Limno: 1 limno depth profile should be collected at key near-field areas (MAM and WTS) to reduce uncertainty regarding the potential occurrence of changes over winter; water chemistry will also be collected if profiling shows unusual results.
WQ: 2 replicate samples from 3m depth and limno profiles at each location.
Phyto: 2 replicate samples from 3m depth; same locations as limno.
Sed: 1 composite for organics (LEPH, HEPH, PAH(low), Mineral Oil and Grease); 5 replicates for grab physical (TOC, Grain Size, Moisture); 10 replicates for core physical (metals, TOC, Moisture)
Coring: 10 replicate sediment core samples (+1 duplicate) for metals and TOC.
Benthos: 5 replicate samples (2 grab composite/sample); same locations as sediment.

Table 7-3. Monitoring components planned for 2020 Baker Lake CREMP.

Area ID	Open-Water		
	July	August	September
BBD	WQ	WQ	WQ
	Phyto	Phyto	Phyto
		Sed	
		Benthos	
BPJ	WQ	WQ	WQ
	Phyto	Phyto	Phyto
		Sed	
		Benthos	
BAP	WQ	WQ	WQ
	Phyto	Phyto	Phyto
		Sed	
		Benthos	
BES		Sed	
		Benthos	

Notes:
WQ: 2 replicate samples from 3m depth and limno profiles at each location.
Phyto: 2 replicate samples from 3m depth; same locations as limno.
Sed: 1 composite for organics (LEPH, HEPH, PAH(low), Mineral Oil and Grease); 5 replicates for grab physical (TOC, Grain Size, Moisture); 10 replicates for core physical (metals, TOC, Moisture)
Coring: 10 replicate sediment core samples (+1 duplicate) for metals and TOC.
Benthos: 5 replicate samples (2 grab composite/sample); same locations as sediment.

8 REFERENCES

The references section is organized into two sections: Annual CREMP Reports and other literature cited in the report, including peer-reviewed studies and technical reports.

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APPENDICES

APPENDIX A
QUALITY ASSURANCE / QUALITY CONTROL ASSESSMENT

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A.1 INTRODUCTION

A.1.1 Quality Assurance / Quality Control

The objective of quality assurance and quality control (QA/QC) is to assure that the chemical and biological data collected are representative of the material or populations being sampled, are of known quality, have sufficient laboratory precision to be highly repeatable, are properly documented, and are scientifically defensible. Data quality was assured throughout the collection and analysis of samples using specified standardized procedures, by the employment of laboratories that have been certified for all applicable methods, and by staffing the program with experienced technicians.

The 2018 CREMP report was a harmonization of the CREMP program and the Whale Tail Pit program and combined QA/QC from the Meadowbank Lakes, Baker Lake, and Whale Tail Pit Lakes. It was the first CREMP reporting year to include Whale Tail Pit data and, as such, QA/QC discussion that referenced previous CREMP reporting years only referenced data from the Meadowbank Lakes and Baker Lake. The 2019 CREMP QA/QC assessment also includes the Meadowbank Lakes, Baker Lake, and Whale Tail Pit Lakes. Expanding the CREMP QA/QC program to include the Whale Tail Pit Lakes has helped refine the sample procedures and QA/QC protocols to ensure consistency between Meadowbank Environment team and the Amaruq Environment team. An overview of the QA/QC program for each component is provided below; refer to the 2015 CREMP plan (Azimuth, 2015) update for a complete description.

Sample Integrity

The first step in the QC program involves documenting any issues with the sample submission. This step applies to all sampling components (e.g., water chemistry, sediment chemistry, phytoplankton, benthic invertebrates, etc.). The analytical laboratory used for water and sediment chemistry in 2019 was ALS Environmental who reports concerns surrounding sample submission as “Sample Integrity” issues in the Sample Receipt Confirmation (SRC) email after the samples are received. Plankton-r-us (phytoplankton) and Zaranko Environmental Assessment Services (ZEAS; benthic invertebrates) also report sample integrity concerns via email. For ALS reports the results are typically recorded in the Sample Integrity assessment for one of three reasons: (1) samples were damaged during transport, (2) the temperature inside the cooler was above 10°C when received by the laboratory, or (3) the recommend hold-time was exceeded prior to analysis. Sample integrity issues don’t necessarily mean the data are unusable; rather, this information is meant to help the client make an informed decision on how to proceed with analysis and using the results.

Data Quality Objectives - Duplicates

Duplicate Samples – Quality control results of the laboratory and field duplicates are assessed by measuring the relative percent difference (RPD) as a percentage between original and duplicate measurements as measure of precision by the laboratory and the magnitude of variability between original and field duplicate samples, respectively. The variability in field duplicates may be attributed to sampling procedures but may also be attributed to natural conditions (i.e., spatial heterogeneity in the sampling media). The equation used to calculate the RPD is:

$$RPD = \frac{(A - B)}{(\frac{A + B}{2})} x\ 100$$

where: A = analytical result; B = duplicate result.

Laboratory duplicate DQOs are parameter-specific and depend on the concentration in the sample. Field duplicate samples are collected for water chemistry, sediment chemistry, and phytoplankton. Laboratory duplicates are run for water chemistry, sediment chemistry, phytoplankton, and benthic invertebrates. Data quality objectives (DQOs) for the duplicate samples are discussed below.

In 2019 the DQOs for field duplicates were revised for water and sediment chemistry field duplicates. The 2018 DQOs for both were RPD values of less than 50% (RPDs can be negative or positive). In 2019 the DQOs for field duplicate have been adjusted to 1.5X the laboratory RPDs unless no RPD is provided by the laboratory (e.g., for chlorophyll-a where the laboratory does not run duplicates) in which case the field duplicate DQO has been set at a default 40%. This approach has been adopted for both water chemistry and sediment chemistry. The adjustment above laboratory RPD levels is to reflect that field duplicates are inherently more variable in comparison to laboratory duplicates partly because field duplicate samples are collected from a large sample volume (i.e., the lake or stream) vs. a small well mixed sample volume (i.e., the single sample container in the laboratory). The Canadian Council of Ministers for the Environment (CCME) state that acceptance limits for field-based QC are broader than laboratory QC and are typically 1.5 to 2 times the laboratory QC limits (CCME 2016).

As stated, RPD values may be either positive or negative, and ideally should provide a mix of the two, clustered around zero. RPDs are not calculated when one of the samples (i.e., either A or B above) is below detection and the other is not. If an RPD value falls outside the field duplicate DQO it is flagged for review. When analyte concentrations are less than 10X DL we expect a greater likelihood of not meeting the DQOs because laboratory precision is slightly less close to the DLs and because smaller concentrations of analytes per volume tends to magnify variability between the original sample and the duplicate. These occasions are still flagged for assessment to reflect upon the implications on sampling protocol and data interpretation; however, given the higher potential to not meet DQOs for those reasons outlined above, they are not weighted as highly unless there is a relatively high percentage of RPD values that did not meet DQOs or if the RPD values themselves are very high. Analyte concentrations that are greater than 10X DL and do not meet the DQOs are given more weight in the QA/QC assessment.

Phytoplankton DQOs did not change in 2019. The laboratory does not calculate RPD values though they do run duplicate samples. The DQOs for phytoplankton laboratory duplicates are less than ±25% RPD and for field duplicates are less than ±50% RPD.

There are no benthic invertebrate field duplicates and RPDs are not calculated for laboratory duplicates. For laboratory duplicates ZEAS calculates the re-sort and re-count percent recovery (the difference between the original sorting and a second sorting from the same sample) with DQOs of 90% or better.

A.1.2 Surface Water

Laboratory QC

There are four main components of the water chemistry laboratory QC program to assess analytical precision, bias, and completeness:

- Laboratory Duplicate – a new aliquot from the same sample is analyzed from the start in the same manner as the original aliquot taken from the bottle/jar. The difference between the two analyses is a measure of the variability associated with duplicate analyses of the same sample in the laboratory.
- Method Blank (MB) – an analyte-free matrix (e.g., water) subjected to the entire analytical process to demonstrate that the analytical system itself does not introduce contamination.
- Matrix Spike (MS) / Matrix Duplicate (MD) – a known amount of a compound similar chemically to the target analyte is added to samples to ascertain any matrix effects on recoveries and to determine the accuracy and precision of the method in this matrix.
- Laboratory Control Sample (LCS) – a well-characterized sample of known analytes and concentration. A reference material (i.e., certified reference material) containing certified amounts of target analytes, may be used as an LCS. Percent recovery of the target analytes in the LCS is compared to established control limits and assists in determining whether the methodology is in control and whether the laboratory is capable of making accurate and precise measurements at the required reporting limit.

Laboratory QC results are included in each laboratory report for CREMP water quality samples. The ALS analytical reports are presented in **Appendix F** (main report).

Field QA/QC

The standard QA procedures included thoroughly flushing the flexible tubing and pump to prevent cross-contamination between areas and thoroughly rinsing the sample containers with site water prior to sample collection. Field QC procedures include collection and/or analysis of field duplicates, travel blanks, and equipment blanks.

Blanks (Travel, Field, Equipment) – Blank samples are collected once per sample event. Results from both the equipment and travel blanks are examined for detectable concentrations of any of the parameters measured; no parameter in either blank should exceed laboratory method detection limits (MDLs). If an analyte is detected in a blank, the results for the batch of samples submitted with the blank are compared with the measured concentration in the blank; results that are less than 5-times the detected analyte concentration in the equipment blank are flagged to examine the potential for cross-contamination to affect the results. Results carried forward in the QA/QC assessment are given either a cautionary flag or an unreliable flag. Cautionary flags are applied to sample results if the analyte was detected in the blank, but the effect of potential cross-contamination is considered minor (e.g., the concentration in the equipment blank is a small percentage of the concentration in the samples). Unreliable data flags are applied to water quality results that are unrepresentative of the water quality (e.g., elevated metals concentrations in a sample that are not observed in other replicate sample(s) collected during the same event). The “cautionary” and “unreliable” data flags are provided for clarity on which results should be excluded from decision making.

A.1.3 Sediment

Laboratory QC

Laboratory duplicates were analyzed for sediment chemistry parameters similar to water chemistry parameters. The full list of laboratory DQOs for each parameter are presented in the SOP appended to the CREMP: 2015 Plan Update (Azimuth, 2015).

Field QA/QC

Field QA consisted of taking care between sampling areas, by rinsing and cleaning the sampling gear for sediment grabs (Petite Ponar grab, stainless steel compositing bowls and spoons) and sediment cores (corer and spatula) using site water and phosphate-free cleaning detergent, avoids the possibility of cross-contamination. Field QC measures included collection and analysis of field duplicates and filter swipes.

Filter Swipe – Metals analysis of an ashless filter (QA/QC Filter) that was swiped over the pre-cleaned bowl at four sampling areas to assess the cleaning procedures. The significance of any metal detected on this filter was evaluated by comparing this amount to the measured concentrations in the sediment samples. Where comparisons were required, the concentration of metals originating from any equipment was estimated by dividing the amount detected on the filter (weight) by: the surface area of 2 Petite Ponar grabs (assuming a thickness of 3 cm was collected from each), that was multiplied by the density of sediment (assumed to be 2 g/cm3).

A.1.4 Biota

Standard procedures were used to collect phytoplankton and benthic invertebrate samples (Azimuth, 2015b). Sampling gear was thoroughly rinsed between sampling areas to ensure that there was no inadvertent introduction (i.e., cross-contamination) of biota from one area to another.

Laboratory QC

Phytoplankton – As a measure of laboratory QA/QC on the enumeration method replicate counts were performed on 10% of the samples. Replicate samples were chosen at random and processed at different times from the original analysis to reduce biases. The laboratory replicate is a new aliquot (10 mL) from the sample jar and is counted from the start in the same manner as the original aliquot (10 mL) taken from the jar. A RPD of 25% for total density and biomass concentrations is considered acceptable for laboratory replicates.

Benthic Invertebrates – ZEAS re-sorts and re-counts approximately 10% of the samples, targeting greater than 90% recovery between the original and re-sorted sample.

Sediment toxicity testing on benthic invertebrates was carried out according to standardized test methods published by Environment Canada. The tests methods prescribe how the tests are conducted, including ambient temperature, light intensity, photo period, and feeding regimen. Test acceptability was assessed by evaluating:

1. Daily water quality monitoring for routine parameters (temperature, dissolved oxygen, pH, specific conductivity,
2. ammonia concentrations in the overlying water,
3. use of reference toxicant tests to confirm test organism survival is within the reported range,
4. minimum survival and dry weight in the laboratory control treatments.

Field QA/QC

Phytoplankton – Field duplicates were collected for phytoplankton during each sampling event (i.e., monthly) in coordination with water sample duplicates and were taken in order to assess sampling variability and sample homogeneity. A RPD of 50% for total density and biomass concentrations is considered acceptable.

Benthic Invertebrates – Field replicates (5 per area) were collected for benthos to determine natural variability and heterogeneity. Replicates were collected at least 20 m apart from one another, within the defined sampling areas.

A.2 RESULTS AND DISCUSSIONS

The QA/QC results present below for the 2019 CREMP program are summarized in **Section 3** of the main report.

A.2.1 QA/QC Overview

QA/QC procedures consisted of a combination of careful field collection and sample handling, the collection of field duplicate samples and the analysis of laboratory replicates and standard reference materials. A discussion of sample shipping and handling procedures is provided upfront, followed by a discussion of the results pertaining to the various CREMP components.

Sample Shipping and Handling

Sample shipping and handling concerns document in previous CREMP reports have largely been rectified in recent years. The Meadowbank and Amaruq Environment Departments plans water sampling events to minimize the amount of time that samples are in transit between Site, Val d'Or, and ALS in Burnaby. The remote location of the mine will always present challenges with some analytes meeting recommended hold-times, but the effect of slightly exceeding hold-times on the quality of the results is considered negligible. Correspondence with the lab regarding hold time exceedance hasn't led to establishing definitive benchmarks for data quality. ALS recommends "professional judgement" when interpreting chemistry data for parameters that exceeded hold-times for analysis.

Table A-1 summarizes sample integrity observations (e.g., broken sample containers, mislabeled containers), cooler temperature upon delivery to the lab, and parameters that exceeded the recommended hold-time for analysis.

Sample shipping and handling summary

The target temperature for samples arriving at ALS is between 5°C and 10 °C. The range of temperatures reported in 2019 was between 5°C in March to a high of 24°C in August. These temperature ranges are similar to past years and reflect the seasonal ambient temperatures. The effect on preserved samples is considered negligible, but for chlorophyll-a samples the increase in temperature means samples may arrive thawed. Keeping the chlorophyll-a samples frozen is a recurring challenge for this program given the logistics of shipping samples from Nunavut to Vancouver in a timely fashion.

There was one broken container in each of the two water shipments from the August sampling event and dissolved metals sample from one station had lost some volume. Given the large number of sample containers shipped during a CREMP cycle year, this represents a very small number of lost samples to breakage or spillage.

There were several incidents of CoC discrepancies – mislabeled samples or samples either submitted and not included on the CoC or included on the CoC but not submitted. CoC discrepancies are identified and forwarded to CREMP project managers immediately after the laboratory receives the samples. As such, these types of errors are often rectified shortly after ALS receives the samples. Ultimately only sample “MAY DUP-2” was impacted by CoC discrepancies. The sample was “held for analysis”; however, because field duplicate samples need to closely match original samples during collection and during handling, holding the sample for longer than the original sample meant that comparison between the two would be suspect.

Recommended hold times are provided by the laboratory for analytes and water quality parameters. The times vary from a low of 0.25 days for pH to six months for metals. Hold times for water samples are regularly exceeded for turbidity, pH, nitrate, nitrite, total dissolved solids, and dissolved orthophosphate (as P). Very occasionally hold times are exceeded for cyanides (free and total). Hold times for sediments were exceeded for moisture, methylmercury, extractable petroleum hydrocarbons (EPHs) and polycyclic aromatic hydrocarbons (PAHs). Samples are generally shipped very soon after collection and though shipping from the Meadowbank Mine has improved in recent years, the distances and logistics make it impossible to meet short hold times. However, it is highly unlikely that results are affected for those parameters or analytes where hold times are not met in 2019.

The sample shipping and handling QA/QC for 2019 was comparable or better than 2018 as fewer samples were lost. There were a few discrepancies between samples submitted and the CoCs but most were rectified without impacting the analytical results. The logistics, distances, and general challenges of collecting and shipping samples from a remote mine in Nunavut meant that hold times were exceeded for several parameters/analytes but the impact on results is considered negligible. Bringing the Meadowbank/Baker CREMP program and the Amaruq program together under one umbrella has likely contributed to the overall improvement seen in 2019. Logistic efficiencies, increased familiarity with the CREMP program, and attention to detail are also likely contributing factors.

A.2.2 Water Chemistry

Field duplicates, laboratory duplicates, and blank samples were analyzed as part of the QA/QC program in each of the five sampling events in 2019. In contrast to 2018, the blank results and field duplicate samples in 2019 have been fully integrated for all CREMP study areas. However, in order to better identify potential QA/QC weakness, each team (i.e., Meadowbank Environment and Amaruq Environment) take turns collecting blank samples and the field duplicate samples are split evenly between the Meadowbank/Baker Lake study areas and the Amaruq study area. This approach ensures that both teams are familiar with the QA/QC process and better appreciate the nuances of sample collection and handling methods. Blank sample collection, particularly equipment blank samples, requires careful planning, attention to detail, focuses on the importance of cleanliness and generally provides a good opportunity to refine sample collection skills.

Results of the QA/QC analysis are discussed below, along with a discussion on the implications of the QA/QC assessment on the sample results from 2019.

Travel Blanks

Travel blanks were not submitted for the first three sample events (i.e., March, May, or July). No travel blank samples were available onsite for these events. Travel blanks should be included in sample container shipments and come directly from the analytical laboratory and be stored in a cool place (e.g., refrigerator). Travel blanks were submitted in August and September; however, the September travel blank for Total Dissolved Solids (TDS) was deemed unreliable because the sample was out of date. For the August TB samples there were detectable concentrations of alkalinity for both bicarbonate and hydroxide and for total chromium. For September there no detectable concentrations for any analytes.

Travel blank results are provided in **Table A-2**.

De-ionized Blanks

The goal of these blanks is to test the quality of the DI water batch and variability in laboratory analytical methods. One DI blank with the full suite of analyses was submitted for each event.

Blanks were collected for the Meadowbank and Baker Lake CREMP and the Whale Tail Pit CREMP; results are reported in **Table A-2**.

DI blanks were submitted for all sample events with the exception of July and two were collected in May – one each by the Amaruq team and the Meadowbank team. There were no detectable concentrations for any analytes in March, May (Amaruq team), or September. In May (Meadowbank team) Silicate (as SiO_2) and total lead were detected at near the detection limits. Both of these analytes were also detected in the May equipment blank. Total chromium was detected in the August DI blank and was also detected in the travel blank and equipment blanks for the same event suggesting a potential laboratory error. DI blanks are submitted for dissolved metals but are not filtered in the field. As an added QA/QC measure for 2019, a DI blank was collected by filtering the sample through the syringe. This sample is in reality an equipment blank in that it assesses the filtration sampling equipment; however, it is not included in the equipment blank assessment because it does not follow standard equipment blank collection procedures. No analytes were detected in this additional QA/QC sample.

Equipment Blanks

Equipment blanks represent one of the best opportunities to assess not only the water sampling equipment but the skills of the sample teams. Collecting these samples requires careful planning and closely following the sample collection methods which are updated yearly but underwent a notable review in 2015 (CREMP: 2015 Plan Update; Azimuth, 2015b).

Several analytes were detected for at least one of the equipment blanks submitted in 2019 – results are provided in **Table A-2**. In general, results are very good for most events and are a general improvement over past CREMP years:

- No analytes were detected in the March equipment blank.
- Total lead was detected in the two equipment blank samples submitted in May (Meadowbank and Amaruq). The reported concentrations were slightly above the detection limit and were also detected in the Meadowbank team's DI blank sample. Silicate (as SiO_2) was also detected in both the DI Blank and the equipment blank for the Meadowbank samples. Samples that are detected in both the DI blanks and equipment blanks are likely reflective of contamination in the DI water or may be related to laboratory error.
- In July total ammonia (as N) was detected at concentrations greater than 10X DL. Total Kjeldahl Nitrogen (TKN) was also detected at approximately twice the detection limit. No other analytes were detected in July suggesting that the total ammonia and TKN results

may be somewhat anomalous; however, both analytes have been flagged for closer scrutiny in the interpretation of the July water quality results.

- Laboratory error is a potential explanation for the total chromium detected in August in the travel blank, DI blank, and equipment blank; however, the laboratory re-ran those samples to confirm the chromium detection. The reported concentrations for chromium in the August blanks were close to the detection limits and it is unlikely that there are implications for data interpretation but no explanation is available for why chromium was detected. In August total tin was also detected at just over the detection limit.
- Total ammonia was detected at 10X DL in September. TKN and total beryllium, calcium, lead, magnesium, manganese, and strontium and dissolved aluminum and lead were also detected in the equipment blank for September. Most of these analytes were just above the detection limit and are considered very unlikely to impact the interpretation of water quality data from that month. Total magnesium and strontium were detected at approximately 5X the DL. All analytes that are detected are flagged for closer scrutiny in the interpretation of the September water quality results.

The implications of possible cross-contamination on interpreting the water quality data from the same event is considered inconsequential for March, May (both samples), and August. Total ammonia in July and September was detected at 10X DL in the EBs suggesting that additional scrutiny of total ammonia in water samples collected in July and September is warranted.

Field Duplicates

Field duplicate analysis has been combined for the Meadowbank / Baker Lake and Whale Tail Pit study areas. The target frequency of duplicate sample collection is approximately 10% of the total number of samples collected. There 19 duplicates collected in 2019 between the Meadowbank Lakes, Baker Lake, and the Whale Tail Pit Lakes, corresponding to 10.9% of the total number of water samples (n=175)[1]. Across all CREMP study areas, four field duplicates were collected in each event (March, May, July, August, and September) with the exception of May when only three duplicates were analyzed because one duplicate sample was collected and submitted but was not processed in the laboratory (see sample handling summary above). The field duplicate assessment is provided in **Table A-3**.

[1] Three duplicate samples are included in this assessment that were collected by the CREMP team but paired with water samples for an alternative study – Lake D1 twice and Lake D5 once in May and July 2019.

As mentioned in **Section A.1.1**, the DQOs for field duplicates were revised in 2019 from a standard 50% RPD for all analytes used in 2018 to 1.5X the laboratory RPD for each analyte unless no RPD was available and a default 40% was used. The laboratory RPDs for water chemistry for most analytes is 20% and, as such, in 2019 the DQOs for field duplicate water samples were generally lowered from less than ±50% to less than ±30%. Despite the more conservative DQOs for 2019, there were only 28 RPDs that did not meet DQOs out of the 851 RPDs calculated[2] - approximately 3%. In 2019 there were 13 RPDs that did not meet DQOs out of a smaller sample size of 13 duplicates. Of the 28 RPDs in 2019, only seven were for concentrations >10X DL and two of those were for chlorophyll-a in August when plant growth is high and some variability might be expected. Those two samples were collected on very calm days when plant communities might not be very well mixed.

Table A-4 is provided below to show RPDs by analytes that did not meet DQOs for each month. The shaded cells indicate one or more RPDs when concentrations were >10X DL. Most of the RPDs that did not meet DQOs show no pattern except that total ammonia (as N), total aluminum, and total magnesium did not meet DQOs in three or more sampling events. Total aluminum concentrations were not above 10X DL. Total ammonia is measured as nitrogen and was most variable in May, July, and August. Some of the variability may be attributed to increased plant (algae) growth in these months. There was significant rainfall in June and July 2019 (AEM personal communications). The ammonia concentrations observed in 2019 in all study areas were variable between months and generally elevated. For example station INUG (a reference lake) exhibited a statistically significant increase in mean concentrations of ammonia over previous years.

Total manganese RPD results did not meet DQOs for all samples. One duplicate sample collected in May, July, and September had RPDs > 30%. Generally total manganese concentrations are low in the study area lakes and well below the trigger of around 0.3 mg/L. For perspective, the maximum concentration of manganese in the 2019 QA/QC dataset was 0.03310 mg/L. As such, the duplicate results do not indicate a level of variability that would influence the interpretation of manganese results.

The low percentage of field duplicate RPDs that do not meet DQOs suggests that sample collection and sample handling in 2019 have maintained a high standard. Furthermore, very few RPDs did not meet DQOs when analyte concentrations were > 10X DL and for at least some of

[2] Reporting an analtye does not necessarily calculate an RPD. See Section A.1.2 for a detailed description on how RPD values are not calculated when either the parent sample or the duplicate are below detection limits.

those instances the differences in analytes concentrations may be related to natural heterogeneity related to algal growth within the lakes.

Laboratory QC Samples

ALS provides a thorough account of their QA assessment in each COA that is issued[3]. These results are provided in **Table A-1**. The various components of the QA assessment are provided to help make informed decisions when interpreting the data. The QA program is comprised of four main elements:

Laboratory Duplicates – The laboratory DQO for most parameters is an RPD of less than 20%. There were no laboratory duplicates that did not meet DQOs for water chemistry in 2019.

Method blanks (MB) – The MB is a blank matrix sample that is taken through the entire analytical procedure to test variability in the analytical method and report any bias in the analysis. MB results are equal to the limit of reporting (or MDL as termed here). MB qualifiers are either:

- "B" – Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
- "MB-LOR" – Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank levels.

For most sample analysis there were no flags or very few flags (e.g., one or two analytes in one sample may have been flagged for B or MB-LOR) in the method blank results. These results meant that the laboratory may have increased MDLs for several samples. However, the limited number of cases with DQO flags for MB samples were reviewed; the results do not affect the interpretation of the 2019 water quality data.

Matrix Spike (MS) – MS recovery is periodically flagged in the QC assessment due to high concentrations of the analyte in the sample. These instances are rare, and are typically associated with parameters such as major cations (e.g., magnesium) or certain metals with detected results above the MDL (i.e., strontium). The limited number of cases with DQO flags for

[3] The COA may include data qualifiers that relate to the sample "batch". The sample batch may include samples that are from other projects and the qualifiers included in the COA may relate to those and not the CREMP samples. In general this does not impact the assessment of laboratory QA; however, in some instances, particularly for sediment laboratory duplicates, data qualifiers in the COA related to sample heterogeneity may not relate to CREMP samples. The Microsoft Excel® report that accompanies the COA includes tabs with detailed assessments of laboratory QA that are project specific and can be reviewed in conjunction with the COAs.

MS samples were reviewed; the results do not affect the interpretation of the 2019 water quality data.

Laboratory Control Samples (LCS) / Certified Reference Material (CRM) / Internal Reference Material (IRM) – reference material analysis met the ALS DQOs for all samples analyzed as part of the 2019 with the exception of one parameter (dissolved sulfur) in one March sample submission. The results do not affect the interpretation of the 2019 water quality data.

Unreliable Results

Part of the QA assessment involves comparing the paired sampling events collected at each station within a given event to confirm the data are representative of current conditions. If the paired samples vary drastically in their concentrations, and no plausible reason for different concentrations is identified, the result is flagged as unreliable. There was only one result that was flagged as anomalous in 2019 – the dissolved zinc concentrations reported for lake DS1 in March for sample DS1-30 was 0.0342 mg/L compared to 0.001 mg/L collected during the same event but at a different location within the lake. Dissolved zinc concentrations in lake DS1 are normally below the detection limit (DL=0.001 mg/L) or very close to the detection limit. The DS1-30 dissolved zinc data point was included in the analysis; however, the results were flagged in the main report as outlier. No other anomalous or unreliable data were flagged in 2019.

Water Chemistry QA/QC Summary

The field and laboratory QA/QC results for water chemistry for 2019 were very good and met or exceeded the results from the 2018 monitoring cycle:

Sample Integrity – There were fewer lost samples from breakage or mislabeling than in 2018. Sample temperatures received at the laboratory were variable depending on season and reflect the challenges with shipping from a remote mine site. Likewise hold time exceedances for parameters and analytes with short hold times are unavoidable but are not considered likely to impact data analysis and interpretation.

Blanks – Blank results for 2019 were generally better than for 2018 and indicated reliable sample handling and that cross-contamination related to sampling equipment is unlikely. Several analytes were detected in the September sample but very few or none were detected in other months.

The implication of possible cross-contamination on interpretation of the 2019 water quality data was evaluated by comparing the sample concentrations with the equipment blank results from the same event. Sample results in the complete datasets were given a cautionary flag using underlining (e.g., 0.001) to indicate that the measured concentration was less than 5-times the concentration detected in the equipment blank. Of the analytes detected in the equipment blanks, total ammonia, and TKN were routinely given a “cautionary” flag. Several other analytes were given cautionary flags in September including lead, manganese, and dissolved aluminum. Total chromium received a cautionary flag for some sample locations in August; however, the blank results for chromium in August are potentially unreliable because chromium was detected in all three blanks including the travel blank which was not opened onsite. In May at station SP-122 the silicate (as SiO_2) results exceeded the trigger and were also given a cautionary flag. In 2019 the total ammonia and TKN results for July collected at TPN-122 exceeded the trigger results and were given a cautionary flag because both analytes were detected in the equipment blank for that month. Also, in July, the TKN results at all three Baker Lake stations exceeded the trigger and were given a cautionary flag. There were several analytes for the samples from the Whale Tail study area lakes that both exceeded their respective trigger and were given a cautionary flag. TKN exceeded the trigger and were given cautionary flags for several samples in the Whale Tail study area lakes. Ammonia did not meet the trigger or threshold in one September sample in MAM. Ortho Phosphate also exceeded the trigger in several WTS samples and received a cautionary flag.

Despite the cautionary flags applied in 2019, potential cross-contamination is considered unlikely to bias interpretation of the 2019 water quality analysis.

Field Duplicates – The 2019 field duplicate results were very good with only 3% of the calculated RPDs not meeting DQOs.

Laboratory QC Assessment –the laboratory QC assessment completed by ALS indicated the 2019 water quality data were typically within the established DQOs. In the few instances where a DQO was exceeded, the lab concluded the results were reliable and fit for use in the water quality assessment.

Outliers – one measurement of dissolved zinc at Lake DS1 was flagged as an obvious outlier in March based on visual examination of the result compared to the paired sample in Lake DS1.

A.2.3 Sediment Chemistry

Sample integrity and hold time exceedances for sediments are reported in **Section A.2.1**.

Filter Swipes

Filter swipes were taken on various pieces of the sampling gear to quantify potential metals cross-contamination for grab and core samples. Ashless filters were swiped on the various sampling gear including the stainless steel spoons and bowls, the core ring, plastic spatulas used for core slicing, and the Petite Ponar and analyzed for metals (µg/filter). Metal parameters that are detected on the blank filter swipe can confound the interpretation of the swipe results. Whatman™ glass microfiber filters (47 mm) were used as swipe material in 2017. The filters are made entirely of borosilicate glass and are touted as “the industry standard for high purity filtration”. Copper, iron, magnesium, sodium, and zinc on the filter paper were detected on the blank filter paper as well as the equipment swipes of the core sampling equipment and grab sampling equipment. A new filter swipe product was used for 2018 and these blank results are an improvement from the results in 2017. No additional changes were made in 2019 and one extra swipe was submitted clean to the laboratory to assess the swipe itself. Copper and iron were detected in the blank swipe but at <10X DL. Zinc was detected at >10X DL in the blank swipe and at the highest concentrations of any swipe results from 2019 (see **Table A-5**). As such swipe results for zinc from 2019 are not included in the review below.

There were four grab sample equipment swipes (Swipes 1 – 4 in **Table A-5**) and one coring sample equipment swipe collected in August 2019. Several analytes were detected on swipes for both coring and grab equipment. These included aluminum, barium, chromium, copper, iron, manganese, nickel, tin, and titanium for grab equipment and copper, iron, and manganese for coring equipment. The majority were <10X DL. Chromium was detected in all grab swipes including two that were >10X DL. Chromium was not detected in the blank swipe or core swipe. Iron was detected in all swipes including the blank swipe although both the coring equipment and blank swipe concentrations were relatively low. The four grab equipment swipe results for iron were >10X DL and ranged between 105 and 306 µg. When comparing the amount of each metal on the filters to the concentration in the sediment core samples, the potential percent contribution from the swipe was less than 0.01% for both metals (chromium and iron). In all cases the concentrations corresponded to well below 0.01% of the concentrations present in the sediment grabs. Despite the confounding effects of metals in the blank swipes, the QA results from 2019 show the potential for cross-contamination to effect the sediment chemistry results is negligible.

Field Duplicates

Ten grab sample field duplicates were collected in 2019 for general chemistry (moisture, pH, particle size, and metals) and two composite hydrocarbon/PAH duplicates. The coring sampling program for 2019 was limited to one round of coring at Third Portage Lake East Basin (TPE) and, as such, only one core field duplicate was collected. The field duplicates for grab samples are provided in **Table A-6** (metals) and **Table A-8** (PAHs), and the core sample in **Table A-7**. The DQOs for sediment samples were adjusted for 2019 as outlined in **Section A.1.2**. The new DQOs for sediment changed the RPD limits to 1.5 times the laboratory RPDs unless no RPD was provided in which case a default ±40% was applied.

The RPD screening identified only one RPD that did not meet the DQOs for metals in sediment from grab samples – the RPD for Sulphur at Wally Lake (Rep 1 and DUP 6) was 58.8%. In general, the RPDs for metals in grab samples was very good in 2019. There was one RPD greater than the DQOs for metals in sediment from core sampling – the RPD for manganese was -92.5%. For grab samples RPDs are also calculated on particle size where a default 40% DQO was applied. There was only one RPD that exceeded 40% - the RPD for % clay was -71.7% at LK-5[4] (Rep 1 and DUP 10). There were no RPDs that did not meet the DQOs for hydrocarbons/PAH composite samples. Overall the low number of RPDs that did not meet DQOs in 2019 is an improvement over the 2018 results and indicates a high level of replicability in sample collection and highlights the careful sample handling.

Laboratory QC Samples

Laboratory QC for sediment samples includes laboratory duplicates, method blanks, matrix spikes, and reference material. The summary for the laboratory QC is provided in **Table A-1**. There was one laboratory duplicate that did not meet ALS DQOs – the RPD of a duplicate of the sample “BES-3” was 30% for bismuth which is also the ALS DQO. This duplicate did not meet the DQO due to sample heterogeneity. There was one method blank for iron that did not meet ALS DQOs. There were also several qualifiers for certified reference material where the DQOs were marginally exceeded (by < 10% absolute) for <10% of analytes in a Multi-Element Scan/Multi-Parameter Scan though these results are considered acceptable CCME. In general the laboratory QC results show a high degree of precision for the laboratory analysis and laboratory processing and analytical methods were consistent between sub-samples.

Sediment Chemistry QA/QC Summary

The field and laboratory QA/QC results for sediment chemistry for 2019 were very good and met or exceeded the results from the 2018 sample year:

There were no sample integrity concerns in 2019.

Filter swipe results were on par with 2018 and although small concentrations of several analytes were detected in one or more filters, the concentrations represent a very low portion of the overall sediment sample size. There are no QA/QC concerns related to filter swipes in 2019.

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[4] LK-1 is the sample ID for Lake D1 which is included in the QA/QC data set though this lake is sampled for another program by the same crew and at the same time as the CREMP.

Field duplicate results were better in 2019 than 2018 and there were very few instances of field duplicates not meeting DQOs. Field duplicate results indicate good field collection methods and a high degree of replicability in sampling.

One laboratory duplicate for bismuth did not meet the DQOs due to sample heterogeneity; however, the results show a high degree of precision for the laboratory analysis and laboratory processing and analytical methods were consistent between sub-samples.

A.2.4 Phytoplankton

The phytoplankton QA/QC assessment for 2019 is combined for the Meadowbank and Baker Lake study areas and the Whale Tail Pit study area. Four field duplicate samples were collected for each sampling event with the exception of March when only three were collected. The field duplicates and laboratory QC duplicates were analyzed for RPDs for total density and total biomass between the original sample and the duplicate. RPD values were also calculated for the major taxa groups, but these results are not relied on for QC purposes because of the tendency for small differences in abundance/biomass between the original and the duplicate to cause large differences in the RPD. Thus, we evaluate the quality of these data based on total density and total biomass both for field and laboratory duplicates.

Results of the RPD analysis for all these parameters are presented in **Table A-9** (field) and **Table A-10** (laboratory) and are discussed below:

Field Duplicates

The DQOs for phytoplankton field duplicates are ±50% RPD. There was only one RPD that did not meet the DQOs – the RPD for total biomass at TPE-123 was 80% in May. This is a slight improvement over 2018 when two RPDs did not meet the DQOs for phytoplankton field duplicates. All other RPDs in 2019 for total density and total biomass were below 50% indicating very good replicability in sample collection.

Laboratory Duplicates

The DQOs for laboratory duplicates for phytoplankton are ±25% RPD. In 2019 no laboratory duplicates were above ±25% for total biomass or density.

Phytoplankton QA/QC Summary

Phytoplankton QA/QC for both field and laboratory components in 2019 was excellent and overall results of the QA/QC analysis were slightly better than in 2018. This indicates very good replicability and sample handling in the field and in the laboratory.

A.2.5 Benthic Invertebrates

No field duplicate samples are collected for benthos. Laboratory replicate counts were performed on approximately 10% of all benthic samples. Replicate samples were chosen at random and processed at different times from the original analysis to reduce bias. Percent recovery was above 95% in all re-sorted samples, with an average percent recovery of approximately 98.1% (**Table A-11**). These results suggest that the majority of individual organisms are recovered by the taxonomist during enumeration. As in previous years, the reference collection of benthic taxa for this project has been maintained.

Benthos QA/QC Summary

There were no QA/QC concerns for benthic invertebrates in 2019.

Sediment Toxicity Tests

Results of the QA/QC assessment are:

- Temperature, dissolved oxygen, conductivity, and pH were within the range of acceptability specified in the Environment Canada test protocols. Conductivity measured in the overlying water of the *H. azteca* control sediment treatment was between 400 and 500 µS/cm. By comparison, the range in conductivity reported for TPE was approximately 330 to 370 µS/cm.
- Total ammonia concentrations at the start and end of the tests were below concentrations associated with effects to either species. Unionized ammonia measured in the reference sediment (i.e., lab control) were below 0.2 mg/L throughout the *H. azteca* test; no overlying water changes were required.
- Reference toxicant tests for *H. azteca* (NaCl) and *C. dilutus* (KCl) were within the historical range, verifying that the batch of organisms were appropriately sensitive for the sediment toxicity tests.

The sediment toxicity test results passed the QA/QC assessment for data acceptability.

A.3 REFERENCES

Azimuth. 2015. Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. November, 2015.

Canadian Council of Ministers of the Environment. 2016. Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment. PN 1551.

TABLES

Table A-1. Laboratory QA/QC summary for water and sediment, all CREMP study areas, 2019.

Event	Lab ID	Parameters Measured	Date Sampled	Date Received	Sample Integrity Observations	Temperature (°C)	Hold-time Exceedances	Data Qualifiers[1]			Laboratory QC Summary									
											Detection Limits		Laboratory Duplicates		Method Blanks		Matrix Spike		LCS / CRM	
								Sample ID	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier
March	L2241655	All parameters	Mar 3 and 4	8-Mar	Discrepancy between CoC and samples received	5	Turbidity, pH, Nitrate, Nitrite, Diss O-PO_4	A20-32	CNP: Tot & Diss CN HTTP: TOC & DOC	CNP HTP	None	-	None	-	None	-	Diss: Ba, Ca, Mg, Sr	MS-B	None	-
	L2244752	All parameters	Mar 7 and 9	15-Mar	None	5	Turbidity, pH, TSS, TDS, Nitrate, Nitrite, Diss O-PO_4, Chl-a	None	-	-	None	-	None	-	None	-	Tot: Hg Diss: Ba, Ca, Mg, Mn, Na, Sr, S SiO_2	MS-B	None	-
	L2247638	All parameters	Mar 7 to 17	21-Mar	None	9	Turbidity, pH, TSS, TDS, Nitrate, Nitrite, Diss O-PO_4, Chl-a	DS1-30	Diss Zn	DTC	None	-	None	-	None	-	Tot: TOC, Mg Diss: As, Ba, B, Ca, Mg, Mo, K, Si, Na, Sr, S SiO_2	MS-B	None	-
	L2247639	All parameters	Mar 14 to 17	21-Mar	None	9	Turbidity, pH, Nitrate, Nitrite, Diss O-PO_4	None	-	-	None	-	None	-	None	-	Tot: Mg Diss: Mg	MS-B	None	-
	L2254150	All parameters	Mar 18 to Apr 1	5-Apr	None	11, 8, 9	Turbidity, pH, TSS, TDS, $CaCO_3$, Nitrate, Nitrite, Diss O-PO_4, Cyanide	DLB: SP-120 DTC: TE-97 HTC: EB-1	DLB: Tot Te DTC: Diss Cu HTC: $CaCO_3$	DLB DTC HTC	None	-	None	-	Total Te	MB-LOR	DOC, TOC, Diss Mg	MS-B	Diss S	MES
May	L2274447	All parameters	May 10 to 11	16-May	None	17, 16, 16, 17	Turbidity, pH, Nitrite	DLCI: MAM-39 RRV: MAY-EB	DLCI: DMA RRV: Tot Pb	DLCI RRV	None	-	None	-	None	-	DOC, TOC Diss: Ba, Ca, Mg, Na, Sr, U, Al Tot: Al, Ba, Ca, Mg, Sr N, SiO_2, SO_4	MS-B	None	-
	L2274449	All parameters	May 6 to 12	16-May	MAY DUP-2 bottles received but not on CoC. Samples not analyzed.	17, 16, 16, 17	Turbidity, pH	DLM: TPN-123 DTC: MAY DUP-1 RRV: TPN-123, EB-1	DLM: SiO_2 DTC: Diss Fe RRV: Diss & Tot P, Tot Ba	DLM DTC RRV	None	-	None	-	Total Te	B	DOC Diss: Mg, Mn, Na, Sr Tot: Ba, Ca, Mg, Se, Na, Sr, S	MS-B	None	-
	L2275188	All parameters	6-May	17-May	None	15	Diss O, TDS, Nitrate, Nitrite, TSS, Turbidity, pH	None	-	-	None	-	None	-	None	-	Diss: Ba, Ca, Fe, Mg, Mn, K, Na, Sr Tot: Ca, Mg, Sr	MS-B	None	-
	L2275597	All parameters	13-May	17-May	None	15	Diss O, Nitrate, Nitrite, Turbidity, pH	WTS-39 WTS-40	DMA Diss: Cr	DLCI DTC	None	-	None	-	None	-	TOC Diss: Ba, B, Ca, Mg, Mn, Na, Sr Tot: Ca, Mg, Sr	MS-B	None	-

Table A-1. Laboratory QA/QC summary for water and sediment, all CREMP study areas, 2019.

Event	Lab ID	Parameters Measured	Date Sampled	Date Received	Sample Integrity Observations	Temperature (°C)	Hold-time Exceedances	Data Qualifiers[1]			Laboratory QC Summary									
											Detection Limits		Laboratory Duplicates		Method Blanks		Matrix Spike		LCS / CRM	
								Sample ID	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier
May (cont.)	L2276489	Chlorophyll a	May 6 and 13	17-May	None	11	None	None	-	-	None	-	None	-	None	-	None	-	None	-
	L2276490	Chlorophyll a	May 10 and 11	17-May	None	11	None	None	-	-	None	-	None	-	None	-	None	-	None	-
July	L2307977	All parameters	Jul 5 and 7	11-Jul	None	21	Diss O, Nitrate, Nitrite, Turbidity, pH	None	-	-	None	-	None	-	None	-	Diss: P Tot: Mg, P	MS-B	None	-
	L2312327	All parameters	10-Jul	18-Jul	SP-124 marked as total but also as preserved and filtered. Re-labelled as dissolved. Other nutrients bottle appeared to be total.	19	Diss O, TDS, Nitrate, Nitrite, pH, TSS, Turbidity	SP-124	Diss: P	RRV	None	-	None	-	None	-	Diss: Ca, Mg, Sr, P	MS-B	None	-
	L2312432	All parameters	Jul 9 to 14	18-Jul	Samples listed on CoC but not received. A76-36 Chl-a sample received but not on CoC. Held for analysis - later analyzed.	20, 21	Diss O, Nitrate, Nitrite, PH, TDS, TSS, Turbidity	DLB: DS1-33&34, LK1-11 DTC: LK8-12 HTD: LK1-11	DLB: Tot As DTC: Diss Pb HTD: DOC	DLB DTC HTD	DLB: Tot As (DS1-33, DS1-34, LK1-11)	DLB	None	-	B: Nitrate MB-LOR: As	B MB-LOR	DOC, TOC, TKN Diss: Ba, Ca, Mg, Mn, Na, Sr	MS-B	None	-
	L2314384	All parameters	Jul 13 and 16	22-Jul	CoC and label discrepancy. Chl-a samples received but not on CoC. Held for analysis - later analyzed.	23	Diss O, Nitrate, Nitrite, PH, TDS, TSS, Turbidity	None	-	-	None	-	None	-	None	-	DOC Diss: Ba, Ca, Mg, Mn, Mo, K, Na, Sr, S Tot: Ba, Ca, Mg, Na, Sr	MS-B	None	-
	L2318863	All parameters (only chlorophyll a for most samples)	Jul 7 to 24	29-Jul	Diss and total metals not labelled - assigned to LK5-11 by process of elimination.	23	Chlorophyll a, Diss O, Nitrate, Nitrite, pH, Turbidity	LK5-11	DOC, TOC	RRV	None	-	None	-	None	-	DOC, TOC, Tot: Al, Ba, Ca, Cu, Fe, Mg, Mn, Sr, Ti	MS-B	None	-
	L2322210	All parameters	Jul 28 and 29	2-Aug	None	20	Diss O, Nitrate, Nitrite, Total Cn, Turbidity, pH	None	-	-	None	-	None	-	None	-	DOC	MS-B	None	-
	L2324036	All parameters	23-Jul	7-Aug	None	22	Diss O, Alkalinity, CN, TDS, Tot Cn, Nitrate, Nitrite, TSS, Turbidity, pH	DLM: BPJ-61 RRV: EB-1	DLM: SiO_2 RRV: TKN	DLM RRV	None	-	None	-	None	-	Diss: Ba, Ca, Mg, Mn, Sr, S Tot: Mg, Na, Sr, P	MS-B	None	-
August	L2331829	All parameters	Aug 11 to 14	20-Aug	One container broken in transit. Discrepancy between CoC and Label (amended)	19.4, 19.3, 18.4	Diss O, TDS, Nitrate, Nitrite, pH, TSS, Turbidity	CNP: SP 126 and SP 127 HTD: DUP-1 and DUP-2	CNP: Tot and Diss CN HTD: Nitrate	CNP HTD	None	-	None	-	B: Nitrate MB-LOR: Diss Cu	B MB-LOR	Diss: Ba, Ca, Li, Mg, Ni, K, Se, Na, Sr, S, U Tot: CN, Ca, Mg, Sr	MS-B	None	-
	L2335617	All parameters	Aug 15 to 20	26-Aug	DOC sample for A76-37 was broken in transit. Diss Metals bottle for A76-37 had very low volume.	18	Diss O, TDS, Nitrate, Nitrite, pH, TSS, Turbidity	DTMF: DS1-35 HTC: TB RRV: DI-1, TB, EB	DTMF: Diss Pb HTC: RRV: Tot Cr	DTMF HTC RRV	None	-	None	-	B: Nitrite MB-LOR: Diss Se	B MB-LOR	DOC, Diss O Diss: Ba, Ca, Mg, Na, Sr, S Tot: Al, Ba, Ca, Cu, Fe, Pb, Mg, Mn, Si, Sr, S, Ti	MS-B	None	-

Table A-1. Laboratory QA/QC summary for water and sediment, all CREMP study areas, 2019.

Event	Lab ID	Parameters Measured	Date Sampled	Date Received	Sample Integrity Observations	Temperature (°C)	Hold-time Exceedances	Data Qualifiers[1]			Laboratory QC Summary									
											Detection Limits		Laboratory Duplicates		Method Blanks		Matrix Spike		LCS / CRM	
								Sample ID	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier
August (cont.)	L2333924	Sediment grabs and cores	Aug 9 to 14	22-Aug	None	20	Moisture, methylmercury, EPH, PAH	SP-1,2,3,4,5 and TPE-1,2,3,4,5 and TPN-2 and WAL-1,2,3,4,5 and PDL-1,2,4,5 and DUP-2,6	Grain size - limited sample available for PSA.	PSAL	PAH (variable), Mineral Oil and Grease, Hydrocarbons (Variable)	DLCI DLHM DLQ	DUP-H, J: Bi	DUP-H, J	Iron	B	None	-	LCS: Sb, V, Mg, K CRM: B, Na	LCS-MES CRM-MES
	L2338125	Sediment grabs	Aug 15 to 19	29-Aug	None	21	Moisture, methylmercury, EPH, PAH	All stations	Grain size - limited sample available for PSA.	PSAL	PAH (variable), Mineral Oil and Grease, Hydrocarbons (Variable)	DLCI DLHM DLQ	None	-	None	-	None	-	Chrysene	LCS-ND
September	L2348992	All parameters except Chlorophyll a	Sep 7 to 9	17-Sep	None	16	TDS, TSS, turbidity, pH	None	-	-	None	-	None	-	None	-	Ca, Mn, SiO_2	MS-B	None	-
	L2350681	All parameters	Sep 7 to 13	19-Sep	Travel Blank TDS sample out of date	15	Diss O, TDS, Nitrate, Nitrite, TSS, Turbidity, pH	Sept EB	Diss: Al, Pb Tot: N, As, Cd, Pb, Mg, Mn, Sr	RRV	Tot: Ti, Tot Hg	DLM	None	-	Tot: Cyanide, Diss: Na	B	TOC, Diss: Ba, Ca, Mg, Mn, K, Si, Na, Sr, S, U	MS-B	None	-
	L2354972	All parameters	Sep 10 to 18	26-Sep	Samples listed on CoC but not received: No nutrients containers received for a number of samples - taken from general bottles for testing.	14	Free Cyanide, TDS, Total Cyanide, Nitrate, Nitrite, TSS, Turbidity, pH	DTMF: BAP-66 DTSE: PDL-82, BBD-65, BBD-66	Diss: Mn, Se	DTMF DTSE	Total Cr	DLB	None	-	Diss: Ni Tot: Cr	MB-LOR	TOC, Diss: As, Ba, Ca, Mg, Mn, K, Na, Sr, S, U	MS-B	None	-

Notes:

[1] Data qualifiers referring to Method Blanks, Matrix Spikes, and LCS/CRM are not flagged here. Separate columns are used for these qualifiers.
Conventionals = analytes that are not preserved
Diss O-PO_4 = dissolved orthophosphate
LCS / CRM = laboratory control sample / certified reference material
TDS = total dissolved solids
TDP = total dissolved phosphorus
TSS = total suspended solids

Data and Laboratory QC qualifiers:
B = Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
CNP = Cyanide test sample appears to have been preserved, but pH was <10 at time of testing. Results may be biased low, particularly for Free CN species.
DLA = Detection Limit adjusted for required dilution.
DLB = Detection Limit Raised: Analyte detected at comparable level in method blank.
DLDS = Detection Limit Raised: Dilution required due to high dissolved solids / electrical conductivity.
DLHM = Detection Limit Adjusted: Sample has high moisture content.
DTMF = Dissolved concentration exceeds total for field-filtered samples. Metallic contaminants may have been introduced to dissolved sample during field filtration.

Data and Laboratory QC qualifiers (continued):
DUP-H = Duplicate results outside ALS DQO, due to sample heterogeneity.
HTD = Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
HTP = Sample preparation or preservation hold time was exceeded.
MB-LOR = Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MES = Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B = Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
n/a = laboratory QC program not included as part of the analyses.

Table A-2. Laboratory detection limits and blanks (travel, de-ionized, and equipment) for all CREMP study areas, 2019.

Month	March			May			May			July		August					September			
Collected by	Agnico			Agnico			Agnico			Agnico		Azimuth					Agnico			
Collected at	Meadowbank			Amaruq			Meadowbank			Meadowbank		Not applicable					Amaruq			
Analyte	DL	DI Blank	Equip. Blank	DL	DI Blank	Equip. Blank	DL	DI Blank	Equip. Blank	DL	Equip. Blank	DL	Travel Blank	DI Blank	Equip. Blank	DI Blank-2*	DL	Travel Blank	DI Blank	Equip. Blank
Physical Tests																				
Conductivity (µS/cm)	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	<2.0	<2.0
Hardness (mg/L)	0.50	<0.50	<0.50	0.50	<0.50	<0.50	0.50	<0.50	<0.50	0.50	<0.50	0.50	<0.50	<0.50	<0.50		0.50	<0.50	<0.50	<0.50
pH (Laboratory)	0.10	5.2	5.2	0.10	5.4	5.4	0.10	5.5	5.4	0.10	5.5	0.10	5.5	5.5	5.6		0.10	5.4	5.4	5.5
Total Suspended Solids (mg/L)	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 Dissolved Solids (mg/L)	3.0	<3.0	<3.0	3.0	<3.0	<3.0	3.0	<3.0	<3.0	3.0	<3.0	3.0		<3.0	<3.0		3.0	<3.0	<3.0	<3.0
Turbidity (NTU)	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	<0.10		0.10	<0.10	**0.18**	<0.10
Anions and Nutrients (mg/L)																				
Alkalinity, Bicarbonate	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	<1.0	<1.0	<1.0
Alkalinity, Carbonate	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
Alkalinity, Hydroxide	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
Alkalinity, Total	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	<1.0	<1.0	<1.0
Ammonia, Total (as N)	0.0050	<0.0050	<0.0050	0.0050	<0.0050	<0.0050	0.0050	<0.0050	<0.0050	0.0050	0.10	0.0050	<0.0050	<0.0050	<0.0050		0.0050		<0.0050	0.15
Bromide (Br)	0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<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)	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	<0.10		0.10	<0.10	<0.10	<0.10
Fluoride (F)	0.020	<0.020	<0.020	0.020	<0.020	<0.020	0.020	<0.020	<0.020	0.020	<0.020	0.020	<0.020	<0.020	<0.020		0.020	<0.020	<0.020	<0.020
Nitrate (as N)	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	<0.0050		0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	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	<0.0010		0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	**0.12**	0.050	<0.050	<0.050	<0.050		0.050		<0.050	**0.18**
Orthophosphate-Dissolved (as P)	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	<0.0010		0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	0.0020	<0.0020	<0.0020	0.0020	<0.0020	<0.0020	0.0020	<0.0020	<0.0020	0.0020	<0.0020	0.0020	<0.0020	<0.0020	<0.0020		0.0020		<0.0020	<0.0020
Phosphorus (P)-Total	0.0020	<0.0020	<0.0020	0.0020	<0.0020	<0.0020	0.0020	<0.0020	<0.0020	0.0020	<0.0020	0.0020	<0.0020	<0.0020	<0.0020		0.0020		<0.0020	<0.0020
Silicate (as SiO_2)	0.50	<0.50	<0.50	0.50	<0.50	<0.50	0.50	**0.96**	**0.60**	0.50	<0.50	0.50	<0.50	<0.50	<0.50		0.50	<0.50	<0.50	<0.50
Sulfate (SO_4)	0.30	<0.30	<0.30	0.30	<0.30	<0.30	0.30	<0.30	<0.30	0.30	<0.30	0.30	<0.30	<0.30	<0.30		0.30	<0.30	<0.30	<0.30
Cyanides (mg/L)																				
Total Cyanide	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	<0.0010		0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	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	<0.0010		0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)																				
Dissolved Organic Carbon	0.50	<0.50		0.50	<0.50	<0.50	0.50	<0.50	<0.50	0.50	<0.50	0.50		<0.50	<0.50		0.50		<0.50	<0.50
Total Organic Carbon	0.50	<0.50	<0.50	0.50	<0.50	<0.50	0.50	<0.50	<0.50	0.50	<0.50	0.50	<0.50	<0.50	<0.50		0.50		<0.50	<0.50

Table A-2. Laboratory detection limits and blanks (travel, de-ionized, and equipment) for all CREMP study areas, 2019.

Month	March			May			May			July		August					September			
Collected by	Agnico			Agnico			Agnico			Agnico		Azimuth					Agnico			
Collected at	Meadowbank			Amaruq			Meadowbank			Meadowbank		Not applicable					Amaruq			
Analyte	DL	DI Blank	Equip. Blank	DL	DI Blank	Equip. Blank	DL	DI Blank	Equip. Blank	DL	Equip. Blank	DL	Travel Blank	DI Blank	Equip. Blank	DI Blank-2*	DL	Travel Blank	DI Blank	Equip. Blank
Total Metals (mg/L)																				
Aluminum	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	<0.0030		0.0030	<0.0030	<0.0030	<0.0030
Antimony	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	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	0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	0.00010	<0.00010	**0.00011**	0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010		0.00010	<0.00010	<0.00010	**0.00034**
Beryllium	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
Bismuth	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	0.00005	<0.000050	0.00005	<0.000050	<0.000050	<0.000050		0.00005	<0.000050	<0.000050	<0.000050
Boron	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	0.00001	<0.0000050	<0.0000050	0.00001	<0.0000050	<0.0000050	0.00001	<0.0000050	<0.0000050	0.00001	<0.0000050	0.00001	<0.0000050	<0.0000050	<0.0000050		0.00001	<0.0000050	<0.0000050	<0.0000050
Calcium	0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	0.050	<0.050	<0.050	<0.050		0.050	<0.050	<0.050	**0.19**
Chromium	0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	0.00010	<0.00010	0.00010	**0.00019**	**0.00014**	**0.00025**		0.00010	<0.00010	<0.00010	<0.00010
Cobalt	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	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
Iron	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
Lead	0.00005	<0.000050	<0.000050	0.00005	<0.000050	**0.00006**	0.00005	**0.00005**	**0.00005**	0.00005	<0.000050	0.00005	<0.000050	<0.000050	<0.000050		0.00005	<0.000050	<0.000050	**0.00014**
Lithium	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	<0.0010		0.0010	<0.0010	<0.0010	<0.0010
Magnesium	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	<0.0050		0.0050	<0.0050	<0.0050	**0.029**
Manganese	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	**0.00023**
Mercury	0.00001	<0.0000050	<0.0000050	0.00001	<0.0000050	<0.0000050	0.00001	<0.0000050	<0.0000050	0.00001	<0.0000050	0.00001	<0.0000050	<0.0000050	<0.0000050		0.00001	<0.000050	<0.0000050	<0.0000050
Molybdenum	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	0.00005	<0.000050	0.00005	<0.000050	<0.000050	<0.000050		0.00005	<0.000050	<0.000050	<0.000050
Nickel	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
Phosphorus	0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	0.050	<0.050	<0.050	<0.050		0.050	<0.050	<0.050	<0.050
Potassium	0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	0.050	<0.050	<0.050	<0.050		0.050	<0.050	<0.050	<0.050
Selenium	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	0.00005	<0.000050	0.00005	<0.000050	<0.000050	<0.000050		0.00005	<0.000050	<0.000050	<0.000050
Silicon	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	<0.10		0.10	<0.10	<0.10	<0.10
Silver	0.00001	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	0.00001	<0.000010	0.00001	<0.000010	<0.000010	<0.000010		0.00001	<0.000010	<0.000010	<0.000010
Sodium	0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	0.050	<0.050	<0.050	<0.050		0.050	<0.050	<0.050	<0.050
Strontium	0.00020	<0.00020	<0.00020	0.00020	<0.00020	<0.00020	0.00020	<0.00020	<0.00020	0.00020	<0.00020	0.00020	<0.00020	<0.00020	<0.00020		0.00020	<0.00020	<0.00020	**0.00096**
Sulfur	0.50	<0.50	<0.50	0.50	<0.50	<0.50	0.50	<0.50	<0.50	0.50	<0.50	0.50	<0.50	<0.50	<0.50		0.50	<0.50	<0.50	<0.50
Thallium	0.00001	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	0.00001	<0.000010	0.00001	<0.000010	<0.000010	<0.000010		0.00001	<0.000010	<0.000010	<0.000010
Tin	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	0.00030	<0.00030	<0.00030	0.00030	<0.00030	<0.00030	0.00030	<0.00030	<0.00030	0.00030	<0.00030	0.00030	<0.00030	<0.00030	<0.00030		0.00030	<0.00030	<0.00030	<0.00030
Uranium	0.00001	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	0.00001	<0.000010	0.00001	<0.000010	<0.000010	<0.000010		0.00001	<0.000010	<0.000010	<0.000010
Vanadium	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
Zinc	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	<0.0030		0.0030	<0.0030	<0.0030	<0.0030

Table A-2. Laboratory detection limits and blanks (travel, de-ionized, and equipment) for all CREMP study areas, 2019.

Month	March			May			May			July		August					September			
Collected by	Agnico			Agnico			Agnico			Agnico		Azimuth					Agnico			
Collected at	Meadowbank			Amaruq			Meadowbank			Meadowbank		Not applicable					Amaruq			
Analyte	DL	DI Blank	Equip. Blank	DL	DI Blank	Equip. Blank	DL	DI Blank	Equip. Blank	DL	Equip. Blank	DL	Travel Blank	DI Blank	Equip. Blank	DI Blank-2*	DL	Travel Blank	DI Blank	Equip. Blank
Dissolved Metals (mg/L)																				
Aluminum	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	0.0010	<0.0010	<0.0010	**0.0023**
Antimony	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	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	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
Beryllium	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
Bismuth	0.00005	<0.000050		0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	0.00005	<0.000050	0.00005		<0.000050	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	<0.000050
Boron	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	0.00001	<0.0000050		0.00001	<0.0000050	<0.0000050	0.00001	<0.0000050	<0.0000050	0.00001	<0.0000050	0.00001		<0.0000050	<0.0000050	<0.0000050	0.00001	<0.0000050	<0.0000050	<0.0000050
Calcium	0.050	<0.050		0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	0.050		<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050
Cesium	0.00001	<0.000010		0.00001	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	0.00001	<0.000010	0.00001		<0.000010	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	<0.000010
Chromium	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
Cobalt	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	0.00020	<0.00020		0.00020	<0.00020	<0.00020	0.00020	<0.00020	<0.00020	0.00020	<0.00020	0.00020		<0.00020	<0.00020	<0.00020	0.00020	<0.00020	<0.00020	<0.00020
Iron	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
Lead	0.00005	<0.000050		0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	0.00005	<0.000050	0.00005		<0.000050	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	**0.00006**
Lithium	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	0.0010	<0.0010	<0.0010	<0.0010
Magnesium	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	0.0050	<0.0050	<0.0050	<0.0050
Manganese	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
Mercury	0.00001	<0.0000050		0.00001	<0.0000050	<0.0000050	0.00001	<0.0000050	<0.0000050	0.00001	<0.0000050	0.00001		<0.0000050	<0.0000050	<0.0000050	0.00001	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.00005	<0.000050		0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	0.00005	<0.000050	0.00005		<0.000050	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	<0.000050
Nickel	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
Phosphorus	0.050	<0.050		0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	0.050		<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050
Potassium	0.050	<0.050		0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	0.050		<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050
Selenium	0.00005	<0.000050		0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	0.00005	<0.000050	0.00005		<0.000050	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	<0.000050
Silicon	0.050	<0.050		0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	0.050		<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050
Silver	0.00001	<0.000010		0.00001	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	0.00001	<0.000010	0.00001		<0.000010	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	<0.000010
Sodium	0.050	<0.050		0.050	<0.050	<0.050	0.050	<0.050	<0.050	0.050	<0.050	0.050		<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050
Strontium	0.00020	<0.00020		0.00020	<0.00020	<0.00020	0.00020	<0.00020	<0.00020	0.00020	<0.00020	0.00020		<0.00020	<0.00020	<0.00020	0.00020	<0.00020	<0.00020	<0.00020
Sulfur	0.50	<0.50		0.50	<0.50	<0.50	0.50	<0.50	<0.50	0.50	<0.50	0.50		<0.50	<0.50	<0.50	0.50	<0.50	<0.50	<0.50
Thallium	0.00001	<0.000010		0.00001	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	0.00001	<0.000010	0.00001		<0.000010	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	<0.000010
Tin	0.00010	<0.00010		0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	0.00010	<0.00010	0.00010		<0.00010	**0.00017**	<0.00010	0.00010	<0.00010	<0.00010	<0.00010
Titanium	0.00030	<0.00030		0.00030	<0.00030	<0.00030	0.00030	<0.00030	<0.00030	0.00030	<0.00030	0.00030		<0.00030	<0.00030	<0.00030	0.00030	<0.00030	<0.00030	<0.00030
Tungsten	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
Uranium	0.00001	<0.000010		0.00001	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	0.00001	<0.000010	0.00001		<0.000010	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	<0.000010
Vanadium	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
Zinc	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	0.0010	<0.0010	<0.0010	<0.0010

Notes:

* DI Blank-2 was collected in August to assess field filtering equipment (see description in **Section 2.2** of **Appendix A**).

Bolded Equipment or Travel Blank concentration exceeds laboratory DLs but < 10x DL.

Shaded Equipment or Travel Blank concentration is > 10x DL.

Italicized numbers are below detection limits.

"-" analyte not measured

Table A-3. Field QA/QC summary for water quality, all CREMP study areas, 2019.

Month				March											
	Lab RPD Values	DQO RPD Values	Mar MDLs	Wally Lake			Third Portage Lake - South Basin			Nemo Lake			Whale Tail Lake - South Basin		
Analyte				WAL-89	MAR DUP-1	**RPD**	TPS-61	MAR DUP-2	**RPD**	NEM-37	MAR DUP-3	**RPD**	WTS-37	MAR DUP-4	**RPD**
Physical Tests															
Conductivity (µS/cm)	10	15	2.0	66	65	0.61	36	35	1.1	34	34	0.30	50	49	2.6
Hardness (mg/L)		40	0.50	29	28	2.1	12	12	0	13	13	2.3	18	18	-2.2
pH (Laboratory)		40	0.10	7.5	7.4	0.27	7.0	7.0	0.14	7.1	7.1	0	6.9	6.8	0.73
Total Suspended Solids (mg/L)		40	1.0	*<1.0*	*<1.0*		1.1	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*	
Total Dissolved Solids (mg/L)		40	3.0	52	47	10	24	22	7.4	19	20	-3.6	38	37	2.7
Turbidity (NTU)	15	22.5	0.10	0.15	0.10	**40**	*<0.10*	*<0.10*		*<0.10*	*<0.10*		0.11	0.11	0
Anions and Nutrients (mg/L)															
Alkalinity, Bicarbonate		40	1.0	24	24	-0.42	8.4	8.1	3.6	9.4	9.4	0	7.3	7.1	2.8
Alkalinity, Carbonate		40	1.0	*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*	
Alkalinity, Hydroxide		40	1.0	*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*	
Alkalinity, Total	20	30	1.0	24	24	-0.42	8.4	8.1	3.6	9.4	9.4	0	7.3	7.1	2.8
Ammonia, Total (as N)	20	30	0.0050	0.016	0.015	4.6	0.020	0.019	3.6	0.010	0.010	2.0	0.015	0.015	-1.3
Bromide (Br)	20	30	0.050	*<0.050*	*<0.050*		*<0.050*	*<0.050*		*<0.050*	*<0.050*		0.091	0.091	0
Chloride (Cl)	20	30	0.10	1.3	1.3	1.6	1.0	1.0	3.9	1.2	1.2	1.7	8.1	8.1	0.62
Fluoride (F)	20	30	0.020	0.073	0.073	0	0.088	0.086	2.3	0.035	0.033	5.9	0.038	0.038	0
Nitrate (as N)	20	30	0.0050	0.019	0.019	0.54	0.017	0.016	4.9	*<0.0050*	*<0.0050*		0.0097	0.0091	6.4
Nitrite (as N)	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	0.0013	
Total Kjeldahl Nitrogen	20	30	0.050	0.15	0.15	-1.4	0.094	0.091	3.2	0.13	0.098	27	0.12	0.12	-6.7
Orthophosphate-Dissolved (as P)	20	30	0.0010	*<0.0010*	*<0.0010*		0.0014	0.0011	24	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Phosphorus (P)-Total Dissolved	25	37.5	0.0020	*<0.0020*	*<0.0020*		*<0.0020*	*<0.0020*		0.0021	*<0.0020*		0.0026	*<0.0020*	
Phosphorus (P)-Total	20	30	0.0020	0.0020	0.0026	-26	*<0.0020*	*<0.0020*		0.0025	0.0027	-7.7	0.0050	0.0029	**53**
Silicate (as SiO_2)	20	30	0.50	1.1	1.1	0.93	*<0.50*	*<0.50*		*<0.50*	*<0.50*		0.65	0.65	0
Sulfate (SO_4)	20	30	0.30	7.5	7.5	0.27	6.2	6.1	2.0	4.3	4.3	0.70	2.4	2.4	0.41
Cyanides (mg/L)															
Total Cyanide	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Free Cyanide	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Organic / Inorganic Carbon (mg/L)															
Dissolved Organic Carbon	20	30	0.50	2.4	2.5	-6.1	1.5	1.6	-9.6	2.3	2.2	8.0	2.3	2.5	-5.0
Total Organic Carbon	20	30	0.50	2.4	2.8	-17	1.5	1.6	-10	2.0	2.4	-17	2.3	2.3	0.87
Plant Pigments (µg/L)															
Chlorophyll-a		40	0.010	0.43	0.39	9.5	0.33	0.32	3.1	0.64	0.65	-1.6	0.89	0.67	29
Total Metals (mg/L)															
Aluminum	20	30	0.0030	*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*		0.0048	0.0038	23
Antimony	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Arsenic	20	30	0.00010	0.00035	0.00032	9.0	0.00019	0.00017	11	0.00033	0.00035	-5.9	0.00025	0.00024	4.1
Barium	20	30	0.00010	0.0040	0.0041	-2.0	0.0036	0.0039	-6.1	0.0055	0.0055	0	0.0100	0.0096	4.0
Beryllium	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Bismuth	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Boron	20	30	0.010	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Cadmium	20	30	0.00001	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Calcium	20	30	0.050	7.7	7.6	1.3	2.8	3.0	-5.9	2.9	2.9	0	5.1	5.1	0
Chromium	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	0.00021		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Cobalt	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Copper	20	30	0.00050	0.00098	0.00099	-1.0	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Iron	20	30	0.010	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*		0.011	*<0.010*	
Lead	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Lithium	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.0013	0.0013	0
Magnesium	20	30	0.0050	2.2	2.1	2.3	1.1	1.2	-7.1	1.4	1.4	-1.4	1.4	1.4	0.72
Manganese	20	30	0.00010	0.0017	0.0016	4.9	0.00030	0.00026	14	0.00088	0.00091	-3.4	0.00082	0.00075	8.9
Mercury	20	30	0.00001	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Molybdenum	20	30	0.00005	0.00023	0.00022	3.6	0.00012	0.00014	-14	*<0.000050*	0.00005		0.00005	*<0.000050*	
Nickel	20	30	0.00050	*<0.00050*	*<0.00050*		0.00051	*<0.00050*		0.00062	0.00061	1.6	0.00071	0.00073	-2.8
Phosphorus	20	30	0.050	*<0.050*	*<0.050*		*<0.050*	*<0.050*		*<0.050*	*<0.050*		*<0.050*	*<0.050*	
Potassium	20	30	0.050	0.79	0.77	2.6	0.61	0.67	-8.4	0.78	0.82	-5.3	0.92	0.89	2.5
Selenium	20	30	0.00005	0.00005	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Silicon	20	30	0.10	0.53	0.52	1.9	*<0.10*	*<0.10*		0.24	0.23	4.3	0.34	0.33	3.0
Silver	20	30	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Sodium	20	30	0.050	1.0	0.98	3.1	1.3	1.4	-7.2	0.66	0.68	-3.0	1.1	1.1	0.90
Strontium	20	30	0.00020	0.041	0.041	-0.48	0.013	0.014	-6.0	0.013	0.013	2.3	0.039	0.040	-2.6
Sulfur	20	30	0.50	2.7	2.8	-3.3	2.1	2.3	-12	1.7	1.4	23	0.70	0.78	-11
Thallium	20	30	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Tin	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Titanium	20	30	0.00030	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*	
Uranium	20	30	0.00001	0.00005	0.00005	4.3	0.00003	0.00004	-8.7	*<0.000010*	*<0.000010*		0.00004	0.00004	13
Vanadium	20	30	0.00050	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Zinc	20	30	0.0030	*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*	
Dissolved Metals (mg/L)															
Aluminum	20	30	0.0010	0.0011	0.0010	9.5	0.0014	0.0012	15	0.0011	0.0012	-8.7	0.0021	0.0021	0
Antimony	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Arsenic	20	30	0.00010	0.00030	0.00029	3.4	0.00018	0.00017	5.7	0.00030	0.00035	-15	0.00022	0.00024	-8.7
Barium	20	30	0.00010	0.0042	0.0042	-0.48	0.0039	0.0038	2.9	0.0056	0.0054	2.5	0.010	0.010	-3.0
Beryllium	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Bismuth	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Boron	20	30	0.010	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Cadmium	20	30	0.00001	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Calcium	20	30	0.050	7.9	7.7	2.4	3.0	3.0	1.0	2.9	2.8	4.6	4.8	4.9	-2.9
Chromium	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Cobalt	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Copper	20	30	0.00020	0.0011	0.0011	-1.8	0.00037	0.00036	2.7	0.00026	0.00025	3.9	0.00043	0.00046	-6.7
Iron	20	30	0.010	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Lead	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Lithium	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.0015	0.0015	0
Magnesium	20	30	0.0050	2.3	2.2	1.3	1.2	1.2	-0.85	1.4	1.4	0.71	1.4	1.5	-0.69
Manganese	20	30	0.00010	0.00025	0.00028	-11	0.00013	0.00016	-21	0.00027	0.00025	7.7	0.00048	0.00049	-2.1
Mercury	20	30	0.00001	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Molybdenum	20	30	0.00005	0.00026	0.00024	6.1	0.00017	0.00014	17	0.00007	0.00007	7.2	*<0.000050*	*<0.000050*	
Nickel	20	30	0.00050	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		0.00057	0.00062	-8.4	0.00064	0.00067	-4.6
Phosphorus	20	30	0.050	*<0.050*	*<0.050*		*<0.050*	*<0.050*		*<0.050*	*<0.050*		*<0.050*	*<0.050*	
Potassium	20	30	0.050	0.78	0.78	0.13	0.64	0.65	-1.9	0.82	0.81	0.98	0.99	1.0	-3.5
Selenium	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Silicon	20	30	0.050	0.47	0.48	-2.1	0.051	0.053	-3.8	0.24	0.23	2.6	0.37	0.36	1.6
Silver	20	30	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Sodium	20	30	0.050	1.0	1.0	0.98	1.5	1.5	-2.0	0.69	0.69	0.58	1.0	1.1	-5.7
Strontium	20	30	0.00020	0.040	0.040	-0.25	0.014	0.014	3.6	0.014	0.014	1.4	0.038	0.039	-3.7
Sulfur	20	30	0.50	2.4	2.5	-5.7	2.1	2.0	0.98	1.6	1.5	5.7	0.85	0.92	-7.9
Thallium	20	30	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Tin	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Titanium	20	30	0.00030	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*	
Uranium	20	30	0.00001	0.00005	0.00004	6.7	0.00003	0.00003	3.0	*<0.000010*	*<0.000010*		0.00004	0.00004	-2.8
Vanadium	20	30	0.00050	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Zinc	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Speciated Metals (µg/L)															
Arsenate (As V)	20	30		-	-		-	-		-	-		-	-	
Arsenite (As III)	20	30		-	-		-	-		-	-		-	-	
Dimethylarsinic Acid (DMA)	20	30		-	-		-	-		-	-		-	-	
Monomethylarsonic Acid (MMA)	20	30		-	-		-	-		-	-		-	-	
Arsenobetaine (AsB)	20	30		-	-		-	-		-	-		-	-	

Notes:
RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.
RPDs are calculated when both samples are above detection.
The data quality objective (DQO) for field duplicates is an RPD of 1.5 x the laboratory RPD.

Bolded RPDs	**RPD values exceeded but < 10 x MDL.**
Shaded RPD	RPD values exceeded and > 10 x MDL.

Italicized numbers are below detection limits.
"-" = No measurement

Table A-3. Field QA/QC summary for water quality, all CREMP study areas, 2019.

Month				May								
	Lab RPD Values	DQO RPD Values	May MDLs	Third Portage Lake - East Basin			Lake D1			Lake D5		
Analyte				TPE-123	MAY DUP-1	**RPD**	LK1-10	MAY DUP-3	**RPD**	LK5-10	MAY DUP-4	**RPD**
Physical Tests												
Conductivity (µS/cm)	10	15	2.0	40	40	0	29	29	-1.4	39	39	-0.77
Hardness (mg/L)		40	0.50	14	14	0	10	11	-3.8	16	17	-11
pH (Laboratory)		40	0.10	7.3	7.3	-0.55	7.1	7.1	0.42	7.3	7.3	0.14
Total Suspended Solids (mg/L)		40	1.0	*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*	
Total Dissolved Solids (mg/L)		40	3.0	24	25	-0.82	21	17	19	27	24	13
Turbidity (NTU)	15	22.5	0.10	*<0.10*	*<0.10*		0.11	0.11	0	0.12	*<0.10*	
Anions and Nutrients (mg/L)												
Alkalinity, Bicarbonate		40	1.0	10	10	0	9.0	9.1	-1.1	15	14	2.1
Alkalinity, Carbonate		40	1.0	*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*	
Alkalinity, Hydroxide		40	1.0	*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*	
Alkalinity, Total	20	30	1.0	10	10	0	9.0	9.1	-1.1	15	14	2.1
Ammonia, Total (as N)	20	30	0.0050	0.015	0.058	-118	0.046	0.0052	**159.6**	0.0062	0.0097	**-44**
Bromide (Br)	20	30	0.050	*<0.050*	*<0.050*		*<0.050*	*<0.050*		*<0.050*	*<0.050*	
Chloride (Cl)	20	30	0.10	0.99	1.0	-3.0	1.4	1.3	3.7	1.0	0.97	4.0
Fluoride (F)	20	30	0.020	0.093	0.092	1.1	0.059	0.050	17	0.048	0.039	21
Nitrate (as N)	20	30	0.0050	0.010	0.010	1.9	0.012	0.012	1.7	*<0.0050*	*<0.0050*	
Nitrite (as N)	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Total Kjeldahl Nitrogen	20	30	0.050	0.086	0.13	**-39**	0.18	0.14	28	0.14	0.13	6.1
Orthophosphate-Dissolved (as P)	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Phosphorus (P)-Total Dissolved	25	37.5	0.0020	*<0.0020*	*<0.0020*		*<0.0020*	*<0.0020*		*<0.0020*	*<0.0020*	
Phosphorus (P)-Total	20	30	0.0020	*<0.0020*	*<0.0020*		0.0027	0.0023	16	0.0027	0.0023	16
Silicate (as SiO_2)	20	30	0.50	1.4	0.67	**68**	0.66	0.67	-1.5	1.3	1.4	-1.5
Sulfate (SO_4)	20	30	0.30	6.1	6.3	-3.5	2.0	1.9	5.1	2.9	2.7	5.0
Cyanides (mg/L)												
Total Cyanide	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Free Cyanide	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Organic / Inorganic Carbon (mg/L)												
Dissolved Organic Carbon	20	30	0.50	1.8	1.8	1.7	2.5	2.4	5.8	2.2	2.0	9.2
Total Organic Carbon	20	30	0.50	1.6	1.7	-9.1	2.7	2.6	1.1	2.5	2.3	5.0
Plant Pigments (µg/L)												
Chlorophyll-a		40	0.010	0.28	0.23	18	0.89	0.67	29	0.86	0.90	-4.5
Total Metals (mg/L)												
Aluminum	20	30	0.0030	0.0038	0.010	**-91**	*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*	
Antimony	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Arsenic	20	30	0.00010	0.00039	0.00035	11	0.00012	0.00013	-8.0	0.00017	0.00020	-16
Barium	20	30	0.00010	0.0038	0.0038	-2.1	0.0050	0.0052	-3.6	0.0047	0.0046	1.5
Beryllium	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Bismuth	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Boron	20	30	0.010	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Cadmium	20	30	0.00001	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Calcium	20	30	0.050	3.4	3.2	4.2	2.5	2.5	0	4.0	3.9	2.3
Chromium	20	30	0.00010	*<0.00010*	0.00011		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Cobalt	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Copper	20	30	0.00050	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Iron	20	30	0.010	*<0.010*	0.017		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Lead	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Lithium	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Magnesium	20	30	0.0050	1.4	1.2	11	1.1	1.1	0	1.7	1.7	0
Manganese	20	30	0.00010	0.00043	0.0011	-88	0.00096	0.00095	1.0	0.0015	0.0014	10
Mercury	20	30	0.00001	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Molybdenum	20	30	0.00005	0.00016	0.00013	19	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Nickel	20	30	0.00050	0.00057	0.00058	-1.7	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Phosphorus	20	30	0.050	*<0.050*	*<0.050*		*<0.050*	*<0.050*		*<0.050*	*<0.050*	
Potassium	20	30	0.050	0.70	0.65	8.4	0.50	0.49	0.81	0.45	0.47	-3.5
Selenium	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Silicon	20	30	0.10	0.11	*<0.10*		0.38	0.38	0	0.67	0.69	-2.9
Silver	20	30	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Sodium	20	30	0.050	1.5	1.3	13	1.1	1.0	3.8	0.87	0.88	-1.7
Strontium	20	30	0.00020	0.015	0.014	7.4	0.014	0.014	2.9	0.015	0.015	5.4
Sulfur	20	30	0.50	2.3	2.3	3.1	0.85	0.69	21	0.90	0.98	-8.5
Thallium	20	30	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Tin	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Titanium	20	30	0.00030	*<0.00030*	0.00054		*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*	
Uranium	20	30	0.00001	0.00004	0.00005	-16	0.00003	0.00003	3.8	0.00001	0.00001	8.7
Vanadium	20	30	0.00050	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Zinc	20	30	0.0030	*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*	
Dissolved Metals (mg/L)												
Aluminum	20	30	0.0010	*<0.0010*	*<0.0010*		0.0017	0.0013	27	*<0.0010*	*<0.0010*	
Antimony	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Arsenic	20	30	0.00010	0.00035	0.00035	0	0.00010	*<0.00010*		0.00016	0.00016	0
Barium	20	30	0.00010	0.0035	0.0035	1.7	0.0047	0.0050	-6.3	0.0043	0.0046	-7.6
Beryllium	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Bismuth	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Boron	20	30	0.010	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Cadmium	20	30	0.00001	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Calcium	20	30	0.050	3.5	3.5	-0.29	2.4	2.4	-3.3	3.7	4.0	-6.2
Chromium	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Cobalt	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Copper	20	30	0.00020	0.00036	0.00037	-2.7	0.00028	0.00029	-3.5	*<0.00020*	*<0.00020*	
Iron	20	30	0.010	*<0.010*	0.077		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Lead	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Lithium	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Magnesium	20	30	0.0050	1.2	1.2	0.81	1.1	1.1	-2.7	1.5	1.8	-18
Manganese	20	30	0.00010	0.00015	0.00071	**-130**	0.00080	0.00083	-3.7	0.00065	0.00054	18
Mercury	20	30	0.00001	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Molybdenum	20	30	0.00005	0.00016	0.00017	-7.3	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Nickel	20	30	0.00050	0.00051	0.00050	2.0	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Phosphorus	20	30	0.050	*<0.050*	*<0.050*		*<0.050*	*<0.050*		*<0.050*	*<0.050*	
Potassium	20	30	0.050	0.63	0.63	-0.32	0.51	0.51	-0.59	0.45	0.50	-9.4
Selenium	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Silicon	20	30	0.050	0.081	0.081	0	0.37	0.36	3.3	0.66	0.64	2.0
Silver	20	30	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Sodium	20	30	0.050	1.4	1.5	-6.3	1.1	1.1	-2.8	0.82	0.94	-13
Strontium	20	30	0.00020	0.014	0.015	-0.69	0.013	0.013	-6.2	0.013	0.015	-12
Sulfur	20	30	0.50	2.1	2.1	-3.4	0.82	0.64	25	0.93	0.99	-6.2
Thallium	20	30	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Tin	20	30	0.00010	*<0.00010*	*<0.00010*		0.00018	*<0.00010*		*<0.00010*	*<0.00010*	
Titanium	20	30	0.00030	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*	
Uranium	20	30	0.00001	0.00004	0.00004	5.4	0.00002	0.00003	-12	*<0.000010*	*<0.000010*	
Vanadium	20	30	0.00050	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Zinc	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.0014	*<0.0010*	
Speciated Metals (µg/L)												
Arsenate (As V)	20	30		-	-		-	-		-	-	
Arsenite (As III)	20	30		-	-		-	-		-	-	
Dimethylarsinic Acid (DMA)	20	30		-	-		-	-		-	-	
Monomethylarsonic Acid (MMA)	20	30		-	-		-	-		-	-	
Arsenobetaine (AsB)	20	30		-	-		-	-		-	-	

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are calculated when both samples are above detection.

The data quality objective (DQO) for field duplicates is an RPD of 1.5 x the laboratory RPD.

Bolded RPDs	**RPD values exceeded but < 10 x MDL.**
Shaded RPD	RPD values exceeded and > 10 x MDL.

Italicized numbers are below detection limits.

"-" = No measurement

Table A-3. Field QA/QC summary for water quality, all CREMP study areas, 2019.

Month				July											
	Lab RPD Values	DQO RPD Values	July MDLs	Third Portage Lake - North Basin			Baker Lake			Mammoth Lake			Lake D1		
Analyte				TPN-124	JULY DUP-1	**RPD**	BAP-62	JULY DUP-2	**RPD**	MAM-41	JULY DUP-3	**RPD**	LK1-11	JULY DUP-4	**RPD**
Physical Tests															
Conductivity (µS/cm)	10	15	2.0	26	26	1.2	59	57	2.6	68	68	0.15	16	16	0.63
Hardness (mg/L)		40	0.50	9.5	9.3	1.5	13	14	-2.2	24	24	0	5.7	5.7	-1.2
pH (Laboratory)		40	0.10	7.1	7.1	0.99	7.2	7.3	-0.28	7.0	6.9	0.57	6.9	6.7	2.8
Total Suspended Solids (mg/L)		40	1.0	*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	1.1		*<1.0*	*<1.0*	
Total Dissolved Solids (mg/L)		40	3.0	16	14	11	35	35	0	54	48	12	18	11	**44**
Turbidity (NTU)	15	22.5	0.10	0.13	0.11	17	0.21	0.22	-4.7	0.45	0.37	20	0.81	0.90	-11
Anions and Nutrients (mg/L)															
Alkalinity, Bicarbonate		40	1.0	6.0	6.6	-9.5	9.3	9.3	0	4.9	5.0	-2.0	4.6	5.0	-8.3
Alkalinity, Carbonate		40	1.0	*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*	
Alkalinity, Hydroxide		40	1.0	*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*	
Alkalinity, Total	20	30	1.0	6.0	6.6	-9.5	9.3	9.3	0	4.9	5.0	-2.0	4.6	5.0	-8.3
Ammonia, Total (as N)	20	30	0.0050	0.074	0.064	14	0.033	0.0063	**135.4**	0.0088	*<0.0050*		0.028	0.040	**-35**
Bromide (Br)	20	30	0.050	*<0.050*	*<0.050*		*<0.050*	*<0.050*		0.16	0.16	-1.3	*<0.050*	*<0.050*	
Chloride (Cl)	20	30	0.10	0.82	0.82	0	11	10	5.8	14	13	2.2	0.67	0.70	-4.4
Fluoride (F)	20	30	0.020	0.070	0.069	1.4	0.065	0.065	0	0.023	0.024	-4.3	0.030	0.031	-3.3
Nitrate (as N)	20	30	0.0050	0.019	0.018	2.2	0.020	0.020	1.5	*<0.0050*	*<0.0050*		*<0.0050*	*<0.0050*	
Nitrite (as N)	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Total Kjeldahl Nitrogen	20	30	0.050	0.19	0.17	9.9	0.22	0.20	7.7	0.096	0.084	13	0.17	0.18	-6.5
Orthophosphate-Dissolved (as P)	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.0011	*<0.0010*	
Phosphorus (P)-Total Dissolved	25	37.5	0.0020	*<0.0020*	*<0.0020*		0.0020	*<0.0020*		0.0025	0.0027	-7.7	0.0028	0.0021	29
Phosphorus (P)-Total	20	30	0.0020	*<0.0020*	*<0.0020*		0.0025	0.0040	**-46**	0.0033	0.0041	-22	0.0055	0.0042	27
Silicate (as SiO_2)	20	30	0.50	*<0.50*	*<0.50*		*<0.50*	*<0.50*		0.53	0.54	-1.9	*<0.50*	*<0.50*	
Sulfate (SO_4)	20	30	0.30	4.7	4.7	1.3	1.9	1.9	3.1	3.6	3.5	4.5	0.97	1.0	-5.0
Cyanides (mg/L)															
Total Cyanide	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Free Cyanide	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Organic / Inorganic Carbon (mg/L)															
Dissolved Organic Carbon	20	30	0.50	1.5	1.4	9.1	3.3	3.2	3.7	1.6	1.7	-2.4	2.3	2.3	0
Total Organic Carbon	20	30	0.50	1.4	1.3	9.5	3.4	3.3	2.4	1.5	1.6	-8.5	2.5	2.5	-0.41
Plant Pigments (µg/L)															
Chlorophyll-a		40	0.010	0.23	0.26	-12	0.75	0.81	-8.1	0.56	0.56	1.3	0.68	0.61	11
Total Metals (mg/L)															
Aluminum	20	30	0.0030	0.0040	0.0034	16	0.0092	0.015	**-45**	0.011	0.0095	12	0.024	0.019	25
Antimony	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Arsenic	20	30	0.00010	0.00016	0.00015	6.5	0.00011	0.00015	**-31**	0.00028	0.00029	-3.5	*<0.00020*	0.00011	
Barium	20	30	0.00010	0.0028	0.0027	3.3	0.017	0.016	4.2	0.013	0.013	1.5	0.0036	0.0034	7.1
Beryllium	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Bismuth	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Boron	20	30	0.010	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Cadmium	20	30	0.00001	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Calcium	20	30	0.050	2.4	2.2	6.1	2.6	2.8	-5.5	7.2	7.2	-0.14	1.4	1.3	4.5
Chromium	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.00011	0.00014	-24	0.00015	0.00016	-6.5
Cobalt	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Copper	20	30	0.00050	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Iron	20	30	0.010	*<0.010*	*<0.010*		0.014	*<0.010*		0.019	0.019	0	0.033	0.028	16
Lead	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Lithium	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	0.0011		0.0024	0.0024	0	*<0.0010*	*<0.0010*	
Magnesium	20	30	0.0050	0.91	0.90	0.77	1.6	1.6	0	1.4	1.4	2.1	0.55	0.57	-4.5
Manganese	20	30	0.00010	0.00098	0.00071	**32**	0.0036	0.0022	50	0.0048	0.0050	-4.9	0.0045	0.0039	13
Mercury	20	30	0.00001	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Molybdenum	20	30	0.00005	0.00012	0.00012	-5.9	*<0.000050*	0.00005		0.00006	0.00005	5.4	*<0.000050*	*<0.000050*	
Nickel	20	30	0.00050	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		0.0013	0.0013	3.9	*<0.00050*	*<0.00050*	
Phosphorus	20	30	0.050	*<0.050*	*<0.050*		*<0.050*	*<0.050*		*<0.050*	*<0.050*		*<0.050*	*<0.050*	
Potassium	20	30	0.050	0.47	0.46	2.1	0.57	0.59	-3.8	0.98	0.96	1.7	0.28	0.29	-3.9
Selenium	20	30	0.00005	0.00005	*<0.000050*		0.00005	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Silicon	20	30	0.10	0.11	*<0.10*		0.20	0.21	-4.9	0.31	0.31	0	0.27	0.28	-3.6
Silver	20	30	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Sodium	20	30	0.050	1.2	1.2	-0.87	5.7	6.0	-4.1	0.78	0.76	3.3	0.56	0.50	10
Strontium	20	30	0.00020	0.010	0.010	2.9	0.021	0.023	-12	0.063	0.063	-0.48	0.0071	0.0072	-0.70
Sulfur	20	30	0.50	1.6	1.5	3.8	0.67	0.60	11	0.88	1.0	-13	*<0.50*	*<0.50*	
Thallium	20	30	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Tin	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Titanium	20	30	0.00030	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		0.00030	0.00032	-6.5	0.00063	0.00044	**36**
Uranium	20	30	0.00001	0.00003	0.00003	11	0.00004	0.00003	8.5	0.00002	0.00002	0	0.00005	0.00005	6.3
Vanadium	20	30	0.00050	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Zinc	20	30	0.0030	*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*	
Dissolved Metals (mg/L)															
Aluminum	20	30	0.0010	0.0016	0.0016	0	0.0052	0.0045	14	0.0055	0.0055	0	0.012	0.011	13
Antimony	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Arsenic	20	30	0.00010	0.00014	0.00013	7.4	0.00011	0.00011	0	0.00024	0.00025	-4.1	0.00010	*<0.00010*	
Barium	20	30	0.00010	0.0027	0.0027	0.74	0.017	0.017	1.8	0.013	0.013	0	0.0036	0.0034	6.4
Beryllium	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Bismuth	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Boron	20	30	0.010	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Cadmium	20	30	0.00001	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Calcium	20	30	0.050	2.3	2.3	2.6	2.7	2.8	-4.0	7.2	7.1	0.28	1.3	1.3	-3.9
Chromium	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Cobalt	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Copper	20	30	0.00020	0.00030	0.00029	3.4	0.00024	0.00022	8.7	0.00037	0.00036	2.7	0.00026	0.00034	-27
Iron	20	30	0.010	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*		0.011	*<0.010*	
Lead	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	0.00011		*<0.000050*	*<0.000050*	
Lithium	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.0022	0.0023	-4.4	*<0.0010*	*<0.0010*	
Magnesium	20	30	0.0050	0.88	0.89	-0.57	1.6	1.6	-1.2	1.4	1.4	-1.4	0.61	0.59	2.7
Manganese	20	30	0.00010	0.00089	0.00081	9.4	0.0020	0.0021	-5.8	0.0043	0.0043	1.2	0.0029	0.0028	2.8
Mercury	20	30	0.00001	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Molybdenum	20	30	0.00005	0.00012	0.00013	-11	*<0.000050*	*<0.000050*		0.00005	*<0.000050*		*<0.000050*	*<0.000050*	
Nickel	20	30	0.00050	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		0.0012	0.0012	-1.7	*<0.00050*	*<0.00050*	
Phosphorus	20	30	0.050	*<0.050*	*<0.050*		*<0.050*	*<0.050*		*<0.050*	*<0.050*		*<0.050*	*<0.050*	
Potassium	20	30	0.050	0.49	0.51	-2.8	0.61	0.63	-2.7	0.99	0.99	0.30	0.33	0.30	11
Selenium	20	30	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Silicon	20	30	0.050	0.074	0.073	1.4	0.18	0.17	7.5	0.26	0.29	-9.9	0.23	0.23	-3.5
Silver	20	30	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Sodium	20	30	0.050	1.1	1.1	0.90	5.8	5.9	-1.9	0.78	0.79	-0.77	0.58	0.54	8.2
Strontium	20	30	0.00020	0.011	0.011	0.94	0.022	0.023	-3.6	0.061	0.063	-2.3	0.0073	0.0075	-2.6
Sulfur	20	30	0.50	1.5	1.5	4.0	0.74	0.65	13	1.1	1.0	4.7	*<0.50*	*<0.50*	
Thallium	20	30	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Tin	20	30	0.00010	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Titanium	20	30	0.00030	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*	
Uranium	20	30	0.00001	0.00003	0.00003	0	0.00004	0.00003	11	0.00002	0.00002	11	0.00004	0.00004	7.1
Vanadium	20	30	0.00050	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Zinc	20	30	0.0010	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		*<0.0010*	0.0013		0.0013	0.0013	0
Speciated Metals (µg/L)															
Arsenate (As V)	20	30	0.020	-	-		-	-		*<0.020*	*<0.020*		*<0.020*	*<0.020*	
Arsenite (As III)	20	30	0.020	-	-		-	-		0.13	0.13	-1.6	0.027	0.027	0
Dimethylarsinic Acid (DMA)	20	30	0.020	-	-		-	-		*<0.020*	0.020		*<0.020*	*<0.020*	
Monomethylarsonic Acid (MMA)	20	30	0.020	-	-		-	-		*<0.020*	*<0.020*		*<0.020*	*<0.020*	
Arsenobetaine (AsB)	20	30	0.050	-	-		-	-		*<0.050*	*<0.050*		*<0.050*	*<0.050*	

Notes:
RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.
RPDs are calculated when both samples are above detection.
The data quality objective (DQO) for field duplicates is an RPD of 1.5 x the laboratory RPD.

Bolded RPDs	**RPD values exceeded but < 10 x MDL.**
Shaded RPD	RPD values exceeded and > 10 x MDL.

Italicized numbers are below detection limits.
"-" = No measurement

Table A-3. Field QA/QC summary for water quality, all CREMP study areas, 2019.

Month								August							
	Lab RPD Values	DQO RPD Values	Aug MDLs	Baker Lake			Third Portage Lake - North Basin			Lake A-76			Pipedream Lake		
Analyte				BAP-63	AUG DUP-1	RPD	TPN-127	AUG DUP-2	RPD	A76-37	AUG DUP-3	RPD	PDL-79	AUG DUP-4	RPD
Physical Tests															
Conductivity (µS/cm)	10	15	2.0	35	36	-1.7	27	28	-0.73	40	42	-4.7	23	23	0
Hardness (mg/L)		40	0.50	12	12	2.6	9.0	8.9	0.90	15	14		8.9	9.0	
pH (Laboratory)		40	0.10	7.3	7.2	0.83	7.1	7.1	0.14	7.0	7.0	0.14	7.2	7.2	-0.14
Total Suspended Solids (mg/L)		40	1.0	<1.0	<1.0		<1.0	<1.0		<1.0	<1.0		<1.0	<1.0	
Total Dissolved Solids (mg/L)		40	3.0	28	26	8.1	16	20	-24	33	33	1.5	18	17	7.4
Turbidity (NTU)	15	22.5	0.10	0.39	0.47	-19	0.30	0.24	22	0.13	0.18	**-32**	0.19	0.19	0
Anions and Nutrients (mg/L)															
Alkalinity, Bicarbonate		40	1.0	9.4	9.3	1.1	6.5	7.5	-14	5.9	8.3	-34	7.8	7.9	-1.3
Alkalinity, Carbonate		40	1.0	<1.0	<1.0		<1.0	<1.0		<1.0	<1.0		<1.0	<1.0	
Alkalinity, Hydroxide		40	1.0	<1.0	<1.0		<1.0	<1.0		<1.0	<1.0		<1.0	<1.0	
Alkalinity, Total	20	30	1.0	9.4	9.3	1.1	6.5	7.5	-14	5.9	8.3	**-34**	7.8	7.9	-1.3
Ammonia, Total (as N)	20	30	0.0050	0.077	<0.0050		0.13	0.12	7.3	0.034	0.028	20	0.13	0.040	103.6
Bromide (Br)	20	30	0.050	<0.050	<0.050		<0.050	<0.050		0.079	0.069	14	<0.050	<0.050	
Chloride (Cl)	20	30	0.10	3.8	4.1	-6.6	0.82	0.82	0	6.3	6.1	3.1	0.71	0.69	2.9
Fluoride (F)	20	30	0.020	0.062	0.061	1.6	0.070	0.066	5.9	0.028	0.028	0	0.044	0.040	9.5
Nitrate (as N)	20	30	0.0050	0.016	0.015	4.6	0.013	0.011	18	<0.0050	<0.0050		<0.0050	<0.0050	
Nitrite (as N)	20	30	0.0010	<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010	
Total Kjeldahl Nitrogen	20	30	0.050	0.24	0.17	**32**	0.19	0.19	2.7	0.14	0.13		0.20	0.11	
Orthophosphate-Dissolved (as P)	20	30	0.0010	<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010	
Phosphorus (P)-Total Dissolved	25	37.5	0.0020	0.0021	0.0020	4.9	<0.0020	<0.0020		<0.0020	<0.0020		<0.0020	<0.0020	
Phosphorus (P)-Total	20	30	0.0020	0.0039	0.0046	-16	<0.0020	<0.0020		<0.0020	<0.0020		<0.0020	<0.0020	
Silicate (as SiO_2)	20	30	0.50	<0.50	<0.50		<0.50	<0.50		0.91	0.91	0	<0.50	<0.50	
Sulfate (SO_4)	20	30	0.30	0.88	1.1	-18	4.8	4.8	1.5	3.8	3.7	4.3	1.9	1.9	1.1
Cyanides (mg/L)															
Total Cyanide	20	30	0.0010	<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010	
Free Cyanide	20	30	0.0010	0.0012	<0.0010		0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010	
Organic / Inorganic Carbon (mg/L)															
Dissolved Organic Carbon	20	30	0.50	3.3	3.4	-2.7	1.3	1.3	-1.5	1.4	1.2	16	1.5	1.5	0
Total Organic Carbon	20	30	0.50	3.3	3.3	-1.5	1.2	1.2	4.2	1.5	1.4	11	1.5	1.5	-4.7
Plant Pigments (µg/L)															
Chlorophyll-a		40	0.010	1.7	1.4	17	0.50	0.85	-52	0.24	0.53	-76	0.40	0.28	34
Total Metals (mg/L)															
Aluminum	20	30	0.0030	0.014	0.014	0.73	0.0048	0.0047	2.1	0.0054	0.0049	9.7	0.0061	0.0041	**39**
Antimony	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
Arsenic	20	30	0.00010	0.00011	0.00010	9.5	0.00015	0.00015	0	0.00020	0.00020	0	0.00015	0.00015	0
Barium	20	30	0.00010	0.019	0.019	-2.7	0.0027	0.0027	1.1	0.0078	0.0078	0.64	0.0019	0.0019	-3.1
Beryllium	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
Bismuth	20	30	0.00005	<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050	
Boron	20	30	0.010	<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010	
Cadmium	20	30	0.00001	<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050	
Calcium	20	30	0.050	2.7	2.7	0	2.2	2.3	-0.89	3.9	4.1	-3.8	2.3	2.4	-3.0
Chromium	20	30	0.00010	0.00011	0.00011	0	0.00010	<0.00010		<0.00010	<0.00010		0.00011	<0.00010	
Cobalt	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
Copper	20	30	0.00050	<0.00050	<0.00050		<0.00050	<0.00050		<0.00050	<0.00050		<0.00050	<0.00050	
Iron	20	30	0.010	0.018	0.018	0	<0.010	<0.010		0.011	0.010	9.5	<0.010	<0.010	
Lead	20	30	0.00005	<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050	
Lithium	20	30	0.0010	<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010	
Magnesium	20	30	0.0050	1.2	1.2	0	0.85	0.85	0.12	1.2	1.2	-0.82	0.80	0.79	0.63
Manganese	20	30	0.00010	0.0035	0.0036	-2.0	0.00097	0.00098	-1.0	0.0013	0.0013	-1.5	0.00077	0.00078	-1.3
Mercury	20	30	0.00001	<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050	
Molybdenum	20	30	0.00005	<0.000050	<0.000050		0.00013	0.00012	14	<0.000050	<0.000050		<0.000050	<0.000050	
Nickel	20	30	0.00050	<0.00050	<0.00050		<0.00050	<0.00050		0.00056	0.00058	-3.5	0.00060	0.00059	1.7
Phosphorus	20	30	0.050	<0.050	<0.050		<0.050	<0.050		<0.050	<0.050		<0.050	<0.050	
Potassium	20	30	0.050	0.45	0.44	0.90	0.44	0.44	-0.23	0.74	0.75	-1.9	0.33	0.32	1.6
Selenium	20	30	0.00005	<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050	
Silicon	20	30	0.10	0.26	0.22	17	0.11	<0.10		0.43	0.44	-2.3	0.16	0.17	-6.1
Silver	20	30	0.00001	<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010	
Sodium	20	30	0.050	1.8	1.9	-5.9	1.0	1.0	0	0.66	0.66	-1.2	0.47	0.47	1.3
Strontium	20	30	0.00020	0.021	0.022	-0.47	0.011	0.011	-0.93	0.023	0.023	-0.87	0.0098	0.0098	0.61
Sulfur	20	30	0.50	<0.50	<0.50		1.3	1.3	-3.1	1.2	1.2	-5.0	<0.50	0.56	
Thallium	20	30	0.00001	<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010	
Tin	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
Titanium	20	30	0.00030	<0.00030	<0.00030		<0.00030	<0.00030		<0.00030	<0.00030		<0.00030	<0.00030	
Uranium	20	30	0.00001	0.00004	0.00004	0	0.00004	0.00004	0	0.00002	0.00002	4.7	0.00003	0.00003	15
Vanadium	20	30	0.00050	<0.00050	<0.00050		<0.00050	<0.00050		<0.00050	<0.00050		<0.00050	<0.00050	
Zinc	20	30	0.0030	<0.0030	<0.0030		<0.0030	<0.0030		<0.0030	<0.0030		<0.0030	<0.0030	
Dissolved Metals (mg/L)															
Aluminum	20	30	0.0010	0.0057	0.0060	-5.1	0.0022	0.0024	-8.7	0.0016	0.0023	**-36**	0.0038	0.0019	**67**
Antimony	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
Arsenic	20	30	0.00010	<0.00010	0.00010		0.00013	0.00014	-7.4	0.00018	0.00019	-5.4	0.00013	0.00013	0
Barium	20	30	0.00010	0.019	0.018	4.9	0.0026	0.0025	5.9	0.0079	0.0073	7.9	0.0018	0.0019	-1.1
Beryllium	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
Bismuth	20	30	0.00005	<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050	
Boron	20	30	0.010	<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010	
Cadmium	20	30	0.00001	<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050	
Calcium	20	30	0.050	2.7	2.6	6.4	2.2	2.1	3.2	4.0	3.7	7.8	2.2	2.3	-2.7
Chromium	20	30	0.00010	0.00014	<0.00010		0.00012	0.00011	8.7	<0.00010	<0.00010		0.00014	<0.00010	
Cobalt	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
Copper	20	30	0.00020	0.00028	0.00030	-6.9	0.00034	0.00035	-2.9	0.00026	0.00033	-24	0.00039	0.00040	-2.5
Iron	20	30	0.010	<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010	
Lead	20	30	0.00005	<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050	
Lithium	20	30	0.0010	<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010	
Magnesium	20	30	0.0050	1.2	1.3	-2.4	0.84	0.87	-3.0	1.2	1.3	-1.6	0.81	0.80	1.2
Manganese	20	30	0.00010	0.00020	0.00024	-18	0.00049	0.00052	-5.9	<0.00010	0.00057		0.00025	0.00021	17
Mercury	20	30	0.00001	<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050	
Molybdenum	20	30	0.00005	0.00005	<0.000050		0.00012	0.00011	8.6	<0.000050	<0.000050		<0.000050	<0.000050	
Nickel	20	30	0.00050	<0.00050	<0.00050		<0.00050	<0.00050		0.00052	0.00055	-5.6	0.00059	0.00059	0
Phosphorus	20	30	0.050	<0.050	<0.050		<0.050	<0.050		<0.050	<0.050		<0.050	<0.050	
Potassium	20	30	0.050	0.48	0.49	-1.2	0.47	0.48	-1.3	0.77	0.74	4.6	0.36	0.35	2.9
Selenium	20	30	0.00005	<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050	
Silicon	20	30	0.050	0.18	0.18	2.3	0.072	0.079	-9.3	0.45	0.46	-0.44	0.13	0.12	9.4
Silver	20	30	0.00001	<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010	
Sodium	20	30	0.050	1.8	2.1	-18	1.0	1.1	-8.5	0.71	0.70	1.4	0.50	0.50	-0.80
Strontium	20	30	0.00020	0.020	0.021	-6.9	0.010	0.010	3.9	0.024	0.023	4.8	0.0092	0.0095	-3.5
Sulfur	20	30	0.50	<0.50	<0.50		1.3	1.4	-3.7	1.1	1.0	4.9	0.52	<0.50	
Thallium	20	30	0.00001	<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010	
Tin	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
Titanium	20	30	0.00030	<0.00030	<0.00030		<0.00030	<0.00030		<0.00030	<0.00030		<0.00030	<0.00030	
Uranium	20	30	0.00001	0.00004	0.00004	13	0.00003	0.00003	3.1	0.00001	0.00002	-29	0.00002	0.00002	4.9
Vanadium	20	30	0.00050	<0.00050	<0.00050		<0.00050	<0.00050		<0.00050	<0.00050		<0.00050	<0.00050	
Zinc	20	30	0.0010	<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010	
Speciated Metals (µg/L)															
Arsenate (As V)	20	30	0.020	-	-		-	-		<0.020	<0.020		-	-	
Arsenite (As III)	20	30	0.020	-	-		-	-		0.085	0.087	-2.3	-	-	
Dimethylarsinic Acid (DMA)	20	30	0.020	-	-		-	-		<0.020	<0.020		-	-	
Monomethylarsonic Acid (MMA)	20	30	0.020	-	-		-	-		<0.020	<0.020		-	-	
Arsenobetaine (AsB)	20	30	0.050	-	-		-	-		<0.050	<0.050		-	-	

Notes:
RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.
RPDs are calculated when both samples are above detection.
The data quality objective (DQO) for field duplicates is an RPD of 1.5 x the laboratory RPD.

Bolded RPDs	**RPD values exceeded but < 10 x MDL.**
Shaded RPD	RPD values exceeded and > 10 x MDL.

Italicized numbers are below detection limits.
"-" = No measurement

Table A-3. Field QA/QC summary for water quality, all CREMP study areas, 2019.

Month				September											
	Lab RPD Values	DQO RPD Values	Sept MDLs	Third Portage Lake - North Basin			Baker Lake - Proposed Jetty			Mammoth Lake			Nemo Lake		
Analyte				TPN-129	SEPT DUP-1	RPD	BPJ-65	SEPT DUP-2	RPD	MAM-45	SEPT DUP-3	RPD	NEM-45	SEPT DUP-4	RPD
Physical Tests															
Conductivity (µS/cm)	10	15	2.0	29	27	8.2	286.0	289.0	-1.0	138.0	139.0	-0.72	78	78	0.51
Hardness (mg/L)		40	0.50	11	9.2	15	33	35	-5.6	50	51	-1.8	29	28	3.1
pH (Laboratory)		40	0.10	7.1	7.0	1.7	7.2	7.2	-0.28	7.4	7.3	0.54	7.2	7.2	0.83
Total Suspended Solids (mg/L)		40	1.0	<1.0	<1.0		<1.0	<1.0		1.4	1.1	24	<1.0	<1.0	
Total Dissolved Solids (mg/L)		40	3.0	20	18	8.0	159.0	149.0	6.5	115.0	119.0	-3.4	68	64	6.1
Turbidity (NTU)	15	22.5	0.10	0.28	0.25	11	0.22	0.25	-13	0.72	0.80	-11	0.43	0.46	-6.7
Anions and Nutrients (mg/L)															
Alkalinity, Bicarbonate		40	1.0	8.1	6.8	17	9.9	10	-2.0	13	13	0	8.5	8.7	-2.3
Alkalinity, Carbonate		40	1.0	<1.0	<1.0		<1.0	<1.0		<1.0	<1.0		<1.0	<1.0	
Alkalinity, Hydroxide		40	1.0	<1.0	<1.0		<1.0	<1.0		<1.0	<1.0		<1.0	<1.0	
Alkalinity, Total	20	30	1.0	8.1	6.8	17	9.9	10	-2.0	13	13	0	8.5	8.7	-2.3
Ammonia, Total (as N)	20	30	0.0050	<0.0050	<0.0050		0.0058	<0.0050		0.15	0.17	-9.9	0.046	0.041	12
Bromide (Br)	20	30	0.050	<0.050	<0.050		0.25	0.25	-1.2	0.26	0.28	-5.2	0.13	0.12	6.6
Chloride (Cl)	20	30	0.10	0.77	0.78	-1.3	70	70	0.14	24	24	0	16	16	0
Fluoride (F)	20	30	0.020	0.081	0.071	13	0.072	0.070	2.8	0.050	0.049	2.0	0.030	0.031	-3.3
Nitrate (as N)	20	30	0.0050	<0.0050	<0.0050		0.017	0.017	0	0.44	0.46	-4.0	0.16	0.16	-3.8
Nitrite (as N)	20	30	0.0010	<0.0010	<0.0010		<0.0010	<0.0010		0.011	0.013	-12	<0.0010	0.0017	
Total Kjeldahl Nitrogen	20	30	0.050	0.083	0.11	-30	0.16	0.17	-11	0.36	0.34	6.3	0.17	0.15	15
Orthophosphate-Dissolved (as P)	20	30	0.0010	<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010	
Phosphorus (P)-Total Dissolved	25	37.5	0.0020	<0.0020	<0.0020		<0.0020	0.0021		0.0022	0.0030	-31	<0.0020	<0.0020	
Phosphorus (P)-Total	20	30	0.0020	<0.0020	<0.0020		0.0048	0.0040	18	0.0051	0.0039	27	<0.0020	<0.0020	
Silicate (as SiO_2)	20	30	0.50	<0.50	<0.50		<0.50	<0.50		1.3	1.3	1.6	<0.50	<0.50	
Sulfate (SO_4)	20	30	0.30	4.8	4.6	2.8	11	11	0	12	12	-2.5	3.9	3.9	0
Cyanides (mg/L)															
Total Cyanide	20	30	0.0010	<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010	
Free Cyanide	20	30	0.0010	<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010	
Organic / Inorganic Carbon (mg/L)															
Dissolved Organic Carbon	20	30	0.50	1.4	1.4	-2.1	3.6	3.3	9.8	2.5	2.4	7.3	2.0	1.8	13
Total Organic Carbon	20	30	0.50	1.5	1.2	21	3.7	3.3	13	2.4	2.5	-4.2	1.8	1.9	-3.2
Plant Pigments (µg/L)															
Chlorophyll-a		40	0	0.78	0.67	14	1.4	1.5	-3.5	2.9	3.2	-8.5	0.90	1.1	-19
Total Metals (mg/L)															
Aluminum	20	30	0.0030	0.0087	0.0063	**32**	0.0082	0.0086	-4.8	0.015	0.013	15	0.012	0.014	-14
Antimony	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		0.00022	0.00021	4.7	<0.00010	<0.00010	
Arsenic	20	30	0.00010	0.00039	0.00018	**74**	0.00015	0.00016	-6.5	0.0011	0.0011	1.9	0.00051	0.00049	4.0
Barium	20	30	0.00010	0.0028	0.0028	0.36	0.020	0.020	3.0	0.024	0.024	-0.41	0.014	0.014	-2.2
Beryllium	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
Bismuth	20	30	0.00005	<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050	
Boron	20	30	0.010	<0.010	<0.010		0.018	0.020	-11	<0.010	<0.010		<0.010	<0.010	
Cadmium	20	30	0.00001	<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050	
Calcium	20	30	0.050	2.7	2.3	16	4.2	4.2	0.72	15	14	4.7	8.8	9.0	-2.0
Chromium	20	30	0.00010	0.0049	<0.00050		<0.00050	<0.00040		0.00022	0.00014	**44**	0.00016	0.00018	-12
Cobalt	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		0.00014	0.00014	0	<0.00010	<0.00010	
Copper	20	30	0.00050	0.00051	<0.00050		<0.00050	<0.00050		0.00061	0.00059	3.3	<0.00050	<0.00050	
Iron	20	30	0.010	0.042	<0.010		<0.010	<0.010		0.087	0.085	2.3	0.029	0.031	-6.7
Lead	20	30	0.00005	<0.000050	<0.000050		<0.000050	<0.000050		0.00005	0.00005	-1.9	<0.000050	<0.000050	
Lithium	20	30	0.0010	<0.0010	<0.0010		0.0016	0.0016	0	0.0024	0.0023	4.3	0.0013	0.0013	0
Magnesium	20	30	0.0050	0.97	0.88	9.5	6.1	6.2	-2.1	3.3	3.3	1.2	1.7	1.7	-1.2
Manganese	20	30	0.00010	0.0015	0.00094	48	0.0011	0.0011	-2.7	0.033	0.033	-0.30	0.0083	0.0084	-0.72
Mercury	20	30	0.00001	<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050	
Molybdenum	20	30	0.00005	0.00025	0.00011	**77**	0.00009	0.00009	1.2	0.0011	0.0011	-2.7	0.00020	0.00021	-4.8
Nickel	20	30	0.00050	0.00067	<0.00050		<0.00050	<0.00050		0.0016	0.0016	5.6	0.0012	0.0012	-1.7
Phosphorus	20	30	0.050	<0.050	<0.050		<0.050	<0.050		<0.050	<0.050		<0.050	<0.050	
Potassium	20	30	0.050	0.51	0.48	6.2	1.8	1.9	-1.6	3.1	3.0	1.3	1.1	1.1	-0.88
Selenium	20	30	0.00005	<0.000050	<0.000050		<0.000050	<0.000050		0.00015	0.00019	-24	<0.000050	<0.000050	
Silicon	20	30	0.10	0.12	0.12	0	0.15	0.16	-6.5	0.61	0.61	0	0.21	0.20	4.9
Silver	20	30	0.00001	<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010	
Sodium	20	30	0.050	1.0	1.1	-0.96	42	42	-0.72	2.0	2.0	0.49	0.84	0.87	-3.6
Strontium	20	30	0.00020	0.011	0.0099	10	0.046	0.046	0.22	0.10	0.10	0	0.058	0.057	1.9
Sulfur	20	30	0.50	1.8	1.5	22	3.4	3.8	-12	4.2	4.1	2.4	1.2	1.2	-0.84
Thallium	20	30	0.00001	<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010	
Tin	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
Titanium	20	30	0.00030	<0.00030	<0.00030		<0.00030	<0.00030		0.00048	0.00046	4.3	0.00037	0.00050	-30
Uranium	20	30	0.00001	0.00004	0.00004	23	0.00004	0.00004	-4.7	0.00021	0.00021	1.4	0.00005	0.00005	-2.2
Vanadium	20	30	0.00050	<0.00050	<0.00050		<0.00050	<0.00050		<0.00050	<0.00050		<0.00050	<0.00050	
Zinc	20	30	0.0030	<0.0030	<0.0030		<0.0030	<0.0030		<0.0030	<0.0030		<0.0030	<0.0030	
Dissolved Metals (mg/L)															
Aluminum	20	30	0.0010	0.0025	0.0024	4.1	0.0044	0.0050	-13	0.0029	0.0034	-16	0.0043	0.0041	4.8
Antimony	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		0.00020	0.00020	0	<0.00010	<0.00010	
Arsenic	20	30	0.00010	0.00030	0.00016	**61**	0.00012	0.00013	-8.0	0.00089	0.00083	7.0	0.00048	0.00046	4.3
Barium	20	30	0.00010	0.0027	0.0028	-4.3	0.019	0.019	-3.7	0.025	0.025	-0.81	0.014	0.014	1.5
Beryllium	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
Bismuth	20	30	0.00005	<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050	
Boron	20	30	0.010	<0.010	<0.010		0.019	0.020	-5.1	<0.010	<0.010		<0.010	<0.010	
Cadmium	20	30	0.00001	<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050	
Calcium	20	30	0.050	2.7	2.2	18	4.1	4.1	-0.98	14	15	-4.7	9.0	8.7	3.2
Chromium	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	0.00010		<0.00010	<0.00010	
Cobalt	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		0.00012	0.00011	8.7	<0.00010	<0.00010	
Copper	20	30	0.00020	0.00040	0.00038	5.1	0.00027	0.00028	-3.6	0.00056	0.00056	0	0.00031	0.00029	6.7
Iron	20	30	0.010	0.011	<0.010		<0.010	<0.010		0.030	0.025	18	0.010	<0.010	
Lead	20	30	0.00005	<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	0.00005		<0.000050	<0.000050	
Lithium	20	30	0.0010	<0.0010	<0.0010		0.0015	0.0015	0	0.0026	0.0027	-3.8	0.0014	0.0014	0
Magnesium	20	30	0.0050	0.96	0.88	8.7	5.5	5.9	-7.7	3.5	3.3	4.7	1.7	1.6	3.7
Manganese	20	30	0.00010	0.00056	0.00045	22	0.00030	0.00034	-13	0.030	0.029	2.7	0.0064	0.0060	5.8
Mercury	20	30	0.00001	<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050		<0.0000050	<0.0000050	
Molybdenum	20	30	0.00005	0.00017	0.00014	21	0.00010	0.00009	8.6	0.0012	0.0012	2.5	0.00020	0.00021	-5.4
Nickel	20	30	0.00050	<0.0020	<0.0010		<0.00050	<0.00050		0.0015	0.0015	0.67	0.0011	0.0011	2.7
Phosphorus	20	30	0.050	<0.050	<0.050		<0.050	<0.050		<0.050	<0.050		<0.050	<0.050	
Potassium	20	30	0.050	0.52	0.51	1.9	1.8	1.9	-5.9	3.0	3.0	1.00	1.2	1.1	4.4
Selenium	20	30	0.00005	<0.000050	<0.000050		0.00014	0.00011	25	0.00014	0.00014	2.8	<0.000050	<0.000050	
Silicon	20	30	0.050	0.080	0.062	25	0.12	0.12	2.5	0.60	0.65	-7.0	0.17	0.17	1.8
Silver	20	30	0.00001	<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010	
Sodium	20	30	0.050	1.1	1.1	-1.9	39	41	-5.6	2.1	2.1	-0.48	0.88	0.86	2.6
Strontium	20	30	0.00020	0.012	0.011	12	0.046	0.047	-3.0	0.10	0.10	-1.00	0.057	0.057	-0.53
Sulfur	20	30	0.50	1.7	1.6	4.8	3.5	3.5	1.1	4.1	4.4	-6.3	1.3	1.5	-16
Thallium	20	30	0.00001	<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010	
Tin	20	30	0.00010	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
Titanium	20	30	0.00030	<0.00030	<0.00030		<0.00030	<0.00030		<0.00030	<0.00030		<0.00030	<0.00030	
Uranium	20	30	0.00001	0.00004	0.00003	14	0.00005	0.00004	13	0.00018	0.00017	4.7	0.00004	0.00004	2.6
Vanadium	20	30	0.00050	<0.00050	<0.00050		<0.00050	<0.00050		<0.00050	<0.00050		<0.00050	<0.00050	
Zinc	20	30	0.0010	<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	0.0025		<0.0010	<0.0010	
Speciated Metals (µg/L)															
Arsenate (As V)	20	30		-	-		-	-		-	-		0.026	0.029	-11
Arsenite (As III)	20	30		-	-		-	-		-	-		0.21	0.21	-0.47
Dimethylarsinic Acid (DMA)	20	30		-	-		-	-		-	-		0.064	0.066	-3.1
Monomethylarsonic Acid (MMA)	20	30		-	-		-	-		-	-		<0.020	<0.020	
Arsenobetaine (AsB)	20	30		-	-		-	-		-	-		<0.050	<0.050	

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are calculated when both samples are above detection.

The data quality objective (DQO) for field duplicates is an RPD of 1.5 x the laboratory RPD.

Bolded RPDs	**RPD values exceeded but < 10 x MDL.**
Shaded RPD	RPD values exceeded and > 10 x MDL.

Italicized numbers are below detection limits.

"-" = No measurement

Table A-4. Water chemistry field duplicate RPDs greater than QA/QC DQOs

Parameter	March	May	July	August	September
Turbidity	I				
TDS			I		
T. Alkalinity				I	
T. Ammonia		III	II	I	
TKN		I			
T. Phosphorus			I		
Silicate		I			
Chlorophyll-a				II	
T. Aluminum		I	I	I	I
T. Arsenic			I		I
T. Magnesium		I	II		I
T. Molybdenum					I
D. Aluminum				II	
D. Arsenic					I
D. Magnesium		I			

Notes:

"T" = Total; "D" = Dissolved; TDS = Total Dissolved Solids; TKN = Total Kjeldahl Nitrogen

Shaded squares mean one or more RPD was >10X DL.

Table A-5. Swipe chemistry data for sediment grab and core analyses, 2019.

Analyte	Swipe DLs (µg)	Blank Swipe	Equipment Swipes				
		SWIPE-QA[1] FILTER	SWIPE-1 FILTER	SWIPE-2 FILTER	SWIPE-3 FILTER	SWIPE-4 FILTER	CORE SWIPE-1 FILTER
Total Metals (mg/kg dw)							
Aluminum	20	<20	**35**	**41**	**68**	**27**	<20
Antimony	20	<20	<20	<20	<20	<20	<20
Arsenic	20	<20	<20	<20	<20	<20	<20
Barium	1.0	<1.0	**1.1**	<1.0	**1.7**	<1.0	<1.0
Beryllium	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bismuth	20	<20	<20	<20	<20	<20	<20
Cadmium	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Calcium	200	<200	<200	<200	<200	<200	<200
Chromium	2.0	<2.0	**19**	**6.3**	44	33	<2.0
Cobalt	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	4.0	<0.40	<0.40	<0.40	<4.0	<0.40	<4.0
Lithium	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Magnesium	100	<100	<100	<100	<100	<100	<100
Manganese	0.50	<0.50	**1.8**	**1.8**	**4.8**	**4.0**	**0.57**
Mercury	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Molybdenum	3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Nickel	5.0	<5.0	**6.9**	<5.0	**15**	**7.0**	<5.0
Phosphorus	30	<30	<30	<30	<30	<30	<30
Potassium	200	<200	<200	<200	<200	<200	<200
Selenium	20	<20	<20	<20	<20	<20	<20
Silver	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Sodium	400	<400	<400	<400	<400	<400	<400
Strontium	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Thallium	20	<20	<20	<20	<20	<20	<20
Tin	3.0	<3.0	<3.0	<3.0	<3.0	**3.8**	<3.0
Titanium	1.0	<1.0	**1.5**	**1.3**	**1.7**	<1.0	<1.0
Vanadium	3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

Notes:

1 Swipe-QA is a blank swipe.

Bold Filter Swipe	**concentration exceeds laboratory DLs, but < 10x DL.**
Shaded Filter Swipe	concentration is > 10x DL.

Table A-6. QA/QC data for analysis of sediment grab samples, 2019.

				Field Duplicates (Grabs)														
				Third Portage Lake - North			Second Portage Lake			Baker Lake - Barge Dock			Baker Lake - East Shore			Pipedream Lake		
	DLs	Laboratory Duplicate	Field Duplicate	TPN Rep 1	DUP-1	RPD[1]	SP Rep 3	DUP-2	RPD[1]	BAP Rep 2	DUP-3	RPD[1]	BES Rep 1	DUP-4	RPD[1]	PDL Rep 3	DUP-5	RPD[1]
Analyte	(mg/kg)	RPD	DQO	09-Aug-18		(%)	11-Aug-18		(%)	12-Aug-18		(%)	20-Aug-18		(%)	14-Aug-18		(%)
Physical & Organic Parameters																		
Moisture (%)	0.25	20	30	59	60	-2	83	84	-1	36	36	1	40	40	1	70	70	0
pH	0.10	20	30	6	6	1	6	6	3	6	6	0	7	7	0	6	6	-2
TOC (% dw)	0.10	20	30	1	1	2	4	4	1	0	0	-15	0	0	-9	2	2	1
Particle Size																		
% Gravel (>2mm)	0.10		50	<1.0	<1.0		<1.0	<1.0		*<1.0*	*<1.0*		<1.0	<1.0		<1.0	<1.0	
% Sand (2.00 - 0.063) mm)	0.10		50	54	58	-6	2	2	20	77	78	-1	62	66	-7	30	32	-7
% Silt (0.063mm - 4µm)	0.10		50	35	35	-1	66	67	-2	21	20	3	33	29	14	66	61	7
% Clay (<4µm)	0.10		50	11	7	40	32	31	3	2	2	-15	4	4	0	5	7	-39
Total Metals (mg/kg dw)																		
Aluminum	50	40	60	13300	13500	-1	34000	32500	5	5420	5150	5	7360	7450	-1	17500	18100	-3
Antimony	0.10	30	45	0	<0.10		0	0	4	0	0	0	0	0	0	0	0	-5
Arsenic	0.100	30	45	9	8	10	53	55	-3	8	7	3	4	4	-8	9	9	2
Barium	0.50	40	60	50	49	1	144	167	-15	486	444	9	107	107	0	71	73	-3
Beryllium	0.10	30	45	1	1	14	3	2	5	0	0	3	0	0	-3	1	1	-5
Bismuth	0.20	30	45	1	1	10	3	3	9	*<0.20*	*<0.20*		<0.20	<0.20		1	1	-4
Boron	5.0	30	45	<5.0	<5.0		10	11	-6	7	7	3	7	7	-9	<5.0	5	
Cadmium	0.020	30	45	0	0	7	0	0	0	0	0	11	0	0	3	0	0	-6
Calcium	50	30	45	1170	1130	3	2190	2040	7	2130	2050	4	2220	2240	-1	1960	2150	-9
Chromium	0.50	30	45	88	78	12	102	99	3	16	16	-1	18	20	-8	114	113	1
Cobalt	0.10	30	45	8	7	13	20	20	0	4	4	4	5	5	-5	10	10	2
Copper	0.50	30	45	29	27	8	95	94	1	4	5	-3	27	28	-4	30	30	0
Iron	50	30	45	22100	19400	13	82400	82200	0	14600	14000	4	13200	13500	-2	23300	24100	-3
Lead	0.50	40	60	10	9	12	26	23	12	4	4	6	5	5	1	10	11	-5
Lithium	2.0	30	45	24	21	13	53	53	0	7	7	1	9	9	-2	19	20	-5
Magnesium	20	30	45	6640	6150	8	11100	11200	-1	3220	3180	1	4170	4330	-4	10500	10100	4
Manganese	1.0	30	45	300	264	13	1820	1860	-2	207	199	4	553	552	0	264	259	2
Mercury	0.0050	40	60	<0.050	<0.050		<0.050	<0.050		*<0.050*	*<0.050*		<0.050	<0.050		<0.050	<0.050	
Molybdenum	0.10	40	60	2	1	21	10	9	6	1	1	15	1	1	7	1	1	-8
Nickel	0.50	30	45	42	37	13	82	79	3	9	9	0	10	11	-9	64	64	-1
Phosphorus	50	30	45	318	285	11	689	729	-6	734	700	5	697	728	-4	582	589	-1
Potassium	100	40	60	1980	1820	8	5610	5700	-2	1310	1240	5	1320	1480	-11	2160	2200	-2
Selenium	0.20	30	45	<0.20	<0.20		1	1	18	*<0.20*	*<0.20*		<0.20	<0.20		0	0	-4
Silver	0.10	40	60	<0.10	<0.10		<0.10	<0.10		*<0.10*	*<0.10*		<0.10	<0.10		0	0	-9
Sodium	50	40	60	96	92	4	218	212	3	102	100	2	107	126	-16	94	112	-17
Strontium	0.50	40	60	12	11	9	22	19	13	49	46	6	44	44	-1	17	19	-11
Sulfur	1000	30	45	<1000	<1000		1800	<1000		*<1000*	*<1000*		<1000	<1000		<1000	<1000	
Thallium	0.050	30	45	0	0	13	0	0	9	0	0	8	0	0	0	0	0	-5
Tin	2.0	40	60	<2.0	<2.0		2	<2.0		*<2.0*	*<2.0*		<2.0	<2.0		<2.0	<2.0	
Titanium	1.0	40	60	498	456	9	991	970	2	370	343	8	349	392	-12	569	600	-5
Tungsten	0.50	30	45	<0.50	<0.50		1	1	2	*<0.50*	*<0.50*		<0.50	<0.50		1	1	-21
Uranium	0.050	30	45	9	8	8	25	27	-8	1	1	6	1	1	3	5	5	-2
Vanadium	0.20	30	45	25	22	12	49	48	4	21	20	5	19	21	-7	31	31	1
Zinc	2.0	30	45	55	49	11	148	143	3	21	20	1	30	32	-7	68	69	-2
Zirconium	1.0	30	45	1	1	15	4	3	26	5	5	6	3	3	0	2	2	0

Notes:

The DQO for field duplicates is 1.5X the laboratory RPD or 40% if no RPD available.

1 RPD (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs have not been calculated for cases where one of the samples is below detection and the other is not and in cases where both are below detection RPD has been left blank.

Bold RPDs **values exceed the DQO, but concentrations are < 10x DL.**

Shaded RPDs values exceed the DQO, and concentrations are > 10x DL.

"Field Dup" grab samples are homogenization duplicates - the original and duplicate samples were split from the same homogenized bowl of sediment.

Italicized numbers are below detection limits.

Table A-6. QA/QC data for analysis of sediment grab samples, 2019.

Analyte	DLs (mg/kg)	Laboratory Duplicate RPD	Field Duplicate DQO	Wally Lake			Whale Tail - South Basin			Mammoth Lake			Lake A76			Lake D5		
				WAL Rep 1	DUP-6	RPD[1]	WTS Rep 1	DUP-7	RPD[1]	MAM Rep 1	DUP-8	RPD[1]	A76 Rep 1	DUP-9	RPD[1]	LKD5 Rep 1	DUP-10	RPD[1]
				11-Aug-18		(%)	18-Aug-18		(%)	19-Aug-18		(%)	15-Aug-18		(%)	16-Aug-18		(%)
Physical & Organic Parameters																		
Moisture (%)	0.25	20	30	89	89	0	82	83	-1	91	91	0	91	92	-1	78	91	-16
pH	0.10	20	30	7	6	2	5	5	-6	5	6	-9	6	6	-6	5	6	-14
TOC (% dw)	0.10	20	30	7	7	0	4	4	1	10	10	0	9	9	2	9	10	-10
Particle Size																		
% Gravel (>2mm)	0.10		50	*<1.0*	*<1.0*		<1.0	<1.0		<1.0	<1.0		<1.0	<1.0		<1.0	<1.0	
% Sand (2.00 - 0.063) mm)	0.10		50	5	5	8	6	7	-6	<1.0	<1.0		<1.0	1		8	7	21
% Silt (0.063mm - 4µm)	0.10		50	81	82	-1	75	80	-7	85	83	3	73	74	-1	88	86	3
% Clay (<4µm)	0.10		50	14	14	5	19	13	36	15	17	-13	26	25	5	3	7	-72
Total Metals (mg/kg dw)																		
Aluminum	50	40	60	23900	23700	1	15700	17400	-10	20800	22100	-6	16800	19500	-15	15800	17300	-9
Antimony	0.10	30	45	0	0	5	0	0	-6	0	0	-8	0	0	-20	0	0	-12
Arsenic	0.100	30	45	26	26	1	263	270	-3	117	119	-2	23	26	-9	47	49	-3
Barium	0.50	40	60	124	152	-20	81	85	-5	124	134	-8	174	200	-14	70	86	-20
Beryllium	0.10	30	45	2	2	11	1	1	0	1	1	-3	1	1	-6	1	1	-5
Bismuth	0.20	30	45	2	2	13	0	0	-9	0	1	-4	0	0	-9	0	0	-9
Boron	5.0	30	45	10	9	11	<5.0	<5.0		15	14	13	11	12	-2	9	10	-15
Cadmium	0.020	30	45	1	1	2	0	0	-4	0	0	2	0	0	-29	0	0	-15
Calcium	50	30	45	4410	4020	9	1460	1600	-9	2880	2970	-3	2850	3140	-10	2160	2400	-11
Chromium	0.50	30	45	64	64	-1	61	67	-10	169	191	-12	91	105	-14	113.0	119.0	-5
Cobalt	0.10	30	45	10	10	1	21	22	-7	14	14	-6	7	8	-12	25	19	27
Copper	0.50	30	45	153.0	150.0	2	38	41	-7	69	73	-6	64	69	-7	53	57	-8
Iron	50	30	45	32300	31800	2	124000	130000	-5	42400	45400	-7	22600	25800	-13	104000	88200	16
Lead	0.50	40	60	36	32	13	10	11	-8	17	18	-5	14	16	-9	11	13	-14
Lithium	2.0	30	45	41	36	13	12	12	-3	17	18	-1	15	16	-8	13	12	7
Magnesium	20	30	45	8450	8890	-5	5330	5820	-9	9480	10200	-7	6820	7780	-13	7230	7370	-2
Manganese	1.0	30	45	360	401	-11	1130	1210	-7	341	355	-4	226	244	-8	401	451	-12
Mercury	0.0050	40	60	*<0.050*	*<0.050*		<0.050	<0.050		0	0	12	<0.050	<0.050		<0.050	0	
Molybdenum	0.10	40	60	8	7	8	7	7	-4	5	5	-5	2	3	-18	8	9	-5
Nickel	0.50	30	45	58	57	3	56	61	-10	117	123	-5	73	82	-12	84	81	4
Phosphorus	50	30	45	667	706	-6	1650	1720	-4	761	755	1	452	473	-5	623	758	-20
Potassium	100	40	60	3740	4070	-8	1650	1820	-10	2920	2930	0	2490	2710	-8	1560	1600	-3
Selenium	0.20	30	45	1	1	-7	1	1	4	1	1	-19	1	1	-24	1	1	11
Silver	0.10	40	60	1	1	9	0	0	-5	0	1	-6	0	1	-10	0	0	0
Sodium	50	40	60	204	224	-9	97	117	-19	164	161	2	166	169	-2	110	127	-14
Strontium	0.50	40	60	30	28	8	16	17	-6	27	27	1	18	20	-9	16	16	-1
Sulfur	1000	30	45	2200	1200	**59**	1100	1200	-9	2600	2700	-4	1900	2500	-27	3200.0	2800.0	13
Thallium	0.050	30	45	0	0	13	0	0	-12	0	0	-3	0	0	-8	0	0	-12
Tin	2.0	40	60	2	*<2.0*		<2.0	<2.0		<2.0	<2.0		<2.0	<2.0		<2.0	<2.0	
Titanium	1.0	40	60	678	682	-1	332	366	-10	493	513	-4	335	422	-23	281	284	-1
Tungsten	0.50	30	45	2	1	23	<0.50	<0.50		1	1	-8	<0.50	1		<0.50	<0.50	
Uranium	0.050	30	45	17	16	7	10	11	-5	13	13	-4	10	11	-10	9	10	-5
Vanadium	0.20	30	45	34	33	2	22	24	-9	39	41	-6	29	33	-11	26	27	-2
Zinc	2.0	30	45	125	123	2	88	97	-10	141	151	-7	80	92	-14	93	110.0	-16
Zirconium	1.0	30	45	5	4	12	<1.0	2		4	4	-23	2	3	-8	4	3	27

Notes:

The DQO for field duplicates is 1.5X the laboratory RPD or 40% if no RPD available.

1 RPD (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs have not been calculated for cases where one of the samples is below detection and the other is not and in cases where both are below detection RPD has been left blank.

Bold RPDs **values exceed the DQO, but concentrations are < 10x DL.**

Shaded RPDs values exceed the DQO, and concentrations are > 10x DL.

"Field Dup" grab samples are homogenization duplicates - the original and duplicate samples were split from the same homogenized bowl of sediment.

Italicized numbers are below detection limits.

Table A-7. QA/QC data for analysis of sediment core samples, 2019.

Analyte	DLs (mg/kg)	Third Portage Lake - East TPE-SC-1	CORE-DUP-1	RPD[1]
		11-Aug-18		(%)
Physical & Organic Parameters				
Moisture (%)	*0.25*	88	90	-2.2
pH	*0.10*	6.4	5.6	13
Total Metals (mg/kg dw)				
Aluminum	*50*	28200	26000	8.1
Antimony	*0.10*	0.30	0.30	0
Arsenic	*0.10*	24	25	-4.2
Barium	*0.50*	159	199	-22
Beryllium	*0.10*	1.7	1.6	7.4
Bismuth	*0.20*	2.1	1.8	11
Boron	*5.0*	9.2	8.9	3.3
Cadmium	*0.020*	0.86	0.90	-4.8
Calcium	*50*	2270	2240	1.3
Chromium	*0.50*	163	184	-12
Cobalt	*0.10*	20	21	-4.9
Copper	*0.50*	57	58	-0.70
Iron	*50*	43400	46200	-6.3
Lead	*0.50*	21	20	8.4
Lithium	*2.0*	43	40	7.0
Magnesium	*20*	11800	11500	2.6
Manganese	*1.0*	5770	15700	-93
Mercury	*0.0050*	*<0.050*	*<0.050*	
Molybdenum	*0.10*	4.8	5.6	-14
Nickel	*0.50*	216	256	-17
Phosphorus	*50*	484	474	2.1
Potassium	*100*	4670	4320	7.8
Selenium	*0.20*	0.85	0.66	25
Silver	*0.10*	0.13	0.17	-27
Sodium	*50*	207	197	5.0
Strontium	*0.50*	19	20	-2.6
Sulfur	*1000*	2300	2000	14
Thallium	*0.050*	0.53	0.56	-5.2
Tin	*2.0*	2.4	3.4	-34
Titanium	*1.0*	900	809	11
Tungsten	*0.50*	0.96	0.90	6.5
Uranium	*0.050*	14	13	5.2
Vanadium	*0.20*	45	43	4.8
Zinc	*2.0*	130	133	-2.3
Zirconium	*1.0*	2.4	2.0	18

Notes:

The DQO for field duplicates is an RPD of < 50%.

1 RPD (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs have not been calculated for cases where one of the samples is below detection and the other is not and in cases where both are below detection the RPD has been left blank.

Bold RPDs	**values exceed the DQO, but concentrations are < 10x DL.**
Shaded RPDs	values exceed the DQO, and concentrations are > 10x DL.

"Field Dup" grab samples are homogenization duplicates - the original and duplicate samples were split from the same homogenized bowl of sediment.

Italicized numbers are below detection limits.

Table A-8. QA/QC results for sediment grab sample hydrocarbon and PAH analyses, 2019.

			Field Duplicates					
			Pipedream Lake			Inuggugayualik Lake		
	DQOs[1]	DLs	PDL-COMP	COMP-DUP-2	RPD[2]	INUG-COMP	COMP-DUP-1	RPD[2]
Analyte		(mg/kg)	14-Aug-19		(%)	15-Aug-19		(%)
Physical Parameters								
Moisture (%)		*0.25*	79	78	0.77	82	84	-2.4
Aggregate Organics (mg/kg)								
Mineral Oil and Grease		*500*	*<1100*	*<1000*		*<1500*	*<1700*	
Hydrocarbons (mg/kg)								
EPH10-19	40	*200*	*<480*	*<420*		*<560*	*<560*	
EPH19-32	40	*200*	*<480*	*<420*		*<560*	*<560*	
LEPH		*200*	*<480*	*<420*		*<560*	*<560*	
HEPH		*200*	*<480*	*<420*		*<560*	*<560*	
2-Bromobenzotrifluoride (%)			98	100	-2.0	97	109	-12
Polycyclic Aromatic Hydrocarbons (mg/kg)								
Acenaphthene	50	*0.0050*	*<0.0070*	*<0.0050*		*<0.017*	*<0.0080*	
Acenaphthylene	50	*0.0050*	*<0.0070*	*<0.0050*		*<0.017*	*<0.0080*	
Anthracene	50	*0.0040*	*<0.0070*	*<0.0040*		*<0.017*	*<0.0080*	
Benz(a)anthracene	50	*0.010*	*<0.010*	*<0.010*		*<0.030*	*<0.010*	
Benzo(a)pyrene	50	*0.010*	*<0.010*	*<0.010*		*<0.017*	*<0.010*	
Benzo(b&j)fluoranthene	50	*0.010*	*<0.010*	*<0.010*		*<0.017*	*<0.010*	
Benzo(b+j+k)fluoranthene	50	*0.015*	*<0.015*	*<0.015*		*<0.024*	*<0.015*	
Benzo(g,h,i)perylene	50	*0.010*	*<0.010*	*<0.010*		*<0.017*	*<0.010*	
Benzo(k)fluoranthene	50	*0.010*	*<0.010*	*<0.010*		*<0.017*	*<0.010*	
Chrysene	50	*0.010*	*<0.010*	*<0.010*		*<0.017*	*<0.010*	
Dibenz(a,h)anthracene	50	*0.0050*	*<0.0070*	*<0.0050*		*<0.017*	*<0.0080*	
Fluoranthene	50	*0.010*	*<0.010*	*<0.010*		*<0.017*	*<0.010*	
Fluorene	50	*0.010*	*<0.010*	*<0.010*		*<0.017*	*<0.010*	
Indeno(1,2,3-c,d)pyrene	50	*0.010*	*<0.010*	*<0.010*		*<0.017*	*<0.010*	
1-Methylnaphthalene		*0.050*	*<0.050*	*<0.050*		*<0.050*	*<0.050*	
2-Methylnaphthalene	50	*0.010*	*<0.010*	*<0.010*		*<0.017*	*<0.010*	
Naphthalene	50	*0.010*	*<0.010*	*<0.010*		*<0.017*	*<0.020*	
Phenanthrene	50	*0.010*	*<0.010*	*<0.010*		*<0.017*	*<0.010*	
Pyrene	50	*0.010*	*<0.010*	*<0.010*		*<0.017*	*<0.010*	
Quinoline		*0.050*	*<0.050*	*<0.050*		*<0.050*	*<0.050*	
Chrysene d12	50		95	99	-3.7	112	108	3.7
Naphthalene d8	50		100	113	-12	108	114	-5.0
Phenanthrene d10	50		101	109	-7.7	116	116	0.086
B(a)P Total Potency Equivalent	50	*0.020*	*<0.020*	*<0.020*		*<0.021*	*<0.020*	
IACR (CCME)	50	*0.15*	*<0.15*	*<0.15*		*<0.22*	*<0.15*	

Notes:

1 The DQO for field duplicates is an RPD of < 50%.

2 RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are not calculated for cases where one of the samples is below detection and the other is not and in cases where both are below detection. RPD has been left blank.

Bold RPDs	**values exceed the DQO, but concentrations are < 10x DL.**
Shaded RPDs	values exceed the DQO, and concentrations are > 10x DL.

COMP-DUP samples are homogenization duplicates - the original and duplicate samples were split from the same homogenized bowl of sediment.

Italicized numbers are below detection limits.

Table A-9. Field QA/QC data for phytoplankton, all CREMP study areas, 2019.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**	
WAL-89	28-Mar-19	0	4.3	20	9.4	10	1.3	45	24
DUP - 1	1-Mar-19	0	3.4	15	7.8	8.1	4.5	39	19
RPD (%)			26	27	20	24	**-111**	15	23
NEM-37	7-Mar-19	0	2.9	15	28	1.7	15	63	24
DUP - 3	1-Mar-19	0	3.1	11	23	2.4	16	55	21
RPD (%)			-4.7	30	19	-34	-2.5	13	13
WTS-37	2-Mar-19	0	1.8	11	4.6	15	8.1	41	20
DUP - 4	1-Mar-19	0	3.0	8.4	5.8	10	18	46	19
RPD (%)			**-50**	24	-23	40	**-77**	-12	5.1
TPE-123	6-May-19	0	2.8	25	1.1	2.2	14	45	19
DUP - 1	1-May-19	0	3.3	7.5	2.7	2.3	3.6	19	18
RPD (%)			-15	**108**	**-86**	-2.1	**118**	**80**	5.4
SP-122	11-May-19	0	3.2	159	4.8	8.6	12	188	22
DUP - 2	1-May-19	0	2.5	131	5.3	7.0	9.9	156	23
RPD (%)			23	20	-9.8	19	19	19	-4.4
LKD1-10	10-May-19	0	4.0	81	6.9	1.2	3.6	97	21
DUP - 3	1-May-19	0	4.8	87	2.1	4.1	1.3	99	20
RPD (%)			-19	-7.1	**106**	**-109**	**94**	-2.6	4.9
LKD5-10	10-May-19	0	13	57	12	3.8	22	108	26
DUP - 4	1-May-19	0	13	34	19	6.2	34	106	29
RPD (%)			-1.3	50	-44	-48	-42	1.5	-11
TPN-124	23-Jul-19	0	16	85	7.4	1.4	15	125	26
DUP - 1	23-Jul-19	0	12	64	10.0	2.4	8.8	97	27
RPD (%)			32	28	-30	**-53**	**55**	26	-3.8
BAP-62	24-Jul-19	0	2.1	92	17	12	13	136	30
DUP - 2	24-Jul-19	0	2.1	114	21	19	4.0	160	32
RPD (%)			-0.07216	-21	-21	-49	**107**	-16	-6.5
MAM-41	7-Jul-19	0	0.45	145	27	13	70	254	27
DUP - 3	1-Jul-19	0	2.0	185	19	13	42	262	29
RPD (%)			**-128**	-24	32	-4.6	48	-2.9	-7.1
LKD1-11	14-Jul-19	0	3.7	191	6.4	4.3	9.0	215	32
DUP - 4	1-Jul-19	0	5.6	189	22	3.8	1.8	224	26
RPD (%)			-39	1.2	**-110**	11	**133**	-4.1	21
BAP-63	12-Aug-19	0	6.8	109	43	18	20	197	37
DUP - 1	12-Aug-19	0.069	3.8	130	39	25	26	224	36
RPD (%)		**NA**	**56**	-17	7.8	-31	-29	-13	2.7
TPN-127	13-Aug-19	0	11	49	6.4	0.82	4.7	73	25
DUP - 2	13-Aug-19	0.033	15	66	17	1.9	11	111	28
RPD (%)		**NA**	-29	-29	**-88**	**-81**	**-81**	-42	-11
A76-37	15-Aug-19	0	10	54	13	2.0	5.4	84	28
DUP - 3	15-Aug-19	0	7.6	51	13	1.8	4.5	78	30
RPD (%)			27	5.7	1.3	11	17	8.2	-6.9
PDL-79	14-Aug-19	1.5	3.0	107	21	0	4.7	138	30
DUP - 4	14-Aug-19	1.2	9.9	70	24	0.34	6.9	113	30
RPD (%)		22	**-107**	42	-11	**NA**	-38	20	0
TPN-129	10-Sep-19	0.26	25	82	13	0.67	7.9	128	30
DUP - 1	1-Sep-19	0.16	28	119	13	5.4	9.1	175	31
RPD (%)		45	-13	-38	-1.8	**-156**	-15	-31	-3.3
BPJ-65	18-Sep-19	0.045	5.3	50	31	5.7	1.5	94	39
DUP - 2	1-Sep-19	0	8.5	53	31	7.2	2.2	102	36
RPD (%)		**NA**	-46	-5.4	-0.24	-24	-39	-8.5	8.0
MAM-45	11-Sep-19	0	4.9	283	191	143	8.2	631	34
DUP - 3	11-Sep-19	0	7.9	286	200	156	10	661	37
RPD (%)			-46	-1.1	-4.3	-8.7	-23	-4.6	-8.5
NEM-45	13-Sep-19	0	4.8	100	65	22	0	192	30
DUP - 4	13-Sep-19	0	4.8	107	54	11	11	187	28
RPD (%)			0.99	-7.0	18	**68**	**NA**	2.2	6.9

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

Bolded RPD values exceed 50%.

RPDs have not been calculated for cases where one or both of the samples is "0".

Table A-9. Field QA/QC data for phytoplankton, all CREMP study areas, 2019.

Area-Replicate	Phytoplankton Density (cells/L)						
	Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
WAL-89	0	103,037	223,504	86,906	35,369	600	449,416
DUP - 1	0	362,702	159,775	125,175	50,945	400	698,997
RPD (%)		**-112**	33	-36	-36	40	-43
NEM-37	0	375,987	237,589	385,594	7,692	1,700	1,008,562
DUP - 3	0	432,624	191,489	333,349	14,584	1,800	973,847
RPD (%)		-14	21	15	**-62**	-5.7	3.5
WTS-37	0	262,511	170,613	248,881	109,583	800	792,388
DUP - 4	0	273,650	177,305	304,019	49,399	1,000	805,373
RPD (%)		-4.2	-3.8	-20	**76**	-22	-1.6
TPE-123	0	429,078	376,787	50,245	4,546	1,100	861,756
DUP - 1	0	265,958	148,936	92,999	14,284	400	522,577
RPD (%)		47	**87**	**-60**	**-103**	**93**	49
SP-122	0	331,464	911,600	96,192	44,304	1,000	1,384,560
DUP - 2	0	222,704	707,464	96,392	30,336	800	1,057,696
RPD (%)		39	25	-0.21	37	22	27
LKD1-10	0	156,328	385,533	104,337	700	400	647,298
DUP - 3	0	237,589	639,514	71,722	12,038	200	961,063
RPD (%)		-41	-50	37	**-178**	**67**	-39
LKD5-10	0	444,063	348,772	566,830	11,938	1,000	1,372,602
DUP - 4	0	315,057	329,095	603,391	6,646	900	1,255,089
RPD (%)		34	5.8	-6.2	**57**	11	8.9
TPN-124	0	417,072	495,912	166,232	800	1,800	1,081,816
DUP - 1	0	359,600	539,416	118,744	1,200	1,200	1,020,160
RPD (%)		15	-8.4	33	-40	40	5.9
BAP-62	0	36,120	755,536	158,664	39,320	1,600	991,240
DUP - 2	0	50,288	877,264	167,248	82,824	800	1,178,424
RPD (%)		-33	-15	-5.3	**-71**	**67**	-17
MAM-41	0	21,952	970,256	362,600	26,952	7,600	1,389,360
DUP - 3	0	352,416	1,106,952	304,728	10,800	4,800	1,779,696
RPD (%)		**-177**	-13	17	**86**	45	-25
LKD1-11	0	101,176	1,552,408	131,312	22,752	1,200	1,808,848
DUP - 4	0	202,352	1,508,504	218,336	22,552	200	1,952,144
RPD (%)		**-67**	2.9	-50	0.88	**143**	-7.6
BAP-63	0	180,000	1,260,200	290,208	89,608	2,400	1,822,416
DUP - 1	200	100,976	1,274,368	458,640	175,216	3,200	2,012,600
RPD (%)	**NA**	**56**	-1.1	-45	**-65**	-29	-9.9
TPN-127	0	345,232	412,288	81,424	600	800	840,344
DUP - 2	200	439,424	542,400	245,656	1,000	1,800	1,230,480
RPD (%)	**NA**	-24	-27	**-100**	-50	**-77**	-38
A76-37	0	571,822	578,614	320,549	11,438	700	1,483,124
DUP - 3	0	425,832	567,776	355,210	800	800	1,350,418
RPD (%)		29	1.9	-10	**174**	-13	9.4
PDL-79	9,984	211,336	591,504	266,808	0	200	1,079,832
DUP - 4	4,200	281,976	404,320	295,544	200	600	986,840
RPD (%)	**82**	-29	38	-10	**NA**	**-100**	9.0
TPN-129	1,200	705,632	710,232	339,848	400	600	1,757,912
DUP - 1	1,000	769,488	779,872	269,008	3,600	800	1,823,768
RPD (%)	18	-8.7	-9.3	23	**-160**	-29	-3.7
BPJ-65	200	230,688	756,720	363,880	64,856	400	1,416,744
DUP - 2	0	367,184	676,296	297,840	72,840	400	1,414,560
RPD (%)	**NA**	-46	11	20	-12	0	0.15
MAM-45	0	417,872	1,507,704	1,722,152	147,640	800	3,796,168
DUP - 3	0	404,704	1,567,176	1,627,376	160,424	600	3,760,280
RPD (%)		3.2	-3.9	5.7	-8.3	29	0.95
NEM-45	0	194,768	1,150,240	719,648	67,872	0	2,132,528
DUP - 4	0	222,904	1,164,608	793,272	61,272	800	2,242,856
RPD (%)		-13	-1.2	-9.7	10	**NA**	-5.0

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

Bolded RPD values exceed 50%.

RPDs have not been calculated for cases where one or both of the samples is "0".

Table A-10. Laboratory QA/QC data for phytoplankton, all CREMP study areas, 2019.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**	
NEM - 38	7-Mar-19	0	6.1	7.4	29	4.7	24	70	20
NEM-38R	7-Mar-19	0	5.7	4.6	31	6.2	28	75	20
RPD (%)			5.7	47	-6.3	-28	-16	-6.2	0
PDL - 74	31-Mar-19	1.6	2.1	7.5	1.9	0.46	0.92	15	23
PDL - 74R	31-Mar-19	0.43	2.4	7.7	3.8	0.46	0.90	16	21
RPD (%)		**113**	-14	-2.3	**-65**	0	1.7	-8.1	9.1
LK5 - 8	9-Mar-19	0	4.7	13	4.9	8.0	66	96	20
LK5 - 08R	9-Mar-19	0	3.3	13	4.2	9.2	58	88	18
RPD (%)			36	0.35	15	-14	12	9.4	11
A20 - 33	11-May-19	0	2.0	40	5.0	1.9	15	64	20
A20 - 33R	11-May-19	0	2.0	41	5.1	1.3	14	64	19
RPD (%)			0.55	-3.1	-3.8	35	3.3	-0.61	5.1
LK1 - 10	10-May-19	0	4.0	81	6.9	1.2	3.6	97	21
LK1 - 10R	10-May-19	0	5.5	84	6.7	1.6	1.8	100	21
RPD (%)			-32	-4.4	4.3	-30	**67**	-3.5	0
PDL - 75S	18-May-19	1.1	2.4	7.0	1.7	4.4	2.1	19	23
PDL - 75SR	18-May-19	1.4	2.3	7.5	1.8	3.4	2.2	19	23
RPD (%)		-25	5.2	-6.7	-5.1	27	-5.4	0.92	0
TPN - 123S	6-May-19	0	2.8	25	1.1	2.2	14	45	19
TPN - 123SR	6-May-19	0	3.4	23	1.4	5.0	16	48	18
RPD (%)			-19	8.7	-28	**-77**	-10	-6.8	5.4
BPJ - 62S	24-Jul-19	0	2.9	109	13	36	16	177	30
BPJ - 62SR	24-Jul-19	0	1.7	120	17	42	24	205	30
RPD (%)			**53**	-9.8	-28	-16	-38	-15	0
DS1 - 33	9-Jul-19	0	5.2	167	20	3.7	21	218	35
DS1 - 33R	9-Jul-19	0	7.1	162	15	4.8	23	212	34
RPD (%)			-31	3.3	32	-27	-9.8	2.7	2.9
INUG - 112S	29-Jul-19	0	11	158	21	2.1	6.6	199	32
INUG - 112SR	29-Jul-19	0	1.6	155	26	4.3	12	198	31
RPD (%)			**149**	2.2	-20	**-68**	**-59**	0.30	3.2
LK5 - 11	24-Jul-19	0	13	133	11	0.49	8.9	167	30
LK5 - 11R	24-Jul-19	0	11	142	7.7	0.24	6.8	167	29
RPD (%)			22	-5.9	35	67	27	0.065	3.4
BBD - 63S	12-Aug-19	0.055	7.4	61	50	25	33	176	44
BBD - 63SR	12-Aug-19	0.16	5.7	69	52	20	34	181	40
RPD (%)		**-100**	26	-13	-4.1	19	-3.6	-3.1	9.5
DS1 - 35	17-Aug-19	0	8.8	83	7.0	7.5	12	118	28
DS1 - 35R	17-Aug-19	0.29	7.5	85	7.2	5.4	13	119	29
RPD (%)		**NA**	16	-3.0	-3.3	32	-12	-1.1	-3.5
LK1 - 14	17-Aug-19	0.061	8.8	47	11	2.4	11	80	31
LK1 - 14R	17-Aug-19	0.020	8.0	52	17	1.6	9.1	88	28
RPD (%)		**100**	10	-11	-41	37	19	-8.9	10
WAL - 95S	11-Aug-19	0	12	64	30	6.4	12	124	39
WAL - 95SR	11-Aug-19	0	11	82	28	5.7	15	141	36
RPD (%)			9.2	-24	7.3	12	-20	-12	8.0
A20 - 40	12-Sep-19	0	5.1	89	20	14	14	143	32
A20 - 40R	12-Sep-19	0	4.9	90	20	13	19	147	30
RPD (%)			4.6	-0.42	-2.1	5.9	-29	-3.2	6.5
DS1 - 37	7-Sep-19	0	5.9	91	8.8	14	20	139	39
DS1 - 37R	7-Sep-19	0	5.2	104	18	12	16	155	36
RPD (%)			12	-14	**-67**	12	19	-11	8.0
SP - 128S	15-Sep-19	0	4.2	81	17	7.4	16	127	35
SP - 128SR	15-Sep-19	0.18	4.6	70	25	6.1	16	122	33
RPD (%)		**NA**	-8.2	14	-35	20	4.2	3.9	5.9
WAL - 98S	14-Sep-19	0	9.4	78	26	0.46	2.0	116	31
WAL - 98SR	14-Sep-19	0	9.6	88	23	0.92	6.2	127	28
RPD (%)			-2.1	-12	14	-67	-102	-9.6	10

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

Bolded RPD values exceed 25%.

RPDs have not been calculated for cases where one or both of the samples is "0".

Table A-10. Laboratory QA/QC data for phytoplankton, all CREMP study areas, 2019.

Area-Replicate	Phytoplankton Density (cells/L)						
	Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
NEM - 38	0	365,248	212,766	399,417	29,169	2,700	1,009,300
NEM-38R	0	333,333	138,298	455,455	36,661	3,300	967,047
RPD (%)		9.1	42	-13	-23	-20	4.3
PDL - 74	30,069	380,233	92,399	57,338	3,646	100	563,784
PDL - 74R	1,200	358,656	103,337	93,399	3,646	100	560,338
RPD (%)	**185**	5.8	-11	-48	0	0	0.61
LK5 - 8	0	184,697	191,689	159,628	7,746	1,300	545,061
LK5 - 08R	0	145,490	202,228	120,121	11,692	1,400	480,931
RPD (%)		24	-5.4	28	-41	-7.4	13
A20 - 33	0	163,121	546,299	236,443	14,284	1,600	961,747
A20 - 33R	0	148,936	489,562	268,058	10,638	1,600	918,794
RPD (%)		9.1	11	-13	29	0	4.6
LK1 - 10	0	156,328	385,533	104,337	700	400	647,298
LK1 - 10R	0	163,121	396,071	101,391	900	200	661,682
RPD (%)		-4.3	-2.7	2.9	-25	**67**	-2.2
PDL - 75S	3,200	347,918	127,860	50,345	15,484	400	545,207
PDL - 75SR	4,100	315,703	96,045	64,930	11,638	300	492,716
RPD (%)	-25	9.7	28	-25	28	29	10
TPN - 123S	0	429,078	376,787	50,245	4,546	1,100	861,756
TPN - 123SR	0	397,263	320,149	67,776	22,477	1,000	808,665
RPD (%)		7.7	16	-30	**-133**	9.5	6.4
BPJ - 62S	0	50,288	952,088	135,912	144,296	2,000	1,284,584
BPJ - 62SR	0	28,736	1,044,480	128,328	174,232	2,600	1,378,376
RPD (%)		**55**	-9.3	5.7	-19	-26	-7.0
DS1 - 33	0	130,112	1,387,544	277,592	36,520	2,600	1,834,368
DS1 - 33R	0	166,032	1,380,360	249,256	43,904	3,200	1,842,752
RPD (%)		-24	0.52	11	-18	-21	-0.46
INUG - 112S	0	73,040	902,000	328,680	1,200	400	1,305,320
INUG - 112SR	0	36,320	952,688	359,816	16,168	800	1,365,792
RPD (%)		**67**	-5.5	-9.0	**-172**	**-67**	-4.5
LK5 - 11	0	304,528	1,415,464	180,200	400	1,200	1,901,792
LK5 - 11R	0	275,392	1,424,248	165,832	200	1,000	1,866,672
RPD (%)		10	-0.62	8.3	67	18	1.9
BBD - 63S	200	137,096	670,512	267,056	120,544	1,000	1,196,408
BBD - 63SR	600	165,632	807,408	274,840	97,992	1,000	1,347,472
RPD (%)	**-100**	-19	-19	-2.9	21	0	-12
DS1 - 35	0	235,243	1,114,175	153,182	37,961	2,900	1,543,461
DS1 - 35R	3,546	203,128	1,248,627	132,206	23,677	3,200	1,614,383
RPD (%)	**NA**	15	-11	15	46	-9.8	-4.5
LK1 - 14	300	285,488	546,899	103,937	28,669	7,792	973,085
LK1 - 14R	100	231,697	642,744	157,328	21,277	4,346	1,057,492
RPD (%)	**100**	21	-16	-41	30	**57**	-8.3
WAL - 95S	0	463,376	869,864	131,328	65,656	1,600	1,531,824
WAL - 95SR	0	362,000	899,000	139,912	65,656	1,600	1,468,168
RPD (%)		25	-3.3	-6.3	0	0	4.2
A20 - 40	0	188,384	1,293,920	114,976	83,624	1,400	1,682,304
A20 - 40R	0	201,952	1,293,520	114,976	41,520	1,600	1,653,568
RPD (%)		-7.0	0.031	0	**67**	-13	1.7
DS1 - 37	0	151,464	1,267,984	108,776	54,288	3,000	1,585,512
DS1 - 37R	0	137,296	1,261,600	218,736	53,488	2,400	1,673,520
RPD (%)		9.8	0.50	**-67**	1.5	22	-5.4
SP - 128S	0	188,384	675,112	376,368	24,752	1,400	1,266,016
SP - 128SR	800	246,256	702,848	434,040	23,952	1,200	1,409,096
RPD (%)	**NA**	-27	-4.0	-14	3.3	15	-11
WAL - 98S	0	340,048	862,496	411,704	400	400	1,615,048
WAL - 98SR	0	381,552	890,032	324,896	800	400	1,597,680
RPD (%)		-12	-3.1	24	-67	0	1.1

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

Bolded RPD values exceed 25%.

RPDs have not been calculated for cases where one or both of the samples is "0".

Table A-11. Percent recovery of benthic invertebrate samples, all CREMP study areas, 2019.

Area-Replicate	Number of Organisms Recovered	Number of Organisms in Re-sort	Percent Recovery
BAP-2	175	184	95.1%
BES-5	166	172	96.5%
INUG-1	61	61	100.0%
A20-5	80	84	95.2%
DS1-4	110	113	97.3%
LK1-3	100	102	98.0%
LK5-1	80	81	98.8%
MAM-1	398	404	98.5%
MAM-4	460	467	98.5%
WTS-1	94	94	100.0%
		Average % Recovery	97.3%

Notes:

All samples were sorted in their entirety.

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.

APPENDIX B
WATER CHEMISTRY DATA AND SUPPLEMENTAL PLOTS

Appendix B1
Water Chemistry – Meadowbank Study Area Lakes

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Table B1-1. Water quality results from the 2019 CREMP, Meadowbank study area lakes.

Lake (Station)					Third Portage Lake East Basin (TPE)									
Area-Replicate ID					TPE-120	TPE-121	TPE-122	TPE-123	TPE-125	TPE-124	TPE-126	TPE-127	TPE-128	TPE-129
ALS Sample ID		Meadowbank Screening Values			L2247639-1	L2247639-2	L2274449-3	L2274449-4	L2314384-3	L2314384-4	L2331829-4	L2331829-5	L2354972-3	L2354972-4
Date	Aquatic Life	Trigger[2]			17-Mar-19	17-Mar-19	07-May-19	07-May-19	13-Jul-19	13-Jul-19	13-Aug-19	13-Aug-19	14-Sep-19	14-Sep-19
Time	Guideline[1]	Meadowbank	Wally Lake	Threshold[2]	10:30	13:30	14:00	15:44	16:35	16:20	16:45	17:20	11:18	10:04
Physical Tests (mg/L)														
Conductivity (µS/cm)		27	37		**39**	**36**	**44**	**40**	**30**	**31**	**29**	**30**	**29**	**29**
Hardness		9.5	17		**13**	**12**	**15**	**14**	**10**	**11**	**11**	**10**	**10.0**	**11**
pH (Laboratory)	6.5 - 9.0	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.2	7.2	7.3	7.3	7.1	7.2	7.2	7.2	7.1	7.1
Total Suspended Solids		3.0	3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids		19	25		**24**	**22**	**26**	**24**	**21**	**23**	16	17	**21**	**20**
Turbidity (NTU)					<0.10	<0.10	<0.10	<0.10	0.26	0.22	0.19	0.22	0.25	0.28
Anions and Nutrients (mg/L)														
Alkalinity - Bicarbonate		8.7	18		**9.7**	8.6	**11**	**10**	7.6	7.9	7.8	8.0	8.0	8.1
Alkalinity - Carbonate		2.0	2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		8.7	18		**9.7**	8.6	**11**	**10**	7.6	7.9	7.8	8.0	8.0	8.1
Ammonia (as N)[3]	***equation***	0.065	0.067	0.13	0.016	0.016	**0.089**	0.015	0.041	0.0052	0.061	**0.092**	<0.0050	<0.0050
Bromide					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	60	60	120	1.0	1.0	1.1	0.99	0.70	0.73	0.78	0.77	0.77	0.77
Fluoride	0.12	0.088	0.080	0.12	0.088	0.082	**0.10**	**0.093**	0.070	0.073	0.075	0.077	0.081	0.081
Nitrate (as N)	3.0	1.5	1.5	3.0	0.013	0.018	0.011	0.010	0.0084	0.010	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.060	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0020	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.17	0.16		0.074	0.10	**0.18**	0.086	0.12	0.091	0.12	0.15	0.083	0.083
Ortho Phosphate (as P)		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P) - Total Diss.					<0.0020	0.0021	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P) - Total	0.0040	0.0051	0.0067	0.0040	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicate (as SiO_2)		1.0	1.1		<0.50	<0.50	1.4	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		65	65	128	6.2	6.0	6.7	6.1	4.4	4.6	4.9	4.8	4.8	4.8
Cyanides (mg/L)														
Total Cyanide					<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.0050				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)														
Dissolved Organic Carbon		2.5	3.2		1.5	1.6	1.9	1.8	1.5	1.4	1.3	1.2	1.5	1.4
Total Organic Carbon		2.6	4.1		1.4	1.7	1.7	1.6	1.3	1.3	1.2	1.2	1.4	1.5
Plant Pigments (µg/L)														
Chlorophyll-*a*					0.22	0.23	0.15	0.28	0.16	0.18	0.82	0.51	0.80	0.70
Total Metals (mg/L)														
Aluminum[3]	***equation***	0.053	0.053	0.10	<0.0030	<0.0030	<0.0030	0.0038	0.0055	0.0056	0.0072	0.0079	0.0083	0.0087
Antimony		0.0046	0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.0026	0.0026	0.0050	0.00029	0.00020	0.00039	0.00039	0.00031	0.00033	0.00035	0.00030	0.00035	0.00039
Barium		0.50	0.50	1.0	0.0037	0.0036	0.0041	0.0038	0.0029	0.0031	0.0028	0.0028	0.0028	0.0028
Beryllium		0.00012	0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.00002	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.4	4.9		**3.3**	**2.9**	**3.6**	**3.4**	**2.5**	**2.6**	**2.6**	**2.6**	**2.6**	**2.7**
Chromium[4]	0.0010	0.0025	0.0026	0.0050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00050	**0.0049**
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.0012	0.0015	0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00051
Iron	0.30	0.15	0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	0.042
Lead[3]	***equation***	0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00006	<0.000050
Lithium		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.93	1.4		**1.3**	**1.2**	**1.5**	**1.4**	**0.99**	**1.0**	**0.95**	**0.95**	**0.98**	**0.97**
Manganese[3]		0.32	0.33	***See text***	0.00035	0.00040	0.00037	0.00043	0.0020	0.0020	0.00097	0.0011	0.0015	0.0015
Mercury	0.00003	0.00002	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.037	0.073	0.00016	0.00016	0.00017	0.00016	0.00012	0.00012	0.00015	0.00013	0.00015	0.00025
Nickel[3]	***equation***	0.013	0.013	0.025	0.00050	<0.00050	0.00057	0.00057	0.00053	0.00057	<0.00050	<0.00050	<0.00050	0.00067
Phosphorus		0.0051	0.0067	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.58	0.59		**0.66**	**0.63**	**0.79**	**0.70**	0.50	0.53	0.46	0.46	0.52	0.51
Selenium	0.0010	0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.20	0.65		<0.10	<0.10	0.12	0.11	0.13	0.11	0.11	0.10	0.12	0.12
Silver	0.00010	0.00013	0.00013	0.00025	<0.000010	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.2	0.72		**1.5**	**1.5**	**1.7**	**1.5**	1.1	1.1	1.00	1.0	1.0	1.0
Strontium		0.028	0.033	0.049	0.015	0.014	0.018	0.015	0.012	0.012	0.012	0.012	0.011	0.011
Sulfur					2.2	2.2	2.6	2.3	1.8	1.7	1.3	1.4	1.7	1.8
Thallium	0.00080	0.00041	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.00020	0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060	0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00034	<0.00030
Uranium	0.015	0.0075	0.0075	0.015	0.00004	0.00004	0.00004	0.00004	0.00005	0.00005	0.00005	0.00005	0.00004	0.00004
Vanadium		0.060	0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc				***See text***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals (mg/L)														
Aluminum[3]		0.026	0.026	0.050	<0.0010	<0.0010	0.0023	<0.0010	0.0017	0.0016	0.0032	0.0030	0.0027	0.0025
Antimony		0.0046	0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.0026	0.0026	0.0050	0.00030	0.00020	0.00035	0.00035	0.00026	0.00032	0.00033	0.00028	0.00028	0.00030
Barium		0.50	0.50	1.0	0.0037	0.0034	0.0042	0.0035	0.0029	0.0030	0.0027	0.0026	0.0027	0.0027
Beryllium		0.00012	0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.00002	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.4	4.9		**3.3**	**3.0**	**3.9**	**3.5**	**2.5**	**2.7**	**2.6**	**2.6**	**2.5**	**2.7**
Chromium		0.00026	0.00026	0.0050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.0012	0.0015	0.0020	0.00042	0.00041	0.00040	0.00036	0.00033	0.00035	0.00036	0.00035	0.00041	0.00040
Iron		0.16	0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	0.011
Lead		0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.93	1.4		**1.3**	**1.2**	**1.4**	**1.2**	**0.95**	**1.00**	**0.96**	**0.94**	0.93	**0.96**
Manganese[3]		0.32	0.33	***See text***	0.00013	0.00016	0.00040	0.00015	0.0016	0.0014	0.00043	0.00047	0.00060	0.00056
Mercury		0.00002	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.037	0.073	0.00016	0.00016	0.00019	0.00016	0.00011	0.00012	0.00013	0.00013	0.00015	0.00017
Nickel		0.013	0.013	0.025	<0.00050	<0.00050	0.00054	0.00051	0.00052	0.00052	<0.00050	<0.00050	<0.0015	<0.0020
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.58	0.59		**0.63**	**0.63**	**0.72**	**0.63**	0.51	0.52	0.50	0.49	0.52	0.52
Selenium		0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.18	0.67		0.074	0.060	0.095	0.081	0.10	0.10	0.085	0.083	0.091	0.080
Silver		0.00013	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.2	0.72		**1.5**	**1.5**	**1.6**	**1.4**	0.97	0.99	1.0	1.0	1.0	1.1
Strontium		0.85	0.86	1.7	0.014	0.014	0.016	0.014	0.011	0.012	0.011	0.011	0.012	0.012
Sulfur					2.1	2.1	2.4	2.1	1.6	1.5	1.4	1.4	1.7	1.7
Thallium		0.00041	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.00020	0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060	0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.0075	0.015	0.00003	0.00003	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00003	0.00004
Vanadium		0.060	0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0018	0.0024	***See text***	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d) and updated in 2019. A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the CREMP: 2015 Plan Update (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.3** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table B1-1. Water quality results from the 2019 CREMP, Meadowbank study area lakes.

Lake (Station)					**Third Portage Lake North Basin (TPN)**									
Area-Replicate ID					TPN-120	TPN-121	TPN-123	TPN-122	TPN-124	TPN-125	TPN-126	TPN-127	TPN-128	TPN-129
ALS Sample ID		**Meadowbank Screening Values**			L2247638-2	L2254150-1	L2274449-1	L2274449-2	L2324036-1	L2324036-2	L2331829-2	L2331829-3	L2354972-1	L2354972-2
Date	Aquatic Life	Trigger[2]			17-Mar-19	18-Mar-19	06-May-19	06-May-19	23-Jul-19	23-Jul-19	13-Aug-19	13-Aug-19	10-Sep-19	14-Sep-19
Time	Guideline[1]	Meadowbank	Wally Lake	Threshold[2]	16:30	11:45	16:15	16:55	15:20	14:10	15:15	10:00	10:00	12:09
Physical Tests (mg/L)														
Conductivity (µS/cm)		27	37		**38**	**35**	**41**	**36**	26	27	27	27	27	27
Hardness		9.5	17		**12**	**12**	**14**	**12**	9.5	9.3	9.0	9.0	9.3	8.9
pH (Laboratory)	6.5 - 9.0	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.2	7.0	7.2	7.2	7.1	7.1	7.1	7.1	7.1	7.1
Total Suspended Solids		3.0	3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids		19	25		**24**	**24**	**25**	**24**	16	16	15	16	17	19
Turbidity (NTU)					<0.10	<0.10	<0.10	<0.10	0.13	0.16	0.16	0.30	0.19	0.19
Anions and Nutrients (mg/L)														
Alkalinity - Bicarbonate		8.7	18		8.7	8.0	**9.8**	8.4	6.0	6.4	6.2	6.5	6.9	6.7
Alkalinity - Carbonate		2.0	2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		8.7	18		8.7	8.0	**9.8**	8.4	6.0	6.4	6.2	6.5	6.9	6.7
Ammonia (as N)[3]	***equation***	0.065	0.067	0.13	0.017	0.022	0.015	**0.086**	0.074	<0.0050	**0.078**	**0.13**	0.0053	0.0061
Bromide					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	60	60	120	1.1	1.0	1.2	1.0	0.82	0.79	0.80	0.82	0.79	0.78
Fluoride	0.12	0.088	0.080	0.12	**0.089**	0.084	**0.094**	0.087	0.070	0.067	0.068	0.070	0.076	0.074
Nitrate (as N)	3.0	1.5	1.5	3.0	0.017	0.018	0.020	0.018	0.019	0.016	0.013	0.013	0.0055	0.0050
Nitrite (as N)	0.060	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.17	0.16		0.11	0.086	0.12	0.16	0.19	0.10	0.16	**0.19**	0.096	0.087
Ortho Phosphate (as P)		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P) - Total Diss.					<0.0020	<0.0020	0.010	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P) - Total	0.0040	0.0051	0.0067	0.0040	<0.0020	<0.0020	0.0021	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicate (as SiO_2)		1.0	1.1		<0.50	<0.50	<2.5	1.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		65	65	128	6.6	6.0	6.7	6.1	4.7	4.7	4.8	4.8	4.6	4.6
Cyanides (mg/L)														
Total Cyanide					<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.0050				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)														
Dissolved Organic Carbon		2.5	3.2		1.8	2.1	2.0	2.0	1.5	1.5	1.5	1.3	1.6	1.4
Total Organic Carbon		2.6	4.1		1.8	1.7	1.9	1.8	1.4	1.4	1.2	1.2	1.4	1.1
Plant Pigments (µg/L)														
Chlorophyll-*a*					0.25	0.25	0.30	0.36	0.23	0.16	0.35	0.50	0.60	0.78
Total Metals (mg/L)														
Aluminum[3]	***equation***	0.053	0.053	0.10	<0.0030	<0.0030	<0.0030	<0.0030	0.0040	0.0047	0.0043	0.0048	0.0068	0.0066
Antimony		0.0046	0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.0026	0.0026	0.0050	0.00020	0.00019	0.00022	0.00019	0.00016	0.00016	0.00016	0.00015	0.00018	0.00017
Barium		0.50	0.50	1.0	0.0037	0.0037	0.0039	0.0038	0.0028	0.0028	0.0028	0.0027	0.0029	0.0029
Beryllium		0.00012	0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.00002	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.4	4.9		**3.0**	**2.9**	**3.3**	**2.9**	2.4	2.2	2.2	2.2	2.3	2.2
Chromium[4]	0.0010	0.0025	0.0026	0.0050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00010	<0.00050	<0.00050
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.0012	0.0015	0.0020	<0.00050	<0.00050	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron	0.30	0.15	0.16	0.30	<0.010	<0.010	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010
Lead[3]	***equation***	0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.93	1.4		**1.2**	**1.1**	**1.4**	**1.2**	0.91	0.90	0.86	0.85	0.91	0.86
Manganese[3]		0.32	0.33	***See text***	0.00037	0.00038	0.00046	0.00030	0.00098	0.0012	0.00092	0.00097	0.0010	0.00097
Mercury	0.00003	0.00002	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.037	0.073	0.00017	0.00015	0.00019	0.00018	0.00012	0.00012	0.00012	0.00013	0.00012	0.00012
Nickel[3]	***equation***	0.013	0.013	0.025	<0.00050	<0.00050	0.00053	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus		0.0051	0.0067	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.58	0.59		**0.66**	**0.63**	**0.78**	**0.70**	0.47	0.47	0.43	0.44	0.49	0.48
Selenium	0.0010	0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.20	0.65		<0.10	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	0.11	0.10	0.11
Silver	0.00010	0.00013	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.2	0.72		**1.5**	**1.3**	**1.7**	**1.6**	1.2	1.2	1.0	1.0	1.1	1.0
Strontium		0.028	0.033	0.049	0.014	0.013	0.016	0.014	0.010	0.010	0.011	0.011	0.010	0.0098
Sulfur					2.2	2.3	2.7	2.5	1.6	1.6	1.4	1.3	1.8	1.6
Thallium	0.00080	0.00041	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.00020	0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060	0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium	0.015	0.0075	0.0075	0.015	0.00004	0.00004	0.00004	0.00004	0.00003	0.00003	0.00004	0.00004	0.00004	0.00003
Vanadium		0.060	0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc				***See text***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals (mg/L)														
Aluminum[3]		0.026	0.026	0.050	<0.0010	0.0013	<0.0010	<0.0010	0.0016	0.0014	0.0027	0.0022	0.0038	0.0022
Antimony		0.0046	0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.0026	0.0026	0.0050	0.00020	0.00021	0.00020	0.00017	0.00014	0.00016	0.00016	0.00013	0.00015	0.00014
Barium		0.50	0.50	1.0	0.0040	0.0037	0.0039	0.0034	0.0027	0.0026	0.0026	0.0026	0.0029	0.0028
Beryllium		0.00012	0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.00002	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.4	4.9		**2.9**	**2.9**	**3.4**	**2.9**	2.3	2.3	2.2	2.2	2.3	2.2
Chromium		0.00026	0.00026	0.0050	<0.00010	0.00017	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	0.00012	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.0012	0.0015	0.0020	0.00040	0.00038	0.00043	0.00035	0.00030	0.00034	0.00035	0.00034	0.00038	0.00037
Iron		0.16	0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.010
Lead		0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.93	1.4		**1.2**	**1.2**	**1.3**	**1.1**	0.88	0.87	0.84	0.84	0.89	0.86
Manganese[3]		0.32	0.33	***See text***	0.00017	0.00016	0.00028	0.00019	0.00089	0.00091	0.00049	0.00049	0.00058	0.00049
Mercury		0.00002	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.037	0.073	0.00020	0.00016	0.00019	0.00017	0.00012	0.00013	0.00013	0.00012	0.00014	0.00014
Nickel		0.013	0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	<0.0015
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.58	0.59		**0.67**	**0.64**	**0.71**	**0.61**	0.49	0.49	0.47	0.47	0.53	0.49
Selenium		0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.18	0.67		0.055	<0.050	0.062	0.056	0.074	0.058	0.062	0.072	0.071	0.075
Silver		0.00013	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.2	0.72		**1.5**	**1.6**	**1.6**	**1.4**	1.1	1.1	1.0	1.0	1.1	1.1
Strontium		0.85	0.86	1.7	0.014	0.014	0.015	0.013	0.011	0.011	0.0100	0.010	0.011	0.011
Sulfur					2.0	1.9	2.4	2.2	1.5	1.7	1.4	1.3	1.7	1.6
Thallium		0.00041	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.00020	0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060	0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.0075	0.015	0.00003	0.00003	0.00004	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003
Vanadium		0.060	0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0018	0.0024	***See text***	<0.0010	**0.0022**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d) and updated in 2019. A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the CREMP: 2015 Plan Update (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.3** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table B1-1. Water quality results from the 2019 CREMP, Meadowbank study area lakes.

Lake (Station)					Second Portage Lake (SP)									
Area-Replicate ID					SPL-120	SPL-121	SP-123	SP-122	SP-124	SP-125	SP-126	SP-127	SP-128	SP-129
ALS Sample ID		Meadowbank Screening Values			L2254150-4	L2254150-5	L2274449-6	L2274449-7	L2312327-1	L2312327-2	L2331829-12	L2331829-13	L2354972-19	L2354972-20
Date	Aquatic Life	Trigger[2]			29-Mar-19	29-Mar-19	11-May-19	11-May-19	10-Jul-19	10-Jul-19	14-Aug-19	14-Aug-19	15-Sep-19	15-Sep-19
Time	Guideline[1]	Meadowbank	Wally Lake	Threshold[2]	9:30	10:20	13:52	14:36	3:00	3:30	11:30	12:18	10:30	11:00
Physical Tests (mg/L)														
Conductivity (µS/cm)		27	37		**49**	**51**	**56**	**54**	**40**	**40**	**40**	**39**	**39**	**39**
Hardness		9.5	17		**20**	**20**	**21**	**21**	**15**	**16**	**15**	**15**	**16**	**16**
pH (Laboratory)	6.5 - 9.0	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.3	7.3	7.5	7.4	7.2	7.3	7.4	7.3	7.1	7.1
Total Suspended Solids		3.0	3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids		19	25		**33**	**27**	**43**	**46**	**26**	**26**	**30**	**26**	**27**	19
Turbidity (NTU)					<0.10	<0.10	0.12	<0.10	0.41	0.40	0.25	0.28	0.19	<0.10
Anions and Nutrients (mg/L)														
Alkalinity - Bicarbonate		8.7	18		**14**	**14**	**16**	**15**	**12**	**11**	**12**	**11**	**12**	**12**
Alkalinity - Carbonate		2.0	2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		8.7	18		**14**	**14**	**16**	**15**	**12**	**11**	**12**	**11**	**12**	**12**
Ammonia (as N)[3]	***equation***	0.065	0.067	0.13	0.015	0.012	0.023	0.011	<0.0050	<0.0050	**0.15**	0.034	<0.0050	<0.0050
Bromide					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	60	60	120	1.2	1.2	1.3	1.3	0.93	0.93	1.1	0.90	0.87	0.87
Fluoride	0.12	0.088	0.080	0.12	**0.093**	**0.10**	**0.10**	**0.097**	0.074	0.076	0.070	0.070	0.072	0.071
Nitrate (as N)	3.0	1.5	1.5	3.0	0.0078	0.012	0.014	0.012	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.060	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.17	0.16		0.096	0.12	0.12	0.12	0.12	0.11	**0.26**	0.13	0.098	0.12
Ortho Phosphate (as P)		0.0020	0.0020		0.0017	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P) - Total Diss.					<0.0020	<0.0020	<0.0020	<0.0020	0.0033	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P) - Total	0.0040	0.0051	0.0067	0.0040	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0029	0.0028	0.0020	0.0022	<0.0020
Silicate (as SiO_2)		1.0	1.1		<0.50	<0.50	0.69	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		65	65	128	7.0	7.5	8.0	7.4	5.6	5.6	5.6	5.4	5.4	5.4
Cyanides (mg/L)														
Total Cyanide					<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.0050				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)														
Dissolved Organic Carbon		2.5	3.2		1.9	2.1	2.1	1.8	1.8	1.9	1.7	1.6	1.9	1.7
Total Organic Carbon		2.6	4.1		1.8	2.2	2.0	1.9	2.2	1.8	1.7	1.8	2.0	2.0
Plant Pigments (µg/L)														
Chlorophyll-*a*					0.60	0.35	0.91	1.4	0.42	0.54	0.51	0.48	0.69	0.73
Total Metals (mg/L)														
Aluminum[3]	***equation***	0.053	0.053	0.10	<0.0030	<0.0030	0.0035	<0.0030	0.011	0.011	0.0072	0.0077	0.0060	0.0064
Antimony		0.0046	0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.0026	0.0026	0.0050	0.00028	0.00030	0.00036	0.00032	0.00021	0.00020	0.00022	0.00022	0.00027	0.00024
Barium		0.50	0.50	1.0	0.0036	0.0040	0.0046	0.0039	0.0029	0.0029	0.0027	0.0026	0.0027	0.0025
Beryllium		0.00012	0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.00002	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.4	4.9		**5.0**	**5.2**	**5.2**	**5.1**	**4.0**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**
Chromium[4]	0.0010	0.0025	0.0026	0.0050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00029	<0.00010	<0.00010	<0.00040	<0.00040
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.0012	0.0015	0.0020	0.00055	0.00063	0.00069	0.00065	0.00052	0.00053	0.00067	0.00069	0.00064	0.00062
Iron	0.30	0.15	0.16	0.30	<0.010	<0.010	<0.010	<0.010	0.019	0.023	0.014	0.015	0.012	0.013
Lead[3]	***equation***	0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.93	1.4		**1.6**	**1.6**	**1.8**	**1.7**	**1.4**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**
Manganese[3]		0.32	0.33	***See text***	0.00035	0.00041	0.0011	0.00046	0.0025	0.0024	0.0012	0.0011	0.00095	0.0010
Mercury	0.00003	0.00002	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.037	0.073	0.00017	0.00017	0.00018	0.00018	0.00015	0.00014	0.00016	0.00016	0.00017	0.00017
Nickel[3]	***equation***	0.013	0.013	0.025	0.00051	0.00051	0.00054	0.00052	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus		0.0051	0.0067	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.58	0.59		**0.71**	**0.76**	**0.83**	**0.75**	0.54	0.52	0.49	0.48	0.56	0.55
Selenium	0.0010	0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.20	0.65		0.18	0.20	0.20	0.18	**0.23**	**0.23**	0.20	**0.21**	**0.21**	**0.22**
Silver	0.00010	0.00013	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.2	0.72		**1.3**	**1.4**	**1.5**	**1.3**	0.84	0.84	0.83	0.80	0.90	0.87
Strontium		0.028	0.033	0.049	0.022	0.023	0.023	0.023	0.019	0.019	0.021	0.020	0.018	0.018
Sulfur					2.4	2.7	2.7	2.5	1.8	1.8	1.5	1.5	1.9	1.7
Thallium	0.00080	0.00041	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.00020	0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060	0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium	0.015	0.0075	0.0075	0.015	0.00004	0.00005	0.00005	0.00005	0.00005	0.00005	0.00006	0.00006	0.00004	0.00004
Vanadium		0.060	0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc				***See text***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals (mg/L)														
Aluminum[3]		0.026	0.026	0.050	0.0016	0.0014	<0.0010	<0.0010	0.0034	0.0029	0.0038	0.0044	0.0023	0.0030
Antimony		0.0046	0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.0026	0.0026	0.0050	0.00027	0.00030	0.00029	0.00028	0.00022	0.00022	0.00020	0.00020	0.00019	0.00020
Barium		0.50	0.50	1.0	0.0038	0.0041	0.0040	0.0036	0.0027	0.0029	0.0026	0.0025	0.0027	0.0025
Beryllium		0.00012	0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.00002	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.4	4.9		**5.2**	**5.2**	**5.6**	**5.6**	**3.9**	**4.0**	**4.0**	**3.9**	**4.0**	**4.1**
Chromium		0.00026	0.00026	0.0050	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.0012	0.0015	0.0020	0.00057	0.00060	0.00053	0.00057	0.0012	0.00065	0.00060	0.00062	0.00055	0.00059
Iron		0.16	0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead		0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.93	1.4		**1.7**	**1.7**	**1.7**	**1.7**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**
Manganese[3]		0.32	0.33	***See text***	<0.00010	0.00024	0.00085	0.00026	0.0019	0.0021	0.00039	0.00039	0.00029	0.00026
Mercury		0.00002	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.037	0.073	0.00019	0.00021	0.00022	0.00021	0.00015	0.00016	0.00015	0.00016	0.00017	0.00015
Nickel		0.013	0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.58	0.59		**0.74**	**0.76**	**0.77**	**0.75**	0.54	0.55	0.52	0.52	0.55	0.55
Selenium		0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.18	0.67		0.14	0.14	**0.19**	**0.19**	0.17	0.17	0.17	0.18	0.17	**0.19**
Silver		0.00013	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.2	0.72		**1.3**	**1.5**	**1.5**	**1.5**	0.90	0.92	0.87	0.85	0.88	0.88
Strontium		0.85	0.86	1.7	0.024	0.025	0.025	0.024	0.019	0.020	0.019	0.020	0.017	0.018
Sulfur					2.4	2.5	2.7	2.7	1.8	1.9	1.6	1.6	1.8	1.8
Thallium		0.00041	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.00020	0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060	0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.0075	0.015	0.00004	0.00004	0.00005	0.00004	0.00005	0.00005	0.00005	0.00005	0.00004	0.00005
Vanadium		0.060	0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0018	0.0024	***See text***	<0.0010	<0.0010	<0.0010	<0.0010	**0.0019**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d) and updated in 2019. A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the CREMP: 2015 Plan Update (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.3** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table B1-1. Water quality results from the 2019 CREMP, Meadowbank study area lakes.

Lake (Station)					Wally Lake (WAL)										Tehek Lake (TE)		Tehek Lake Far-field (TEFF)	
Area-Replicate ID					WAL-89	WAL-90	WAL-91	WAL-92	WAL-93	WAL-94	WAL-95	WAL-96	WAL-97	WAL-98	TE-96	TE-97	TEFF-48	TEFF-49
ALS Sample ID		Meadowbank Screening Values			L2254150-3	L2254150-2	L2278655-5	L2278655-6	L2314384-1	L2314384-2	L2331829-1	Not Collected	L2354972-5	L2354972-6	L2254150-9	L2254150-12	L2254150-11	L2254150-10
Date	Aquatic Life	Trigger[2]			28-Mar-19	28-Mar-19	16-May-19	16-May-19	16-Jul-19	16-Jul-19	11-Aug-19		14-Sep-19	14-Sep-19	31-Mar-19	01-Apr-19	01-Apr-19	01-Apr-19
Time	Guideline[1]	Meadowbank	Wally Lake	Threshold[2]	16:00	14:30	17:00	15:46	11:00	11:30	12:50		15:43	16:28	16:20	10:50	9:55	9:10
Physical Tests (mg/L)																		
Conductivity (µS/cm)		27	37		**66**	**61**	**55**	**65**	**37**	37	**37**		**40**	**39**	**40**	**33**	24	27
Hardness		9.5	17		**29**	**27**	**24**	**29**	15	15	16		17	16	**15**	**12**	8.7	9.3
pH (Laboratory)	6.5 - 9.0	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.5	7.4	7.4	7.5	7.3	7.3	7.3		7.3	7.3	7.1	7.0	6.9	7.0
Total Suspended Solids		3.0	3.0	5.0	*<1.0*	*<1.0*	*<1.0*	*<1.0*	1.9	1.5	*<1.0*		*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Total Dissolved Solids		19	25		**52**	**43**	**36**	**41**	**26**	**27**	23		**27**	**27**	**23**	**24**	17	19
Turbidity (NTU)					0.15	*<0.10*	*<0.10*	0.11	0.33	0.38	0.31		0.23	0.26	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Anions and Nutrients (mg/L)																		
Alkalinity - Bicarbonate		8.7	18		**24**	**22**	**21**	**24**	12	12	15		14	13	**11**	**9.2**	6.3	6.9
Alkalinity - Carbonate		2.0	2.0		*<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*
Alkalinity - Hydroxide					*<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*
Alkalinity - Total		8.7	18		**24**	**22**	**21**	**24**	12	12	15		14	13	**11**	**9.2**	6.3	6.9
Ammonia (as N)[3]	***equation***	0.065	0.067	0.13	0.016	0.018	0.064	0.017	*<0.0050*	0.036	*<0.0050*		0.0050	*<0.0050*	0.0072	*<0.0050*	*<0.0050*	0.0064
Bromide					*<0.050*	*<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	120	60	60	120	1.3	1.2	1.1	1.3	0.64	0.65	0.69		0.69	0.68	1.2	1.1	0.95	1.0
Fluoride	0.12	0.088	0.080	0.12	0.073	0.071	0.061	0.068	0.042	0.043	0.046		0.053	0.053	**0.097**	**0.094**	0.079	0.085
Nitrate (as N)	3.0	1.5	1.5	3.0	0.019	0.015	0.031	0.018	*<0.0050*	*<0.0050*	*<0.0050*		*<0.0050*	*<0.0050*	0.0066	*<0.0050*	*<0.0050*	*<0.0050*
Nitrite (as N)	0.060	0.031	0.031	0.060	*<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*
Total Kjeldahl Nitrogen		0.17	0.16		0.15	0.13	**0.22**	**0.17**	0.10	0.16	0.12		0.12	0.11	0.095	0.092	0.078	0.075
Ortho Phosphate (as P)		0.0020	0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	0.0011	0.0010	*<0.0010*	*<0.0010*
Phosphorus (P) - Total Diss.					*<0.0020*	*<0.0020*	0.0021	0.0024	*<0.0020*	*<0.0020*	*<0.0020*		*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Phosphorus (P) - Total	0.0040	0.0051	0.0067	0.0040	0.0020	*<0.0020*	*<0.0020*	*<0.0020*	0.0023	0.0026	0.0024		0.0028	0.0034	0.0027	*<0.0020*	*<0.0020*	*<0.0020*
Silicate (as SiO_2)		1.0	1.1		1.1	0.95	0.89	0.86	*<0.50*	*<0.50*	*<0.50*		0.80	0.78	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Sulphate (SO_4)		65	65	128	7.5	7.2	6.2	7.2	3.8	3.9	4.4		4.7	4.6	5.3	4.4	3.2	3.5
Cyanides (mg/L)																		
Total Cyanide					*<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*
Free Cyanide	0.0050				*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	0.0012		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Organic / Inorganic Carbon (mg/L)																		
Dissolved Organic Carbon		2.5	3.2		2.4	2.5	2.1	2.7	2.1	2.1	2.1		2.2	2.2	1.9	2.1	1.7	1.9
Total Organic Carbon		2.6	4.1		2.4	2.4	2.1	2.8	2.1	2.1	2.1		2.0	2.1	1.9	2.0	1.5	1.6
Plant Pigments (µg/L)																		
Chlorophyll-*a*					0.86	1.5	1.2	2.0	0.38	0.53	0.70		0.69	0.78	0.63	0.59	0.63	0.57
Total Metals (mg/L)																		
Aluminum[3]	***equation***	0.053	0.053	0.10	*<0.0030*	*<0.0030*	*<0.0030*	0.0034	0.0061	0.0052	0.0069		0.0039	0.0050	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Antimony		0.0046	0.0046	0.0090	*<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	0.0050	0.0026	0.0026	0.0050	0.00035	0.00031	0.00026	0.00029	0.00022	0.00022	0.00028		0.00031	0.00032	0.00017	0.00015	0.00010	*<0.00010*
Barium		0.50	0.50	1.0	0.0040	0.0039	0.0037	0.0044	0.0023	0.0024	0.0022		0.0021	0.0021	0.0040	0.0037	0.0031	0.0033
Beryllium		0.00012	0.00012	0.00013	*<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*
Bismuth					*<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*
Boron	1.5	0.76	0.76	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[3]	***equation***	0.00002	0.00002	0.00004	*<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*
Calcium		2.4	4.9		**7.7**	**7.3**	**6.3**	**7.4**	4.2	4.1	4.4		4.6	4.5	**3.7**	**2.8**	1.9	2.1
Chromium[4]	0.0010	0.0025	0.0026	0.0050	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*		*<0.00040*	*<0.00040*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt					*<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[3]	***equation***	0.0012	0.0015	0.0020	0.00098	0.0011	0.0013	0.0010	0.00076	0.00075	0.00093		0.00087	0.00091	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Iron	0.30	0.15	0.16	0.30	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.012		0.010	0.016	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Lead[3]	***equation***	0.00053	0.00053	0.0010	*<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		0.0020	0.0020		*<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		0.93	1.4		**2.2**	**2.0**	**1.7**	**2.0**	1.2	1.2	1.2		1.3	1.3	**1.3**	**1.1**	0.79	0.86
Manganese[3]		0.32	0.33	***See text***	0.0017	0.0015	0.00075	0.00089	0.0014	0.0013	0.0013		0.0012	0.0019	0.00051	0.00051	0.00059	0.00051
Mercury	0.00003	0.00002	0.00002	0.00003	*<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	0.073	0.037	0.037	0.073	0.00023	0.00027	0.00022	0.00025	0.00015	0.00016	0.00017		0.00018	0.00016	0.00008	0.00006	*<0.000050*	*<0.000050*
Nickel[3]	***equation***	0.013	0.013	0.025	*<0.00050*	0.00052	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus		0.0051	0.0067	0.0040	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*		*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.58	0.59		**0.79**	**0.75**	**0.66**	**0.77**	0.45	0.45	0.41		0.49	0.45	**0.76**	**0.66**	0.54	**0.59**
Selenium	0.0010	0.00053	0.00053	0.0010	0.00005	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.20	0.65		0.53	0.48	0.47	0.46	0.26	0.27	0.32		0.38	0.38	**0.24**	**0.21**	0.17	0.18
Silver	0.00010	0.00013	0.00013	0.00025	*<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		1.2	0.72		**1.0**	**0.94**	**0.86**	**1.1**	0.60	0.60	0.55		0.59	0.59	**1.2**	1.0	0.85	0.91
Strontium		0.028	0.033	0.049	**0.041**	**0.040**	0.032	**0.039**	0.021	0.022	0.024		0.022	0.020	0.018	0.015	0.011	0.012
Sulfur					2.7	2.8	2.4	2.8	1.4	1.7	1.3		1.6	1.5	2.1	1.6	1.2	1.5
Thallium	0.00080	0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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		0.00060	0.00060		*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Uranium	0.015	0.0075	0.0075	0.015	0.00005	0.00005	0.00004	0.00005	0.00005	0.00004	0.00006		0.00005	0.00006	0.00004	0.00004	0.00003	0.00004
Vanadium		0.060	0.060	0.12	*<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*
Zinc				***See text***	*<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*
Dissolved Metals (mg/L)																		
Aluminum[3]		0.026	0.026	0.050	0.0011	*<0.0010*	*<0.0010*	0.0052	0.0035	0.0049	0.0031		0.0021	0.0016	0.0014	0.0014	0.0015	0.0012
Antimony		0.0046	0.0046	0.0090	*<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		0.0026	0.0026	0.0050	0.00030	0.00028	0.00024	0.00025	0.00021	0.00020	0.00026		0.00028	0.00026	0.00016	0.00012	*<0.00010*	0.00010
Barium		0.50	0.50	1.0	0.0042	0.0038	0.0034	0.0042	0.0023	0.0023	0.0021		0.0022	0.0021	0.0042	0.0038	0.0033	0.0034
Beryllium		0.00012	0.00012	0.00013	*<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*
Bismuth					*<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*
Boron		0.76	0.76	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		0.00002	0.00002	0.00004	*<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*
Calcium		2.4	4.9		**7.9**	**7.3**	**6.6**	**8.1**	4.1	4.1	4.2		4.5	4.3	**3.8**	**3.1**	2.0	2.2
Chromium		0.00026	0.00026	0.0050	*<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*
Cobalt					*<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		0.0012	0.0015	0.0020	0.0011	0.0011	0.00082	0.00097	0.00065	0.00072	0.00081		0.00085	0.00091	0.00046	**0.0031**	0.00028	0.00031
Iron		0.16	0.16	0.30	*<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*
Lead		0.00053	0.00053	0.0010	*<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		0.0020	0.0020		*<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		0.93	1.4		**2.3**	**2.1**	**1.8**	**2.1**	1.2	1.2	1.2		1.4	1.3	**1.4**	**1.2**	0.87	**0.95**
Manganese[3]		0.32	0.33	***See text***	0.00025	0.00019	0.00011	0.00043	0.00074	0.00078	0.00018		0.00034	0.00033	0.00028	0.00033	0.00020	0.00024
Mercury		0.00002	0.00002	0.00003	*<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		0.037	0.037	0.073	0.00026	0.00027	0.00022	0.00022	0.00014	0.00015	0.00016		0.00020	0.00019	0.00012	0.00008	*<0.000050*	*<0.000050*
Nickel		0.013	0.013	0.025	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*		*<0.0010*	*<0.0010*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*		*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.58	0.59		**0.78**	**0.76**	**0.64**	**0.76**	0.45	0.45	0.44		0.50	0.48	**0.76**	**0.71**	**0.58**	**0.62**
Selenium		0.00053	0.00053	0.0010	*<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*
Silicon		0.18	0.67		0.47	0.42	0.44	0.46	0.25	0.25	0.28		0.39	0.37	**0.20**	**0.19**	0.13	0.15
Silver		0.00013	0.00013	0.00025	*<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		1.2	0.72		**1.0**	**0.96**	**0.84**	**0.98**	0.54	0.55	0.56		0.63	0.63	**1.3**	1.1	0.90	1.00
Strontium		0.85	0.86	1.7	0.040	0.037	0.032	0.036	0.020	0.020	0.022		0.023	0.022	0.019	0.016	0.011	0.012
Sulfur					2.4	2.2	2.2	2.9	1.1	1.6	1.2		1.4	1.6	1.7	1.9	1.0	1.3
Thallium		0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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		0.00060	0.00060		*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Uranium		0.0075	0.0075	0.015	0.00005	0.00005	0.00004	0.00004	0.00004	0.00004	0.00005		0.00005	0.00005	0.00004	0.00004	0.00003	0.00004
Vanadium		0.060	0.060	0.12	*<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*
Zinc[3]		0.0018	0.0024	***See text***	*<0.0010*	*<0.0010*	*<0.0010*	**0.0038**	*<0.0010*	**0.0031**	*<0.0010*		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d) and updated in 2019. A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the CREMP: 2015 Plan Update (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.3** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table B1-1. Water quality results from the 2019 CREMP, Meadowbank study area lakes.

Lake (Station)					Third Portage Lake South Basin (TPS) (TPS)		Inuggugayualik Lake (INUG)									
Area-Replicate ID					TPS-61	TPS-62	INUG-108	INUG-109	INUG-110	INUG-111	INUG-112	INUG-113	INUG-114	INUG-115	INUG-116	INUG-117
ALS Sample ID		Meadowbank Screening Values			L2254150-6	L2247638-1	L2254150-14	L2254150-13	L2278655-1	L2278655-2	L2322210-3	L2322210-4	L2335617-23	L2335617-24	L2354972-17	L2354972-18
Date	Aquatic Life	Trigger[2]			30-Mar-19	12-Mar-19	01-Apr-19	01-Apr-19	18-May-19	18-May-19	29-Jul-19	29-Jul-19	15-Aug-19	15-Aug-19	18-Sep-19	18-Sep-19
Time	Guideline[1]	Meadowbank	Wally Lake	Threshold[2]	15:10	1:50	14:55	14:05	10:55	11:50	15:19	14:55	14:00	14:35	13:20	14:20
Physical Tests (mg/L)																
Conductivity (µS/cm)		27	37		**36**	**37**	27	20	20	22	16	16	16	16	15	15
Hardness		9.5	17		**12**	**12**	**11**	7.4	6.9	7.7	6.3	6.3	5.8	5.7	5.9	6.0
pH (Laboratory)	6.5 - 9.0	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.0	7.2	7.0	6.9	7.0	7.1	6.9	6.9	7.0	7.0	7.0	6.9
Total Suspended Solids		3.0	3.0	5.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids		19	25		**24**	**22**	**20**	14	11	16	14	12	15	13	14	14
Turbidity (NTU)					<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.31	0.27	0.16	0.20	0.34	0.33
Anions and Nutrients (mg/L)																
Alkalinity - Bicarbonate		8.7	18		8.4	8.3	8.7	6.4	6.7	7.1	5.6	5.5	4.9	4.9	5.8	5.5
Alkalinity - Carbonate		2.0	2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		8.7	18		8.4	8.3	8.7	6.4	6.7	7.1	5.6	5.5	4.9	4.9	5.8	5.5
Ammonia (as N)[3]	***equation***	0.065	0.067	0.13	0.020	0.021	0.012	0.017	**0.55**	**0.11**	0.0096	<0.0050	<0.0050	**0.13**	<0.0050	<0.0050
Bromide					<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	120	60	60	120	1.0	1.1	1.4	1.0	0.97	1.1	0.81	0.82	0.80	0.79	0.85	0.82
Fluoride	0.12	0.088	0.080	0.12	0.088	0.086	**0.091**	0.077	0.073	0.079	0.064	0.065	0.063	0.063	0.067	0.069
Nitrate (as N)	3.0	1.5	1.5	3.0	0.017	0.017	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.060	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.17	0.16		0.094	0.099	0.11	0.092	**0.75**	**0.26**	0.13	0.10	0.13	**0.25**	0.11	0.11
Ortho Phosphate (as P)		0.0020	0.0020		0.0014	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P) - Total Diss.					<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0036	0.0020	0.0021	<0.0020	<0.0020	<0.0020
Phosphorus (P) - Total	0.0040	0.0051	0.0067	0.0040	<0.0020	<0.0020	0.0022	0.0027	0.0031	0.0038	0.0025	0.0025	<0.0020	0.0023	0.0028	0.0023
Silicate (as SiO_2)		1.0	1.1		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		65	65	128	6.2	6.4	1.7	1.2	1.1	1.2	0.90	0.89	0.88	0.88	0.99	1.0
Cyanides (mg/L)																
Total Cyanide					<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.0050				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)																
Dissolved Organic Carbon		2.5	3.2		1.5	1.3	**2.6**	2.0	2.1	2.3	2.4	2.2	1.9	1.7	2.0	1.9
Total Organic Carbon		2.6	4.1		1.5	1.7	2.5	2.2	2.3	2.4	2.1	2.1	1.8	1.8	1.8	2.2
Plant Pigments (µg/L)																
Chlorophyll-*a*					0.33	0.21	0.54	0.55	0.72	1.2	0.15	0.29	0.33	0.32	0.66	0.65
Total Metals (mg/L)																
Aluminum[3]	***equation***	0.053	0.053	0.10	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0096	0.0098	0.010	0.0084	0.012	0.012
Antimony		0.0046	0.0046	0.0090	<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	0.0050	0.0026	0.0026	0.0050	0.00019	0.00020	0.00010	0.00011	<0.00010	0.00010	0.00011	0.00011	0.00011	0.00012	0.00012	0.00013
Barium		0.50	0.50	1.0	0.0036	0.0035	0.0027	0.0019	0.0019	0.0023	0.0019	0.0019	0.0017	0.0017	0.0018	0.0018
Beryllium		0.00012	0.00012	0.00013	<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					<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	1.5	0.76	0.76	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[3]	***equation***	0.00002	0.00002	0.00004	<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		2.4	4.9		**2.8**	**2.8**	1.9	1.5	1.5	1.6	1.2	1.2	1.1	1.1	1.2	1.2
Chromium[4]	0.0010	0.0025	0.0026	0.0050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00024	<0.00010	<0.00050	<0.00040
Cobalt					<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[3]	***equation***	0.0012	0.0015	0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron	0.30	0.15	0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	0.014	0.011	0.011	0.016	0.014
Lead[3]	***equation***	0.00053	0.00053	0.0010	<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		0.0020	0.0020		<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		0.93	1.4		**1.1**	**1.1**	**1.1**	0.88	0.77	0.88	0.73	0.75	0.68	0.68	0.74	0.73
Manganese[3]		0.32	0.33	***See text***	0.00030	0.00037	0.00074	0.00051	0.00068	0.00052	0.0029	0.0034	0.0016	0.0017	0.0013	0.0012
Mercury	0.00003	0.00002	0.00002	0.00003	<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	0.073	0.037	0.037	0.073	0.00012	0.00017	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel[3]	***equation***	0.013	0.013	0.025	0.00051	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	0.00051	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus		0.0051	0.0067	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.58	0.59		**0.61**	**0.62**	**0.58**	0.49	0.44	0.52	0.39	0.40	0.36	0.34	0.40	0.41
Selenium	0.0010	0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.20	0.65		<0.10	<0.10	**0.21**	0.16	0.12	0.12	0.16	0.17	0.17	0.16	0.18	0.18
Silver	0.00010	0.00013	0.00013	0.00025	<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		1.2	0.72		**1.3**	**1.5**	0.84	0.71	0.71	0.80	0.59	0.61	0.55	0.55	0.60	0.59
Strontium		0.028	0.033	0.049	0.013	0.013	0.010	0.0080	0.0084	0.0093	0.0072	0.0070	0.0065	0.0065	0.0063	0.0063
Sulfur					2.1	2.1	0.87	0.78	0.71	0.52	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Thallium	0.00080	0.00041	0.00041	0.00080	<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		0.00020	0.00020		<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		0.00060	0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00032	<0.00030
Uranium	0.015	0.0075	0.0075	0.015	0.00003	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00005	0.00005	0.00005	0.00006
Vanadium		0.060	0.060	0.12	<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				***See text***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals (mg/L)																
Aluminum[3]		0.026	0.026	0.050	0.0014	0.0013	0.0015	0.0016	0.0031	0.0015	0.0044	0.0045	0.0059	0.0058	0.0042	0.0043
Antimony		0.0046	0.0046	0.0090	<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		0.0026	0.0026	0.0050	0.00018	0.00019	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Barium		0.50	0.50	1.0	0.0039	0.0037	0.0031	0.0020	0.0020	0.0022	0.0019	0.0019	0.0017	0.0017	0.0017	0.0018
Beryllium		0.00012	0.00012	0.00013	<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					<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		0.76	0.76	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		0.00002	0.00002	0.00004	<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		2.4	4.9		**3.0**	**2.8**	2.1	1.4	1.4	1.6	1.2	1.2	1.1	1.1	1.1	1.2
Chromium		0.00026	0.00026	0.0050	<0.00010	0.00014	<0.00010	<0.00010	0.00013	<0.00010	<0.00010	<0.00010	0.00026	<0.00010	<0.00010	<0.00010
Cobalt					<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		0.0012	0.0015	0.0020	0.00037	0.00040	0.00046	0.00033	0.00034	0.00033	0.00039	0.00035	0.00031	0.00036	0.00032	0.00035
Iron		0.16	0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead		0.00053	0.00053	0.0010	<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		0.0020	0.0020		<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		0.93	1.4		**1.2**	**1.2**	**1.3**	0.92	0.80	0.91	0.79	0.79	0.73	0.71	0.74	0.76
Manganese[3]		0.32	0.33	***See text***	0.00013	0.00020	0.00046	0.00022	0.00016	0.00020	0.0016	0.0019	0.00044	0.00047	0.00022	0.00032
Mercury		0.00002	0.00002	0.00003	<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		0.037	0.037	0.073	0.00017	0.00019	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel		0.013	0.013	0.025	<0.00050	0.00059	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.58	0.59		**0.64**	**0.62**	**0.68**	0.47	0.44	0.50	0.43	0.42	0.38	0.38	0.41	0.41
Selenium		0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.18	0.67		0.051	0.055	**0.19**	0.12	0.11	0.13	0.12	0.12	0.15	0.15	0.13	0.14
Silver		0.00013	0.00013	0.00025	<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		1.2	0.72		**1.5**	**1.5**	0.98	0.71	0.66	0.74	0.62	0.61	0.59	0.61	0.59	0.60
Strontium		0.85	0.86	1.7	0.014	0.014	0.011	0.0085	0.0076	0.0088	0.0067	0.0068	0.0064	0.0062	0.0060	0.0060
Sulfur					2.1	2.1	0.62	<0.50	0.88	0.55	<0.50	<0.50	<0.50	<0.50	0.54	<0.50
Thallium		0.00041	0.00041	0.00080	<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		0.00020	0.00020		<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		0.00060	0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.0075	0.015	0.00003	0.00004	0.00004	0.00003	0.00003	0.00004	0.00004	0.00004	0.00005	0.00005	0.00005	0.00005
Vanadium		0.060	0.060	0.12	<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[3]		0.0018	0.0024	***See text***	<0.0010	<0.0010	<0.0010	<0.0010	**0.0021**	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	0.0017

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d) and updated in 2019. A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the CREMP: 2015 Plan Update (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.3** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table B1-1. Water quality results from the 2019 CREMP, Meadowbank study area lakes.

Lake (Station)					Pipedream Lake (PDL)									
Area-Replicate ID					PDL-73	PDL-74	PDL-75	PDL-76	PDL-77	PDL-78	PDL-79	PDL-80	PDL-81	PDL-82
ALS Sample ID		Meadowbank Screening Values			L2254150-8	L2254150-7	L2278655-3	L2278655-4	L2322210-1	L2322210-2	L2331829-14	L2331829-15	L2354972-8	L2354972-9
Date	Aquatic Life	Trigger[2]			31-Mar-19	31-Mar-19	18-May-19	18-May-19	28-Jul-19	28-Jul-19	14-Aug-19	14-Aug-19	12-Sep-19	12-Sep-19
Time	Guideline[1]	Meadowbank	Wally Lake	Threshold[2]	12:05	11:10	13:30	12:45	14:00	14:40	14:45	14:30	12:10	12:50
Physical Tests (mg/L)														
Conductivity (µS/cm)		27	37		24	24	**30**	27	23	22	23	23	22	22
Hardness		9.5	17		**9.9**	**9.9**	**12**	**11**	9.5	**9.9**	8.9	8.9	9.0	9.3
pH (Laboratory)	6.5 - 9.0	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.0	7.0	7.3	7.2	7.2	7.1	7.2	7.2	7.1	7.1
Total Suspended Solids		3.0	3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids		19	25		18	18	19	19	15	7.7	18	17	16	12
Turbidity (NTU)					<0.10	<0.10	<0.10	<0.10	0.17	0.17	0.19	0.18	0.20	0.15
Anions and Nutrients (mg/L)														
Alkalinity - Bicarbonate		8.7	18		8.5	8.4	**11**	**9.7**	**8.8**	8.0	7.8	7.7	8.5	8.5
Alkalinity - Carbonate		2.0	2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		8.7	18		8.5	8.4	**11**	**9.7**	**8.8**	8.0	7.8	7.7	8.5	8.5
Ammonia (as N)[3]	***equation***	0.065	0.067	0.13	0.0071	0.0093	**0.11**	**0.078**	<0.0050	<0.0050	**0.13**	0.050	<0.0050	<0.0050
Bromide					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	60	60	120	0.71	0.70	0.86	0.79	0.65	0.66	0.71	0.68	0.66	0.66
Fluoride	0.12	0.088	0.080	0.12	0.044	0.042	0.049	0.046	0.042	0.041	0.044	0.045	0.042	0.042
Nitrate (as N)	3.0	1.5	1.5	3.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.060	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.17	0.16		0.074	0.068	**0.21**	**0.17**	0.091	0.12	**0.20**	0.14	0.082	0.092
Ortho Phosphate (as P)		0.0020	0.0020		0.0011	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P) - Total Diss.					<0.0020	<0.0020	<0.0020	<0.0020	0.0030	0.0024	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P) - Total	0.0040	0.0051	0.0067	0.0040	**0.0053**	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicate (as SiO_2)		1.0	1.1		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		65	65	128	1.9	1.9	2.2	2.0	1.8	1.7	1.9	1.9	1.9	1.9
Cyanides (mg/L)														
Total Cyanide					<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.0050				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)														
Dissolved Organic Carbon		2.5	3.2		1.7	1.6	1.8	1.9	2.3	2.3	1.5	1.5	1.5	1.5
Total Organic Carbon		2.6	4.1		1.5	1.5	1.7	1.5	2.3	1.8	1.5	1.4	1.5	1.4
Plant Pigments (µg/L)														
Chlorophyll-*a*					0.33	0.32	0.39	0.57	0.63	0.38	0.40	0.39	0.49	0.41
Total Metals (mg/L)														
Aluminum[3]	***equation***	0.053	0.053	0.10	<0.0030	<0.0030	<0.0030	<0.0030	0.0056	0.0041	0.0061	0.0059	0.0060	0.0077
Antimony		0.0046	0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.0026	0.0026	0.0050	0.00015	0.00017	0.00019	0.00018	0.00019	0.00017	0.00015	0.00015	0.00018	0.00015
Barium		0.50	0.50	1.0	0.0021	0.0021	0.0027	0.0024	0.0019	0.0019	0.0019	0.0019	0.0020	0.0021
Beryllium		0.00012	0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.00002	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.4	4.9		**2.4**	**2.5**	**3.0**	**2.9**	**2.4**	2.4	2.3	2.4	2.4	2.4
Chromium[4]	0.0010	0.0025	0.0026	0.0050	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	0.00011	0.00012	<0.00050	<0.00040
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.0012	0.0015	0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron	0.30	0.15	0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead[3]	***equation***	0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.93	1.4		0.84	0.84	**0.97**	0.88	0.84	0.84	0.80	0.80	0.80	0.80
Manganese[3]		0.32	0.33	***See text***	0.00054	0.00063	0.00059	0.00044	0.0012	0.0011	0.00077	0.00083	0.00097	0.00094
Mercury	0.00003	0.00002	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.037	0.073	<0.000050	<0.000050	0.00006	0.00007	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00006
Nickel[3]	***equation***	0.013	0.013	0.025	0.00054	0.00050	0.00072	0.00063	0.00071	0.00070	0.00060	0.00060	0.00063	0.00068
Phosphorus		0.0051	0.0067	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.58	0.59		0.37	0.39	0.48	0.43	0.37	0.36	0.33	0.32	0.36	0.35
Selenium	0.0010	0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.20	0.65		0.15	0.15	0.16	0.14	0.15	0.15	0.16	0.15	0.16	0.15
Silver	0.00010	0.00013	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.2	0.72		0.53	0.54	0.71	0.63	0.53	0.54	0.47	0.47	0.50	0.49
Strontium		0.028	0.033	0.049	0.0099	0.010	0.013	0.013	0.010	0.010	0.0098	0.0099	0.0092	0.0091
Sulfur					0.92	0.87	0.85	0.89	0.73	0.72	<0.50	0.51	0.76	0.78
Thallium	0.00080	0.00041	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.00020	0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060	0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium	0.015	0.0075	0.0075	0.015	0.00002	0.00002	0.00003	0.00002	0.00002	0.00002	0.00003	0.00003	0.00003	0.00003
Vanadium		0.060	0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc				***See text***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0045	<0.0030
Dissolved Metals (mg/L)														
Aluminum[3]		0.026	0.026	0.050	0.0011	0.0010	0.0010	0.0011	0.0045	0.0023	0.0038	0.0024	0.0019	0.0023
Antimony		0.0046	0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.0026	0.0026	0.0050	0.00015	0.00014	0.00015	0.00015	0.00017	0.00016	0.00013	0.00013	0.00016	0.00013
Barium		0.50	0.50	1.0	0.0020	0.0021	0.0024	0.0022	0.0021	0.0021	0.0018	0.0018	0.0019	0.0019
Beryllium		0.00012	0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.00002	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.4	4.9		**2.5**	**2.5**	**3.0**	**2.8**	2.3	**2.5**	2.2	2.3	2.3	**2.4**
Chromium		0.00026	0.00026	0.0050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	0.00012	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.0012	0.0015	0.0020	0.00036	0.00032	0.00047	0.00039	0.00046	0.00046	0.00039	0.00041	0.00041	0.00037
Iron		0.16	0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead		0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.93	1.4		0.87	0.87	**0.97**	0.90	0.91	0.90	0.81	0.80	0.79	0.81
Manganese[3]		0.32	0.33	***See text***	0.00014	0.00011	0.00029	0.00015	0.00052	0.00047	0.00025	0.00021	0.00016	0.00011
Mercury		0.00002	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.037	0.073	<0.000050	0.00006	<0.000050	<0.000050	<0.000050	0.00006	<0.000050	<0.000050	0.00006	0.00005
Nickel		0.013	0.013	0.025	<0.00050	<0.00050	0.00071	0.00056	0.00059	0.00061	0.00059	0.00054	<0.0010	<0.00050
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.58	0.59		0.37	0.37	0.45	0.42	0.41	0.40	0.36	0.35	0.37	0.38
Selenium		0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00044
Silicon		0.18	0.67		0.12	0.11	0.15	0.15	0.13	0.12	0.13	0.13	0.15	0.13
Silver		0.00013	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.2	0.72		0.54	0.54	0.63	0.58	0.57	0.55	0.50	0.50	0.51	0.50
Strontium		0.85	0.86	1.7	0.010	0.010	0.012	0.011	0.0099	0.0098	0.0092	0.0094	0.0098	0.0090
Sulfur					0.75	0.58	0.88	0.77	0.60	0.60	0.52	0.51	<0.50	0.63
Thallium		0.00041	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.00020	0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060	0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.0075	0.015	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00003
Vanadium		0.060	0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0018	0.0024	***See text***	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d) and updated in 2019. A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the CREMP: 2015 Plan Update (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.3** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table B1-2. Water quality results from Third Portage Lake in 2019 compared against predicted concentrations in the FEIS.

Lake and Station		Simulated Maximum Whole Lake Concentration (mg/L) Third Portage Lake[2]				Third Portage Lake East Basin (TPE)									
		Upper Mixing Estimate (169 Mm³)		Mid-range Mixing Estimate (92 Mm³)											
Area-Replicate ID	CCME (2012)					TPE-120	TPE-121	TPE-122	TPE-123	TPE-124	TPE-125	TPE-126	TPE-127	TPE-128	TPE-129
Depth (m)	Guideline[1]	Without Dike Leaching	With Dike Leaching	Without Dike Leaching	With Dike Leaching	3	3	3	3	3	3	3	3	3	3
Date						17-Mar-19	17-Mar-19	7-May-19	7-May-19	13-Jul-19	13-Jul-19	13-Aug-19	13-Aug-19	14-Sep-19	14-Sep-19
Physical Tests (mg/L)															
Hardness		5.7	6.0	6.0	6.4	***13***	***12***	***15***	***14***	***11***	***10***	***11***	***10***	***10.0***	***11***
Anions and Nutrients (mg/L)															
Alkalinity - Total		4.1	4.1	4.2	4.2	***9.7***	***8.6***	***11***	***10***	***7.9***	***7.6***	***7.8***	***8.0***	***8.0***	***8.1***
Ammonia (as N)[3]	***equation***	0.033	0.033	0.050	0.050	0.016	0.016	***0.089***	0.015	0.0052	0.041	***0.061***	***0.092***	*<0.0050*	*<0.0050*
Chloride	120	0.80	0.80	1.0	1.1	**1.0**	**1.0**	***1.1***	0.99	0.73	0.70	0.78	0.77	0.77	0.77
Fluoride	0.12	0.070	0.080	0.070	0.090	**0.088**	**0.082**	***0.10***	***0.093***	**0.073**	0.070	**0.075**	**0.077**	**0.081**	**0.081**
Nitrate (as N)	3.0	0.035	0.036	0.057	0.059	***0.088***	***0.082***	0.011	0.010	0.010	0.0084	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Ortho Phosphate (as P)		0.0022	0.0022	0.0024	0.0024	***0.074***	***0.10***	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P) - Total	0.0040	0.0027	0.0029	0.0032	0.0035	*<0.0020*	0.0021	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Sulphate (SO_4)		1.7	1.7	2.0	2.0	*<0.50*	*<0.50*	***6.7***	***6.1***	***4.6***	***4.4***	***4.9***	***4.8***	***4.8***	***4.8***
Cyanides (mg/L)															
Total Cyanide		0	0	0	0	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Total Metals (mg/L)															
Aluminum[3]	***equation***	0.0070	0.0090	0.0070	0.010	*<0.0030*	*<0.0030*	*<0.0030*	0.0038	0.0056	0.0055	**0.0072**	**0.0079**	**0.0083**	**0.0087**
Antimony		0.00056	0.00057	0.00060	0.00062	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.0050	0.00062	0.00062	0.00072	0.00072	0.00029	0.00020	0.00039	0.00039	0.00033	0.00031	0.00035	0.00030	0.00035	0.00039
Barium		0.020	0.022	0.020	0.023	0.0037	0.0036	0.0041	0.0038	0.0031	0.0029	0.0028	0.0028	0.0028	0.0028
Beryllium		0.0010	0.0010	0.0010	0.0010	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Bismuth		0.10	0.10	0.10	0.10	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	1.5	0.00001	0.00001	0.00001	0.00001	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium[3]	***equation***	<0.000051	<0.000051	<0.000052	<0.000052	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		1.3	1.4	1.5	1.5	***3.3***	***2.9***	***3.6***	***3.4***	***2.6***	***2.5***	***2.6***	***2.6***	***2.6***	***2.7***
Chromium[4]	0.001	0.0010	0.0010	0.0010	0.0010	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00010	*<0.00050*	***0.0049***
Cobalt		0.0040	0.0013	0.00040	0.0017	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.0012	0.0012	0.0013	0.0013	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	0.00051
Iron	0.3	0.030	0.030	0.030	0.030	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.015	***0.042***
Lead[3]	***equation***	0.00060	0.00060	0.00060	0.00070	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	0.00006	*<0.000050*
Lithium		0.0050	0.0050	0.0050	0.0050	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		0.60	0.60	0.60	0.70	***1.3***	***1.2***	***1.5***	***1.4***	***1.0***	***0.99***	***0.95***	***0.95***	***0.98***	***0.97***
Manganese[3]		0.0090	0.052	0.015	0.072	0.00035	0.00040	0.00037	0.00043	0.0020	0.0020	0.00097	0.0011	0.0015	0.0015
Mercury	0.000026	0.00005	0.00005	0.00005	0.00005	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.0010	0.0010	0.0010	0.0010	0.00016	0.00016	0.00017	0.00016	0.00012	0.00012	0.00015	0.00013	0.00015	0.00025
Nickel[3]	***equation***	0.0016	0.0016	0.0020	0.0021	0.00050	*<0.00050*	0.00057	0.00057	0.00057	0.00053	*<0.00050*	*<0.00050*	*<0.00050*	0.00067
Potassium		2.0	2.1	2.0	2.1	0.66	0.63	0.79	0.70	0.53	0.50	0.46	0.46	0.52	0.51
Selenium	0.001	0.0010	0.0010	0.0010	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.010	0.080	0.020	0.12	*<0.10*	*<0.10*	**0.12**	**0.11**	**0.11**	***0.13***	**0.11**	**0.10**	**0.12**	**0.12**
Silver	0.0001	0.00002	0.00002	0.00002	0.00002	*<0.000010*	0.00001	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		2.0	2.0	2.0	2.1	1.5	1.5	1.7	1.5	1.1	1.1	1.00	1.0	1.0	1.0
Strontium		0.0020	0.0050	0.0040	0.0070	***0.015***	***0.014***	***0.018***	***0.015***	***0.012***	***0.012***	***0.012***	***0.012***	***0.011***	***0.011***
Thallium	0.0008	0.00020	0.00020	0.00020	0.00020	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Uranium	0.015	0.00020	0.00020	0.00020	0.00030	0.00004	0.00004	0.00004	0.00004	0.00005	0.00005	0.00005	0.00005	0.00004	0.00004
Vanadium		0.030	0.030	0.030	0.030	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc		0.011	0.011	0.015	0.015	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*

Notes:

1 . CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2016.

2. Whole lake data are given for a range of mixing conditions, representing mid-range and upper mixing estimate for the north basin discharge location. The model includes treated water releases from the project (Years 1 to 4), and long-term substance loading due to leaching from the Bay-Goose dike (Cumberland, 2005).

3. "***equation*** " means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

Mid-range Mixing Estimate (92 Mm³):

- ***Bold italicized*** = concentrations exceed the prediction "With Dike Leaching."
- **Bold** = concentrations exceed the prediction "Without Dike Leaching."

Upper-range Mixing Estimate (169 Mm³):

- Bordered cells = concentrations exceed the prediction "With Dike Leaching."
- Shaded cells = concentrations exceed the prediction "Without Dike Leaching."

Italicized numbers are below detection limits.

Table B1-2. Water quality results from Third Portage Lake in 2019 compared against predicted concentrations in the FEIS.

Lake and Station		Simulated Maximum Whole Lake Concentration (mg/L) Third Portage Lake[2]				Third Portage Lake North Basin (TPN)										Third Portage Lake South Basin (TPS)	
Area-Replicate ID	CCME (2012) Guideline[1]	Upper Mixing Estimate (169 Mm^3)		Mid-range Mixing Estimate (92 Mm^3)		TPN-120	TPN-121	TPN-122	TPN-123	TPN-124	TPN-125	TPN-126	TPN-127	TPN-128	TPN-129	TPS-61	TPS-62
Depth (m)		Without Dike Leaching	With Dike Leaching	Without Dike Leaching	With Dike Leaching	3	3	3	3	3	3	3	3	3	3	3	3
Date						17-Mar-19	18-Mar-19	06-May-19	06-May-19	23-Jul-19	23-Jul-19	13-Aug-19	13-Aug-19	10-Sep-19	14-Sep-19	30-Mar-19	12-Mar-19
Physical Tests (mg/L)																	
Hardness		5.7	6.0	6.0	6.4	12	12	12	14	9.5	9.3	9.0	9.0	9.3	8.9	12	12
Anions and Nutrients (mg/L)																	
Alkalinity - Total		4.1	4.1	4.2	4.2	8.7	8.0	8.4	9.8	6.0	6.4	6.2	6.5	6.9	6.7	8.4	8.3
Ammonia (as N)[3]	***equation***	0.033	0.033	0.050	0.050	0.017	0.022	0.086	0.015	0.074	*<0.0050*	0.078	0.13	0.0053	0.0061	0.020	0.021
Chloride	120	0.80	0.80	1.0	1.1	1.1	1.0	1.0	1.2	0.82	0.79	0.80	0.82	0.79	0.78	1.0	1.1
Fluoride	0.12	0.070	0.080	0.070	0.090	0.017	0.018	0.087	0.094	0.070	0.067	0.068	0.070	0.076	0.074	0.088	0.086
Nitrate (as N)	3.0	0.035	0.036	0.057	0.059	*<0.0010*	*<0.0010*	0.018	0.020	0.019	0.016	0.013	0.013	0.0055	0.0050	0.017	0.017
Ortho Phosphate (as P)		0.0022	0.0022	0.0024	0.0024	*<0.0020*	*<0.0020*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	0.0014	*<0.0010*
Phosphorus (P) - Total	0.0040	0.0027	0.0029	0.0032	0.0035	*<0.50*	*<0.50*	*<0.0020*	0.0021	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Sulphate (SO_4)		1.7	1.7	2.0	2.0	6.6	6.0	6.1	6.7	4.7	4.7	4.8	4.8	4.6	4.6	6.2	6.4
Cyanides (mg/L)																	
Total Cyanide		0	0	0	0	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010* ()	*<0.0010* ()
Total Metals (mg/L)																0	0
Aluminum[3]	***equation***	0.0070	0.0090	0.0070	0.010	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	0.0040	0.0047	0.0043	0.0048	0.0068	0.0066	*<0.0030*	*<0.0030*
Antimony		0.00056	0.00057	0.00060	0.00062	*<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	0.0050	0.00062	0.00062	0.00072	0.00072	0.00020	0.00019	0.00019	0.00022	0.00016	0.00016	0.00016	0.00015	0.00018	0.00017	0.00019	0.00020
Barium		0.020	0.022	0.020	0.023	0.0037	0.0037	0.0038	0.0039	0.0028	0.0028	0.0028	0.0027	0.0029	0.0029	0.0036	0.0035
Beryllium		0.0010	0.0010	0.0010	0.0010	*<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		0.10	0.10	0.10	0.10	*<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	1.5	0.00001	0.00001	0.00001	0.00001	*<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[3]	***equation***	<0.000051	<0.000051	<0.000052	<0.000052	*<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		1.3	1.4	1.5	1.5	3.0	2.9	2.9	3.3	2.4	2.2	2.2	2.2	2.3	2.2	2.8	2.8
Chromium[4]	0.001	0.0010	0.0010	0.0010	0.0010	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00011	0.00010	*<0.00050*	*<0.00050*	*<0.00010*	*<0.00010*
Cobalt		0.0040	0.0013	0.00040	0.0017	*<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[3]	***equation***	0.0012	0.0012	0.0013	0.0013	*<0.00050*	*<0.00050*	*<0.00050*	0.00050	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Iron	0.3	0.030	0.030	0.030	0.030	*<0.010*	*<0.010*	*<0.010*	0.010	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.010	*<0.010*	*<0.010*	*<0.010*
Lead[3]	***equation***	0.00060	0.00060	0.00060	0.00070	*<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		0.0050	0.0050	0.0050	0.0050	*<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		0.60	0.60	0.60	0.70	1.2	1.1	1.2	1.4	0.91	0.90	0.86	0.85	0.91	0.86	1.1	1.1
Manganese[3]		0.0090	0.052	0.015	0.072	0.00037	0.00038	0.00030	0.00046	0.00098	0.0012	0.00092	0.00097	0.0010	0.00097	0.00030	0.00037
Mercury	0.000026	0.00005	0.00005	0.00005	0.00005	*<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	0.073	0.0010	0.0010	0.0010	0.0010	0.00017	0.00015	0.00018	0.00019	0.00012	0.00012	0.00012	0.00013	0.00012	0.00012	0.00012	0.00017
Nickel[3]	***equation***	0.0016	0.0016	0.0020	0.0021	*<0.00050*	*<0.00050*	*<0.00050*	0.00053	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	0.00051	*<0.00050*
Potassium		2.0	2.1	2.0	2.1	0.66	0.63	0.70	0.78	0.47	0.47	0.43	0.44	0.49	0.48	0.61	0.62
Selenium	0.001	0.0010	0.0010	0.0010	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	0.00005	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.010	0.080	0.020	0.12	*<0.10*	*<0.10*	*<0.10*	*<0.10*	0.11	*<0.10*	*<0.10*	0.11	0.10	0.11	*<0.10*	*<0.10*
Silver	0.0001	0.00002	0.00002	0.00002	0.00002	*<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		2.0	2.0	2.0	2.1	1.5	1.3	1.6	1.7	1.2	1.2	1.0	1.0	1.1	1.0	1.3	1.5
Strontium		0.0020	0.0050	0.0040	0.0070	0.014	0.013	0.014	0.016	0.010	0.010	0.011	0.011	0.010	0.0098	0.013	0.013
Thallium	0.0008	0.00020	0.00020	0.00020	0.00020	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Uranium	0.015	0.00020	0.00020	0.00020	0.00030	0.00004	0.00004	0.00004	0.00004	0.00003	0.00003	0.00004	0.00004	0.00004	0.00003	0.00003	0.00004
Vanadium		0.030	0.030	0.030	0.030	*<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		0.011	0.011	0.015	0.015	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*

Notes:

1 . CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2016.

2. Whole lake data are given for a range of mixing conditions, representing mid-range and upper mixing estimate for the north basin discharge location. The model includes treated water releases from the project (Years 1 to 4), and long-term substance loading due to leaching from the Bay-Goose dike (Cumberland, 2005).

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

Mid-range Mixing Estimate (92 Mm^3):

- ***Bold italicized*** = concentrations exceed the prediction "With Dike Leaching."
- **Bold** = concentrations exceed the prediction "Without Dike Leaching."

Upper-range Mixing Estimate (169 Mm^3):

- Bordered cells = concentrations exceed the prediction "With Dike Leaching."
- Shaded cells = concentrations exceed the prediction "Without Dike Leaching."

Italicized numbers are below detection limits.

Table B1-3. Water quality results from Second Portage Lake in 2019 compared against predicted concentrations in the FEIS.

Lake and Station		Simulated Maximum Whole Lake Concentration (mg/L) Second Portage Lake[2]				Second Portage Lake (SP)									
Area-Replicate ID	CCME (2012)	Upper Mixing Estimate (169 Mm³)		Mid-range Mixing Estimate (92 Mm³)		SPL-120	SPL-121	SP-122	SP-123	SP-124	SP-125	SP-126	SP-127	SP-128	SP-129
Depth (m)	Guideline[1]	Without Dike Leaching	With Dike Leaching	Without Dike Leaching	With Dike Leaching	3	3	3	3	3	3	3	3	3	3
Date						29-Mar-19	29-Mar-19	11-May-19	11-May-19	10-Jul-19	10-Jul-19	14-Aug-19	14-Aug-19	15-Sep-19	15-Sep-19
Physical Tests (mg/L)															
Hardness		8.9	8.9	8.9	8.9	***20***	***20***	***21***	***21***	***15***	***16***	***15***	***15***	***16***	***16***
Anions and Nutrients (mg/L)															
Alkalinity - Total		7.0	7.0	7.0	7.0	***14***	***14***	***15***	***16***	***12***	***11***	***12***	***11***	***12***	***12***
Ammonia (as N)[3]	***equation***	0.025	0.025	0.031	0.031	0.015	0.012	0.011	0.023	<0.0050	<0.0050	***0.15***	***0.034***	<0.0050	<0.0050
Chloride	120	0.70	0.70	0.80	0.80	***1.2***	***1.2***	***1.3***	***1.3***	***0.93***	***0.93***	***1.1***	***0.90***	***0.87***	***0.87***
Fluoride	0.12	0.070	0.071	0.070	0.071	***0.093***	***0.10***	***0.097***	***0.10***	***0.074***	***0.076***	0.070	0.070	***0.072***	***0.071***
Nitrate (as N)	3.0	0.017	0.017	0.025	0.025	0.0078	0.012	0.012	0.014	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Ortho Phosphate (as P)		0.0030	0.0030	0.0030	0.0030	0.0017	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P) - Total	0.0040	0.0030	0.0030	0.0031	0.0031	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0029	0.0028	0.0020	0.0022	<0.0020
Sulphate (SO_4)		2.8	2.8	2.8	2.8	***7.0***	***7.5***	***7.4***	***8.0***	***5.6***	***5.6***	***5.6***	***5.4***	***5.4***	***5.4***
Cyanides (mg/L)															
Total Cyanide		0	0	0	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Metals (mg/L)															
Aluminum[3]	***equation***	0.0070	0.0070	0.0070	0.0070	<0.0030	<0.0030	<0.0030	0.0035	***0.011***	***0.011***	***0.0072***	***0.0077***	0.0060	0.0064
Antimony		0.00050	0.00050	0.00050	0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.00050	0.00050	0.00060	0.00060	0.00028	0.00030	0.00032	0.00036	0.00021	0.00020	0.00022	0.00022	0.00027	0.00024
Barium		0.020	0.020	0.020	0.020	0.0036	0.0040	0.0039	0.0046	0.0029	0.0029	0.0027	0.0026	0.0027	0.0025
Beryllium		0.0010	0.0010	0.0010	0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth		0.10	0.10	0.10	0.10	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.00001	**0.00001**	**0.00001**	0.00001	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	<0.000050	<0.000050	<0.000051	<0.000051	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.3	2.3	2.3	2.3	***5.0***	***5.2***	***5.1***	***5.2***	***4.0***	***4.1***	***4.1***	***4.1***	***4.1***	***4.1***
Chromium[4]	0.0010	0.0010	0.0010	0.0010	0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00029	<0.00010	<0.00010	<0.00040	<0.00040
Cobalt		0.00030	0.00040	0.00030	0.00040	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.0011	0.0011	0.0011	0.0011	0.00055	0.00063	0.00065	0.00069	0.00052	0.00053	0.00067	0.00069	0.00064	0.00062
Iron	0.30	0.030	0.030	0.030	0.030	<0.010	<0.010	<0.010	<0.010	0.019	0.023	0.014	0.015	0.012	0.013
Lead[3]	***equation***	0.00090	0.00090	0.00090	0.00090	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0050	0.0050	0.0050	0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.80	0.80	0.80	0.80	***1.6***	***1.6***	***1.7***	***1.8***	***1.4***	***1.3***	***1.3***	***1.3***	***1.3***	***1.3***
Manganese[3]		0.0044	0.0067	0.0066	0.0089	0.00035	0.00041	0.00046	0.0011	0.0025	0.0024	0.0012	0.0011	0.00095	0.0010
Mercury	0.00003	0.00005	0.00005	0.00005	0.00005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.0010	0.0010	0.0010	0.0010	0.00017	0.00017	0.00018	0.00018	0.00015	0.00014	0.00016	0.00016	0.00017	0.00017
Nickel[3]	***equation***	0.0010	0.0010	0.0010	0.0010	0.00051	0.00051	0.00052	0.00054	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Potassium		2.0	2.0	2.0	2.0	0.71	0.76	0.75	0.83	0.54	0.52	0.49	0.48	0.56	0.55
Selenium	0.0010	0.0010	0.0010	0.0010	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.010	0.010	0.010	0.010	***0.18***	***0.20***	***0.18***	***0.20***	***0.23***	***0.23***	***0.20***	***0.21***	***0.21***	***0.22***
Silver	0.00010	0.00001	**0.00001**	**0.00001**	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		2.0	2.0	2.0	2.0	1.3	1.4	1.3	1.5	0.84	0.84	0.83	0.80	0.90	0.87
Strontium		0.80	0.80	0.80	0.80	0.022	0.023	0.023	0.023	0.019	0.019	0.021	0.020	0.018	0.018
Thallium	0.00080	0.00020	**0.00020**	**0.00020**	0.00020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium	0.015	0.00020	0.00020	0.00020	0.00020	0.00004	0.00005	0.00005	0.00005	0.00005	0.00005	0.00006	0.00006	0.00004	0.00004
Vanadium		0.030	**0.030**	**0.030**	0.030	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc		0.0070	0.0070	0.0090	0.0090	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2016.

2. The Second Portage Lake water quality model includes substance loading from the Third Portage and East dikes and inflow from Third Portage and Wally lakes. Changes in water quality in Second Portage Lake were modelled for two different mixing scenarios of water releases into Third Portage Lake (Cumberland, 2005).

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

Mid-range Mixing Estimate (92 Mm³):

- ***Bold italicized*** = concentrations exceed the prediction "With Dike Leaching."
- **Bold** = concentrations exceed the prediction "Without Dike Leaching."

Upper-range Mixing Estimate (169 Mm³):

- Bordered cells = concentrations exceed the prediction "With Dike Leaching."
- Shaded cells = concentrations exceed the prediction "Without Dike Leaching."

Italicized numbers are below detection limits.

Table B1-4. Water quality results from Wally Lake in 2019 compared against predicted concentrations in the FEIS.

Lake and Station	CCME (2012) Guideline[1]	Simulated Maximum Whole Lake Concentration (mg/L) Wally Lake[2]		Wally Lake (WAL)								
Area-Replicate ID				WAL-89	WAL-90	WAL-91	WAL-92	WAL-93	WAL-94	WAL-95	WAL-97	WAL-98
Depth (m)		Without Dike Leaching	With Dike Leaching	3	3	3	3	3	3	3	3	3
Date				28-Mar-19	28-Mar-19	16-May-19	16-May-19	16-Jul-19	16-Jul-19	11-Aug-19	14-Sep-19	14-Sep-19
Physical Tests (mg/L)												
Hardness		17	17	***29***	***27***	***24***	***29***	15	15	16	17	16
Anions and Nutrients (mg/L)												
Alkalinity - Total		13	13	***24***	***22***	***21***	***24***	**12**	12	***15***	***14***	13
Ammonia (as N)[3]	***equation***	0.089	0.089	0.016	0.018	**0.064**	0.017	*<0.0050*	0.036	*<0.0050*	0.0050	*<0.0050*
Chloride	120	0.70	0.70	***1.3***	***1.2***	***1.1***	***1.3***	0.64	0.65	0.69	0.69	0.68
Fluoride	0.12	0.050	0.050	***0.073***	***0.071***	***0.061***	***0.068***	0.042	0.043	**0.046**	***0.053***	***0.053***
Nitrate (as N)	3.0	0.10	0.10	0.019	0.015	**0.031**	**0.018**	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Ortho Phosphate (as P)		0.0030	0.0030	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P) - Total	0.0040	0.0039	0.0040	**0.0020**	*<0.0020*	*<0.0020*	*<0.0020*	0.0023	0.0026	0.0024	0.0028	0.0034
Sulphate (SO_4)		5.3	5.3	***7.5***	***7.2***	***6.2***	***7.2***	3.8	3.9	4.4	4.7	4.6
Cyanides (mg/L)												
Total Cyanide		0.00000	0.00000	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Total Metals (mg/L)												
Aluminum[3]	***equation***	0.012	0.013	*<0.0030*	*<0.0030*	*<0.0030*	0.0034	0.0061	0.0052	0.0069	0.0039	0.0050
Antimony		0.00090	0.00090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.0050	0.0050	0.0060	0.00035	0.00031	0.00026	0.00029	0.00022	0.00022	0.00028	0.00031	0.00032
Barium		0.020	0.020	0.0040	0.0039	0.0037	0.0044	0.0023	0.0024	0.0022	0.0021	0.0021
Beryllium		0.0010	0.0010	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Bismuth		0.10	0.10	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	1.5	0.00001	0.00001	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium[3]	***equation***	0.00018	0.00019	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		4.7	4.7	***7.7***	***7.3***	***6.3***	***7.4***	4.2	4.1	4.4	4.6	4.5
Chromium[4]	0.001	0.0010	0.0010	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00040*	*<0.00040*
Cobalt		0.00030	0.00030	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.0020	0.0020	0.00098	0.0011	0.0013	0.0010	0.00076	0.00075	0.00093	0.00087	0.00091
Iron	0.3	0.030	0.030	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.012	0.010	0.016
Lead[3]	***equation***	0.00070	0.00070	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.0050	0.0050	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		1.3	1.3	***2.2***	***2.0***	***1.7***	***2.0***	1.2	1.2	**1.2**	***1.3***	1.3
Manganese[3]		0.0020	0.0020	0.0017	0.0015	0.00075	0.00089	0.0014	0.0013	0.0013	0.0012	0.0019
Mercury	0.000026	0.00010	0.00010	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.0020	0.0020	0.00023	0.00027	0.00022	0.00025	0.00015	0.00016	0.00017	0.00018	0.00016
Nickel[3]	***equation***	0.0010	0.0010	*<0.00050*	**0.00052**	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Potassium		2.0	2.0	0.79	0.75	0.66	0.77	0.45	0.45	0.41	0.49	0.45
Selenium	0.001	0.0010	0.0010	**0.00005**	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.040	0.040	***0.53***	***0.48***	***0.47***	***0.46***	***0.26***	***0.27***	***0.32***	***0.38***	***0.38***
Silver	0.0001	0.00002	0.00002	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		2.0	2.0	1.0	0.94	0.86	1.1	0.60	0.60	0.55	0.59	0.59
Thallium	0.0008	0.00020	0.00020	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Uranium	0.015	0.00070	0.00070	0.00005	0.00005	0.00004	0.00005	0.00005	0.00004	0.00006	0.00005	0.00006
Vanadium		0.030	0.030	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc		0.013	0.013	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2016.
2. Preliminary modelling of whole lake water quality in the receiving environment water bodies incorporates long-term loadings from the Vault dike and effluent releases from the Vault Attenuation pond (Cumberland, 2005).
3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. Ammonia and aluminum (t & d) guidelines vary with pH; cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.
4. Chromium CCME guideline is for Cr VI.

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

- ***Bold italicized*** = concentrations exceed the prediction "With Dike Leaching."
- **Bold** = concentrations exceed the prediction "Without Dike Leaching."

Italicized numbers are below detection limits.

FIGURES

Figure B1 - 1. Carbonate alkalinity (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

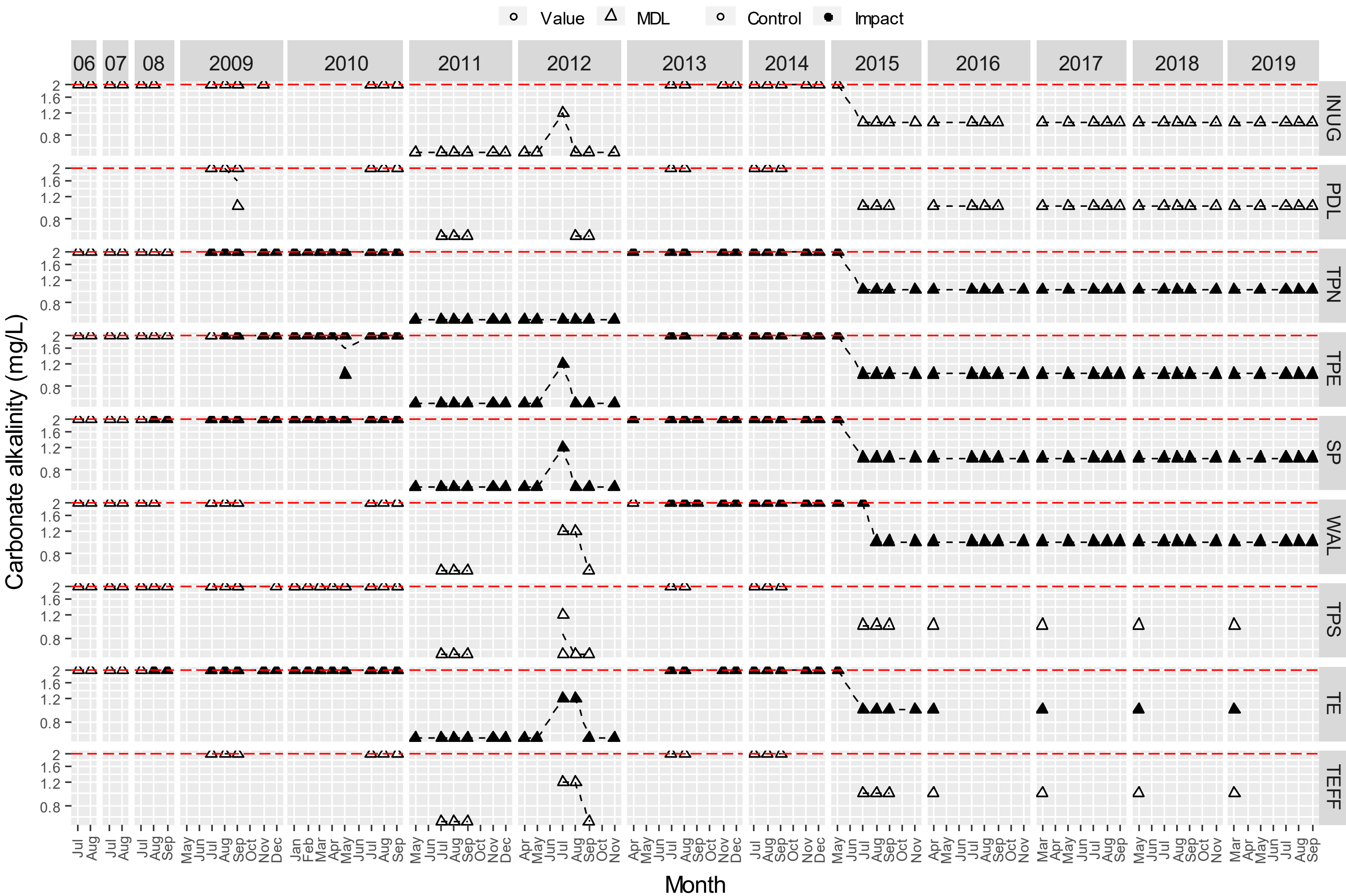


Figure B1 - 2. Nitrite-N (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

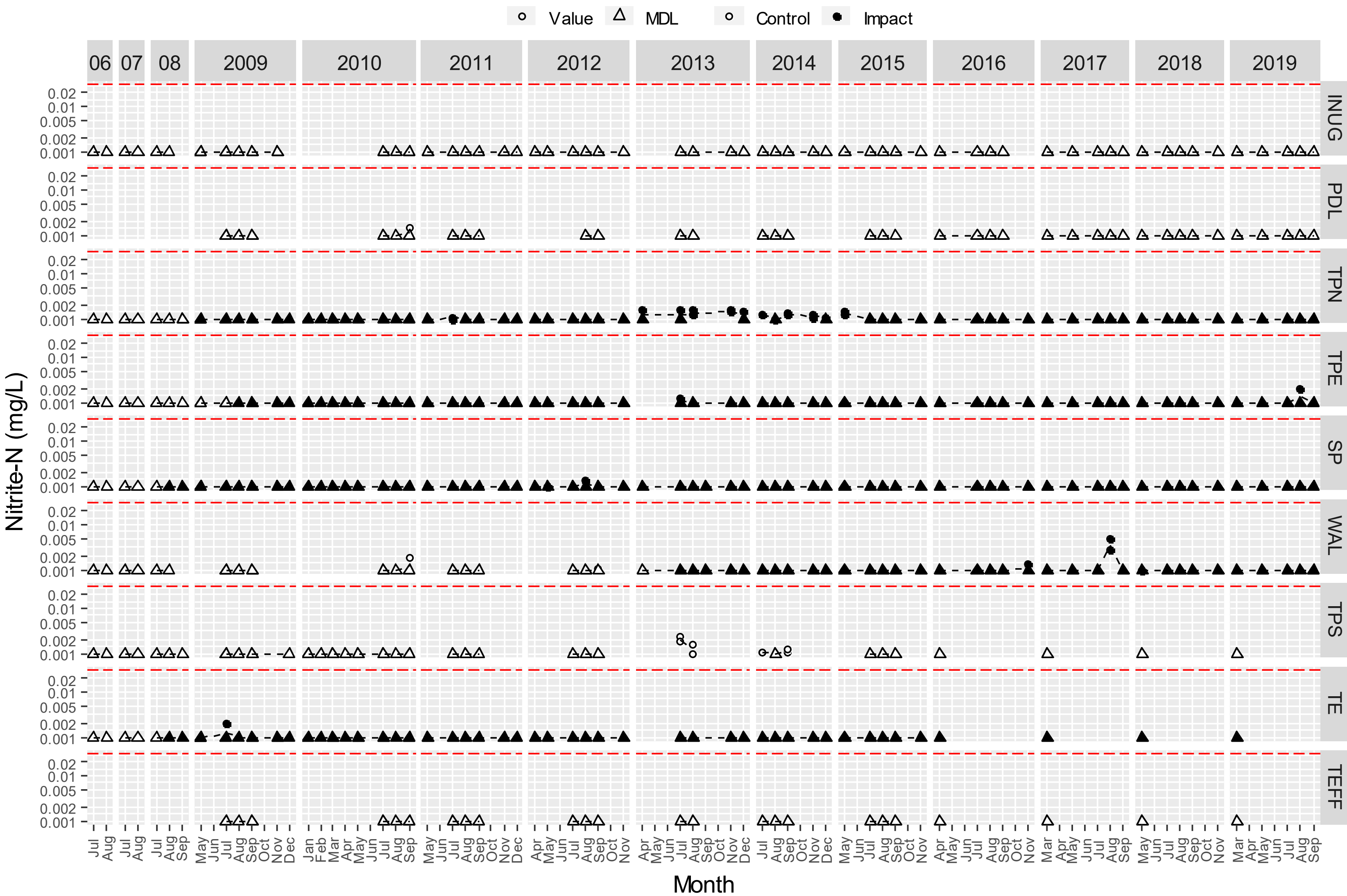


Figure B1 - 3. Ortho-phosphate (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

Figure B1 - 4. Total cyanide (mg/L) in water samples from Meadowbank Study lakes since 2006.

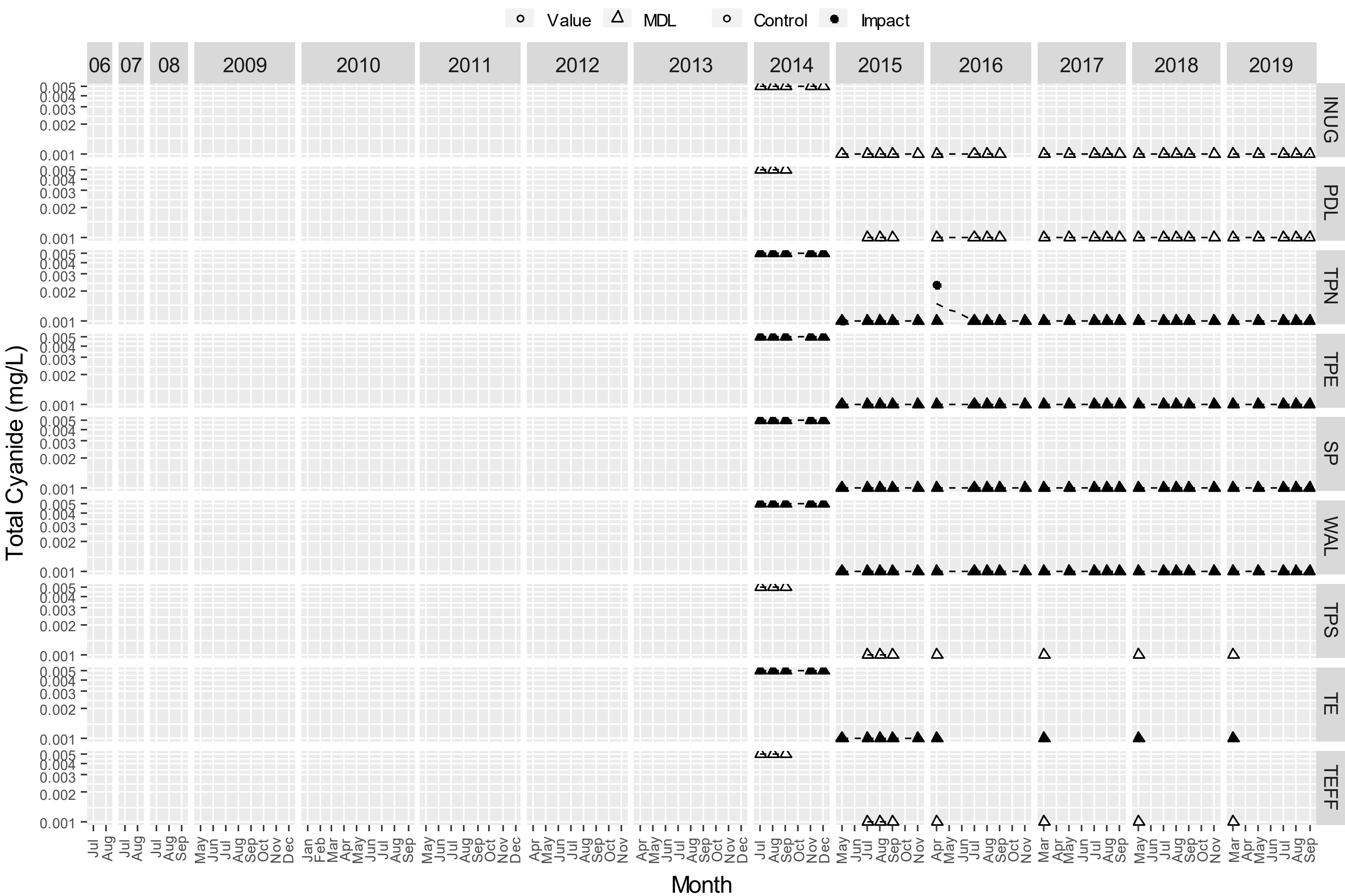


Figure B1 - 5. Free cyanide (mg/L) in water samples from Meadowbank Study lakes since 2006.

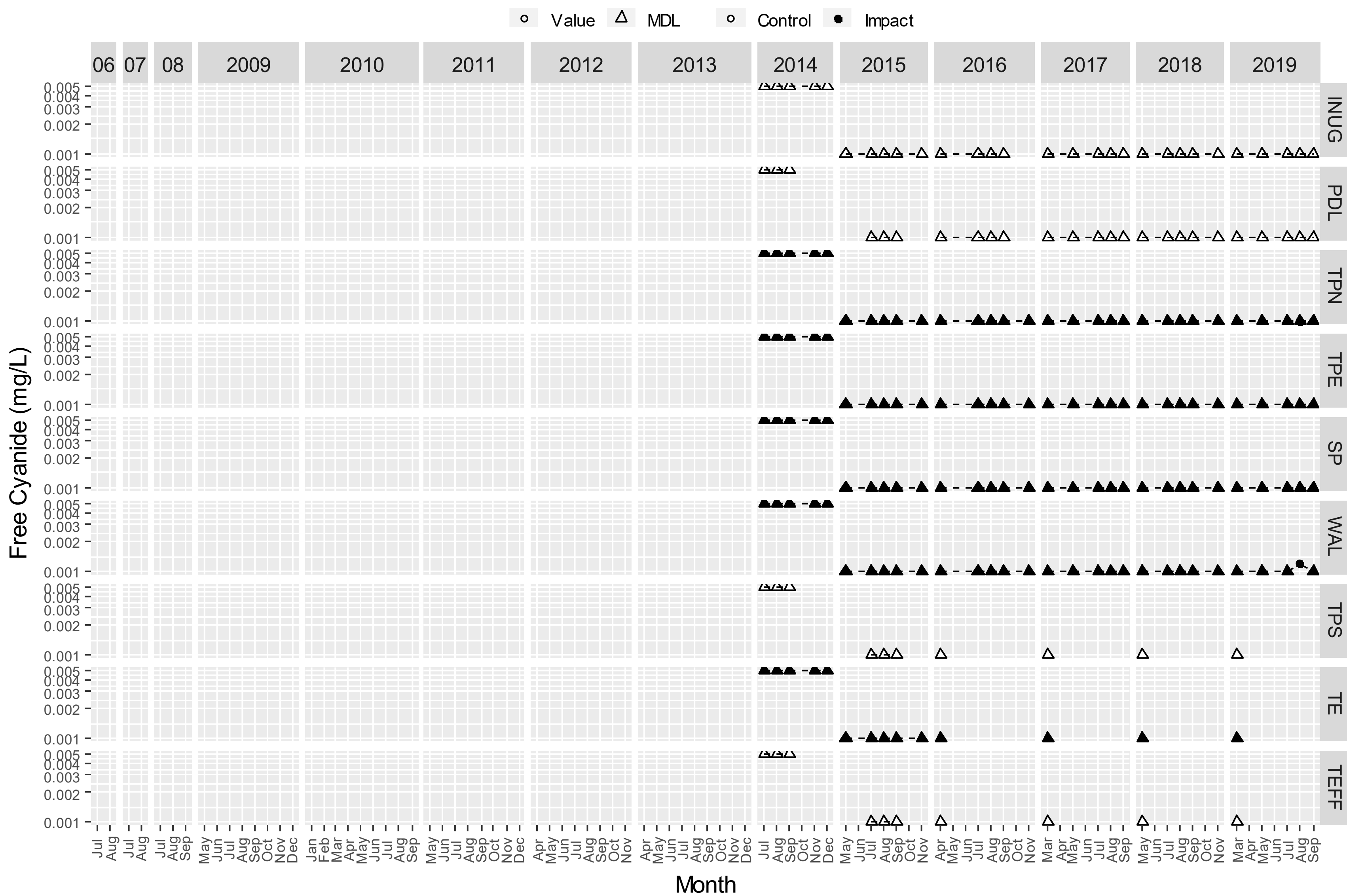


Figure B1 - 6. Total antimony (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.

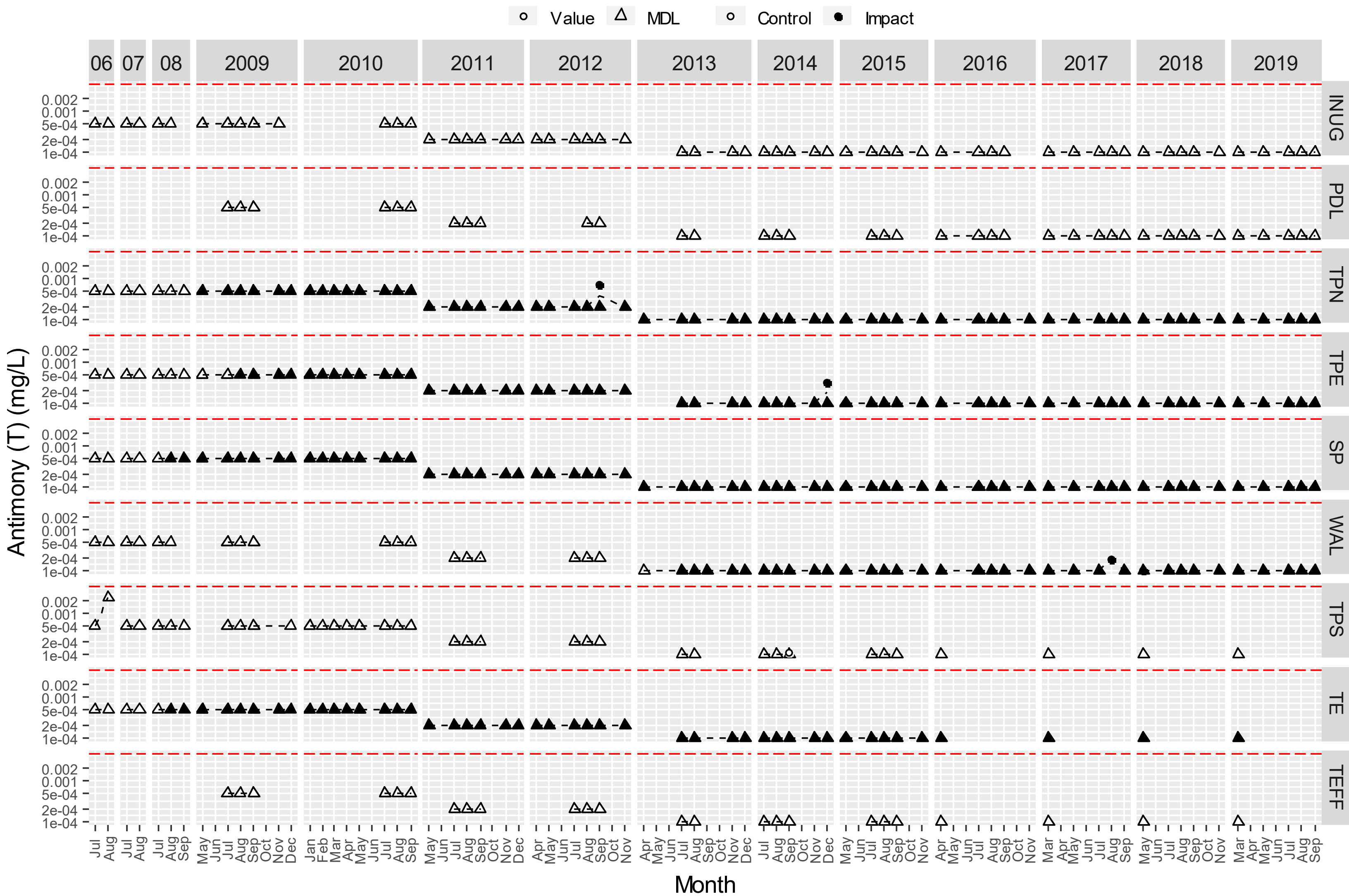


Figure B1 - 7. Total beryllium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value. The blue dashed line = FEIS screening prediction.

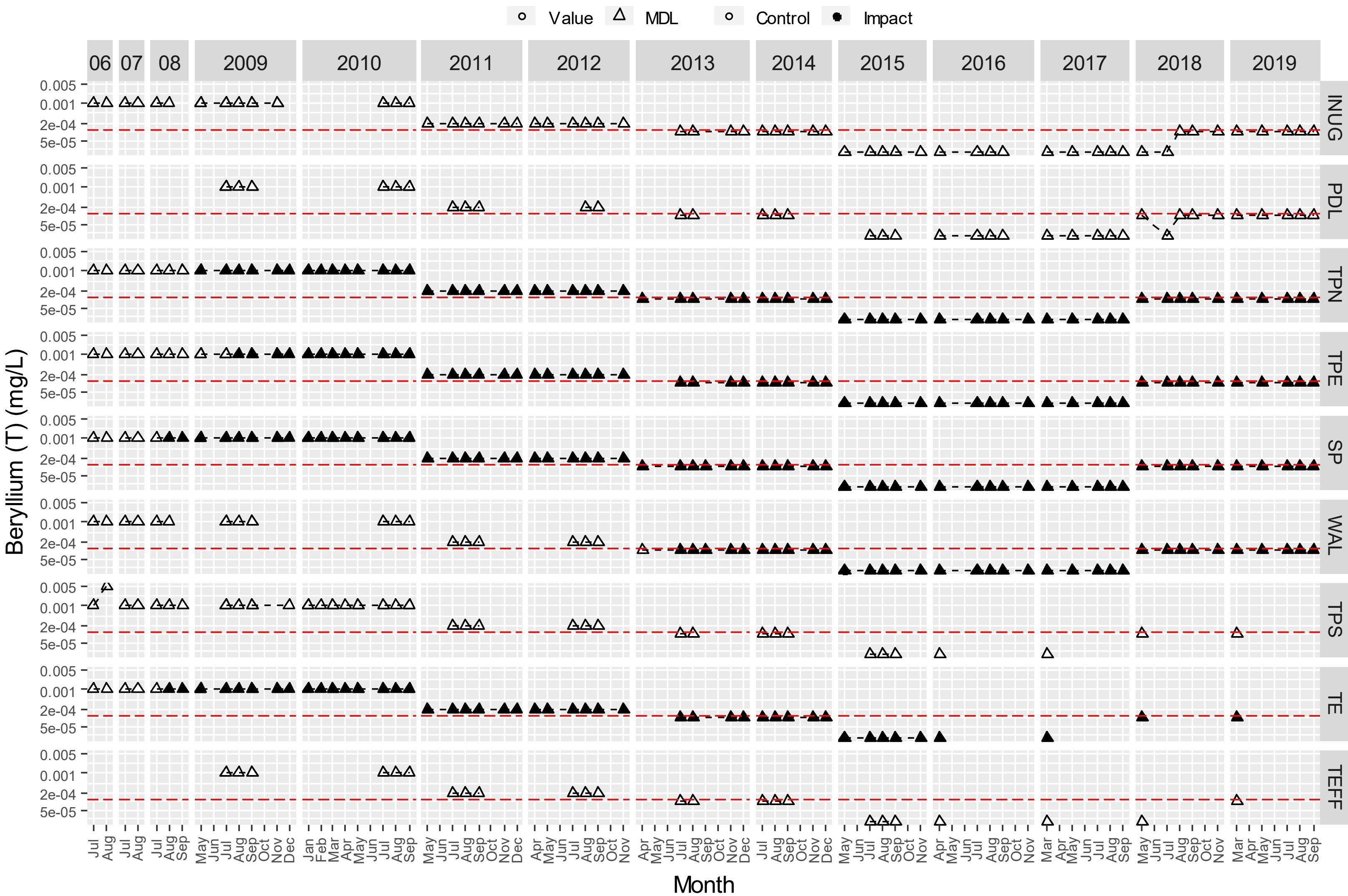


Figure B1 - 8. Total boron (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

Figure B1 - 9. Total cadmium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

Figure B1 - 10. Total lead (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

Figure B1 - 11. Total lithium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

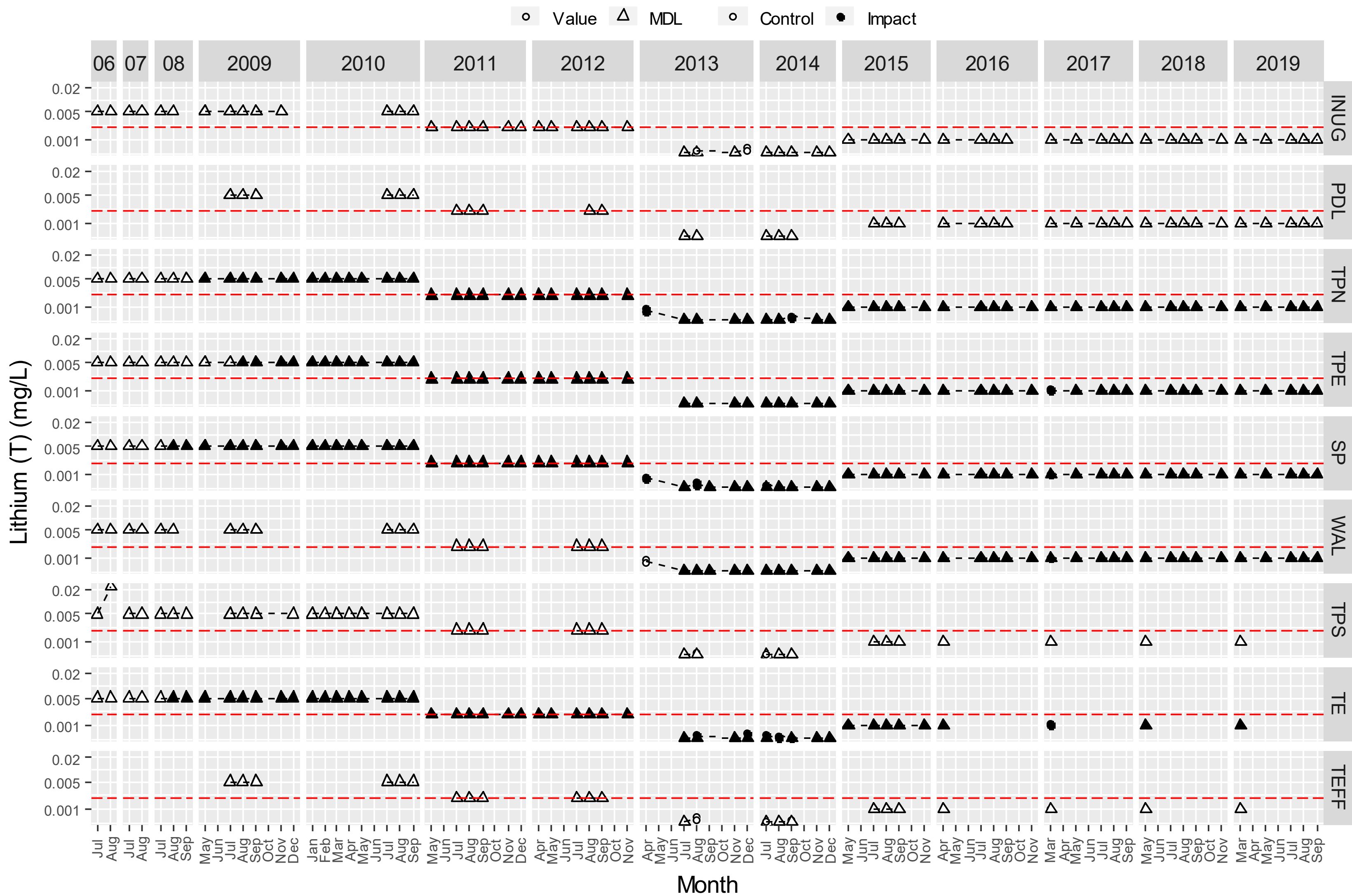


Figure B1 - 12. Total mercury (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

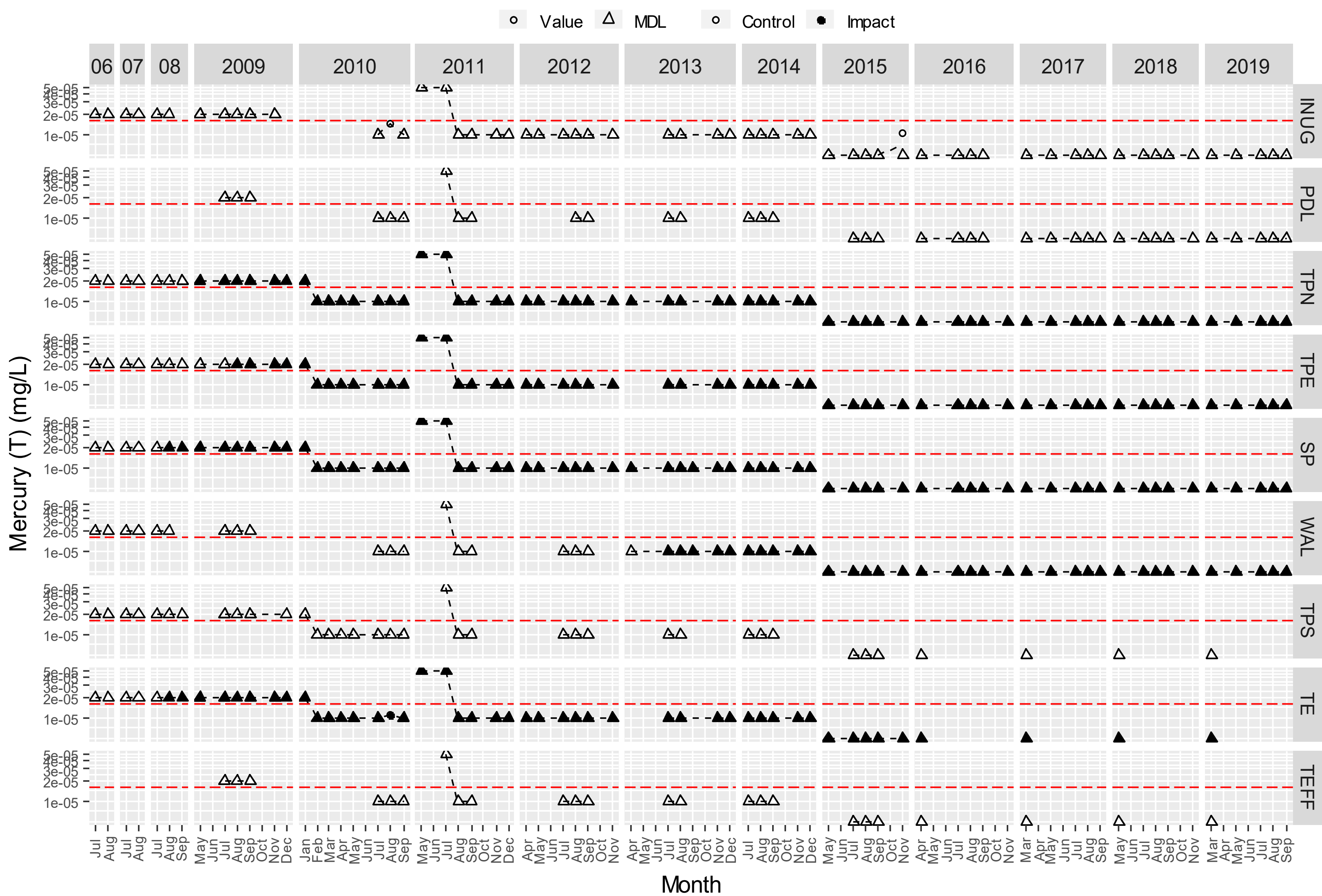


Figure B1 - 13. Total selenium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

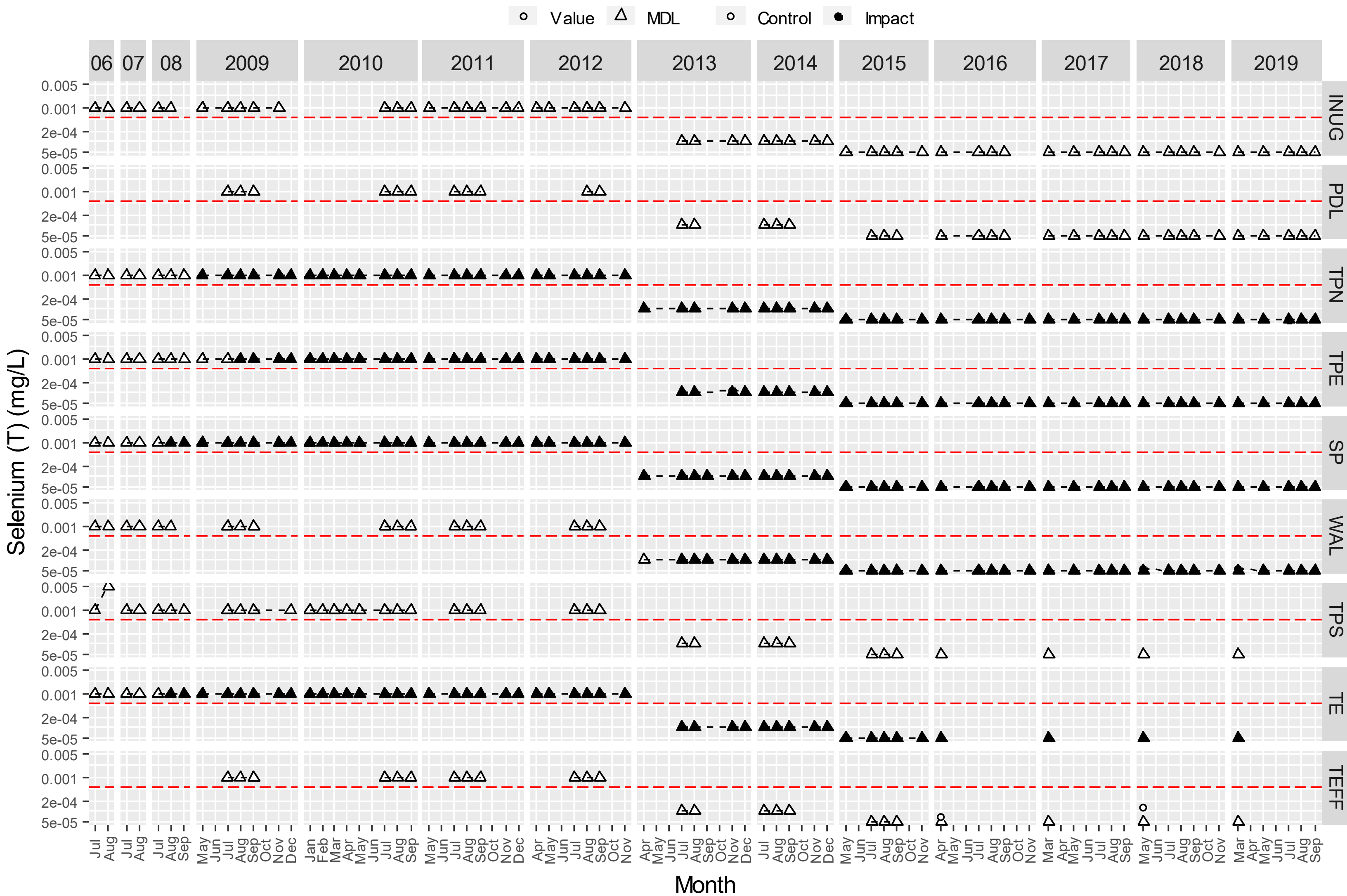


Figure B1 - 14. Total silver (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

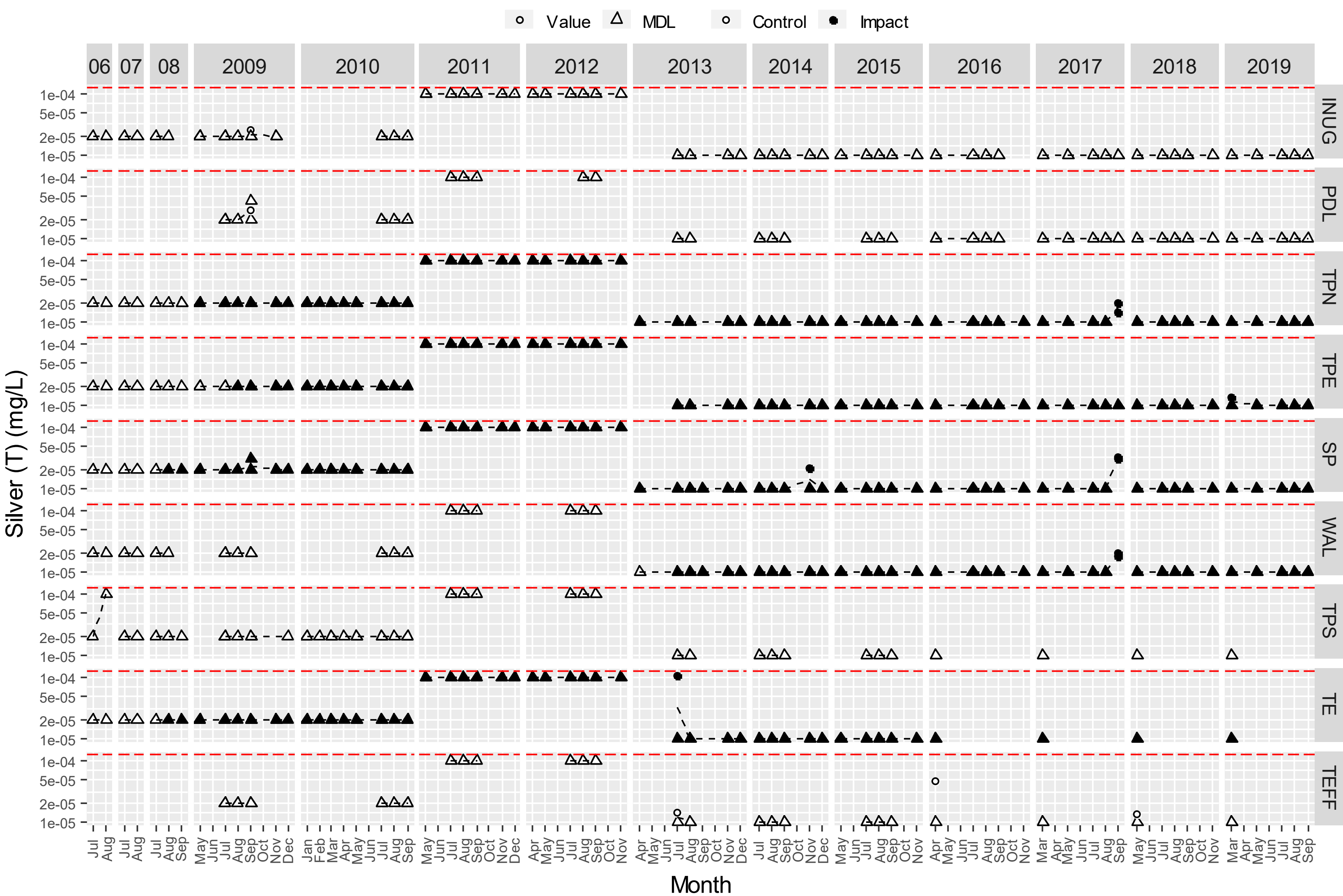


Figure B1 - 15. Total thallium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

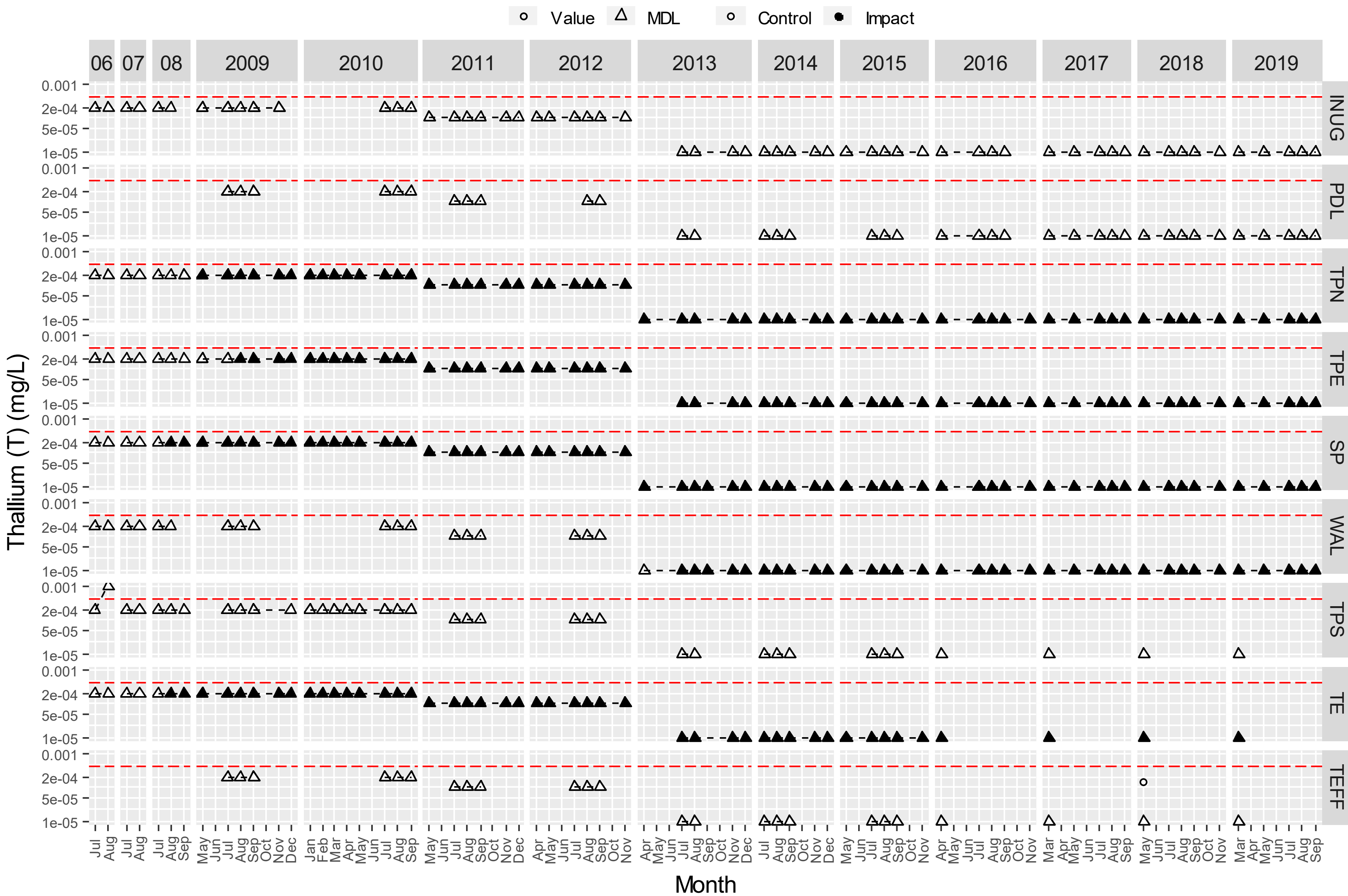


Figure B1 - 16. Total tin (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

Figure B1 - 17. Total titanium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

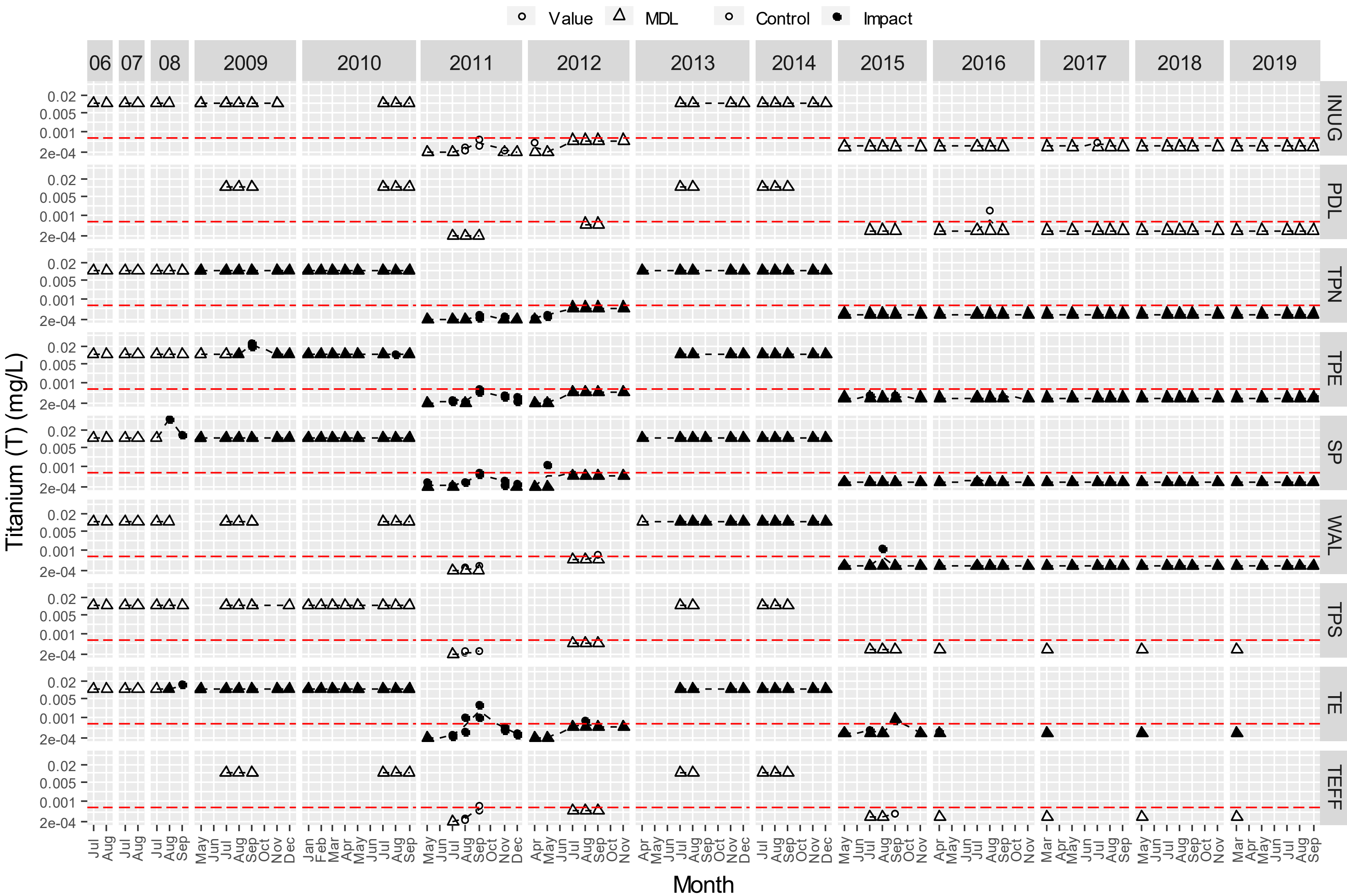


Figure B1 - 18. Total vanadium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

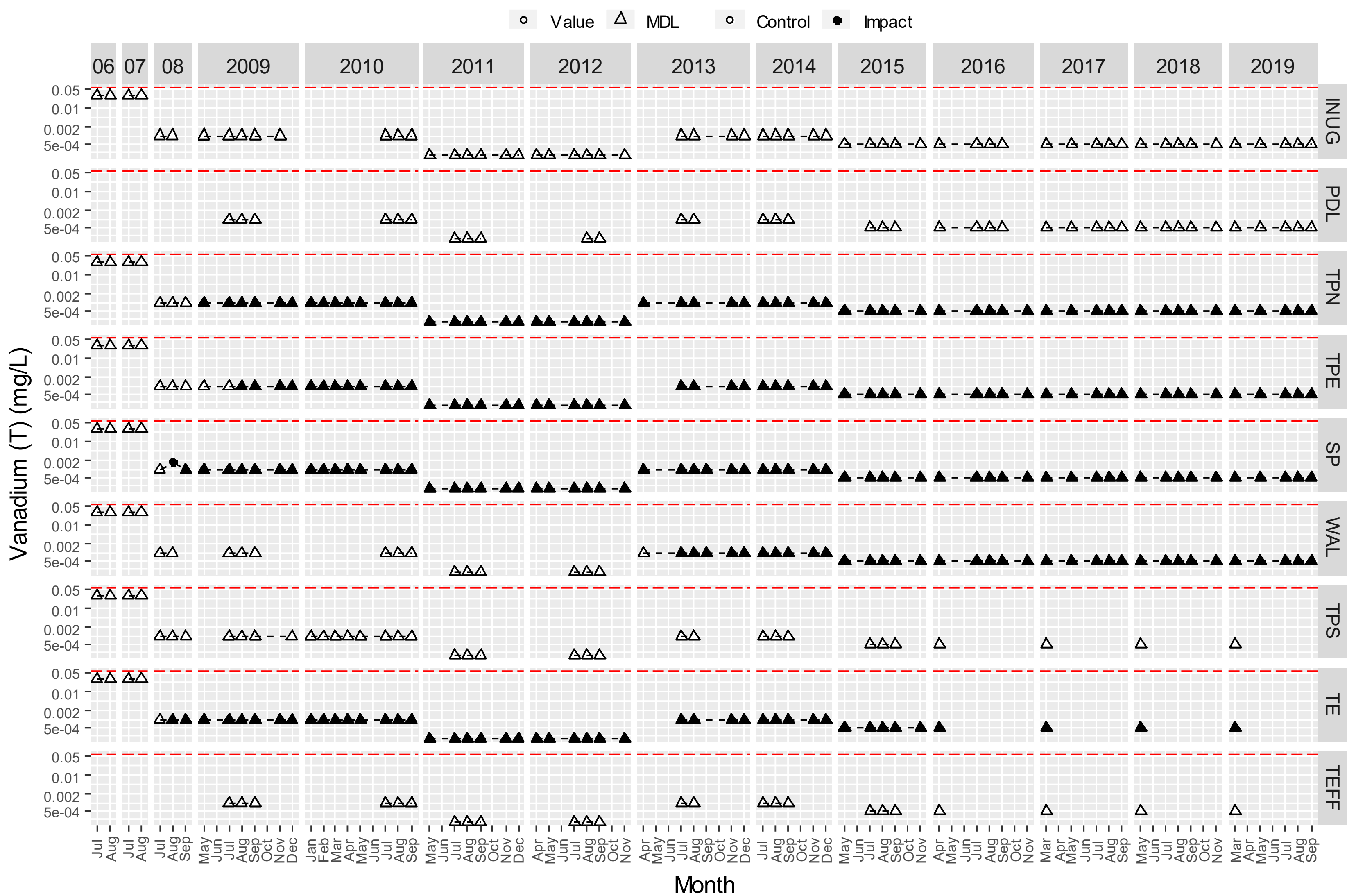


Figure B1 - 19. Total zinc (mg/L) in water samples from Meadowbank Study lakes since 2006.

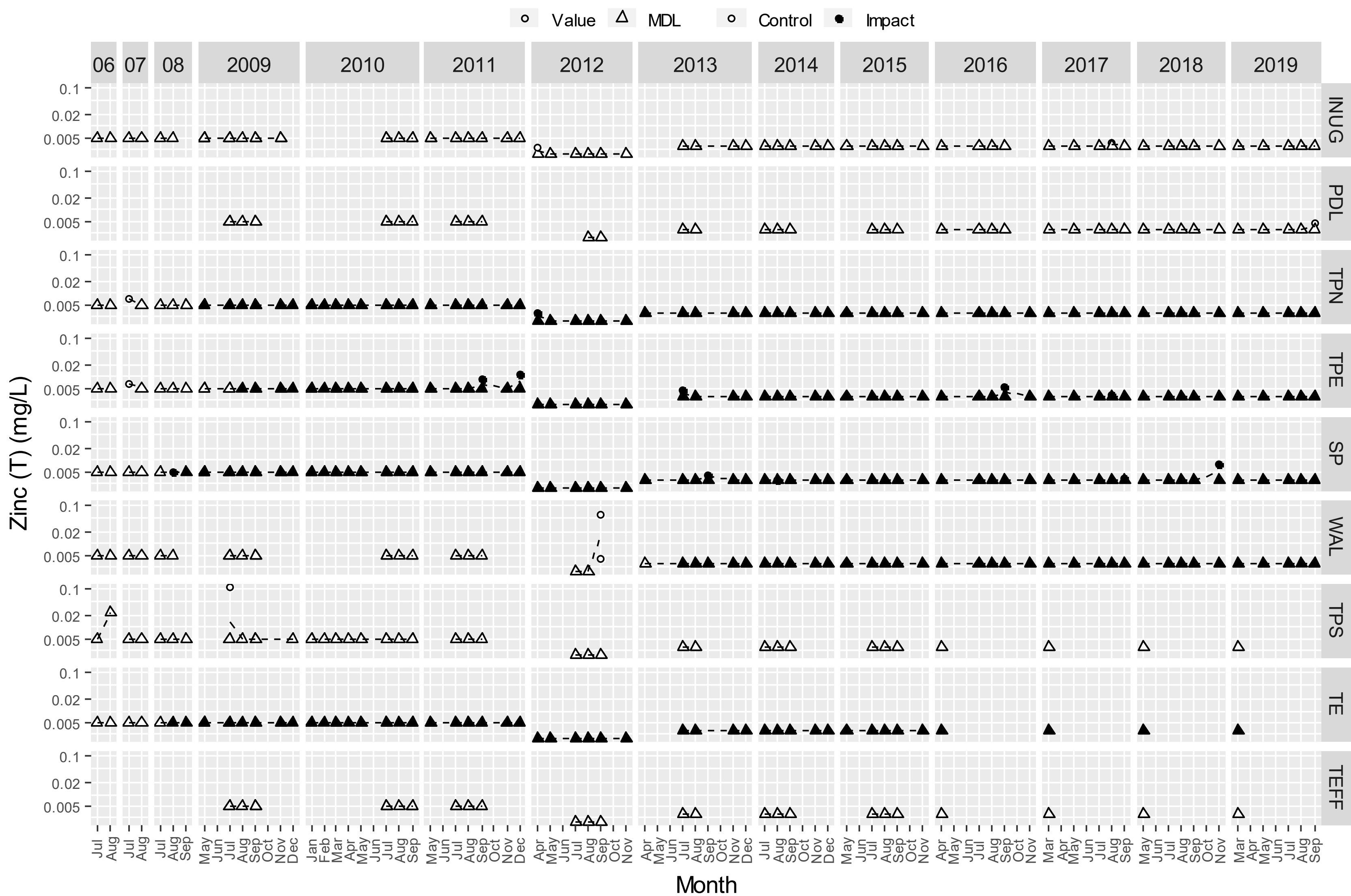


Figure B1 - 20. Dissolved antimony (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

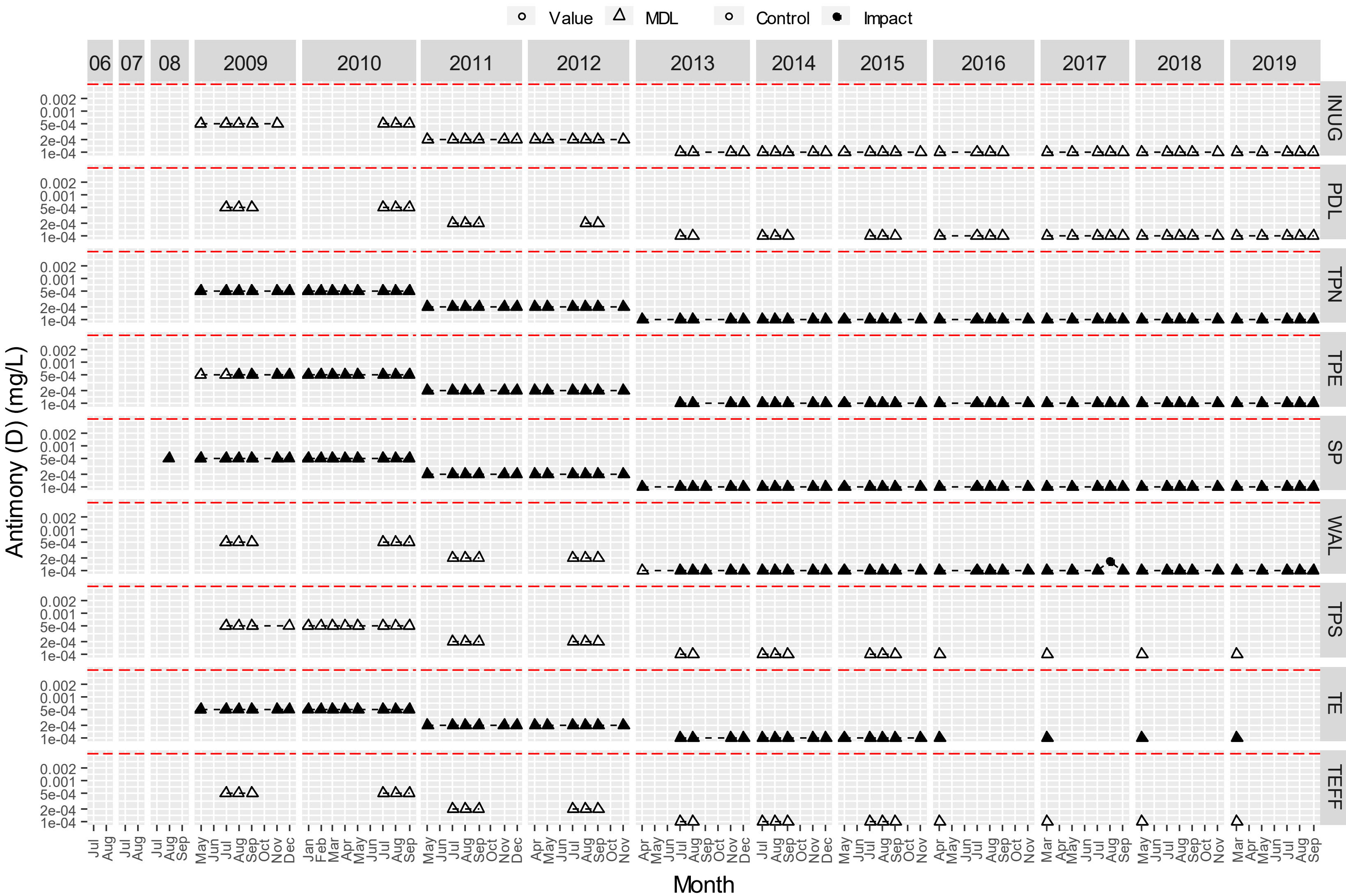


Figure B1 - 21. Dissolved beryllium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

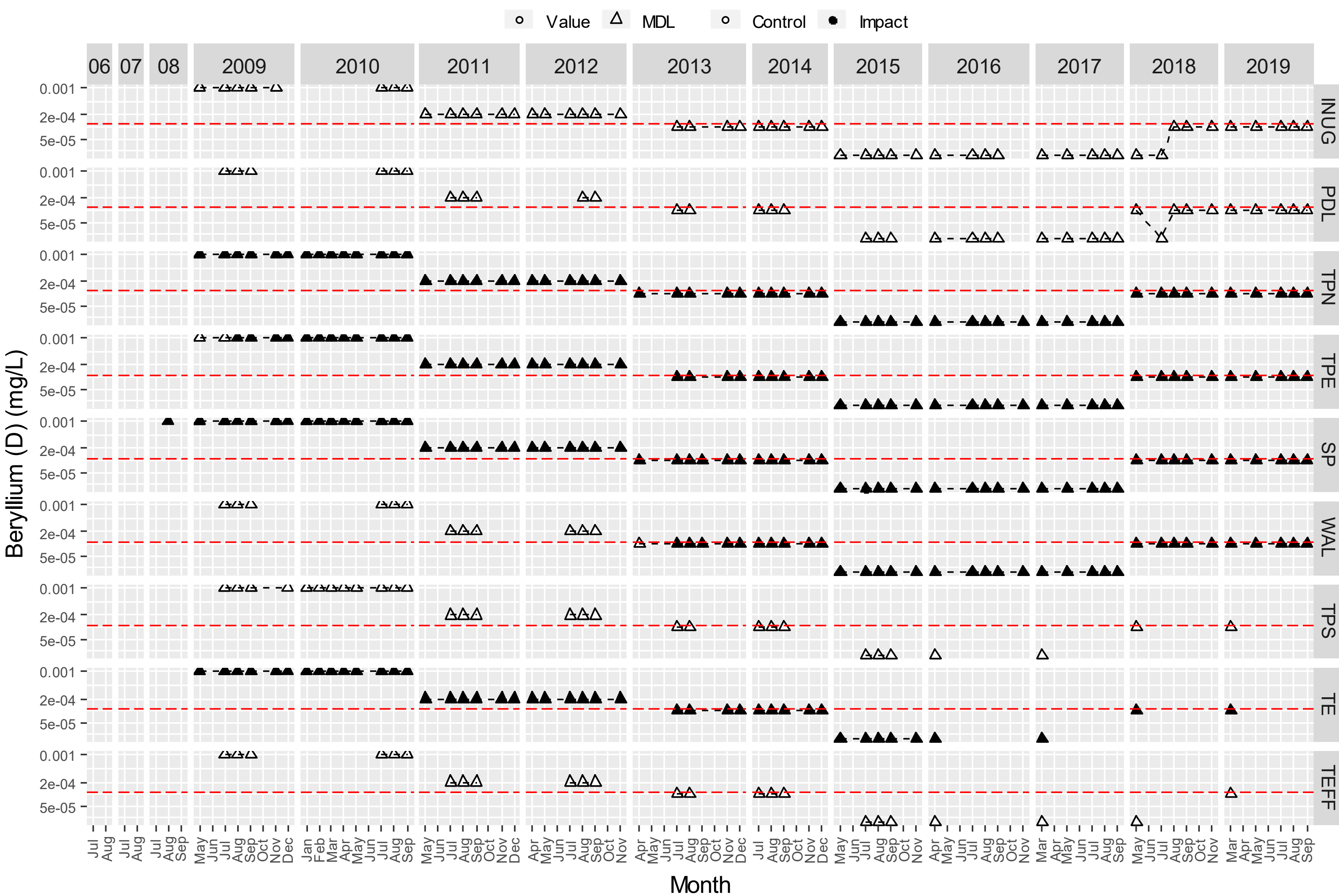


Figure B1 - 22. Dissolved boron (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

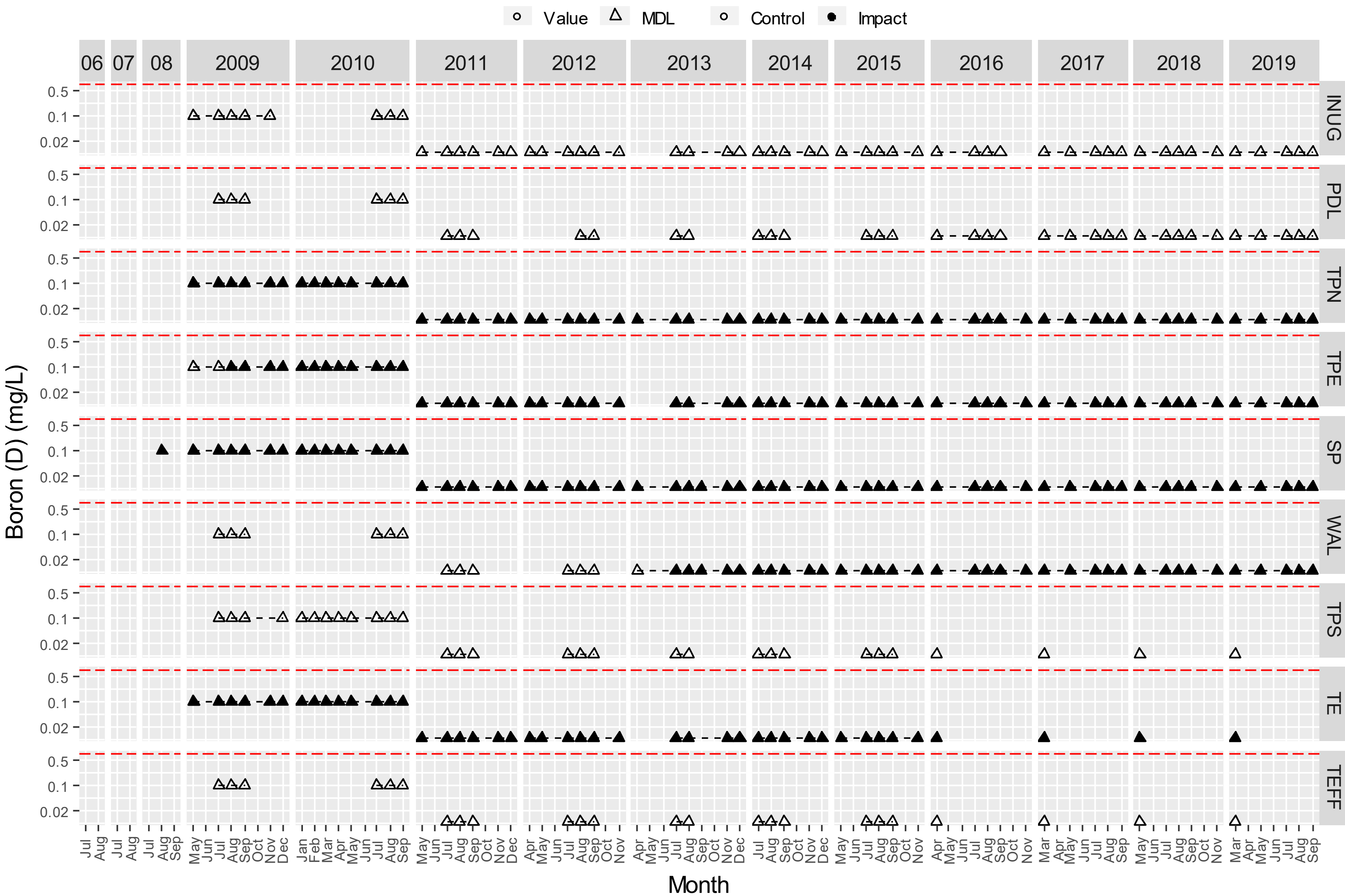


Figure B1 - 23. Dissolved cadmium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

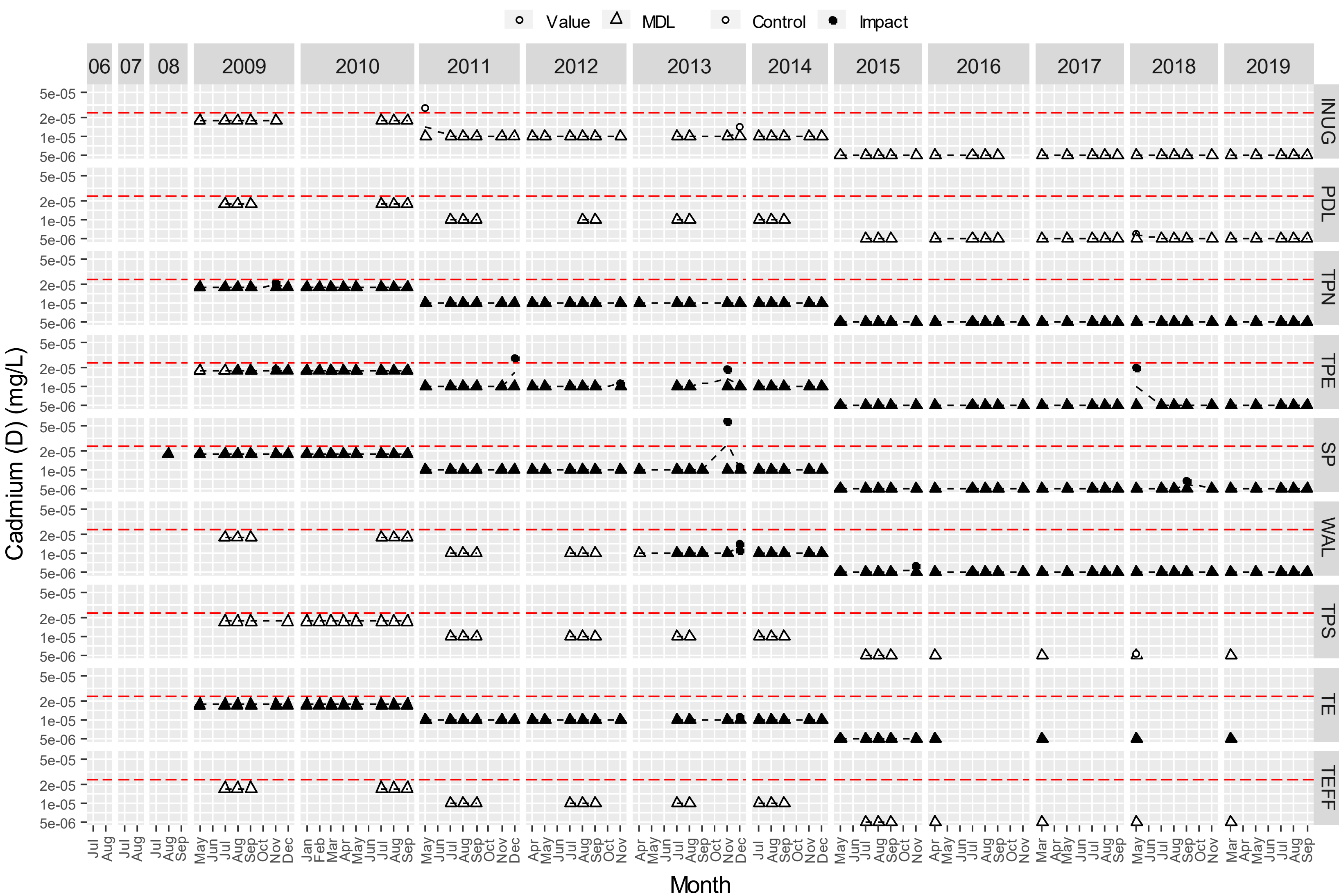


Figure B1 - 24. Dissolved chromium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

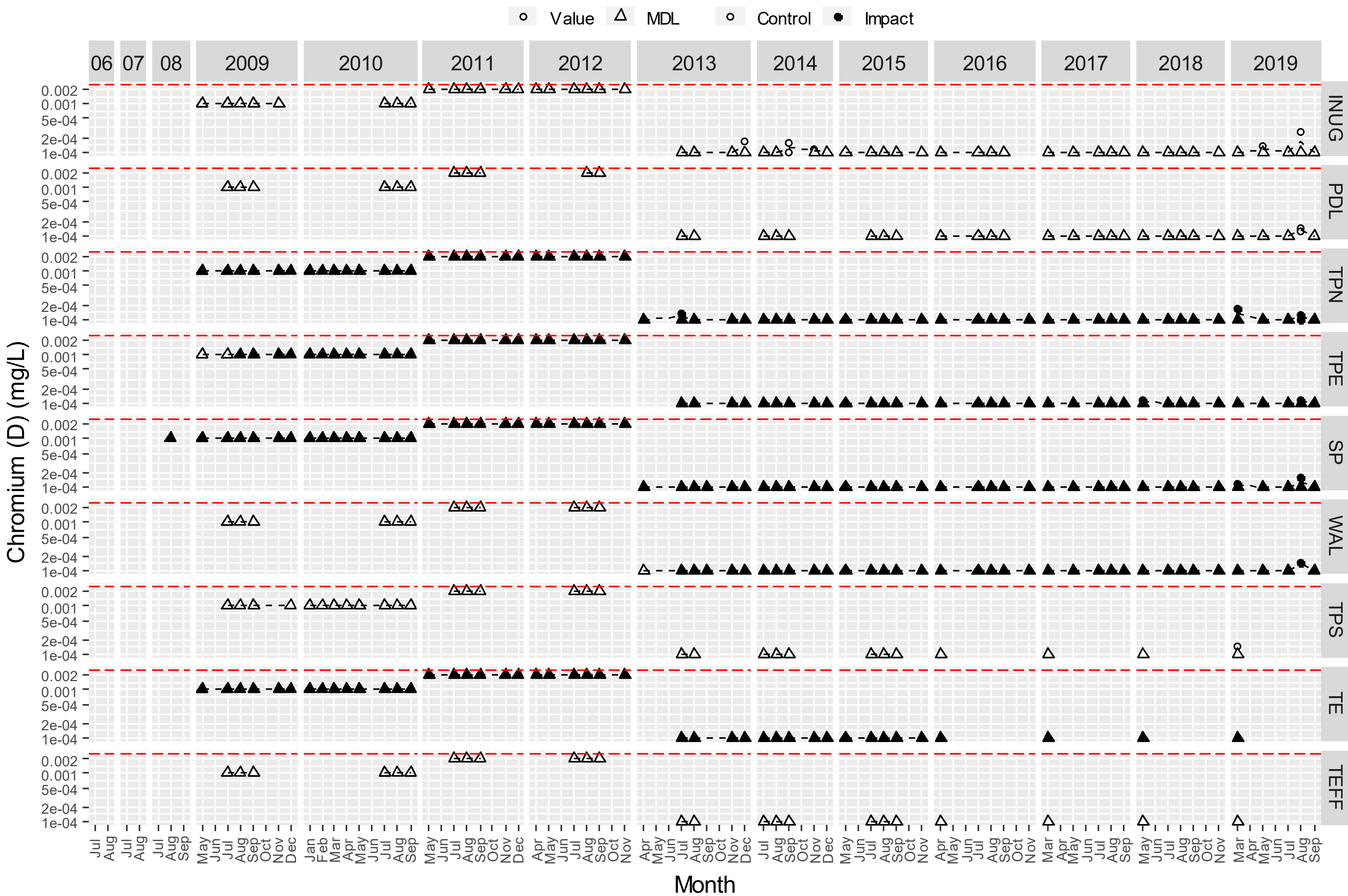


Figure B1 - 25. Dissolved iron (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

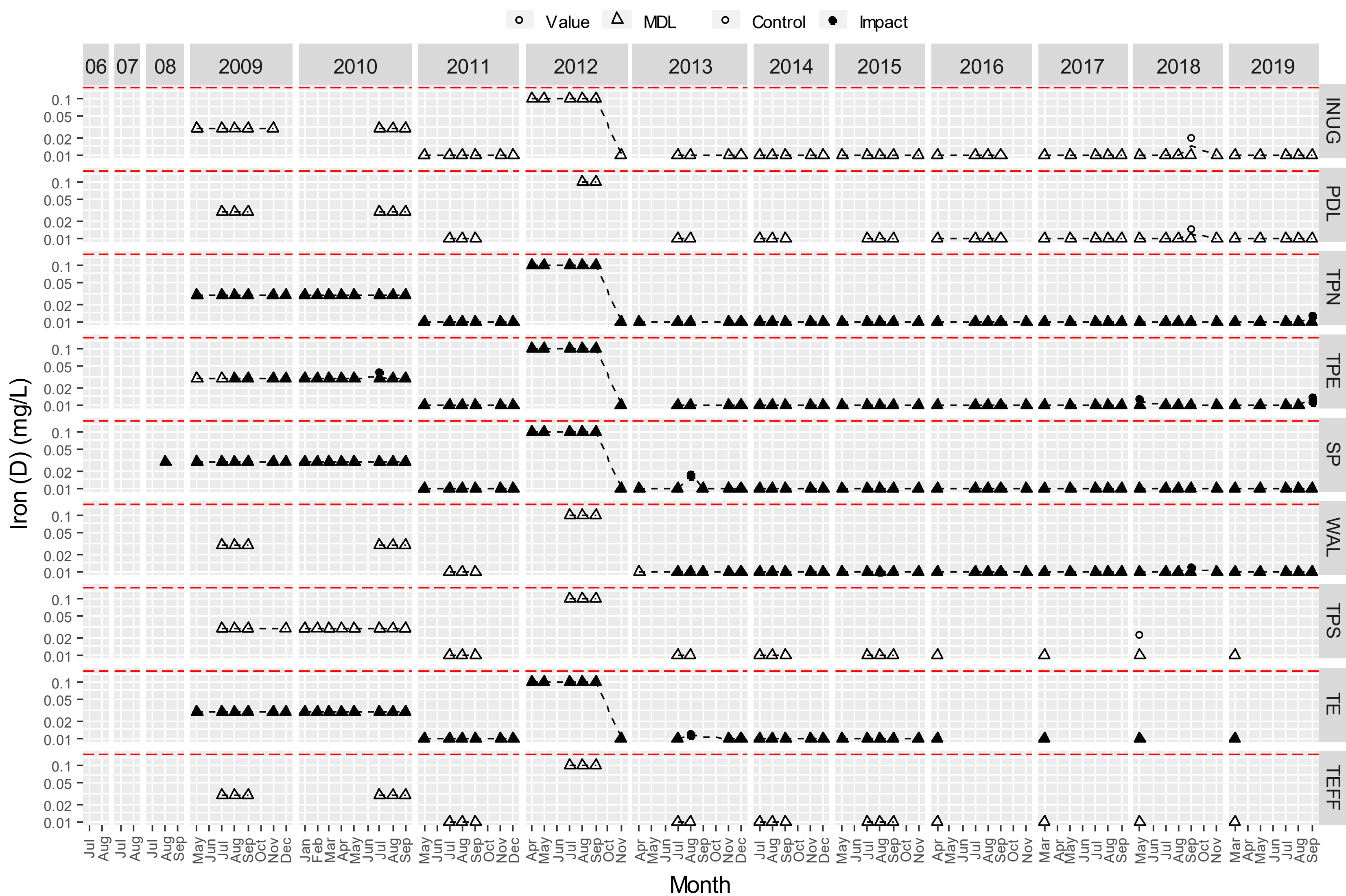


Figure B1 - 26. Dissolved lead (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

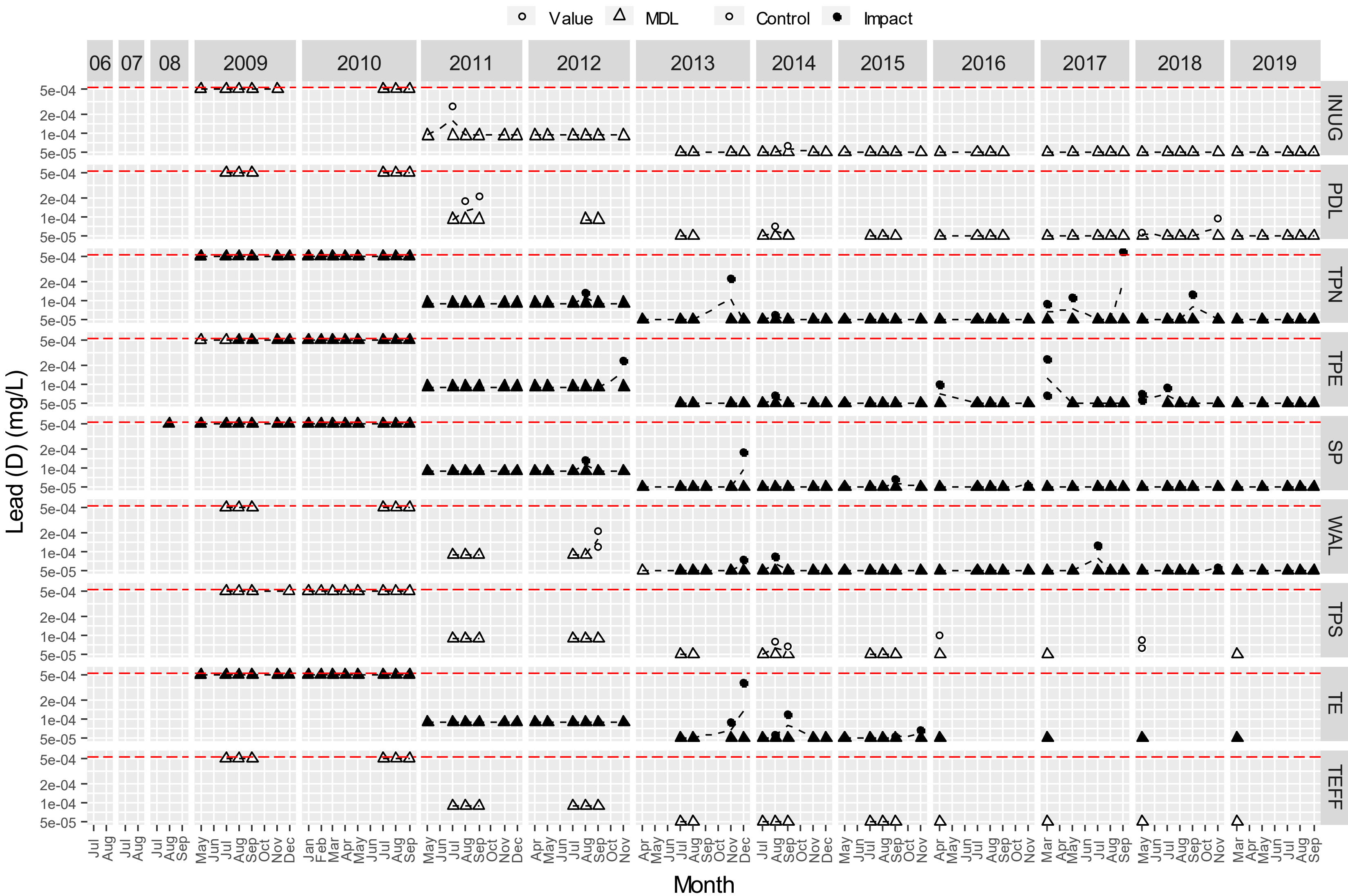


Figure B1 - 27. Dissolved lithium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

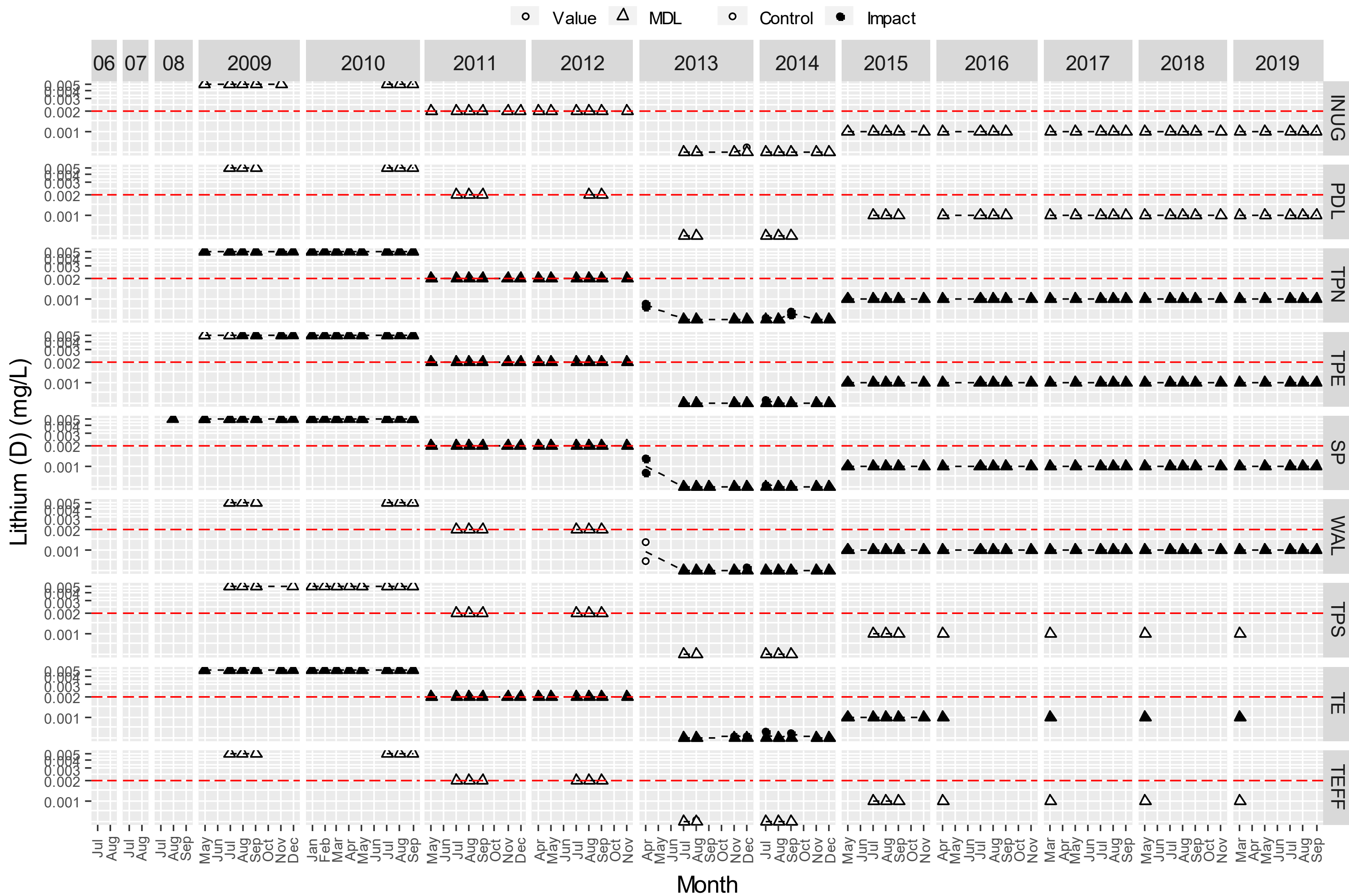


Figure B1 - 28. Dissolved mercury (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

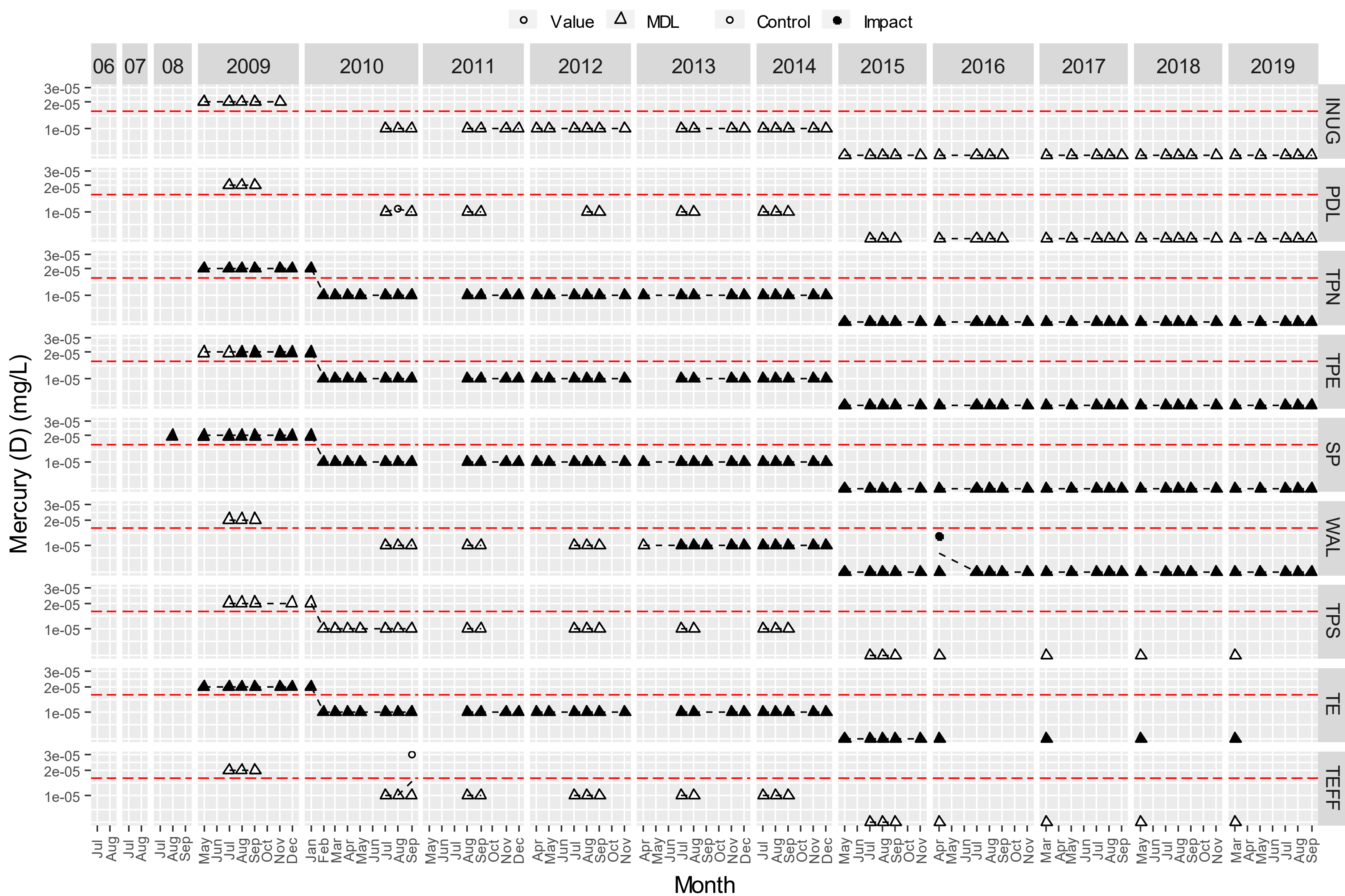


Figure B1 - 29. Dissolved selenium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

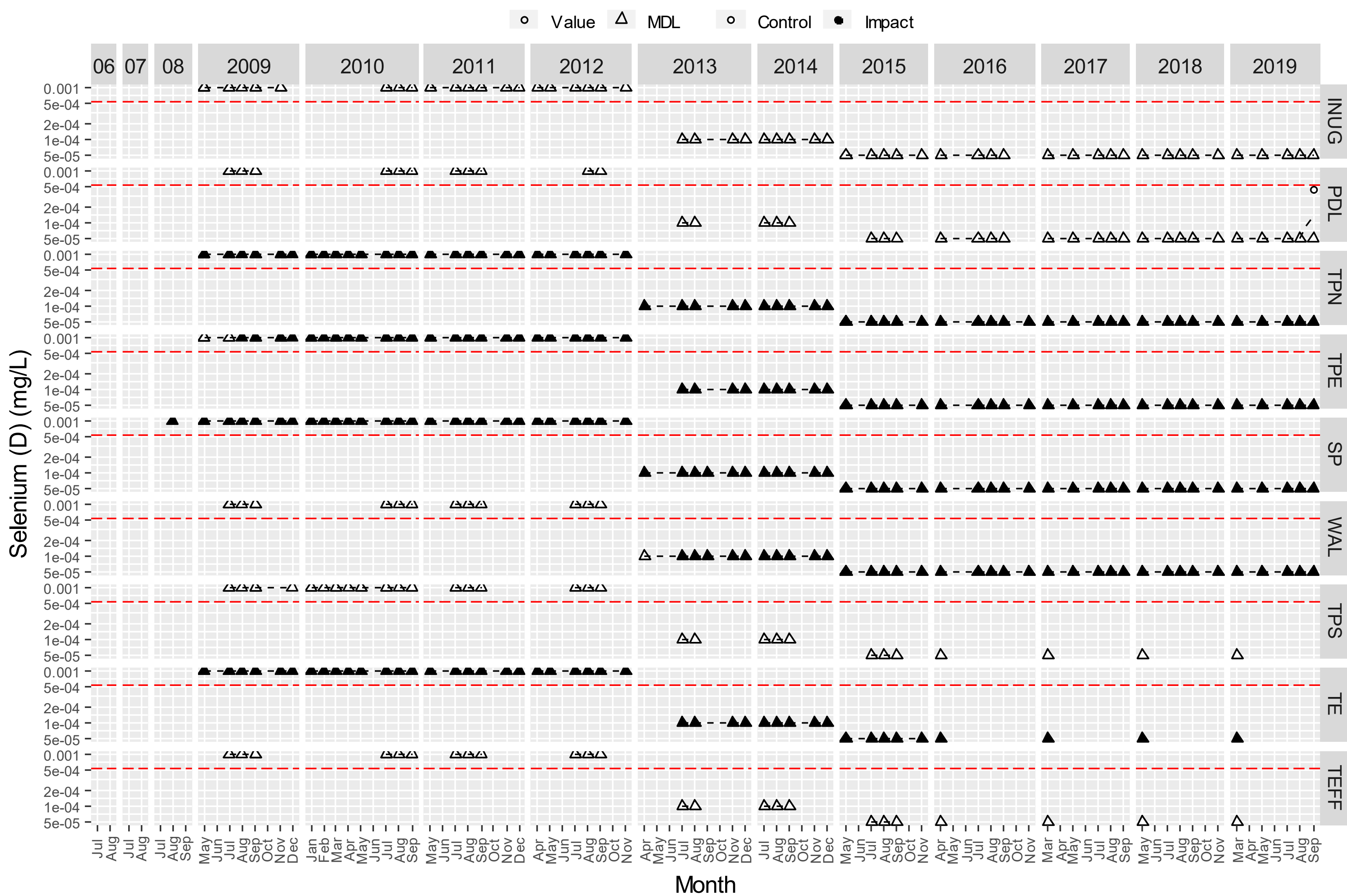


Figure B1 - 30. Dissolved thallium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

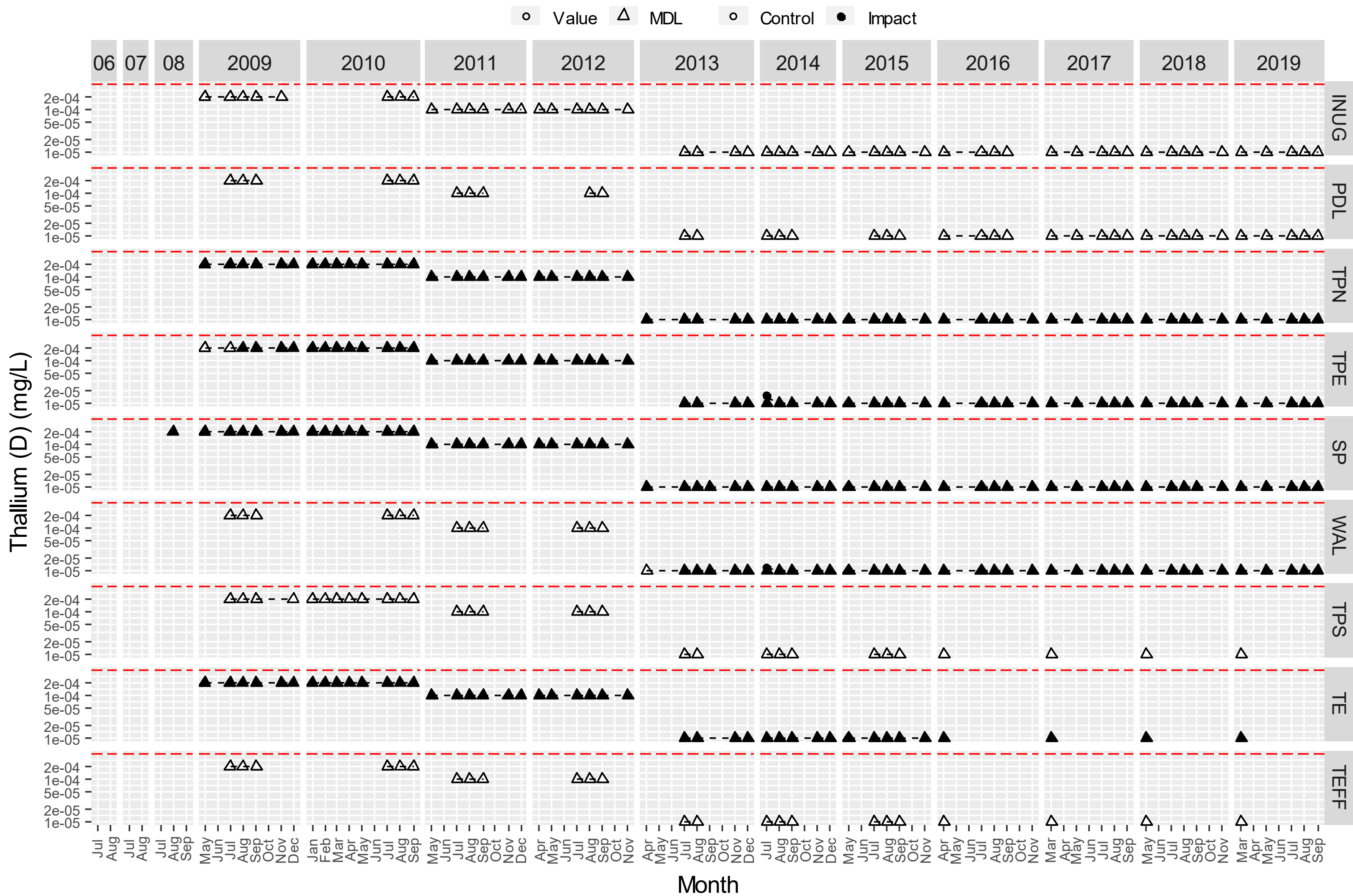


Figure B1 - 31. Dissolved tin (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

Figure B1 - 32. Dissolved titanium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

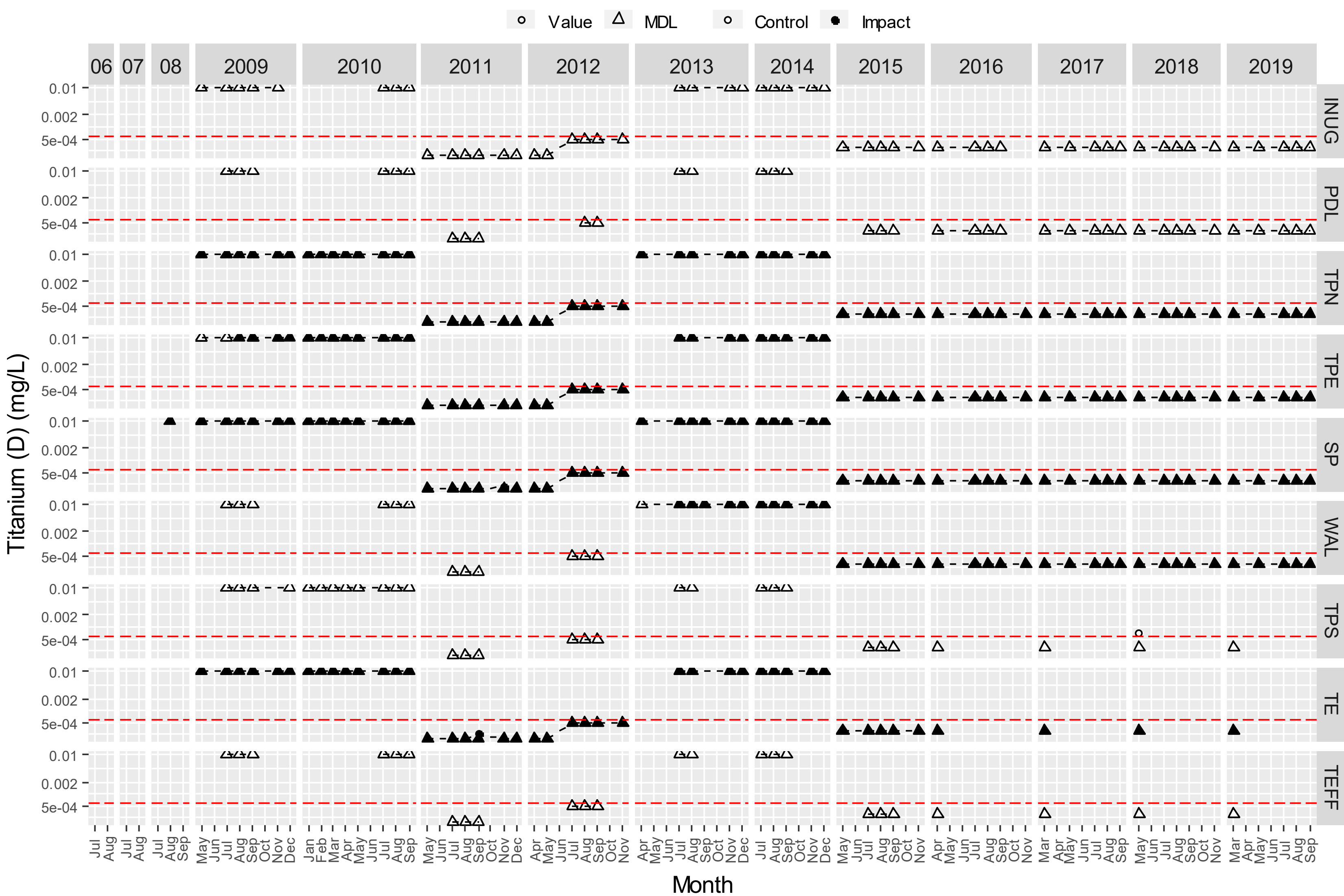


Figure B1 - 33. Dissolved vanadium (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.

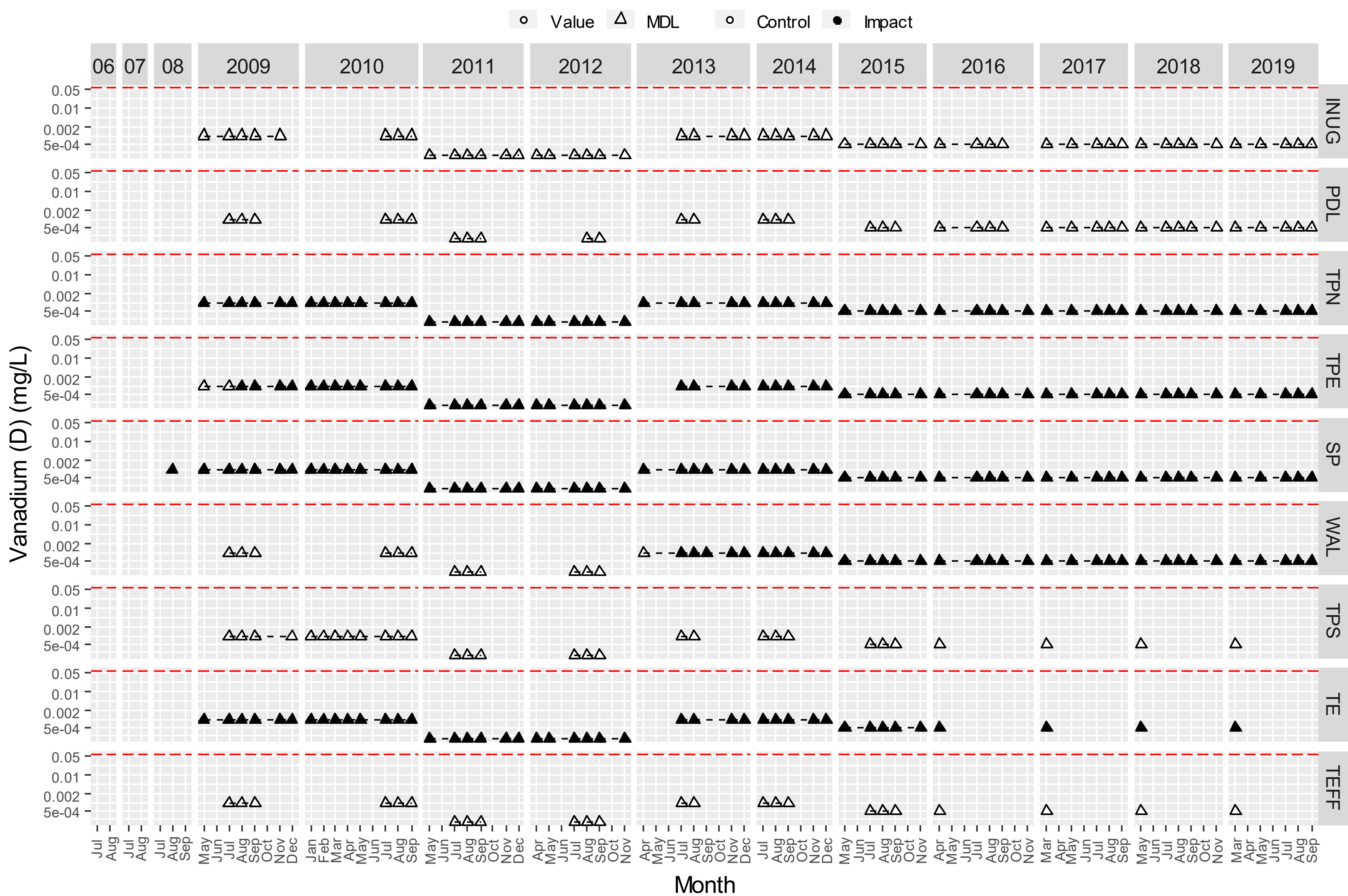
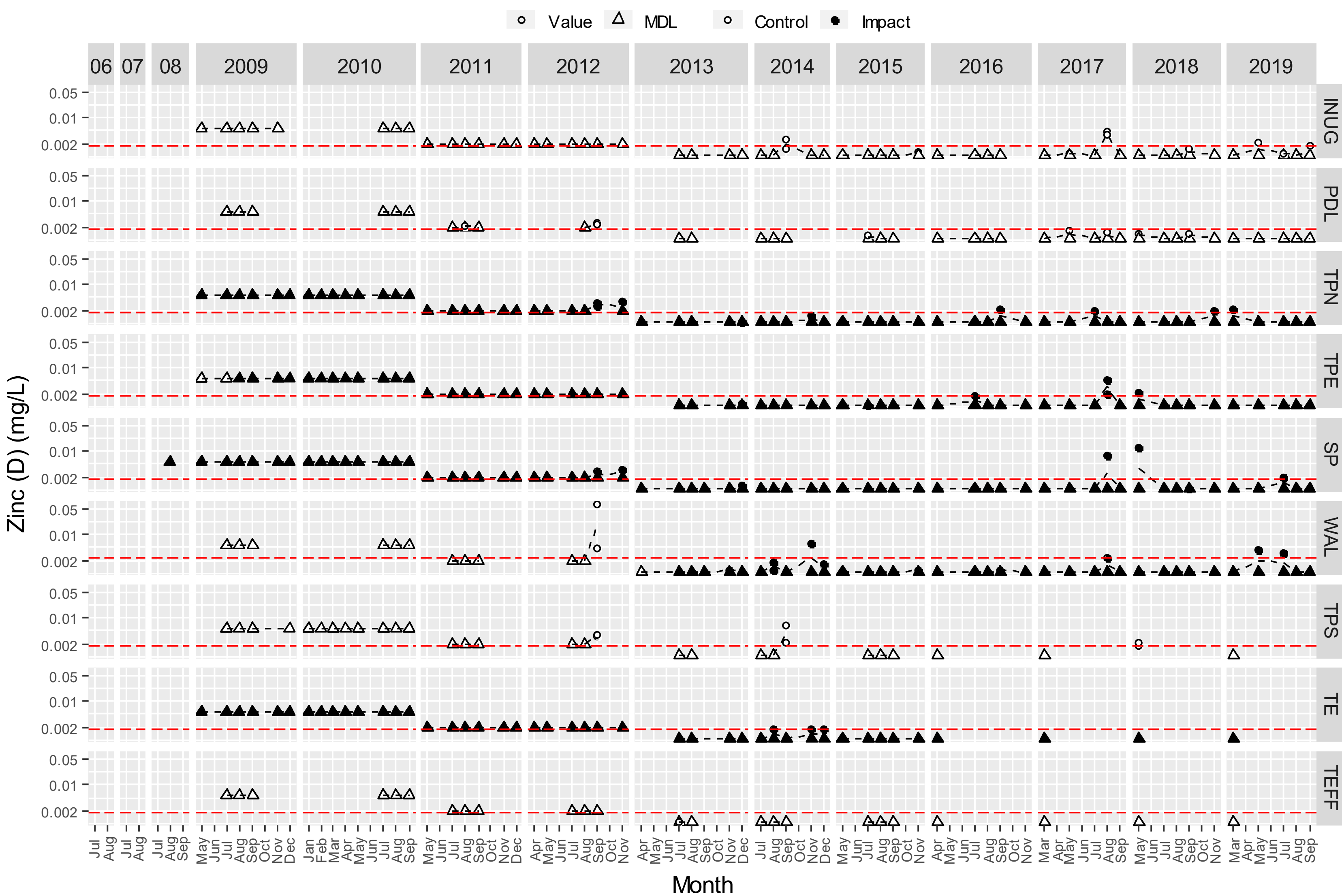


Figure B1 - 34. Dissolved zinc (mg/L) in water samples from Meadowbank Study lakes since 2006.

Note: The red dashed line = trigger value.



Appendix B2
Water Chemistry – Whale Tail Study Area Lakes

LIST OF TABLES

LIST OF FIGURES

TABLES

Table B2-1. Water chemistry data for Whale Tail study area lakes, 2019.

Lake				Whale Tail Lake									
(Station)				(WTS)									
Month				March	March	May	May	July	July	August	August	September	September
Area-Replicate ID				WTS-37	WTS-38	WTS-39	WTS-40	WTS-41	WTS-42	WTS-43	WTS-44	WTS-45	WTS-46
ALS Sample ID		WTP Screening Values		L2241655-5	L2241655-6	L2275597-3	L2275597-4	L2307977-3	L2307977-4	L2335617-7	L2335617-8	L2350681-7	L2350681-8
Date	Aquatic Life	Triggers	Thresholds	4-Mar-19	4-Mar-19	13-May-19	13-May-19	7-Jul-19	7-Jul-19	18-Aug-19	18-Aug-19	12-Sep-19	12-Sep-19
Time	Guideline[1]			13:30	15:00	9:15	8:45	11:45	12:15	16:07	15:37	16:20	16:00
Physical Tests (mg/L)													
Conductivity (µS/cm)		49		**50**	**50**	**151**	**131**	**87**	**89**	**78**	**78**	**74**	**74**
Hardness		17		**18**	**18**	**49**	**43**	**30**	**31**	**28**	**28**	**27**	**28**
pH (Laboratory)	6.5 - 9.0	6.57-7.97	6.5-9.0	6.9	6.9	7.3	7.3	7.2	7.2	7.2	7.2	7.2	7.3
Total Suspended Solids		3.0	5.0	<1.0	<1.0	<1.0	<1.0	1.7	1.2	1.5	1.1	1.9	1.7
Total Dissolved Solids		39		38	38	**124**	**117**	**68**	**73**	**80**	**82**	**56**	**61**
Turbidity (NTU)				0.11	0.12	0.66	0.26	0.58	0.82	0.28	0.65	1.4	1.7
Anions and Nutrients (mg/L)													
Alkalinity - Bicarbonate		9.6		7.3	7.3	**13**	**11**	8.3	8.3	**10**	**11**	**10**	**10**
Alkalinity - Carbonate		2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		9.6		7.3	7.3	**13**	**11**	8.3	8.3	**10**	**11**	**10**	**10**
Ammonia (as N)[3]	***equation***	0.065	0.13	0.015	0.013	0.051	0.038	<0.0050	0.0063	**0.080**	0.058	**0.13**	**0.16**
Bromide				0.091	0.093	0.37	0.33	0.20	0.21	0.19	0.19	0.18	0.19
Chloride	120	60	120	8.1	8.1	30	26	17	17	15	15	14	15
Fluoride	0.12	0.077	0.12	0.038	0.040	0.047	0.049	0.037	0.036	0.042	0.043	0.041	0.040
Nitrate (as N)	3	1.5	3.0	0.0097	0.0098	0.40	0.34	0.16	0.17	0.014	0.0071	<0.0050	<0.0050
Nitrite (as N)	0.06	0.031	0.060	<0.0010	<0.0010	0.0034	0.0028	0.0014	0.0012	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.17		0.12	0.11	**0.20**	**0.22**	0.17	0.17	**0.30**	**0.30**	**0.32**	**0.36**
Ortho Phosphate (as P)		0.0022		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.				0.0026	0.0044	<0.0020	<0.0020	0.0034	0.0030	0.0020	0.0023	0.0020	<0.0020
Phosphorus (P)-Total	0.004	0.0045	0.0040	**0.0050**	0.0037	0.0024	<0.0020	**0.0075**	**0.0061**	**0.0050**	**0.0054**	**0.0052**	**0.0058**
Silicate (as SiO_2)		1.3		0.65	0.60	**1.7**	1.3	1.1	1.1	0.80	0.79	0.78	0.79
Sulphate (SO_4)		65	128	2.4	2.4	4.6	4.3	3.0	3.0	2.9	2.8	2.7	2.7
Cyanides													
Total Cyanide				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005			<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010
Organic / Inorganic Carbon (mg/L)													
Dissolved Organic Carbon		2.4		2.3	**2.6**	2.4	**2.5**	**3.0**	**2.6**	**3.3**	**3.4**	**3.9**	**4.0**
Total Organic Carbon		2.4		2.3	2.3	2.1	**2.6**	**3.0**	**2.8**	**3.4**	**3.6**	**3.7**	**3.6**
Plant Pigments (µg/L)													
Chlorophyll-*a*				0.89	1.1	2.6	1.7	1.6	1.7	4.5	4.5	3.1	2.7
Total Metals (mg/L)													
Aluminum[3]	***equation***	0.052	0.10	0.0048	0.0042	0.031	0.016	0.027	0.033	0.022	0.021	**0.061**	**0.058**
Antimony		0.0046	0.0090	<0.00010	<0.00010	0.00017	0.00014	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.005	0.013	0.025	0.00025	0.00027	0.0012	0.00078	0.00058	0.00059	0.00071	0.00069	0.00067	0.00070
Barium		0.50	1.0	0.0100	0.010	0.030	0.025	0.018	0.018	0.017	0.017	0.016	0.016
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	0.00001	<0.0000050	<0.0000050	0.00001	<0.0000050	<0.0000050	<0.0000050
Calcium		4.6		**5.1**	**5.1**	**17**	**15**	**9.3**	**9.8**	**9.0**	**8.7**	**8.3**	**8.2**
Cesium				<0.000010	<0.000010	0.00001	<0.000010	<0.000010	<0.000010	0.00001	<0.000010	0.00002	0.00002
Chromium[4]	0.001	0.0025	0.0050	<0.00010	0.00021	0.00068	0.00019	0.00027	0.00038	0.00039	0.00026	0.00042	0.00040
Cobalt				<0.00010	<0.00010	0.00014	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010
Copper[2]	***equation***	0.0013	0.0020	<0.00050	0.00053	0.00067	0.00063	0.00058	0.00056	0.00058	0.00061	0.00067	0.00072
Iron	0.3	0.16	0.30	0.011	<0.010	0.14	0.052	0.038	0.045	0.041	0.041	0.099	0.10
Lead[2]	***equation***	0.00053	0.0010	<0.000050	<0.000050	0.00008	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020		0.0013	0.0014	**0.0079**	**0.0066**	**0.0039**	**0.0040**	**0.0028**	**0.0028**	**0.0027**	**0.0027**
Magnesium		1.4		1.4	**1.4**	**2.6**	**2.3**	**1.6**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**
Manganese[3]		0.32	***See text***	0.00082	0.00073	0.040	0.0097	0.018	0.019	0.020	0.020	0.014	0.013
Mercury	0.000026	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.073	0.00005	0.00007	0.0013	0.00098	0.00054	0.00059	0.00047	0.00046	0.00037	0.00037
Nickel[3]	***equation***	0.013	0.025	0.00071	0.00080	0.0019	0.0015	0.0014	0.0015	0.0014	0.0014	0.0017	0.0018
Phosphorus		0.0045	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.84		**0.92**	**0.95**	**2.6**	**2.3**	**1.6**	**1.7**	**1.6**	**1.6**	**1.6**	**1.6**
Rubidium				0.0016	0.0017	0.0037	0.0031	0.0025	0.0025	0.0027	0.0027	0.0028	0.0027
Selenium	0.001	0.00053	0.0010	<0.000050	<0.000050	<0.000050	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.61		0.34	0.36	**1.1**	**0.76**	0.58	0.59	0.41	0.36	0.49	0.48
Silver	0.00025	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.0		**1.1**	**1.1**	**1.8**	**1.6**	**1.1**	**1.2**	**1.1**	**1.1**	**1.1**	**1.1**
Strontium		0.61	0.049	0.039	0.036	0.20	0.16	0.098	0.10	0.085	0.083	0.078	0.076
Sulfur				0.70	0.79	1.8	1.6	0.86	1.1	1.0	1.0	0.86	0.91
Tellurium				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium	0.0008	0.00013	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin		0.033		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00041		<0.00030	<0.00030	**0.0014**	**0.00052**	**0.00064**	**0.0010**	<0.00030	0.00033	**0.0019**	<0.0018
Tungsten				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.015	0.00020	0.015	0.00004	0.00004	0.00017	0.00013	0.00009	0.00010	0.00010	0.00010	0.00011	0.00011
Vanadium		0.00060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.03	0.0075	***See text***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium				<0.000060	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00036
Dissolved Metals (mg/L)													
Aluminum[3]		0.026	0.050	0.0021	0.0023	0.0040	0.0035	0.013	0.012	0.011	0.011	0.019	0.016
Antimony		0.0050	0.0090	<0.00010	<0.00010	0.00015	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.013	0.025	0.00022	0.00023	0.00063	0.00065	0.00046	0.00053	0.00066	0.00074	0.00063	0.00068
Barium		0.50	1.0	0.010	0.010	0.026	0.023	0.017	0.017	0.017	0.018	0.015	0.015
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.6		**4.8**	**4.9**	**16**	**14**	**9.3**	**9.8**	**8.7**	**8.6**	**8.3**	**8.6**
Cesium				<0.000010	<0.000010	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium		0.0026	0.0050	<0.00010	<0.00010	0.00074	0.00042	<0.00010	0.00015	0.00016	0.00025	0.00020	0.00020
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.0012	0.0020	0.00043	0.00044	0.00056	0.00061	0.00046	0.00050	0.00052	0.00063	0.00060	0.00058
Iron		0.16	0.30	<0.010	<0.010	0.016	0.016	0.013	0.010	0.011	0.015	0.026	0.025
Lead		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00007	<0.000050	<0.000050
Lithium		0.0020		0.0015	0.0015	**0.0074**	**0.0065**	**0.0038**	**0.0040**	**0.0033**	**0.0033**	**0.0029**	**0.0029**
Magnesium		1.4		**1.4**	1.4	**2.3**	**2.1**	**1.5**	**1.6**	**1.6**	**1.7**	**1.5**	**1.5**
Manganese[3]		0.32	***See text***	0.00048	0.00039	0.030	0.0075	0.016	0.016	0.00095	0.0033	0.0052	0.0060
Mercury		0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.073	<0.000050	0.00005	0.0013	0.00094	0.00053	0.00057	0.00043	0.00046	0.00040	0.00039
Nickel		0.013	0.025	0.00064	0.00066	0.0017	0.0016	0.0013	0.0014	0.0012	0.0013	0.0015	0.0016
Phosphorus				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.84		**0.99**	**0.97**	**2.4**	**2.2**	**1.6**	**1.6**	**1.6**	**1.7**	**1.5**	**1.5**
Rubidium				0.0016	0.0016	0.0036	0.0031	0.0025	0.0025	0.0025	0.0026	0.0024	0.0025
Selenium		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.57		0.37	0.34	**0.82**	**0.62**	0.53	0.52	0.40	0.42	0.36	0.36
Silver		0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.0		**1.0**	**1.0**	**1.7**	**1.4**	**1.1**	**1.2**	**1.1**	**1.1**	**1.0**	**1.1**
Strontium		0.034	0.049	**0.038**	**0.038**	**0.18**	**0.16**	**0.096**	**0.099**	**0.086**	**0.084**	**0.075**	**0.077**
Sulfur				0.85	0.82	1.5	1.4	1.0	0.87	1.1	1.1	1.0	1.1
Tellurium				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium		0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin		0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00037	0.00036
Tungsten				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium		0.0075	0.015	0.00004	0.00004	0.00014	0.00012	0.00008	0.00008	0.00008	0.00009	0.00010	0.00010
Vanadium		0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0023	***See text***	<0.0010	<0.0010	**0.0026**	<0.0010	0.0010	<0.0010	<0.0010	**0.0025**	<0.0010	<0.0010
Zirconium				<0.000060	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals (µg/L)													
Arsenate (As V)				-	-	<0.020	-	<0.020	-	<0.020	-	<0.020	-
Arsenite (As III)				-	-	0.52	-	0.33	-	0.44	-	0.36	-
Dimethylarsinic Acid (DMA)				-	-	<0.030	-	0.027	-	0.045	-	0.067	-
Monomethylarsonic Acid (MMA)				-	-	<0.020	-	<0.020	-	<0.020	-	<0.020	-
Arsenobetaine (AsB)				-	-	<0.050	-	<0.050	-	<0.050	-	<0.050	-

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2018.

2. Trigger and threshold values are presented in *CREMP 2015 Plan Update* (Azimuth 2015a). A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015a) for details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

Shaded concentrations exceed the CCME aquatic life guidelines.

123 Bolded concentrations exceed the trigger value.

123 Bold, italicized concentrations exceed the threshold value.

Italicized numbers are below detection limits.

"-" not analyzed/not sampled

n/a = issues with the water quality probe. No data collected.

underline = results were given a cautionary flag in the QC assessment (refer to **Appendix A** for details).

~~strikethrough~~ = results flagged as unreliable in the QC assessment (refer to **Appendix A** for details).

Table B2-1. Water chemistry data for Whale Tail study area lakes, 2019.

Lake				Mammoth Lake									
(Station)				(MAM)									
Month				March	March	May	May	July	July	August	August	September	September
Area-Replicate ID				MAM-37	MAM-38	MAM-39	MAM-40	MAM-41	MAM-42	MAM-43	MAM-44	MAM-45	MAM-46
ALS Sample ID		WTP Screening Values		L2241655-1	L2241655-2	L2274447-1	L2274447-2	L2307977-5	L2307977-6	L2335617-17	L2335617-18	L2350681-9	L2350681-10
Date	Aquatic Life Guideline[1]	Triggers	Thresholds	4-Mar-19	4-Mar-19	10-May-19	10-May-19	7-Jul-19	7-Jul-19	20-Aug-19	20-Aug-19	11-Sep-19	11-Sep-19
Time				15:15	15:40	9:40	10:30	15:22	15:00	11:14	10:51	14:45	15:10
Physical Tests (mg/L)													
Conductivity (µS/cm)		49		**166**	**94**	**173**	**106**	**68**	**90**	**111**	**81**	**138**	**101**
Hardness		17		**59**	**36**	**64**	**39**	**24**	**31**	**39**	**29**	**50**	**37**
pH (Laboratory)	6.5 - 9.0	6.57-7.97	6.5-9.0	7.0	6.8	7.2	7.1	7.0	7.1	7.3	7.2	7.4	7.2
Total Suspended Solids		3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.5	1.9	1.7	1.4	1.3
Total Dissolved Solids		39		**123**	**79**	**94**	**60**	**54**	**73**	**107**	**76**	**115**	**85**
Turbidity (NTU)				0.33	<0.10	0.17	0.16	0.45	0.47	0.68	0.42	0.72	0.48
Anions and Nutrients (mg/L)													
Alkalinity - Bicarbonate		9.6		**11**	7.0	**12**	8.5	4.9	5.9	**10**	6.8	**13**	9.0
Alkalinity - Carbonate		2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		9.6		**11**	7.0	**12**	8.5	4.9	5.9	**10**	6.8	**13**	9.0
Ammonia (as N)[3]	***equation***	0.065	0.13	0.030	0.014	0.0079	0.0058	0.0088	0.0070	**0.14**	0.042	**0.15**	0.050
Bromide				0.45	0.23	0.46	0.26	0.16	0.20	0.21	0.17	0.26	0.22
Chloride	120	60	120	36	19	36	21	14	19	20	16	24	20
Fluoride	0.12	0.077	0.12	0.045	0.036	0.048	0.039	0.023	0.028	0.042	0.032	0.050	0.039
Nitrate (as N)	3	1.5	3.0	0.23	0.017	0.13	<0.0050	<0.0050	0.037	0.17	<0.0050	0.44	0.089
Nitrite (as N)	0.06	0.031	0.060	0.0022	<0.0010	0.0017	<0.0010	<0.0010	<0.0010	0.012	<0.0010	0.011	0.0031
Total Kjeldahl Nitrogen		0.17		**0.19**	0.11	0.15	0.14	0.096	0.11	**0.33**	**0.19**	**0.36**	**0.21**
Ortho Phosphate (as P)		0.0022		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.				<0.0020	<0.0020	<0.0020	<0.0020	0.0025	0.0035	0.0023	0.0024	0.0022	<0.0020
Phosphorus (P)-Total	0.004	0.0045	0.0040	0.0025	0.0021	0.0021	0.0043	0.0033	**0.0051**	0.0045	0.0021	**0.0051**	0.0037
Silicate (as SiO_2)		1.3		1.2	0.98	1.3	1.2	0.53	0.75	0.74	0.60	1.3	0.65
Sulphate (SO_4)		65	128	6.6	5.3	7.1	5.7	3.6	4.3	7.5	4.7	12	7.5
Cyanides													
Total Cyanide				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005			<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)													
Dissolved Organic Carbon		2.4		**2.5**	2.1	**2.5**	2.1	1.6	1.8	1.9	1.7	**2.5**	2.3
Total Organic Carbon		2.4		**4.4**	2.0	**2.9**	**2.7**	1.5	1.8	1.9	1.6	2.4	2.2
Plant Pigments (µg/L)													
Chlorophyll-*a*				0.11	0.96	0.97	1.4	0.56	0.61	3.1	2.4	2.9	4.0
Total Metals (mg/L)													
Aluminum[3]	***equation***	0.052	0.10	0.014	<0.0030	0.0057	<0.0030	0.011	0.017	0.027	0.0099	0.015	0.0073
Antimony		0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	<0.00010	0.00022	0.00011
Arsenic	0.005	0.013	0.025	0.00049	0.00033	0.00046	0.00032	0.00028	0.00048	0.0012	0.00053	0.0011	0.00062
Barium		0.50	1.0	0.034	0.019	0.036	0.020	0.013	0.018	0.022	0.015	0.024	0.017
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.6		**20**	**10**	**21**	**12**	**7.2**	**9.4**	**13**	**9.0**	**15**	**11**
Cesium				0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00001	<0.000010	0.00001	<0.000010
Chromium[4]	0.001	0.0025	0.0050	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00023	0.00040	0.00016	0.00022	0.00015
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00013	<0.00010	0.00014	<0.00010
Copper[2]	***equation***	0.0013	0.0020	0.00055	<0.00050	0.00054	<0.00050	<0.00050	0.00050	0.00062	<0.00050	0.00061	<0.00050
Iron	0.3	0.16	0.30	<0.010	<0.010	<0.010	<0.010	0.019	0.045	0.088	0.024	0.087	0.034
Lead[2]	***equation***	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00005	<0.000050
Lithium		0.0020		**0.0076**	**0.0033**	**0.0075**	**0.0038**	**0.0024**	**0.0030**	**0.0026**	**0.0022**	**0.0024**	**0.0022**
Magnesium		1.4		**3.3**	**2.2**	**3.6**	**2.6**	**1.4**	**1.7**	**2.5**	**1.8**	**3.3**	**2.3**
Manganese[3]		0.32	***See text***	0.0013	0.0018	0.0025	0.0022	0.0048	0.016	0.025	0.0055	0.033	0.0070
Mercury	0.000026	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.073	0.00041	0.00006	0.00025	<0.000050	0.00006	0.00020	0.00094	0.00035	0.0011	0.00055
Nickel[3]	***equation***	0.013	0.025	0.0020	0.0012	0.0022	0.0014	0.0013	0.0015	0.0016	0.00092	0.0016	0.0011
Phosphorus		0.0045	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.84		**2.6**	**1.4**	**2.5**	**1.4**	**0.98**	**1.4**	**2.3**	**1.4**	**3.1**	**2.0**
Rubidium				0.0037	0.0019	0.0036	0.0021	0.0014	0.0019	0.0030	0.0020	0.0036	0.0026
Selenium	0.001	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00009	<0.000050	0.00015	0.00007
Silicon		0.61		**0.68**	0.54	**0.64**	0.58	0.31	0.39	0.38	0.27	0.61	0.35
Silver	0.00025	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.0		**1.8**	**1.2**	**1.9**	**1.3**	0.78	**1.1**	**1.6**	**1.1**	**2.0**	**1.4**
Strontium		0.61	0.049	0.19	0.083	0.21	0.11	0.063	0.081	0.092	0.072	0.10	0.079
Sulfur				2.1	1.8	2.4	2.0	0.88	1.6	2.7	1.6	4.2	2.6
Tellurium				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium	0.0008	0.00013	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin		0.033		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00041		<0.00030	<0.00030	<0.00030	<0.00030	0.00030	**0.00048**	**0.0011**	<0.00030	**0.00048**	<0.00030
Tungsten				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.015	0.00020	0.015	0.00004	0.00001	0.00003	0.00001	0.00002	0.00004	0.00015	0.00004	**0.00021**	0.00007
Vanadium		0.00060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.03	0.0075	***See text***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium				<0.000060	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals (mg/L)													
Aluminum[3]		0.026	0.050	0.0084	0.0010	0.0037	<0.0010	0.0055	0.0048	0.0032	0.0024	0.0029	0.0013
Antimony		0.0050	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00013	<0.00010	0.00020	0.00010
Arsenic		0.013	0.025	0.00043	0.00031	0.00038	0.00028	0.00024	0.00035	0.00087	0.00048	0.00089	0.00054
Barium		0.50	1.0	0.030	0.018	0.034	0.020	0.013	0.018	0.020	0.014	0.025	0.017
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.6		**19**	**11**	**20**	**11**	**7.2**	**9.5**	**11**	**8.6**	**14**	**11**
Cesium				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00001	<0.000010	0.00001	<0.000010
Chromium		0.0026	0.0050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010
Copper		0.0012	0.0020	0.00048	0.00039	0.00052	0.00039	0.00037	0.00042	0.00055	0.00053	0.00056	0.00044
Iron		0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	<0.010	<0.010	0.030	<0.010
Lead		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020		**0.0075**	**0.0034**	**0.0070**	**0.0035**	**0.0022**	**0.0029**	**0.0025**	**0.0023**	**0.0026**	**0.0023**
Magnesium		1.4		**3.0**	**2.2**	**3.5**	**2.5**	1.4	**1.7**	**2.6**	**1.9**	**3.5**	**2.3**
Manganese[3]		0.32	***See text***	0.00089	0.0015	0.0022	0.0015	0.0043	0.014	0.012	0.0019	0.030	0.0035
Mercury		0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.073	0.00037	<0.000050	0.00024	<0.000050	0.00005	0.00018	0.00088	0.00032	0.0012	0.00055
Nickel		0.013	0.025	0.0017	0.0012	0.0021	0.0014	0.0012	0.0014	0.0014	0.00085	0.0015	0.00099
Phosphorus				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.84		**2.5**	**1.4**	**2.6**	**1.4**	**0.99**	**1.4**	**2.4**	**1.6**	**3.0**	**2.0**
Rubidium				0.0036	0.0020	0.0036	0.0022	0.0014	0.0021	0.0028	0.0020	0.0035	0.0024
Selenium		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00006	<0.000050	0.00014	0.00009
Silicon		0.57		**0.62**	0.50	**0.61**	0.55	0.26	0.36	0.35	0.28	**0.60**	0.33
Silver		0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.0		**1.7**	**1.2**	**1.8**	**1.3**	0.78	**1.1**	**1.7**	**1.2**	**2.1**	**1.5**
Strontium		0.034	0.049	**0.19**	**0.087**	**0.19**	**0.098**	**0.061**	**0.081**	**0.089**	**0.072**	**0.10**	**0.080**
Sulfur				2.0	1.7	2.4	1.8	1.1	1.3	2.4	1.5	4.1	2.5
Tellurium				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium		0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin		0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium		0.0075	0.015	0.00003	0.00002	0.00003	0.00001	0.00002	0.00003	0.00010	0.00003	0.00018	0.00006
Vanadium		0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0023	***See text***	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	<0.0010	<0.0010
Zirconium				<0.000060	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals (µg/L)													
Arsenate (As V)				-	-	0.023	-	<0.020	-	-	0.026	0.073	0.038
Arsenite (As III)				-	-	0.17	-	0.13	-	-	0.26	0.41	0.29
Dimethylarsinic Acid (DMA)				-	-	<0.020	-	<0.020	-	-	0.029	0.12	0.048
Monomethylarsonic Acid (MMA)				-	-	<0.030	-	<0.020	-	-	<0.020	<0.020	<0.020
Arsenobetaine (AsB)				-	-	<0.050	-	<0.050	-	-	<0.050	<0.050	<0.050

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2018.

2. Trigger and threshold values are presented in *CREMP 2015 Plan Update* (Azimuth 2015a). A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015a) for details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

Shaded concentrations exceed the CCME aquatic life guidelines.

123 Bolded concentrations exceed the trigger value.

123 Bold, italicized concentrations exceed the threshold value.

Italicized numbers are below detection limits.

"-" not analyzed/not sampled

n/a = issues with the water quality probe. No data collected.

underline = results were given a cautionary flag in the QC assessment (refer to **Appendix A** for details).

strikethrough = results flagged as unreliable in the QC assessment (refer to **Appendix A** for details).

Table B2-1. Water chemistry data for Whale Tail study area lakes, 2019.

Lake				Lake A20									
(Station)				(A20)									
Month				March	March	May	May	July	July	August	August	September	September
Area-Replicate ID				A20-31	A20-32	A20-33	A20-34	A20-35	A20-36	A20-37	A20-38	A20-39	A20-40
ALS Sample ID		WTP Screening Values		L2241655-3	L2241655-4	L2274447-7	L2274447-8	L2312432-3	L2312432-4	L2335617-5	L2335617-6	L2350681-5	L2350681-6
Date	Aquatic Life	Triggers	Thresholds	4-Mar-19	4-Mar-19	11-May-19	11-May-19	13-Jul-19	13-Jul-19	16-Aug-19	16-Aug-19	12-Sep-19	12-Sep-19
Time	Guideline[1]			12:30	13:00	12:00	12:25	13:30	14:20	0:00	10:46	15:30	14:30
Physical Tests (mg/L)													
Conductivity (µS/cm)		49		19	19	32	19	13	13	14	14	16	15
Hardness		17		6.7	7.1	11	6.4	4.6	4.5	4.7	4.7	5.0	4.8
pH (Laboratory)	6.5 - 9.0	6.57-7.97	6.5-9.0	6.9	6.9	7.2	7.0	6.8	6.8	6.9	6.9	6.9	6.9
Total Suspended Solids		3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0
Total Dissolved Solids		39		8.3	6.8	20	11	11	14	16	15	10	11
Turbidity (NTU)				0.13	0.13	0.13	0.14	0.32	0.36	0.29	0.45	0.36	0.38
Anions and Nutrients (mg/L)													
Alkalinity - Bicarbonate		9.6		6.0	5.8	**10**	5.7	4.2	4.2	4.2	4.1	4.5	4.1
Alkalinity - Carbonate		2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		9.6		6.0	5.8	**10**	5.7	4.2	4.2	4.2	4.1	4.5	4.1
Ammonia (as N)[3]	***equation***	0.065	0.13	<0.0050	<0.0050	<0.0050	0.056	<0.0050	<0.0050	**0.25**	**0.080**	<0.0050	<0.0050
Bromide				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	60	120	0.86	0.87	1.4	0.83	0.60	0.60	0.69	0.68	1.1	0.82
Fluoride	0.12	0.077	0.12	0.034	0.037	0.048	0.037	0.024	0.024	0.030	0.029	0.031	0.029
Nitrate (as N)	3	1.5	3.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.06	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.17		0.084	0.087	0.16	0.17	0.13	0.091	**0.36**	**0.22**	0.11	0.099
Ortho Phosphate (as P)		0.0022		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.				<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0026	<0.0020
Phosphorus (P)-Total	0.004	0.0045	0.0040	0.0034	0.0023	0.0023	<0.0020	0.0021	<0.0020	<0.0020	<0.0020	0.0042	0.0034
Silicate (as SiO_2)		1.3		0.97	0.97	**1.4**	0.93	<0.50	<0.50	0.91	0.91	1.0	1.1
Sulphate (SO_4)		65	128	1.4	1.4	2.3	1.3	0.92	0.91	1.1	1.1	1.3	1.1
Cyanides													
Total Cyanide				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005			<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)													
Dissolved Organic Carbon		2.4		2.0	1.9	**2.7**	2.0	1.9	2.0	1.9	1.8	2.4	2.4
Total Organic Carbon		2.4		1.9	1.8	**3.3**	2.2	1.9	1.9	2.0	1.9	2.2	1.9
Plant Pigments (µg/L)													
Chlorophyll-*a*				0.15	1.2	0.53	0.67	0.45	0.18	0.71	0.45	0.78	0.92
Total Metals (mg/L)													
Aluminum[3]	***equation***	0.052	0.10	<0.0030	<0.0030	<0.0030	<0.0030	0.012	0.010	0.013	0.015	0.016	0.016
Antimony		0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.005	0.013	0.025	0.00012	0.00010	0.00016	0.00010	<0.00010	<0.00010	0.00011	0.00011	0.00012	0.00010
Barium		0.50	1.0	0.0040	0.0042	0.0074	0.0040	0.0031	0.0032	0.0036	0.0036	0.0036	0.0035
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.6		1.8	1.8	3.0	1.7	1.2	1.1	1.2	1.2	1.4	1.3
Cesium				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium[4]	0.001	0.0025	0.0050	0.00023	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00022	<0.00010	<0.00010	<0.00010
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[2]	***equation***	0.0013	0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00075
Iron	0.3	0.16	0.30	<0.010	<0.010	<0.010	<0.010	0.016	0.014	0.018	0.016	0.029	0.029
Lead[2]	***equation***	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00008	<0.000050	<0.000050	<0.000050
Lithium		0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		1.4		0.60	0.61	1.0	0.58	0.41	0.39	0.43	0.43	0.49	0.46
Manganese[3]		0.32	***See text***	0.00050	0.00034	0.0022	0.0013	0.0017	0.0013	0.0018	0.0017	0.0019	0.0021
Mercury	0.000026	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.073	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel[3]	***equation***	0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus		0.0045	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.84		0.44	0.45	0.69	0.41	0.31	0.29	0.35	0.35	0.39	0.38
Rubidium				0.00050	0.00053	0.00073	0.00049	0.00033	0.00034	0.00049	0.00044	0.00051	0.00043
Selenium	0.001	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.61		0.51	0.51	**0.68**	0.50	0.40	0.34	0.44	0.41	0.49	0.50
Silver	0.00025	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.0		0.78	0.78	**1.1**	0.72	0.50	0.49	0.56	0.57	0.62	0.61
Strontium		0.61	0.049	0.0086	0.0087	0.016	0.0091	0.0060	0.0059	0.0068	0.0067	0.0073	0.0070
Sulfur				<0.50	<0.50	0.71	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tellurium				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium	0.0008	0.00013	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin		0.033		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00041		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00032	<0.00030
Tungsten				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.015	0.00020	0.015	0.00003	0.00002	0.00003	0.00002	0.00004	0.00004	0.00005	0.00005	0.00005	0.00005
Vanadium		0.00060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.03	0.0075	***See text***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium				<0.000060	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals (mg/L)													
Aluminum[3]		0.026	0.050	0.0012	<0.0010	0.0013	0.0016	0.0075	0.0062	0.0088	0.0079	0.0074	0.0078
Antimony		0.0050	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.013	0.025	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	0.00010	0.00010	<0.00010	0.00015
Barium		0.50	1.0	0.0039	0.0040	0.0079	0.0037	0.0032	0.0031	0.0033	0.0032	0.0035	0.0032
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.6		1.7	1.8	2.8	1.7	1.2	1.1	1.2	1.2	1.3	1.2
Cesium				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium		0.0026	0.0050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	<0.00010	<0.00010	<0.00010
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.0012	0.0020	0.00025	0.00022	0.00043	0.00023	0.00025	0.00023	0.00031	0.00027	0.00034	0.00031
Iron		0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		1.4		0.61	0.61	1.1	0.56	0.41	0.40	0.42	0.40	0.44	0.42
Manganese[3]		0.32	***See text***	0.00023	0.00018	0.0020	0.00079	0.0013	0.00094	0.0012	0.0011	0.0018	0.0020
Mercury		0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.073	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel		0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.84		0.47	0.48	0.77	0.44	0.31	0.31	0.35	0.34	0.38	0.35
Rubidium				0.00052	0.00053	0.00092	0.00052	0.00039	0.00041	0.00042	0.00037	0.00046	0.00042
Selenium		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.57		0.50	0.48	**0.70**	0.47	0.33	0.31	0.42	0.40	0.46	0.47
Silver		0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.0		0.78	0.80	**1.4**	0.72	0.52	0.53	0.57	0.55	0.57	0.53
Strontium		0.034	0.049	0.0088	0.0093	0.014	0.0079	0.0063	0.0062	0.0064	0.0063	0.0073	0.0067
Sulfur				0.54	<0.50	0.68	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tellurium				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium		0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin		0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium		0.0075	0.015	0.00002	0.00002	0.00003	0.00002	0.00003	0.00004	0.00005	0.00005	0.00005	0.00004
Vanadium		0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0023	***See text***	<0.0010	<0.0010	0.0012	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zirconium				<0.000060	0.00007	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals (µg/L)													
Arsenate (As V)				-	-	<0.020	-	<0.020	-	-	<0.020	<0.020	-
Arsenite (As III)				-	-	<0.020	-	<0.020	-	-	<0.020	0.029	-
Dimethylarsinic Acid (DMA)				-	-	<0.020	-	<0.020	-	-	<0.020	<0.020	-
Monomethylarsonic Acid (MMA)				-	-	<0.020	-	<0.020	-	-	<0.020	<0.020	-
Arsenobetaine (AsB)				-	-	<0.050	-	<0.050	-	-	<0.050	<0.050	-

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2018.

2. Trigger and threshold values are presented in *CREMP 2015 Plan Update* (Azimuth 2015a). A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015a) for details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

Shaded concentrations exceed the CCME aquatic life guidelines.

123 Bolded concentrations exceed the trigger value.

123 Bold, italicized concentrations exceed the threshold value.

Italicized numbers are below detection limits.

"-" not analyzed/not sampled

n/a = issues with the water quality probe. No data collected.

underline = results were given a cautionary flag in the QC assessment (refer to **Appendix A** for details).

~~strikethrough~~ = results flagged as unreliable in the QC assessment (refer to **Appendix A** for details).

Table B2-1. Water chemistry data for Whale Tail study area lakes, 2019.

Lake				Lake A76									
(Station)				(A76)									
Month				March	March	May	May	July	July	August	August	September	September
Area-Replicate ID				A76-31	A76-32	A76-33	A76-34	A76-35	A76-36	A76-37	A76-38	A76-39	A76-40
ALS Sample ID		WTP Screening Values		L2247638-3	L2247638-4	L2275188-1	L2275188-2	L2312432-5	L2312432-6	L2335617-3	L2335617-4	L2348992-5	L2348992-6
Date	Aquatic Life	Triggers	Thresholds	16-Mar-19	16-Mar-19	6-May-19	6-May-19	12-Jul-19	12-Jul-19	15-Aug-19	15-Aug-19	8-Sep-19	8-Sep-19
Time	Guideline[1]			12:17	11:50	12:50	12:15	12:20	13:00	11:46	12:35	15:00	15:40
Physical Tests (mg/L)													
Conductivity (µS/cm)		49		**58**	**62**	**61**	**60**	40	39	40	41	44	42
Hardness		17		**21**	**22**	**19**	**19**	14	14	15	15	15	15
pH (Laboratory)	6.5 - 9.0	6.57-7.97	6.5-9.0	7.2	7.2	7.2	7.2	7.0	7.0	7.0	7.0	7.0	7.0
Total Suspended Solids		3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids		39		**40**	**42**	**46**	**39**	29	22	33	34	33	30
Turbidity (NTU)				0.14	<0.10	0.15	0.11	0.30	0.63	0.13	0.13	0.13	0.12
Anions and Nutrients (mg/L)													
Alkalinity - Bicarbonate		9.6		8.4	**9.9**	9.0	9.1	5.3	5.7	5.9	5.7	6.1	6.1
Alkalinity - Carbonate		2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		9.6		8.4	**9.9**	9.0	9.1	5.3	5.7	5.9	5.7	6.1	6.1
Ammonia (as N)[3]	***equation***	0.065	0.13	0.0057	<0.0050	<0.0050	0.0084	<0.0050	<0.0050	0.034	<0.0050	<0.0050	<0.0050
Bromide				0.089	0.096	0.088	0.082	0.059	0.061	0.079	0.078	0.073	0.067
Chloride	120	60	120	7.9	8.5	8.0	7.9	5.3	5.5	6.3	6.4	6.6	6.3
Fluoride	0.12	0.077	0.12	0.034	0.036	0.031	0.036	0.023	0.025	0.028	0.028	0.033	0.032
Nitrate (as N)	3	1.5	3.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.06	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.17		0.062	0.072	0.10	0.11	0.11	0.10	0.14	0.10	0.12	0.090
Ortho Phosphate (as P)		0.0022		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.				<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total	0.004	0.0045	0.0040	<0.0020	**0.0051**	<0.0020	<0.0020	0.0021	**0.013**	<0.0020	<0.0020	0.0021	0.0025
Silicate (as SiO_2)		1.3		**1.4**	**1.5**	**1.5**	**1.5**	0.63	0.60	0.91	0.92	0.99	0.93
Sulphate (SO_4)		65	128	5.2	5.5	4.9	5.0	3.2	3.3	3.8	3.9	3.9	3.8
Cyanides													
Total Cyanide				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005			<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)													
Dissolved Organic Carbon		2.4		1.6	1.8	2.1	1.8	1.4	1.4	1.4	1.4	1.8	1.6
Total Organic Carbon		2.4		1.8	1.7	2.2	1.9	1.6	1.9	1.5	1.3	1.9	1.8
Plant Pigments (µg/L)													
Chlorophyll-*a*				0.91	1.0	0.46	0.64	0.33	0.27	0.24	0.48	0.60	0.50
Total Metals (mg/L)													
Aluminum[3]	***equation***	0.052	0.10	0.0046	<0.0030	0.0083	<0.0030	0.0082	0.0081	0.0054	0.0067	0.0048	0.0046
Antimony		0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.005	0.013	0.025	0.00022	0.00024	0.00032	0.00031	0.00018	0.00017	0.00020	0.00020	0.00024	0.00023
Barium		0.50	1.0	0.011	0.011	0.012	0.012	0.0079	0.0079	0.0078	0.0083	0.0080	0.0079
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.6		**5.5**	**6.1**	**5.7**	**5.7**	3.7	3.7	3.9	4.0	4.2	4.3
Cesium				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium[4]	0.001	0.0025	0.0050	0.00056	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[2]	***equation***	0.0013	0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron	0.3	0.16	0.30	0.013	<0.010	0.013	<0.010	0.014	0.015	0.011	0.012	0.011	0.010
Lead[2]	***equation***	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		1.4		**1.7**	**1.8**	**2.0**	**1.8**	1.1	1.1	1.2	1.2	1.2	1.2
Manganese[3]		0.32	***See text***	0.0011	0.0011	0.0033	0.0013	0.0021	0.0023	0.0013	0.0013	0.0012	0.0012
Mercury	0.000026	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.073	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel[3]	***equation***	0.013	0.025	0.00078	0.00081	0.00094	0.00083	0.00071	0.00076	0.00056	0.00095	0.00060	0.00050
Phosphorus		0.0045	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.84		**0.98**	**1.1**	**1.1**	**1.0**	0.67	0.68	0.74	0.75	0.76	0.77
Rubidium				0.0013	0.0014	0.0016	0.0015	0.00093	0.00093	0.0011	0.0011	0.0011	0.0011
Selenium	0.001	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.61		**0.66**	**0.71**	**0.73**	**0.72**	0.48	0.47	0.43	0.45	0.47	0.46
Silver	0.00025	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.0		0.93	**1.0**	**1.1**	0.99	0.59	0.60	0.66	0.67	0.70	0.70
Strontium		0.61	0.049	0.028	0.031	0.031	0.030	0.020	0.021	0.023	0.023	0.024	0.024
Sulfur				1.7	1.8	1.6	1.6	1.1	1.2	1.2	1.2	1.5	1.5
Tellurium				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium	0.0008	0.00013	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin		0.033		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00041		<0.00030	<0.00030	0.00036	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.015	0.00020	0.015	0.00001	0.00001	0.00002	0.00001	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
Vanadium		0.00060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.03	0.0075	***See text***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium				<0.000060	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals (mg/L)													
Aluminum[3]		0.026	0.050	<0.0010	<0.0010	<0.0010	<0.0010	0.0027	0.0032	0.0016	0.0021	0.0012	0.0037
Antimony		0.0050	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.013	0.025	0.00020	0.00022	0.00019	0.00020	0.00016	0.00016	0.00018	0.00020	0.00019	0.00017
Barium		0.50	1.0	0.011	0.012	0.010	0.010	0.0080	0.0081	0.0079	0.0083	0.0077	0.0075
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.6		**5.5**	**5.9**	**5.1**	**5.0**	3.7	3.8	4.0	3.9	4.1	3.9
Cesium				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium		0.0026	0.0050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.0012	0.0020	0.00027	0.00089	0.00032	0.00031	0.00028	0.00031	0.00026	0.00033	0.00033	0.00035
Iron		0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		1.4		**1.7**	**1.8**	**1.6**	**1.6**	1.2	1.2	1.2	1.2	1.2	1.2
Manganese[3]		0.32	***See text***	0.00027	0.00044	0.0024	0.00078	0.0017	0.0019	<0.00010	0.00060	0.00054	0.00054
Mercury		0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.073	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel		0.013	0.025	0.00069	0.00081	0.00083	0.00081	0.00061	0.00071	0.00052	0.00052	0.00052	0.00054
Phosphorus				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.84		**0.95**	**1.0**	**0.96**	**0.97**	0.68	0.69	0.77	0.76	0.81	0.80
Rubidium				0.0014	0.0015	0.0014	0.0013	0.00096	0.00098	0.0011	0.0010	0.0012	0.0013
Selenium		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.57		**0.68**	**0.72**	**0.68**	**0.70**	0.41	0.40	0.45	0.44	0.46	0.44
Silver		0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.0		0.94	**1.0**	0.95	0.99	0.64	0.65	0.71	0.65	0.72	0.71
Strontium		0.034	0.049	0.029	0.032	0.032	0.032	0.022	0.021	0.024	0.021	0.026	0.026
Sulfur				1.7	1.8	1.5	1.7	0.86	0.90	1.1	0.86	1.3	1.2
Tellurium				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium		0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin		0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium		0.0075	0.015	0.00001	0.00001	<0.000010	0.00001	0.00002	0.00002	0.00001	0.00002	0.00002	0.00002
Vanadium		0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0023	***See text***	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zirconium				<0.000060	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals (µg/L)													
Arsenate (As V)				-	-	-	<0.020	<0.020	-	<0.020	-	<0.020	-
Arsenite (As III)				-	-	-	0.096	0.067	-	0.085	-	0.095	-
Dimethylarsinic Acid (DMA)				-	-	-	<0.020	<0.020	-	<0.020	-	<0.020	-
Monomethylarsonic Acid (MMA)				-	-	-	<0.020	<0.020	-	<0.020	-	<0.020	-
Arsenobetaine (AsB)				-	-	-	<0.050	<0.050	-	<0.050	-	<0.050	-

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2018.

2. Trigger and threshold values are presented in *CREMP 2015 Plan Update* (Azimuth 2015a). A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015a) for details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

Shaded concentrations exceed the CCME aquatic life guidelines.

123 Bolded concentrations exceed the trigger value.

123 Bold, italicized concentrations exceed the threshold value.

Italicized numbers are below detection limits.

"-" not analyzed/not sampled

n/a = issues with the water quality probe. No data collected.

underline = results were given a cautionary flag in the QC assessment (refer to **Appendix A** for details).

~~strikethrough~~ = results flagged as unreliable in the QC assessment (refer to **Appendix A** for details).

Table B2-1. Water chemistry data for Whale Tail study area lakes, 2019.

Lake				Lake DS1									
(Station)				(DS1)									
Month				March	March	May	May	July	July	August	August	September	September
Area-Replicate ID				DS1-29	DS1-30	DS1-31	DS1-32	DS1-33	DS1-34	DS1-35	DS1-36	DS1-37	DS1-38
ALS Sample ID		WTP Screening Values		L2247638-5	L2247638-6	L2275188-3	L2275188-4	L2312432-1	L2312432-2	L2335617-1	L2335617-2	L2348992-3	L2348992-4
Date	Aquatic Life	Triggers	Thresholds	16-Mar-19	16-Mar-19	6-May-19	6-May-19	9-Jul-19	9-Jul-19	17-Aug-19	17-Aug-19	7-Sep-19	7-Sep-19
Time	Guideline[1]			9:30	10:00	10:40	11:20	15:15	15:30	14:35	13:44	16:20	17:00
Physical Tests (mg/L)													
Conductivity (µS/cm)		49		26	45	27	44	13	12	15	21	21	21
Hardness		17		8.7	15	8.0	13	4.6	4.0	5.0	7.6	7.4	8.7
pH (Laboratory)	6.5 - 9.0	6.57-7.97	6.5-9.0	7.0	7.2	7.1	7.2	6.8	6.7	6.8	6.9	6.8	7.0
Total Suspended Solids		3.0	5.0	<1.0	<1.0	<1.0	<1.0	2.5	<1.0	<1.0	1.5	1.1	<1.0
Total Dissolved Solids		39		18	26	18	30	9.7	10	15	21	21	19
Turbidity (NTU)				0.10	0.19	0.14	0.17	0.69	0.65	0.43	1.6	0.75	0.60
Anions and Nutrients (mg/L)													
Alkalinity - Bicarbonate		9.6		6.3	**9.9**	6.8	**11**	4.1	3.6	4.1	5.6	5.6	7.4
Alkalinity - Carbonate		2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		9.6		6.3	**9.9**	6.8	**11**	4.1	3.6	4.1	5.6	5.6	7.4
Ammonia (as N)[3]	***equation***	0.065	0.13	0.025	<0.0050	0.0057	0.0060	0.0080	0.0057	<0.0050	0.036	<0.0050	0.0053
Bromide				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	60	120	2.1	4.3	2.3	4.1	0.89	0.80	1.1	1.8	1.8	1.2
Fluoride	0.12	0.077	0.12	0.055	0.054	0.056	0.052	0.049	0.052	0.058	0.038	0.047	0.059
Nitrate (as N)	3	1.5	3.0	0.011	0.0063	0.011	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.06	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.17		**0.40**	0.13	0.14	0.17	0.14	0.13	0.16	**0.24**	0.16	0.16
Ortho Phosphate (as P)		0.0022		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.				<0.0020	0.0021	0.0025	0.0024	<0.0020	0.0036	<0.0020	0.0026	0.0033	0.0033
Phosphorus (P)-Total	0.004	0.0045	0.0040	0.0040	0.0037	0.0031	0.0042	0.0037	0.0027	<0.0020	0.0031	**0.013**	**0.0051**
Silicate (as SiO_2)		1.3		0.81	**2.1**	0.74	**2.0**	<0.50	<0.50	0.76	**1.4**	1.2	0.88
Sulphate (SO_4)		65	128	1.9	3.7	1.8	3.3	0.85	0.77	1.0	1.6	1.6	1.3
Cyanides													
Total Cyanide				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005			<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)													
Dissolved Organic Carbon		2.4		2.1	**2.8**	2.1	**2.9**	**2.9**	**2.6**	**2.7**	**3.8**	**3.1**	**3.5**
Total Organic Carbon		2.4		**2.5**	**3.5**	2.1	**3.1**	2.4	**2.5**	2.3	**3.5**	**3.1**	**3.7**
Plant Pigments (µg/L)													
Chlorophyll-*a*				0.91	2.7	2.1	0.96	0.72	0.58	1.4	0.80	1.1	1.1
Total Metals (mg/L)													
Aluminum[3]	***equation***	0.052	0.10	0.0044	0.0059	0.0050	0.0063	0.031	0.026	0.024	**0.063**	0.028	0.029
Antimony		0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.005	0.013	0.025	0.00011	0.00014	0.00017	0.00021	<0.00030	<0.00020	<0.00010	0.00015	0.00017	0.00026
Barium		0.50	1.0	0.0043	0.0076	0.0048	0.0079	0.0038	0.0037	0.0038	0.0044	0.0038	0.0039
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.6		2.1	4.2	2.3	4.1	1.3	1.1	1.3	2.1	2.0	2.1
Cesium				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium[4]	0.001	0.0025	0.0050	<0.00010	0.00023	0.00012	0.00013	0.00012	<0.00010	0.00011	0.00021	0.00013	0.00014
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[2]	***equation***	0.0013	0.0020	<0.00050	<0.00050	<0.00050	0.00054	<0.00050	<0.00050	<0.00050	0.00057	<0.00050	0.00054
Iron	0.3	0.16	0.30	<0.010	0.015	<0.010	0.017	0.041	0.031	0.048	0.12	0.073	0.11
Lead[2]	***equation***	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00007	<0.000050	<0.000050	<0.000050	0.00006
Lithium		0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		1.4		0.78	1.2	0.89	1.3	0.41	0.33	0.46	0.67	0.61	0.86
Manganese[3]		0.32	***See text***	0.00080	0.0016	0.0028	0.0034	0.0023	0.0013	0.0015	0.0029	0.0015	0.0032
Mercury	0.000026	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.073	<0.000050	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00005	<0.000050	<0.000050
Nickel[3]	***equation***	0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus		0.0045	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.84		0.42	0.80	0.47	0.81	0.26	0.24	0.29	0.42	0.39	0.32
Rubidium				0.00055	0.00091	0.00071	0.00099	0.00047	0.00040	0.00048	0.00070	0.00057	0.00057
Selenium	0.001	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.61		0.40	**0.99**	0.42	**0.92**	0.32	0.28	0.38	**0.74**	0.60	0.45
Silver	0.00025	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.0		0.92	**1.6**	**1.2**	**1.7**	0.71	0.64	0.68	0.91	0.90	0.72
Strontium		0.61	0.049	0.0099	0.019	0.011	0.018	0.0067	0.0064	0.0077	0.010	0.0095	0.0078
Sulfur				0.71	1.2	0.65	1.2	<0.50	<0.50	<0.50	0.54	0.77	0.60
Tellurium				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium	0.0008	0.00013	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin		0.033		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00041		<0.00030	<0.00030	<0.00030	<0.00030	**0.00056**	**0.00045**	0.00041	**0.0013**	**0.00054**	**0.00059**
Tungsten				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.015	0.00020	0.015	0.00003	0.00003	0.00003	0.00003	0.00006	0.00005	0.00005	0.00008	0.00006	0.00007
Vanadium		0.00060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.03	0.0075	***See text***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium				<0.000060	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	0.00023	<0.00020	<0.00020
Dissolved Metals (mg/L)													
Aluminum[3]		0.026	0.050	0.0032	0.0042	0.0049	0.0037	0.014	0.013	0.015	0.023	0.010	0.012
Antimony		0.0050	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.013	0.025	0.00011	0.00013	0.00010	0.00012	<0.00010	<0.00010	0.00014	0.00013	0.00010	0.00018
Barium		0.50	1.0	0.0047	0.0079	0.0042	0.0070	0.0036	0.0038	0.0039	0.0040	0.0034	0.0036
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.6		2.1	4.0	1.9	3.5	1.1	1.0	1.3	2.0	2.0	2.0
Cesium				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium		0.0026	0.0050	0.00020	0.00028	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00013	<0.00010	<0.00010
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.0012	0.0020	0.00029	0.00038	0.00036	0.00037	0.00028	0.00026	0.00033	0.00053	0.00041	0.00049
Iron		0.16	0.30	<0.010	<0.010	<0.010	<0.010	0.015	0.012	0.020	0.053	0.028	0.054
Lead		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00015	<0.000050	<0.000050	<0.000050
Lithium		0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		1.4		0.83	1.3	0.78	1.2	0.43	0.35	0.45	0.64	0.61	0.88
Manganese[3]		0.32	***See text***	0.00040	0.00078	0.0010	0.0023	0.0012	0.00073	0.00082	0.0021	0.00056	0.00042
Mercury		0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.073	0.00005	0.00006	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00005	<0.000050	<0.000050
Nickel		0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.84		0.44	0.76	0.45	0.78	0.26	0.25	0.30	0.40	0.38	0.31
Rubidium				0.00060	0.00087	0.00059	0.00095	0.00044	0.00045	0.00043	0.00052	0.00051	0.00055
Selenium		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.57		0.38	**1.0**	0.40	**0.93**	0.25	0.24	0.38	**0.69**	0.54	0.44
Silver		0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.0		0.98	**1.7**	**1.1**	**1.7**	0.61	0.62	0.68	0.89	0.92	0.74
Strontium		0.034	0.049	0.0099	0.018	0.012	0.019	0.0066	0.0063	0.0071	0.0094	0.0100	0.0079
Sulfur				0.58	1.2	0.66	1.3	<0.50	<0.50	<0.50	0.54	0.60	<0.50
Tellurium				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium		0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin		0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium		0.0075	0.015	0.00002	0.00003	0.00003	0.00003	0.00005	0.00005	0.00005	0.00008	0.00006	0.00007
Vanadium		0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0023	***See text***	0.0010	**0.038**	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010
Zirconium				<0.000060	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals (µg/L)													
Arsenate (As V)				-	-	<0.020	-	<0.020	-	<0.020	-	<0.020	-
Arsenite (As III)				-	-	0.035	-	0.024	-	<0.020	-	0.021	-
Dimethylarsinic Acid (DMA)				-	-	<0.020	-	<0.020	-	<0.020	-	<0.020	-
Monomethylarsonic Acid (MMA)				-	-	<0.020	-	<0.020	-	<0.020	-	<0.020	-
Arsenobetaine (AsB)				-	-	<0.050	-	<0.050	-	<0.050	-	<0.050	-

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2018.

2. Trigger and threshold values are presented in *CREMP 2015 Plan Update* (Azimuth 2015a). A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015a) for details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

Shaded concentrations exceed the CCME aquatic life guidelines.

123 Bolded concentrations exceed the trigger value.

123 Bold, italicized concentrations exceed the threshold value.

Italicized numbers are below detection limits.

"-" not analyzed/not sampled

n/a = issues with the water quality probe. No data collected.

underline = results were given a cautionary flag in the QC assessment (refer to **Appendix A** for details).

~~strikethrough~~ = results flagged as unreliable in the QC assessment (refer to **Appendix A** for details).

Table B2-1. Water chemistry data for Whale Tail study area lakes, 2019.

Lake				Nemo Lake									
(Station)				(NEM)									
Month		WTP Screening Values		March	March	May	May	July	July	August	August	September	September
Area-Replicate ID				NEM-37	NEM-38	NEM-39	NEM-40	NEM-41	NEM-42	NEM-43	NEM-44	NEM-45	NEM-46
ALS Sample ID				L2244752-1	L2244752-2	L2275597-1	L2275597-2	L2307977-1	L2307977-2	L2335617-15	L2335617-16	L2350681-11	L2350681-12
Date	Aquatic Life Guideline[1]	Triggers	Thresholds	7-Mar-19	7-Mar-19	13-May-19	13-May-19	5-Jul-19	5-Jul-19	20-Aug-19	20-Aug-19	13-Sep-19	13-Sep-19
Time				12:18	13:11	10:35	10:15	16:00	16:20	15:09	14:30	15:00	15:30
Physical Tests (mg/L)													
Conductivity (µS/cm)		49		34	33	34	34	27	28	**59**	**59**	**78**	**76**
Hardness		17		13	12	12	12	10	10	**23**	**22**	**29**	**29**
pH (Laboratory)	6.5 - 9.0	6.57-7.97	6.5-9.0	7.1	7.1	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2
Total Suspended Solids		3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids		39		19	21	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Turbidity (NTU)				<0.10	0.11	0.14	0.12	0.22	0.20	0.29	0.25	0.43	0.38
Anions and Nutrients (mg/L)													
Alkalinity - Bicarbonate		9.6		9.4	9.2	**10**	**9.9**	6.8	7.3	7.8	7.7	8.5	8.3
Alkalinity - Carbonate		2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		9.6		9.4	9.2	**10**	**9.9**	6.8	7.3	7.8	7.7	8.5	8.3
Ammonia (as N)[3]	***equation***	0.065	0.13	0.010	**0.069**	0.051	0.048	<0.0050	0.043	0.0077	0.014	0.046	**0.29**
Bromide				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.068	0.068	0.13	0.12
Chloride	120	60	120	1.2	1.1	1.1	1.1	0.95	0.96	9.7	9.8	16	15
Fluoride	0.12	0.077	0.12	0.035	0.031	0.027	0.027	0.023	0.024	0.028	0.028	0.030	0.031
Nitrate (as N)	3	1.5	3.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.075	0.079	0.16	0.15
Nitrite (as N)	0.06	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0017	0.0019	<0.0010	0.0015
Total Kjeldahl Nitrogen		0.17		0.13	0.16	**0.29**	**0.20**	0.12	0.14	0.13	0.15	**0.17**	**0.41**
Ortho Phosphate (as P)		0.0022		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.				0.0021	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0022	<0.0020	<0.0020
Phosphorus (P)-Total	0.004	0.0045	0.0040	0.0025	<0.0020	0.0036	**0.0084**	0.0037	**0.0054**	<0.0020	<0.0020	<0.0020	<0.0020
Silicate (as SiO_2)		1.3		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		65	128	4.3	4.1	4.1	4.1	3.3	3.4	3.5	3.5	3.9	3.9
Cyanides													
Total Cyanide				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005			<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)													
Dissolved Organic Carbon		2.4		2.3	1.8	2.2	2.1	1.7	1.8	1.6	1.5	2.0	1.9
Total Organic Carbon		2.4		2.0	2.0	**2.5**	2.1	1.6	1.8	1.7	1.7	1.8	2.0
Plant Pigments (µg/L)													
Chlorophyll-*a*				0.64	0.81	0.51	0.56	0.42	0.54	0.90	0.89	0.90	1.0
Total Metals (mg/L)													
Aluminum[3]	***equation***	0.052	0.10	<0.0030	<0.0030	<0.0030	<0.0030	0.0072	0.0072	0.0083	0.0077	0.012	0.013
Antimony		0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.005	0.013	0.025	0.00033	0.00038	0.00028	0.00031	0.00032	0.00029	0.00047	0.00045	0.00051	0.00052
Barium		0.50	1.0	0.0055	0.0051	0.0053	0.0055	0.0043	0.0050	0.011	0.011	0.014	0.014
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.6		2.9	2.9	3.0	2.9	2.3	2.3	**6.6**	**6.6**	**8.8**	**8.7**
Cesium				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium[4]	0.001	0.0025	0.0050	<0.00010	<0.00010	<0.00010	0.00022	0.00036	0.00013	0.00010	0.00012	0.00016	0.00016
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[2]	***equation***	0.0013	0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron	0.3	0.16	0.30	<0.010	<0.010	<0.010	<0.010	0.017	0.013	0.015	0.014	0.029	0.027
Lead[2]	***equation***	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	0.0010	0.0013	0.0013
Magnesium		1.4		1.4	1.3	1.4	1.4	1.0	1.0	**1.5**	**1.5**	**1.7**	**1.7**
Manganese[3]		0.32	***See text***	0.00088	0.0010	0.0017	0.0020	0.0031	0.0033	0.0075	0.0078	0.0083	0.0081
Mercury	0.000026	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.073	<0.000050	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	0.00017	0.00018	0.00020	0.00020
Nickel[3]	***equation***	0.013	0.025	0.00062	0.00058	0.00061	0.00065	0.00079	0.00078	0.0011	0.0011	0.0012	0.0012
Phosphorus		0.0045	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.84		0.78	0.76	0.75	0.77	0.58	0.60	**0.98**	**0.98**	**1.1**	**1.1**
Rubidium				0.00087	0.00086	0.00087	0.00083	0.00077	0.00061	0.0013	0.0014	0.0016	0.0014
Selenium	0.001	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.61		0.24	0.23	0.29	0.29	0.21	0.20	0.19	0.19	0.21	0.19
Silver	0.00025	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.0		0.66	0.62	0.62	0.61	0.50	0.49	0.76	0.76	0.84	0.87
Strontium		0.61	0.049	0.013	0.013	0.016	0.014	0.010	0.010	0.043	0.043	0.058	0.056
Sulfur				1.7	1.4	1.7	1.4	1.1	0.92	1.2	1.3	1.2	1.2
Tellurium				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium	0.0008	0.00013	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin		0.033		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00041		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00037	<0.00030
Tungsten				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.015	0.00020	0.015	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00003	0.00004	0.00005	0.00005
Vanadium		0.00060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.03	0.0075	***See text***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium				<0.000060	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals (mg/L)													
Aluminum[3]		0.026	0.050	0.0011	<0.0010	0.0010	<0.0010	0.0026	0.0038	0.0048	0.0038	0.0043	0.0045
Antimony		0.0050	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.013	0.025	0.00030	0.00027	0.00031	0.00028	0.00026	0.00026	0.00045	0.00041	0.00048	0.00047
Barium		0.50	1.0	0.0056	0.0052	0.0047	0.0049	0.0047	0.0047	0.0100	0.010	0.014	0.014
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.6		2.9	2.7	2.8	2.6	2.3	2.3	**6.4**	**6.4**	**9.0**	**9.0**
Cesium				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium		0.0026	0.0050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.0012	0.0020	0.00026	0.00026	0.00020	0.00022	0.00023	0.00026	0.00031	0.00029	0.00031	0.00031
Iron		0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.010
Lead		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	0.0011	0.0014	0.0014
Magnesium		1.4		**1.4**	1.3	1.3	1.3	1.0	1.0	**1.6**	**1.6**	**1.7**	**1.6**
Manganese[3]		0.32	***See text***	0.00027	0.00018	0.00076	0.00079	0.0024	0.0024	0.0057	0.0058	0.0064	0.0061
Mercury		0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.073	0.00007	0.00006	<0.000050	<0.000050	<0.000050	<0.000050	0.00018	0.00017	0.00020	0.00020
Nickel		0.013	0.025	0.00057	0.00063	0.00070	0.00068	0.00066	0.00068	0.0010	0.00099	0.0011	0.0011
Phosphorus				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.84		0.82	0.78	0.71	0.71	0.61	0.61	**0.98**	**0.97**	**1.2**	**1.1**
Rubidium				0.00086	0.00085	0.00082	0.00084	0.00071	0.00070	0.0011	0.0011	0.0016	0.0014
Selenium		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.57		0.24	0.21	0.23	0.22	0.16	0.17	0.17	0.17	0.17	0.17
Silver		0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.0		0.69	0.64	0.63	0.62	0.49	0.49	0.83	0.80	0.88	0.86
Strontium		0.034	0.049	0.014	0.013	0.014	0.013	0.010	0.010	**0.043**	**0.044**	**0.057**	**0.055**
Sulfur				1.6	1.4	1.3	1.4	1.2	1.2	1.2	1.1	1.3	1.4
Tellurium				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium		0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin		0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium		0.0075	0.015	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00003	0.00003	0.00004	0.00004
Vanadium		0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0023	***See text***	<0.0010	<0.0010	<0.0010	0.0014	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zirconium				<0.000060	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals (µg/L)													
Arsenate (As V)				-	-	<0.020	-	-	<0.020	-	0.020	0.026	-
Arsenite (As III)				-	-	0.16	-	-	0.12	-	0.22	0.21	-
Dimethylarsinic Acid (DMA)				-	-	0.024	-	-	<0.020	-	0.033	0.064	-
Monomethylarsonic Acid (MMA)				-	-	<0.020	-	-	<0.020	-	<0.020	<0.020	-
Arsenobetaine (AsB)				-	-	<0.050	-	-	<0.050	-	<0.050	<0.050	-

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2018.

2. Trigger and threshold values are presented in *CREMP 2015 Plan Update* (Azimuth 2015a). A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015a) for details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

Shaded concentrations exceed the CCME aquatic life guidelines.

123 Bolded concentrations exceed the trigger value.

123 Bold, italicized concentrations exceed the threshold value.

Italicized numbers are below detection limits.

"-" not analyzed/not sampled

n/a = issues with the water quality probe. No data collected.

underline = results were given a cautionary flag in the QC assessment (refer to **Appendix A** for details).

~~strikethrough~~ = results flagged as unreliable in the QC assessment (refer to **Appendix A** for details).

FIGURES

Figure B2 - 1. Carbonate alkalinity (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

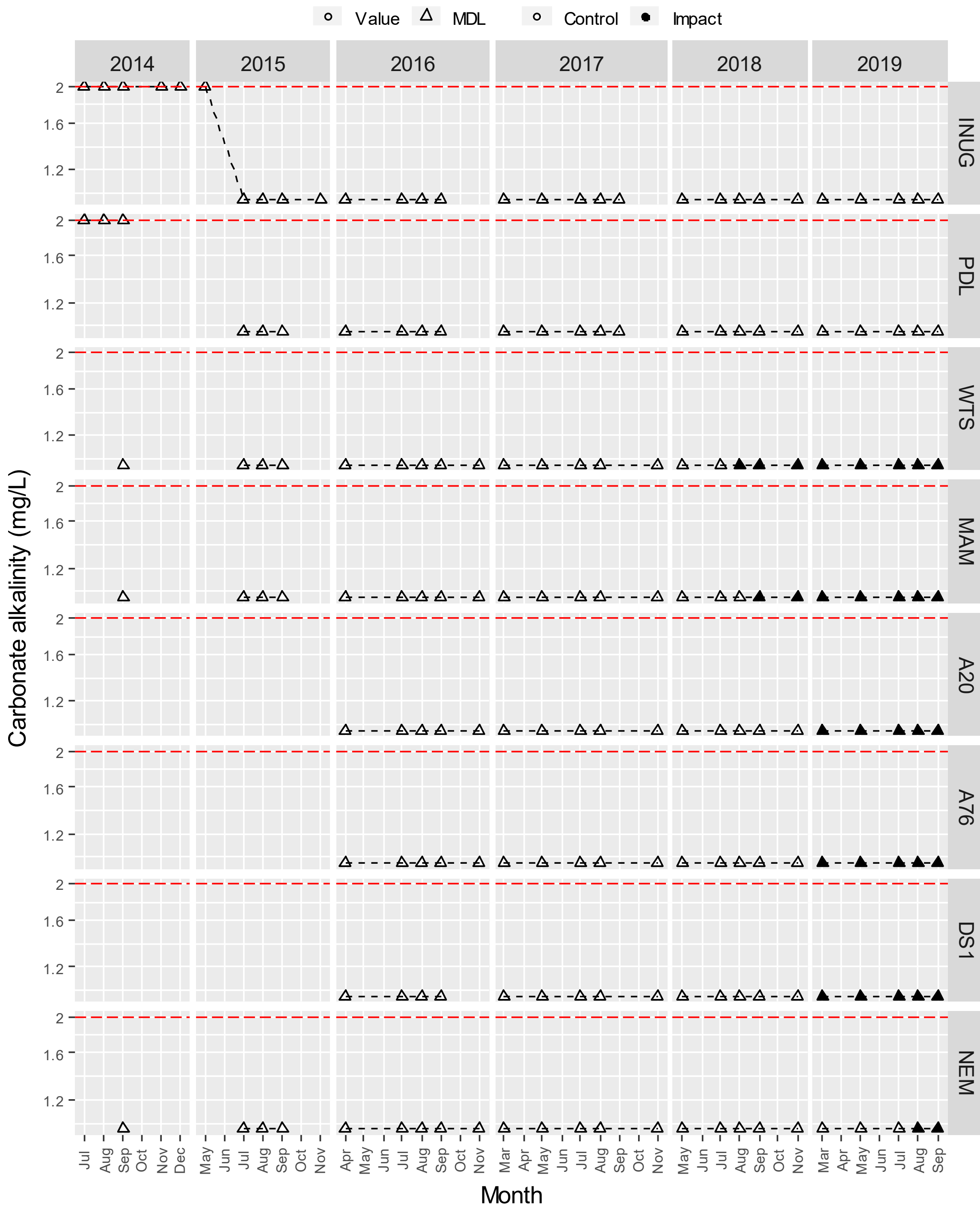


Figure B2 - 2. Ortho-phosphate (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

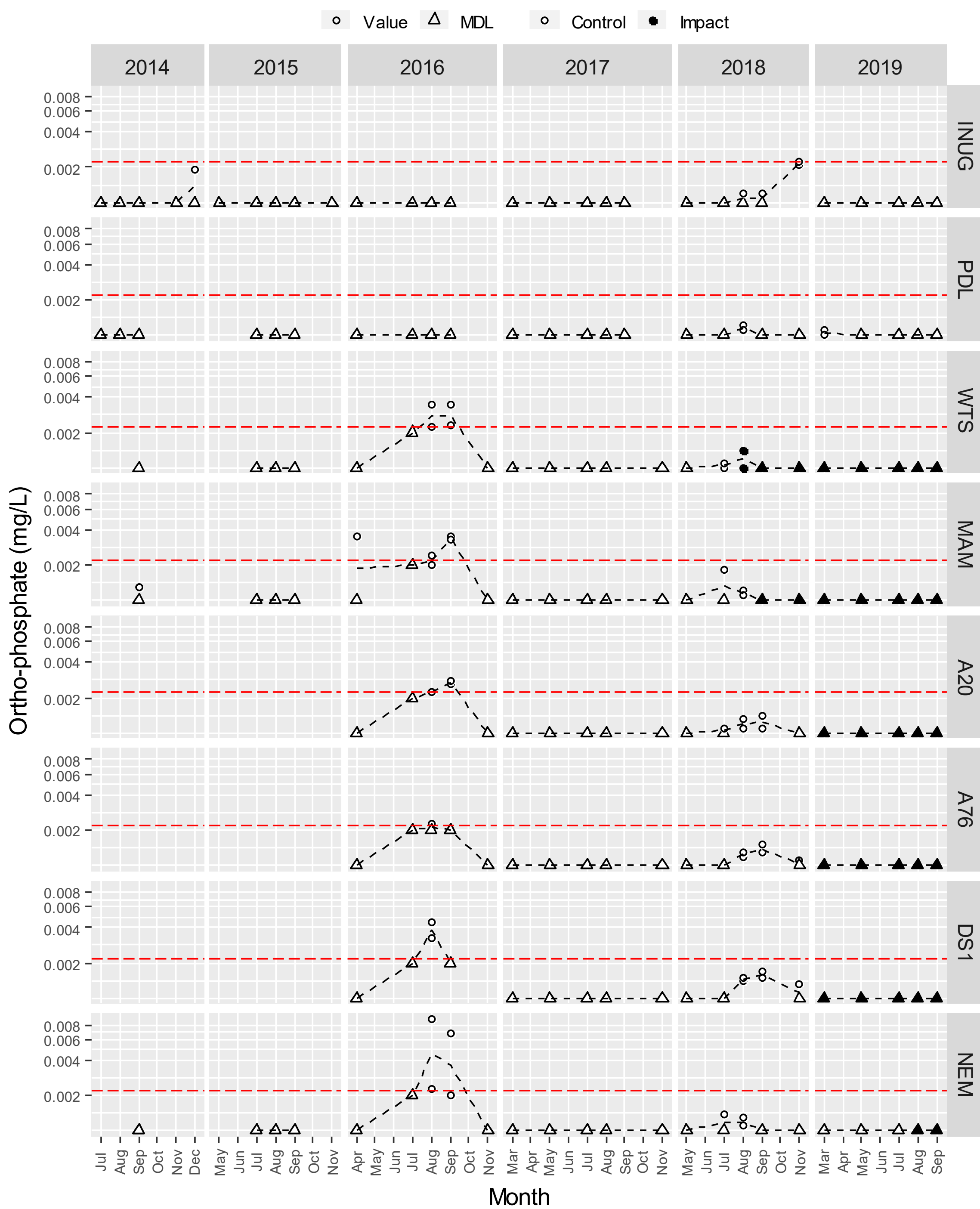


Figure B2 - 3. Total cyanide (mg/L) in water samples from Whale Tail Pit since 2014.

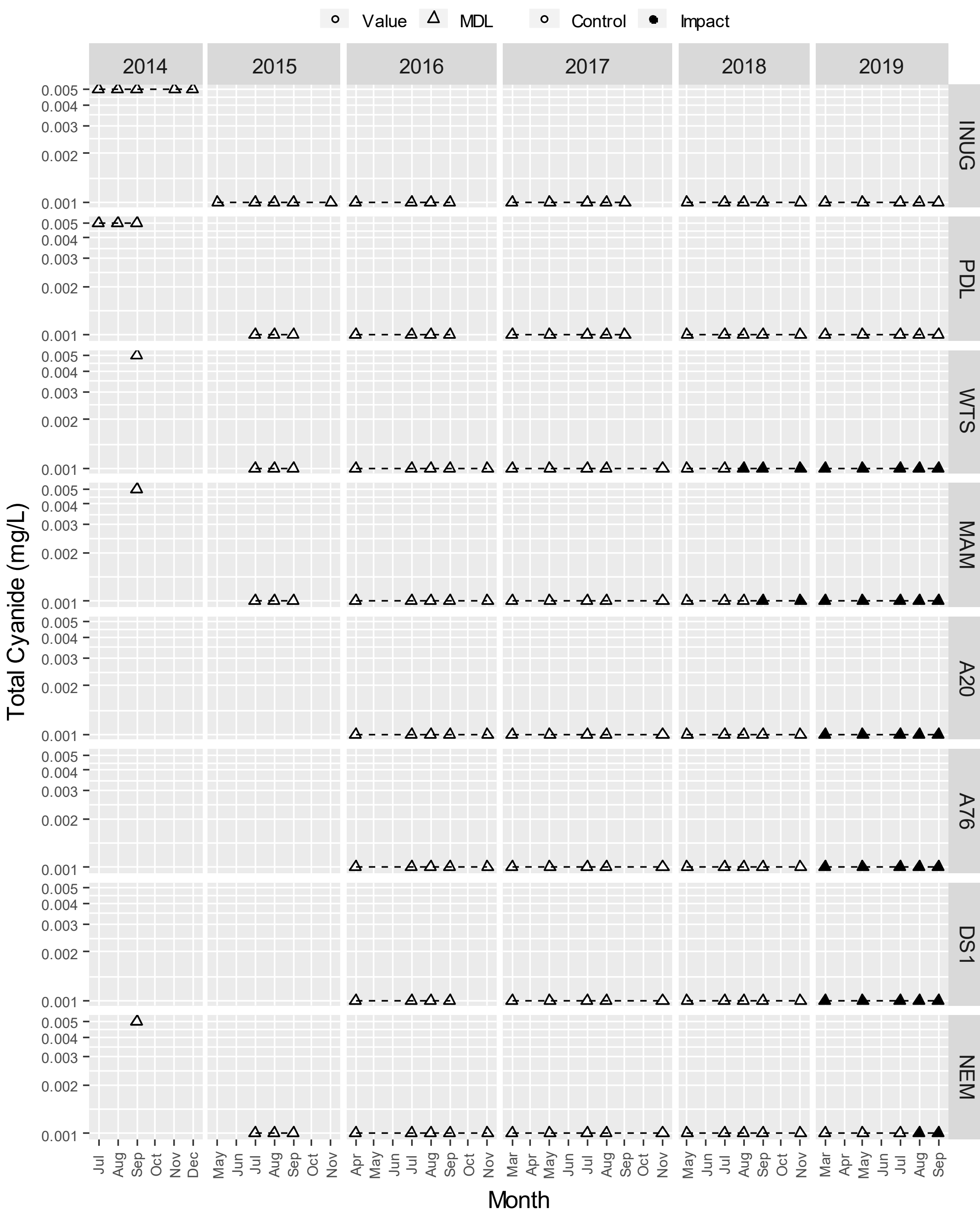


Figure B2 - 4. Free cyanide (mg/L) in water samples from Whale Tail Pit since 2014.

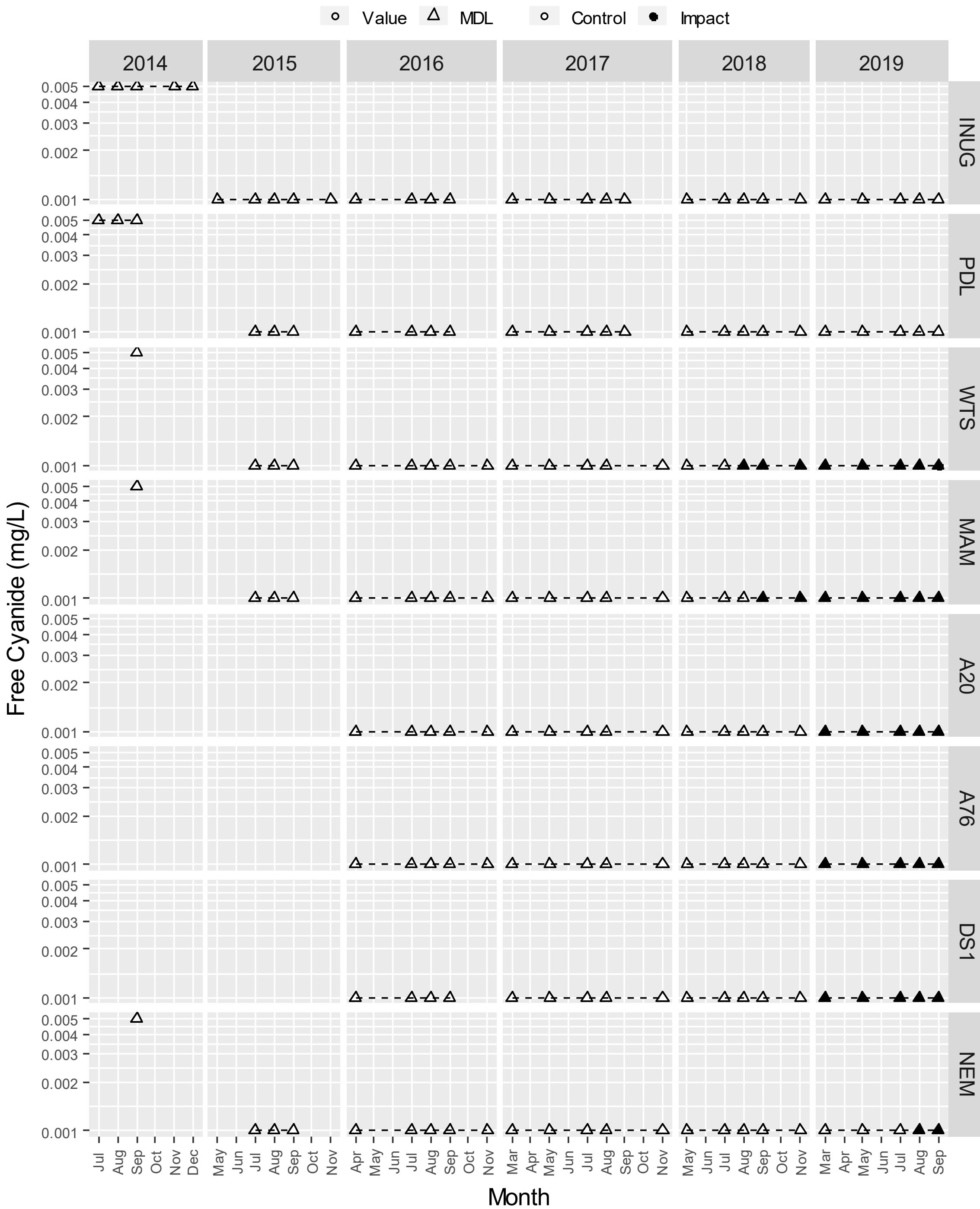


Figure B2 - 5. Total antimony (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

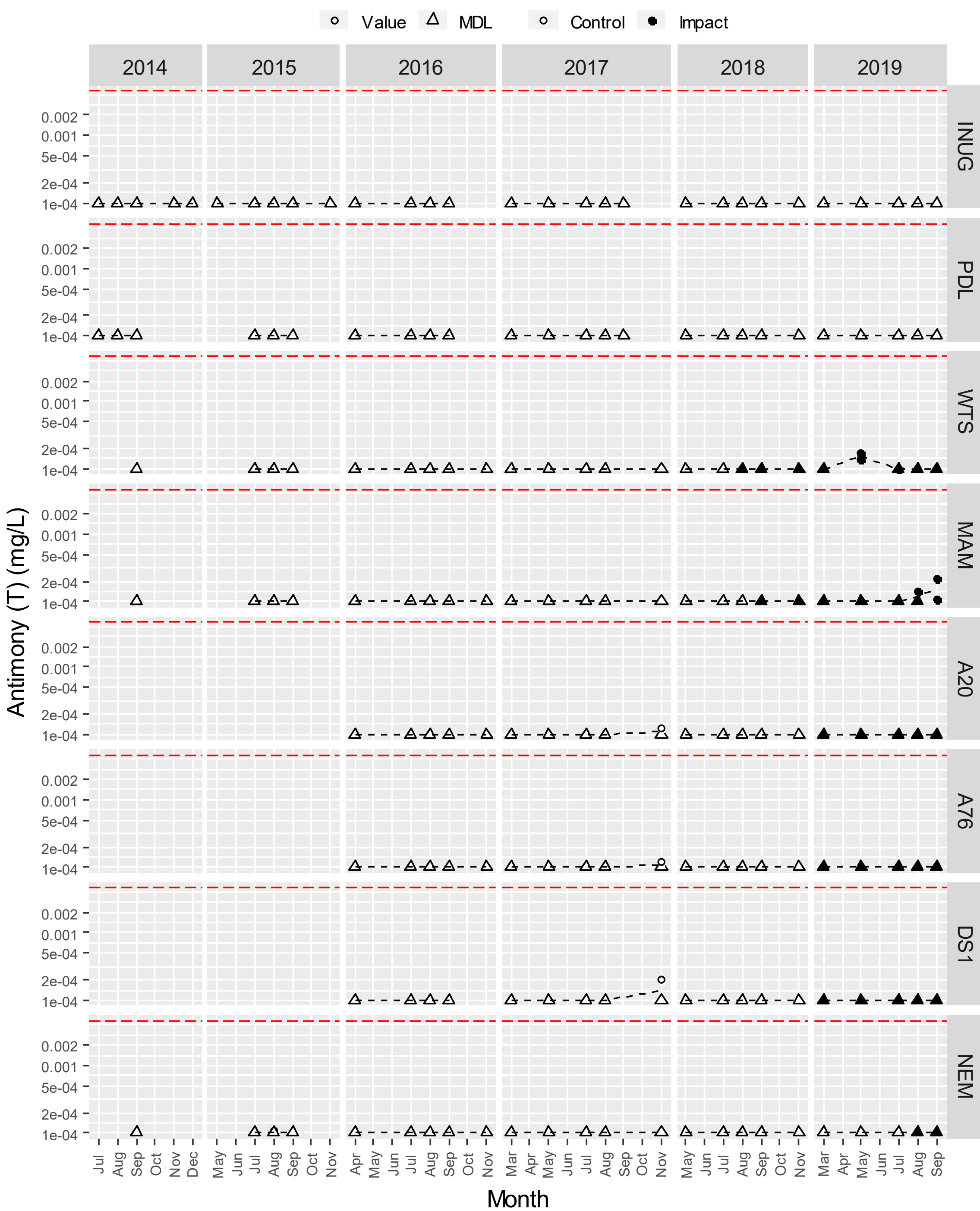


Figure B2 - 6. Total beryllium (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

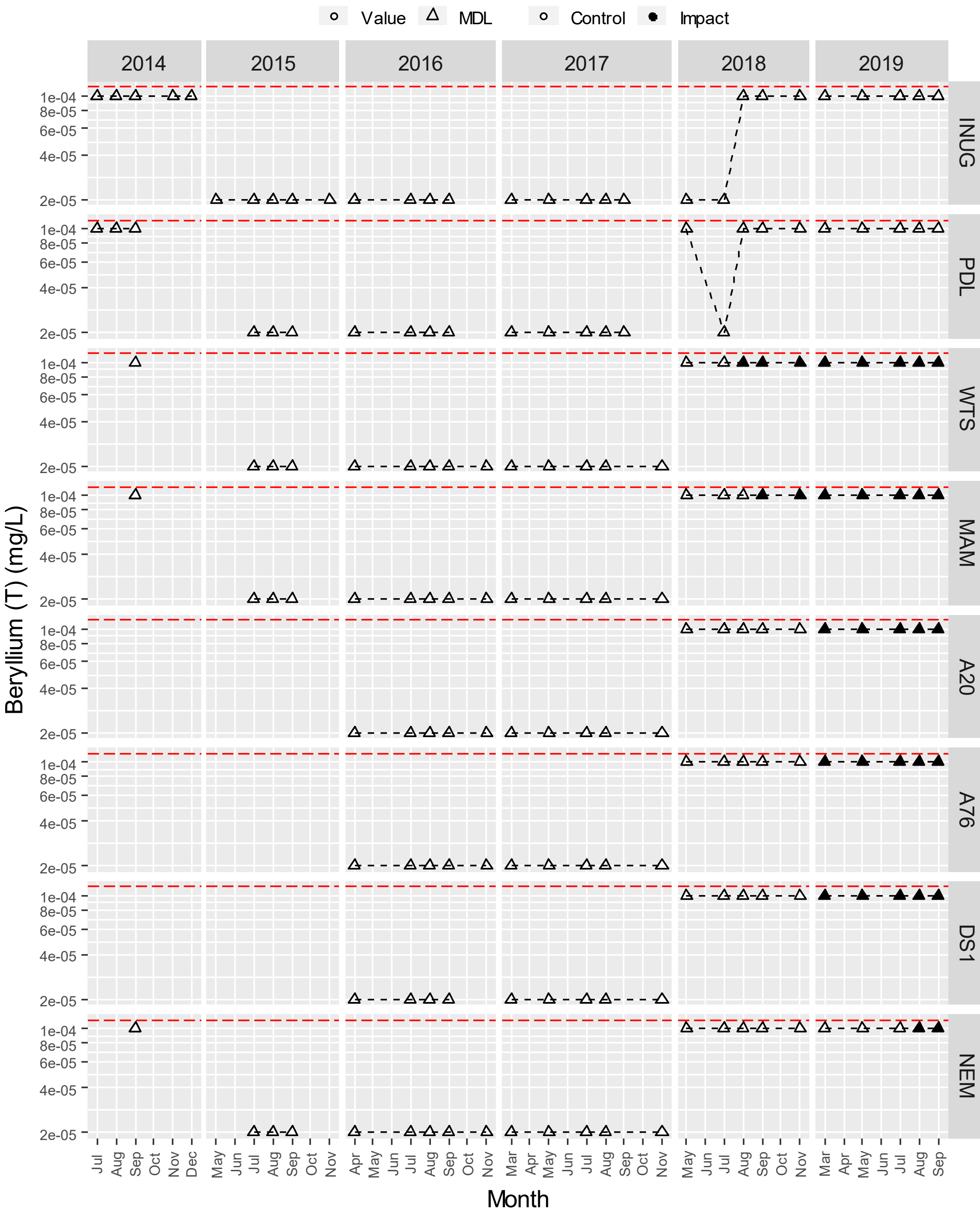


Figure B2 - 7. Total boron (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

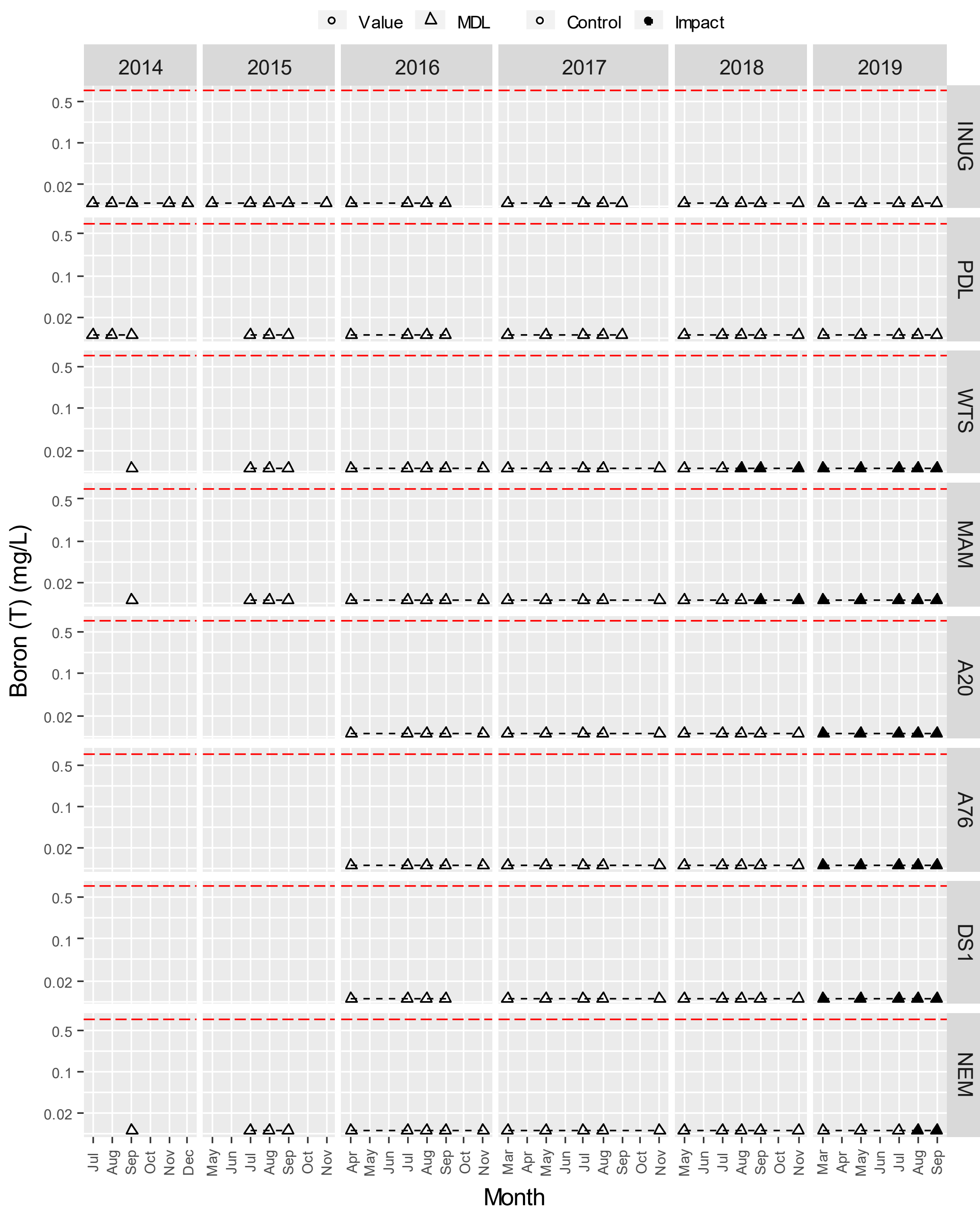


Figure B2 - 8. Total cadmium (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

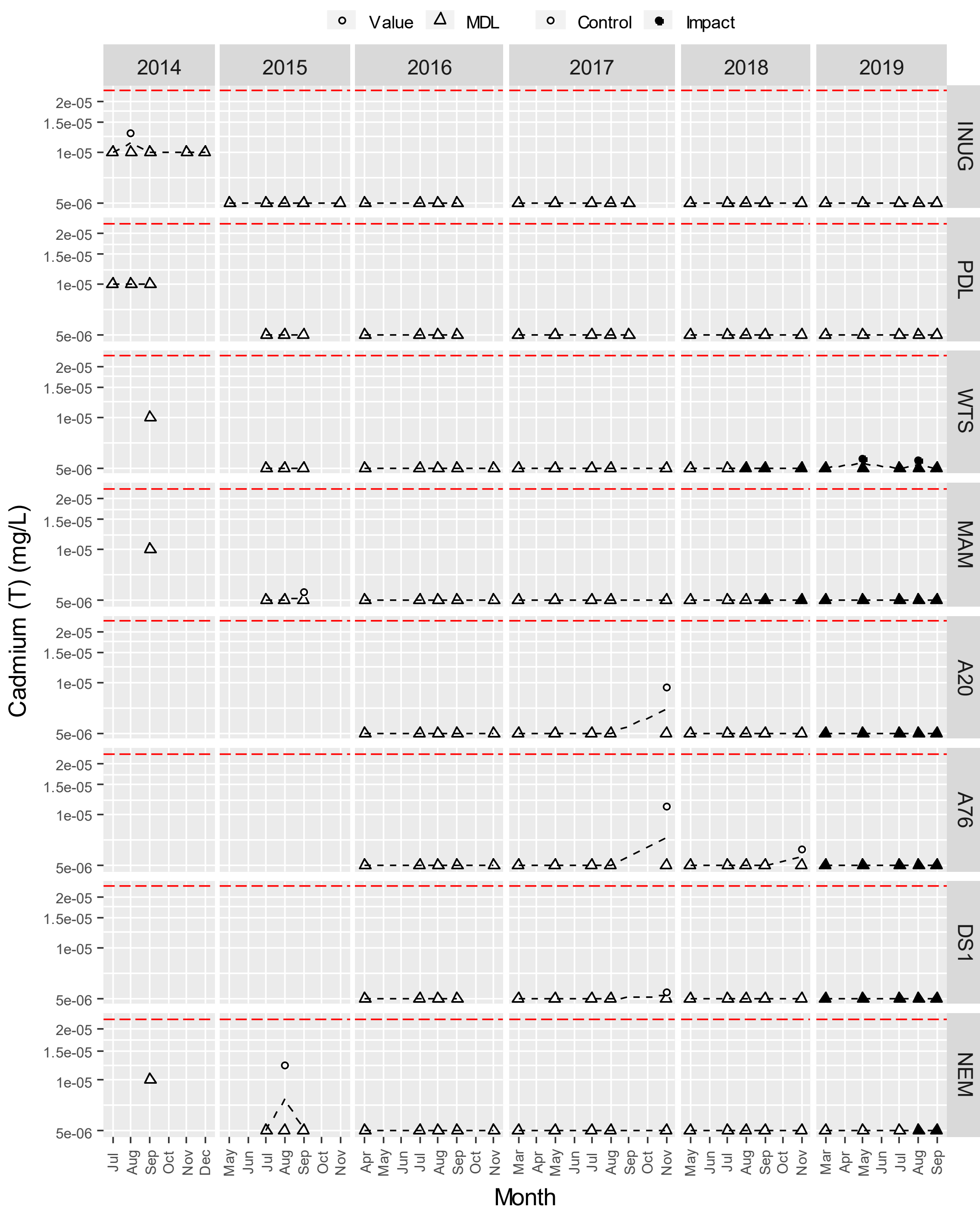


Figure B2 - 9. Total mercury (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

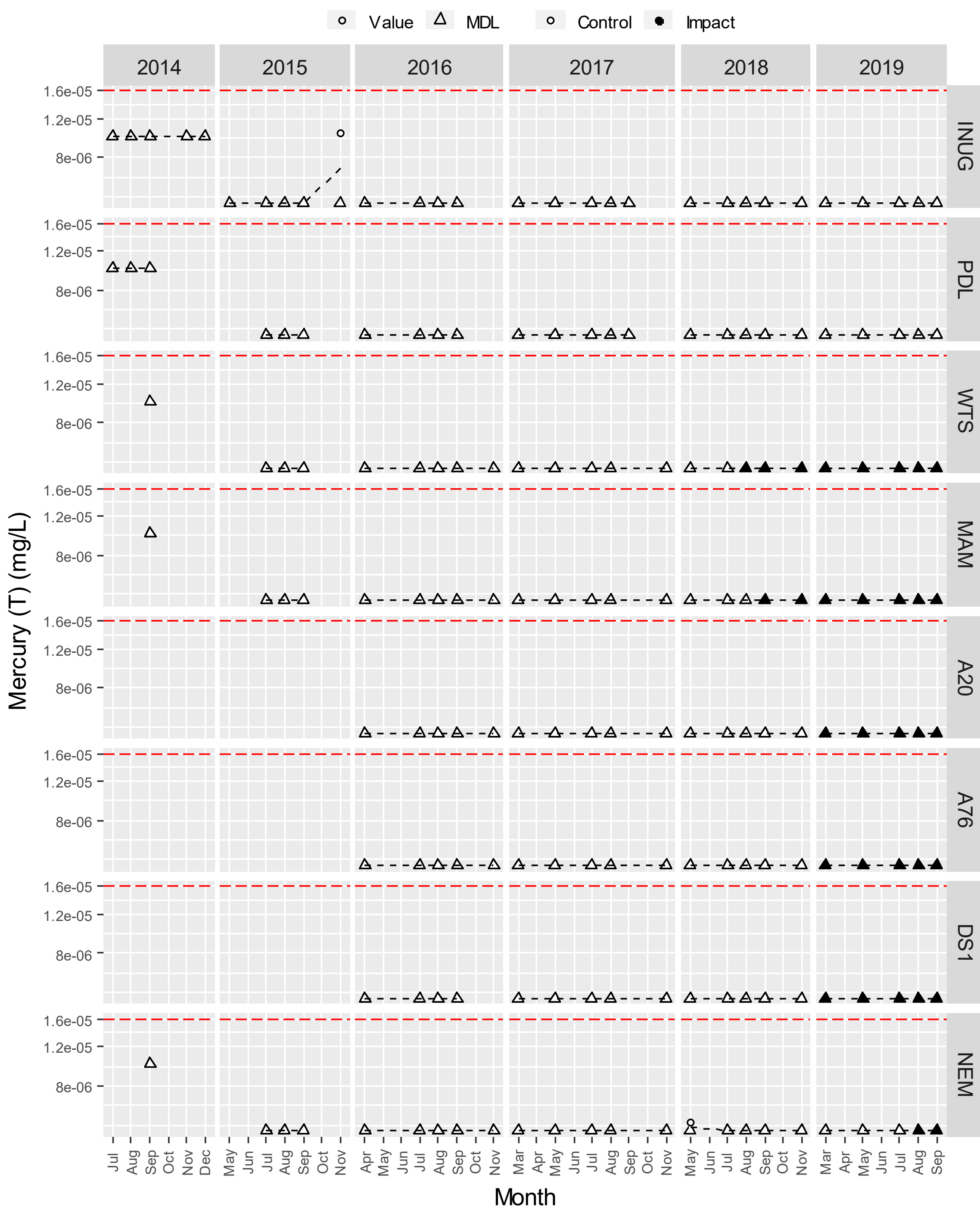


Figure B2 - 10. Total selenium (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

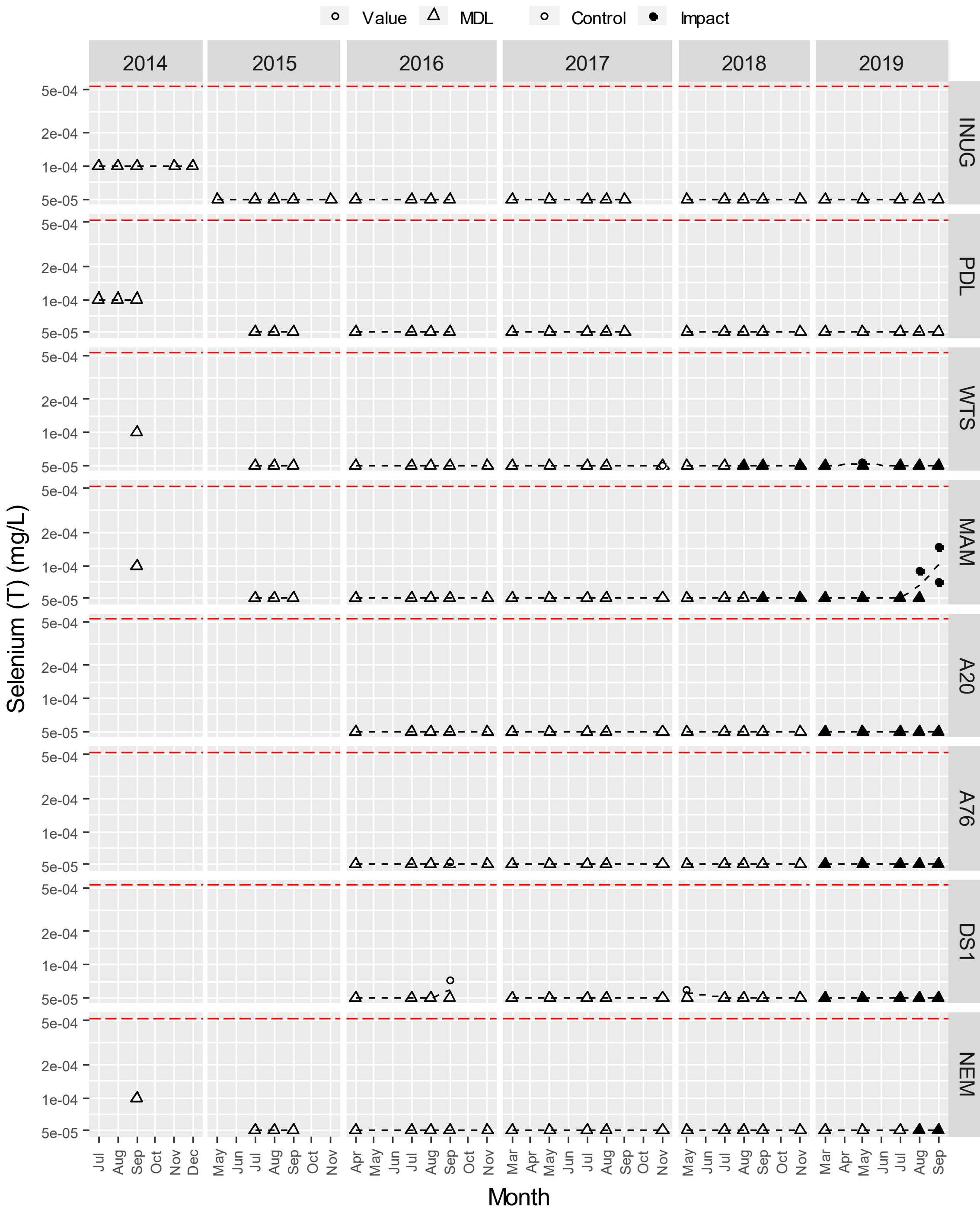


Figure B2 - 11. Total silver (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

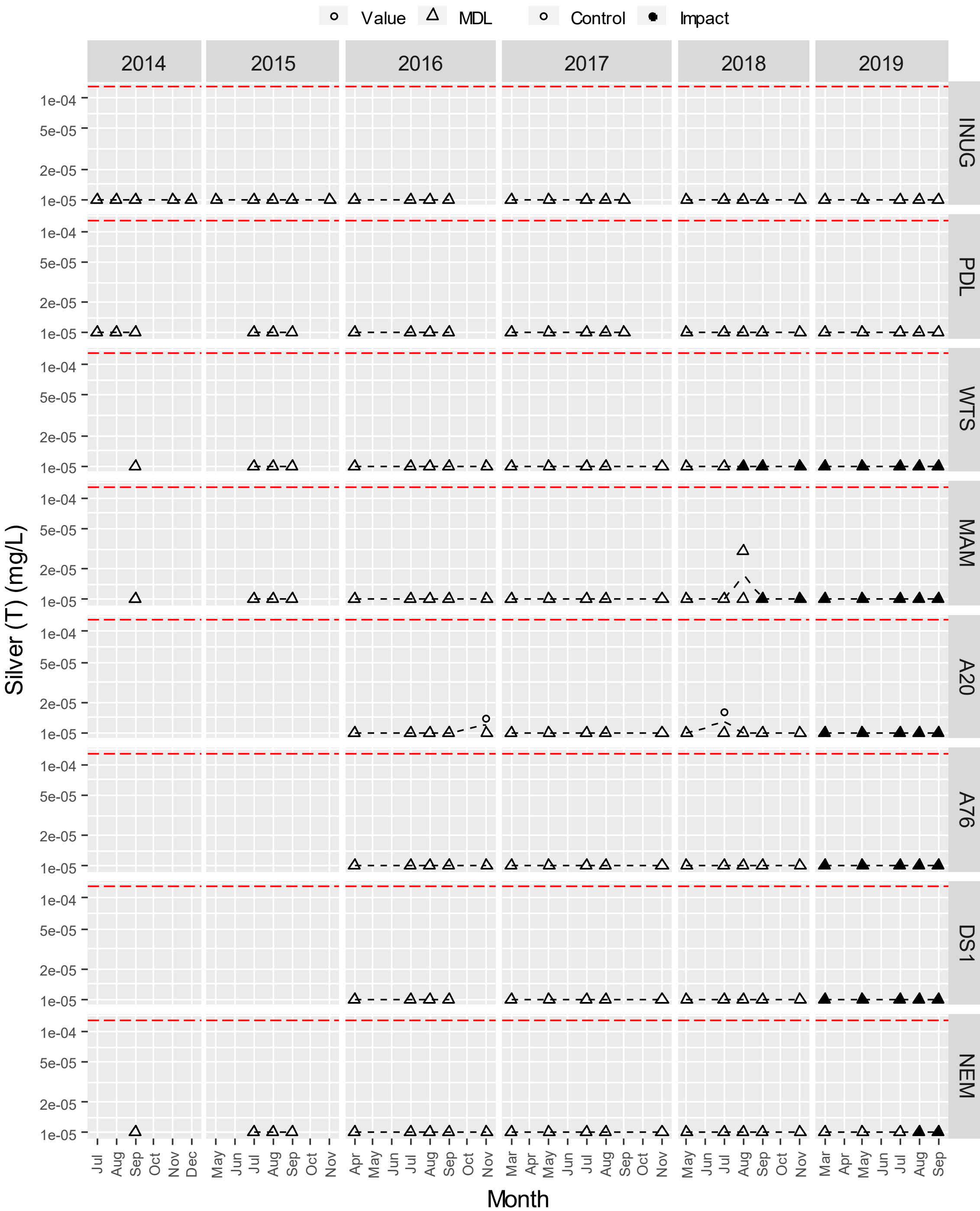


Figure B2 - 12. Total thallium (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

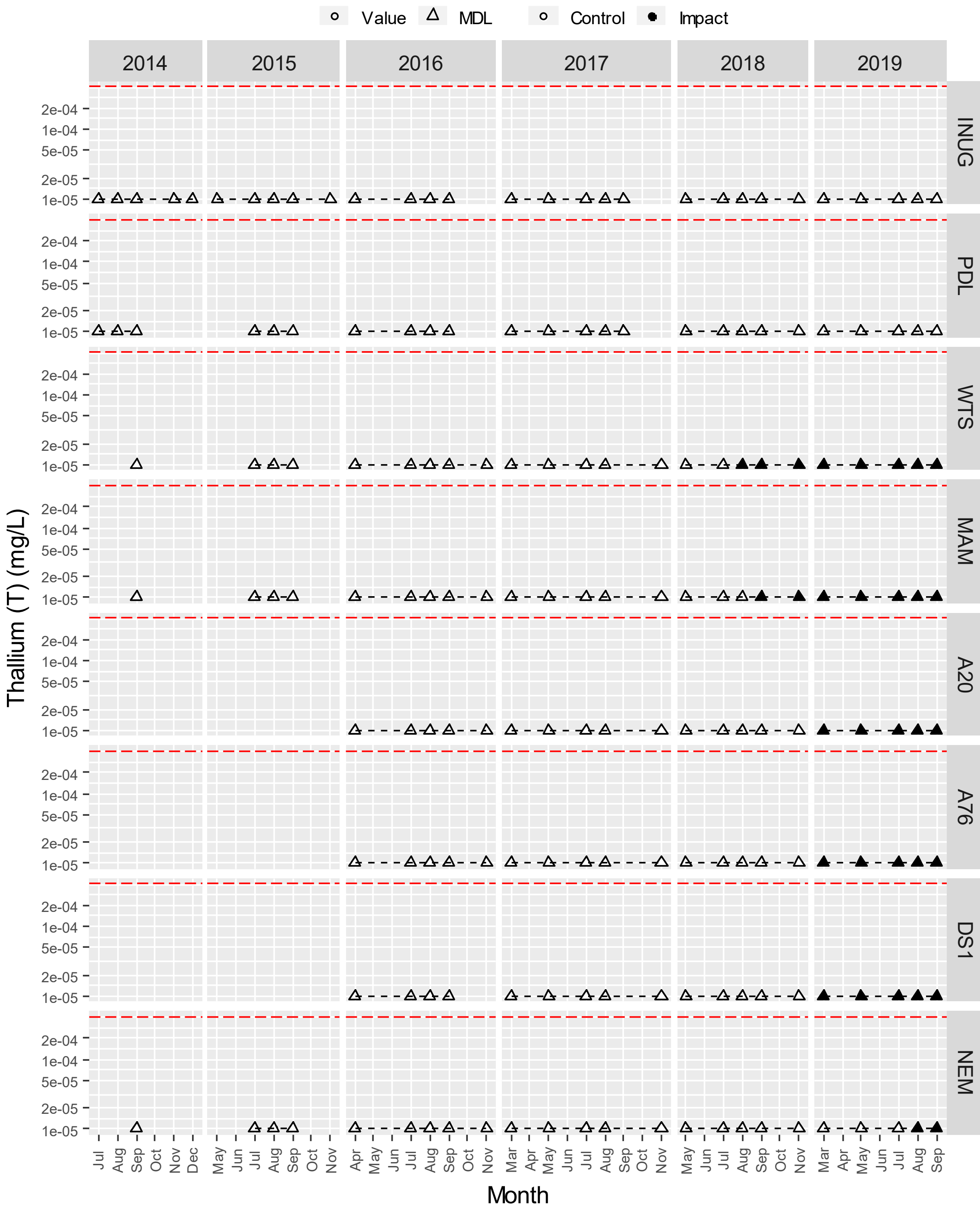


Figure B2 - 13. Total tin (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

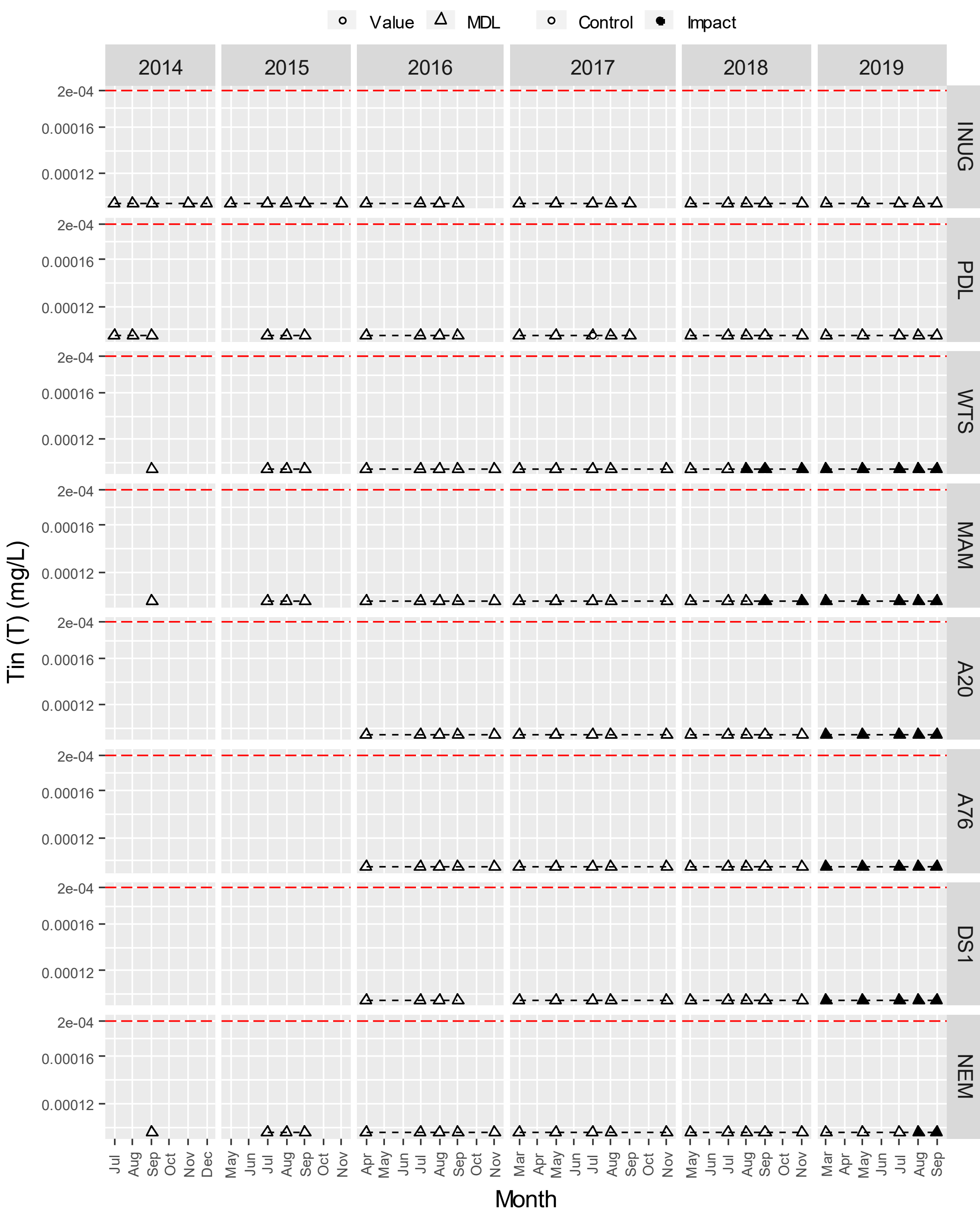


Figure B2 - 14. Total vanadium (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

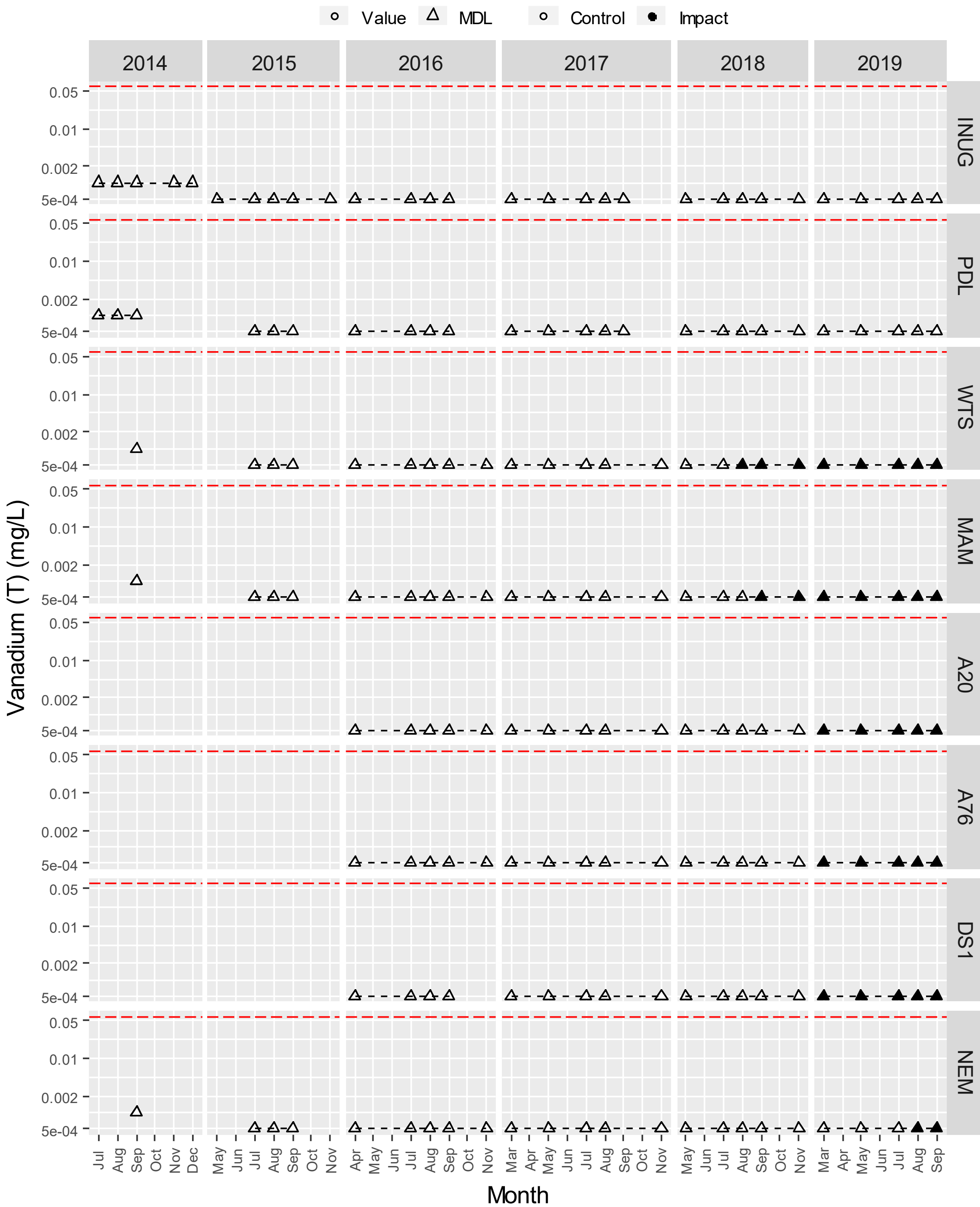


Figure B2 - 15. Total zinc (mg/L) in water samples from Whale Tail Pit since 2014.

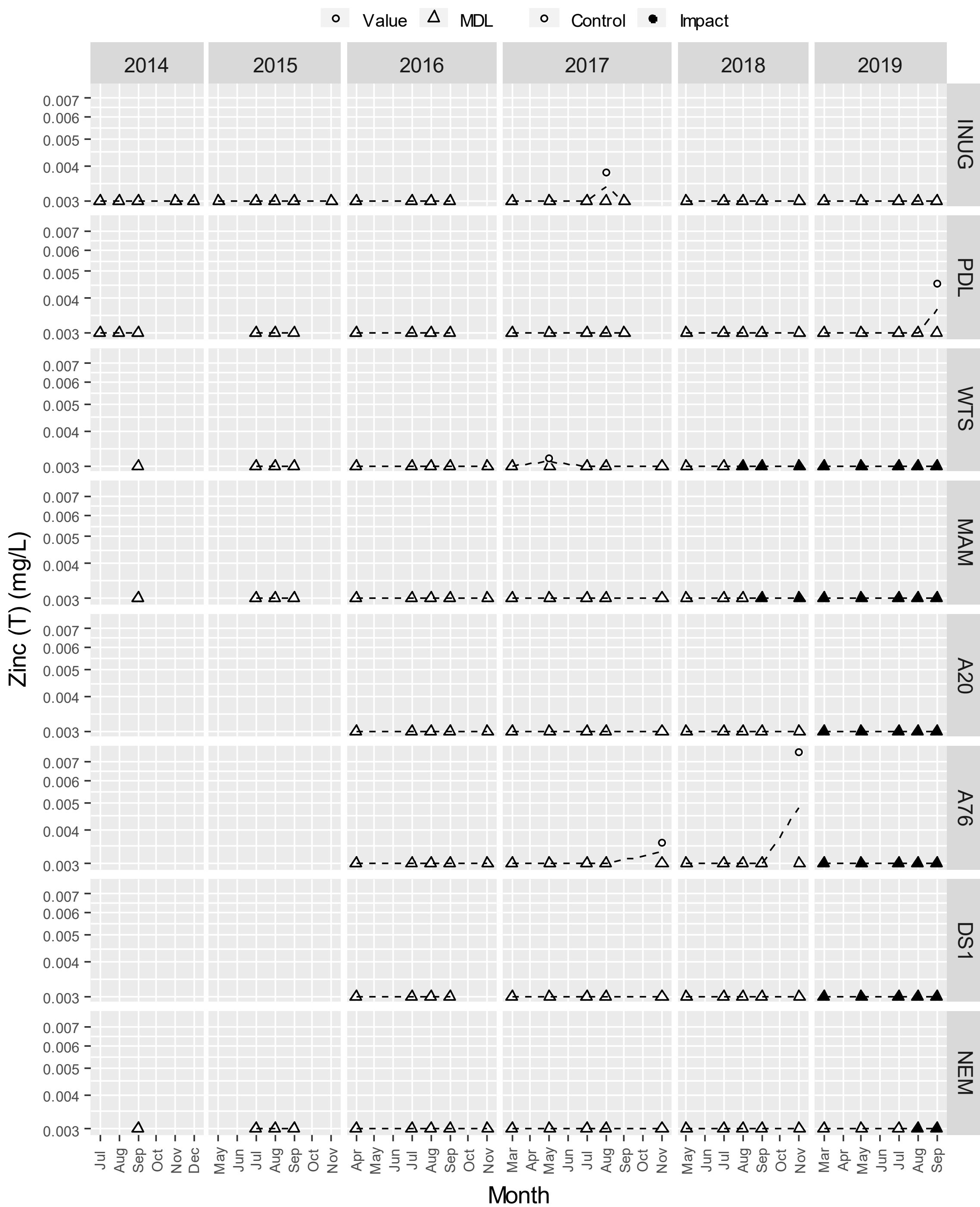


Figure B2 - 16. Dissolved antimony (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

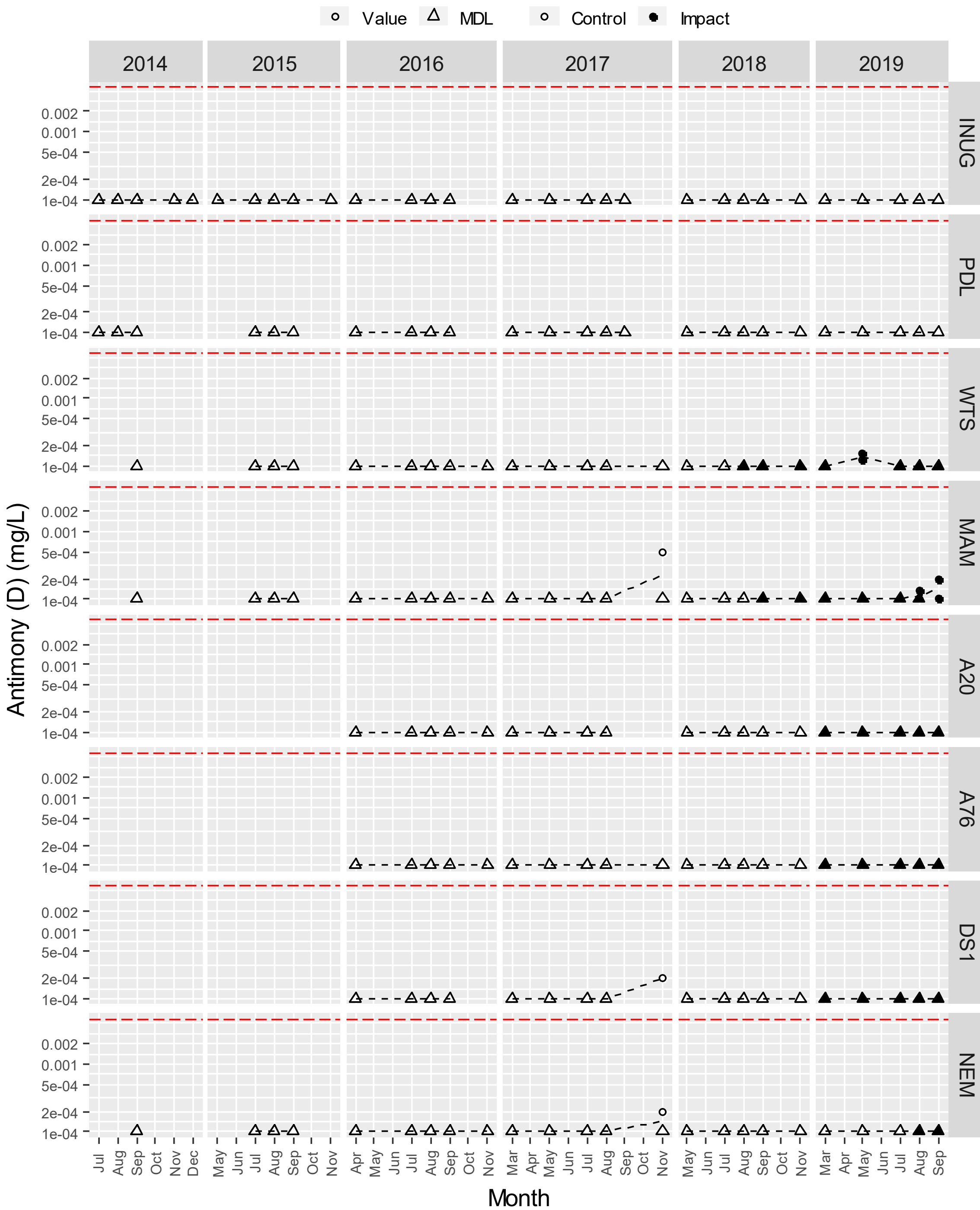


Figure B2 - 17. Dissolved beryllium (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

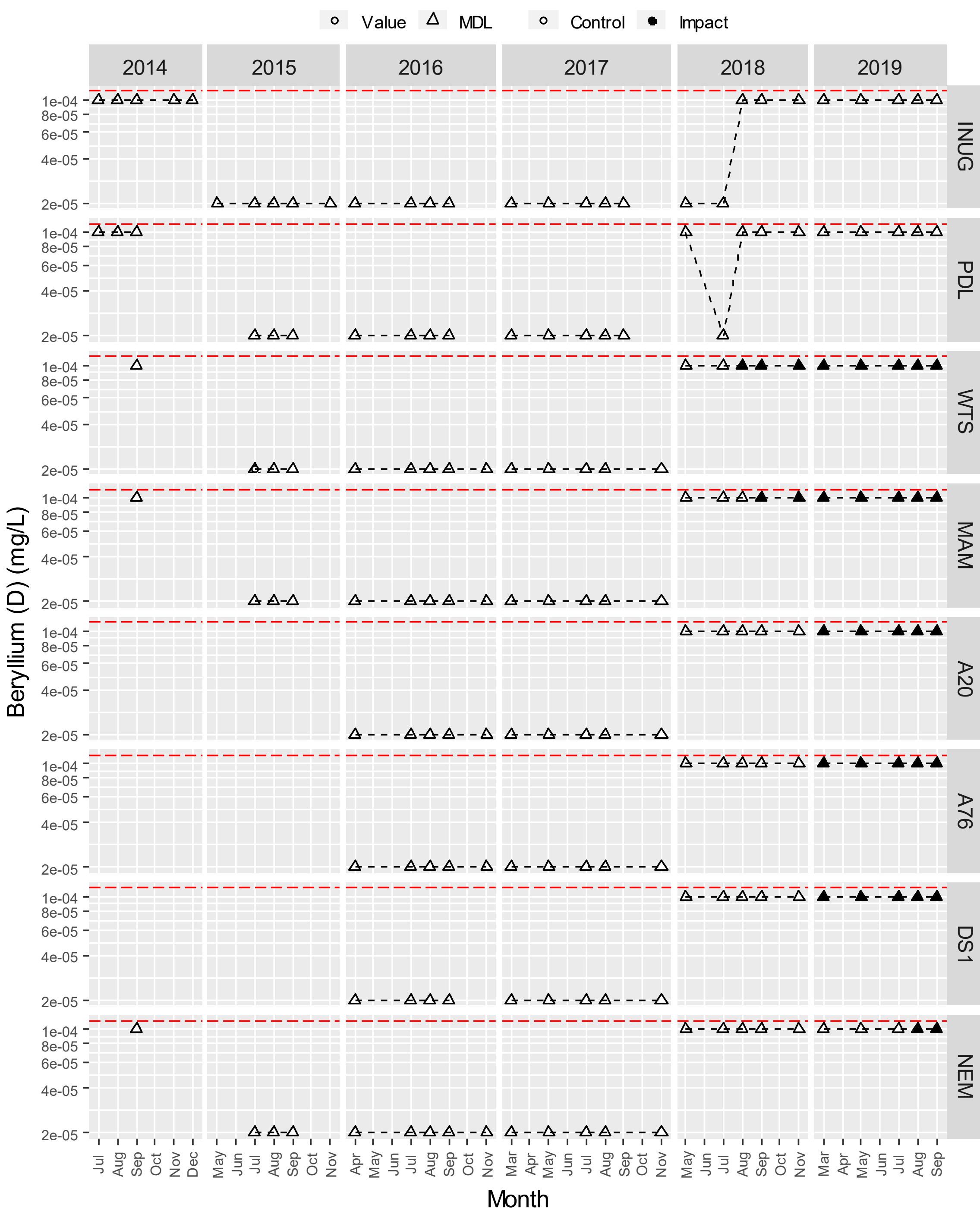


Figure B2 - 18. Dissolved boron (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

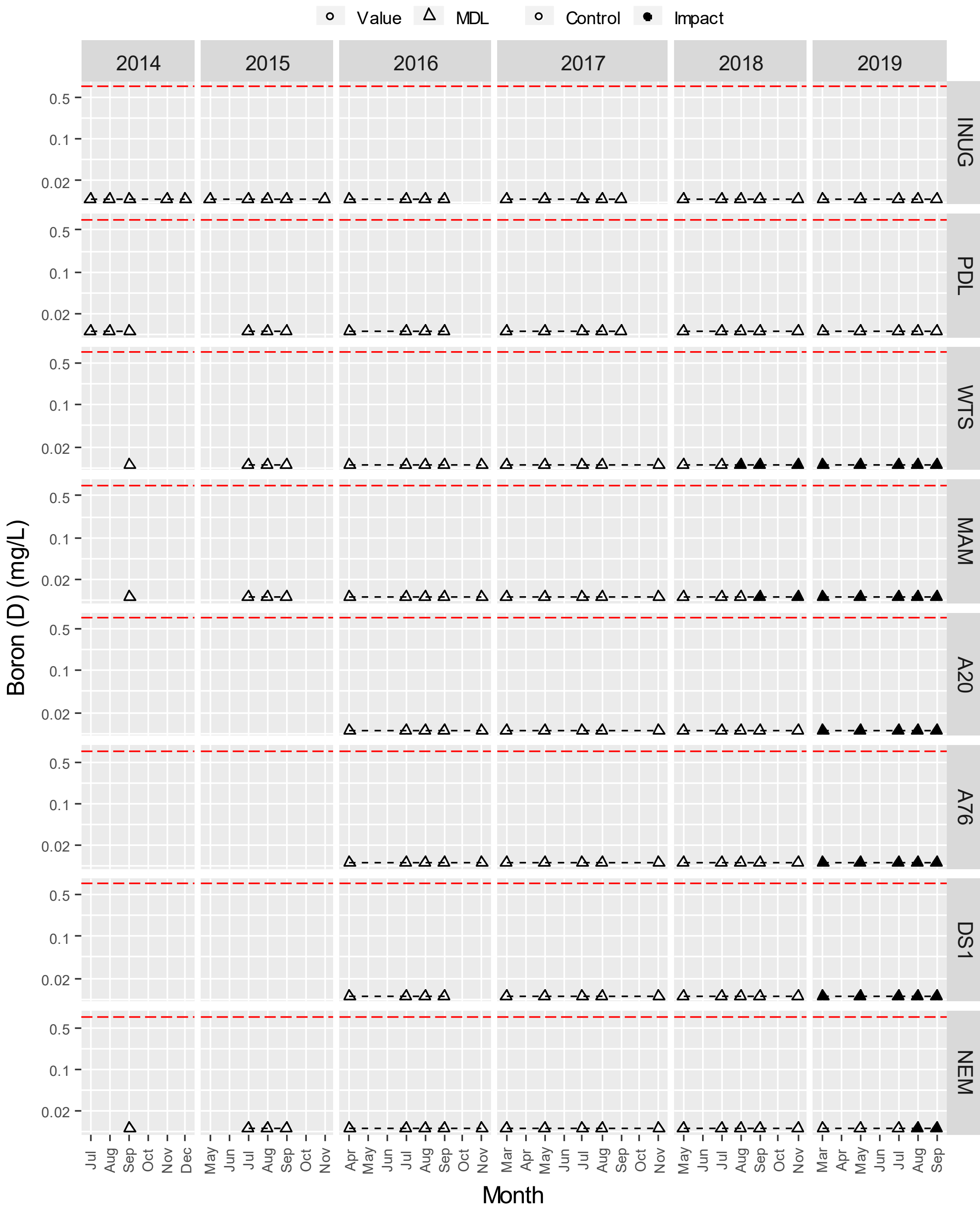


Figure B2 - 19. Dissolved cadmium (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

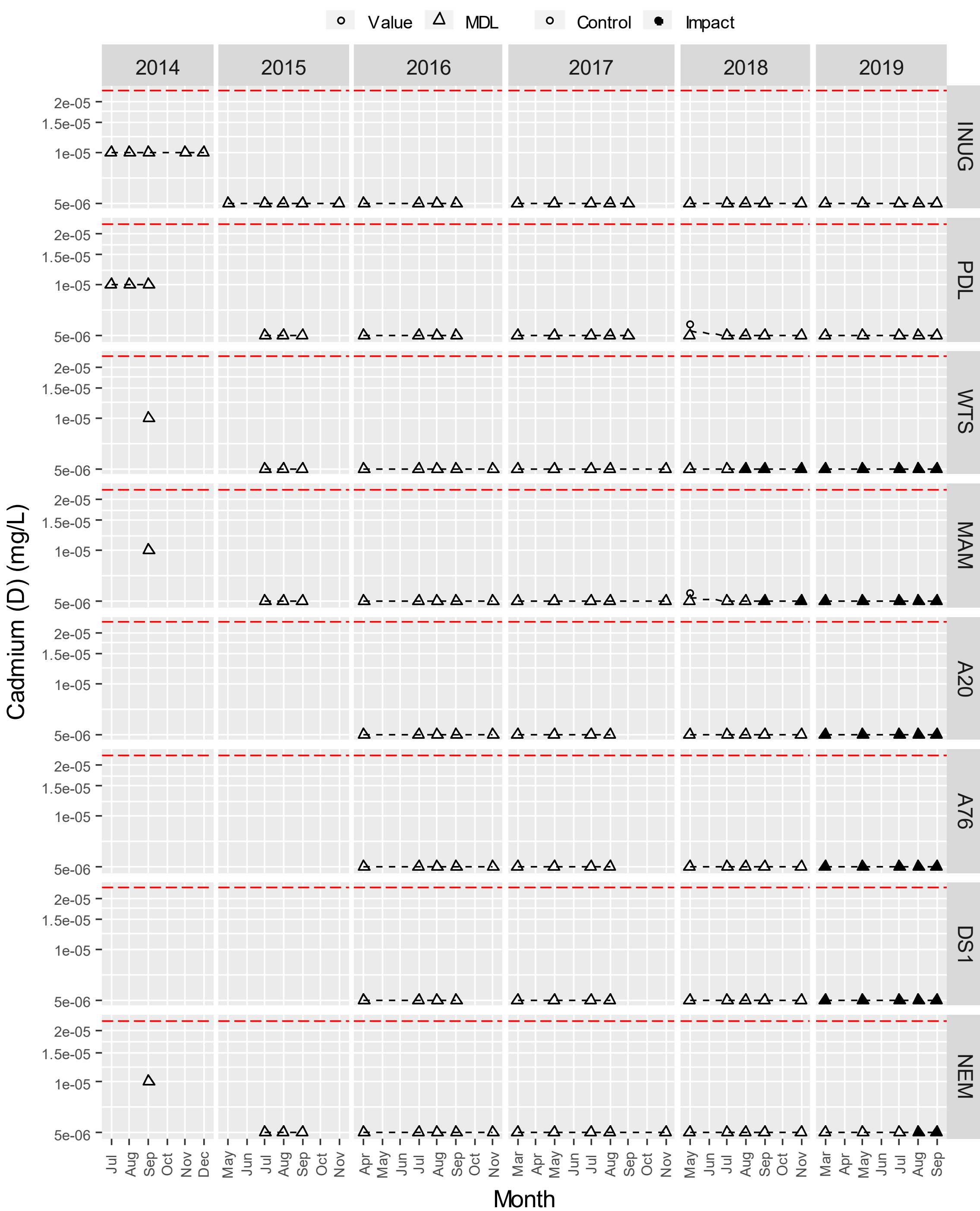


Figure B2 - 20. Dissolved mercury (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

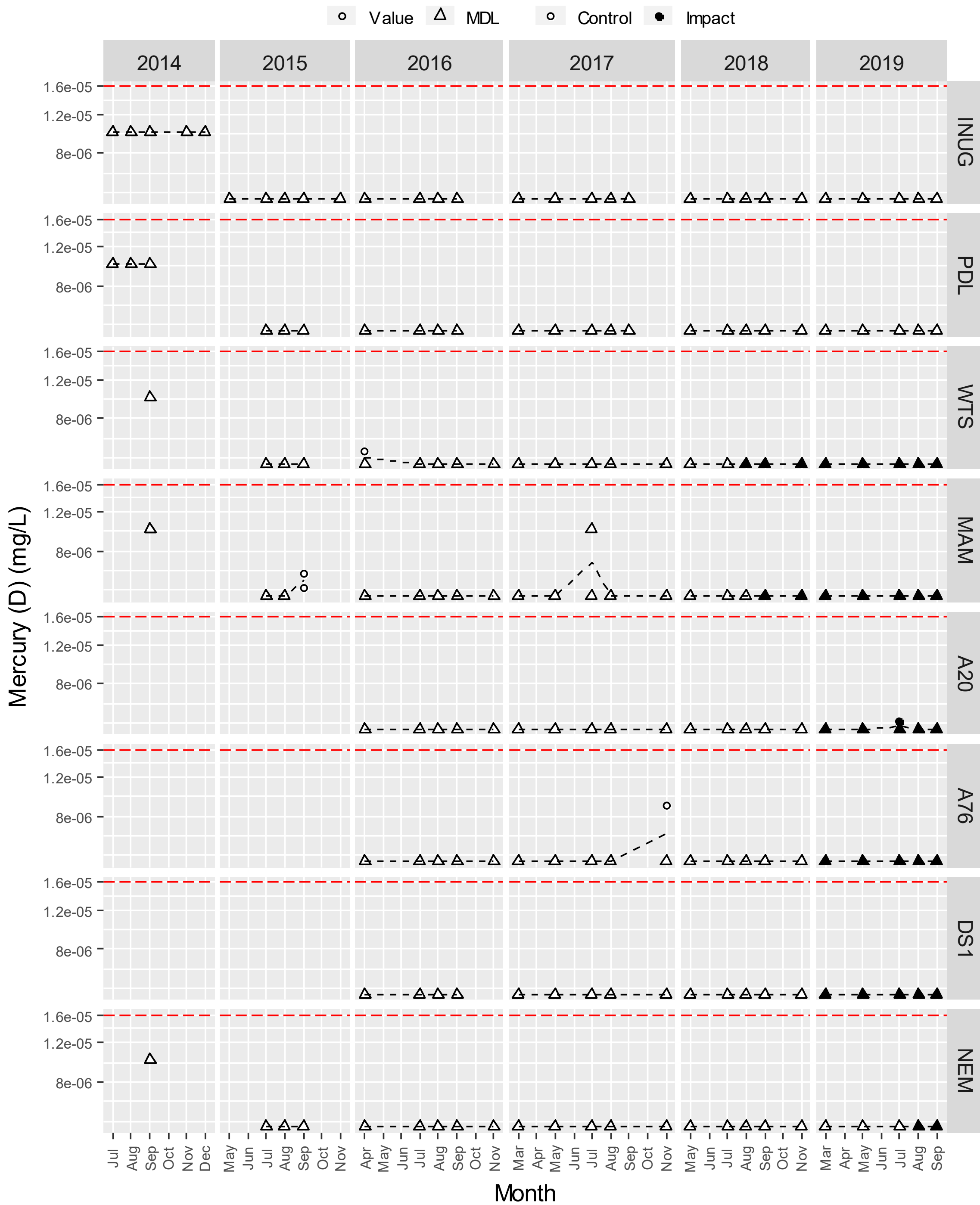


Figure B2 - 21. Dissolved selenium (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

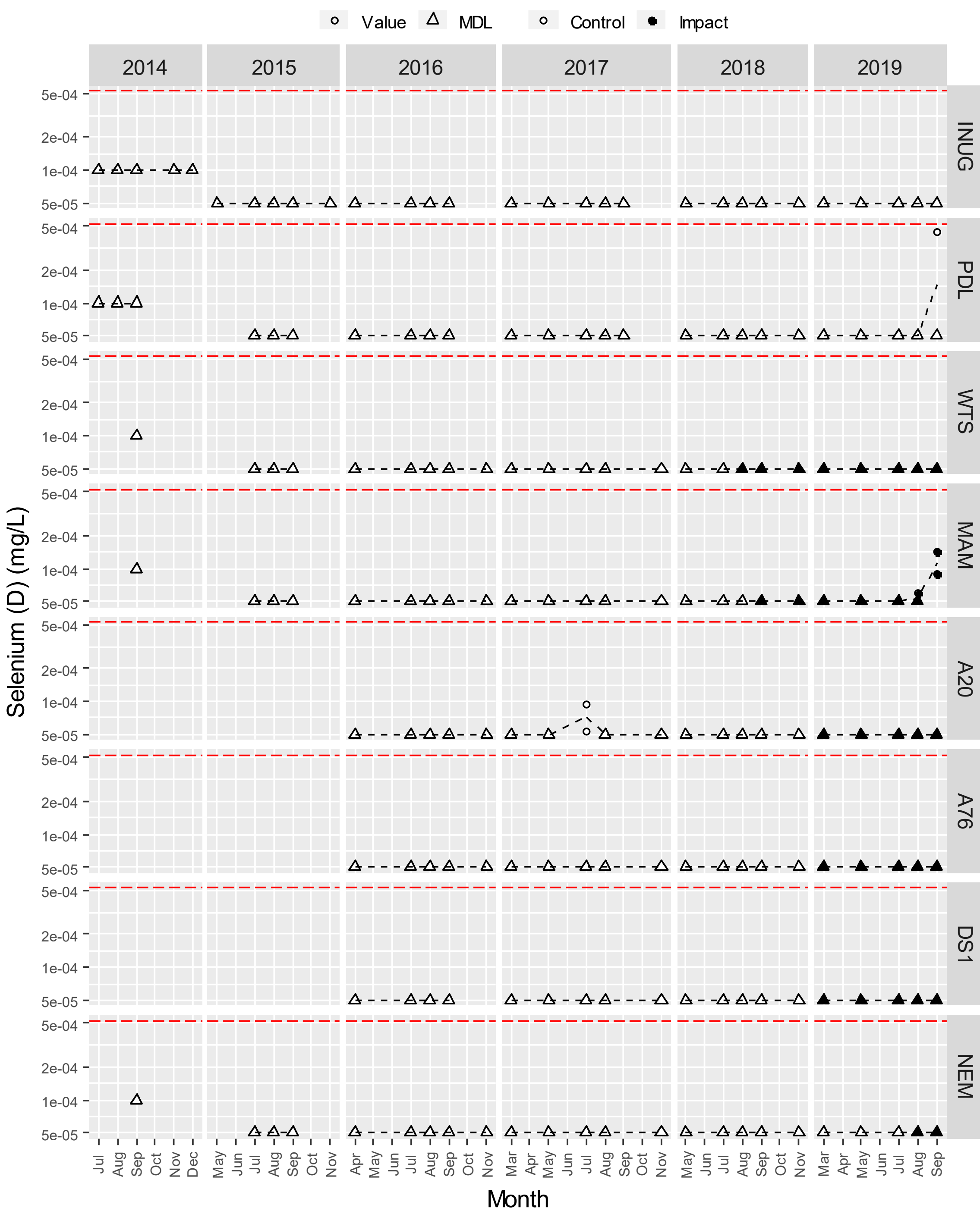


Figure B2 - 22. Dissolved silver (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

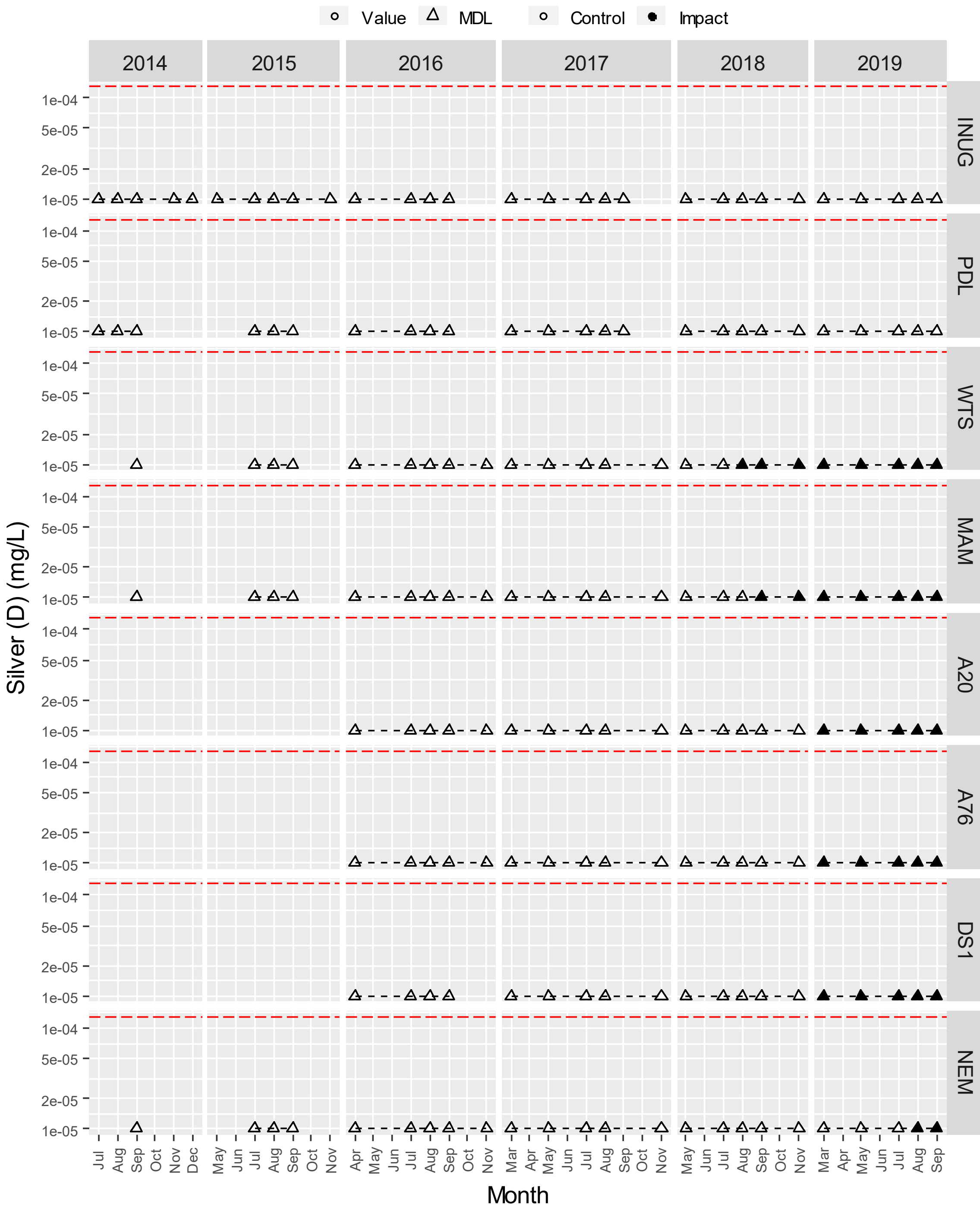


Figure B2 - 23. Dissolved thallium (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

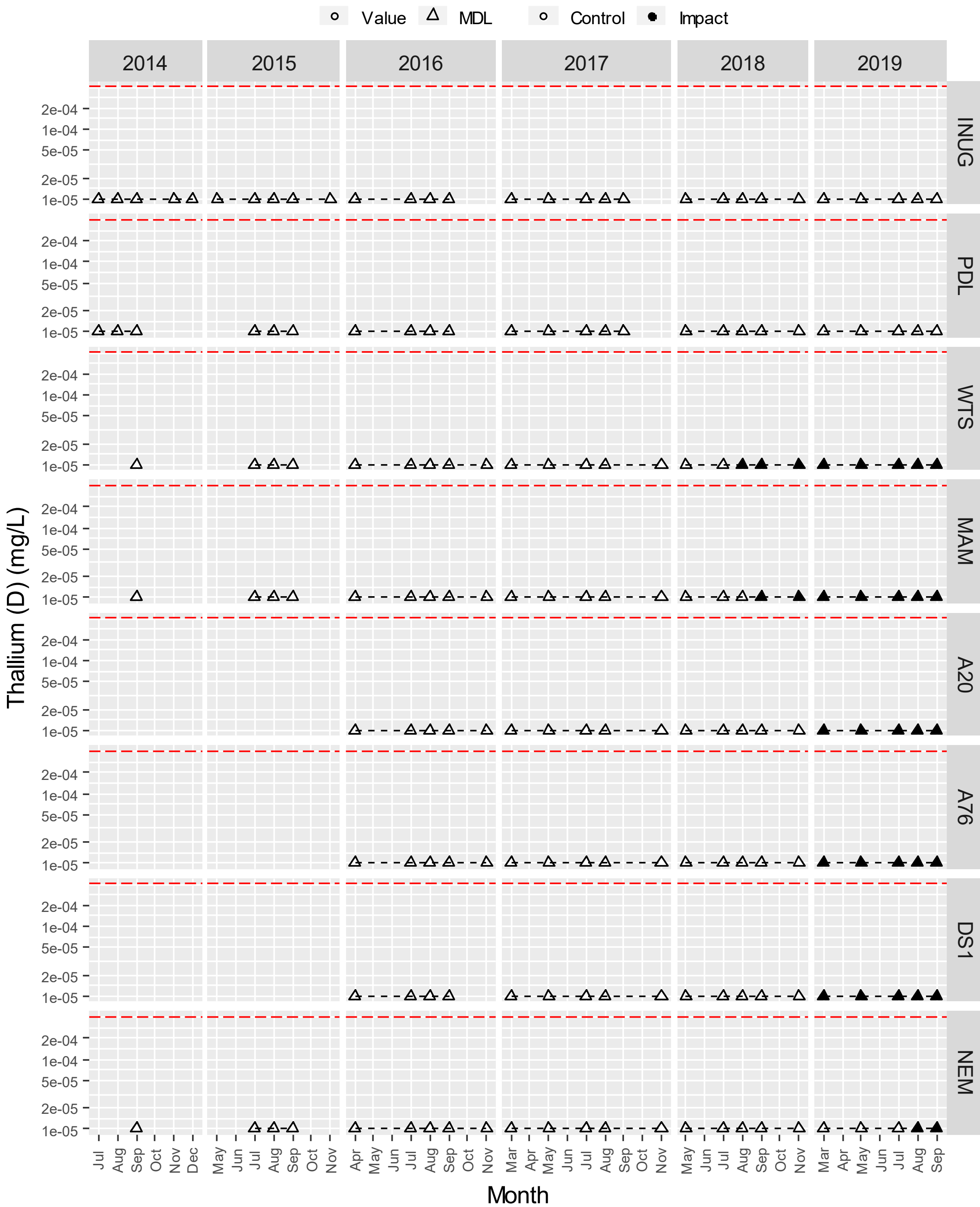


Figure B2 - 24. Dissolved tin (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

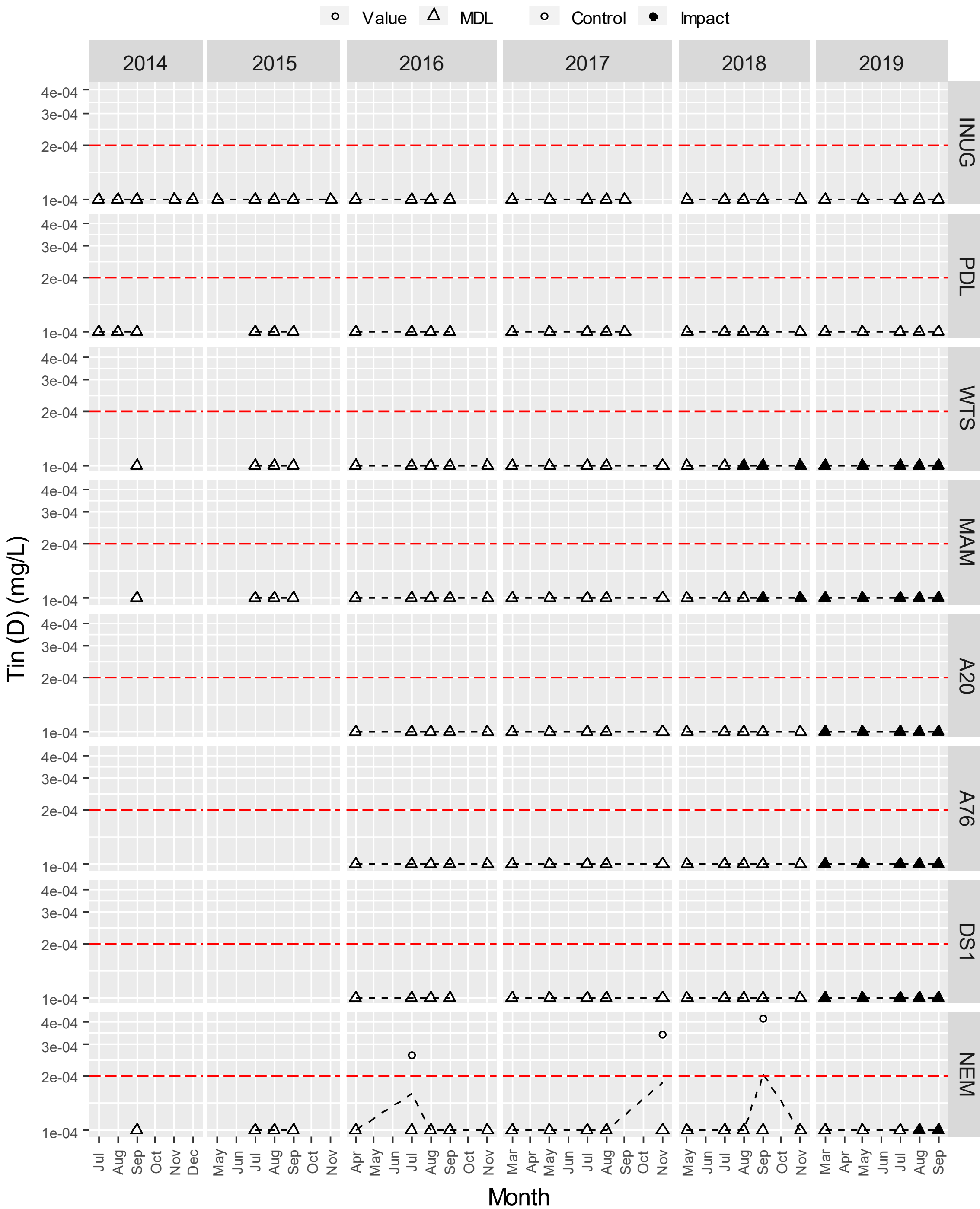


Figure B2 - 25. Dissolved titanium (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.

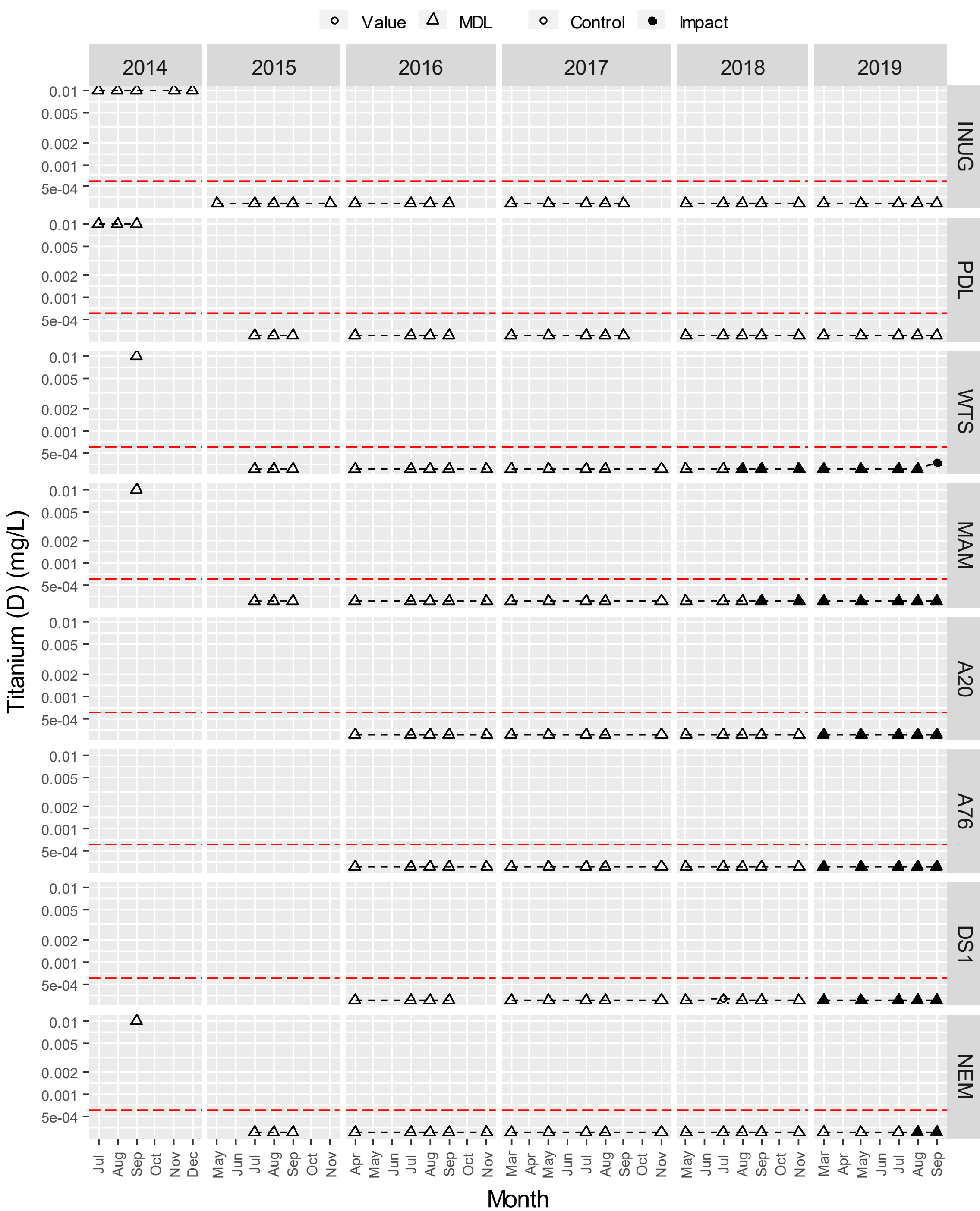
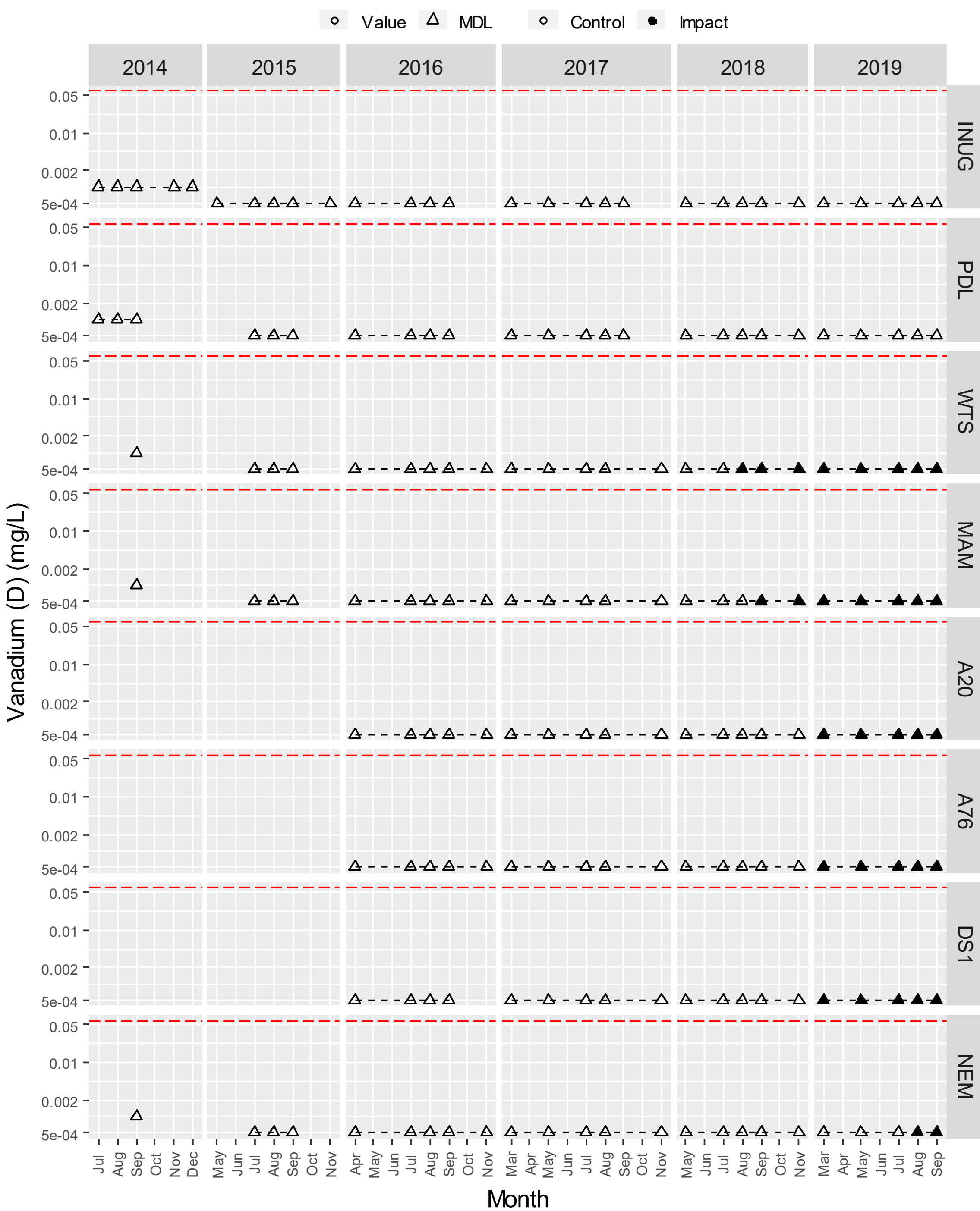


Figure B2 - 26. Dissolved vanadium (mg/L) in water samples from Whale Tail Pit since 2014.

Note: The red dashed line = trigger value.



Appendix B3
Water Chemistry – Baker Lake

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Table B3–1. Water quality results from the 2019 CREMP, Baker Lake.

Lake				Baker Lake					
Area (Station)				Akilahaarjuk Point (BAP)					
Area-Replicate ID				BAP-61	BAP-62	BAP-63	BAP-64	BAP-65	BAP-66
ALS Sample ID	Baker Lake Screening Values			L2324036-7	L2324036-8	L2331829-10	L2331829-11	L2354972-14	L2354972-15
Date	Aquatic Life	Trigger[2]	Threshold[2]	23-Jul-19	23-Jul-19	12-Aug-19	12-Aug-19	18-Sep-19	18-Sep-19
Time	Guideline[1]			13:26	13:56	13:20	15:00	14:30	15:00
Physical Tests (mg/L)									
Conductivity (µS/cm)		642		63	59	35	59	364	379
Hardness		65		14	13	12	13	41	44
pH (Laboratory)	6.5 - 9.0	6.75-8.05	6.5 - 9.0	7.2	7.2	7.3	7.3	7.2	7.2
Total Suspended Solids		3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids		245		38	35	28	53	194	216
Turbidity (NTU)				0.21	0.21	0.39	0.47	0.18	0.21
Anions and Nutrients (mg/L)									
Alkalinity - Bicarbonate		11		8.9	9.3	9.4	9.2	10	11
Alkalinity - Carbonate		2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		11		8.9	9.3	9.4	9.2	10	11
Ammonia (as N)[3]	***equation***	0.066	0.13	0.08	0.03	**0.077**	0.060	0.006	0.006
Bromide				<0.050	<0.050	<0.050	<0.050	0.32	0.34
Chloride	120	169	120	12	11	3.8	10	90	94
Fluoride	0.120	0.088	0.12	0.064	0.065	0.062	0.061	0.078	0.077
Nitrate (as N)	3.0	1.5	3.0	0.022	0.020	0.016	0.013	0.015	0.016
Nitrite (as N)	0.060	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.22		0.24	0.22	**0.24**	**0.22**	0.16	0.16
Ortho Phosphate (as P)		0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.				0.0036	0.0020	0.0021	0.0020	0.0023	0.0022
Phosphorus (P)-Total	0.0040	0.0075	0.0040	0.0030	0.0025	0.0039	0.0034	0.0035	0.0038
Silicate (as SiO_2)		1.0		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		66	128	2.1	1.9	0.88	2.0	14	14
Cyanides (mg/L)									
Total Cyanide				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005			<0.0010	<0.0010	0.0012	0.0014	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)									
Dissolved Organic Carbon		3.9		3.5	3.3	3.3	3.3	3.2	3.3
Total Organic Carbon		4.0		3.5	3.4	3.3	3.3	3.3	3.3
Plant Pigments (µg/L)									
Chlorophyll-*a*				0.54	0.75	1.7	1.2	1.7	1.6
Total Metals (mg/L)									
Aluminum[3]	***equation***	0.056	0.10	0.0094	0.0092	0.014	0.012	0.0053	0.0055
Antimony		0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.0026	0.0050	0.00015	0.00011	0.00011	0.00011	0.00012	0.00015
Barium		0.51	1.0	0.016	0.017	0.019	0.018	0.019	0.019
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.75	1.5	<0.010	<0.010	<0.010	<0.010	0.024	0.024
Cadmium[3]	***equation***	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		6.2		2.7	2.6	2.7	2.8	4.6	4.7
Chromium[4]	0.001	0.0025	0.0050	<0.00010	<0.00010	0.00011	<0.00010	<0.00050	<0.00050
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.0012	0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron	0.3	0.16	0.30	0.011	0.014	0.018	0.016	<0.010	<0.010
Lead[3]	***equation***	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0030	0.096	<0.0010	<0.0010	<0.0010	<0.0010	0.0017	0.0018
Magnesium		12		1.7	1.6	1.2	1.6	7.5	7.7
Manganese[3]		0.34	***equation***	0.0020	0.0036	0.0035	0.0030	0.00065	0.00062
Mercury	0.000026	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.073	0.00005	<0.000050	<0.000050	0.00005	0.00009	0.00011
Nickel[3]	***equation***	0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		3.9		0.63	0.57	0.45	0.55	2.2	2.3
Selenium	0.001	0.00053	0.0010	<0.000050	0.00005	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.28		0.21	0.20	0.26	0.18	0.16	0.17
Silver	0.0001	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		89		6.8	5.7	1.8	4.9	53	55
Strontium		0.083	0.049	0.023	0.021	0.021	0.023	**0.054**	**0.056**
Sulfur				0.64	0.67	<0.50	0.52	4.4	4.4
Thallium	0.0008	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060	2.0	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium	0.015	0.0075	0.015	0.00003	0.00004	0.00004	0.00005	0.00004	0.00004
Vanadium		0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.030	***see text***	***equation***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals (mg/L)									
Aluminum[3]		0.027	0.050	0.0048	0.0052	0.0057	0.0055	0.003	0.004
Antimony		0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.0026	0.0050	0.00011	0.00011	<0.00010	0.00011	0.00012	0.00012
Barium		0.51	1.0	0.017	0.017	0.019	0.018	0.019	0.019
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.75	1.5	<0.010	<0.010	<0.010	<0.010	0.024	0.026
Cadmium		0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		6.2		2.8	2.7	2.7	2.8	4.6	4.7
Chromium		0.00026	0.0050	<0.00010	<0.00010	0.00014	0.00013	<0.00010	<0.00010
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.0011	0.0020	0.00021	0.00024	0.00028	0.00029	0.00027	0.00027
Iron		0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Lead		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0022	0.096	<0.0010	<0.0010	<0.0010	<0.0010	0.0016	0.0017
Magnesium		12		1.7	1.6	1.2	1.6	7.1	7.8
Manganese[3]		0.34	***equation***	0.0020	0.0020	0.00020	0.00019	0.00016	0.0012
Mercury		0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.073	0.00005	<0.000050	0.00005	<0.000050	0.00010	0.00011
Nickel		0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		3.9		0.64	0.61	0.48	0.59	2.3	2.4
Selenium		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	0.00009	0.00013
Silicon		0.25		0.17	0.18	0.18	0.17	0.14	0.13
Silver		0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		89		6.6	5.8	1.8	5.1	52	55
Strontium		0.86	1.7	0.023	0.022	0.020	0.022	0.055	0.054
Sulfur				0.62	0.74	<0.50	<0.50	4.4	4.6
Thallium		0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.015	0.00003	0.00004	0.00004	0.00004	0.00005	0.00004
Vanadium		0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0042	***equation***	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d).

A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the *CREMP: 2015 Plan Update* (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123	Bolded concentrations exceed the trigger value.
123	Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.3** Main Report for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table B3–1. Water quality results from the 2019 CREMP, Baker Lake.

Lake				Baker Lake					
Area (Station)				Barge Dock (BBD)					
Area-Replicate ID				BBD-61	BBD-62	BBD-63	BBD-64	BBD-65	BBD-66
ALS Sample ID	Baker Lake Screening Values			L2324036-3	L2324036-4	L2331829-6	L2331829-7	L2354972-10	L2354972-11
Date	Aquatic Life Guideline[1]	Trigger[2]	Threshold[2]	23-Jul-19	23-Jul-19	12-Aug-19	12-Aug-19	18-Sep-19	18-Sep-19
Time				11:00	11:40	16:50	17:05	10:30	11:05
Physical Tests (mg/L)									
Conductivity (µS/cm)		642		52	57	45	69	50	79
Hardness		65		13	13	13	15	13	15
pH (Laboratory)	6.5 - 9.0	6.75-8.05	6.5 - 9.0	7.3	7.3	7.3	7.3	7.2	7.2
Total Suspended Solids		3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids		245		31	33	33	49	33	46
Turbidity (NTU)				0.27	0.25	0.39	0.35	0.51	0.34
Anions and Nutrients (mg/L)									
Alkalinity - Bicarbonate		11		9.4	9.1	9.4	10	9.7	9.5
Alkalinity - Carbonate		2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		11		9.4	9.1	9.4	10	9.7	9.5
Ammonia (as N)[3]	***equation***	0.066	0.13	0.09	<0.0050	**0.13**	**0.20**	<0.0050	0.006
Bromide				<0.050	<0.050	<0.050	<0.050	<0.050	0.061
Chloride	120	169	120	8.6	9.8	6.4	13	7.9	15
Fluoride	0.120	0.088	0.12	0.063	0.064	0.060	0.061	0.064	0.061
Nitrate (as N)	3.0	1.5	3.0	0.017	0.020	0.020	0.020	0.016	0.018
Nitrite (as N)	0.060	0.031	0.060	0.0017	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.22		0.25	0.20	**0.28**	**0.34**	0.16	0.17
Ortho Phosphate (as P)		0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.				<0.0020	0.0020	0.0026	<0.0020	0.0022	0.0022
Phosphorus (P)-Total	0.0040	0.0075	0.0040	0.0036	0.0036	**0.0047**	**0.0046**	**0.0043**	**0.0050**
Silicate (as SiO_2)		1.0		<0.50	<2.5	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		66	128	1.7	1.8	1.4	2.2	1.6	2.7
Cyanides (mg/L)									
Total Cyanide				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005			<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)									
Dissolved Organic Carbon		3.9		3.4	3.3	3.2	3.3	3.5	3.4
Total Organic Carbon		4.0		3.4	3.5	3.3	3.3	**5.9**	3.3
Plant Pigments (µg/L)									
Chlorophyll-*a*				0.64	0.57	1.3	1.2	1.4	1.3
Total Metals (mg/L)									
Aluminum[3]	***equation***	0.056	0.10	0.012	0.012	0.011	0.012	0.018	0.014
Antimony		0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.0026	0.0050	0.00011	0.00012	0.00011	0.00013	0.00015	0.00013
Barium		0.51	1.0	0.017	0.017	0.019	0.019	0.020	0.020
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.75	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		6.2		2.6	2.6	2.8	2.9	2.8	2.9
Chromium[4]	0.001	0.0025	0.0050	<0.00010	0.00013	<0.00010	0.00012	<0.00040	<0.00040
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.0012	0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron	0.3	0.16	0.30	0.017	0.017	0.018	0.019	0.018	0.020
Lead[3]	***equation***	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0030	0.096	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	0.0011
Magnesium		12		1.6	1.6	1.4	1.8	1.5	2.0
Manganese[3]		0.34	***equation***	0.0035	0.0036	0.0040	0.0041	0.0017	0.0019
Mercury	0.000026	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.073	<0.000050	<0.000050	0.00005	0.00006	<0.000050	0.00005
Nickel[3]	***equation***	0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		3.9		0.55	0.56	0.50	0.62	0.57	0.73
Selenium	0.001	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.28		0.19	0.21	0.20	0.20	0.15	0.15
Silver	0.0001	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		89		5.1	5.5	3.3	6.6	4.4	8.8
Strontium		0.083	0.049	0.021	0.022	0.023	0.025	0.020	0.023
Sulfur				0.68	0.67	<0.50	0.55	0.54	0.87
Thallium	0.0008	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060	2.0	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium	0.015	0.0075	0.015	0.00004	0.00004	0.00004	0.00005	0.00004	0.00004
Vanadium		0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.030	***see text***	***equation***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals (mg/L)									
Aluminum[3]		0.027	0.050	0.0057	0.0056	0.0064	0.0061	0.006	0.006
Antimony		0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.0026	0.0050	0.00012	0.00010	0.00010	0.00010	<0.00010	0.00010
Barium		0.51	1.0	0.017	0.016	0.019	0.018	0.019	0.019
Beryllium		0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.75	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		6.2		2.7	2.6	2.8	2.9	2.8	2.9
Chromium		0.00026	0.0050	<0.00010	<0.00010	0.00013	0.00015	<0.00010	<0.00010
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.0011	0.0020	0.00025	0.00024	0.00029	0.00029	0.00025	0.00024
Iron		0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0022	0.096	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010
Magnesium		12		1.4	1.5	1.4	1.8	1.5	2.0
Manganese[3]		0.34	***equation***	0.0022	0.0022	0.00088	0.0011	0.00035	0.00064
Mercury		0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.073	<0.000050	<0.000050	<0.000050	0.00005	0.00005	0.00006
Nickel		0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		3.9		0.56	0.56	0.53	0.67	0.60	0.73
Selenium		0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	0.00024	0.00017
Silicon		0.25		0.16	0.15	0.19	0.20	0.11	0.098
Silver		0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		89		4.5	4.9	3.3	6.9	4.2	8.5
Strontium		0.86	1.7	0.021	0.021	0.021	0.023	0.021	0.023
Sulfur				0.78	0.94	<0.50	0.66	<0.50	0.83
Thallium		0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.00020		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		0.00060		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.015	0.00004	0.00004	0.00005	0.00004	0.00004	0.00004
Vanadium		0.060	0.12	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0042	***equation***	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d).

A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the *CREMP: 2015 Plan Update* (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.3** Main Report for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table B3–1. Water quality results from the 2019 CREMP, Baker Lake.

Lake				Baker Lake					
Area (Station)				Proposed Jetty (BPJ)					
Area-Replicate ID	Baker Lake Screening Values			BPJ61	BPJ-62	BPJ-63	BPJ-64	BPJ-65	BPJ-66
ALS Sample ID				L2324036-5	L2324036-6	L2331829-8	L2331829-9	L2354972-12	L2354972-13
Date	Aquatic Life Guideline[1]	Trigger[2]	Threshold[2]	23-Jul-19	23-Jul-19	12-Aug-19	12-Aug-19	18-Sep-19	18-Sep-19
Time				12:20	12:47	16:11	15:20	12:30	13:10
Physical Tests (mg/L)									
Conductivity (µS/cm)		642		40	142	68	68	286	345
Hardness		65		12	19	15	14	33	38
pH (Laboratory)	6.5 - 9.0	6.75-8.05	6.5 - 9.0	7.3	7.3	7.3	7.2	7.2	7.2
Total Suspended Solids		3.0	5.0	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Total Dissolved Solids		245		26	73	57	55	159	173
Turbidity (NTU)				0.19	0.24	0.29	0.33	0.22	0.19
Anions and Nutrients (mg/L)									
Alkalinity - Bicarbonate		11		9.1	9.3	9.6	9.7	9.9	11
Alkalinity - Carbonate		2.0		*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Alkalinity - Hydroxide				*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Alkalinity - Total		11		9.1	9.3	9.6	9.7	9.9	11
Ammonia (as N)[3]	***equation***	0.066	0.13	0.05	*<0.0050*	**0.32**	**0.093**	0.006	0.006
Bromide				*<0.050*	0.12	0.052	0.059	0.25	0.31
Chloride	120	169	120	5.7	33	13	13	70	85
Fluoride	0.120	0.088	0.12	0.064	0.068	0.062	0.060	0.072	0.075
Nitrate (as N)	3.0	1.5	3.0	0.021	0.026	0.019	0.019	0.017	0.017
Nitrite (as N)	0.060	0.031	0.060	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Total Kjeldahl Nitrogen		0.22		0.25	0.22	**0.46**	**0.23**	0.16	0.17
Ortho Phosphate (as P)		0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P)-Total Diss.				*<0.0020*	0.0021	0.0030	0.0022	*<0.0020*	*<0.0020*
Phosphorus (P)-Total	0.0040	0.0075	0.0040	0.0038	0.0038	**0.0048**	**0.0045**	**0.0048**	0.0039
Silicate (as SiO_2)		1.0		*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Sulphate (SO_4)		66	128	1.2	5.2	2.3	2.3	11	13
Cyanides (mg/L)									
Total Cyanide				*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Free Cyanide	0.005			*<0.0010*	*<0.0010*	*<0.0010*	0.0016	*<0.0010*	*<0.0010*
Organic / Inorganic Carbon (mg/L)									
Dissolved Organic Carbon		3.9		3.4	3.3	3.2	3.3	3.6	3.2
Total Organic Carbon		4.0		3.4	3.4	3.4	3.4	3.7	3.5
Plant Pigments (µg/L)									
Chlorophyll-*a*				0.58	0.51	1.3	1.2	1.4	1.7
Total Metals (mg/L)									
Aluminum[3]	***equation***	0.056	0.10	0.0070	0.0096	0.012	0.012	0.0082	0.0066
Antimony		0.0046	0.0090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.0050	0.0026	0.0050	0.00013	0.00013	0.00012	0.00011	0.00015	0.00014
Barium		0.51	1.0	0.018	0.018	0.019	0.019	0.020	0.020
Beryllium		0.00012	0.00013	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Bismuth				*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	1.5	0.75	1.5	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.018	0.021
Cadmium[3]	***equation***	0.00002	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		6.2		2.6	3.1	2.9	2.9	4.2	4.4
Chromium[4]	0.001	0.0025	0.0050	*<0.00010*	*<0.00010*	*<0.00010*	0.00010	*<0.00050*	*<0.00050*
Cobalt				*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.0012	0.0020	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Iron	0.3	0.16	0.30	*<0.010*	0.018	0.017	0.018	*<0.010*	*<0.010*
Lead[3]	***equation***	0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.0030	0.096	*<0.0010*	0.0011	0.0010	0.0010	0.0016	0.0017
Magnesium		12		1.4	3.2	1.8	1.8	6.1	7.0
Manganese[3]		0.34	***equation***	0.0017	0.0043	0.0034	0.0033	0.0011	0.0009
Mercury	0.000026	0.00002	0.00003	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.037	0.073	*<0.000050*	0.00007	0.00006	0.00006	0.00009	0.00010
Nickel[3]	***equation***	0.013	0.025	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus				*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		3.9		0.50	0.94	0.60	0.61	1.8	2.1
Selenium	0.001	0.00053	0.0010	0.00006	0.00005	*<0.000050*	*<0.000050*	*<0.000050*	0.00005
Silicon		0.28		0.20	0.21	0.19	0.21	0.15	0.17
Silver	0.0001	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		89		3.3	17	6.6	6.5	42	48
Strontium		0.083	0.049	0.020	0.029	0.025	0.026	0.046	**0.051**
Sulfur				*<0.50*	1.7	0.57	0.61	3.4	4.6
Thallium	0.0008	0.00041	0.00080	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Tin		0.00020		*<0.00010*	*<0.00010*	*<0.00010*	0.00018	*<0.00010*	*<0.00010*
Titanium		0.00060	2.0	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Uranium	0.015	0.0075	0.015	0.00003	0.00004	0.00005	0.00005	0.00004	0.00005
Vanadium		0.060	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]	0.030	***see text***	***equation***	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Dissolved Metals (mg/L)									
Aluminum[3]		0.027	0.050	0.0046	0.0043	0.0077	0.0061	0.004	0.004
Antimony		0.0046	0.0090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic		0.0026	0.0050	0.00011	0.00010	0.00010	*<0.00010*	0.00012	0.00011
Barium		0.51	1.0	0.017	0.018	0.019	0.018	0.019	0.020
Beryllium		0.00012	0.00013	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Bismuth				*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron		0.75	1.5	*<0.010*	0.011	*<0.010*	*<0.010*	0.019	0.023
Cadmium		0.00002	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		6.2		2.6	3.1	2.9	2.8	4.1	4.4
Chromium		0.00026	0.0050	*<0.00010*	*<0.00010*	0.00013	0.00010	*<0.00010*	*<0.00010*
Cobalt				*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper		0.0011	0.0020	0.00022	0.00027	0.00029	0.00030	0.00027	0.00025
Iron		0.16	0.30	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Lead		0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.0022	0.096	*<0.0010*	0.0011	0.0010	*<0.0010*	0.0015	0.0016
Magnesium		12		1.3	2.9	1.8	1.8	5.5	6.5
Manganese[3]		0.34	***equation***	0.0022	0.0029	0.00043	0.00034	0.00030	0.00022
Mercury		0.00002	0.00003	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum		0.037	0.073	*<0.000050*	0.00007	0.00006	0.00005	0.00010	0.00009
Nickel		0.013	0.025	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus				*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		3.9		0.53	0.93	0.65	0.66	1.8	2.1
Selenium		0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	0.00014	0.00013
Silicon		0.25		0.16	0.17	0.17	0.17	0.12	0.12
Silver		0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		89		3.3	16	6.7	6.9	39	46
Strontium		0.86	1.7	0.021	0.029	0.024	0.024	0.046	0.049
Sulfur				*<0.50*	1.4	0.53	*<0.50*	3.5	3.7
Thallium		0.00041	0.00080	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Tin		0.00020		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		0.00060		*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Uranium		0.0075	0.015	0.00003	0.00004	0.00004	0.00004	0.00005	0.00004
Vanadium		0.060	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]		0.0042	***equation***	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d).

A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the *CREMP: 2015 Plan Update* (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.3** Main Report for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

FIGURES

Figure B3 - 1. Carbonate alkalinity (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

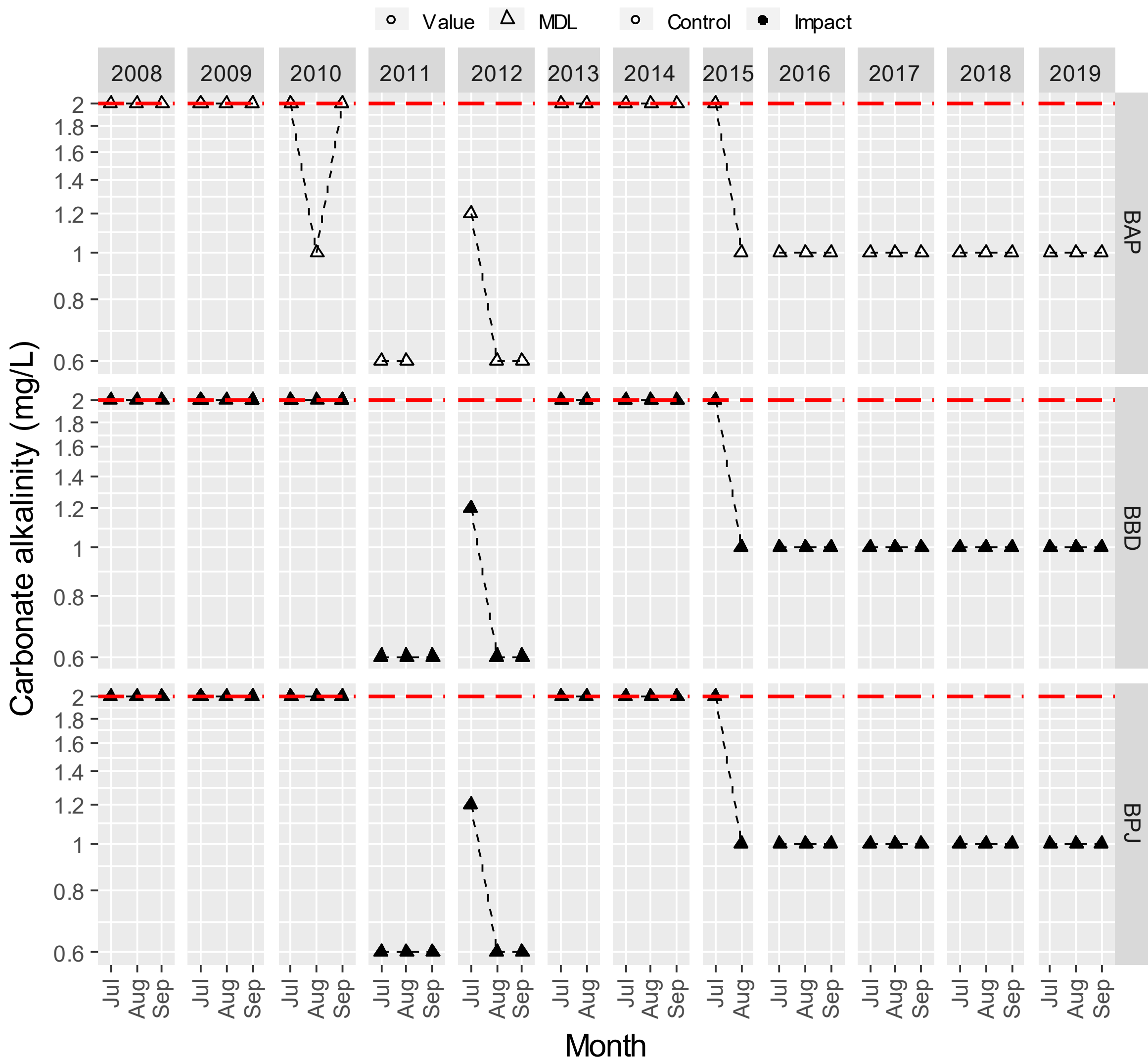


Figure B3 - 2. Nitrite (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

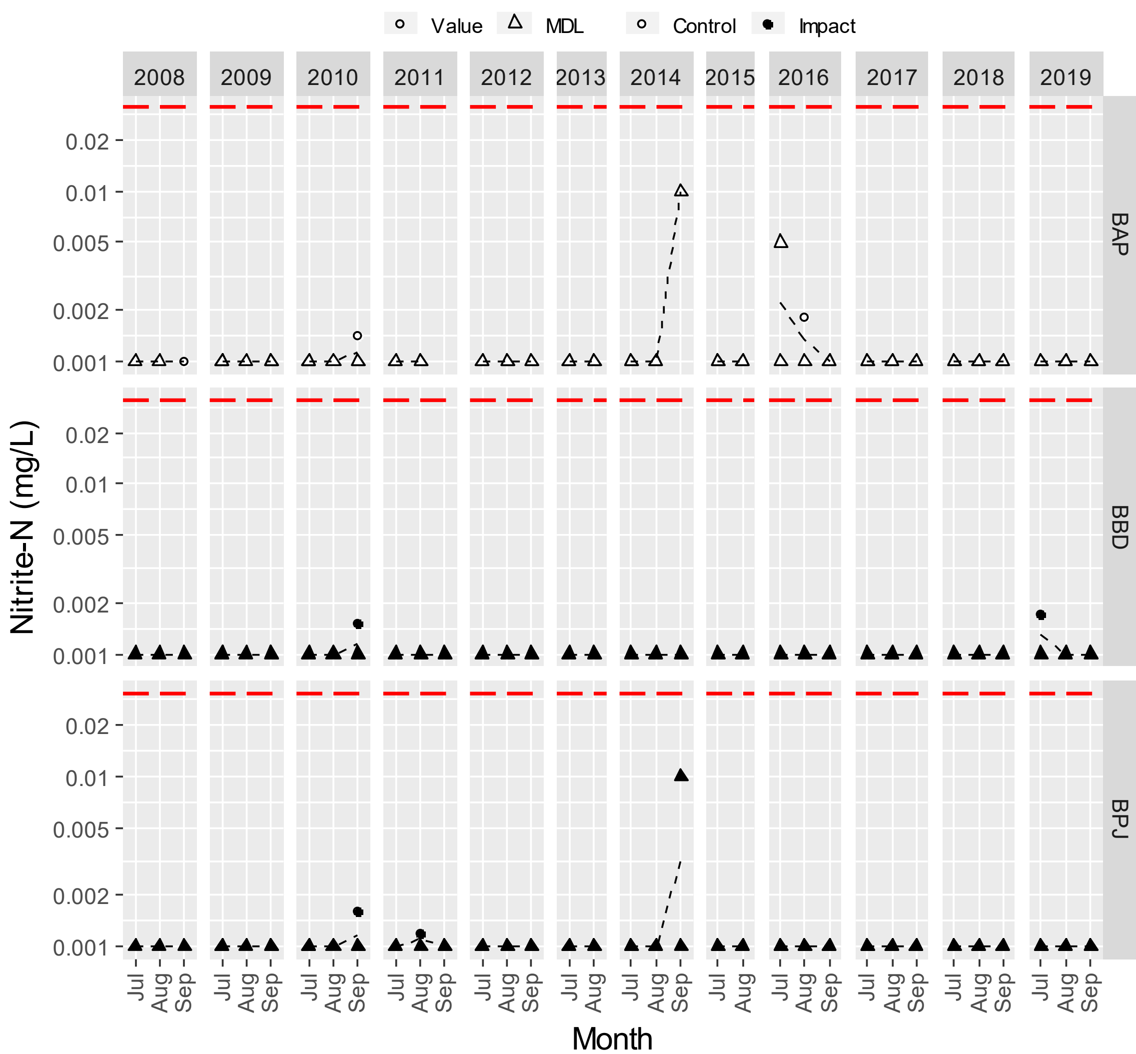


Figure B3 - 3. Total cyanide (mg/L) in water samples from Baker Lake since 2008.

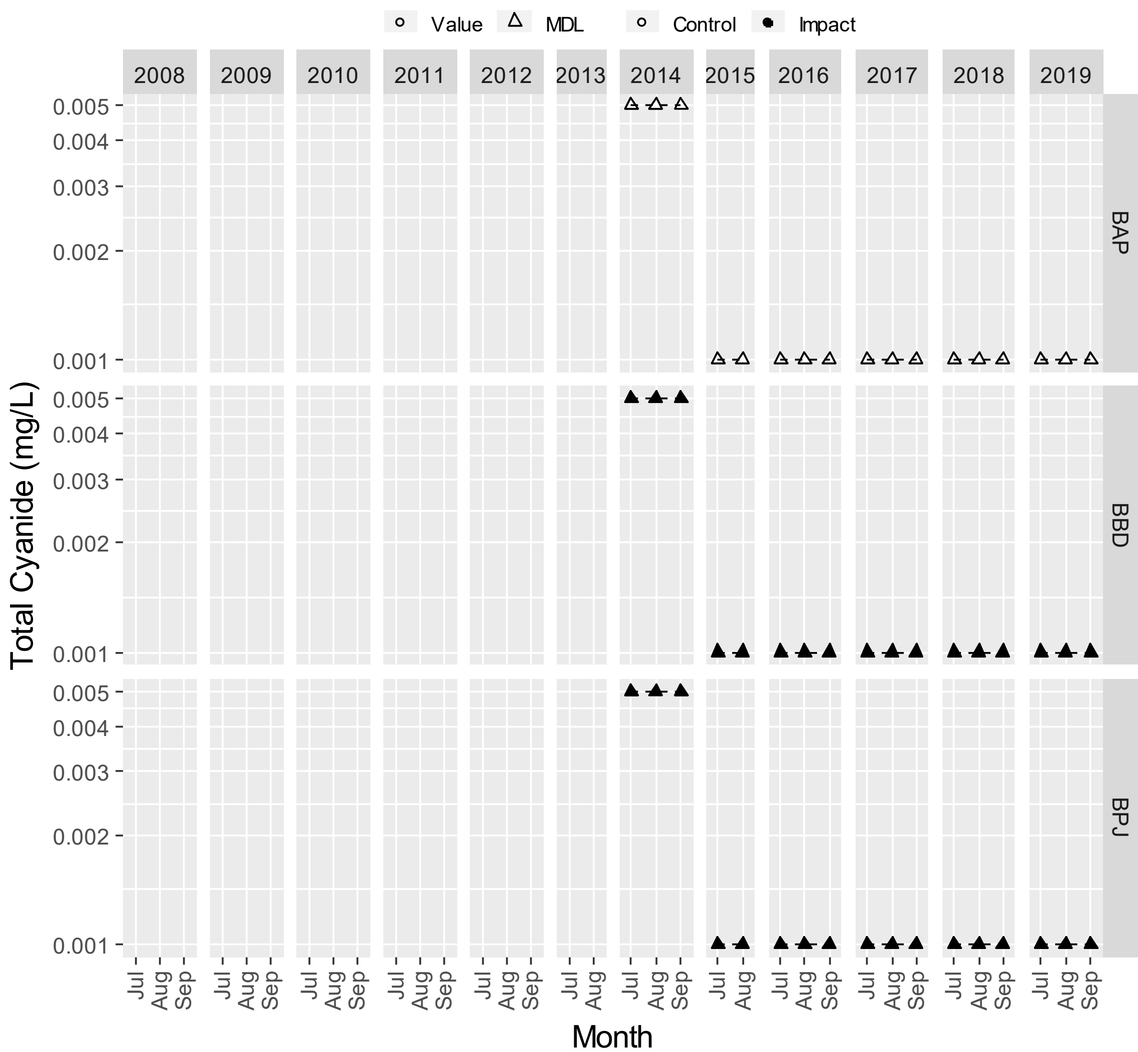


Figure B3 - 4. Free cyanide (mg/L) in water samples from Baker Lake since 2008.

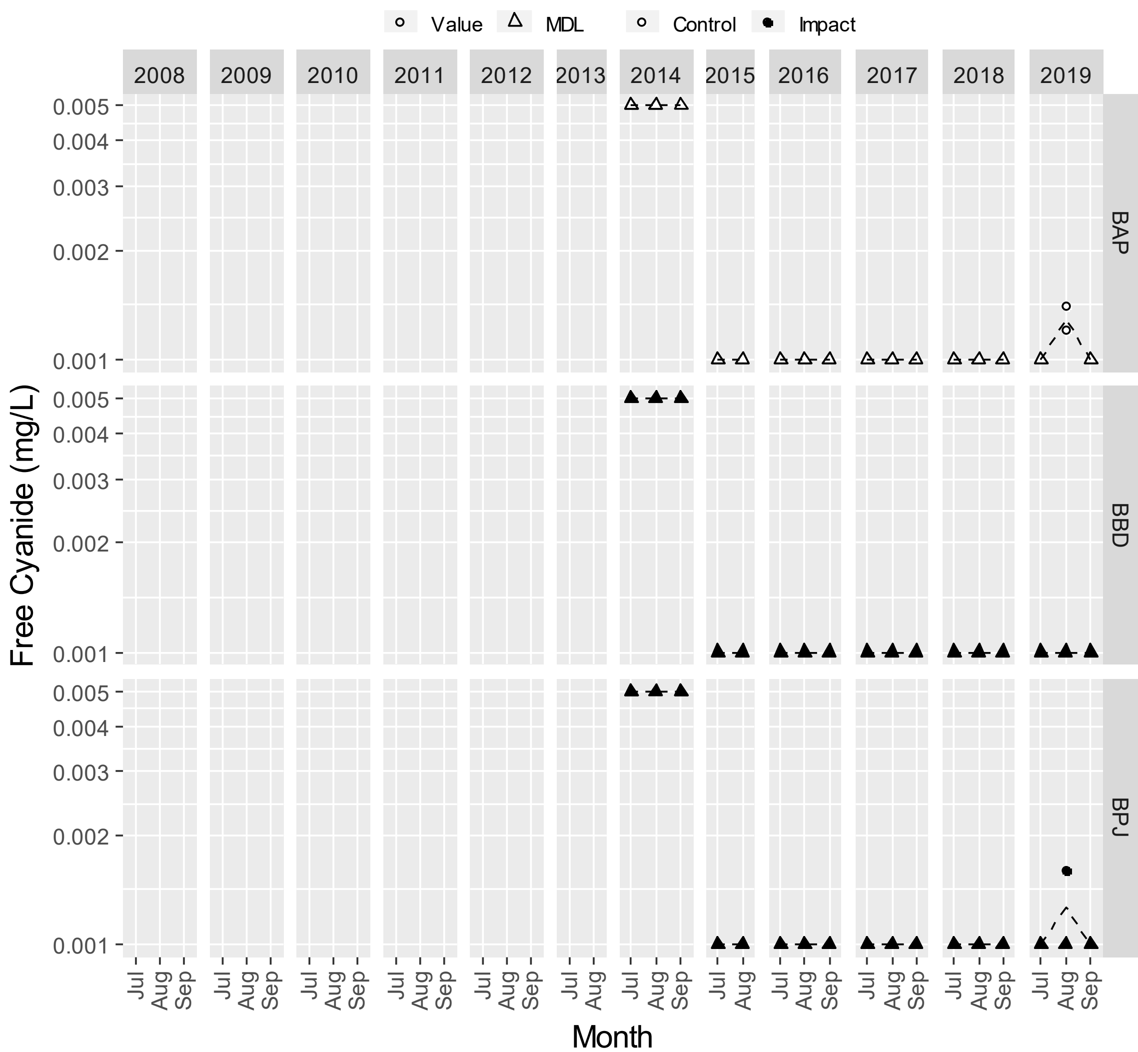


Figure B3 - 5. Total antimony (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

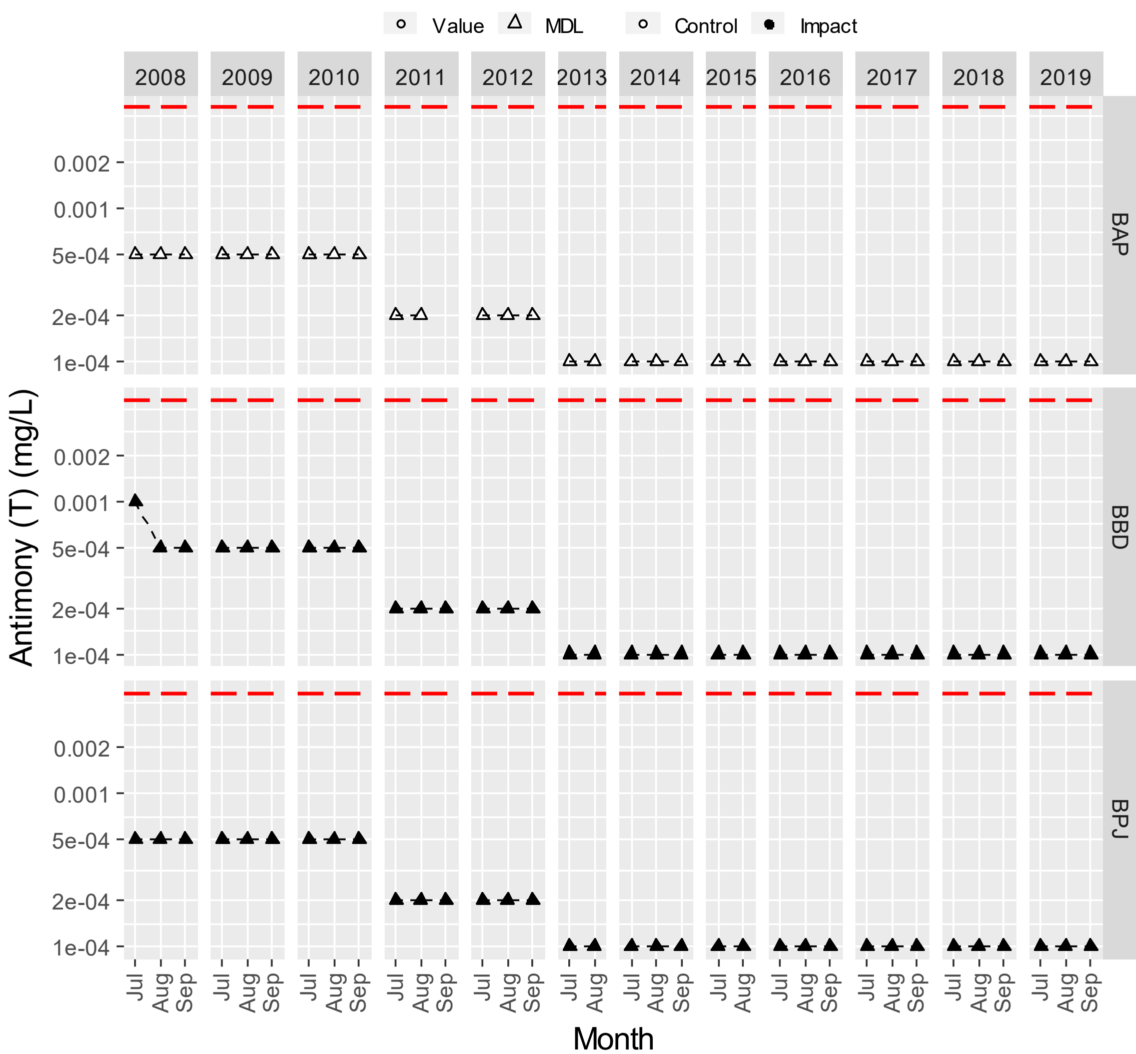


Figure B3 - 6. Total beryllium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

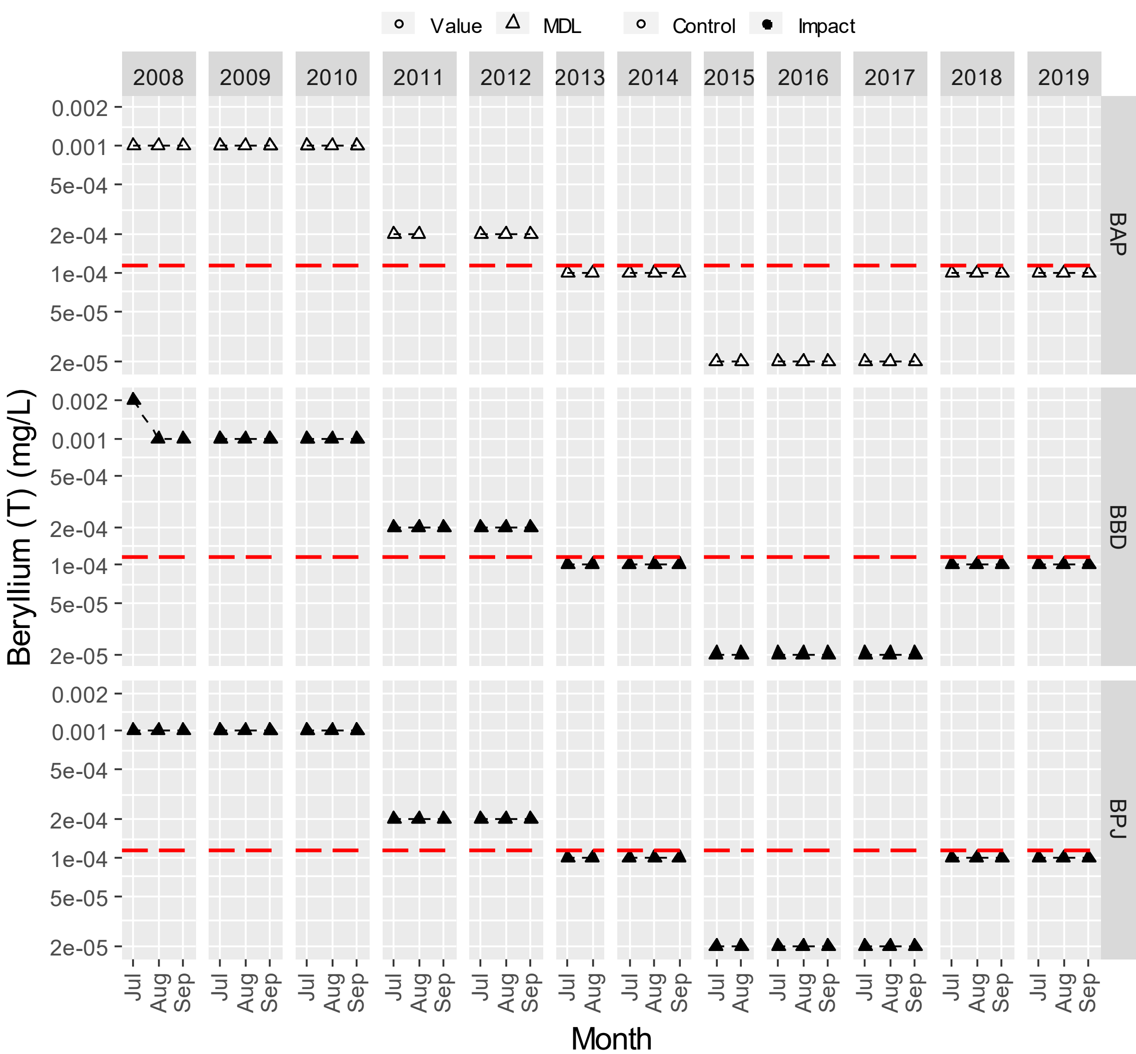


Figure B3 - 7. Total cadmium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

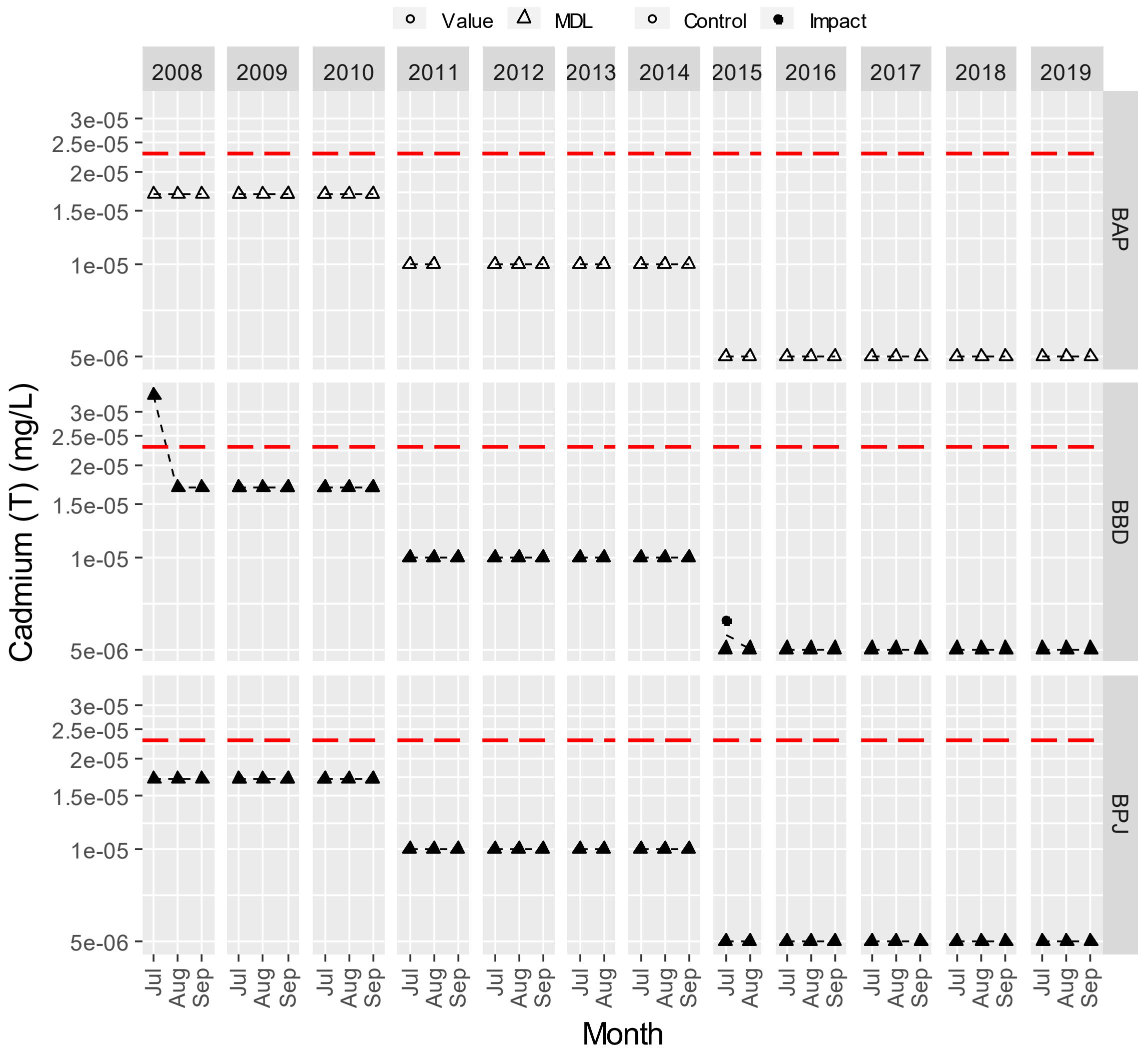


Figure B3 - 8. Total lead (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

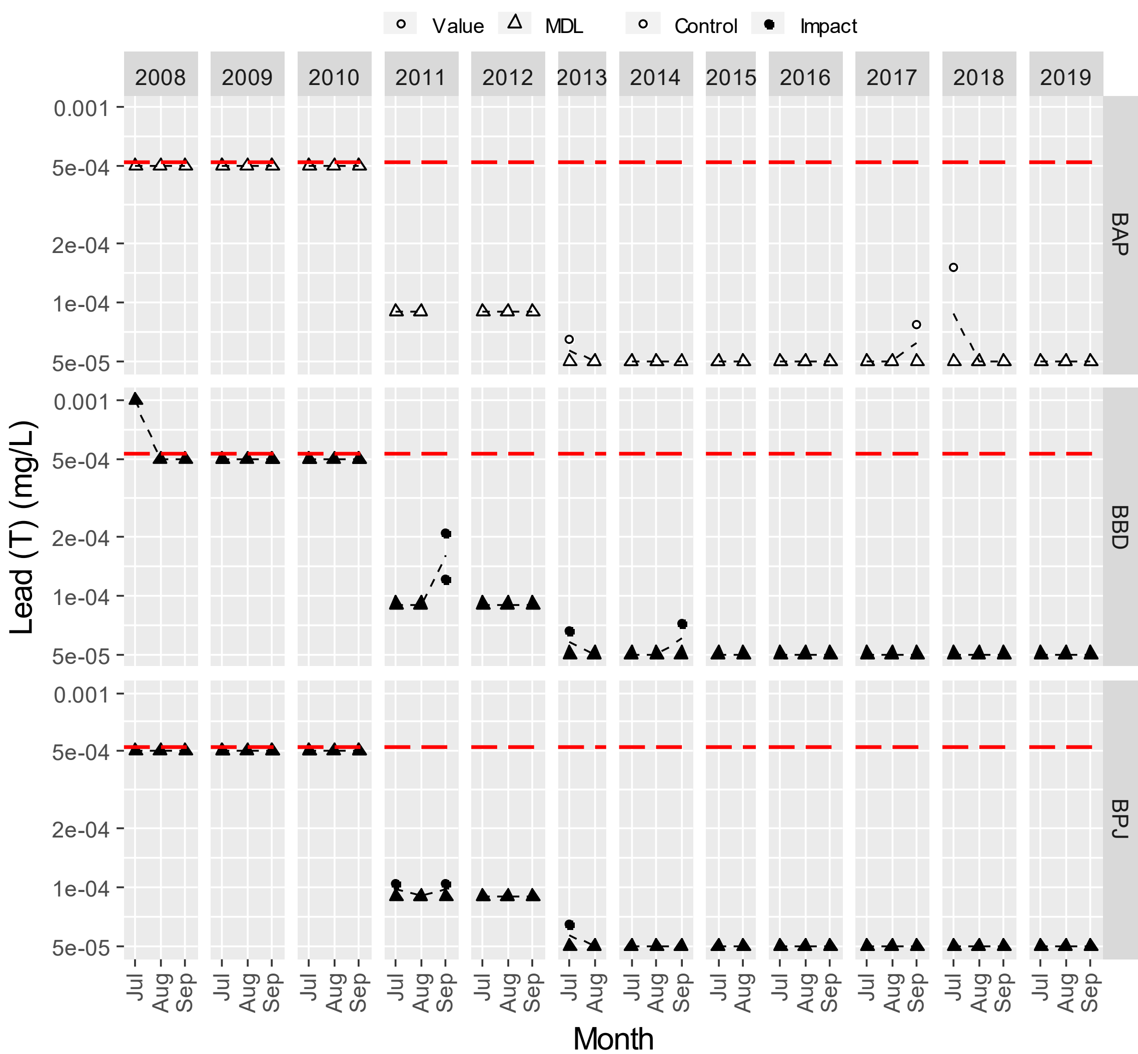


Figure B3 - 9. Total mercury (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

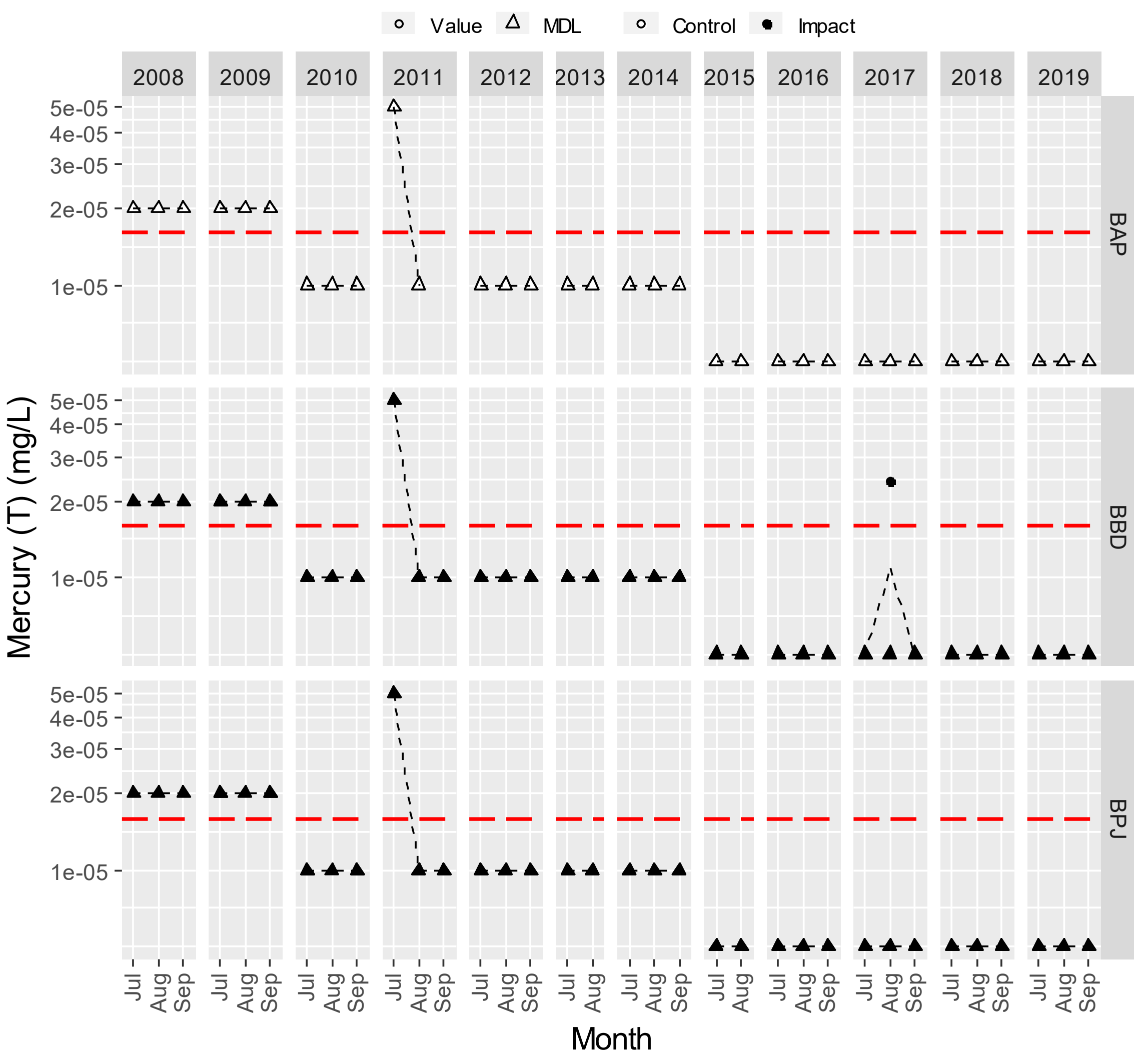


Figure B3 - 10. Total nickel (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

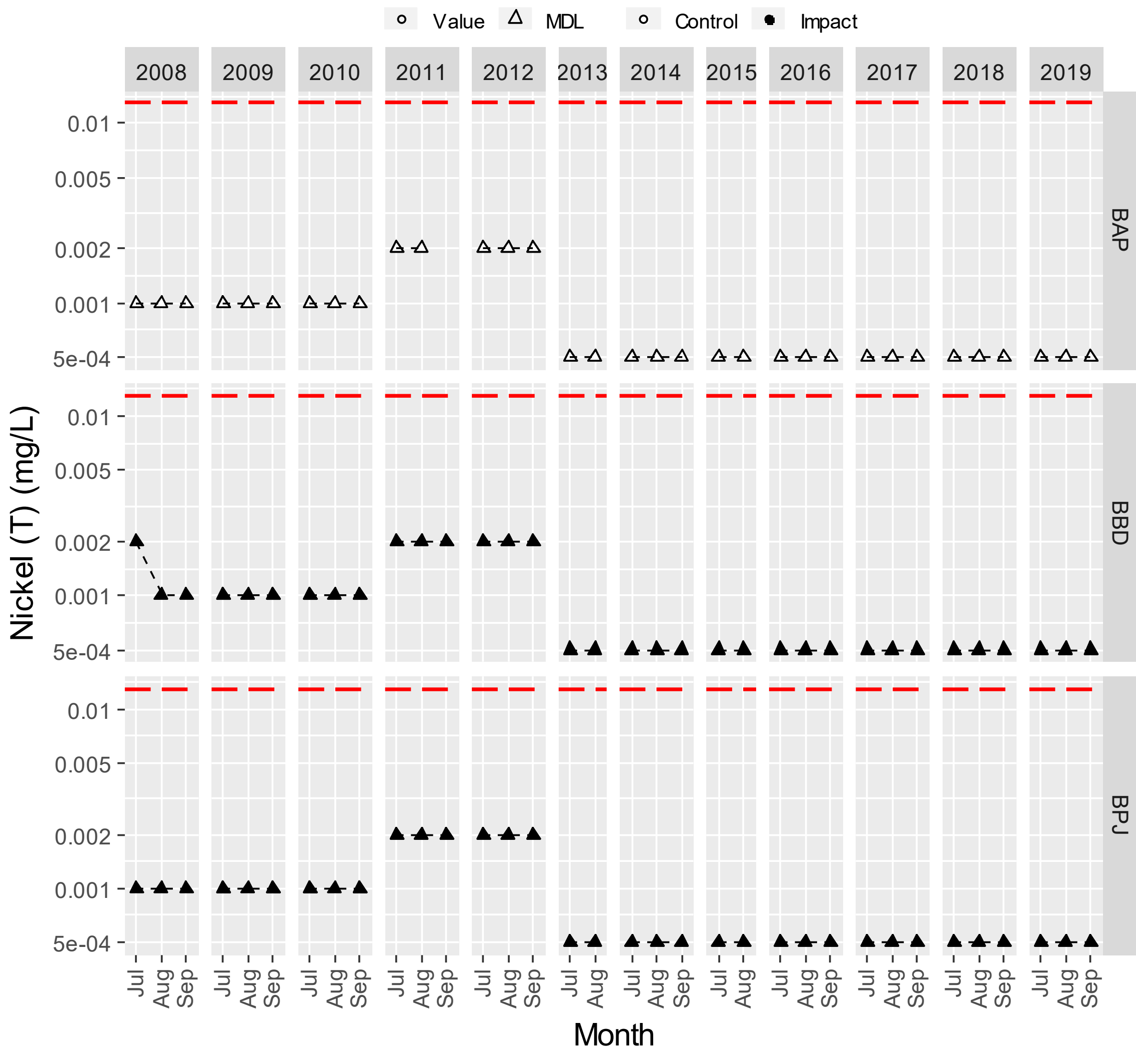


Figure B3 - 11. Total selenium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

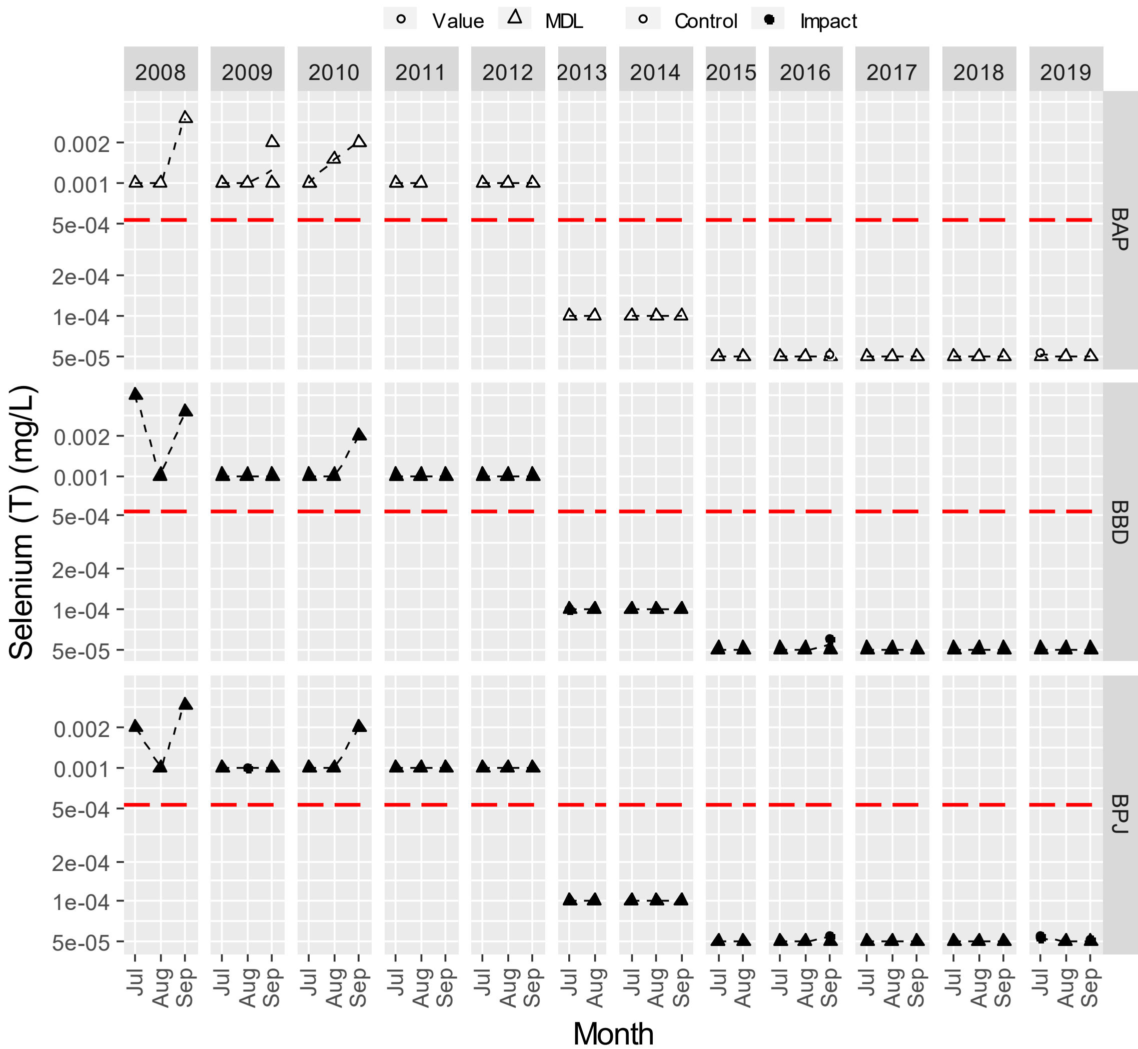


Figure B3 - 12. Total thallium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

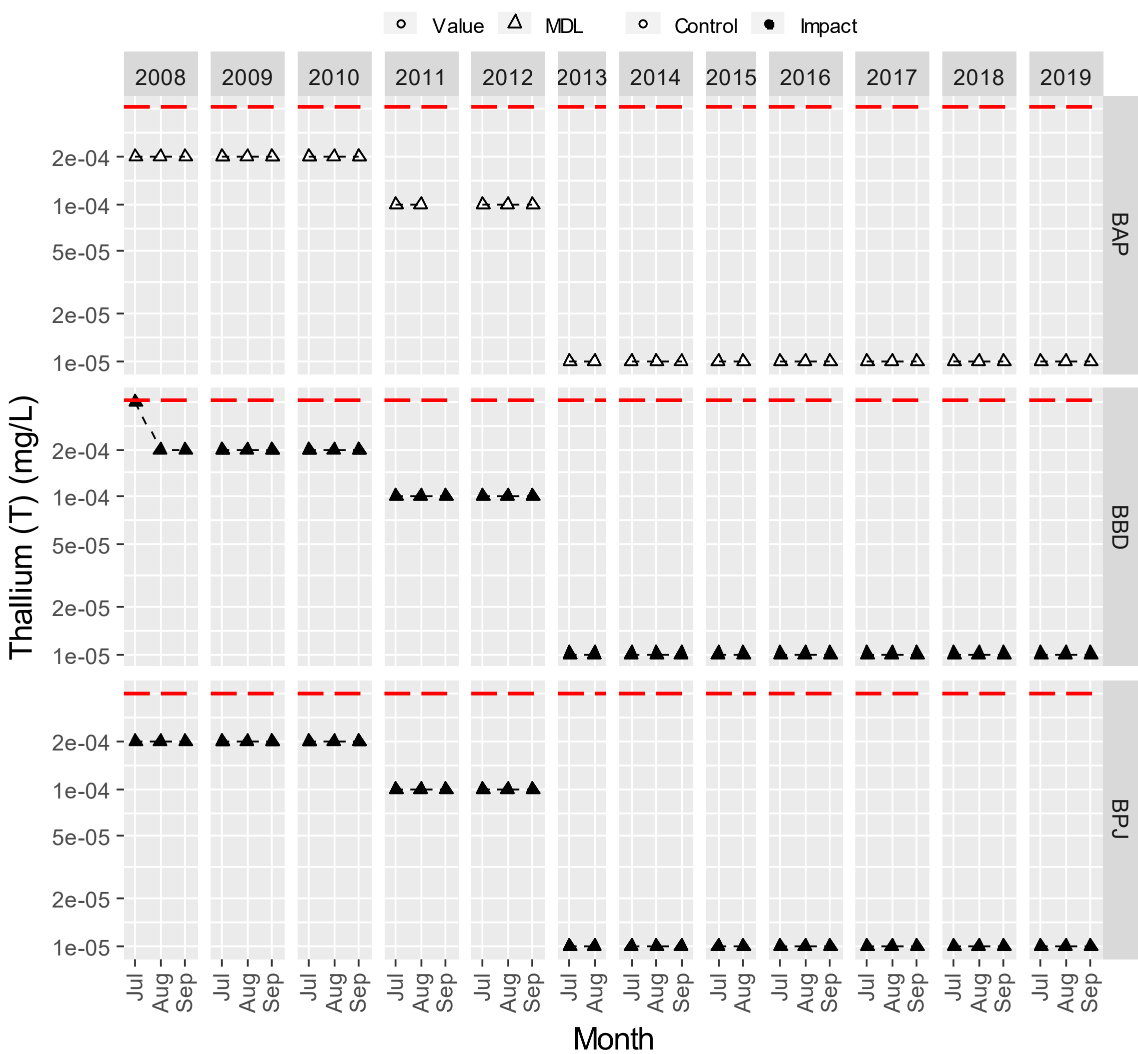


Figure B3 - 13. Total tin (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

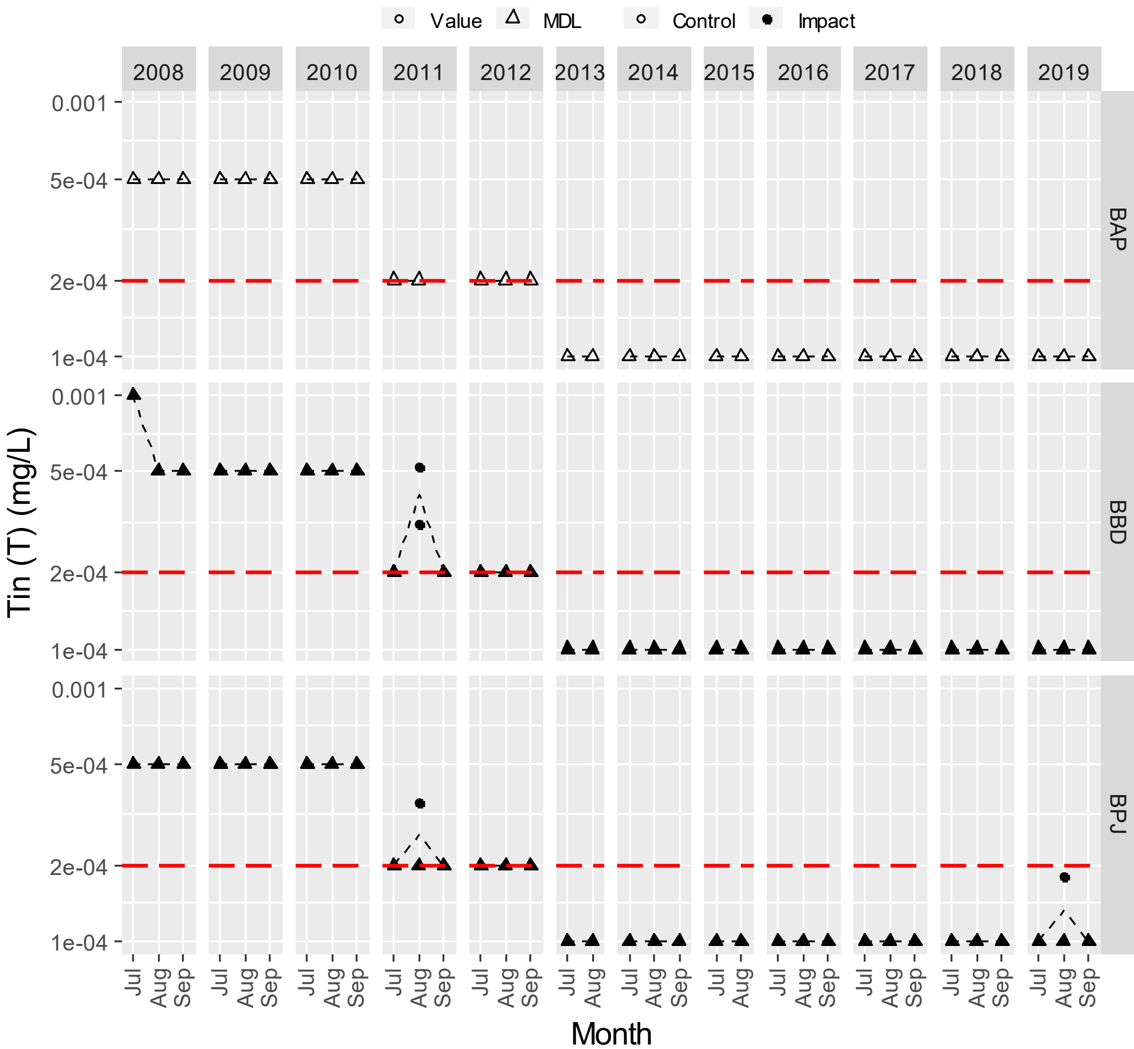


Figure B3 - 14. Total vanadium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

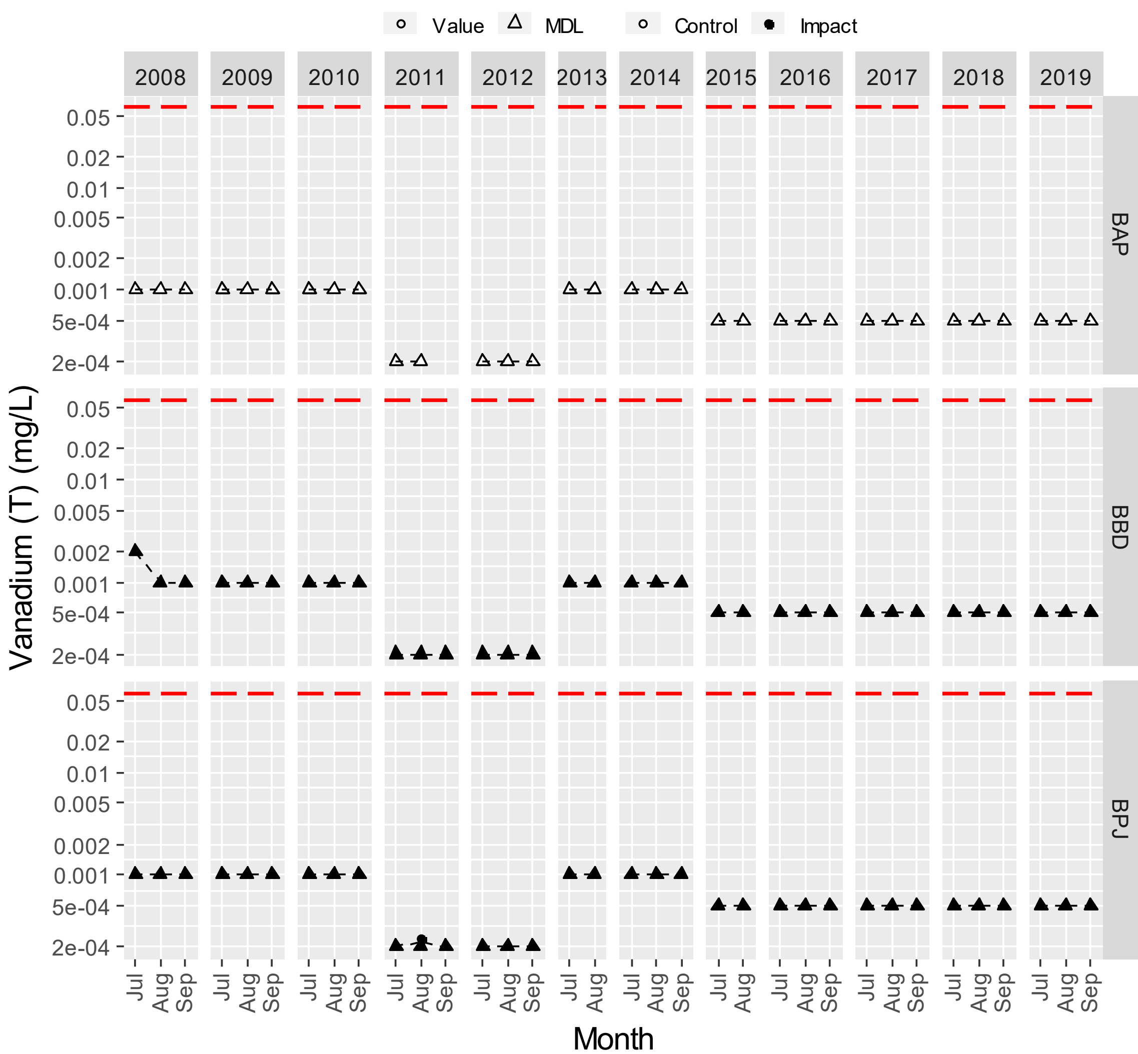


Figure B3 - 15. Total zinc (mg/L) in water samples from Baker Lake since 2008.

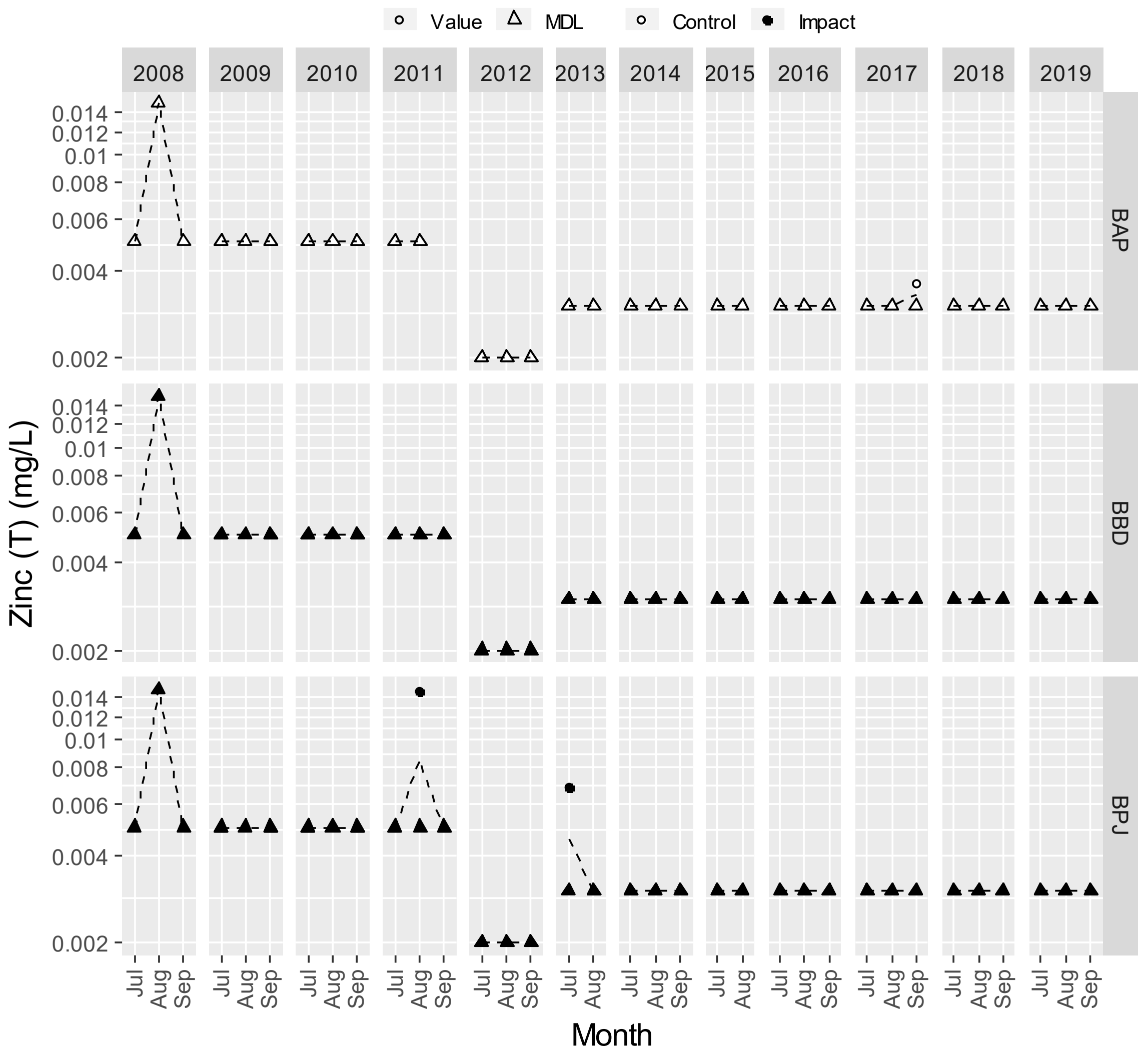


Figure B3 - 16. Dissolved antimony (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

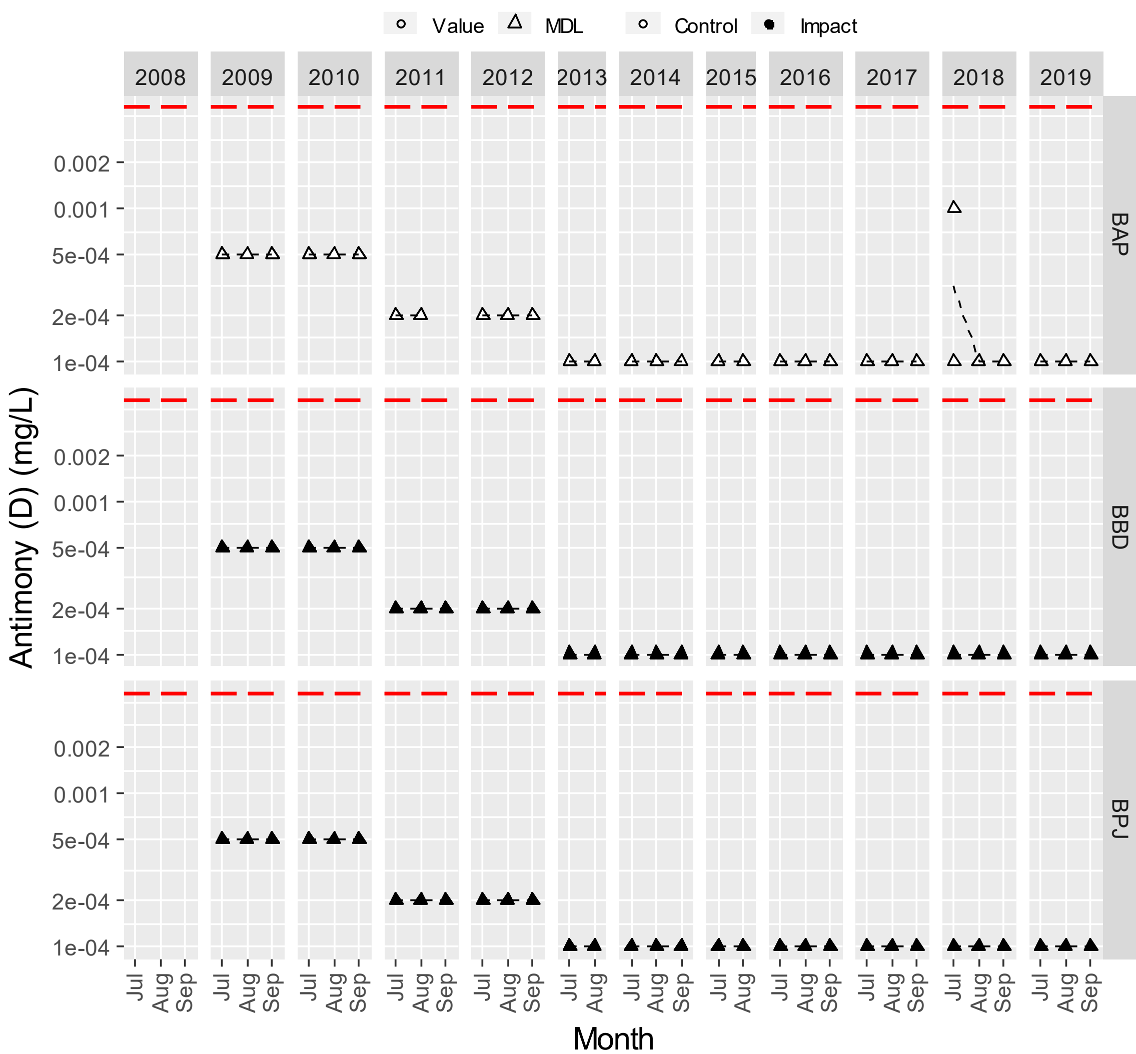


Figure B3 - 17. Dissolved beryllium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

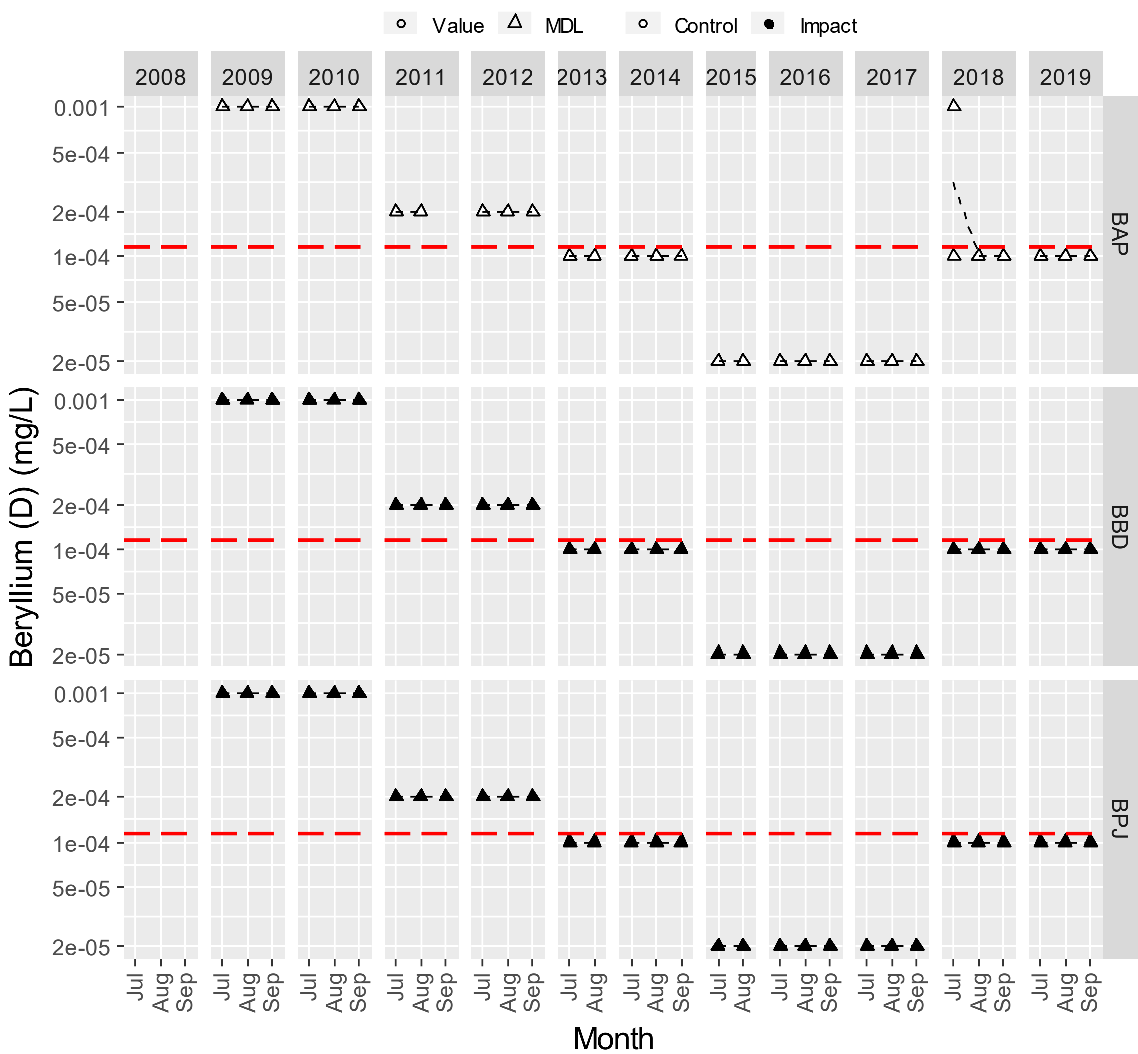


Figure B3 - 18. Dissolved cadmium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

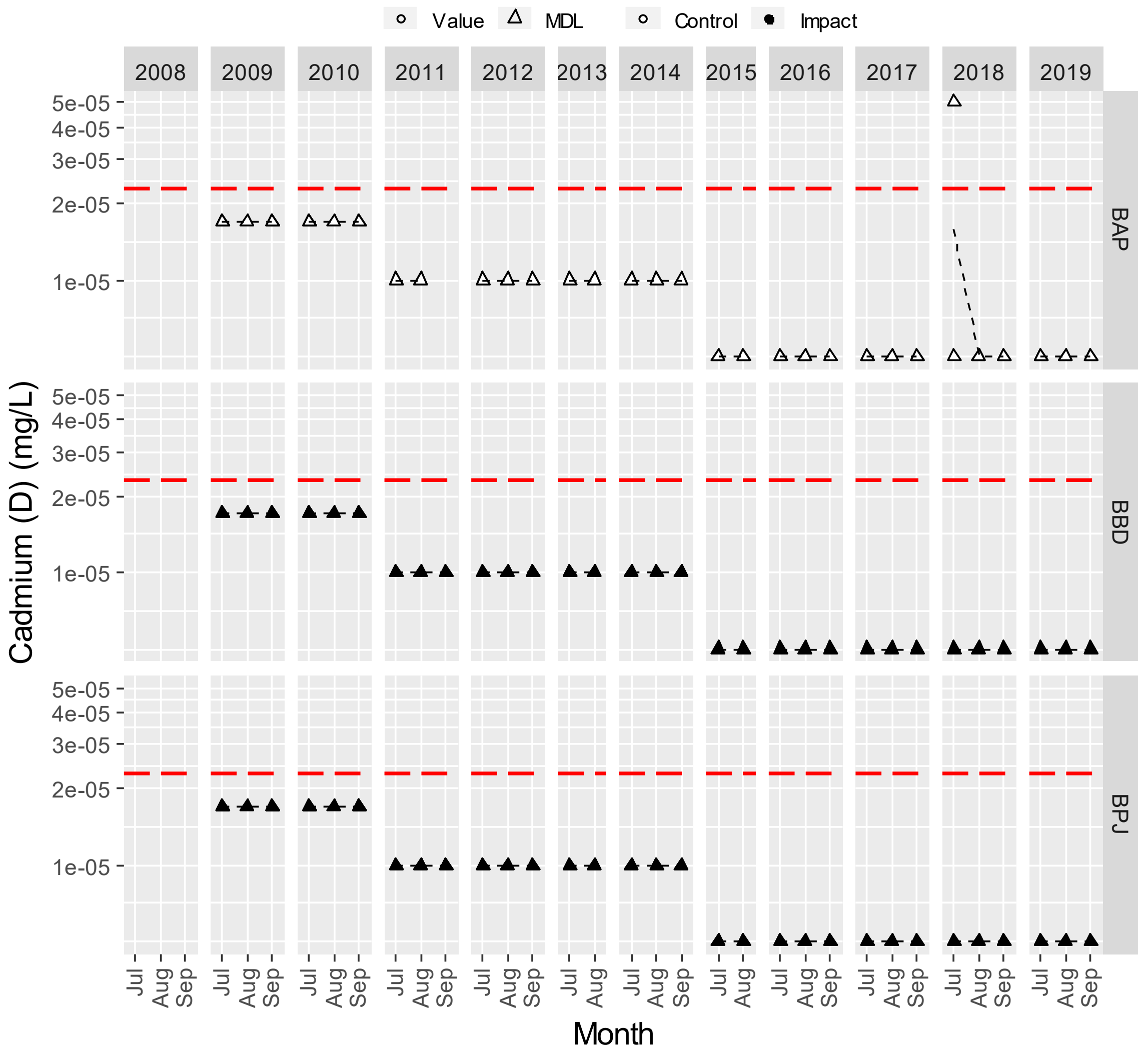


Figure B3 - 19. Dissolved chromium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

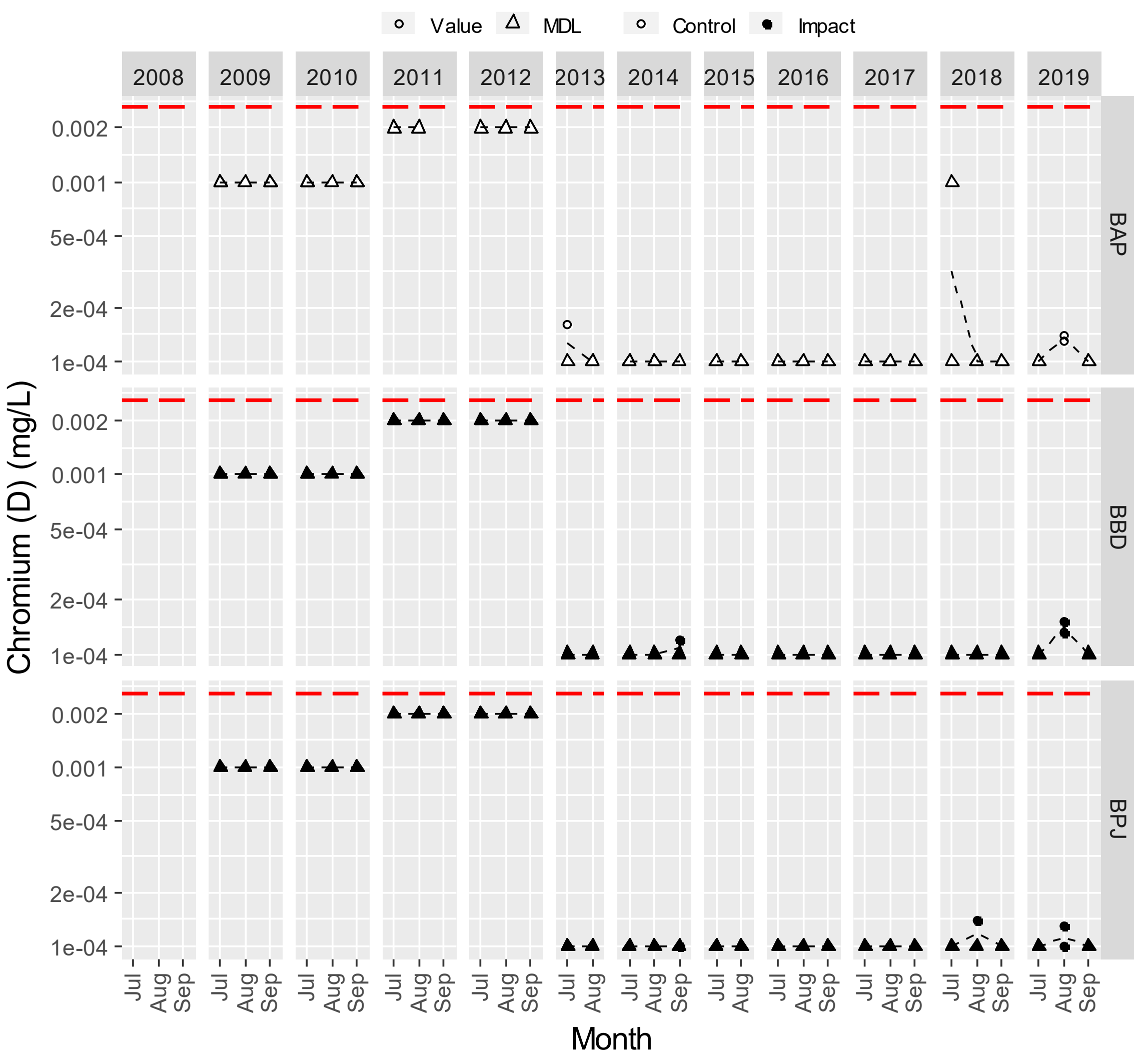


Figure B3 - 20. Dissolved iron (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

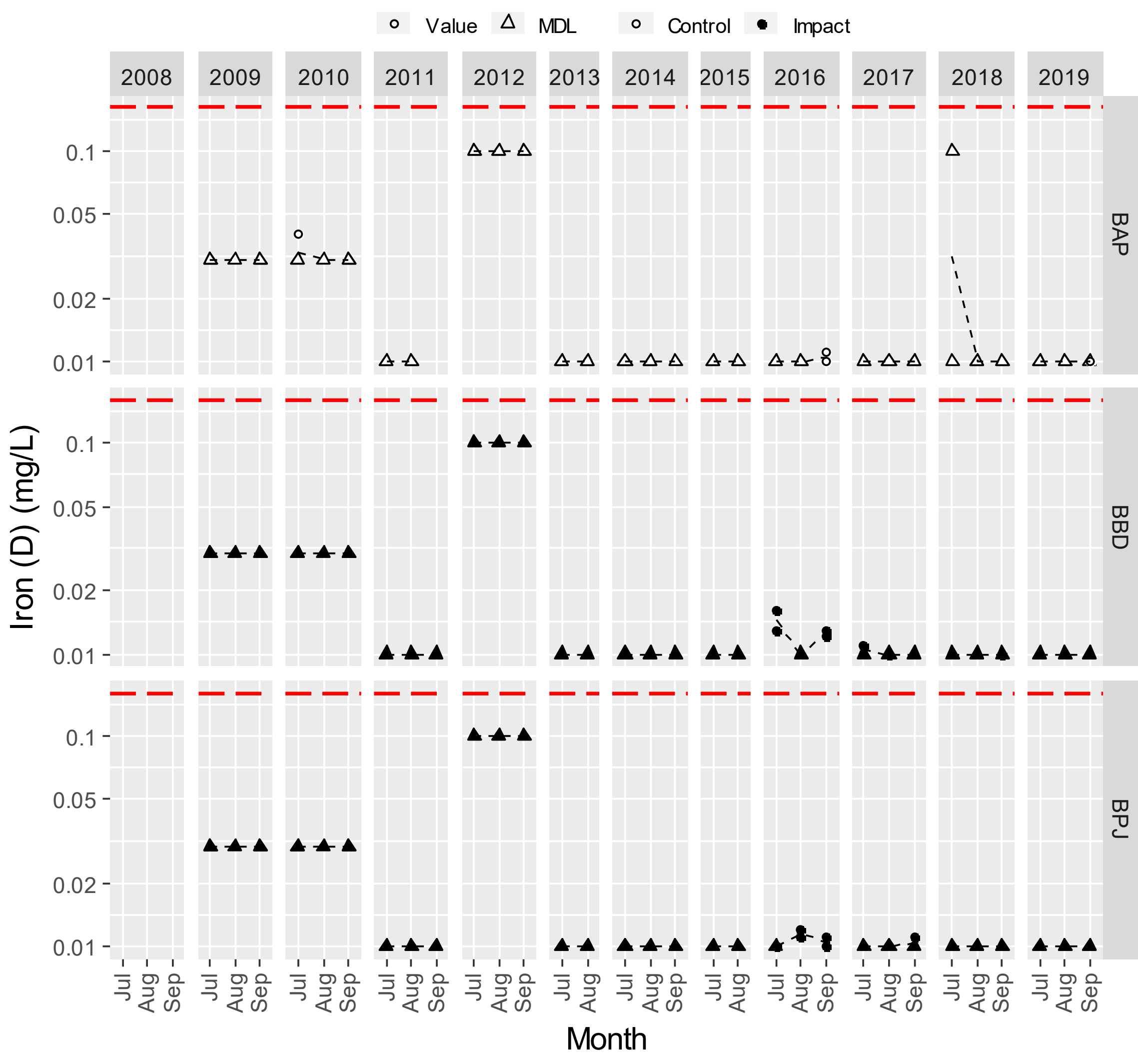


Figure B3 - 21. Dissolved lead (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

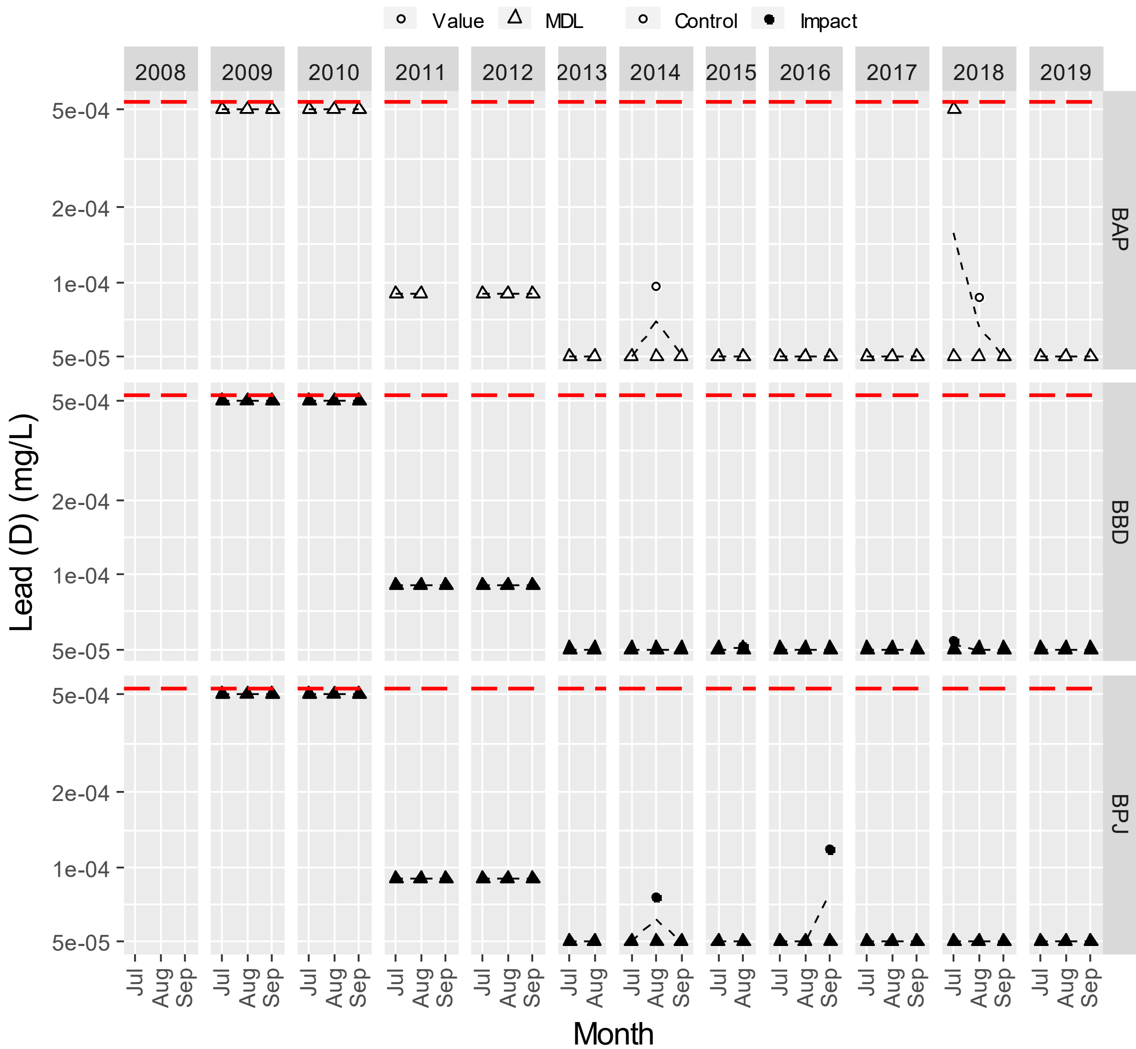


Figure B3 - 22. Dissolved mercury (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

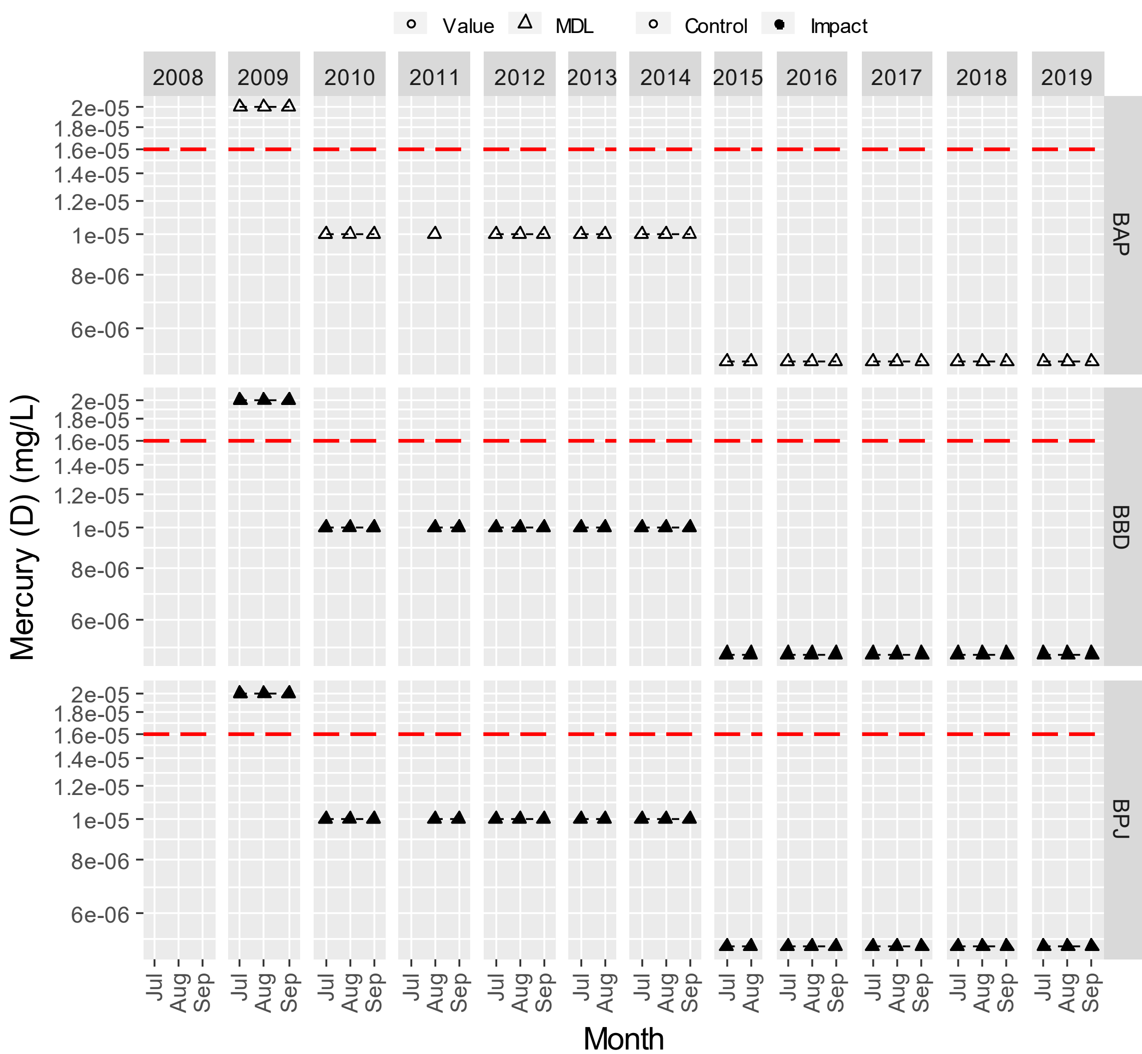


Figure B3 - 23. Dissolved nickel (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

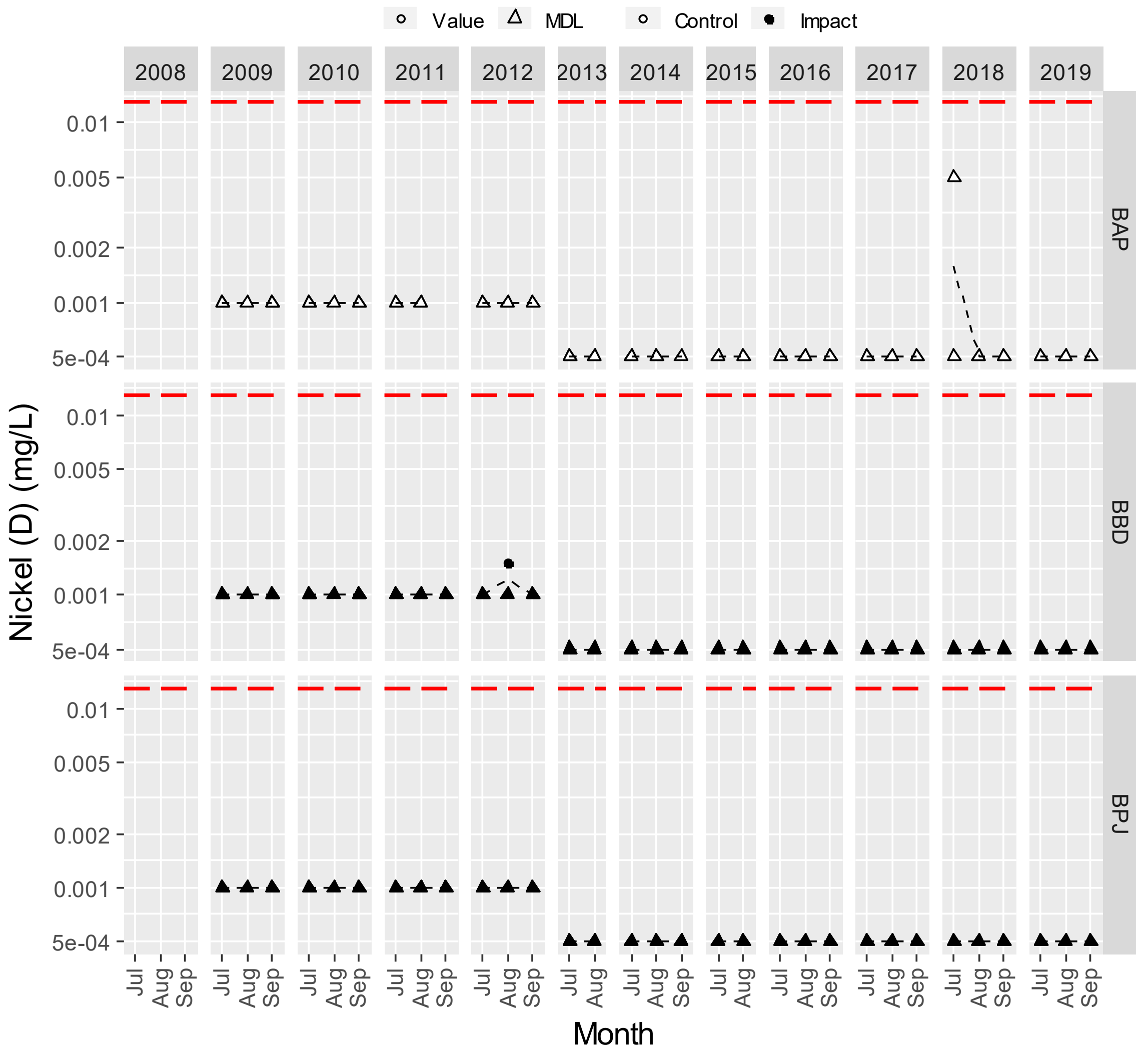


Figure B3 - 24. Dissolved selenium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

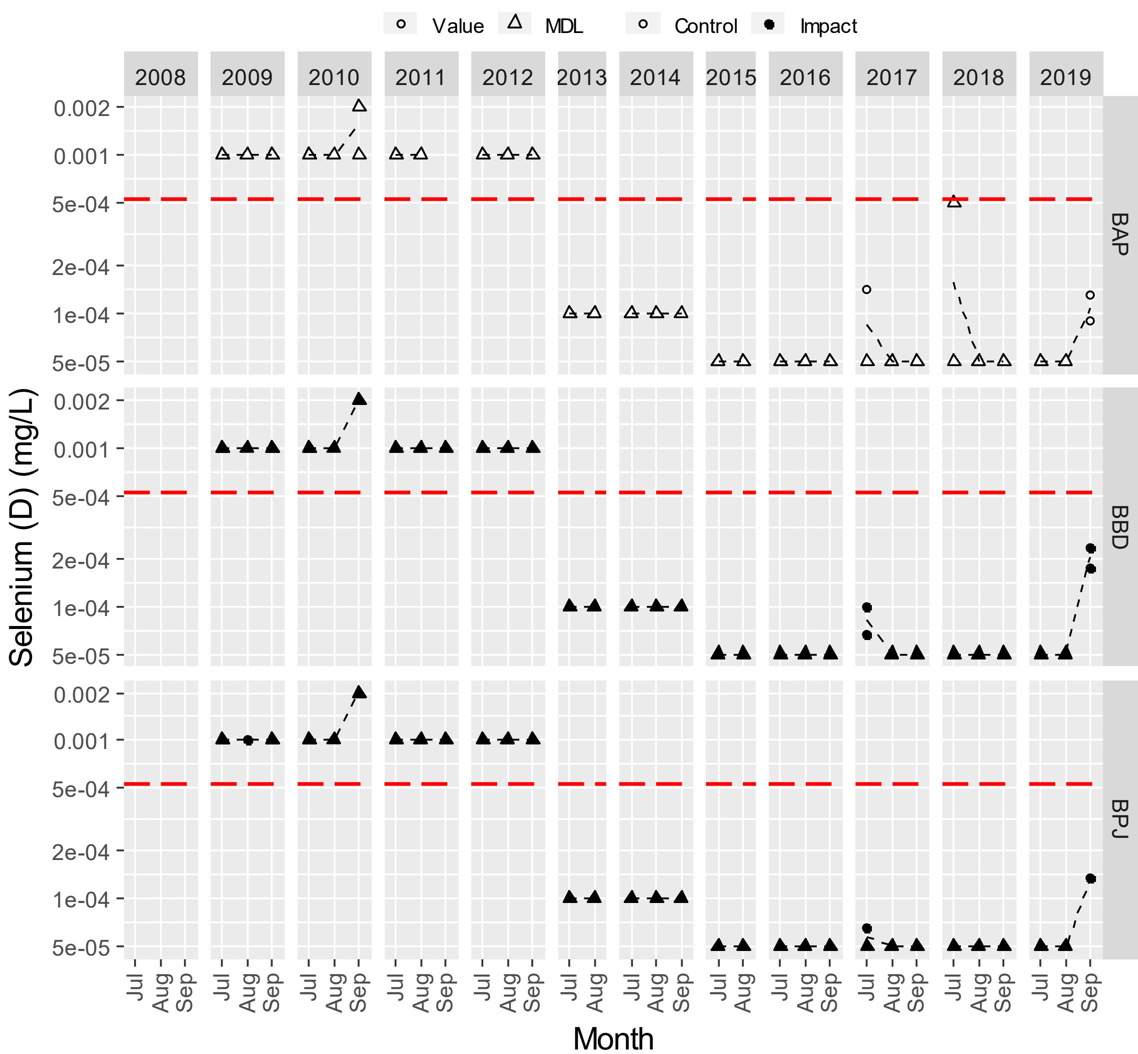


Figure B3 - 25. Dissolved thallium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

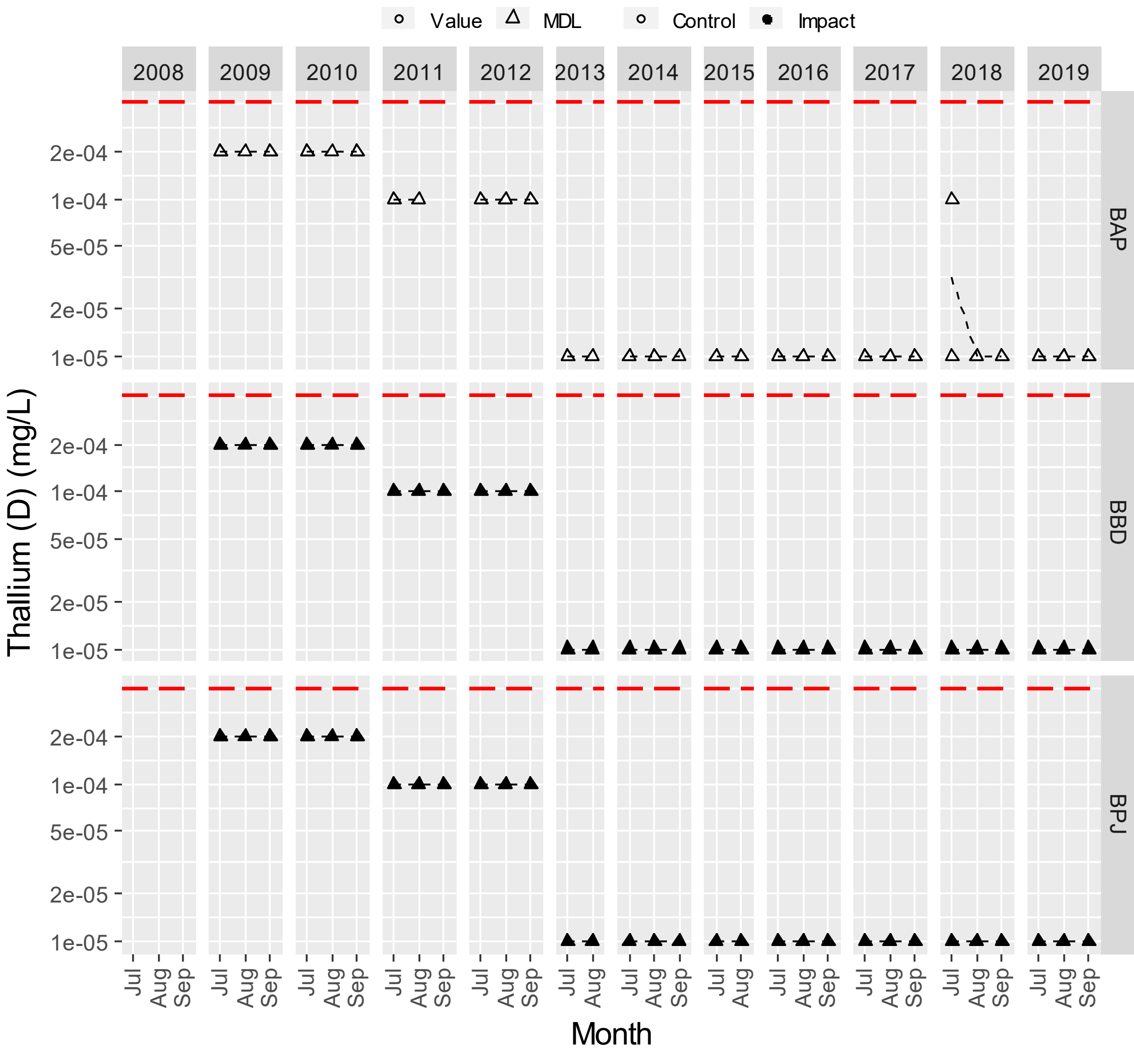


Figure B3 - 26. Dissolved tin (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

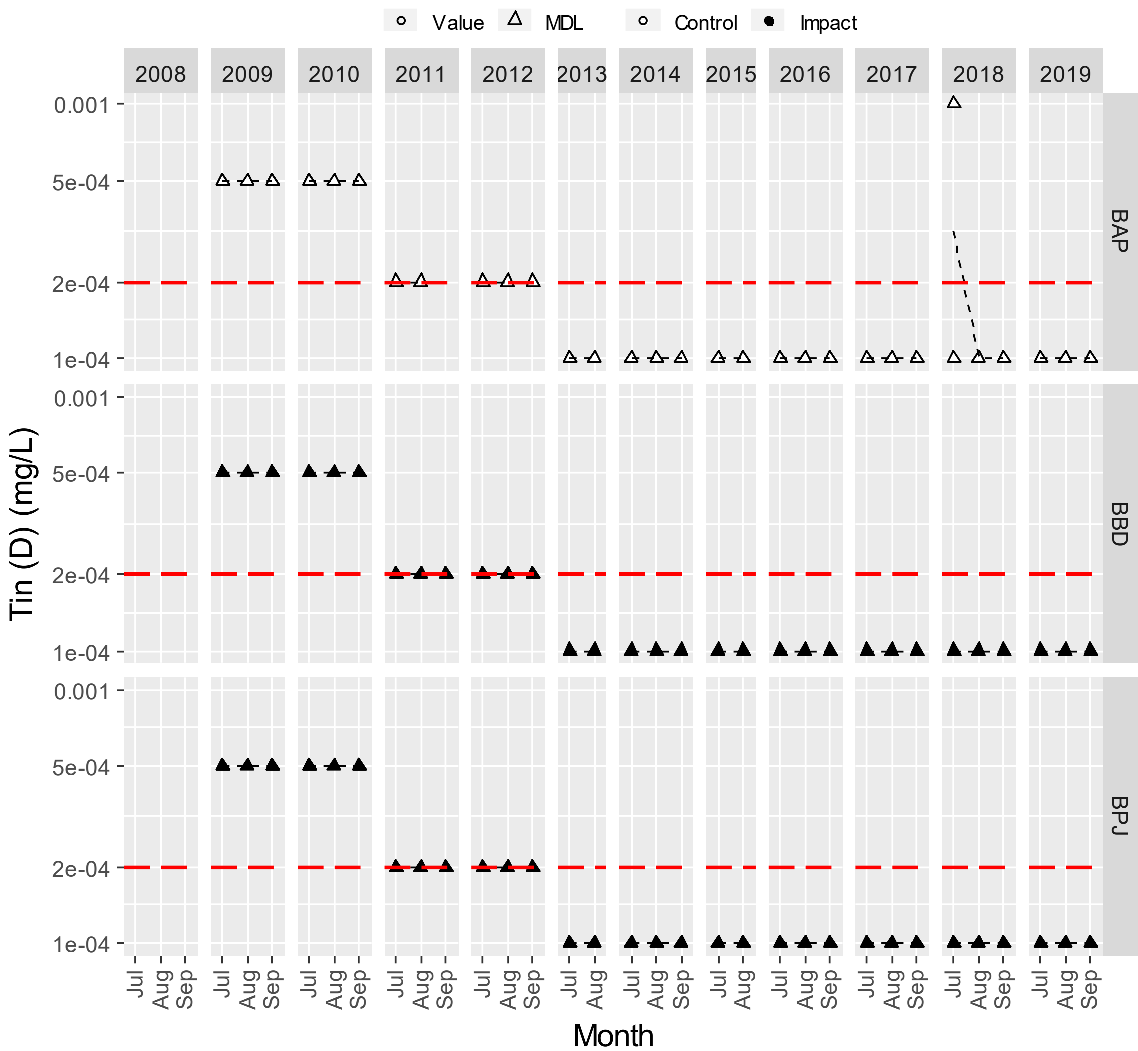


Figure B3 - 27. Dissolved titanium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

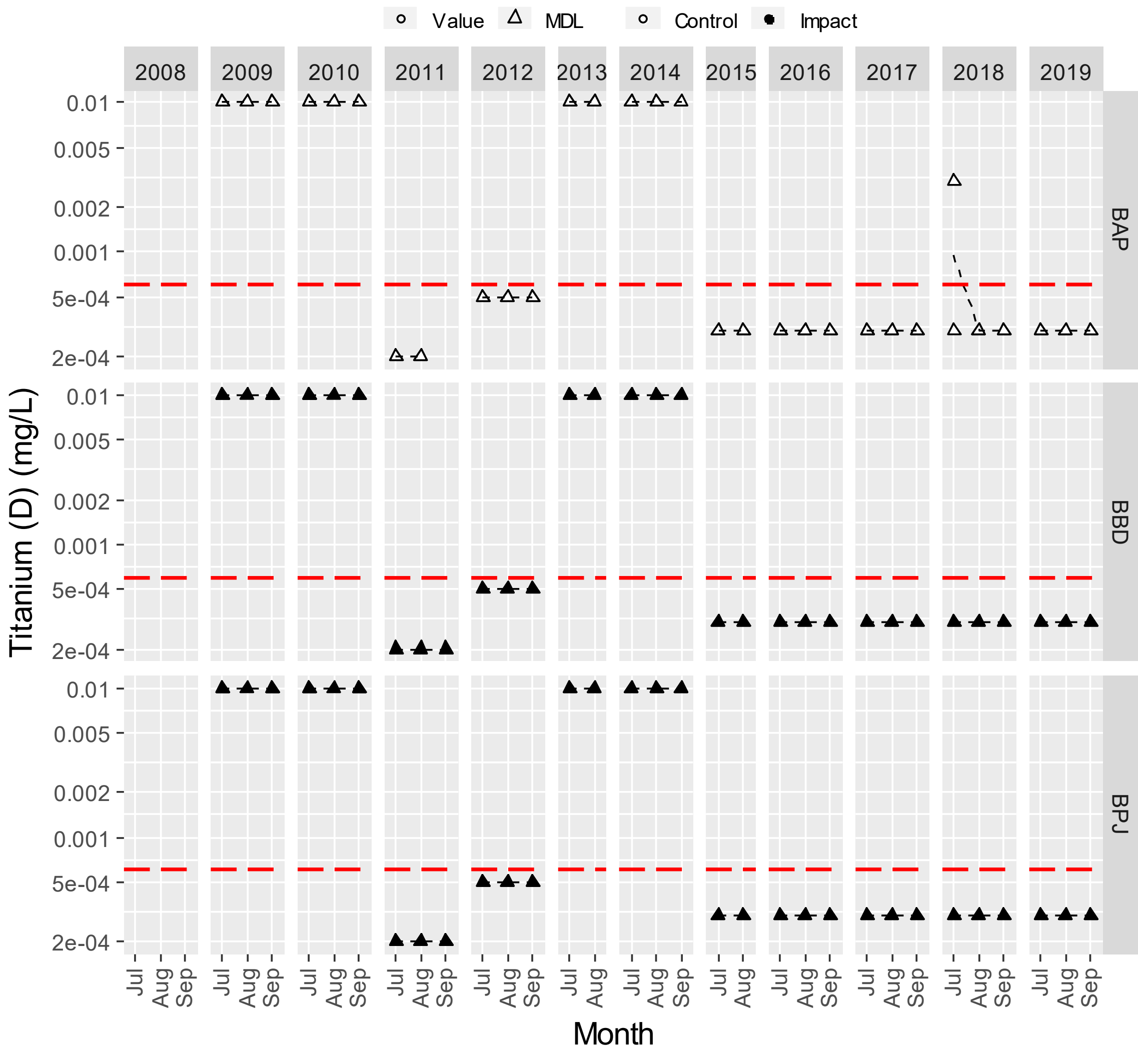


Figure B3 - 28. Dissolved vanadium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.

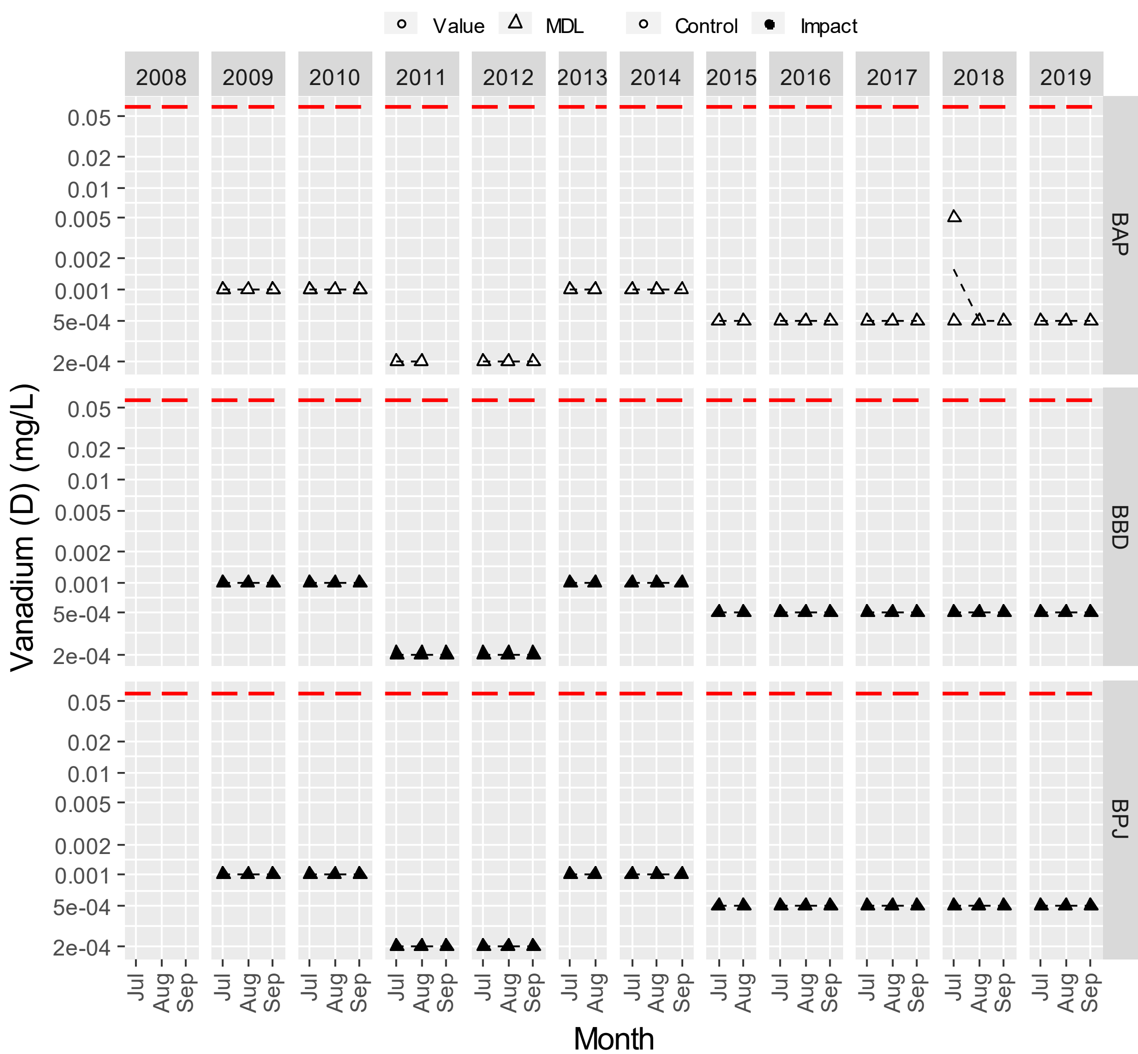
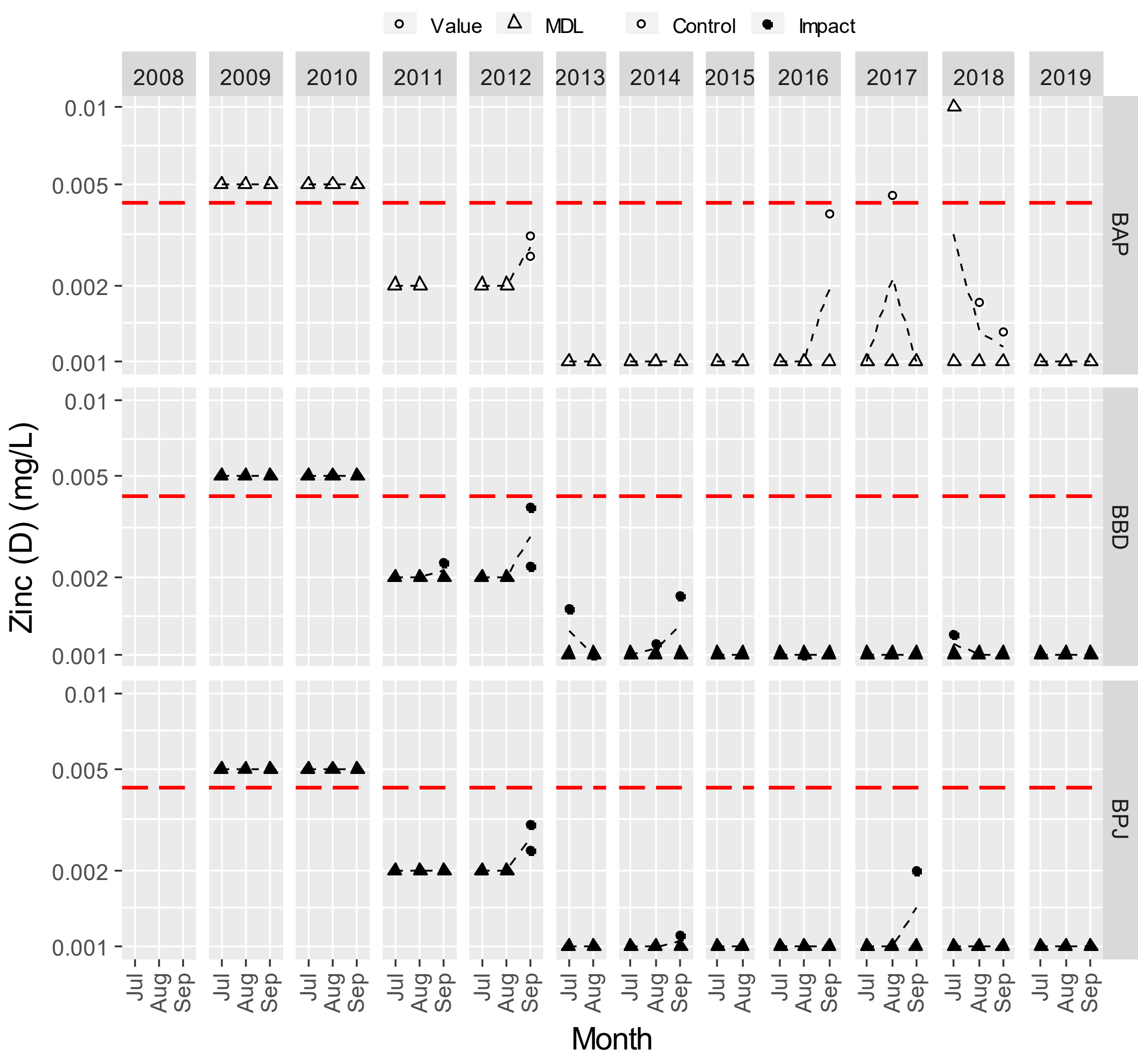


Figure B3 - 29. Dissolved zinc (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line = trigger value.



APPENDIX C
SEDIMENT CHEMISTRY DATA

Appendix C1
Sediment Chemistry – Meadowbank Study Area Lakes

LIST OF TABLES

TABLES

Table C1-1. Sediment core chemistry, Meadowbank study lakes, 2019.

Lake & Basin	Screening Criteria				Third Portage Lake - East Basin									
					TPE									
Area-Replicate ID	CCME[1]	Trigger Values[2]		Threshold Values[3]	SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	SC-7	SC-8	SC-9	SC-10
Date					10-Aug-19	10-Aug-19	10-Aug-19	10-Aug-19	10-Aug-19	10-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19
ALS Sample ID	ISQG	MBK	WAL		L2333924-61	L2333924-62	L2333924-63	L2333924-64	L2333924-65	L2333924-66	L2333924-67	L2333924-68	L2333924-69	L2333924-70
Physical & Organic Parameters														
Moisture (%)					88	90	90	89	89	87	90	87	88	91
pH					6.4	6.0	6.7	5.9	5.9	5.9	6.0	6.1	6.1	5.9
TOC (% dw)														
Total Metals (mg/kg dw)														
Aluminum					28200	27200	24100	26600	28600	30200	28700	29200	27200	27600
Antimony					0.30	0.31	0.31	0.30	0.26	0.25	0.24	0.25	0.34	0.29
Arsenic*	5.9	121	45		24	21	25	21	18	19	22	25	46	22
Barium					159	99	90	109	127	145	118	110	90	106
Beryllium					1.7	1.6	1.4	1.6	1.8	1.8	1.9	1.5	1.4	1.9
Bismuth					2.1	2.0	1.7	2.1	2.1	2.4	2.1	1.8	1.7	2.2
Boron					9.2	8.2	7.7	8.1	8.4	8.7	8.7	7.9	7.3	10
Cadmium*	0.60	1.1	0.66		0.86	0.18	0.29	0.24	0.33	0.17	0.15	0.22	0.22	0.17
Calcium					2270	2440	2640	2290	2220	1970	2240	2280	2350	2440
Chromium*	37	135	61		**163**	**168**	**250**	**167**	**140**	120	130	**234**	**389**	**172**
Cobalt					20	16	19	16	16	16	17	19	23	17
Copper*	36	83	257		57	51	45	49	56	58	58	52	53	57
Iron					43400	43900	47200	46100	40500	42100	50100	50200	66700	46200
Lead †	35	25	37	35	21	20	19	19	20	20	20	19	20	21
Lithium					43	43	35	41	45	48	48	53	39	47
Magnesium					11800	11700	13000	11400	10700	10800	10600	14600	17200	11600
Manganese					5770	1520	2630	2350	2340	1360	1790	1750	1930	1360
Mercury	0.17	0.10	0.12	0.17	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Molybdenum					4.8	4.1	4.2	4.7	4.2	3.9	4.4	4.0	5.9	4.3
Nickel					216	79	120	84	107	75	67	103	144	80
Phosphorus					484	457	496	438	477	449	453	503	630	524
Potassium					4670	4360	3630	4450	4780	5250	4960	4670	3650	4940
Selenium					0.85	0.81	0.71	0.78	0.80	0.71	0.67	0.64	0.61	0.68
Silver					0.13	0.14	0.18	0.13	*<0.10*	*<0.10*	*<0.10*	0.15	0.25	0.16
Sodium					207	213	169	197	196	205	203	201	176	201
Strontium					19	19	19	18	19	18	18	19	18	20
Thallium					0.53	0.31	0.29	0.35	0.40	0.39	0.34	0.32	0.29	0.34
Tin					2.4	3.2	4.3	2.3	2.2	2.1	4.4	5.2	4.2	6.2
Titanium					900	807	662	839	852	977	931	1010	754	874
Uranium					14	14	12	13	15	16	18	15	13	15
Vanadium					45	43	42	43	42	46	44	50	53	46
Zinc †	123	114	142	123	**130**	101	94	104	113	**117**	112	112	101	108

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

"†" CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table C1-2. Sediment grab chemistry, Meadowbank study lakes, 2019.

Lake & Basin	Screening Criteria				Third Portage Lake									
					East Basin					North Basin				
Area-Replicate ID	CCME[1]	Trigger Values[2]		Threshold Values[3]	TPE-1	TPE-2	TPE-3	TPE-4	TPE-5	TPN-1	TPN-2	TPN-3	TPN-4	TPN-5
Date					10-Aug-19	10-Aug-19	10-Aug-19	10-Aug-19	10-Aug-19	10-Aug-18	10-Aug-18	10-Aug-18	10-Aug-18	10-Aug-18
ALS Sample ID	ISQG	MBK	WAL		L2333924-7	L2333924-8	L2333924-9	L2333924-10	L2333924-11	L2156055-13	L2156055-14	L2156055-15	L2156055-16	L2156055-17
Physical & Organic Parameters														
Moisture (%)					86	86	85	83	80	59	76	33	49	37
pH					6.4	6.3	6.5	5.9	5.9	5.9	5.5	6.2	6.1	6.1
TOC (% dw)					3.3	3.3	3.1	2.7	2.4	0.96	2.2	0.38	0.65	0.42
Particle Size														
% Gravel (>2mm)					*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	2.9	3.2	22
% Sand (2.00mm - 0.063mm)					3.3	3.6	3.9	7.3	11	54	33	32	52	13
% Silt (0.063mm - 4µm)					67	66	66	61	59	35	52	44	31	38
% Clay (<4µm)					30	30	30	32	31	11	15	21	14	28
Total Metals (mg/kg dw)														
Aluminum					28600	28400	29200	29900	32200	13300	18500	15600	15300	26800
Antimony					0.24	0.25	0.24	0.24	0.23	0.10	0.18	0.12	0.10	0.15
Arsenic *	5.9	121	45		20	20	18	23	23	9.0	22	13	13	19
Barium					126	127	140	128	138	50	70	61	60	119
Beryllium					1.9	1.9	2.0	2.1	2.2	0.71	1.1	0.71	0.90	1.2
Bismuth					2.5	2.4	2.7	2.7	3.0	0.75	1.2	0.74	0.84	1.3
Boron					9.7	9.7	10	9.8	9.9	*<5.0*	7.1	*<5.0*	*<5.0*	7.0
Cadmium *	0.60	1.1	0.66		0.21	0.23	0.30	0.14	0.13	0.043	0.087	0.067	0.051	0.11
Calcium					2240	2270	2200	2200	2100	1170	1430	1210	1230	2050
Chromium *	37	135	61		**151**	**157**	126	**137**	**140**	88	127	83	89	118
Cobalt					18	18	18	19	19	8.0	12	11	8.6	17
Copper *	36	83	257		54	51	57	58	66	29	47	22	33	31
Iron					47400	50300	45900	56100	56300	22100	38100	28200	27500	42100
Lead †	35	25	37	35	22	22	23	24	**26**	9.8	15	11	11	17
Lithium					52	48	52	56	65	24	30	34	29	56
Magnesium					11600	11200	10900	11200	12100	6640	8800	7730	7440	12000
Manganese					2330	2440	2850	2030	1820	300	376	520	387	677
Mercury	0.17	0.10	0.12	0.17	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Molybdenum					4.2	4.3	4.4	5.2	5.4	1.6	3.5	5.1	1.9	5.0
Nickel					86	91	100	71	77	42	60	51	45	72
Phosphorus					449	441	435	421	461	318	606	236	355	341
Potassium					4820	4660	5070	4910	5580	1980	2650	2400	2420	4690
Selenium					0.74	0.75	0.73	0.48	0.35	*<0.20*	0.32	*<0.20*	*<0.20*	*<0.20*
Silver					*<0.10*	0.10	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Sodium					210	212	218	192	173	96	125	99	83	181
Strontium					22	21	21	20	21	12	15	14	12	21
Thallium					0.41	0.41	0.49	0.41	0.46	0.14	0.20	0.18	0.17	0.34
Tin					2.1	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					1030	1000	1060	1130	1200	498	584	741	585	1260
Uranium					18	17	20	21	24	8.9	13	9.2	10	16
Vanadium					47	46	46	49	53	25	33	29	26	48
Zinc †	123	114	142	123	**115**	113	**122**	**118**	**130**	55	75	65	67	101

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.
2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.
3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

"†" CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table C1-2. Sediment grab chemistry, Meadowbank study lakes, 2019.

Lake & Basin	**Screening Criteria**				**Second Portage Lake**					**Wally Lake**				
Area-Replicate ID / **Date**	**CCME**[1]	**Trigger Values**[2]		**Threshold Values**[3]	**SP-1**	**SP-2**	**SP-3**	**SP-4**	**SP-5**	**WAL-1**	**WAL-2**	**WAL-3**	**WAL-4**	**WAL-5**
					11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19
ALS Sample ID	**ISQG**	**MBK**	**WAL**		L2333924-1	L2333924-2	L2333924-3	L2333924-4	L2333924-5	L2333924-19	L2333924-20	L2333924-21	L2333924-22	L2333924-23
Physical & Organic Parameters														
Moisture (%)					85	85	83	84	84	89	91	92	92	88
pH					5.7	6.0	5.8	5.8	6.3	6.5	6.4	6.5	6.6	6.3
TOC (% dw)					3.6	3.6	3.7	3.6	3.8	7.1	7.6	8.0	9.3	5.3
Particle Size														
% Gravel (>2mm)					*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
% Sand (2.00mm - 0.063mm)					2.6	2.1	2.2	2.7	2.7	5.1	2.6	2.2	2.1	6.6
% Silt (0.063mm - 4µm)					73	74	66	66	67	81	85	85	90	86
% Clay (<4µm)					24	24	32	31	31	14	13	13	8.3	7.9
Total Metals (mg/kg dw)														
Aluminum					29200	29200	34000	35500	33300	23900	25700	26300	23600	30600
Antimony					0.29	0.26	0.29	0.29	0.30	0.41	0.43	0.45	0.49	0.59
Arsenic *	5.9	121	45		54	31	53	32	41	26	28	**46**	28	21
Barium					135	132	144	152	144	124	140	140	126	196
Beryllium					2.3	2.1	2.5	2.7	2.6	1.8	1.9	2.0	1.7	2.0
Bismuth					2.5	2.5	2.8	3.0	2.8	2.3	2.5	2.6	2.2	2.5
Boron					10	10	10	11	9.9	10	11	12	14	11
Cadmium *	0.60	1.1	0.66		0.29	0.27	0.28	0.23	0.27	0.54	0.61	0.55	0.54	**1.2**
Calcium					2510	2300	2190	2710	2390	4410	4330	4620	5020	4070
Chromium *	37	135	61		90	90	102	110	108	**64**	**72**	**73**	**64**	**81**
Cobalt					18	17	20	18	21	9.7	10	11	10	12
Copper *	36	83	257		82	77	**95**	**94**	**94**	153	178	187	163	191
Iron					91300	70400	82400	61300	69500	32300	34800	42900	30700	31900
Lead †	35	25	37	35	24	23	**26**	**27**	**26**	36	**39**	**41**	**38**	**38**
Lithium					48	47	53	60	55	41	41	42	40	53
Magnesium					10100	9880	11100	11900	11300	8450	8790	8980	8350	11300
Manganese					2050	1860	1820	2380	2720	360	355	397	368	428
Mercury	0.17	0.10	0.12	0.17	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	0.051	0.059	*<0.050*
Molybdenum					10	7.2	9.8	8.4	8.3	7.9	9.5	12	8.8	5.5
Nickel					70	71	82	78	77	58	66	69	59	69
Phosphorus					899	568	689	562	612	667	717	794	656	653
Potassium					4930	4940	5610	5860	5320	3740	4010	4160	3790	5450
Selenium					0.81	0.67	0.62	0.49	0.57	0.81	0.97	1.1	0.91	1.3
Silver					0.17	0.12	*<0.10*	0.10	0.13	0.59	0.71	0.73	0.78	0.66
Sodium					228	224	218	222	211	204	222	237	232	239
Strontium					23	22	22	24	22	30	31	33	34	31
Thallium					0.41	0.40	0.43	0.46	0.44	0.34	0.36	0.38	0.35	0.39
Tin					*<2.0*	*<2.0*	2.0	2.4	2.0	2.1	2.0	2.7	2.4	2.4
Titanium					959	927	991	1060	960	678	696	718	692	994
Uranium					21	21	25	28	25	17	20	22	19	24
Vanadium					44	44	49	53	50	34	37	39	34	42
Zinc †	123	114	142	123	**138**	**130**	**148**	**151**	**148**	125	136	**148**	130	**155**

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.
2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.
3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

"†" CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table C1-2. Sediment grab chemistry, Meadowbank study lakes, 2019.

Lake & Basin	Screening Criteria				Inuggugayualik Lake					Pipedream Lake				
Area-Replicate ID	CCME[1]	Trigger Values[2]		Threshold Values[3]	INUG-1	INUG-2	INUG-3	INUG-4	INUG-5	PDL-1	PDL-2	PDL-3	PDL-4	PDL-5
Date					15-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19	14-Aug-19	14-Aug-19	14-Aug-19	14-Aug-19	14-Aug-19
ALS Sample ID	ISQG	MBK	WAL		L2338125-1	L2338125-2	L2338125-3	L2338125-4	L2338125-5	L2333924-25	L2333924-26	L2333924-27	L2333924-28	L2333924-29
Physical & Organic Parameters														
Moisture (%)					82	81	85	83	84	84	85	70	73	78
pH					4.6	5.4	5.3	5.0	4.9	5.2	5.2	5.6	6.0	5.8
TOC (% dw)					3.2	2.6	3.4	3.4	3.6	3.5	4.2	1.8	1.9	2.6
Particle Size														
% Gravel (>2mm)					*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
% Sand (2.00mm - 0.063mm)					6.9	13	4.9	2.8	2.4	13	9.8	30	8.5	13
% Silt (0.063mm - 4µm)					72	69	71	73	75	77	80	66	75	76
% Clay (<4µm)					21	19	24	24	23	11	10	4.5	17	11
Total Metals (mg/kg dw)														
Aluminum					22900	23500	27500	24900	22600	21600	20500	17500	26000	22500
Antimony					0.17	0.12	0.17	0.16	0.17	0.23	0.24	0.18	0.25	0.22
Arsenic *	5.9	121	45		83	6.7	11	80	**126**	13	15	8.8	55	10
Barium					118	123	155	143	122	101	92	71	105	109
Beryllium					1.3	1.4	1.6	1.5	1.3	0.85	0.86	0.63	1.2	0.91
Bismuth					1.1	1.0	1.3	1.2	1.1	0.69	0.70	0.55	1.1	0.74
Boron					7.7	6.7	8.2	7.9	7.3	7.3	7.9	*<5.0*	8.0	7.1
Cadmium *	0.60	1.1	0.66		0.12	0.11	0.28	0.23	0.20	0.30	0.27	0.19	0.27	0.26
Calcium					1880	2040	2140	1880	1660	2210	2140	1960	1930	2250
Chromium *	37	135	61		107	110	123	113	106	**137**	127	114	**157**	**136**
Cobalt					12	9.5	11	13	13	11	11	10	22	11
Copper *	36	83	257		44	42	53	49	46	46	44	30	62	44
Iron					89200	26500	32800	89000	106000	26800	27200	23300	47700	26000
Lead †	35	25	37	35	12	12	14	13	12	13	13	10.0	16	12
Lithium					25	29	31	28	25	25	24	19	31	27
Magnesium					9400	10500	11400	10300	9700	11400	10600	10500	12400	11300
Manganese					861	371	461	881	855	292	279	264	2060	291
Mercury	0.17	0.10	0.12	0.17	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Molybdenum					6.5	1.9	3.0	6.8	8.4	2.0	2.2	1.3	4.8	1.6
Nickel					66	75	91	81	74	84	84	64	118	82
Phosphorus					2250	725	968	2640	2460	500	511	582	496	494
Potassium					3750	3380	3940	3750	3180	3200	2800	2160	3440	3070
Selenium					0.56	0.38	0.61	0.69	0.68	0.40	0.39	0.27	0.20	0.38
Silver					0.12	0.12	0.19	0.17	0.17	0.21	0.24	0.11	*<0.10*	0.19
Sodium					159	162	192	173	154	126	132	94	127	145
Strontium					23	23	26	24	20	21	20	17	22	23
Thallium					0.19	0.16	0.21	0.21	0.18	0.17	0.16	0.13	0.25	0.16
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					598	616	672	634	569	638	558	569	640	620
Uranium					15	14	18	16	15	7.2	7.3	5.0	12	7.7
Vanadium					35	37	41	38	35	35	33	31	42	36
Zinc †	123	114	142	123	83	86	103	96	93	86	82	68	96	81

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.
2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.
3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

"†" CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table C1-3. Hydrocarbon and PAH results for composite sediment grabs at Meadowbank study lakes, 2019.

Lake	**CCME (2002) Guidelines[1]**	**Third Portage Lake**		**Second Portage**	**Wally**	**Inuggugayualik**	**Pipedream**
Area ID		**TPE**	**TPN**	**SP**	**WAL**	**INUG**	**PDL**
Date		10-Aug-19	09-Aug-19	11-Aug-19	11-Aug-19	15-Aug-19	14-Aug-19
ALS Sample ID	**ISQG**	L2333924-12	L2333924-18	L2333924-6	L2333924-24	L2338125-6	L2333924-30
Physical Parameters							
Moisture (%)		84	48	85	90	82	79
Aggregate Organics (mg/kg)							
Mineral Oil and Grease		*<1600*	*<500*	*<1600*	*<2000*	*<1500*	*<1100*
Hydrocarbons (mg/kg)							
EPH10-19		*<580*	*<200*	*<600*	*<980*	*<560*	*<480*
EPH19-32		*<580*	*<200*	*<600*	*<980*	*<560*	*<480*
LEPH		*<580*	*<200*	*<600*	*<980*	*<560*	*<480*
HEPH		*<580*	*<200*	*<600*	*<980*	*<560*	*<480*
Polycyclic Aromatic Hydrocarbons (mg/kg)							
Acenaphthene	0.0067	*<0.0090*	*<0.0050*	*<0.0090*	*<0.015*	*<0.017*	*<0.0070*
Acenaphthylene	0.0059	*<0.0090*	*<0.0050*	*<0.0090*	*<0.015*	*<0.017*	*<0.0070*
Anthracene	0.047	*<0.0090*	*<0.0040*	*<0.0090*	*<0.015*	*<0.017*	*<0.0070*
Benzo(a)anthracene	0.032	*<0.010*	*<0.010*	*<0.010*	*<0.020*	*<0.030*	*<0.010*
Benzo(a)pyrene	0.032	*<0.010*	*<0.010*	*<0.010*	*<0.015*	*<0.017*	*<0.010*
Benzo(b&j)fluoranthene		*<0.010*	*<0.010*	*<0.010*	*<0.015*	*<0.017*	*<0.010*
Benzo(b+j+k)fluoranthene		*<0.015*	*<0.015*	*<0.015*	*<0.021*	*<0.024*	*<0.015*
Benzo(g,h,i)perylene		*<0.010*	*<0.010*	*<0.010*	*<0.015*	*<0.017*	*<0.010*
Benzo(k)fluoranthene		*<0.010*	*<0.010*	*<0.010*	*<0.015*	*<0.017*	*<0.010*
Chrysene	0.057	*<0.010*	*<0.010*	*<0.010*	*<0.040*	*<0.017*	*<0.010*
Dibenz(a,h)anthracene	0.0062	*<0.0090*	*<0.0050*	*<0.0090*	*<0.015*	*<0.017*	*<0.0070*
Fluoranthene	0.11	*<0.010*	*<0.010*	*<0.010*	*<0.015*	*<0.017*	*<0.010*
Fluorene	0.021	*<0.010*	*<0.010*	*<0.010*	*<0.015*	*<0.017*	*<0.010*
Indeno(1,2,3-c,d)pyrene		*<0.010*	*<0.010*	*<0.010*	*<0.020*	*<0.017*	*<0.010*
1-Methylnaphthalene		*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
2-Methylnaphthalene	0.020	*<0.010*	*<0.010*	*<0.010*	*<0.015*	*<0.017*	*<0.010*
Naphthalene	0.035	*<0.020*	*<0.010*	*<0.020*	*<0.030*	*<0.017*	*<0.010*
Phenanthrene	0.042	*<0.010*	*<0.010*	*<0.010*	*<0.015*	*<0.017*	*<0.010*
Pyrene	0.053	*<0.010*	*<0.010*	*<0.010*	*<0.015*	*<0.017*	*<0.010*
Quinoline		*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
d12-Chrysene (%)		110	93	97	108	112	95
d8-Naphthalene (%)		119	102	96	110	108	100
d10-Phenanthrene (%)		119	101	102	117	116	101
B(a)P Total Potency Equivalent		*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.021*	*<0.020*
IACR (CCME)		*<0.15*	*<0.15*	*<0.15*	*<0.19*	*<0.22*	*<0.15*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = Interim freshwater Sediment Quality Guideline

Bolded concentrations exceed the ISQG guideline.

Italicized numbers are below detection limits.

Appendix C2

Sediment Chemistry – Whale Tail Study Area Lakes

LIST OF TABLES

TABLES

Table C2-1. Sediment grab chemistry, Whale Tail Pit study lakes, 2019.

Lake & Basin	Screening Criteria									Whale Tail Lake - South Basin				
Area-Replicate ID	CCME[1]		WTS	MAM	A20	A76	DS1	NEM	All Lakes	WTS-1	WTS-2	WTS-3	WTS-4	WTS-5
Date										18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19
ALS Sample ID	ISQG	PEL	Trigger	Trigger	Trigger	Trigger	Trigger	Trigger	Threshold	L2338125-7	L2338125-8	L2338125-9	L2338125-10	L2338125-11
Physical & Organic Parameters														
Moisture (%)										82	83	87	88	78
pH										5.0	5.0	5.7	4.9	5.6
TOC (% dw)										3.7	4.0	6.1	5.5	2.7
Particle Size														
% Gravel (>2mm)										*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
% Sand (2.00mm - 0.063mm)										6.3	5.6	3.7	2.0	7.2
% Silt (0.063mm - 4µm)										75	79	77	82	72
% Clay (<4µm)										19	16	19	17	21
Total Metals (mg/kg dw)														
Aluminum										15700	16400	18400	19100	25200
Antimony										0.17	0.19	0.18	0.23	0.24
Arsenic*	5.9	17	83	140	43	461	198	61	5.9	**263**	**247**	11	**130**	80
Barium										81	102	111	126	108
Beryllium										1.3	1.4	1.3	1.5	1.9
Bismuth										0.45	0.50	0.45	0.56	0.70
Boron										*<5.0*	5.1	8.0	8.1	5.5
Cadmium*	0.60	3.5	0.93	0.43	0.37	0.44	0.45	0.41	0.60	0.15	0.19	0.27	0.36	0.20
Calcium										1460	1820	2810	2270	1660
Chromium*	37	90	81	194	53	103	80	130	37	61	65	71	76	**84**
Cobalt										21	20	7.8	14	25
Copper*	36	197	49	77	42	76	26	43	36	38	40	40	47	**56**
Iron										124000	110000	22500	73600	69900
Lead	35	91	24	26	25	26	26	22	35	10	12	12	13	16
Lithium										12	13	16	14	20
Magnesium										5330	5910	7080	7060	8120
Manganese										1130	1170	268	891	4610
Mercury	0.17	0.49	0.12	0.13	0.11	0.11	0.12	0.10	0.17	*<0.050*	0.051	0.056	0.063	*<0.050*
Molybdenum										7.2	5.5	2.0	3.4	5.6
Nickel										56	64	59	83	72
Phosphorus										1650	2220	739	1960	1190
Potassium										1650	1820	2290	2280	2820
Selenium										0.78	0.83	0.47	0.85	0.24
Silver										0.18	0.25	0.29	0.33	0.12
Sodium										97	122	156	177	108
Strontium										16	20	27	24	20
Sulfur										1100	1300	1800	1600	1100
Thallium										0.14	0.16	0.15	0.19	0.24
Tin										*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium										332	348	375	430	526
Tungsten										*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Uranium										10	10	9.7	12	18
Vanadium										22	24	24	27	34
Zinc*	123	315	196	139	103	112	101	89	123	88	94	83	106	106

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

2. Trigger and threshold values shown here for context only; they were developed for Meadowbank in the *CREMP Design Document 2012* (Azimuth, 2012d).

ISQG = interim sediment quality guideline

PEL = probable effect level

Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the lake specific trigger.

123 Bolded and shaded concentrations also exceed the threshold if threshold is greater than lake specific trigger.

Italicized numbers are below detection limits.

Table C2-1. Sediment grab chemistry, Whale Tail Pit study lakes, 2019.

Lake & Basin	Screening Criteria									Mammoth Lake				
Area-Replicate ID	CCME[1]		WTS	MAM	A20	A76	DS1	NEM	All Lakes	MAM-1	MAM-2	MAM-3	MAM-4	MAM-5
Date										19-Aug-19	19-Aug-19	19-Aug-19	19-Aug-19	19-Aug-19
ALS Sample ID	ISQG	PEL	Trigger	Trigger	Trigger	Trigger	Trigger	Trigger	Threshold	L2338125-19	L2338125-20	L2338125-21	L2338125-22	L2338125-23
Physical & Organic Parameters														
Moisture (%)										91	91	90	90	90
pH										5.2	5.6	5.8	5.1	5.4
TOC (% dw)										9.9	9.7	9.9	8.8	10
Particle Size														
% Gravel (>2mm)										*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
% Sand (2.00mm - 0.063mm)										*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
% Silt (0.063mm - 4µm)										85	83	83	83	81
% Clay (<4µm)										15	16	16	17	18
Total Metals (mg/kg dw)														
Aluminum										20800	21900	20100	24300	17000
Antimony										0.37	0.29	0.30	0.38	0.26
Arsenic*	5.9	17	83	140	43	461	198	61	5.9	117	97	59	93	58
Barium										124	174	158	149	109
Beryllium										1.4	1.5	1.3	1.6	1.2
Bismuth										0.49	0.51	0.45	0.55	0.41
Boron										15	17	16	15	15
Cadmium*	0.60	3.5	0.93	0.43	0.37	0.44	0.45	0.41	0.60	0.42	0.41	0.42	0.43	0.30
Calcium										2880	3110	3580	2830	2830
Chromium*	37	90	81	194	53	103	80	130	37	169	182	165	188	137
Cobalt										14	12	12	20	11
Copper*	36	197	49	77	42	76	26	43	36	69	**82**	67	**77**	54
Iron										42400	39700	29800	42800	27400
Lead	35	91	24	26	25	26	26	22	35	17	17	17	19	15
Lithium										17	18	19	20	16
Magnesium										9480	9850	9160	10700	8460
Manganese										341	328	311	400	328
Mercury	0.17	0.49	0.12	0.13	0.11	0.11	0.12	0.10	0.17	0.081	0.067	0.078	0.068	0.093
Molybdenum										4.6	4.4	3.2	5.9	2.8
Nickel										117	121	110	137	95
Phosphorus										761	746	639	674	635
Potassium										2920	2920	2760	3170	2430
Selenium										0.72	0.74	0.66	0.90	0.56
Silver										0.49	0.47	0.46	0.60	0.39
Sodium										164	167	164	178	153
Strontium										27	26	29	24	26
Sulfur										2600	2200	2200	2400	2200
Thallium										0.29	0.24	0.23	0.37	0.21
Tin										*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium										493	504	470	608	410
Tungsten										0.70	0.67	0.61	0.64	0.68
Uranium										13	14	12	15	9.7
Vanadium										39	42	37	43	32
Zinc*	123	315	196	139	103	112	101	89	123	**141**	130	113	**155**	104

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

2. Trigger and threshold values shown here for context only; they were developed for Meadowbank in the *CREMP Design Document 2012* (Azimuth, 2012d).

ISQG = interim sediment quality guideline

PEL = probable effect level

Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the lake specific trigger.

123 Bolded and shaded concentrations also exceed the threshold if threshold is greater than lake specific trigger.

Italicized numbers are below detection limits.

Table C2-1. Sediment grab chemistry, Whale Tail Pit study lakes, 2019.

Lake & Basin	Screening Criteria									Lake A20				
Area-Replicate ID	CCME[1]		WTS	MAM	A20	A76	DS1	NEM	All Lakes	A20-1	A20-2	A20-3	A20-4	A20-5
Date										16-Aug-19	16-Aug-19	16-Aug-19	16-Aug-19	16-Aug-19
ALS Sample ID	ISQG	PEL	Trigger	Trigger	Trigger	Trigger	Trigger	Trigger	Threshold	L2338125-25	L2338125-26	L2338125-27	L2338125-28	L2338125-29
Physical & Organic Parameters														
Moisture (%)										87	72	91	88	87
pH										4.9	5.4	5.4	4.9	5.7
TOC (% dw)										4.7	1.3	7.8	4.7	4.6
Particle Size														
% Gravel (>2mm)										*<1.0*	1.5	*<1.0*	*<1.0*	*<1.0*
% Sand (2.00mm - 0.063mm)										*<1.0*	7.6	*<1.0*	1.2	2.1
% Silt (0.063mm - 4µm)										68	51	69	66	62
% Clay (<4µm)										32	40	30	33	36
Total Metals (mg/kg dw)														
Aluminum										25300	25700	21300	27400	35000
Antimony										0.19	0.17	0.13	0.19	0.24
Arsenic*	5.9	17	83	140	43	461	198	61	5.9	**50**	28	6.0	41	34
Barium										173	150	179	214	217
Beryllium										2.3	2.0	1.5	3.0	2.9
Bismuth										1.1	0.90	0.61	1.1	1.4
Boron										7.9	*<5.0*	9.0	7.4	8.5
Cadmium*	0.60	3.5	0.93	0.43	0.37	0.44	0.45	0.41	0.60	0.10	0.075	0.22	0.10	0.12
Calcium										2030	2390	2880	2150	2220
Chromium*	37	90	81	194	53	103	80	130	37	**61**	**72**	50	**68**	**85**
Cobalt										16	19	8.0	14	25
Copper*	36	197	49	77	42	76	26	43	36	**46**	38	33	**55**	**70**
Iron										85800	63600	21700	74200	70200
Lead	35	91	24	26	25	26	26	22	35	19	16	14	21	**27**
Lithium										21	27	18	21	28
Magnesium										8040	10800	7450	8700	10800
Manganese										1070	1370	316	799	3010
Mercury	0.17	0.49	0.12	0.13	0.11	0.11	0.12	0.10	0.17	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Molybdenum										6.0	4.5	1.4	5.5	6.0
Nickel										38	52	35	43	50
Phosphorus										1590	716	490	1920	934
Potassium										3680	3540	3040	3930	4910
Selenium										0.71	*<0.20*	0.45	0.84	0.42
Silver										0.18	*<0.10*	0.28	0.25	*<0.10*
Sodium										232	197	243	236	205
Strontium										22	29	23	23	24
Sulfur										1500	*<1000*	2200	1500	2000
Thallium										0.27	0.24	0.20	0.26	0.38
Tin										*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium										538	1100	480	605	682
Tungsten										0.57	*<0.50*	*<0.50*	0.80	0.62
Uranium										14	13	11	18	24
Vanadium										35	41	26	40	51
Zinc*	123	315	196	139	103	112	101	89	123	102	**116**	85	**117**	**137**

Notes:

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2. Trigger and threshold values shown here for context only; they were developed for Meadowbank in the *CREMP Design Document 2012* (Azimuth, 2012d).

ISQG = interim sediment quality guideline

PEL = probable effect level

Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the lake specific trigger.

123 Bolded and shaded concentrations also exceed the threshold if threshold is greater than lake specific trigger.

Italicized numbers are below detection limits.

Table C2-1. Sediment grab chemistry, Whale Tail Pit study lakes, 2019.

Lake & Basin	Screening Criteria									Lake A76				
Area-Replicate ID	CCME[1]		WTS	MAM	A20	A76	DS1	NEM	All Lakes	A76-1	A76-2	A76-3	A76-4	A76-5
Date										15-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19
ALS Sample ID	ISQG	PEL	Trigger	Trigger	Trigger	Trigger	Trigger	Trigger	Threshold	L2338125-31	L2338125-32	L2338125-33	L2338125-34	L2338125-35
Physical & Organic Parameters														
Moisture (%)										91	73	76	71	80
pH										5.9	5.2	4.9	5.1	5.1
TOC (% dw)										8.8	6.5	5.4	5.5	5.1
Particle Size														
% Gravel (>2mm)										*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
% Sand (2.00mm - 0.063mm)										*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
% Silt (0.063mm - 4µm)										73	75	73	74	72
% Clay (<4µm)										26	25	27	26	28
Total Metals (mg/kg dw)														
Aluminum										16800	23600	23400	24500	26600
Antimony										0.23	0.34	0.36	0.39	0.43
Arsenic*	5.9	17	83	140	43	461	198	61	5.9	23	281	434	331	233
Barium										174	197	172	185	183
Beryllium										1.0	1.6	1.6	1.7	1.8
Bismuth										0.44	0.70	0.68	0.72	0.80
Boron										11	6.8	6.6	6.8	6.8
Cadmium*	0.60	3.5	0.93	0.43	0.37	0.44	0.45	0.41	0.60	0.21	0.25	0.17	0.22	0.20
Calcium										2850	2370	2040	2250	2310
Chromium*	37	90	81	194	53	103	80	130	37	91	**131**	**123**	**133**	**145**
Cobalt										7.5	17	21	24	24
Copper*	36	197	49	77	42	76	26	43	36	64	**96**	**87**	**94**	**94**
Iron										22600	102000	122000	103000	96400
Lead	35	91	24	26	25	26	26	22	35	14	20	20	21	23
Lithium										15	18	17	19	21
Magnesium										6820	8850	8710	9290	10100
Manganese										226	1400	1260	1120	1290
Mercury	0.17	0.49	0.12	0.13	0.11	0.11	0.12	0.10	0.17	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Molybdenum										2.3	5.2	5.8	6.5	6.1
Nickel										73	111	101	116	109
Phosphorus										452	1320	1870	1300	1360
Potassium										2490	3460	3300	3550	3570
Selenium										0.56	1.2	1.1	0.93	0.84
Silver										0.48	0.49	0.31	0.23	0.22
Sodium										166	175	163	165	162
Strontium										18	19	18	19	20
Sulfur										1900	2000	2000	2200	2100
Thallium										0.21	0.30	0.29	0.32	0.33
Tin										*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium										335	474	461	498	570
Tungsten										*<0.50*	0.56	0.54	0.55	0.63
Uranium										10	14	14	15	16
Vanadium										29	43	42	44	47
Zinc*	123	315	196	139	103	112	101	89	123	80	**134**	**125**	**143**	**139**

Notes:

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2. Trigger and threshold values shown here for context only; they were developed for Meadowbank in the *CREMP Design Document 2012* (Azimuth, 2012d).

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Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the lake specific trigger.

123 Bolded and shaded concentrations also exceed the threshold if threshold is greater than lake specific trigger.

Italicized numbers are below detection limits.

Table C2-1. Sediment grab chemistry, Whale Tail Pit study lakes, 2019.

Lake & Basin	**Screening Criteria**									**Lake DS1**				
Area-Replicate ID	**CCME[1]**		**WTS**	**MAM**	**A20**	**A76**	**DS1**	**NEM**	**All Lakes**	**DS1-1**	**DS1-2**	**DS1-3**	**DS1-4**	**DS1-5**
Date										17-Aug-19	17-Aug-19	17-Aug-19	17-Aug-19	17-Aug-19
ALS Sample ID	**ISQG**	**PEL**	**Trigger**	**Trigger**	**Trigger**	**Trigger**	**Trigger**	**Trigger**	**Threshold**	L2338125-37	L2338125-38	L2338125-39	L2338125-40	L2338125-41
Physical & Organic Parameters														
Moisture (%)										73	69	73	66	70
pH										6.6	6.7	6.0	6.7	6.1
TOC (% dw)										1.6	1.5	1.9	1.3	1.8
Particle Size														
% Gravel (>2mm)										*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
% Sand (2.00mm - 0.063mm)										1.3	1.3	1.0	1.8	*<1.0*
% Silt (0.063mm - 4µm)										79	77	77	76	76
% Clay (<4µm)										20	21	23	23	23
Total Metals (mg/kg dw)														
Aluminum										17900	18400	17900	20100	18600
Antimony										0.27	0.28	0.28	0.29	0.32
Arsenic*	5.9	17	83	140	43	461	198	61	5.9	41	47	36	17	46
Barium										158	144	153	109	163
Beryllium										1.0	1.0	1.0	1.1	1.1
Bismuth										0.63	0.64	0.69	0.66	0.68
Boron										11	13	13	14	14
Cadmium*	0.60	3.5	0.93	0.43	0.37	0.44	0.45	0.41	0.60	0.27	0.21	0.30	0.14	0.37
Calcium										1950	2330	2010	2560	2320
Chromium*	37	90	81	194	53	103	80	130	37	80	**85**	**82**	**93**	**86**
Cobalt										17	16	17	18	20
Copper*	36	197	49	77	42	76	26	43	36	16	16	17	16	18
Iron										50700	44600	42900	44600	42200
Lead	35	91	24	26	25	26	26	22	35	16	16	18	16	17
Lithium										21	23	22	24	23
Magnesium										11100	11800	11400	12100	11900
Manganese										10900	5240	3230	10300	3450
Mercury	0.17	0.49	0.12	0.13	0.11	0.11	0.12	0.10	0.17	0.053	*<0.050*	0.064	*<0.050*	0.064
Molybdenum										4.7	3.4	2.5	2.3	3.2
Nickel										53	54	55	53	63
Phosphorus										1150	960	942	922	860
Potassium										2150	2470	2360	2510	2660
Selenium										0.35	0.26	0.29	0.32	0.27
Silver										0.13	0.15	0.16	0.14	0.14
Sodium										123	129	133	132	139
Strontium										24	27	25	29	29
Sulfur										*<1000*	*<1000*	*<1000*	*<1000*	*<1000*
Thallium										0.18	0.17	0.20	0.17	0.20
Tin										*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium										436	529	493	553	564
Tungsten										0.57	0.55	0.51	0.51	0.51
Uranium										3.8	3.9	4.2	3.9	4.3
Vanadium										38	39	39	41	41
Zinc*	123	315	196	139	103	112	101	89	123	84	84	89	81	93

Notes:

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123 Bolded concentrations exceed the lake specific trigger.

123 Bolded and shaded concentrations also exceed the threshold if threshold is greater than lake specific trigger.

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Table C2-1. Sediment grab chemistry, Whale Tail Pit study lakes, 2019.

Lake & Basin	Screening Criteria									Nemo Lake				
Area-Replicate ID	CCME[1]		WTS	MAM	A20	A76	DS1	NEM	All Lakes	NEM-1	NEM-2	NEM-3	NEM-4	NEM-5
Date										18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19
ALS Sample ID	ISQG	PEL	Trigger	Trigger	Trigger	Trigger	Trigger	Trigger	Threshold	L2338125-13	L2338125-14	L2338125-15	L2338125-16	L2338125-17
Physical & Organic Parameters														
Moisture (%)										90	84	83	89	90
pH										6.2	6.1	6.4	6.2	6.2
TOC (% dw)										8.8	6.6	8.2	7.7	9.7
Particle Size														
% Gravel (>2mm)										*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
% Sand (2.00mm - 0.063mm)										21	26	27	19	13
% Silt (0.063mm - 4µm)										70	67	67	72	78
% Clay (<4µm)										8.9	7.5	6.7	8.8	8.9
Total Metals (mg/kg dw)														
Aluminum										10500	11100	10600	11200	11700
Antimony										0.35	0.34	0.36	0.38	0.44
Arsenic*	5.9	17	83	140	43	461	198	61	5.9	36	19	26	31	38
Barium										75	75	75	89	95
Beryllium										0.61	0.62	0.59	0.63	0.72
Bismuth										0.21	0.21	0.22	0.23	0.25
Boron										10	7.8	9.0	9.4	11
Cadmium*	0.60	3.5	0.93	0.43	0.37	0.44	0.45	0.41	0.60	0.26	0.27	0.29	0.28	0.27
Calcium										3220	2460	2870	2750	3050
Chromium*	37	90	81	194	53	103	80	130	37	104	104	103	108	113
Cobalt										6.9	6.7	7.0	7.0	7.8
Copper*	36	197	49	77	42	76	26	43	36	37	38	35	42	**45**
Iron										20900	18200	18600	20400	22000
Lead	35	91	24	26	25	26	26	22	35	8.0	7.0	8.6	8.0	8.8
Lithium										10	11	11	11	11
Magnesium										6420	6610	6580	6500	6630
Manganese										217	255	219	262	233
Mercury	0.17	0.49	0.12	0.13	0.11	0.11	0.12	0.10	0.17	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Molybdenum										2.3	2.2	2.1	2.9	3.5
Nickel										75	75	75	80	86
Phosphorus										555	447	561	538	557
Potassium										1100	1100	1090	1150	1190
Selenium										0.52	0.49	0.49	0.51	0.58
Silver										0.14	0.15	0.15	0.16	0.20
Sodium										83	77	85	84	94
Strontium										22	21	22	21	22
Sulfur										2200	1700	2100	2000	2400
Thallium										0.073	0.072	0.073	0.079	0.094
Tin										*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium										199	215	217	182	187
Tungsten										*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Uranium										3.9	4.1	3.7	4.4	4.6
Vanadium										21	22	21	22	24
Zinc*	123	315	196	139	103	112	101	89	123	55	52	53	56	71

Notes:

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123 Bolded and shaded concentrations also exceed the threshold if threshold is greater than lake specific trigger.

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Table C2-2. Hydrocarbon and PAH results for composite sediment grabs, Whale Tail Pit study lakes, 2019.

Lake	Lowest DL	CCME Guidelines[1]		Whale Tail	Mammoth	Lake A20	Lake A76	Lake DS1	Nemo
Area ID		ISQG	PEL	WTS	MAM	A20	A76	DS1	NEM
Date				18-Aug-19	19-Aug-19	16-Aug-19	15-Aug-19	17-Aug-19	18-Aug-19
Physical Parameters									
Moisture (%)				84	90	86	89	69	90
Aggregate Organics (mg/kg)									
Mineral Oil and Grease	500			*<1500*	*<2500*	*<1700*	*<2200*	*<800*	2400
Hydrocarbons (mg/kg)									
EPH10-19	200			*<580*	*<920*	*<640*	*<1000*	*<300*	*<1000*
EPH19-32	200			*<580*	*<920*	*<640*	*<1000*	*<300*	*<1000*
LEPH	200			*<580*	*<920*	*<640*	*<1000*	*<300*	*<1000*
HEPH	200			*<580*	*<920*	*<640*	*<1000*	*<300*	*<1000*
Polycyclic Aromatic Hydrocarbons (mg/kg)									
Acenaphthene	0.0050	0.0067	0.089	*<0.0090*	*<0.014*	*<0.020*	*<0.030*	*<0.0050*	*<0.015*
Acenaphthylene	0.0050	0.0059	0.13	*<0.0090*	*<0.014*	*<0.020*	*<0.030*	*<0.0050*	*<0.015*
Anthracene	0.0040	0.047	0.25	*<0.0090*	*<0.014*	*<0.020*	*<0.030*	*<0.0040*	*<0.015*
Benz(a)anthracene	0.010	0.032	0.39	*<0.010*	*<0.014*	*<0.020*	*<0.030*	*<0.010*	*<0.015*
Benzo(a)pyrene	0.010	0.032	0.78	*<0.010*	*<0.014*	*<0.020*	*<0.030*	*<0.010*	*<0.015*
Benzo(b&j)fluoranthene	0.010			*<0.010*	*<0.014*	*<0.020*	*<0.030*	*<0.010*	*<0.015*
Benzo(b+j+k)fluoranthene	0.015			*<0.015*	*<0.020*	*<0.028*	*<0.042*	*<0.015*	*<0.021*
Benzo(g,h,i)perylene	0.010			*<0.010*	*<0.014*	*<0.020*	0.073	*<0.010*	*<0.015*
Benzo(k)fluoranthene	0.010			*<0.010*	*<0.014*	*<0.020*	*<0.030*	*<0.010*	*<0.015*
Chrysene	0.010	0.057	0.86	*<0.010*	*<0.014*	*<0.020*	*<0.030*	*<0.010*	*<0.015*
Dibenz(a,h)anthracene	0.0050	0.0062	0.14	*<0.0090*	*<0.014*	*<0.020*	*<0.030*	*<0.0050*	*<0.015*
Fluoranthene	0.010	0.11	2.4	*<0.010*	*<0.014*	*<0.020*	*<0.030*	*<0.010*	*<0.015*
Fluorene	0.010	0.021	0.14	*<0.010*	*<0.014*	*<0.020*	*<0.030*	*<0.010*	*<0.015*
Indeno(1,2,3-c,d)pyrene	0.010			*<0.010*	*<0.014*	*<0.020*	*<0.030*	*<0.010*	*<0.015*
1-Methylnaphthalene	0.050			*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
2-Methylnaphthalene	0.010	0.020	0.20	*<0.010*	*<0.014*	*<0.020*	*<0.030*	*<0.010*	*<0.015*
Naphthalene	0.010	0.035	0.39	*<0.010*	*<0.020*	*<0.020*	*<0.030*	*<0.010*	*<0.020*
Phenanthrene	0.010	0.042	0.52	*<0.010*	*<0.014*	*<0.020*	*<0.030*	*<0.010*	*<0.015*
Pyrene	0.010	0.053	0.88	*<0.010*	*<0.014*	*<0.020*	*<0.030*	*<0.010*	*<0.015*
Quinoline	0.050			*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
d12-Chrysene (%)				109	123	106	109	100	94
d8-Naphthalene (%)				114	125	103	107	99	102
d10-Phenanthrene (%)				116	129	110	111	104	103
B(a)P Total Potency Equivalent	0.020			*<0.020*	*<0.020*	*<0.024*	0.037	*<0.020*	*<0.020*
IACR (CCME)	0.15			*<0.15*	*<0.17*	*<0.24*	0.36	*<0.15*	*<0.18*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
   ISQG = interim sediment quality guideline
   PEL = probable effect level

Bolded concentrations exceed the ISQG guideline.

Italicized numbers are below detection limits.

Appendix C3
Sediment Chemistry – Baker Lake

LIST OF TABLES

TABLES

Table C3-1. Sediment grab chemistry, Baker Lake, 2019.

Lake & Basin	Screening Criteria			Baker Lake									
				Barge Dock					Proposed Jetty				
Area-Replicate ID	CCME[1]	Baker Laker[2]		BBD-1	BBD-2	BBD-3	BBD-4	BBD-5	BPJ-1	BPJ-2	BPJ-3	BPJ-4	BPJ-5
Date	ISQG	Trigger	Threshold	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19
ALS Sample ID				L2333924-55	L2333924-56	L2333924-57	L2333924-58	L2333924-59	L2333924-49	L2333924-50	L2333924-51	L2333924-52	L2333924-53
Physical & Organic Parameters													
Moisture (%)				38	40	34	23	33	50	52	42	37	32
pH				6.6	5.8	6.2	6.5	6.6	7.2	6.7	6.0	6.3	6.8
TOC (% dw)				0.47	0.48	0.34	0.16	0.31	0.66	0.62	0.51	0.38	0.28
Particle Size													
% Gravel (>2mm)				*<1.0*	*<1.0*	*<1.0*	5.2	*<1.0*	*<1.0*	3.1	*<1.0*	1.8	*<1.0*
% Sand (2.00mm - 0.063mm)				34	56	68	85	71	38	32	19	50	73
% Silt (0.063mm - 4µm)				59	40	29	9.2	26	55	56	68	41	24
% Clay (<4µm)				7.2	3.6	3.0	1.2	2.5	6.9	9.5	12	7.0	2.8
Total Metals (mg/kg dw)													
Aluminum				9340	7480	6540	3990	5820	10600	10800	11300	8590	5960
Antimony				0.13	0.12	*<0.10*	*<0.10*	*<0.10*	0.16	0.16	0.17	0.13	0.10
Arsenic*	5.9	7.6		7.0	6.0	5.0	2.6	**8.2**	**8.9**	**25**	6.5	**18**	6.5
Barium				93	74	78	35	69	122	103	107	105	89
Beryllium				0.35	0.29	0.25	0.18	0.25	0.45	0.44	0.51	0.39	0.26
Bismuth				*<0.20*	0.51	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	0.22	*<0.20*	*<0.20*
Boron				8.0	5.9	5.4	*<5.0*	*<5.0*	8.8	8.8	11	8.9	5.6
Cadmium	0.60	0.32	0.60	0.038	0.041	0.038	*<0.020*	0.038	0.088	0.080	0.065	0.042	0.055
Calcium				2760	2140	1880	1050	1890	2870	2590	3130	2410	1860
Chromium	37	27	37	20	16	13	8.8	13	23	23	25	19	16
Cobalt				6.3	4.8	4.6	3.0	4.5	7.7	7.7	7.4	6.1	5.0
Copper	36	20	36	8.8	7.3	7.3	3.6	5.9	9.3	9.8	11	8.4	6.7
Iron				15900	13300	12300	7970	12600	19700	21100	19900	19300	15200
Lead	35	20	35	7.4	5.8	5.1	2.6	4.8	8.5	8.7	9.7	7.2	5.4
Lithium				11	9.1	8.6	6.7	8.1	12	12	14	11	8.0
Magnesium				4650	4190	3910	2700	3720	5260	5380	5740	4310	3360
Manganese				554	187	264	145	408	2340	1300	788	1180	1960
Mercury	0.17	0.088	0.17	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Molybdenum				0.68	0.62	0.46	0.30	0.76	1.6	1.7	0.98	1.6	1.4
Nickel				12	10	9.0	5.7	8.5	15	14	15	11	9.3
Phosphorus				952	677	600	312	689	917	1040	993	998	540
Potassium				1710	1160	1030	610	930	1830	1820	2400	1760	1110
Selenium				*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Silver				*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Sodium				150	83	68	*<50*	87	139	144	274	182	101
Strontium				51	39	38	22	39	57	55	57	54	45
Sulfur				*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*
Thallium				0.066	*<0.050*	*<0.050*	*<0.050*	*<0.050*	0.074	0.074	0.098	0.064	*<0.050*
Tin				*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium				477	377	311	149	278	513	478	561	417	349
Uranium				1.9	1.2	0.96	0.49	0.99	1.8	1.8	2.1	1.8	1.0
Vanadium				25	18	17	9.8	17	26	27	32	24	20
Zinc	123	73	123	33	29	26	17	25	41	40	45	34	27

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table C3-1. Sediment grab chemistry, Baker Lake, 2019.

Lake & Basin	Screening Criteria			Baker Lake									
				Akilahaarjuk Point					East Shore				
Area-Replicate ID	CCME[1]	Baker Laker[2]		BAP-1	BAP-2	BAP-3	BAP-4	BAP-5	BES-1	BES-2	BES-3	BES-4	BES-5
Date	ISQG	Trigger	Threshold	12-Aug-19	12-Aug-19	12-Aug-19	12-Aug-19	12-Aug-19 #	12-Aug-19	12-Aug-19	12-Aug-19	12-Aug-19	12-Aug-19
ALS Sample ID				L2333924-37	L2333924-38	L2333924-39	L2333924-40	L2333924-41	L2333924-43	L2333924-44	L2333924-45	L2333924-46	L2333924-47
Physical & Organic Parameters													
Moisture (%)				35	36	35	47	34	40	38	41	36	36
pH				6.1	6.1	5.9	6.0	7.0	7.2	6.4	6.3	7.5	6.5
TOC (% dw)				0.42	0.33	0.46	0.69	0.27	0.43	0.42	0.42	0.41	0.40
Particle Size													
% Gravel (>2mm)				*<1.0*	*<1.0*	*<1.0*	*<1.0*	2.6	*<1.0*	*<1.0*	*<1.0*	*<1.0*	2.0
% Sand (2.00mm - 0.063mm)				79	77	72	66	80	62	65	64	73	59
% Silt (0.063mm - 4µm)				20	21	26	31	16	33	31	33	24	35
% Clay (<4µm)				1.7	1.9	2.5	3.2	1.8	4.2	3.4	2.8	2.0	4.1
Total Metals (mg/kg dw)													
Aluminum				4850	5420	6310	7550	4770	7360	6850	7950	6900	8030
Antimony				0.13	0.13	0.14	0.15	0.13	0.13	0.12	0.16	0.14	0.15
Arsenic*	5.9	7.6		6.7	**7.6**	4.1	3.9	3.7	3.6	3.8	5.1	3.7	4.0
Barium				445	486	460	413	334	107	136	136	144	86
Beryllium				0.26	0.30	0.32	0.38	0.31	0.36	0.30	0.38	0.31	0.36
Bismuth				*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Boron				6.0	7.0	7.1	8.6	5.8	6.5	6.4	7.3	6.3	7.1
Cadmium	0.60	0.32	0.60	0.025	0.029	0.031	0.047	0.023	0.037	0.040	0.050	0.042	0.037
Calcium				2040	2130	2160	2210	1740	2220	2050	2290	2180	2320
Chromium	37	27	37	16	16	18	20	15	18	20	23	19	21
Cobalt				3.8	4.1	4.3	4.9	3.9	4.7	5.0	5.8	5.2	5.2
Copper	36	20	36	4.2	4.5	5.3	7.5	4.1	**27**	5.2	6.0	5.1	5.6
Iron				13500	14600	14400	14600	13200	13200	13700	15200	13900	14200
Lead	35	20	35	3.9	4.2	4.5	5.4	3.8	5.3	4.8	5.3	4.5	5.1
Lithium				6.6	7.3	7.5	9.0	6.7	9.0	8.5	9.9	9.0	9.2
Magnesium				2950	3220	3650	4030	3170	4170	4270	4840	4290	4280
Manganese				180	207	148	132	265	553	1630	1550	832	715
Mercury	0.17	0.088	0.17	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Molybdenum				0.41	0.58	0.44	0.49	0.41	0.59	0.81	1.0	0.56	0.56
Nickel				9.0	8.9	9.7	12	8.7	10	11	14	12	12
Phosphorus				704	734	730	713	597	697	699	791	732	794
Potassium				1150	1310	1480	1750	1170	1320	1340	1490	1320	1480
Selenium				*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Silver				*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Sodium				87	102	117	128	76	107	96	110	80	98
Strontium				43	49	46	52	42	44	41	43	39	45
Sulfur				*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*
Thallium				*<0.050*	0.055	0.055	0.066	*<0.050*	0.061	0.054	0.061	0.057	0.056
Tin				*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium				311	370	396	408	298	349	351	378	367	386
Uranium				1.2	1.2	1.4	1.7	1.0	1.4	1.2	1.3	1.1	1.2
Vanadium				19	21	23	24	20	19	20	23	21	22
Zinc	123	73	123	19	21	23	29	19	30	26	29	26	27

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.
2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017.
3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table C3-2. Hydrocarbon and PAH results from composite sediment grabs at Baker Lake, 2019.

Lake	**CCME (2002) Guidelines[1]**	**Baker Lake**			
Area ID		**BAP**	**BES**	**BBD**	**BPJ**
Date		12-Aug-19	12-Aug-19	13-Aug-19	13-Aug-19
ALS Sample ID	**ISQG**	L2333924-42	L2333924-48	L2333924-60	L2333924-54
Physical Parameters					
Moisture (%)		34	39	32	41
Aggregate Organics (mg/kg)					
Mineral Oil and Grease		*<500*	*<500*	*<500*	*<500*
Hydrocarbons (mg/kg)					
EPH10-19		*<200*	*<200*	*<200*	*<200*
EPH19-32		*<200*	*<200*	*<200*	*<200*
LEPH		*<200*	*<200*	*<200*	*<200*
HEPH		*<200*	*<200*	*<200*	*<200*
Polycyclic Aromatic Hydrocarbons (mg/kg)					
Acenaphthene	0.0067	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Acenaphthylene	0.0059	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Anthracene	0.047	*<0.0040*	*<0.0040*	*<0.0040*	*<0.0040*
Benzo(a)anthracene	0.032	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Benzo(a)pyrene	0.032	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Benzo(b)fluoranthene		*<0.010*	*<0.010*	*<0.010*	*<0.010*
Benzo(b+j+k)fluoranthene		*<0.015*	*<0.015*	*<0.015*	*<0.015*
Benzo(g,h,i)perylene		*<0.010*	*<0.010*	*<0.010*	*<0.010*
Benzo(k)fluoranthene		*<0.010*	*<0.010*	*<0.010*	*<0.010*
Chrysene	0.057	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Dibenz(a,h)anthracene	0.0062	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Fluoranthene	0.11	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Fluorene	0.021	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Indeno(1,2,3-c,d)pyrene		*<0.010*	*<0.010*	*<0.010*	*<0.010*
1-Methylnaphthalene		*<0.050*	*<0.050*	*<0.050*	*<0.050*
2-Methylnaphthalene	0.020	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Naphthalene	0.035	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Phenanthrene	0.042	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Pyrene	0.053	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Quinoline		*<0.050*	*<0.050*	*<0.050*	*<0.050*
d10-Acenaphthene (%)		98	96	96	95
d12-Chrysene (%)		98	96	107	108
d8-Naphthalene (%)		105	101	104	104
d10-Phenanthrene (%)		*<0.020*	*<0.020*	*<0.020*	*<0.020*
B(a)P Total Potency Equivalent		*<0.15*	*<0.15*	*<0.15*	*<0.15*
IACR (CCME)		*<0.15*	*<0.15*	*<0.15*	*<0.15*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = Interim freshwater Sediment Quality Guideline

Bolded concentrations exceed the ISQG guideline.

Italicized numbers are below detection limits.

APPENDIX D
PHYTOPLANKTON TAXONOMY DATA AND SUPPLEMENTAL PLOTS

Appendix D1

Phyto Data – Meadowbank Study Area Lakes

LIST OF TABLES – APPENDIX D1

LIST OF FIGURES – APPENDIX D1

Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2019.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		
Inuggugayualik Lake										
INUG - 108	1-Apr-19	0.057	2.7	19	1.4	11	2.8	37	16	0.63
INUG - 109	1-Apr-19	0.17	2.9	13	2.1	8.0	4.1	30	18	0.65
INUG - 110	18-May-19	0	2.0	21	3.3	5.1	26	57	24	0.67
INUG - 111	18-May-19	0	4.1	48	1.4	6.7	37	97	25	0.79
INUG - 112	29-Jul-19	0	11	158	21	2.1	6.6	199	32	0.88
INUG - 113	29-Jul-19	0	2.5	141	19	0.34	0	163	27	0.86
INUG - 114	15-Aug-19	0.090	7.5	61	7.4	0.77	8.3	85	29	0.89
INUG - 115	15-Aug-19	0	7.0	60	5.4	0.78	2.8	76	30	0.91
INUG - 116	18-Sep-19	0.67	2.5	24	11	0.30	2.8	41	30	0.74
INUG - 117	18-Sep-19	0.51	3.6	31	8.1	0.41	0.92	44	32	0.84
Percent Density or Biomass		***0.18***	***5.5***	***70***	***9.6***	***4.3***	***11***			
Pipedream Lake										
PDL - 73	31-Mar-19	0.58	2.8	4.5	4.8	1.4	0	14	18	0.53
PDL - 74	31-Mar-19	1.6	2.1	7.5	1.9	0.46	0.92	15	23	0.55
PDL - 75	18-May-19	1.1	2.4	7.0	1.7	4.4	2.1	19	23	0.61
PDL - 76	18-May-19	1.2	3.1	8.1	1.1	2.8	2.1	18	18	0.67
PDL - 77	28-Jul-19	0.98	3.4	70	37	1.7	15	129	27	0.88
PDL - 78	28-Jul-19	0.34	1.9	106	31	2.0	16	157	25	0.90
PDL - 79	14-Aug-19	1.5	3.0	107	21	0	4.7	138	30	0.88
PDL - 80	14-Aug-19	1.1	2.7	95	18	0	1.4	118	28	0.87
PDL - 81	12-Sep-19	3.1	4.6	60	11	1.3	2.0	82	29	0.92
PDL - 82	12-Sep-19	2.9	6.2	69	7.6	0	0.66	87	27	0.91
Percent Density or Biomass		***1.9***	***4.2***	***69***	***17***	***1.8***	***5.8***			
Third Portage Lake - East Basin										
TPE - 120	17-Mar-19	0	2.4	4.7	1.6	3.7	3.4	16	15	0.74
TPE - 121	17-Mar-19	0	4.1	6.1	6.3	1.6	4.1	22	18	0.64
TPE - 122	7-May-19	0	2.6	6.2	1.4	2.4	6.0	19	16	0.39
TPE - 123	7-May-19	0	2.1	14	1.9	6.4	0.32	24	14	0.82
TPE - 124	13-Jul-19	0	5.1	47	28	3.9	7.3	92	24	0.69
TPE - 125	13-Jul-19	0.098	7.1	40	23	1.9	7.8	80	30	0.76
TPE - 126	13-Aug-19	0	11	59	19	2.8	4.7	96	29	0.84
TPE - 127	13-Aug-19	0	22	63	18	4.8	7.3	116	27	0.87
TPE - 128	13-Sep-19	0.035	25	109	14	5.5	6.0	160	29	0.89
TPE - 129	13-Sep-19	0	31	105	11	2.9	6.6	156	28	0.88
Percent Density or Biomass		***<0.1***	***17***	***64***	***12***	***3.0***	***4.7***			

Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2019.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Inuggugayualik Lake								
INUG - 108	1-Apr-19	300	585,107	242,835	51,445	83,760	800	964,247
INUG - 109	1-Apr-19	900	485,816	188,443	74,968	68,576	300	819,003
INUG - 110	18-May-19	0	397,163	208,674	106,383	15,884	1,400	729,504
INUG - 111	18-May-19	0	407,902	493,862	63,930	33,015	2,400	1,001,108
INUG - 112	29-Jul-19	0	73,040	902,000	328,680	1,200	400	1,305,320
INUG - 113	29-Jul-19	0	73,640	786,456	274,592	200	0	1,134,888
INUG - 114	15-Aug-19	400	339,448	561,352	159,248	400	800	1,061,648
INUG - 115	15-Aug-19	0	381,952	568,136	115,344	7,384	200	1,073,016
INUG - 116	18-Sep-19	3,400	48,099	378,187	345,972	3,546	300	779,504
INUG - 117	18-Sep-19	2,200	278,296	345,672	256,819	3,646	100	886,733
Percent Density or Biomass		***<0.1***	***31***	***48***	***18***	***2.2***	***<0.1***	
Pipedream Lake								
PDL - 73	31-Mar-19	1,600	436,470	64,330	117,921	14,284	0	634,606
PDL - 74	31-Mar-19	30,069	380,233	92,399	57,338	3,646	100	563,784
PDL - 75	18-May-19	3,200	347,918	127,860	50,345	15,484	400	545,207
PDL - 76	18-May-19	4,000	280,142	110,129	40,007	14,584	400	449,263
PDL - 77	28-Jul-19	4,000	122,928	407,520	483,528	1,000	1,600	1,020,576
PDL - 78	28-Jul-19	1,200	95,592	392,568	259,224	7,984	1,800	758,368
PDL - 79	14-Aug-19	9,984	211,336	591,504	266,808	0	200	1,079,832
PDL - 80	14-Aug-19	3,800	146,880	612,256	245,056	0	200	1,008,192
PDL - 81	12-Sep-19	18,000	211,620	377,541	182,151	14,384	300	803,996
PDL - 82	12-Sep-19	16,700	231,697	602,291	151,536	0	100	1,002,324
Percent Density or Biomass		***1.2***	***33***	***40***	***25***	***0.94***	***<0.1***	
Third Portage Lake - East Basin								
TPE - 120	17-Mar-19	0	195,036	78,214	74,568	28,969	100	376,887
TPE - 121	17-Mar-19	0	343,972	92,299	59,138	4,346	200	499,954
TPE - 122	7-May-19	0	485,816	88,653	22,277	14,384	700	611,829
TPE - 123	7-May-19	0	159,575	187,943	60,384	33,115	100	441,116
TPE - 124	13-Jul-19	0	230,088	322,496	783,656	15,968	600	1,352,808
TPE - 125	13-Jul-19	600	230,488	448,808	676,696	7,984	1,000	1,365,576
TPE - 126	13-Aug-19	0	338,248	483,928	456,192	2,000	1,000	1,281,368
TPE - 127	13-Aug-19	0	691,064	442,024	483,328	3,400	1,000	1,620,816
TPE - 128	13-Sep-19	200	806,808	835,560	382,952	17,168	400	2,043,088
TPE - 129	13-Sep-19	0	756,320	826,976	218,120	1,800	400	1,803,616
Percent Density or Biomass		***<0.1***	***37***	***33***	***28***	***1.1***	***<0.1***	

Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2019.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		
Third Portage Lake - North Basin										
TPN - 120	17-Mar-19	0	1.3	7.3	3.1	2.3	4.6	19	15	0.73
TPN - 121	17-Mar-19	0.050	1.9	3.6	5.8	1.4	7.0	20	13	0.57
TPN - 122	6-May-19	0	7.5	2.1	1.8	2.2	8.6	22	14	0.31
TPN - 123	6-May-19	0	2.8	25	1.1	2.2	14	45	19	0.68
TPN - 124	23-Jul-19	0	16	85	7.4	1.4	15	125	26	0.91
TPN - 125	23-Jul-19	0	4.7	59	8.5	0.70	12	85	24	0.89
TPN - 126	13-Aug-19	0.72	15	47	8.1	0.82	5.8	77	30	0.89
TPN - 127	13-Aug-19	0	11	49	6.4	0.82	4.7	73	25	0.89
TPN - 128	10-Sep-19	0.079	26	69	16	3.4	4.7	119	29	0.89
TPN - 129	10-Sep-19	0.26	25	82	13	0.67	7.9	128	30	0.89
Percent Density or Biomass		***0.16***	***19***	***62***	***11***	***1.4***	***5.8***			
Second Portage Lake										
SP - 120	29-Mar-19	0	4.0	9.5	6.6	3.1	0.90	24	22	0.56
SP - 121	29-Mar-19	0	6.0	9.8	7.6	3.9	0.72	28	23	0.63
SP - 122	11-May-19	0	3.2	159	4.8	8.6	12	188	22	0.86
SP - 123	11-May-19	0	2.5	93	4.1	11	15	126	21	0.83
SP - 124	10-Jul-19	0	2.8	82	60	4.7	18	167	29	0.86
SP - 125	10-Jul-19	0	2.3	78	71	12	15	178	27	0.86
SP - 126	14-Aug-19	0.27	9.0	44	24	9.9	5.8	92	31	0.89
SP - 127	14-Aug-19	0	11	62	20	11	5.8	109	35	0.89
SP - 128	15-Sep-19	0	4.2	81	17	7.4	16	127	35	0.87
SP - 129	15-Sep-19	0.045	7.6	86	19	6.1	17	136	34	0.89
Percent Density or Biomass		***<0.1***	***6.8***	***59***	***17***	***7.4***	***9.7***			

Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2019.

Area-Replicate	**Date**	**Phytoplankton Density (cells/L)**						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Third Portage Lake - North Basin								
TPN - 120	17-Mar-19	0	145,490	106,583	60,984	14,484	400	327,941
TPN - 121	17-Mar-19	100	287,234	74,568	82,860	400	600	445,763
TPN - 122	6-May-19	0	1,127,660	113,675	40,607	11,038	500	1,293,480
TPN - 123	6-May-19	0	429,078	376,787	50,245	4,546	1,100	861,756
TPN - 124	23-Jul-19	0	417,072	495,912	166,232	800	1,800	1,081,816
TPN - 125	23-Jul-19	0	193,968	353,832	202,152	400	1,000	751,352
TPN - 126	13-Aug-19	7,184	389,136	378,568	173,416	600	800	949,704
TPN - 127	13-Aug-19	0	345,232	412,288	81,424	600	800	840,344
TPN - 128	10-Sep-19	600	762,504	564,152	305,128	8,984	200	1,641,568
TPN - 129	10-Sep-19	1,200	705,632	710,232	339,848	400	600	1,757,912
Percent Density or Biomass		***<0.1***	***48***	***36***	***15***	***0.42***	***<0.1***	
Second Portage Lake								
SP - 120	29-Mar-19	0	575,168	159,975	85,760	5,146	100	826,149
SP - 121	29-Mar-19	0	557,738	181,051	102,791	8,992	100	850,672
SP - 122	11-May-19	0	331,464	911,600	96,192	44,304	1,000	1,384,560
SP - 123	11-May-19	0	294,544	778,488	95,392	52,488	1,200	1,222,112
SP - 124	10-Jul-19	0	72,040	674,912	353,832	16,168	2,000	1,118,952
SP - 125	10-Jul-19	0	72,440	557,368	546,000	33,936	600	1,210,344
SP - 126	14-Aug-19	14,368	482,328	524,432	411,888	33,736	800	1,467,552
SP - 127	14-Aug-19	0	461,376	733,568	276,592	47,504	1,200	1,520,240
SP - 128	15-Sep-19	0	188,384	675,112	376,368	24,752	1,400	1,266,016
SP - 129	15-Sep-19	200	273,792	595,288	243,672	17,168	1,200	1,131,320
Percent Density or Biomass		***0.12***	***28***	***48***	***22***	***2.4***	***<0.1***	

Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2019.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		
Wally Lake										
WAL - 89	28-Mar-19	0	4.3	20	9.4	10	1.3	45	24	0.74
WAL - 90	28-Mar-19	0	5.7	26	17	9.9	0.92	59	25	0.78
WAL - 91	16-May-19	0	2.2	19	10.0	3.4	3.7	39	21	0.75
WAL - 92	16-May-19	0	4.2	136	11	5.9	24	181	24	0.85
WAL - 93	16-Jul-19	0.48	4.9	78	27	1.3	3.6	115	30	0.88
WAL - 94	16-Jul-19	0.16	2.3	123	22	3.4	5.7	157	31	0.87
WAL - 95	11-Aug-19	0	12	64	30	6.4	12	124	39	0.91
WAL - 96	14-Sep-19	0	8.7	123	22	2.1	5.8	162	30	0.90
WAL - 97	14-Sep-19	0	9.4	78	26	0.46	2.0	116	31	0.89
Percent Density or Biomass		***<0.1***	***7.4***	***66***	***19***	***2.2***	***5.0***			
All 2019 Locations Relative Density or Biomass (%)		***0.21***	***7.4***	***60***	***15***	***4.2***	***8.2***			

Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2019.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Wally Lake								
WAL - 89	28-Mar-19	0	103,037	223,504	86,906	35,369	600	449,416
WAL - 90	28-Mar-19	0	177,305	67,576	86,306	38,161	400	369,748
WAL - 91	16-May-19	0	50,688	1,182,408	317,160	99,592	2,200	1,652,048
WAL - 92	16-May-19	0	21,952	1,759,512	385,416	126,128	1,600	2,294,608
WAL - 93	16-Jul-19	179,600	1,049,864	705,032	441,640	23,152	600	2,399,888
WAL - 94	16-Jul-19	36,120	1,215,496	935,320	414,504	15,168	400	2,617,008
WAL - 95	11-Aug-19	600	863,680	889,432	827,176	59,472	400	2,640,760
WAL - 96	14-Sep-19	1,200	1,020,928	896,216	784,320	73,040	1,000	2,776,704
WAL - 97	14-Sep-19	0	503,280	993,008	634,808	38,520	400	2,170,016
Percent Density or Biomass		***1.3***	***29***	***44***	***23***	***2.9***	***<0.1***	
All 2019 Locations Relative Density or Biomass (%)		***0.44***	***32***	***40***	***20***	***1.8***	***<0.1***	

Figure D1-1. Cyanophyte biomass (mg/m³) from Meadowbank study lakes since 2006.

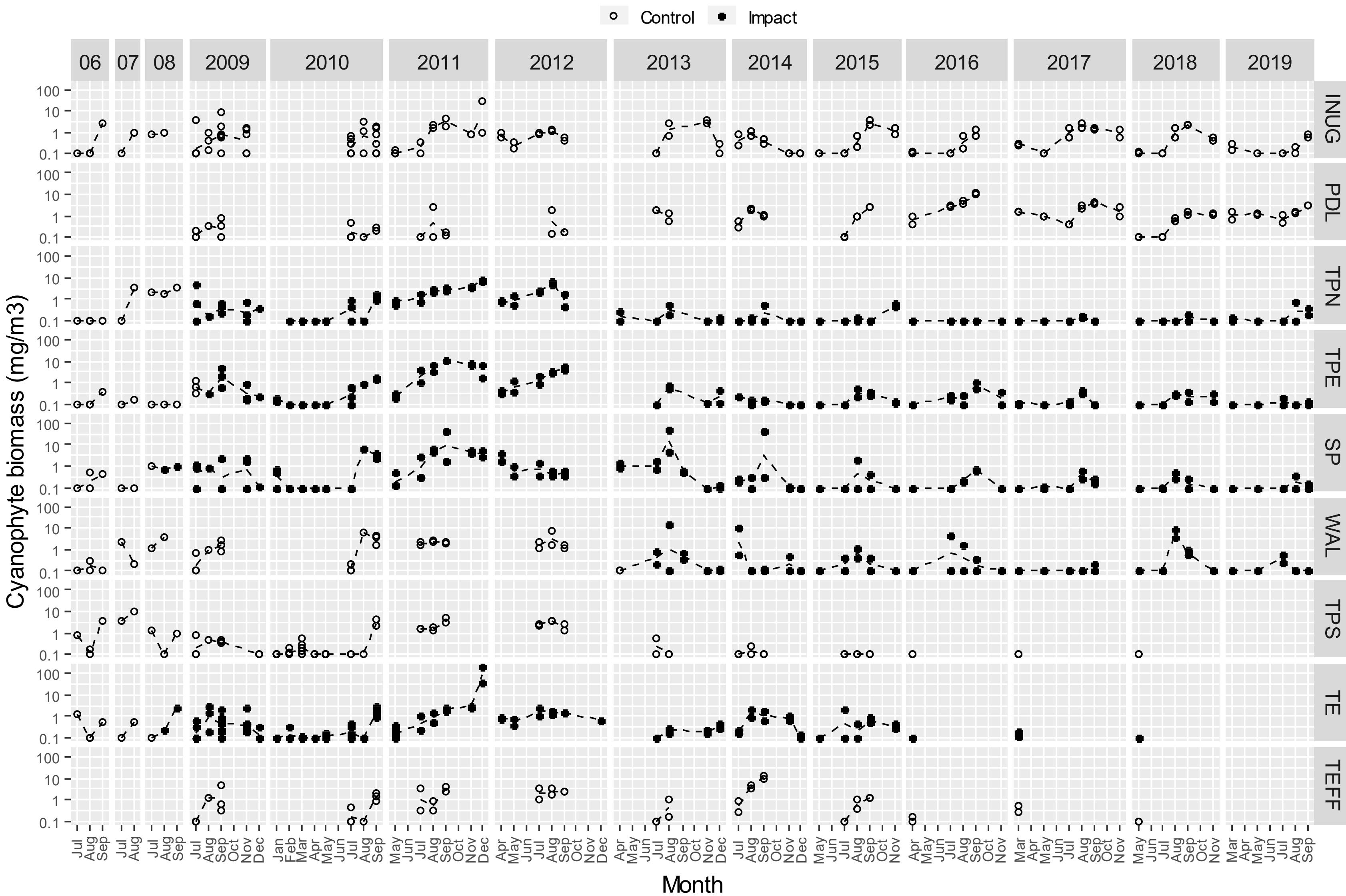


Figure D1-2. Chlorophyte biomass (mg/m³) from Meadowbank study lakes since 2006.

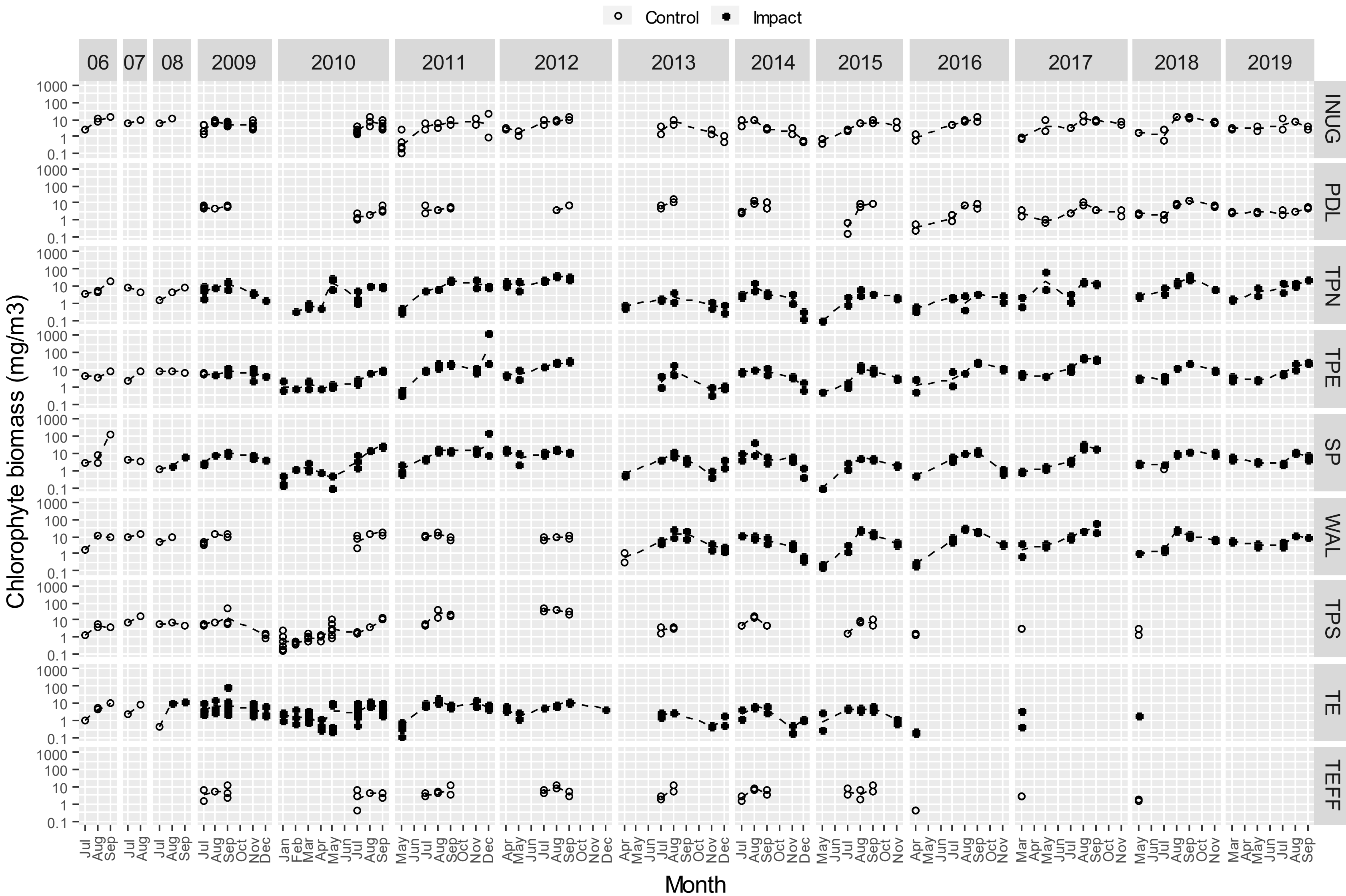


Figure D1-3. Chrysophyte biomass (mg/m³) from Meadowbank study lakes since 2006.

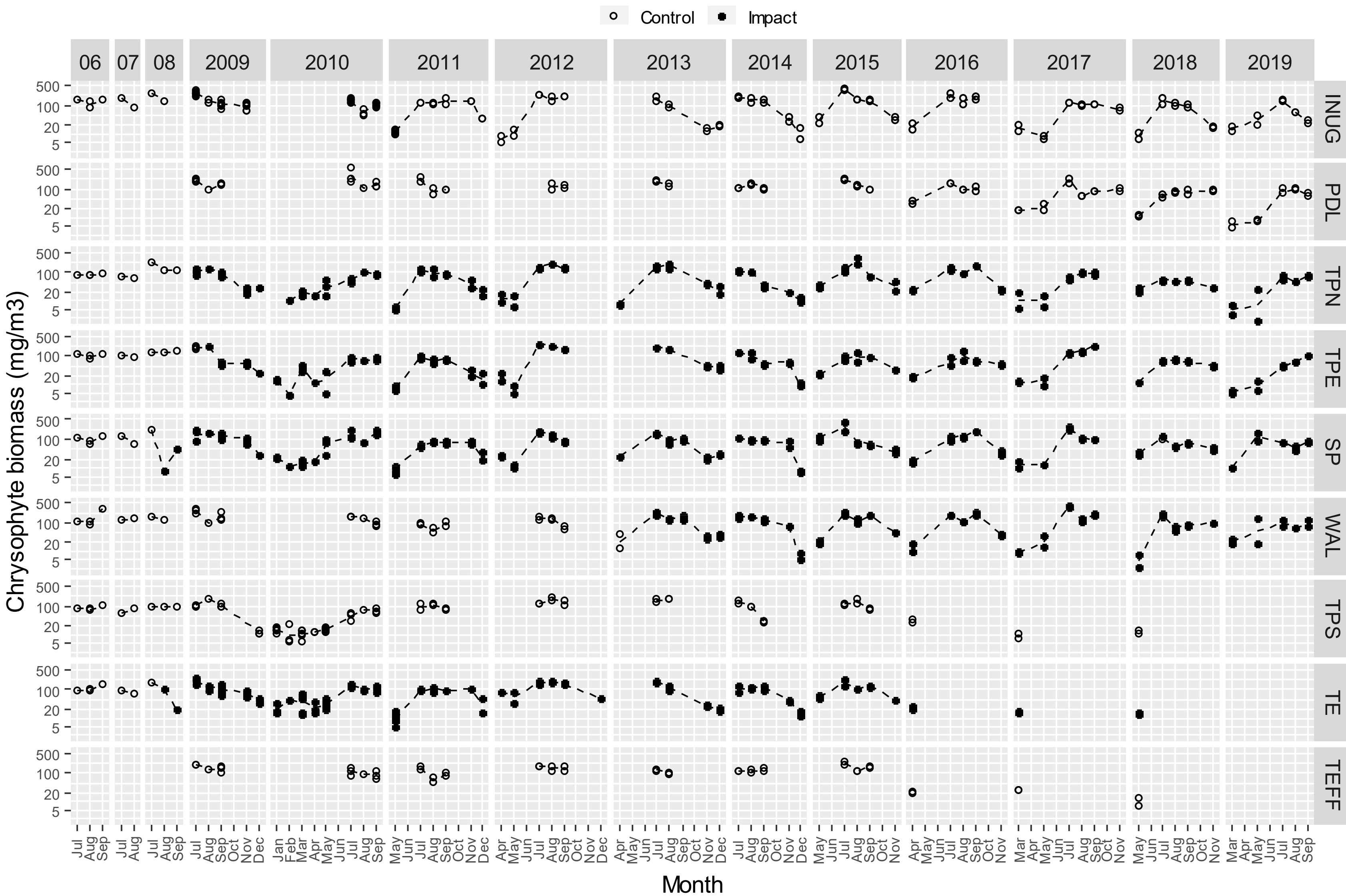


Figure D1-4. Diatom biomass (mg/m³) from Meadowbank study lakes since 2006.

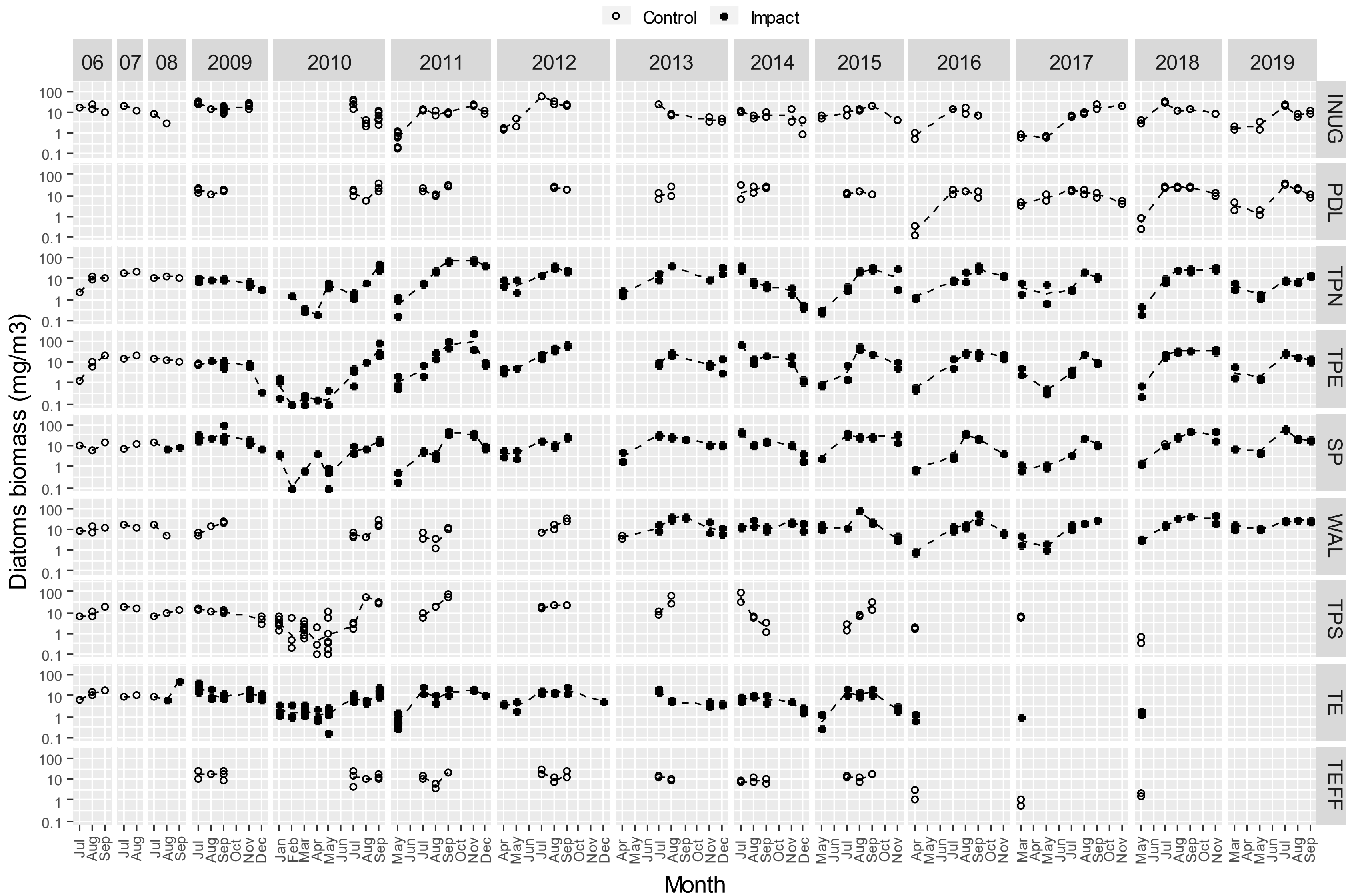


Figure D1-5. Cryptophyte biomass (mg/m³) from Meadowbank study lakes since 2006.

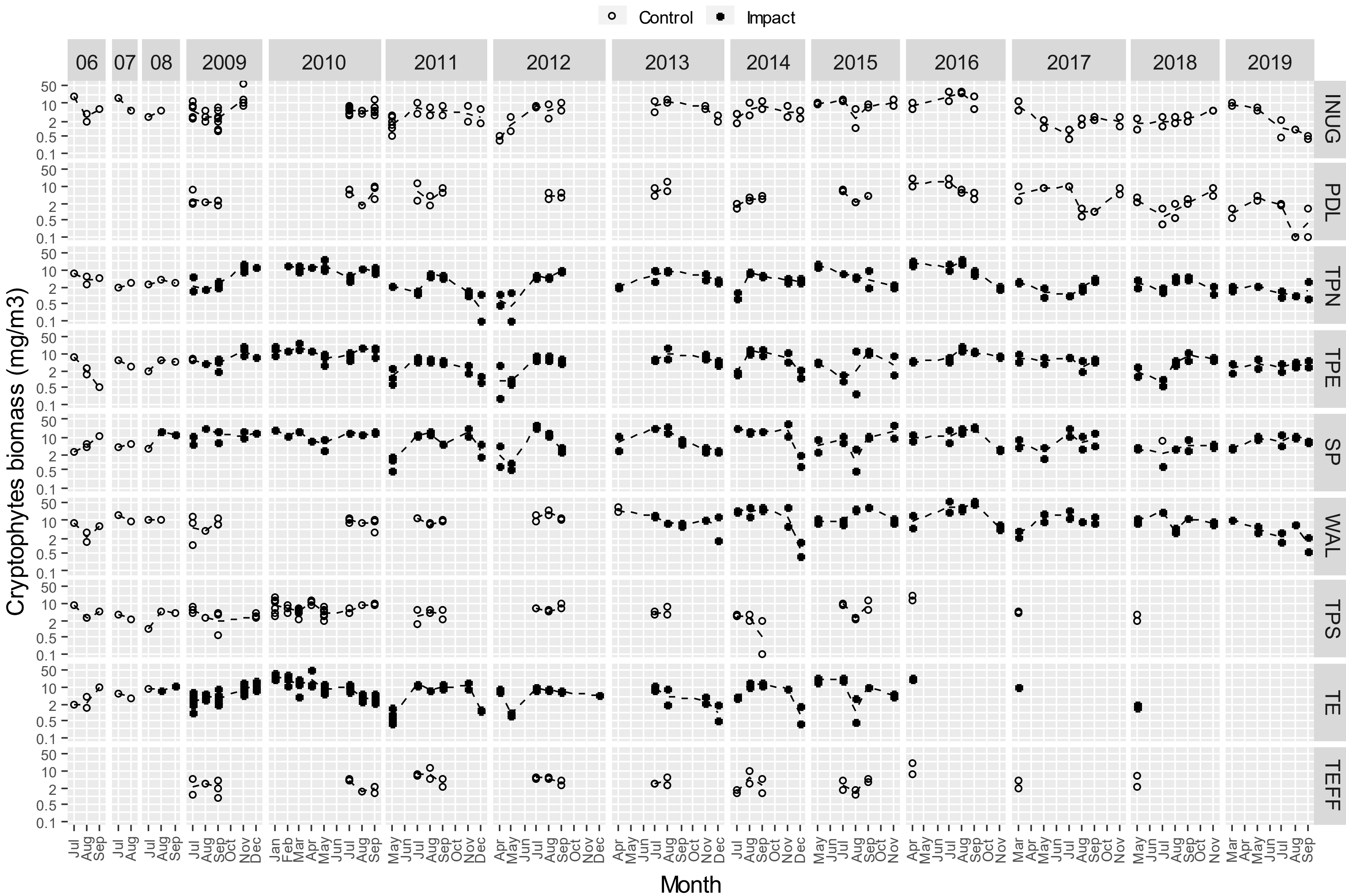


Figure D1-6. Dinoflagellate biomass (mg/m³) from Meadowbank study lakes since 2006.

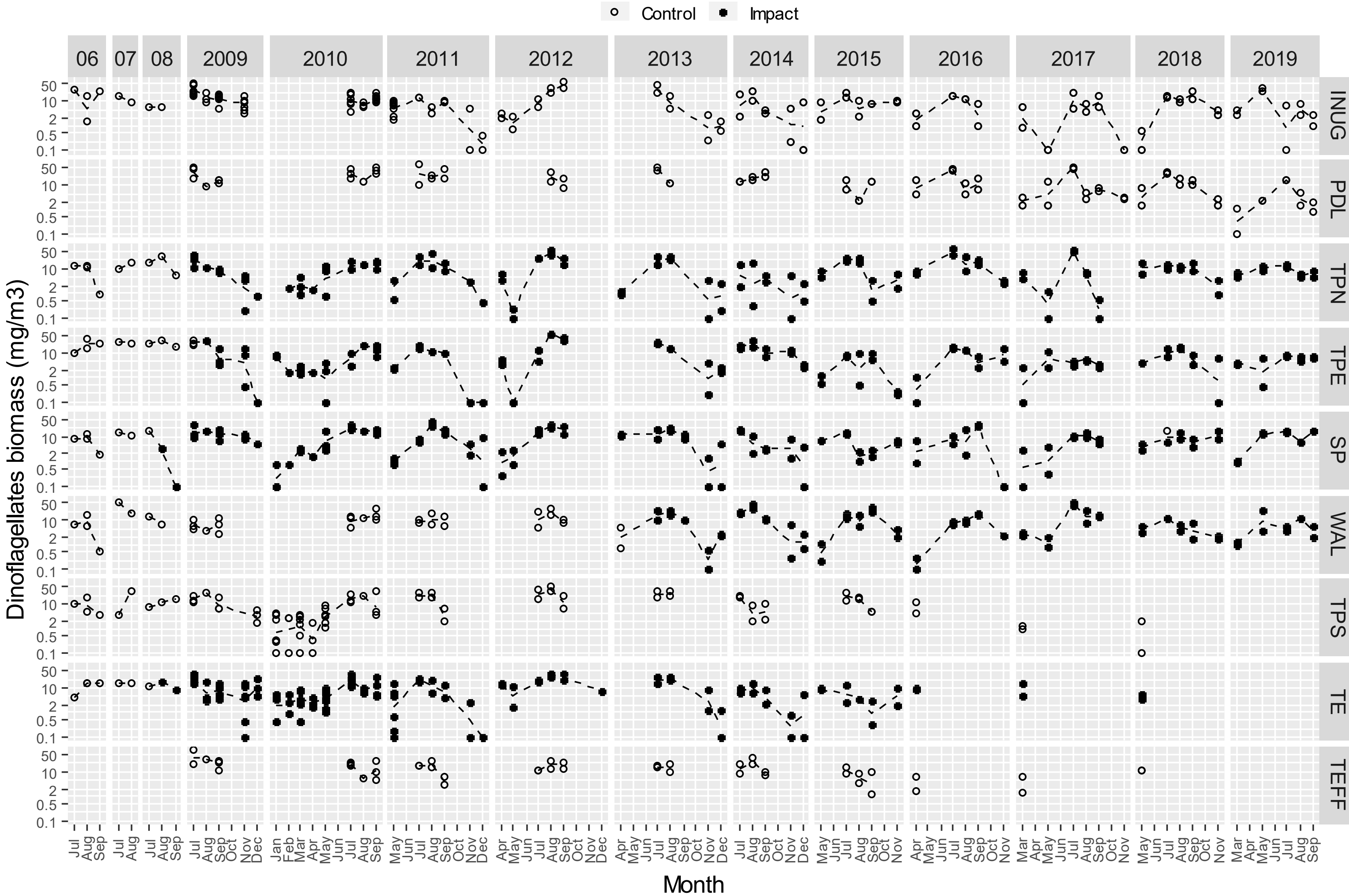


Figure D1-7. Phytoplankton density (cells/L) by major taxa group from Meadowbank study lakes since 2006.

Note: High chlorophyll value in December 2011 at TPE omitted.

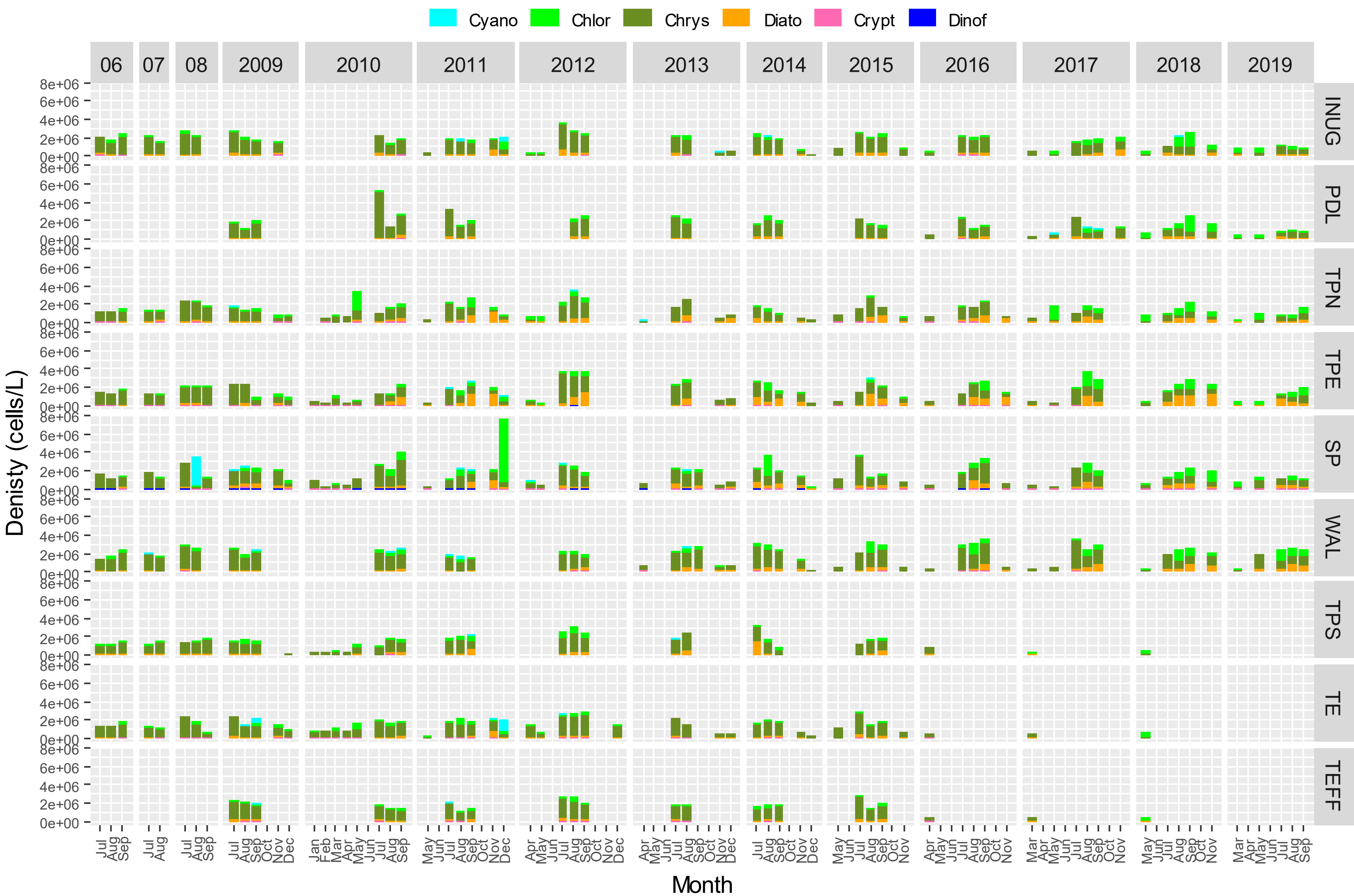


Figure D1-8. Relative phytoplankton density by major taxa group from Meadowbank study lakes since 2006.

Figure D1-9. Cyanophyte density (cells/L) by major taxa group from Meadowbank study lakes since 2006.

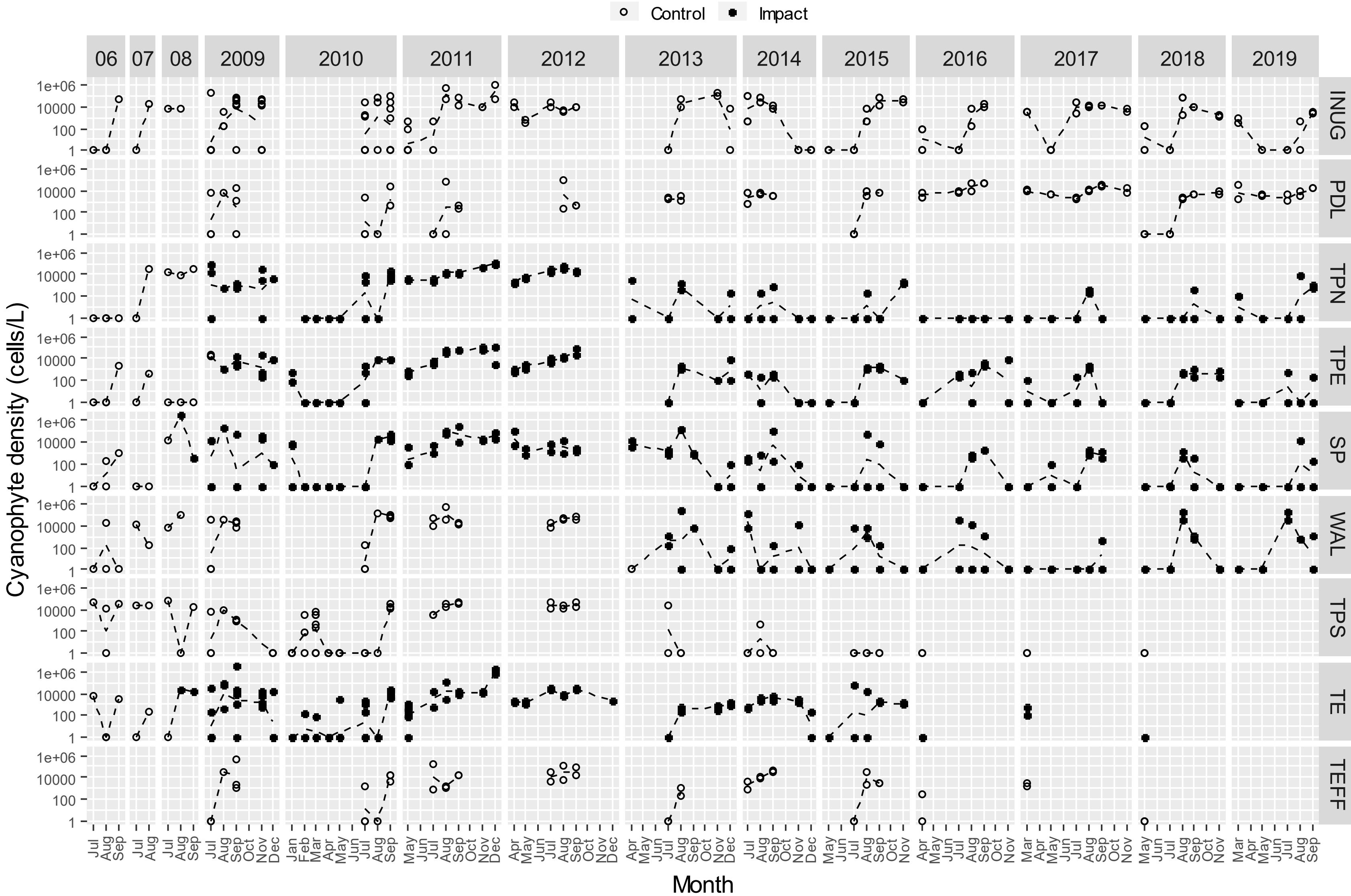


Figure D1-10. Chlorophyte density (cells/L) by major taxa group from Meadowbank study lakes since 2006.

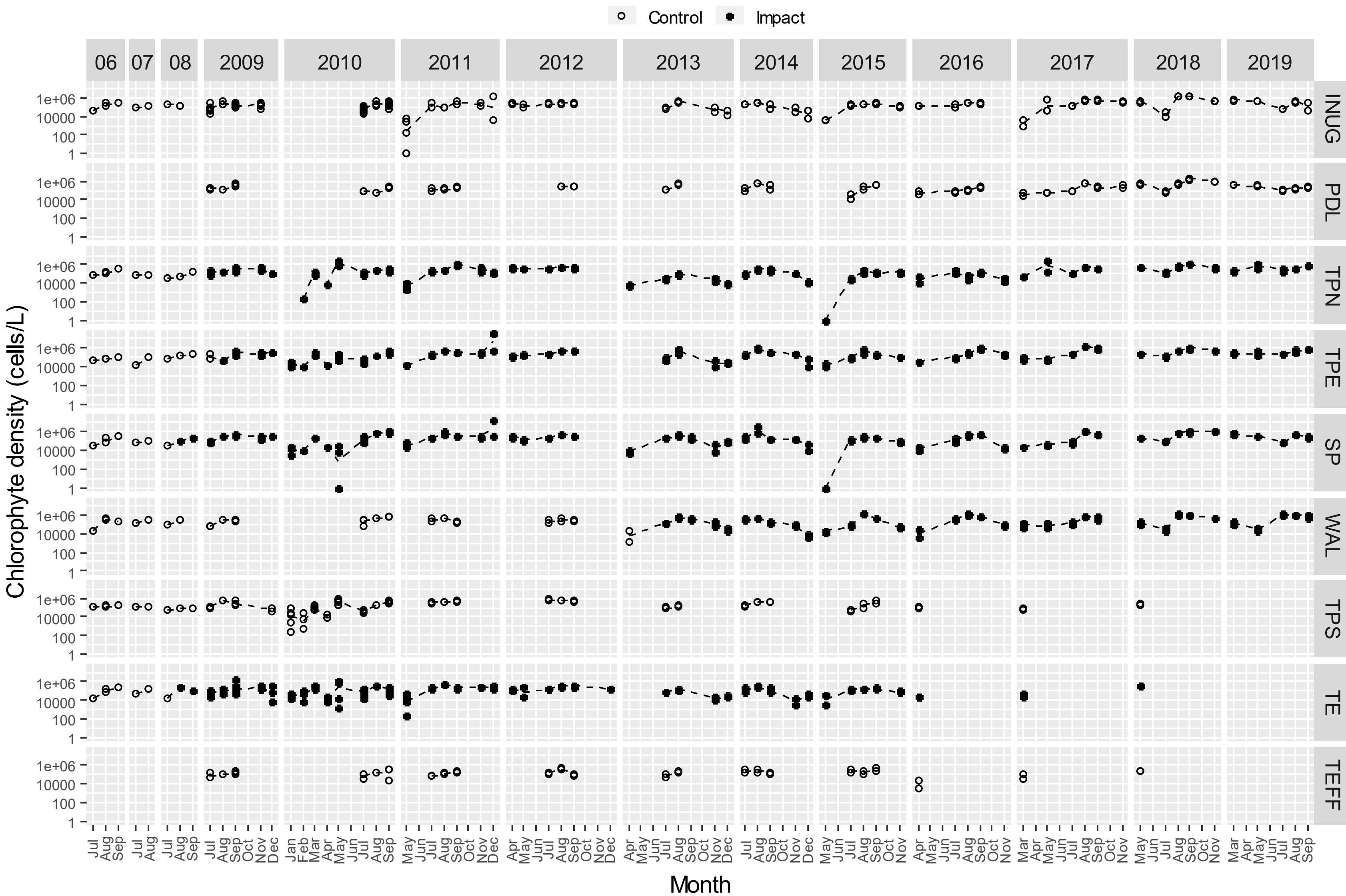


Figure D1-11. Chrysophyte density (cells/L) by major taxa group from Meadowbank study lakes since 2006.

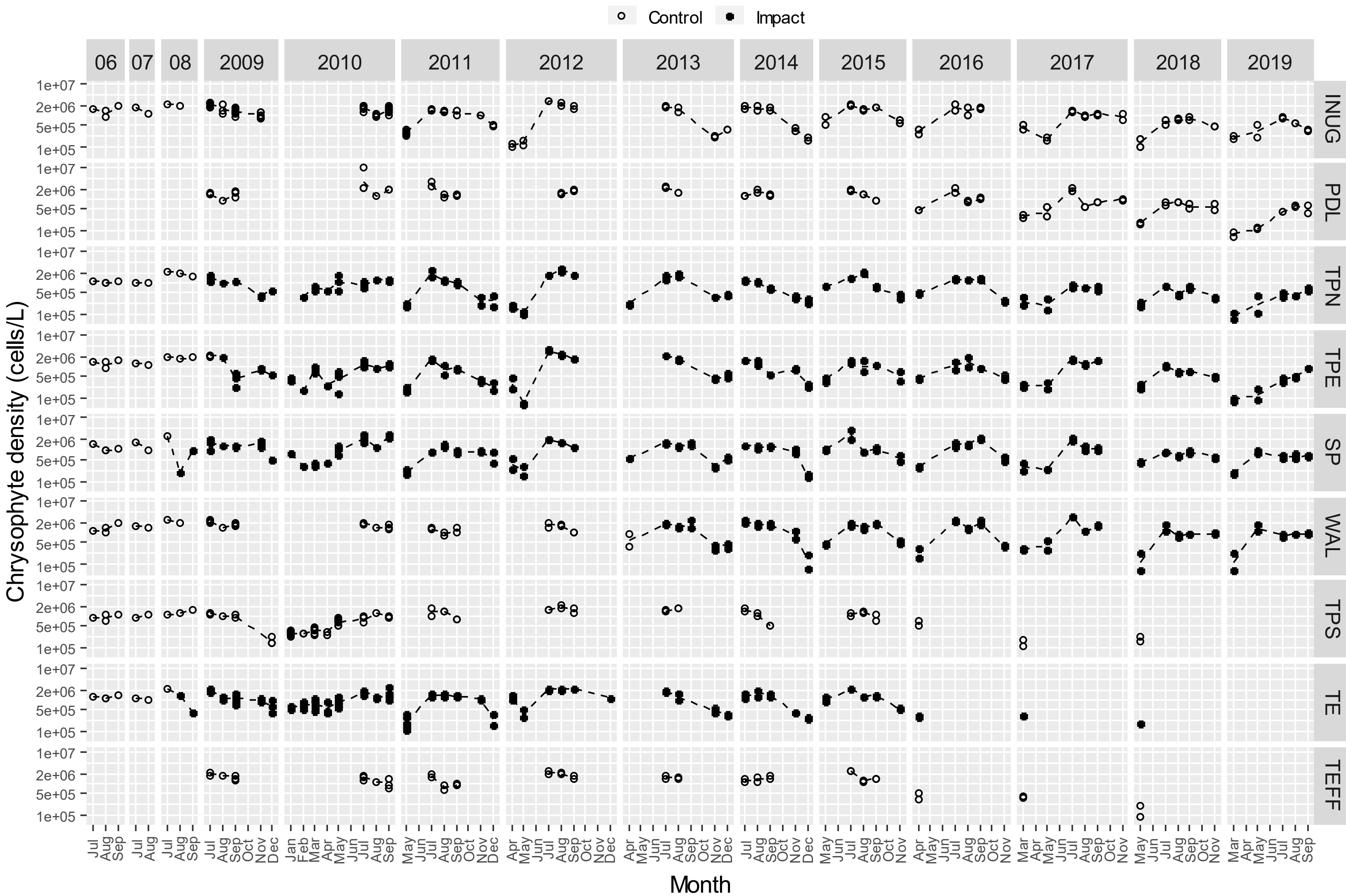


Figure D1-12. Diatom density (cells/L) by major taxa group from Meadowbank study lakes since 2006.

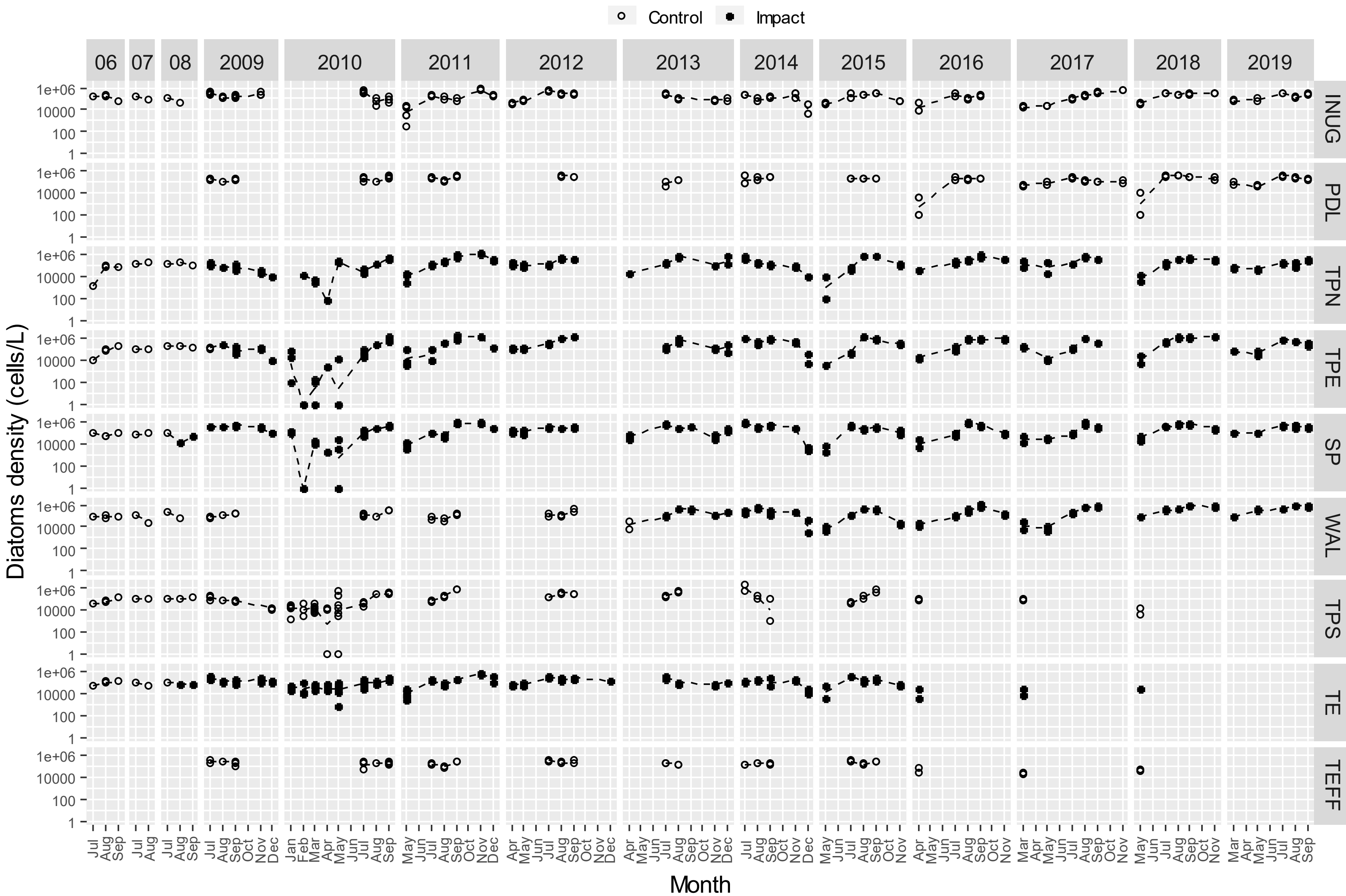


Figure D1-13. Cryptophytes density (cells/L) by major taxa group from Meadowbank study lakes since 2006.

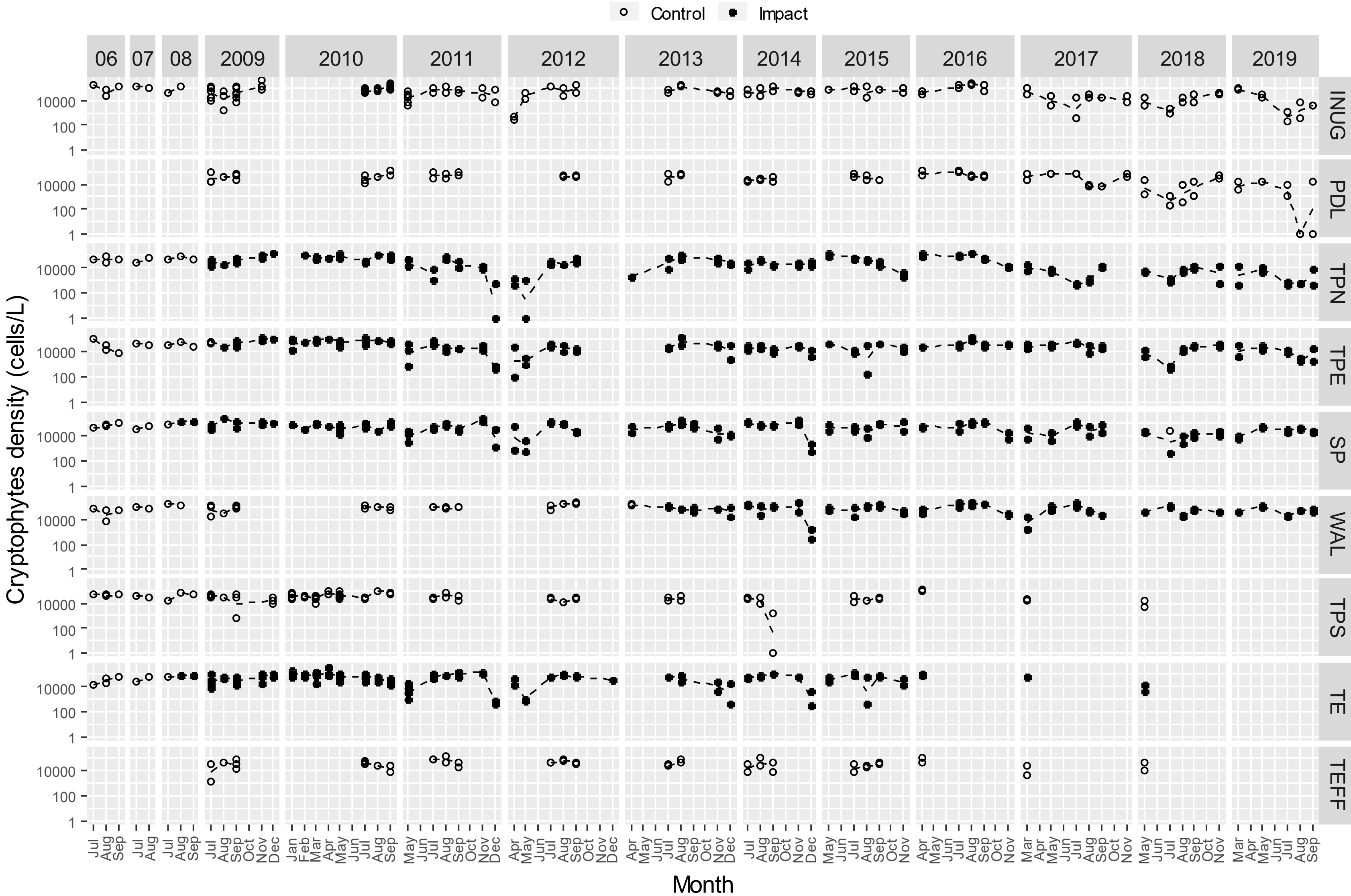


Figure D1-14. Dinoflagellates density (cells/L) by major taxa group from Meadowbank study lakes since 2006.

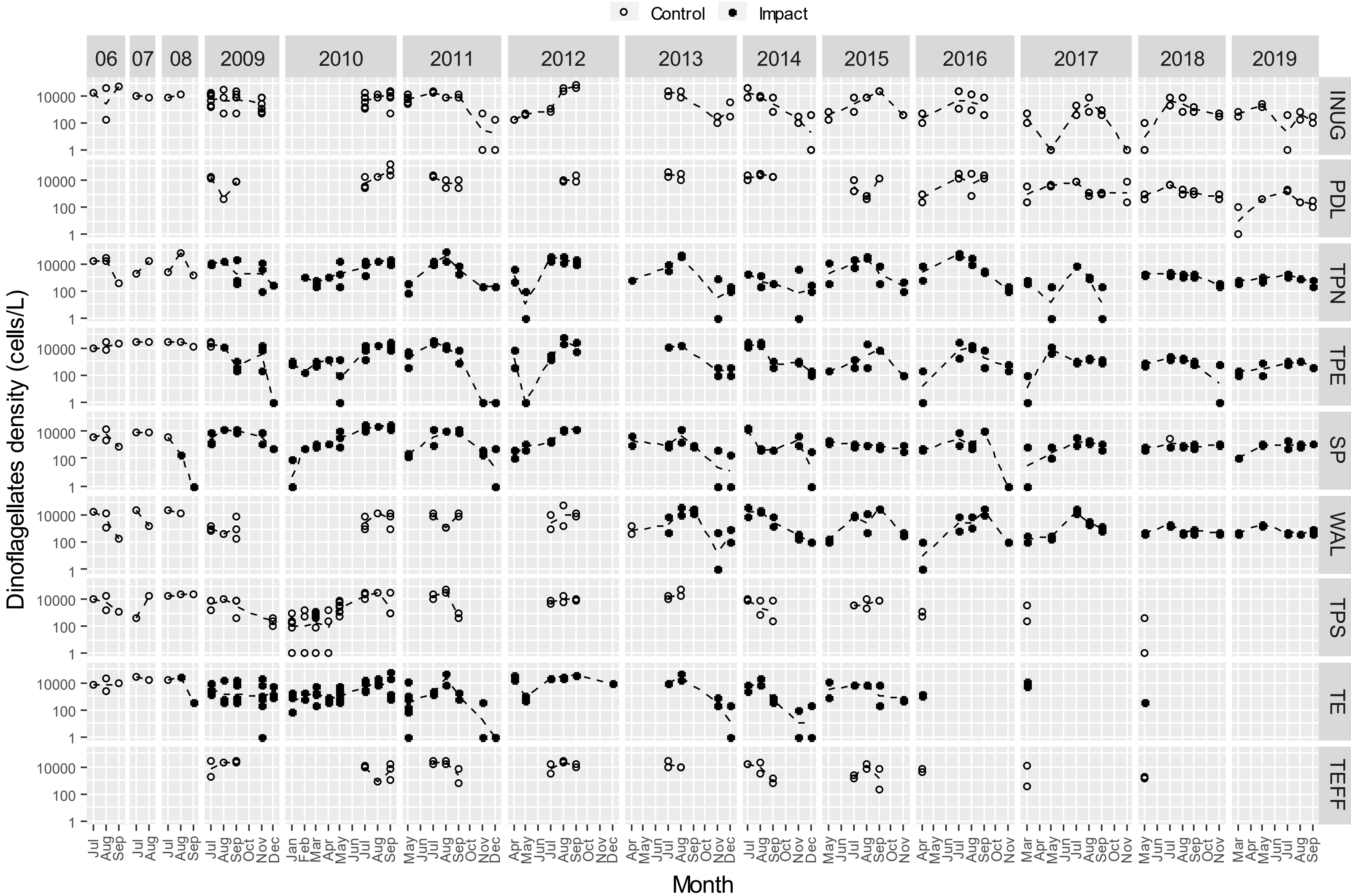
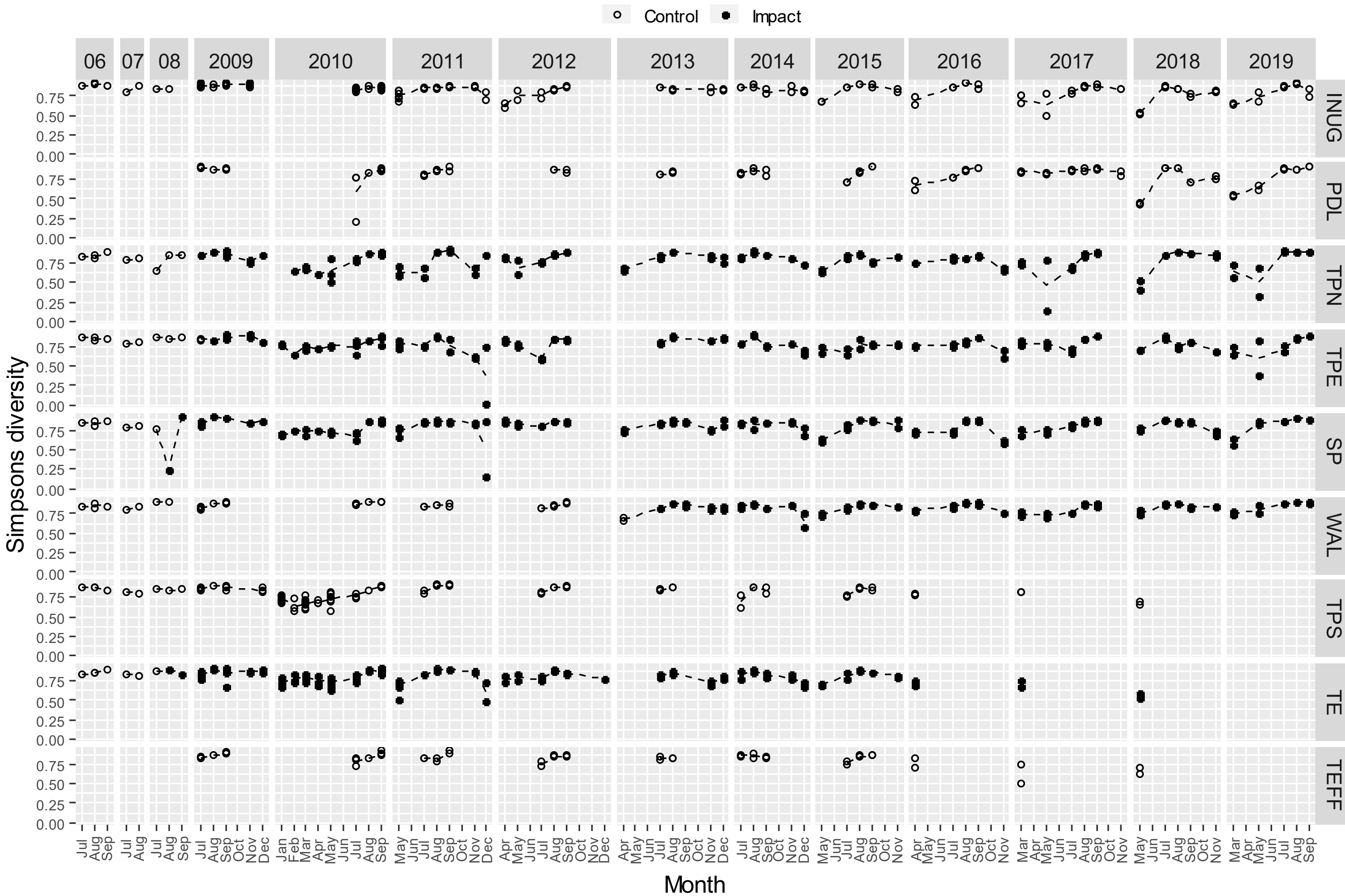


Figure D1-15. Simpsons' Diversity for the phytoplankton community from Meadowbank study lakes since 2006.



Appendix D2

Phyto Data – Whale Tail Study Area Lakes

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Table D2-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Whale Tail Pit study lakes, 2019.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		
Mammoth Lake										
MAM - 37	4-Mar-19	0	5.2	27	2.8	2.3	51	88	20	0.62
MAM - 38	4-Mar-19	0	2.8	16	3.7	6.4	28	57	23	0.60
MAM - 39	10-May-19	0	1.6	213	9.6	3.9	44	272	23	0.87
MAM - 40	10-May-19	0	1.9	123	18	6.8	87	237	27	0.89
MAM - 41	7-Jul-19	0	0.45	145	27	13	70	254	27	0.88
MAM - 42	7-Jul-19	0	2.5	175	26	31	22	256	32	0.88
MAM - 43	20-Aug-19	0	4.2	231	160	47	11	453	33	0.81
MAM - 44	20-Aug-19	0.16	6.8	226	168	42	13	456	38	0.73
MAM - 45	11-Sep-19	0	4.9	283	191	143	8.2	631	34	0.87
MAM - 46	11-Sep-19	0	5.4	298	210	140	6.4	660	36	0.88
Percent Density or Biomass		***<0.1***	***1.1***	***52***	***24***	***13***	***10***			
Nemo Lake										
NEM - 37	7-Mar-19	0	2.9	15	28	1.7	15	63	24	0.75
NEM - 38	7-Mar-19	0	6.1	7.4	29	4.7	24	70	20	0.78
NEM - 39	13-May-19	0	3.6	19	59	0	4.7	86	23	0.42
NEM - 40	13-May-19	0	1.1	41	45	0.66	15	103	24	0.56
NEM - 41	5-Jul-19	0	5.4	58	21	2.0	13	99	29	0.88
NEM - 42	5-Jul-19	0	3.0	60	33	0.95	17	114	30	0.85
NEM - 43	20-Aug-19	0	6.2	69	26	32	0.59	133	31	0.89
NEM - 44	20-Aug-19	0	3.6	60	39	29	12	143	27	0.85
NEM - 45	13-Sep-19	0	4.8	100	65	22	0	192	30	0.84
NEM - 46	13-Sep-19	0	8.5	115	50	21	7.5	202	28	0.86
Percent Density or Biomass		***<0.1***	***3.7***	***45***	***33***	***9.4***	***9.1***			
Whale Tail South										
WTS - 37	2-Mar-19	0	1.8	11	4.6	15	8.1	41	20	0.77
WTS - 38	2-Mar-19	0	2.2	16	4.6	29	21	73	21	0.78
WTS - 39	13-May-19	0	2.5	169	4.0	7.9	22	205	24	0.84
WTS - 40	13-May-19	0	1.5	156	4.0	6.4	1.8	170	21	0.85
WTS - 41	6-Jul-19	0	3.0	331	8.3	15	18	375	27	0.81
WTS - 42	6-Jul-19	0	1.2	321	8.7	12	21	364	26	0.81
WTS - 43	18-Aug-19	2.6	21	753	211	118	12	1,117	35	0.90
WTS - 44	18-Aug-19	1.5	23	695	193	143	18	1,074	37	0.89
WTS - 45	12-Sep-19	0	33	141	139	16	9.6	340	34	0.86
WTS - 46	12-Sep-19	0	32	160	135	14	2.6	343	35	0.87
Percent Density or Biomass		***<0.1***	***3.8***	***61***	***24***	***10***	***1.5***			

Table D2-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Whale Tail Pit study lakes, 2019.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Mammoth Lake								
MAM - 37	4-Mar-19	0	794,326	437,970	60,638	14,684	7,600	1,315,219
MAM - 38	4-Mar-19	0	485,816	142,644	104,237	37,161	4,000	773,858
MAM - 39	10-May-19	0	129,312	798,304	218,520	8,784	4,400	1,159,320
MAM - 40	10-May-19	0	216,120	617,856	356,648	10,384	8,800	1,209,808
MAM - 41	7-Jul-19	0	21,952	970,256	362,600	26,952	7,600	1,389,360
MAM - 42	7-Jul-19	0	107,960	1,459,968	412,888	30,368	2,600	2,013,784
MAM - 43	20-Aug-19	0	389,336	1,466,736	2,140,192	65,304	2,400	4,063,968
MAM - 44	20-Aug-19	600	519,448	1,581,280	3,120,000	69,488	2,000	5,292,816
MAM - 45	11-Sep-19	0	417,872	1,507,704	1,722,152	147,640	800	3,796,168
MAM - 46	11-Sep-19	0	311,512	1,606,496	1,668,696	187,344	600	3,774,648
Percent Density or Biomass		***<0.1***	***14***	***43***	***41***	***2.4***	***0.16***	
Nemo Lake								
NEM - 37	7-Mar-19	0	375,987	237,589	385,594	7,692	1,700	1,008,562
NEM - 38	7-Mar-19	0	365,248	212,766	399,417	29,169	2,700	1,009,300
NEM - 39	13-May-19	0	124,614	148,290	1,135,129	0	500	1,408,533
NEM - 40	13-May-19	0	181,051	229,850	968,801	3,646	1,800	1,385,149
NEM - 41	5-Jul-19	0	452,792	440,424	257,040	7,984	1,000	1,159,240
NEM - 42	5-Jul-19	0	359,400	555,968	409,904	7,384	1,200	1,333,856
NEM - 43	20-Aug-19	0	223,704	798,224	37,352	66,488	200	1,125,968
NEM - 44	20-Aug-19	0	194,368	791,240	537,248	51,520	1,200	1,575,576
NEM - 45	13-Sep-19	0	194,768	1,150,240	719,648	67,872	0	2,132,528
NEM - 46	13-Sep-19	0	424,056	1,257,800	581,752	74,056	400	2,338,064
Percent Density or Biomass		***<0.1***	***23***	***34***	***41***	***1.7***	***0.10***	
Whale Tail South								
WTS - 37	2-Mar-19	0	262,511	170,613	248,881	109,583	800	792,388
WTS - 38	2-Mar-19	0	255,819	223,504	231,350	120,829	2,300	833,803
WTS - 39	13-May-19	0	64,656	1,299,936	125,528	10,584	2,000	1,502,704
WTS - 40	13-May-19	0	179,800	1,165,256	187,184	9,784	200	1,542,224
WTS - 41	6-Jul-19	0	72,240	2,207,536	155,264	42,120	2,600	2,479,760
WTS - 42	6-Jul-19	0	35,920	2,113,344	130,128	33,936	2,400	2,315,728
WTS - 43	18-Aug-19	7,200	557,968	3,334,976	1,599,744	202,680	1,600	5,704,168
WTS - 44	18-Aug-19	4,200	630,808	3,154,576	1,491,168	202,712	2,600	5,486,064
WTS - 45	12-Sep-19	0	704,432	1,885,608	1,332,632	43,520	400	3,966,792
WTS - 46	12-Sep-19	0	669,512	2,210,088	1,256,392	63,472	200	4,199,664
Percent Density or Biomass		***<0.1***	***12***	***62***	***23***	***2.9***	***<0.1***	

Table D2-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Whale Tail Pit study lakes, 2019.

Area-Replicate	**Date**	**Phytoplankton Biomass (mg/m^3)**							**Taxa Richness**	**Simpson's Diversity**
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		
Lake A-20										
A20 - 31	4-Mar-19	0	2.2	27	99	6.6	26	160	27	0.73
A20 - 32	4-Mar-19	0	2.7	26	103	5.5	9.4	147	24	0.67
A20 - 33	11-May-19	0	2.0	40	5.0	1.9	15	64	20	0.87
A20 - 34	11-May-19	0	2.7	65	24	1.5	7.5	101	26	0.84
A20 - 35	13-Jul-19	0	4.4	105	11	1.5	1.5	124	28	0.85
A20 - 36	13-Jul-19	0	3.7	136	7.8	4.0	17	169	34	0.86
A20 - 37	16-Aug-19	0	4.7	68	8.6	2.8	7.8	92	29	0.89
A20 - 38	16-Aug-19	0.050	1.9	53	6.3	2.6	6.5	70	28	0.85
A20 - 39	12-Sep-19	0	3.9	137	28	10	19	197	32	0.86
A20 - 40	12-Sep-19	0	5.1	89	20	14	14	143	32	0.86
Percent Density or Biomass		***<0.1***	***3.1***	***69***	***12***	***5.9***	***9.4***			
Lake A-76										
A76 - 31	16-Mar-19	0	3.1	32	8.5	2.0	16	61	23	0.87
A76 - 32	16-Mar-19	0	2.4	32	8.9	1.7	20	65	22	0.86
A76 - 33	6-May-19	0	1.0	79	14	1.1	53	148	24	0.87
A76 - 34	6-May-19	0	2.6	50	14	3.3	6.3	76	25	0.88
A76 - 35	12-Jul-19	0	1.5	108	19	0.24	13	141	26	0.88
A76 - 36	12-Jul-19	0.70	1.3	110	28	0.61	21	162	31	0.88
A76 - 37	15-Aug-19	0	10	54	13	2.0	5.4	84	28	0.87
A76 - 38	15-Aug-19	0	8.3	44	12	1.9	8.3	75	33	0.85
A76 - 39	8-Sep-19	0	2.6	58	22	1.7	4.4	89	27	0.69
A76 - 40	8-Sep-19	0	2.6	61	17	0.99	4.0	86	25	0.67
Percent Density or Biomass		***<0.1***	***7.0***	***65***	***19***	***2.0***	***6.7***			
Lake DS-1										
DS1 - 29	16-Mar-19	0	1.8	168	9.8	33	12	224	26	0.81
DS1 - 30	16-Mar-19	0	2.1	191	12	26	16	247	26	0.81
DS1 - 31	6-May-19	0	7.3	108	39	12	13	180	33	0.90
DS1 - 32	6-May-19	0	1.5	178	25	20	31	255	31	0.89
DS1 - 33	9-Jul-19	0	5.2	167	20	3.7	21	218	35	0.90
DS1 - 34	9-Jul-19	0	7.0	102	29	3.0	33	173	34	0.91
DS1 - 35	17-Aug-19	0	8.8	83	7.0	7.5	12	118	28	0.87
DS1 - 36	17-Aug-19	0	4.1	54	3.9	18	15	95	32	0.88
DS1 - 37	7-Sep-19	0	5.9	91	8.8	14	20	139	39	0.87
DS1 - 38	7-Sep-19	0	8.9	63	14	24	5.1	114	35	0.89
Percent Density or Biomass		***<0.1***	***6.0***	***62***	***7.1***	***13***	***11***			
All 2019 Locations Relative Density or Biomass (%)		***<0.1***	***2.4***	***54***	***16***	***6.5***	***8.0***			

Table D2-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Whale Tail Pit study lakes, 2019.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Lake A-20								
A20 - 31	4-Mar-19	0	324,280	302,328	783,736	37,720	2,800	1,450,864
A20 - 32	4-Mar-19	0	281,176	252,040	864,560	23,352	1,200	1,422,328
A20 - 33	11-May-19	0	163,121	546,299	236,443	14,284	1,600	961,747
A20 - 34	11-May-19	0	294,726	613,629	475,293	4,346	800	1,388,795
A20 - 35	13-Jul-19	0	110,160	1,180,176	74,840	21,752	400	1,387,328
A20 - 36	13-Jul-19	0	173,616	1,718,976	66,856	22,952	2,000	1,984,400
A20 - 37	16-Aug-19	0	358,756	691,590	88,006	28,569	700	1,167,621
A20 - 38	16-Aug-19	100	163,421	748,927	65,930	4,846	800	984,024
A20 - 39	12-Sep-19	0	209,736	1,662,504	249,072	46,704	1,800	2,169,816
A20 - 40	12-Sep-19	0	188,384	1,293,920	114,976	83,624	1,400	1,682,304
Percent Density or Biomass		***<0.1***	***16***	***62***	***21***	***2.0***	***<0.1***	
Lake A-76								
A76 - 31	16-Mar-19	0	181,151	343,526	195,943	4,446	1,700	726,766
A76 - 32	16-Mar-19	0	223,604	328,441	215,520	11,038	2,100	780,704
A76 - 33	6-May-19	0	56,838	490,631	317,603	800	5,900	871,772
A76 - 34	6-May-19	0	156,028	326,303	153,536	5,646	500	642,014
A76 - 35	12-Jul-19	0	230,088	972,040	325,480	200	2,600	1,530,408
A76 - 36	12-Jul-19	28,736	64,856	920,952	413,088	600	2,800	1,431,032
A76 - 37	15-Aug-19	0	571,822	578,614	320,549	11,438	700	1,483,124
A76 - 38	15-Aug-19	0	589,253	397,463	334,433	21,677	1,400	1,344,226
A76 - 39	8-Sep-19	0	103,137	452,955	747,181	4,746	1,000	1,309,019
A76 - 40	8-Sep-19	0	145,390	478,777	807,365	4,146	900	1,436,578
Percent Density or Biomass		***0.25***	***20***	***46***	***33***	***0.56***	***0.17***	
Lake DS-1								
DS1 - 29	16-Mar-19	0	136,896	1,836,536	97,792	194,784	2,000	2,268,008
DS1 - 30	16-Mar-19	0	201,152	2,104,344	163,848	143,496	2,400	2,615,240
DS1 - 31	6-May-19	0	409,488	960,288	564,400	39,320	1,600	1,975,096
DS1 - 32	6-May-19	0	237,072	1,491,520	418,088	43,720	3,200	2,193,600
DS1 - 33	9-Jul-19	0	130,112	1,387,544	277,592	36,520	2,600	1,834,368
DS1 - 34	9-Jul-19	0	196,368	874,680	454,992	22,352	3,400	1,551,792
DS1 - 35	17-Aug-19	0	235,243	1,114,175	153,182	37,961	2,900	1,543,461
DS1 - 36	17-Aug-19	0	195,236	709,520	57,638	118,575	2,000	1,082,968
DS1 - 37	7-Sep-19	0	151,464	1,267,984	108,776	54,288	3,000	1,585,512
DS1 - 38	7-Sep-19	0	134,904	1,028,112	86,888	139,896	1,000	1,390,800
Percent Density or Biomass		***<0.1***	***11***	***71***	***13***	***4.6***	***0.13***	
All 2019 Locations Relative Density or Biomass (%)		***322***	***118,148***	***439,175***	***211,969***	***19,386***	***961***	

Figure D2-1. Cyanophyte biomass (mg/m^3) from Whale Tail Pit lakes since 2015.

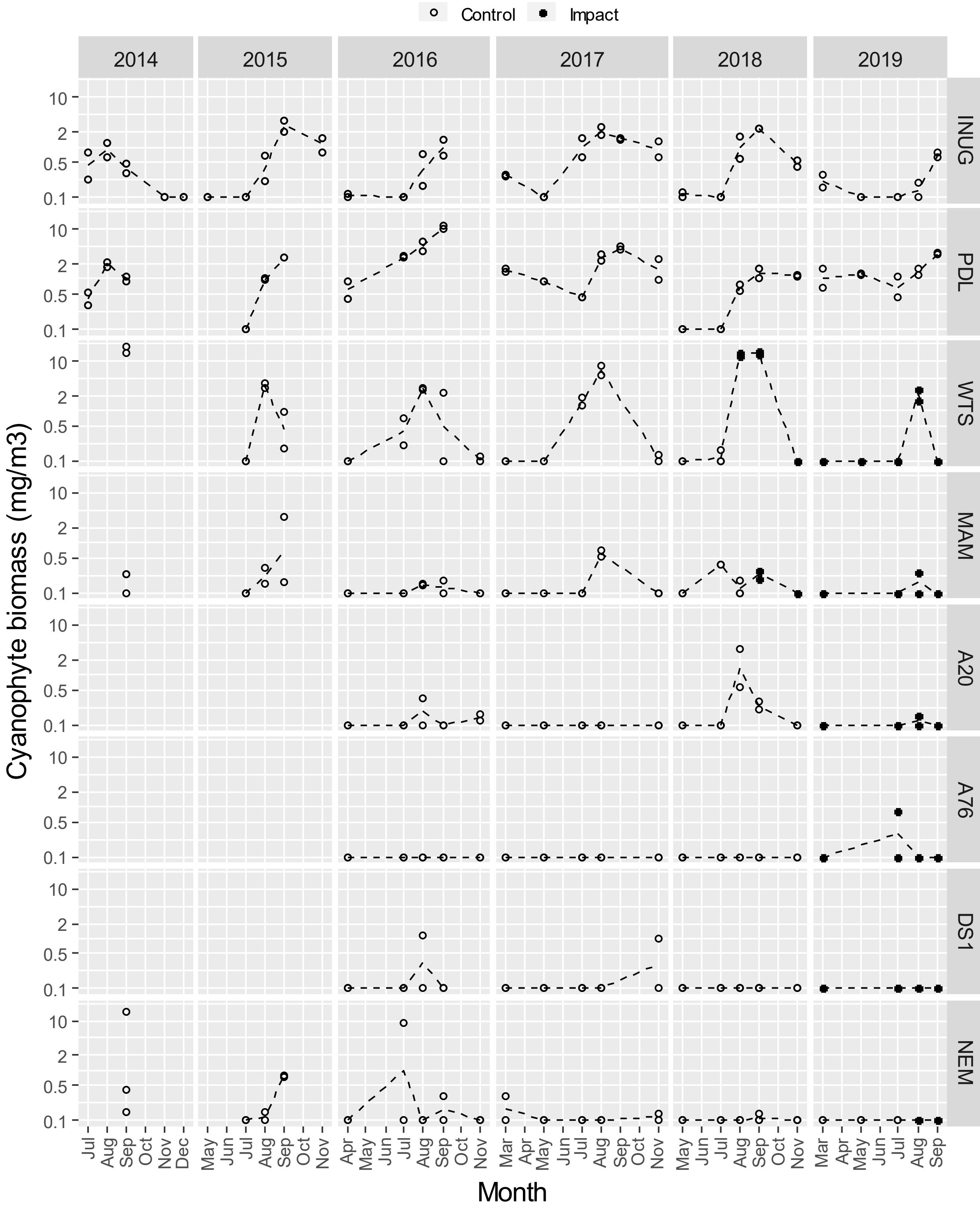


Figure D2-2. Chlorophyte biomass (mg/m^3) from Whale Tail Pit lakes since 2015.

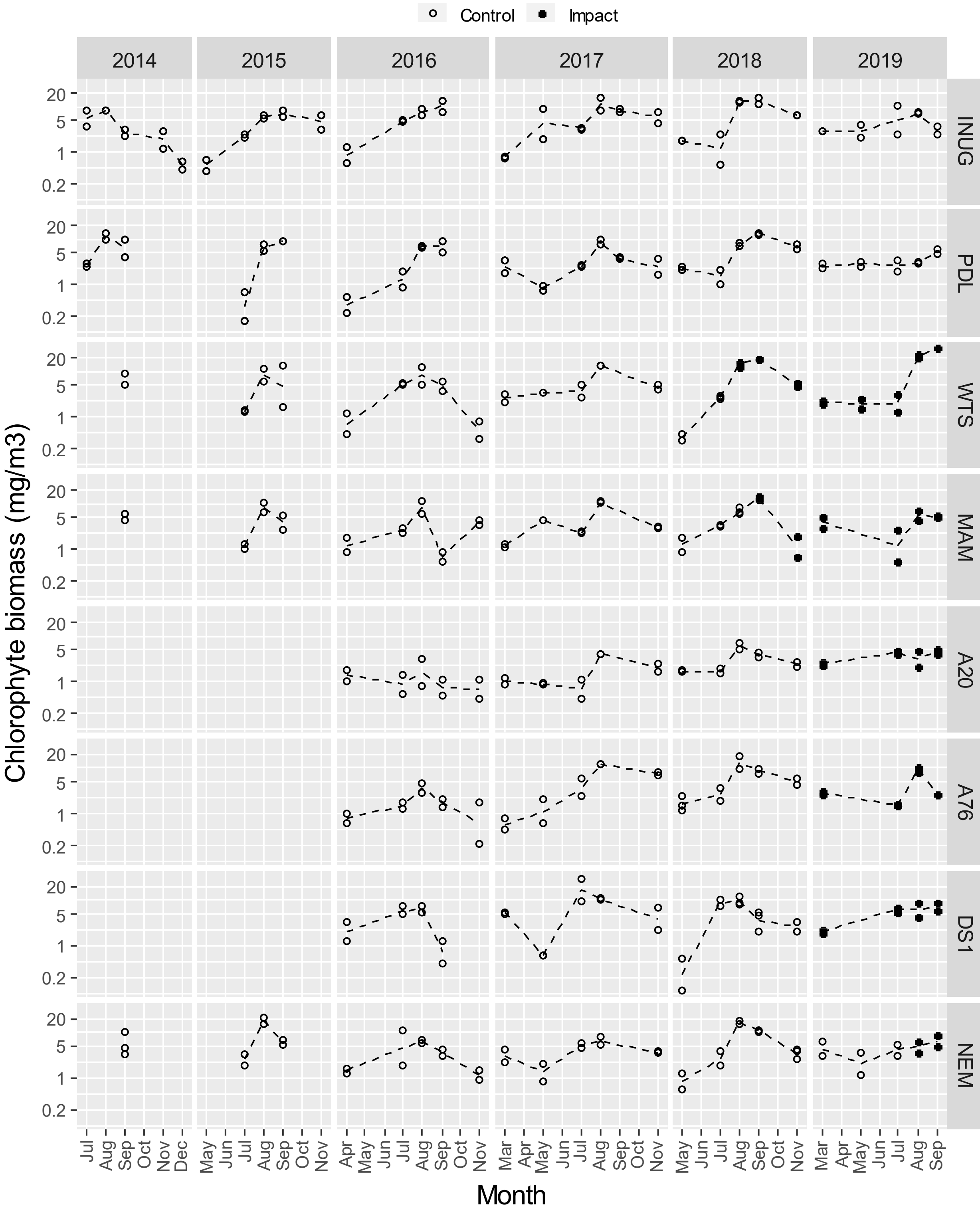


Figure D2-3. Chrysophyte biomass (mg/m^3) from Whale Tail Pit lakes since 2015.

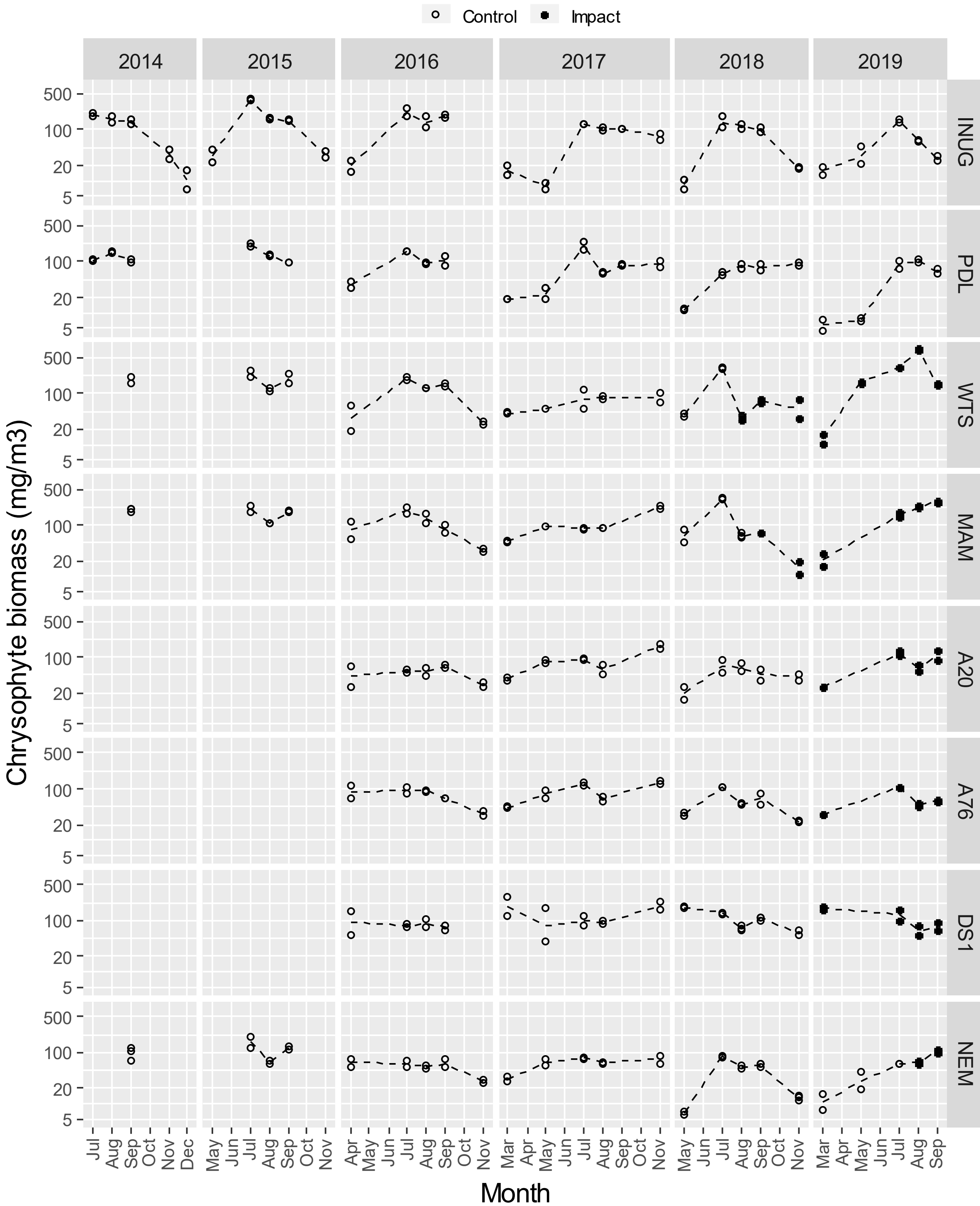


Figure D2-4. Diatom biomass (mg/m^3) from Whale Tail Pit lakes since 2015.

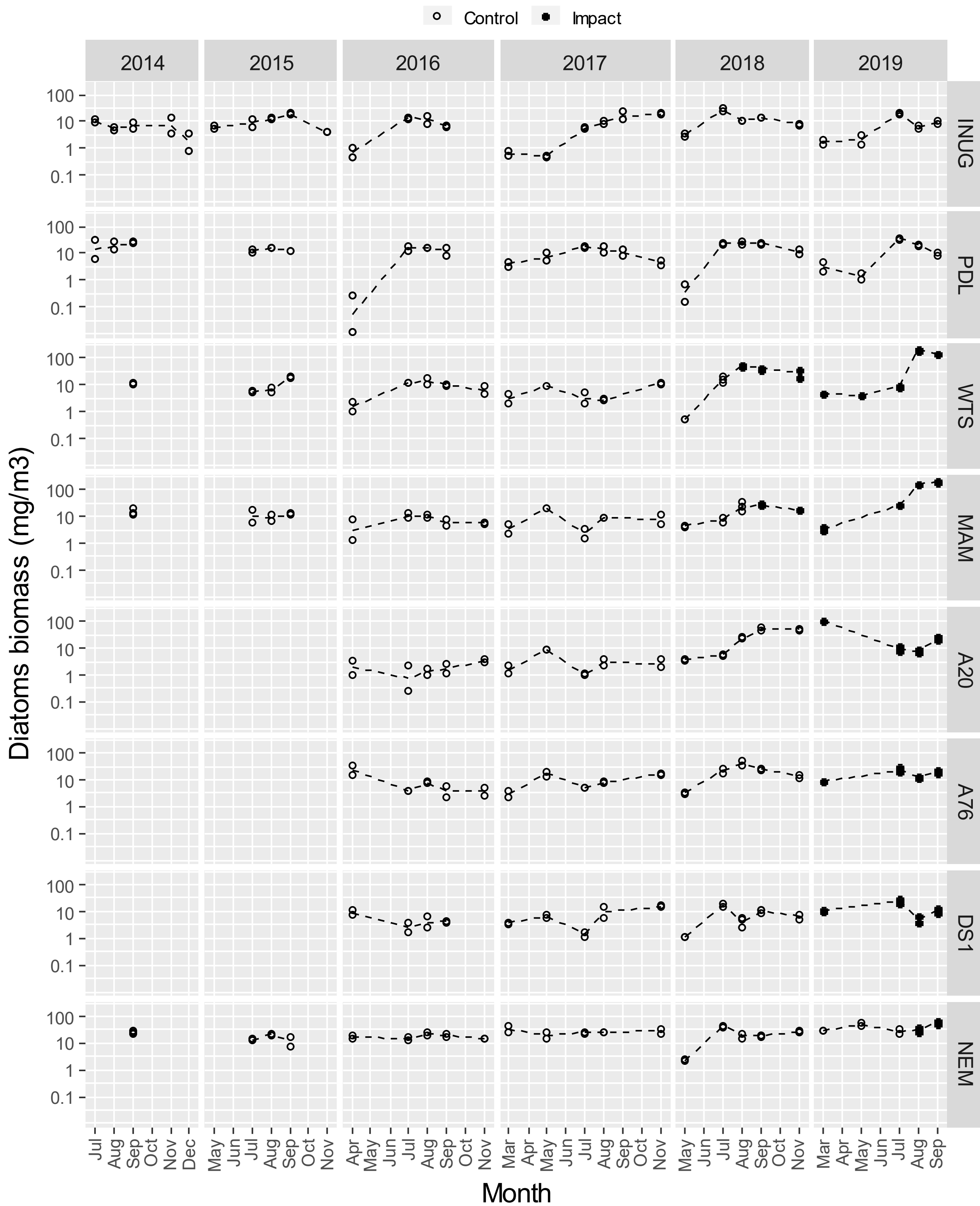


Figure D2-5. Cryptophyte biomass (mg/m^3) from Whale Tail Pit lakes since 2015.

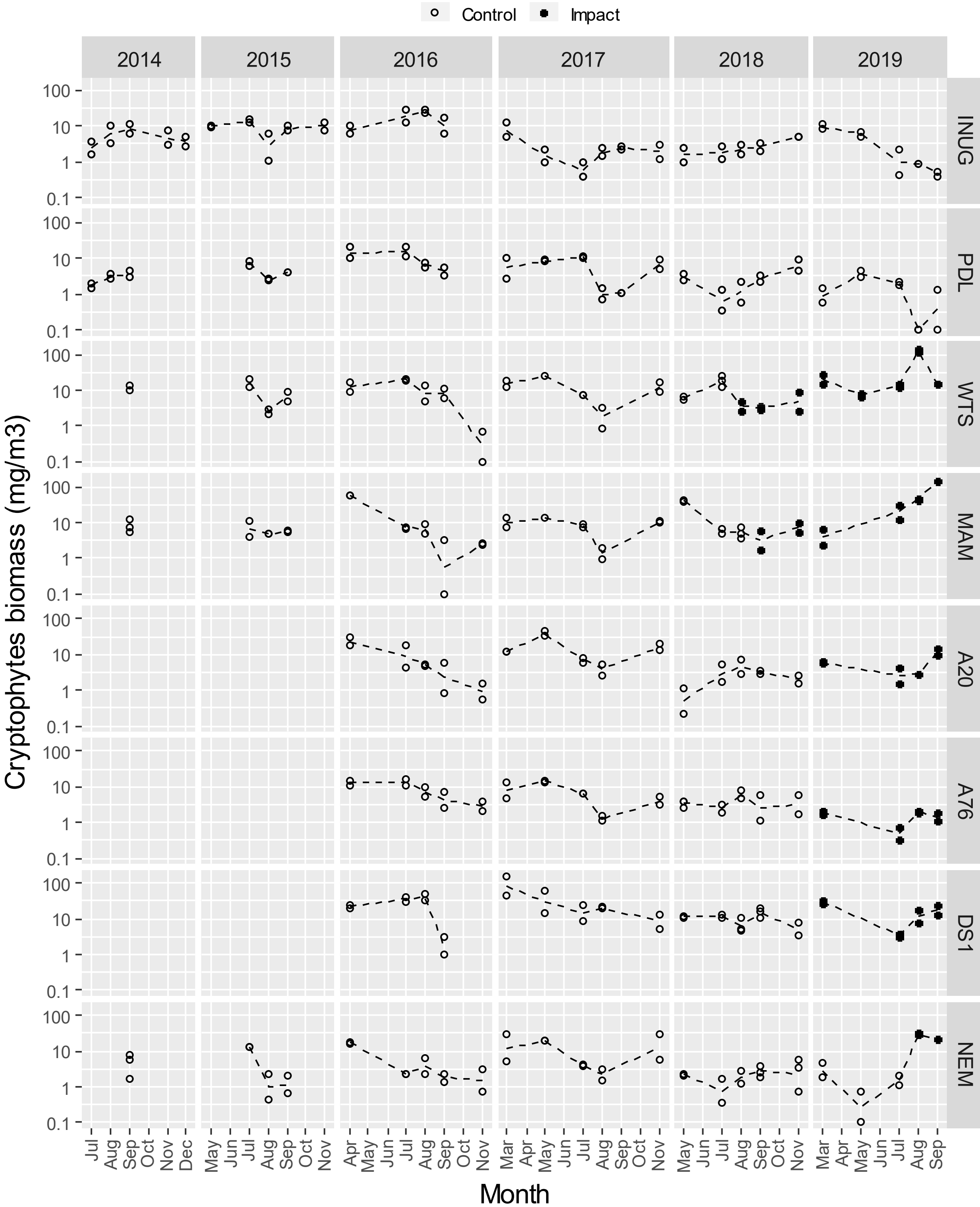


Figure D2-6. Dinoflagellate biomass (mg/m^3) from Whale Tail Pit lakes since 2015.

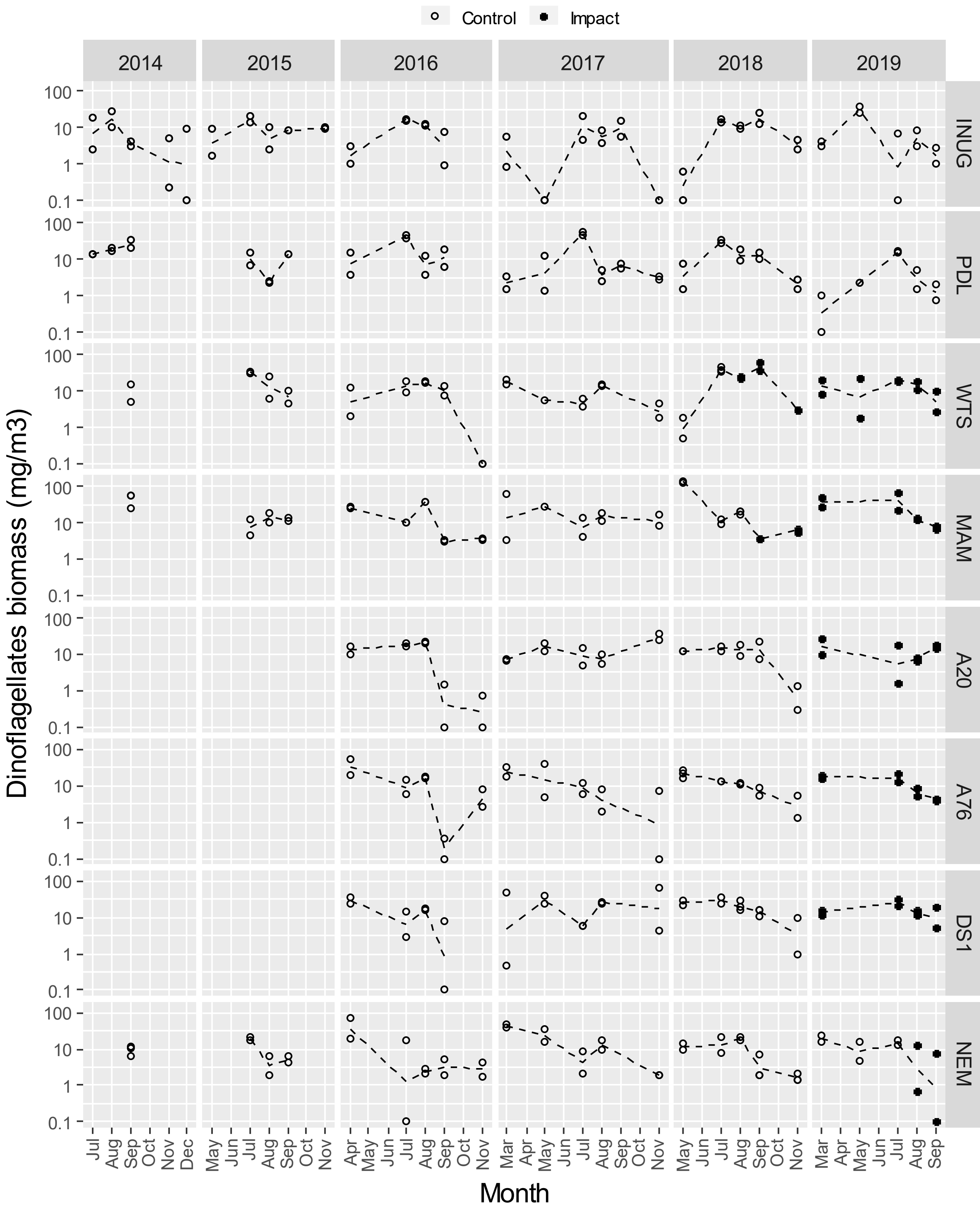


Figure D2-7. Phytoplankton density (cells/L) by major taxa group from Whale Tail Pit lakes since 2015.

Figure D2-8. Relative phytoplankton density from Whale Tail Pit lakes since 2015.

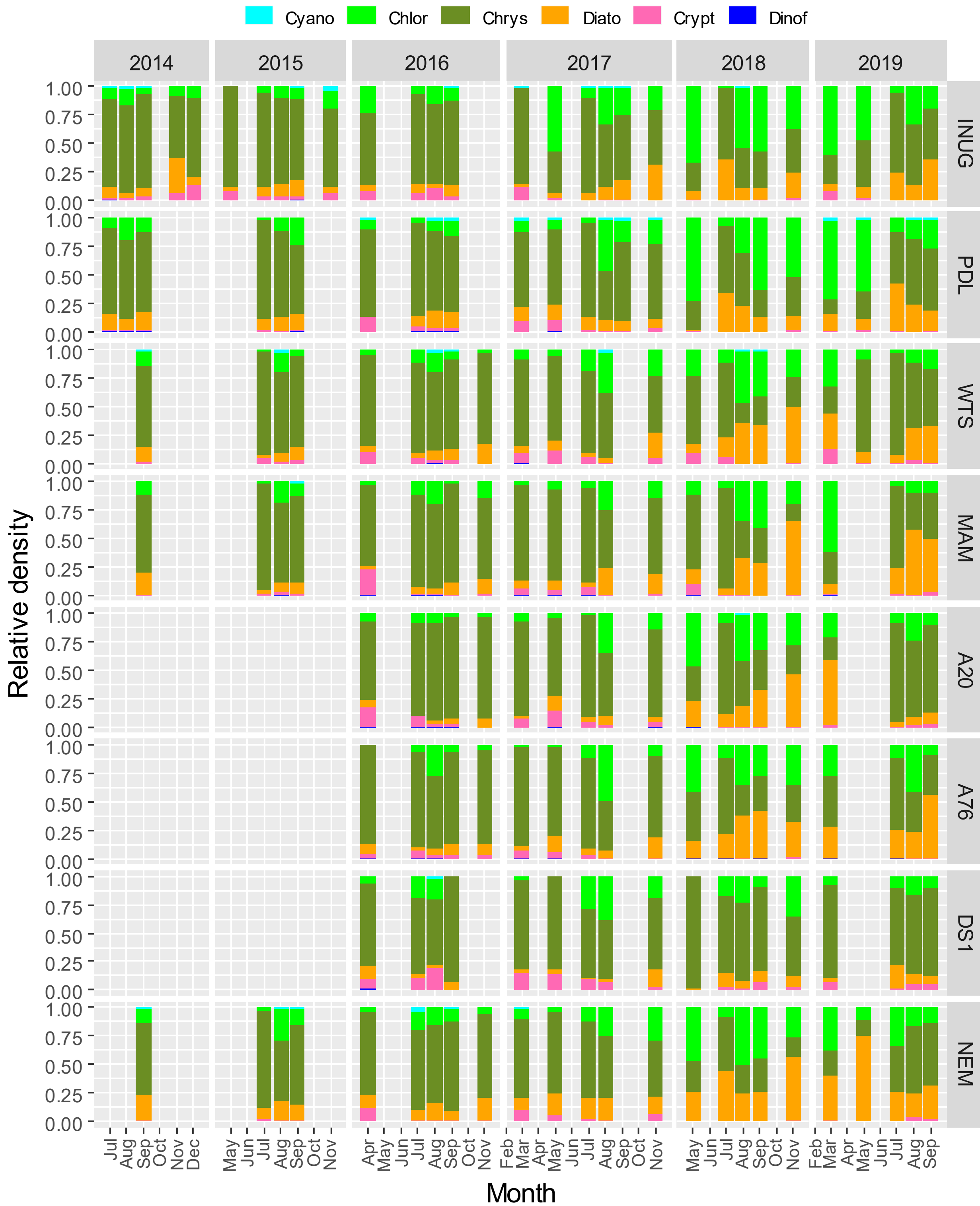


Figure D2-9. Cyanophyte density (cells/L) from Whale Tail Pit lakes since 2015.

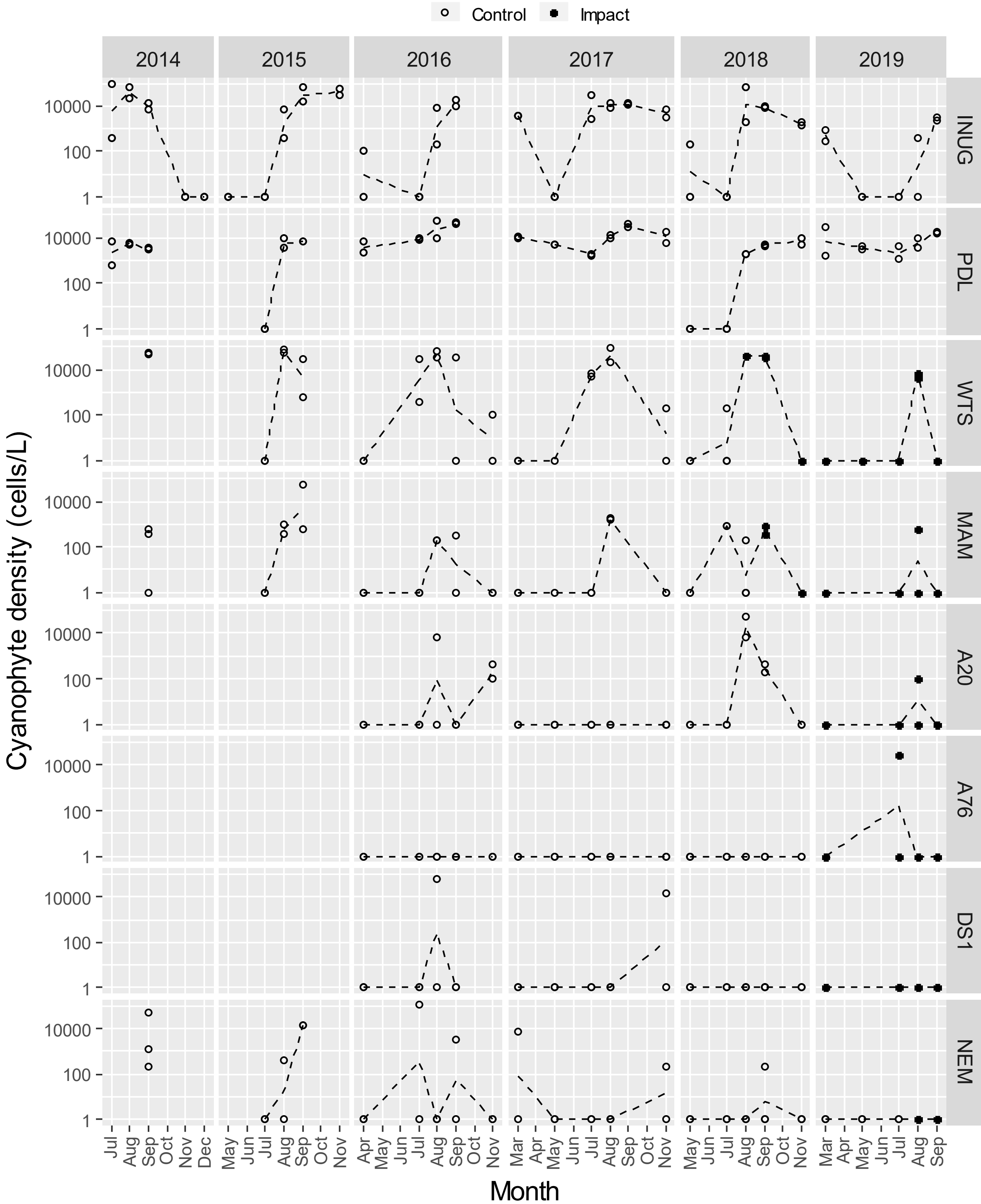


Figure D2-10. Chlorphyte density (cells/L) from Whale Tail Pit lakes since 2015.

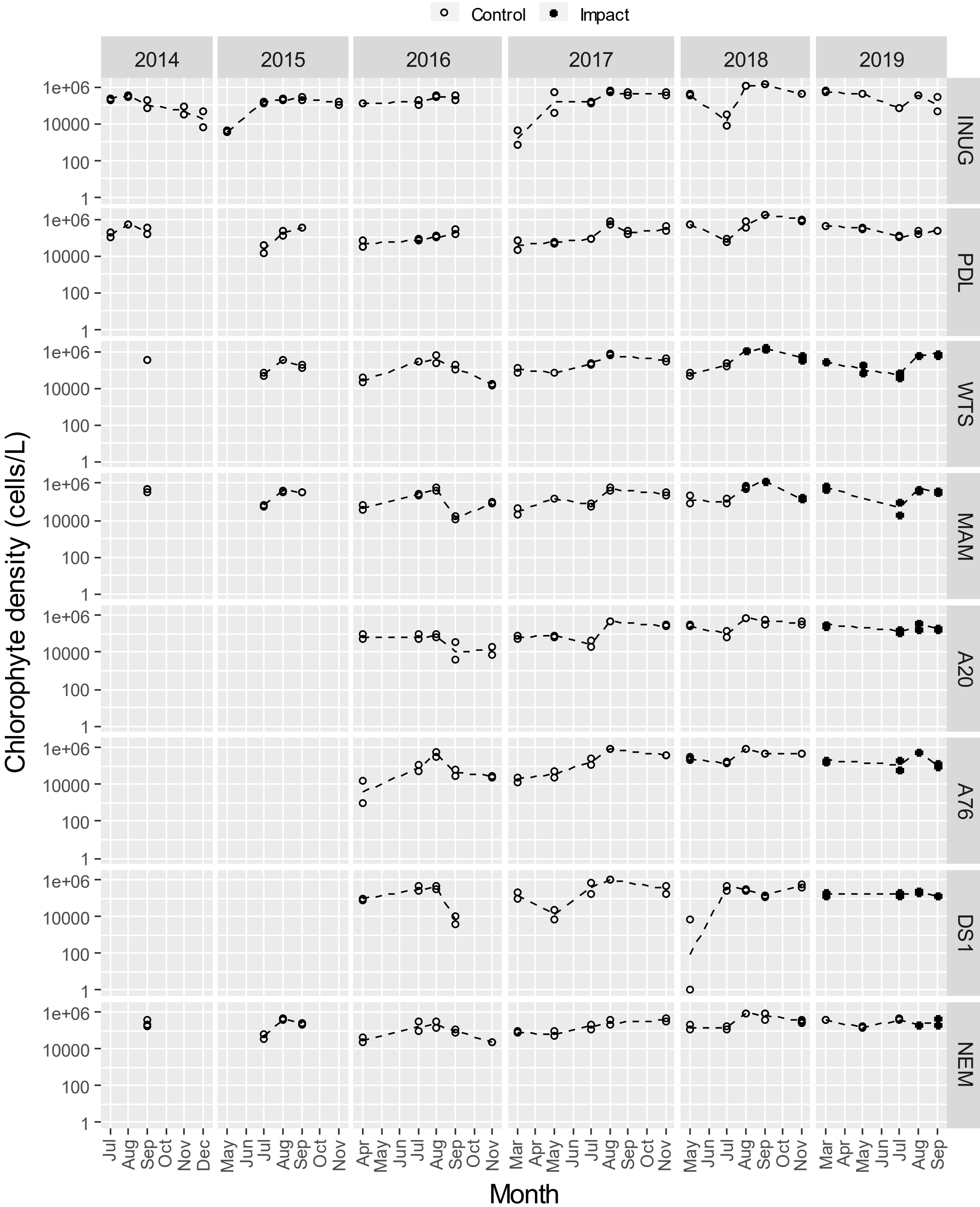


Figure D2-11. Chrysophyte density (cells/L) from Whale Tail Pit lakes since 2015.

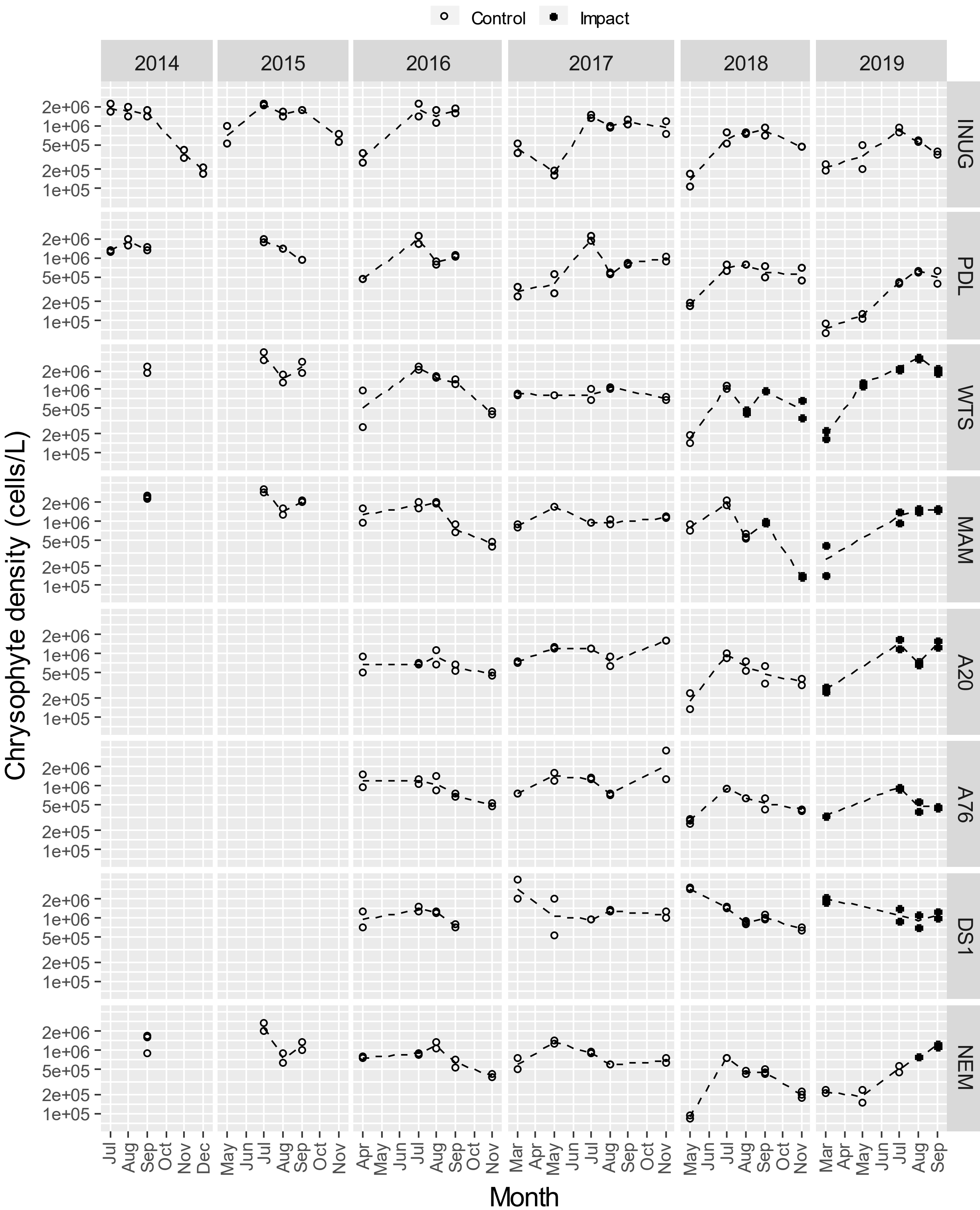


Figure D2-12. Diatom density (cells/L) from Whale Tail Pit lakes since 2015.

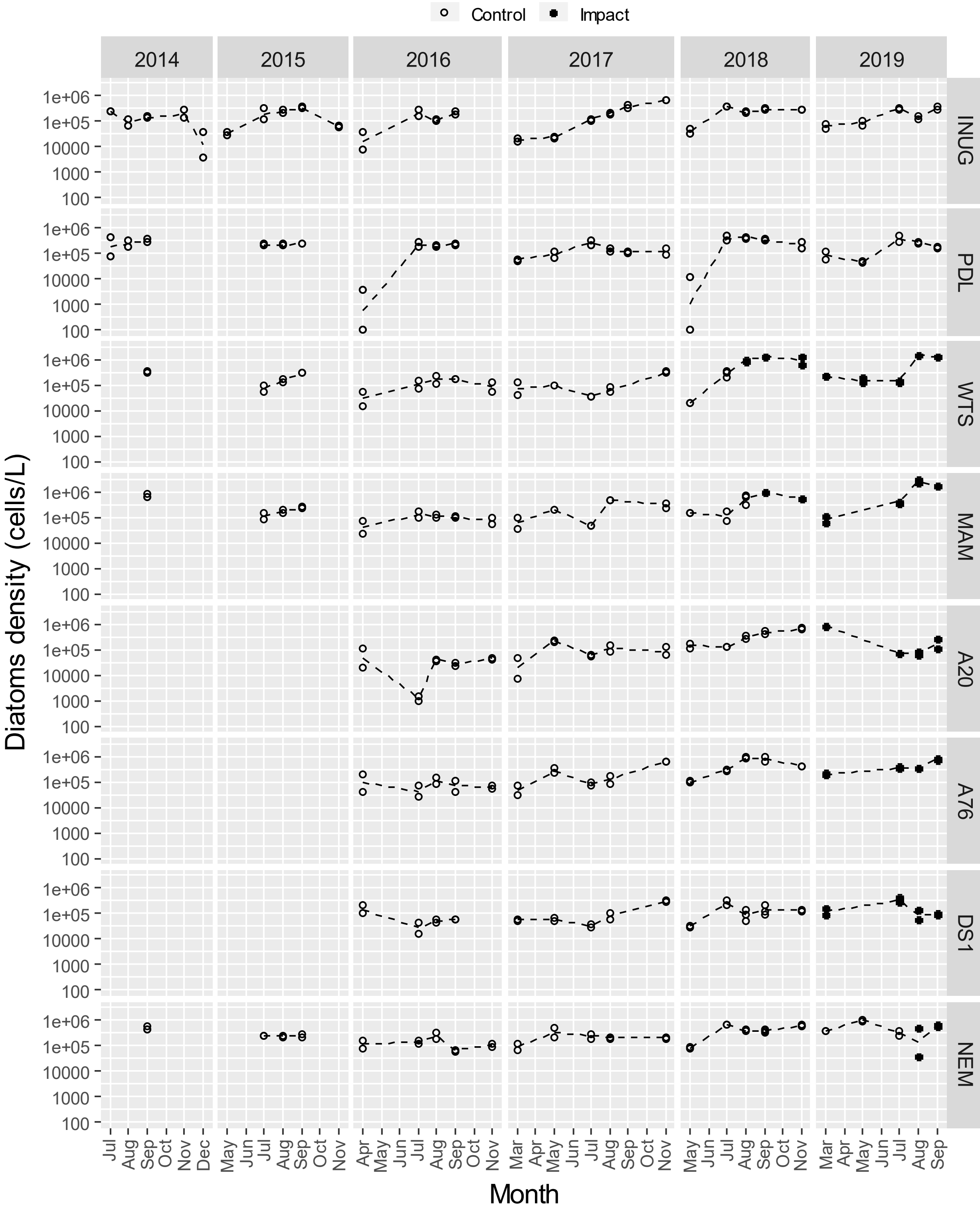


Figure D2-13. Cryptophytes density (cells/L) from Whale Tail Pit lakes since 2015.

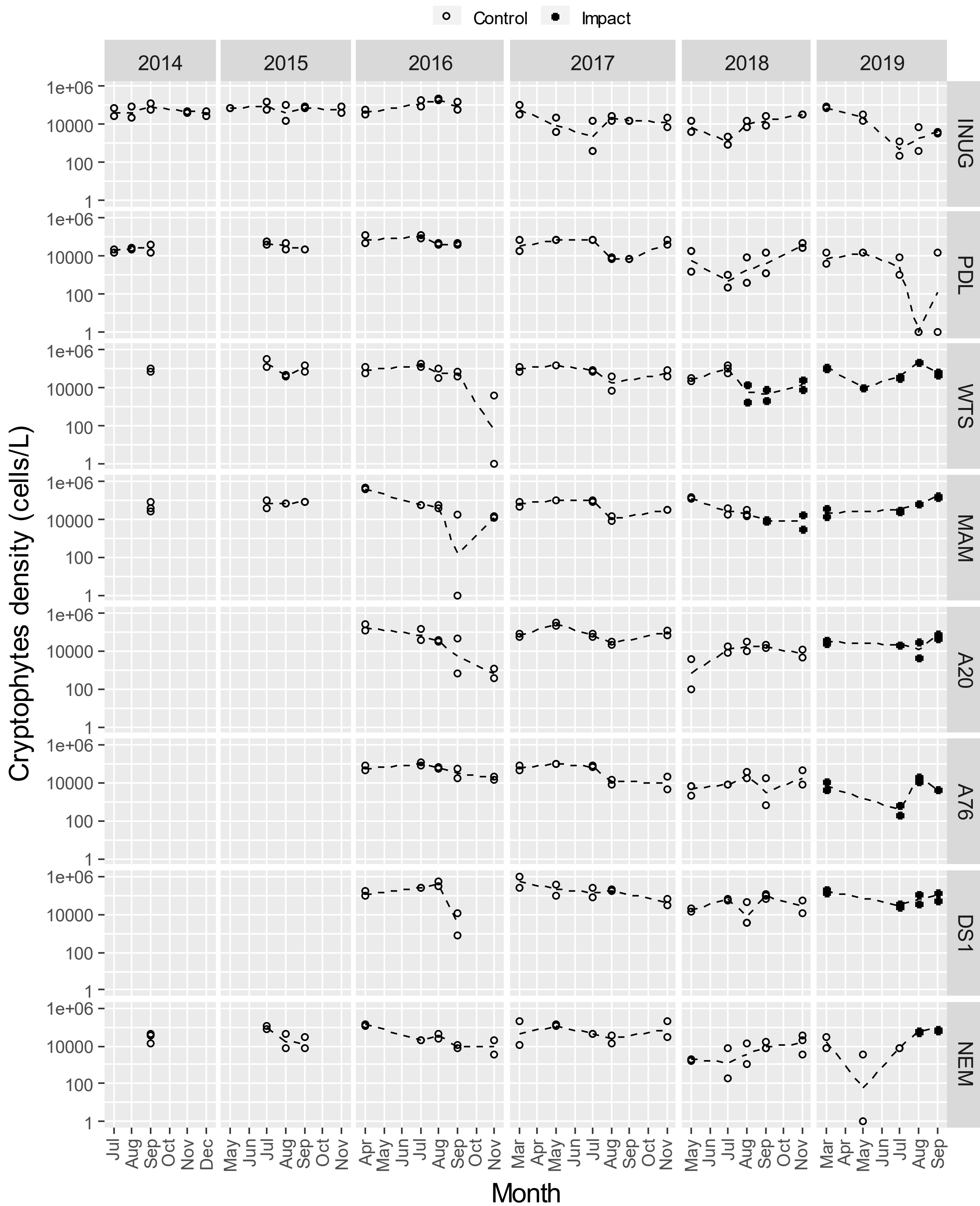


Figure D2-14. Dinoflagellate density (cells/L) from Whale Tail Pit lakes since 2015.

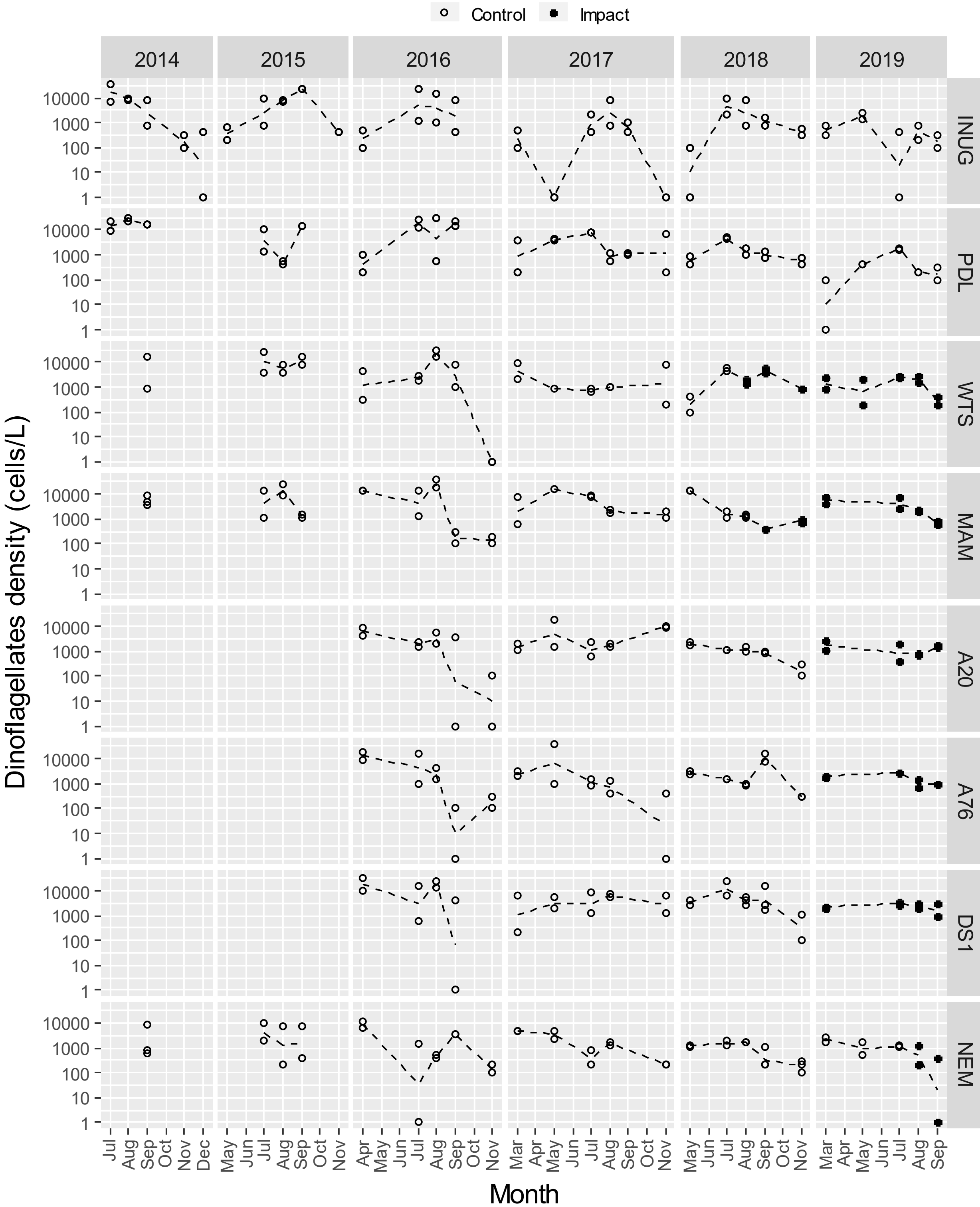
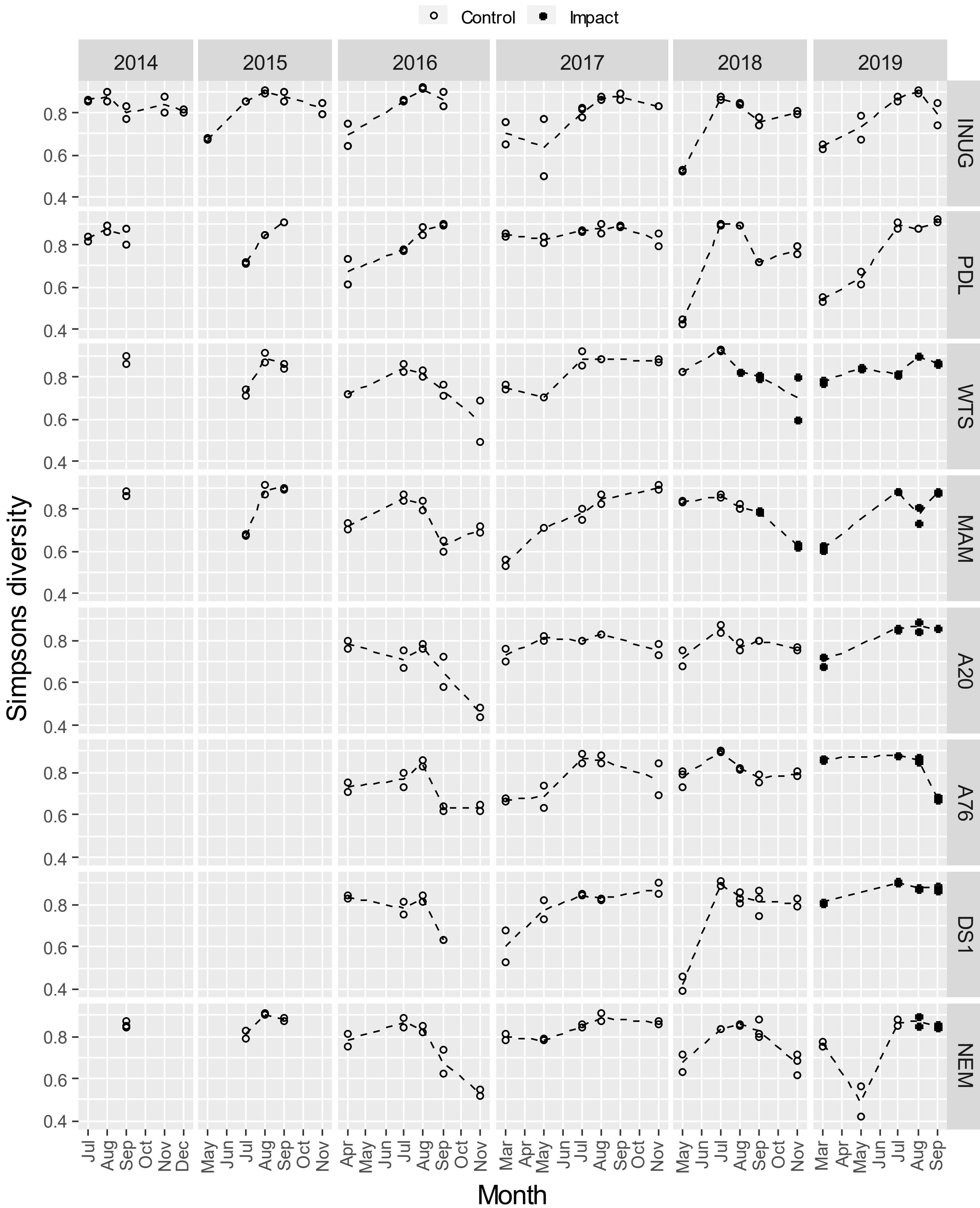


Figure D2-15. Simpsons' Diversity for the phytoplankton community from Whale Tail Pit lakes since 2015.



Appendix D3

Phyto Data – Baker Lake

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Table D3-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Baker Lake, 2019.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	TOTAL		
Baker Akilahaarjuk Point										
BAP - 61	24-Jul-19	0	3	87	26	24	9	148	33	0.91
BAP - 62	24-Jul-19	0	2	92	17	12	13	136	30	0.89
BAP - 63	12-Aug-19	0	7	109	43	18	20	197	37	0.87
BAP - 64	12-Aug-19	0	16	108	40	25	16	204	37	0.89
BAP - 65	18-Sep-19	0	8	79	22	5	4	118	35	0.84
BAP - 66	18-Sep-19	0	11	87	28	4	16	146	38	0.84
Percent Density or Biomass		***<0.1***	***5.0***	***59***	***19***	***9.2***	***8.1***			
Baker Barge Dock										
BBD-61										
BBD-62	24-Jul-19	0	5	183	58	44	31	321	38	0.95
BBD-63	12-Aug-19	0	7	61	50	25	33	176	44	0.91
BBD-64	12-Aug-19	0	3	102	39	34	12	189	35	0.85
BBD-65	18-Sep-19	0	7	48	35	6	6	102	35	0.87
BBD-66	18-Sep-19	0	2	62	39	7	7	117	33	0.85
Percent Density or Biomass		***<0.1***	***2.7***	***50***	***24***	***13***	***9.8***			
Baker Proposed Jetty										
BPJ - 61	24-Jul-19	0	2	90	24	29	19	164	31	0.89
BPJ - 62	24-Jul-19	0	3	109	13	36	16	177	30	0.88
BPJ - 63	12-Aug-19	0	8	84	37	34	10	173	38	0.87
BPJ - 64	12-Aug-19	0	5	97	24	22	5	154	34	0.86
BPJ - 65	18-Sep-19	0	5	50	31	6	1	94	39	0.88
BPJ - 66	18-Sep-19	0	9	56	34	5	5	108	37	0.90
Percent Density or Biomass		***<0.1***	***3.6***	***56***	***19***	***15***	***6.4***			
All 2019 Locations Relative Density or Biomass (%)		***<0.1***	***3.8***	***55***	***21***	***12***	***8.2***			

Table D3-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Baker Lake, 2019.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Baker Akilahaarjuk Point								
BAP - 61	24-Jul-19	0	43,304	769,104	186,200	85,024	1,000	1,084,632
BAP - 62	24-Jul-19	0	36,120	755,536	158,664	39,320	1,600	991,240
BAP - 63	12-Aug-19	0	180,000	1,260,200	290,208	89,608	2,400	1,822,416
BAP - 64	12-Aug-19	0	179,800	1,115,720	282,024	113,560	2,400	1,693,504
BAP - 65	18-Sep-19	0	222,904	819,776	417,736	57,872	800	1,519,088
BAP - 66	18-Sep-19	0	238,872	676,496	532,880	36,520	2,000	1,486,768
Percent Density or Biomass		***<0.1***	***10***	***63***	***22***	***4.9***	***0.12***	
Baker Barge Dock								
BBD-61								
BBD-62	24-Jul-19	0	114,944	1,476,136	398,352	155,680	3,600	2,148,712
BBD-63	12-Aug-19	200	137,096	670,512	267,056	120,544	1,000	1,196,408
BBD-64	12-Aug-19	0	50,288	1,215,696	303,360	192,184	1,600	1,763,128
BBD-65	18-Sep-19	0	129,912	671,512	184,496	58,272	1,000	1,045,192
BBD-66	18-Sep-19	0	57,472	694,264	127,824	80,024	1,200	960,784
Percent Density or Biomass		***<0.1***	***6.9***	***66***	***18***	***8.5***	***0.12***	
Baker Proposed Jetty								
BPJ - 61	24-Jul-19	0	50,688	966,856	130,528	113,360	2,400	1,263,832
BPJ - 62	24-Jul-19	0	50,288	952,088	135,912	144,296	2,000	1,284,584
BPJ - 63	12-Aug-19	0	179,800	899,600	299,192	153,680	1,600	1,533,872
BPJ - 64	12-Aug-19	200	143,680	1,043,480	287,024	106,176	1,000	1,581,560
BPJ - 65	18-Sep-19	200	230,688	756,720	363,880	64,856	400	1,416,744
BPJ - 66	18-Sep-19	0	317,496	655,744	357,496	50,688	800	1,382,224
Percent Density or Biomass		***<0.1***	***11***	***62***	***19***	***7.5***	***<0.1***	
All 2019 Locations Relative Density or Biomass (%)		***<0.1***	***9.8***	***64***	***20***	***6.9***	***0.11***	

Figure D3-1. Cyanophyte biomass (mg/m³) from Baker Lake since 2008.

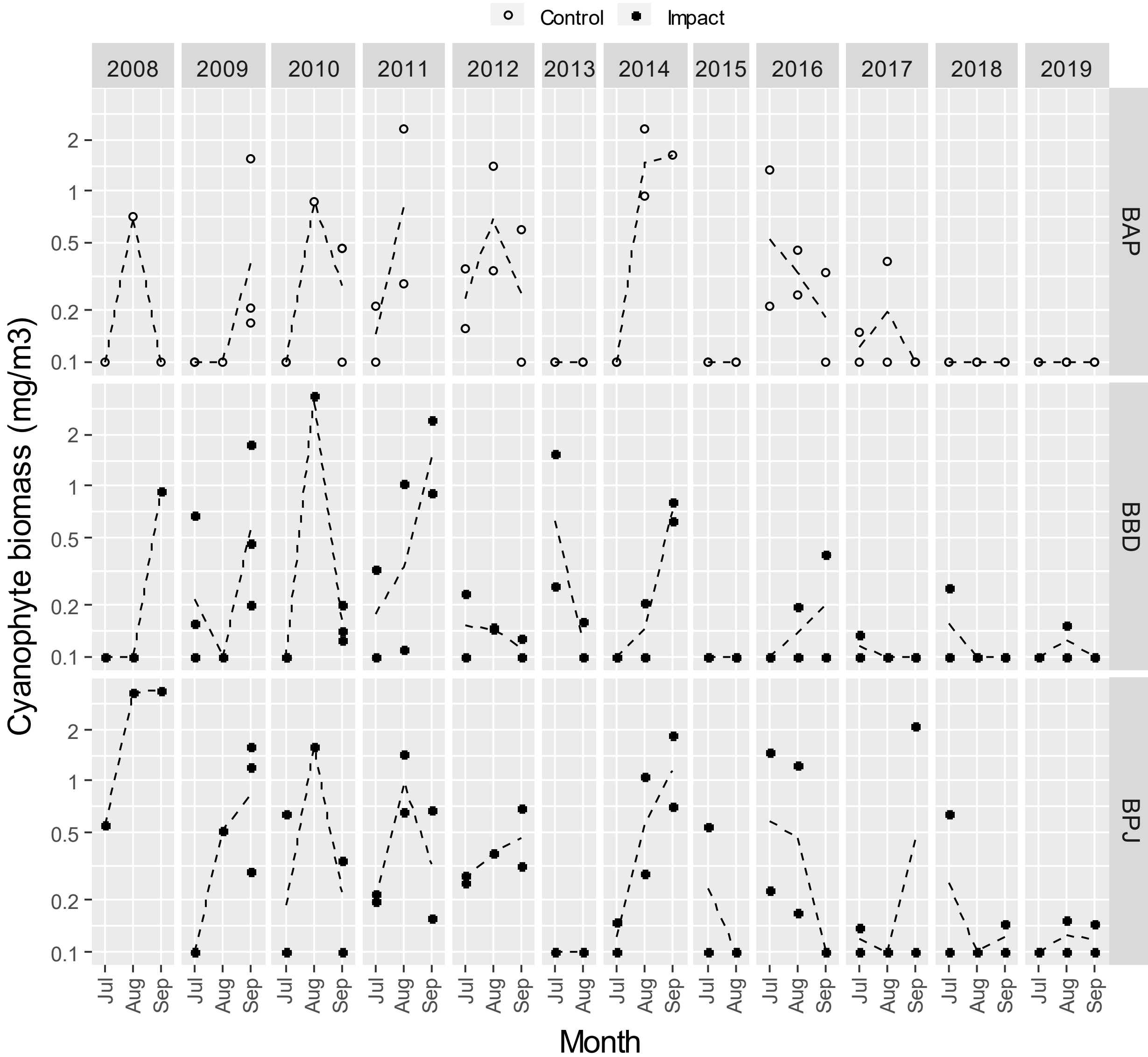


Figure D3-2. Chlorophyte biomass (mg/m³) from Baker Lake since 2008.

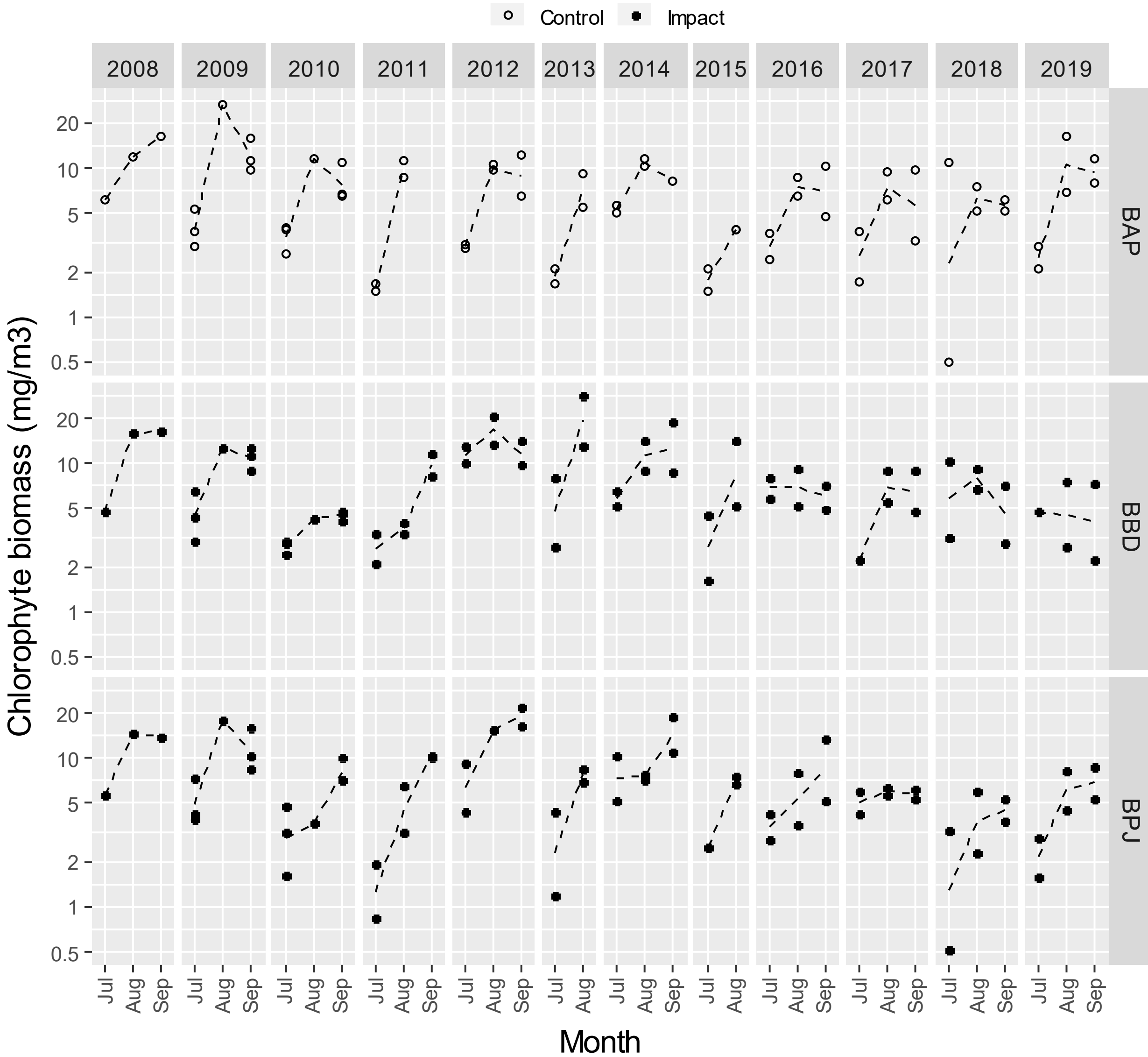


Figure D3-3. Chrysophyte biomass (mg/m³) from Baker Lake since 2008.

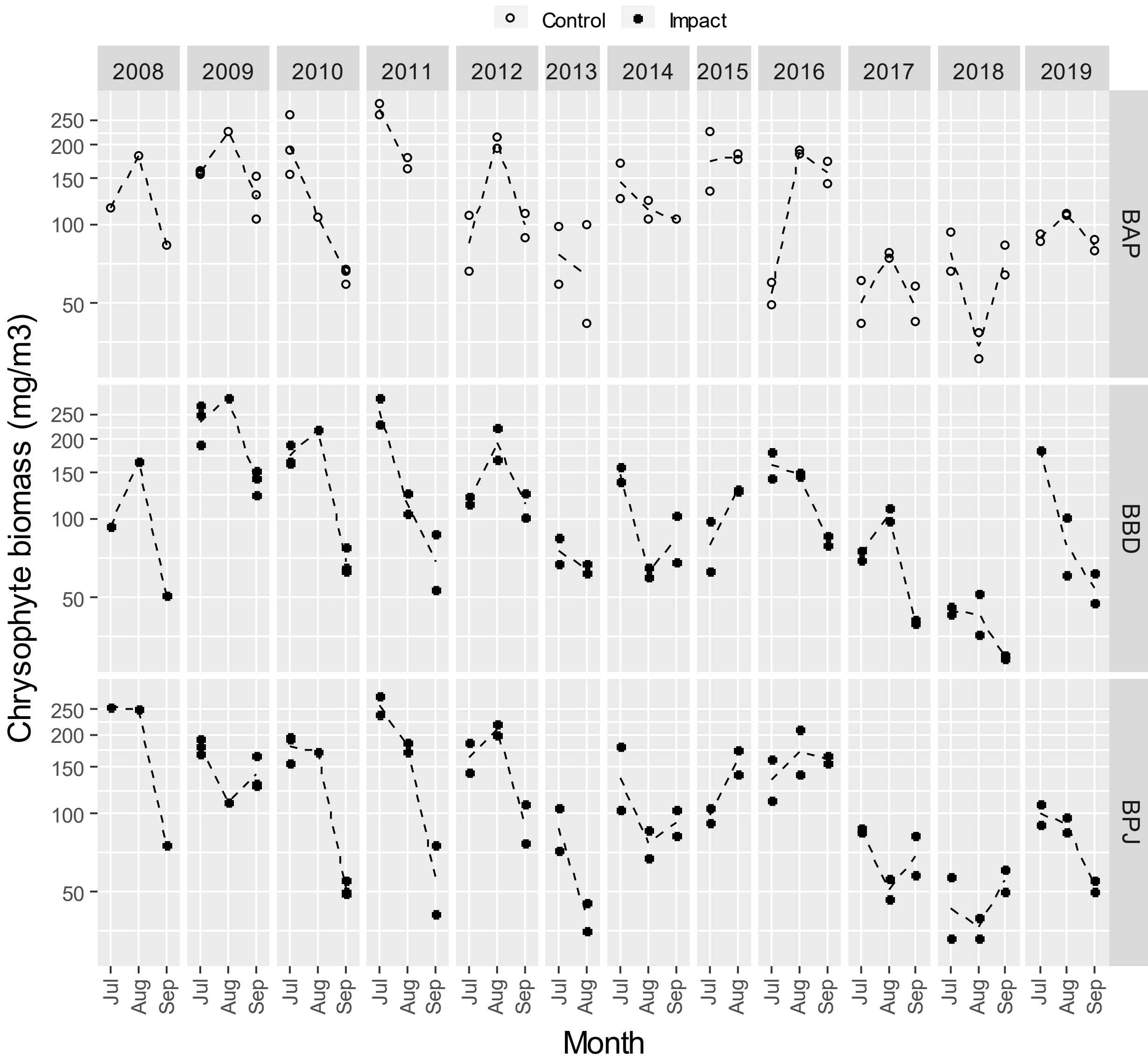


Figure D3-4. Diatom biomass (mg/m^3) from Baker Lake since 2008.

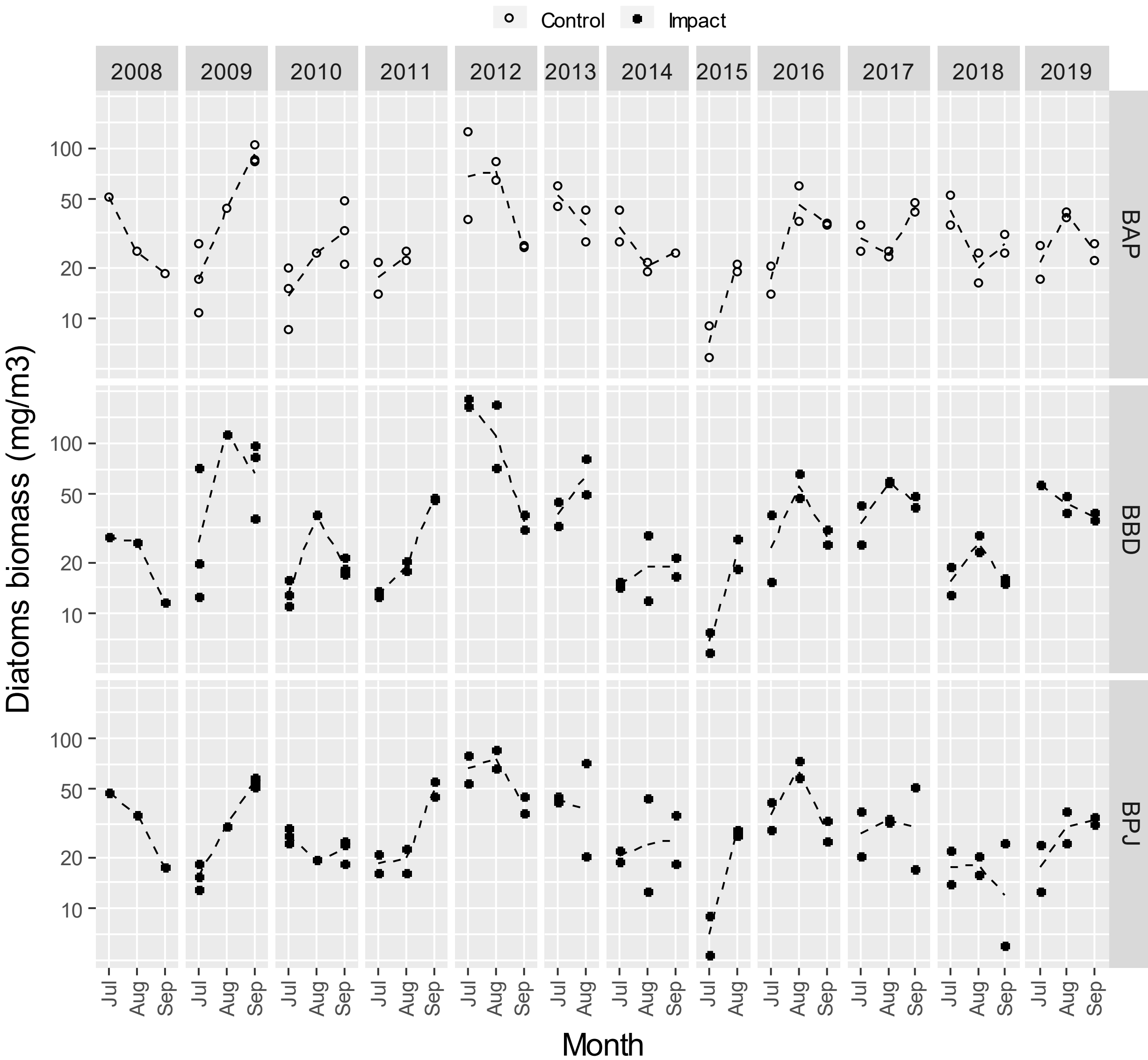


Figure D3-5. Cryptophyte biomass (mg/m^3) from Baker Lake since 2008.

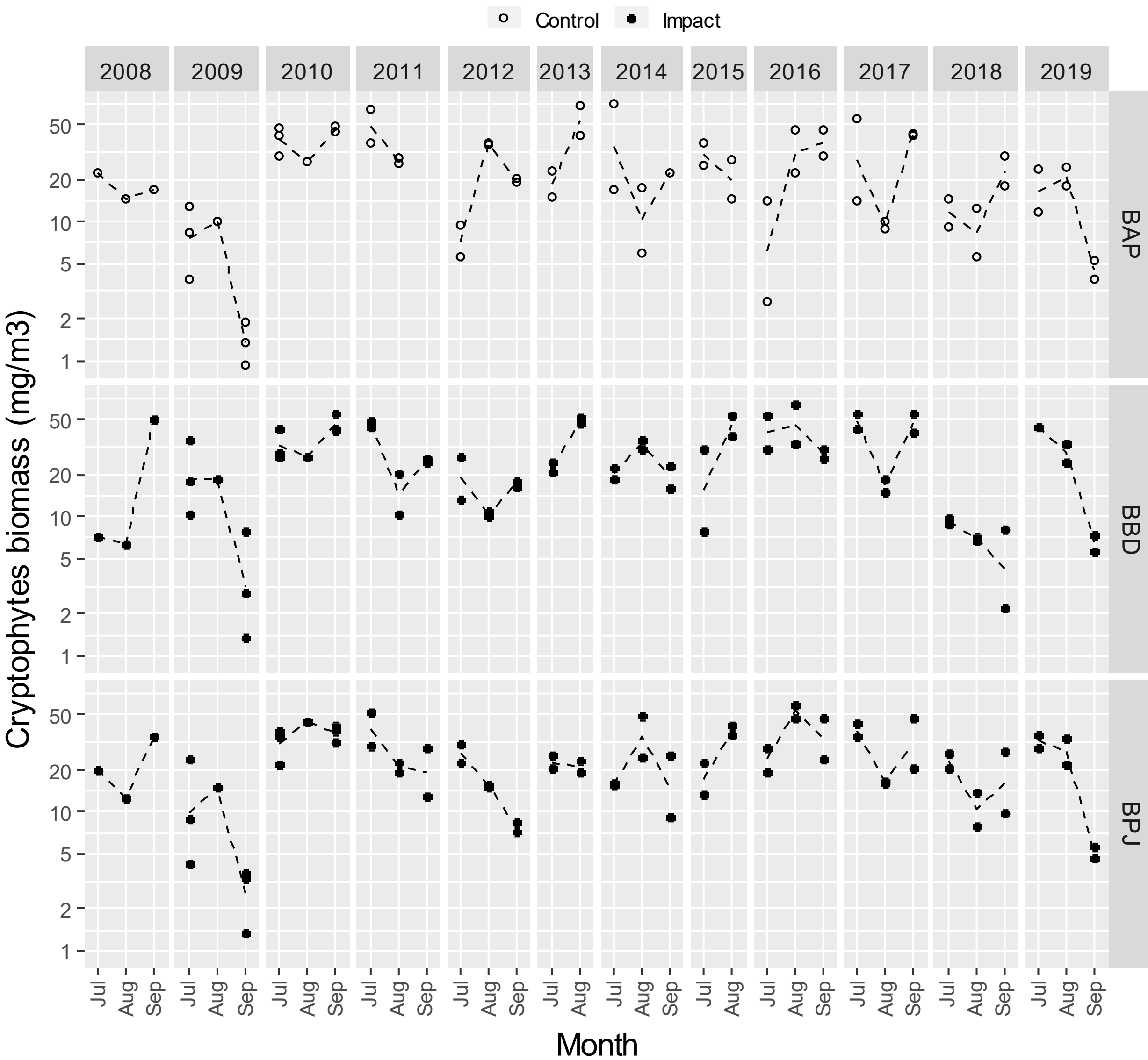


Figure D3-6. Dinoflagellate biomass (mg/m^3) from Baker Lake since 2008.

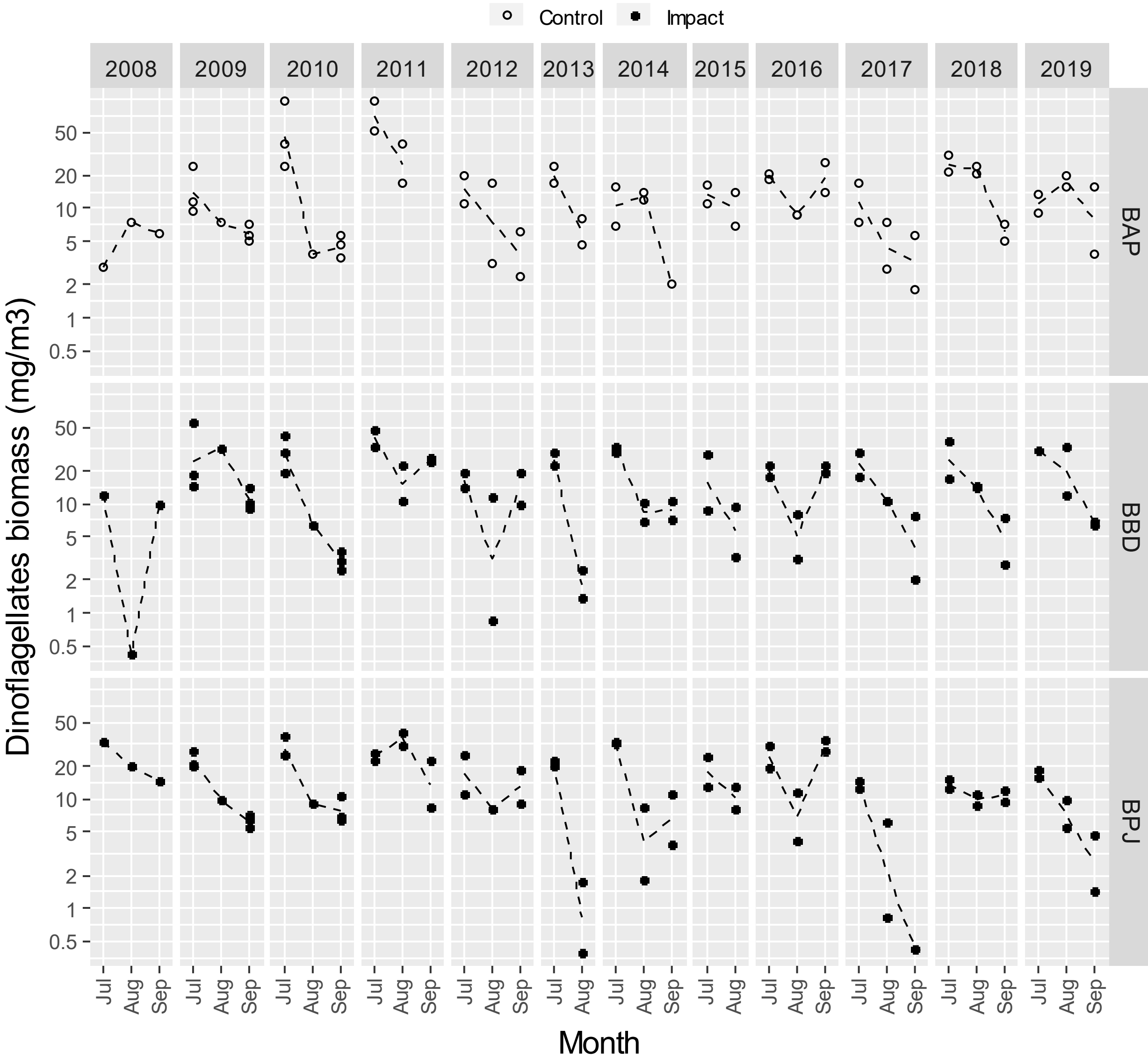


Figure D3-7. Phytoplankton density (cells/L) by major taxa group from Baker Lake since 2008.

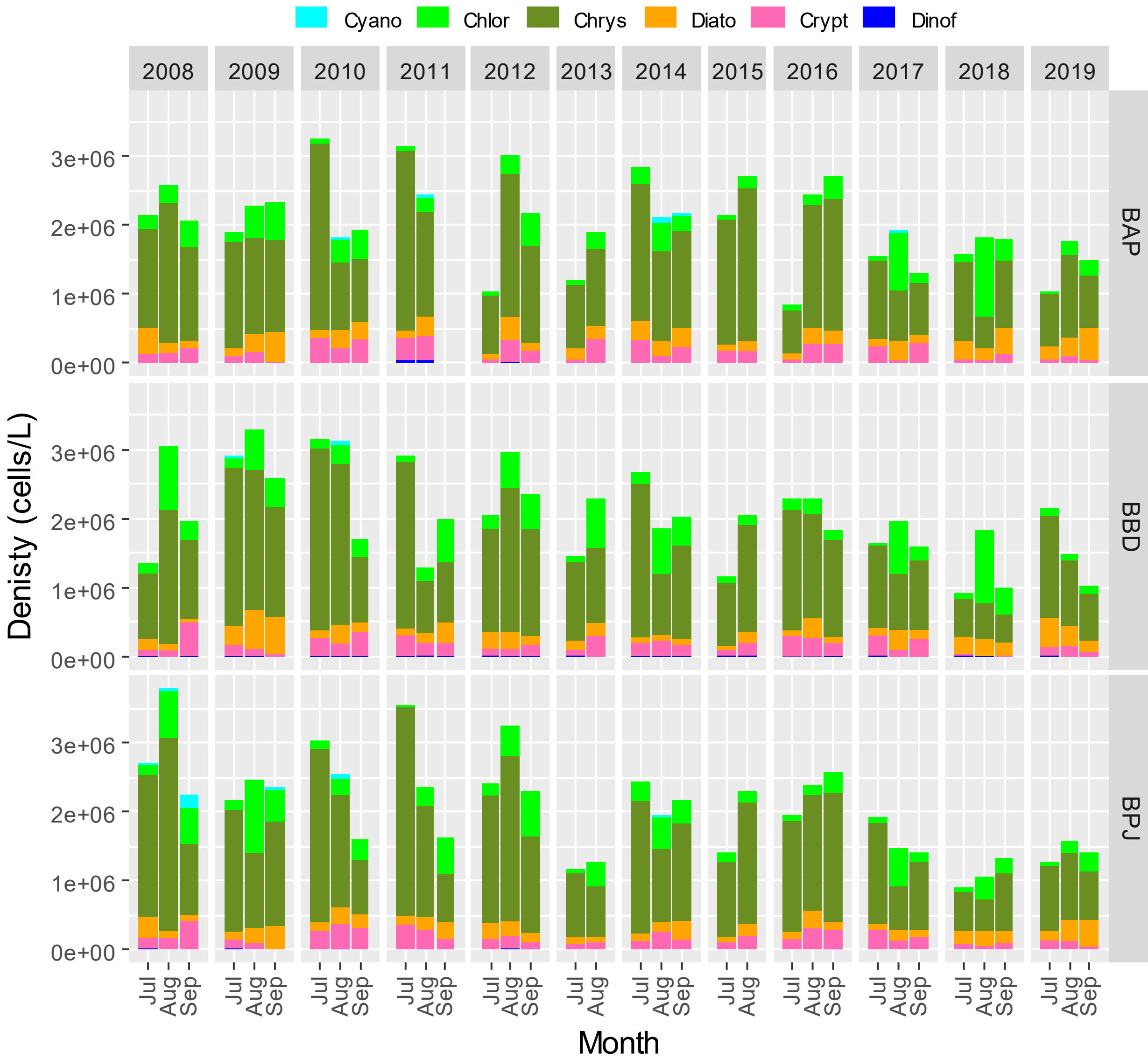


Figure D3-8. Relative phytoplankton density from Baker Lake since 2008.

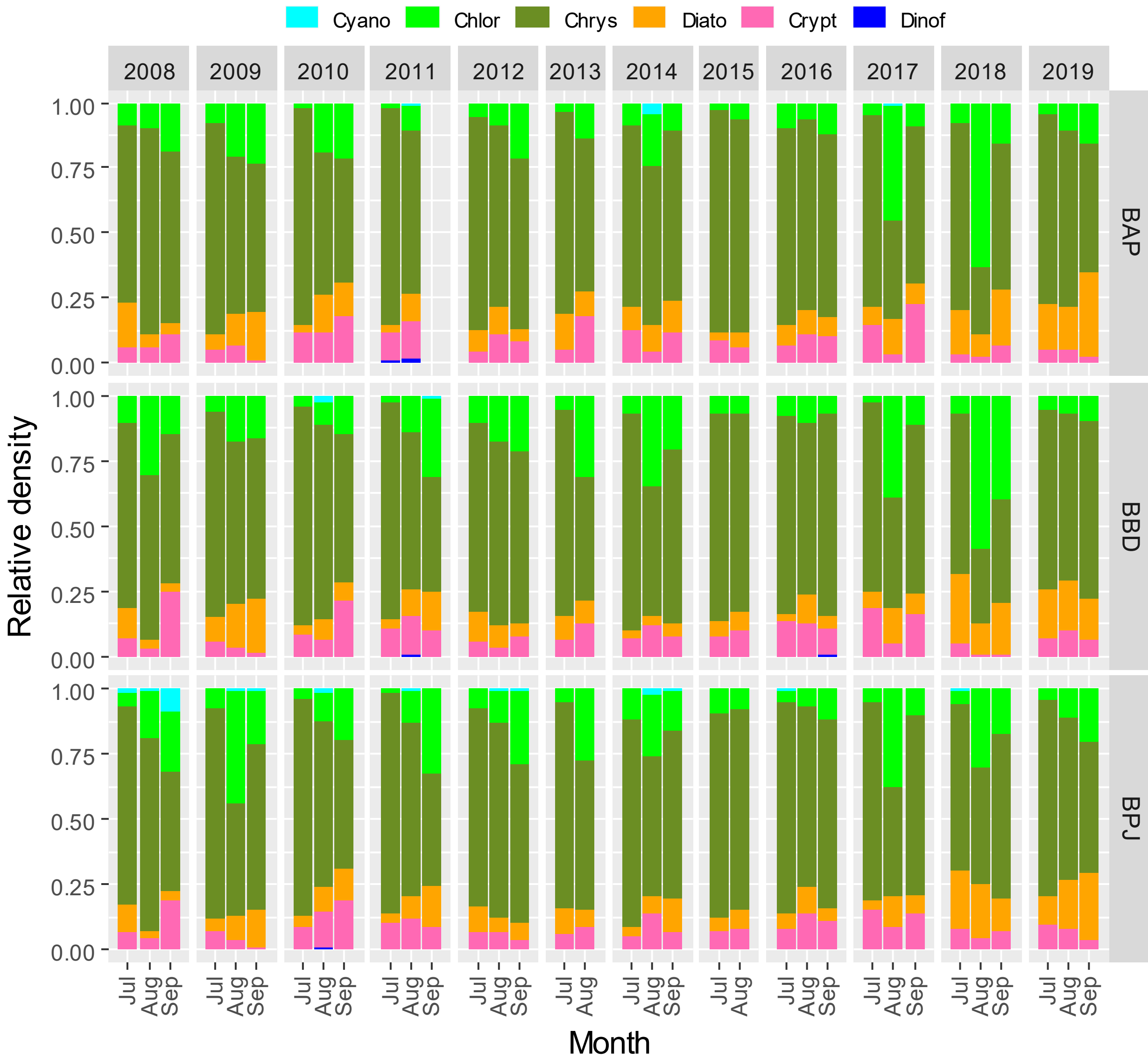


Figure D3-9. Cyanophyte density (cells/L) from Baker Lake since 2008.

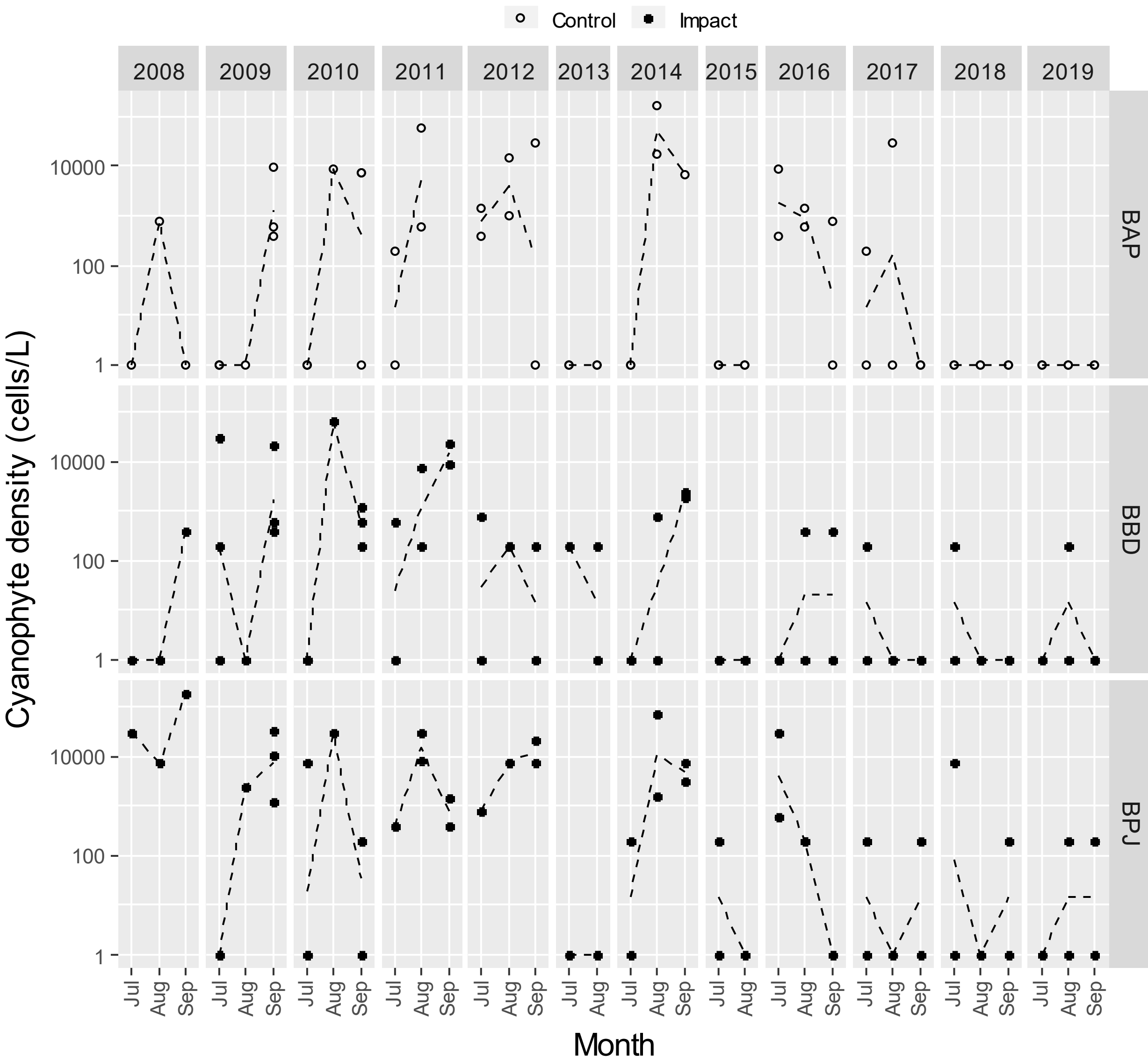


Figure D3-10. Chlorophyte density (cells/L) from Baker Lake since 2008.

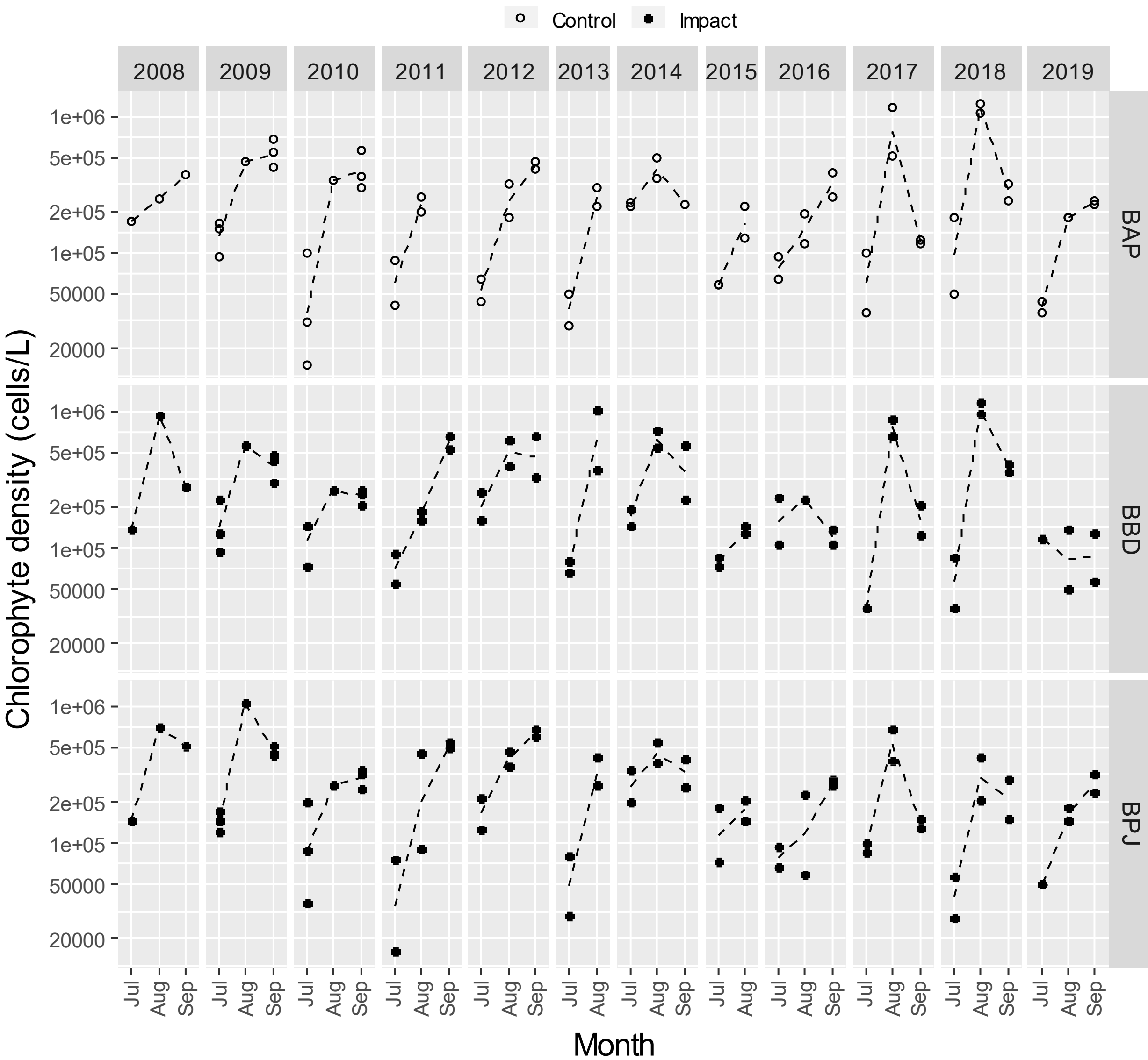


Figure D3-11. Chrysophyte density (cells/L) from Baker Lake since 2008.

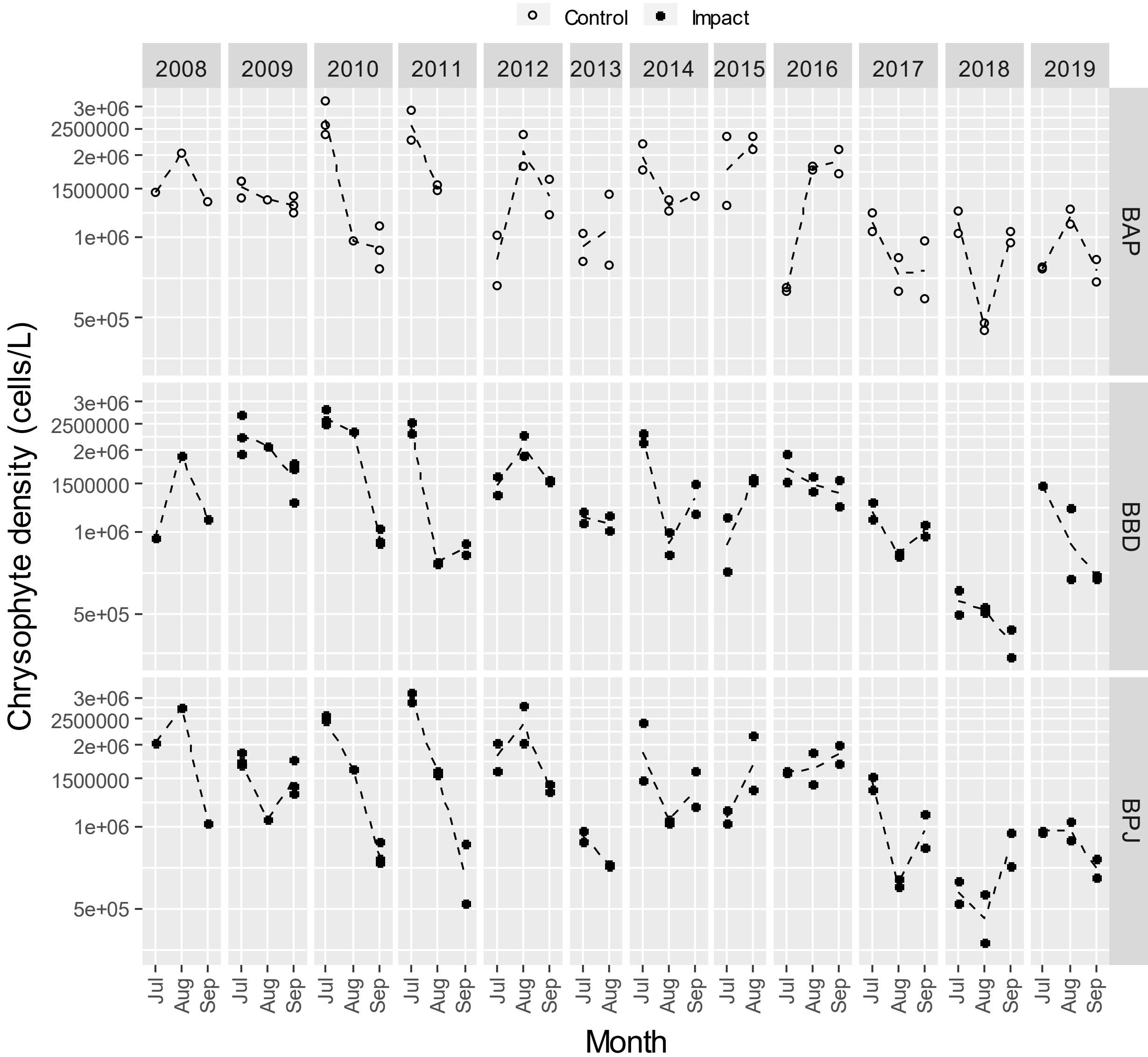


Figure D3-12. Diatom density (cells/L) from Baker Lake since 2008.

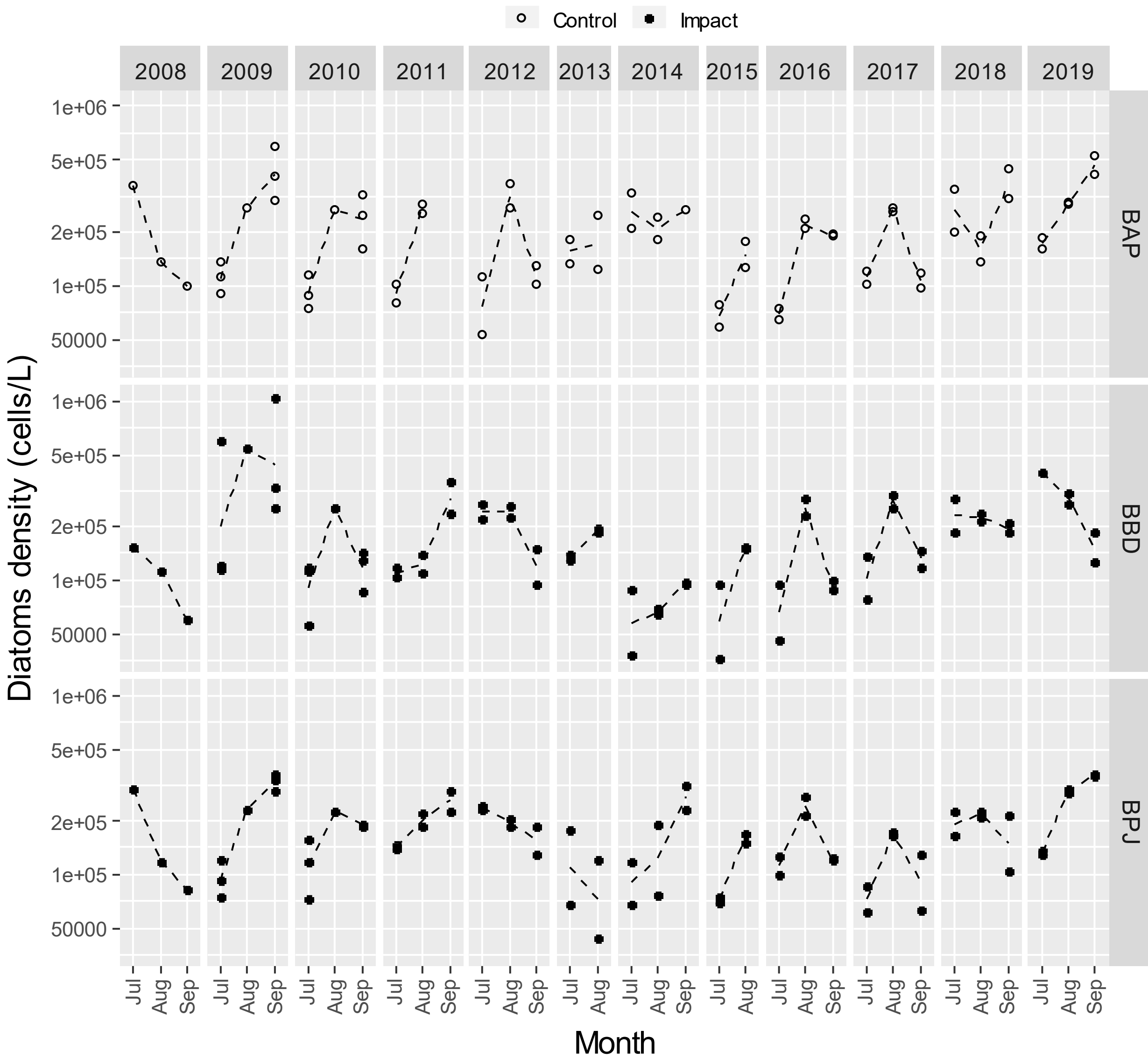


Figure D3-13. Cryptophyte density (cells/L) from Baker Lake since 2008.

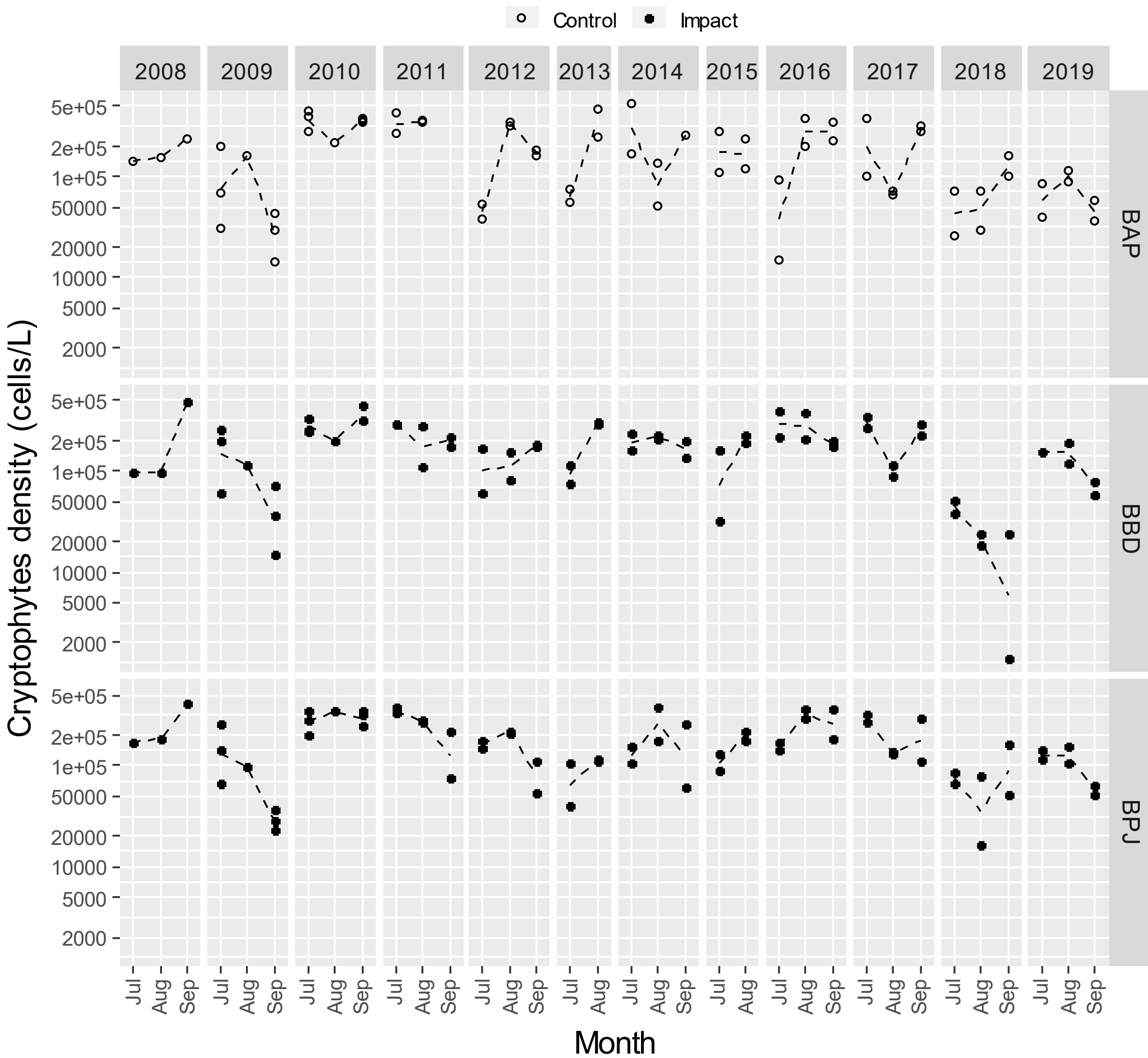


Figure D3-14. Dinoflagellate density (cells/L) from Baker Lake since 2008.

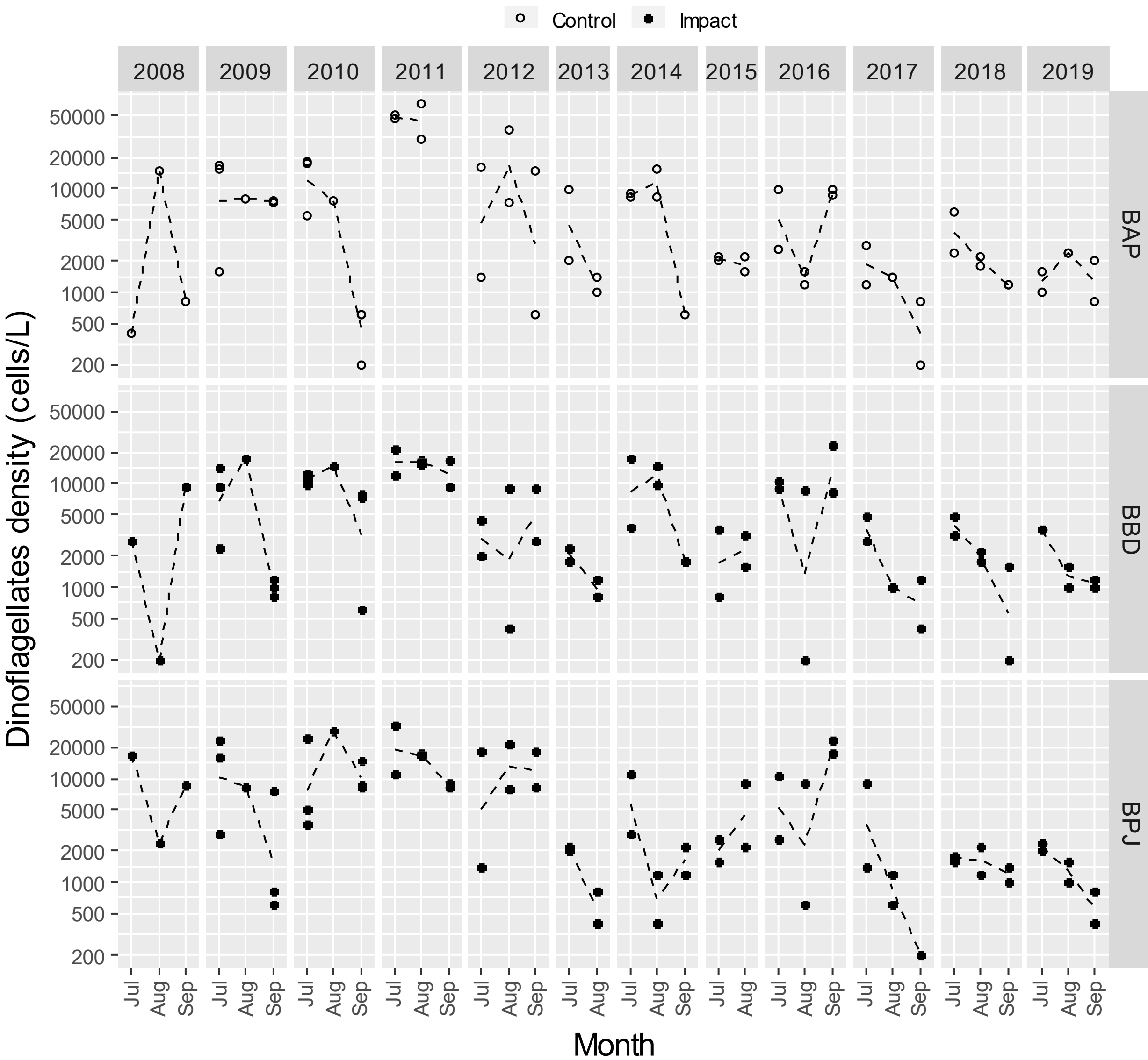
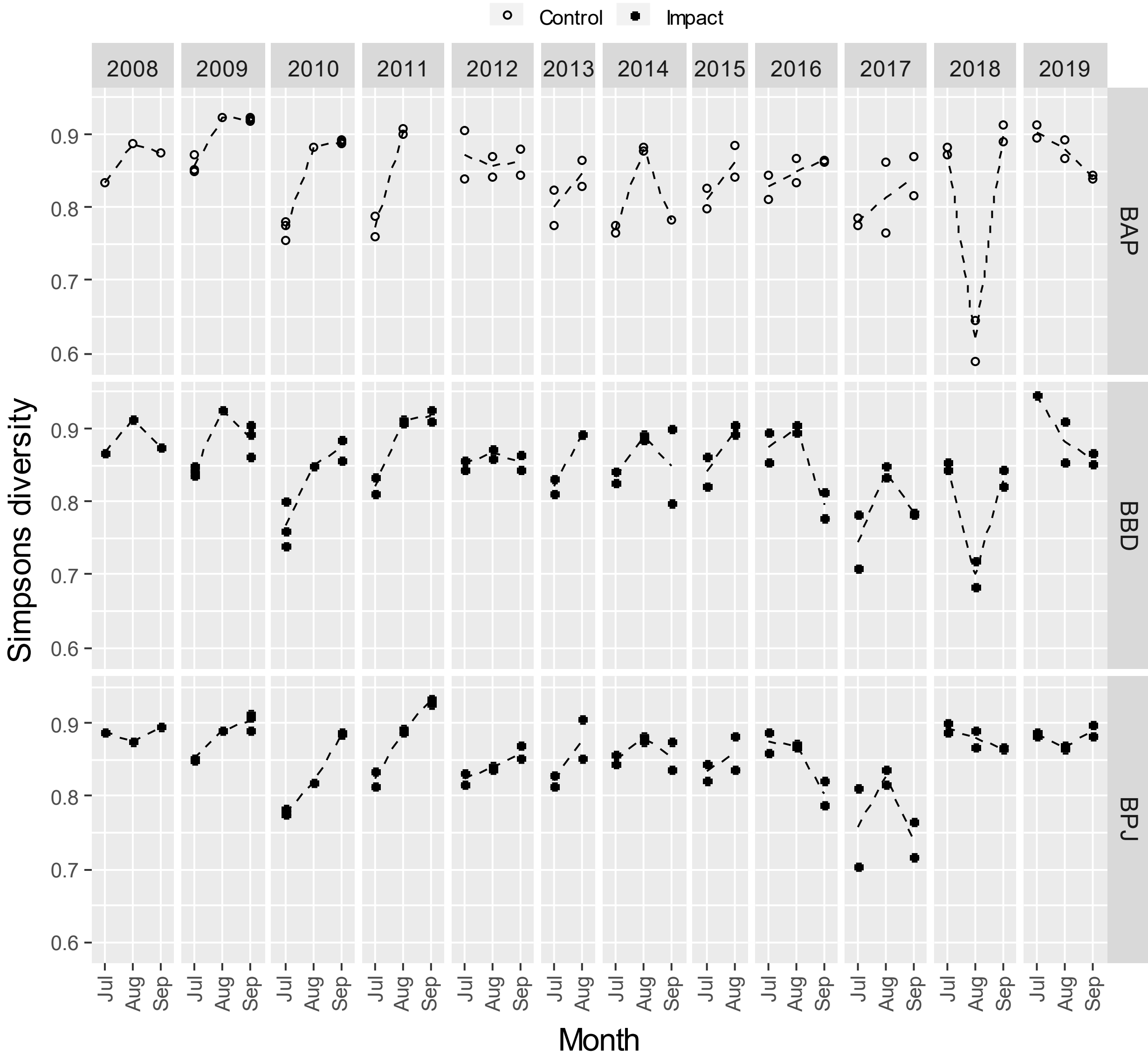


Figure D3-15. Simpsons' Diversity for the phytoplankton community from Baker Lake since 2008.



APPENDIX E

BENTHOS TAXONOMY DATA AND SUPPLEMENTAL PLOTS

Appendix E1

Benthos Data – Meadowbank Study Area Lakes

LIST OF TABLES – APPENDIX E1

LIST OF FIGURES – APPENDIX E1

Table E1-1. Benthic invertebrate abundance (#/m2) and richness (# taxa) by major taxa group, Meadowbank study area lakes, 2019.

Area-Replicate	Date	Depth (m)	Abundance (#/m^2)					Richness (# taxa)					Simpson's Diversity	Bray-Curtis Index
			Oligochaetes	Insects	Molluscs	Other Taxa[1]	TOTAL	Oligochaetes	Insects	Molluscs	Other Taxa[1]	TOTAL		
Inuggugayualik Lake														
INUG-1	15-Aug-19	7	0	848	326	43	1,217	0	7	3	1	11	0.82	0.18
INUG-2	15-Aug-19	7	22	1,304	696	0	2,022	1	12	3	0	16	0.87	0.25
INUG-3	15-Aug-19	8.0	22	1,348	478	22	1,870	1	10	2	1	14	0.89	0.16
INUG-4	15-Aug-19	8.7	0	870	261	109	1,239	0	10	2	2	14	0.90	0.27
INUG-5	15-Aug-19	9.4	0	804	326	0	1,130	0	8	3	0	11	0.85	0.08
Area Mean			***9***	***1,035***	***417***	***35***	***1,496***	***0***	***9***	***3***	***1***	***13***	***0.87***	***0.19***
Pipedream Lake														
PDL-1	14-Aug-19	6.7	130	435	109	22	696	1	7	1	1	10	0.90	0.24
PDL-2	14-Aug-19	7	65	891	109	0	1,065	0	4	2	0	6	0.84	0.47
PDL-3	14-Aug-19	6.8	130	609	239	0	978	1	4	2	0	7	0.82	0.16
PDL-4	14-Aug-19	7.4	0	543	217	0	761	0	3	1	0	4	0.74	0.13
PDL-5	14-Aug-19	6.6	65	1,087	543	22	1,717	1	10	2	1	14	0.83	0.37
Area Mean			***78***	***713***	***243***	***9***	***1,043***	***1***	***6***	***2***	***0***	***8***	***0.83***	***0.27***
Second Portage Lake														
SP-1	11-Aug-19	8	87	543	413	87	1,130	1	5	2	3	11	0.86	0.34
SP-2	11-Aug-19	7.9	0	435	261	65	761	0	8	2	2	12	0.90	0.37
SP-3	11-Aug-19	8.3	0	500	500	65	1,065	0	6	2	1	9	0.82	0.36
SP-4	11-Aug-19	7.6	0	196	326	65	587	0	5	1	2	8	0.71	0.42
SP-5	11-Aug-19	7.3	65	522	174	22	783	2	7	2	1	12	0.88	0.52
Area Mean			***30***	***439***	***335***	***61***	***865***	***1***	***6***	***2***	***2***	***10***	***0.84***	***0.40***
Third Portage Lake - East Basin														
TPE-1	10-Aug-19	8.8	130	2,848	478	43	3,500	2	11	1	2	16	0.87	0.52
TPE-2	10-Aug-19	7.2	87	3,087	652	65	3,891	1	11	1	2	15	0.82	0.64
TPE-3	10-Aug-19	7.5	435	2,435	674	22	3,565	2	11	1	1	15	0.83	0.53
TPE-4	10-Aug-19	6.5	87	2,587	826	0	3,500	2	13	1	0	16	0.79	0.63
TPE-5	10-Aug-19	7.3	65	2,239	717	0	3,022	2	12	1	0	15	0.83	0.59
Area Mean			***161***	***2,639***	***670***	***26***	***3,496***	***2***	***12***	***1***	***1***	***15***	***0.83***	***0.58***
Third Portage Lake - North Basin														
TPN-1	9-Aug-19	7.5	43	1,522	348	0	1,913	2	9	1	0	12	0.80	0.34
TPN-2	9-Aug-19	7.7	87	1,261	304	0	1,652	2	9	1	0	12	0.82	0.32
TPN-3	9-Aug-19	8.8	0	348	43	0	391	0	8	2	0	10	0.92	0.56
TPN-4	9-Aug-19	8.1	0	370	87	0	457	0	7	1	0	8	0.90	0.54
TPN-5	9-Aug-19	8.3	0	87	43	0	130	0	3	1	0	4	0.87	0.64
Area Mean			***26***	***717***	***165***	***0***	***909***	***1***	***7***	***1***	***0***	***9***	***0.86***	***0.48***
Wally Lake														
WAL-1	11-Aug-19	8	0	717	370	0	1,087	0	6	2	0	8	0.79	0.18
WAL-2	11-Aug-19	7.7	0	804	717	43	1,565	0	8	2	1	11	0.83	0.30
WAL-3	11-Aug-19	7.6	0	1,522	587	43	2,152	0	7	2	2	11	0.81	0.41
WAL-4	11-Aug-19	8.5	22	1,826	652	152	2,652	1	8	3	2	14	0.87	0.43
WAL-5	11-Aug-19	8.5	0	1,109	565	65	1,739	0	8	2	2	12	0.88	0.26
Area Mean			***4***	***1,196***	***578***	***61***	***1,839***	***0***	***7***	***2***	***1***	***11***	***0.84***	***0.32***

Notes:

1. "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, Pionidae, Harpacticoida, and O. Notostraca).

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2019.

Program	**Meadowbank**									
Location	**Inuggugayualik Lake**					**Pipedream Lake**				
Station	**INUG**					**PDL**				
Control/Impact?	Control					Control				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	15-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19	14-Aug-19	14-Aug-19	14-Aug-19	14-Aug-19	14-Aug-19
Sample Depth (m)	7.0	7.0	8.0	8.7	9.4	6.7	7.0	6.8	7.4	6.6
ROUNDWORMS										
P. Nemata	5	1	1	1	-	1	-	1	4	6
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	1	-	-	-	-	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
Limnodrilus hoffmeisteri										
Tasserkidrilus americanus	-	-	-	-	-	-	-	1	-	-
immatures with hair chaetae	-	-	-	-	-	5	3	5	-	2
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	-	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae										
Lumbriculus	-	1	1	-	-	1	-	-	-	1
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	-	-	-	-	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	-	-	-	-	-	-	-	-	-	-
F. Hygrobatidae										
Hygrobates	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae										
Lebertia	-	-	1	-	-	1	-	-	-	-
F. Oxidae										
Oxus	2	-	-	4	-	-	-	-	-	-
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	-	3	-	-	-	6	15	5	3	8
TADPOLE SHRIMP										
O. Notostraca										
Lepidurus arcticus	-	-	-	-	-	-	-	-	-	1
INSECTS										
Cl. Insecta	-	-	-	-	-	-	-	-	-	-
CADDISFLIES										
O. Trichoptera	-	-	-	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	1	-	-	-	-	-	-	1
immature	-	-	-	-	-	-	-	-	-	**1**
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	-	**3**	**3**	**2**	**1**	**1**	**7**	**2**	**2**	**1**
S.F. Chironominae										
Chironomus	-	-	-	-	-	-	-	-	-	-
Cladotanytarsus	-	-	1	1	-	-	-	-	-	-
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	-	4	6	10	2	-	-	-	-	-
?Corynocera oliveri	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	1	-	-	-	-	-	-	-	-
Micropsectra	6	17	10	6	9	-	-	-	-	1
Microtendipes	-	1	-	-	1	-	-	-	-	-
Parachironomus	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	7	5	10	1	-	-	8	-	-	-
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	1
Stempellinella	-	-	-	-	-	-	-	-	-	-
Stictochironomus	18	11	18	5	15	7	3	16	14	20
Tanytarsus	1	5	4	5	4	3	8	6	-	2
S.F. Diamesinae										
Pagastia	-	-	-	-	-	-	-	-	-	-
Protanypus	-	2	-	-	-	-	-	-	-	-
Potthastia	-	-	-	-	-	-	-	-	-	-
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	-	-	-	1	-	-	-	1
Corynoneura	-	-	-	-	-	-	-	-	-	-
Cricotopus	-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	1	4	3	1	1	-	-	-	4	1
Hydrobaenus	-	-	-	-	-	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-
Oliveridia	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-
Parakiefferiella	-	-	-	-	-	-	-	-	-	-
Psectrocladius	1	1	-	1	1	3	-	1	-	2
Zalutschia	-	-	-	-	-	-	-	-	-	1
Orthocladiinae *Genus "Greenland"*	-	-	-	-	-	1	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	-	3	2	2	3	1	-	-	-	-
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	-	-	-	-
Procladius	5	3	4	6	-	3	15	3	5	18
Thienemannimyia complex	-	-	-	-	-	-	-	-	-	-
F. Empididae										
Neoplasta/ Chelifera/Metachela	-	-	-	-	-	-	-	-	-	-
Wiedemannia	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2019.

Program	Meadowbank									
Location	Second Portage Lake					Third Portage Lake - East Basin				
Station	SP					TPE				
Control/Impact?	Impact					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	10-Aug-19	10-Aug-19	10-Aug-19	10-Aug-19	10-Aug-19
Sample Depth (m)	8.0	7.9	8.3	7.6	7.3	8.8	7.2	7.5	6.5	7.3
ROUNDWORMS										
P. Nemata	2	4	3	8	8	8	16	4	7	8
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	-	-	-	-	-	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
Limnodrilus hoffmeisteri										
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	3	-	-	-	-	-	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	1	-	-	-	2	1	4	16	1	2
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae										
Lumbriculus	-	-	-	-	1	5	-	4	3	1
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	-	-	-	-	-	-	-	-	1
F. Acalyptonotidae										
Acalyptonotus	1	-	-	1	-	1	-	1	-	-
F. Hygrobatidae										
Hygrobates	2	1	-	-	-	-	1	-	-	-
F. Lebertiidae										
Lebertia	1	-	-	-	-	-	-	-	-	-
F. Oxidae										
Oxus	-	2	3	2	1	1	2	-	-	-
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	14	12	13	-	3	90	88	70	34	55
TADPOLE SHRIMP										
O. Notostraca										
Lepidurus arcticus	-	-	-	-	-	-	-	-	-	-
INSECTS										
Cl. Insecta	-	-	-	1	-	-	-	-	-	-
CADDISFLIES										
O. Trichoptera	-	-	-	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	-	-	-	-	-	1	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	**5**	**3**	**3**	**1**	**4**	**6**	**6**	**2**	**1**	**9**
S.F. Chironominae										
Chironomus	-	-	-	-	-	-	-	-	-	-
Cladotanytarsus	-	-	-	-	-	-	-	-	-	-
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	-	-	-	-	-	-	-	-	-	-
?Corynocera oliveri	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-
Micropsectra	-	-	-	1	1	12	9	11	12	7
Microtendipes	-	-	-	-	-	-	-	-	-	-
Parachironomus	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	-	-	-	-	-	40	65	54	60	44
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	2	-	-	-	-	-	-	1
Stictochironomus	6	1	3	2	1	20	5	14	4	1
Tanytarsus	1	3	-	-	1	-	2	1	2	3
S.F. Diamesinae										
Pagastia	-	-	-	-	-	-	-	-	-	-
Protanypus	-	1	-	-	-	1	-	-	1	-
Potthastia	-	-	-	-	-	-	-	-	-	-
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	-	-	-	1	5	6	4	3
Corynoneura	-	-	-	-	-	-	-	-	-	-
Cricotopus	-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-	-	1	-	-	-
Heterotrissocladius	-	-	-	-	1	1	15	3	6	8
Hydrobaenus	-	1	-	-	-	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	1
Oliveridia	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	3	-
Parakiefferiella	-	-	-	-	-	-	-	-	-	-
Psectrocladius	4	2	3	1	4	19	17	9	12	15
Zalutschia	-	1	1	-	-	-	-	-	-	1
Orthocladiinae *Genus "Greenland"*	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	2	1	2	1	3	6	1	1	2	3
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	-	-	-	-
Procladius	7	7	9	3	9	23	15	7	8	7
Thienemannimyia complex	-	-	-	-	-	1	-	3	3	-
F. Empididae										
Neoplasta/ Chelifera/Metachela	-	-	-	-	-	-	1	1	1	-
Wiedemannia	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2019.

Program	Meadowbank									
Location	Third Portage Lake - North Basin					Wally Lake				
Station	TPN					WAL				
Control/Impact?	Impact					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	9-Aug-19	9-Aug-19	9-Aug-19	9-Aug-19	9-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19
Sample Depth (m)	7.5	7.7	8.8	8.1	8.3	8.0	7.7	7.6	8.5	8.5
ROUNDWORMS										
P. Nemata	-	-	4	2	-	1	2	1	2	1
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	-	-	-	-	1	6	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
Limnodrilus hoffmeisteri										
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	-	-	-	-	-	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	1	3	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae										
Lumbriculus	1	1	-	-	-	-	-	-	1	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	-	-	-	-	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	-	-	-	-	-	-	-	-	-	-
F. Hygrobatidae										
Hygrobates	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae										
Lebertia	-	-	-	-	-	-	2	-	1	1
F. Oxidae										
Oxus	-	-	-	-	-	-	-	1	-	2
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	9	18	13	4	4	11	4	6	8	12
TADPOLE SHRIMP										
O. Notostraca										
Lepidurus arcticus	-	-	-	-	-	-	-	-	-	-
INSECTS										
Cl. Insecta	-	-	-	-	-	-	-	-	-	-
CADDISFLIES										
O. Trichoptera	-	-	-	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	1	-	-	-	-	1	-	-	-
immature	1	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	**3**	**5**	-	**1**	-	-	-	-	-	**1**
S.F. Chironominae										
Chironomus	-	-	-	-	-	-	-	-	-	-
Cladotanytarsus	-	-	-	-	-	-	-	5	-	7
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	-	-	-	-	-	6	8	16	14	13
?Corynocera oliveri	-	-	-	-	-	2	-	-	14	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-
Micropsectra	16	23	3	2	1	-	-	-	2	-
Microtendipes	-	-	-	-	-	-	-	-	-	-
Parachironomus	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	-	1	4	1	-	-	2	3	4	9
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	-	-	-
Stictochironomus	32	17	2	4	-	18	17	33	32	13
Tanytarsus	3	-	1	2	-	1	-	2	-	2
S.F. Diamesinae										
Pagastia	-	-	-	-	-	-	-	-	-	-
Protanypus	2	-	1	-	-	-	-	-	-	-
Potthastia	-	-	-	-	-	-	-	-	-	-
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	-	-	-	-	-	-	-	-
Corynoneura	-	-	-	-	-	-	-	-	-	-
Cricotopus	-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	1	1	2	-	-	-	-	-	-	-
Hydrobaenus	-	2	-	1	-	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-
Oliveridia	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-
Parakiefferiella	-	-	-	-	-	-	-	-	-	-
Psectrocladius	1	-	-	-	-	-	1	-	-	1
Zalutschia	-	2	-	-	-	-	-	-	-	-
Orthocladiinae *Genus "Greenland"*	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	1	-	-	-	-	1	4	3	5	3
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	1	-	-	-
Procladius	6	4	2	4	2	5	3	8	12	2
Thienemannimyia complex	4	2	1	2	1	-	-	-	1	-
F. Empididae										
Neoplasta/ Chelifera/Metachela	-	-	-	-	-	-	-	-	-	-
Wiedemannia	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2019.

Program	**Meadowbank**									
Location	**Inuggugayualik Lake**					**Pipedream Lake**				
Station	**INUG**					**PDL**				
Control/Impact?	Control					Control				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	15-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19	14-Aug-19	14-Aug-19	14-Aug-19	14-Aug-19	14-Aug-19
Sample Depth (m)	7.0	7.0	8.0	8.7	9.4	6.7	7.0	6.8	7.4	6.6
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium (Cyclocalyx)/Neopisidium	13	25	15	11	10	-	3	5	10	8
Pisidium (Cyclocalyx)	1	4	7	1	3	5	2	6	-	17
Sphaerium nitidum	1	3	-	-	2	-	-	-	-	-
R (Richness) - totals [2,3]										
Total	11	16	14	14	11	10	6	7	4	14
Oligochaete	0	1	1	0	0	1	0	1	0	1
Insect	7	12	10	10	8	7	4	4	3	10
Mollusc	3	3	2	2	3	1	2	2	1	2
Other[4]	1	0	1	2	0	1	0	0	0	1
Abundance (raw) - totals [5,6]										
Total	56	93	86	57	52	32	49	45	35	79
Oligochaete	0	1	1	0	0	6	3	6	0	3
Insect	39	60	62	40	37	20	41	28	25	50
Mollusc	15	32	22	12	15	5	5	11	10	25
Other[4]	2	0	1	5	0	1	0	0	0	1
N (Abundance) - #/m^2										
Total	1,217	2,022	1,870	1,239	1,130	696	1,065	978	761	1,717
Oligochaete	0	22	22	0	0	130	65	130	0	65
Insect	848	1,304	1,348	870	804	435	891	609	543	1,087
Mollusc	326	696	478	261	326	109	109	239	217	543
Other[4]	43	0	22	109	0	22	0	0	0	22

Notes:

1. Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
2. Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
3. Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
4. Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertiidae, F. Oxidae, F. Pionidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
5. Abundance totals exclude P. Nemata and Cl. Ostracoda.
6. Raw abundance from two grabs (grab area = 0.023 m^2).

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2019.

Program	**Meadowbank**									
Location	**Second Portage Lake**					**Third Portage Lake - East Basin**				
Station	**SP**					**TPE**				
Control/Impact?	Impact					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	10-Aug-19	10-Aug-19	10-Aug-19	10-Aug-19	10-Aug-19
Sample Depth (m)	8.0	7.9	8.3	7.6	7.3	8.8	7.2	7.5	6.5	7.3
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium (Cyclocalyx)/Neopisidium	16	7	18	15	7	22	30	31	38	33
Pisidium (Cyclocalyx)	3	5	5	-	1	-	-	-	-	-
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-
R (Richness) - totals [2,3]										
Total	11	12	9	8	12	16	15	15	16	15
Oligochaete	1	0	0	0	2	2	1	2	2	2
Insect	5	8	6	5	7	11	11	11	13	12
Mollusc	2	2	2	1	2	1	1	1	1	1
Other[4]	3	2	1	2	1	2	2	1	0	0
Abundance (raw) - totals [5,6]										
Total	52	35	49	27	36	161	179	164	161	139
Oligochaete	4	0	0	0	3	6	4	20	4	3
Insect	25	20	23	9	24	131	142	112	119	103
Mollusc	19	12	23	15	8	22	30	31	38	33
Other[4]	4	3	3	3	1	2	3	1	0	0
N (Abundance) - #/m²										
Total	1,130	761	1,065	587	783	3,500	3,891	3,565	3,500	3,022
Oligochaete	87	0	0	0	65	130	87	435	87	65
Insect	543	435	500	196	522	2,848	3,087	2,435	2,587	2,239
Mollusc	413	261	500	326	174	478	652	674	826	717
Other[4]	87	65	65	65	22	43	65	22	0	0

Notes:

1. Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
2. Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
3. Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
4. Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertiidae, F. Oxidae, F. Pionidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
5. Abundance totals exclude P. Nemata and Cl. Ostracoda.
6. Raw abundance from two grabs (grab area = 0.023 m^2).

Table E1-2. Raw benthic invertebrate data from the Meadowbank Study Lakes 2019.

Program	Meadowbank									
Location	**Third Portage Lake - North Basin**					**Wally Lake**				
Station	**TPN**					**WAL**				
Control/Impact?	Impact					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	9-Aug-19	9-Aug-19	9-Aug-19	9-Aug-19	9-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19	11-Aug-19
Sample Depth (m)	7.5	7.7	8.8	8.1	8.3	8.0	7.7	7.6	8.5	8.5
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium (Cyclocalyx)/Neopisidium	16	14	1	4	2	13	16	20	11	15
Pisidium (Cyclocalyx)	-	-	1	-	-	4	17	7	18	11
Sphaerium nitidum	-	-	-	-	-	-	-	-	1	-
R (Richness) - totals [2,3]										
Total	12	12	10	8	4	8	11	11	14	12
Oligochaete	2	2	0	0	0	0	0	0	1	0
Insect	9	9	8	7	3	6	8	7	8	8
Mollusc	1	1	2	1	1	2	2	2	3	2
Other[4]	0	0	0	0	0	0	1	2	2	2
Abundance (raw) - totals [5,6]										
Total	88	76	18	21	6	50	72	99	122	80
Oligochaete	2	4	0	0	0	0	0	0	1	0
Insect	70	58	16	17	4	33	37	70	84	51
Mollusc	16	14	2	4	2	17	33	27	30	26
Other[4]	0	0	0	0	0	0	2	2	7	3
N (Abundance) - #/m²										
Total	1,913	1,652	391	457	130	1,087	1,565	2,152	2,652	1,739
Oligochaete	43	87	0	0	0	0	0	0	22	0
Insect	1,522	1,261	348	370	87	717	804	1,522	1,826	1,109
Mollusc	348	304	43	87	43	370	717	587	652	565
Other[4]	0	0	0	0	0	0	43	43	152	65

Notes:

1. Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
2. Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
3. Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
4. Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertiidae, F. Oxidae, F. Pionidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
5. Abundance totals exclude P. Nemata and Cl. Ostracoda.
6. Raw abundance from two grabs (grab area = 0.023 m^2).

Figure E1-1. Oligochaete abundance (#/m^2) from Meadowbank study lakes since 2006.

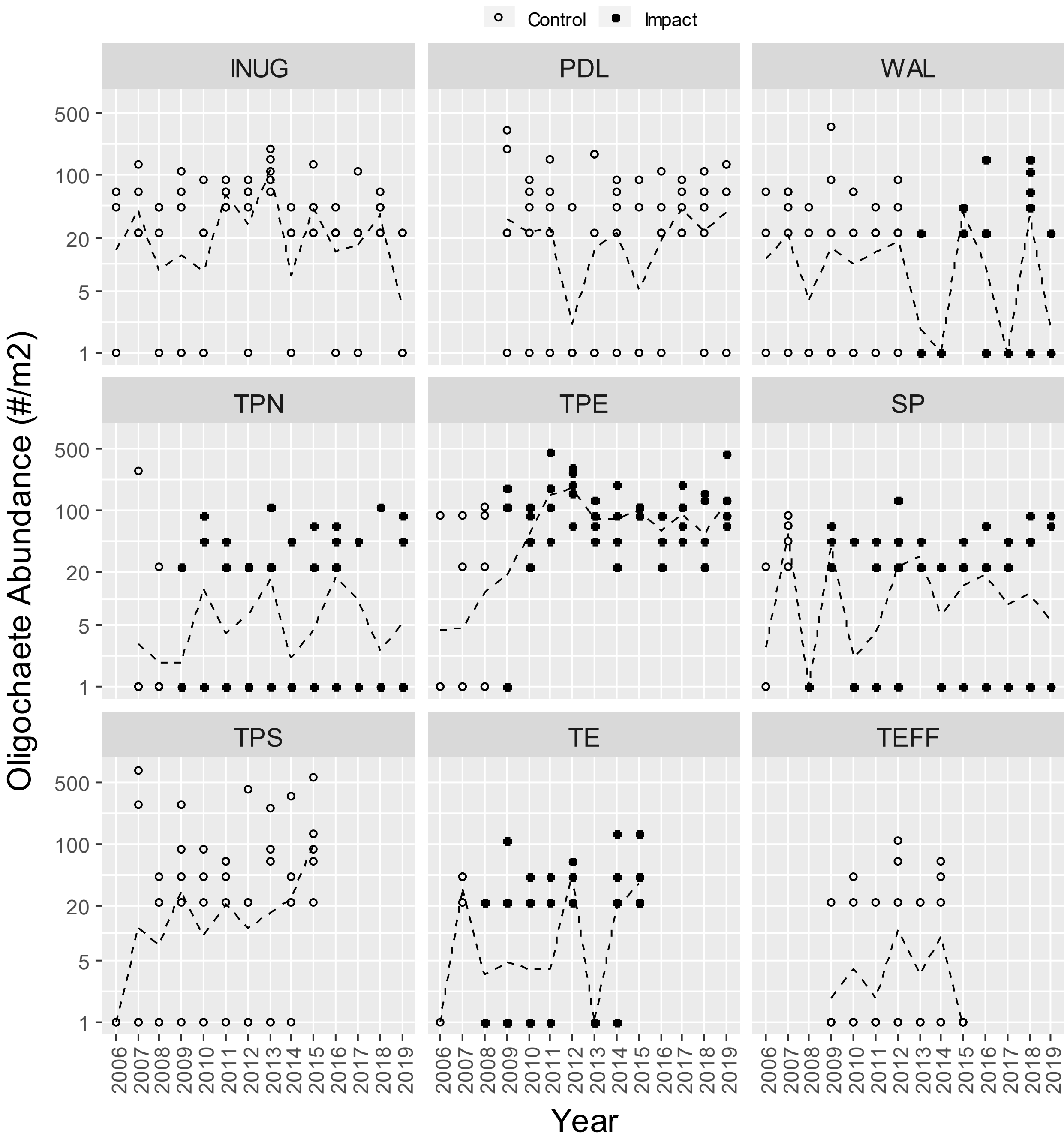


Figure E1-2. Insect abundance (#/m^2) from Meadowbank study lakes since 2006.

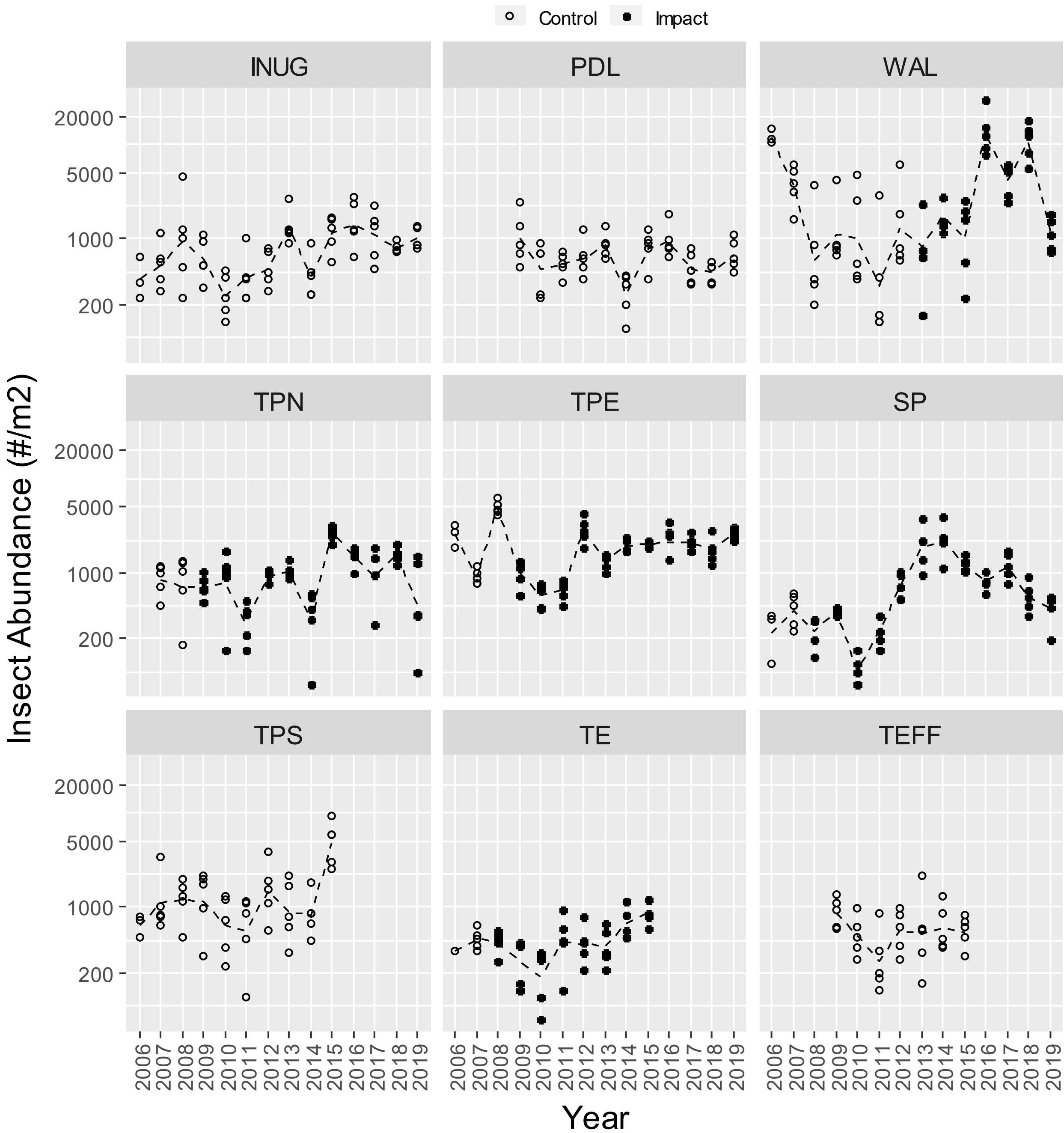


Figure E1-3. Mollusc abundance (#/m²) from Meadowbank study lakes since 2006.

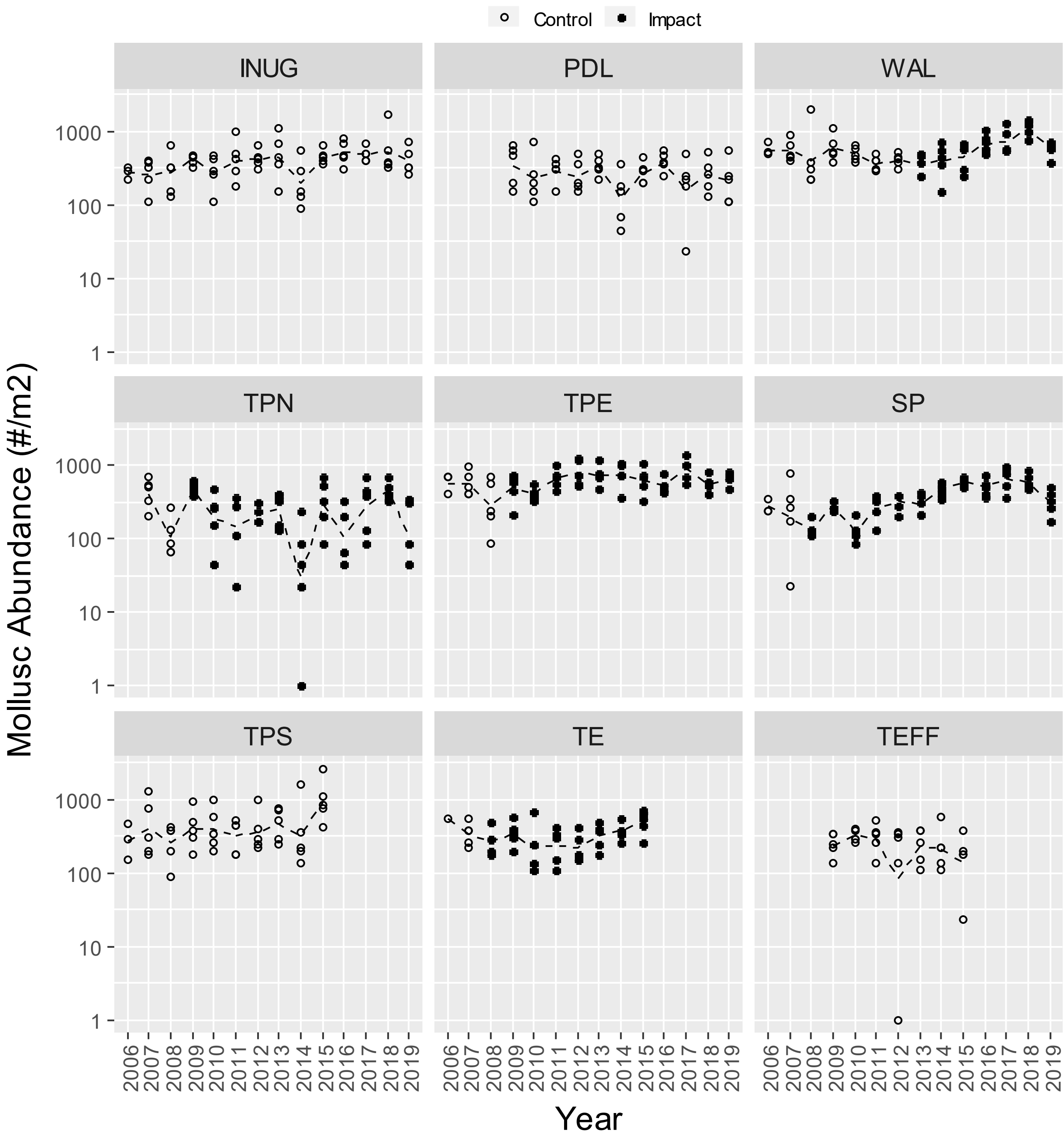


Figure E1-4. Other taxa abundance (#/m^2) from Meadowbank study lakes since 2006.

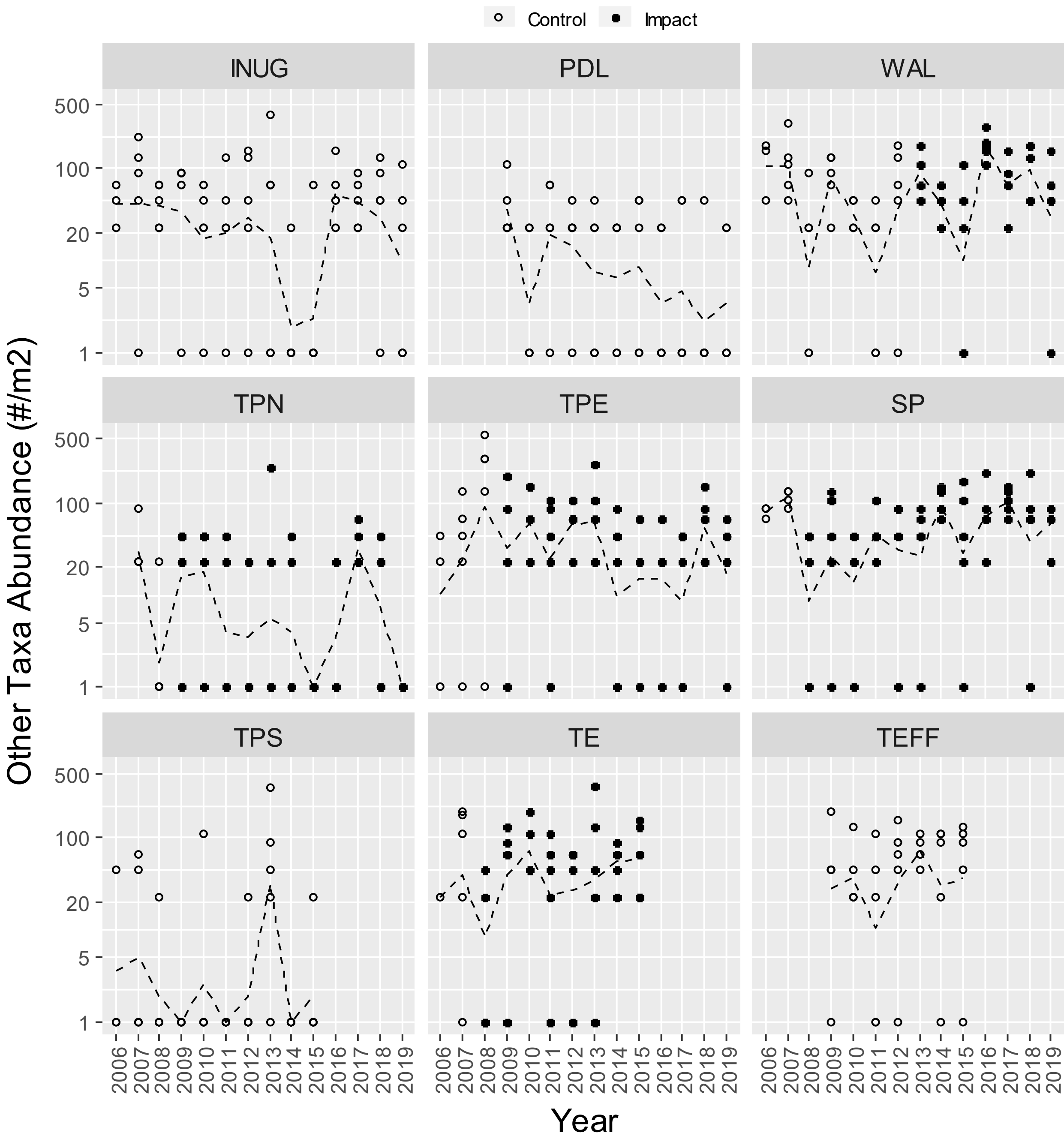


Figure E1-5. Oligochaete richness (# of taxa) from Meadowbank study lakes since 2006.

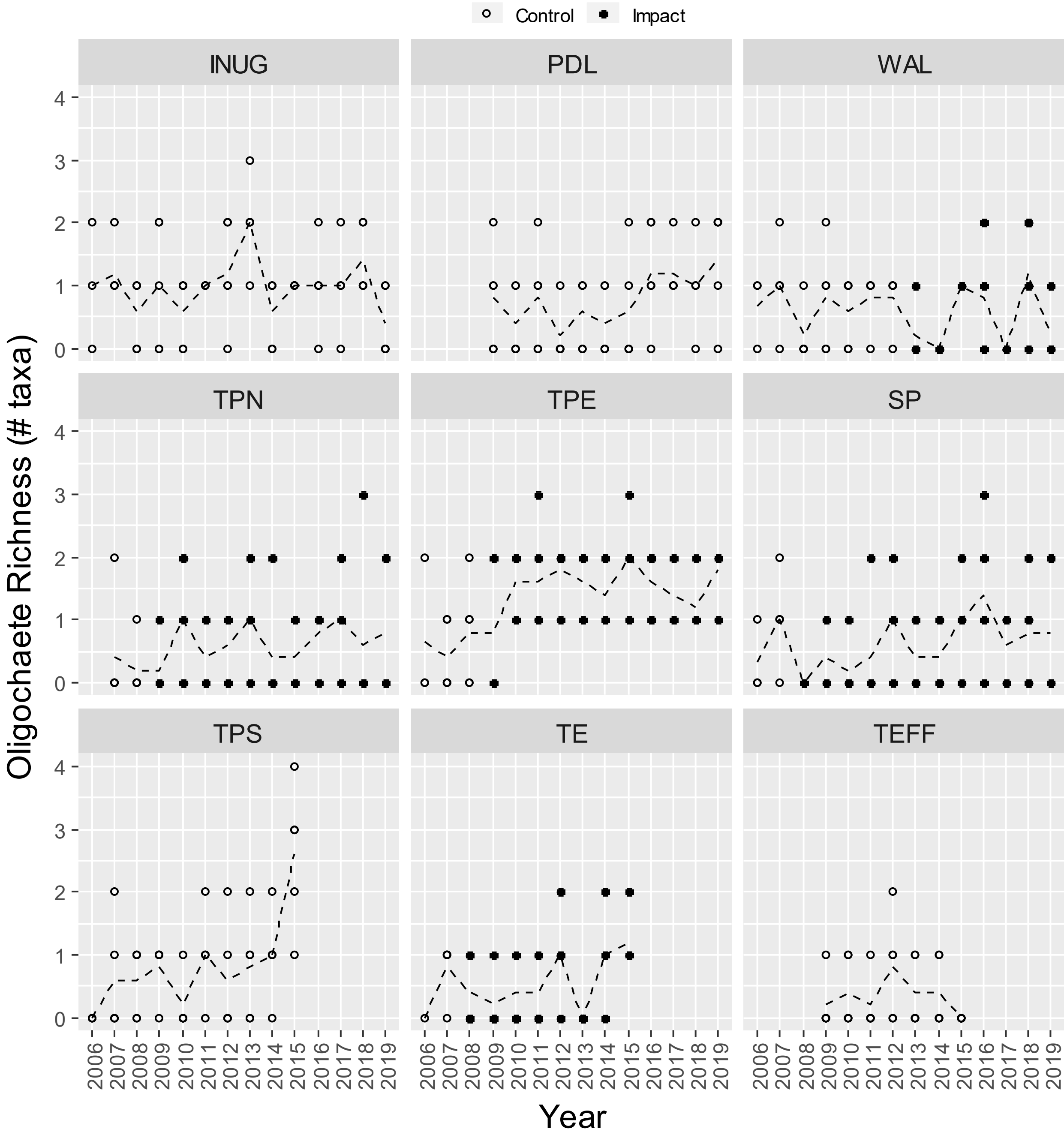


Figure E1-6. Insect richness (# of taxa) from Meadowbank study lakes since 2006.

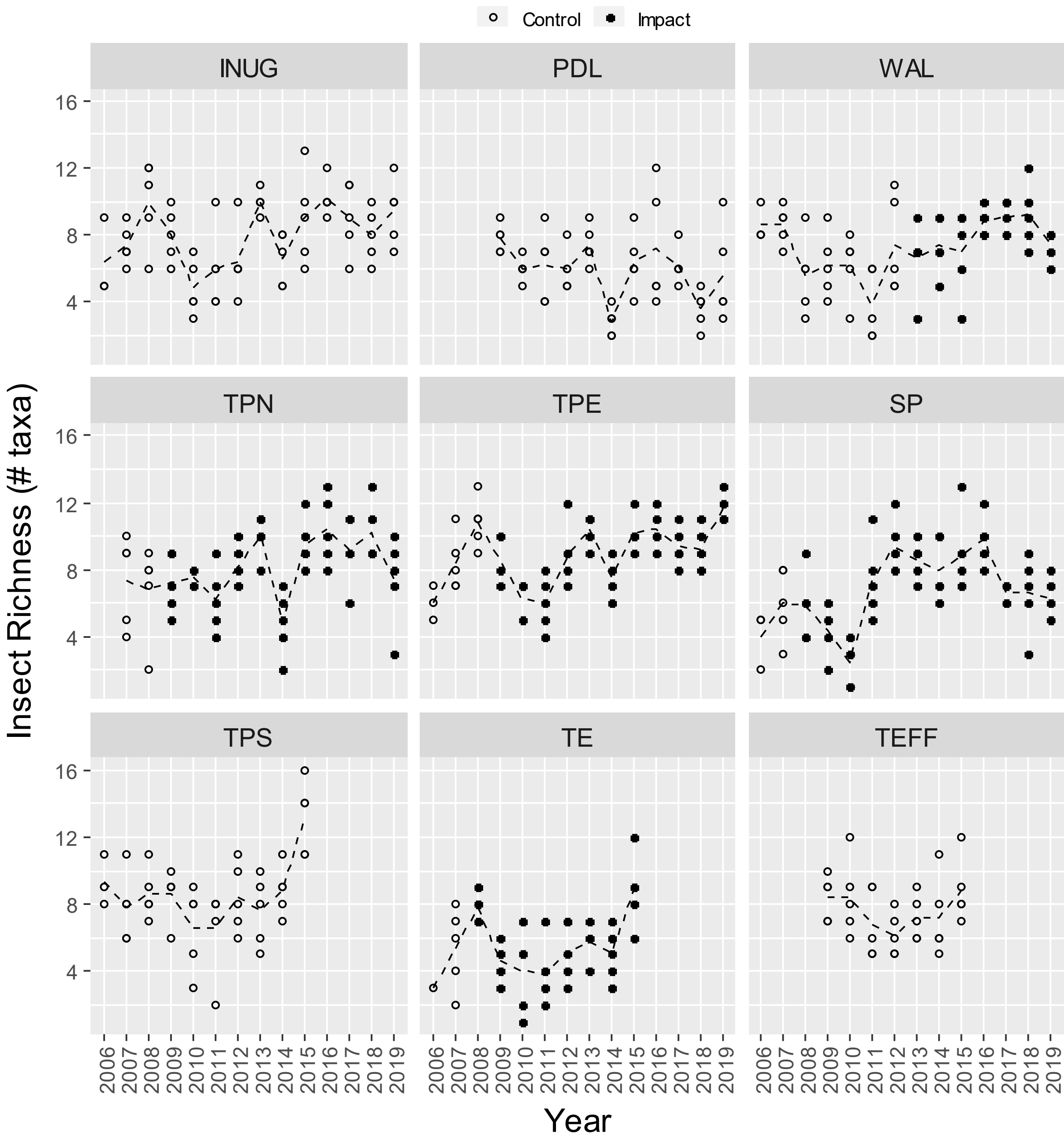


Figure E1-7. Mollusc richness (# of taxa) from Meadowbank study lakes since 2006.

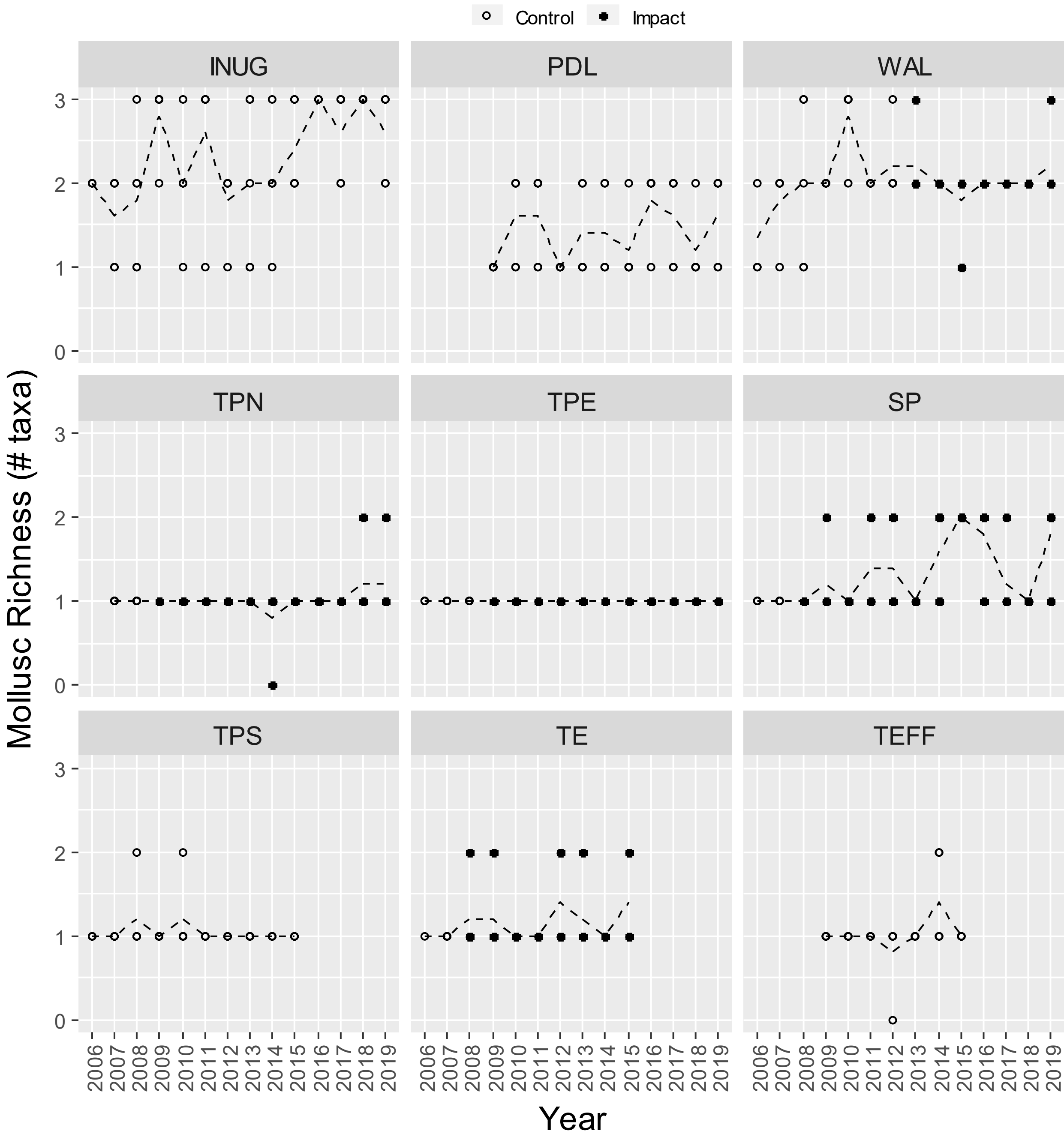


Figure E1-8. Other taxa richness (# of taxa) from Meadowbank study lakes since 2006.

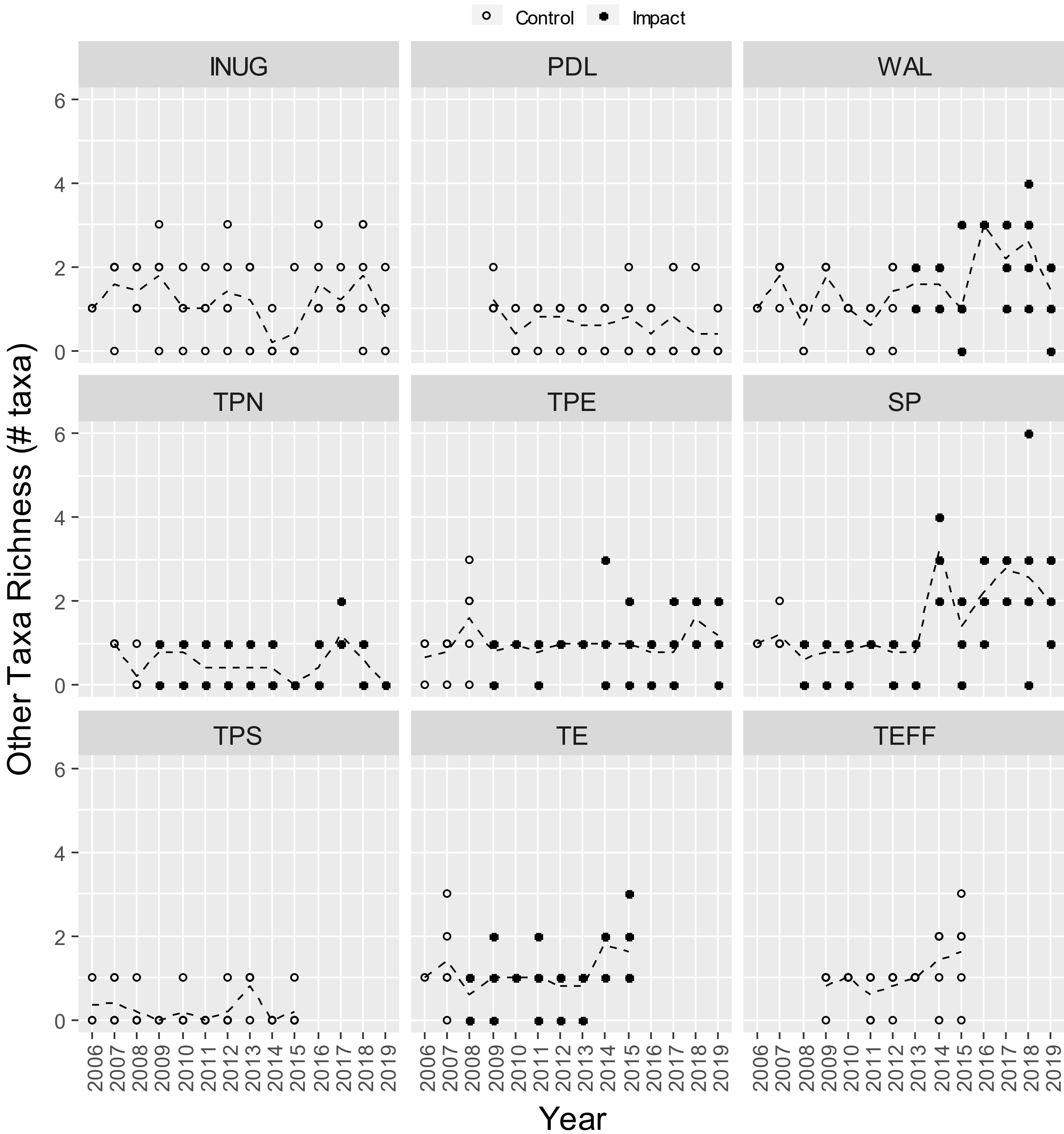


Figure E1-9. Simpsons' Diversity for the benthic invertebrate community at the Meadowbank study lakes since 2006.

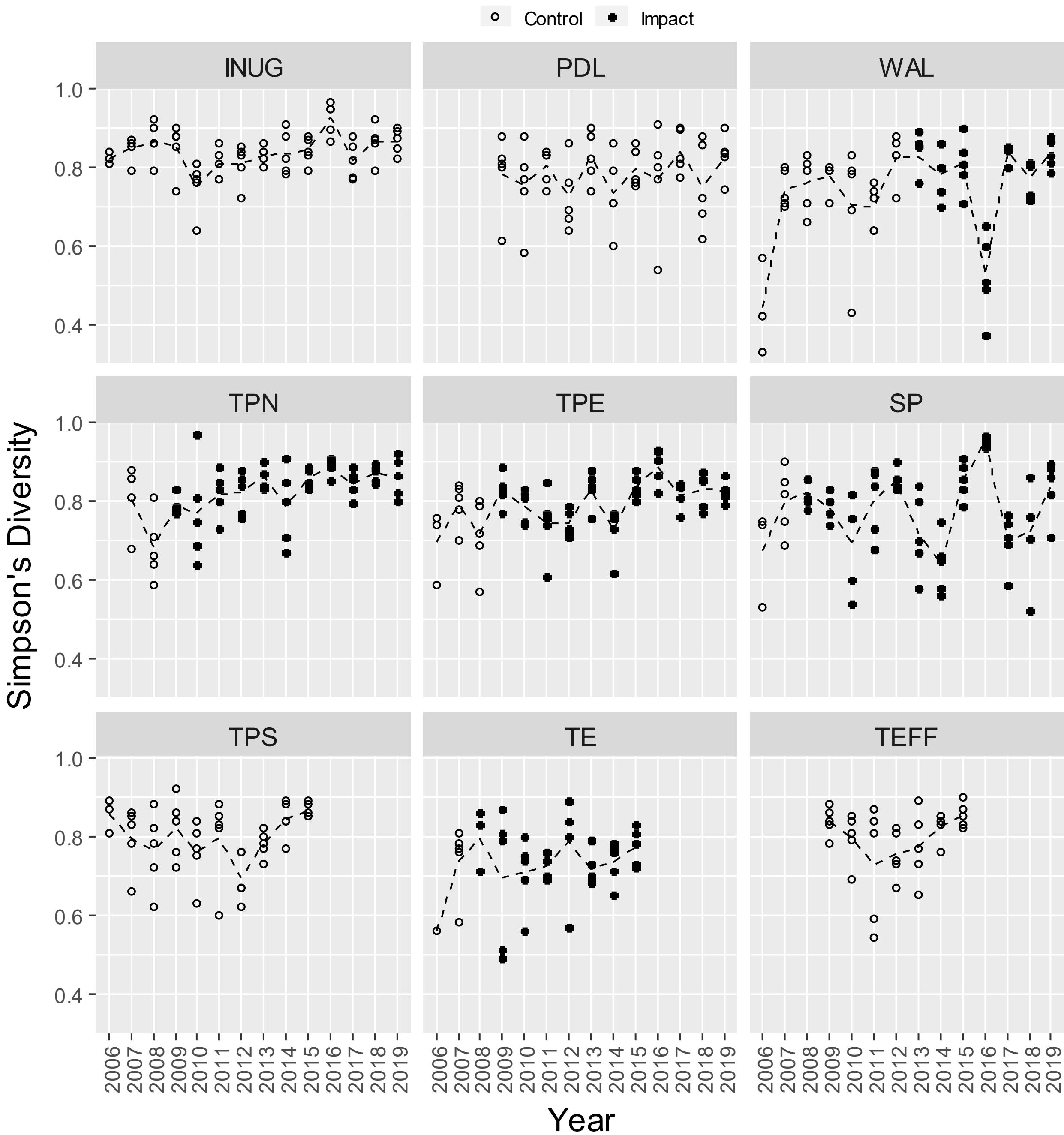
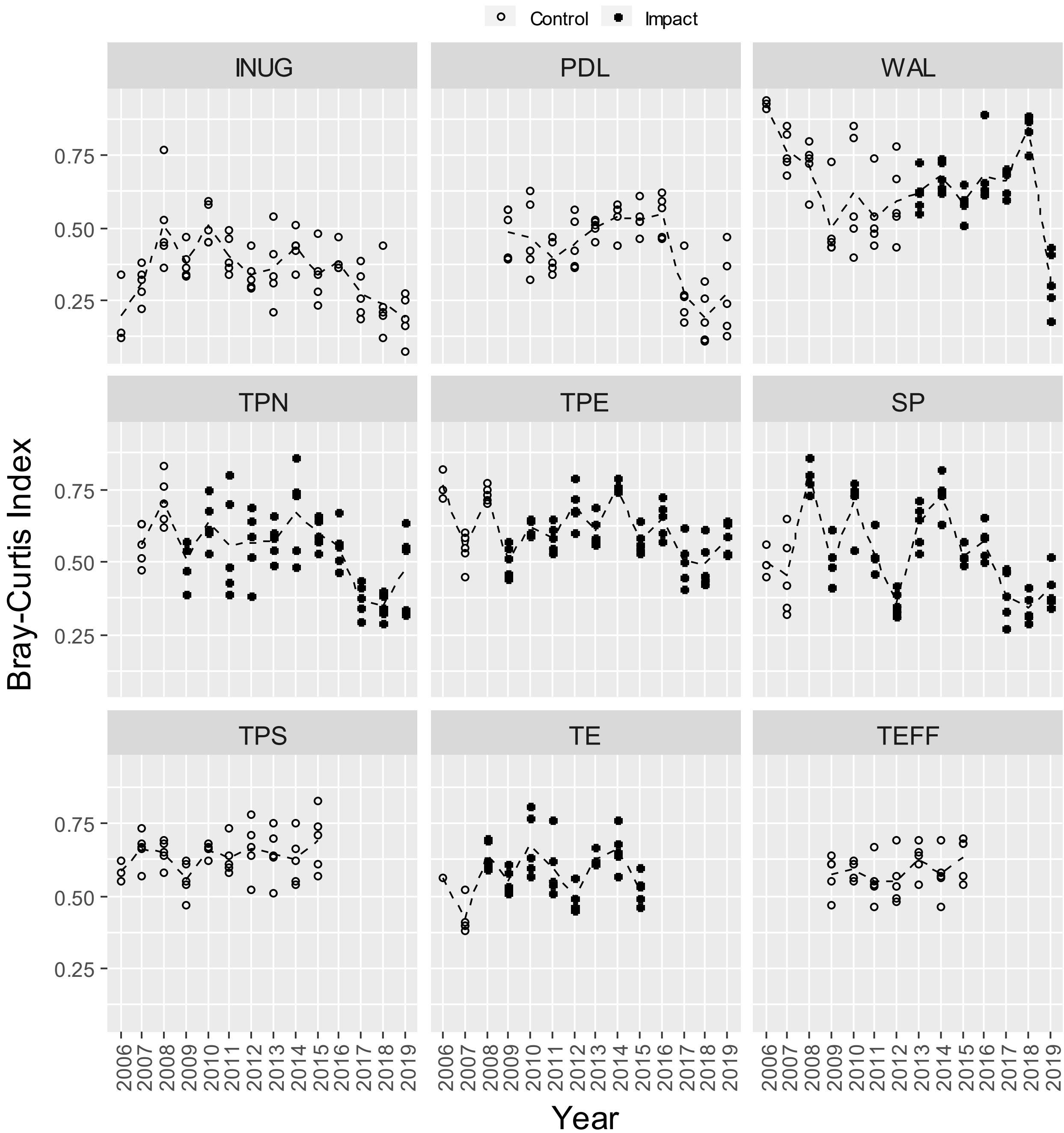


Figure E1-10. Bray-Curtis Index for the benthic invertebrate community at the Meadowbank study lakes since 2006.



Appendix E2

Benthos Data – Whale Tail Study Area Lakes

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Table E2-1. Benthic invertebrate abundance (#/m2) and richness (# taxa) by major taxa group, Whale Tail Pit study lakes, 2019.

Area-Replicate	Date	Depth (m)	Abundance (#/m^2)					Richness (# taxa)					Simpson's Diversity	Bray-Curtis Index
			Oligochaetes	Insects	Molluscs	Other Taxa[1]	TOTAL	Oligochaetes	Insects	Molluscs	Other Taxa[1]	TOTAL		
Whale Tail South Basin (WTS)														
WTS-1	18-Aug-19	9.9	22	1,283	457	0	1,761	1	9	3	0	13	0.88	0.35
WTS-2	18-Aug-19	11.9	22	1,870	565	152	2,609	1	6	2	4	13	0.82	0.55
WTS-3	18-Aug-19	10.9	87	6,957	609	0	7,652	2	7	3	0	12	0.68	0.72
WTS-4	18-Aug-19	10.6	22	2,870	609	152	3,652	1	8	3	3	15	0.83	0.56
WTS-5	18-Aug-19	10.5	22	630	587	0	1,239	1	7	2	0	10	0.78	0.44
	Area Mean		***35***	***2,722***	***565***	***61***	***3,383***	***1***	***7***	***3***	***1***	***13***	***0.80***	***0.52***
Mammoth Lake (MAM)														
MAM-1	19-Aug-19	8.6	43	6,848	1,326	43	8,261	2	10	3	1	16	0.81	0.74
MAM-2	19-Aug-19	7.6	22	3,500	543	0	4,065	1	10	3	0	14	0.83	0.50
MAM-3	19-Aug-19	8.3	87	6,348	1,000	0	7,435	1	11	3	0	15	0.83	0.70
MAM-4	19-Aug-19	8.5	43	8,087	1,543	87	9,761	2	8	2	3	15	0.75	0.82
MAM-5	19-Aug-19	8.2	109	7,457	565	0	8,130	2	9	3	0	14	0.75	0.76
	Area Mean		***61***	***6,448***	***996***	***26***	***7,530***	***2***	***10***	***3***	***1***	***15***	***0.79***	***0.70***
Lake A20														
A20-1	16-Aug-19	7.9	22	435	543	109	1,109	1	10	1	3	15	0.75	0.44
A20-2	16-Aug-19	8.4	22	1,413	652	65	2,152	1	9	2	1	13	0.81	0.49
A20-3	16-Aug-19	8.9	174	10,696	217	43	11,130	3	9	3	2	17	0.63	0.86
A20-4	16-Aug-19	9.2	22	2,326	391	22	2,761	1	12	2	1	16	0.73	0.51
A20-5	16-Aug-19	9.1	0	630	804	22	1,457	0	8	2	1	11	0.67	0.54
	Area Mean		***48***	***3,100***	***522***	***52***	***3,722***	***1***	***10***	***2***	***2***	***14***	***0.72***	***0.57***
Lake A76														
A76-1	15-Aug-19	9.1	22	3,935	326	22	4,304	1	9	3	1	14	0.68	0.65
A76-2	15-Aug-19	9.0	22	8,326	739	130	9,217	1	9	3	3	16	0.35	0.81
A76-3	15-Aug-19	8.4	0	1,087	413	0	1,500	0	9	1	0	10	0.82	0.41
A76-4	15-Aug-19	8.3	43	1,804	217	65	2,130	2	9	2	3	16	0.72	0.37
A76-5	15-Aug-19	8.2	43	826	500	43	1,413	2	10	3	2	17	0.87	0.26
	Area Mean		***26***	***3,196***	***439***	***52***	***3,713***	***1***	***9***	***2***	***2***	***15***	***0.69***	***0.50***
Lake DS1														
DS1-1	17-Aug-19	9.3	0	1,391	457	22	1,870	0	8	2	1	11	0.68	0.54
DS1-2	17-Aug-19	8.8	43	717	370	43	1,174	1	3	3	2	9	0.66	0.44
DS1-3	17-Aug-19	9.1	22	2,304	1,109	130	3,565	1	10	4	4	19	0.76	0.59
DS1-4	17-Aug-19	9.3	43	1,435	804	0	2,283	1	11	3	0	15	0.74	0.52
DS1-5	17-Aug-19	6.5	65	1,217	1,522	109	2,913	1	7	4	3	15	0.81	0.52
	Area Mean		***109***	***2,957***	***783***	***43***	***3,891***	***3***	***9***	***3***	***1***	***16***	***0.63***	***0.64***
Nemo Lake (NEM)														
NEM-1	18-Aug-19	9.2	0	5,152	326	0	5,478	0	9	2	0	11	0.77	0.73
NEM-2	18-Aug-19	9.0	43	3,848	326	22	4,239	1	8	1	1	11	0.81	0.66
NEM-3	18-Aug-19	9.3	65	4,413	217	22	4,717	1	9	2	1	13	0.71	0.68
NEM-4	18-Aug-19	8.9	0	6,826	500	22	7,348	0	7	3	1	11	0.77	0.78
NEM-5	18-Aug-19	8.2	*43*	*4,696*	*348*	*0*	*5,087*	*1*	*10*	*2*	*0*	*13*	*0.84*	*0.67*
	Area Mean		***30***	***4,987***	***343***	***13***	***5,374***	***1***	***9***	***2***	***1***	***12***	***0.78***	***0.71***

Notes:

1. "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, Pionidae, Harpacticoida, and O. Notostraca).

Table E2-2. Raw benthic invertebrate data from the Whale Tail Pit study area 2019.

Program	Whale Tail Pit									
Location	Lake A20					Lake A76				
Station	A20					A76				
Control/Impact?	Control					Control				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	16-Aug-19	16-Aug-19	16-Aug-19	16-Aug-19	16-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19
Sample Depth (m)	7.9	8.4	8.9	9.2	9.1	9.1	9.0	8.4	8.3	8.2
ROUNDWORMS										
P. Nemata	3	6	15	4	5	6	3	9	1	4
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	-	-	-	3	-	1	1
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	3	-	-	-	-	-	-	-
S.F. Tubificinae										
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	-	-	-	-	-	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	1	1	2	-	-	1	1	-	1	1
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae										
Lumbriculus	-	-	3	1	-	-	-	-	1	1
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	1	-	-	-	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	2	-	-	1	1	-	-	-	-	-
F. Hygrobatidae										
Hygrobates	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae										
Lebertia	2	-	1	-	-	-	1	-	1	-
F. Oxidae										
Oxus	1	2	1	-	-	1	2	-	1	1
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	32	20	53	21	12	13	23	2	10	4
TADPOLE SHRIMP										
O. Notostraca										
Lepidurus arcticus	-	-	-	-	-	-	-	-	-	-
SPRINGTAILS										
Cl. Entognatha										
O. Collembola	-	-	-	-	-	-	-	-	-	-
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature	-	-	-	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	1	-	-	-	-	2	-
immature	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	-	-	1	1	1	-	1	1	-	2
S.F. Chironominae										
Chironomus	-	-	-	-	-	-	-	-	-	-
Cladotanytarsus	-	-	-	-	-	-	-	-	-	1
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	1	8	147	8	-	106	13	4	2	2
?Corynocera oliveri	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-
Micropsectra	1	5	26	19	3	22	339	12	48	7
Microtendipes	1	-	-	-	-	-	-	-	-	-
Pagastiella	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	6	32	272	62	13	27	13	18	5	10
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	-	-	-
Stictochironomus	3	3	1	3	1	2	2	1	17	5
Tanytarsus	1	3	27	1	1	5	1	-	4	3
S.F. Diamesinae										
Pagastia	-	-	-	-	-	-	-	-	-	-
Protanypus	-	-	-	2	2	-	1	1	-	1
Potthastia	-	-	-	-	-	-	-	-	-	-
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	-	-	-	-	-	-	-	-
Corynoneura	-	-	-	-	-	-	-	-	-	-
Cricotopus	-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	-	-	-	-	-	-	-	-	-	-
Hydrobaenus	-	-	-	1	-	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-
Oliveridia	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-
Parakiefferiella	-	-	-	-	-	-	-	-	-	-
Psectrocladius	1	-	1	1	-	1	1	4	2	1
Zalutschia	-	-	-	-	-	-	-	-	-	-
Orthocladiinae Genus "Greenland"	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	3	4	5	2	-	4	5	4	-	4
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	1	-	1	1	-
Procladius	2	3	6	3	4	13	7	4	2	2
Thienemannimyia complex	1	5	6	3	2	-	-	-	-	-
F. Empididae										
Chelifera/Metachela	-	2	-	-	2	-	-	-	-	-
Wiedemannia	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-

Table E2-2. Raw benthic invertebrate data from the Whale Tail Pit study area 2019.

Program	Whale Tail Pit									
Location	Lake DS1					Mammoth Lake				
Station	DS1					MAM				
Control/Impact?	Impact					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	17-Aug-19	17-Aug-19	17-Aug-19	17-Aug-19	17-Aug-19	19-Aug-19	19-Aug-19	19-Aug-19	19-Aug-19	19-Aug-19
Sample Depth (m)						8.6	7.6	8.3	8.5	8.2
ROUNDWORMS										
P. Nemata	6	2	8	4	13	-	2	1	6	14
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	2	-	3	-	-	-	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	-	-	-	-	-	-	-	1	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	2	1	-	3	1	-	-	1	1
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae										
Lumbriculus	-	-	-	2	-	1	1	4	-	4
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	-	-	-	-	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	-	-	-	-	-	2	-	-	1	-
F. Hygrobatidae										
Hygrobates	-	1	1	-	1	-	-	-	-	-
F. Lebertiidae										
Lebertia	1	-	2	-	1	-	-	-	-	-
F. Oxidae										
Oxus	-	1	1	-	-	-	-	-	2	-
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	2	1	10	4	14	24	10	28	12	7
TADPOLE SHRIMP										
O. Notostraca										
Lepidurus arcticus	-	-	-	-	-	-	-	-	1	-
SPRINGTAILS										
Cl. Entognatha										
O. Collembola	-	-	-	-	-	-	-	-	-	-
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature	-	-	-	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	-	-	-	2	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	1	-	-	-	-	-	-	-	-	3
S.F. Chironominae										
Chironomus	-	-	-	-	-	-	-	-	-	-
Cladotanytarsus	6	-	-	-	-	-	-	-	-	-
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	-	-	-	-	-	119	35	89	83	159
?Corynocera oliveri	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	3	1	6	2	12	2	1	2	-	-
Micropsectra	-	-	-	-	-	27	61	64	184	54
Microtendipes	-	-	-	-	-	-	-	-	-	1
Pagastiella	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	44	28	73	46	30	32	18	24	14	19
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	-	-	-
Stictochironomus	-	-	9	7	4	11	17	16	1	6
Tanytarsus	-	-	4	1	-	97	17	78	74	78
S.F. Diamesinae										
Pagastia	-	-	-	-	-	-	-	-	-	-
Protanypus	-	-	-	1	-	-	-	-	-	-
Potthastia	1	-	-	-	-	-	-	-	-	-
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	2	-	-	-	-	-	-	-
Corynoneura	-	-	-	-	-	-	-	-	-	-
Cricotopus	-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	2	-	1	2	-	-	1	1	-	-
Hydrobaenus	-	-	1	-	-	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-
Oliveridia	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-
Parakiefferiella	-	-	-	-	-	-	-	-	-	-
Psectrocladius	-	-	-	1	-	5	2	3	-	-
Zalutschia	-	-	-	-	-	-	-	-	-	-
Orthocladiinae Genus "Greenland"	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	3	-	-	1	2	4	3	2	2	2
S.F. Tanypodinae										
Ablabesmyia	-	-	-	1	1	3	-	-	-	2
Procladius	3	4	6	2	5	15	6	12	12	19
Thienemannimyia complex	1	-	2	-	2	-	-	1	2	-
F. Empididae										
Chelifera/Metachela	-	-	2	-	-	-	-	-	-	-
Wiedemannia	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-

Table E2-2. Raw benthic invertebrate data from the Whale Tail Pit study area 2019.

Program	Whale Tail Pit									
Location	Nemo Lake					Whale Tail Lake - South Basin				
Station	NEM					WTS				
Control/Impact?	Control					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19
Sample Depth (m)	9.2	9.0	9.3	8.9	8.2	9.9	11.9	10.9	10.6	10.5
ROUNDWORMS										
P. Nemata	2	3	2	6	5	4	-	3	-	4
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	1	-	-	1	-	4	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	-	-	-	-	-	1	-	1	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	-	-	-	-	1	-	3	-	1
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae										
Lumbriculus	-	2	3	-	2	-	-	1	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	-	-	-	-	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	-	1	1	-	-	-	4	-	-	-
F. Hygrobatidae										
Hygrobates	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae										
Lebertia	-	-	-	-	-	-	1	-	1	-
F. Oxidae										
Oxus	-	-	-	-	-	-	1	-	2	-
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	13	19	13	15	35	9	7	11	8	8
TADPOLE SHRIMP										
O. Notostraca										
Lepidurus arcticus	-	-	-	-	-	-	-	-	-	-
SPRINGTAILS										
Cl. Entognatha										
O. Collembola	-	-	-	-	-	-	-	-	-	-
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature	-	-	1	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	-	1	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	-	-	-	-	1	-	-	-	-	-
S.F. Chironominae										
Chironomus	1	-	-	-	1	-	-	-	-	-
Cladotanytarsus	-	-	3	-	6	-	4	-	-	-
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	-	-	-	-	-	12	29	170	11	9
?Corynocera oliveri	-	-	-	-	-	6	-	99	6	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-
Micropsectra	28	52	24	83	46	9	11	-	52	2
Microtendipes	-	-	-	-	-	1	-	-	-	-
Pagastiella	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	68	44	25	30	54	1	-	8	1	1
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	-	-	-
Stictochironomus	27	27	28	58	41	7	-	5	10	4
Tanytarsus	90	41	109	122	40	15	30	25	35	10
S.F. Diamesinae										
Pagastia	-	-	-	-	-	-	-	-	-	-
Protanypus	-	1	-	-	-	-	-	-	-	-
Potthastia	1	-	-	-	-	-	-	-	-	-
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	-	-	-	-	-	-	-	-
Corynoneura	-	-	-	-	-	-	-	-	-	-
Cricotopus	-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	-	-	-	-	-	-	-	-	-	-
Hydrobaenus	-	-	-	-	-	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-
Oliveridia	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-
Parakiefferiella	-	-	-	-	-	-	-	-	-	-
Psectrocladius	2	1	5	1	5	-	-	-	-	-
Zalutschia	-	-	-	-	-	-	-	-	-	-
Orthocladiinae Genus "Greenland"	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	-	-	-	-	-	2	2	5	6	1
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	-	-	-	-
Procladius	16	7	6	12	13	6	10	8	11	2
Thienemannimyia complex	4	4	2	8	8	-	-	-	-	-
F. Empididae										
Chelifera/Metachela	-	-	-	-	-	-	-	-	-	-
Wiedemannia	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-

Table E2-2. Raw benthic invertebrate data from the Whale Tail Pit study area 2019.

Program	Whale Tail Pit									
Location	Lake A20					Lake A76				
Station	A20					A76				
Control/Impact?	Control					Control				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	16-Aug-19	16-Aug-19	16-Aug-19	16-Aug-19	16-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19	15-Aug-19
Sample Depth (m)	7.9	8.4	8.9	9.2	9.1	9.1	9.0	8.4	8.3	8.2
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium (Cyclocalyx)/Neopisidium	25	28	2	14	36	11	32	19	9	19
Pisidium (Cyclocalyx)	-	-	4	4	-	3	1	-	1	2
Sphaerium nitidum	-	2	4	-	1	1	1	-	-	2
R (Richness) - totals [2,3]										
Total	15	13	17	16	11	14	16	10	16	17
Oligochaete	1	1	3	1	0	1	1	0	2	2
Insect	10	9	9	12	8	9	9	9	9	10
Mollusc	1	2	3	2	2	3	3	1	2	3
Other[4]	3	1	2	1	1	1	3	0	3	2
Abundance (raw) - totals [5,6]										
Total	51	99	512	127	67	198	424	69	98	65
Oligochaete	1	1	8	1	0	1	1	0	2	2
Insect	20	65	492	107	29	181	383	50	83	38
Mollusc	25	30	10	18	37	15	34	19	10	23
Other[4]	5	3	2	1	1	1	6	0	3	2
N (Abundance) - #/m²										
Total	1,109	2,152	11,130	2,761	1,457	4,304	9,217	1,500	2,130	1,413
Oligochaete	22	22	174	22	0	22	22	0	43	43
Insect	435	1,413	10,696	2,326	630	3,935	8,326	1,087	1,804	826
Mollusc	543	652	217	391	804	326	739	413	217	500
Other[4]	109	65	43	22	22	22	130	0	65	43

Notes:

1. Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
2. Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
3. Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
4. Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertiidae, F. Oxidae, F. Pionidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
5. Abundance totals exclude P. Nemata and Cl. Ostracoda.
6. Raw abundance from two grabs (grab area = 0.023 m^2).

Table E2-2. Raw benthic invertebrate data from the Whale Tail Pit study area 2019.

Program	**Whale Tail Pit**									
Location	**Lake DS1**					**Mammoth Lake**				
Station	**DS1**					**MAM**				
Control/Impact?	Impact					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	17-Aug-19	17-Aug-19	17-Aug-19	17-Aug-19	17-Aug-19	19-Aug-19	19-Aug-19	19-Aug-19	19-Aug-19	19-Aug-19
Sample Depth (m)						8.6	7.6	8.3	8.5	8.2
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata	1	1	19	9	44	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium (Cyclocalyx)/Neopisidium	20	15	27	26	22	20	13	9	16	10
Pisidium (Cyclocalyx)	-	1	1	2	2	34	10	35	55	14
Sphaerium nitidum	-	-	4	-	2	7	2	2	-	2
R (Richness) - totals [2,3]										
Total	11	9	19	15	15	16	14	15	15	14
Oligochaete	0	1	1	1	1	2	1	1	2	2
Insect	8	3	10	11	7	10	10	11	8	9
Mollusc	2	3	4	3	4	3	3	3	2	3
Other[4]	1	2	4	0	3	1	0	0	3	0
Abundance (raw) - totals [5,6]										
Total	86	54	164	105	134	380	187	342	449	374
Oligochaete	0	2	1	2	3	2	1	4	2	5
Insect	64	33	106	66	56	315	161	292	372	343
Mollusc	21	17	51	37	70	61	25	46	71	26
Other[4]	1	2	6	0	5	2	0	0	4	0
N (Abundance) - #/m²										
Total	1,870	1,174	3,565	2,283	2,913	8,261	4,065	7,435	9,761	8,130
Oligochaete	0	43	22	43	65	43	22	87	43	109
Insect	1,391	717	2,304	1,435	1,217	6,848	3,500	6,348	8,087	7,457
Mollusc	457	370	1,109	804	1,522	1,326	543	1,000	1,543	565
Other[4]	22	43	130	0	109	43	0	0	87	0

Notes:

1. Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
2. Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
3. Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
4. Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertiidae, F. Oxidae, F. Pionidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
5. Abundance totals exclude P. Nemata and Cl. Ostracoda.
6. Raw abundance from two grabs (grab area = 0.023 m^2).

Table E2-2. Raw benthic invertebrate data from the Whale Tail Pit study area 2019.

Program	Whale Tail Pit									
Location	Nemo Lake					Whale Tail Lake - South Basin				
Station	NEM					WTS				
Control/Impact?	Control					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19	18-Aug-19
Sample Depth (m)	9.2	9.0	9.3	8.9	8.2	9.9	11.9	10.9	10.6	10.5
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium (Cyclocalyx)/Neopisidium	2	-	1	2	6	17	25	20	24	23
Pisidium (Cyclocalyx)	13	15	9	17	10	3	1	6	3	-
Sphaerium nitidum	-	-	-	4	-	1	-	2	1	4
R (Richness) - totals [2,3]										
Total	11	11	13	11	13	13	13	12	15	10
Oligochaete	0	1	1	0	1	1	1	2	1	1
Insect	9	8	9	7	10	9	6	7	8	7
Mollusc	2	1	2	3	2	3	2	3	3	2
Other[4]	0	1	1	1	0	0	4	0	3	0
Abundance (raw) - totals [5,6]										
Total	252	195	217	338	234	81	120	352	168	57
Oligochaete	0	2	3	0	2	1	1	4	1	1
Insect	237	177	203	314	216	59	86	320	132	29
Mollusc	15	15	10	23	16	21	26	28	28	27
Other[4]	0	1	1	1	0	0	7	0	7	0
N (Abundance) - #/m²										
Total	5,478	4,239	4,717	7,348	5,087	1,761	2,609	7,652	3,652	1,239
Oligochaete	0	43	65	0	43	22	22	87	22	22
Insect	5,152	3,848	4,413	6,826	4,696	1,283	1,870	6,957	2,870	630
Mollusc	326	326	217	500	348	457	565	609	609	587
Other[4]	0	22	22	22	0	0	152	0	152	0

Notes:

1. Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
2. Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
3. Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
4. Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertiidae, F. Oxidae, F. Pionidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
5. Abundance totals exclude P. Nemata and Cl. Ostracoda.
6. Raw abundance from two grabs (grab area = 0.023 m^2).

Figure E2-1. Oligochaete abundance (#/m^2) from the Whale Tail Pit study lakes since 2015.

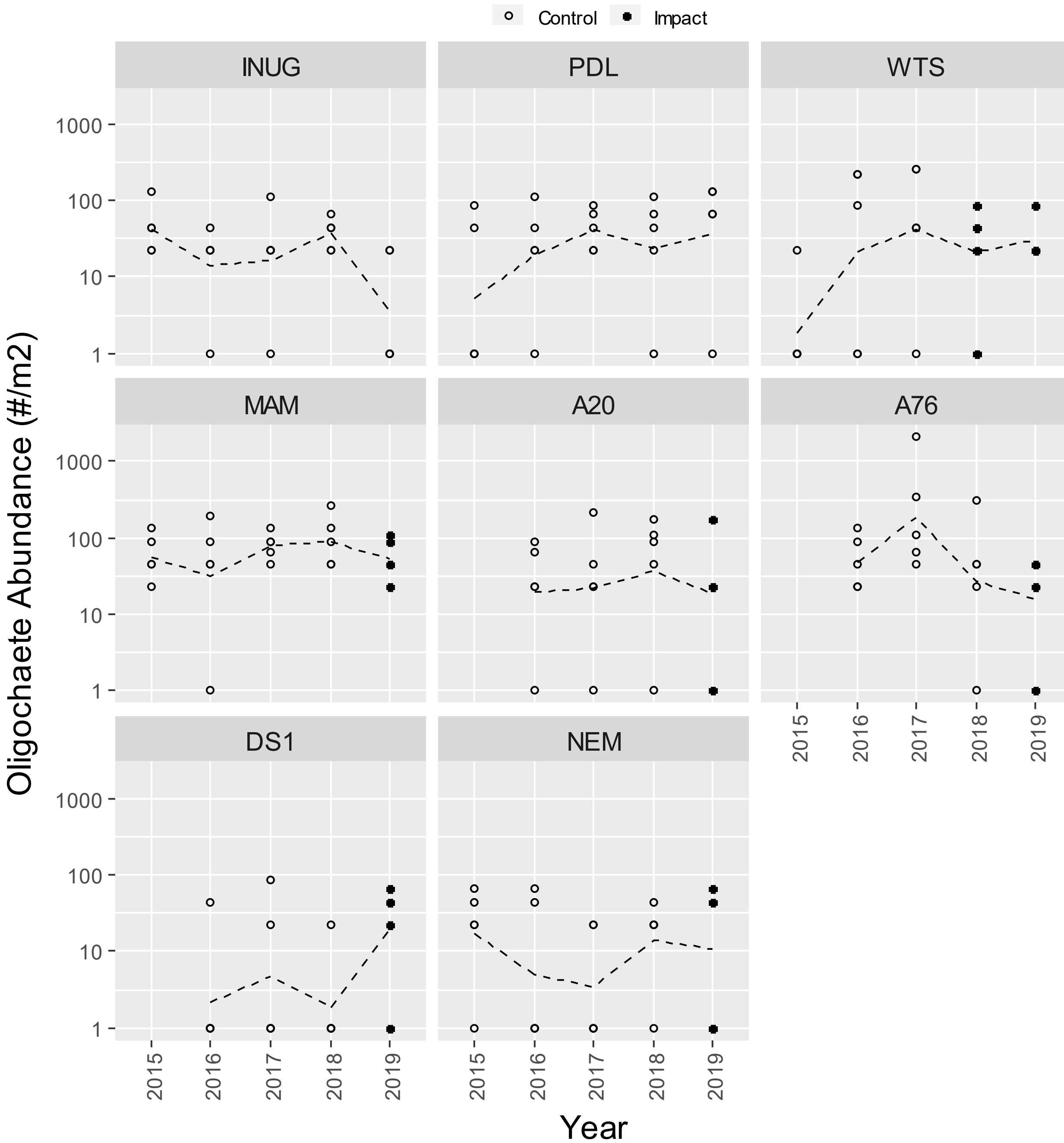


Figure E2-2. Insect abundance (#/m^2) from the Whale Tail Pit study lakes since 2015.

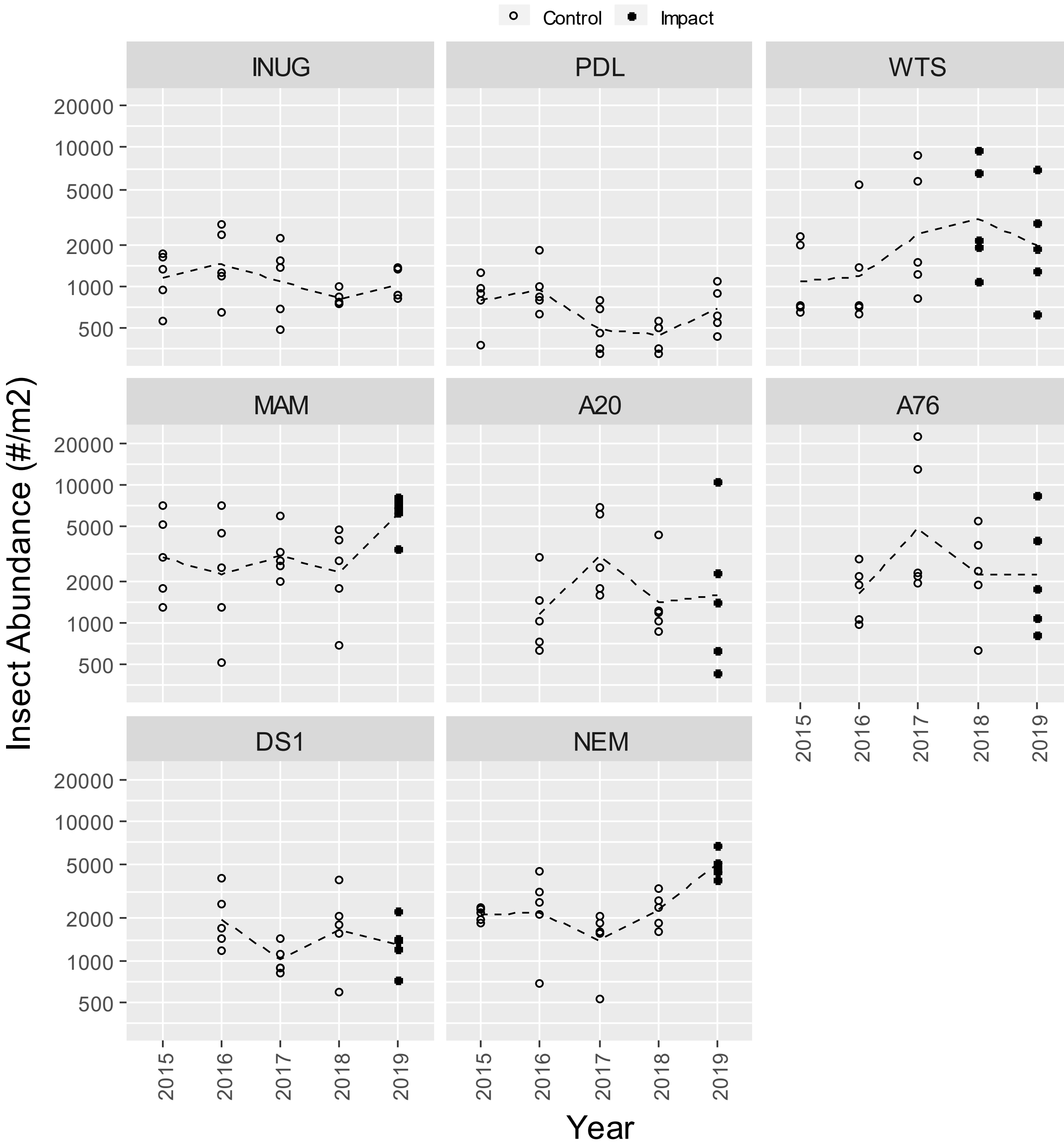


Figure E2-3. Mollusc abundance (#/m²) from the Whale Tail Pit study lakes since 2015.

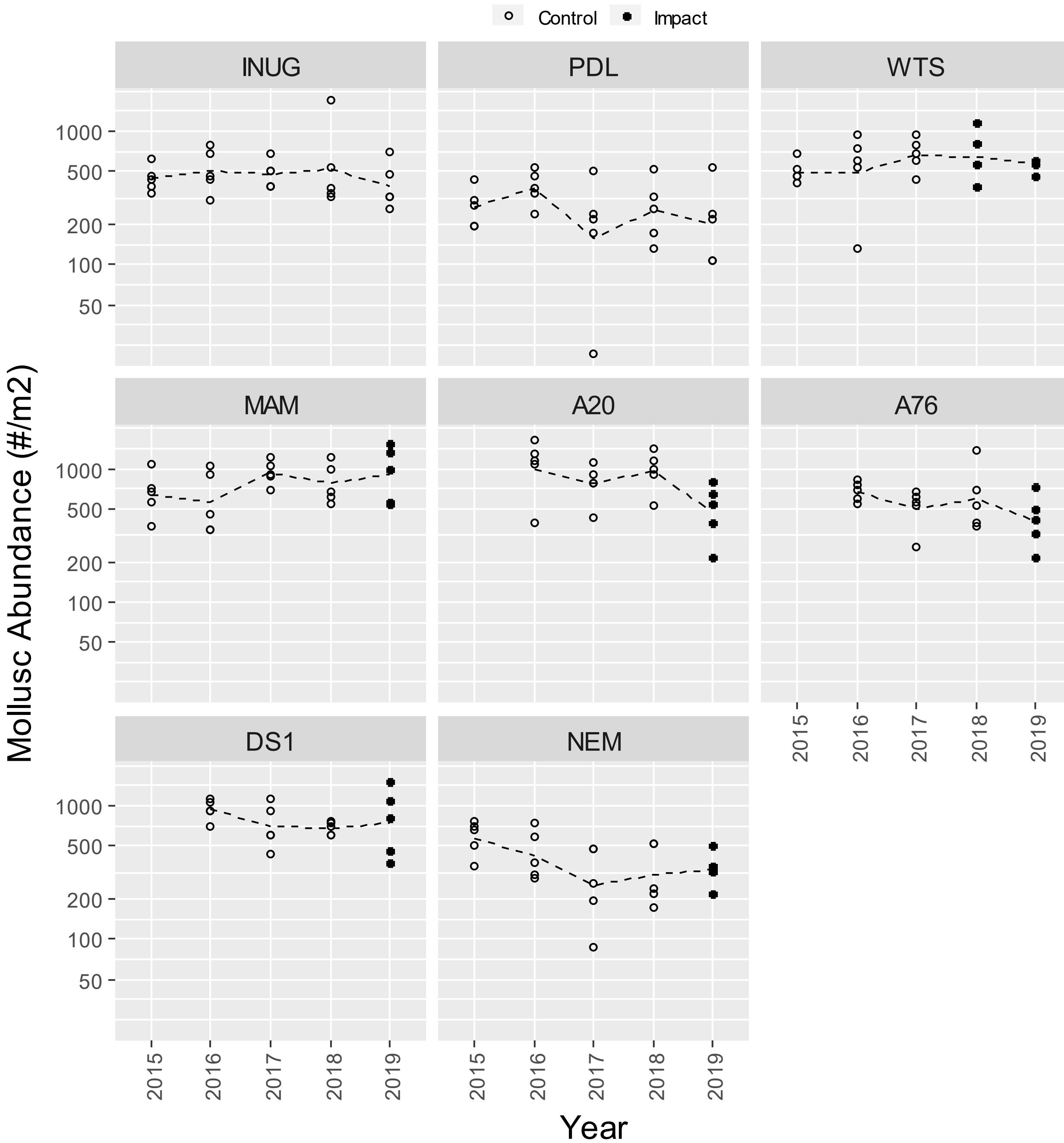


Figure E2-4. Other taxa abundance (#/m^2) from the Whale Tail Pit study lakes since 2015.

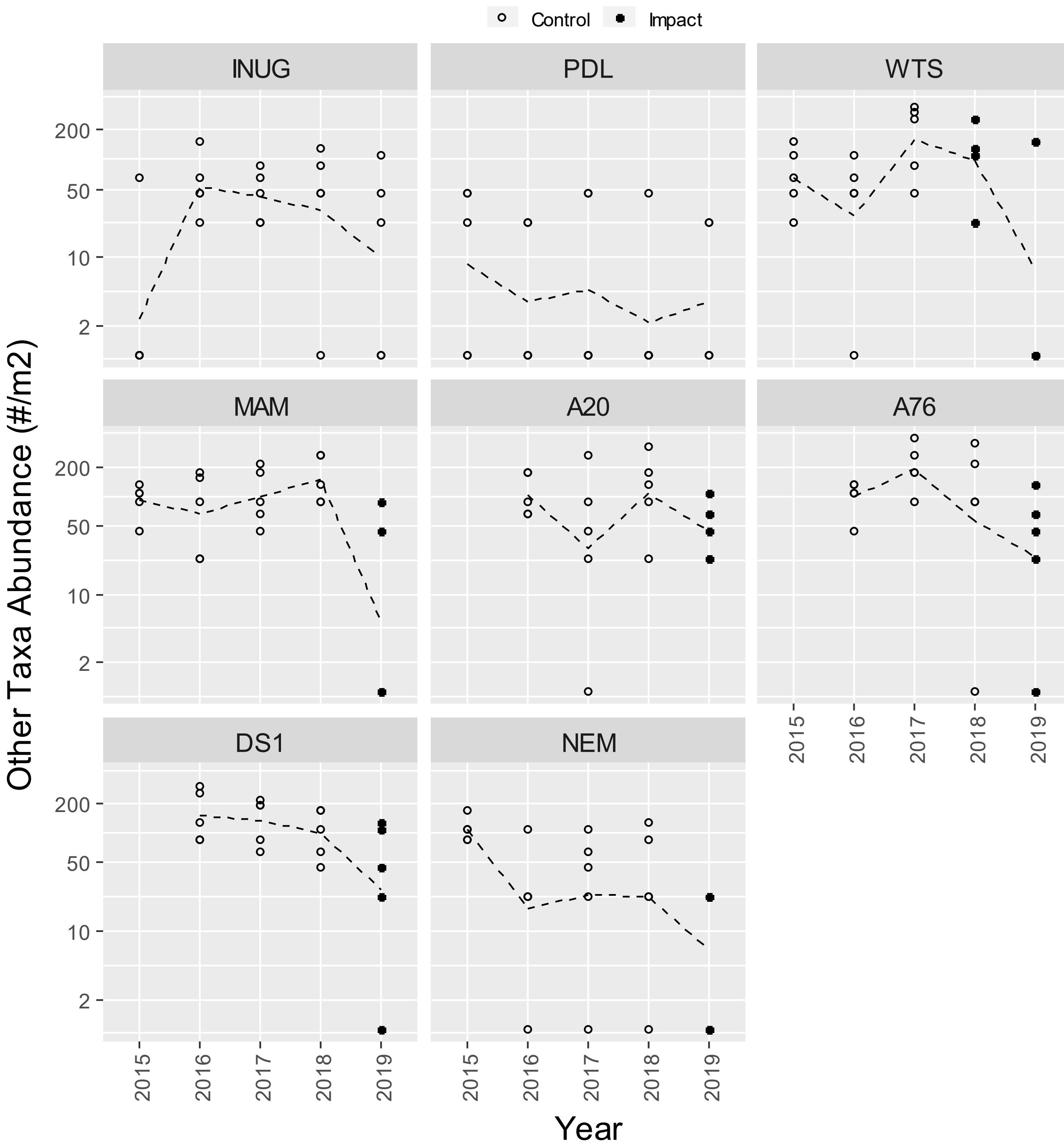


Figure E2-5. Oligochaete richness (# of taxa) from the Whale Tail Pit study lakes since 2015.

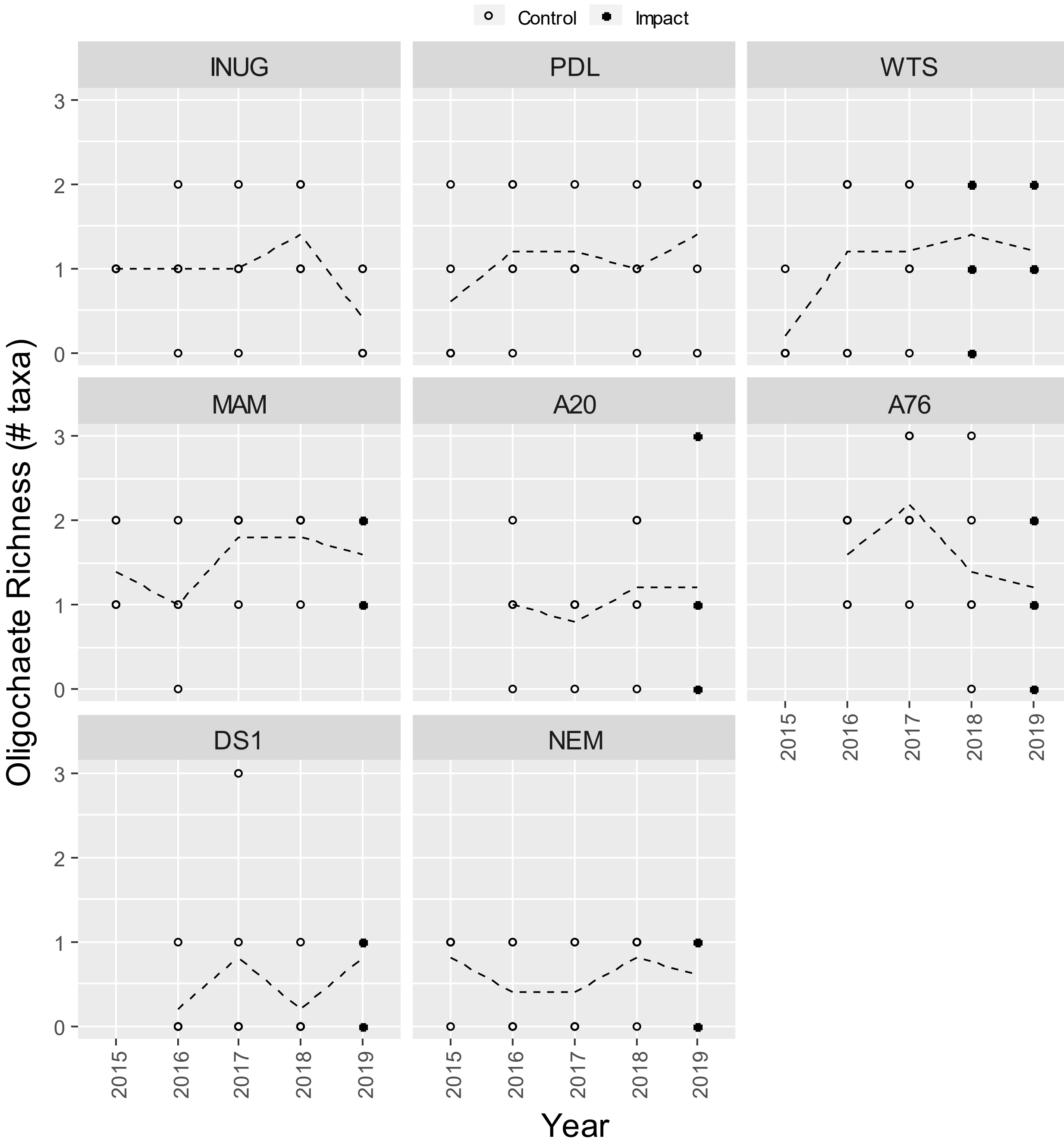


Figure E2-6. Insect richness (# of taxa) from the Whale Tail Pit study lakes since 2015.

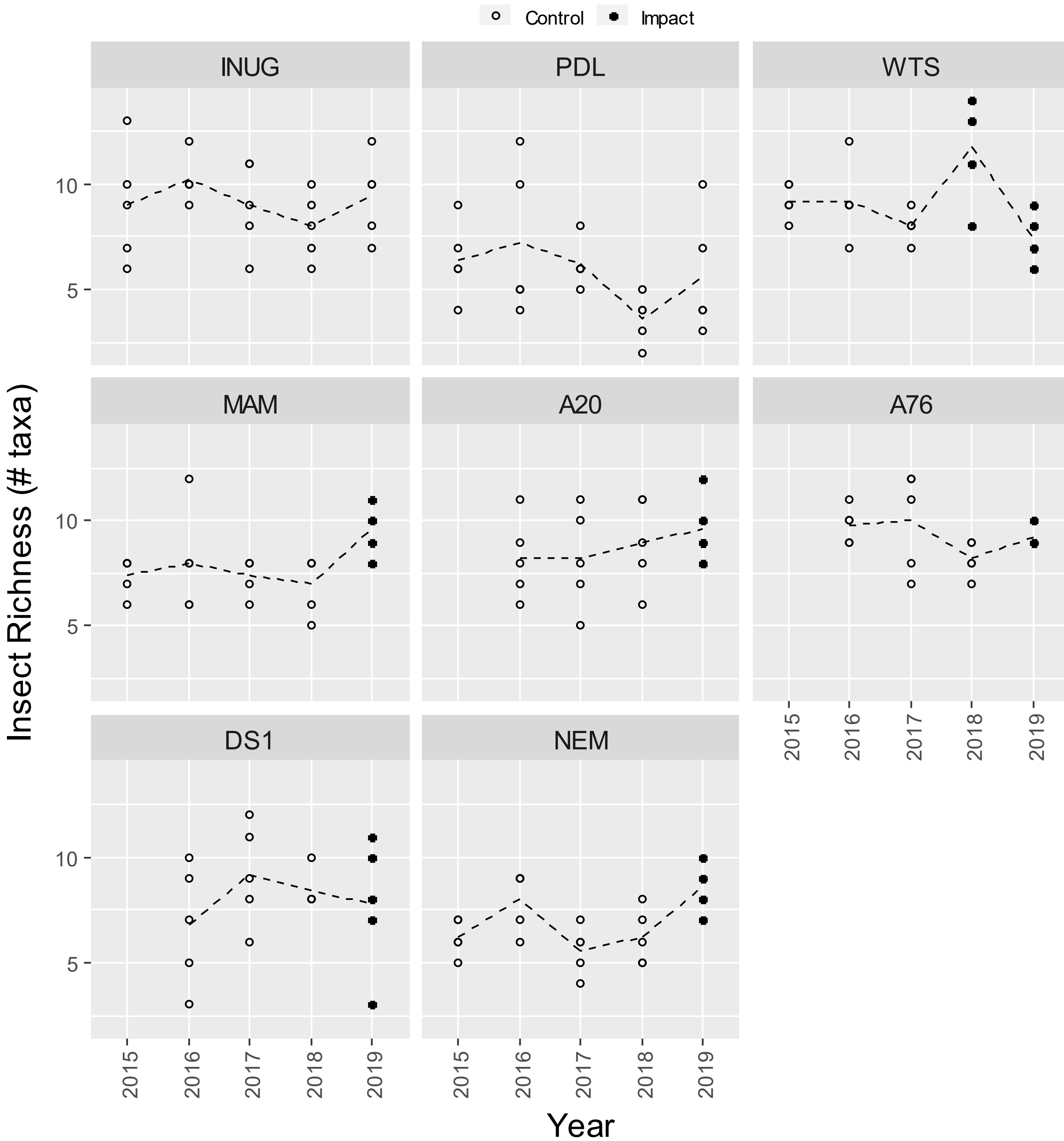


Figure E2-7. Mollusc richness (# of taxa) from the Whale Tail Pit study lakes since 2015.

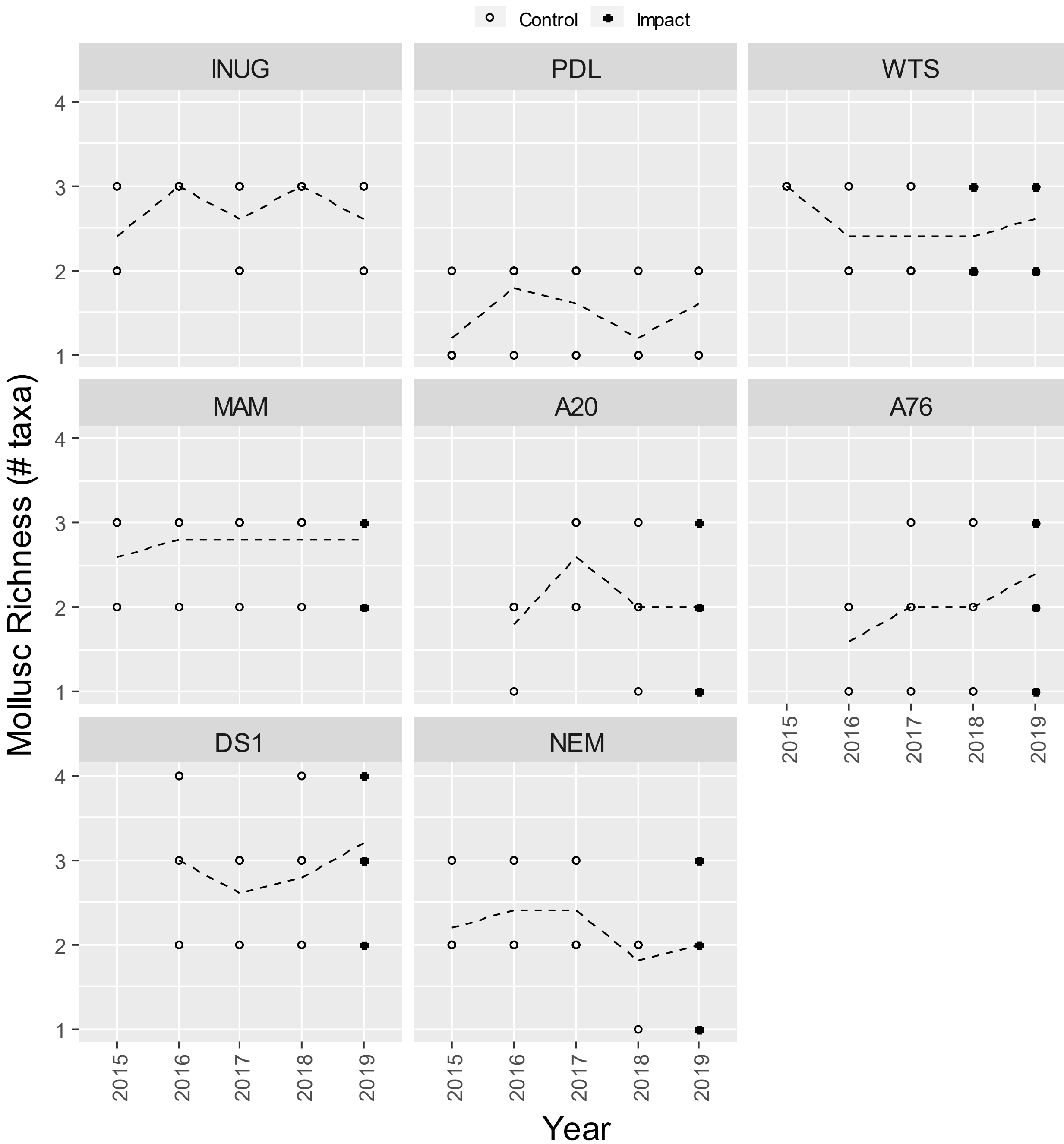


Figure E2-8. Other taxa richness (# of taxa) from the Whale Tail Pit study lakes since 2015.

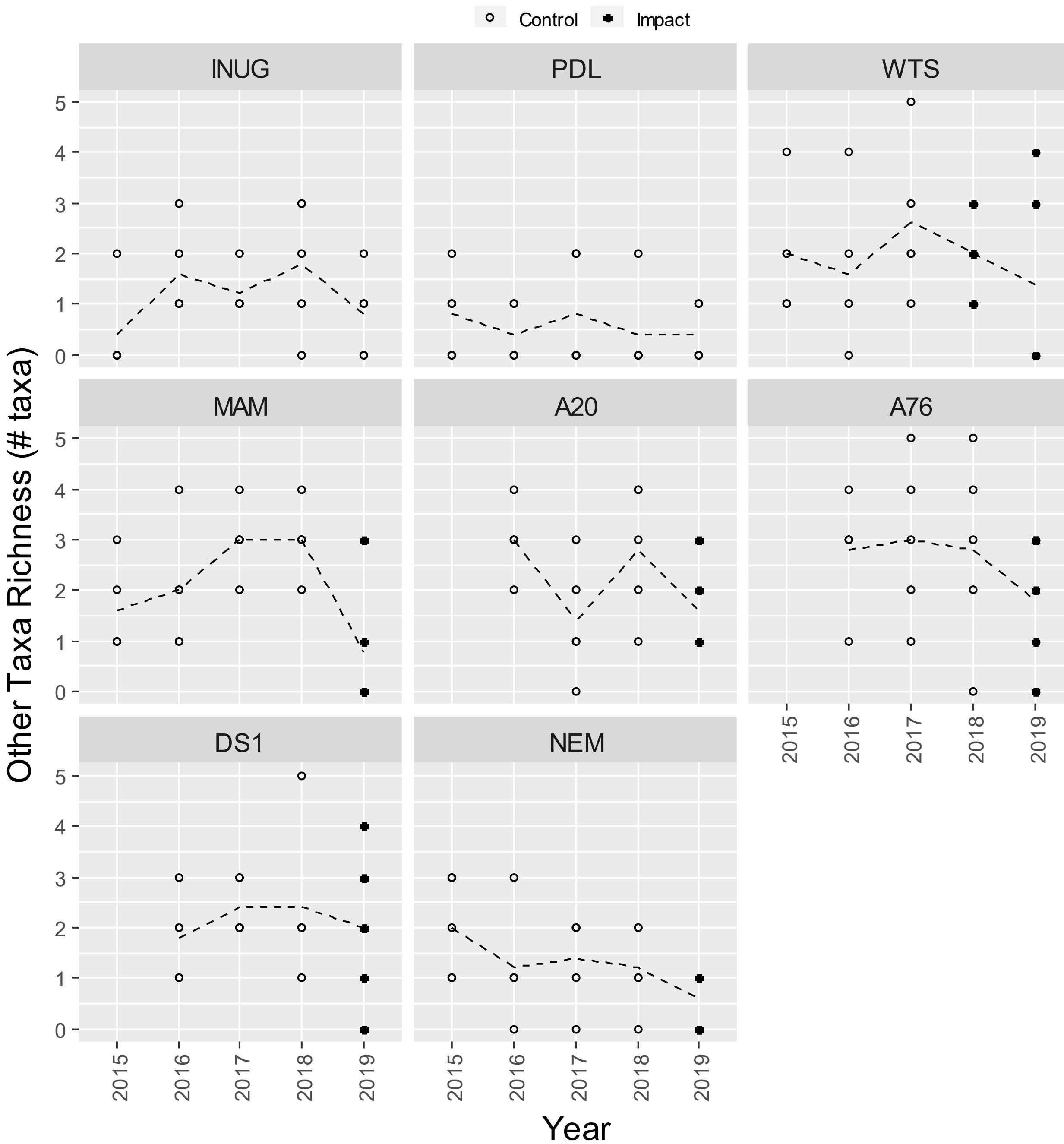


Figure E2-9. Simpson's Diversity for the benthic invertebrate community at the Whale Tail Pit study lakes since 2015.

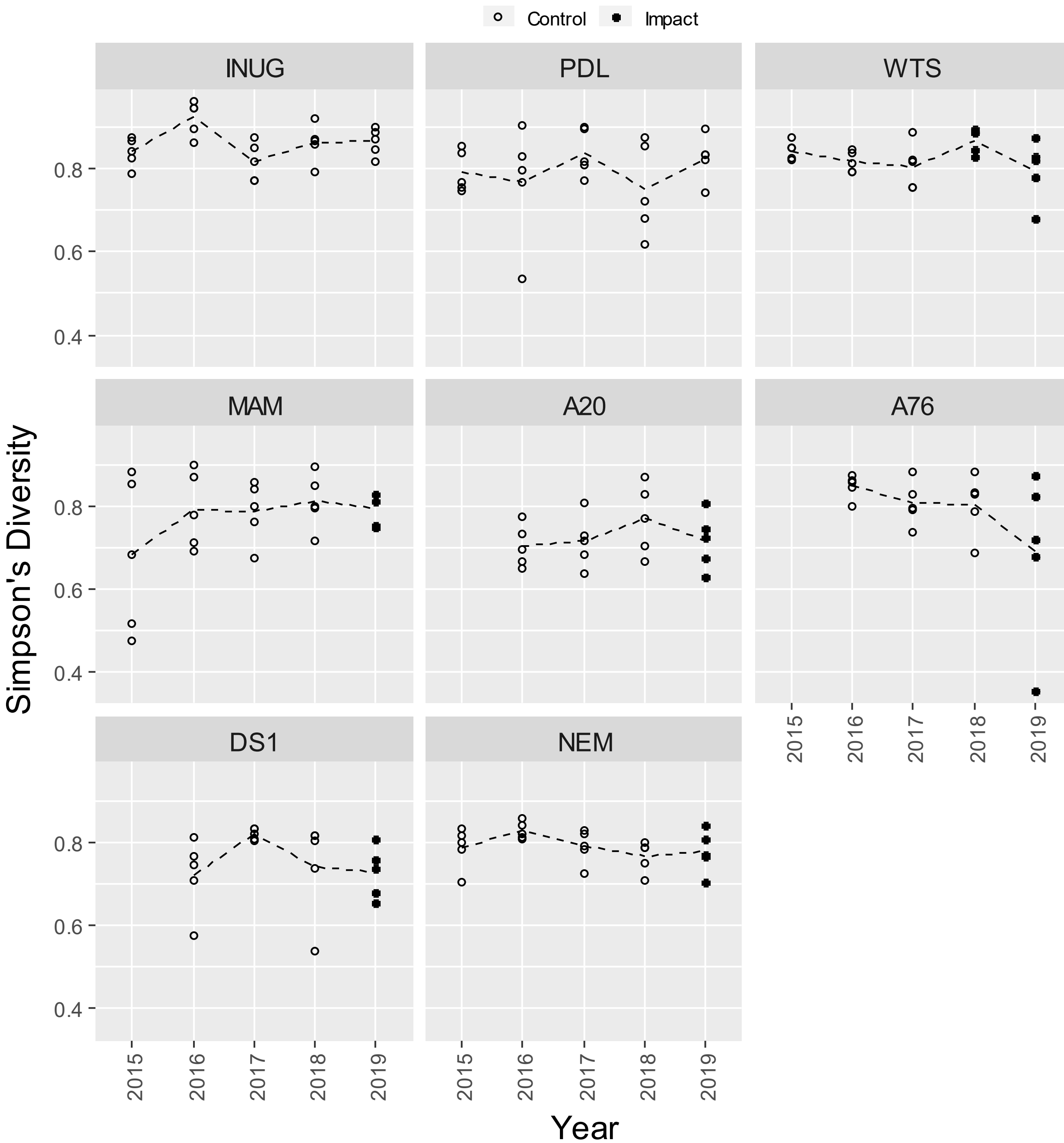
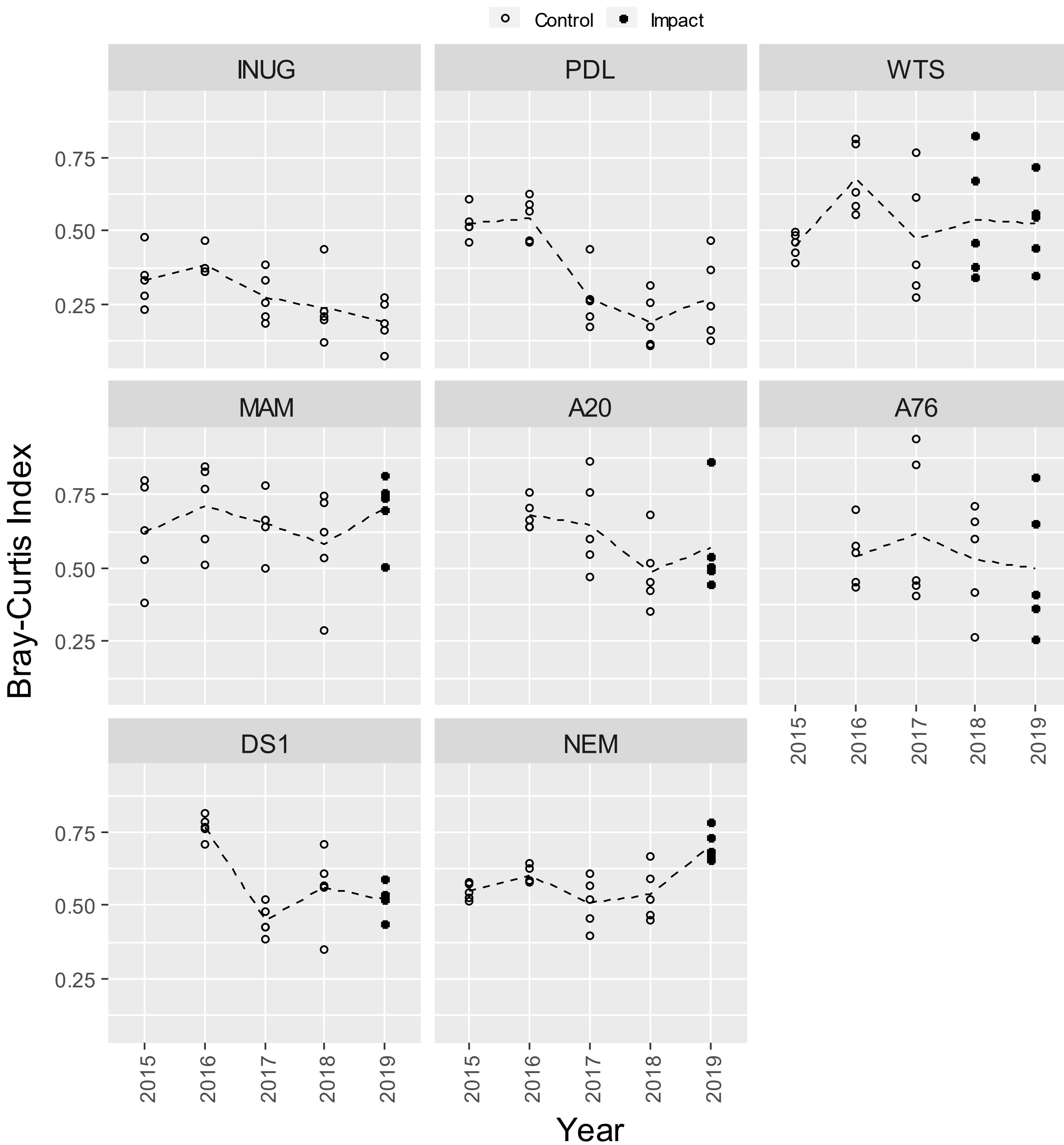


Figure E2-10. Bray-Curtis Index for the benthic invertebrate community at the Whale Tail Pit study lakes since 2015.



Appendix E3

Benthos Data – Baker Lake

LIST OF TABLES – APPENDIX E3

LIST OF FIGURES – APPENDIX E3

Table E3-1. Benthic invertebrate abundance (#/m2) and richness (# taxa) by major taxa group, Baker Lake.

Area-Replicate	Date	Depth (m)	Abundance (#/m^2)					Richness (# taxa)					Simpson's Diversity	Bray-Curtis Index
			Oligochaetes	Insects	Molluscs	Other Taxa[1]	TOTAL	Oligochaetes	Insects	Molluscs	Other Taxa[1]	TOTAL		
Baker Akilahaarjuk Point														
BAP-1	20-Aug-18	8.3	283	2,826	500	130	3,739	3	15	1	2	21	0.88	0.17
BAP-2	20-Aug-18	7.7	587	2,587	783	65	4,022	3	13	2	2	20	0.89	0.23
BAP-3	20-Aug-18	7.8	978	4,522	935	65	6,500	3	19	1	2	25	0.90	0.31
BAP-4	20-Aug-18	7.3	4,152	4,261	43	43	8,500	5	17	2	1	25	0.89	0.40
BAP-5	20-Aug-18	9.0	1,239	2,696	413	22	4,370	3	12	2	1	18	0.91	0.26
Area Mean			***1,448***	***3,378***	***535***	***65***	***5,426***	***3***	***15***	***2***	***2***	***22***	***0.89***	***0.27***
Baker Barge Dock														
BBD-1	21-Aug-18	9	130	14,478	609	43	15,261	2	11	2	1	16	0.37	0.76
BBD-2	21-Aug-18	7.6	43	6,609	22	109	6,783	1	16	1	3	21	0.76	0.54
BBD-3	21-Aug-18	7.6	22	4,891	0	22	4,935	1	18	0	1	20	0.73	0.55
BBD-4	21-Aug-18	8.4	22	11,022	65	43	11,152	1	17	1	2	21	0.76	0.62
BBD-5	21-Aug-18	8.7	391	10,609	1,435	43	12,478	2	9	2	1	14	0.59	0.72
Area Mean			***122***	***9,522***	***426***	***52***	***10,122***	***1***	***14***	***1***	***2***	***18***	***0.64***	***0.64***
Baker East Shore														
BES-1	20-Aug-18	8.4	130	3,283	261	109	3,783	2	15	1	4	22	0.86	0.18
BES-2	20-Aug-18	8.1	87	3,522	370	109	4,087	1	17	1	2	21	0.90	0.18
BES-3	20-Aug-18	8.5	87	1,652	283	130	2,152	2	14	1	3	20	0.90	0.28
BES-4	20-Aug-18	8.1	43	1,413	435	0	1,891	2	13	1	0	16	0.87	0.25
BES-5	20-Aug-18	8.3	217	2,978	565	217	3,978	2	19	1	4	26	0.90	0.17
Area Mean			***113***	***2,570***	***383***	***113***	***3,178***	***2***	***16***	***1***	***3***	***21***	***0.89***	***0.21***
Baker Proposed Jetty														
BPJ-1	21-Aug-18	7.1	65	6,130	435	87	6,717	1	19	1	3	24	0.92	0.41
BPJ-2	21-Aug-18	6.9	152	5,174	565	174	6,065	1	17	1	4	23	0.91	0.31
BPJ-3	21-Aug-18	7.5	0	2,935	0	65	3,000	0	16	0	3	19	0.90	0.39
BPJ-4	21-Aug-18	8.0	22	1,935	22	22	2,000	1	13	1	1	16	0.90	0.44
BPJ-5	21-Aug-18	7.5	174	10,239	1,087	152	11,652	2	20	2	4	28	0.85	0.53
Area Mean			***83***	***5,283***	***422***	***100***	***5,887***	***1***	***17***	***1***	***3***	***22***	***0.89***	***0.42***

Notes:

1. "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, Pionidae, Harpacticoida, and O. Notostraca).

Table E3-2. Raw benthic invertebrate data from the Baker Lake 2019.

Program	**Baker Lake**									
Location	**Baker Akilahaarjuk Point**					**Baker Barge Dock**				
Station	**BAP**					**BBD**				
Control/Impact?	Control					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	12-Aug-19	12-Aug-19	12-Aug-19	12-Aug-19	12-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19
Sample Depth (m)	7.0	9.3	8.8	7.8	9.1	8.4	9.2	8.3	8.6	8.2
ROUNDWORMS										
P. Nemata	18	18	10	75	2	1	4	2	7	6
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	-	-	-	-	-	-	1
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	13	3	1	8	1	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	1	-
S.F. Tubificinae										
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	7	-	1	50	3	-	-	-	-	-
immatures without hair chaetae	1	-	-	4	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	2	-	-	5	-	-	-	-	-	-
Rhyacodrilus montana	14	5	4	17	3	1	9	2	-	-
F. Lumbriculidae										
Lumbriculus	-	-	-	4	-	-	-	-	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	-	-	-	-	-	-	-	1	1
F. Acalyptonotidae										
Acalyptonotus	5	3	-	2	5	-	-	-	-	-
F. Hygrobatidae										
Hygrobates	3	-	2	2	2	-	-	-	-	1
F. Lebertiidae										
Lebertia	8	1	5	-	2	-	1	3	-	1
F. Oxidae										
Oxus	4	-	-	1	-	-	-	-	-	1
F. Pionidae										
indeterminate	-	-	-	-	1	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	3	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	3	4	-	7	-	1	10	24	2	4
TADPOLE SHRIMP										
O. Notostraca										
Lepidurus arcticus	-	-	-	-	-	-	-	-	-	-
SPRINGTAILS										
Cl. Entognatha										
O. Collembola	-	-	-	-	-	-	-	-	-	-
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature	-	-	-	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	1	1	-	-	-	1	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	82	16	50	15	8	60	44	31	25	40
S.F. Chironominae										
Chironomus	-	-	-	-	-	-	-	-	-	-
Cladotanytarsus	3	7	3	-	3	-	-	-	-	-
Constempellina	7	-	2	-	5	-	3	3	-	2
Corynocera ambigua	-	-	-	1	-	-	-	-	-	-
?Corynocera oliveri	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-
Micropsectra	5	21	12	57	22	17	3	-	4	7
Microtendipes	-	-	-	-	-	-	-	-	-	-
Pagastiella	-	-	-	-	-	-	-	-	-	-
Paracladopelma	10	2	1	-	1	2	1	-	-	1
Paratanytarsus	8	12	23	5	10	4	-	-	3	14
Polypedilum	-	-	-	1	-	3	-	-	1	1
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	6	-	3	-	9	-	-	-
Stictochironomus	18	15	22	19	1	151	368	336	115	101
Tanytarsus	11	4	15	3	5	-	2	-	7	6
S.F. Diamesinae										
Pagastia	-	-	-	-	-	-	-	-	-	1
Protanypus	-	-	1	-	1	-	1	1	-	-
Potthastia	1	-	1	-	-	-	-	-	1	-
Pseudodiamesa	-	-	-	1	5	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	-	-	-	-	3	3	-	1
Corynoneura	2	-	-	-	-	-	-	-	-	-
Cricotopus	-	-	-	1	-	1	-	-	-	-
Cricotopus/Orthocladius	5	1	-	2	5	6	2	-	1	2
Heterotrissocladius	31	38	45	1	14	27	22	14	23	15
Hydrobaenus	3	2	2	1	4	-	-	-	-	1
Mesocricotopus	14	3	4	-	4	5	5	3	1	13
Oliveridia	-	-	-	-	-	-	-	-	-	1
Paracladius	7	6	10	-	17	15	1	-	3	7
Parakiefferiella	6	-	5	-	1	11	-	-	2	2
Psectrocladius	-	-	-	-	-	-	-	-	-	-
Zalutschia	-	-	-	-	-	-	-	-	-	1
Orthocladiinae Genus "Greenland"	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	1	1	-	-	-	5	5	5	3	1
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	-	-	-	-
Procladius	3	3	5	-	-	1	3	3	-	2
Thienemannimyia complex	1	1	-	-	-	1	1	-	-	2
F. Empididae										
Chelifera/Metachela	1	-	-	-	1	-	-	-	-	-
Wiedemannia	-	-	1	-	-	-	-	-	-	-
pupae	1	-	1	-	-	-	-	-	-	-

Table E3-2. Raw benthic invertebrate data from the Baker Lake 2019.

Program	Baker Lake									
Location	**Baker East Shore**					**Baker Proposed Jetty**				
Station	**BES**					**BPJ**				
Control/Impact?	Control					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	12-Aug-19	12-Aug-19	12-Aug-19	12-Aug-19	12-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19
Sample Depth (m)	9.1	8.7	9.4	8.4	9.0	7.3	9.1	8.4	8.4	8.0
ROUNDWORMS										
P. Nemata	1	21	6	9	11	6	6	8	3	3
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	2	-	1	-	-	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	3	10	14	14	11	-	-	-	2	2
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	2	-	-	-	-	2	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	-	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	1	8	5	-	4	1	-	8
F. Lumbriculidae										
Lumbriculus	-	-	-	-	-	-	-	-	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	3	2	2	-	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	-	2	-	-	-	-	1	1	-	-
F. Hygrobatidae										
Hygrobates	-	1	-	-	-	1	-	-	-	1
F. Lebertiidae										
Lebertia	2	6	2	6	11	1	2	-	-	-
F. Oxidae										
Oxus	-	-	-	-	-	-	-	-	-	-
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	1	1	2	4	1	11	3	9	-	1
TADPOLE SHRIMP										
O. Notostraca										
Lepidurus arcticus	-	-	-	-	-	-	-	-	-	-
SPRINGTAILS										
Cl. Entognatha										
O. Collembola	-	-	-	-	-	-	-	-	-	-
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature	-	-	-	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	-	1	-	1	-	1	1	-	1	1
F. Limnephilidae										
Grensia praeterita	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	26	22	27	61	37	35	21	10	3	3
S.F. Chironominae										
Chironomus	-	-	-	-	-	-	-	-	-	-
Cladotanytarsus	-	-	1	4	-	2	5	-	-	-
Constempellina	2	5	3	1	5	12	6	9	-	-
Corynocera ambigua	-	-	-	-	-	-	-	-	-	-
?Corynocera oliveri	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-
Micropsectra	-	-	6	1	-	2	20	27	-	2
Microtendipes	-	-	-	-	-	-	-	-	-	-
Pagastiella	-	-	-	-	-	-	-	-	-	-
Paracladopelma	1	3	3	-	1	-	-	-	-	1
Paratanytarsus	6	11	19	17	16	7	5	-	1	12
Polypedilum	-	-	-	-	1	-	-	-	-	7
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	1	-	1	4	-	2	-	4	-	-
Stictochironomus	-	-	-	-	-	64	18	3	-	146
Tanytarsus	7	3	8	8	9	-	2	-	-	-
S.F. Diamesinae										
Pagastia	-	-	-	1	1	-	-	-	-	-
Protanypus	-	-	-	-	-	1	1	-	-	-
Potthastia	-	-	-	-	-	-	-	-	-	-
Pseudodiamesa	-	1	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	-	-	-	4	2	14	-	1
Corynoneura	-	-	-	-	-	-	-	-	-	-
Cricotopus	-	-	-	-	-	-	-	2	-	-
Cricotopus/Orthocladius	-	1	3	1	-	-	3	-	-	-
Heterotrissocladius	5	8	18	9	15	8	14	6	1	1
Hydrobaenus	1	-	1	1	-	-	1	-	-	-
Mesocricotopus	5	6	5	3	6	3	4	1	1	1
Oliveridia	-	-	-	-	-	-	-	-	-	-
Paracladius	-	17	16	27	19	2	15	6	-	-
Parakiefferiella	1	1	4	7	2	8	6	3	-	-
Psectrocladius	-	-	-	-	-	-	-	-	-	-
Zalutschia	-	-	-	-	-	2	1	1	-	-
Orthocladiinae Genus "Greenland"	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	-	2	1	3	2	2	4	5	-	1
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	-	-	-	-
Procladius	11	1	-	-	1	10	7	8	-	1
Thienemannimyia complex	-	1	-	-	1	1	-	-	1	-
F. Empididae										
Chelifera/Metachela	-	-	-	-	2	-	2	2	-	-
Wiedemannia	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	1	-	1	-	-

Table E3-2. Raw benthic invertebrate data from the Baker Lake 2019.

Program	**Baker Lake**									
Location	**Baker Akilahaarjuk Point**					**Baker Barge Dock**				
Station	**BAP**					**BBD**				
Control/Impact?	Control					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	12-Aug-19	12-Aug-19	12-Aug-19	12-Aug-19	12-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19
Sample Depth (m)	7.0	9.3	8.8	7.8	9.1	8.4	9.2	8.3	8.6	8.2
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium (Cyclocalyx)/Neopisidium	16	17	28	-	13	1	31	29	-	1
Pisidium (Cyclocalyx)	7	-	-	-	-	-	2	3	-	-
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-
R (Richness) - totals [2,3]										
Total	30	20	23	20	25	17	19	12	14	25
Oligochaete	4	2	3	5	3	1	1	1	1	0
Insect	20	15	17	11	17	15	15	8	12	20
Mollusc	2	1	1	0	1	1	2	2	0	1
Other[4]	4	2	2	4	4	0	1	1	1	4
Abundance (raw) - totals [5,6]										
Total	301	162	250	203	140	312	516	436	191	227
Oligochaete	37	8	6	88	7	1	9	2	1	0
Insect	221	133	209	107	110	310	473	399	189	221
Mollusc	23	17	28	0	13	1	33	32	0	1
Other[4]	20	4	7	8	10	0	1	3	1	5
Abundance - totals (#/m^2) [5]										
Total	6,543	3,522	5,435	4,413	3,043	6,783	11,217	9,478	4,152	4,935
Oligochaete	804	174	130	1,913	152	22	196	43	22	0
Insect	4,804	2,891	4,543	2,326	2,391	6,739	10,283	8,674	4,109	4,804
Mollusc	500	370	609	0	283	22	717	696	0	22
Other[4]	435	87	152	174	217	0	22	65	22	109

Notes:

1. Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
2. Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
3. Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
4. Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertiidae, F. Oxidae, F. Pionidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
5. Abundance totals exclude P. Nemata and Cl. Ostracoda.
6. Raw abundance from two grabs (grab area = 0.023 m^2).

Table E3-2. Raw benthic invertebrate data from the Baker Lake 2019.

Program	Baker Lake									
Location	Baker East Shore					Baker Proposed Jetty				
Station	BES					BPJ				
Control/Impact?	Control					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	12-Aug-19	12-Aug-19	12-Aug-19	12-Aug-19	12-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19	13-Aug-19
Sample Depth (m)	9.1	8.7	9.4	8.4	9.0	7.3	9.1	8.4	8.4	8.0
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium (Cyclocalyx)/Neopisidium	3	14	12	30	15	27	-	4	-	1
Pisidium (Cyclocalyx)	-	-	-	-	-	-	-	-	-	-
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-
R (Richness) - totals [2,3]										
Total	14	19	18	20	18	23	22	17	6	15
Oligochaete	2	1	2	2	2	1	1	1	1	2
Insect	10	14	14	15	14	18	19	14	5	11
Mollusc	1	1	1	1	1	1	0	1	0	1
Other[4]	1	3	1	2	1	3	2	1	0	1
Abundance (raw) - totals [5,6]										
Total	76	119	147	211	160	199	145	108	10	189
Oligochaete	5	10	15	22	16	2	4	1	2	10
Insect	66	83	116	149	118	167	138	102	8	177
Mollusc	3	14	12	30	15	27	0	4	0	1
Other[4]	2	12	4	10	11	3	3	1	0	1
Abundance - totals (#/m^2) [5]										
Total	1,652	2,587	3,196	4,587	3,478	4,326	3,152	2,348	217	4,109
Oligochaete	109	217	326	478	348	43	87	22	43	217
Insect	1,435	1,804	2,522	3,239	2,565	3,630	3,000	2,217	174	3,848
Mollusc	65	304	261	652	326	587	0	87	0	22
Other[4]	43	261	87	217	239	65	65	22	0	22

Notes:

1. Benthic invertebrate count data shown in this table are from composite of two grabs sieved to 500 µm.
2. Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
3. Pupae and immatures (bolded values) are excluded from the richness totals if other life stages are present in the replicate sample.
4. Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertiidae, F. Oxidae, F. Pionidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
5. Abundance totals exclude P. Nemata and Cl. Ostracoda.
6. Raw abundance from two grabs (grab area = 0.023 m^2).

Figure E3-1. Oligochaete abundance (#/m^2) from Baker Lake since 2008.

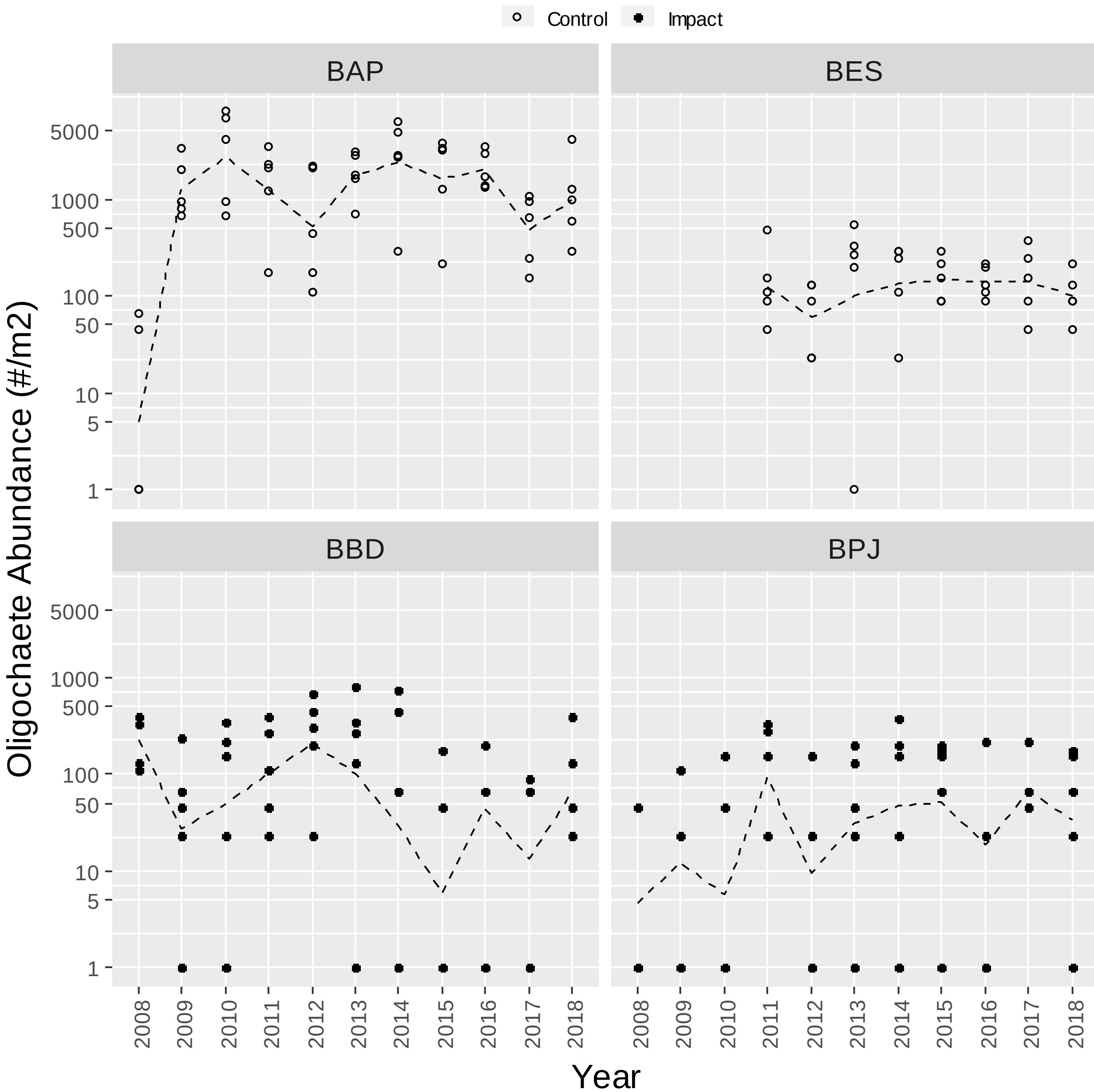


Figure E3-2. Insect abundance (#/m²) from Baker Lake since 2008.

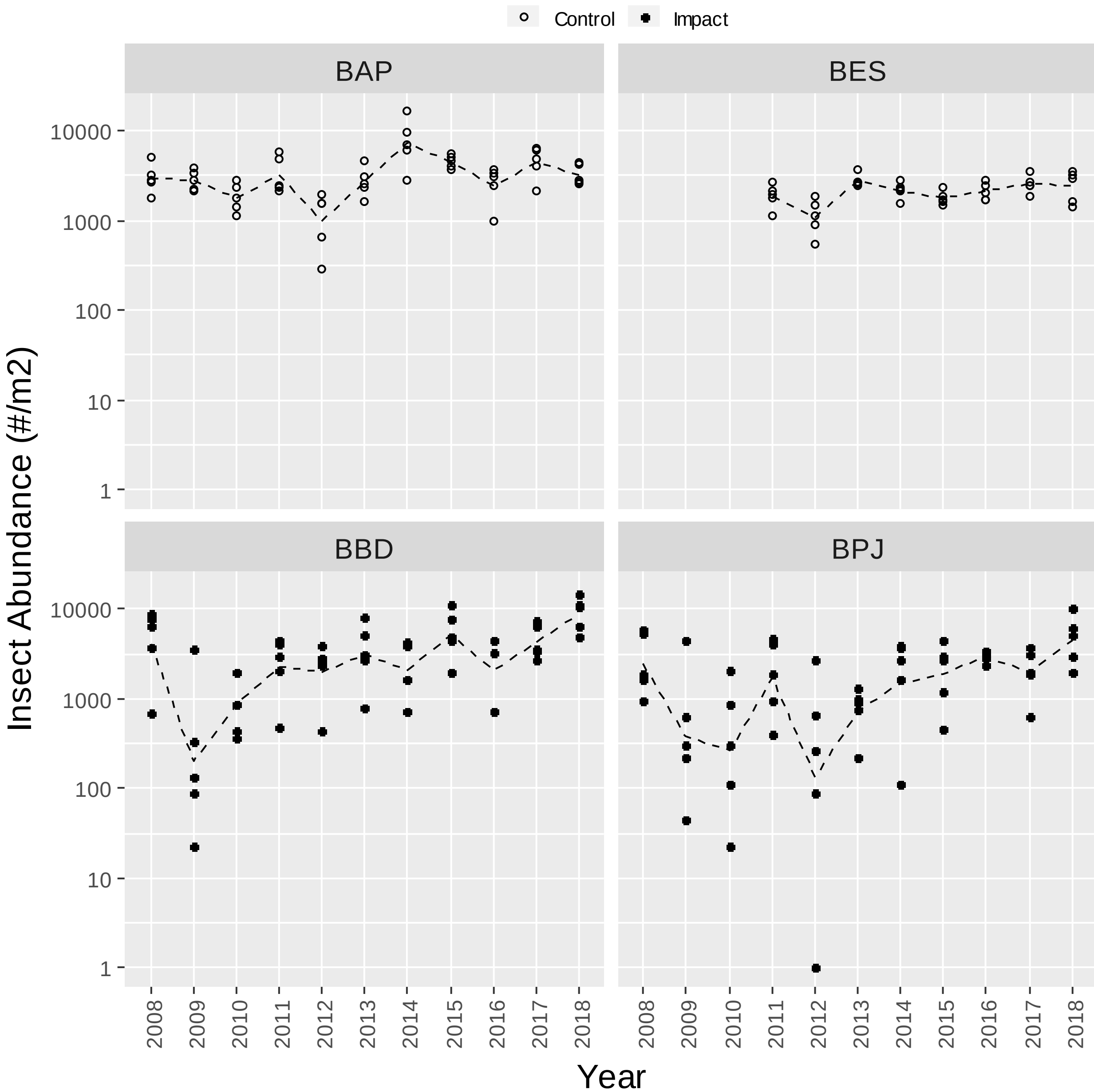


Figure E3-3. Mollusc abundance (#/m²) from Baker Lake since 2008.

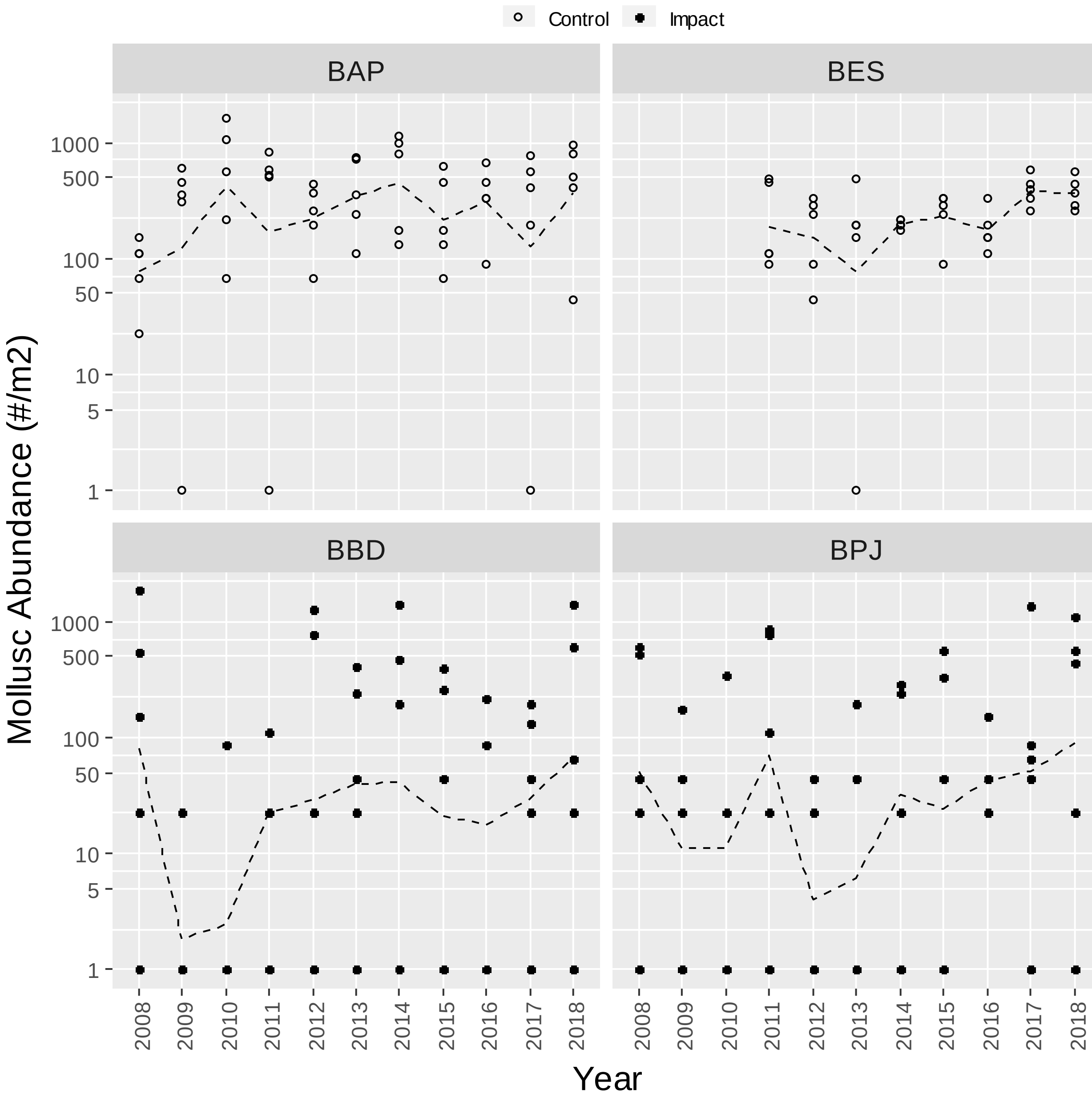


Figure E3-4. Other taxa abundance (#/m²) from Baker Lake since 2008.

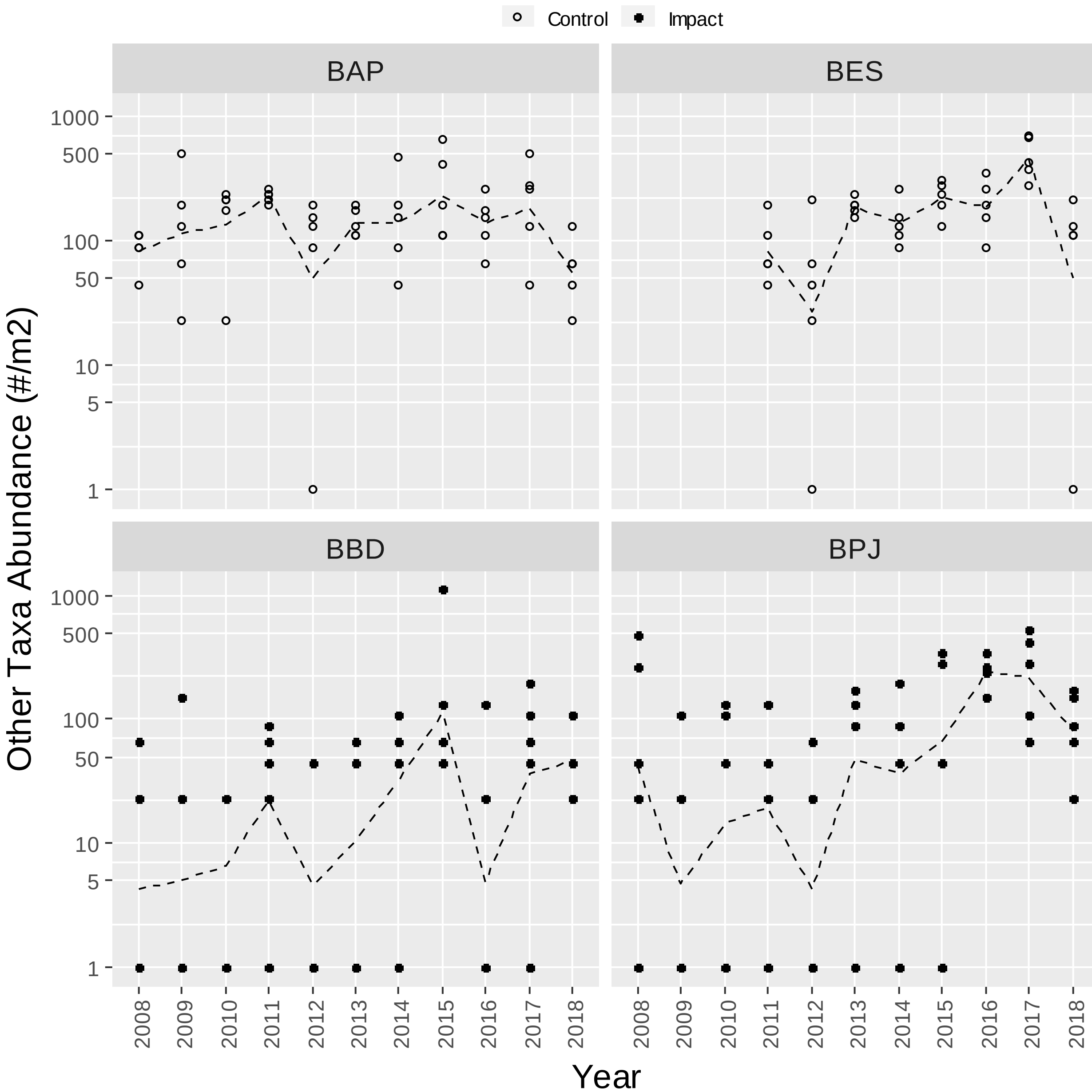


Figure E3-5. Oligochaete richness (# of taxa) from Baker Lake since 2008.

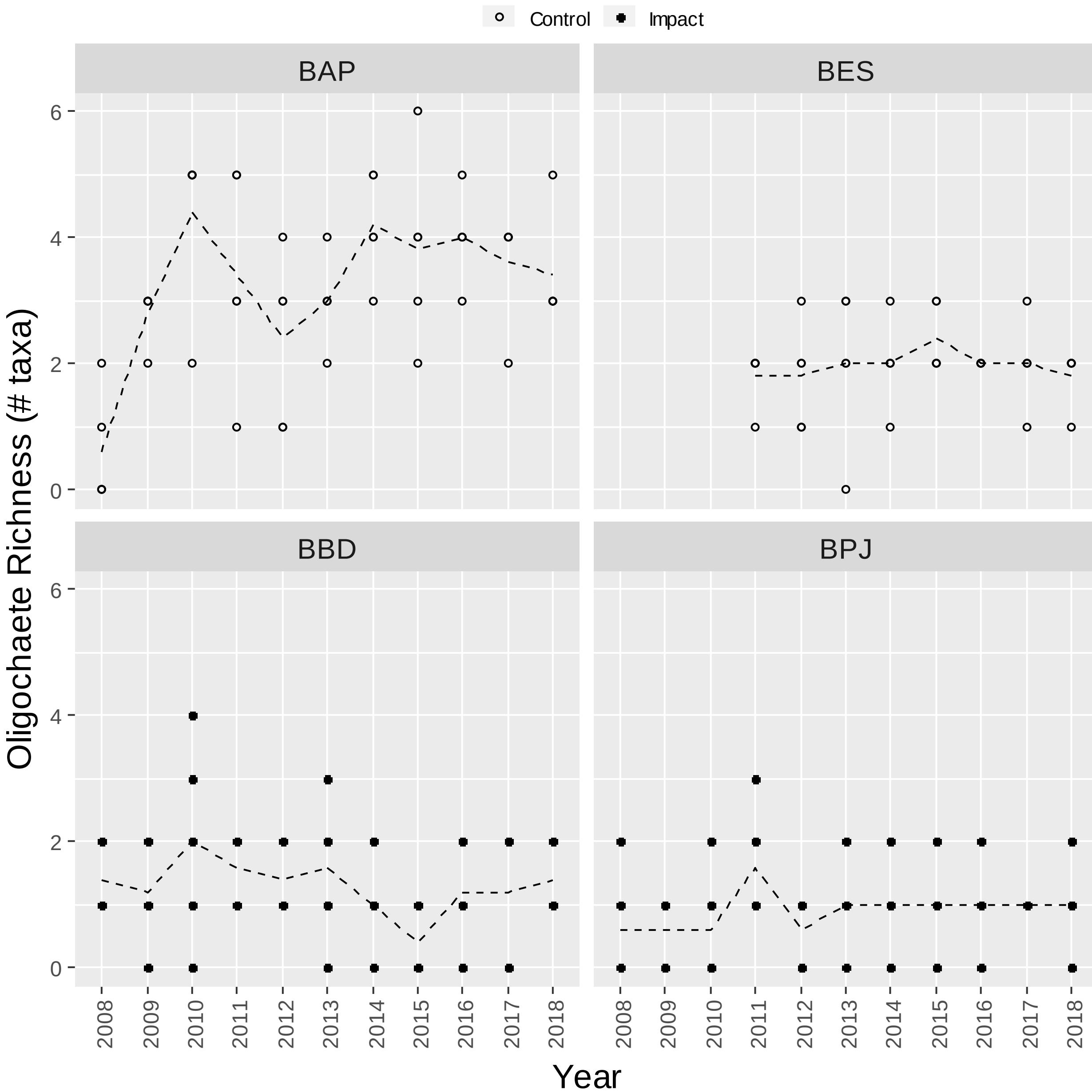


Figure E3-6. Insect richness (# of taxa) from Baker Lake since 2008.

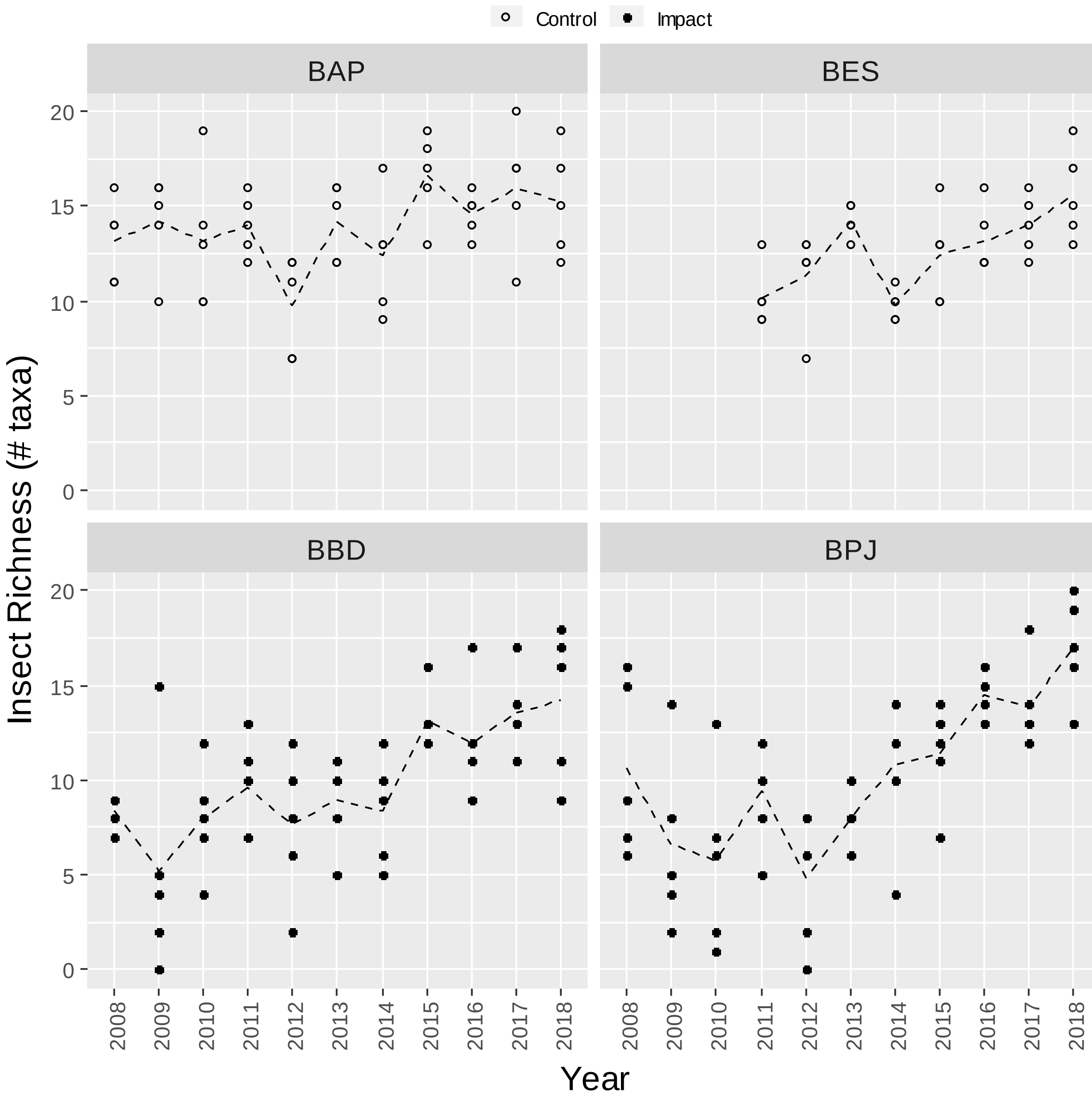


Figure E3-7. Mollusc richness (# of taxa) from Baker Lake since 2008.

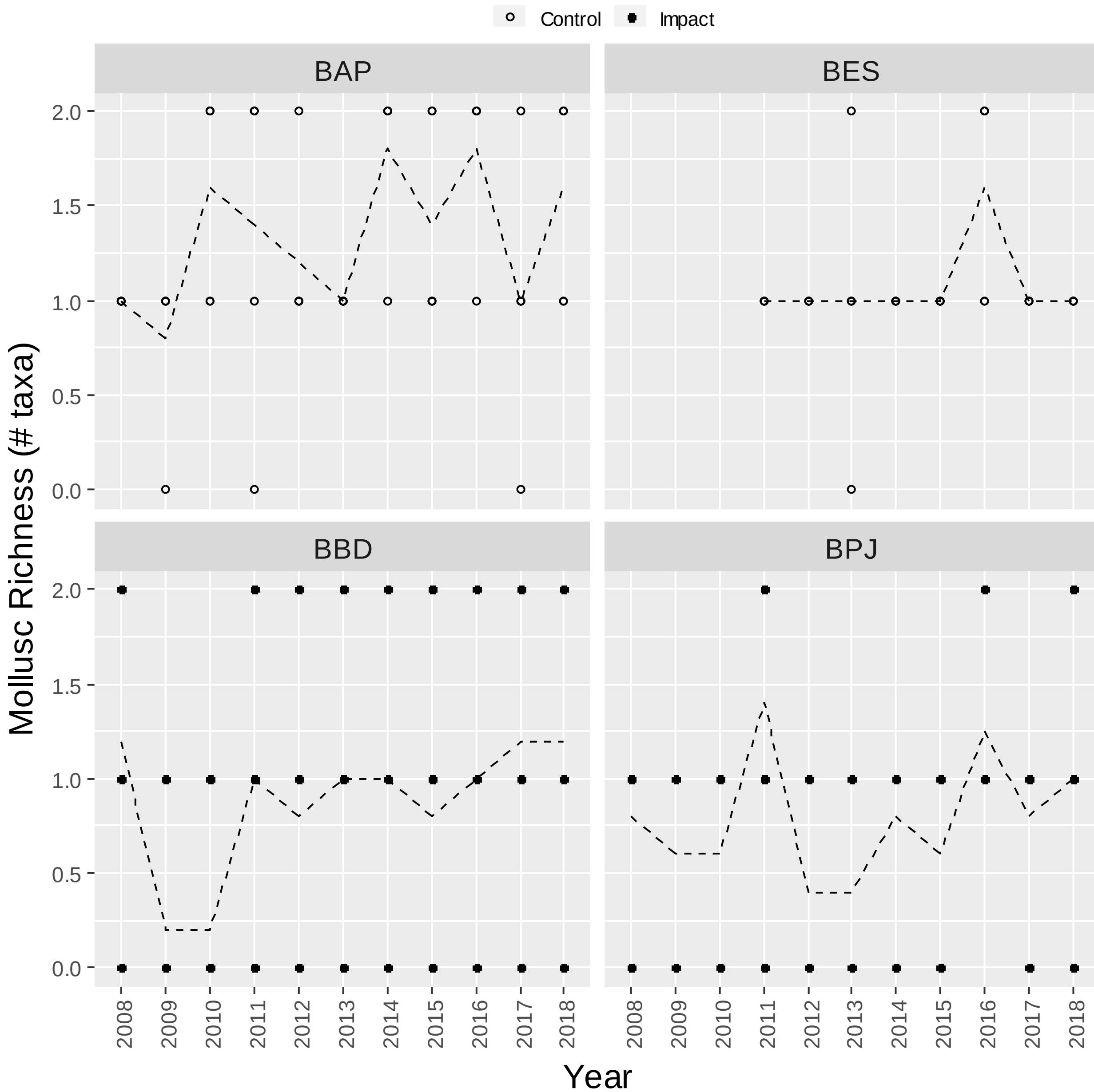


Figure E3-8. Other taxa richness (# of taxa) from Baker Lake since 2008.

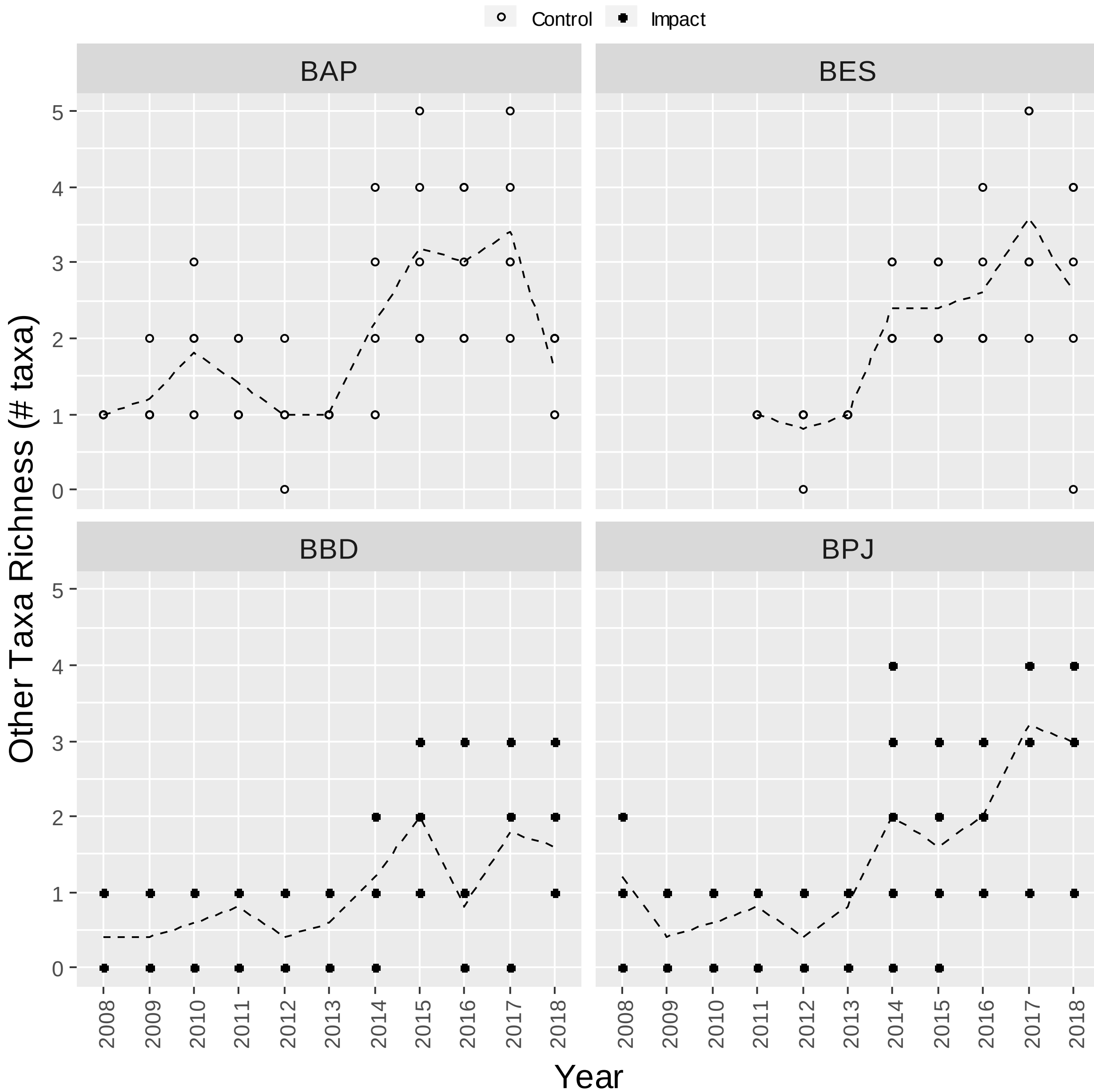


Figure E3-9. Simpsons' Diversity for the benthic invertebrate community at Baker Lake since 2008.

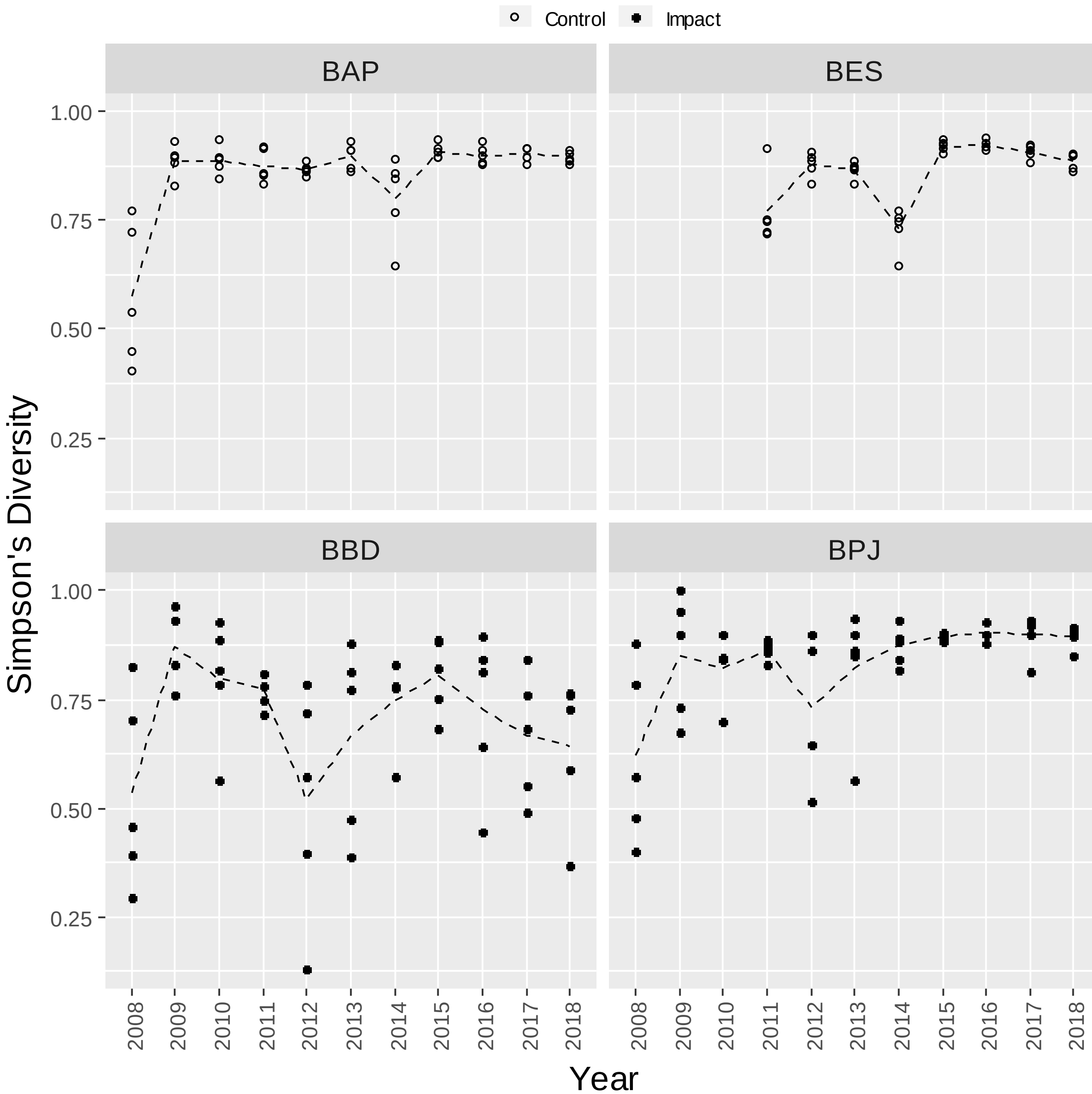
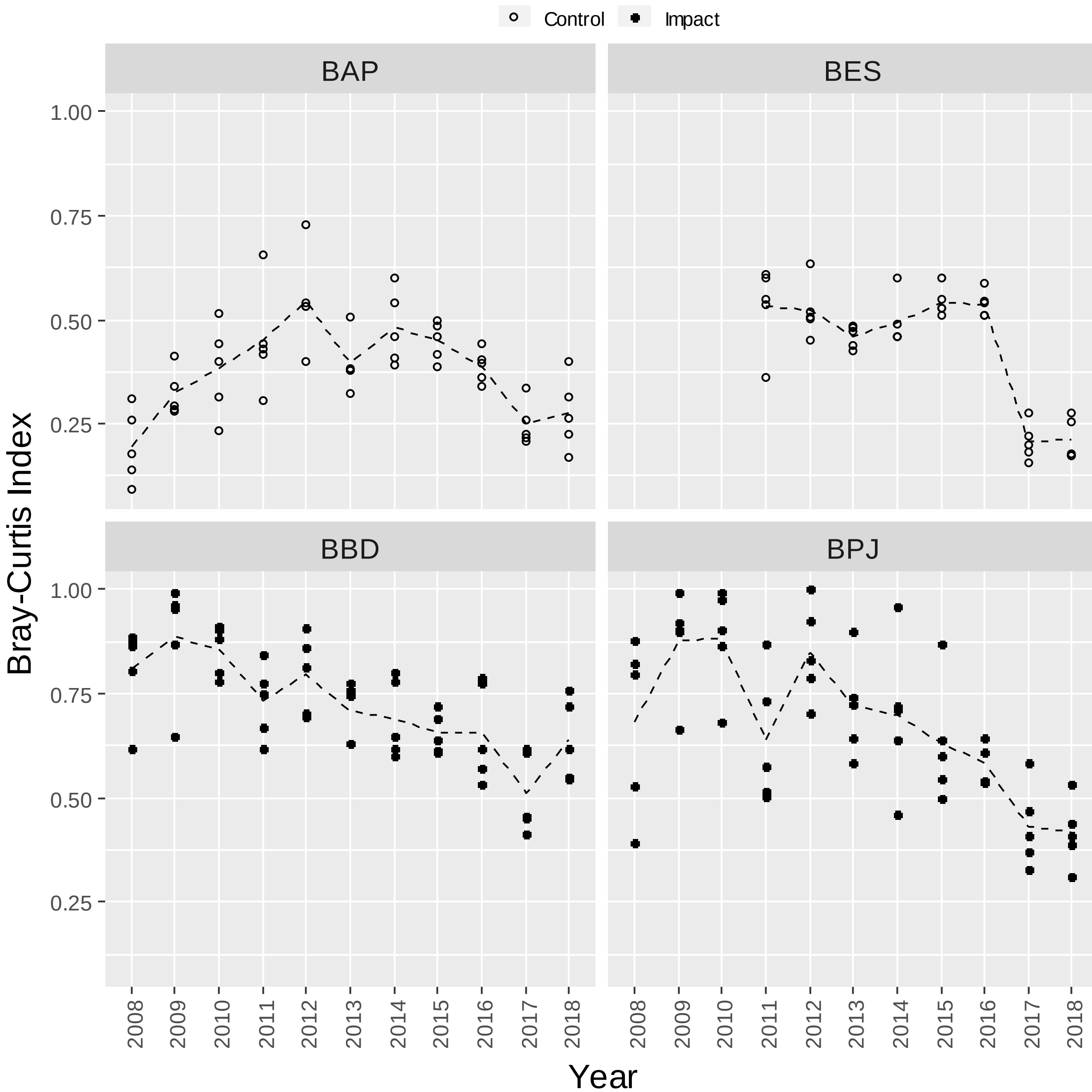


Figure E3-10. Bray-Curtis Index for the benthic invertebrate community at Baker Lake since 2008.



APPENDIX F
WATER AND SEDIMENT CHEMISTRY 2019 LAB REPORTS

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 08-MAR-19
Report Date: 19-MAR-19 14:41 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2241655

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2241655-1	L2241655-2	L2241655-3	L2241655-4	L2241655-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-MAR-19	04-MAR-19	04-MAR-19	04-MAR-19	04-MAR-19
	Sampled Time	15:15	15:40	12:30	13:00	13:30
	Client ID	MAM-37	MAM-38	A20-31	A20-32	WTS-37
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.110	0.964	0.148	1.24	0.889

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2241655-6	L2241655-7			
		Description	Water	Water			
		Sampled Date	04-MAR-19	02-MAR-19			
		Sampled Time	15:00	15:00			
		Client ID	WTS-38	MARCH DUP-4			
Grouping	**Analyte**						
FILTER							
Plant Pigments	Chlorophyll a (ug/L)		1.09	0.885			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2241655-1	L2241655-2	L2241655-3	L2241655-4	L2241655-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-MAR-19	04-MAR-19	04-MAR-19	04-MAR-19	04-MAR-19
	Sampled Time	15:15	15:40	12:30	13:00	13:30
	Client ID	MAM-37	MAM-38	A20-31	A20-32	WTS-37
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	166	93.8	18.5	18.7	50.1
	Hardness (as CaCO3) (mg/L)	58.9	35.8	6.65	7.10	17.9
	pH (pH)	6.98	6.82	6.91	6.87	6.87
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	123	79	8.3	6.8	38
	Turbidity (NTU)	0.33	<0.10	0.13	0.13	0.11
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	10.6	7.0	6.0	5.8	7.3
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	10.6	7.0	6.0	5.8	7.3
	Ammonia, Total (as N) (mg/L)	0.0295	0.0140	<0.0050	<0.0050	0.0151
	Bromide (Br) (mg/L)	0.454	0.234	<0.050	<0.050	0.091
	Chloride (Cl) (mg/L)	35.9	19.3	0.86	0.87	8.14
	Fluoride (F) (mg/L)	0.045	0.036	0.034	0.037	0.038
	Nitrate (as N) (mg/L)	0.225	0.0174	<0.0050	<0.0050	0.0097
	Nitrite (as N) (mg/L)	0.0022	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.194	0.111	0.084	0.087	0.115
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	0.0026
	Phosphorus (P)-Total (mg/L)	0.0025	0.0021	0.0034	0.0023	0.0050
	Silicate (as SiO2) (mg/L)	1.21	0.98	0.97	0.97	0.65
	Sulfate (SO4) (mg/L)	6.61	5.30	1.39	1.41	2.42
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010 CNP	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010 CNP	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.51	2.08	1.95	1.91 HTP	2.33
	Total Organic Carbon (mg/L)	4.39	1.97	1.92	1.76 HTP	2.31
Total Metals	Aluminum (Al)-Total (mg/L)	0.0135	<0.0030	<0.0030	<0.0030	0.0048
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00049	0.00033	0.00012	0.00010	0.00025
	Barium (Ba)-Total (mg/L)	0.0344	0.0191	0.00401	0.00416	0.00997
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	20.3	10.1	1.77	1.80	5.09
	Cesium (Cs)-Total (mg/L)	0.000011	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2241655-6	L2241655-7			
	Description	Water	Water			
	Sampled Date	04-MAR-19	02-MAR-19			
	Sampled Time	15:00	15:00			
	Client ID	WTS-38	MARCH DUP-4			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	50.2	48.8			
	Hardness (as CaCO3) (mg/L)	17.9	18.3			
	pH (pH)	6.86	6.82			
	Total Suspended Solids (mg/L)	<1.0	<1.0			
	Total Dissolved Solids (mg/L)	38	37			
	Turbidity (NTU)	0.12	0.11			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	7.3	7.1			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	7.3	7.1			
	Ammonia, Total (as N) (mg/L)	0.0132	0.0153			
	Bromide (Br) (mg/L)	0.093	0.091			
	Chloride (Cl) (mg/L)	8.13	8.09			
	Fluoride (F) (mg/L)	0.040	0.038			
	Nitrate (as N) (mg/L)	0.0098	0.0091			
	Nitrite (as N) (mg/L)	<0.0010	0.0013			
	Total Kjeldahl Nitrogen (mg/L)	0.112	0.123			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	0.0044	<0.0020			
	Phosphorus (P)-Total (mg/L)	0.0037	0.0029			
	Silicate (as SiO2) (mg/L)	0.60	0.65			
	Sulfate (SO4) (mg/L)	2.43	2.41			
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010			
	Cyanide, Free (mg/L)	<0.0010	<0.0010			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.61	2.45			
	Total Organic Carbon (mg/L)	2.34	2.29			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0042	0.0038			
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00027	0.00024			
	Barium (Ba)-Total (mg/L)	0.0104	0.00958			
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Total (mg/L)	5.12	5.09			
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2241655-1	L2241655-2	L2241655-3	L2241655-4	L2241655-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-MAR-19	04-MAR-19	04-MAR-19	04-MAR-19	04-MAR-19
	Sampled Time	15:15	15:40	12:30	13:00	13:30
	Client ID	MAM-37	MAM-38	A20-31	A20-32	WTS-37
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	0.00023	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00055	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	0.011
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0076	0.0033	<0.0010	<0.0010	0.0013
	Magnesium (Mg)-Total (mg/L)	3.30	2.24	0.595	0.608	1.39
	Manganese (Mn)-Total (mg/L)	0.00132	0.00179	0.00050	0.00034	0.00082
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000411	0.000059	<0.000050	<0.000050	0.000052
	Nickel (Ni)-Total (mg/L)	0.00200	0.00122	<0.00050	<0.00050	0.00071
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	2.58	1.37	0.444	0.453	0.915
	Rubidium (Rb)-Total (mg/L)	0.00372	0.00185	0.00050	0.00053	0.00164
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.68	0.54	0.51	0.51	0.34
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.76	1.17	0.780	0.782	1.12
	Strontium (Sr)-Total (mg/L)	0.185	0.0829	0.00862	0.00869	0.0386
	Sulfur (S)-Total (mg/L)	2.09	1.82	<0.50	<0.50	0.70
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000042	0.000014	0.000025	0.000018	0.000040
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0084	0.0010	0.0012	<0.0010	0.0021
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00043	0.00031	<0.00010	<0.00010	0.00022
	Barium (Ba)-Dissolved (mg/L)	0.0298	0.0175	0.00386	0.00396	0.0100
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2241655-6	L2241655-7			
	Description	Water	Water			
	Sampled Date	04-MAR-19	02-MAR-19			
	Sampled Time	15:00	15:00			
	Client ID	WTS-38	MARCH DUP-4			
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00021	<0.00010			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	0.00053	<0.00050			
	Iron (Fe)-Total (mg/L)	<0.010	<0.010			
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Total (mg/L)	0.0014	0.0013			
	Magnesium (Mg)-Total (mg/L)	1.43	1.38			
	Manganese (Mn)-Total (mg/L)	0.00073	0.00075			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000069	<0.000050			
	Nickel (Ni)-Total (mg/L)	0.00080	0.00073			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.948	0.892			
	Rubidium (Rb)-Total (mg/L)	0.00171	0.00153			
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Total (mg/L)	0.36	0.33			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	1.06	1.11			
	Strontium (Sr)-Total (mg/L)	0.0364	0.0396			
	Sulfur (S)-Total (mg/L)	0.79	0.78			
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Total (mg/L)	0.000037	0.000035			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0023	0.0021			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00023	0.00024			
	Barium (Ba)-Dissolved (mg/L)	0.0101	0.0103			
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2241655-1	L2241655-2	L2241655-3	L2241655-4	L2241655-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-MAR-19	04-MAR-19	04-MAR-19	04-MAR-19	04-MAR-19
	Sampled Time	15:15	15:40	12:30	13:00	13:30
	Client ID	MAM-37	MAM-38	A20-31	A20-32	WTS-37
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	18.6	10.7	1.66	1.83	4.80
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00048	0.00039	0.00025	0.00022	0.00043
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0075	0.0034	<0.0010	<0.0010	0.0015
	Magnesium (Mg)-Dissolved (mg/L)	3.02	2.23	0.612	0.614	1.44
	Manganese (Mn)-Dissolved (mg/L)	0.00089	0.00147	0.00023	0.00018	0.00048
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000365	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	0.00168	0.00116	<0.00050	<0.00050	0.00064
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	2.45	1.38	0.469	0.477	0.985
	Rubidium (Rb)-Dissolved (mg/L)	0.00356	0.00201	0.00052	0.00053	0.00158
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.621	0.499	0.502	0.481	0.369
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.65	1.19	0.782	0.801	1.03
	Strontium (Sr)-Dissolved (mg/L)	0.189	0.0870	0.00879	0.00932	0.0375
	Sulfur (S)-Dissolved (mg/L)	2.00	1.66	0.54	<0.50	0.85
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000033	0.000015	0.000022	0.000018	0.000035
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	0.000065	<0.000060

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2241655-6	L2241655-7			
	Sample ID	L2241655-6	L2241655-7			
	Description	Water	Water			
	Sampled Date	04-MAR-19	02-MAR-19			
	Sampled Time	15:00	15:00			
	Client ID	WTS-38	MARCH DUP-4			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	4.87	4.94			
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00044	0.00046			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0015	0.0015			
	Magnesium (Mg)-Dissolved (mg/L)	1.40	1.45			
	Manganese (Mn)-Dissolved (mg/L)	0.00039	0.00049			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000052	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	0.00066	0.00067			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.971	1.02			
	Rubidium (Rb)-Dissolved (mg/L)	0.00161	0.00157			
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	0.338	0.363			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	1.02	1.09			
	Strontium (Sr)-Dissolved (mg/L)	0.0381	0.0389			
	Sulfur (S)-Dissolved (mg/L)	0.82	0.92			
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Dissolved (mg/L)	0.000037	0.000036			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L2241655-1
Matrix Spike	Dissolved Organic Carbon	MS-B	L2241655-2, -3, -4, -5, -6, -7
Matrix Spike	Total Organic Carbon	MS-B	L2241655-1
Matrix Spike	Total Organic Carbon	MS-B	L2241655-2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2241655-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2241655-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2241655-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2241655-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Total	MS-B	L2241655-5, -6, -7
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2241655-5, -6, -7
Matrix Spike	Strontium (Sr)-Total	MS-B	L2241655-5, -6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
CNP	Cyanide test sample appears to have been preserved, but pH was <10 at time of testing. Results may be biased low, particularly for Free CN species.
HTP	Sample preparation or preservation hold time was exceeded.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L2241655-COFC

ALS Environ[illegible]

in of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # ______

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☑ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact: Brent Mack	**Sampler:** Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ● Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	MAM-37	04-Mar-19	15:15	Water	X	X	X	X	X	X	X	X	X	X			10
	MAM-38	04-Mar-19	15:40	Water	X	X	X	X	X	X	X	X	X	X			10
	A20-31	04-Mar-19	12:30	Water	X	X	X	X	X	X	X	X	X	X			10
	A20-32	04-Mar-19	13:00	Water	X	X	X	X	X	X	X	X	X	X			10
	WTS-37	03-Mar-19	13:30	Water	X	X	X	X	X	X	X	X	X	X			10
	WTS-38	03-Mar-19	15:00	Water	X	X	X	X	X	X	X	X	X	X			10

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JC	Date: MAR - 8 2019	Time: 835AM	Temperature: 5 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

L2241655-COFC

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 15-MAR-19
Report Date: 22-MAR-19 12:31 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2244752

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2244752-1 Water 07-MAR-19 12:18 NEM-37	L2244752-2 Water 07-MAR-19 13:11 NEM-38	L2244752-3 Water 07-MAR-19 12:18 MARCH DUP-3	L2244752-4 Water 09-MAR-19 12:30 LK5-7	L2244752-5 Water 09-MAR-19 13:28 LK5-8
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	33.9	32.8	33.8	36.6	36.2
	Hardness (as CaCO3) (mg/L)	13.1	12.1	12.8	14.2	14.0
	pH (pH)	7.13	7.11	7.13	7.16	7.16
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	19.1	21.2	19.8	21.5	22.8
	Turbidity (NTU)	<0.10	0.11	<0.10	0.11	0.11
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.4	9.2	9.4	13.0	12.6
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.4	9.2	9.4	13.0	12.6
	Ammonia, Total (as N) (mg/L)	0.0102	0.0687	0.0100	0.0128	0.0128
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	1.21	1.13	1.19	0.99	0.97
	Fluoride (F) (mg/L)	0.035	0.031	0.033	0.047	0.044
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.129	0.159	0.098	0.109	0.117
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0021	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0025	<0.0020	0.0027	0.0032	0.0069
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	1.20	1.14
	Sulfate (SO4) (mg/L)	4.28	4.12	4.25	2.65	2.66
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.34	1.84	2.16	1.84	1.84
	Total Organic Carbon (mg/L)	2.00	2.02	2.37	2.03	2.14
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00033	0.00038	0.00035	0.00019	0.00019
	Barium (Ba)-Total (mg/L)	0.00549	0.00505	0.00549	0.00418	0.00403
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.94	2.89	2.94	3.36	3.40
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2244752-1	L2244752-2	L2244752-3	L2244752-4	L2244752-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	07-MAR-19	07-MAR-19	07-MAR-19	09-MAR-19	09-MAR-19
	Sampled Time	12:18	13:11	12:18	12:30	13:28
	Client ID	NEM-37	NEM-38	MARCH DUP-3	LK5-7	LK5-8
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.37	1.28	1.39	1.54	1.49
	Manganese (Mn)-Total (mg/L)	0.00088	0.00103	0.00091	0.00112	0.00091
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	0.000051	0.000054	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00062	0.00058	0.00061	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.778	0.755	0.820	0.502	0.478
	Rubidium (Rb)-Total (mg/L)	0.00087	0.00086	0.00097	0.00047	0.00048
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.24	0.23	0.23	0.58	0.56
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.664	0.624	0.684	0.866	0.838
	Strontium (Sr)-Total (mg/L)	0.0134	0.0129	0.0131	0.0129	0.0129
	Sulfur (S)-Total (mg/L)	1.70	1.35	1.35	0.82	0.84
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	<0.000010	<0.000010	<0.000010	0.000013	0.000011
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0011	<0.0010	0.0012	<0.0010	0.0012
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00030	0.00027	0.00035	0.00017	0.00016
	Barium (Ba)-Dissolved (mg/L)	0.00557	0.00520	0.00543	0.00371	0.00385
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2244752-1	L2244752-2	L2244752-3	L2244752-4	L2244752-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	07-MAR-19	07-MAR-19	07-MAR-19	09-MAR-19	09-MAR-19
	Sampled Time	12:18	13:11	12:18	12:30	13:28
	Client ID	NEM-37	NEM-38	MARCH DUP-3	LK5-7	LK5-8
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.92	2.65	2.79	3.26	3.22
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00026	0.00026	0.00025	0.00023	0.00022
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.42	1.34	1.41	1.48	1.45
	Manganese (Mn)-Dissolved (mg/L)	0.00027	0.00018	0.00025	0.00018	0.00023
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000072	0.000062	0.000067	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	0.00057	0.00063	0.00062	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.822	0.777	0.814	0.460	0.460
	Rubidium (Rb)-Dissolved (mg/L)	0.00086	0.00085	0.00089	0.00047	0.00045
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.235	0.213	0.229	0.564	0.569
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.689	0.642	0.685	0.832	0.820
	Strontium (Sr)-Dissolved (mg/L)	0.0141	0.0132	0.0139	0.0139	0.0139
	Sulfur (S)-Dissolved (mg/L)	1.63	1.44	1.54	1.06	0.80
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000012	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Mercury (Hg)-Total	MS-B	L2244752-1, -2, -3, -4, -5
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2244752-1, -2, -3, -4, -5
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2244752-1, -2, -3, -4, -5
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2244752-1, -2, -3, -4, -5
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2244752-1, -2, -3, -4, -5
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2244752-1, -2, -3, -4, -5
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2244752-1, -2, -3, -4, -5
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2244752-1, -2, -3, -4, -5
Matrix Spike	Silicate (as SiO2)	MS-B	L2244752-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

Reference Information

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids

Reference Information

(TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☑Standard ☐Other	
☑PDF ☑Excel ☐Digital ☐Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	NEM-37	07-Mar-19	12:18	Water	x	x	x	x	x	x	x	x	x				9
	NEM-38	07-Mar-19	13:11	Water	x	x	x	x	x	x	x	x	x				9
	March DUP-3	07-Mar-19	12:18	Water	x	x	x	x	x	x	x	x	x				9
	LK5-7	09-Mar-19	12:30	Water	x	x	x	x	x	x	x	x	x				9
	LK5-8	09-Mar-19	13:28	Water	x	x	x	x	x	x	x	x	x				9

L2244752-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations:
			SC	Mar 15, 2019	830 Am	5 C				

L2244752-COFC

Louis Dubois	12-Mar-19	17:00	JC	mar 15, 2019	830AM	5 °C				Yes / No ? If Yes add SIF

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 21-MAR-19
Report Date: 01-APR-19 14:33 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2247638

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247638-1	L2247638-2	L2247638-3	L2247638-4	L2247638-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-MAR-19	17-MAR-19	16-MAR-19	16-MAR-19	16-MAR-19
	Sampled Time	01:50	16:30	12:17	11:50	09:30
	Client ID	TPS-62	TPN-120	A76-31	A76-32	DS1-29
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.212	0.248	0.912	1.02	0.914

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247638-6	L2247638-7	L2247638-8	L2247638-9	L2247638-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	16-MAR-19	07-MAR-19	07-MAR-19	07-MAR-19	14-MAR-19
	Sampled Time	10:00	12:18	13:11	12:18	13:50
	Client ID	DS1-30	NEM-37	NEM-38	MARCH DUP-3	LK1-7
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	2.69	0.638	0.812	0.648	0.623

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247638-11	L2247638-12	L2247638-13	L2247638-14	L2247638-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	14-MAR-19	15-MAR-19	15-MAR-19	09-MAR-19	09-MAR-19
	Sampled Time	13:24	14:50	15:30	12:30	13:28
	Client ID	LK1-8	LK8-7	LK8-8	LK5-7	LK5-8
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.602	0.624	0.566	1.05	0.578

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247638-16	L2247638-17			
	Description	Surface Water	Surface Water			
	Sampled Date	17-MAR-19	17-MAR-19			
	Sampled Time	10:30	13:30			
	Client ID	TPE-120	TPE-121			
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.221	0.225			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247638-1	L2247638-2	L2247638-3	L2247638-4	L2247638-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-MAR-19	17-MAR-19	16-MAR-19	16-MAR-19	16-MAR-19
	Sampled Time	01:50	16:30	12:17	11:50	09:30
	Client ID	TPS-62	TPN-120	A76-31	A76-32	DS1-29
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	36.7	37.9	58.3	62.1	25.8
	Hardness (as CaCO3) (mg/L)	11.8	12.2	20.7	22.2	8.71
	pH (pH)	7.19	7.18	7.16	7.18	7.02
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	22.3	24.4	40	42	18.3
	Turbidity (NTU)	<0.10	<0.10	0.14	<0.10	0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.3	8.7	8.4	9.9	6.3
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	8.3	8.7	8.4	9.9	6.3
	Ammonia, Total (as N) (mg/L)	0.0211	0.0166	0.0057	<0.0050	0.0246
	Bromide (Br) (mg/L)	<0.050	<0.050	0.089	0.096	<0.050
	Chloride (Cl) (mg/L)	1.06	1.11	7.92	8.46	2.14
	Fluoride (F) (mg/L)	0.086	0.089	0.034	0.036	0.055
	Nitrate (as N) (mg/L)	0.0169	0.0174	<0.0050	<0.0050	0.0107
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.099	0.105	0.062	0.072	0.404
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	0.0051	0.0040
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	1.44	1.47	0.81
	Sulfate (SO4) (mg/L)	6.38	6.60	5.20	5.54	1.90
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.33	1.80	1.63	1.77	2.05
	Total Organic Carbon (mg/L)	1.66	1.80	1.80	1.73	2.52
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	0.0046	<0.0030	0.0044
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00020	0.00020	0.00022	0.00024	0.00011
	Barium (Ba)-Total (mg/L)	0.00351	0.00365	0.0105	0.0112	0.00428
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.82	2.95	5.48	6.10	2.12
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247638-6				
	Description	Surface Water				
	Sampled Date	16-MAR-19				
	Sampled Time	10:00				
	Client ID	DS1-30				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	45.4				
	Hardness (as CaCO3) (mg/L)	15.1				
	pH (pH)	7.15				
	Total Suspended Solids (mg/L)	<1.0				
	Total Dissolved Solids (mg/L)	25.6				
	Turbidity (NTU)	0.19				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.9				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	9.9				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	4.31				
	Fluoride (F) (mg/L)	0.054				
	Nitrate (as N) (mg/L)	0.0063				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	0.125				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	0.0021				
	Phosphorus (P)-Total (mg/L)	0.0037				
	Silicate (as SiO2) (mg/L)	2.14				
	Sulfate (SO4) (mg/L)	3.69				
Cyanides	Cyanide, Total (mg/L)	<0.0010				
	Cyanide, Free (mg/L)	<0.0010				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.82				
	Total Organic Carbon (mg/L)	3.45				
Total Metals	Aluminum (Al)-Total (mg/L)	0.0059				
	Antimony (Sb)-Total (mg/L)	<0.00010				
	Arsenic (As)-Total (mg/L)	0.00014				
	Barium (Ba)-Total (mg/L)	0.00761				
	Beryllium (Be)-Total (mg/L)	<0.00010				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				
	Calcium (Ca)-Total (mg/L)	4.18				
	Cesium (Cs)-Total (mg/L)	<0.000010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247638-1	L2247638-2	L2247638-3	L2247638-4	L2247638-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-MAR-19	17-MAR-19	16-MAR-19	16-MAR-19	16-MAR-19
	Sampled Time	01:50	16:30	12:17	11:50	09:30
	Client ID	TPS-62	TPN-120	A76-31	A76-32	DS1-29
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	0.00056	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	0.013	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.12	1.19	1.66	1.79	0.783
	Manganese (Mn)-Total (mg/L)	0.00037	0.00037	0.00106	0.00107	0.00080
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000166	0.000171	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	0.00078	0.00081	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.617	0.664	0.980	1.07	0.417
	Rubidium (Rb)-Total (mg/L)	0.00089	0.00099	0.00131	0.00144	0.00055
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	<0.10	<0.10	0.66	0.71	0.40
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.47	1.53	0.932	1.04	0.917
	Strontium (Sr)-Total (mg/L)	0.0134	0.0138	0.0282	0.0308	0.00986
	Sulfur (S)-Total (mg/L)	2.14	2.15	1.66	1.80	0.71
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000036	0.000036	0.000014	0.000013	0.000026
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0013	<0.0010	<0.0010	<0.0010	0.0032
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00019	0.00020	0.00020	0.00022	0.00011
	Barium (Ba)-Dissolved (mg/L)	0.00367	0.00398	0.0105	0.0121	0.00466
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247638-6				
	Description	Surface Water				
	Sampled Date	16-MAR-19				
	Sampled Time	10:00				
	Client ID	DS1-30				
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00023				
	Cobalt (Co)-Total (mg/L)	<0.00010				
	Copper (Cu)-Total (mg/L)	<0.00050				
	Iron (Fe)-Total (mg/L)	0.015				
	Lead (Pb)-Total (mg/L)	<0.000050				
	Lithium (Li)-Total (mg/L)	<0.0010				
	Magnesium (Mg)-Total (mg/L)	1.24				
	Manganese (Mn)-Total (mg/L)	0.00156				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	0.000053				
	Nickel (Ni)-Total (mg/L)	<0.00050				
	Phosphorus (P)-Total (mg/L)	<0.050				
	Potassium (K)-Total (mg/L)	0.795				
	Rubidium (Rb)-Total (mg/L)	0.00091				
	Selenium (Se)-Total (mg/L)	<0.000050				
	Silicon (Si)-Total (mg/L)	0.99				
	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	1.63				
	Strontium (Sr)-Total (mg/L)	0.0186				
	Sulfur (S)-Total (mg/L)	1.22				
	Tellurium (Te)-Total (mg/L)	<0.00020				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Thorium (Th)-Total (mg/L)	<0.00010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	<0.00030				
	Tungsten (W)-Total (mg/L)	<0.00010				
	Uranium (U)-Total (mg/L)	0.000033				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.000060				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0042				
	Antimony (Sb)-Dissolved (mg/L)	<0.00010				
	Arsenic (As)-Dissolved (mg/L)	0.00013				
	Barium (Ba)-Dissolved (mg/L)	0.00785				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2247638-1	L2247638-2	L2247638-3	L2247638-4	L2247638-5
	Sample ID	L2247638-1	L2247638-2	L2247638-3	L2247638-4	L2247638-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-MAR-19	17-MAR-19	16-MAR-19	16-MAR-19	16-MAR-19
	Sampled Time	01:50	16:30	12:17	11:50	09:30
	Client ID	TPS-62	TPN-120	A76-31	A76-32	DS1-29
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.83	2.89	5.48	5.89	2.13
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	0.00014	<0.00010	<0.00010	<0.00010	0.00020
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00040	0.00040	0.00027	0.00089	0.00029
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.16	1.20	1.70	1.83	0.826
	Manganese (Mn)-Dissolved (mg/L)	0.00020	0.00017	0.00027	0.00044	0.00040
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000192	0.000202	<0.000050	<0.000050	0.000052
	Nickel (Ni)-Dissolved (mg/L)	0.00059	<0.00050	0.00069	0.00081	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.622	0.666	0.947	1.03	0.436
	Rubidium (Rb)-Dissolved (mg/L)	0.00081	0.00091	0.00135	0.00154	0.00060
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.055	0.055	0.682	0.716	0.381
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.48	1.53	0.940	1.01	0.979
	Strontium (Sr)-Dissolved (mg/L)	0.0135	0.0138	0.0288	0.0318	0.00986
	Sulfur (S)-Dissolved (mg/L)	2.06	1.96	1.70	1.83	0.58
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000035	0.000034	0.000011	0.000013	0.000024
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247638-6				
	Description	Surface Water				
	Sampled Date	16-MAR-19				
	Sampled Time	10:00				
	Client ID	DS1-30				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				
	Calcium (Ca)-Dissolved (mg/L)	3.98				
	Cesium (Cs)-Dissolved (mg/L)	<0.000010				
	Chromium (Cr)-Dissolved (mg/L)	0.00028				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00038				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	1.25				
	Manganese (Mn)-Dissolved (mg/L)	0.00078				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000061				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.764				
	Rubidium (Rb)-Dissolved (mg/L)	0.00087				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	1.00				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	1.67				
	Strontium (Sr)-Dissolved (mg/L)	0.0181				
	Sulfur (S)-Dissolved (mg/L)	1.23				
	Tellurium (Te)-Dissolved (mg/L)	<0.00020				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Thorium (Th)-Dissolved (mg/L)	<0.00010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Tungsten (W)-Dissolved (mg/L)	<0.00010				
	Uranium (U)-Dissolved (mg/L)	0.000029				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0382 DTC				
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L2247638-1
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L2247638-6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2247638-6
Matrix Spike	Boron (B)-Dissolved	MS-B	L2247638-6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2247638-6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2247638-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2247638-6
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L2247638-6
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2247638-6
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2247638-6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2247638-6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2247638-6
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2247638-6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2247638-1, -2, -3, -4, -5, -6
Matrix Spike	Silicate (as SiO2)	MS-B	L2247638-1, -2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

Reference Information

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

L2247638-COFC

COC # ____________

Page 1 of 1

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Rep…	
☑ Sta…	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	ENV

…ce Requested (Rush for routine analysis subject to availability)

- …ular (Standard Turnaround Times - Business Days)
- ◯ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ◯ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ◯ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	TPS-62	12-Mar-19	13:50	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TPN-120	17-Mar-19	16:30	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	A76-31	16-Mar-19	12:17	Surface Water	x	x	x	x	x	x	x	x	x	x			10
	A76-32	16-Mar-19	11:50	Surface Water	x	x	x	x	x	x	x	x	x	x			10
	DS1-29	16-Mar-19	9:30	Surface Water	x	x	x	x	x	x	x	x	x	x			10
	DS1-30	16-Mar-19	10:00	Surface Water	x	x	x	x	x	x	x	x	x	x			10
	NEM-37	07-Mar-19	12:18	Surface Water										x			1
	NEM-38	07-Mar-19	13:11	Surface Water										x			1
	March DUP-3	07-Mar-19	12:18	Surface Water										x			1
	LK1-7	14-Mar-19	13:50	Surface Water										x			1
	LK1-8	14-Mar-19	13:24	Surface Water										x			1
	LK8-7	15-Mar-19	14:50	Surface Water										x			1
	LK8-8	15-Mar-19	15:30	Surface Water										x			1
	LK5-7	09-Mar-19	12:30	Surface Water										x			1
	LK5-8	09-Mar-19	13:28	Surface Water										x			1
	TPE-120	17-Mar-19	10:30	Surface Water										X			1
	TPE-121	17-Mar-19	13:30	Surface Water										X			1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Louis Dubois	Date (dd-mmm-yy) 18-Mar-19	Time (hh-mm) 9:30	Received by: HA	Date: 3/21	Time: 1012	Temperature: 9(2.2)°C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 21-MAR-19
Report Date: 01-APR-19 17:46 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2247639

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247639-1	L2247639-2	L2247639-3	L2247639-4	L2247639-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	17-MAR-19	17-MAR-19	15-MAR-19	15-MAR-19	14-MAR-19
	Sampled Time	10:30	13:30	14:50	15:30	13:50
	Client ID	TPE-120	TPE-121	LK8-7	LK8-8	LK1-7
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	39.2	36.4	20.3	18.0	26.5
	Hardness (as CaCO3) (mg/L)	13.4	12.4	7.23	6.17	9.16
	pH (pH)	7.18	7.17	7.04	6.97	7.06
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	23.9	21.7	14.6	14.1	18.8
	Turbidity (NTU)	<0.10	<0.10	<0.10	0.17	0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.7	8.6	6.3	5.5	8.4
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.7	8.6	6.3	5.5	8.4
	Ammonia, Total (as N) (mg/L)	0.0156	0.0162	0.0054	0.0102	0.0163
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	1.03	1.04	0.78	0.69	1.27
	Fluoride (F) (mg/L)	0.088	0.082	0.032	0.030	0.049
	Nitrate (as N) (mg/L)	0.0134	0.0181	<0.0050	<0.0050	0.0083
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.074	0.103	0.069	0.069	0.184
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	0.0021	0.0022	0.0027	0.0025
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	0.0022	0.0030
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	0.73	0.63	0.76
	Sulfate (SO4) (mg/L)	6.16	6.00	1.82	1.64	1.72
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.47	1.63	1.69	1.40	2.40
	Total Organic Carbon (mg/L)	1.36	1.66	2.07	1.65	2.35
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	0.0031	0.0063	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00029	0.00020	0.00017	0.00017	0.00011
	Barium (Ba)-Total (mg/L)	0.00372	0.00356	0.00301	0.00283	0.00466
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	3.31	2.94	1.48	1.31	2.23
	Cesium (Cs)-Total (mg/L)	0.000013	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247639-6				
	Description	Surface Water				
	Sampled Date	14-MAR-19				
	Sampled Time	13:24				
	Client ID	LK1-8				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	24.9				
	Hardness (as CaCO3) (mg/L)	8.79				
	pH (pH)	7.04				
	Total Suspended Solids (mg/L)	<1.0				
	Total Dissolved Solids (mg/L)	17.1				
	Turbidity (NTU)	<0.10				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	7.9				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	7.9				
	Ammonia, Total (as N) (mg/L)	0.0198				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	1.18				
	Fluoride (F) (mg/L)	0.050				
	Nitrate (as N) (mg/L)	<0.0050				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	0.116				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	0.0037				
	Phosphorus (P)-Total (mg/L)	0.0023				
	Silicate (as SiO2) (mg/L)	0.62				
	Sulfate (SO4) (mg/L)	1.64				
Cyanides	Cyanide, Total (mg/L)	<0.0010				
	Cyanide, Free (mg/L)	<0.0010				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.38				
	Total Organic Carbon (mg/L)	2.11				
Total Metals	Aluminum (Al)-Total (mg/L)	0.0031				
	Antimony (Sb)-Total (mg/L)	<0.00010				
	Arsenic (As)-Total (mg/L)	0.00013				
	Barium (Ba)-Total (mg/L)	0.00392				
	Beryllium (Be)-Total (mg/L)	<0.00010				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				
	Calcium (Ca)-Total (mg/L)	2.04				
	Cesium (Cs)-Total (mg/L)	<0.000010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247639-1	L2247639-2	L2247639-3	L2247639-4	L2247639-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	17-MAR-19	17-MAR-19	15-MAR-19	15-MAR-19	14-MAR-19
	Sampled Time	10:30	13:30	14:50	15:30	13:50
	Client ID	TPE-120	TPE-121	LK8-7	LK8-8	LK1-7
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00035	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	0.013	0.068
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.31	1.18	0.851	0.758	0.980
	Manganese (Mn)-Total (mg/L)	0.00035	0.00040	0.00065	0.00063	0.00145
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000161	0.000160	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.660	0.631	0.431	0.382	0.449
	Rubidium (Rb)-Total (mg/L)	0.00096	0.00095	0.00066	0.00063	0.00057
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	<0.10	<0.10	0.36	0.33	0.34
	Silver (Ag)-Total (mg/L)	<0.000010	0.000013	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.52	1.52	0.652	0.568	0.942
	Strontium (Sr)-Total (mg/L)	0.0149	0.0135	0.00686	0.00604	0.0120
	Sulfur (S)-Total (mg/L)	2.22	2.16	0.72	0.63	0.71
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000037	0.000035	0.000014	0.000013	0.000029
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0012
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00030	0.00020	0.00015	0.00014	0.00011
	Barium (Ba)-Dissolved (mg/L)	0.00366	0.00340	0.00301	0.00268	0.00455
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247639-6				
	Description	Surface Water				
	Sampled Date	14-MAR-19				
	Sampled Time	13:24				
	Client ID	LK1-8				
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010				
	Cobalt (Co)-Total (mg/L)	<0.00010				
	Copper (Cu)-Total (mg/L)	<0.00050				
	Iron (Fe)-Total (mg/L)	<0.010				
	Lead (Pb)-Total (mg/L)	<0.000050				
	Lithium (Li)-Total (mg/L)	<0.0010				
	Magnesium (Mg)-Total (mg/L)	0.948				
	Manganese (Mn)-Total (mg/L)	0.00070				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	<0.000050				
	Nickel (Ni)-Total (mg/L)	<0.00050				
	Phosphorus (P)-Total (mg/L)	<0.050				
	Potassium (K)-Total (mg/L)	0.426				
	Rubidium (Rb)-Total (mg/L)	0.00055				
	Selenium (Se)-Total (mg/L)	<0.000050				
	Silicon (Si)-Total (mg/L)	0.32				
	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	0.906				
	Strontium (Sr)-Total (mg/L)	0.0112				
	Sulfur (S)-Total (mg/L)	0.54				
	Tellurium (Te)-Total (mg/L)	<0.00020				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Thorium (Th)-Total (mg/L)	<0.00010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	<0.00030				
	Tungsten (W)-Total (mg/L)	<0.00010				
	Uranium (U)-Total (mg/L)	0.000029				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.000060				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0011				
	Antimony (Sb)-Dissolved (mg/L)	<0.00010				
	Arsenic (As)-Dissolved (mg/L)	0.00012				
	Barium (Ba)-Dissolved (mg/L)	0.00378				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2247639-1	L2247639-2	L2247639-3	L2247639-4	L2247639-5
	Sample ID	L2247639-1	L2247639-2	L2247639-3	L2247639-4	L2247639-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	17-MAR-19	17-MAR-19	15-MAR-19	15-MAR-19	14-MAR-19
	Sampled Time	10:30	13:30	14:50	15:30	13:50
	Client ID	TPE-120	TPE-121	LK8-7	LK8-8	LK1-7
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	3.26	3.04	1.53	1.27	2.07
	Cesium (Cs)-Dissolved (mg/L)	0.000012	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00042	0.00041	0.00036	0.00036	0.00028
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.28	1.17	0.830	0.729	0.966
	Manganese (Mn)-Dissolved (mg/L)	0.00013	0.00016	0.00044	0.00030	0.00043
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000156	0.000160	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.628	0.631	0.441	0.361	0.430
	Rubidium (Rb)-Dissolved (mg/L)	0.00095	0.00091	0.00070	0.00061	0.00060
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.074	0.060	0.349	0.291	0.327
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.51	1.52	0.703	0.553	0.921
	Strontium (Sr)-Dissolved (mg/L)	0.0144	0.0136	0.00687	0.00583	0.0113
	Sulfur (S)-Dissolved (mg/L)	2.07	2.09	0.62	0.52	0.63
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000032	0.000029	0.000012	0.000011	0.000025
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	0.0011	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2247639-6
	Description	Surface Water
	Sampled Date	14-MAR-19
	Sampled Time	13:24
	Client ID	LK1-8
Grouping	**Analyte**	
WATER		
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	1.98
	Cesium (Cs)-Dissolved (mg/L)	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00027
	Iron (Fe)-Dissolved (mg/L)	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.932
	Manganese (Mn)-Dissolved (mg/L)	0.00033
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050
	Potassium (K)-Dissolved (mg/L)	0.410
	Rubidium (Rb)-Dissolved (mg/L)	0.00049
	Selenium (Se)-Dissolved (mg/L)	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.305
	Silver (Ag)-Dissolved (mg/L)	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.893
	Strontium (Sr)-Dissolved (mg/L)	0.0109
	Sulfur (S)-Dissolved (mg/L)	0.62
	Tellurium (Te)-Dissolved (mg/L)	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000025
	Vanadium (V)-Dissolved (mg/L)	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2247639-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2247639-1, -2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Reference Information

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

Reference Information

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody

L2247639-COFC

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report	
☑ Stanc	
☑ PDF ☐ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◯ Regular (Standard Turnaround Times - Business Days)
- ◯ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ◯ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ◯ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
	TPE-120	17-Mar-19	10:30	Surface Water	x	x	x	x	x	x	x	x	x				
	TPE-121	17-Mar-19	13:30	Surface Water	x	x	x	x	x	x	x	x	x				
	LK8-7	15-Mar-19	14:50	Surface Water	x	x	x	x	x	x	x	x	x				
	LK8-8	15-Mar-19	15:30	Surface Water	x	x	x	x	x	x	x	x	x				
	LK1-7	14-Mar-19	13:50	Surface Water	x	x	x	x	x	x	x	x	x				
	LK1-8	14-Mar-19	13:24	Surface Water	x	x	x	x	x	x	x	x	x				

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations:
			HA	3/21	1012	5c 9(of2)				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 05-APR-19
Report Date: 18-APR-19 11:47 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2254150

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP-SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-1	L2254150-2	L2254150-3	L2254150-4	L2254150-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	18-MAR-19	28-MAR-19	28-MAR-19	29-MAR-19	29-MAR-19
	Sampled Time	11:45	14:30	16:00	09:30	10:20
	Client ID	TPN-121	WAL-90	WAL-89	SPL-120	SPL-121
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.247	1.49	0.864	0.603	0.353

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-6	L2254150-7	L2254150-8	L2254150-9	L2254150-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	30-MAR-19	31-MAR-19	31-MAR-19	31-MAR-19	01-APR-19
	Sampled Time	15:10	11:10	12:05	16:20	09:10
	Client ID	TPS-61	PDL-74	PDL-73	TE-96	TEFF-49
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.327	0.315	0.328	0.633	0.568

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-11	L2254150-12	L2254150-13	L2254150-14	L2254150-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	01-APR-19	01-APR-19	01-APR-19	01-APR-19	28-MAR-19
	Sampled Time	09:55	10:50	14:05	14:55	
	Client ID	TEFF-48	TE-97	INUG-109	INUG-108	MARCH DUP-1
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.629	0.594	0.546	0.536	0.796

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-16				
	Description	Surface Water				
	Sampled Date	30-MAR-19				
	Sampled Time					
	Client ID	MARCH DUP -2				
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.317				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-1	L2254150-2	L2254150-3	L2254150-4	L2254150-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	18-MAR-19	28-MAR-19	28-MAR-19	29-MAR-19	29-MAR-19
	Sampled Time	11:45	14:30	16:00	09:30	10:20
	Client ID	TPN-121	WAL-90	WAL-89	SPL-120	SPL-121
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	34.8	61.1	65.5	48.5	50.7
	Hardness (as CaCO3) (mg/L)	11.9	26.8	29.0	19.9	19.8
	pH (pH)	7.00	7.42	7.45	7.25	7.26
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	24.1	43.2	52.2	32.5	27.4
	Turbidity (NTU)	<0.10	<0.10	0.15	<0.10	<0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.0	22.2	23.9	14.0	14.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	8.0	22.2	23.9	14.0	14.0
	Ammonia, Total (as N) (mg/L)	0.0215	0.0182	0.0156	0.0148	0.0118
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	1.00	1.19	1.27	1.16	1.23
	Fluoride (F) (mg/L)	0.084	0.071	0.073	0.093	0.100
	Nitrate (as N) (mg/L)	0.0175	0.0150	0.0186	0.0078	0.0122
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.086	0.131	0.145	0.096	0.117
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	0.0017	0.0015
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	0.95	1.08	<0.50	<0.50
	Sulfate (SO4) (mg/L)	5.95	7.24	7.51	7.03	7.50
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.08	2.47	2.38	1.94	2.07
	Total Organic Carbon (mg/L)	1.74	2.42	2.35	1.77	2.16
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00019	0.00031	0.00035	0.00028	0.00030
	Barium (Ba)-Total (mg/L)	0.00366	0.00388	0.00402	0.00359	0.00397
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.87	7.30	7.70	4.98	5.18
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	0.000012	0.000013

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-6	L2254150-7	L2254150-8	L2254150-9	L2254150-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	30-MAR-19	31-MAR-19	31-MAR-19	31-MAR-19	01-APR-19
	Sampled Time	15:10	11:10	12:05	16:20	09:10
	Client ID	TPS-61	PDL-74	PDL-73	TE-96	TEFF-49
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	35.8	23.7	23.7	39.6	26.5
	Hardness (as CaCO3) (mg/L)	12.3	9.85	9.85	15.2	9.30
	pH (pH)	7.03	7.04	7.04	7.13	6.96
	Total Suspended Solids (mg/L)	1.1	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	23.9	18.2	17.8	22.5	18.8
	Turbidity (NTU)	<0.10	<0.10	<0.10	<0.10	<0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.4	8.4	8.5	10.7	6.9
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	8.4	8.4	8.5	10.7	6.9
	Ammonia, Total (as N) (mg/L)	0.0197	0.0093	0.0071	0.0072	0.0064
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	1.04	0.70	0.71	1.22	1.04
	Fluoride (F) (mg/L)	0.088	0.042	0.044	0.097	0.085
	Nitrate (as N) (mg/L)	0.0168	<0.0050	<0.0050	0.0066	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.094	0.068	0.074	0.095	0.075
	Orthophosphate-Dissolved (as P) (mg/L)	0.0014	0.0010	0.0011	0.0011	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	0.0053	0.0027	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	6.20	1.89	1.90	5.34	3.50
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.49	1.64	1.67	1.90	1.93
	Total Organic Carbon (mg/L)	1.48	1.53	1.52	1.90	1.63
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00019	0.00017	0.00015	0.00017	<0.00010
	Barium (Ba)-Total (mg/L)	0.00363	0.00205	0.00208	0.00395	0.00325
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.82	2.49	2.43	3.74	2.11
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-11	L2254150-12	L2254150-13	L2254150-14	L2254150-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	01-APR-19	01-APR-19	01-APR-19	01-APR-19	28-MAR-19
	Sampled Time	09:55	10:50	14:05	14:55	
	Client ID	TEFF-48	TE-97	INUG-109	INUG-108	MARCH DUP-1
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	24.2	33.2	20.0	27.2	65.1
	Hardness (as CaCO3) (mg/L)	8.68	12.4	7.37	10.5	28.4
	pH (pH)	6.91	7.02	6.91	7.01	7.43
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	17.3	23.5	14.4	19.6	47.2
	Turbidity (NTU)	<0.10	<0.10	<0.10	<0.10	0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	6.3	9.2	6.4	8.7	24.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	6.3	9.2	6.4	8.7	24.0
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0165	0.0116	0.0149
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.95	1.14	1.01	1.42	1.25
	Fluoride (F) (mg/L)	0.079	0.094	0.077	0.091	0.073
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0185
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.078	0.092	0.092	0.106	0.147
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	0.0027	0.0022	0.0026
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	1.07
	Sulfate (SO4) (mg/L)	3.20	4.38	1.20	1.71	7.49
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.65	2.05	2.03	2.58	2.53
	Total Organic Carbon (mg/L)	1.51	2.02	2.23	2.48	2.80
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00010	0.00015	0.00011	0.00010	0.00032
	Barium (Ba)-Total (mg/L)	0.00305	0.00371	0.00194	0.00271	0.00410
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	1.93	2.81	1.46	1.89	7.60
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-16	L2254150-17	L2254150-18		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	30-MAR-19	01-APR-19	30-MAR-19		
	Sampled Time					
	Client ID	MARCH DUP -2	MARCH DI	MARCH EB		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	35.4	<2.0	<2.0		
	Hardness (as CaCO3) (mg/L)	12.3	<0.50	<0.50 HTC		
	pH (pH)	7.02	5.17	5.18		
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0		
	Total Dissolved Solids (mg/L)	22.2	<3.0	<3.0		
	Turbidity (NTU)	<0.10	<0.10	<0.10		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.1	<1.0	<1.0		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	8.1	<1.0	<1.0		
	Ammonia, Total (as N) (mg/L)	0.0190	<0.0050	<0.0050		
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050		
	Chloride (Cl) (mg/L)	1.00	<0.10	<0.10		
	Fluoride (F) (mg/L)	0.086	<0.020	<0.020		
	Nitrate (as N) (mg/L)	0.0160	<0.0050	<0.0050		
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010		
	Total Kjeldahl Nitrogen (mg/L)	0.091	<0.050	<0.050		
	Orthophosphate-Dissolved (as P) (mg/L)	0.0011	<0.0010	<0.0010		
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020		
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020		
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50		
	Sulfate (SO4) (mg/L)	6.08	<0.30	<0.30		
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.64	<0.50			
	Total Organic Carbon (mg/L)	1.64	<0.50	<0.50		
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	<0.0030		
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00017	<0.00010	<0.00010		
	Barium (Ba)-Total (mg/L)	0.00386	<0.00010	<0.00010		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010		
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Calcium (Ca)-Total (mg/L)	2.99	<0.050	<0.050		
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-1	L2254150-2	L2254150-3	L2254150-4	L2254150-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	18-MAR-19	28-MAR-19	28-MAR-19	29-MAR-19	29-MAR-19
	Sampled Time	11:45	14:30	16:00	09:30	10:20
	Client ID	TPN-121	WAL-90	WAL-89	SPL-120	SPL-121
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00109	0.00098	0.00055	0.00063
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.08	2.00	2.18	1.59	1.61
	Manganese (Mn)-Total (mg/L)	0.00038	0.00148	0.00168	0.00035	0.00041
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000150	0.000266	0.000229	0.000174	0.000173
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00052	<0.00050	0.00051	0.00051
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.628	0.746	0.790	0.705	0.755
	Rubidium (Rb)-Total (mg/L)	0.00095	0.00109	0.00109	0.00106	0.00120
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	0.000053	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	<0.10	0.48	0.53	0.18	0.20
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.34	0.943	1.01	1.25	1.37
	Strontium (Sr)-Total (mg/L)	0.0134	0.0403	0.0412	0.0222	0.0226
	Sulfur (S)-Total (mg/L)	2.26	2.81	2.69	2.41	2.66
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	DLB <0.00040	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000036	0.000050	0.000047	0.000039	0.000045
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0013	<0.0010	0.0011	0.0016	0.0014
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00021	0.00028	0.00030	0.00027	0.00030
	Barium (Ba)-Dissolved (mg/L)	0.00366	0.00379	0.00418	0.00382	0.00413
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-6	L2254150-7	L2254150-8	L2254150-9	L2254150-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	30-MAR-19	31-MAR-19	31-MAR-19	31-MAR-19	01-APR-19
	Sampled Time	15:10	11:10	12:05	16:20	09:10
	Client ID	TPS-61	PDL-74	PDL-73	TE-96	TEFF-49
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.08	0.838	0.835	1.34	0.855
	Manganese (Mn)-Total (mg/L)	0.00030	0.00063	0.00054	0.00051	0.00051
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000122	<0.000050	<0.000050	0.000083	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00051	0.00050	0.00054	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.613	0.388	0.368	0.764	0.594
	Rubidium (Rb)-Total (mg/L)	0.00084	0.00045	0.00045	0.00131	0.00125
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	<0.10	0.15	0.15	0.24	0.18
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.34	0.535	0.527	1.18	0.911
	Strontium (Sr)-Total (mg/L)	0.0130	0.0101	0.00985	0.0182	0.0118
	Sulfur (S)-Total (mg/L)	2.08	0.87	0.92	2.14	1.50
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000033	0.000016	0.000019	0.000044	0.000041
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	0.000356	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0014	0.0010	0.0011	0.0014	0.0012
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00018	0.00014	0.00015	0.00016	0.00010
	Barium (Ba)-Dissolved (mg/L)	0.00386	0.00205	0.00202	0.00421	0.00342
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2254150-11	L2254150-12	L2254150-13	L2254150-14	L2254150-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	01-APR-19	01-APR-19	01-APR-19	01-APR-19	28-MAR-19
	Sampled Time	09:55	10:50	14:05	14:55	
	Client ID	TEFF-48	TE-97	INUG-109	INUG-108	MARCH DUP-1
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00099
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	0.789	1.07	0.882	1.08	2.13
	Manganese (Mn)-Total (mg/L)	0.00059	0.00051	0.00051	0.00074	0.00160
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	0.000060	<0.000050	<0.000050	0.000221
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.544	0.658	0.490	0.581	0.770
	Rubidium (Rb)-Total (mg/L)	0.00122	0.00121	0.00060	0.00079	0.00112
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.17	0.21	0.16	0.21	0.52
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.850	1.02	0.707	0.838	0.979
	Strontium (Sr)-Total (mg/L)	0.0106	0.0145	0.00796	0.0102	0.0414
	Sulfur (S)-Total (mg/L)	1.23	1.57	0.78	0.87	2.78
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000034	0.000038	0.000032	0.000041	0.000045
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0015	0.0014	0.0016	0.0015	0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	<0.00010	0.00012	<0.00010	0.00013	0.00029
	Barium (Ba)-Dissolved (mg/L)	0.00327	0.00379	0.00199	0.00308	0.00420
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-16	L2254150-17	L2254150-18		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	30-MAR-19	01-APR-19	30-MAR-19		
	Sampled Time					
	Client ID	MARCH DUP -2	MARCH DI	MARCH EB		
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00021	<0.00010	<0.00010		
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010		
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Magnesium (Mg)-Total (mg/L)	1.16	<0.0050	<0.0050		
	Manganese (Mn)-Total (mg/L)	0.00026	<0.00010	<0.00010		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.000140	<0.000050	<0.000050		
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	0.667	<0.050	<0.050		
	Rubidium (Rb)-Total (mg/L)	0.00094	<0.00020	<0.00020		
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Total (mg/L)	<0.10	<0.10	<0.10		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	1.44	<0.050	<0.050		
	Strontium (Sr)-Total (mg/L)	0.0138	<0.00020	<0.00020		
	Sulfur (S)-Total (mg/L)	2.34	<0.50	<0.50		
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030		
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Uranium (U)-Total (mg/L)	0.000036	<0.000010	<0.000010		
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030		
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0012	<0.0010			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00017	<0.00010			
	Barium (Ba)-Dissolved (mg/L)	0.00375	<0.00010			
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2254150-1 Surface Water 18-MAR-19 11:45 TPN-121	L2254150-2 Surface Water 28-MAR-19 14:30 WAL-90	L2254150-3 Surface Water 28-MAR-19 16:00 WAL-89	L2254150-4 Surface Water 29-MAR-19 09:30 SPL-120	L2254150-5 Surface Water 29-MAR-19 10:20 SPL-121
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.88	7.31	7.86	5.19	5.15
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000013	0.000014
	Chromium (Cr)-Dissolved (mg/L)	0.00017	<0.00010	<0.00010	<0.00010	0.00011
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00038	0.00108	0.00108	0.00057	0.00060
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.16	2.08	2.27	1.68	1.68
	Manganese (Mn)-Dissolved (mg/L)	0.00016	0.00019	0.00025	<0.00010	0.00024
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000163	0.000274	0.000255	0.000188	0.000210
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.637	0.757	0.781	0.738	0.757
	Rubidium (Rb)-Dissolved (mg/L)	0.00088	0.00120	0.00110	0.00116	0.00116
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	<0.050	0.415	0.465	0.137	0.142
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.59	0.961	1.03	1.32	1.47
	Strontium (Sr)-Dissolved (mg/L)	0.0144	0.0373	0.0395	0.0242	0.0246
	Sulfur (S)-Dissolved (mg/L)	1.93	2.23	2.38	2.35	2.51
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000030	0.000051	0.000046	0.000039	0.000040
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0022	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-6	L2254150-7	L2254150-8	L2254150-9	L2254150-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	30-MAR-19	31-MAR-19	31-MAR-19	31-MAR-19	01-APR-19
	Sampled Time	15:10	11:10	12:05	16:20	09:10
	Client ID	TPS-61	PDL-74	PDL-73	TE-96	TEFF-49
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	3.00	2.52	2.51	3.81	2.16
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00037	0.00032	0.00036	0.00046	0.00031
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.17	0.865	0.872	1.38	0.946
	Manganese (Mn)-Dissolved (mg/L)	0.00013	0.00011	0.00014	0.00028	0.00024
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000168	0.000058	<0.000050	0.000118	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.637	0.369	0.368	0.764	0.622
	Rubidium (Rb)-Dissolved (mg/L)	0.00089	0.00050	0.00050	0.00144	0.00134
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.051	0.114	0.117	0.198	0.150
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.46	0.541	0.539	1.26	0.997
	Strontium (Sr)-Dissolved (mg/L)	0.0142	0.0104	0.0104	0.0192	0.0123
	Sulfur (S)-Dissolved (mg/L)	2.06	0.58	0.75	1.69	1.26
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000034	0.000018	0.000018	0.000043	0.000041
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-11	L2254150-12	L2254150-13	L2254150-14	L2254150-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	01-APR-19	01-APR-19	01-APR-19	01-APR-19	28-MAR-19
	Sampled Time	09:55	10:50	14:05	14:55	
	Client ID	TEFF-48	TE-97	INUG-109	INUG-108	MARCH DUP-1
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.04	3.05	1.44	2.11	7.67
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00028	DTC 0.00307	0.00033	0.00046	0.00110
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.870	1.16	0.919	1.28	2.24
	Manganese (Mn)-Dissolved (mg/L)	0.00020	0.00033	0.00022	0.00046	0.00028
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	0.000078	<0.000050	<0.000050	0.000240
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.583	0.707	0.469	0.675	0.780
	Rubidium (Rb)-Dissolved (mg/L)	0.00120	0.00136	0.00073	0.00103	0.00120
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.131	0.191	0.121	0.185	0.475
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.903	1.10	0.705	0.977	1.02
	Strontium (Sr)-Dissolved (mg/L)	0.0114	0.0158	0.00849	0.0114	0.0396
	Sulfur (S)-Dissolved (mg/L)	1.04	1.85	<0.50	0.62	2.52
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000032	0.000037	0.000033	0.000038	0.000043
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2254150-16	L2254150-17	L2254150-18		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	30-MAR-19	01-APR-19	30-MAR-19		
	Sampled Time					
	Client ID	MARCH DUP -2	MARCH DI	MARCH EB		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	2.97	<0.050			
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00036	<0.00020			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	1.18	<0.0050			
	Manganese (Mn)-Dissolved (mg/L)	0.00016	<0.00010			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000142	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.649	<0.050			
	Rubidium (Rb)-Dissolved (mg/L)	0.00095	<0.00020			
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	0.053	<0.050			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	1.49	<0.050			
	Strontium (Sr)-Dissolved (mg/L)	0.0137	<0.00020			
	Sulfur (S)-Dissolved (mg/L)	2.04	<0.50			
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Dissolved (mg/L)	0.000033	<0.000010			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Tellurium (Te)-Total	MB-LOR	L2254150-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Laboratory Control Sample	Sulfur (S)-Dissolved	MES	L2254150-12
Matrix Spike	Dissolved Organic Carbon	MS-B	L2254150-1
Matrix Spike	Dissolved Organic Carbon	MS-B	L2254150-10, -12, -13, -14, -15, -16, -17
Matrix Spike	Total Organic Carbon	MS-B	L2254150-18
Matrix Spike	Total Organic Carbon	MS-B	L2254150-18
Matrix Spike	Total Organic Carbon	MS-B	L2254150-4
Matrix Spike	Total Organic Carbon	MS-B	L2254150-4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2254150-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

		Fluoride in Water by IC	EPA 300.1 (mod)

Reference Information

F-IC-N-VA Water

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

Reference Information

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☑ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q39503	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: ENV

Analysis Request — Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	TPN-121	18-03-2019	11:45	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	WAL-90	28-03-2019	14:30	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	WAL-89	28-03-2019	16:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	SPL-120	29-03-2019	9:30	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	SPL-121	29-03-2019	10:20	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TPS-61	30-03-2019	15:10	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	PDL-74	31-03-2019	11:10	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	PDL-73	31-03-2019	12:05	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TE-96	31-03-2019	16:20	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TEFF-49	01-Apr-19	9:10	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TEFF-48	01-Apr-19	9:55	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TE-97	01-Apr-19	10:50	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	INUG-109	01-Apr-19	14:05	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	INUG-108	01-Apr-19	14:55	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	March DUP-1	28-03-2019		Surface Water	X	X	X	X	X	X	X	X	X	X			10
	March DUP-2	30-03-2019		Surface Water	X	X	X	X	X	X	X	X	X	X			10
	March DI	01-Apr-19		Surface Water	X	X	X	X	X	X	X	X	X				9
	March EB	30-03-2019		Surface Water	X	X	X		X	X		X					6

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Jamie K	Date (dd-mmm-yy) 24-Sep-18	Time (hh-mm) 9:00	Received by: JK	Date: APR - 5 2019	Time: 850 AM	Temperature: 11,8,9 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

L2254150-COFC

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 16-MAY-19
Report Date: 29-MAY-19 12:44 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2274447

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACE WATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-1	L2274447-2	L2274447-3	L2274447-4	L2274447-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19
	Sampled Time	09:40	10:30	14:10	14:35	12:35
	Client ID	MAM-39	MAM-40	LK5-9	LK5-10	LK1-9
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	173	106	38.6	39.0	28.7
	Hardness (as CaCO3) (mg/L)	63.7	38.5	15.6	15.6	10.4
	pH (pH)	7.24	7.10	7.35	7.34	7.15
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	94	65	27.5	26.9	20.6
	Turbidity (NTU)	0.17	0.16	0.14	0.12	0.12
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	12.0	8.5	14.4	14.5	9.1
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	12.0	8.5	14.4	14.5	9.1
	Ammonia, Total (as N) (mg/L)	0.0079	0.0058	<0.0050	0.0062	0.144
	Bromide (Br) (mg/L)	0.462	0.259	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	36.3	20.7	0.99	1.01	1.41
	Fluoride (F) (mg/L)	0.048	0.039	0.048	0.048	0.063
	Nitrate (as N) (mg/L)	0.126	<0.0050	<0.0050	<0.0050	0.0051
	Nitrite (as N) (mg/L)	0.0017	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.154	0.140	0.151	0.135	0.294
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0021	0.0043	0.0069	0.0027	0.0021
	Silicate (as SiO2) (mg/L)	1.28	1.22	1.45	1.33	0.69
	Sulfate (SO4) (mg/L)	7.13	5.67	2.83	2.88	2.02
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.54	2.05	1.94	2.15	2.41
	Total Organic Carbon (mg/L)	2.91	2.65	2.06	2.45	2.78
Total Metals	Aluminum (Al)-Total (mg/L)	0.0057	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00046	0.00032	0.00018	0.00017	0.00014
	Barium (Ba)-Total (mg/L)	0.0357	0.0204	0.00449	0.00469	0.00512
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	20.6	11.8	3.87	3.97	2.62
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-6	L2274447-7	L2274447-8	L2274447-9	L2274447-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-MAY-19	11-MAY-19	11-MAY-19	11-MAY-19	11-MAY-19
	Sampled Time	13:10	12:00	12:25	09:50	10:25
	Client ID	LK1-10	A20-33	A20-34	LK8-9	LK8-10
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	28.8	31.6	19.0	19.3	17.7
	Hardness (as CaCO3) (mg/L)	10.4	11.3	6.42	6.58	6.37
	pH (pH)	7.13	7.17	6.95	6.94	6.91
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	21.0	20.2	10.6	13.7	12.9
	Turbidity (NTU)	0.11	0.13	0.14	<0.10	0.12
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.0	10.2	5.7	5.7	5.2
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.0	10.2	5.7	5.7	5.2
	Ammonia, Total (as N) (mg/L)	0.0463	<0.0050	0.0563	<0.0050	0.0056
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	1.38	1.39	0.83	0.74	0.68
	Fluoride (F) (mg/L)	0.059	0.048	0.037	0.035	0.033
	Nitrate (as N) (mg/L)	0.0118	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.181	0.163	0.168	0.085	0.086
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0027	0.0023	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	0.66	1.38	0.93	0.58	0.52
	Sulfate (SO4) (mg/L)	2.03	2.27	1.33	1.84	1.71
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.49	2.73	1.98	1.70	1.76
	Total Organic Carbon (mg/L)	2.65	3.28	2.16	2.14	1.71
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00012	0.00016	0.00010	0.00015	0.00014
	Barium (Ba)-Total (mg/L)	0.00498	0.00743	0.00404	0.00294	0.00263
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.50	3.02	1.69	1.46	1.35
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2274447-11 Water 10-MAY-19 MAY DUP-3	L2274447-12 Water 10-MAY-19 MAY DUP-4	L2274447-13 Water 12-MAY-19 MAY EB	L2274447-14 Water 12-MAY-19 MAY DI	L2274447-15 Water 10-MAY-19 09:40 MAM-39-B
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	29.2	39.3	<2.0	<2.0	199
	Hardness (as CaCO3) (mg/L)	10.8	17.4	<0.50	<0.50	77.0
	pH (pH)	7.10	7.33	5.43	5.35	7.31
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	17.3	23.7	<3.0	<3.0	171
	Turbidity (NTU)	0.11	<0.10	<0.10	<0.10	0.27
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.1	14.2	<1.0	<1.0	13.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.1	14.2	<1.0	<1.0	13.0
	Ammonia, Total (as N) (mg/L)	0.0052	0.0097	<0.0050	<0.0050	0.0070
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	0.524
	Chloride (Cl) (mg/L)	1.33	0.97	<0.10	<0.10	42.3
	Fluoride (F) (mg/L)	0.050	0.039	<0.020	<0.020	0.039
	Nitrate (as N) (mg/L)	0.0116	<0.0050	<0.0050	<0.0050	0.106
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0011
	Total Kjeldahl Nitrogen (mg/L)	0.137	0.127	<0.050	<0.050	0.155
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	0.0027
	Phosphorus (P)-Total (mg/L)	0.0023	0.0023	<0.0020	<0.0020	0.0030
	Silicate (as SiO2) (mg/L)	0.67	1.35	<0.50	<0.50	1.03
	Sulfate (SO4) (mg/L)	1.93	2.74	<0.30	<0.30	8.05
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.35	1.96	<0.50	<0.50	3.24
	Total Organic Carbon (mg/L)	2.62	2.33	<0.50	<0.50	3.03
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	0.0046
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00013	0.00020	<0.00010	<0.00010	0.00041
	Barium (Ba)-Total (mg/L)	0.00516	0.00462	<0.00010	<0.00010	0.0439
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000067
	Calcium (Ca)-Total (mg/L)	2.50	3.88	<0.050	<0.050	29.1
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	0.000011

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-16				
	Description	Water				
	Sampled Date	10-MAY-19				
	Sampled Time	10:30				
	Client ID	MAM-40-B				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	107				
	Hardness (as CaCO3) (mg/L)	41.6				
	pH (pH)	7.09				
	Total Suspended Solids (mg/L)	<1.0				
	Total Dissolved Solids (mg/L)	86				
	Turbidity (NTU)	0.16				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.6				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	8.6				
	Ammonia, Total (as N) (mg/L)	0.0090				
	Bromide (Br) (mg/L)	0.248				
	Chloride (Cl) (mg/L)	20.7				
	Fluoride (F) (mg/L)	0.032				
	Nitrate (as N) (mg/L)	<0.0050				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	0.117				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020				
	Phosphorus (P)-Total (mg/L)	0.0025				
	Silicate (as SiO2) (mg/L)	1.08				
	Sulfate (SO4) (mg/L)	5.46				
Cyanides	Cyanide, Total (mg/L)	<0.0010				
	Cyanide, Free (mg/L)	<0.0010				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.21				
	Total Organic Carbon (mg/L)	2.41				
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030				
	Antimony (Sb)-Total (mg/L)	<0.00010				
	Arsenic (As)-Total (mg/L)	0.00033				
	Barium (Ba)-Total (mg/L)	0.0211				
	Beryllium (Be)-Total (mg/L)	<0.00010				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				
	Calcium (Ca)-Total (mg/L)	12.2				
	Cesium (Cs)-Total (mg/L)	<0.000010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-1	L2274447-2	L2274447-3	L2274447-4	L2274447-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19
	Sampled Time	09:40	10:30	14:10	14:35	12:35
	Client ID	MAM-39	MAM-40	LK5-9	LK5-10	LK1-9
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00054	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0075	0.0038	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	3.61	2.57	1.63	1.65	1.11
	Manganese (Mn)-Total (mg/L)	0.00246	0.00222	0.00128	0.00152	0.00091
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000246	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00220	0.00142	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	2.49	1.42	0.442	0.449	0.510
	Rubidium (Rb)-Total (mg/L)	0.00360	0.00209	0.00042	0.00048	0.00077
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.64	0.58	0.69	0.67	0.39
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.88	1.26	0.859	0.867	1.05
	Strontium (Sr)-Total (mg/L)	0.209	0.108	0.0153	0.0153	0.0148
	Sulfur (S)-Total (mg/L)	2.41	2.00	0.91	0.90	0.81
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000031	0.000014	0.000011	0.000012	0.000030
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0037	<0.0010	0.0014	<0.0010	0.0018
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00038	0.00028	0.00015	0.00016	0.00012
	Barium (Ba)-Dissolved (mg/L)	0.0335	0.0197	0.00450	0.00429	0.00476
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-6	L2274447-7	L2274447-8	L2274447-9	L2274447-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-MAY-19	11-MAY-19	11-MAY-19	11-MAY-19	11-MAY-19
	Sampled Time	13:10	12:00	12:25	09:50	10:25
	Client ID	LK1-10	A20-33	A20-34	LK8-9	LK8-10
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.12	1.01	0.575	0.791	0.735
	Manganese (Mn)-Total (mg/L)	0.00096	0.00222	0.00128	0.00116	0.00190
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.496	0.687	0.414	0.394	0.362
	Rubidium (Rb)-Total (mg/L)	0.00067	0.00073	0.00049	0.00074	0.00061
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.38	0.68	0.50	0.33	0.32
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.08	1.12	0.715	0.576	0.533
	Strontium (Sr)-Total (mg/L)	0.0140	0.0159	0.00908	0.00687	0.00641
	Sulfur (S)-Total (mg/L)	0.85	0.71	<0.50	0.72	0.60
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000027	0.000032	0.000022	0.000013	0.000012
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0017	0.0013	0.0016	0.0013	0.0011
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00010	0.00012	<0.00010	0.00012	0.00012
	Barium (Ba)-Dissolved (mg/L)	0.00473	0.00791	0.00370	0.00284	0.00252
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-11	L2274447-12	L2274447-13	L2274447-14	L2274447-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-MAY-19	10-MAY-19	12-MAY-19	12-MAY-19	10-MAY-19
	Sampled Time					09:40
	Client ID	MAY DUP-3	MAY DUP-4	MAY EB	MAY DI	MAM-39-B
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00059
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	RRV 0.000057	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0077
	Magnesium (Mg)-Total (mg/L)	1.12	1.65	<0.0050	<0.0050	4.79
	Manganese (Mn)-Total (mg/L)	0.00095	0.00137	<0.00010	<0.00010	0.00499
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000191
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00288
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.492	0.465	<0.050	<0.050	3.52
	Rubidium (Rb)-Total (mg/L)	0.00062	0.00047	<0.00020	<0.00020	0.00433
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.38	0.69	<0.10	<0.10	0.54
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.04	0.882	<0.050	<0.050	2.24
	Strontium (Sr)-Total (mg/L)	0.0136	0.0145	<0.00020	<0.00020	0.282
	Sulfur (S)-Total (mg/L)	0.69	0.98	<0.50	<0.50	2.68
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000026	0.000011	<0.000010	<0.000010	0.000029
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0013	<0.0010	<0.0010	<0.0010	0.0019
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	<0.00010	0.00016	<0.00010	<0.00010	0.00036
	Barium (Ba)-Dissolved (mg/L)	0.00504	0.00463	<0.00010	<0.00010	0.0427
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-16				
	Description	Water				
	Sampled Date	10-MAY-19				
	Sampled Time	10:30				
	Client ID	MAM-40-B				
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010				
	Cobalt (Co)-Total (mg/L)	<0.00010				
	Copper (Cu)-Total (mg/L)	<0.00050				
	Iron (Fe)-Total (mg/L)	<0.010				
	Lead (Pb)-Total (mg/L)	<0.000050				
	Lithium (Li)-Total (mg/L)	0.0039				
	Magnesium (Mg)-Total (mg/L)	2.43				
	Manganese (Mn)-Total (mg/L)	0.00230				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	<0.000050				
	Nickel (Ni)-Total (mg/L)	0.00133				
	Phosphorus (P)-Total (mg/L)	<0.050				
	Potassium (K)-Total (mg/L)	1.41				
	Rubidium (Rb)-Total (mg/L)	0.00195				
	Selenium (Se)-Total (mg/L)	<0.000050				
	Silicon (Si)-Total (mg/L)	0.59				
	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	1.23				
	Strontium (Sr)-Total (mg/L)	0.104				
	Sulfur (S)-Total (mg/L)	2.09				
	Tellurium (Te)-Total (mg/L)	<0.00020				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Thorium (Th)-Total (mg/L)	<0.00010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	<0.00030				
	Tungsten (W)-Total (mg/L)	<0.00010				
	Uranium (U)-Total (mg/L)	0.000016				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.000060				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0014				
	Antimony (Sb)-Dissolved (mg/L)	<0.00010				
	Arsenic (As)-Dissolved (mg/L)	0.00033				
	Barium (Ba)-Dissolved (mg/L)	0.0209				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-1	L2274447-2	L2274447-3	L2274447-4	L2274447-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19
	Sampled Time	09:40	10:30	14:10	14:35	12:35
	Client ID	MAM-39	MAM-40	LK5-9	LK5-10	LK1-9
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	19.7	11.2	3.71	3.72	2.38
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00052	0.00039	<0.00020	<0.00020	0.00029
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0070	0.0035	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	3.51	2.54	1.54	1.54	1.09
	Manganese (Mn)-Dissolved (mg/L)	0.00218	0.00153	0.00049	0.00065	0.00071
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000237	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	0.00212	0.00144	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	2.64	1.43	0.459	0.454	0.525
	Rubidium (Rb)-Dissolved (mg/L)	0.00360	0.00217	0.00049	0.00052	0.00066
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.606	0.548	0.674	0.655	0.352
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.80	1.28	0.837	0.824	1.10
	Strontium (Sr)-Dissolved (mg/L)	0.190	0.0976	0.0133	0.0132	0.0126
	Sulfur (S)-Dissolved (mg/L)	2.43	1.79	0.99	0.93	0.65
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000029	0.000012	<0.000010	<0.000010	0.000029
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0014	0.0014	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Speciated Metals	Arsenate (As V) (ug/L)	0.023		0.138		<0.020
	Arsenite (As III) (ug/L)	0.174		0.052		<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-6	L2274447-7	L2274447-8	L2274447-9	L2274447-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-MAY-19	11-MAY-19	11-MAY-19	11-MAY-19	11-MAY-19
	Sampled Time	13:10	12:00	12:25	09:50	10:25
	Client ID	LK1-10	A20-33	A20-34	LK8-9	LK8-10
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.36	2.80	1.65	1.38	1.30
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00028	0.00043	0.00023	0.00033	0.00031
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.10	1.05	0.561	0.760	0.759
	Manganese (Mn)-Dissolved (mg/L)	0.00080	0.00196	0.00079	0.00085	0.00054
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.507	0.772	0.439	0.401	0.384
	Rubidium (Rb)-Dissolved (mg/L)	0.00061	0.00092	0.00052	0.00062	0.00061
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.370	0.698	0.467	0.319	0.282
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.05	1.35	0.718	0.560	0.560
	Strontium (Sr)-Dissolved (mg/L)	0.0125	0.0137	0.00794	0.00590	0.00616
	Sulfur (S)-Dissolved (mg/L)	0.82	0.68	<0.50	0.54	<0.50
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	0.00018	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000023	0.000030	0.000020	<0.000010	0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0012	0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Speciated Metals	Arsenate (As V) (ug/L)		<0.020		<0.020	
	Arsenite (As III) (ug/L)		<0.020		0.070	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-11	L2274447-12	L2274447-13	L2274447-14	L2274447-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-MAY-19	10-MAY-19	12-MAY-19	12-MAY-19	10-MAY-19
	Sampled Time					09:40
	Client ID	MAY DUP-3	MAY DUP-4	MAY EB	MAY DI	MAM-39-B
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.44	3.96	<0.050	<0.050	24.0
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	0.000011
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00029	<0.00020	<0.00020	<0.00020	0.00054
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0081
	Magnesium (Mg)-Dissolved (mg/L)	1.13	1.84	<0.0050	<0.0050	4.16
	Manganese (Mn)-Dissolved (mg/L)	0.00083	0.00054	<0.00010	<0.00010	0.00271
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000154
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00255
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.510	0.499	<0.050	<0.050	3.07
	Rubidium (Rb)-Dissolved (mg/L)	0.00061	0.00057	<0.00020	<0.00020	0.00378
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.358	0.642	<0.050	<0.050	0.499
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.08	0.943	<0.050	<0.050	2.22
	Strontium (Sr)-Dissolved (mg/L)	0.0133	0.0149	<0.00020	<0.00020	0.246
	Sulfur (S)-Dissolved (mg/L)	0.64	0.99	<0.50	<0.50	2.69
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000026	<0.000010	<0.000010	<0.000010	0.000023
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Speciated Metals	Arsenate (As V) (ug/L)					
	Arsenite (As III) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-16				
	Description	Water				
	Sampled Date	10-MAY-19				
	Sampled Time	10:30				
	Client ID	MAM-40-B				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				
	Calcium (Ca)-Dissolved (mg/L)	12.0				
	Cesium (Cs)-Dissolved (mg/L)	<0.000010				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00039				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	0.0038				
	Magnesium (Mg)-Dissolved (mg/L)	2.82				
	Manganese (Mn)-Dissolved (mg/L)	0.00176				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000055				
	Nickel (Ni)-Dissolved (mg/L)	0.00149				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	1.59				
	Rubidium (Rb)-Dissolved (mg/L)	0.00215				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	0.551				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	1.40				
	Strontium (Sr)-Dissolved (mg/L)	0.104				
	Sulfur (S)-Dissolved (mg/L)	1.77				
	Tellurium (Te)-Dissolved (mg/L)	<0.00020				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Thorium (Th)-Dissolved (mg/L)	<0.00010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Tungsten (W)-Dissolved (mg/L)	<0.00010				
	Uranium (U)-Dissolved (mg/L)	0.000014				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0010				
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060				
Speciated Metals	Arsenate (As V) (ug/L)					
	Arsenite (As III) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-1	L2274447-2	L2274447-3	L2274447-4	L2274447-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19
	Sampled Time	09:40	10:30	14:10	14:35	12:35
	Client ID	MAM-39	MAM-40	LK5-9	LK5-10	LK1-9
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	<0.020		<0.020		<0.020
	Monomethylarsonic Acid (MMA, as As) (ug/L)	DLCI <0.030		<0.020		<0.020
	Arsenobetaine (AsB, as As) (ug/L)	<0.050		<0.050		<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-6	L2274447-7	L2274447-8	L2274447-9	L2274447-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-MAY-19	11-MAY-19	11-MAY-19	11-MAY-19	11-MAY-19
	Sampled Time	13:10	12:00	12:25	09:50	10:25
	Client ID	LK1-10	A20-33	A20-34	LK8-9	LK8-10
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)		<0.020		<0.020	
	Monomethylarsonic Acid (MMA, as As) (ug/L)		<0.020		<0.020	
	Arsenobetaine (AsB, as As) (ug/L)		<0.050		<0.050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-11	L2274447-12	L2274447-13	L2274447-14	L2274447-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-MAY-19	10-MAY-19	12-MAY-19	12-MAY-19	10-MAY-19
	Sampled Time					09:40
	Client ID	MAY DUP-3	MAY DUP-4	MAY EB	MAY DI	MAM-39-B
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)					
	Monomethylarsonic Acid (MMA, as As) (ug/L)					
	Arsenobetaine (AsB, as As) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274447-16				
	Description	Water				
	Sampled Date	10-MAY-19				
	Sampled Time	10:30				
	Client ID	MAM-40-B				
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)					
	Monomethylarsonic Acid (MMA, as As) (ug/L)					
	Arsenobetaine (AsB, as As) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L2274447-10, -11, -12, -13, -14, -15, -16
Matrix Spike	Total Organic Carbon	MS-B	L2274447-1, -10, -11, -12, -13, -14, -15, -16, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2274447-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2274447-10, -11, -12, -13, -14, -15, -16
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2274447-14
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2274447-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2274447-10, -11, -12, -13, -14, -15, -16
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2274447-14
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2274447-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2274447-10, -11, -12, -13, -14, -15, -16
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2274447-14
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2274447-10, -11, -12, -13, -14, -15, -16
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2274447-14
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2274447-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2274447-10, -11, -12, -13, -14, -15, -16
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2274447-14
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2274447-10, -11, -12, -13, -14, -15, -16
Matrix Spike	Aluminum (Al)-Total	MS-B	L2274447-1, -10, -11, -12, -13, -14, -15, -16, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L2274447-13
Matrix Spike	Calcium (Ca)-Total	MS-B	L2274447-1, -10, -11, -12, -13, -14, -15, -16, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2274447-13
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2274447-13
Matrix Spike	Strontium (Sr)-Total	MS-B	L2274447-1, -10, -11, -12, -13, -14, -15, -16, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2274447-13
Matrix Spike	Nitrate (as N)	MS-B	L2274447-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Silicate (as SiO2)	MS-B	L2274447-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sulfate (SO4)	MS-B	L2274447-1, -10, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ALS Test Code	Matrix	Test Description	Method Reference**
AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

ALS Test Code	Matrix	Test Description	Method Reference**
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ALS Test Code	Matrix	Test Description	Method Reference**
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

Reference Information

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

Reference Information

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L2274447-COFC

ALS Environmental

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COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☑ Standard ☐ Other		● Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2GB	Email 2:	marie-pier.marcil@agnicoeagle.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q39503	
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: Eric Franz	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a	Arsenic		Number of Containers
							P	F/P	P	P	F/P	P	F/P	F	F/P		
	MAM-39	10-May-19	9:40	water	X	X	X	X	X	X	X	X	X		X		11
	MAM-40	10-May-19	10:30	water	X	X	X	X	X	X	X	X	X				10
	LK5-9	10-May-19	14:10	water	X	X	X	X	X	X	X	X	X		X		11
	LK5-10	10-May-19	14:35	water	X	X	X	X	X	X	X	X	X				10
	LK1-9	10-May-19	12:35	water	X	X	X	X	X	X	X	X	X		X		11
	LK1-10	10-May-19	13:10	water	X	X	X	X	X	X	X	X	X				10
	A20-33	11-May-19	12:00	water	X	X	X	X	X	X	X	X	X		X		11
	A20-34	11-May-19	12:25	water	X	X	X	X	X	X	X	X	X				10
	LK8-9	11-May-19	9:50	water	X	X	X	X	X	X	X	X	X		X		11
	LK8-10	11-May-19	10:25	water	X	X	X	X	X	X	X	X	X				10
	May DUP-3	10-May-19		water	X	X	X	X	X	X	X	X	X				10
	May DUP-4	10-May-19		water	X	X	X	X	X	X	X	X	X				10
	May EB	12-May-19		water	X	X	X	X	X	X	X	X	X				10
	May DI	12-May-19		water	X	X	X	X	X	X	X	X	X				10
	MAM-39-b	10-May-19	9:40	water	X	X	X	X	X	X	X	X	X				10
	MAM-40-b	10-May-19	10:30	water	X	X	X	X	X	X	X	X	X				10

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Louis Dubois	13-May-19	7:00	SC	MAY 16 2019	840AM	17,16,16,17 °C				

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 16-MAY-19
Report Date: 30-MAY-19 15:37 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2274449

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACE WATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274449-1	L2274449-2	L2274449-3	L2274449-4	L2274449-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	06-MAY-19	06-MAY-19	07-MAY-19	07-MAY-19	07-MAY-19
	Sampled Time	16:15	16:55	14:00	15:44	15:44
	Client ID	TPN-123	TPN-122	TPE-122	TPE-123	MAY DUP-1
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.304	0.357	0.145	0.280	0.234

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274449-6	L2274449-7			
	Description	Surface Water	Surface Water			
	Sampled Date	11-MAY-19	11-MAY-19			
	Sampled Time	13:52	14:36			
	Client ID	SP-123	SP-122			
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.913	1.36			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274449-1	L2274449-2	L2274449-3	L2274449-4	L2274449-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	06-MAY-19	06-MAY-19	07-MAY-19	07-MAY-19	07-MAY-19
	Sampled Time	16:15	16:55	14:00	15:44	15:44
	Client ID	TPN-123	TPN-122	TPE-122	TPE-123	MAY DUP-1
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	41.0	36.4	43.7	39.5	39.5
	Hardness (as CaCO3) (mg/L)	13.7	11.9	15.4	13.8	13.8
	pH (pH)	7.22	7.17	7.26	7.25	7.29
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	25.4	23.8	26.3	24.3	24.5
	Turbidity (NTU)	<0.10	<0.10	<0.10	<0.10	<0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.8	8.4	11.3	10.4	10.4
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.8	8.4	11.3	10.4	10.4
	Ammonia, Total (as N) (mg/L)	0.0150	0.0856	0.0887	0.0151	0.0582
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	1.15	1.03	1.11	0.99	1.02
	Fluoride (F) (mg/L)	0.094	0.087	0.100	0.093	0.092
	Nitrate (as N) (mg/L)	0.0204	0.0178	0.0112	0.0104	0.0102
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.123	0.162	0.180	0.086	0.128
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0104 RRV	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0021 RRV	<0.0020	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<2.5 DLM	1.19	1.43	1.36	0.67
	Sulfate (SO4) (mg/L)	6.69	6.06	6.70	6.09	6.31
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.99	1.97	1.90	1.80	1.77
	Total Organic Carbon (mg/L)	1.89	1.76	1.70	1.58	1.73
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	<0.0030	0.0038	0.0102
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00022	0.00019	0.00039	0.00039	0.00035
	Barium (Ba)-Total (mg/L)	0.00391	0.00382	0.00406	0.00375	0.00383
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	3.34	2.90	3.64	3.38	3.24
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	0.000019	0.000015	0.000017

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274449-6	L2274449-7	L2274449-8	L2274449-9	
	Description	Surface Water	Surface Water	Surface Water	Surface Water	
	Sampled Date	11-MAY-19	11-MAY-19	12-MAY-19	12-MAY-19	
	Sampled Time	13:52	14:36	13:00	13:15	
	Client ID	SP-123	SP-122	MAY MBK DI-1	MAY MBK EB-1	
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	55.9	54.3	<2.0	<2.0	
	Hardness (as CaCO3) (mg/L)	21.1	21.1	<0.50	<0.50	
	pH (pH)	7.46	7.37	5.45	5.42	
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Total Dissolved Solids (mg/L)	43	46	<3.0	<3.0	
	Turbidity (NTU)	0.12	<0.10	<0.10	<0.10	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	16.0	15.2	<1.0	<1.0	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	16.0	15.2	<1.0	<1.0	
	Ammonia, Total (as N) (mg/L)	0.0231	0.0112	<0.0050	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	1.34	1.25	<0.10	<0.10	
	Fluoride (F) (mg/L)	0.103	0.097	<0.020	<0.020	
	Nitrate (as N) (mg/L)	0.0141	0.0122	<0.0050	<0.0050	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.121	0.123	<0.050	<0.050	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	
	Silicate (as SiO2) (mg/L)	0.69	1.39	0.96	0.60	
	Sulfate (SO4) (mg/L)	7.97	7.40	<0.30	<0.30	
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.07	1.84	<0.50	<0.50	
	Total Organic Carbon (mg/L)	1.99	1.91	<0.50	<0.50	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0035	<0.0030	<0.0030	<0.0030	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Total (mg/L)	0.00036	0.00032	<0.00010	<0.00010	
	Barium (Ba)-Total (mg/L)	0.00456	0.00390	<0.00010	RRV 0.00011	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Total (mg/L)	5.24	5.12	<0.050	<0.050	
	Cesium (Cs)-Total (mg/L)	0.000010	0.000012	<0.000010	<0.000010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274449-1	L2274449-2	L2274449-3	L2274449-4	L2274449-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	06-MAY-19	06-MAY-19	07-MAY-19	07-MAY-19	07-MAY-19
	Sampled Time	16:15	16:55	14:00	15:44	15:44
	Client ID	TPN-123	TPN-122	TPE-122	TPE-123	MAY DUP-1
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00011
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.010	<0.010	<0.010	<0.010	0.017
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.35	1.21	1.51	1.37	1.23
	Manganese (Mn)-Total (mg/L)	0.00046	0.00030	0.00037	0.00043	0.00110
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000186	0.000175	0.000173	0.000157	0.000130
	Nickel (Ni)-Total (mg/L)	0.00053	<0.00050	0.00057	0.00057	0.00058
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.777	0.695	0.793	0.704	0.647
	Rubidium (Rb)-Total (mg/L)	0.00106	0.00087	0.00116	0.00104	0.00094
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	<0.10	<0.10	0.12	0.11	<0.10
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.69	1.58	1.69	1.53	1.34
	Strontium (Sr)-Total (mg/L)	0.0163	0.0142	0.0175	0.0154	0.0143
	Sulfur (S)-Total (mg/L)	2.72	2.49	2.63	2.33	2.26
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	0.00054
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000044	0.000035	0.000041	0.000039	0.000046
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	<0.0010	0.0023	<0.0010	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00020	0.00017	0.00035	0.00035	0.00035
	Barium (Ba)-Dissolved (mg/L)	0.00394	0.00344	0.00418	0.00353	0.00347
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274449-6	L2274449-7	L2274449-8	L2274449-9	
	Description	Surface Water	Surface Water	Surface Water	Surface Water	
	Sampled Date	11-MAY-19	11-MAY-19	12-MAY-19	12-MAY-19	
	Sampled Time	13:52	14:36	13:00	13:15	
	Client ID	SP-123	SP-122	MAY MBK DI-1	MAY MBK EB-1	
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Total (mg/L)	0.00069	0.00065	<0.00050	<0.00050	
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	RRV 0.000053	RRV 0.000053	
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Total (mg/L)	1.84	1.65	<0.0050	<0.0050	
	Manganese (Mn)-Total (mg/L)	0.00114	0.00046	<0.00010	<0.00010	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000184	0.000177	<0.000050	<0.000050	
	Nickel (Ni)-Total (mg/L)	0.00054	0.00052	<0.00050	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.827	0.751	<0.050	<0.050	
	Rubidium (Rb)-Total (mg/L)	0.00141	0.00109	<0.00020	<0.00020	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.20	0.18	<0.10	<0.10	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	1.54	1.32	<0.050	<0.050	
	Strontium (Sr)-Total (mg/L)	0.0228	0.0225	<0.00020	<0.00020	
	Sulfur (S)-Total (mg/L)	2.69	2.47	<0.50	<0.50	
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Total (mg/L)	0.000046	0.000046	<0.000010	<0.000010	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)	0.00029	0.00028	<0.00010	<0.00010	
	Barium (Ba)-Dissolved (mg/L)	0.00401	0.00363	<0.00010	<0.00010	
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2274449-1	L2274449-2	L2274449-3	L2274449-4	L2274449-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	06-MAY-19	06-MAY-19	07-MAY-19	07-MAY-19	07-MAY-19
	Sampled Time	16:15	16:55	14:00	15:44	15:44
	Client ID	TPN-123	TPN-122	TPE-122	TPE-123	MAY DUP-1
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	3.38	2.94	3.91	3.48	3.49
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	0.000017	0.000017	0.000017
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00043	0.00035	0.00040	0.00036	0.00037
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	DTC 0.077
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.27	1.10	1.37	1.24	1.23
	Manganese (Mn)-Dissolved (mg/L)	0.00028	0.00019	0.00040	0.00015	0.00071
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000185	0.000168	0.000185	0.000159	0.000171
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.00054	0.00051	0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.713	0.605	0.715	0.627	0.629
	Rubidium (Rb)-Dissolved (mg/L)	0.00103	0.00088	0.00107	0.00102	0.00096
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.062	0.056	0.095	0.081	0.081
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.63	1.41	1.57	1.39	1.48
	Strontium (Sr)-Dissolved (mg/L)	0.0149	0.0129	0.0161	0.0144	0.0145
	Sulfur (S)-Dissolved (mg/L)	2.35	2.15	2.36	2.05	2.12
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000038	0.000033	0.000039	0.000038	0.000036
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2274449-6	L2274449-7	L2274449-8	L2274449-9
	Sample ID	L2274449-6	L2274449-7	L2274449-8	L2274449-9
	Description	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	11-MAY-19	11-MAY-19	12-MAY-19	12-MAY-19
	Sampled Time	13:52	14:36	13:00	13:15
	Client ID	SP-123	SP-122	MAY MBK DI-1	MAY MBK EB-1
Grouping	**Analyte**				
WATER					
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	5.60	5.58	<0.050	<0.050
	Cesium (Cs)-Dissolved (mg/L)	0.000011	0.000011	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00053	0.00057	<0.00020	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.73	1.73	<0.0050	<0.0050
	Manganese (Mn)-Dissolved (mg/L)	0.00085	0.00026	<0.00010	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000221	0.000206	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.766	0.747	<0.050	<0.050
	Rubidium (Rb)-Dissolved (mg/L)	0.00116	0.00109	<0.00020	<0.00020
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.185	0.186	<0.050	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.50	1.50	<0.050	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.0245	0.0242	<0.00020	<0.00020
	Sulfur (S)-Dissolved (mg/L)	2.74	2.69	<0.50	<0.50
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000046	0.000040	<0.000010	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Tellurium (Te)-Total	B	L2274449-5
Matrix Spike	Dissolved Organic Carbon	MS-B	L2274449-1, -2, -3
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2274449-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2274449-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2274449-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2274449-5, -8
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2274449-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2274449-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2274449-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L2274449-5
Matrix Spike	Barium (Ba)-Total	MS-B	L2274449-7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2274449-6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2274449-5
Matrix Spike	Calcium (Ca)-Total	MS-B	L2274449-7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2274449-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2274449-6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2274449-5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2274449-7, -8, -9
Matrix Spike	Selenium (Se)-Total	MS-B	L2274449-5
Matrix Spike	Sodium (Na)-Total	MS-B	L2274449-5
Matrix Spike	Strontium (Sr)-Total	MS-B	L2274449-6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2274449-5
Matrix Spike	Strontium (Sr)-Total	MS-B	L2274449-7, -8, -9
Matrix Spike	Sulfur (S)-Total	MS-B	L2274449-5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

Reference Information

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Page 1 of 1

Report To		**Report Format / Distribution**		**Service Requested** (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☑ Standard ☐ Other		● Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	**Analysis Request**
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q39503	
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: ENV	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
	TPN-123	06-May-19	16:15	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TPN-122	06-May-19	16:55	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TPE-122	07-May-19	14:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TPE-123	07-May-19	15:44	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	MAY DUP-1	07-May-19	15:44	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	SP-123	11-May-19	13:52	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	SP-122	11-May-19	14:36	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	MAY MBK DI-1	12-May-19	13:00	Surface Water	X	X	X	X	X	X	X	X	X				9
	MAY MBK EB-1	2019-05--12	13:15	Surface Water	X	X	X	X	X	X	X	X	X				9

L2274449-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Tom Thomson	Date (dd-mmm-yy): 13-May-19	Time (hh-mm): 8:00	Received by: JL	Date: MAY 16 2019	Time: 840AM	Temperature: 16,16,17,18 C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 17-MAY-19
Report Date: 31-MAY-19 14:54 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2275188

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2275188-1	L2275188-2	L2275188-3	L2275188-4	
	Description	Water	Water	Water	Water	
	Sampled Date	06-MAY-19	06-MAY-19	06-MAY-19	06-MAY-19	
	Sampled Time	12:50	12:15	10:40	11:20	
	Client ID	A76-33	A76-34	DS1-31	DS1-32	
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	60.7	59.8	26.6	44.0	
	Hardness (as CaCO3) (mg/L)	19.4	19.1	8.01	13.4	
	pH (pH)	7.19	7.19	7.06	7.21	
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Total Dissolved Solids (mg/L)	46	39	18.2	29.5	
	Turbidity (NTU)	0.15	0.11	0.14	0.17	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.0	9.1	6.8	10.6	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	9.0	9.1	6.8	10.6	
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0084	0.0057	0.0060	
	Bromide (Br) (mg/L)	0.088	0.082	<0.050	<0.050	
	Chloride (Cl) (mg/L)	8.04	7.93	2.34	4.07	
	Fluoride (F) (mg/L)	0.031	0.036	0.056	0.052	
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.0114	<0.0050	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.102	0.108	0.137	0.168	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	0.0025	0.0024	
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	0.0031	0.0042	
	Silicate (as SiO2) (mg/L)	1.49	1.50	0.74	1.98	
	Sulfate (SO4) (mg/L)	4.94	4.96	1.78	3.27	
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.10	1.76	2.13	2.90	
	Total Organic Carbon (mg/L)	2.17	1.92	2.14	3.08	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0083	<0.0030	0.0050	0.0063	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Total (mg/L)	0.00032	0.00031	0.00017	0.00021	
	Barium (Ba)-Total (mg/L)	0.0123	0.0115	0.00476	0.00787	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Total (mg/L)	5.70	5.72	2.30	4.05	
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2275188-1	L2275188-2	L2275188-3	L2275188-4	
	Description	Water	Water	Water	Water	
	Sampled Date	06-MAY-19	06-MAY-19	06-MAY-19	06-MAY-19	
	Sampled Time	12:50	12:15	10:40	11:20	
	Client ID	A76-33	A76-34	DS1-31	DS1-32	
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00012	<0.00010	0.00012	0.00013	
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00054	
	Iron (Fe)-Total (mg/L)	0.013	<0.010	<0.010	0.017	
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Total (mg/L)	1.96	1.84	0.892	1.30	
	Manganese (Mn)-Total (mg/L)	0.00332	0.00126	0.00277	0.00338	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Nickel (Ni)-Total (mg/L)	0.00094	0.00083	<0.00050	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	1.09	1.03	0.474	0.814	
	Rubidium (Rb)-Total (mg/L)	0.00155	0.00149	0.00071	0.00099	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.73	0.72	0.42	0.92	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	1.07	0.993	1.18	1.72	
	Strontium (Sr)-Total (mg/L)	0.0310	0.0298	0.0110	0.0184	
	Sulfur (S)-Total (mg/L)	1.62	1.56	0.65	1.22	
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	0.00036	<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Total (mg/L)	0.000015	0.000012	0.000028	0.000032	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	<0.0010	0.0049	0.0037	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)	0.00019	0.00020	0.00010	0.00012	
	Barium (Ba)-Dissolved (mg/L)	0.0102	0.0103	0.00420	0.00704	
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2275188-1	L2275188-2	L2275188-3	L2275188-4	
	Description	Water	Water	Water	Water	
	Sampled Date	06-MAY-19	06-MAY-19	06-MAY-19	06-MAY-19	
	Sampled Time	12:50	12:15	10:40	11:20	
	Client ID	A76-33	A76-34	DS1-31	DS1-32	
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)	5.08	4.97	1.91	3.45	
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)	0.00032	0.00031	0.00036	0.00037	
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Dissolved (mg/L)	1.62	1.63	0.784	1.17	
	Manganese (Mn)-Dissolved (mg/L)	0.00242	0.00078	0.00102	0.00227	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Nickel (Ni)-Dissolved (mg/L)	0.00083	0.00081	<0.00050	<0.00050	
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)	0.962	0.968	0.451	0.777	
	Rubidium (Rb)-Dissolved (mg/L)	0.00136	0.00134	0.00059	0.00095	
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Dissolved (mg/L)	0.678	0.704	0.404	0.927	
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	0.950	0.991	1.11	1.65	
	Strontium (Sr)-Dissolved (mg/L)	0.0319	0.0318	0.0115	0.0193	
	Sulfur (S)-Dissolved (mg/L)	1.54	1.65	0.66	1.26	
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Dissolved (mg/L)	<0.000010	0.000013	0.000026	0.000027	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	
Speciated Metals	Arsenate (As V) (ug/L)		<0.020	<0.020		
	Arsenite (As III) (ug/L)		0.096	0.035		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2275188-1	L2275188-2	L2275188-3	L2275188-4	
	Description	Water	Water	Water	Water	
	Sampled Date	06-MAY-19	06-MAY-19	06-MAY-19	06-MAY-19	
	Sampled Time	12:50	12:15	10:40	11:20	
	Client ID	A76-33	A76-34	DS1-31	DS1-32	
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)		<0.020	<0.020		
	Monomethylarsonic Acid (MMA, as As) (ug/L)		<0.020	<0.020		
	Arsenobetaine (AsB, as As) (ug/L)		<0.050	<0.050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2275188-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2275188-1, -2, -3, -4
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2275188-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2275188-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2275188-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2275188-1, -2, -3, -4
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2275188-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2275188-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2275188-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L2275188-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2275188-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L2275188-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L2275188-COFC

COC # ______

ALS Environmental

www.alsglobal.com

Page 1 of 1

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☑ Standard ☐ Other		● Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q39503	
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: Eric Franz	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)	Arsenic (F/P)		Number of Containers
	A76-33	06-May-19	12:50	water	X	X	X	X	X	X	X	X	X				10
	A76-34	06-May-19	12:15	water	X	X	X	X	X	X	X	X	X		X		11
	DS1-31	06-May-19	10:40	water	X	X	X	X	X	X	X	X	X		X		11
	DS1-32	06-May-19	11:20	water	X	X	X	X	X	X	X	X	X				10

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Louis Dubois	Date (dd-mmm-yy) 9-May-19	Time (hh-mm) 7:00	Received by: JC	Date: MAY 17 2019	Time: 850Am	Temperature: 15 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 17-MAY-19
Report Date: 05-JUN-19 11:40 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2275597

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2275597-1	L2275597-2	L2275597-3	L2275597-4	
	Description	Water	Water	Water	Water	
	Sampled Date	13-MAY-19	13-MAY-19	13-MAY-19	13-MAY-19	
	Sampled Time	10:35	10:15	09:15	08:45	
	Client ID	NEM-39	NEM-40	WTS-39	WTS-40	
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	34.2	33.8	151	131	
	Hardness (as CaCO3) (mg/L)	12.2	11.7	49.2	42.8	
	pH (pH)	7.23	7.23	7.27	7.32	
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Total Dissolved Solids (mg/L)	40	25	124	117	
	Turbidity (NTU)	0.14	0.12	0.66	0.26	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	10.0	9.9	13.2	11.3	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	10.0	9.9	13.2	11.3	
	Ammonia, Total (as N) (mg/L)	0.0505	0.0481	0.0514	0.0378	
	Bromide (Br) (mg/L)	<0.050	<0.050	0.372	0.330	
	Chloride (Cl) (mg/L)	1.07	1.08	29.9	26.2	
	Fluoride (F) (mg/L)	0.027	0.027	0.047	0.049	
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.403	0.338	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0034	0.0028	
	Total Kjeldahl Nitrogen (mg/L)	0.291	0.202	0.196	0.216	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	
	Phosphorus (P)-Total (mg/L)	0.0036	0.0084	0.0024	<0.0020	
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	1.72	1.29	
	Sulfate (SO4) (mg/L)	4.09	4.08	4.60	4.33	
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.19	2.06	2.42	2.50	
	Total Organic Carbon (mg/L)	2.52	2.06	2.06	2.62	
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	0.0309	0.0164	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	0.00017	0.00014	
	Arsenic (As)-Total (mg/L)	0.00028	0.00031	0.00120	0.00078	
	Barium (Ba)-Total (mg/L)	0.00530	0.00552	0.0297	0.0251	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	0.0000057	
	Calcium (Ca)-Total (mg/L)	2.95	2.85	17.1	14.5	
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	0.000014	<0.000010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2275597-1	L2275597-2	L2275597-3	L2275597-4	
	Description	Water	Water	Water	Water	
	Sampled Date	13-MAY-19	13-MAY-19	13-MAY-19	13-MAY-19	
	Sampled Time	10:35	10:15	09:15	08:45	
	Client ID	NEM-39	NEM-40	WTS-39	WTS-40	
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	0.00022	0.00068	0.00019	
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	0.00014	<0.00010	
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	0.00067	0.00063	
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	0.141	0.052	
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	0.000084	<0.000050	
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	0.0079	0.0066	
	Magnesium (Mg)-Total (mg/L)	1.38	1.38	2.56	2.25	
	Manganese (Mn)-Total (mg/L)	0.00169	0.00198	0.0400	0.00973	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	0.00134	0.000981	
	Nickel (Ni)-Total (mg/L)	0.00061	0.00065	0.00188	0.00152	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.751	0.769	2.63	2.30	
	Rubidium (Rb)-Total (mg/L)	0.00087	0.00083	0.00371	0.00307	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	0.000053	
	Silicon (Si)-Total (mg/L)	0.29	0.29	1.07	0.76	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	0.616	0.614	1.76	1.55	
	Strontium (Sr)-Total (mg/L)	0.0155	0.0143	0.203	0.163	
	Sulfur (S)-Total (mg/L)	1.66	1.44	1.83	1.59	
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	0.00137	0.00052	
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Total (mg/L)	<0.000010	<0.000010	0.000170	0.000129	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0010	<0.0010	0.0040	0.0035	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00015	0.00012	
	Arsenic (As)-Dissolved (mg/L)	0.00031	0.00028	0.00063	0.00065	
	Barium (Ba)-Dissolved (mg/L)	0.00469	0.00493	0.0257	0.0229	
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2275597-1	L2275597-2	L2275597-3	L2275597-4	
	Description	Water	Water	Water	Water	
	Sampled Date	13-MAY-19	13-MAY-19	13-MAY-19	13-MAY-19	
	Sampled Time	10:35	10:15	09:15	08:45	
	Client ID	NEM-39	NEM-40	WTS-39	WTS-40	
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)	2.77	2.64	16.0	13.8	
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	0.000011	<0.000010	
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	0.00074	DTC 0.00042	
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)	0.00020	0.00022	0.00056	0.00061	
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.016	0.016	
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	0.0074	0.0065	
	Magnesium (Mg)-Dissolved (mg/L)	1.28	1.25	2.27	2.05	
	Manganese (Mn)-Dissolved (mg/L)	0.00076	0.00079	0.0297	0.00753	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	0.00128	0.000940	
	Nickel (Ni)-Dissolved (mg/L)	0.00070	0.00068	0.00174	0.00163	
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)	0.708	0.713	2.42	2.16	
	Rubidium (Rb)-Dissolved (mg/L)	0.00082	0.00084	0.00364	0.00314	
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Dissolved (mg/L)	0.232	0.217	0.815	0.617	
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	0.626	0.621	1.71	1.42	
	Strontium (Sr)-Dissolved (mg/L)	0.0142	0.0134	0.182	0.162	
	Sulfur (S)-Dissolved (mg/L)	1.26	1.35	1.46	1.43	
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Dissolved (mg/L)	<0.000010	<0.000010	0.000139	0.000122	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0014	0.0026	<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	
Speciated Metals	Arsenate (As V) (ug/L)	<0.020		<0.020		
	Arsenite (As III) (ug/L)	0.158		0.523		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2275597-1	L2275597-2	L2275597-3	L2275597-4	
	Description	Water	Water	Water	Water	
	Sampled Date	13-MAY-19	13-MAY-19	13-MAY-19	13-MAY-19	
	Sampled Time	10:35	10:15	09:15	08:45	
	Client ID	NEM-39	NEM-40	WTS-39	WTS-40	
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	0.024		DLCI <0.030		
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020		<0.020		
	Arsenobetaine (AsB, as As) (ug/L)	<0.050		<0.050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L2275597-1, -2
Matrix Spike	Total Organic Carbon	MS-B	L2275597-3
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2275597-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2275597-1, -2, -4
Matrix Spike	Boron (B)-Dissolved	MS-B	L2275597-1, -2, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2275597-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2275597-1, -2, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2275597-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2275597-1, -2, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2275597-1, -2, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2275597-1, -2, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2275597-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2275597-1, -2, -4
Matrix Spike	Barium (Ba)-Total	MS-B	L2275597-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L2275597-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2275597-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L2275597-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are

Reference Information

available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody

L2275597-COFC

COC # ____________

Page 1 of 1

Report To		Report Format	
Company:	Azimuth Consulting Group	☑Standard	
Contact:	Eric Franz	☑PDF ☑Excel ☐Digital ☐Fax	
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To:	Same as Report ? ☑Yes ☐No	Client / Project Information	
Hardcopy of Invoice with Report?	☐Yes ☑No	Job #:	Meadowbank CREMP - Surfacewater
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q39503
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- Standard Turnaround Times - Business Days)
- ○Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)	Arsenic		Number of Containers
	NEM-39 (Arsenic samples with no EDTA and acetic acid)	13-May-19	10:35		X	X	X	X	X	X	X	X	X		x		
	NEM-40	13-May-19	10:15		X	X	X	X	X	X	X	X	X				
	WTS-39 (Arsenic samples with no EDTA and acetic acid)	13-May-19	9:15		X	X	X	X	X	X	X	X	X		x		
	WTS-40	13-May-19	8:45		X	X	X	X	X	X	X	X	X				

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Louis Dubois	14-May-19	7:00	HA	5/17	2:20pm	15 °C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 21-MAY-19
Report Date: 30-MAY-19 14:19 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2276489

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2276489-1	L2276489-2	L2276489-3	L2276489-4	L2276489-5
	Description					
	Sampled Date	13-MAY-19	13-MAY-19	13-MAY-19	13-MAY-19	06-MAY-19
	Sampled Time	10:35	10:15	09:15	08:45	12:50
	Client ID	NEM-39	NEM-40	WTS-39	WTS-40	A76-33
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.511	0.557	2.55	1.65	0.464

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2276489-6	L2276489-7	L2276489-8		
	Description					
	Sampled Date	06-MAY-19	06-MAY-19	06-MAY-19		
	Sampled Time	12:15	10:40	11:20		
	Client ID	A76-34	DS1-31	DS1-32		
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.641	2.13	0.964		

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Page 1 of 1

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☑ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)
- ● Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
	NEM-39	13-May-19	10:35											X			1
	NEM-40	13-May-19	10:15											X			1
	WTS-39	13-May-19	9:15											X			1
	WTS-40	13-May-19	8:45											X			1
	A76-33	06-May-19	12:50											X			1
	A76-34	06-May-19	12:15											X			1
	DS1-31	06-May-19	10:40											X			1
	DS1-32	06-May-19	11:20											X			1

L2276489-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
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Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Samuel Tapp	15-May-19	7:00	U	May 17	12:00pm	11 °C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 21-MAY-19
Report Date: 30-MAY-19 14:33 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2276490

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2276490-1	L2276490-2	L2276490-3	L2276490-4	L2276490-5
	Description					
	Sampled Date	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19
	Sampled Time	09:40	10:30	14:10	14:35	12:35
	Client ID	MAM-39	MAM-40	LK5-9	LK5-10	LK1-9
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.972	1.40	1.08	0.863	0.550

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2276490-6	L2276490-7	L2276490-8	L2276490-9	L2276490-10
		Description					
		Sampled Date	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19
		Sampled Time	13:10	12:00	12:25	09:50	10:25
		Client ID	LK1-10	A20-33	A20-34	LK8-9	LK8-10
Grouping	**Analyte**						
FILTER							
Plant Pigments	Chlorophyll a (ug/L)		1.33	0.530	0.665	0.815	1.07

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2276490-11	L2276490-12	L2276490-13	L2276490-14	
	Description					
	Sampled Date	10-MAY-19	10-MAY-19	10-MAY-19	10-MAY-19	
	Sampled Time			09:40	10:30	
	Client ID	MAY DUP-3	MAY DUP-4	MAM-39-B	MAM-40-B	
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	1.01	0.903	1.67	1.78	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # ______

L2276490-COFC

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☑ Standard ☐ Other		● Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q39503	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: Eric Franz

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F	F/P		
	MAM-39	10-May-19	9:40											X			1
	MAM-40	10-May-19	10:30											X			1
	LK5-9	10-May-19	14:10											X			1
	LK5-10	10-May-19	14:35											X			1
	LK1-9	10-May-19	12:35											X			1
	LK1-10	10-May-19	13:10											X			1
	A20-33	11-May-19	12:00											X			1
	A20-34	11-May-19	12:25											X			1
	LK8-9	11-May-19	9:50											X			1
	LK8-10	11-May-19	10:25											X			1
	May DUP-3	10-May-19												X			1
	May DUP-4	10-May-19												X			1
	MAM-39-b	10-May-19	9:40											X			1
	MAM-40-b	10-May-19	10:30											X			1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Samuel Tapp	15-May-19	7:00	[illegible]	May 17	12:00	11 °C				

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 24-MAY-19
Report Date: 04-JUN-19 14:54 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2278655

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2278655-1	L2278655-2	L2278655-3	L2278655-4	L2278655-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-MAY-19	18-MAY-19	18-MAY-19	18-MAY-19	16-MAY-19
	Sampled Time	10:55	11:50	13:30	12:45	17:00
	Client ID	INUG-110	INUG-111	PDL-75	PDL-76	WAL-91
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.719	1.23	0.387	0.566	1.19

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2278655-6				
	Description	Water				
	Sampled Date	16-MAY-19				
	Sampled Time	15:46				
	Client ID	WAL-92				
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	1.96				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2278655-1	L2278655-2	L2278655-3	L2278655-4	L2278655-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-MAY-19	18-MAY-19	18-MAY-19	18-MAY-19	16-MAY-19
	Sampled Time	10:55	11:50	13:30	12:45	17:00
	Client ID	INUG-110	INUG-111	PDL-75	PDL-76	WAL-91
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	20.0	22.1	30.0	27.2	55.1
	Hardness (as CaCO3) (mg/L)	6.87	7.73	11.5	10.8	23.8
	pH (pH)	7.04	7.05	7.25	7.21	7.42
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	10.9	15.7	19.0	18.7	36.3
	Turbidity (NTU)	<0.10	<0.10	<0.10	<0.10	<0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	6.7	7.1	10.6	9.7	21.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	6.7	7.1	10.6	9.7	21.0
	Ammonia, Total (as N) (mg/L)	0.549	0.110	0.106	0.0780	0.0637
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.97	1.12	0.86	0.79	1.06
	Fluoride (F) (mg/L)	0.073	0.079	0.049	0.046	0.061
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0308
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.754	0.257	0.207	0.172	0.224
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	0.0021
	Phosphorus (P)-Total (mg/L)	0.0031	0.0038	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	0.89
	Sulfate (SO4) (mg/L)	1.09	1.23	2.20	2.03	6.18
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.14	2.26	1.76	1.86	2.05
	Total Organic Carbon (mg/L)	2.28	2.36	1.73	1.49	2.12
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	<0.00010	0.00010	0.00019	0.00018	0.00026
	Barium (Ba)-Total (mg/L)	0.00193	0.00230	0.00267	0.00239	0.00370
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	1.48	1.63	3.04	2.91	6.34
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2278655-6				
		Description	Water				
		Sampled Date	16-MAY-19				
		Sampled Time	15:46				
		Client ID	WAL-92				
Grouping	**Analyte**						
WATER							
Physical Tests	Conductivity (uS/cm)		64.5				
	Hardness (as CaCO3) (mg/L)		28.7				
	pH (pH)		7.50				
	Total Suspended Solids (mg/L)		<1.0				
	Total Dissolved Solids (mg/L)		41.2				
	Turbidity (NTU)		0.11				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)		24.3				
	Alkalinity, Carbonate (as CaCO3) (mg/L)		<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)		<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)		24.3				
	Ammonia, Total (as N) (mg/L)		0.0173				
	Bromide (Br) (mg/L)		<0.050				
	Chloride (Cl) (mg/L)		1.25				
	Fluoride (F) (mg/L)		0.068				
	Nitrate (as N) (mg/L)		0.0184				
	Nitrite (as N) (mg/L)		<0.0010				
	Total Kjeldahl Nitrogen (mg/L)		0.169				
	Orthophosphate-Dissolved (as P) (mg/L)		<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)		0.0024				
	Phosphorus (P)-Total (mg/L)		<0.0020				
	Silicate (as SiO2) (mg/L)		0.86				
	Sulfate (SO4) (mg/L)		7.18				
Cyanides	Cyanide, Total (mg/L)		<0.0010				
	Cyanide, Free (mg/L)		<0.0010				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)		2.72				
	Total Organic Carbon (mg/L)		2.80				
Total Metals	Aluminum (Al)-Total (mg/L)		0.0034				
	Antimony (Sb)-Total (mg/L)		<0.00010				
	Arsenic (As)-Total (mg/L)		0.00029				
	Barium (Ba)-Total (mg/L)		0.00438				
	Beryllium (Be)-Total (mg/L)		<0.00010				
	Bismuth (Bi)-Total (mg/L)		<0.000050				
	Boron (B)-Total (mg/L)		<0.010				
	Cadmium (Cd)-Total (mg/L)		<0.0000050				
	Calcium (Ca)-Total (mg/L)		7.36				
	Cesium (Cs)-Total (mg/L)		<0.000010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2278655-1	L2278655-2	L2278655-3	L2278655-4	L2278655-5
	Sample ID	L2278655-1	L2278655-2	L2278655-3	L2278655-4	L2278655-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-MAY-19	18-MAY-19	18-MAY-19	18-MAY-19	16-MAY-19
	Sampled Time	10:55	11:50	13:30	12:45	17:00
	Client ID	INUG-110	INUG-111	PDL-75	PDL-76	WAL-91
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00128
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	0.767	0.877	0.965	0.876	1.73
	Manganese (Mn)-Total (mg/L)	0.00068	0.00052	0.00059	0.00044	0.00075
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	0.000063	0.000070	0.000222
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	0.00072	0.00063	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.442	0.521	0.480	0.432	0.663
	Rubidium (Rb)-Total (mg/L)	0.00061	0.00066	0.00063	0.00055	0.00088
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.12	0.12	0.16	0.14	0.47
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.709	0.804	0.708	0.627	0.859
	Strontium (Sr)-Total (mg/L)	0.00839	0.00934	0.0129	0.0125	0.0323
	Sulfur (S)-Total (mg/L)	0.71	0.52	0.85	0.89	2.41
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000040	0.000042	0.000027	0.000024	0.000044
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0031	0.0015	0.0010	0.0011	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	<0.00010	<0.00010	0.00015	0.00015	0.00024
	Barium (Ba)-Dissolved (mg/L)	0.00196	0.00221	0.00244	0.00224	0.00335
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2278655-6
	Description	Water
	Sampled Date	16-MAY-19
	Sampled Time	15:46
	Client ID	WAL-92
Grouping	**Analyte**	
WATER		
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010
	Copper (Cu)-Total (mg/L)	0.00104
	Iron (Fe)-Total (mg/L)	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.99
	Manganese (Mn)-Total (mg/L)	0.00089
	Mercury (Hg)-Total (mg/L)	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000248
	Nickel (Ni)-Total (mg/L)	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050
	Potassium (K)-Total (mg/L)	0.771
	Rubidium (Rb)-Total (mg/L)	0.00103
	Selenium (Se)-Total (mg/L)	<0.000050
	Silicon (Si)-Total (mg/L)	0.46
	Silver (Ag)-Total (mg/L)	<0.000010
	Sodium (Na)-Total (mg/L)	1.05
	Strontium (Sr)-Total (mg/L)	0.0385
	Sulfur (S)-Total (mg/L)	2.79
	Tellurium (Te)-Total (mg/L)	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010
	Uranium (U)-Total (mg/L)	0.000046
	Vanadium (V)-Total (mg/L)	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.000060
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD
	Dissolved Metals Filtration Location	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0052
	Antimony (Sb)-Dissolved (mg/L)	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00025
	Barium (Ba)-Dissolved (mg/L)	0.00421
	Beryllium (Be)-Dissolved (mg/L)	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2278655-1	L2278655-2	L2278655-3	L2278655-4	L2278655-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-MAY-19	18-MAY-19	18-MAY-19	18-MAY-19	16-MAY-19
	Sampled Time	10:55	11:50	13:30	12:45	17:00
	Client ID	INUG-110	INUG-111	PDL-75	PDL-76	WAL-91
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	1.44	1.60	3.02	2.83	6.58
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	0.00013	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00034	0.00033	0.00047	0.00039	0.00082
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.797	0.908	0.971	0.903	1.77
	Manganese (Mn)-Dissolved (mg/L)	0.00016	0.00020	0.00029	0.00015	0.00011
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000222
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.00071	0.00056	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.438	0.502	0.453	0.415	0.641
	Rubidium (Rb)-Dissolved (mg/L)	0.00058	0.00067	0.00056	0.00048	0.00087
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.110	0.125	0.147	0.150	0.444
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.660	0.737	0.634	0.580	0.839
	Strontium (Sr)-Dissolved (mg/L)	0.00756	0.00884	0.0124	0.0114	0.0318
	Sulfur (S)-Dissolved (mg/L)	0.88	0.55	0.88	0.77	2.16
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000033	0.000035	0.000022	0.000019	0.000039
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0021	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
Speciated Metals	Arsenate (As V) (ug/L)	0.023	<0.020	<0.020	<0.020	
	Arsenite (As III) (ug/L)	0.023	0.023	0.094	0.094	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2278655-6				
	Description	Water				
	Sampled Date	16-MAY-19				
	Sampled Time	15:46				
	Client ID	WAL-92				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				
	Calcium (Ca)-Dissolved (mg/L)	8.06				
	Cesium (Cs)-Dissolved (mg/L)	<0.000010				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00097				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	2.08				
	Manganese (Mn)-Dissolved (mg/L)	0.00043				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000218				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.763				
	Rubidium (Rb)-Dissolved (mg/L)	0.00099				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	0.456				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	0.984				
	Strontium (Sr)-Dissolved (mg/L)	0.0358				
	Sulfur (S)-Dissolved (mg/L)	2.87				
	Tellurium (Te)-Dissolved (mg/L)	<0.00020				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Thorium (Th)-Dissolved (mg/L)	<0.00010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Tungsten (W)-Dissolved (mg/L)	<0.00010				
	Uranium (U)-Dissolved (mg/L)	0.000039				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0038				
	Zirconium (Zr)-Dissolved (mg/L)	0.000102				
Speciated Metals	Arsenate (As V) (ug/L)					
	Arsenite (As III) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2278655-1	L2278655-2	L2278655-3	L2278655-4	L2278655-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-MAY-19	18-MAY-19	18-MAY-19	18-MAY-19	16-MAY-19
	Sampled Time	10:55	11:50	13:30	12:45	17:00
	Client ID	INUG-110	INUG-111	PDL-75	PDL-76	WAL-91
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	<0.020	<0.020	<0.020	<0.020	
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020	<0.020	<0.020	<0.020	
	Arsenobetaine (AsB, as As) (ug/L)	<0.050	<0.050	<0.050	<0.050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2278655-6				
	Description	Water				
	Sampled Date	16-MAY-19				
	Sampled Time	15:46				
	Client ID	WAL-92				
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)					
	Monomethylarsonic Acid (MMA, as As) (ug/L)					
	Arsenobetaine (AsB, as As) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L2278655-2, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Total	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Boron (B)-Total	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Total	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Manganese (Mn)-Total	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Potassium (K)-Total	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Total	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Total	MS-B	L2278655-1, -2, -3, -4, -5, -6
Matrix Spike	Sulfur (S)-Total	MS-B	L2278655-1, -2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

Reference Information

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Reference Information

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	**Laboratory Location**
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L2278655-COFC

COC # ______

ALS Environmental

Report To		Report Format / Distribution	
Company:	Azimuth Consulting Group	☑ Standard ☐ Other	
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q39503
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ● Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)	Arsenic (F/P)		Number of Containers
	INUG-110	18-May-19	10:55	water	X	X	X	X	X	X	X	X	X	X	X		11
	INUG-111	18-May-19	11:50	water	X	X	X	X	X	X	X	X	X	X	X		11
	PDL-75	18-May-19	13:30	water	X	X	X	X	X	X	X	X	X	X	X		11
	PDL-76	18-May-19	12:45	water	X	X	X	X	X	X	X	X	X	X	X		11
	WAL-91	16-May-19	17:00	water	X	X	X	X	X	X	X	X	X	X			10
	WAL-92	16-May-19	15h46	water	X	X	X	X	X	X	X	X	X	X			10

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Isabelle Couture	21-May-19	8:00	JC	May 24/19	840AM	15 °C				

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 11-JUL-19
Report Date: 25-JUL-19 16:36 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2307977

Project P.O. #:	NOT SUBMITTED
Job Reference:	WTP CREMP-SURFACE WATER
C of C Numbers:	
Legal Site Desc:	

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2307977-1	L2307977-2	L2307977-3	L2307977-4	L2307977-5
	Sample ID	L2307977-1	L2307977-2	L2307977-3	L2307977-4	L2307977-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	05-JUL-19	05-JUL-19	07-JUL-19	07-JUL-19	07-JUL-19
	Sampled Time	16:00	16:20	11:45	12:15	15:22
	Client ID	NEM-41	NEM-42	WTS-41	WTS-42	MAM-41
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	27.1	27.7	86.9	88.8	68.0
	Hardness (as CaCO3) (mg/L)	10.1	10.0	29.6	31.0	23.6
	pH (pH)	7.16	7.18	7.19	7.18	6.98
	Total Suspended Solids (mg/L)	<1.0	<1.0	1.7	1.2	<1.0
	Total Dissolved Solids (mg/L)	15.1	15.6	68	73	54
	Turbidity (NTU)	0.22	0.20	0.58	0.82	0.45
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	6.8	7.3	8.3	8.3	4.9
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	6.8	7.3	8.3	8.3	4.9
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0434	<0.0050	0.0063	0.0088
	Bromide (Br) (mg/L)	<0.050	<0.050	0.203	0.212	0.155
	Chloride (Cl) (mg/L)	0.95	0.96	17.0	17.2	13.7
	Fluoride (F) (mg/L)	0.023	0.024	0.037	0.036	0.023
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.159	0.168	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0014	0.0012	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.116	0.135	0.166	0.168	0.096
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	0.0034	0.0030	0.0025
	Phosphorus (P)-Total (mg/L)	0.0037	0.0054	0.0075	0.0061	0.0033
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	1.06	1.06	0.53
	Sulfate (SO4) (mg/L)	3.34	3.37	3.03	3.01	3.61
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.66	1.78	2.96	2.63	1.63
	Total Organic Carbon (mg/L)	1.60	1.79	2.95	2.79	1.47
Total Metals	Aluminum (Al)-Total (mg/L)	0.0072	0.0072	0.0273	0.0330	0.0107
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00032	0.00029	0.00058	0.00059	0.00028
	Barium (Ba)-Total (mg/L)	0.00434	0.00501	0.0178	0.0177	0.0132
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.26	2.32	9.26	9.78	7.20
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2307977-6	L2307977-7			
	Description	Surface Water	Surface Water			
	Sampled Date	07-JUL-19	07-JUL-19			
	Sampled Time	15:00				
	Client ID	MAM-42	JULY DUP-3			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	89.5	67.9			
	Hardness (as CaCO3) (mg/L)	30.8	23.6			
	pH (pH)	7.09	6.94			
	Total Suspended Solids (mg/L)	1.5	1.1			
	Total Dissolved Solids (mg/L)	73	48			
	Turbidity (NTU)	0.47	0.37			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	5.9	5.0			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	5.9	5.0			
	Ammonia, Total (as N) (mg/L)	0.0070	<0.0050			
	Bromide (Br) (mg/L)	0.202	0.157			
	Chloride (Cl) (mg/L)	18.5	13.4			
	Fluoride (F) (mg/L)	0.028	0.024			
	Nitrate (as N) (mg/L)	0.0368	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.105	0.084			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	0.0035	0.0027			
	Phosphorus (P)-Total (mg/L)	0.0051	0.0041			
	Silicate (as SiO2) (mg/L)	0.75	0.54			
	Sulfate (SO4) (mg/L)	4.34	3.45			
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010			
	Cyanide, Free (mg/L)	<0.0010	<0.0010			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.83	1.67			
	Total Organic Carbon (mg/L)	1.84	1.60			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0168	0.0095			
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00048	0.00029			
	Barium (Ba)-Total (mg/L)	0.0181	0.0130			
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Total (mg/L)	9.35	7.21			
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2307977-1	L2307977-2	L2307977-3	L2307977-4	L2307977-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	05-JUL-19	05-JUL-19	07-JUL-19	07-JUL-19	07-JUL-19
	Sampled Time	16:00	16:20	11:45	12:15	15:22
	Client ID	NEM-41	NEM-42	WTS-41	WTS-42	MAM-41
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00036	0.00013	0.00027	0.00038	0.00011
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	0.00058	0.00056	<0.00050
	Iron (Fe)-Total (mg/L)	0.017	0.013	0.038	0.045	0.019
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	0.0039	0.0040	0.0024
	Magnesium (Mg)-Total (mg/L)	1.02	1.04	1.59	1.65	1.42
	Manganese (Mn)-Total (mg/L)	0.00310	0.00328	0.0178	0.0187	0.00475
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	0.000537	0.000592	0.000057
	Nickel (Ni)-Total (mg/L)	0.00079	0.00078	0.00141	0.00149	0.00130
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.580	0.604	1.59	1.66	0.981
	Rubidium (Rb)-Total (mg/L)	0.00077	0.00061	0.00246	0.00248	0.00136
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.21	0.20	0.58	0.59	0.31
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.497	0.488	1.12	1.15	0.780
	Strontium (Sr)-Total (mg/L)	0.0102	0.0102	0.0978	0.100	0.0629
	Sulfur (S)-Total (mg/L)	1.12	0.92	0.86	1.06	0.88
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	0.00064	0.00101	0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	<0.000010	<0.000010	0.000091	0.000096	0.000020
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0026	0.0038	0.0127	0.0120	0.0055
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00026	0.00026	0.00046	0.00053	0.00024
	Barium (Ba)-Dissolved (mg/L)	0.00468	0.00471	0.0169	0.0172	0.0133
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID / Description / Sampled Date / Sampled Time / Client ID	L2307977-6 Surface Water 07-JUL-19 15:00 MAM-42	L2307977-7 Surface Water 07-JUL-19 JULY DUP-3			
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00023	0.00014			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	0.045	0.019			
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Total (mg/L)	0.0030	0.0024			
	Magnesium (Mg)-Total (mg/L)	1.72	1.39			
	Manganese (Mn)-Total (mg/L)	0.0156	0.00499			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000204	0.000054			
	Nickel (Ni)-Total (mg/L)	0.00152	0.00125			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	1.35	0.964			
	Rubidium (Rb)-Total (mg/L)	0.00186	0.00140			
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Total (mg/L)	0.39	0.31			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	1.11	0.755			
	Strontium (Sr)-Total (mg/L)	0.0808	0.0632			
	Sulfur (S)-Total (mg/L)	1.59	1.00			
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	0.00048	0.00032			
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Total (mg/L)	0.000039	0.000020			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0048	0.0055			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00035	0.00025			
	Barium (Ba)-Dissolved (mg/L)	0.0181	0.0133			
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2307977-1 Surface Water 05-JUL-19 16:00 NEM-41	L2307977-2 Surface Water 05-JUL-19 16:20 NEM-42	L2307977-3 Surface Water 07-JUL-19 11:45 WTS-41	L2307977-4 Surface Water 07-JUL-19 12:15 WTS-42	L2307977-5 Surface Water 07-JUL-19 15:22 MAM-41
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.32	2.31	9.33	9.80	7.16
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00015	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00023	0.00026	0.00046	0.00050	0.00037
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.013	0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	0.0038	0.0040	0.0022
	Magnesium (Mg)-Dissolved (mg/L)	1.04	1.04	1.53	1.58	1.39
	Manganese (Mn)-Dissolved (mg/L)	0.00241	0.00238	0.0159	0.0160	0.00430
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	0.000531	0.000574	0.000052
	Nickel (Ni)-Dissolved (mg/L)	0.00066	0.00068	0.00127	0.00135	0.00116
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.607	0.606	1.58	1.64	0.990
	Rubidium (Rb)-Dissolved (mg/L)	0.00071	0.00070	0.00248	0.00251	0.00137
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.162	0.169	0.526	0.515	0.260
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.490	0.492	1.09	1.15	0.780
	Strontium (Sr)-Dissolved (mg/L)	0.0101	0.0102	0.0955	0.0987	0.0612
	Sulfur (S)-Dissolved (mg/L)	1.17	1.21	1.00	0.87	1.09
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	<0.000010	<0.000010	0.000077	0.000084	0.000020
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)		<0.020	<0.020		<0.020
	Arsenite (As III) (ug/L)		0.115	0.329		0.125

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2307977-6	L2307977-7			
	Description	Surface Water	Surface Water			
	Sampled Date	07-JUL-19	07-JUL-19			
	Sampled Time	15:00				
	Client ID	MAM-42	JULY DUP-3			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	9.52	7.14			
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010			
	Chromium (Cr)-Dissolved (mg/L)	0.00011	<0.00010			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00042	0.00036			
	Iron (Fe)-Dissolved (mg/L)	0.015	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	0.000114			
	Lithium (Li)-Dissolved (mg/L)	0.0029	0.0023			
	Magnesium (Mg)-Dissolved (mg/L)	1.71	1.41			
	Manganese (Mn)-Dissolved (mg/L)	0.0143	0.00425			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000184	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	0.00143	0.00118			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	1.38	0.987			
	Rubidium (Rb)-Dissolved (mg/L)	0.00205	0.00146			
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	0.357	0.287			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	1.12	0.786			
	Strontium (Sr)-Dissolved (mg/L)	0.0814	0.0626			
	Sulfur (S)-Dissolved (mg/L)	1.27	1.04			
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Dissolved (mg/L)	0.000031	0.000018			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0013			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020			
Speciated Metals	Arsenate (As V) (ug/L)		<0.020			
	Arsenite (As III) (ug/L)		0.127			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2307977-1	L2307977-2	L2307977-3	L2307977-4	L2307977-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	05-JUL-19	05-JUL-19	07-JUL-19	07-JUL-19	07-JUL-19
	Sampled Time	16:00	16:20	11:45	12:15	15:22
	Client ID	NEM-41	NEM-42	WTS-41	WTS-42	MAM-41
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)		<0.020	0.027		<0.020
	Monomethylarsonic Acid (MMA, as As) (ug/L)		<0.020	<0.020		<0.020
	Arsenobetaine (AsB, as As) (ug/L)		<0.050	<0.050		<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2307977-6	L2307977-7			
	Description	Surface Water	Surface Water			
	Sampled Date	07-JUL-19	07-JUL-19			
	Sampled Time	15:00				
	Client ID	MAM-42	JULY DUP-3			
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)		0.020			
	Monomethylarsonic Acid (MMA, as As) (ug/L)		<0.020			
	Arsenobetaine (AsB, as As) (ug/L)		<0.050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2307977-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Phosphorus (P)-Total	MS-B	L2307977-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L2307977-7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Reference Information

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

Reference Information

Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☑ Standard ☐ Other		● Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	WTP CREMP - Surfacewater	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q39503	
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: ENV.	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a	Arcenic Speciation		Number of Containers
							P	F/P	P	P	F/P	P	F/P	F	F/P		
	NEM-41	05-Jul-19	16:00	Surface Water	x	x	x	x	x	x	x	x	x				
	NEM-42	05-Jul-19	16:20	Surface Water	x	x	x	x	x	x	x	x	x		x		
	WTS-41	07-Jun-19	11:45	Surface Water	x	x	x	x	x	x	x	x	x		x		
	WTS-42	07-Jun-19	12:15	Surface Water	x	x	x	x	x	x	x	x	x				
	MAM-41	07-Jul-19	15:22	Surface Water	x	x	x	x	x	x	x	x	x		x		
	MAM-42	07-Jul-19	15:00	Surface Water	x	x	x	x	x	x	x	x	x				
	July DUP-3	07-Jul-19		Surface Water	x	x	x	x	x	x	x	x	x		x		

L2307977-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

ZZ July 11, 2019 8:40am

21°C

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 18-JUL-19
Report Date: 29-JUL-19 15:30 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2312327

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP-SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2312327-1	L2312327-2			
	Description	Water	Water			
	Sampled Date	10-JUL-19	10-JUL-19			
	Sampled Time	03:00	03:30			
	Client ID	SP-124	SP-125			
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.419	0.542			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2312327-1	L2312327-2			
	Description	Water	Water			
	Sampled Date	10-JUL-19	10-JUL-19			
	Sampled Time	03:00	03:30			
	Client ID	SP-124	SP-125			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	40.4	40.1			
	Hardness (as CaCO3) (mg/L)	15.1	15.5			
	pH (pH)	7.21	7.25			
	Total Suspended Solids (mg/L)	<1.0	<1.0			
	Total Dissolved Solids (mg/L)	25.7	26.2			
	Turbidity (NTU)	0.41	0.40			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	11.6	11.2			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	11.6	11.2			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	0.93	0.93			
	Fluoride (F) (mg/L)	0.074	0.076			
	Nitrate (as N) (mg/L)	<0.0050	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.121	0.107			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	0.0033 RRV	<0.0020			
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0029			
	Silicate (as SiO2) (mg/L)	<0.50	<0.50			
	Sulfate (SO4) (mg/L)	5.55	5.58			
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010			
	Cyanide, Free (mg/L)	<0.0010	<0.0010			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.81	1.91			
	Total Organic Carbon (mg/L)	2.18	1.76			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0110	0.0109			
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00021	0.00020			
	Barium (Ba)-Total (mg/L)	0.00292	0.00291			
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Total (mg/L)	4.01	4.07			
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2312327-1 Water 10-JUL-19 03:00 SP-124	L2312327-2 Water 10-JUL-19 03:30 SP-125			
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	0.00029			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	0.00052	0.00053			
	Iron (Fe)-Total (mg/L)	0.019	0.023			
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Total (mg/L)	1.35	1.32			
	Manganese (Mn)-Total (mg/L)	0.00249	0.00242			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000151	0.000142			
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.538	0.523			
	Rubidium (Rb)-Total (mg/L)	0.00079	0.00069			
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Total (mg/L)	0.23	0.23			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	0.840	0.835			
	Strontium (Sr)-Total (mg/L)	0.0192	0.0189			
	Sulfur (S)-Total (mg/L)	1.80	1.82			
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Total (mg/L)	0.000050	0.000049			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0034	0.0029			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00022	0.00022			
	Barium (Ba)-Dissolved (mg/L)	0.00270	0.00291			
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2312327-1	L2312327-2			
	Description	Water	Water			
	Sampled Date	10-JUL-19	10-JUL-19			
	Sampled Time	03:00	03:30			
	Client ID	SP-124	SP-125			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	3.89	4.02			
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00118	0.00065			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	1.32	1.33			
	Manganese (Mn)-Dissolved (mg/L)	0.00192	0.00210			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000150	0.000158			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.537	0.552			
	Rubidium (Rb)-Dissolved (mg/L)	0.00078	0.00078			
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	0.166	0.170			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	0.897	0.915			
	Strontium (Sr)-Dissolved (mg/L)	0.0194	0.0202			
	Sulfur (S)-Dissolved (mg/L)	1.80	1.90			
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Dissolved (mg/L)	0.000052	0.000049			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0019	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2312327-1, -2
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2312327-1, -2
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2312327-1, -2
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L2312327-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Reference Information

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

Reference Information

Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # ______

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☑ Standard	☐ Other
☑ PDF ☑ Excel	☐ Digital ☐ Fax
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ● Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	SP-124	10-Jul-19	3:00	Water	X	X	X	X	X	X	X	X	X	X			10
	SP-125	10-Jul-19	3:30	Water	X	X	X	X	X	X	X	X	X	X			10

L2312327-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

L2312327-COFC

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Mickaël Boillet-Albert	17-07-19	7:00	SC AI	JUL 18 2019	8:40AM	19 °C				

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 18-JUL-19
Report Date: 01-AUG-19 12:45 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2312432

Project P.O. #: NOT SUBMITTED
Job Reference: WTP CREMP-SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2312432-1	L2312432-2	L2312432-3	L2312432-4	L2312432-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	09-JUL-19	09-JUL-19	13-JUL-19	13-JUL-19	12-JUL-19
	Sampled Time	15:15	15:30	13:30	14:20	12:20
	Client ID	D51-33	D51-34	A20-35	A20-36	A76-35
WATER						
Physical Tests	Conductivity (uS/cm)	13.2	11.6	13.4	13.3	39.5
	Hardness (as CaCO3) (mg/L)	4.61	3.99	4.58	4.50	14.1
	pH (pH)	6.80	6.73	6.84	6.84	6.96
	Total Suspended Solids (mg/L)	2.5	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	9.7	10.4	11.3	13.8	28.9
	Turbidity (NTU)	0.69	0.65	0.32	0.36	0.30
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	4.1	3.6	4.2	4.2	5.3
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	4.1	3.6	4.2	4.2	5.3
	Ammonia, Total (as N) (mg/L)	0.0080	0.0057	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	0.059
	Chloride (Cl) (mg/L)	0.89	0.80	0.60	0.60	5.32
	Fluoride (F) (mg/L)	0.049	0.052	0.024	0.024	0.023
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.135	0.125	0.127	0.091	0.108
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	0.0036	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0037	0.0027	0.0021	<0.0020	0.0021
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	0.63
	Sulfate (SO4) (mg/L)	0.85	0.77	0.92	0.91	3.23
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.89	2.59	1.91	2.03	1.44
	Total Organic Carbon (mg/L)	2.42	2.48	1.88	1.92	1.62
Total Metals	Aluminum (Al)-Total (mg/L)	0.0310	0.0262	0.0124	0.0102	0.0082
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	DLB <0.00030	DLB <0.00020	<0.00010	<0.00010	0.00018
	Barium (Ba)-Total (mg/L)	0.00382	0.00366	0.00309	0.00317	0.00786
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	1.25	1.06	1.17	1.12	3.73
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2312432-6	L2312432-7	L2312432-8	L2312432-9	L2312432-10
	Sample ID	L2312432-6	L2312432-7	L2312432-8	L2312432-9	L2312432-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-JUL-19	14-JUL-19	12-JUL-19	12-JUL-19	14-JUL-19
	Sampled Time	13:00	12:00	16:00	16:40	12:35
	Client ID	A76-36	JULY DUP-4	LK8-11	LK8-12	LK1-11
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	38.9	15.9	14.5	14.5	16.0
	Hardness (as CaCO3) (mg/L)	14.3	5.73	5.24	5.16	5.66
	pH (pH)	7.00	6.74	6.73	6.87	6.93
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	22.3	11.3	12.4	13.2	17.7
	Turbidity (NTU)	0.63	0.90	0.61	0.62	0.81
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	5.7	5.0	4.5	3.9	4.6
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	5.7	5.0	4.5	3.9	4.6
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0403	0.0317	0.0403	0.0283
	Bromide (Br) (mg/L)	0.061	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	5.45	0.70	0.55	0.53	0.67
	Fluoride (F) (mg/L)	0.025	0.031	0.024	0.024	0.030
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.102	0.176	0.118	0.111	0.165
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0011
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	0.0021	<0.0020	0.0022	0.0028
	Phosphorus (P)-Total (mg/L)	0.0125	0.0042	<0.0020	<0.0020	0.0055
	Silicate (as SiO2) (mg/L)	0.60	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	3.32	1.02	1.36	1.29	0.97
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.39	2.31	1.54	1.58	HTD 2.31
	Total Organic Carbon (mg/L)	1.85	2.47	1.66	2.05	2.46
Total Metals	Aluminum (Al)-Total (mg/L)	0.0081	0.0187	0.0060	0.0058	0.0241
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00017	0.00011	0.00011	0.00010	DLB <0.00020
	Barium (Ba)-Total (mg/L)	0.00785	0.00339	0.00224	0.00227	0.00364
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	3.69	1.29	0.998	1.02	1.35
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID / Description / Sampled Date / Sampled Time / Client ID				
		L2312432-11 Surface Water 14-JUL-19 12:00 LK1-12				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	15.6				
	Hardness (as CaCO3) (mg/L)	5.80				
	pH (pH)	6.81				
	Total Suspended Solids (mg/L)	1.4				
	Total Dissolved Solids (mg/L)	14.2				
	Turbidity (NTU)	1.17				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	5.3				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	5.3				
	Ammonia, Total (as N) (mg/L)	0.0360				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	0.69				
	Fluoride (F) (mg/L)	0.030				
	Nitrate (as N) (mg/L)	<0.0050				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	0.175				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020				
	Phosphorus (P)-Total (mg/L)	0.0033				
	Silicate (as SiO2) (mg/L)	<0.50				
	Sulfate (SO4) (mg/L)	1.01				
Cyanides	Cyanide, Total (mg/L)	<0.0010				
	Cyanide, Free (mg/L)	<0.0010				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.12				
	Total Organic Carbon (mg/L)	2.25				
Total Metals	Aluminum (Al)-Total (mg/L)	0.0192				
	Antimony (Sb)-Total (mg/L)	<0.00010				
	Arsenic (As)-Total (mg/L)	0.00010				
	Barium (Ba)-Total (mg/L)	0.00333				
	Beryllium (Be)-Total (mg/L)	<0.00010				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				
	Calcium (Ca)-Total (mg/L)	1.29				
	Cesium (Cs)-Total (mg/L)	<0.000010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2312432-1	L2312432-2	L2312432-3	L2312432-4	L2312432-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	09-JUL-19	09-JUL-19	13-JUL-19	13-JUL-19	12-JUL-19
	Sampled Time	15:15	15:30	13:30	14:20	12:20
	Client ID	D51-33	D51-34	A20-35	A20-36	A76-35
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00012	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.041	0.031	0.016	0.014	0.014
	Lead (Pb)-Total (mg/L)	<0.000050	0.000066	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	0.411	0.329	0.406	0.388	1.13
	Manganese (Mn)-Total (mg/L)	0.00226	0.00130	0.00168	0.00127	0.00209
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00071
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.263	0.241	0.309	0.293	0.668
	Rubidium (Rb)-Total (mg/L)	0.00047	0.00040	0.00033	0.00034	0.00093
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.32	0.28	0.40	0.34	0.48
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.710	0.635	0.503	0.489	0.594
	Strontium (Sr)-Total (mg/L)	0.00672	0.00641	0.00597	0.00585	0.0202
	Sulfur (S)-Total (mg/L)	<0.50	<0.50	<0.50	<0.50	1.12
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	0.00056	0.00045	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000060	0.000053	0.000038	0.000039	0.000022
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0138	0.0130	0.0075	0.0062	0.0027
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00016
	Barium (Ba)-Dissolved (mg/L)	0.00362	0.00376	0.00322	0.00311	0.00797
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2312432-6	L2312432-7	L2312432-8	L2312432-9	L2312432-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-JUL-19	14-JUL-19	12-JUL-19	12-JUL-19	14-JUL-19
	Sampled Time	13:00	12:00	16:00	16:40	12:35
	Client ID	A76-36	JULY DUP-4	LK8-11	LK8-12	LK1-11
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	0.00016	<0.00010	<0.00010	0.00015
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.015	0.028	<0.010	<0.010	0.033
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.13	0.574	0.591	0.570	0.549
	Manganese (Mn)-Total (mg/L)	0.00229	0.00389	0.00211	0.00200	0.00445
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00076	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.679	0.288	0.307	0.295	0.277
	Rubidium (Rb)-Total (mg/L)	0.00093	0.00040	0.00046	0.00044	0.00046
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.47	0.28	0.28	0.26	0.27
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.600	0.504	0.421	0.413	0.559
	Strontium (Sr)-Total (mg/L)	0.0206	0.00719	0.00470	0.00468	0.00714
	Sulfur (S)-Total (mg/L)	1.16	<0.50	<0.50	0.50	<0.50
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	0.00044	<0.00030	<0.00030	0.00063
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000021	0.000046	0.000013	0.000014	0.000049
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0032	0.0107	0.0036	0.0038	0.0122
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00016	<0.00010	0.00012	0.00011	0.00010
	Barium (Ba)-Dissolved (mg/L)	0.00808	0.00335	0.00237	0.00229	0.00357
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2312432-11				
	Description	Surface Water				
	Sampled Date	14-JUL-19				
	Sampled Time	12:00				
	Client ID	LK1-12				
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00016				
	Cobalt (Co)-Total (mg/L)	<0.00010				
	Copper (Cu)-Total (mg/L)	<0.00050				
	Iron (Fe)-Total (mg/L)	0.030				
	Lead (Pb)-Total (mg/L)	<0.000050				
	Lithium (Li)-Total (mg/L)	<0.0010				
	Magnesium (Mg)-Total (mg/L)	0.568				
	Manganese (Mn)-Total (mg/L)	0.00407				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	<0.000050				
	Nickel (Ni)-Total (mg/L)	<0.00050				
	Phosphorus (P)-Total (mg/L)	<0.050				
	Potassium (K)-Total (mg/L)	0.290				
	Rubidium (Rb)-Total (mg/L)	0.00042				
	Selenium (Se)-Total (mg/L)	<0.000050				
	Silicon (Si)-Total (mg/L)	0.28				
	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	0.495				
	Strontium (Sr)-Total (mg/L)	0.00719				
	Sulfur (S)-Total (mg/L)	<0.50				
	Tellurium (Te)-Total (mg/L)	<0.00020				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Thorium (Th)-Total (mg/L)	<0.00010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	0.00054				
	Tungsten (W)-Total (mg/L)	<0.00010				
	Uranium (U)-Total (mg/L)	0.000048				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.00020				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0088				
	Antimony (Sb)-Dissolved (mg/L)	<0.00010				
	Arsenic (As)-Dissolved (mg/L)	0.00010				
	Barium (Ba)-Dissolved (mg/L)	0.00338				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2312432-1	L2312432-2	L2312432-3	L2312432-4	L2312432-5
	Sample ID	L2312432-1	L2312432-2	L2312432-3	L2312432-4	L2312432-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	09-JUL-19	09-JUL-19	13-JUL-19	13-JUL-19	12-JUL-19
	Sampled Time	15:15	15:30	13:30	14:20	12:20
	Client ID	D51-33	D51-34	A20-35	A20-36	A76-35
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	1.14	1.02	1.16	1.14	3.72
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00028	0.00026	0.00025	0.00023	0.00028
	Iron (Fe)-Dissolved (mg/L)	0.015	0.012	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.430	0.353	0.406	0.401	1.16
	Manganese (Mn)-Dissolved (mg/L)	0.00115	0.00073	0.00127	0.00094	0.00171
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	0.0000054	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00061
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.259	0.254	0.308	0.306	0.681
	Rubidium (Rb)-Dissolved (mg/L)	0.00044	0.00045	0.00039	0.00041	0.00096
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.248	0.243	0.326	0.308	0.406
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.612	0.615	0.524	0.526	0.641
	Strontium (Sr)-Dissolved (mg/L)	0.00655	0.00634	0.00631	0.00619	0.0217
	Sulfur (S)-Dissolved (mg/L)	<0.50	<0.50	<0.50	<0.50	0.86
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000051	0.000050	0.000034	0.000036	0.000020
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)	<0.020		<0.020		<0.020
	Arsenite (As III) (ug/L)	0.024		<0.020		0.067

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2312432-6	L2312432-7	L2312432-8	L2312432-9	L2312432-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-JUL-19	14-JUL-19	12-JUL-19	12-JUL-19	14-JUL-19
	Sampled Time	13:00	12:00	16:00	16:40	12:35
	Client ID	A76-36	JULY DUP-4	LK8-11	LK8-12	LK1-11
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	3.80	1.32	1.09	1.05	1.27
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00031	0.00034	0.00032	0.00031	0.00026
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	0.011
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	DTC 0.00463	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.18	0.590	0.614	0.618	0.606
	Manganese (Mn)-Dissolved (mg/L)	0.00186	0.00280	0.00148	0.00149	0.00288
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	0.00071	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.692	0.297	0.314	0.306	0.332
	Rubidium (Rb)-Dissolved (mg/L)	0.00098	0.00044	0.00050	0.00052	0.00043
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.397	0.234	0.232	0.227	0.226
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.646	0.538	0.449	0.454	0.584
	Strontium (Sr)-Dissolved (mg/L)	0.0213	0.00749	0.00523	0.00507	0.00730
	Sulfur (S)-Dissolved (mg/L)	0.90	<0.50	<0.50	<0.50	<0.50
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000020	0.000041	0.000014	0.000013	0.000044
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0013	<0.0010	<0.0010	0.0013
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)		<0.020	<0.020		<0.020
	Arsenite (As III) (ug/L)		0.027	0.038		0.027

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2312432-11				
	Description	Surface Water				
	Sampled Date	14-JUL-19				
	Sampled Time	12:00				
	Client ID	LK1-12				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				
	Calcium (Ca)-Dissolved (mg/L)	1.32				
	Cesium (Cs)-Dissolved (mg/L)	<0.000010				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00026				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	0.000068				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	0.607				
	Manganese (Mn)-Dissolved (mg/L)	0.00287				
	Mercury (Hg)-Dissolved (mg/L)	0.0000081				
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.299				
	Rubidium (Rb)-Dissolved (mg/L)	0.00042				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	0.229				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	0.544				
	Strontium (Sr)-Dissolved (mg/L)	0.00746				
	Sulfur (S)-Dissolved (mg/L)	<0.50				
	Tellurium (Te)-Dissolved (mg/L)	<0.00020				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Thorium (Th)-Dissolved (mg/L)	<0.00010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Tungsten (W)-Dissolved (mg/L)	<0.00010				
	Uranium (U)-Dissolved (mg/L)	0.000040				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0010				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020				
Speciated Metals	Arsenate (As V) (ug/L)					
	Arsenite (As III) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2312432-1	L2312432-2	L2312432-3	L2312432-4	L2312432-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	09-JUL-19	09-JUL-19	13-JUL-19	13-JUL-19	12-JUL-19
	Sampled Time	15:15	15:30	13:30	14:20	12:20
	Client ID	D51-33	D51-34	A20-35	A20-36	A76-35
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	<0.020		<0.020		<0.020
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020		<0.020		<0.020
	Arsenobetaine (AsB, as As) (ug/L)	<0.050		<0.050		<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2312432-6	L2312432-7	L2312432-8	L2312432-9	L2312432-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-JUL-19	14-JUL-19	12-JUL-19	12-JUL-19	14-JUL-19
	Sampled Time	13:00	12:00	16:00	16:40	12:35
	Client ID	A76-36	JULY DUP-4	LK8-11	LK8-12	LK1-11
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)		<0.020	<0.020		<0.020
	Monomethylarsonic Acid (MMA, as As) (ug/L)		<0.020	<0.020		<0.020
	Arsenobetaine (AsB, as As) (ug/L)		<0.050	<0.050		<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2312432-11				
	Description	Surface Water				
	Sampled Date	14-JUL-19				
	Sampled Time	12:00				
	Client ID	LK1-12				
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)					
	Monomethylarsonic Acid (MMA, as As) (ug/L)					
	Arsenobetaine (AsB, as As) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Nitrate (as N)	B	L2312432-11, -7, -8
Method Blank	Arsenic (As)-Total	MB-LOR	L2312432-1, -10, -2
Matrix Spike	Dissolved Organic Carbon	MS-B	L2312432-10
Matrix Spike	Total Organic Carbon	MS-B	L2312432-9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2312432-11, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2312432-9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2312432-11, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2312432-9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2312432-11, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2312432-9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2312432-11, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2312432-9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2312432-11, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2312432-9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2312432-11, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2312432-9
Matrix Spike	Total Kjeldahl Nitrogen	MS-B	L2312432-1, -2, -3, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

Reference Information

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

Reference Information

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # ____________

Report To			
Company:	Azimuth Consulting Group		
Contact:	Eric Franz		
Address:	218-2902 West Broadway		
	Vancouver, BC V6K2G8		
Phone:	604-730-1220	Fax:	
Invoice To	Same as Report ?	☑ Yes	☐ No
Hardcopy of Invoice with Report?		☐ Yes	☑ No
Company:			
Contact:			
Address:			
Phone:		Fax:	
Lab Work Order # (lab use only)			

Report Format / Distribution			
☑ Standard	☐ Other		
☑ PDF	☑ Excel	☐ Digital	☐ Fax
Email 1:	efranz@azimuthgroup.ca		
Email 2:	marie-pier.marcil@agnicoeagle.com		
Email 3:	robin.allard@agnicoeagle.com		
Client / Project Information			
Job #:	WTP CREMP - Surfacewater		
PO / AFE:			
LSD:			
Quote #:	Q39503		
ALS Contact:	Brent Mack	**Sampler:**	ENV.

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a	Arcenic Speciation		Number of Containers
							P	F/P	P	P	F/P	P	F/P	F	F/P		
	~~DS-33~~ DS1-33	09-Jul-19	15:15	Surface Water	X	X	X	X	X	X	X	X	X		X		
	~~DS-34~~ DS1-34	09-Jul-19	15:30	Surface Water	X	X	X	X	X	X	X	X	X				
	A20-35	13-Jul-19	13:30	Surface Water	X	X	X	X	X	X	X	X	X		X		
	A20-36	13-Jul-19	14:20	Surface Water	X	X	X	X	X	X	X	X	X				
	A76-35	12-Jul-19	12:20	Surface Water	X	X	X	X	X	X	X	X	X		X		
	A76-36	12-Jul-19	13:00	Surface Water	X	X	X	X	X	X	X	X	X				
	July DUP-4	14-Jul-19	12:00	Surface Water	X	X	X	X	X	X	X	X	X		X		
	LK8-11	12-Jul-19	16:00	Surface Water	X	X	X	X	X	X	X	X	X		X		
	LK8-12	12-Jul-19	16:40	Surface Water	X	X	X	X	X	X	X	X	X				
	LK1-11	14-Jul-19	12:35	Surface Water	X	X	X	X	X	X	X	X	X		X		
	LK1-12	14-Jul-19	12:00	Surface Water	X	X	X	X	X	X	X	X	X				

L2312432-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

AZ JUL 18 2019 20;21°c 840AM JC

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 22-JUL-19
Report Date: 01-AUG-19 12:41 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2314384

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2314384-1	L2314384-2	L2314384-3	L2314384-4	
		Description	Surface Water	Surface Water	Surface Water	Surface Water	
		Sampled Date	16-JUL-19	16-JUL-19	13-JUL-19	13-JUL-19	
		Sampled Time	11:00	11:30	16:35	16:20	
		Client ID	WAL-93	WAL-94	TPE-125	TPE-124	
Grouping	**Analyte**						
FILTER							
Plant Pigments	Chlorophyll a (ug/L)		0.383	0.529	0.155	0.176	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2314384-1	L2314384-2	L2314384-3	L2314384-4	
	Description	Surface Water	Surface Water	Surface Water	Surface Water	
	Sampled Date	16-JUL-19	16-JUL-19	13-JUL-19	13-JUL-19	
	Sampled Time	11:00	11:30	16:35	16:20	
	Client ID	WAL-93	WAL-94	TPE-125	TPE-124	
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	37.0	36.5	29.6	31.0	
	Hardness (as CaCO3) (mg/L)	15.1	15.2	10.1	10.8	
	pH (pH)	7.29	7.32	7.12	7.15	
	Total Suspended Solids (mg/L)	1.9	1.5	<1.0	<1.0	
	Total Dissolved Solids (mg/L)	25.9	26.9	21.3	22.9	
	Turbidity (NTU)	0.33	0.38	0.26	0.22	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	11.8	11.9	7.6	7.9	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	11.8	11.9	7.6	7.9	
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0360	0.0409	0.0052	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	0.64	0.65	0.70	0.73	
	Fluoride (F) (mg/L)	0.042	0.043	0.070	0.073	
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.0084	0.0100	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.101	0.158	0.123	0.091	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	
	Phosphorus (P)-Total (mg/L)	0.0023	0.0026	<0.0020	<0.0020	
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	
	Sulfate (SO4) (mg/L)	3.84	3.86	4.37	4.60	
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.12	2.12	1.47	1.41	
	Total Organic Carbon (mg/L)	2.05	2.14	1.30	1.26	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0061	0.0052	0.0055	0.0056	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Total (mg/L)	0.00022	0.00022	0.00031	0.00033	
	Barium (Ba)-Total (mg/L)	0.00226	0.00241	0.00294	0.00305	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Total (mg/L)	4.15	4.11	2.50	2.59	
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	0.000016	0.000018	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2314384-1	L2314384-2	L2314384-3	L2314384-4	
	Description	Surface Water	Surface Water	Surface Water	Surface Water	
	Sampled Date	16-JUL-19	16-JUL-19	13-JUL-19	13-JUL-19	
	Sampled Time	11:00	11:30	16:35	16:20	
	Client ID	WAL-93	WAL-94	TPE-125	TPE-124	
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Total (mg/L)	0.00076	0.00075	<0.00050	<0.00050	
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Total (mg/L)	1.21	1.22	0.989	1.04	
	Manganese (Mn)-Total (mg/L)	0.00137	0.00128	0.00198	0.00196	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000152	0.000158	0.000122	0.000121	
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	0.00053	0.00057	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.453	0.446	0.503	0.527	
	Rubidium (Rb)-Total (mg/L)	0.00061	0.00056	0.00075	0.00072	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.26	0.27	0.13	0.11	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	0.596	0.596	1.07	1.11	
	Strontium (Sr)-Total (mg/L)	0.0212	0.0224	0.0117	0.0122	
	Sulfur (S)-Total (mg/L)	1.38	1.68	1.79	1.70	
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Total (mg/L)	0.000048	0.000043	0.000045	0.000047	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0035	0.0049	0.0017	0.0016	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)	0.00021	0.00020	0.00026	0.00032	
	Barium (Ba)-Dissolved (mg/L)	0.00231	0.00230	0.00289	0.00298	
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L2314384-1 Surface Water 16-JUL-19 11:00 WAL-93	L2314384-2 Surface Water 16-JUL-19 11:30 WAL-94	L2314384-3 Surface Water 13-JUL-19 16:35 TPE-125	L2314384-4 Surface Water 13-JUL-19 16:20 TPE-124	
Grouping	**Analyte**						
WATER							
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)		<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)		4.09	4.12	2.48	2.69	
	Cesium (Cs)-Dissolved (mg/L)		<0.000010	<0.000010	0.000013	0.000016	
	Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)		0.00065	0.00072	0.00033	0.00035	
	Iron (Fe)-Dissolved (mg/L)		<0.010	<0.010	<0.010	<0.010	
	Lead (Pb)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Dissolved (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Dissolved (mg/L)		1.18	1.18	0.948	0.995	
	Manganese (Mn)-Dissolved (mg/L)		0.00074	0.00078	0.00157	0.00143	
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)		0.000136	0.000149	0.000110	0.000123	
	Nickel (Ni)-Dissolved (mg/L)		<0.00050	<0.00050	0.00052	0.00052	
	Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)		0.453	0.448	0.505	0.521	
	Rubidium (Rb)-Dissolved (mg/L)		0.00066	0.00059	0.00076	0.00079	
	Selenium (Se)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Dissolved (mg/L)		0.249	0.247	0.104	0.101	
	Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)		0.542	0.546	0.972	0.992	
	Strontium (Sr)-Dissolved (mg/L)		0.0202	0.0202	0.0110	0.0115	
	Sulfur (S)-Dissolved (mg/L)		1.13	1.56	1.55	1.52	
	Tellurium (Te)-Dissolved (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (Tl)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Dissolved (mg/L)		0.000040	0.000042	0.000036	0.000036	
	Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)		<0.0010	0.0031	<0.0010	<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Total	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Total	MS-B	L2314384-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L2314384-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

Reference Information

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution

☑ Standard ☐ Other

☑ PDF ☑ Excel ☐ Digital ☐ Fax

Email 1: efranz@azimuthgroup.ca

Email 2: marie-pier.marcil@agnicoeagle.com

Email 3: robin.allard@agnicoeagle.com

Client / Project Information

Job #: Meadowbank CREMP - Surfacewater

PO / AFE:

LSD:

Quote #: Q39503

ALS Contact: Brent Mack — Sampler: ENV

Service Requested (Rush for routine analysis subject to availability)

● Regular (Standard Turnaround Times - Business Days)

○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT

○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT

○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
	WAL-93	16-07-2019	11:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	WAL-94	16-07-2019	11:30	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TPE-125	13-07-2019	16:35	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TPE-124	13-07-2019	16:20	Surface Water	X	X	X	X	X	X	X	X	X	X			10
				Surface Water													
				Surface Water													
				Surface Water													
				Surface Water													
				Surface Water													
				Surface Water													

L2314384-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Jamie K	Date (dd-mmm-yy) 17-07-2019	Time (hh-mm) 9:00	Received by: EZ	Date: July 22 2019	Time: 12:44	Temperature: 23 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

a

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 29-JUL-19
Report Date: 14-AUG-19 16:10 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2318863

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2318863-1	L2318863-2	L2318863-3	L2318863-4	L2318863-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	24-JUL-19	24-JUL-19	14-JUL-19	14-JUL-19	12-JUL-19
	Sampled Time	13:30	13:50	12:35	12:00	12:20
	Client ID	LK5-11	LK5-12	LK1-12	LK1-11	A76-35
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.695	0.641	0.607	0.681	0.327

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2318863-6	L2318863-7	L2318863-8	L2318863-9	L2318863-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	12-JUL-19	07-JUL-19	07-JUL-19	05-JUL-19	05-JUL-19
	Sampled Time	13:00	15:22	15:00	16:00	16:20
	Client ID	A76-36	MAM-41	MAM-42	NEM-41	NEM-42
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.271	0.562	0.606	0.247	0.330

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2318863-11	L2318863-12	L2318863-13	L2318863-14	L2318863-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	12-JUL-19	12-JUL-19	13-JUL-19	13-JUL-19	09-JUL-19
	Sampled Time	16:00	16:40	13:30	14:20	15:15
	Client ID	LK8-12	LK8-11	A20-35	A20-36	DS1-34
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.404	0.412	0.450	0.179	0.583

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2318863-16	L2318863-17	L2318863-18	L2318863-19	L2318863-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	09-JUL-19	06-JUL-19	06-JUL-19	09-APR-19	14-JUL-19
	Sampled Time	15:30	11:45	12:15		
	Client ID	DS1-33	WTS-41	WTS-42	JULY DUP-3	JULY DUP-4
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.716	1.59	1.65	0.555	0.611

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2318863-1	L2318863-2			
	Description	Water	Water			
	Sampled Date	24-JUL-19	24-JUL-19			
	Sampled Time	13:30	13:50			
	Client ID	LK5-11	LK5-12			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	24.3	24.6			
	Hardness (as CaCO3) (mg/L)	9.93	9.80			
	pH (pH)	7.19	7.14			
	Total Suspended Solids (mg/L)	<1.0	<1.0			
	Total Dissolved Solids (mg/L)	12.9	18.1			
	Turbidity (NTU)	0.27	0.28			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	10.1	9.4			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	10.1	9.4			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	0.63	0.63			
	Fluoride (F) (mg/L)	0.029	0.028			
	Nitrate (as N) (mg/L)	<0.0050	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.196	0.103			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	0.0024	<0.0020			
	Phosphorus (P)-Total (mg/L)	0.0102	0.0033			
	Silicate (as SiO2) (mg/L)	0.54	0.56			
	Sulfate (SO4) (mg/L)	1.85	1.85			
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010			
	Cyanide, Free (mg/L)	<0.0010	<0.0010			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.53 RRV	2.24			
	Total Organic Carbon (mg/L)	2.55 RRV	1.91			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0099	0.0087			
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00017	0.00018			
	Barium (Ba)-Total (mg/L)	0.00312	0.00291			
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Total (mg/L)	2.49	2.43			
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2318863-1	L2318863-2			
	Description	Water	Water			
	Sampled Date	24-JUL-19	24-JUL-19			
	Sampled Time	13:30	13:50			
	Client ID	LK5-11	LK5-12			
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	0.00021			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	0.021	0.020			
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Total (mg/L)	1.05	1.04			
	Manganese (Mn)-Total (mg/L)	0.00232	0.00243			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050			
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.313	0.313			
	Rubidium (Rb)-Total (mg/L)	0.00034	0.00039			
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Total (mg/L)	0.40	0.40			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	0.562	0.555			
	Strontium (Sr)-Total (mg/L)	0.00934	0.00900			
	Sulfur (S)-Total (mg/L)	0.72	0.75			
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Total (mg/L)	0.000021	0.000020			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0035	0.0031			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00016	0.00015			
	Barium (Ba)-Dissolved (mg/L)	0.00284	0.00291			
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2318863-1	L2318863-2			
	Description	Water	Water			
	Sampled Date	24-JUL-19	24-JUL-19			
	Sampled Time	13:30	13:50			
	Client ID	LK5-11	LK5-12			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	2.34	2.29			
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00021	0.00025			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	0.995	0.992			
	Manganese (Mn)-Dissolved (mg/L)	0.00059	0.00078			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.301	0.306			
	Rubidium (Rb)-Dissolved (mg/L)	0.00038	0.00037			
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	0.312	0.325			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	0.563	0.560			
	Strontium (Sr)-Dissolved (mg/L)	0.00815	0.00847			
	Sulfur (S)-Dissolved (mg/L)	0.63	0.58			
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Dissolved (mg/L)	0.000024	0.000018			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0013	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020			
Speciated Metals	Arsenate (As V) (ug/L)	<0.020				
	Arsenite (As III) (ug/L)	0.045				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2318863-1	L2318863-2			
	Description	Water	Water			
	Sampled Date	24-JUL-19	24-JUL-19			
	Sampled Time	13:30	13:50			
	Client ID	LK5-11	LK5-12			
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	<0.020				
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020				
	Arsenobetaine (AsB, as As) (ug/L)	<0.050				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L2318863-2
Matrix Spike	Dissolved Organic Carbon	MS-B	L2318863-1
Matrix Spike	Total Organic Carbon	MS-B	L2318863-1
Matrix Spike	Aluminum (Al)-Total	MS-B	L2318863-1, -2
Matrix Spike	Barium (Ba)-Total	MS-B	L2318863-1, -2
Matrix Spike	Calcium (Ca)-Total	MS-B	L2318863-1, -2
Matrix Spike	Copper (Cu)-Total	MS-B	L2318863-1, -2
Matrix Spike	Iron (Fe)-Total	MS-B	L2318863-1, -2
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2318863-1, -2
Matrix Spike	Manganese (Mn)-Total	MS-B	L2318863-1, -2
Matrix Spike	Strontium (Sr)-Total	MS-B	L2318863-1, -2
Matrix Spike	Titanium (Ti)-Total	MS-B	L2318863-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Reference Information

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

L2318863-COFC

COC #

Report To			
Company:	Azimuth Consulting Group		
Contact:	Eric Franz		
Address:	218-2902 West Broadway		
	Vancouver, BC V6K2G8		
Phone:	604-730-1220	Fax:	
Invoice To	Same as Report ?	☑ Yes	☐ No
Hardcopy of Invoice with Report?		☐ Yes	☑ No
Company:			
Contact:			
Address:			
Phone:		Fax:	
Lab Work Order # (lab use only)			

☑ PDF ☑ Excel ☐ Digital ☐ Fax

Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- Regular (Standard Turnaround Times - Business Days)
- Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a	Arsenic speciation		Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	LK5-11	24-Jul-19	13:30	water	x	x	x	x	x	x	x	x	x	x	X		
	LK5-12	24-Jul-19	13:50	Water	x	x	x	x	x	x	x	x	x	x			
	LK1-12	14-Jul-19	12:35	Water										x			
	LK1-11	14-Jul-19	12:00	Water										x			
	A76-35	12-Jul-19	12:20	Water										x			
	A76-36	12-Jul-19	13:00	Water										x			
	MAM-41	07-Jul-19	15:22	Water										x			
	MAM-42	07-Jul-19	15:00	Water										x			
	NEM-41	05-Jul-19	16:00	Water										x			
	NEM-42	05-Jul-19	16:20	Water										x			
	LK8-11	12-Jul-19	16:00	Water										x			
	LK8-12	12-Jul-19	16:40	Water										x			
	A20-35	13-Jul-19	13:30	Water										x			
	A20-36	13-Jul-19	14:20	Water										x			
	DS1-34	09-Jul-19	15:15	Water										x			
	DS1-33	09-Jul-19	15:30	Water										x			
	WTS-41	06-Jul-19	11:45	Water										x			
	WTS-42	06-Jul-19	12:15	Water										x			
	July DUP-3	09-Apr-19		Water										x			
	July DUP-4	14-Jul-19		Water										x			

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Fanny Laporte	25-Jul-19	7:30	HA	7/29	2:10p	23 °C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 02-AUG-19
Report Date: 16-AUG-19 13:16 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2322210

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2322210-1	L2322210-2	L2322210-3	L2322210-4	
	Description	Water	Water	Water	Water	
	Sampled Date	28-JUL-19	28-JUL-19	29-JUL-19	29-JUL-19	
	Sampled Time	14:00	14:40	15:19	14:55	
	Client ID	PDL-77	PDL-78	INUG-112	INUG-113	
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.630	0.375	0.147	0.285	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2322210-1	L2322210-2	L2322210-3	L2322210-4
	Description	Water	Water	Water	Water
	Sampled Date	28-JUL-19	28-JUL-19	29-JUL-19	29-JUL-19
	Sampled Time	14:00	14:40	15:19	14:55
	Client ID	PDL-77	PDL-78	INUG-112	INUG-113
Grouping	**Analyte**				
WATER					
Physical Tests	Conductivity (uS/cm)	22.8	22.0	15.8	15.5
	Hardness (as CaCO3) (mg/L)	9.50	9.92	6.34	6.32
	pH (pH)	7.24	7.08	6.87	6.88
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	15.1	7.7	13.5	12.2
	Turbidity (NTU)	0.17	0.17	0.31	0.27
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.8	8.0	5.6	5.5
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	8.8	8.0	5.6	5.5
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0096	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.65	0.66	0.81	0.82
	Fluoride (F) (mg/L)	0.042	0.041	0.064	0.065
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.091	0.117	0.127	0.100
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0030	0.0024	0.0036	0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	0.0025	0.0025
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	1.76	1.71	0.90	0.89
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010 HTD	<0.0010 HTD
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.26	2.30	2.40	2.17
	Total Organic Carbon (mg/L)	2.34	1.84	2.13	2.05
Total Metals	Aluminum (Al)-Total (mg/L)	0.0056	0.0041	0.0096	0.0098
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00019	0.00017	0.00011	0.00011
	Barium (Ba)-Total (mg/L)	0.00194	0.00194	0.00187	0.00189
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.41	2.37	1.23	1.21
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte					
	Sample ID	L2322210-1	L2322210-2	L2322210-3	L2322210-4	
	Description	Water	Water	Water	Water	
	Sampled Date	28-JUL-19	28-JUL-19	29-JUL-19	29-JUL-19	
	Sampled Time	14:00	14:40	15:19	14:55	
	Client ID	PDL-77	PDL-78	INUG-112	INUG-113	
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	0.013	0.014	
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Total (mg/L)	0.844	0.843	0.733	0.752	
	Manganese (Mn)-Total (mg/L)	0.00117	0.00105	0.00289	0.00338	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Nickel (Ni)-Total (mg/L)	0.00071	0.00070	0.00050	0.00051	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.365	0.363	0.390	0.400	
	Rubidium (Rb)-Total (mg/L)	0.00046	0.00044	0.00056	0.00062	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.15	0.15	0.16	0.17	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	0.534	0.536	0.591	0.613	
	Strontium (Sr)-Total (mg/L)	0.0102	0.0102	0.00717	0.00700	
	Sulfur (S)-Total (mg/L)	0.73	0.72	<0.50	<0.50	
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Total (mg/L)	0.000023	0.000020	0.000049	0.000048	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0045	0.0023	0.0044	0.0045	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)	0.00017	0.00016	<0.00010	<0.00010	
	Barium (Ba)-Dissolved (mg/L)	0.00212	0.00206	0.00190	0.00192	
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2322210-1	L2322210-2	L2322210-3	L2322210-4	
	Description	Water	Water	Water	Water	
	Sampled Date	28-JUL-19	28-JUL-19	29-JUL-19	29-JUL-19	
	Sampled Time	14:00	14:40	15:19	14:55	
	Client ID	PDL-77	PDL-78	INUG-112	INUG-113	
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)	2.31	2.49	1.24	1.23	
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)	0.00046	0.00046	0.00039	0.00035	
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Dissolved (mg/L)	0.906	0.897	0.789	0.791	
	Manganese (Mn)-Dissolved (mg/L)	0.00052	0.00047	0.00157	0.00190	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	0.000061	<0.000050	<0.000050	
	Nickel (Ni)-Dissolved (mg/L)	0.00059	0.00061	<0.00050	<0.00050	
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)	0.409	0.404	0.429	0.421	
	Rubidium (Rb)-Dissolved (mg/L)	0.00048	0.00048	0.00063	0.00057	
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Dissolved (mg/L)	0.128	0.116	0.118	0.120	
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	0.566	0.552	0.618	0.612	
	Strontium (Sr)-Dissolved (mg/L)	0.00990	0.00983	0.00674	0.00678	
	Sulfur (S)-Dissolved (mg/L)	0.60	0.60	<0.50	<0.50	
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Dissolved (mg/L)	0.000021	0.000021	0.000042	0.000044	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	0.0011	
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
Speciated Metals	Arsenate (As V) (ug/L)	<0.020		<0.020		
	Arsenite (As III) (ug/L)	0.052		<0.020		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2322210-1	L2322210-2	L2322210-3	L2322210-4	
	Description	Water	Water	Water	Water	
	Sampled Date	28-JUL-19	28-JUL-19	29-JUL-19	29-JUL-19	
	Sampled Time	14:00	14:40	15:19	14:55	
	Client ID	PDL-77	PDL-78	INUG-112	INUG-113	
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	<0.020		<0.020		
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020		<0.020		
	Arsenobetaine (AsB, as As) (ug/L)	<0.050		<0.050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L2322210-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Reference Information

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

Reference Information

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Ch L2322210-COFC

COC # ______

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report	
☑ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a	Arsenic speciation		Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	PDL-77	28-Jul-19	14:00	Water	x	x	x	x	x	x	x	x	x	x	x		11
	PDL-78	28-Jul-19	14:40	Water	x	x	x	x	x	x	x	x	x	x			10
	INUG-112	29-Jul-19	15:19	Water	x	x	x	x	x	x	x	x	x	x	x		11
	INUG-113	29-Jul-19	14:55	Water	x	x	x	x	x	x	x	x	x	x			10

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Louis Dubois	30-Jul-19		HA	8/2	11:30am	20 °C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 07-AUG-19
Report Date: 16-AUG-19 10:45 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2324036

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBACNK CREMP - SURFACE WATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2324036-1	L2324036-2	L2324036-3	L2324036-4	L2324036-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
	Sampled Time	15:20	14:10	11:00	11:40	12:20
	Client ID	TPN-124	TPN-125	BDD-61	BDD-62	BPJ61
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.229	0.155	0.639	0.571	0.583

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2324036-6	L2324036-7	L2324036-8	L2324036-9	L2324036-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
	Sampled Time	12:47	13:26	13:56		
	Client ID	BPJ-62	BAP-61	BAP-62	CREMP JULY DUP-1	CREMP JULY DUP-2
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.513	0.536	0.749	0.257	0.812

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2324036-1	L2324036-2	L2324036-3	L2324036-4	L2324036-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
	Sampled Time	15:20	14:10	11:00	11:40	12:20
	Client ID	TPN-124	TPN-125	BDD-61	BDD-62	BPJ61
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	26.0	26.5	52.2	57.1	40.2
	Hardness (as CaCO3) (mg/L)	9.48	9.27	12.5	12.6	11.9
	pH (pH)	7.14	7.14	7.26	7.26	7.26
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	15.7	16.3	31	33	25.8
	Turbidity (NTU)	0.13	0.16	0.27	0.25	0.19
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	6.0	6.4	9.4	9.1	9.1
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	6.0	6.4	9.4	9.1	9.1
	Ammonia, Total (as N) (mg/L)	0.0742	<0.0050	0.0882	<0.0050	0.0512
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.82	0.79	8.63	9.83	5.66
	Fluoride (F) (mg/L)	0.070	0.067	0.063	0.064	0.064
	Nitrate (as N) (mg/L)	0.0185	0.0159	0.0172	0.0195	0.0205
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0017	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.191	0.101	0.249	0.196	0.245
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	0.0036	0.0036	0.0038
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	DLM <2.5	<0.50
	Sulfate (SO4) (mg/L)	4.74	4.71	1.66	1.81	1.23
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.50	1.45	3.44	3.32	3.40
	Total Organic Carbon (mg/L)	1.43	1.44	3.44	3.51	3.37
Total Metals	Aluminum (Al)-Total (mg/L)	0.0040	0.0047	0.0119	0.0122	0.0070
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00016	0.00016	0.00011	0.00012	0.00013
	Barium (Ba)-Total (mg/L)	0.00281	0.00281	0.0168	0.0170	0.0175
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.35	2.23	2.56	2.62	2.58
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2324036-6	L2324036-7	L2324036-8	L2324036-9	L2324036-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
	Sampled Time	12:47	13:26	13:56		
	Client ID	BPJ-62	BAP-61	BAP-62	CREMP JULY DUP-1	CREMP JULY DUP-2
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	142	62.9	58.5	25.7	57.0
	Hardness (as CaCO3) (mg/L)	19.3	14.1	13.4	9.34	13.7
	pH (pH)	7.25	7.23	7.23	7.07	7.25
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	73	38	35	14.1	35
	Turbidity (NTU)	0.24	0.21	0.21	0.11	0.22
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.3	8.9	9.3	6.6	9.3
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.3	8.9	9.3	6.6	9.3
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0751	0.0327	0.0643	0.0063
	Bromide (Br) (mg/L)	0.117	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	33.3	11.9	10.7	0.82	10.1
	Fluoride (F) (mg/L)	0.068	0.064	0.065	0.069	0.065
	Nitrate (as N) (mg/L)	0.0257	0.0220	0.0204	0.0181	0.0201
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.217	0.240	0.216	0.173	0.200
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0021	0.0036	0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0038	0.0030	0.0025	<0.0020	0.0040
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	5.16	2.11	1.94	4.68	1.88
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.32	3.48	3.32	1.37	3.20
	Total Organic Carbon (mg/L)	3.44	3.52	3.41	1.30	3.33
Total Metals	Aluminum (Al)-Total (mg/L)	0.0096	0.0094	0.0092	0.0034	0.0146
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00013	0.00015	0.00011	0.00015	0.00015
	Barium (Ba)-Total (mg/L)	0.0177	0.0164	0.0169	0.00272	0.0162
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	3.07	2.66	2.63	2.21	2.78
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2324036-11				
	Description	Water				
	Sampled Date	23-JUL-19				
	Sampled Time					
	Client ID	CREMP JULY EB-1				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	<2.0				
	Hardness (as CaCO3) (mg/L)	<0.50				
	pH (pH)	5.49				
	Total Suspended Solids (mg/L)	<1.0				
	Total Dissolved Solids (mg/L)	<3.0				
	Turbidity (NTU)	<0.10				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0				
	Ammonia, Total (as N) (mg/L)	0.103				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.10				
	Fluoride (F) (mg/L)	<0.020				
	Nitrate (as N) (mg/L)	<0.0050				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	RRV 0.118				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020				
	Phosphorus (P)-Total (mg/L)	<0.0020				
	Silicate (as SiO2) (mg/L)	<0.50				
	Sulfate (SO4) (mg/L)	<0.30				
Cyanides	Cyanide, Total (mg/L)	<0.0010				
	Cyanide, Free (mg/L)	<0.0010				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50				
	Total Organic Carbon (mg/L)	<0.50				
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030				
	Antimony (Sb)-Total (mg/L)	<0.00010				
	Arsenic (As)-Total (mg/L)	<0.00010				
	Barium (Ba)-Total (mg/L)	<0.00010				
	Beryllium (Be)-Total (mg/L)	<0.00010				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				
	Calcium (Ca)-Total (mg/L)	<0.050				
	Cesium (Cs)-Total (mg/L)	<0.000010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2324036-1	L2324036-2	L2324036-3	L2324036-4	L2324036-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
	Sampled Time	15:20	14:10	11:00	11:40	12:20
	Client ID	TPN-124	TPN-125	BDD-61	BDD-62	BPJ61
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00013	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	0.017	0.017	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	0.910	0.903	1.57	1.61	1.38
	Manganese (Mn)-Total (mg/L)	0.00098	0.00119	0.00354	0.00357	0.00172
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000115	0.000117	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.471	0.474	0.552	0.560	0.499
	Rubidium (Rb)-Total (mg/L)	0.00068	0.00073	0.00084	0.00091	0.00080
	Selenium (Se)-Total (mg/L)	0.000050	<0.000050	<0.000050	<0.000050	0.000055
	Silicon (Si)-Total (mg/L)	0.11	<0.10	0.19	0.21	0.20
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.15	1.15	5.06	5.45	3.30
	Strontium (Sr)-Total (mg/L)	0.0104	0.0101	0.0207	0.0219	0.0199
	Sulfur (S)-Total (mg/L)	1.59	1.63	0.68	0.67	<0.50
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000028	0.000032	0.000042	0.000038	0.000031
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0016	0.0014	0.0057	0.0056	0.0046
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00014	0.00016	0.00012	0.00010	0.00011
	Barium (Ba)-Dissolved (mg/L)	0.00270	0.00264	0.0168	0.0160	0.0172
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2324036-6	L2324036-7	L2324036-8	L2324036-9	L2324036-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
	Sampled Time	12:47	13:26	13:56		
	Client ID	BPJ-62	BAP-61	BAP-62	CREMP JULY DUP-1	CREMP JULY DUP-2
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.018	0.011	0.014	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0011	<0.0010	<0.0010	<0.0010	0.0011
	Magnesium (Mg)-Total (mg/L)	3.18	1.72	1.64	0.903	1.64
	Manganese (Mn)-Total (mg/L)	0.00431	0.00195	0.00362	0.00071	0.00218
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000065	0.000050	<0.000050	0.000122	0.000051
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.944	0.629	0.572	0.461	0.594
	Rubidium (Rb)-Total (mg/L)	0.00100	0.00093	0.00089	0.00068	0.00094
	Selenium (Se)-Total (mg/L)	0.000053	<0.000050	0.000054	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.21	0.21	0.20	<0.10	0.21
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	17.3	6.76	5.72	1.16	5.96
	Strontium (Sr)-Total (mg/L)	0.0290	0.0233	0.0206	0.0101	0.0232
	Sulfur (S)-Total (mg/L)	1.71	0.64	0.67	1.53	0.60
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000039	0.000032	0.000037	0.000025	0.000034
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0043	0.0048	0.0052	0.0016	0.0045
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00010	0.00011	0.00011	0.00013	0.00011
	Barium (Ba)-Dissolved (mg/L)	0.0178	0.0171	0.0169	0.00268	0.0166
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2324036-11				
	Description	Water				
	Sampled Date	23-JUL-19				
	Sampled Time					
	Client ID	CREMP JULY EB-1				
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010				
	Cobalt (Co)-Total (mg/L)	<0.00010				
	Copper (Cu)-Total (mg/L)	<0.00050				
	Iron (Fe)-Total (mg/L)	<0.010				
	Lead (Pb)-Total (mg/L)	<0.000050				
	Lithium (Li)-Total (mg/L)	<0.0010				
	Magnesium (Mg)-Total (mg/L)	<0.0050				
	Manganese (Mn)-Total (mg/L)	<0.00010				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	<0.000050				
	Nickel (Ni)-Total (mg/L)	<0.00050				
	Phosphorus (P)-Total (mg/L)	<0.050				
	Potassium (K)-Total (mg/L)	<0.050				
	Rubidium (Rb)-Total (mg/L)	<0.00020				
	Selenium (Se)-Total (mg/L)	<0.000050				
	Silicon (Si)-Total (mg/L)	<0.10				
	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	<0.050				
	Strontium (Sr)-Total (mg/L)	<0.00020				
	Sulfur (S)-Total (mg/L)	<0.50				
	Tellurium (Te)-Total (mg/L)	<0.00020				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Thorium (Th)-Total (mg/L)	<0.00010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	<0.00030				
	Tungsten (W)-Total (mg/L)	<0.00010				
	Uranium (U)-Total (mg/L)	<0.000010				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.00020				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	<0.0010				
	Antimony (Sb)-Dissolved (mg/L)	<0.00010				
	Arsenic (As)-Dissolved (mg/L)	<0.00010				
	Barium (Ba)-Dissolved (mg/L)	<0.00010				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte					
	Sample ID	L2324036-1	L2324036-2	L2324036-3	L2324036-4	L2324036-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
	Sampled Time	15:20	14:10	11:00	11:40	12:20
	Client ID	TPN-124	TPN-125	BDD-61	BDD-62	BPJ61
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.34	2.27	2.65	2.60	2.57
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00030	0.00034	0.00025	0.00024	0.00022
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.882	0.874	1.44	1.48	1.34
	Manganese (Mn)-Dissolved (mg/L)	0.00089	0.00091	0.00221	0.00219	0.00217
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000115	0.000125	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.494	0.491	0.557	0.561	0.531
	Rubidium (Rb)-Dissolved (mg/L)	0.00069	0.00072	0.00091	0.00081	0.00086
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.074	0.058	0.162	0.154	0.161
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.11	1.08	4.47	4.94	3.28
	Strontium (Sr)-Dissolved (mg/L)	0.0107	0.0105	0.0214	0.0212	0.0208
	Sulfur (S)-Dissolved (mg/L)	1.53	1.69	0.78	0.94	<0.50
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000027	0.000028	0.000036	0.000037	0.000031
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2324036-6	L2324036-7	L2324036-8	L2324036-9	L2324036-10
	Sample ID	L2324036-6	L2324036-7	L2324036-8	L2324036-9	L2324036-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
	Sampled Time	12:47	13:26	13:56		
	Client ID	BPJ-62	BAP-61	BAP-62	CREMP JULY DUP-1	CREMP JULY DUP-2
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.011	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	3.05	2.81	2.69	2.28	2.80
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00027	0.00021	0.00024	0.00029	0.00022
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0011	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	2.85	1.72	1.61	0.887	1.63
	Manganese (Mn)-Dissolved (mg/L)	0.00289	0.00203	0.00202	0.00081	0.00214
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000068	0.000054	<0.000050	0.000129	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.925	0.638	0.611	0.508	0.628
	Rubidium (Rb)-Dissolved (mg/L)	0.00102	0.00089	0.00090	0.00065	0.00085
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.174	0.168	0.179	0.073	0.166
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	15.5	6.62	5.80	1.10	5.91
	Strontium (Sr)-Dissolved (mg/L)	0.0287	0.0230	0.0219	0.0106	0.0227
	Sulfur (S)-Dissolved (mg/L)	1.41	0.62	0.74	1.47	0.65
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000040	0.000031	0.000037	0.000027	0.000033
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2324036-11				
	Description	Water				
	Sampled Date	23-JUL-19				
	Sampled Time					
	Client ID	CREMP JULY EB-1				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				
	Calcium (Ca)-Dissolved (mg/L)	<0.050				
	Cesium (Cs)-Dissolved (mg/L)	<0.000010				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	<0.00020				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	<0.0050				
	Manganese (Mn)-Dissolved (mg/L)	<0.00010				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	<0.050				
	Rubidium (Rb)-Dissolved (mg/L)	<0.00020				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	<0.050				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	<0.050				
	Strontium (Sr)-Dissolved (mg/L)	<0.00020				
	Sulfur (S)-Dissolved (mg/L)	<0.50				
	Tellurium (Te)-Dissolved (mg/L)	<0.00020				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Thorium (Th)-Dissolved (mg/L)	<0.00010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Tungsten (W)-Dissolved (mg/L)	<0.00010				
	Uranium (U)-Dissolved (mg/L)	<0.000010				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0010				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2324036-6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2324036-6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2324036-6
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2324036-6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2324036-6
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2324036-6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2324036-10, -7
Matrix Spike	Sodium (Na)-Total	MS-B	L2324036-10, -7
Matrix Spike	Strontium (Sr)-Total	MS-B	L2324036-10, -7
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L2324036-1, -10, -11, -2, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Reference Information

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of C... L2324036-COFC

COC # ______

Page 1 of 1

Report To		Report Format		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☑ St...		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q39503	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: Nicolas Saucier

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	TPN-124	23-Jul-19	15:20	Water	X	X	X	X	X	X	X	X	X	X			10
	TPN-125	23-Jul-19	14:10	Water	X	X	X	X	X	X	X	X	X	X			10
	BDD-61	24-Jul-19	11:00	Water	X	X	X	X	X	X	X	X	X	X			10
	BDD-62	24-Jul-19	11:40	Water	X	X	X	X	X	X	X	X	X	X			10
	BPJ-61	24-Jul-19	12:20	Water	X	X	X	X	X	X	X	X	X	X			10
	BPJ-62	24-Jul-19	12:47	Water	X	X	X	X	X	X	X	X	X	X			10
	BAP-61	24-Jul-19	13:26	Water	X	X	X	X	X	X	X	X	X	X			10
	BAP-62	24-Jul-19	13:56	Water	X	X	X	X	X	X	X	X	X	X			10
	CREMP JULY DUP-1	23-Jul-19		Water	X	X	X	X	X	X	X	X	X	X			10
	CREMP JULY DUP-2	24-Jul-19		Water	X	X	X	X	X	X	X	X	X	X			10
	CREMP JULY EB-1	28-Jul-19		Water	X	X	X	X	X	X	X	X	X				9

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

ALS Environmental

Chain of C... L2324036-COFC

COC # ____

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Repo...	
☑ St...	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Nicolas Saucier

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
	TPN-124 ✓	23-Jul-19	15:20	Water	X	X	X	X	X	X	X	X	X	X			10
	TPN-125 ✓	23-Jul-19	14:10	Water	X	X	X	X	X	X	X	X	X	X			10
	BDD-61 ✓	24-Jul-19	11:00	Water	X	X	X	X	X	X	X	X	X	X			10
	BDD-62 ✓	24-Jul-19	11:40	Water	X	X	X	X	X	X	X	X	X	X			10
	BPJ-61 ✓	24-Jul-19	12:20	Water	X	X	X	X	X	X	X	X	X	X			10
	BPJ-62 ✓	24-Jul-19	12:47	Water	X	X	X	X	X	X	X	X	X	X			10
	BAP-61 ✓	24-Jul-19	13:26	Water	X	X	X	X	X	X	X	X	X	X			10
	BAP-62 ✓	24-Jul-19	13:56	Water	X	X	X	X	X	X	X	X	X	X			10
	CREMP JULY DUP-1 ✓	23-Jul-19		Water	X	X	X	X	X	X	X	X	X	X			10
	CREMP JULY DUP-2 ✓	24-Jul-19		Water	X	X	X	X	X	X	X	X	X	X			10
	CREMP JULY EB-1 ✓	28-Jul-19		Water	X	X	X	X	X	X	X	X	X				9

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by: HA	Date: 8/7	Time: 12 pm	Temperature: 22 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

L2324036-COFC

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 20-AUG-19
Report Date: 29-AUG-19 17:51 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2331829

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACE WATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2331829-1	L2331829-2	L2331829-3	L2331829-4	L2331829-5
		Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
		Sampled Date	11-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19
		Sampled Time	12:50	15:15	10:00	16:45	17:20
		Client ID	WAL-95	TPN-126	TPN-127	TPE-126	TPE-127
Grouping	**Analyte**						
FILTER							
Plant Pigments	Chlorophyll a (ug/L)		0.700	0.352	0.498	0.820	0.512

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-6	L2331829-7	L2331829-8	L2331829-9	L2331829-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19
	Sampled Time	16:50	17:05	16:11	15:20	13:20
	Client ID	BBD-63	BBD-64	BPJ-63	BPJ-64	BAP-63
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	1.27	1.24	1.25	1.23	1.67

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2331829-11	L2331829-12	L2331829-13	L2331829-14	L2331829-15
	Sample ID	L2331829-11	L2331829-12	L2331829-13	L2331829-14	L2331829-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19
	Sampled Time	15:00	11:30	12:18	14:45	14:30
	Client ID	BAP-64	SP-126	SP-127	PDL-79	PDL-80
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	1.18	0.509	0.477	0.400	0.393

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-16	L2331829-17	L2331829-18		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date					
	Sampled Time					
	Client ID	DUP-1	DUP-2	DUP-4		
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	1.41	0.846	0.284		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2331829-1 Surface Water 11-AUG-19 12:50 WAL-95	L2331829-2 Surface Water 13-AUG-19 15:15 TPN-126	L2331829-3 Surface Water 13-AUG-19 10:00 TPN-127	L2331829-4 Surface Water 13-AUG-19 16:45 TPE-126	L2331829-5 Surface Water 13-AUG-19 17:20 TPE-127
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	36.8	27.2	27.3	29.3	30.0
	Hardness (as CaCO3) (mg/L)	15.5	8.97	8.97	10.5	10.4
	pH (pH)	7.31	7.06	7.09	7.17	7.21
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	22.5	15.0	16.0	16.3	16.8
	Turbidity (NTU)	0.31	0.16	0.30	0.19	0.22
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	14.6	6.2	6.5	7.8	8.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	14.6	6.2	6.5	7.8	8.0
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0777	0.127	0.0608	0.0921
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.69	0.80	0.82	0.78	0.77
	Fluoride (F) (mg/L)	0.046	0.068	0.070	0.075	0.077
	Nitrate (as N) (mg/L)	<0.0050	0.0126	0.0130	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	0.0020	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.117	0.161	0.191	0.124	0.152
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0024	<0.0020	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	4.43	4.79	4.84	4.90	4.81
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	0.0012	<0.0010	0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.10	1.52	1.29	1.26	1.21
	Total Organic Carbon (mg/L)	2.10	1.16	1.21	1.15	1.18
Total Metals	Aluminum (Al)-Total (mg/L)	0.0069	0.0043	0.0048	0.0072	0.0079
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00028	0.00016	0.00015	0.00035	0.00030
	Barium (Ba)-Total (mg/L)	0.00221	0.00281	0.00273	0.00282	0.00276
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	4.39	2.24	2.24	2.58	2.55
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	0.000015	0.000018

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2331829-6 Surface Water 12-AUG-19 16:50 BBD-63	L2331829-7 Surface Water 12-AUG-19 17:05 BBD-64	L2331829-8 Surface Water 12-AUG-19 16:11 BPJ-63	L2331829-9 Surface Water 12-AUG-19 15:20 BPJ-64	L2331829-10 Surface Water 12-AUG-19 13:20 BAP-63
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	44.9	68.6	67.5	68.1	35.0
	Hardness (as CaCO3) (mg/L)	12.7	14.5	14.5	14.3	11.8
	pH (pH)	7.27	7.27	7.28	7.23	7.28
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	32.5	49	57	55	28.2
	Turbidity (NTU)	0.39	0.35	0.29	0.33	0.39
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.4	10.3	9.6	9.7	9.4
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.4	10.3	9.6	9.7	9.4
	Ammonia, Total (as N) (mg/L)	0.126	0.196	0.321	0.0927	0.0770
	Bromide (Br) (mg/L)	<0.050	<0.050	0.052	0.059	<0.050
	Chloride (Cl) (mg/L)	6.36	12.6	12.6	13.0	3.81
	Fluoride (F) (mg/L)	0.060	0.061	0.062	0.060	0.062
	Nitrate (as N) (mg/L)	0.0195	0.0195	0.0187	0.0193	0.0157
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.280	0.340	0.464	0.234	0.235
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0026	<0.0020	0.0030	0.0022	0.0021
	Phosphorus (P)-Total (mg/L)	0.0047	0.0046	0.0048	0.0045	0.0039
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	1.36	2.24	2.25	2.29	0.88
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	0.0016	0.0012
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.19	3.27	3.21	3.26	3.32
	Total Organic Carbon (mg/L)	3.28	3.29	3.37	3.36	3.28
Total Metals	Aluminum (Al)-Total (mg/L)	0.0111	0.0117	0.0115	0.0118	0.0138
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00011	0.00013	0.00012	0.00011	0.00011
	Barium (Ba)-Total (mg/L)	0.0191	0.0191	0.0186	0.0188	0.0185
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.75	2.88	2.90	2.88	2.68
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2331829-11	L2331829-12	L2331829-13	L2331829-14	L2331829-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19
	Sampled Time	15:00	11:30	12:18	14:45	14:30
	Client ID	BAP-64	SP-126	SP-127	PDL-79	PDL-80
WATER						
Physical Tests	Conductivity (uS/cm)	58.9	39.7	39.2	22.5	22.5
	Hardness (as CaCO3) (mg/L)	13.4	15.2	14.9	8.88	8.94
	pH (pH)	7.26	7.39	7.32	7.17	7.17
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	53	30.4	25.9	18.3	17.2
	Turbidity (NTU)	0.47	0.25	0.28	0.19	0.18
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.2	11.8	11.3	7.8	7.7
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.2	11.8	11.3	7.8	7.7
	Ammonia, Total (as N) (mg/L)	0.0602	0.151	0.0338	0.127	0.0504
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	10.3	1.06	0.90	0.71	0.68
	Fluoride (F) (mg/L)	0.061	0.070	0.070	0.044	0.045
	Nitrate (as N) (mg/L)	0.0134	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.221	0.260	0.127	0.202	0.137
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0034	0.0028	0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	2.01	5.59	5.44	1.90	1.88
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010 CNP	<0.0010 CNP	<0.0010	<0.0010
	Cyanide, Free (mg/L)	0.0014	<0.0010 CNP	<0.0010 CNP	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.25	1.70	1.64	1.46	1.50
	Total Organic Carbon (mg/L)	3.34	1.66	1.82	1.45	1.40
Total Metals	Aluminum (Al)-Total (mg/L)	0.0119	0.0072	0.0077	0.0061	0.0059
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00011	0.00022	0.00022	0.00015	0.00015
	Barium (Ba)-Total (mg/L)	0.0181	0.00272	0.00262	0.00188	0.00193
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.82	4.12	4.08	2.29	2.37
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-16	L2331829-17	L2331829-18		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date					
	Sampled Time					
	Client ID	DUP-1	DUP-2	DUP-4		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	35.6	27.5	22.5		
	Hardness (as CaCO3) (mg/L)	11.5	8.89	9.00		
	pH (pH)	7.22	7.08	7.18		
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0		
	Total Dissolved Solids (mg/L)	26.0	20.4	17.0		
	Turbidity (NTU)	0.47	0.24	0.19		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.3	7.5	7.9		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	9.3	7.5	7.9		
	Ammonia, Total (as N) (mg/L)	<0.0050	0.118	0.0403		
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050		
	Chloride (Cl) (mg/L)	4.07	0.82	0.69		
	Fluoride (F) (mg/L)	0.061	0.066	0.040		
	Nitrate (as N) (mg/L)	0.0150 HTD	0.0108 HTD	<0.0050		
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010		
	Total Kjeldahl Nitrogen (mg/L)	0.171	0.186	0.109		
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010		
	Phosphorus (P)-Total Dissolved (mg/L)	0.0020	<0.0020	<0.0020		
	Phosphorus (P)-Total (mg/L)	0.0046	<0.0020	<0.0020		
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50		
	Sulfate (SO4) (mg/L)	1.05	4.77	1.88		
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.41	1.31	1.46		
	Total Organic Carbon (mg/L)	3.33	1.16	1.52		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0137	0.0047	0.0041		
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00010	0.00015	0.00015		
	Barium (Ba)-Total (mg/L)	0.0190	0.00270	0.00194		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010		
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Calcium (Ca)-Total (mg/L)	2.68	2.26	2.36		
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010		

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-1	L2331829-2	L2331829-3	L2331829-4	L2331829-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	11-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19
	Sampled Time	12:50	15:15	10:00	16:45	17:20
	Client ID	WAL-95	TPN-126	TPN-127	TPE-126	TPE-127
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	0.00011	0.00010	<0.00010	0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00093	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.012	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.24	0.859	0.854	0.950	0.949
	Manganese (Mn)-Total (mg/L)	0.00125	0.00092	0.00097	0.00097	0.00106
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000171	0.000121	0.000133	0.000147	0.000130
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.409	0.431	0.435	0.455	0.458
	Rubidium (Rb)-Total (mg/L)	0.00067	0.00070	0.00068	0.00079	0.00079
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.32	<0.10	0.11	0.11	0.10
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.551	1.04	1.01	0.995	1.00
	Strontium (Sr)-Total (mg/L)	0.0237	0.0105	0.0107	0.0115	0.0116
	Sulfur (S)-Total (mg/L)	1.33	1.37	1.28	1.25	1.41
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000055	0.000036	0.000037	0.000048	0.000048
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	LAB	FIELD	FIELD
			LAB	FIELD	LAB	LAB
	Aluminum (Al)-Dissolved (mg/L)	0.0031	0.0027	0.0022	0.0032	0.0030
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00026	0.00016	0.00013	0.00033	0.00028
	Barium (Ba)-Dissolved (mg/L)	0.00205	0.00260	0.00263	0.00267	0.00259

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2331829-6	L2331829-7	L2331829-8	L2331829-9	L2331829-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19
	Sampled Time	16:50	17:05	16:11	15:20	13:20
	Client ID	BBD-63	BBD-64	BPJ-63	BPJ-64	BAP-63
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	0.00012	<0.00010	0.00010	0.00011
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.018	0.019	0.017	0.018	0.018
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	0.0010	0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.42	1.80	1.80	1.77	1.22
	Manganese (Mn)-Total (mg/L)	0.00395	0.00410	0.00337	0.00327	0.00351
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000054	0.000057	0.000055	0.000059	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.497	0.616	0.601	0.607	0.445
	Rubidium (Rb)-Total (mg/L)	0.00089	0.00089	0.00088	0.00090	0.00084
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.20	0.20	0.19	0.21	0.26
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	3.34	6.56	6.63	6.50	1.81
	Strontium (Sr)-Total (mg/L)	0.0233	0.0245	0.0249	0.0258	0.0214
	Sulfur (S)-Total (mg/L)	<0.50	0.55	0.57	0.61	<0.50
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00018	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000044	0.000047	0.000045	0.000045	0.000043
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	LAB	LAB	FIELD	LAB	FIELD
		FIELD	FIELD	LAB	FIELD	LAB
	Aluminum (Al)-Dissolved (mg/L)	0.0064	0.0061	0.0077	0.0061	0.0057
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00010	0.00010	0.00010	<0.00010	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.0187	0.0181	0.0188	0.0182	0.0187

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2331829-11 Surface Water 12-AUG-19 15:00 BAP-64	L2331829-12 Surface Water 14-AUG-19 11:30 SP-126	L2331829-13 Surface Water 14-AUG-19 12:18 SP-127	L2331829-14 Surface Water 14-AUG-19 14:45 PDL-79	L2331829-15 Surface Water 14-AUG-19 14:30 PDL-80
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00011	0.00012
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00067	0.00069	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.016	0.014	0.015	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.55	1.28	1.26	0.796	0.797
	Manganese (Mn)-Total (mg/L)	0.00295	0.00120	0.00114	0.00077	0.00083
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000053	0.000160	0.000156	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00060	0.00060
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.549	0.486	0.482	0.325	0.322
	Rubidium (Rb)-Total (mg/L)	0.00083	0.00083	0.00082	0.00047	0.00038
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.18	0.20	0.21	0.16	0.15
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	4.90	0.829	0.797	0.474	0.474
	Strontium (Sr)-Total (mg/L)	0.0231	0.0209	0.0198	0.00981	0.00986
	Sulfur (S)-Total (mg/L)	0.52	1.52	1.46	<0.50	0.51
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000046	0.000055	0.000056	0.000029	0.000026
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	LAB FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0055	0.0038	0.0044	0.0038	0.0024
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00011	0.00020	0.00020	0.00013	0.00013
	Barium (Ba)-Dissolved (mg/L)	0.0177	0.00259	0.00248	0.00183	0.00183

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-16	L2331829-17	L2331829-18		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date					
	Sampled Time					
	Client ID	DUP-1	DUP-2	DUP-4		
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00011	<0.00010	<0.00010		
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Iron (Fe)-Total (mg/L)	0.018	<0.010	<0.010		
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Magnesium (Mg)-Total (mg/L)	1.22	0.853	0.791		
	Manganese (Mn)-Total (mg/L)	0.00358	0.00098	0.00078		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	<0.000050	0.000116	<0.000050		
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	0.00059		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	0.441	0.436	0.320		
	Rubidium (Rb)-Total (mg/L)	0.00080	0.00068	0.00045		
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Total (mg/L)	0.22	<0.10	0.17		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	1.92	1.01	0.468		
	Strontium (Sr)-Total (mg/L)	0.0215	0.0108	0.00975		
	Sulfur (S)-Total (mg/L)	<0.50	1.32	0.56		
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030		
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Uranium (U)-Total (mg/L)	0.000043	0.000037	0.000025		
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030		
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0060	0.0024	0.0019		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Dissolved (mg/L)	0.00010	0.00014	0.00013		
	Barium (Ba)-Dissolved (mg/L)	0.0178	0.00248	0.00185		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-1	L2331829-2	L2331829-3	L2331829-4	L2331829-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	11-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19
	Sampled Time	12:50	15:15	10:00	16:45	17:20
	Client ID	WAL-95	TPN-126	TPN-127	TPE-126	TPE-127
Grouping	**Analyte**					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	4.24	2.21	2.20	2.63	2.61
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000015	0.000013
	Chromium (Cr)-Dissolved (mg/L)	0.00014	0.00010	0.00012	<0.00010	0.00011
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00081	0.00035	0.00034	0.00036	0.00035
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.19	0.841	0.841	0.955	0.940
	Manganese (Mn)-Dissolved (mg/L)	0.00018	0.00049	0.00049	0.00043	0.00047
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000163	0.000127	0.000121	0.000128	0.000129
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.437	0.467	0.470	0.502	0.490
	Rubidium (Rb)-Dissolved (mg/L)	0.00059	0.00066	0.00064	0.00079	0.00081
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.284	0.062	0.072	0.085	0.083
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.559	1.03	1.02	1.03	1.01
	Strontium (Sr)-Dissolved (mg/L)	0.0221	0.00996	0.0104	0.0114	0.0111
	Sulfur (S)-Dissolved (mg/L)	1.23	1.36	1.32	1.38	1.36
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000053	0.000033	0.000033	0.000043	0.000041
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-6	L2331829-7	L2331829-8	L2331829-9	L2331829-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19
	Sampled Time	16:50	17:05	16:11	15:20	13:20
	Client ID	BBD-63	BBD-64	BPJ-63	BPJ-64	BAP-63
Grouping	**Analyte**					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.79	2.86	2.90	2.78	2.73
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	0.00013	0.00015	0.00013	0.00010	0.00014
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00029	0.00029	0.00029	0.00030	0.00028
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.39	1.79	1.76	1.78	1.22
	Manganese (Mn)-Dissolved (mg/L)	0.00088	0.00105	0.00043	0.00034	0.00020
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	0.000053	0.000060	0.000053	0.000054
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.526	0.668	0.650	0.660	0.481
	Rubidium (Rb)-Dissolved (mg/L)	0.00089	0.00082	0.00087	0.00084	0.00082
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.193	0.196	0.174	0.167	0.179
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	3.29	6.85	6.68	6.86	1.79
	Strontium (Sr)-Dissolved (mg/L)	0.0212	0.0232	0.0235	0.0237	0.0195
	Sulfur (S)-Dissolved (mg/L)	<0.50	0.66	0.53	<0.50	<0.50
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000048	0.000042	0.000041	0.000042	0.000042
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-11	L2331829-12	L2331829-13	L2331829-14	L2331829-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19
	Sampled Time	15:00	11:30	12:18	14:45	14:30
	Client ID	BAP-64	SP-126	SP-127	PDL-79	PDL-80
Grouping	**Analyte**					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.81	3.96	3.87	2.22	2.26
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	0.00013	<0.00010	0.00016	0.00014	0.00012
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00029	0.00060	0.00062	0.00039	0.00041
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.56	1.29	1.27	0.813	0.804
	Manganese (Mn)-Dissolved (mg/L)	0.00019	0.00039	0.00039	0.00025	0.00021
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	0.000150	0.000160	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.00059	0.00054
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.587	0.520	0.518	0.355	0.351
	Rubidium (Rb)-Dissolved (mg/L)	0.00086	0.00079	0.00078	0.00045	0.00046
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.168	0.172	0.176	0.134	0.126
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	5.05	0.871	0.846	0.497	0.499
	Strontium (Sr)-Dissolved (mg/L)	0.0223	0.0192	0.0197	0.00918	0.00943
	Sulfur (S)-Dissolved (mg/L)	<0.50	1.64	1.63	0.52	0.51
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000042	0.000048	0.000052	0.000021	0.000021
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)					<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-16	L2331829-17	L2331829-18		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date					
	Sampled Time					
	Client ID	DUP-1	DUP-2	DUP-4		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)	2.56	2.13	2.28		
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00011	<0.00010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)	0.00030	0.00035	0.00040		
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Magnesium (Mg)-Dissolved (mg/L)	1.25	0.867	0.803		
	Manganese (Mn)-Dissolved (mg/L)	0.00024	0.00052	0.00021		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	0.000111	<0.000050		
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.00059		
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	0.487	0.476	0.345		
	Rubidium (Rb)-Dissolved (mg/L)	0.00085	0.00075	0.00044		
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Dissolved (mg/L)	0.175	0.079	0.122		
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	2.14	1.11	0.501		
	Strontium (Sr)-Dissolved (mg/L)	0.0209	0.0100	0.00951		
	Sulfur (S)-Dissolved (mg/L)	<0.50	1.37	<0.50		
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Uranium (U)-Dissolved (mg/L)	0.000037	0.000032	0.000020		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
Speciated Metals	Arsenate (As V) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-1	L2331829-2	L2331829-3	L2331829-4	L2331829-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	11-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19
	Sampled Time	12:50	15:15	10:00	16:45	17:20
	Client ID	WAL-95	TPN-126	TPN-127	TPE-126	TPE-127
Grouping	**Analyte**					
WATER						
Speciated Metals	Arsenite (As III) (ug/L)					
	Dimethylarsinic Acid (DMA, as As) (ug/L)					
	Monomethylarsonic Acid (MMA, as As) (ug/L)					
	Arsenobetaine (AsB, as As) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-6	L2331829-7	L2331829-8	L2331829-9	L2331829-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19
	Sampled Time	16:50	17:05	16:11	15:20	13:20
	Client ID	BBD-63	BBD-64	BPJ-63	BPJ-64	BAP-63
Grouping	**Analyte**					
WATER						
Speciated Metals	Arsenite (As III) (ug/L)					
	Dimethylarsinic Acid (DMA, as As) (ug/L)					
	Monomethylarsonic Acid (MMA, as As) (ug/L)					
	Arsenobetaine (AsB, as As) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-11	L2331829-12	L2331829-13	L2331829-14	L2331829-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19
	Sampled Time	15:00	11:30	12:18	14:45	14:30
	Client ID	BAP-64	SP-126	SP-127	PDL-79	PDL-80
Grouping	**Analyte**					
WATER						
Speciated Metals	Arsenite (As III) (ug/L)					0.050
	Dimethylarsinic Acid (DMA, as As) (ug/L)					<0.020
	Monomethylarsonic Acid (MMA, as As) (ug/L)					<0.020
	Arsenobetaine (AsB, as As) (ug/L)					<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2331829-16	L2331829-17	L2331829-18		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date					
	Sampled Time					
	Client ID	DUP-1	DUP-2	DUP-4		
Grouping	**Analyte**					
WATER						
Speciated Metals	Arsenite (As III) (ug/L)					
	Dimethylarsinic Acid (DMA, as As) (ug/L)					
	Monomethylarsonic Acid (MMA, as As) (ug/L)					
	Arsenobetaine (AsB, as As) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Nitrate (as N)	B	L2331829-13, -14, -15, -16, -17, -18
Method Blank	Copper (Cu)-Dissolved	MB-LOR	L2331829-1
Matrix Spike	Cyanide, Total	MS-B	L2331829-10, -11, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2331829-12, -13, -14, -15, -16, -17, -18
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2331829-12, -13, -14, -15, -16, -17, -18
Matrix Spike	Lithium (Li)-Dissolved	MS-B	L2331829-12, -13, -14, -15, -16, -17, -18
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2331829-12, -13, -14, -15, -16, -17, -18
Matrix Spike	Nickel (Ni)-Dissolved	MS-B	L2331829-12, -13, -14, -15, -16, -17, -18
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2331829-12, -13, -14, -15, -16, -17, -18
Matrix Spike	Selenium (Se)-Dissolved	MS-B	L2331829-12, -13, -14, -15, -16, -17, -18
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2331829-12, -13, -14, -15, -16, -17, -18
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2331829-12, -13, -14, -15, -16, -17, -18
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2331829-12, -13, -14, -15, -16, -17, -18
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2331829-12, -13, -14, -15, -16, -17, -18
Matrix Spike	Calcium (Ca)-Total	MS-B	L2331829-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2331829-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2331829-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
CNP	Cyanide test sample appears to have been preserved, but pH was <10 at time of testing. Results may be biased low, particularly for Free CN species.
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

Reference Information

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L2331829-COFC

ALS Enviro

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To		**Report Format / Distribution**	
Company:	Azimuth Consulting Group	☑Standard ☐Other	
Contact:	Eric Franz	☑PDF ☑Excel ☐Digital ☐Fax	
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q39503
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: E. Franz, M. Finley

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury	Dissolved mercury (F)	Total Metals	Dissolved Metals (F)	Conventionals** see notes	TSS-Low, TDS-Low	Chlorophyll-a (F)	Arsenic speciation (F/P)	
1	WAL-95	11-Aug-19	12:50	Surface Water	X	X	X	X	X	X	X	X	X	X		
2	TPN-126	13-Aug-19	15:15	Surface Water	X	X	X	X	X	X	X	X	X	X		
3	TPN-127	13-Aug-19	10:00	Surface Water	X	X	X	X	X	X	X	X	X	X		
4	TPE-126	13-Aug-19	16:45	Surface Water	X	X	X	X	X	X	X	X	X	X		
5	TPE-127	13-Aug-19	17:20	Surface Water	X	X	X	X	X	X	X	X	X	X		
6	BBD-63	12-Aug-19	16:50	Surface Water	X	X	X	X	X	X	X	X	X	X		
7	BBD-64	12-Aug-19	17:05	Surface Water	X	X	X	X	X	X	X	X	X	X		
8	BPJ-63	12-Aug-19	16:11	Surface Water	X	X	X	X	X	X	X	X	X	X		
9	BPJ-64	12-Aug-19	15:20	Surface Water	X	X	X	X	X	X	X	X	X	X		
10	BAP-63	12-Aug-19	13:20	Surface Water	X	X	X	X	X	X	X	X	X	X		
11	BAP-64	12-Aug-19	15:00	Surface Water	X	X	X	X	X	X	X	X	X	X		
12	SP-126	14-Aug-19	11:30	Surface Water	X	X	X	X	X	X	X	X	X	X		

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JW	Date: Aug 19	Time: 08:35	Temperature: 19.3/19.4°C 18.4	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add

ALS Env

L2331829-COFC

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC #

Report To		**Report Format / Distribution**	
Company:	Azimuth Consulting Group	☑ Standard ☐ Other	
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q39503
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: E. Franz M. Finley

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
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Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury	Dissolved mercury (F)	Total Metals	Dissolved Metals (F)	Conventionals** see notes	TSS-Low, TDS-Low	Chlorophyll-a (F)	Arsenic specation (F/P)		Number of Containers
13	SP-127	14-Aug-19	12:18	Surface Water	X	X	X	X	X	X	X	X	X	X			10
14	PDL-79	14-Aug-19	14:45	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
15	PDL-80	14-Aug-19	14:30	Surface Water	X	X	X	X	X	X	X	X	X	X			10
16	DUP-1	-	-	Surface Water	X	X	X	X	X	X	X	X	X	X			10
17	DUP-2	-	-	Surface Water	X	X	X	X	X	X	X	X	X	X			10
18	DUP-4	-	-	Surface Water	X	X	X	X	X	X	X	X	X	X			10

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

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Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JW	Date: Aug 19	Time: 0835	Temperature: 19.3/19.4°C 18.4	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 26-AUG-19
Report Date: 09-SEP-19 13:39 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2335617

Project P.O. #:	NOT SUBMITTED
Job Reference:	MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:	
Legal Site Desc:	

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-1	L2335617-2	L2335617-3	L2335617-4	L2335617-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	17-AUG-19	17-AUG-19	15-AUG-19	15-AUG-19	16-AUG-19
	Sampled Time	14:35	13:44	11:46	12:35	
	Client ID	DS1-35	DS1-36	A76-37	A76-38	A20-37
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.681	0.803	0.238	0.475	0.709

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-6	L2335617-7	L2335617-8	L2335617-9	L2335617-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	16-AUG-19	18-AUG-19	18-AUG-19	17-AUG-19	17-AUG-19
	Sampled Time	10:46	16:07	15:37	16:15	17:00
	Client ID	A20-38	WTS-43	WTS-44	LK1-13	LK1-14
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.452	4.50	4.47	0.526	0.342

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-11	L2335617-12	L2335617-13	L2335617-14	L2335617-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19	20-AUG-19
	Sampled Time	13:40	14:15		15:24	15:09
	Client ID	LK5-13	LK5-14	LK8-13	LK8-14	NEM-43
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.706	0.530	0.181	0.413	0.895

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-16	L2335617-17	L2335617-18	L2335617-19	L2335617-23
	Description	Water	Water	Water	Water	Water
	Sampled Date	20-AUG-19	20-AUG-19	20-AUG-19	20-AUG-19	15-AUG-19
	Sampled Time	14:30	11:14	10:51	10:51	14:00
	Client ID	NEM-44	MAM-43	MAM-44	DUP-3	INUG-114
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.887	3.07	2.37	0.531	0.334

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-24				
	Description	Water				
	Sampled Date	15-AUG-19				
	Sampled Time	14:35				
	Client ID	INUG-115				
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.322				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-1	L2335617-2	L2335617-3	L2335617-4	L2335617-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	17-AUG-19	17-AUG-19	15-AUG-19	15-AUG-19	16-AUG-19
	Sampled Time	14:35	13:44	11:46	12:35	
	Client ID	DS1-35	DS1-36	A76-37	A76-38	A20-37
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	14.9	20.9	39.6	40.7	13.6
	Hardness (as CaCO3) (mg/L)	5.00	7.56	15.1	14.8	4.69
	pH (pH)	6.80	6.92	7.01	7.02	6.85
	Total Suspended Solids (mg/L)	<1.0	1.5	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	15.3	21.2	33.2	34.1	16.0
	Turbidity (NTU)	0.43	1.56	0.13	0.13	0.29
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	4.1	5.6	5.9	5.7	4.2
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	4.1	5.6	5.9	5.7	4.2
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0361	0.0341	<0.0050	0.247
	Bromide (Br) (mg/L)	<0.050	<0.050	0.079	0.078	<0.050
	Chloride (Cl) (mg/L)	1.11	1.83	6.27	6.41	0.69
	Fluoride (F) (mg/L)	0.058	0.038	0.028	0.028	0.030
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.161	0.240	0.138	0.101	0.360
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	0.0026	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0031	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	0.76	1.42	0.91	0.92	0.91
	Sulfate (SO4) (mg/L)	1.02	1.63	3.82	3.85	1.05
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.67	3.75	1.35	1.36	1.92
	Total Organic Carbon (mg/L)	2.33	3.49	1.53	1.29	1.98
Total Metals	Aluminum (Al)-Total (mg/L)	0.0243	0.0632	0.0054	0.0067	0.0134
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	<0.00010	0.00015	0.00020	0.00020	0.00011
	Barium (Ba)-Total (mg/L)	0.00381	0.00438	0.00782	0.00831	0.00355
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	1.28	2.05	3.92	4.00	1.18
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2335617-6 Water 16-AUG-19 10:46 A20-38	L2335617-7 Water 18-AUG-19 16:07 WTS-43	L2335617-8 Water 18-AUG-19 15:37 WTS-44	L2335617-9 Water 17-AUG-19 16:15 LK1-13	L2335617-10 Water 17-AUG-19 17:00 LK1-14
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	13.5	77.8	77.6	13.8	13.8
	Hardness (as CaCO3) (mg/L)	4.71	28.3	28.4	4.93	4.87
	pH (pH)	6.85	7.17	7.19	6.87	6.88
	Total Suspended Solids (mg/L)	<1.0	1.5	1.1	1.1	1.0
	Total Dissolved Solids (mg/L)	14.5	80.2	81.8	14.3	15.5
	Turbidity (NTU)	0.45	0.28	0.65	0.36	0.27
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	4.1	10.1	10.5	4.4	4.8
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	4.1	10.1	10.5	4.4	4.8
	Ammonia, Total (as N) (mg/L)	0.0797	0.0804	0.0581	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	0.190	0.192	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.68	15.4	15.4	0.74	0.76
	Fluoride (F) (mg/L)	0.029	0.042	0.043	0.043	0.039
	Nitrate (as N) (mg/L)	<0.0050	0.0139	0.0071	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0012
	Total Kjeldahl Nitrogen (mg/L)	0.216	0.302	0.303	0.125	0.119
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	0.0020	0.0023	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0050	0.0054	0.0022	0.0022
	Silicate (as SiO2) (mg/L)	0.91	0.80	0.79	0.55	0.51
	Sulfate (SO4) (mg/L)	1.05	2.86	2.84	1.12	1.01
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.84	3.26	3.40	2.33	1.51
	Total Organic Carbon (mg/L)	1.91	3.44	3.58	2.31	1.23
Total Metals	Aluminum (Al)-Total (mg/L)	0.0148	0.0224	0.0207	0.0167	0.0098
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00011	0.00071	0.00069	0.00012	<0.00010
	Barium (Ba)-Total (mg/L)	0.00356	0.0172	0.0169	0.00313	0.00311
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	0.0000055	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	1.19	9.01	8.67	1.16	1.18
	Cesium (Cs)-Total (mg/L)	<0.000010	0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-11	L2335617-12	L2335617-13	L2335617-14	L2335617-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19	20-AUG-19
	Sampled Time	13:40	14:15		15:24	15:09
	Client ID	LK5-13	LK5-14	LK8-13	LK8-14	NEM-43
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	24.4	24.3	14.0	14.2	58.7
	Hardness (as CaCO3) (mg/L)	10.2	10.0	5.11	5.15	22.5
	pH (pH)	7.20	7.22	6.88	6.95	7.22
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	1.1	<1.0
	Total Dissolved Solids (mg/L)	19.5	21.4	13.3	12.7	52.2
	Turbidity (NTU)	0.18	0.30	0.19	0.18	0.29
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.9	9.0	4.1	4.2	7.8
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	8.9	9.0	4.1	4.2	7.8
	Ammonia, Total (as N) (mg/L)	0.0103	<0.0050	0.0883	0.0369	0.0077
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	0.068
	Chloride (Cl) (mg/L)	0.71	0.70	0.60	0.61	9.73
	Fluoride (F) (mg/L)	0.036	0.036	0.028	0.028	0.028
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0752
	Nitrite (as N) (mg/L)	0.0014	<0.0010	<0.0010	<0.0010	0.0017
	Total Kjeldahl Nitrogen (mg/L)	0.148	0.190	0.492	0.148	0.129
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0030	<0.0020	0.0044	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	0.83	0.92	0.58	0.59	<0.50
	Sulfate (SO4) (mg/L)	2.13	2.17	1.51	1.51	3.47
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.97	1.74	1.37	1.26	1.62
	Total Organic Carbon (mg/L)	1.93	2.05	1.49	1.41	1.72
Total Metals	Aluminum (Al)-Total (mg/L)	0.0086	0.0088	0.0075	0.0074	0.0083
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00017	0.00017	0.00014	0.00013	0.00047
	Barium (Ba)-Total (mg/L)	0.00284	0.00284	0.00233	0.00241	0.0107
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.40	2.37	1.09	1.13	6.57
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-16	L2335617-17	L2335617-18	L2335617-19	L2335617-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	20-AUG-19	20-AUG-19	20-AUG-19	20-AUG-19	20-AUG-19
	Sampled Time	14:30	11:14	10:51	10:51	
	Client ID	NEM-44	MAM-43	MAM-44	DUP-3	EB-1
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	58.6	111	81.0	41.5	<2.0
	Hardness (as CaCO3) (mg/L)	22.4	39.1	29.3	14.4	<0.50
	pH (pH)	7.24	7.33	7.17	7.00	5.58
	Total Suspended Solids (mg/L)	<1.0	1.9	1.7	<1.0	<1.0
	Total Dissolved Solids (mg/L)	58.5	107	75.8	32.7	<3.0
	Turbidity (NTU)	0.25	0.68	0.42	0.18	<0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	7.7	10.0	6.8	8.3	<1.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	7.7	10.0	6.8	8.3	<1.0
	Ammonia, Total (as N) (mg/L)	0.0140	0.138	0.0422	0.0278	<0.0050
	Bromide (Br) (mg/L)	0.068	0.205	0.170	0.069	<0.050
	Chloride (Cl) (mg/L)	9.75	20.3	15.9	6.08	<0.10
	Fluoride (F) (mg/L)	0.028	0.042	0.032	0.028	<0.020
	Nitrate (as N) (mg/L)	0.0787	0.169	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	0.0019	0.0121	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.148	0.329	0.187	0.132	<0.050
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0022	0.0023	0.0024	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0045	0.0021	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	0.74	0.60	0.91	<0.50
	Sulfate (SO4) (mg/L)	3.45	7.47	4.71	3.66	<0.30
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.52	1.86	1.66	1.15	<0.50
	Total Organic Carbon (mg/L)	1.68	1.94	1.64	1.37	<0.50
Total Metals	Aluminum (Al)-Total (mg/L)	0.0077	0.0268	0.0099	0.0049	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	0.00014	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00045	0.00118	0.00053	0.00020	<0.00010
	Barium (Ba)-Total (mg/L)	0.0108	0.0220	0.0152	0.00777	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	6.58	12.8	9.04	4.07	<0.050
	Cesium (Cs)-Total (mg/L)	<0.000010	0.000014	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-21	L2335617-22	L2335617-23	L2335617-24	L2335617-25
	Description	Water	Water	Water	Water	Water
	Sampled Date	20-AUG-19	20-AUG-19	15-AUG-19	15-AUG-19	20-AUG-19
	Sampled Time			14:00	14:35	
	Client ID	DI-1	TB	INUG-114	INUG-115	DI-2
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	<2.0	<2.0	15.7	15.7	
	Hardness (as CaCO3) (mg/L)	<0.50	<0.50 HTC	5.84	5.66	
	pH (pH)	5.51	5.53	7.03	7.04	
	Total Suspended Solids (mg/L)	<1.0		<1.0	<1.0	
	Total Dissolved Solids (mg/L)	<3.0		15.1	13.4	
	Turbidity (NTU)	<0.10	<0.10	0.16	0.20	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0	1.1	4.9	4.9	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0	1.1	4.9	4.9	
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	0.129	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.10	<0.10	0.80	0.79	
	Fluoride (F) (mg/L)	<0.020	<0.020	0.063	0.063	
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	<0.050	<0.050	0.129	0.250	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	0.0021	<0.0020	
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	0.0023	
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	
	Sulfate (SO4) (mg/L)	<0.30	<0.30	0.88	0.88	
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50		1.91	1.68	<0.50
	Total Organic Carbon (mg/L)	<0.50	<0.50	1.84	1.79	
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	0.0100	0.0084	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Total (mg/L)	<0.00010	<0.00010	0.00011	0.00012	
	Barium (Ba)-Total (mg/L)	<0.00010	<0.00010	0.00166	0.00168	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Total (mg/L)	<0.050	<0.050	1.11	1.13	
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2335617-1 Water 17-AUG-19 14:35 DS1-35	L2335617-2 Water 17-AUG-19 13:44 DS1-36	L2335617-3 Water 15-AUG-19 11:46 A76-37	L2335617-4 Water 15-AUG-19 12:35 A76-38	L2335617-5 Water 16-AUG-19 A20-37
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00011	0.00021	<0.00010	<0.00010	0.00022
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00057	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.048	0.124	0.011	0.012	0.018
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000077
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	0.461	0.672	1.21	1.23	0.434
	Manganese (Mn)-Total (mg/L)	0.00152	0.00289	0.00130	0.00132	0.00184
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	0.00056	0.00095	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.294	0.417	0.737	0.753	0.347
	Rubidium (Rb)-Total (mg/L)	0.00048	0.00070	0.00110	0.00114	0.00049
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.38	0.74	0.43	0.45	0.44
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.684	0.914	0.655	0.668	0.561
	Strontium (Sr)-Total (mg/L)	0.00769	0.0104	0.0230	0.0233	0.00681
	Sulfur (S)-Total (mg/L)	<0.50	0.54	1.18	1.24	<0.50
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	0.00041	0.00128	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000051	0.000081	0.000022	0.000021	0.000045
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	0.00023	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	LAB	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0151	0.0234	0.0016	0.0021	0.0088
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00014	0.00013	0.00018	0.00020	0.00010
	Barium (Ba)-Dissolved (mg/L)	0.00392	0.00403	0.00786	0.00830	0.00328
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-6	L2335617-7	L2335617-8	L2335617-9	L2335617-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	16-AUG-19	18-AUG-19	18-AUG-19	17-AUG-19	17-AUG-19
	Sampled Time	10:46	16:07	15:37	16:15	17:00
	Client ID	A20-38	WTS-43	WTS-44	LK1-13	LK1-14
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	0.00039	0.00026	0.00011	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00058	0.00061	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.016	0.041	0.041	0.031	0.014
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	0.000128	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	0.0028	0.0028	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	0.430	1.69	1.65	0.537	0.531
	Manganese (Mn)-Total (mg/L)	0.00174	0.0200	0.0198	0.00320	0.00185
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	0.000473	0.000459	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00140	0.00139	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.354	1.64	1.61	0.270	0.269
	Rubidium (Rb)-Total (mg/L)	0.00044	0.00271	0.00265	0.00043	0.00034
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.41	0.41	0.36	0.25	0.23
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.568	1.14	1.11	0.550	0.547
	Strontium (Sr)-Total (mg/L)	0.00666	0.0854	0.0825	0.00710	0.00720
	Sulfur (S)-Total (mg/L)	<0.50	1.03	1.03	<0.50	<0.50
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	0.00033	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000045	0.000097	0.000095	0.000070	0.000053
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0079	0.0105	0.0110	0.0096	0.0062
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00010	0.00066	0.00074	0.00012	0.00010
	Barium (Ba)-Dissolved (mg/L)	0.00321	0.0167	0.0176	0.00320	0.00307
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-11	L2335617-12	L2335617-13	L2335617-14	L2335617-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19	20-AUG-19
	Sampled Time	13:40	14:15		15:24	15:09
	Client ID	LK5-13	LK5-14	LK8-13	LK8-14	NEM-43
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00011	<0.00010	<0.00010	<0.00010	0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.017	0.018	<0.010	<0.010	0.015
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0010
	Magnesium (Mg)-Total (mg/L)	1.06	1.07	0.627	0.630	1.51
	Manganese (Mn)-Total (mg/L)	0.00214	0.00184	0.00126	0.00130	0.00754
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000173
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00105
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.321	0.323	0.319	0.327	0.978
	Rubidium (Rb)-Total (mg/L)	0.00034	0.00039	0.00057	0.00052	0.00126
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.40	0.44	0.26	0.28	0.19
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.586	0.600	0.468	0.464	0.760
	Strontium (Sr)-Total (mg/L)	0.00954	0.00952	0.00515	0.00524	0.0431
	Sulfur (S)-Total (mg/L)	0.78	0.83	0.58	<0.50	1.16
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000024	0.000029	0.000020	0.000017	0.000034
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0039	0.0058	0.0042	0.0047	0.0048
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00015	0.00016	0.00013	0.00014	0.00045
	Barium (Ba)-Dissolved (mg/L)	0.00270	0.00272	0.00232	0.00234	0.00996
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-16	L2335617-17	L2335617-18	L2335617-19	L2335617-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	20-AUG-19	20-AUG-19	20-AUG-19	20-AUG-19	20-AUG-19
	Sampled Time	14:30	11:14	10:51	10:51	
	Client ID	NEM-44	MAM-43	MAM-44	DUP-3	EB-1
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00012	0.00040	0.00016	<0.00010	RRV 0.00025
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00013	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00062	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.014	0.088	0.024	0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0010	0.0026	0.0022	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.50	2.52	1.83	1.22	<0.0050
	Manganese (Mn)-Total (mg/L)	0.00778	0.0246	0.00546	0.00132	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000176	0.000944	0.000345	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00109	0.00163	0.00092	0.00058	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.984	2.32	1.44	0.751	<0.050
	Rubidium (Rb)-Total (mg/L)	0.00135	0.00303	0.00199	0.00111	<0.00020
	Selenium (Se)-Total (mg/L)	<0.000050	0.000090	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.19	0.38	0.27	0.44	<0.10
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.758	1.63	1.10	0.663	<0.050
	Strontium (Sr)-Total (mg/L)	0.0434	0.0915	0.0722	0.0232	<0.00020
	Sulfur (S)-Total (mg/L)	1.34	2.72	1.60	1.24	<0.50
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	0.00108	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000035	0.000148	0.000040	0.000021	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0038	0.0032	0.0024	0.0023	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	0.00013	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00041	0.00087	0.00048	0.00019	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.0102	0.0196	0.0138	0.00726	<0.00010
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2335617-21 Water 20-AUG-19 DI-1	L2335617-22 Water 20-AUG-19 TB	L2335617-23 Water 15-AUG-19 14:00 INUG-114	L2335617-24 Water 15-AUG-19 14:35 INUG-115	L2335617-25 Water 20-AUG-19 DI-2
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00014 RRV	0.00019 RRV	0.00024	<0.00010	
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	0.011	0.011	
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Total (mg/L)	<0.0050	<0.0050	0.682	0.678	
	Manganese (Mn)-Total (mg/L)	<0.00010	<0.00010	0.00164	0.00172	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	<0.050	<0.050	0.357	0.343	
	Rubidium (Rb)-Total (mg/L)	<0.00020	<0.00020	0.00052	0.00051	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	<0.10	<0.10	0.17	0.16	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	<0.050	<0.050	0.553	0.548	
	Strontium (Sr)-Total (mg/L)	<0.00020	<0.00020	0.00645	0.00646	
	Sulfur (S)-Total (mg/L)	<0.50	<0.50	<0.50	<0.50	
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Total (mg/L)	<0.000010	<0.000010	0.000049	0.000048	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD		FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD		FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0010		0.0059	0.0058	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010	<0.00010
	Barium (Ba)-Dissolved (mg/L)	<0.00010		0.00171	0.00166	<0.00010
	Beryllium (Be)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-1	L2335617-2	L2335617-3	L2335617-4	L2335617-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	17-AUG-19	17-AUG-19	15-AUG-19	15-AUG-19	16-AUG-19
	Sampled Time	14:35	13:44	11:46	12:35	
	Client ID	DS1-35	DS1-36	A76-37	A76-38	A20-37
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	1.27	1.97	4.01	3.94	1.19
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00013	<0.00010	<0.00010	0.00014
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00033	0.00053	0.00026	0.00033	0.00031
	Iron (Fe)-Dissolved (mg/L)	0.020	0.053	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	DTMF 0.000153	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.448	0.640	1.23	1.21	0.415
	Manganese (Mn)-Dissolved (mg/L)	0.00082	0.00207	<0.00010	0.00060	0.00118
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	0.000053	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.00052	0.00052	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.296	0.400	0.773	0.763	0.345
	Rubidium (Rb)-Dissolved (mg/L)	0.00043	0.00052	0.00109	0.00104	0.00042
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.376	0.691	0.453	0.441	0.423
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.676	0.890	0.713	0.654	0.570
	Strontium (Sr)-Dissolved (mg/L)	0.00706	0.00942	0.0236	0.0209	0.00642
	Sulfur (S)-Dissolved (mg/L)	<0.50	0.54	1.05	0.86	<0.50
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000049	0.000075	0.000012	0.000020	0.000045
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0011	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)	<0.020		<0.020		
	Arsenite (As III) (ug/L)	<0.020		0.085		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-6	L2335617-7	L2335617-8	L2335617-9	L2335617-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	16-AUG-19	18-AUG-19	18-AUG-19	17-AUG-19	17-AUG-19
	Sampled Time	10:46	16:07	15:37	16:15	17:00
	Client ID	A20-38	WTS-43	WTS-44	LK1-13	LK1-14
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	1.23	8.69	8.64	1.11	1.13
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00016	0.00025	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00027	0.00052	0.00063	0.00030	0.00023
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.011	0.015	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000066	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	0.0033	0.0033	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.400	1.61	1.66	0.527	0.497
	Manganese (Mn)-Dissolved (mg/L)	0.00106	0.00095	0.00329	0.00083	0.00035
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	0.000432	0.000457	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00123	0.00134	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.337	1.64	1.68	0.271	0.261
	Rubidium (Rb)-Dissolved (mg/L)	0.00037	0.00248	0.00257	0.00037	0.00037
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.401	0.398	0.423	0.251	0.257
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.553	1.11	1.14	0.547	0.529
	Strontium (Sr)-Dissolved (mg/L)	0.00628	0.0862	0.0843	0.00671	0.00678
	Sulfur (S)-Dissolved (mg/L)	<0.50	1.07	1.07	<0.50	<0.50
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000045	0.000083	0.000093	0.000061	0.000045
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0025	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)	<0.020	<0.020			<0.020
	Arsenite (As III) (ug/L)	<0.020	0.440			<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2335617-11	L2335617-12	L2335617-13	L2335617-14	L2335617-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19	20-AUG-19
	Sampled Time	13:40	14:15		15:24	15:09
	Client ID	LK5-13	LK5-14	LK8-13	LK8-14	NEM-43
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.40	2.33	1.07	1.08	6.37
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00026	0.00026	0.00036	0.00039	0.00031
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0011
	Magnesium (Mg)-Dissolved (mg/L)	1.02	1.02	0.592	0.597	1.61
	Manganese (Mn)-Dissolved (mg/L)	0.00022	0.00026	0.00052	0.00060	0.00567
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000179
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00100
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.312	0.314	0.311	0.311	0.978
	Rubidium (Rb)-Dissolved (mg/L)	0.00036	0.00034	0.00049	0.00048	0.00114
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.400	0.429	0.268	0.276	0.170
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.592	0.618	0.458	0.453	0.825
	Strontium (Sr)-Dissolved (mg/L)	0.00918	0.00911	0.00493	0.00492	0.0425
	Sulfur (S)-Dissolved (mg/L)	<0.50	0.57	<0.50	<0.50	1.23
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000022	0.000026	0.000016	0.000018	0.000032
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)	<0.020		<0.020		
	Arsenite (As III) (ug/L)	0.047		0.046		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2335617-16 Water 20-AUG-19 14:30 NEM-44	L2335617-17 Water 20-AUG-19 11:14 MAM-43	L2335617-18 Water 20-AUG-19 10:51 MAM-44	L2335617-19 Water 20-AUG-19 10:51 DUP-3	L2335617-20 Water 20-AUG-19 EB-1
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	6.35	11.3	8.58	3.71	<0.050
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00029	0.00055	0.00053	0.00033	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0011	0.0025	0.0023	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.59	2.64	1.92	1.25	<0.0050
	Manganese (Mn)-Dissolved (mg/L)	0.00579	0.0122	0.00187	0.00057	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000171	0.000878	0.000324	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	0.00099	0.00136	0.00085	0.00055	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.967	2.44	1.58	0.738	<0.050
	Rubidium (Rb)-Dissolved (mg/L)	0.00112	0.00279	0.00197	0.00096	<0.00020
	Selenium (Se)-Dissolved (mg/L)	<0.000050	0.000060	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.171	0.353	0.278	0.455	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.804	1.71	1.21	0.703	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.0436	0.0885	0.0716	0.0225	<0.00020
	Sulfur (S)-Dissolved (mg/L)	1.11	2.43	1.50	1.00	<0.50
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00017
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000030	0.000100	0.000031	0.000016	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0013	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)	0.020		0.026	<0.020	
	Arsenite (As III) (ug/L)	0.215		0.263	0.087	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2335617-21	L2335617-22	L2335617-23	L2335617-24	L2335617-25
	Sample ID	L2335617-21	L2335617-22	L2335617-23	L2335617-24	L2335617-25
	Description	Water	Water	Water	Water	Water
	Sampled Date	20-AUG-19	20-AUG-19	15-AUG-19	15-AUG-19	20-AUG-19
	Sampled Time			14:00	14:35	
	Client ID	DI-1	TB	INUG-114	INUG-115	DI-2
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050		<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010		<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050		<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	<0.050		1.14	1.10	<0.050
	Cesium (Cs)-Dissolved (mg/L)	<0.000010		<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010		0.00026	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	<0.00020		0.00031	0.00036	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010		<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050		<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010		<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	<0.0050		0.726	0.710	<0.0050
	Manganese (Mn)-Dissolved (mg/L)	<0.00010		0.00044	0.00047	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050		<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050		<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050		<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050		<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	<0.050		0.378	0.376	<0.050
	Rubidium (Rb)-Dissolved (mg/L)	<0.00020		0.00054	0.00049	<0.00020
	Selenium (Se)-Dissolved (mg/L)	<0.000050		<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	<0.050		0.145	0.146	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000010		<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	<0.050		0.591	0.606	<0.050
	Strontium (Sr)-Dissolved (mg/L)	<0.00020		0.00643	0.00618	<0.00020
	Sulfur (S)-Dissolved (mg/L)	<0.50		<0.50	<0.50	<0.50
	Tellurium (Te)-Dissolved (mg/L)	<0.00020		<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010		<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030		<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	<0.000010		0.000047	0.000048	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050		<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010		<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020		<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)				<0.020	
	Arsenite (As III) (ug/L)				<0.020	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-1	L2335617-2	L2335617-3	L2335617-4	L2335617-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	17-AUG-19	17-AUG-19	15-AUG-19	15-AUG-19	16-AUG-19
	Sampled Time	14:35	13:44	11:46	12:35	
	Client ID	DS1-35	DS1-36	A76-37	A76-38	A20-37
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	<0.020		<0.020		
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020		<0.020		
	Arsenobetaine (AsB, as As) (ug/L)	<0.050		<0.050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-6	L2335617-7	L2335617-8	L2335617-9	L2335617-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	16-AUG-19	18-AUG-19	18-AUG-19	17-AUG-19	17-AUG-19
	Sampled Time	10:46	16:07	15:37	16:15	17:00
	Client ID	A20-38	WTS-43	WTS-44	LK1-13	LK1-14
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	<0.020	0.045			<0.020
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020	<0.020			<0.020
	Arsenobetaine (AsB, as As) (ug/L)	<0.050	<0.050			<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-11	L2335617-12	L2335617-13	L2335617-14	L2335617-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19	20-AUG-19
	Sampled Time	13:40	14:15		15:24	15:09
	Client ID	LK5-13	LK5-14	LK8-13	LK8-14	NEM-43
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	<0.020		<0.020		
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020		<0.020		
	Arsenobetaine (AsB, as As) (ug/L)	<0.050		<0.050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-16	L2335617-17	L2335617-18	L2335617-19	L2335617-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	20-AUG-19	20-AUG-19	20-AUG-19	20-AUG-19	20-AUG-19
	Sampled Time	14:30	11:14	10:51	10:51	
	Client ID	NEM-44	MAM-43	MAM-44	DUP-3	EB-1
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	0.033		0.029	<0.020	
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020		<0.020	<0.020	
	Arsenobetaine (AsB, as As) (ug/L)	<0.050		<0.050	<0.050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335617-21	L2335617-22	L2335617-23	L2335617-24	L2335617-25
	Description	Water	Water	Water	Water	Water
	Sampled Date	20-AUG-19	20-AUG-19	15-AUG-19	15-AUG-19	20-AUG-19
	Sampled Time			14:00	14:35	
	Client ID	DI-1	TB	INUG-114	INUG-115	DI-2
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)				<0.020	
	Monomethylarsonic Acid (MMA, as As) (ug/L)				<0.020	
	Arsenobetaine (AsB, as As) (ug/L)				<0.050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Nitrite (as N)	B	L2335617-19, -22
Method Blank	Selenium (Se)-Dissolved	MB-LOR	L2335617-3
Matrix Spike	Dissolved Organic Carbon	MS-B	L2335617-23, -24, -25
Matrix Spike	Dissolved Organic Carbon	MS-B	L2335617-2
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2335617-3
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2335617-21, -23
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2335617-3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2335617-21, -23
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2335617-3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2335617-21, -23
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2335617-3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2335617-21, -23
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2335617-3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2335617-21, -23
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2335617-21, -23
Matrix Spike	Aluminum (Al)-Total	MS-B	L2335617-21, -22, -23, -24
Matrix Spike	Aluminum (Al)-Total	MS-B	L2335617-21, -22
Matrix Spike	Barium (Ba)-Total	MS-B	L2335617-21, -22, -23, -24
Matrix Spike	Calcium (Ca)-Total	MS-B	L2335617-21, -22, -23, -24
Matrix Spike	Calcium (Ca)-Total	MS-B	L2335617-20
Matrix Spike	Copper (Cu)-Total	MS-B	L2335617-21, -22, -23, -24
Matrix Spike	Iron (Fe)-Total	MS-B	L2335617-21, -22, -23, -24
Matrix Spike	Lead (Pb)-Total	MS-B	L2335617-21, -22, -23, -24
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2335617-21, -22, -23, -24
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2335617-20
Matrix Spike	Manganese (Mn)-Total	MS-B	L2335617-21, -22, -23, -24
Matrix Spike	Manganese (Mn)-Total	MS-B	L2335617-20
Matrix Spike	Silicon (Si)-Total	MS-B	L2335617-21, -22, -23, -24
Matrix Spike	Strontium (Sr)-Total	MS-B	L2335617-21, -22, -23, -24
Matrix Spike	Strontium (Sr)-Total	MS-B	L2335617-20
Matrix Spike	Sulfur (S)-Total	MS-B	L2335617-20
Matrix Spike	Titanium (Ti)-Total	MS-B	L2335617-21, -22, -23, -24
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L2335617-19, -22

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ALS Test Code	Matrix	Test Description	Method Reference**
AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-

Reference Information

163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

BR-L-IC-N-VA | Water | Bromide in Water by IC (Low Level) | EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA | Water | Dissolved organic carbon by combustion | APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA | Water | Total organic carbon by combustion | APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA | Filter | Chlorophyll a by Fluorometer (Filter) | EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA | Water | Chloride in Water by IC (Low Level) | EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA | Water | Low Level Free Cyanide in water by CFA | ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA | Water | Low Level Total Cyanide in water by CFA | ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA | Water | Conductivity (Automated) | APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA | Water | Conductivity Screen (Internal Use Only) | APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA | Water | Fluoride in Water by IC | EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA | Water | Hardness | APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA | Water | Diss. Mercury in Water by CVAAS or CVAFS | APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA | Water | Total Mercury in Water by CVAAS or CVAFS | EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA | Water | Dissolved Metals in Water by CRC ICPMS | APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA | Water | Total Metals in Water by CRC ICPMS | EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA | Water | Ammonia in Water by Fluorescence | J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

Reference Information

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L2335617-COFC

ALS Envi

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To		
Company:	Azimuth Consulting Group	
Contact:	Eric Franz	
Address:	218-2902 West Broadway	
	Vancouver, BC V6K2G8	
Phone:	604-730-1220	Fax:
Invoice To	Same as Report ?	☑ Yes ☐ No
Hardcopy of Invoice with Report?		☐ Yes ☑ No
Company:		
Contact:		
Address:		
Phone:		Fax:
Lab Work Order # (lab use only)		

Report Format / Distribution	
☑ Standard	☐ Other
☑ PDF ☑ Excel	☐ Digital ☐ Fax
Email 1:	efranz@azimuthgroup.ca
Email 2:	mfinley@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	E. Franz M. Finley

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved Metals	Conventionals** see notes	TSS-Low, TDS-Low	Chlorophyll-a	Arsenic speciation		Number of Containers
					P	F/P	P		F		F			F	F/P		
	LK8-13	16-Aug-19	-	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	LK8-14	16-Aug-19	15:24	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	NEM-43	20-Aug-19	15:09	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	NEM-44	20-Aug-19	14:30	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	MAM-43	20-Aug-19	11:14	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	MAM-44	20-Aug-19	10:51	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	DUP-3	-	-	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	EB-1	20-Aug-19	-	Water	X	X	X	X	X	X	X	X	X				9
	DI-1	20-Aug-19	-	Water	X	X	X	X	X	X	X	X	X				9
	TB	-	-	Water	X		X	X		X		X					5
	INUG-114	15-Aug-19	14:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	INUG-115	15-Aug-19	14:35	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JG	Date: 26Aug19	Time: 8:40AM	Temperature: 18° °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L2335617-COFC

ALS Enviror

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

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COC #

Report To		Report Format / Distribution	
Company:	Azimuth Consulting Group	☑ Standard ☐ Other	
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q39503
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: E. Franz, M. Finley

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
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- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury	Dissolved mercury (F)	Total Metals	Dissolved Metals (F)	Conventionals** see notes	TSS-Low, TDS-Low	Chlorophyll-a (F)	Arsenic speciation (F/P)		Number of Containers
	DS1-35	17-Aug-19	14:35	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	DS1-36	17-Aug-19	13:44	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	A76-37	15-Aug-19	11:46	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	A76-38	15-Aug-19	12:35	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	A20-37	16-Aug-19	-	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	A20-38	16-Aug-19	10:46	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	WTS-43	18-Aug-19	16:07	Surface Water	X	X	X	X	X	X	X	X	X	X	X		
	WTS-44	18-Aug-19	15:37	Surface Water	X	X	X	X	X	X	X	X	X	X			
	LK1-13	17-Aug-19	16:15	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	LK1-14	17-Aug-19	17:00	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	LK5-13	16-Aug-19	13:40	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	LK5-14	16-Aug-19	14:15	Surface Water	X	X	X	X	X	X	X	X	X	X			10

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy) 22-AUG-19	Time (hh-mm) 8:05	Received by: JG	Date: 26 Aug 19	Time: 8:40AM	Temperature: 18 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L2335617-COFC

ALS Enui

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☑ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	mfinley@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	E. Franz M. Finley

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury	Dissolved mercury (F)	Total Metals	Dissolved Metals (F)	Conventionals** see notes	TSS-Low, TDS-Low	Chlorophyll-a (F)	Arsenic speciation (F/P)		Number of Containers
	DI-2	20-Aug-19	-	Surface Water		X			X		X						3

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

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Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
			JG	26Aug19	8:40AM	18°C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 26-AUG-19
Report Date: 27-AUG-19 20:11 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2335615

Project P.O. #: NOT SUBMITTED
Job Reference: AMARUQ STREAM WQ
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335615-1	L2335615-2	L2335615-3	L2335615-4	L2335615-5
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	19-AUG-19	19-AUG-19	19-AUG-19	19-AUG-19	19-AUG-19
	Sampled Time	15:57	09:57	14:00	09:34	15:39
	Client ID	A76-A75	A81-A80	C38-C12	A14-A13	A69-DS1
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	40.1	15.7	58.6	61.6	21.2
	Hardness (as CaCO3) (mg/L)	13.9	5.35	22.2	22.9	7.64
	pH (pH)	7.06	6.98	7.18	7.01	7.03
	Total Suspended Solids (mg/L)	<1.0	<1.0	1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	53	16.3	51	54	20.1
	Turbidity (NTU)	0.26	0.34	0.32	0.30	0.36
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	5.4	4.5	7.3	5.9	5.3
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	5.4	4.5	7.3	5.9	5.3
	Ammonia, Total (as N) (mg/L)	0.117	0.0248	0.0087	0.153	0.0309
	Bromide (Br) (mg/L)	0.063	<0.050	0.076	0.132	<0.050
	Chloride (Cl) (mg/L)	6.09	0.96	10.0	11.2	1.72
	Fluoride (F) (mg/L)	0.029	0.032	0.032	0.029	0.036
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.0898	0.0121	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0012	<0.0010	0.0014
	Total Kjeldahl Nitrogen (mg/L)	0.214	0.143	0.153	0.256	0.172
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	0.0036
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0025	0.0023	<0.0020	0.0030
	Silicate (as SiO2) (mg/L)	0.91	1.03	<0.50	0.85	1.20
	Sulfate (SO4) (mg/L)	3.69	1.05	3.62	4.88	1.61
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.50	2.22	1.51	1.58	2.95
	Total Organic Carbon (mg/L)	2.04	2.57	1.77	1.66	3.45
Total Metals	Aluminum (Al)-Total (mg/L)	0.0108	0.0268	0.0116	0.0079	0.0199
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00022	0.00010	0.00041	0.00034	0.00012
	Barium (Ba)-Total (mg/L)	0.00849	0.00222	0.00986	0.0116	0.00362
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000131	0.0000099	0.0000055	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	4.04	1.77	6.30	6.49	2.10
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335615-6	L2335615-7	L2335615-8	L2335615-9
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	19-AUG-19	19-AUG-19	19-AUG-19	19-AUG-19
	Sampled Time	14:46	15:23	15:05	
	Client ID	DS1	A5-A4	C8-C7	DUP-STREAM
Grouping	**Analyte**				
WATER					
Physical Tests	Conductivity (uS/cm)	25.4	35.1	27.1	58.1
	Hardness (as CaCO3) (mg/L)	10.3	12.9	10.9	22.7
	pH (pH)	7.25	7.08	7.33	7.20
	Total Suspended Solids (mg/L)	1.3	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	21.2	30.0	21.1	55
	Turbidity (NTU)	0.31	0.25	0.23	0.28
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.0	5.6	10.0	7.9
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.0	5.6	10.0	7.9
	Ammonia, Total (as N) (mg/L)	0.0242	0.133	0.0694	0.0471
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	0.076
	Chloride (Cl) (mg/L)	1.17	4.73	0.62	10.0
	Fluoride (F) (mg/L)	0.038	0.028	0.037	0.029
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	0.0890
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	0.0011
	Total Kjeldahl Nitrogen (mg/L)	0.174	0.238	0.175	0.159
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0039	<0.0020	0.0057	0.0022
	Silicate (as SiO2) (mg/L)	<0.50	1.23	1.41	<0.50
	Sulfate (SO4) (mg/L)	1.52	3.54	2.51	3.58
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.42	1.43	1.34	1.63
	Total Organic Carbon (mg/L)	2.66	1.77	1.35	1.69
Total Metals	Aluminum (Al)-Total (mg/L)	0.0112	0.0087	0.0081	0.0212
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00016	0.00022	0.00040	0.00047
	Barium (Ba)-Total (mg/L)	0.00298	0.00749	0.0101	0.0102
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	0.0000081
	Calcium (Ca)-Total (mg/L)	2.40	3.36	2.50	6.53
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335615-1	L2335615-2	L2335615-3	L2335615-4	L2335615-5
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	19-AUG-19	19-AUG-19	19-AUG-19	19-AUG-19	19-AUG-19
	Sampled Time	15:57	09:57	14:00	09:34	15:39
	Client ID	A76-A75	A81-A80	C38-C12	A14-A13	A69-DS1
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00014	0.00022	0.00038	<0.00010	0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00081	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.024	0.053	0.022	0.015	0.069
	Lead (Pb)-Total (mg/L)	<0.000050	0.000102	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	0.0010	0.0015	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.22	0.399	1.43	1.41	0.594
	Manganese (Mn)-Total (mg/L)	0.00205	0.00311	0.00317	0.00074	0.00192
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	0.000069	0.000179	0.000083	0.000055
	Nickel (Ni)-Total (mg/L)	0.00051	<0.00050	0.00093	0.00100	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.780	0.316	0.971	1.07	0.392
	Rubidium (Rb)-Total (mg/L)	0.00106	0.00040	0.00121	0.00159	0.00056
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.52	0.57	0.22	0.49	0.64
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.693	0.801	0.758	0.834	0.775
	Strontium (Sr)-Total (mg/L)	0.0227	0.00735	0.0415	0.0491	0.0100
	Sulfur (S)-Total (mg/L)	1.07	0.61	1.20	1.57	<0.50
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	0.00032	0.00047	0.00034	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000025	0.000081	0.000032	0.000028	0.000071
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0037	0.0077	0.0038	0.0031	0.0140
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00018	<0.00010	0.00039	0.00030	0.00010
	Barium (Ba)-Dissolved (mg/L)	0.00765	0.00197	0.0105	0.0122	0.00360
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335615-6	L2335615-7	L2335615-8	L2335615-9
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	19-AUG-19	19-AUG-19	19-AUG-19	19-AUG-19
	Sampled Time	14:46	15:23	15:05	
	Client ID	DS1	A5-A4	C8-C7	DUP-STREAM
Grouping	**Analyte**				
WATER					
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	0.00011	0.00030
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00146
	Iron (Fe)-Total (mg/L)	0.026	0.029	<0.010	0.031
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	0.000207
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	0.0011
	Magnesium (Mg)-Total (mg/L)	1.03	1.08	1.15	1.43
	Manganese (Mn)-Total (mg/L)	0.00168	0.00094	0.00147	0.00385
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	0.000135	0.000187
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00060	0.00053	0.00117
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.370	0.705	0.514	1.10
	Rubidium (Rb)-Total (mg/L)	0.00059	0.00109	0.00059	0.00138
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.29	0.65	0.76	0.23
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.717	0.658	0.593	1.11
	Strontium (Sr)-Total (mg/L)	0.00712	0.0176	0.0136	0.0415
	Sulfur (S)-Total (mg/L)	0.51	1.06	0.66	1.12
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	0.00060
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000081	0.000034	0.000027	0.000033
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	0.0051
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0072	0.0053	0.0049	0.0036
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00012	0.00018	0.00039	0.00039
	Barium (Ba)-Dissolved (mg/L)	0.00294	0.00758	0.00999	0.0104
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335615-1	L2335615-2	L2335615-3	L2335615-4	L2335615-5
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	19-AUG-19	19-AUG-19	19-AUG-19	19-AUG-19	19-AUG-19
	Sampled Time	15:57	09:57	14:00	09:34	15:39
	Client ID	A76-A75	A81-A80	C38-C12	A14-A13	A69-DS1
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	3.67	1.49	6.42	6.66	2.04
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00033	0.00033	0.00029	0.00043	0.00044
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.013	<0.010	<0.010	0.037
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	0.0011	0.0016	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.14	0.394	1.50	1.52	0.616
	Manganese (Mn)-Dissolved (mg/L)	0.00079	0.00046	0.00164	0.00042	0.00117
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	0.000052	0.000153	0.000078	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.00063	0.00078	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.686	0.287	0.973	1.10	0.388
	Rubidium (Rb)-Dissolved (mg/L)	0.00105	0.00040	0.00122	0.00161	0.00052
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.486	0.554	0.174	0.473	0.614
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.619	0.696	0.746	0.844	0.757
	Strontium (Sr)-Dissolved (mg/L)	0.0195	0.00653	0.0406	0.0477	0.00917
	Sulfur (S)-Dissolved (mg/L)	0.81	<0.50	0.85	1.50	<0.50
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000023	0.000065	0.000028	0.000021	0.000065
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2335615-6	L2335615-7	L2335615-8	L2335615-9
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	19-AUG-19	19-AUG-19	19-AUG-19	19-AUG-19
	Sampled Time	14:46	15:23	15:05	
	Client ID	DS1	A5-A4	C8-C7	DUP-STREAM
Grouping	**Analyte**				
WATER					
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.37	3.39	2.47	6.60
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00041	0.00038	0.00034	0.00027
	Iron (Fe)-Dissolved (mg/L)	0.012	0.013	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	0.0011
	Magnesium (Mg)-Dissolved (mg/L)	1.06	1.08	1.15	1.52
	Manganese (Mn)-Dissolved (mg/L)	0.00059	0.00060	0.00051	0.00174
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	0.000121	0.000135
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.00063
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.358	0.678	0.500	0.985
	Rubidium (Rb)-Dissolved (mg/L)	0.00054	0.00094	0.00046	0.00121
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.247	0.654	0.767	0.184
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.693	0.624	0.563	0.746
	Strontium (Sr)-Dissolved (mg/L)	0.00688	0.0159	0.0124	0.0414
	Sulfur (S)-Dissolved (mg/L)	<0.50	0.90	<0.50	1.15
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000070	0.000027	0.000023	0.000027
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2335615-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2335615-2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2335615-2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2335615-2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Reference Information

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

Reference Information

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L2335615-COFC

ALS Enuir

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To		**Report Format / Distribution**		**Service Requested** (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☑ Standard ☐ Other		○ Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	● Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:		**Analysis Request**
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Amaruq stream WQ	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q39503	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: M. DiMauro, M. Finley

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury	Dissolved mercury (F)	Total Metals	Dissolved Metals (F)	Conventionals** see notes	TSS-Low, TDS-Low	Arsenic speciation (F/P)			Number of Containers
	A76-A75	19-Aug-19	15:57	Surface Water	X	X	X	X	X	X	X	X	X				10
	A81-A80	19-Aug-19	9:57	Surface Water	X	X	X	X	X	X	X	X	X				10
	C38-C12	20-Aug-19	14:00	Surface Water	X	X	X	X	X	X	X	X	X				10
	A14-A13	19-Aug-19	9:34	Surface Water	X	X	X	X	X	X	X	X	X				10
	A69-DS1	19-Aug-19	15:39	Surface Water	X	X	X	X	X	X	X	X	X				10
	DS1	19-Aug-19	14:46	Surface Water	X	X	X	X	X	X	X	X	X				10
	A5-A4	19-Aug-19	15:23	Surface Water	X	X	X	X	X	X	X	X	X				10
	C8-C7	19-Aug-19	15:05	Surface Water	X	X	X	X	X	X	X	X	X				10
	DUP-Stream			Surface Water	X	X	X	X	X	X	X	X	X				9

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

HOLD samples for arsenic speciation analysis until we confirm which samples are being analyzed.
**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Morgan Finley	21-Aug-19		JG	26Aug19	8:40AM	20 °C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 22-AUG-19
Report Date: 20-SEP-19 14:23 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2333924

Project P.O. #: NOT SUBMITTED
Job Reference: CREMP SEDIMENT
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-1 Sediment 11-AUG-19 10:58 SP-1	L2333924-2 Sediment 11-AUG-19 11:15 SP-2	L2333924-3 Sediment 11-AUG-19 11:45 SP-3	L2333924-4 Sediment 11-AUG-19 12:08 SP-4	L2333924-5 Sediment 11-AUG-19 12:41 SP-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	84.7	84.7	83.4	84.0	83.8
	pH (1:2 soil:water) (pH)	5.71	5.99	5.78	5.80	6.25
Particle Size	% Gravel (>2mm) (%)	PSAL <1.0	PSAL <1.0	PSAL <1.0	PSAL <1.0	PSAL <1.0
	% Sand (2.0mm - 0.063mm) (%)	PSAL 2.6	PSAL 2.1	PSAL 2.2	PSAL 2.7	PSAL 2.7
	% Silt (0.063mm - 4um) (%)	PSAL 73.4	PSAL 73.8	PSAL 65.7	PSAL 66.3	PSAL 66.8
	% Clay (<4um) (%)	PSAL 23.9	PSAL 24.1	PSAL 32.1	PSAL 31.0	PSAL 30.5
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	3.62	3.58	3.65	3.61	3.78
Metals	Aluminum (Al) (mg/kg)	29200	29200	34000	35500	33300
	Antimony (Sb) (mg/kg)	0.29	0.26	0.29	0.29	0.30
	Arsenic (As) (mg/kg)	54.1	31.2	53.3	31.7	40.5
	Barium (Ba) (mg/kg)	135	132	144	152	144
	Beryllium (Be) (mg/kg)	2.34	2.14	2.54	2.66	2.59
	Bismuth (Bi) (mg/kg)	2.52	2.47	2.75	2.95	2.79
	Boron (B) (mg/kg)	10.0	10.3	10.1	11.4	9.9
	Cadmium (Cd) (mg/kg)	0.289	0.268	0.283	0.229	0.268
	Calcium (Ca) (mg/kg)	2510	2300	2190	2710	2390
	Chromium (Cr) (mg/kg)	89.7	90.1	102	110	108
	Cobalt (Co) (mg/kg)	18.0	17.4	19.7	17.7	20.5
	Copper (Cu) (mg/kg)	82.0	76.9	94.7	94.3	94.0
	Iron (Fe) (mg/kg)	91300	70400	82400	61300	69500
	Lead (Pb) (mg/kg)	23.5	23.2	25.6	27.2	26.3
	Lithium (Li) (mg/kg)	47.5	47.1	53.0	59.7	54.9
	Magnesium (Mg) (mg/kg)	10100	9880	11100	11900	11300
	Manganese (Mn) (mg/kg)	2050	1860	1820	2380	2720
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	10.3	7.18	9.77	8.41	8.30
	Nickel (Ni) (mg/kg)	69.7	70.5	81.6	78.0	77.1
	Phosphorus (P) (mg/kg)	899	568	689	562	612
	Potassium (K) (mg/kg)	4930	4940	5610	5860	5320
	Selenium (Se) (mg/kg)	0.81	0.67	0.62	0.49	0.57
	Silver (Ag) (mg/kg)	0.17	0.12	<0.10	0.10	0.13
	Sodium (Na) (mg/kg)	228	224	218	222	211
	Strontium (Sr) (mg/kg)	22.8	21.7	21.9	24.2	22.2
	Sulfur (S) (mg/kg)	1600	1700	1800	1700	1900
	Thallium (Tl) (mg/kg)	0.411	0.401	0.430	0.461	0.437

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-6	L2333924-7	L2333924-8	L2333924-9	L2333924-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-19	10-AUG-19	10-AUG-19	10-AUG-19	10-AUG-19
	Sampled Time	12:45				16:53
	Client ID	SP-COMP	TPE-1	TPE-2	TPE-3	TPE-4
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	84.5	85.7	85.7	84.6	82.9
	pH (1:2 soil:water) (pH)		6.35	6.31	6.53	5.94
Particle Size	% Gravel (>2mm) (%)		<1.0 PSAL	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL
	% Sand (2.0mm - 0.063mm) (%)		3.3 PSAL	3.6 PSAL	3.9 PSAL	7.3 PSAL
	% Silt (0.063mm - 4um) (%)		67.2 PSAL	66.1 PSAL	65.8 PSAL	60.5 PSAL
	% Clay (<4um) (%)		29.6 PSAL	30.2 PSAL	30.3 PSAL	32.2 PSAL
	Texture		Silt loam	Silt loam	Silt loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)		3.32	3.33	3.10	2.73
Metals	Aluminum (Al) (mg/kg)		28600	28400	29200	29900
	Antimony (Sb) (mg/kg)		0.24	0.25	0.24	0.24
	Arsenic (As) (mg/kg)		19.5	19.8	17.7	23.3
	Barium (Ba) (mg/kg)		126	127	140	128
	Beryllium (Be) (mg/kg)		1.93	1.88	2.04	2.10
	Bismuth (Bi) (mg/kg)		2.51	2.41	2.69	2.72
	Boron (B) (mg/kg)		9.7	9.7	10.4	9.8
	Cadmium (Cd) (mg/kg)		0.208	0.232	0.300	0.136
	Calcium (Ca) (mg/kg)		2240	2270	2200	2200
	Chromium (Cr) (mg/kg)		151	157	126	137
	Cobalt (Co) (mg/kg)		17.7	18.2	17.8	19.1
	Copper (Cu) (mg/kg)		53.7	51.0	56.6	58.2
	Iron (Fe) (mg/kg)		47400	50300	45900	56100
	Lead (Pb) (mg/kg)		22.1	22.3	23.0	24.0
	Lithium (Li) (mg/kg)		51.7	47.6	51.6	55.5
	Magnesium (Mg) (mg/kg)		11600	11200	10900	11200
	Manganese (Mn) (mg/kg)		2330	2440	2850	2030
	Mercury (Hg) (mg/kg)		<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)		4.20	4.28	4.38	5.24
	Nickel (Ni) (mg/kg)		85.7	91.1	99.7	71.0
	Phosphorus (P) (mg/kg)		449	441	435	421
	Potassium (K) (mg/kg)		4820	4660	5070	4910
	Selenium (Se) (mg/kg)		0.74	0.75	0.73	0.48
	Silver (Ag) (mg/kg)		<0.10	0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)		210	212	218	192
	Strontium (Sr) (mg/kg)		21.8	20.7	20.5	20.3
	Sulfur (S) (mg/kg)		2000	2300	1900	1600
	Thallium (Tl) (mg/kg)		0.413	0.413	0.489	0.411

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-11 Sediment 10-AUG-19 17:19 TPE-5	L2333924-12 Sediment 10-AUG-19 17:25 TPE-COMP	L2333924-13 Sediment 09-AUG-19 09:00 TPN-1	L2333924-14 Sediment 09-AUG-19 09:30 TPN-2	L2333924-15 Sediment 09-AUG-19 10:00 TPN-3
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	79.9	84.4	58.8	76.4	32.9
	pH (1:2 soil:water) (pH)	5.92		5.94	5.54	6.23
Particle Size	% Gravel (>2mm) (%)	<1.0 PSAL		<1.0	<1.0 PSAL	2.9
	% Sand (2.0mm - 0.063mm) (%)	10.7 PSAL		54.2	32.6 PSAL	32.4
	% Silt (0.063mm - 4um) (%)	58.5 PSAL		35.0	52.3 PSAL	43.9
	% Clay (<4um) (%)	30.8 PSAL		10.8	14.6 PSAL	20.8
	Texture	Silt loam		Sandy loam	Silt loam	Loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	2.41		0.961	2.24	0.384
Metals	Aluminum (Al) (mg/kg)	32200		13300	18500	15600
	Antimony (Sb) (mg/kg)	0.23		0.10	0.18	0.12
	Arsenic (As) (mg/kg)	23.2		8.98	21.7	12.9
	Barium (Ba) (mg/kg)	138		49.5	69.5	61.4
	Beryllium (Be) (mg/kg)	2.23		0.71	1.06	0.71
	Bismuth (Bi) (mg/kg)	3.03		0.75	1.17	0.74
	Boron (B) (mg/kg)	9.9		<5.0	7.1	<5.0
	Cadmium (Cd) (mg/kg)	0.133		0.043	0.087	0.067
	Calcium (Ca) (mg/kg)	2100		1170	1430	1210
	Chromium (Cr) (mg/kg)	140		88.3	127	82.7
	Cobalt (Co) (mg/kg)	19.2		8.03	11.9	10.9
	Copper (Cu) (mg/kg)	66.4		28.7	46.5	22.3
	Iron (Fe) (mg/kg)	56300		22100	38100	28200
	Lead (Pb) (mg/kg)	26.2		9.83	15.3	10.9
	Lithium (Li) (mg/kg)	64.5		24.0	29.6	33.6
	Magnesium (Mg) (mg/kg)	12100		6640	8800	7730
	Manganese (Mn) (mg/kg)	1820		300	376	520
	Mercury (Hg) (mg/kg)	<0.050		<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	5.42		1.61	3.54	5.10
	Nickel (Ni) (mg/kg)	76.6		42.0	60.0	51.2
	Phosphorus (P) (mg/kg)	461		318	606	236
	Potassium (K) (mg/kg)	5580		1980	2650	2400
	Selenium (Se) (mg/kg)	0.35		<0.20	0.32	<0.20
	Silver (Ag) (mg/kg)	<0.10		<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	173		96	125	99
	Strontium (Sr) (mg/kg)	20.9		11.7	14.8	14.2
	Sulfur (S) (mg/kg)	1500		<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.461		0.142	0.201	0.175

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-16 Sediment 09-AUG-19 10:25 TPN-4	L2333924-17 Sediment 09-AUG-19 11:20 TPN-5	L2333924-18 Sediment 09-AUG-19 11:25 TPN-COMP	L2333924-19 Sediment 11-AUG-19 09:40 WAL-1	L2333924-20 Sediment 11-AUG-19 10:50 WAL-2
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	48.5	37.2	48.1	89.1	91.1
	pH (1:2 soil:water) (pH)	6.13	6.14		6.54	6.37
Particle Size	% Gravel (>2mm) (%)	3.2	21.9		PSAL <1.0	PSAL <1.0
	% Sand (2.0mm - 0.063mm) (%)	52.4	12.5		PSAL 5.1	PSAL 2.6
	% Silt (0.063mm - 4um) (%)	30.6	38.0		PSAL 80.7	PSAL 84.5
	% Clay (<4um) (%)	13.7	27.5		PSAL 14.2	PSAL 12.9
	Texture	Sandy loam	Silty clay loam		Silt	Silt
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.647	0.420		7.08	7.59
Metals	Aluminum (Al) (mg/kg)	15300	26800		23900	25700
	Antimony (Sb) (mg/kg)	0.10	0.15		0.41	0.43
	Arsenic (As) (mg/kg)	13.4	18.9		26.2	27.8
	Barium (Ba) (mg/kg)	60.1	119		124	140
	Beryllium (Be) (mg/kg)	0.90	1.20		1.77	1.90
	Bismuth (Bi) (mg/kg)	0.84	1.33		2.25	2.45
	Boron (B) (mg/kg)	<5.0	7.0		10.4	10.5
	Cadmium (Cd) (mg/kg)	0.051	0.109		0.541	0.608
	Calcium (Ca) (mg/kg)	1230	2050		4410	4330
	Chromium (Cr) (mg/kg)	88.5	118		63.7	72.4
	Cobalt (Co) (mg/kg)	8.56	17.0		9.69	10.4
	Copper (Cu) (mg/kg)	33.1	30.9		153	178
	Iron (Fe) (mg/kg)	27500	42100		32300	34800
	Lead (Pb) (mg/kg)	10.9	16.8		36.0	38.5
	Lithium (Li) (mg/kg)	29.3	55.7		40.9	41.4
	Magnesium (Mg) (mg/kg)	7440	12000		8450	8790
	Manganese (Mn) (mg/kg)	387	677		360	355
	Mercury (Hg) (mg/kg)	<0.050	<0.050		<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	1.88	5.03		7.87	9.53
	Nickel (Ni) (mg/kg)	44.6	71.8		58.4	66.2
	Phosphorus (P) (mg/kg)	355	341		667	717
	Potassium (K) (mg/kg)	2420	4690		3740	4010
	Selenium (Se) (mg/kg)	<0.20	<0.20		0.81	0.97
	Silver (Ag) (mg/kg)	<0.10	<0.10		0.59	0.71
	Sodium (Na) (mg/kg)	83	181		204	222
	Strontium (Sr) (mg/kg)	12.1	21.1		30.2	31.3
	Sulfur (S) (mg/kg)	<1000	<1000		2200	2300
	Thallium (Tl) (mg/kg)	0.166	0.335		0.339	0.362

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-21	L2333924-22	L2333924-23	L2333924-24	L2333924-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-19	11-AUG-19	11-AUG-19	11-AUG-19	14-AUG-19
	Sampled Time	11:05	11:35	12:00	12:05	12:30
	Client ID	WAL-3	WAL-4	WAL-5	WAL-COMP	PDL-1
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	92.1	92.0	87.6	89.6	84.4
	pH (1:2 soil:water) (pH)	6.51	6.64	6.29		5.22
Particle Size	% Gravel (>2mm) (%)	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL		<1.0 PSAL
	% Sand (2.0mm - 0.063mm) (%)	2.2 PSAL	2.1 PSAL	6.6 PSAL		12.5 PSAL
	% Silt (0.063mm - 4um) (%)	84.8 PSAL	89.7 PSAL	85.5 PSAL		76.5 PSAL
	% Clay (<4um) (%)	13.0 PSAL	8.3 PSAL	7.9 PSAL		11.0 PSAL
	Texture	Silt	Silt	Silt		Silt loam / Silt
Organic / Inorganic Carbon	Total Organic Carbon (%)	7.95	9.33	5.34		3.52
Metals	Aluminum (Al) (mg/kg)	26300	23600	30600		21600
	Antimony (Sb) (mg/kg)	0.45	0.49	0.59		0.23
	Arsenic (As) (mg/kg)	46.1	27.8	20.6		12.7
	Barium (Ba) (mg/kg)	140	126	196		101
	Beryllium (Be) (mg/kg)	2.04	1.73	2.02		0.85
	Bismuth (Bi) (mg/kg)	2.55	2.20	2.50		0.69
	Boron (B) (mg/kg)	12.3	14.1	10.7		7.3
	Cadmium (Cd) (mg/kg)	0.552	0.541	1.16		0.296
	Calcium (Ca) (mg/kg)	4620	5020	4070		2210
	Chromium (Cr) (mg/kg)	72.9	63.9	80.7		137
	Cobalt (Co) (mg/kg)	10.9	10.1	11.5		11.1
	Copper (Cu) (mg/kg)	187	163	191		45.5
	Iron (Fe) (mg/kg)	42900	30700	31900		26800
	Lead (Pb) (mg/kg)	40.8	37.5	37.5		12.6
	Lithium (Li) (mg/kg)	42.1	39.7	52.7		25.0
	Magnesium (Mg) (mg/kg)	8980	8350	11300		11400
	Manganese (Mn) (mg/kg)	397	368	428		292
	Mercury (Hg) (mg/kg)	0.051	0.059	<0.050		<0.050
	Molybdenum (Mo) (mg/kg)	12.3	8.75	5.47		1.99
	Nickel (Ni) (mg/kg)	68.7	59.0	68.9		84.4
	Phosphorus (P) (mg/kg)	794	656	653		500
	Potassium (K) (mg/kg)	4160	3790	5450		3200
	Selenium (Se) (mg/kg)	1.14	0.91	1.31		0.40
	Silver (Ag) (mg/kg)	0.73	0.78	0.66		0.21
	Sodium (Na) (mg/kg)	237	232	239		126
	Strontium (Sr) (mg/kg)	32.6	34.1	31.2		20.7
	Sulfur (S) (mg/kg)	2500	2800	1400		<1000
	Thallium (Tl) (mg/kg)	0.383	0.351	0.389		0.165

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-26	L2333924-27	L2333924-28	L2333924-29	L2333924-30
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19
	Sampled Time	12:47	13:15	13:03	14:15	14:20
	Client ID	PDL-2	PDL-3	PDL-4	PDL-5	PDL-COMP
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	85.3	70.4	72.7	78.1	78.5
	pH (1:2 soil:water) (pH)	5.19	5.60	6.02	5.75	
Particle Size	% Gravel (>2mm) (%)	<1.0 PSAL	<1.0	<1.0 PSAL	<1.0 PSAL	
	% Sand (2.0mm - 0.063mm) (%)	9.8 PSAL	29.7	8.5 PSAL	12.5 PSAL	
	% Silt (0.063mm - 4um) (%)	80.0 PSAL	65.8	75.0 PSAL	76.2 PSAL	
	% Clay (<4um) (%)	10.3 PSAL	4.5	16.5 PSAL	11.4 PSAL	
	Texture	Silt	Silt loam	Silt	Silt loam	
Organic / Inorganic Carbon	Total Organic Carbon (%)	4.20	1.75	1.88	2.59	
Metals	Aluminum (Al) (mg/kg)	20500	17500	26000	22500	
	Antimony (Sb) (mg/kg)	0.24	0.18	0.25	0.22	
	Arsenic (As) (mg/kg)	14.6	8.78	55.0	10.3	
	Barium (Ba) (mg/kg)	91.5	71.2	105	109	
	Beryllium (Be) (mg/kg)	0.86	0.63	1.15	0.91	
	Bismuth (Bi) (mg/kg)	0.70	0.55	1.06	0.74	
	Boron (B) (mg/kg)	7.9	<5.0	8.0	7.1	
	Cadmium (Cd) (mg/kg)	0.269	0.187	0.269	0.256	
	Calcium (Ca) (mg/kg)	2140	1960	1930	2250	
	Chromium (Cr) (mg/kg)	127	114	157	136	
	Cobalt (Co) (mg/kg)	11.2	10.3	21.5	11.4	
	Copper (Cu) (mg/kg)	44.3	29.9	62.1	44.4	
	Iron (Fe) (mg/kg)	27200	23300	47700	26000	
	Lead (Pb) (mg/kg)	12.8	9.99	15.9	12.3	
	Lithium (Li) (mg/kg)	24.4	19.1	31.2	26.7	
	Magnesium (Mg) (mg/kg)	10600	10500	12400	11300	
	Manganese (Mn) (mg/kg)	279	264	2060	291	
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	
	Molybdenum (Mo) (mg/kg)	2.17	1.25	4.80	1.59	
	Nickel (Ni) (mg/kg)	83.7	63.9	118	81.8	
	Phosphorus (P) (mg/kg)	511	582	496	494	
	Potassium (K) (mg/kg)	2800	2160	3440	3070	
	Selenium (Se) (mg/kg)	0.39	0.27	0.20	0.38	
	Silver (Ag) (mg/kg)	0.24	0.11	<0.10	0.19	
	Sodium (Na) (mg/kg)	132	94	127	145	
	Strontium (Sr) (mg/kg)	19.9	17.1	22.2	22.9	
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	
	Thallium (Tl) (mg/kg)	0.159	0.130	0.252	0.160	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-31	L2333924-32	L2333924-33	L2333924-34	L2333924-35
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19
	Sampled Time	14:20	14:20	14:20	14:20	14:20
	Client ID	DUP-1	DUP-2	DUP-3	DUP-4	DUP-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	60.1	84.2	35.6	39.8	70.2
	pH (1:2 soil:water) (pH)	5.87	5.62	6.04	7.14	5.73
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0 PSAL	<1.0	<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)	57.5	1.8 PSAL	77.6	66.1	31.9
	% Silt (0.063mm - 4um) (%)	35.3	66.9 PSAL	20.1	28.9	61.3
	% Clay (<4um) (%)	7.2	31.3 PSAL	2.2	4.2	6.7
	Texture	Sandy loam	Silt loam	Loamy sand	Sandy loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.938	3.60	0.388	0.468	1.74
Metals	Aluminum (Al) (mg/kg)	13500	32500	5150	7450	18100
	Antimony (Sb) (mg/kg)	<0.10	0.28	0.13	0.13	0.19
	Arsenic (As) (mg/kg)	8.10	54.7	7.39	3.87	8.59
	Barium (Ba) (mg/kg)	48.8	167	444	107	73.3
	Beryllium (Be) (mg/kg)	0.62	2.41	0.29	0.37	0.66
	Bismuth (Bi) (mg/kg)	0.68	2.52	<0.20	<0.20	0.57
	Boron (B) (mg/kg)	<5.0	10.7	6.8	7.1	5.0
	Cadmium (Cd) (mg/kg)	0.040	0.283	0.026	0.036	0.199
	Calcium (Ca) (mg/kg)	1130	2040	2050	2240	2150
	Chromium (Cr) (mg/kg)	78.4	98.6	16.2	19.9	113
	Cobalt (Co) (mg/kg)	7.08	19.7	3.90	4.99	10.1
	Copper (Cu) (mg/kg)	26.5	93.6	4.61	28.2	30.0
	Iron (Fe) (mg/kg)	19400	82200	14000	13500	24100
	Lead (Pb) (mg/kg)	8.70	22.8	4.00	5.24	10.5
	Lithium (Li) (mg/kg)	21.1	53.1	7.2	9.2	20.0
	Magnesium (Mg) (mg/kg)	6150	11200	3180	4330	10100
	Manganese (Mn) (mg/kg)	264	1860	199	552	259
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	1.31	9.18	0.50	0.55	1.36
	Nickel (Ni) (mg/kg)	36.7	79.1	8.90	11.2	64.3
	Phosphorus (P) (mg/kg)	285	729	700	728	589
	Potassium (K) (mg/kg)	1820	5700	1240	1480	2200
	Selenium (Se) (mg/kg)	<0.20	0.52	<0.20	<0.20	0.28
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	0.12
	Sodium (Na) (mg/kg)	92	212	100	126	112
	Strontium (Sr) (mg/kg)	10.7	19.3	46.2	43.9	19.0
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.125	0.394	0.051	0.061	0.137

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-36	L2333924-37	L2333924-38	L2333924-39	L2333924-40
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	14-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19
	Sampled Time	14:20	11:22	11:39	11:50	12:02
	Client ID	DUP-6	BAP-1	BAP-2	BAP-3	BAP-4
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	88.7	35.2	35.8	35.4	47.2
	pH (1:2 soil:water) (pH)	6.40	6.10	6.05	5.88	5.96
Particle Size	% Gravel (>2mm) (%)	<1.0 PSAL	<1.0	<1.0	<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)	4.7 PSAL	78.6	77.2	71.5	66.1
	% Silt (0.063mm - 4um) (%)	81.8 PSAL	19.7	20.8	26.0	30.7
	% Clay (<4um) (%)	13.5 PSAL	1.7	1.9	2.5	3.2
	Texture	Silt	Loamy sand	Loamy sand	Loamy sand	Sandy loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	7.11	0.423	0.334	0.458	0.689
Metals	Aluminum (Al) (mg/kg)	23700	4850	5420	6310	7550
	Antimony (Sb) (mg/kg)	0.39	0.13	0.13	0.14	0.15
	Arsenic (As) (mg/kg)	26.0	6.68	7.61	4.14	3.88
	Barium (Ba) (mg/kg)	152	445	486	460	413
	Beryllium (Be) (mg/kg)	1.58	0.26	0.30	0.32	0.38
	Bismuth (Bi) (mg/kg)	1.97	<0.20	<0.20	<0.20	<0.20
	Boron (B) (mg/kg)	9.3	6.0	7.0	7.1	8.6
	Cadmium (Cd) (mg/kg)	0.529	0.025	0.029	0.031	0.047
	Calcium (Ca) (mg/kg)	4020	2040	2130	2160	2210
	Chromium (Cr) (mg/kg)	64.1	16.4	16.1	18.1	20.2
	Cobalt (Co) (mg/kg)	9.60	3.81	4.06	4.30	4.91
	Copper (Cu) (mg/kg)	150	4.15	4.49	5.31	7.54
	Iron (Fe) (mg/kg)	31800	13500	14600	14400	14600
	Lead (Pb) (mg/kg)	31.7	3.88	4.23	4.50	5.39
	Lithium (Li) (mg/kg)	35.8	6.6	7.3	7.5	9.0
	Magnesium (Mg) (mg/kg)	8890	2950	3220	3650	4030
	Manganese (Mn) (mg/kg)	401	180	207	148	132
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	7.29	0.41	0.58	0.44	0.49
	Nickel (Ni) (mg/kg)	56.5	8.97	8.93	9.70	12.1
	Phosphorus (P) (mg/kg)	706	704	734	730	713
	Potassium (K) (mg/kg)	4070	1150	1310	1480	1750
	Selenium (Se) (mg/kg)	0.87	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	0.54	<0.10	<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	224	87	102	117	128
	Strontium (Sr) (mg/kg)	27.8	43.2	48.9	45.9	51.7
	Sulfur (S) (mg/kg)	1200	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.298	<0.050	0.055	0.055	0.066

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-41 Sediment 12-AUG-19 12:28 BAP-5	L2333924-42 Sediment 12-AUG-19 12:35 BAP-COMP	L2333924-43 Sediment 12-AUG-19 14:00 BES-1	L2333924-44 Sediment 12-AUG-19 14:20 BES-2	L2333924-45 Sediment 12-AUG-19 14:50 BES-3
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	33.5	33.5	40.1	38.3	40.9
	pH (1:2 soil:water) (pH)	7.01		7.16	6.38	6.28
Particle Size	% Gravel (>2mm) (%)	2.6		<1.0	<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)	80.1		61.9	65.4	64.1
	% Silt (0.063mm - 4um) (%)	15.5		33.3	31.0	32.8
	% Clay (<4um) (%)	1.8		4.2	3.4	2.8
	Texture	Loamy sand		Sandy loam	Sandy loam / Loamy sand	Sandy loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.270		0.429	0.415	0.416
Metals	Aluminum (Al) (mg/kg)	4770		7360	6850	7950
	Antimony (Sb) (mg/kg)	0.13		0.13	0.12	0.16
	Arsenic (As) (mg/kg)	3.73		3.59	3.76	5.11
	Barium (Ba) (mg/kg)	334		107	136	136
	Beryllium (Be) (mg/kg)	0.31		0.36	0.30	0.38
	Bismuth (Bi) (mg/kg)	<0.20		<0.20	<0.20	<0.20
	Boron (B) (mg/kg)	5.8		6.5	6.4	7.3
	Cadmium (Cd) (mg/kg)	0.023		0.037	0.040	0.050
	Calcium (Ca) (mg/kg)	1740		2220	2050	2290
	Chromium (Cr) (mg/kg)	15.4		18.3	19.6	22.5
	Cobalt (Co) (mg/kg)	3.93		4.74	4.98	5.82
	Copper (Cu) (mg/kg)	4.06		27.0	5.17	6.00
	Iron (Fe) (mg/kg)	13200		13200	13700	15200
	Lead (Pb) (mg/kg)	3.79		5.30	4.80	5.31
	Lithium (Li) (mg/kg)	6.7		9.0	8.5	9.9
	Magnesium (Mg) (mg/kg)	3170		4170	4270	4840
	Manganese (Mn) (mg/kg)	265		553	1630	1550
	Mercury (Hg) (mg/kg)	<0.050		<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	0.41		0.59	0.81	1.00
	Nickel (Ni) (mg/kg)	8.73		10.2	11.4	13.6
	Phosphorus (P) (mg/kg)	597		697	699	791
	Potassium (K) (mg/kg)	1170		1320	1340	1490
	Selenium (Se) (mg/kg)	<0.20		<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10		<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	76		107	96	110
	Strontium (Sr) (mg/kg)	41.7		43.5	40.6	43.1
	Sulfur (S) (mg/kg)	<1000		<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	<0.050		0.061	0.054	0.061

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-46 Sediment 12-AUG-19 15:18 BES-4	L2333924-47 Sediment 12-AUG-19 15:44 BES-5	L2333924-48 Sediment 12-AUG-19 15:50 BES-COMP	L2333924-49 Sediment 13-AUG-19 11:24 BPJ-1	L2333924-50 Sediment 13-AUG-19 11:49 BPJ-2
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	35.8	36.3	39.4	50.1	51.7
	pH (1:2 soil:water) (pH)	7.49	6.50		7.22	6.70
Particle Size	% Gravel (>2mm) (%)	<1.0	2.0		<1.0	3.1
	% Sand (2.0mm - 0.063mm) (%)	73.2	58.9		38.1	31.5
	% Silt (0.063mm - 4um) (%)	24.4	35.1		55.0	56.0
	% Clay (<4um) (%)	2.0	4.1		6.9	9.5
	Texture	Loamy sand	Sandy loam		Silt loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.414	0.396		0.655	0.615
Metals	Aluminum (Al) (mg/kg)	6900	8030		10600	10800
	Antimony (Sb) (mg/kg)	0.14	0.15		0.16	0.16
	Arsenic (As) (mg/kg)	3.70	4.02		8.90	24.6
	Barium (Ba) (mg/kg)	144	85.6		122	103
	Beryllium (Be) (mg/kg)	0.31	0.36		0.45	0.44
	Bismuth (Bi) (mg/kg)	<0.20	<0.20		<0.20	<0.20
	Boron (B) (mg/kg)	6.3	7.1		8.8	8.8
	Cadmium (Cd) (mg/kg)	0.042	0.037		0.088	0.080
	Calcium (Ca) (mg/kg)	2180	2320		2870	2590
	Chromium (Cr) (mg/kg)	19.4	20.7		23.4	23.0
	Cobalt (Co) (mg/kg)	5.15	5.19		7.66	7.70
	Copper (Cu) (mg/kg)	5.08	5.58		9.26	9.84
	Iron (Fe) (mg/kg)	13900	14200		19700	21100
	Lead (Pb) (mg/kg)	4.53	5.12		8.53	8.68
	Lithium (Li) (mg/kg)	9.0	9.2		11.7	11.5
	Magnesium (Mg) (mg/kg)	4290	4280		5260	5380
	Manganese (Mn) (mg/kg)	832	715		2340	1300
	Mercury (Hg) (mg/kg)	<0.050	<0.050		<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	0.56	0.56		1.64	1.66
	Nickel (Ni) (mg/kg)	11.7	11.8		14.5	14.4
	Phosphorus (P) (mg/kg)	732	794		917	1040
	Potassium (K) (mg/kg)	1320	1480		1830	1820
	Selenium (Se) (mg/kg)	<0.20	<0.20		<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10		<0.10	<0.10
	Sodium (Na) (mg/kg)	80	98		139	144
	Strontium (Sr) (mg/kg)	38.6	45.1		56.9	54.9
	Sulfur (S) (mg/kg)	<1000	<1000		<1000	<1000
	Thallium (Tl) (mg/kg)	0.057	0.056		0.074	0.074

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-51	L2333924-52	L2333924-53	L2333924-54	L2333924-55
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	13-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19
	Sampled Time	12:10	12:39	13:05		
	Client ID	BPJ-3	BPJ-4	BPJ-5	BPJ-COMP	BBD-1
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	41.7	37.4	31.7	41.0	38.4
	pH (1:2 soil:water) (pH)	6.04	6.25	6.80		6.59
Particle Size	% Gravel (>2mm) (%)	<1.0	1.8	<1.0		<1.0
	% Sand (2.0mm - 0.063mm) (%)	19.1	50.2	73.4		33.8
	% Silt (0.063mm - 4um) (%)	68.3	41.0	23.6		58.8
	% Clay (<4um) (%)	12.3	7.0	2.8		7.2
	Texture	Silt loam	Sandy loam	Loamy sand		Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.513	0.383	0.277		0.468
Metals	Aluminum (Al) (mg/kg)	11300	8590	5960		9340
	Antimony (Sb) (mg/kg)	0.17	0.13	0.10		0.13
	Arsenic (As) (mg/kg)	6.47	18.3	6.45		6.95
	Barium (Ba) (mg/kg)	107	105	88.8		93.1
	Beryllium (Be) (mg/kg)	0.51	0.39	0.26		0.35
	Bismuth (Bi) (mg/kg)	0.22	<0.20	<0.20		<0.20
	Boron (B) (mg/kg)	11.2	8.9	5.6		8.0
	Cadmium (Cd) (mg/kg)	0.065	0.042	0.055		0.038
	Calcium (Ca) (mg/kg)	3130	2410	1860		2760
	Chromium (Cr) (mg/kg)	25.4	18.9	16.2		19.7
	Cobalt (Co) (mg/kg)	7.39	6.07	5.01		6.30
	Copper (Cu) (mg/kg)	11.0	8.43	6.71		8.81
	Iron (Fe) (mg/kg)	19900	19300	15200		15900
	Lead (Pb) (mg/kg)	9.71	7.18	5.36		7.36
	Lithium (Li) (mg/kg)	14.2	11.0	8.0		10.5
	Magnesium (Mg) (mg/kg)	5740	4310	3360		4650
	Manganese (Mn) (mg/kg)	788	1180	1960		554
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050		<0.050
	Molybdenum (Mo) (mg/kg)	0.98	1.58	1.35		0.68
	Nickel (Ni) (mg/kg)	15.2	11.2	9.33		11.7
	Phosphorus (P) (mg/kg)	993	998	540		952
	Potassium (K) (mg/kg)	2400	1760	1110		1710
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20		<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10		<0.10
	Sodium (Na) (mg/kg)	274	182	101		150
	Strontium (Sr) (mg/kg)	57.1	54.1	44.5		51.4
	Sulfur (S) (mg/kg)	<1000	<1000	<1000		<1000
	Thallium (Tl) (mg/kg)	0.098	0.064	<0.050		0.066

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-56 Sediment 13-AUG-19 BBD-2	L2333924-57 Sediment 13-AUG-19 BBD-3	L2333924-58 Sediment 13-AUG-19 BBD-4	L2333924-59 Sediment 13-AUG-19 BBD-5	L2333924-60 Sediment 13-AUG-19 BBD-COMP
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	39.7	34.1	23.3	32.6	32.4
	pH (1:2 soil:water) (pH)	5.80	6.23	6.50	6.61	
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0	5.2	<1.0	
	% Sand (2.0mm - 0.063mm) (%)	56.2	67.9	84.5	70.6	
	% Silt (0.063mm - 4um) (%)	40.1	29.0	9.2	26.1	
	% Clay (<4um) (%)	3.6	3.0	1.2	2.5	
	Texture	Sandy loam	Sandy loam	Sand	Loamy sand	
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.475	0.343	0.160	0.310	
Metals	Aluminum (Al) (mg/kg)	7480	6540	3990	5820	
	Antimony (Sb) (mg/kg)	0.12	<0.10	<0.10	<0.10	
	Arsenic (As) (mg/kg)	5.97	5.02	2.60	8.22	
	Barium (Ba) (mg/kg)	74.3	77.6	35.2	68.7	
	Beryllium (Be) (mg/kg)	0.29	0.25	0.18	0.25	
	Bismuth (Bi) (mg/kg)	0.51	<0.20	<0.20	<0.20	
	Boron (B) (mg/kg)	5.9	5.4	<5.0	<5.0	
	Cadmium (Cd) (mg/kg)	0.041	0.038	<0.020	0.038	
	Calcium (Ca) (mg/kg)	2140	1880	1050	1890	
	Chromium (Cr) (mg/kg)	15.7	13.4	8.84	12.6	
	Cobalt (Co) (mg/kg)	4.79	4.58	3.02	4.48	
	Copper (Cu) (mg/kg)	7.31	7.33	3.58	5.87	
	Iron (Fe) (mg/kg)	13300	12300	7970	12600	
	Lead (Pb) (mg/kg)	5.77	5.06	2.64	4.82	
	Lithium (Li) (mg/kg)	9.1	8.6	6.7	8.1	
	Magnesium (Mg) (mg/kg)	4190	3910	2700	3720	
	Manganese (Mn) (mg/kg)	187	264	145	408	
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	
	Molybdenum (Mo) (mg/kg)	0.62	0.46	0.30	0.76	
	Nickel (Ni) (mg/kg)	10.1	8.98	5.66	8.47	
	Phosphorus (P) (mg/kg)	677	600	312	689	
	Potassium (K) (mg/kg)	1160	1030	610	930	
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	
	Sodium (Na) (mg/kg)	83	68	<50	87	
	Strontium (Sr) (mg/kg)	38.6	37.6	21.7	39.3	
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	
	Thallium (Tl) (mg/kg)	<0.050	<0.050	<0.050	<0.050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2333924-61	L2333924-62	L2333924-63	L2333924-64	L2333924-65
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-19	10-AUG-19	10-AUG-19	10-AUG-19	10-AUG-19
	Sampled Time	14:10	14:25	15:15	15:41	15:55
	Client ID	TPE-SC-1	TPE-SC-2	TPE-SC-3	TPE-SC-4	TPE-SC-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	88.4	90.1	90.2	89.2	88.9
	pH (1:2 soil:water) (pH)	6.35	6.01	6.71	5.93	5.91
Particle Size	% Gravel (>2mm) (%)					
	% Sand (2.0mm - 0.063mm) (%)					
	% Silt (0.063mm - 4um) (%)					
	% Clay (<4um) (%)					
	Texture					
Organic / Inorganic Carbon	Total Organic Carbon (%)					
Metals	Aluminum (Al) (mg/kg)	28200	27200	24100	26600	28600
	Antimony (Sb) (mg/kg)	0.30	0.31	0.31	0.30	0.26
	Arsenic (As) (mg/kg)	23.5	21.1	25.0	21.2	17.5
	Barium (Ba) (mg/kg)	159	99.1	90.3	109	127
	Beryllium (Be) (mg/kg)	1.68	1.59	1.38	1.64	1.77
	Bismuth (Bi) (mg/kg)	2.05	2.04	1.71	2.10	2.13
	Boron (B) (mg/kg)	9.2	8.2	7.7	8.1	8.4
	Cadmium (Cd) (mg/kg)	0.862	0.183	0.287	0.237	0.327
	Calcium (Ca) (mg/kg)	2270	2440	2640	2290	2220
	Chromium (Cr) (mg/kg)	163	168	250	167	140
	Cobalt (Co) (mg/kg)	19.8	15.9	18.9	16.0	16.1
	Copper (Cu) (mg/kg)	57.3	51.4	44.9	48.8	55.5
	Iron (Fe) (mg/kg)	43400	43900	47200	46100	40500
	Lead (Pb) (mg/kg)	21.2	19.5	18.5	19.3	19.5
	Lithium (Li) (mg/kg)	43.1	42.9	35.4	41.4	44.7
	Magnesium (Mg) (mg/kg)	11800	11700	13000	11400	10700
	Manganese (Mn) (mg/kg)	5770	1520	2630	2350	2340
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	4.83	4.13	4.19	4.70	4.21
	Nickel (Ni) (mg/kg)	216	79.2	120	84.2	107
	Phosphorus (P) (mg/kg)	484	457	496	438	477
	Potassium (K) (mg/kg)	4670	4360	3630	4450	4780
	Selenium (Se) (mg/kg)	0.85	0.81	0.71	0.78	0.80
	Silver (Ag) (mg/kg)	0.13	0.14	0.18	0.13	<0.10
	Sodium (Na) (mg/kg)	207	213	169	197	196
	Strontium (Sr) (mg/kg)	19.0	19.3	18.8	18.1	18.7
	Sulfur (S) (mg/kg)	2300	2000	2300	1900	2300
	Thallium (Tl) (mg/kg)	0.527	0.312	0.294	0.346	0.396

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-66	L2333924-67	L2333924-68	L2333924-69	L2333924-70
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-19	11-AUG-19	11-AUG-19	11-AUG-19	11-AUG-19
	Sampled Time	16:34	08:50	09:10	09:20	09:50
	Client ID	TPE-SC-6	TPE-SC-7	TPE-SC-8	TPE-SC-9	TPE-SC-10
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	87.1	89.6	87.4	87.9	90.8
	pH (1:2 soil:water) (pH)	5.92	6.02	6.11	6.10	5.88
Particle Size	% Gravel (>2mm) (%)					
	% Sand (2.0mm - 0.063mm) (%)					
	% Silt (0.063mm - 4um) (%)					
	% Clay (<4um) (%)					
	Texture					
Organic / Inorganic Carbon	Total Organic Carbon (%)					
Metals	Aluminum (Al) (mg/kg)	30200	28700	29200	27200	27600
	Antimony (Sb) (mg/kg)	0.25	0.24	0.25	0.34	0.29
	Arsenic (As) (mg/kg)	19.1	21.9	24.9	45.5	22.4
	Barium (Ba) (mg/kg)	145	118	110	89.6	106
	Beryllium (Be) (mg/kg)	1.82	1.89	1.51	1.37	1.86
	Bismuth (Bi) (mg/kg)	2.36	2.14	1.79	1.67	2.16
	Boron (B) (mg/kg)	8.7	8.7	7.9	7.3	10.2
	Cadmium (Cd) (mg/kg)	0.171	0.146	0.216	0.224	0.172
	Calcium (Ca) (mg/kg)	1970	2240	2280	2350	2440
	Chromium (Cr) (mg/kg)	120	130	234	389	172
	Cobalt (Co) (mg/kg)	16.2	16.8	18.8	23.3	16.8
	Copper (Cu) (mg/kg)	57.7	58.2	52.4	53.1	57.4
	Iron (Fe) (mg/kg)	42100	50100	50200	66700	46200
	Lead (Pb) (mg/kg)	19.8	20.3	19.1	20.2	21.1
	Lithium (Li) (mg/kg)	47.6	47.6	53.4	39.3	47.4
	Magnesium (Mg) (mg/kg)	10800	10600	14600	17200	11600
	Manganese (Mn) (mg/kg)	1360	1790	1750	1930	1360
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	3.93	4.41	3.95	5.86	4.26
	Nickel (Ni) (mg/kg)	75.1	66.7	103	144	79.6
	Phosphorus (P) (mg/kg)	449	453	503	630	524
	Potassium (K) (mg/kg)	5250	4960	4670	3650	4940
	Selenium (Se) (mg/kg)	0.71	0.67	0.64	0.61	0.68
	Silver (Ag) (mg/kg)	<0.10	<0.10	0.15	0.25	0.16
	Sodium (Na) (mg/kg)	205	203	201	176	201
	Strontium (Sr) (mg/kg)	18.2	18.2	19.2	18.1	19.8
	Sulfur (S) (mg/kg)	2100	1000	<1000	1100	1900
	Thallium (Tl) (mg/kg)	0.387	0.335	0.324	0.286	0.336

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-71	L2333924-75			
	Description	Sediment	Sediment			
	Sampled Date	11-AUG-19	12-AUG-19			
	Sampled Time	09:50				
	Client ID	CORE-DUP-1	COMP-DUP-2			
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	90.4	77.9			
	pH (1:2 soil:water) (pH)	5.55				
Particle Size	% Gravel (>2mm) (%)					
	% Sand (2.0mm - 0.063mm) (%)					
	% Silt (0.063mm - 4um) (%)					
	% Clay (<4um) (%)					
	Texture					
Organic / Inorganic Carbon	Total Organic Carbon (%)					
Metals	Aluminum (Al) (mg/kg)	26000				
	Antimony (Sb) (mg/kg)	0.30				
	Arsenic (As) (mg/kg)	24.5				
	Barium (Ba) (mg/kg)	199				
	Beryllium (Be) (mg/kg)	1.56				
	Bismuth (Bi) (mg/kg)	1.83				
	Boron (B) (mg/kg)	8.9				
	Cadmium (Cd) (mg/kg)	0.904				
	Calcium (Ca) (mg/kg)	2240				
	Chromium (Cr) (mg/kg)	184				
	Cobalt (Co) (mg/kg)	20.8				
	Copper (Cu) (mg/kg)	57.7				
	Iron (Fe) (mg/kg)	46200				
	Lead (Pb) (mg/kg)	19.5				
	Lithium (Li) (mg/kg)	40.2				
	Magnesium (Mg) (mg/kg)	11500				
	Manganese (Mn) (mg/kg)	15700				
	Mercury (Hg) (mg/kg)	<0.050				
	Molybdenum (Mo) (mg/kg)	5.58				
	Nickel (Ni) (mg/kg)	256				
	Phosphorus (P) (mg/kg)	474				
	Potassium (K) (mg/kg)	4320				
	Selenium (Se) (mg/kg)	0.66				
	Silver (Ag) (mg/kg)	0.17				
	Sodium (Na) (mg/kg)	197				
	Strontium (Sr) (mg/kg)	19.5				
	Sulfur (S) (mg/kg)	2000				
	Thallium (Tl) (mg/kg)	0.555				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2333924-1	L2333924-2	L2333924-3	L2333924-4	L2333924-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-19	11-AUG-19	11-AUG-19	11-AUG-19	11-AUG-19
	Sampled Time	10:58	11:15	11:45	12:08	12:41
	Client ID	SP-1	SP-2	SP-3	SP-4	SP-5
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0	<2.0	2.0	2.4	2.0
	Titanium (Ti) (mg/kg)	959	927	991	1060	960
	Tungsten (W) (mg/kg)	0.92	0.81	0.87	0.96	0.99
	Uranium (U) (mg/kg)	20.9	20.8	24.8	27.8	25.3
	Vanadium (V) (mg/kg)	43.9	43.6	49.4	53.3	49.8
	Zinc (Zn) (mg/kg)	138	130	148	151	148
	Zirconium (Zr) (mg/kg)	3.2	2.8	3.5	3.3	3.1
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)					
Hydrocarbons	EPH10-19 (mg/kg)					
	EPH19-32 (mg/kg)					
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b&j)fluoranthene (mg/kg)					
	Benzo(b+j+k)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	1-Methylnaphthalene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Quinoline (mg/kg)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2333924-6	L2333924-7	L2333924-8	L2333924-9	L2333924-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-19	10-AUG-19	10-AUG-19	10-AUG-19	10-AUG-19
	Sampled Time	12:45				16:53
	Client ID	SP-COMP	TPE-1	TPE-2	TPE-3	TPE-4
SOIL						
Metals	Tin (Sn) (mg/kg)		2.1	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)		1030	1000	1060	1130
	Tungsten (W) (mg/kg)		0.96	0.89	0.84	0.81
	Uranium (U) (mg/kg)		17.7	17.1	19.7	20.8
	Vanadium (V) (mg/kg)		46.5	45.5	46.3	49.1
	Zinc (Zn) (mg/kg)		115	113	122	118
	Zirconium (Zr) (mg/kg)		3.2	3.3	3.3	3.7
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)	<1600 DLHM				
Hydrocarbons	EPH10-19 (mg/kg)	<600 DLHM				
	EPH19-32 (mg/kg)	<600 DLHM				
	LEPH (mg/kg)	<600				
	HEPH (mg/kg)	<600				
	Surrogate: 2-Bromobenzotrifluoride (%)	96.9				
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.0090 DLHM				
	Acenaphthylene (mg/kg)	<0.0090 DLHM				
	Anthracene (mg/kg)	<0.0090 DLHM				
	Benz(a)anthracene (mg/kg)	<0.010				
	Benzo(a)pyrene (mg/kg)	<0.010				
	Benzo(b&j)fluoranthene (mg/kg)	<0.010				
	Benzo(b+j+k)fluoranthene (mg/kg)	<0.015				
	Benzo(g,h,i)perylene (mg/kg)	<0.010				
	Benzo(k)fluoranthene (mg/kg)	<0.010				
	Chrysene (mg/kg)	<0.010				
	Dibenz(a,h)anthracene (mg/kg)	<0.0090 DLHM				
	Fluoranthene (mg/kg)	<0.010				
	Fluorene (mg/kg)	<0.010				
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.010				
	1-Methylnaphthalene (mg/kg)	<0.050				
	2-Methylnaphthalene (mg/kg)	<0.010				
	Naphthalene (mg/kg)	<0.020 DLQ				
	Phenanthrene (mg/kg)	<0.010				
	Pyrene (mg/kg)	<0.010				
	Quinoline (mg/kg)	<0.050				
	Surrogate: Chrysene d12 (%)	96.6				
	Surrogate: Naphthalene d8 (%)	96.0				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2333924-11	L2333924-12	L2333924-13	L2333924-14	L2333924-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-19	10-AUG-19	09-AUG-19	09-AUG-19	09-AUG-19
	Sampled Time	17:19	17:25	09:00	09:30	10:00
	Client ID	TPE-5	TPE-COMP	TPN-1	TPN-2	TPN-3
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0		<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	1200		498	584	741
	Tungsten (W) (mg/kg)	0.87		<0.50	0.66	0.51
	Uranium (U) (mg/kg)	24.4		8.90	13.4	9.18
	Vanadium (V) (mg/kg)	53.3		24.5	33.0	28.5
	Zinc (Zn) (mg/kg)	130		55.3	74.5	65.3
	Zirconium (Zr) (mg/kg)	3.8		1.4	1.6	9.8
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)		<1600 DLHM			
Hydrocarbons	EPH10-19 (mg/kg)		<580 DLHM			
	EPH19-32 (mg/kg)		<580 DLHM			
	LEPH (mg/kg)		<580			
	HEPH (mg/kg)		<580			
	Surrogate: 2-Bromobenzotrifluoride (%)		106.5			
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)		<0.0090 DLHM			
	Acenaphthylene (mg/kg)		<0.0090 DLHM			
	Anthracene (mg/kg)		<0.0090 DLHM			
	Benz(a)anthracene (mg/kg)		<0.010			
	Benzo(a)pyrene (mg/kg)		<0.010			
	Benzo(b&j)fluoranthene (mg/kg)		<0.010			
	Benzo(b+j+k)fluoranthene (mg/kg)		<0.015			
	Benzo(g,h,i)perylene (mg/kg)		<0.010			
	Benzo(k)fluoranthene (mg/kg)		<0.010			
	Chrysene (mg/kg)		<0.010			
	Dibenz(a,h)anthracene (mg/kg)		<0.0090 DLHM			
	Fluoranthene (mg/kg)		<0.010			
	Fluorene (mg/kg)		<0.010			
	Indeno(1,2,3-c,d)pyrene (mg/kg)		<0.010			
	1-Methylnaphthalene (mg/kg)		<0.050			
	2-Methylnaphthalene (mg/kg)		<0.010			
	Naphthalene (mg/kg)		<0.020 DLHM			
	Phenanthrene (mg/kg)		<0.010			
	Pyrene (mg/kg)		<0.010			
	Quinoline (mg/kg)		<0.050			
	Surrogate: Chrysene d12 (%)		110.1			
	Surrogate: Naphthalene d8 (%)		118.9			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2333924-16	L2333924-17	L2333924-18	L2333924-19	L2333924-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	09-AUG-19	09-AUG-19	09-AUG-19	11-AUG-19	11-AUG-19
	Sampled Time	10:25	11:20	11:25	09:40	10:50
	Client ID	TPN-4	TPN-5	TPN-COMP	WAL-1	WAL-2
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0	<2.0		2.1	2.0
	Titanium (Ti) (mg/kg)	585	1260		678	696
	Tungsten (W) (mg/kg)	<0.50	0.53		1.73	1.57
	Uranium (U) (mg/kg)	10.3	15.9		17.4	19.7
	Vanadium (V) (mg/kg)	26.3	48.0		34.1	36.9
	Zinc (Zn) (mg/kg)	67.3	101		125	136
	Zirconium (Zr) (mg/kg)	2.3	19.8		4.5	4.7
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)			<500		
Hydrocarbons	EPH10-19 (mg/kg)			<200		
	EPH19-32 (mg/kg)			<200		
	LEPH (mg/kg)			<200		
	HEPH (mg/kg)			<200		
	Surrogate: 2-Bromobenzotrifluoride (%)			99.0		
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)			<0.0050		
	Acenaphthylene (mg/kg)			<0.0050		
	Anthracene (mg/kg)			<0.0040		
	Benz(a)anthracene (mg/kg)			<0.010		
	Benzo(a)pyrene (mg/kg)			<0.010		
	Benzo(b&j)fluoranthene (mg/kg)			<0.010		
	Benzo(b+j+k)fluoranthene (mg/kg)			<0.015		
	Benzo(g,h,i)perylene (mg/kg)			<0.010		
	Benzo(k)fluoranthene (mg/kg)			<0.010		
	Chrysene (mg/kg)			<0.010		
	Dibenz(a,h)anthracene (mg/kg)			<0.0050		
	Fluoranthene (mg/kg)			<0.010		
	Fluorene (mg/kg)			<0.010		
	Indeno(1,2,3-c,d)pyrene (mg/kg)			<0.010		
	1-Methylnaphthalene (mg/kg)			<0.050		
	2-Methylnaphthalene (mg/kg)			<0.010		
	Naphthalene (mg/kg)			<0.010		
	Phenanthrene (mg/kg)			<0.010		
	Pyrene (mg/kg)			<0.010		
	Quinoline (mg/kg)			<0.050		
	Surrogate: Chrysene d12 (%)			92.9		
	Surrogate: Naphthalene d8 (%)			102.1		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2333924-21	L2333924-22	L2333924-23	L2333924-24	L2333924-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-19	11-AUG-19	11-AUG-19	11-AUG-19	14-AUG-19
	Sampled Time	11:05	11:35	12:00	12:05	12:30
	Client ID	WAL-3	WAL-4	WAL-5	WAL-COMP	PDL-1
SOIL						
Metals	Tin (Sn) (mg/kg)	2.7	2.4	2.4		<2.0
	Titanium (Ti) (mg/kg)	718	692	994		638
	Tungsten (W) (mg/kg)	1.50	1.51	1.79		<0.50
	Uranium (U) (mg/kg)	21.6	18.8	23.5		7.15
	Vanadium (V) (mg/kg)	39.1	33.5	41.5		35.3
	Zinc (Zn) (mg/kg)	148	130	155		85.7
	Zirconium (Zr) (mg/kg)	4.2	4.4	6.4		2.1
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					0.000129
Aggregate Organics	Mineral Oil and Grease (mg/kg)				<2000 DLHM	
Hydrocarbons	EPH10-19 (mg/kg)				<980 DLHM	
	EPH19-32 (mg/kg)				<980 DLHM	
	LEPH (mg/kg)				<980	
	HEPH (mg/kg)				<980	
	Surrogate: 2-Bromobenzotrifluoride (%)				97.1	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)				<0.015 DLHM	
	Acenaphthylene (mg/kg)				<0.015 DLHM	
	Anthracene (mg/kg)				<0.015 DLCI	
	Benz(a)anthracene (mg/kg)				<0.020 DLHM	
	Benzo(a)pyrene (mg/kg)				<0.015 DLHM	
	Benzo(b&j)fluoranthene (mg/kg)				<0.015 DLHM	
	Benzo(b+j+k)fluoranthene (mg/kg)				<0.021	
	Benzo(g,h,i)perylene (mg/kg)				<0.015 DLHM	
	Benzo(k)fluoranthene (mg/kg)				<0.015 DLHM	
	Chrysene (mg/kg)				<0.040 DLCI	
	Dibenz(a,h)anthracene (mg/kg)				<0.015 DLHM	
	Fluoranthene (mg/kg)				<0.015 DLHM	
	Fluorene (mg/kg)				<0.015 DLHM	
	Indeno(1,2,3-c,d)pyrene (mg/kg)				<0.020 DLQ	
	1-Methylnaphthalene (mg/kg)				<0.050	
	2-Methylnaphthalene (mg/kg)				<0.015 DLHM	
	Naphthalene (mg/kg)				<0.030 DLQ	
	Phenanthrene (mg/kg)				<0.015 DLHM	
	Pyrene (mg/kg)				<0.015 DLHM	
	Quinoline (mg/kg)				<0.050	
	Surrogate: Chrysene d12 (%)				108.1	
	Surrogate: Naphthalene d8 (%)				109.9	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2333924-26	L2333924-27	L2333924-28	L2333924-29	L2333924-30
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19
	Sampled Time	12:47	13:15	13:03	14:15	14:20
	Client ID	PDL-2	PDL-3	PDL-4	PDL-5	PDL-COMP
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	
	Titanium (Ti) (mg/kg)	558	569	640	620	
	Tungsten (W) (mg/kg)	<0.50	0.63	0.56	0.55	
	Uranium (U) (mg/kg)	7.32	4.96	12.1	7.65	
	Vanadium (V) (mg/kg)	32.8	31.1	41.7	35.7	
	Zinc (Zn) (mg/kg)	82.3	67.6	96.4	81.0	
	Zirconium (Zr) (mg/kg)	2.0	2.3	1.8	1.9	
Speciated Metals	Methylmercury (as MeHg) (mg/kg)	0.000167	0.000113	<0.000050	0.000068	
Aggregate Organics	Mineral Oil and Grease (mg/kg)					<1100 DLHM
Hydrocarbons	EPH10-19 (mg/kg)					<480 DLHM
	EPH19-32 (mg/kg)					<480 DLHM
	LEPH (mg/kg)					<480
	HEPH (mg/kg)					<480
	Surrogate: 2-Bromobenzotrifluoride (%)					98.2
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					<0.0070 DLHM
	Acenaphthylene (mg/kg)					<0.0070 DLHM
	Anthracene (mg/kg)					<0.0070 DLHM
	Benz(a)anthracene (mg/kg)					<0.010
	Benzo(a)pyrene (mg/kg)					<0.010
	Benzo(b&j)fluoranthene (mg/kg)					<0.010
	Benzo(b+j+k)fluoranthene (mg/kg)					<0.015
	Benzo(g,h,i)perylene (mg/kg)					<0.010
	Benzo(k)fluoranthene (mg/kg)					<0.010
	Chrysene (mg/kg)					<0.010
	Dibenz(a,h)anthracene (mg/kg)					<0.0070 DLHM
	Fluoranthene (mg/kg)					<0.010
	Fluorene (mg/kg)					<0.010
	Indeno(1,2,3-c,d)pyrene (mg/kg)					<0.010
	1-Methylnaphthalene (mg/kg)					<0.050
	2-Methylnaphthalene (mg/kg)					<0.010
	Naphthalene (mg/kg)					<0.010
	Phenanthrene (mg/kg)					<0.010
	Pyrene (mg/kg)					<0.010
	Quinoline (mg/kg)					<0.050
	Surrogate: Chrysene d12 (%)					95.0
	Surrogate: Naphthalene d8 (%)					100.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-31	L2333924-32	L2333924-33	L2333924-34	L2333924-35
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19
	Sampled Time	14:20	14:20	14:20	14:20	14:20
	Client ID	DUP-1	DUP-2	DUP-3	DUP-4	DUP-5
Grouping	**Analyte**					
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	456	970	343	392	600
	Tungsten (W) (mg/kg)	<0.50	0.85	<0.50	<0.50	0.78
	Uranium (U) (mg/kg)	8.19	26.9	1.14	1.31	5.05
	Vanadium (V) (mg/kg)	21.8	47.5	19.7	20.9	30.9
	Zinc (Zn) (mg/kg)	49.4	143	20.4	32.1	69.0
	Zirconium (Zr) (mg/kg)	1.2	2.7	4.8	2.6	2.3
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)					
Hydrocarbons	EPH10-19 (mg/kg)					
	EPH19-32 (mg/kg)					
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b&j)fluoranthene (mg/kg)					
	Benzo(b+j+k)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	1-Methylnaphthalene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Quinoline (mg/kg)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-36	L2333924-37	L2333924-38	L2333924-39	L2333924-40
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	14-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19
	Sampled Time	14:20	11:22	11:39	11:50	12:02
	Client ID	DUP-6	BAP-1	BAP-2	BAP-3	BAP-4
Grouping	**Analyte**					
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	682	311	370	396	408
	Tungsten (W) (mg/kg)	1.37	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	16.3	1.17	1.21	1.38	1.71
	Vanadium (V) (mg/kg)	33.3	18.9	20.7	22.5	24.2
	Zinc (Zn) (mg/kg)	123	19.1	20.7	23.4	29.3
	Zirconium (Zr) (mg/kg)	4.0	4.5	5.1	5.5	5.7
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)					
Hydrocarbons	EPH10-19 (mg/kg)					
	EPH19-32 (mg/kg)					
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b&j)fluoranthene (mg/kg)					
	Benzo(b+j+k)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	1-Methylnaphthalene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Quinoline (mg/kg)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2333924-41	L2333924-42	L2333924-43	L2333924-44	L2333924-45
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19
	Sampled Time	12:28	12:35	14:00	14:20	14:50
	Client ID	BAP-5	BAP-COMP	BES-1	BES-2	BES-3
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0		<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	298		349	351	378
	Tungsten (W) (mg/kg)	<0.50		<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	1.03		1.35	1.23	1.28
	Vanadium (V) (mg/kg)	19.5		19.4	20.1	22.5
	Zinc (Zn) (mg/kg)	19.3		29.9	26.3	28.9
	Zirconium (Zr) (mg/kg)	3.6		2.6	2.1	2.1
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)		<500			
Hydrocarbons	EPH10-19 (mg/kg)		<200			
	EPH19-32 (mg/kg)		<200			
	LEPH (mg/kg)		<200			
	HEPH (mg/kg)		<200			
	Surrogate: 2-Bromobenzotrifluoride (%)		93.9			
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)		<0.0050			
	Acenaphthylene (mg/kg)		<0.0050			
	Anthracene (mg/kg)		<0.0040			
	Benz(a)anthracene (mg/kg)		<0.010			
	Benzo(a)pyrene (mg/kg)		<0.010			
	Benzo(b&j)fluoranthene (mg/kg)		<0.010			
	Benzo(b+j+k)fluoranthene (mg/kg)		<0.015			
	Benzo(g,h,i)perylene (mg/kg)		<0.010			
	Benzo(k)fluoranthene (mg/kg)		<0.010			
	Chrysene (mg/kg)		<0.010			
	Dibenz(a,h)anthracene (mg/kg)		<0.0050			
	Fluoranthene (mg/kg)		<0.010			
	Fluorene (mg/kg)		<0.010			
	Indeno(1,2,3-c,d)pyrene (mg/kg)		<0.010			
	1-Methylnaphthalene (mg/kg)		<0.050			
	2-Methylnaphthalene (mg/kg)		<0.010			
	Naphthalene (mg/kg)		<0.010			
	Phenanthrene (mg/kg)		<0.010			
	Pyrene (mg/kg)		<0.010			
	Quinoline (mg/kg)		<0.050			
	Surrogate: Chrysene d12 (%)		97.5			
	Surrogate: Naphthalene d8 (%)		98.2			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2333924-46	L2333924-47	L2333924-48	L2333924-49	L2333924-50
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	12-AUG-19	12-AUG-19	12-AUG-19	13-AUG-19	13-AUG-19
	Sampled Time	15:18	15:44	15:50	11:24	11:49
	Client ID	BES-4	BES-5	BES-COMP	BPJ-1	BPJ-2
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0	<2.0		<2.0	<2.0
	Titanium (Ti) (mg/kg)	367	386		513	478
	Tungsten (W) (mg/kg)	<0.50	<0.50		<0.50	<0.50
	Uranium (U) (mg/kg)	1.10	1.22		1.80	1.78
	Vanadium (V) (mg/kg)	20.6	22.0		26.2	26.5
	Zinc (Zn) (mg/kg)	25.8	27.0		41.4	39.9
	Zirconium (Zr) (mg/kg)	2.3	2.5		3.5	4.1
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)			<500		
Hydrocarbons	EPH10-19 (mg/kg)			<200		
	EPH19-32 (mg/kg)			<200		
	LEPH (mg/kg)			<200		
	HEPH (mg/kg)			<200		
	Surrogate: 2-Bromobenzotrifluoride (%)			94.3		
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)			<0.0050		
	Acenaphthylene (mg/kg)			<0.0050		
	Anthracene (mg/kg)			<0.0040		
	Benz(a)anthracene (mg/kg)			<0.010		
	Benzo(a)pyrene (mg/kg)			<0.010		
	Benzo(b&j)fluoranthene (mg/kg)			<0.010		
	Benzo(b+j+k)fluoranthene (mg/kg)			<0.015		
	Benzo(g,h,i)perylene (mg/kg)			<0.010		
	Benzo(k)fluoranthene (mg/kg)			<0.010		
	Chrysene (mg/kg)			<0.010		
	Dibenz(a,h)anthracene (mg/kg)			<0.0050		
	Fluoranthene (mg/kg)			<0.010		
	Fluorene (mg/kg)			<0.010		
	Indeno(1,2,3-c,d)pyrene (mg/kg)			<0.010		
	1-Methylnaphthalene (mg/kg)			<0.050		
	2-Methylnaphthalene (mg/kg)			<0.010		
	Naphthalene (mg/kg)			<0.010		
	Phenanthrene (mg/kg)			<0.010		
	Pyrene (mg/kg)			<0.010		
	Quinoline (mg/kg)			<0.050		
	Surrogate: Chrysene d12 (%)			95.5		
	Surrogate: Naphthalene d8 (%)			95.7		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-51	L2333924-52	L2333924-53	L2333924-54	L2333924-55
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	13-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19
	Sampled Time	12:10	12:39	13:05		
	Client ID	BPJ-3	BPJ-4	BPJ-5	BPJ-COMP	BBD-1
Grouping	**Analyte**					
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0		<2.0
	Titanium (Ti) (mg/kg)	561	417	349		477
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50		<0.50
	Uranium (U) (mg/kg)	2.07	1.81	1.03		1.92
	Vanadium (V) (mg/kg)	31.7	23.9	20.2		24.6
	Zinc (Zn) (mg/kg)	45.2	33.5	27.4		33.4
	Zirconium (Zr) (mg/kg)	7.2	4.4	3.0		5.6
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)				<500	
Hydrocarbons	EPH10-19 (mg/kg)				<200	
	EPH19-32 (mg/kg)				<200	
	LEPH (mg/kg)				<200	
	HEPH (mg/kg)				<200	
	Surrogate: 2-Bromobenzotrifluoride (%)				94.4	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)				<0.0050	
	Acenaphthylene (mg/kg)				<0.0050	
	Anthracene (mg/kg)				<0.0040	
	Benz(a)anthracene (mg/kg)				<0.010	
	Benzo(a)pyrene (mg/kg)				<0.010	
	Benzo(b&j)fluoranthene (mg/kg)				<0.010	
	Benzo(b+j+k)fluoranthene (mg/kg)				<0.015	
	Benzo(g,h,i)perylene (mg/kg)				<0.010	
	Benzo(k)fluoranthene (mg/kg)				<0.010	
	Chrysene (mg/kg)				<0.010	
	Dibenz(a,h)anthracene (mg/kg)				<0.0050	
	Fluoranthene (mg/kg)				<0.010	
	Fluorene (mg/kg)				<0.010	
	Indeno(1,2,3-c,d)pyrene (mg/kg)				<0.010	
	1-Methylnaphthalene (mg/kg)				<0.050	
	2-Methylnaphthalene (mg/kg)				<0.010	
	Naphthalene (mg/kg)				<0.010	
	Phenanthrene (mg/kg)				<0.010	
	Pyrene (mg/kg)				<0.010	
	Quinoline (mg/kg)				<0.050	
	Surrogate: Chrysene d12 (%)				95.0	
	Surrogate: Naphthalene d8 (%)				107.7	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-56 Sediment 13-AUG-19 BBD-2	L2333924-57 Sediment 13-AUG-19 BBD-3	L2333924-58 Sediment 13-AUG-19 BBD-4	L2333924-59 Sediment 13-AUG-19 BBD-5	L2333924-60 Sediment 13-AUG-19 BBD-COMP
Grouping	**Analyte**					
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	
	Titanium (Ti) (mg/kg)	377	311	149	278	
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	
	Uranium (U) (mg/kg)	1.18	0.963	0.486	0.988	
	Vanadium (V) (mg/kg)	18.4	16.6	9.75	17.1	
	Zinc (Zn) (mg/kg)	28.9	26.0	17.4	24.7	
	Zirconium (Zr) (mg/kg)	4.2	3.4	2.8	3.2	
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)					<500
Hydrocarbons	EPH10-19 (mg/kg)					<200
	EPH19-32 (mg/kg)					<200
	LEPH (mg/kg)					<200
	HEPH (mg/kg)					<200
	Surrogate: 2-Bromobenzotrifluoride (%)					92.1
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					<0.0050
	Acenaphthylene (mg/kg)					<0.0050
	Anthracene (mg/kg)					<0.0040
	Benz(a)anthracene (mg/kg)					<0.010
	Benzo(a)pyrene (mg/kg)					<0.010
	Benzo(b&j)fluoranthene (mg/kg)					<0.010
	Benzo(b+j+k)fluoranthene (mg/kg)					<0.015
	Benzo(g,h,i)perylene (mg/kg)					<0.010
	Benzo(k)fluoranthene (mg/kg)					<0.010
	Chrysene (mg/kg)					<0.010
	Dibenz(a,h)anthracene (mg/kg)					<0.0050
	Fluoranthene (mg/kg)					<0.010
	Fluorene (mg/kg)					<0.010
	Indeno(1,2,3-c,d)pyrene (mg/kg)					<0.010
	1-Methylnaphthalene (mg/kg)					<0.050
	2-Methylnaphthalene (mg/kg)					<0.010
	Naphthalene (mg/kg)					<0.010
	Phenanthrene (mg/kg)					<0.010
	Pyrene (mg/kg)					<0.010
	Quinoline (mg/kg)					<0.050
	Surrogate: Chrysene d12 (%)					96.2
	Surrogate: Naphthalene d8 (%)					107.4

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-61	L2333924-62	L2333924-63	L2333924-64	L2333924-65
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-19	10-AUG-19	10-AUG-19	10-AUG-19	10-AUG-19
	Sampled Time	14:10	14:25	15:15	15:41	15:55
	Client ID	TPE-SC-1	TPE-SC-2	TPE-SC-3	TPE-SC-4	TPE-SC-5
Grouping	**Analyte**					
SOIL						
Metals	Tin (Sn) (mg/kg)	2.4	3.2	4.3	2.3	2.2
	Titanium (Ti) (mg/kg)	900	807	662	839	852
	Tungsten (W) (mg/kg)	0.96	0.96	0.90	0.86	0.77
	Uranium (U) (mg/kg)	13.9	13.5	11.8	12.9	14.6
	Vanadium (V) (mg/kg)	44.7	43.0	41.9	42.9	42.2
	Zinc (Zn) (mg/kg)	130	101	93.8	104	113
	Zirconium (Zr) (mg/kg)	2.4	3.2	2.2	2.7	3.0
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)					
Hydrocarbons	EPH10-19 (mg/kg)					
	EPH19-32 (mg/kg)					
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b&j)fluoranthene (mg/kg)					
	Benzo(b+j+k)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	1-Methylnaphthalene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Quinoline (mg/kg)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-66	L2333924-67	L2333924-68	L2333924-69	L2333924-70
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-19	11-AUG-19	11-AUG-19	11-AUG-19	11-AUG-19
	Sampled Time	16:34	08:50	09:10	09:20	09:50
	Client ID	TPE-SC-6	TPE-SC-7	TPE-SC-8	TPE-SC-9	TPE-SC-10
Grouping	**Analyte**					
SOIL						
Metals	Tin (Sn) (mg/kg)	2.1	4.4	5.2	4.2	6.2
	Titanium (Ti) (mg/kg)	977	931	1010	754	874
	Tungsten (W) (mg/kg)	0.73	0.76	0.84	1.17	0.82
	Uranium (U) (mg/kg)	16.2	17.8	14.7	12.9	15.2
	Vanadium (V) (mg/kg)	45.7	43.9	50.0	53.4	45.8
	Zinc (Zn) (mg/kg)	117	112	112	101	108
	Zirconium (Zr) (mg/kg)	3.4	3.6	4.5	3.4	2.6
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)					
Hydrocarbons	EPH10-19 (mg/kg)					
	EPH19-32 (mg/kg)					
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b&j)fluoranthene (mg/kg)					
	Benzo(b+j+k)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	1-Methylnaphthalene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Quinoline (mg/kg)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-71 Sediment 11-AUG-19 09:50 CORE-DUP-1	L2333924-75 Sediment 12-AUG-19 COMP-DUP-2			
Grouping	**Analyte**					
SOIL						
Metals	Tin (Sn) (mg/kg)	3.4				
	Titanium (Ti) (mg/kg)	809				
	Tungsten (W) (mg/kg)	0.90				
	Uranium (U) (mg/kg)	13.2				
	Vanadium (V) (mg/kg)	42.6				
	Zinc (Zn) (mg/kg)	133				
	Zirconium (Zr) (mg/kg)	2.0				
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)		<1000 DLHM			
Hydrocarbons	EPH10-19 (mg/kg)		<420 DLHM			
	EPH19-32 (mg/kg)		<420 DLHM			
	LEPH (mg/kg)		<420			
	HEPH (mg/kg)		<420			
	Surrogate: 2-Bromobenzotrifluoride (%)		100.2			
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)		<0.0050			
	Acenaphthylene (mg/kg)		<0.0050			
	Anthracene (mg/kg)		<0.0040			
	Benz(a)anthracene (mg/kg)		<0.010			
	Benzo(a)pyrene (mg/kg)		<0.010			
	Benzo(b&j)fluoranthene (mg/kg)		<0.010			
	Benzo(b+j+k)fluoranthene (mg/kg)		<0.015			
	Benzo(g,h,i)perylene (mg/kg)		<0.010			
	Benzo(k)fluoranthene (mg/kg)		<0.010			
	Chrysene (mg/kg)		<0.010			
	Dibenz(a,h)anthracene (mg/kg)		<0.0050			
	Fluoranthene (mg/kg)		<0.010			
	Fluorene (mg/kg)		<0.010			
	Indeno(1,2,3-c,d)pyrene (mg/kg)		<0.010			
	1-Methylnaphthalene (mg/kg)		<0.050			
	2-Methylnaphthalene (mg/kg)		<0.010			
	Naphthalene (mg/kg)		<0.010			
	Phenanthrene (mg/kg)		<0.010			
	Pyrene (mg/kg)		<0.010			
	Quinoline (mg/kg)		<0.050			
	Surrogate: Chrysene d12 (%)		98.6			
	Surrogate: Naphthalene d8 (%)		112.6			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-1 Sediment 11-AUG-19 10:58 SP-1	L2333924-2 Sediment 11-AUG-19 11:15 SP-2	L2333924-3 Sediment 11-AUG-19 11:45 SP-3	L2333924-4 Sediment 11-AUG-19 12:08 SP-4	L2333924-5 Sediment 11-AUG-19 12:41 SP-5
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)					
	B(a)P Total Potency Equivalent (mg/kg)					
	IACR (CCME)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-6	L2333924-7	L2333924-8	L2333924-9	L2333924-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-19	10-AUG-19	10-AUG-19	10-AUG-19	10-AUG-19
	Sampled Time	12:45				16:53
	Client ID	SP-COMP	TPE-1	TPE-2	TPE-3	TPE-4
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)	101.7				
	B(a)P Total Potency Equivalent (mg/kg)	<0.020				
	IACR (CCME)	<0.15				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2333924-11	L2333924-12	L2333924-13	L2333924-14	L2333924-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-19	10-AUG-19	09-AUG-19	09-AUG-19	09-AUG-19
	Sampled Time	17:19	17:25	09:00	09:30	10:00
	Client ID	TPE-5	TPE-COMP	TPN-1	TPN-2	TPN-3
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)		118.9			
	B(a)P Total Potency Equivalent (mg/kg)		<0.020			
	IACR (CCME)		<0.15			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-16 Sediment 09-AUG-19 10:25 TPN-4	L2333924-17 Sediment 09-AUG-19 11:20 TPN-5	L2333924-18 Sediment 09-AUG-19 11:25 TPN-COMP	L2333924-19 Sediment 11-AUG-19 09:40 WAL-1	L2333924-20 Sediment 11-AUG-19 10:50 WAL-2
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)			100.7		
	B(a)P Total Potency Equivalent (mg/kg)			<0.020		
	IACR (CCME)			<0.15		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-21 Sediment 11-AUG-19 11:05 WAL-3	L2333924-22 Sediment 11-AUG-19 11:35 WAL-4	L2333924-23 Sediment 11-AUG-19 12:00 WAL-5	L2333924-24 Sediment 11-AUG-19 12:05 WAL-COMP	L2333924-25 Sediment 14-AUG-19 12:30 PDL-1
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)				116.6	
	B(a)P Total Potency Equivalent (mg/kg)				<0.020	
	IACR (CCME)				<0.19	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-26 Sediment 14-AUG-19 12:47 PDL-2	L2333924-27 Sediment 14-AUG-19 13:15 PDL-3	L2333924-28 Sediment 14-AUG-19 13:03 PDL-4	L2333924-29 Sediment 14-AUG-19 14:15 PDL-5	L2333924-30 Sediment 14-AUG-19 14:20 PDL-COMP
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)					100.6
	B(a)P Total Potency Equivalent (mg/kg)					<0.020
	IACR (CCME)					<0.15

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-31	L2333924-32	L2333924-33	L2333924-34	L2333924-35
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19	14-AUG-19
	Sampled Time	14:20	14:20	14:20	14:20	14:20
	Client ID	DUP-1	DUP-2	DUP-3	DUP-4	DUP-5
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)					
	B(a)P Total Potency Equivalent (mg/kg)					
	IACR (CCME)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-36	L2333924-37	L2333924-38	L2333924-39	L2333924-40
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	14-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19	12-AUG-19
	Sampled Time	14:20	11:22	11:39	11:50	12:02
	Client ID	DUP-6	BAP-1	BAP-2	BAP-3	BAP-4
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)					
	B(a)P Total Potency Equivalent (mg/kg)					
	IACR (CCME)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-41 Sediment 12-AUG-19 12:28 BAP-5	L2333924-42 Sediment 12-AUG-19 12:35 BAP-COMP	L2333924-43 Sediment 12-AUG-19 14:00 BES-1	L2333924-44 Sediment 12-AUG-19 14:20 BES-2	L2333924-45 Sediment 12-AUG-19 14:50 BES-3
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)		105.3			
	B(a)P Total Potency Equivalent (mg/kg)		<0.020			
	IACR (CCME)		<0.15			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID		L2333924-46	L2333924-47	L2333924-48	L2333924-49	L2333924-50
Description		Sediment	Sediment	Sediment	Sediment	Sediment
Sampled Date		12-AUG-19	12-AUG-19	12-AUG-19	13-AUG-19	13-AUG-19
Sampled Time		15:18	15:44	15:50	11:24	11:49
Client ID		BES-4	BES-5	BES-COMP	BPJ-1	BPJ-2
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)			101.0		
	B(a)P Total Potency Equivalent (mg/kg)			<0.020		
	IACR (CCME)			<0.15		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2333924-51 Sediment 13-AUG-19 12:10 BPJ-3	L2333924-52 Sediment 13-AUG-19 12:39 BPJ-4	L2333924-53 Sediment 13-AUG-19 13:05 BPJ-5	L2333924-54 Sediment 13-AUG-19 BPJ-COMP	L2333924-55 Sediment 13-AUG-19 BBD-1
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)				104.0	
	B(a)P Total Potency Equivalent (mg/kg)				<0.020	
	IACR (CCME)				<0.15	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-56	L2333924-57	L2333924-58	L2333924-59	L2333924-60
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	13-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19	13-AUG-19
	Sampled Time					
	Client ID	BBD-2	BBD-3	BBD-4	BBD-5	BBD-COMP
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)					104.0
	B(a)P Total Potency Equivalent (mg/kg)					<0.020
	IACR (CCME)					<0.15

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-61	L2333924-62	L2333924-63	L2333924-64	L2333924-65
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-19	10-AUG-19	10-AUG-19	10-AUG-19	10-AUG-19
	Sampled Time	14:10	14:25	15:15	15:41	15:55
	Client ID	TPE-SC-1	TPE-SC-2	TPE-SC-3	TPE-SC-4	TPE-SC-5
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)					
	B(a)P Total Potency Equivalent (mg/kg)					
	IACR (CCME)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-66	L2333924-67	L2333924-68	L2333924-69	L2333924-70
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-19	11-AUG-19	11-AUG-19	11-AUG-19	11-AUG-19
	Sampled Time	16:34	08:50	09:10	09:20	09:50
	Client ID	TPE-SC-6	TPE-SC-7	TPE-SC-8	TPE-SC-9	TPE-SC-10
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)					
	B(a)P Total Potency Equivalent (mg/kg)					
	IACR (CCME)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-71	L2333924-75			
	Description	Sediment	Sediment			
	Sampled Date	11-AUG-19	12-AUG-19			
	Sampled Time	09:50				
	Client ID	CORE-DUP-1	COMP-DUP-2			
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: Phenanthrene d10 (%)		108.7			
	B(a)P Total Potency Equivalent (mg/kg)		<0.020			
	IACR (CCME)		<0.15			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333924-72	L2333924-73	L2333924-74		
	Description	Other	Other	Other		
	Sampled Date	10-AUG-19	11-AUG-19	12-AUG-19		
	Sampled Time					
	Client ID	CORE-SWIPE-1	SWIPE-2	SWIPE-3		
Grouping	**Analyte**					
SWAB						
Metals	Aluminum (Al)-Total (ug)	<20	41	68		
	Antimony (Sb)-Total (ug)	<20	<20	<20		
	Arsenic (As)-Total (ug)	<20	<20	<20		
	Barium (Ba)-Total (ug)	<1.0	<1.0	1.7		
	Beryllium (Be)-Total (ug)	<0.50	<0.50	<0.50		
	Bismuth (Bi)-Total (ug)	<20	<20	<20		
	Cadmium (Cd)-Total (ug)	<1.0	<1.0	<1.0		
	Calcium (Ca)-Total (ug)	<200	<200	<200		
	Chromium (Cr)-Total (ug)	<2.0	6.3	44.0		
	Cobalt (Co)-Total (ug)	<1.0	<1.0	<1.0		
	Copper (Cu)-Total (ug)	1.3	<1.0	1.4		
	Iron (Fe)-Total (ug)	23.8	105	306		
	Lead (Pb)-Total (ug)	<4.0	<0.40	<4.0		
	Lithium (Li)-Total (ug)	<1.0	<1.0	<1.0		
	Magnesium (Mg)-Total (ug)	<100	<100	<100		
	Manganese (Mn)-Total (ug)	0.57	1.76	4.81		
	Mercury (Hg)-Total (ug)	<0.010	<0.010	<0.010		
	Molybdenum (Mo)-Total (ug)	<3.0	<3.0	<3.0		
	Nickel (Ni)-Total (ug)	<5.0	<5.0	15.3		
	Phosphorus (P)-Total (ug)	<30	<30	<30		
	Potassium (K)-Total (ug)	<200	<200	<200		
	Selenium (Se)-Total (ug)	<20	<20	<20		
	Silver (Ag)-Total (ug)	<1.0	<1.0	<1.0		
	Sodium (Na)-Total (ug)	<400	<400	<400		
	Strontium (Sr)-Total (ug)	<0.50	<0.50	<0.50		
	Thallium (Tl)-Total (ug)	<20	<20	<20		
	Tin (Sn)-Total (ug)	<3.0	<3.0	<3.0		
	Titanium (Ti)-Total (ug)	<1.0	1.3	1.7		
	Vanadium (V)-Total (ug)	<3.0	<3.0	<3.0		
	Zinc (Zn)-Total (ug)	137	36.1	98.8		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Iron (Fe)-Total	B	L2333924-72, -73, -74
Duplicate	Calcium (Ca)	DUP-H	L2333924-67, -68, -69
Duplicate	Bismuth (Bi)	DUP-H,J	L2333924-45, -46, -47, -49, -50, -61, -62, -63, -64, -65, -66
Certified Reference Material	Boron (B)	MES	L2333924-51, -52, -53
Certified Reference Material	Sodium (Na)	MES	L2333924-1, -10, -11, -13, -14, -15, -16, -17, -19, -2, -20, -21, -22, -3, -4, -5, -7, -8, -9
Certified Reference Material	Sodium (Na)	MES	L2333924-51, -52, -53
Laboratory Control Sample	Antimony (Sb)	MES	L2333924-45, -46, -47, -49, -50, -61, -62, -63, -64, -65, -66
Laboratory Control Sample	Magnesium (Mg)	MES	L2333924-23, -25, -26, -27, -28, -29, -31, -32, -33, -34, -35, -36, -37, -38, -39, -40, -41, -43, -44
Laboratory Control Sample	Antimony (Sb)-Total	MES	L2333924-72, -73, -74
Laboratory Control Sample	Vanadium (V)-Total	MES	L2333924-72, -73, -74

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
DLHM	Detection Limit Adjusted: Sample has High Moisture Content
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
DUP-H,J	Duplicate results outside ALS DQO, due to sample heterogeneity. Duplicate results and limits are expressed in terms of absolute difference.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217

A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.

ALS Test Code	Matrix	Test Description	Method Reference**
C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2

Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)

ALS Test Code	Matrix	Test Description	Method Reference**
C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2

The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.

ALS Test Code	Matrix	Test Description	Method Reference**
EPH-TUMB-FID-VA	Soil	EPH in Solids by Tumbler and GCFID	BC MOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Solids by GC/FID", v2.1, July 1999. Soil samples are extracted with a 1:1 mixture of hexane and acetone using a rotary extraction technique modified from EPA 3570 prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

ALS Test Code	Matrix	Test Description	Method Reference**
HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)

Soil samples are digested with hot nitric and hydrochloric acids, followed by CVAAS analysis. This method is fully compliant with the BC SALM strong acid leachable metals digestion method.

ALS Test Code	Matrix	Test Description	Method Reference**
HG-UG-CVAF-VA	Swab	Mercury in Swab by CVAFS	NIOSH 7303/EPA 245.7

This analysis is carried out using procedures adapted from Method 7303 in the NIOSH Manual of Analytcial Methods (NMAM). The procedure involves a hot block digestion of the swab material, using a combination of nitric acid and hydrochloric acid. Instrumental analysis of the swab extract is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

ALS Test Code	Matrix	Test Description	Method Reference**
IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO3 Equivalent	Calculation
LEPH/HEPH-CALC-VA	Soil	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHs and HEPHs are measures of Light and Heavy Extractable Petroleum Hydrocarbons in soil. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

Reference Information

LEPHs = EPH10-19 minus Naphthalene and Phenanthrene.

HEPHs = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, and Pyrene.

MEHG-GCAF-VA | Soil | Methylmercury in Soil by GCAFS | DeWild et al. (2004)

This method follows procedures published by DeWild, Olund, Olsen and Tate (2004) for the US Geological Survey (Techniques and Methods 5A-7). Samples are leached with an acidic copper sulphate solution to solubilize methylmercury for inorganic complexes. The methylmercury is then extracted into dichloromethane and then an aliquot is back extracted into ultra-pure water. The extract is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg".

MET-200.2-CCMS-VA | Soil | Metals in Soil by CRC ICPMS | EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

MET-UG-CCMS-VA | Swab | Metals in Swab by CRC ICPMS | NIOSH 7303/EPA 6020B (mod)

This analysis is carried out using procedures adapted from Method 7303 in the NIOSH Manual of Analytcial Methods . The swab material is digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

MOISTURE-VA | Soil | Moisture content | CCME PHC in Soil - Tier 1 (mod)

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of two hours.

OGG-TUMB-SG-VA | Soil | Mineral Oil & Grease in Soil | CCME PETROLEUM HYDROCARBONS-GRAVIMETRIC

This analysis is carried out in accordance with the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." A subsample of the sediment/soil is extracted with 1:1 hexane:acetone using a rotary extraction apparatus. The extract undergoes a silica-gel clean-up to remove polar compounds, and is analyzed gravimetrically. Mineral Oil and Grease is equivalent to fraction F4G of the Canada-wide Standard for Petroleum Hydrocarbons.

Accuracy target values for Reference Materials used in this method are derived from averages of long-term method performance, as certified values do not exist for the reported parameters.

PAH-TMB-H/A-MS-VA | Soil | PAH - Rotary Extraction (Hexane/Acetone) | EPA 3570/8270

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3570 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses a mechanical shaking technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation. Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

Benzo(a)pyrene Total Potency Equivalents [B(a)P TPE] represents the sum of estimated cancer potency relative to B(a)P for all potentially carcinogenic unsubstituted PAHs, and is calculated as per the CCME PAH Soil Quality Guidelines reference document (2010).

PH-1:2-VA | Soil | pH in Soil (1:2 Soil:Water Extraction) | BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in "pH, Electrometric in Soil and Sediment - Prescriptive Method", Rev. 2005, Section B Physical, Inorganic and Misc. Constituents, BC Environmental Laboratory Manual. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

PSA-PIPET+GRAVEL-SK | Soil | Particle size - Sieve and Pipette | SSIR-51 METHOD 3.2.1

Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

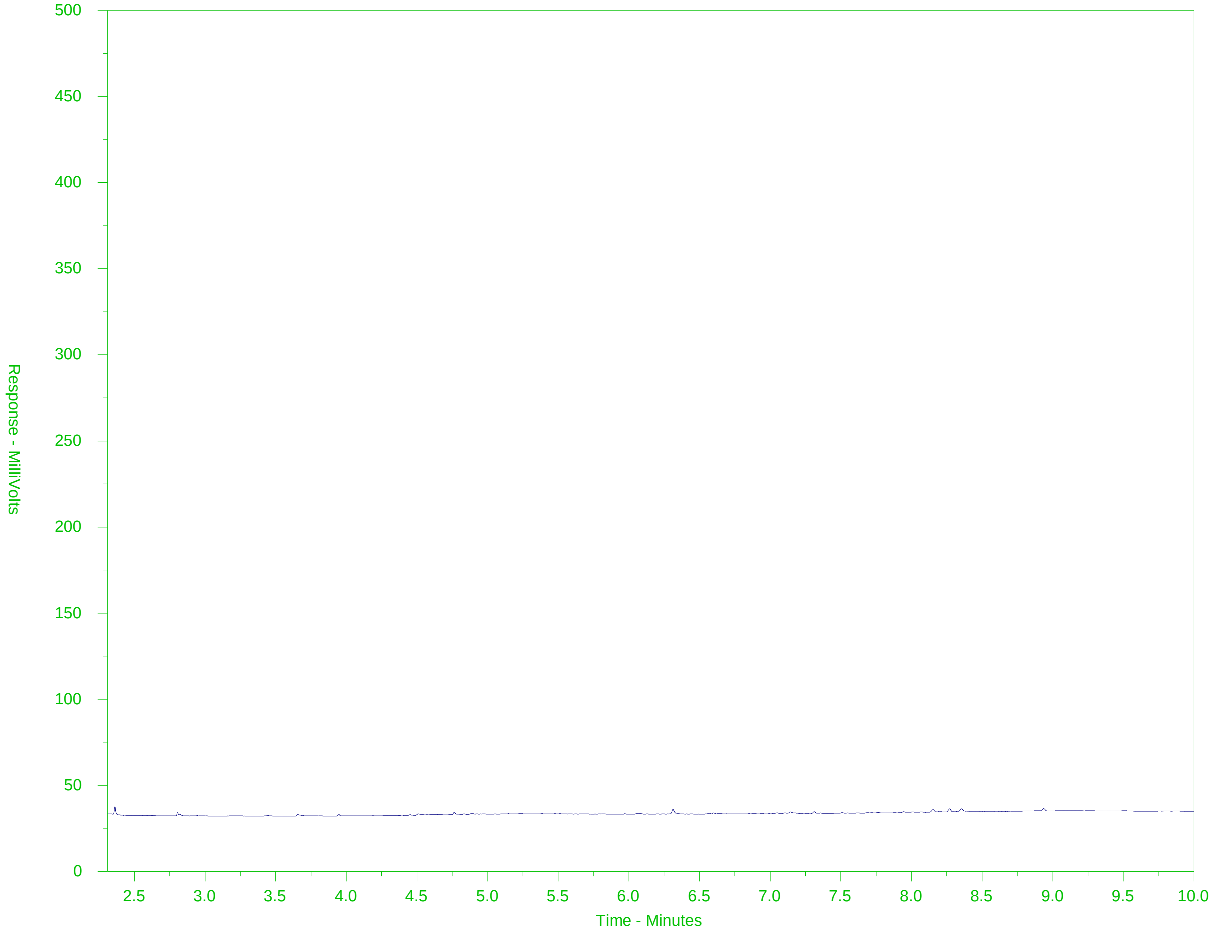
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2333924-6
Client Sample ID: SP-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

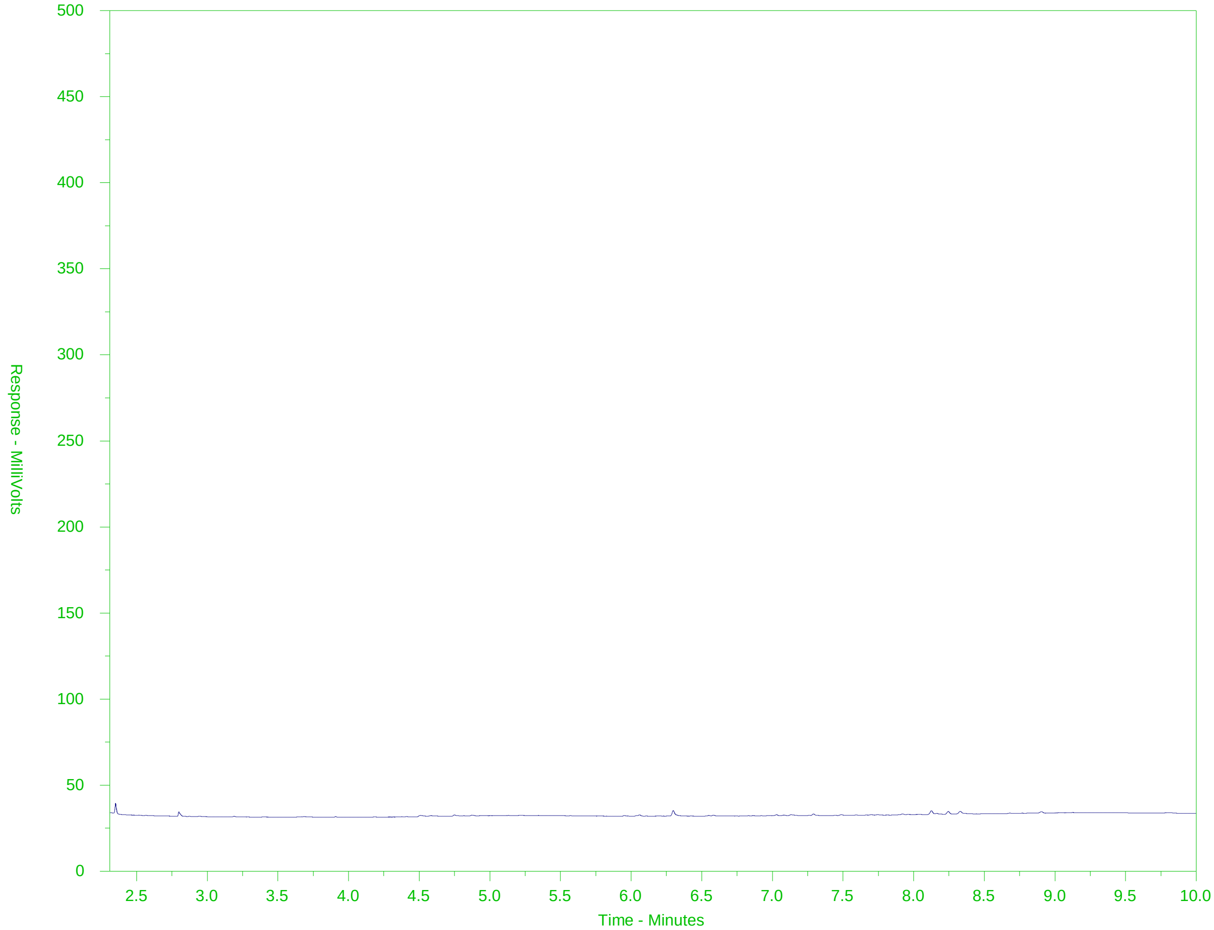
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WG3142821-3#L2333924-6
Client Sample ID: SP-COMP



←EPH10-19→	←EPH19-32→	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	←Motor Oils/ Lube Oils/ Grease→	
←Diesel/ Jet Fuels→		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

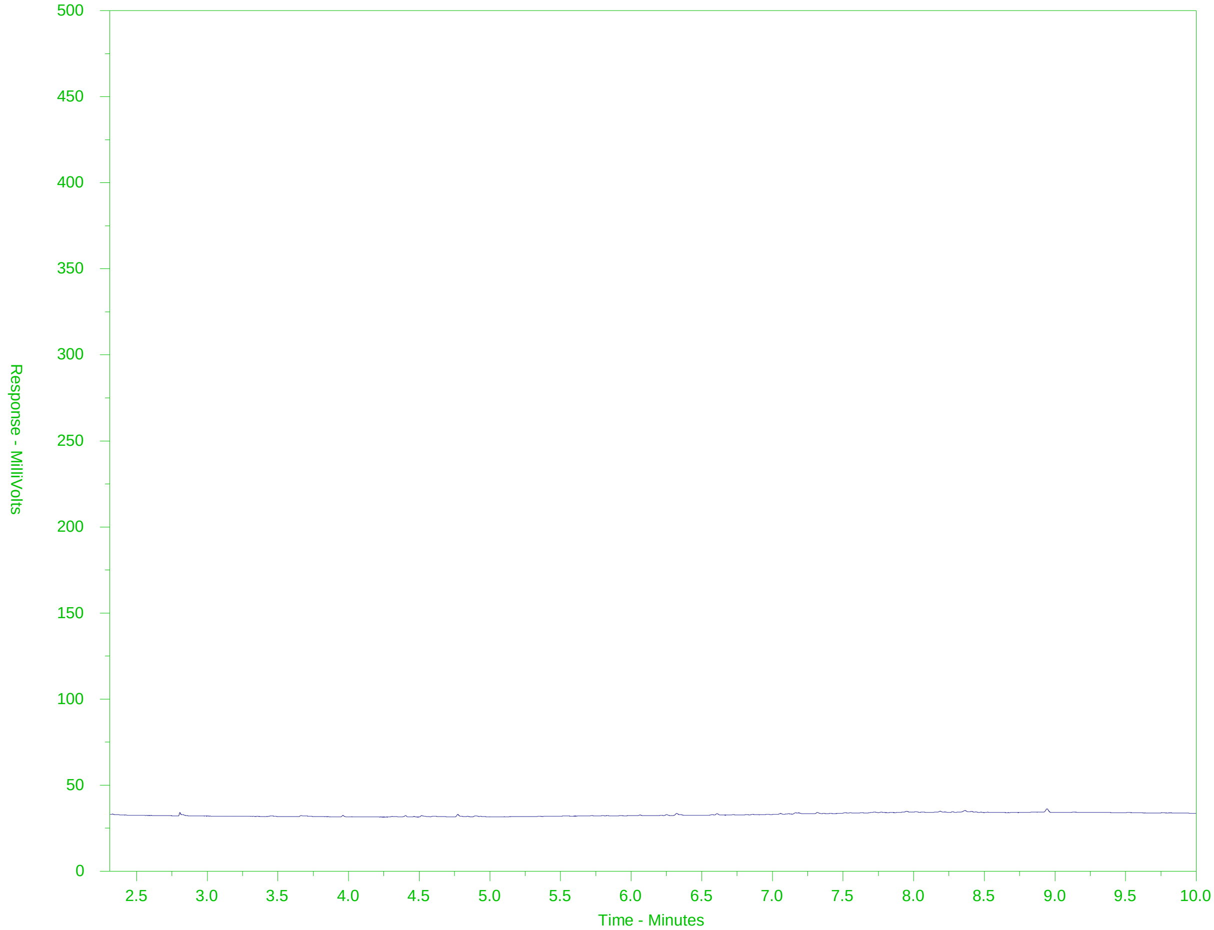
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2333924-12
Client Sample ID: TPE-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

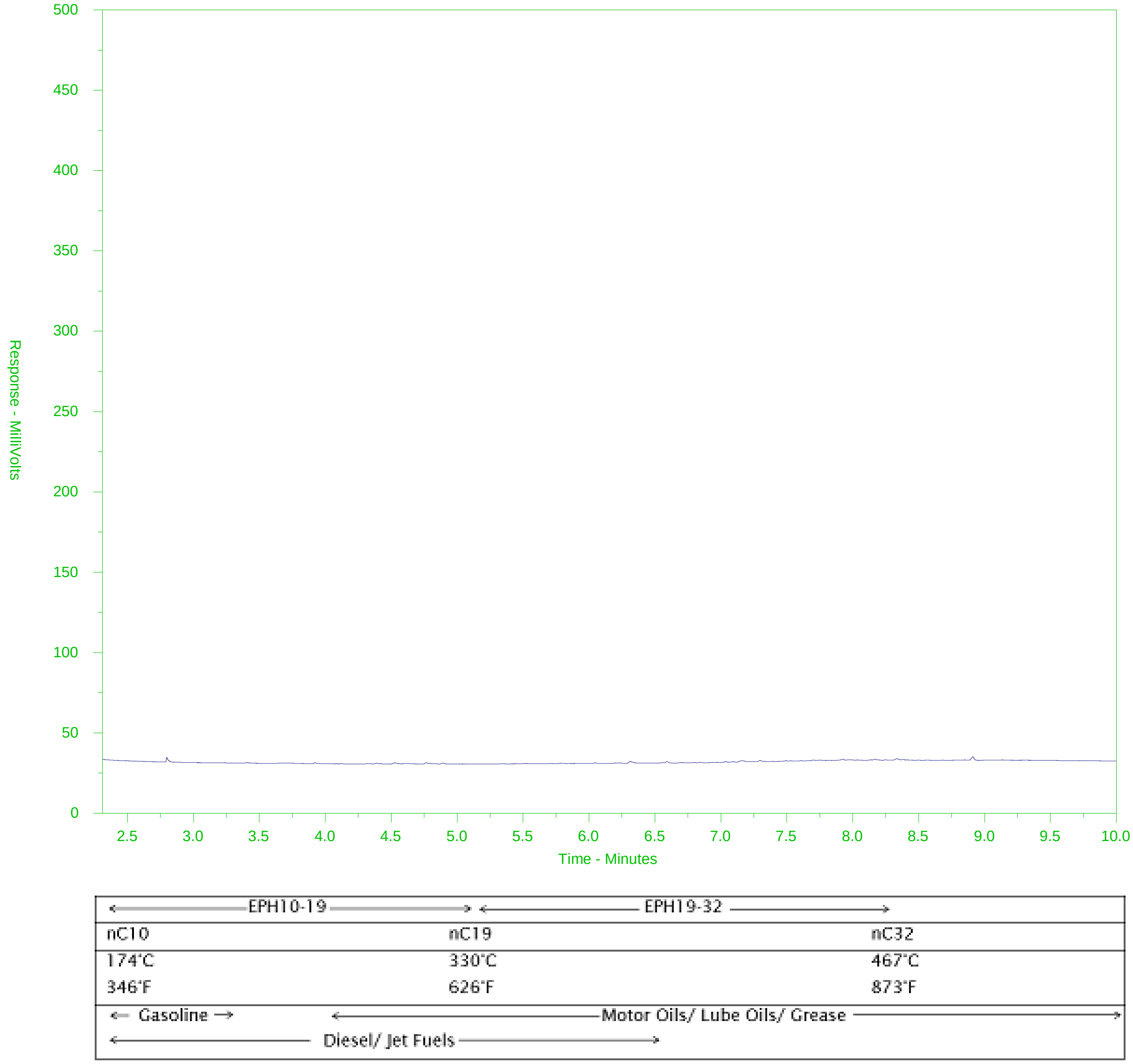
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WG3143539-3#L2333924-12
Client Sample ID: TPE-COMP



The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

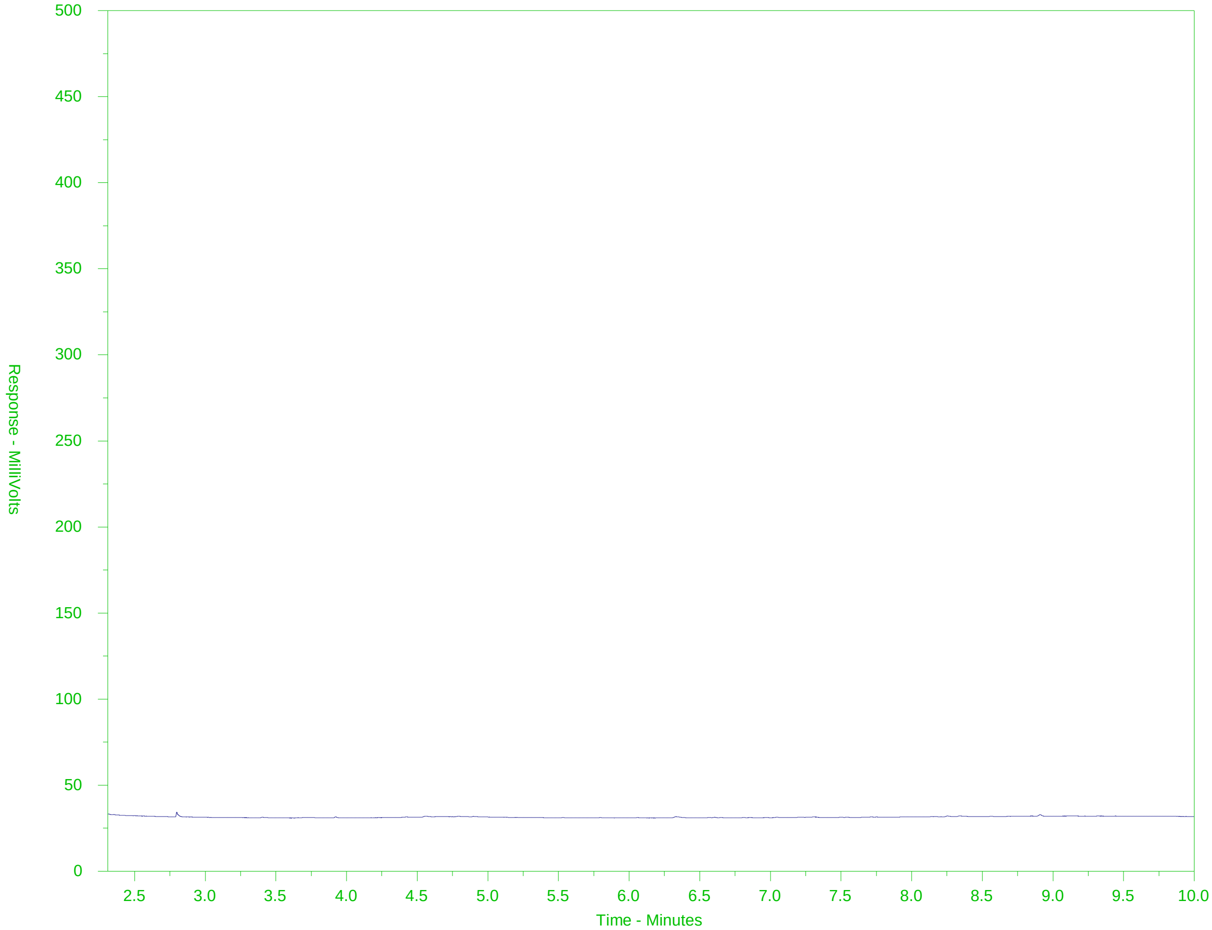
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2333924-18
Client Sample ID: TPN-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

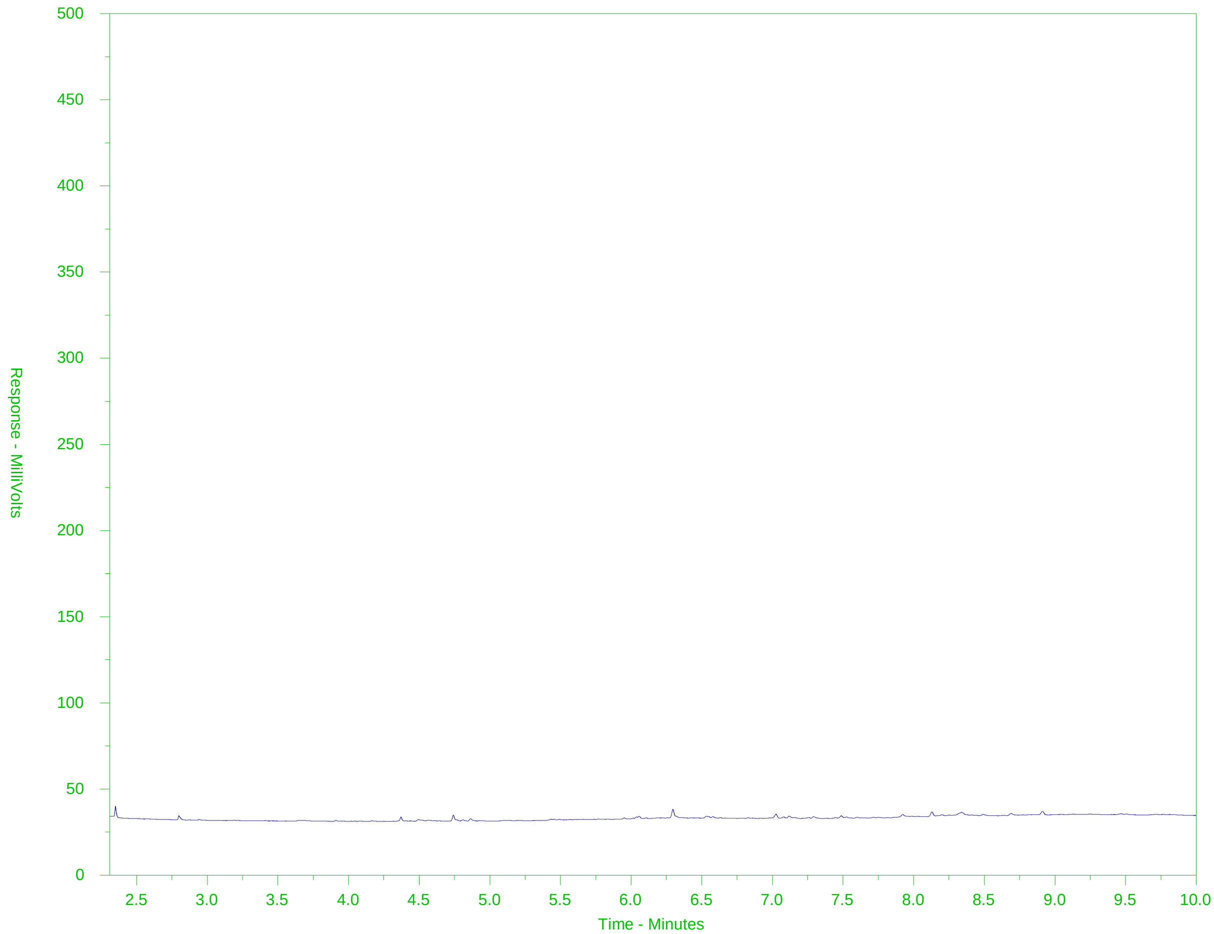
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2333924-24
Client Sample ID: WAL-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

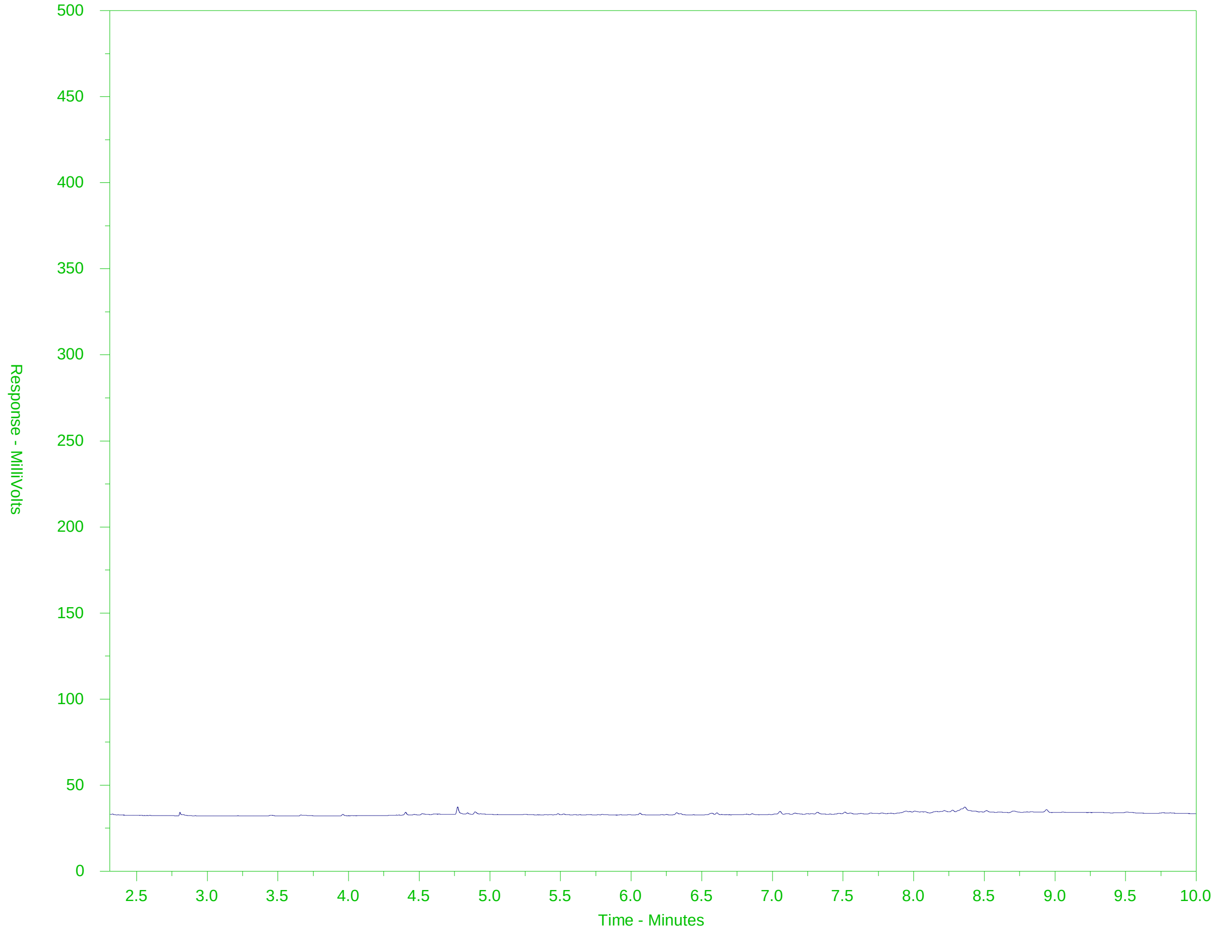
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2333924-30
Client Sample ID: PDL-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

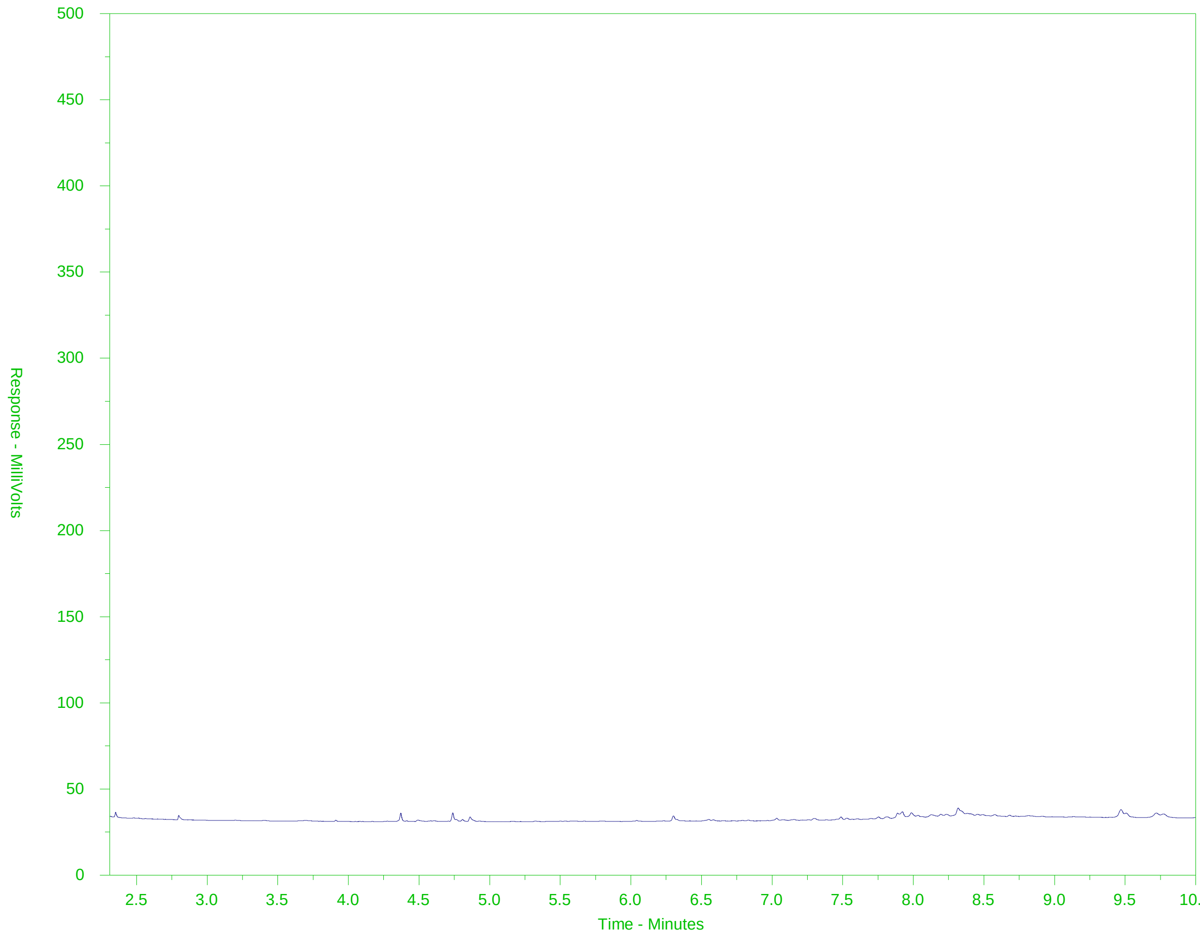
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2333924-42
Client Sample ID: BAP-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

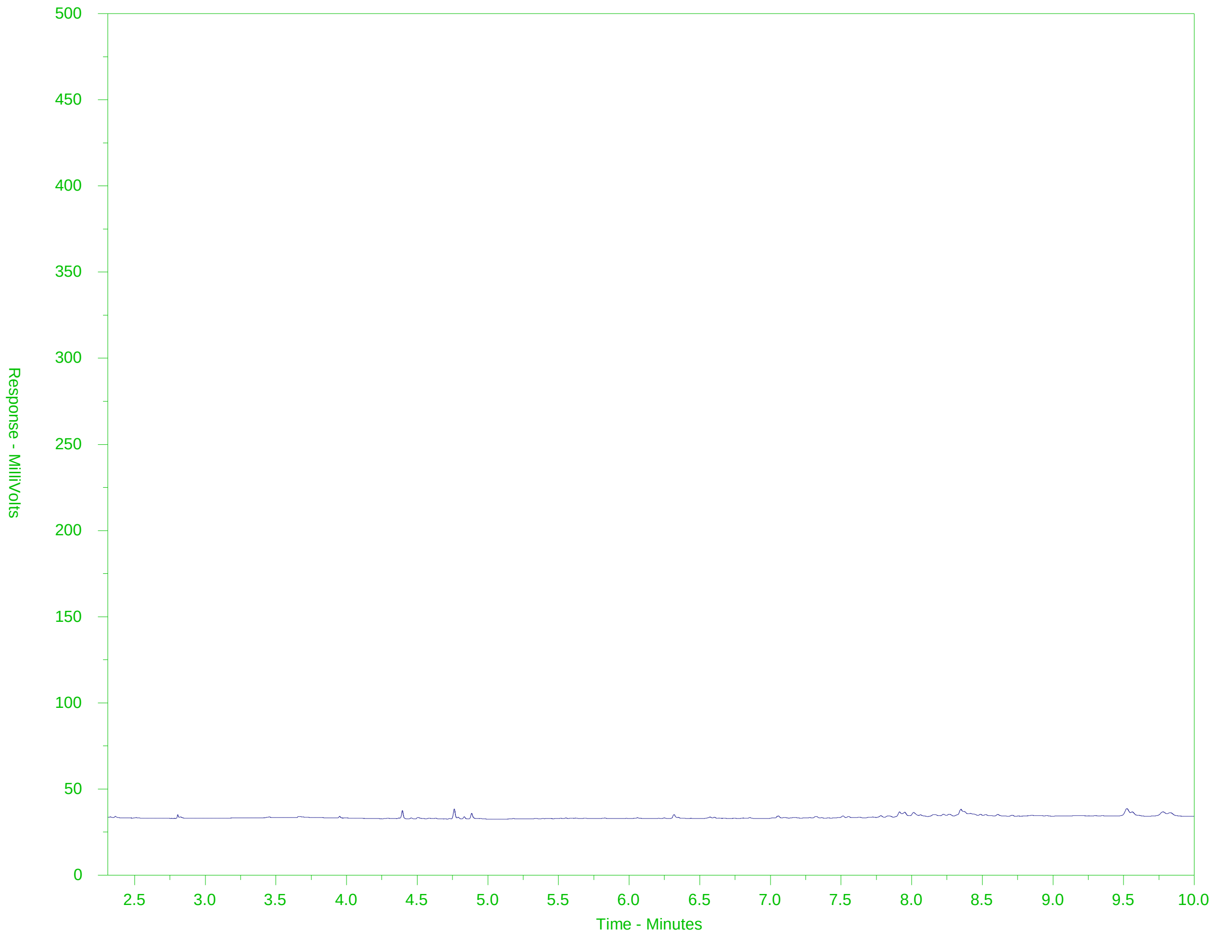
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WG3143846-3#L2333924-42
Client Sample ID: BAP-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

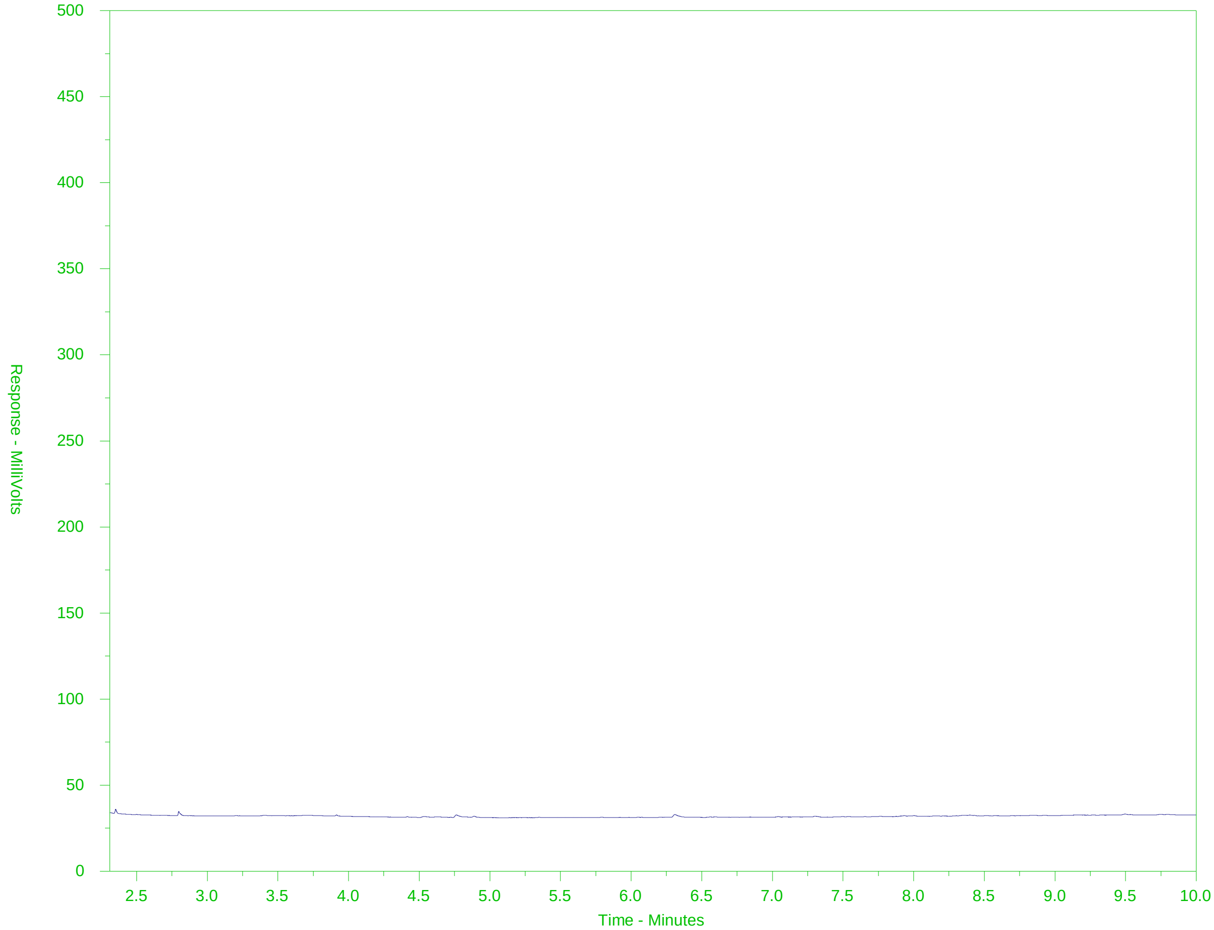
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2333924-48
Client Sample ID: BES-COMP



← EPH10-19 →	← EPH19-32	→
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease	→
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

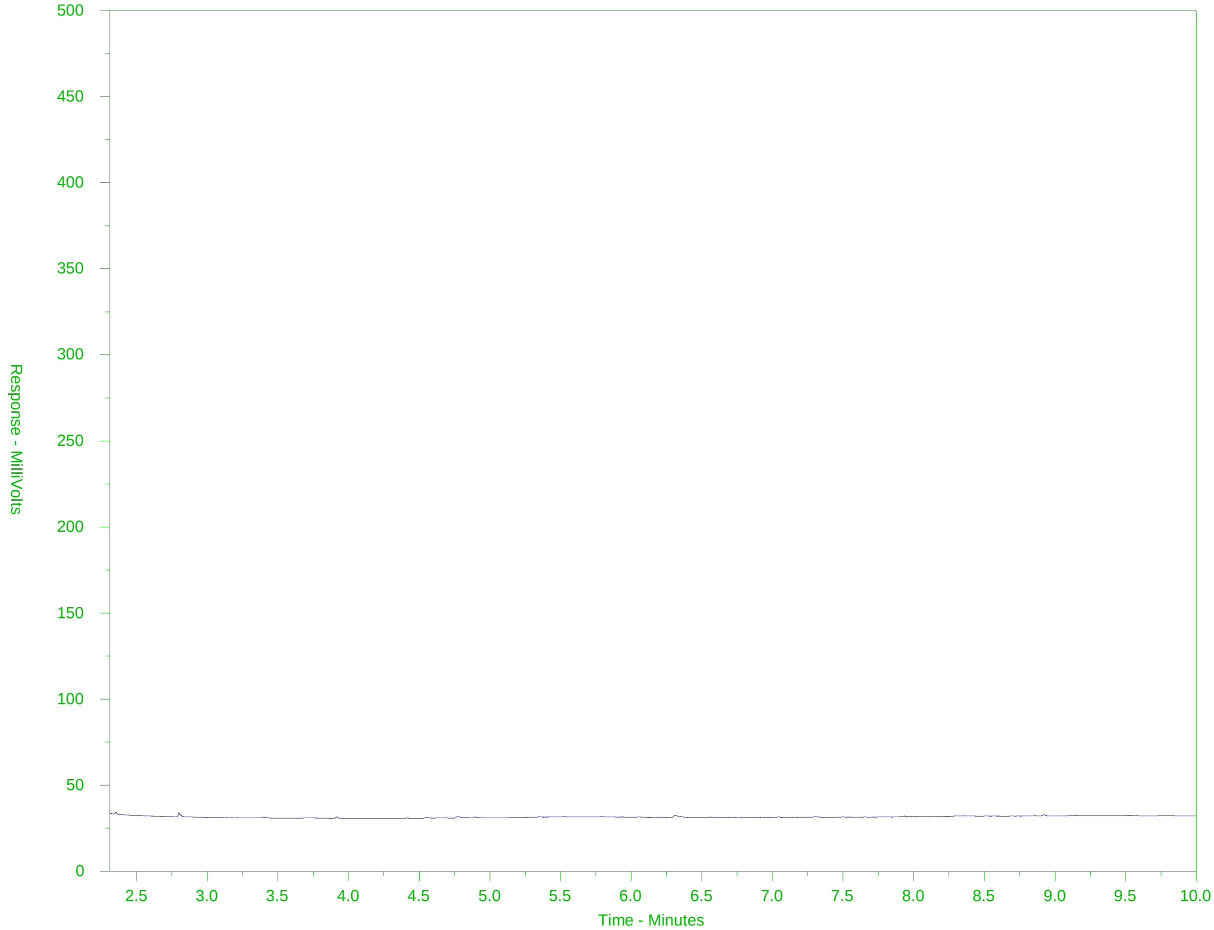
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2333924-54
Client Sample ID: BPJ-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

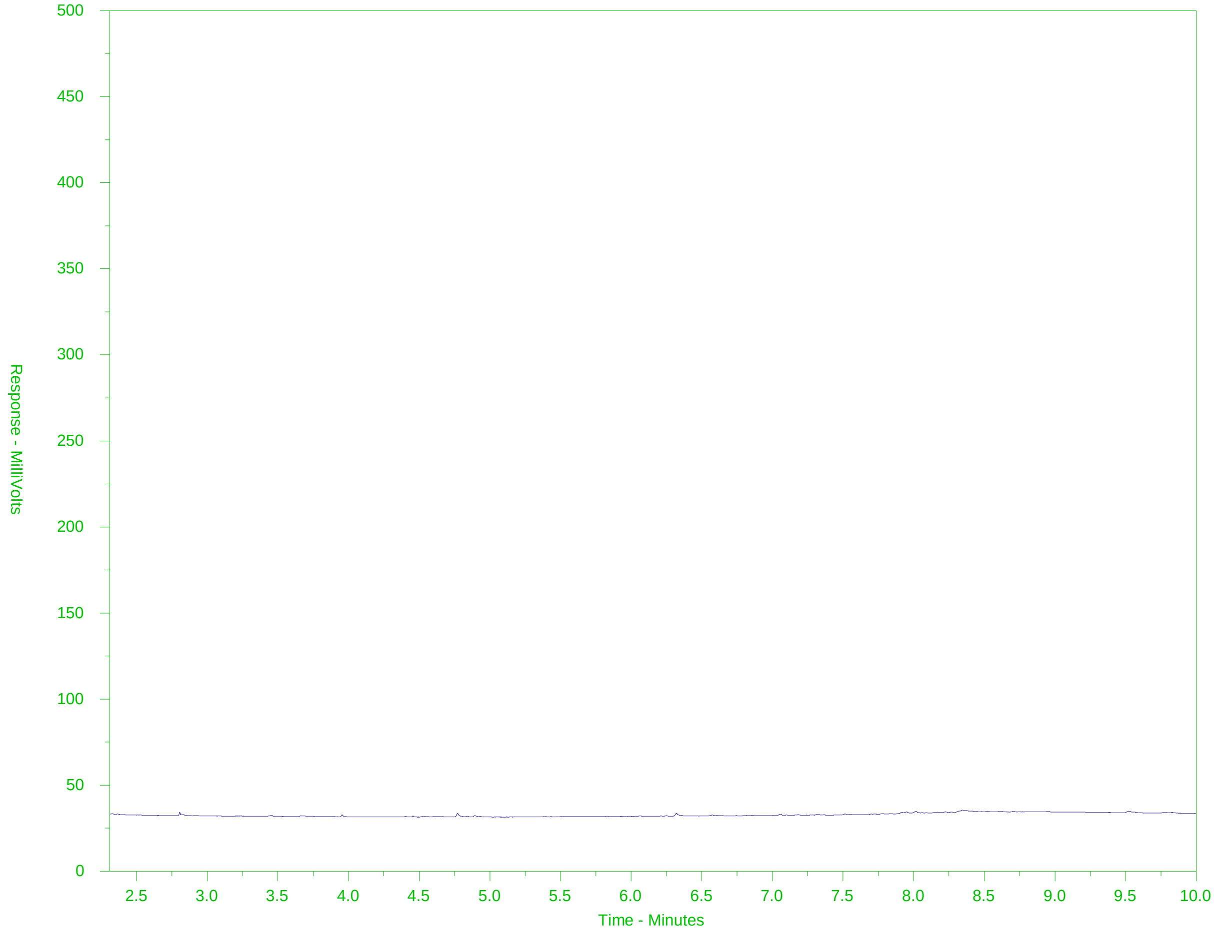
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2333924-60
Client Sample ID: BBD-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

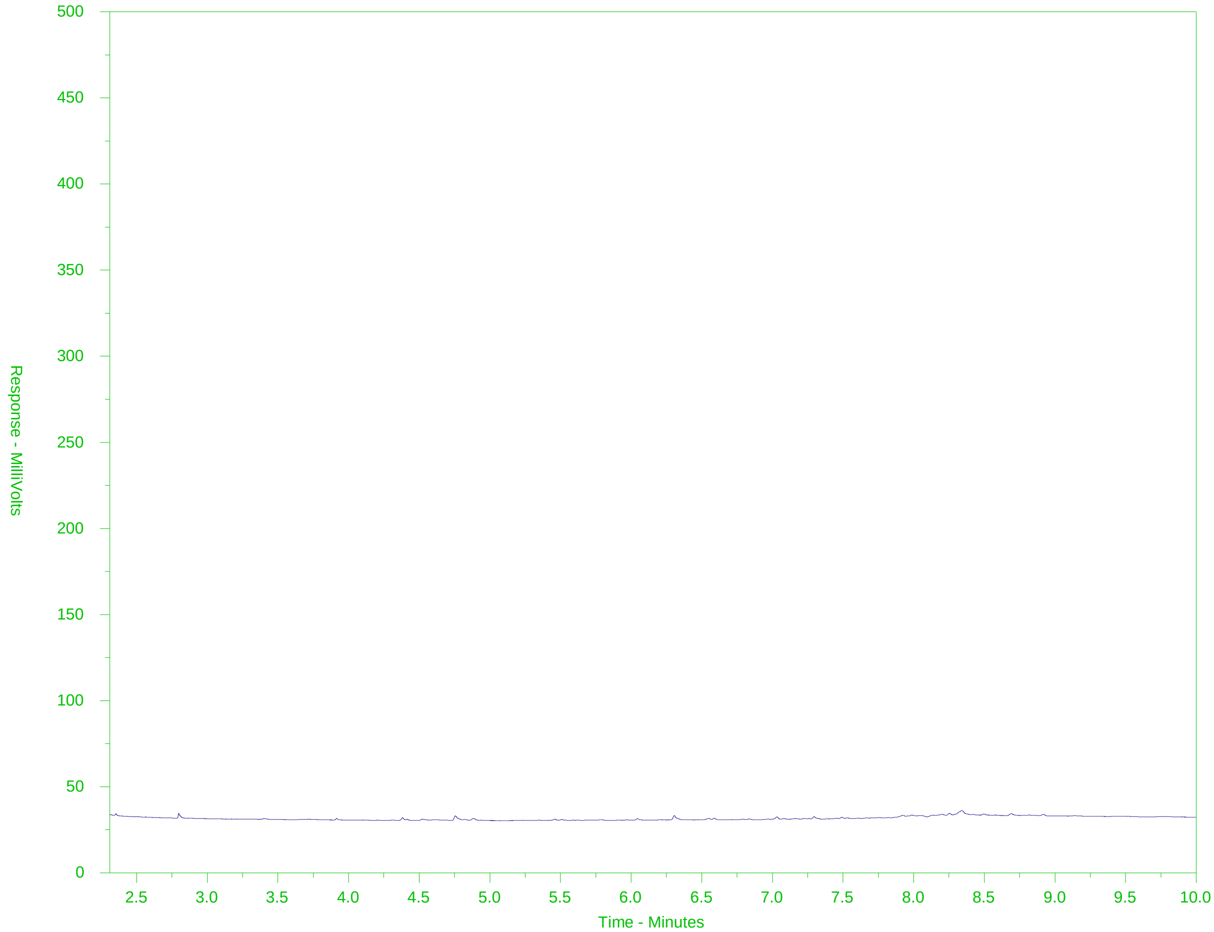
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2333924-75
Client Sample ID: COMP-DUP-2



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

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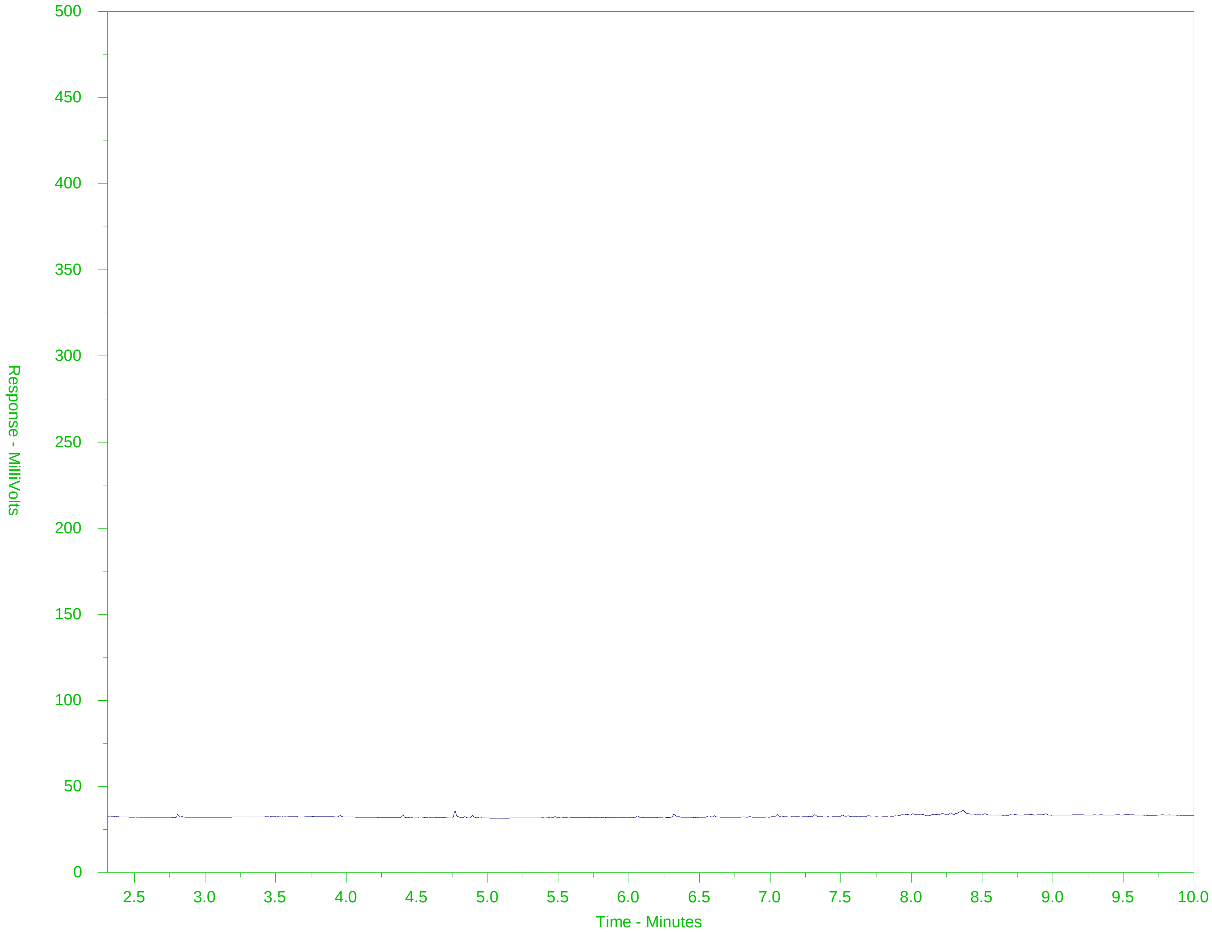
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WG3144907-3#L2333924-75
Client Sample ID: COMP-DUP-2



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

L2333924-COFC

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☐Standard ☐Other		◉Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑PDF ☑Excel ☐Digital ☐Fax		○Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca	○Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	CREMP Sediment	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q38011	
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: Azimuth	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG									Number of Containers
	SP-1	11-Aug-19	10:58	Sediment	X	X	X										3
	SP-2	11-Aug-19	11:15	Sediment	X	X	X										3
	SP-3	11-Aug-19	11:45	Sediment	X	X	X										3
	SP-4	11-Aug-19	12:08	Sediment	X	X	X										3
	SP-5	11-Aug-19	12:41	Sediment	X	X	X										3
	SP-COMP	11-Aug-19	12:45	Sediment				X									1
	TPE-1	10-Aug-19	-	Sediment	X	X	X										3
	TPE-2	10-Aug-19	-	Sediment	X	X	X										3
	TPE-3	10-Aug-19	-	Sediment	X	X	X										3
	TPE-4	10-Aug-19	16:53	Sediment	X	X	X										3
	TPE-5	10-Aug-19	17:19	Sediment	X	X	X										3
	TPE-COMP	10-Aug-19	17:25	Sediment				X									1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Eric Franz	14, Aug 2019	20:25	JC	Aug 22	08:35	20/20/20 °C				

L2333924-COFC

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☐Standard ☐Other		◉Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑PDF ☑Excel ☐Digital ☐Fax		○Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca	○Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	CREMP Sediment	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q38011	
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: Azimuth	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG									Number of Containers
	TPN-1	09-Aug-19	9:00	Sediment	X	X	X										3
	TPN-2	09-Aug-19	9:30	Sediment	X	X	X										3
	TPN-3	09-Aug-19	10:00	Sediment	X	X	X										3
	TPN-4	09-Aug-19	10:25	Sediment	X	X	X										3
	TPN-5	09-Aug-19	11:20	Sediment	X	X	X										3
	TPN-COMP	09-Aug-19	11:25	Sediment				X									1
	WAL-1	11-Aug-19	9:40	Sediment	X	X	X										3
	WAL-2	11-Aug-19	10:50	Sediment	X	X	X										3
	WAL-3	11-Aug-19	11:05	Sediment	X	X	X										3
	WAL-4	11-Aug-19	11:35	Sediment	X	X	X										3
	WAL-5	11-Aug-19	12:00	Sediment	X	X	X										3
	WAL-COMP	11-Aug-19	12:05	Sediment				X									1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JC	Date: Aug 22	Time: 08:35	Temperature: 20 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L2333924-COFC

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☐Standard ☐Other		◉Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑PDF ☑Excel ☐Digital ☐Fax		○Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca	○Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	CREMP Sediment	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q38011	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: Azimuth

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG									Number of Containers
	PDL-1	14-Aug-19	12:30	Sediment	X	X	X										3
	PDL-2	14-Aug-19	12:47	Sediment	X	X	X										3
	PDL-3	14-Aug-19	13:15	Sediment	X	X	X										3
	PDL-4	14-Aug-19	13:03	Sediment	X	X	X										3
	PDL-5	14-Aug-19	14:15	Sediment	X	X	X										3
	PDL-COMP	14-Aug-19	14:20	Sediment				X									1
	DUP-1	-	-	Sediment	X	X	X										3
	DUP-2	-	-	Sediment	X	X	X										3
	DUP-3	-	-	Sediment	X	X	X										3
	DUP-4	-	-	Sediment	X	X	X										3
	DUP-5	-	-	Sediment	X	X	X										3
	DUP-6	-	-	Sediment	X	X	X										3

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JC	Date: Aug 22	Time: 08:35	Temperature: 20 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L2333924-COFC

Chain of Custody / Analytical Request Form
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www.alsglobal.com

COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☐ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	CREMP Sediment	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q38011	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: Azimuth

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG									Number of Containers
	BAP-1	12-Aug-19	11:22	Sediment	X	X	X										3
	BAP-2	12-Aug-19	11:39	Sediment	X	X	X										3
	BAP-3	12-Aug-19	11:50	Sediment	X	X	X										3
	BAP-4	12-Aug-19	12:02	Sediment	X	X	X										3
	BAP-5	12-Aug-19	12:28	Sediment	X	X	X										3
	BAP-COMP	12-Aug-19	12:35	Sediment				X									1
	BES-1	12-Aug-19	14:00	Sediment	X	X	X										3
	BES-2	12-Aug-19	14:20	Sediment	X	X	X										3
	BES-3	12-Aug-19	14:50	Sediment	X	X	X										3
	BES-4	12-Aug-19	15:18	Sediment	X	X	X										3
	BES-5	12-Aug-19	15:44	Sediment	X	X	X										3
	BES-COMP	12-Aug-19	15:50	Sediment				X									1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Eric Franz			JC	Aug 22	08:35	20 °C				

L2333924-COFC

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # ______

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☐ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	CREMP Sediment	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q38011	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: Azimuth

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG	Number of Containers
	BPJ-1	13-Aug-19	11:24	Sediment	X	X	X		3
	BPJ-2	13-Aug-19	11:49	Sediment	X	X	X		3
	BPJ-3	13-Aug-19	12:10	Sediment	X	X	X		3
	BPJ-4	13-Aug-19	12:39	Sediment	X	X	X		3
	BPJ-5	13-Aug-19	13:05	Sediment	X	X	X		3
	BPJ-COMP	13-Aug-19	-	Sediment				X	1
	BBD-1	13-Aug-19	-	Sediment	X	X	X		3
	BBD-2	13-Aug-19	-	Sediment	X	X	X		3
	BBD-3	13-Aug-19	-	Sediment	X	X	X		3
	BBD-4	13-Aug-19	-	Sediment	X	X	X		3
	BBD-5	13-Aug-19	-	Sediment	X	X	X		3
	BBD-COMP	13-Aug-19	-	Sediment				X	1

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JC	Date: Aug 22	Time: 08:35	Temperature: 20 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L2333924-COFC

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # ____________

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐Standard ☐Other	
☑PDF ☑Excel ☐Digital ☐Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	mfinley@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	CREMP Sediment
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Azimuth

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG	Number of Containers
	TPE-SC-1	10-Aug-19	14:10	Sediment	X				1
	TPE-SC-2	10-Aug-19	14:25	Sediment	X				1
	TPE-SC-3	10-Aug-19	15:15	Sediment	X				1
	TPE-SC-4	10-Aug-19	15:41	Sediment	X				1
	TPE-SC-5	10-Aug-19	15:55	Sediment	X				1
	TPE-SC-6	10-Aug-19	16:34	Sediment	X				1
	TPE-SC-7	11-Aug-19	8:50	Sediment	X				1
	TPE-SC-8	11-Aug-19	9:10	Sediment	X				1
	TPE-SC-9	11-Aug-19	9:20	Sediment	X				1
	TPE-SC-10	11-Aug-19	9:50	Sediment	X				1
	CORE-DUP-1	-	-	Sediment	X				1
	CORE-SWIPE-1	10-Aug-19	-	Other	X				1

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Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JC	Date: Aug 22	Time: 08:35	Temperature: 20 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To			
Company:	Azimuth Consulting Group		
Contact:	Eric Franz		
Address:	218-2902 West Broadway		
	Vancouver, BC V6K2G8		
Phone:	604-730-1220	Fax:	
Invoice To	Same as Report ?	☑ Yes	☐ No
Hardcopy of Invoice with Report?		☐ Yes	☑ No
Company:			
Contact:			
Address:			
Phone:		Fax:	
Lab Work Order # (lab use only)			

Report Format / Distribution

☐Standard ☐Other

☑PDF ☑Excel ☐Digital ☐Fax

Email 1: efranz@azimuthgroup.ca
Email 2: mfinley@azimuthgroup.ca
Email 3: robin.allard@agnicoeagle.com

Client / Project Information

Job #: CREMP Sediment
PO / AFE:
LSD:

Quote #: Q38011

ALS Contact: Brent Mack | Sampler: Azimuth

Service Requested (Rush for routine analysis subject to availability)

◉ Regular (Standard Turnaround Times - Business Days)
○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG									Number of Containers
	SWIPE-2	11-Aug-19	-	Other	X												1
	SWIPE-3	12-Aug-19	-	Other	X												1
	COMP-DUP-2			Sediment				X									1

L2333924-COFC

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JC	Date: Aug 22	Time: 08:35	Temperature: 2.0 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 29-AUG-19
Report Date: 09-OCT-19 15:16 (MT)
Version: FINAL REV. 2

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2338125

Project P.O. #: NOT SUBMITTED
Job Reference: CREMP SEDIMENT
C of C Numbers:
Legal Site Desc:

Comments: 9-OCT-2019 This report replaces the previous version and contains previously missing Moisture data for certain samples.

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-1	L2338125-2	L2338125-3	L2338125-4	L2338125-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19
	Sampled Time	11:15	12:10	12:35	13:15	13:40
	Client ID	INUG-1	INUG-2	INUG-3	INUG-4	INUG-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	82.1	80.7	84.7	82.5	83.5
	pH (1:2 soil:water) (pH)	4.64	5.40	5.32	5.03	4.87
Particle Size	% Gravel (>2mm) (%)	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL
	% Sand (2.0mm - 0.063mm) (%)	6.9 PSAL	13.0 PSAL	4.9 PSAL	2.8 PSAL	2.4 PSAL
	% Silt (0.063mm - 4um) (%)	72.0 PSAL	68.6 PSAL	71.3 PSAL	73.2 PSAL	74.8 PSAL
	% Clay (<4um) (%)	21.2 PSAL	18.5 PSAL	23.7 PSAL	24.0 PSAL	22.7 PSAL
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	3.22	2.64	3.42	3.36	3.58
Metals	Aluminum (Al) (mg/kg)	22900	23500	27500	24900	22600
	Antimony (Sb) (mg/kg)	0.17	0.12	0.17	0.16	0.17
	Arsenic (As) (mg/kg)	82.8	6.68	10.6	79.9	126
	Barium (Ba) (mg/kg)	118	123	155	143	122
	Beryllium (Be) (mg/kg)	1.32	1.36	1.59	1.48	1.33
	Bismuth (Bi) (mg/kg)	1.11	1.04	1.26	1.17	1.13
	Boron (B) (mg/kg)	7.7	6.7	8.2	7.9	7.3
	Cadmium (Cd) (mg/kg)	0.115	0.114	0.276	0.228	0.200
	Calcium (Ca) (mg/kg)	1880	2040	2140	1880	1660
	Chromium (Cr) (mg/kg)	107	110	123	113	106
	Cobalt (Co) (mg/kg)	12.1	9.53	11.4	13.2	12.5
	Copper (Cu) (mg/kg)	43.9	41.9	53.0	48.8	46.1
	Iron (Fe) (mg/kg)	89200	26500	32800	89000	106000
	Lead (Pb) (mg/kg)	12.3	11.5	14.0	12.9	12.1
	Lithium (Li) (mg/kg)	25.4	29.2	30.7	27.5	25.0
	Magnesium (Mg) (mg/kg)	9400	10500	11400	10300	9700
	Manganese (Mn) (mg/kg)	861	371	461	881	855
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	6.54	1.87	2.97	6.76	8.39
	Nickel (Ni) (mg/kg)	66.3	74.7	90.5	80.7	73.5
	Phosphorus (P) (mg/kg)	2250	725	968	2640	2460
	Potassium (K) (mg/kg)	3750	3380	3940	3750	3180
	Selenium (Se) (mg/kg)	0.56	0.38	0.61	0.69	0.68
	Silver (Ag) (mg/kg)	0.12	0.12	0.19	0.17	0.17
	Sodium (Na) (mg/kg)	159	162	192	173	154
	Strontium (Sr) (mg/kg)	23.4	22.6	26.0	23.5	20.3
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	1100
	Thallium (Tl) (mg/kg)	0.188	0.164	0.213	0.209	0.183
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2338125-6 Sediment 15-AUG-19 INUG-COMP	L2338125-7 Sediment 18-AUG-19 16:40 WTS-1	L2338125-8 Sediment 18-AUG-19 WTS-2	L2338125-9 Sediment 18-AUG-19 WTS-3	L2338125-10 Sediment 18-AUG-19 WTS-4
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	82.4	82.1	83.0	87.2	87.6
	pH (1:2 soil:water) (pH)		4.99	4.95	5.65	4.90
Particle Size	% Gravel (>2mm) (%)		<1.0 PSAL	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL
	% Sand (2.0mm - 0.063mm) (%)		6.3 PSAL	5.6 PSAL	3.7 PSAL	2.0 PSAL
	% Silt (0.063mm - 4um) (%)		75.1 PSAL	78.9 PSAL	77.0 PSAL	81.5 PSAL
	% Clay (<4um) (%)		18.7 PSAL	15.5 PSAL	19.3 PSAL	16.5 PSAL
	Texture		Silt	Silt	Silt loam	Silt
Organic / Inorganic Carbon	Total Organic Carbon (%)		3.66	4.04	6.11	5.54
Metals	Aluminum (Al) (mg/kg)		15700	16400	18400	19100
	Antimony (Sb) (mg/kg)		0.17	0.19	0.18	0.23
	Arsenic (As) (mg/kg)		263	247	10.8	130
	Barium (Ba) (mg/kg)		80.5	102	111	126
	Beryllium (Be) (mg/kg)		1.34	1.41	1.25	1.54
	Bismuth (Bi) (mg/kg)		0.45	0.50	0.45	0.56
	Boron (B) (mg/kg)		<5.0	5.1	8.0	8.1
	Cadmium (Cd) (mg/kg)		0.153	0.187	0.271	0.360
	Calcium (Ca) (mg/kg)		1460	1820	2810	2270
	Chromium (Cr) (mg/kg)		60.9	65.1	71.4	75.8
	Cobalt (Co) (mg/kg)		20.5	20.1	7.78	13.7
	Copper (Cu) (mg/kg)		38.4	40.2	39.8	46.5
	Iron (Fe) (mg/kg)		124000	110000	22500	73600
	Lead (Pb) (mg/kg)		10.2	11.5	11.6	13.1
	Lithium (Li) (mg/kg)		11.6	12.5	16.1	14.4
	Magnesium (Mg) (mg/kg)		5330	5910	7080	7060
	Manganese (Mn) (mg/kg)		1130	1170	268	891
	Mercury (Hg) (mg/kg)		<0.050	0.051	0.056	0.063
	Molybdenum (Mo) (mg/kg)		7.18	5.54	1.97	3.42
	Nickel (Ni) (mg/kg)		55.5	64.3	58.9	82.7
	Phosphorus (P) (mg/kg)		1650	2220	739	1960
	Potassium (K) (mg/kg)		1650	1820	2290	2280
	Selenium (Se) (mg/kg)		0.78	0.83	0.47	0.85
	Silver (Ag) (mg/kg)		0.18	0.25	0.29	0.33
	Sodium (Na) (mg/kg)		97	122	156	177
	Strontium (Sr) (mg/kg)		16.0	19.9	26.6	24.2
	Sulfur (S) (mg/kg)		1100	1300	1800	1600
	Thallium (Tl) (mg/kg)		0.136	0.162	0.148	0.190
	Tin (Sn) (mg/kg)		<2.0	<2.0	<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2338125-11	L2338125-12	L2338125-13	L2338125-14	L2338125-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	18-AUG-19	18-AUG-19	18-AUG-19	18-AUG-19	18-AUG-19
	Sampled Time			15:45	16:05	16:35
	Client ID	WTS-5	WTS-COMP	NEM-1	NEM-2	NEM-3
SOIL						
Physical Tests	Moisture (%)	78.1	83.8	89.8	84.0	83.0
	pH (1:2 soil:water) (pH)	5.64		6.15	6.11	6.39
Particle Size	% Gravel (>2mm) (%)	<1.0 PSAL		<1.0 PSAL	<1.0 PSAL	<1.0 PSAL
	% Sand (2.0mm - 0.063mm) (%)	7.2 PSAL		20.8 PSAL	26.0 PSAL	26.8 PSAL
	% Silt (0.063mm - 4um) (%)	71.7 PSAL		70.4 PSAL	66.5 PSAL	66.5 PSAL
	% Clay (<4um) (%)	21.1 PSAL		8.9 PSAL	7.5 PSAL	6.7 PSAL
	Texture	Silt loam		Silt loam	Silt loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	2.70		8.84	6.64	8.19
Metals	Aluminum (Al) (mg/kg)	25200		10500	11100	10600
	Antimony (Sb) (mg/kg)	0.24		0.35	0.34	0.36
	Arsenic (As) (mg/kg)	80.2		36.3	19.4	25.9
	Barium (Ba) (mg/kg)	108		74.9	75.0	75.4
	Beryllium (Be) (mg/kg)	1.85		0.61	0.62	0.59
	Bismuth (Bi) (mg/kg)	0.70		0.21	0.21	0.22
	Boron (B) (mg/kg)	5.5		10.2	7.8	9.0
	Cadmium (Cd) (mg/kg)	0.199		0.261	0.273	0.289
	Calcium (Ca) (mg/kg)	1660		3220	2460	2870
	Chromium (Cr) (mg/kg)	84.1		104	104	103
	Cobalt (Co) (mg/kg)	24.8		6.89	6.70	6.98
	Copper (Cu) (mg/kg)	56.4		36.9	38.3	34.8
	Iron (Fe) (mg/kg)	69900		20900	18200	18600
	Lead (Pb) (mg/kg)	15.8		7.98	7.03	8.58
	Lithium (Li) (mg/kg)	19.7		10.4	11.2	10.9
	Magnesium (Mg) (mg/kg)	8120		6420	6610	6580
	Manganese (Mn) (mg/kg)	4610		217	255	219
	Mercury (Hg) (mg/kg)	<0.050		<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	5.55		2.34	2.20	2.13
	Nickel (Ni) (mg/kg)	71.5		75.3	75.1	74.6
	Phosphorus (P) (mg/kg)	1190		555	447	561
	Potassium (K) (mg/kg)	2820		1100	1100	1090
	Selenium (Se) (mg/kg)	0.24		0.52	0.49	0.49
	Silver (Ag) (mg/kg)	0.12		0.14	0.15	0.15
	Sodium (Na) (mg/kg)	108		83	77	85
	Strontium (Sr) (mg/kg)	20.3		21.6	21.3	22.1
	Sulfur (S) (mg/kg)	1100		2200	1700	2100
	Thallium (Tl) (mg/kg)	0.242		0.073	0.072	0.073
	Tin (Sn) (mg/kg)	<2.0		<2.0	<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte					
	Sample ID	L2338125-16	L2338125-17	L2338125-18	L2338125-19	L2338125-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	18-AUG-19	18-AUG-19	18-AUG-19	19-AUG-19	19-AUG-19
	Sampled Time	17:15	18:00		11:06	
	Client ID	NEM-4	NEM-5	NEM-COMP	MAM-1	MAM-2
SOIL						
Physical Tests	Moisture (%)	89.0	90.4	90.3	90.8	91.0
	pH (1:2 soil:water) (pH)	6.24	6.21		5.22	5.61
Particle Size	% Gravel (>2mm) (%)	<1.0 PSAL	<1.0 PSAL		<1.0 PSAL	<1.0 PSAL
	% Sand (2.0mm - 0.063mm) (%)	18.8 PSAL	13.0 PSAL		<1.0 PSAL	<1.0 PSAL
	% Silt (0.063mm - 4um) (%)	72.4 PSAL	78.0 PSAL		84.9 PSAL	83.0 PSAL
	% Clay (<4um) (%)	8.8 PSAL	8.9 PSAL		14.6 PSAL	16.3 PSAL
	Texture	Silt loam	Silt loam		Silt	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	7.66	9.74		9.87	9.74
Metals	Aluminum (Al) (mg/kg)	11200	11700		20800	21900
	Antimony (Sb) (mg/kg)	0.38	0.44		0.37	0.29
	Arsenic (As) (mg/kg)	31.2	38.2		117	97.3
	Barium (Ba) (mg/kg)	88.7	95.0		124	174
	Beryllium (Be) (mg/kg)	0.63	0.72		1.43	1.48
	Bismuth (Bi) (mg/kg)	0.23	0.25		0.49	0.51
	Boron (B) (mg/kg)	9.4	11.1		15.4	16.5
	Cadmium (Cd) (mg/kg)	0.276	0.271		0.422	0.412
	Calcium (Ca) (mg/kg)	2750	3050		2880	3110
	Chromium (Cr) (mg/kg)	108	113		169	182
	Cobalt (Co) (mg/kg)	6.99	7.80		13.6	12.2
	Copper (Cu) (mg/kg)	41.7	44.9		69.2	81.9
	Iron (Fe) (mg/kg)	20400	22000		42400	39700
	Lead (Pb) (mg/kg)	8.00	8.75		17.0	17.3
	Lithium (Li) (mg/kg)	10.6	10.8		17.4	18.1
	Magnesium (Mg) (mg/kg)	6500	6630		9480	9850
	Manganese (Mn) (mg/kg)	262	233		341	328
	Mercury (Hg) (mg/kg)	<0.050	<0.050		0.081	0.067
	Molybdenum (Mo) (mg/kg)	2.87	3.50		4.60	4.43
	Nickel (Ni) (mg/kg)	79.5	86.2		117	121
	Phosphorus (P) (mg/kg)	538	557		761	746
	Potassium (K) (mg/kg)	1150	1190		2920	2920
	Selenium (Se) (mg/kg)	0.51	0.58		0.72	0.74
	Silver (Ag) (mg/kg)	0.16	0.20		0.49	0.47
	Sodium (Na) (mg/kg)	84	94		164	167
	Strontium (Sr) (mg/kg)	20.9	22.1		26.9	25.5
	Sulfur (S) (mg/kg)	2000	2400		2600	2200
	Thallium (Tl) (mg/kg)	0.079	0.094		0.291	0.241
	Tin (Sn) (mg/kg)	<2.0	<2.0		<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2338125-21	L2338125-22	L2338125-23	L2338125-24	L2338125-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	19-AUG-19	19-AUG-19	19-AUG-19	19-AUG-19	16-AUG-19
	Sampled Time					
	Client ID	MAM-3	MAM-4	MAM-5	MAM-COMP	A20-1
SOIL						
Physical Tests	Moisture (%)	90.2	89.8	89.5	90.1	87.3
	pH (1:2 soil:water) (pH)	5.80	5.09	5.38		4.92
Particle Size	% Gravel (>2mm) (%)	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL		<1.0 PSAL
	% Sand (2.0mm - 0.063mm) (%)	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL		<1.0 PSAL
	% Silt (0.063mm - 4um) (%)	83.2 PSAL	82.5 PSAL	81.4 PSAL		67.8 PSAL
	% Clay (<4um) (%)	16.0 PSAL	16.7 PSAL	17.9 PSAL		31.6 PSAL
	Texture	Silt loam	Silt loam	Silt loam		Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	9.85	8.84	10.4		4.68
Metals	Aluminum (Al) (mg/kg)	20100	24300	17000		25300
	Antimony (Sb) (mg/kg)	0.30	0.38	0.26		0.19
	Arsenic (As) (mg/kg)	58.9	92.5	58.4		50.1
	Barium (Ba) (mg/kg)	158	149	109		173
	Beryllium (Be) (mg/kg)	1.31	1.59	1.15		2.28
	Bismuth (Bi) (mg/kg)	0.45	0.55	0.41		1.05
	Boron (B) (mg/kg)	16.4	14.9	15.3		7.9
	Cadmium (Cd) (mg/kg)	0.418	0.425	0.299		0.103
	Calcium (Ca) (mg/kg)	3580	2830	2830		2030
	Chromium (Cr) (mg/kg)	165	188	137		60.7
	Cobalt (Co) (mg/kg)	11.5	19.8	11.4		16.4
	Copper (Cu) (mg/kg)	66.9	77.3	53.8		45.8
	Iron (Fe) (mg/kg)	29800	42800	27400		85800
	Lead (Pb) (mg/kg)	16.5	18.6	14.9		18.9
	Lithium (Li) (mg/kg)	18.5	19.5	16.0		20.8
	Magnesium (Mg) (mg/kg)	9160	10700	8460		8040
	Manganese (Mn) (mg/kg)	311	400	328		1070
	Mercury (Hg) (mg/kg)	0.078	0.068	0.093		<0.050
	Molybdenum (Mo) (mg/kg)	3.16	5.87	2.81		6.04
	Nickel (Ni) (mg/kg)	110	137	94.6		37.5
	Phosphorus (P) (mg/kg)	639	674	635		1590
	Potassium (K) (mg/kg)	2760	3170	2430		3680
	Selenium (Se) (mg/kg)	0.66	0.90	0.56		0.71
	Silver (Ag) (mg/kg)	0.46	0.60	0.39		0.18
	Sodium (Na) (mg/kg)	164	178	153		232
	Strontium (Sr) (mg/kg)	29.1	24.0	26.3		21.7
	Sulfur (S) (mg/kg)	2200	2400	2200		1500
	Thallium (Tl) (mg/kg)	0.232	0.365	0.212		0.267
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0		<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-26	L2338125-27	L2338125-28	L2338125-29	L2338125-30
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19
	Sampled Time					
	Client ID	A20-2	A20-3	A20-4	A20-5	A20-COMP
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	72.0	90.9	87.7	86.5	85.5
	pH (1:2 soil:water) (pH)	5.41	5.37	4.93	5.74	
Particle Size	% Gravel (>2mm) (%)	PSAL 1.5	PSAL <1.0	PSAL <1.0	PSAL <1.0	
	% Sand (2.0mm - 0.063mm) (%)	PSAL 7.6	PSAL <1.0	PSAL 1.2	PSAL 2.1	
	% Silt (0.063mm - 4um) (%)	PSAL 50.9	PSAL 69.0	PSAL 66.1	PSAL 62.3	
	% Clay (<4um) (%)	PSAL 40.0	PSAL 30.3	PSAL 32.7	PSAL 35.6	
	Texture	Silty clay loam	Silt loam	Silt loam	Silt loam	
Organic / Inorganic Carbon	Total Organic Carbon (%)	1.29	7.78	4.74	4.58	
Metals	Aluminum (Al) (mg/kg)	25700	21300	27400	35000	
	Antimony (Sb) (mg/kg)	0.17	0.13	0.19	0.24	
	Arsenic (As) (mg/kg)	28.3	6.04	40.9	34.4	
	Barium (Ba) (mg/kg)	150	179	214	217	
	Beryllium (Be) (mg/kg)	1.95	1.54	2.96	2.89	
	Bismuth (Bi) (mg/kg)	0.90	0.61	1.10	1.41	
	Boron (B) (mg/kg)	<5.0	9.0	7.4	8.5	
	Cadmium (Cd) (mg/kg)	0.075	0.219	0.102	0.119	
	Calcium (Ca) (mg/kg)	2390	2880	2150	2220	
	Chromium (Cr) (mg/kg)	72.0	50.4	67.8	84.5	
	Cobalt (Co) (mg/kg)	19.1	7.98	14.2	24.7	
	Copper (Cu) (mg/kg)	37.8	32.8	54.8	70.4	
	Iron (Fe) (mg/kg)	63600	21700	74200	70200	
	Lead (Pb) (mg/kg)	16.2	13.5	20.7	27.2	
	Lithium (Li) (mg/kg)	27.0	18.4	21.4	28.2	
	Magnesium (Mg) (mg/kg)	10800	7450	8700	10800	
	Manganese (Mn) (mg/kg)	1370	316	799	3010	
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	
	Molybdenum (Mo) (mg/kg)	4.49	1.42	5.47	5.97	
	Nickel (Ni) (mg/kg)	52.2	34.8	43.0	50.4	
	Phosphorus (P) (mg/kg)	716	490	1920	934	
	Potassium (K) (mg/kg)	3540	3040	3930	4910	
	Selenium (Se) (mg/kg)	<0.20	0.45	0.84	0.42	
	Silver (Ag) (mg/kg)	<0.10	0.28	0.25	<0.10	
	Sodium (Na) (mg/kg)	197	243	236	205	
	Strontium (Sr) (mg/kg)	29.0	23.1	22.9	24.4	
	Sulfur (S) (mg/kg)	<1000	2200	1500	2000	
	Thallium (Tl) (mg/kg)	0.235	0.201	0.261	0.376	
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2338125-31	L2338125-32	L2338125-33	L2338125-34	L2338125-35
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19
	Sampled Time					
	Client ID	A76-1	A76-2	A76-3	A76-4	A76-5
SOIL						
Physical Tests	Moisture (%)	90.9	73.2	76.2	71.4	79.8
	pH (1:2 soil:water) (pH)	5.86	5.23	4.92	5.08	5.13
Particle Size	% Gravel (>2mm) (%)	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL
	% Sand (2.0mm - 0.063mm) (%)	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL
	% Silt (0.063mm - 4um) (%)	73.2 PSAL	74.9 PSAL	72.9 PSAL	73.6 PSAL	71.5 PSAL
	% Clay (<4um) (%)	26.2 PSAL	24.6 PSAL	26.6 PSAL	25.8 PSAL	27.7 PSAL
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	8.81	6.45	5.39	5.52	5.11
Metals	Aluminum (Al) (mg/kg)	16800	23600	23400	24500	26600
	Antimony (Sb) (mg/kg)	0.23	0.34	0.36	0.39	0.43
	Arsenic (As) (mg/kg)	23.3	281	434	331	233
	Barium (Ba) (mg/kg)	174	197	172	185	183
	Beryllium (Be) (mg/kg)	1.00	1.58	1.56	1.70	1.79
	Bismuth (Bi) (mg/kg)	0.44	0.70	0.68	0.72	0.80
	Boron (B) (mg/kg)	11.3	6.8	6.6	6.8	6.8
	Cadmium (Cd) (mg/kg)	0.213	0.248	0.171	0.216	0.201
	Calcium (Ca) (mg/kg)	2850	2370	2040	2250	2310
	Chromium (Cr) (mg/kg)	91.1	131	123	133	145
	Cobalt (Co) (mg/kg)	7.46	17.3	20.8	24.3	24.3
	Copper (Cu) (mg/kg)	64.0	96.1	87.3	94.2	93.7
	Iron (Fe) (mg/kg)	22600	102000	122000	103000	96400
	Lead (Pb) (mg/kg)	14.2	20.4	19.8	21.3	23.2
	Lithium (Li) (mg/kg)	14.9	17.8	17.4	19.0	21.0
	Magnesium (Mg) (mg/kg)	6820	8850	8710	9290	10100
	Manganese (Mn) (mg/kg)	226	1400	1260	1120	1290
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	2.30	5.16	5.78	6.48	6.05
	Nickel (Ni) (mg/kg)	72.8	111	101	116	109
	Phosphorus (P) (mg/kg)	452	1320	1870	1300	1360
	Potassium (K) (mg/kg)	2490	3460	3300	3550	3570
	Selenium (Se) (mg/kg)	0.56	1.21	1.12	0.93	0.84
	Silver (Ag) (mg/kg)	0.48	0.49	0.31	0.23	0.22
	Sodium (Na) (mg/kg)	166	175	163	165	162
	Strontium (Sr) (mg/kg)	18.4	19.1	17.8	18.6	19.5
	Sulfur (S) (mg/kg)	1900	2000	2000	2200	2100
	Thallium (Tl) (mg/kg)	0.209	0.303	0.291	0.322	0.326
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID: L2338125-36	L2338125-37	L2338125-38	L2338125-39	L2338125-40
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19
	Sampled Time					
	Client ID	A76-COMP	DS1-1	DS1-2	DS1-3	DS1-4
SOIL						
Physical Tests	Moisture (%)	89.1	73.2	68.6	72.9	65.7
	pH (1:2 soil:water) (pH)		6.57	6.71	6.01	6.68
Particle Size	% Gravel (>2mm) (%)		<1.0 PSAL	<1.0 PSAL	<1.0 PSAL	<1.0 PSAL
	% Sand (2.0mm - 0.063mm) (%)		1.3 PSAL	1.3 PSAL	1.0 PSAL	1.8 PSAL
	% Silt (0.063mm - 4um) (%)		79.1 PSAL	77.4 PSAL	76.5 PSAL	75.7 PSAL
	% Clay (<4um) (%)		19.7 PSAL	21.3 PSAL	22.5 PSAL	22.5 PSAL
	Texture		Silt	Silt loam	Silt loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)		1.62	1.45	1.88	1.28
Metals	Aluminum (Al) (mg/kg)		17900	18400	17900	20100
	Antimony (Sb) (mg/kg)		0.27	0.28	0.28	0.29
	Arsenic (As) (mg/kg)		40.7	47.0	36.4	16.7
	Barium (Ba) (mg/kg)		158	144	153	109
	Beryllium (Be) (mg/kg)		1.01	1.04	1.04	1.08
	Bismuth (Bi) (mg/kg)		0.63	0.64	0.69	0.66
	Boron (B) (mg/kg)		10.9	13.4	12.5	13.6
	Cadmium (Cd) (mg/kg)		0.269	0.211	0.295	0.144
	Calcium (Ca) (mg/kg)		1950	2330	2010	2560
	Chromium (Cr) (mg/kg)		79.9	84.9	82.4	93.0
	Cobalt (Co) (mg/kg)		17.3	16.4	17.2	17.9
	Copper (Cu) (mg/kg)		15.8	16.4	17.3	16.3
	Iron (Fe) (mg/kg)		50700	44600	42900	44600
	Lead (Pb) (mg/kg)		16.2	16.0	17.6	16.1
	Lithium (Li) (mg/kg)		21.3	22.8	22.4	23.5
	Magnesium (Mg) (mg/kg)		11100	11800	11400	12100
	Manganese (Mn) (mg/kg)		10900	5240	3230	10300
	Mercury (Hg) (mg/kg)		0.053	<0.050	0.064	<0.050
	Molybdenum (Mo) (mg/kg)		4.71	3.43	2.47	2.31
	Nickel (Ni) (mg/kg)		52.8	53.6	55.0	53.2
	Phosphorus (P) (mg/kg)		1150	960	942	922
	Potassium (K) (mg/kg)		2150	2470	2360	2510
	Selenium (Se) (mg/kg)		0.35	0.26	0.29	0.32
	Silver (Ag) (mg/kg)		0.13	0.15	0.16	0.14
	Sodium (Na) (mg/kg)		123	129	133	132
	Strontium (Sr) (mg/kg)		24.1	27.3	25.1	28.9
	Sulfur (S) (mg/kg)		<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)		0.175	0.168	0.195	0.172
	Tin (Sn) (mg/kg)		<2.0	<2.0	<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2338125-41	L2338125-42	L2338125-43	L2338125-44	L2338125-45
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19
	Sampled Time					
	Client ID	DS1-5	DS1-COMP	LK1-1	LK1-2	LK1-3
SOIL						
Physical Tests	Moisture (%)	70.3	69.3	56.9	49.9	68.9
	pH (1:2 soil:water) (pH)	6.09		5.62	5.65	5.39
Particle Size	% Gravel (>2mm) (%)	<1.0 PSAL		<1.0 PSAL	<1.0 PSAL	<1.0 PSAL
	% Sand (2.0mm - 0.063mm) (%)	<1.0 PSAL		5.6 PSAL	5.8 PSAL	5.8 PSAL
	% Silt (0.063mm - 4um) (%)	76.0 PSAL		77.2 PSAL	77.7 PSAL	80.9 PSAL
	% Clay (<4um) (%)	23.0 PSAL		17.2 PSAL	16.4 PSAL	13.3 PSAL
	Texture	Silt loam		Silt	Silt	Silt
Organic / Inorganic Carbon	Total Organic Carbon (%)	1.82		1.07	1.15	3.82
Metals	Aluminum (Al) (mg/kg)	18600		17900	18700	24300
	Antimony (Sb) (mg/kg)	0.32		0.18	0.15	0.18
	Arsenic (As) (mg/kg)	46.0		11.1	5.12	42.6
	Barium (Ba) (mg/kg)	163		78.8	98.3	153
	Beryllium (Be) (mg/kg)	1.12		0.97	0.98	2.32
	Bismuth (Bi) (mg/kg)	0.68		0.42	0.56	0.72
	Boron (B) (mg/kg)	14.4		<5.0	<5.0	5.3
	Cadmium (Cd) (mg/kg)	0.371		0.052	0.094	0.063
	Calcium (Ca) (mg/kg)	2320		2040	2960	1730
	Chromium (Cr) (mg/kg)	86.2		126	109	102
	Cobalt (Co) (mg/kg)	19.7		14.1	13.4	15.5
	Copper (Cu) (mg/kg)	18.0		19.8	25.6	49.2
	Iron (Fe) (mg/kg)	42200		40800	25900	74400
	Lead (Pb) (mg/kg)	17.2		9.90	12.0	15.9
	Lithium (Li) (mg/kg)	22.7		17.7	18.8	18.9
	Magnesium (Mg) (mg/kg)	11900		10500	10100	8450
	Manganese (Mn) (mg/kg)	3450		458	345	1020
	Mercury (Hg) (mg/kg)	0.064		<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	3.16		1.90	1.00	5.33
	Nickel (Ni) (mg/kg)	63.2		81.2	94.3	75.7
	Phosphorus (P) (mg/kg)	860		561	652	892
	Potassium (K) (mg/kg)	2660		1700	2180	2700
	Selenium (Se) (mg/kg)	0.27		<0.20	<0.20	0.62
	Silver (Ag) (mg/kg)	0.14		<0.10	0.13	0.15
	Sodium (Na) (mg/kg)	139		87	106	104
	Strontium (Sr) (mg/kg)	28.5		21.2	26.7	20.7
	Sulfur (S) (mg/kg)	<1000		<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.196		0.101	0.135	0.160
	Tin (Sn) (mg/kg)	<2.0		<2.0	<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-46	L2338125-47	L2338125-48	L2338125-49	L2338125-50
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	17-AUG-19	17-AUG-19	17-AUG-19	16-AUG-19	16-AUG-19
	Sampled Time	14:50	15:15		11:30	11:50
	Client ID	LK1-4	LK1-5	LK1-COMP	LK5-1	LK5-2
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	75.4	75.8	69.9	77.8	85.9
	pH (1:2 soil:water) (pH)	5.87	5.78		4.90	5.09
Particle Size	% Gravel (>2mm) (%)	<1.0 PSAL	<1.0 PSAL		<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)	6.5 PSAL	10.3 PSAL		8.3	6.8
	% Silt (0.063mm - 4um) (%)	78.7 PSAL	80.5 PSAL		88.4	83.7
	% Clay (<4um) (%)	14.7 PSAL	9.2 PSAL		3.4	9.5
	Texture	Silt	Silt		Silt	Silt
Organic / Inorganic Carbon	Total Organic Carbon (%)	3.83	2.88		9.35	10.3
Metals	Aluminum (Al) (mg/kg)	24000	18100		15800	15500
	Antimony (Sb) (mg/kg)	0.19	0.17		0.39	0.39
	Arsenic (As) (mg/kg)	21.3	24.1		46.9	46.5
	Barium (Ba) (mg/kg)	125	99.5		70.3	83.1
	Beryllium (Be) (mg/kg)	2.06	1.24		1.13	1.18
	Bismuth (Bi) (mg/kg)	0.79	0.57		0.45	0.50
	Boron (B) (mg/kg)	7.1	<5.0		8.8	10.8
	Cadmium (Cd) (mg/kg)	0.067	0.157		0.265	0.267
	Calcium (Ca) (mg/kg)	1990	2190		2160	2160
	Chromium (Cr) (mg/kg)	96.5	106		113	111
	Cobalt (Co) (mg/kg)	15.5	11.9		24.8	17.9
	Copper (Cu) (mg/kg)	43.0	34.5		52.7	53.6
	Iron (Fe) (mg/kg)	58300	38100		104000	81800
	Lead (Pb) (mg/kg)	17.9	12.1		11.2	12.0
	Lithium (Li) (mg/kg)	20.5	16.7		12.5	11.5
	Magnesium (Mg) (mg/kg)	8180	8380		7230	6640
	Manganese (Mn) (mg/kg)	1120	621		401	393
	Mercury (Hg) (mg/kg)	<0.050	<0.050		<0.050	0.064
	Molybdenum (Mo) (mg/kg)	4.28	4.04		8.17	7.75
	Nickel (Ni) (mg/kg)	74.8	69.9		83.7	77.1
	Phosphorus (P) (mg/kg)	783	669		623	709
	Potassium (K) (mg/kg)	2940	1950		1560	1600
	Selenium (Se) (mg/kg)	0.53	0.43		1.28	1.12
	Silver (Ag) (mg/kg)	0.11	0.14		0.36	0.34
	Sodium (Na) (mg/kg)	117	93		110	124
	Strontium (Sr) (mg/kg)	23.1	21.8		15.9	15.8
	Sulfur (S) (mg/kg)	1100	<1000		3200	2700
	Thallium (Tl) (mg/kg)	0.189	0.126		0.138	0.147
	Tin (Sn) (mg/kg)	<2.0	<2.0		<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2338125-51 Sediment 16-AUG-19 12:15 LK5-3	L2338125-52 Sediment 16-AUG-19 12:45 LK5-4	L2338125-53 Sediment 16-AUG-19 13:15 LK5-5	L2338125-54 Sediment 16-AUG-19 LK5-COMP	L2338125-55 Sediment 16-AUG-19 LK8-1
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	88.7	89.4	89.8	89.5	56.9
	pH (1:2 soil:water) (pH)	5.28	5.44	5.82		5.87
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0	<1.0		<1.0
	% Sand (2.0mm - 0.063mm) (%)	10.4	8.0	11.8		19.7
	% Silt (0.063mm - 4um) (%)	79.4	83.9	75.7		71.9
	% Clay (<4um) (%)	10.1	8.0	12.5		8.3
	Texture	Silt	Silt	Silt loam		Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	7.93	8.52	8.66		0.870
Metals	Aluminum (Al) (mg/kg)	17400	17500	15400		14700
	Antimony (Sb) (mg/kg)	0.35	0.34	0.38		0.17
	Arsenic (As) (mg/kg)	22.3	19.9	11.3		15.8
	Barium (Ba) (mg/kg)	99.9	119	80.4		36.2
	Beryllium (Be) (mg/kg)	1.15	1.21	0.82		0.49
	Bismuth (Bi) (mg/kg)	0.42	0.42	0.32		0.25
	Boron (B) (mg/kg)	8.6	9.7	10.4		<5.0
	Cadmium (Cd) (mg/kg)	0.243	0.256	0.176		0.109
	Calcium (Ca) (mg/kg)	2470	2850	3040		1480
	Chromium (Cr) (mg/kg)	128	128	102		134
	Cobalt (Co) (mg/kg)	16.1	13.2	9.56		17.8
	Copper (Cu) (mg/kg)	48.8	48.5	33.9		27.1
	Iron (Fe) (mg/kg)	42500	36400	22400		27700
	Lead (Pb) (mg/kg)	10.7	10.7	12.5		7.11
	Lithium (Li) (mg/kg)	14.4	14.2	11.9		14.6
	Magnesium (Mg) (mg/kg)	8340	8500	8010		10300
	Manganese (Mn) (mg/kg)	356	363	344		1520
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050		<0.050
	Molybdenum (Mo) (mg/kg)	5.43	5.71	2.20		1.83
	Nickel (Ni) (mg/kg)	80.9	81.2	63.4		81.8
	Phosphorus (P) (mg/kg)	496	527	691		422
	Potassium (K) (mg/kg)	1840	1940	1710		1110
	Selenium (Se) (mg/kg)	1.07	0.86	0.59		<0.20
	Silver (Ag) (mg/kg)	0.31	0.27	0.21		<0.10
	Sodium (Na) (mg/kg)	145	145	157		53
	Strontium (Sr) (mg/kg)	19.5	20.1	20.2		19.2
	Sulfur (S) (mg/kg)	2900	2100	2200		<1000
	Thallium (Tl) (mg/kg)	0.161	0.167	0.125		0.106
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0		<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-56	L2338125-57	L2338125-58	L2338125-59	L2338125-60
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19
	Sampled Time					
	Client ID	LK8-2	LK8-3	LK8-4	LK8-5	LK8-COMP
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	70.0	48.4	69.5	64.1	68.3
	pH (1:2 soil:water) (pH)	5.58	6.18	5.82	5.88	
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0	<1.0	<1.0	
	% Sand (2.0mm - 0.063mm) (%)	23.7	12.1	11.7	54.7	
	% Silt (0.063mm - 4um) (%)	66.8	77.5	75.2	42.2	
	% Clay (<4um) (%)	9.6	10.4	13.0	3.1	
	Texture	Silt loam	Silt	Silt	Sandy loam	
Organic / Inorganic Carbon	Total Organic Carbon (%)	2.17	0.561	1.83	1.38	
Metals	Aluminum (Al) (mg/kg)	14700	16200	15800	11500	
	Antimony (Sb) (mg/kg)	0.13	0.13	0.17	0.12	
	Arsenic (As) (mg/kg)	7.11	10.2	21.1	14.0	
	Barium (Ba) (mg/kg)	44.1	37.6	41.0	34.6	
	Beryllium (Be) (mg/kg)	0.56	0.46	0.66	0.41	
	Bismuth (Bi) (mg/kg)	0.22	0.29	0.28	<0.20	
	Boron (B) (mg/kg)	<5.0	<5.0	<5.0	<5.0	
	Cadmium (Cd) (mg/kg)	0.082	0.060	0.074	0.104	
	Calcium (Ca) (mg/kg)	1850	1900	1410	1310	
	Chromium (Cr) (mg/kg)	139	157	151	113	
	Cobalt (Co) (mg/kg)	8.99	13.9	16.4	12.8	
	Copper (Cu) (mg/kg)	26.1	27.4	35.6	17.4	
	Iron (Fe) (mg/kg)	20700	22900	33100	25000	
	Lead (Pb) (mg/kg)	6.88	7.95	7.96	5.73	
	Lithium (Li) (mg/kg)	14.3	16.6	14.4	11.8	
	Magnesium (Mg) (mg/kg)	9980	11100	9890	8860	
	Manganese (Mn) (mg/kg)	226	473	1300	828	
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	
	Molybdenum (Mo) (mg/kg)	1.28	1.82	1.87	1.08	
	Nickel (Ni) (mg/kg)	70.1	83.7	70.9	64.5	
	Phosphorus (P) (mg/kg)	559	520	506	312	
	Potassium (K) (mg/kg)	1110	1230	1190	890	
	Selenium (Se) (mg/kg)	0.23	<0.20	0.22	<0.20	
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	
	Sodium (Na) (mg/kg)	67	73	60	<50	
	Strontium (Sr) (mg/kg)	20.9	19.7	17.1	17.0	
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	
	Thallium (Tl) (mg/kg)	0.071	0.087	0.100	0.072	
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2338125-64	L2338125-65	L2338125-66	L2338125-67	L2338125-68
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19
	Sampled Time					
	Client ID	DUP-7	DUP-8	DUP-9	DUP-10	COMP-DUP-1
SOIL						
Physical Tests	Moisture (%)	82.6	90.8	92.1	91.2	82.7
	pH (1:2 soil:water) (pH)	5.32	5.71	6.20	5.66	
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0	<1.0	<1.0	
	% Sand (2.0mm - 0.063mm) (%)	6.7	<1.0	1.2	6.7	
	% Silt (0.063mm - 4um) (%)	80.3	82.7	74.1	86.0	
	% Clay (<4um) (%)	13.0	16.7	24.8	7.2	
	Texture	Silt	Silt loam	Silt loam	Silt	
Organic / Inorganic Carbon	Total Organic Carbon (%)	3.62	9.86	8.65	10.3	
Metals	Aluminum (Al) (mg/kg)	17400	22100	19500	17300	
	Antimony (Sb) (mg/kg)	0.18	0.40	0.28	0.44	
	Arsenic (As) (mg/kg)	270	119	25.6	48.5	
	Barium (Ba) (mg/kg)	84.7	134	200	85.9	
	Beryllium (Be) (mg/kg)	1.34	1.47	1.06	1.19	
	Bismuth (Bi) (mg/kg)	0.49	0.51	0.48	0.49	
	Boron (B) (mg/kg)	<5.0	13.5	11.5	10.2	
	Cadmium (Cd) (mg/kg)	0.159	0.412	0.286	0.308	
	Calcium (Ca) (mg/kg)	1600	2970	3140	2400	
	Chromium (Cr) (mg/kg)	67.3	191	105	119	
	Cobalt (Co) (mg/kg)	22.0	14.4	8.43	18.9	
	Copper (Cu) (mg/kg)	41.2	73.4	68.8	56.9	
	Iron (Fe) (mg/kg)	130000	45400	25800	88200	
	Lead (Pb) (mg/kg)	11.0	17.8	15.6	12.9	
	Lithium (Li) (mg/kg)	11.9	17.6	16.1	11.6	
	Magnesium (Mg) (mg/kg)	5820	10200	7780	7370	
	Manganese (Mn) (mg/kg)	1210	355	244	451	
	Mercury (Hg) (mg/kg)	<0.050	0.072	<0.050	0.058	
	Molybdenum (Mo) (mg/kg)	7.48	4.83	2.76	8.57	
	Nickel (Ni) (mg/kg)	61.1	123	82.3	80.7	
	Phosphorus (P) (mg/kg)	1720	755	473	758	
	Potassium (K) (mg/kg)	1820	2930	2710	1600	
	Selenium (Se) (mg/kg)	0.75	0.87	0.71	1.15	
	Silver (Ag) (mg/kg)	0.19	0.52	0.53	0.36	
	Sodium (Na) (mg/kg)	117	161	169	127	
	Strontium (Sr) (mg/kg)	17.0	26.5	20.2	16.1	
	Sulfur (S) (mg/kg)	1200	2700	2500	2800	
	Thallium (Tl) (mg/kg)	0.154	0.299	0.227	0.156	
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-1	L2338125-2	L2338125-3	L2338125-4	L2338125-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19
	Sampled Time	11:15	12:10	12:35	13:15	13:40
	Client ID	INUG-1	INUG-2	INUG-3	INUG-4	INUG-5
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	598	616	672	634	569
	Tungsten (W) (mg/kg)	0.65	0.78	0.60	0.69	0.62
	Uranium (U) (mg/kg)	15.0	14.4	17.6	16.3	15.1
	Vanadium (V) (mg/kg)	35.3	36.8	40.9	37.7	35.3
	Zinc (Zn) (mg/kg)	83.4	86.0	103	96.0	92.7
	Zirconium (Zr) (mg/kg)	2.5	1.9	3.0	2.6	2.6
Speciated Metals	Methylmercury (as MeHg) (mg/kg)	0.000142	0.000117	0.000160	0.000149	0.000301
Aggregate Organics	Mineral Oil and Grease (mg/kg)					
Hydrocarbons	EPH10-19 (mg/kg)					
	EPH19-32 (mg/kg)					
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b&j)fluoranthene (mg/kg)					
	Benzo(b+j+k)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	1-Methylnaphthalene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Quinoline (mg/kg)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-6	L2338125-7	L2338125-8	L2338125-9	L2338125-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	18-AUG-19	18-AUG-19	18-AUG-19	18-AUG-19
	Sampled Time		16:40			
	Client ID	INUG-COMP	WTS-1	WTS-2	WTS-3	WTS-4
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)		332	348	375	430
	Tungsten (W) (mg/kg)		<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)		10.1	10.0	9.74	11.6
	Vanadium (V) (mg/kg)		22.1	24.0	24.2	27.0
	Zinc (Zn) (mg/kg)		87.5	93.5	82.5	106
	Zirconium (Zr) (mg/kg)		<1.0	1.1	1.8	2.6
Speciated Metals	Methylmercury (as MeHg) (mg/kg)		0.000228	0.000484	0.000713	0.000723
Aggregate Organics	Mineral Oil and Grease (mg/kg)	<1500 DLHM				
Hydrocarbons	EPH10-19 (mg/kg)	<560 DLHM				
	EPH19-32 (mg/kg)	<560 DLHM				
	LEPH (mg/kg)	<560				
	HEPH (mg/kg)	<560				
	Surrogate: 2-Bromobenzotrifluoride (%)	97.1				
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.017 DLHM				
	Acenaphthylene (mg/kg)	<0.017 DLHM				
	Anthracene (mg/kg)	<0.017 DLHM				
	Benz(a)anthracene (mg/kg)	<0.030 DLCI				
	Benzo(a)pyrene (mg/kg)	<0.017 DLHM				
	Benzo(b&j)fluoranthene (mg/kg)	<0.017 DLHM				
	Benzo(b+j+k)fluoranthene (mg/kg)	<0.024				
	Benzo(g,h,i)perylene (mg/kg)	<0.017 DLHM				
	Benzo(k)fluoranthene (mg/kg)	<0.017 DLHM				
	Chrysene (mg/kg)	<0.017 DLHM				
	Dibenz(a,h)anthracene (mg/kg)	<0.017 DLHM				
	Fluoranthene (mg/kg)	<0.017 DLHM				
	Fluorene (mg/kg)	<0.017 DLHM				
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.017 DLHM				
	1-Methylnaphthalene (mg/kg)	<0.050				
	2-Methylnaphthalene (mg/kg)	<0.017 DLHM				
	Naphthalene (mg/kg)	<0.017 DLHM				
	Phenanthrene (mg/kg)	<0.017 DLHM				
	Pyrene (mg/kg)	<0.017 DLHM				
	Quinoline (mg/kg)	<0.050				
	Surrogate: Chrysene d12 (%)	112.4				
	Surrogate: Naphthalene d8 (%)	108.2				
	Surrogate: Phenanthrene d10 (%)	116.3				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-11	L2338125-12	L2338125-13	L2338125-14	L2338125-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	18-AUG-19	18-AUG-19	18-AUG-19	18-AUG-19	18-AUG-19
	Sampled Time			15:45	16:05	16:35
	Client ID	WTS-5	WTS-COMP	NEM-1	NEM-2	NEM-3
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	526		199	215	217
	Tungsten (W) (mg/kg)	<0.50		<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	17.8		3.87	4.11	3.70
	Vanadium (V) (mg/kg)	33.8		21.2	21.5	20.9
	Zinc (Zn) (mg/kg)	106		55.1	52.1	53.1
	Zirconium (Zr) (mg/kg)	1.5		<1.0	<1.0	<1.0
Speciated Metals	Methylmercury (as MeHg) (mg/kg)	<0.000050				
Aggregate Organics	Mineral Oil and Grease (mg/kg)		DLHM <1500			
Hydrocarbons	EPH10-19 (mg/kg)		DLHM <580			
	EPH19-32 (mg/kg)		DLHM <580			
	LEPH (mg/kg)		<580			
	HEPH (mg/kg)		<580			
	Surrogate: 2-Bromobenzotrifluoride (%)		111.6			
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)		DLHM <0.0090			
	Acenaphthylene (mg/kg)		DLHM <0.0090			
	Anthracene (mg/kg)		DLHM <0.0090			
	Benz(a)anthracene (mg/kg)		<0.010			
	Benzo(a)pyrene (mg/kg)		<0.010			
	Benzo(b&j)fluoranthene (mg/kg)		<0.010			
	Benzo(b+j+k)fluoranthene (mg/kg)		<0.015			
	Benzo(g,h,i)perylene (mg/kg)		<0.010			
	Benzo(k)fluoranthene (mg/kg)		<0.010			
	Chrysene (mg/kg)		<0.010			
	Dibenz(a,h)anthracene (mg/kg)		DLHM <0.0090			
	Fluoranthene (mg/kg)		<0.010			
	Fluorene (mg/kg)		<0.010			
	Indeno(1,2,3-c,d)pyrene (mg/kg)		<0.010			
	1-Methylnaphthalene (mg/kg)		<0.050			
	2-Methylnaphthalene (mg/kg)		<0.010			
	Naphthalene (mg/kg)		<0.010			
	Phenanthrene (mg/kg)		<0.010			
	Pyrene (mg/kg)		<0.010			
	Quinoline (mg/kg)		<0.050			
	Surrogate: Chrysene d12 (%)		108.6			
	Surrogate: Naphthalene d8 (%)		113.7			
	Surrogate: Phenanthrene d10 (%)		115.5			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2338125-16 Sediment 18-AUG-19 17:15 NEM-4	L2338125-17 Sediment 18-AUG-19 18:00 NEM-5	L2338125-18 Sediment 18-AUG-19 NEM-COMP	L2338125-19 Sediment 19-AUG-19 11:06 MAM-1	L2338125-20 Sediment 19-AUG-19 MAM-2
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	182	187		493	504
	Tungsten (W) (mg/kg)	<0.50	<0.50		0.70	0.67
	Uranium (U) (mg/kg)	4.40	4.55		12.8	13.6
	Vanadium (V) (mg/kg)	22.4	23.7		38.5	42.0
	Zinc (Zn) (mg/kg)	55.6	70.6		141	130
	Zirconium (Zr) (mg/kg)	<1.0	<1.0		3.5	2.9
Speciated Metals	Methylmercury (as MeHg) (mg/kg)				0.000639	0.000658
Aggregate Organics	Mineral Oil and Grease (mg/kg)			DLHM 2400		
Hydrocarbons	EPH10-19 (mg/kg)			DLHM <1000		
	EPH19-32 (mg/kg)			DLHM <1000		
	LEPH (mg/kg)			<1000		
	HEPH (mg/kg)			<1000		
	Surrogate: 2-Bromobenzotrifluoride (%)			108.4		
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)			DLHM <0.015		
	Acenaphthylene (mg/kg)			DLHM <0.015		
	Anthracene (mg/kg)			DLHM <0.015		
	Benz(a)anthracene (mg/kg)			DLHM <0.015		
	Benzo(a)pyrene (mg/kg)			DLHM <0.015		
	Benzo(b&j)fluoranthene (mg/kg)			DLHM <0.015		
	Benzo(b+j+k)fluoranthene (mg/kg)			<0.021		
	Benzo(g,h,i)perylene (mg/kg)			DLHM <0.015		
	Benzo(k)fluoranthene (mg/kg)			DLHM <0.015		
	Chrysene (mg/kg)			DLHM <0.015		
	Dibenz(a,h)anthracene (mg/kg)			DLHM <0.015		
	Fluoranthene (mg/kg)			DLHM <0.015		
	Fluorene (mg/kg)			DLHM <0.015		
	Indeno(1,2,3-c,d)pyrene (mg/kg)			DLHM <0.015		
	1-Methylnaphthalene (mg/kg)			<0.050		
	2-Methylnaphthalene (mg/kg)			DLHM <0.015		
	Naphthalene (mg/kg)			DLQ <0.020		
	Phenanthrene (mg/kg)			DLHM <0.015		
	Pyrene (mg/kg)			DLHM <0.015		
	Quinoline (mg/kg)			<0.050		
	Surrogate: Chrysene d12 (%)			94.2		
	Surrogate: Naphthalene d8 (%)			101.7		
	Surrogate: Phenanthrene d10 (%)			103.2		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2338125-21	L2338125-22	L2338125-23	L2338125-24	L2338125-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	19-AUG-19	19-AUG-19	19-AUG-19	19-AUG-19	16-AUG-19
	Sampled Time					
	Client ID	MAM-3	MAM-4	MAM-5	MAM-COMP	A20-1
SOIL						
Metals	Titanium (Ti) (mg/kg)	470	608	410		538
	Tungsten (W) (mg/kg)	0.61	0.64	0.68		0.57
	Uranium (U) (mg/kg)	11.8	15.2	9.67		14.0
	Vanadium (V) (mg/kg)	37.1	43.4	32.1		34.7
	Zinc (Zn) (mg/kg)	113	155	104		102
	Zirconium (Zr) (mg/kg)	3.0	4.6	2.6		2.4
Speciated Metals	Methylmercury (as MeHg) (mg/kg)	0.00104	0.000500	0.00134		0.000299
Aggregate Organics	Mineral Oil and Grease (mg/kg)				DLHM <2500	
Hydrocarbons	EPH10-19 (mg/kg)				DLHM <920	
	EPH19-32 (mg/kg)				DLHM <920	
	LEPH (mg/kg)				<920	
	HEPH (mg/kg)				<920	
	Surrogate: 2-Bromobenzotrifluoride (%)				109.4	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)				DLHM <0.014	
	Acenaphthylene (mg/kg)				DLHM <0.014	
	Anthracene (mg/kg)				DLHM <0.014	
	Benz(a)anthracene (mg/kg)				DLHM <0.014	
	Benzo(a)pyrene (mg/kg)				DLHM <0.014	
	Benzo(b&j)fluoranthene (mg/kg)				DLHM <0.014	
	Benzo(b+j+k)fluoranthene (mg/kg)				<0.020	
	Benzo(g,h,i)perylene (mg/kg)				DLHM <0.014	
	Benzo(k)fluoranthene (mg/kg)				DLHM <0.014	
	Chrysene (mg/kg)				DLHM <0.014	
	Dibenz(a,h)anthracene (mg/kg)				DLHM <0.014	
	Fluoranthene (mg/kg)				DLHM <0.014	
	Fluorene (mg/kg)				DLHM <0.014	
	Indeno(1,2,3-c,d)pyrene (mg/kg)				DLHM <0.014	
	1-Methylnaphthalene (mg/kg)				<0.050	
	2-Methylnaphthalene (mg/kg)				DLHM <0.014	
	Naphthalene (mg/kg)				DLQ <0.020	
	Phenanthrene (mg/kg)				DLHM <0.014	
	Pyrene (mg/kg)				DLHM <0.014	
	Quinoline (mg/kg)				<0.050	
	Surrogate: Chrysene d12 (%)				123.0	
	Surrogate: Naphthalene d8 (%)				125.2	
	Surrogate: Phenanthrene d10 (%)				129.0	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-26	L2338125-27	L2338125-28	L2338125-29	L2338125-30
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19
	Sampled Time					
	Client ID	A20-2	A20-3	A20-4	A20-5	A20-COMP
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	1100	480	605	682	
	Tungsten (W) (mg/kg)	<0.50	<0.50	0.80	0.62	
	Uranium (U) (mg/kg)	12.8	10.5	17.8	23.5	
	Vanadium (V) (mg/kg)	40.5	26.4	40.2	50.7	
	Zinc (Zn) (mg/kg)	116	84.9	117	137	
	Zirconium (Zr) (mg/kg)	4.8	3.2	4.4	3.1	
Speciated Metals	Methylmercury (as MeHg) (mg/kg)	0.000107	0.000462	0.000482	0.00117	
Aggregate Organics	Mineral Oil and Grease (mg/kg)					<1700 DLHM
Hydrocarbons	EPH10-19 (mg/kg)					<640 DLHM
	EPH19-32 (mg/kg)					<640 DLHM
	LEPH (mg/kg)					<640
	HEPH (mg/kg)					<640
	Surrogate: 2-Bromobenzotrifluoride (%)					94.6
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					<0.020 DLHM
	Acenaphthylene (mg/kg)					<0.020 DLHM
	Anthracene (mg/kg)					<0.020 DLHM
	Benz(a)anthracene (mg/kg)					<0.020 DLHM
	Benzo(a)pyrene (mg/kg)					<0.020 DLHM
	Benzo(b&j)fluoranthene (mg/kg)					<0.020 DLHM
	Benzo(b+j+k)fluoranthene (mg/kg)					<0.028
	Benzo(g,h,i)perylene (mg/kg)					<0.020 DLHM
	Benzo(k)fluoranthene (mg/kg)					<0.020 DLHM
	Chrysene (mg/kg)					<0.020 DLHM
	Dibenz(a,h)anthracene (mg/kg)					<0.020 DLHM
	Fluoranthene (mg/kg)					<0.020 DLHM
	Fluorene (mg/kg)					<0.020 DLHM
	Indeno(1,2,3-c,d)pyrene (mg/kg)					<0.020 DLHM
	1-Methylnaphthalene (mg/kg)					<0.050
	2-Methylnaphthalene (mg/kg)					<0.020 DLHM
	Naphthalene (mg/kg)					<0.020 DLHM
	Phenanthrene (mg/kg)					<0.020 DLHM
	Pyrene (mg/kg)					<0.020 DLHM
	Quinoline (mg/kg)					<0.050
	Surrogate: Chrysene d12 (%)					105.7
	Surrogate: Naphthalene d8 (%)					103.3
	Surrogate: Phenanthrene d10 (%)					109.6

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-31	L2338125-32	L2338125-33	L2338125-34	L2338125-35
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19
	Sampled Time					
	Client ID	A76-1	A76-2	A76-3	A76-4	A76-5
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	335	474	461	498	570
	Tungsten (W) (mg/kg)	<0.50	0.56	0.54	0.55	0.63
	Uranium (U) (mg/kg)	10.1	13.8	13.8	15.4	15.9
	Vanadium (V) (mg/kg)	29.2	42.6	41.7	43.9	47.1
	Zinc (Zn) (mg/kg)	80.1	134	125	143	139
	Zirconium (Zr) (mg/kg)	2.3	2.0	2.0	1.8	2.2
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)					
Hydrocarbons	EPH10-19 (mg/kg)					
	EPH19-32 (mg/kg)					
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b&j)fluoranthene (mg/kg)					
	Benzo(b+j+k)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	1-Methylnaphthalene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Quinoline (mg/kg)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-36	L2338125-37	L2338125-38	L2338125-39	L2338125-40
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19
	Sampled Time					
	Client ID	A76-COMP	DS1-1	DS1-2	DS1-3	DS1-4
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)		436	529	493	553
	Tungsten (W) (mg/kg)		0.57	0.55	0.51	0.51
	Uranium (U) (mg/kg)		3.78	3.91	4.19	3.85
	Vanadium (V) (mg/kg)		37.9	39.3	39.4	41.3
	Zinc (Zn) (mg/kg)		83.8	83.6	89.4	81.1
	Zirconium (Zr) (mg/kg)		4.1	7.1	7.8	4.9
Speciated Metals	Methylmercury (as MeHg) (mg/kg)		0.000084	0.000158	0.000283	<0.000050
Aggregate Organics	Mineral Oil and Grease (mg/kg)	DLHM <2200				
Hydrocarbons	EPH10-19 (mg/kg)	DLHM <1000				
	EPH19-32 (mg/kg)	DLHM <1000				
	LEPH (mg/kg)	<1000				
	HEPH (mg/kg)	<1000				
	Surrogate: 2-Bromobenzotrifluoride (%)	94.9				
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	DLHM <0.030				
	Acenaphthylene (mg/kg)	DLHM <0.030				
	Anthracene (mg/kg)	DLHM <0.030				
	Benz(a)anthracene (mg/kg)	DLHM <0.030				
	Benzo(a)pyrene (mg/kg)	DLHM <0.030				
	Benzo(b&j)fluoranthene (mg/kg)	DLHM <0.030				
	Benzo(b+j+k)fluoranthene (mg/kg)	<0.042				
	Benzo(g,h,i)perylene (mg/kg)	0.073				
	Benzo(k)fluoranthene (mg/kg)	DLHM <0.030				
	Chrysene (mg/kg)	DLHM <0.030				
	Dibenz(a,h)anthracene (mg/kg)	DLHM <0.030				
	Fluoranthene (mg/kg)	DLHM <0.030				
	Fluorene (mg/kg)	DLHM <0.030				
	Indeno(1,2,3-c,d)pyrene (mg/kg)	DLHM <0.030				
	1-Methylnaphthalene (mg/kg)	<0.050				
	2-Methylnaphthalene (mg/kg)	DLHM <0.030				
	Naphthalene (mg/kg)	DLHM <0.030				
	Phenanthrene (mg/kg)	DLHM <0.030				
	Pyrene (mg/kg)	DLHM <0.030				
	Quinoline (mg/kg)	<0.050				
	Surrogate: Chrysene d12 (%)	108.6				
	Surrogate: Naphthalene d8 (%)	106.7				
	Surrogate: Phenanthrene d10 (%)	111.4				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-41	L2338125-42	L2338125-43	L2338125-44	L2338125-45
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19
	Sampled Time					
	Client ID	DS1-5	DS1-COMP	LK1-1	LK1-2	LK1-3
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	564		721	779	556
	Tungsten (W) (mg/kg)	0.51		<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	4.30		8.70	13.5	19.2
	Vanadium (V) (mg/kg)	40.9		31.7	31.1	33.3
	Zinc (Zn) (mg/kg)	93.3		76.5	91.8	109
	Zirconium (Zr) (mg/kg)	9.9		5.7	6.2	2.6
Speciated Metals	Methylmercury (as MeHg) (mg/kg)	0.000330				
Aggregate Organics	Mineral Oil and Grease (mg/kg)		<800 DLHM			
Hydrocarbons	EPH10-19 (mg/kg)		<300 DLHM			
	EPH19-32 (mg/kg)		<300 DLHM			
	LEPH (mg/kg)		<300			
	HEPH (mg/kg)		<300			
	Surrogate: 2-Bromobenzotrifluoride (%)		92.5			
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)		<0.0050			
	Acenaphthylene (mg/kg)		<0.0050			
	Anthracene (mg/kg)		<0.0040			
	Benz(a)anthracene (mg/kg)		<0.010			
	Benzo(a)pyrene (mg/kg)		<0.010			
	Benzo(b&j)fluoranthene (mg/kg)		<0.010			
	Benzo(b+j+k)fluoranthene (mg/kg)		<0.015			
	Benzo(g,h,i)perylene (mg/kg)		<0.010			
	Benzo(k)fluoranthene (mg/kg)		<0.010			
	Chrysene (mg/kg)		<0.010			
	Dibenz(a,h)anthracene (mg/kg)		<0.0050			
	Fluoranthene (mg/kg)		<0.010			
	Fluorene (mg/kg)		<0.010			
	Indeno(1,2,3-c,d)pyrene (mg/kg)		<0.010			
	1-Methylnaphthalene (mg/kg)		<0.050			
	2-Methylnaphthalene (mg/kg)		<0.010			
	Naphthalene (mg/kg)		<0.010			
	Phenanthrene (mg/kg)		<0.010			
	Pyrene (mg/kg)		<0.010			
	Quinoline (mg/kg)		<0.050			
	Surrogate: Chrysene d12 (%)		100.1			
	Surrogate: Naphthalene d8 (%)		99.1			
	Surrogate: Phenanthrene d10 (%)		104.0			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-46	L2338125-47	L2338125-48	L2338125-49	L2338125-50
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	17-AUG-19	17-AUG-19	17-AUG-19	16-AUG-19	16-AUG-19
	Sampled Time	14:50	15:15		11:30	11:50
	Client ID	LK1-4	LK1-5	LK1-COMP	LK5-1	LK5-2
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	576	541		281	254
	Tungsten (W) (mg/kg)	<0.50	0.52		<0.50	<0.50
	Uranium (U) (mg/kg)	17.5	18.1		9.43	9.88
	Vanadium (V) (mg/kg)	33.6	29.4		26.3	25.6
	Zinc (Zn) (mg/kg)	110	78.0		93.4	102
	Zirconium (Zr) (mg/kg)	1.8	3.0		3.8	2.6
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)			<900 DLHM		
Hydrocarbons	EPH10-19 (mg/kg)			<660 DLHM		
	EPH19-32 (mg/kg)			<660 DLHM		
	LEPH (mg/kg)			<660		
	HEPH (mg/kg)			<660		
	Surrogate: 2-Bromobenzotrifluoride (%)			85.7		
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)			<0.0050		
	Acenaphthylene (mg/kg)			<0.0050		
	Anthracene (mg/kg)			<0.0040		
	Benz(a)anthracene (mg/kg)			<0.010		
	Benzo(a)pyrene (mg/kg)			<0.010		
	Benzo(b&j)fluoranthene (mg/kg)			<0.010		
	Benzo(b+j+k)fluoranthene (mg/kg)			<0.015		
	Benzo(g,h,i)perylene (mg/kg)			<0.010		
	Benzo(k)fluoranthene (mg/kg)			<0.010		
	Chrysene (mg/kg)			<0.010		
	Dibenz(a,h)anthracene (mg/kg)			<0.0050		
	Fluoranthene (mg/kg)			<0.010		
	Fluorene (mg/kg)			<0.010		
	Indeno(1,2,3-c,d)pyrene (mg/kg)			<0.010		
	1-Methylnaphthalene (mg/kg)			<0.050		
	2-Methylnaphthalene (mg/kg)			<0.010		
	Naphthalene (mg/kg)			<0.010		
	Phenanthrene (mg/kg)			<0.010		
	Pyrene (mg/kg)			<0.010		
	Quinoline (mg/kg)			<0.050		
	Surrogate: Chrysene d12 (%)			88.9		
	Surrogate: Naphthalene d8 (%)			87.3		
	Surrogate: Phenanthrene d10 (%)			90.7		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2338125-51 Sediment 16-AUG-19 12:15 LK5-3	L2338125-52 Sediment 16-AUG-19 12:45 LK5-4	L2338125-53 Sediment 16-AUG-19 13:15 LK5-5	L2338125-54 Sediment 16-AUG-19 LK5-COMP	L2338125-55 Sediment 16-AUG-19 LK8-1
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	373	372	344		454
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50		<0.50
	Uranium (U) (mg/kg)	9.49	9.54	6.75		4.27
	Vanadium (V) (mg/kg)	28.8	29.2	23.8		28.7
	Zinc (Zn) (mg/kg)	106	113	73.2		61.5
	Zirconium (Zr) (mg/kg)	2.8	1.8	1.5		<1.0
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)				DLHM <2500	
Hydrocarbons	EPH10-19 (mg/kg)				DLHM <960	
	EPH19-32 (mg/kg)				DLHM <960	
	LEPH (mg/kg)				<960	
	HEPH (mg/kg)				<960	
	Surrogate: 2-Bromobenzotrifluoride (%)				101.4	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)				DLHM <0.030	
	Acenaphthylene (mg/kg)				DLHM <0.030	
	Anthracene (mg/kg)				DLHM <0.030	
	Benz(a)anthracene (mg/kg)				DLHM <0.030	
	Benzo(a)pyrene (mg/kg)				DLHM <0.030	
	Benzo(b&j)fluoranthene (mg/kg)				DLHM <0.030	
	Benzo(b+j+k)fluoranthene (mg/kg)				<0.042	
	Benzo(g,h,i)perylene (mg/kg)				DLHM <0.030	
	Benzo(k)fluoranthene (mg/kg)				DLHM <0.030	
	Chrysene (mg/kg)				DLHM <0.030	
	Dibenz(a,h)anthracene (mg/kg)				DLHM <0.030	
	Fluoranthene (mg/kg)				DLHM <0.030	
	Fluorene (mg/kg)				DLHM <0.030	
	Indeno(1,2,3-c,d)pyrene (mg/kg)				DLHM <0.030	
	1-Methylnaphthalene (mg/kg)				<0.050	
	2-Methylnaphthalene (mg/kg)				DLHM <0.030	
	Naphthalene (mg/kg)				DLHM <0.030	
	Phenanthrene (mg/kg)				DLHM <0.030	
	Pyrene (mg/kg)				DLHM <0.030	
	Quinoline (mg/kg)				<0.050	
	Surrogate: Chrysene d12 (%)				117.0	
	Surrogate: Naphthalene d8 (%)				113.2	
	Surrogate: Phenanthrene d10 (%)				119.8	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-56	L2338125-57	L2338125-58	L2338125-59	L2338125-60
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19
	Sampled Time					
	Client ID	LK8-2	LK8-3	LK8-4	LK8-5	LK8-COMP
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	359	453	330	362	
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	
	Uranium (U) (mg/kg)	4.06	4.42	5.42	2.50	
	Vanadium (V) (mg/kg)	28.6	29.4	30.7	23.7	
	Zinc (Zn) (mg/kg)	59.4	66.7	61.2	47.5	
	Zirconium (Zr) (mg/kg)	1.4	1.4	<1.0	<1.0	
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)					<800 DLHM
Hydrocarbons	EPH10-19 (mg/kg)					<320 DLHM
	EPH19-32 (mg/kg)					<320 DLHM
	LEPH (mg/kg)					<320
	HEPH (mg/kg)					<320
	Surrogate: 2-Bromobenzotrifluoride (%)					108.8
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					<0.0050
	Acenaphthylene (mg/kg)					<0.0050
	Anthracene (mg/kg)					<0.0040
	Benz(a)anthracene (mg/kg)					<0.010
	Benzo(a)pyrene (mg/kg)					<0.010
	Benzo(b&j)fluoranthene (mg/kg)					<0.010
	Benzo(b+j+k)fluoranthene (mg/kg)					<0.015
	Benzo(g,h,i)perylene (mg/kg)					<0.010
	Benzo(k)fluoranthene (mg/kg)					<0.010
	Chrysene (mg/kg)					<0.010
	Dibenz(a,h)anthracene (mg/kg)					<0.0050
	Fluoranthene (mg/kg)					<0.010
	Fluorene (mg/kg)					<0.010
	Indeno(1,2,3-c,d)pyrene (mg/kg)					<0.010
	1-Methylnaphthalene (mg/kg)					<0.050
	2-Methylnaphthalene (mg/kg)					<0.010
	Naphthalene (mg/kg)					<0.010
	Phenanthrene (mg/kg)					<0.010
	Pyrene (mg/kg)					<0.010
	Quinoline (mg/kg)					<0.050
	Surrogate: Chrysene d12 (%)					122.5
	Surrogate: Naphthalene d8 (%)					121.4
	Surrogate: Phenanthrene d10 (%)					86.8

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2338125-64 Sediment 15-AUG-19 DUP-7	L2338125-65 Sediment 15-AUG-19 DUP-8	L2338125-66 Sediment 15-AUG-19 DUP-9	L2338125-67 Sediment 15-AUG-19 DUP-10	L2338125-68 Sediment 15-AUG-19 COMP-DUP-1
SOIL						
Metals	Titanium (Ti) (mg/kg)	366	513	422	284	
	Tungsten (W) (mg/kg)	<0.50	0.76	0.53	<0.50	
	Uranium (U) (mg/kg)	10.6	13.3	11.2	9.87	
	Vanadium (V) (mg/kg)	24.3	41.0	32.5	26.9	
	Zinc (Zn) (mg/kg)	97.1	151	92.3	110	
	Zirconium (Zr) (mg/kg)	1.5	4.4	2.5	2.9	
Speciated Metals	Methylmercury (as MeHg) (mg/kg)					
Aggregate Organics	Mineral Oil and Grease (mg/kg)					DLHM <1700
Hydrocarbons	EPH10-19 (mg/kg)					DLHM <560
	EPH19-32 (mg/kg)					DLHM <560
	LEPH (mg/kg)					<560
	HEPH (mg/kg)					<560
	Surrogate: 2-Bromobenzotrifluoride (%)					109.2
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					DLHM <0.0080
	Acenaphthylene (mg/kg)					DLHM <0.0080
	Anthracene (mg/kg)					DLHM <0.0080
	Benz(a)anthracene (mg/kg)					<0.010
	Benzo(a)pyrene (mg/kg)					<0.010
	Benzo(b&j)fluoranthene (mg/kg)					<0.010
	Benzo(b+j+k)fluoranthene (mg/kg)					<0.015
	Benzo(g,h,i)perylene (mg/kg)					<0.010
	Benzo(k)fluoranthene (mg/kg)					<0.010
	Chrysene (mg/kg)					<0.010
	Dibenz(a,h)anthracene (mg/kg)					DLHM <0.0080
	Fluoranthene (mg/kg)					<0.010
	Fluorene (mg/kg)					<0.010
	Indeno(1,2,3-c,d)pyrene (mg/kg)					<0.010
	1-Methylnaphthalene (mg/kg)					<0.050
	2-Methylnaphthalene (mg/kg)					<0.010
	Naphthalene (mg/kg)					DLQ <0.020
	Phenanthrene (mg/kg)					<0.010
	Pyrene (mg/kg)					<0.010
	Quinoline (mg/kg)					<0.050
	Surrogate: Chrysene d12 (%)					108.3
	Surrogate: Naphthalene d8 (%)					113.7
	Surrogate: Phenanthrene d10 (%)					116.2

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-1	L2338125-2	L2338125-3	L2338125-4	L2338125-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19
	Sampled Time	11:15	12:10	12:35	13:15	13:40
	Client ID	INUG-1	INUG-2	INUG-3	INUG-4	INUG-5
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)					
	IACR (CCME)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-6	L2338125-7	L2338125-8	L2338125-9	L2338125-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	18-AUG-19	18-AUG-19	18-AUG-19	18-AUG-19
	Sampled Time		16:40			
	Client ID	INUG-COMP	WTS-1	WTS-2	WTS-3	WTS-4
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)	<0.021				
	IACR (CCME)	<0.22				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-11	L2338125-12	L2338125-13	L2338125-14	L2338125-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	18-AUG-19	18-AUG-19	18-AUG-19	18-AUG-19	18-AUG-19
	Sampled Time			15:45	16:05	16:35
	Client ID	WTS-5	WTS-COMP	NEM-1	NEM-2	NEM-3
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)		<0.020			
	IACR (CCME)		<0.15			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-16	L2338125-17	L2338125-18	L2338125-19	L2338125-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	18-AUG-19	18-AUG-19	18-AUG-19	19-AUG-19	19-AUG-19
	Sampled Time	17:15	18:00		11:06	
	Client ID	NEM-4	NEM-5	NEM-COMP	MAM-1	MAM-2
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)			<0.020		
	IACR (CCME)			<0.18		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-21	L2338125-22	L2338125-23	L2338125-24	L2338125-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	19-AUG-19	19-AUG-19	19-AUG-19	19-AUG-19	16-AUG-19
	Sampled Time					
	Client ID	MAM-3	MAM-4	MAM-5	MAM-COMP	A20-1
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)				<0.020	
	IACR (CCME)				<0.17	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-26	L2338125-27	L2338125-28	L2338125-29	L2338125-30
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19
	Sampled Time					
	Client ID	A20-2	A20-3	A20-4	A20-5	A20-COMP
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)					<0.024
	IACR (CCME)					<0.24

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-31	L2338125-32	L2338125-33	L2338125-34	L2338125-35
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19
	Sampled Time					
	Client ID	A76-1	A76-2	A76-3	A76-4	A76-5
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)					
	IACR (CCME)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-36	L2338125-37	L2338125-38	L2338125-39	L2338125-40
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19
	Sampled Time					
	Client ID	A76-COMP	DS1-1	DS1-2	DS1-3	DS1-4
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)	0.037				
	IACR (CCME)	0.36				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2338125-41 Sediment 17-AUG-19 DS1-5	L2338125-42 Sediment 17-AUG-19 DS1-COMP	L2338125-43 Sediment 17-AUG-19 LK1-1	L2338125-44 Sediment 17-AUG-19 LK1-2	L2338125-45 Sediment 17-AUG-19 LK1-3
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)		<0.020			
	IACR (CCME)		<0.15			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-46	L2338125-47	L2338125-48	L2338125-49	L2338125-50
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	17-AUG-19	17-AUG-19	17-AUG-19	16-AUG-19	16-AUG-19
	Sampled Time	14:50	15:15		11:30	11:50
	Client ID	LK1-4	LK1-5	LK1-COMP	LK5-1	LK5-2
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)			<0.020		
	IACR (CCME)			<0.15		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-51	L2338125-52	L2338125-53	L2338125-54	L2338125-55
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19	16-AUG-19
	Sampled Time	12:15	12:45	13:15		
	Client ID	LK5-3	LK5-4	LK5-5	LK5-COMP	LK8-1
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)				<0.036	
	IACR (CCME)				<0.35	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-56	L2338125-57	L2338125-58	L2338125-59	L2338125-60
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19	17-AUG-19
	Sampled Time					
	Client ID	LK8-2	LK8-3	LK8-4	LK8-5	LK8-COMP
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)					<0.020
	IACR (CCME)					<0.15

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-64	L2338125-65	L2338125-66	L2338125-67	L2338125-68
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19	15-AUG-19
	Sampled Time					
	Client ID	DUP-7	DUP-8	DUP-9	DUP-10	COMP-DUP-1
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	B(a)P Total Potency Equivalent (mg/kg)					<0.020
	IACR (CCME)					<0.15

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2338125-61	L2338125-62	L2338125-63		
	Description	Other	Other	Other		
	Sampled Date	15-AUG-19	15-AUG-19	15-AUG-19		
	Sampled Time					
	Client ID	SWIPE-1	SWIPE-4	SWIPE-5		
Grouping	**Analyte**					
SWAB						
Metals	Aluminum (Al)-Total (ug)	35	27	<20		
	Antimony (Sb)-Total (ug)	<20	<20	<20		
	Arsenic (As)-Total (ug)	<20	<20	<20		
	Barium (Ba)-Total (ug)	1.1	<1.0	<1.0		
	Beryllium (Be)-Total (ug)	<0.50	<0.50	<0.50		
	Bismuth (Bi)-Total (ug)	<20	<20	<20		
	Cadmium (Cd)-Total (ug)	<1.0	<1.0	<1.0		
	Calcium (Ca)-Total (ug)	<200	<200	<200		
	Chromium (Cr)-Total (ug)	19.1	32.8	<2.0		
	Cobalt (Co)-Total (ug)	<1.0	<1.0	<1.0		
	Copper (Cu)-Total (ug)	1.5	<1.0	1.3		
	Iron (Fe)-Total (ug)	155	161	8.5		
	Lead (Pb)-Total (ug)	<0.40	<0.40	<0.40		
	Lithium (Li)-Total (ug)	<1.0	<1.0	<1.0		
	Magnesium (Mg)-Total (ug)	<100	<100	<100		
	Manganese (Mn)-Total (ug)	1.77	3.98	<0.50		
	Mercury (Hg)-Total (ug)	<0.010	<0.010	<0.010		
	Molybdenum (Mo)-Total (ug)	<3.0	<3.0	<3.0		
	Nickel (Ni)-Total (ug)	6.9	7.0	<5.0		
	Phosphorus (P)-Total (ug)	<30	<30	<30		
	Potassium (K)-Total (ug)	<200	<200	<200		
	Selenium (Se)-Total (ug)	<20	<20	<20		
	Silver (Ag)-Total (ug)	<1.0	<1.0	<1.0		
	Sodium (Na)-Total (ug)	<400	<400	<400		
	Strontium (Sr)-Total (ug)	<0.50	<0.50	<0.50		
	Thallium (Tl)-Total (ug)	<20	<20	<20		
	Tin (Sn)-Total (ug)	<3.0	3.8	<3.0		
	Titanium (Ti)-Total (ug)	1.5	<1.0	<1.0		
	Vanadium (V)-Total (ug)	<3.0	<3.0	<3.0		
	Zinc (Zn)-Total (ug)	97.3	98.4	143		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Antimony (Sb)	DUP-H	L2338125-10, -11, -13, -14, -15, -16, -17, -19, -2, -20, -21, -22, -3, -4, -5, -7, -8, -9
Duplicate	Copper (Cu)	DUP-H	L2338125-53, -55, -56, -57, -58, -59
Duplicate	Lead (Pb)	DUP-H	L2338125-53, -55, -56, -57, -58, -59
Duplicate	Lithium (Li)	DUP-H	L2338125-53, -55, -56, -57, -58, -59
Duplicate	Manganese (Mn)	DUP-H	L2338125-46, -47, -49, -50, -51, -52
Duplicate	Nickel (Ni)	DUP-H	L2338125-53, -55, -56, -57, -58, -59
Duplicate	Phosphorus (P)	DUP-H	L2338125-53, -55, -56, -57, -58, -59
Duplicate	Thallium (Tl)	DUP-H	L2338125-53, -55, -56, -57, -58, -59
Duplicate	Titanium (Ti)	DUP-H	L2338125-53, -55, -56, -57, -58, -59
Duplicate	Tungsten (W)	DUP-H	L2338125-53, -55, -56, -57, -58, -59
Duplicate	Zinc (Zn)	DUP-H	L2338125-53, -55, -56, -57, -58, -59
Laboratory Control Sample	Benz(a)anthracene	LCS-ND	L2338125-30, -36, -42, -48, -54, -6, -60
Laboratory Control Sample	Chrysene	LCS-ND	L2338125-30, -36, -42, -48, -54, -6, -60

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
DLHM	Detection Limit Adjusted: Sample has High Moisture Content
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
LCS-ND	Lab Control Sample recovery was slightly outside ALS DQO. Reported non-detect results for associated samples were unaffected.
PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217

A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.

C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2

Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)

C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2

The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.

EPH-TUMB-FID-VA	Soil	EPH in Solids by Tumbler and GCFID	BC MOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Solids by GC/FID", v2.1, July 1999. Soil samples are extracted with a 1:1 mixture of hexane and acetone using a rotary extraction technique modified from EPA 3570 prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)

Soil samples are digested with hot nitric and hydrochloric acids, followed by CVAAS analysis. This method is fully compliant with the BC SALM strong acid leachable metals digestion method.

HG-UG-CVAF-VA	Swab	Mercury in Swab by CVAFS	NIOSH 7303/EPA 245.7

This analysis is carried out using procedures adapted from Method 7303 in the NIOSH Manual of Analytcial Methods (NMAM). The procedure involves a hot block digestion of the swab material, using a combination of nitric acid and hydrochloric acid. Instrumental analysis of the swab extract is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO3 Equivalent	Calculation
LEPH/HEPH-CALC-VA	Soil	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHs and HEPHs are measures of Light and Heavy Extractable Petroleum Hydrocarbons in soil. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHs = EPH10-19 minus Naphthalene and Phenanthrene.

HEPHs = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, and Pyrene.

Reference Information

MEHG-GCAF-VA Soil Methylmercury in Soil by GCAFS DeWild et al. (2004)

This method follows procedures published by DeWild, Olund, Olsen and Tate (2004) for the US Geological Survey (Techniques and Methods 5A-7). Samples are leached with an acidic copper sulphate solution to solubilize methylmercury for inorganic complexes. The methylmercury is then extracted into dichloromethane and then an aliquot is back extracted into ultra-pure water. The extract is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg".

MET-200.2-CCMS-VA Soil Metals in Soil by CRC ICPMS EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H_2S) may be excluded if lost during sampling, storage, or digestion.

MET-UG-CCMS-VA Swab Metals in Swab by CRC ICPMS NIOSH 7303/EPA 6020B (mod)

This analysis is carried out using procedures adapted from Method 7303 in the NIOSH Manual of Analytcial Methods . The swab material is digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

MOISTURE-VA Soil Moisture content CCME PHC in Soil - Tier 1 (mod)

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of two hours.

OGG-TUMB-SG-VA Soil Mineral Oil & Grease in Soil CCME PETROLEUM HYDROCARBONS-GRAVIMETRIC

This analysis is carried out in accordance with the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." A subsample of the sediment/soil is extracted with 1:1 hexane:acetone using a rotary extraction apparatus. The extract undergoes a silica-gel clean-up to remove polar compounds, and is analyzed gravimetrically. Mineral Oil and Grease is equivalent to fraction F4G of the Canada-wide Standard for Petroleum Hydrocarbons.

Accuracy target values for Reference Materials used in this method are derived from averages of long-term method performance, as certified values do not exist for the reported parameters.

PAH-TMB-H/A-MS-VA Soil PAH - Rotary Extraction (Hexane/Acetone) EPA 3570/8270

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3570 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses a mechanical shaking technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation. Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

Benzo(a)pyrene Total Potency Equivalents [B(a)P TPE] represents the sum of estimated cancer potency relative to B(a)P for all potentially carcinogenic unsubstituted PAHs, and is calculated as per the CCME PAH Soil Quality Guidelines reference document (2010).

PH-1:2-VA Soil pH in Soil (1:2 Soil:Water Extraction) BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in "pH, Electrometric in Soil and Sediment - Prescriptive Method", Rev. 2005, Section B Physical, Inorganic and Misc. Constituents, BC Environmental Laboratory Manual. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

PSA-PIPET+GRAVEL-SK Soil Particle size - Sieve and Pipette SSIR-51 METHOD 3.2.1

Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

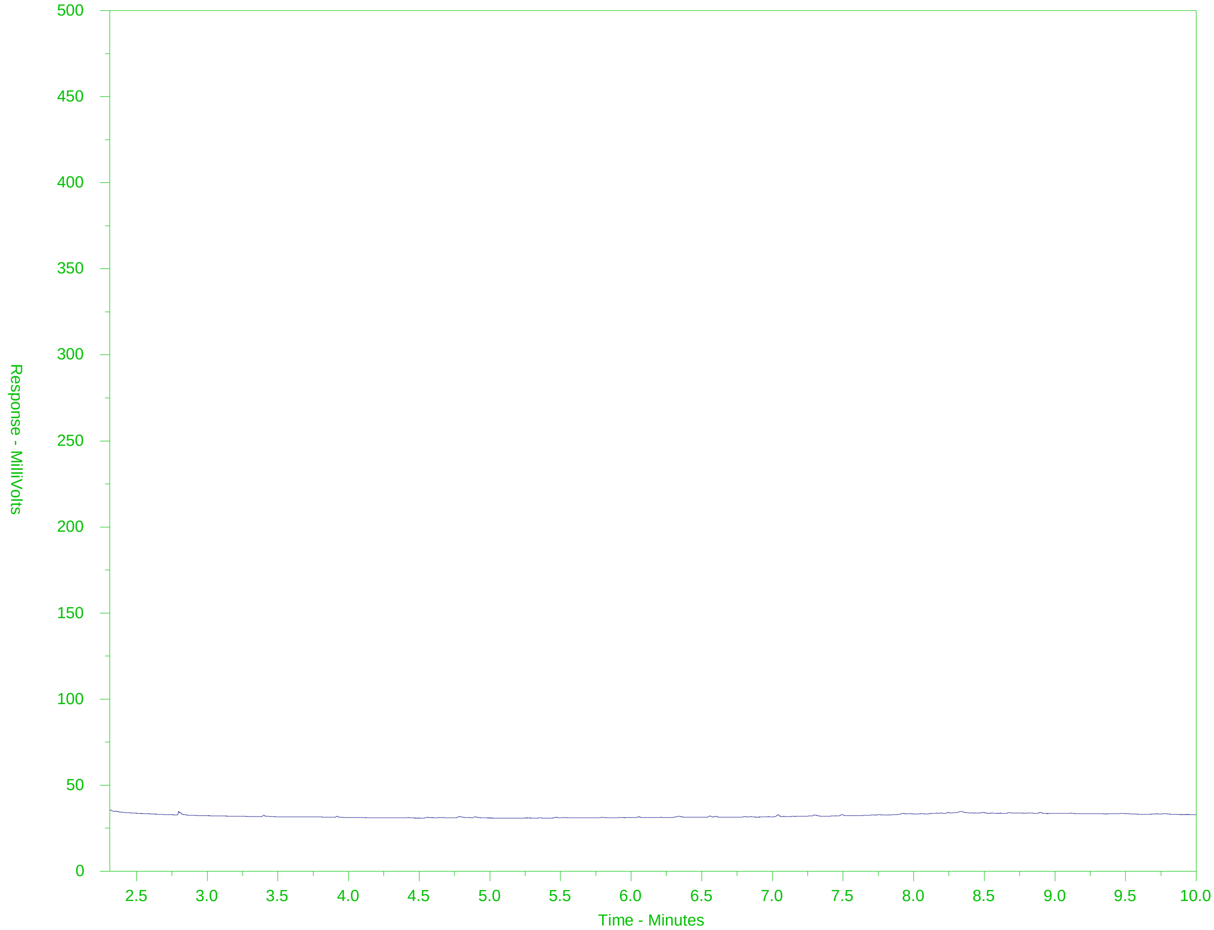
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2338125-6
Client Sample ID: INUG-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

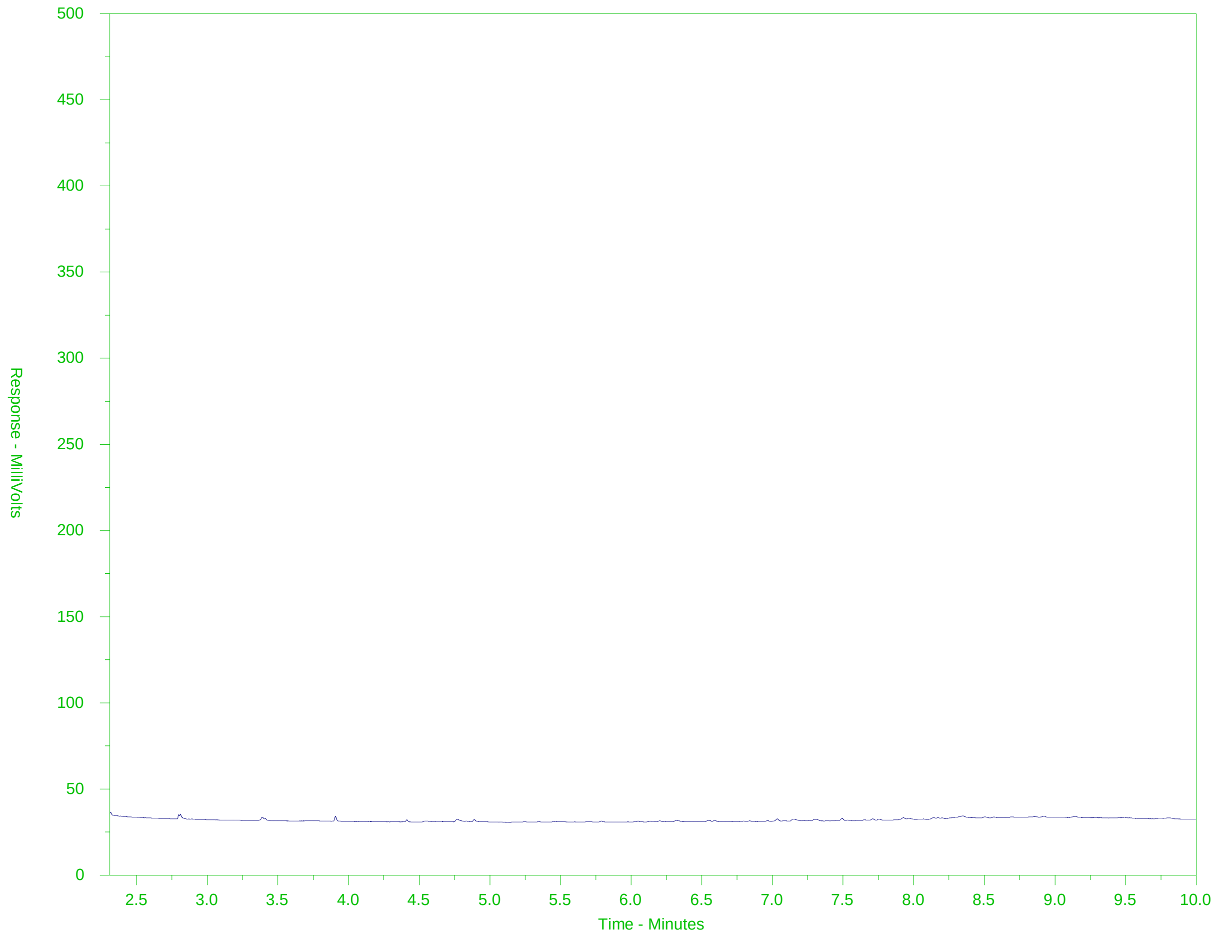
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2338125-12
Client Sample ID: WTS-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

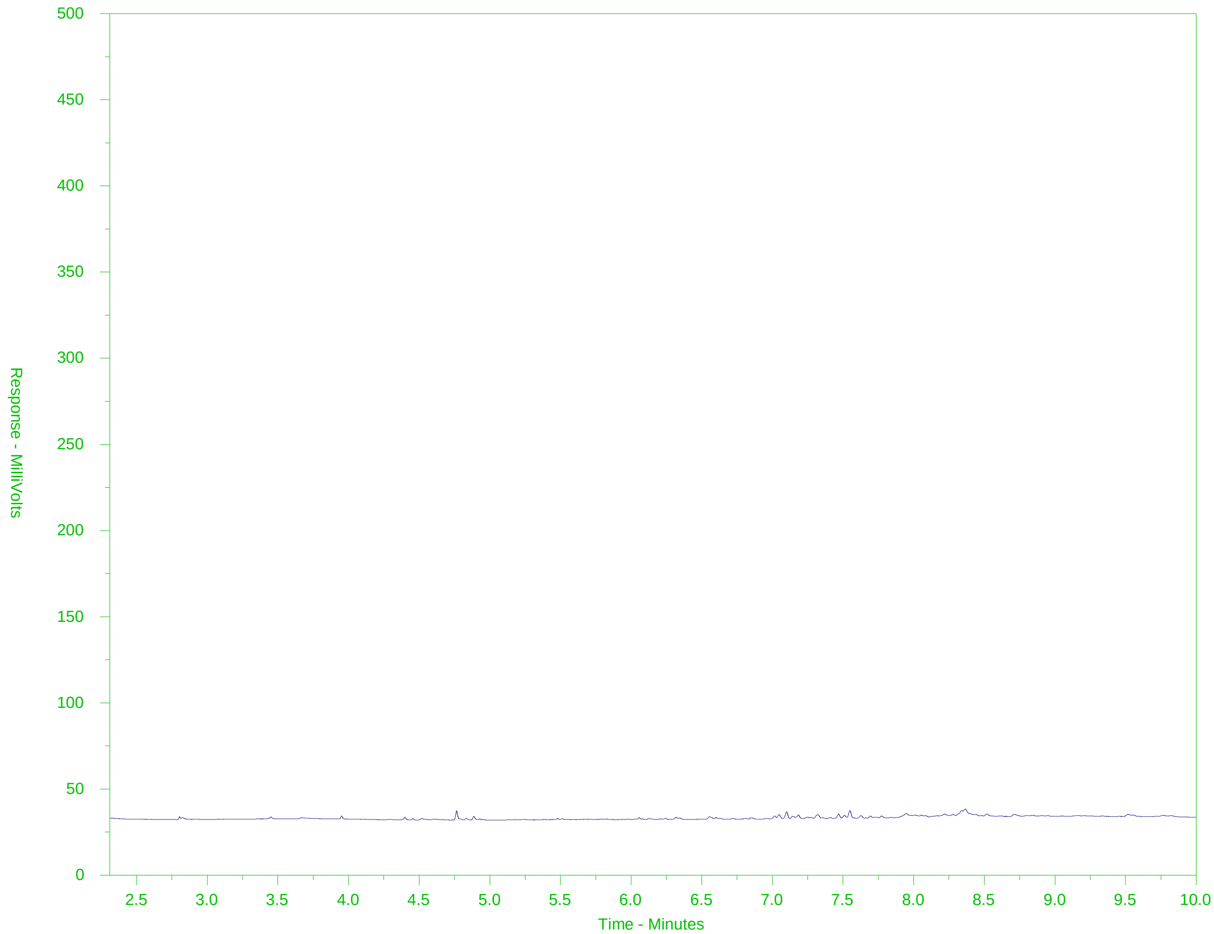
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2338125-18
Client Sample ID: NEM-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

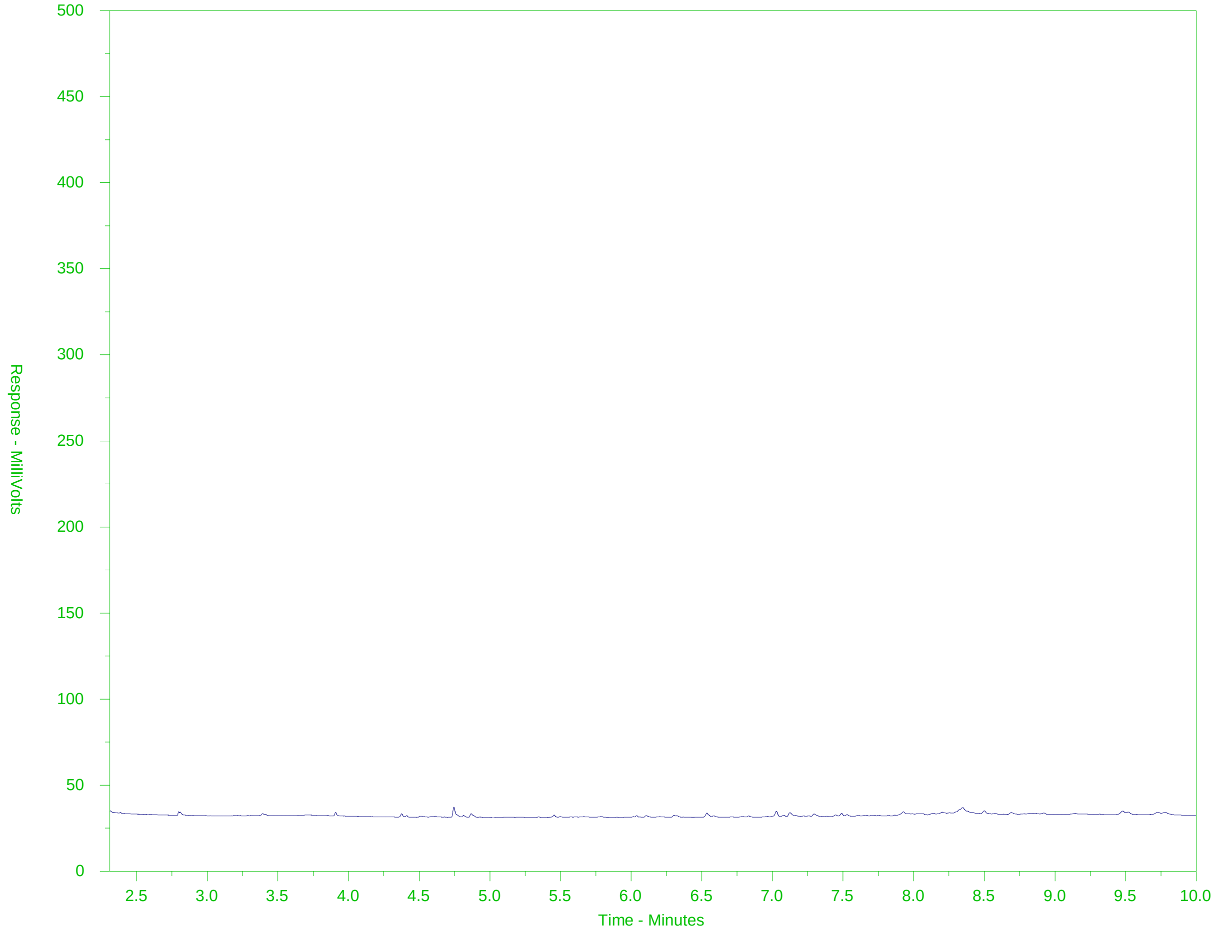
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2338125-24
Client Sample ID: MAM-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

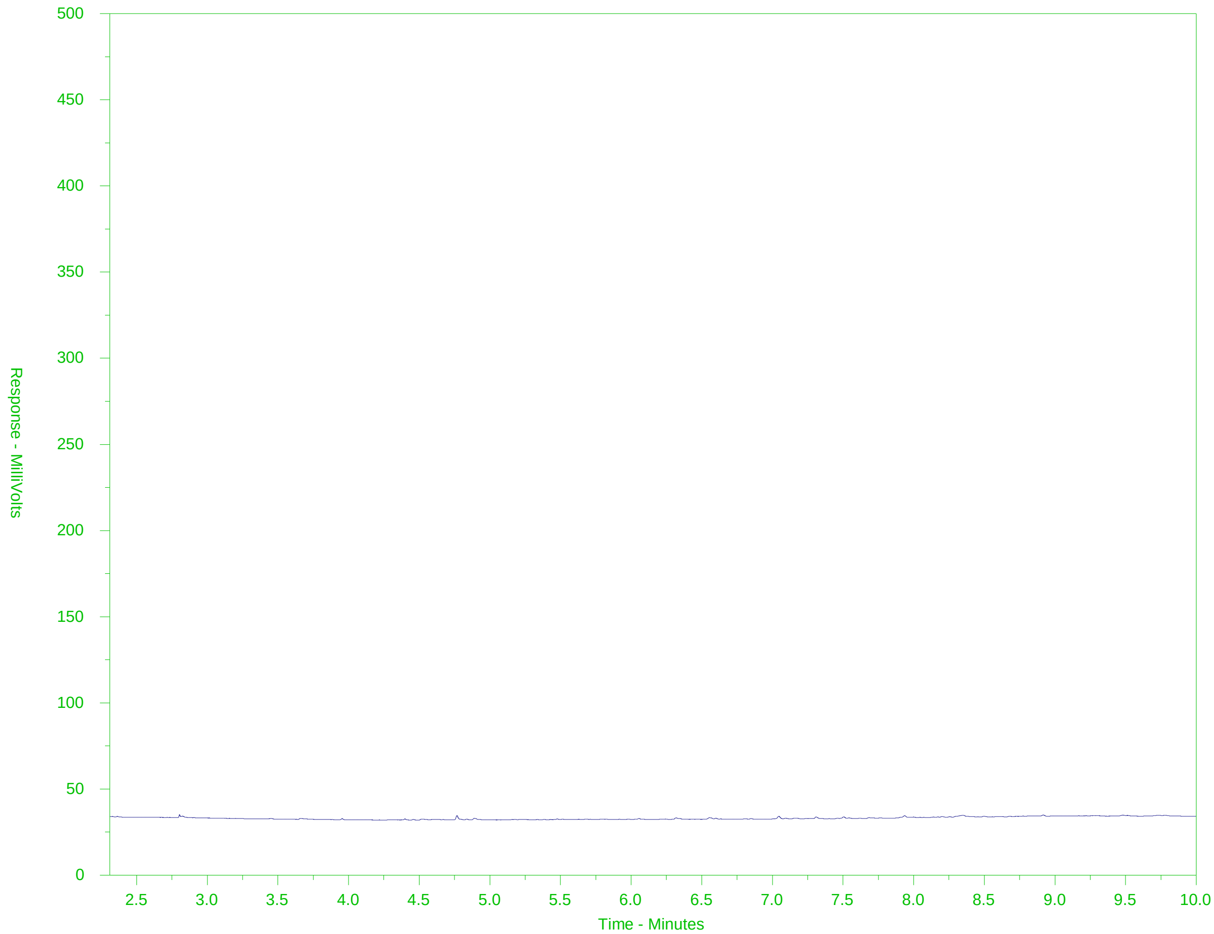
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2338125-30
Client Sample ID: A20-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

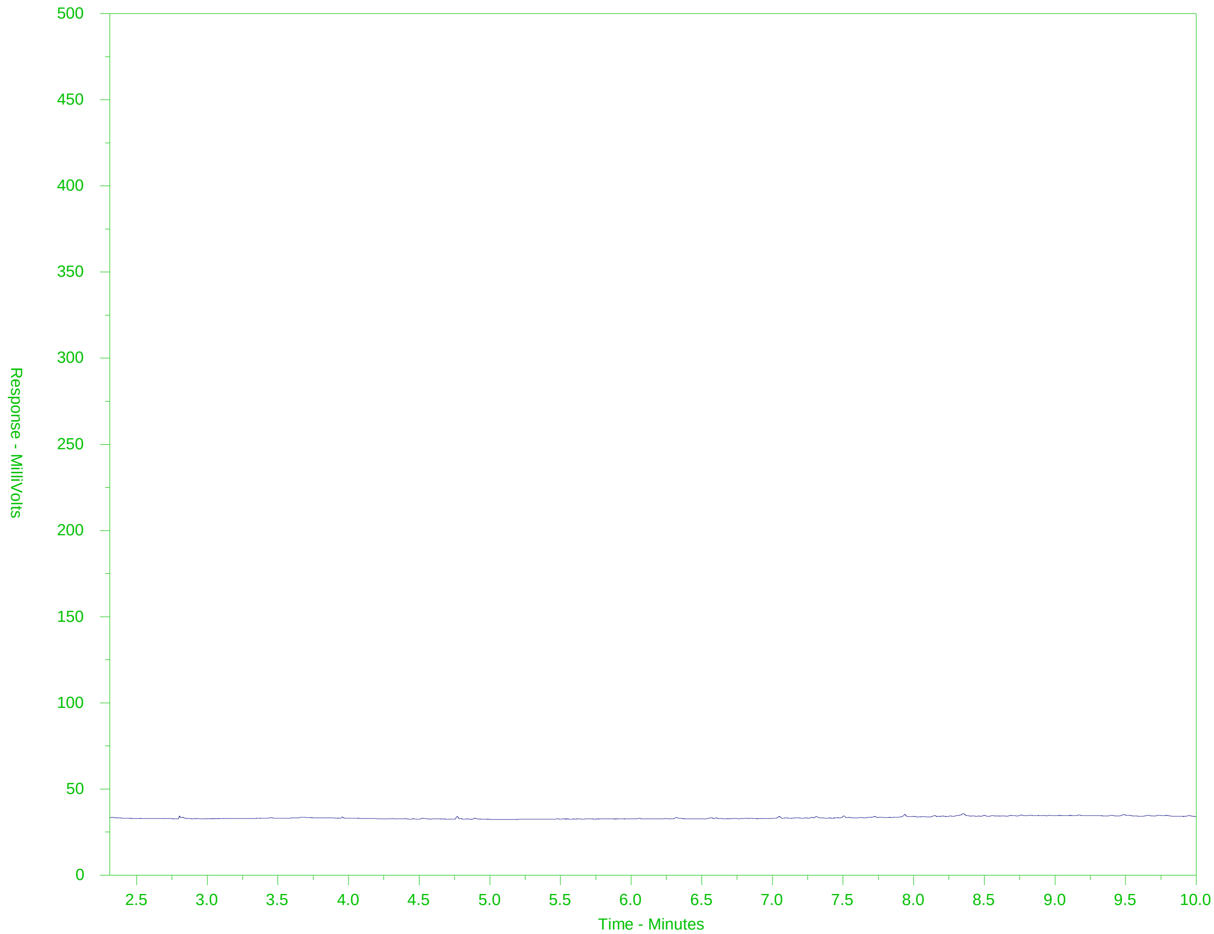
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2338125-36
Client Sample ID: A76-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

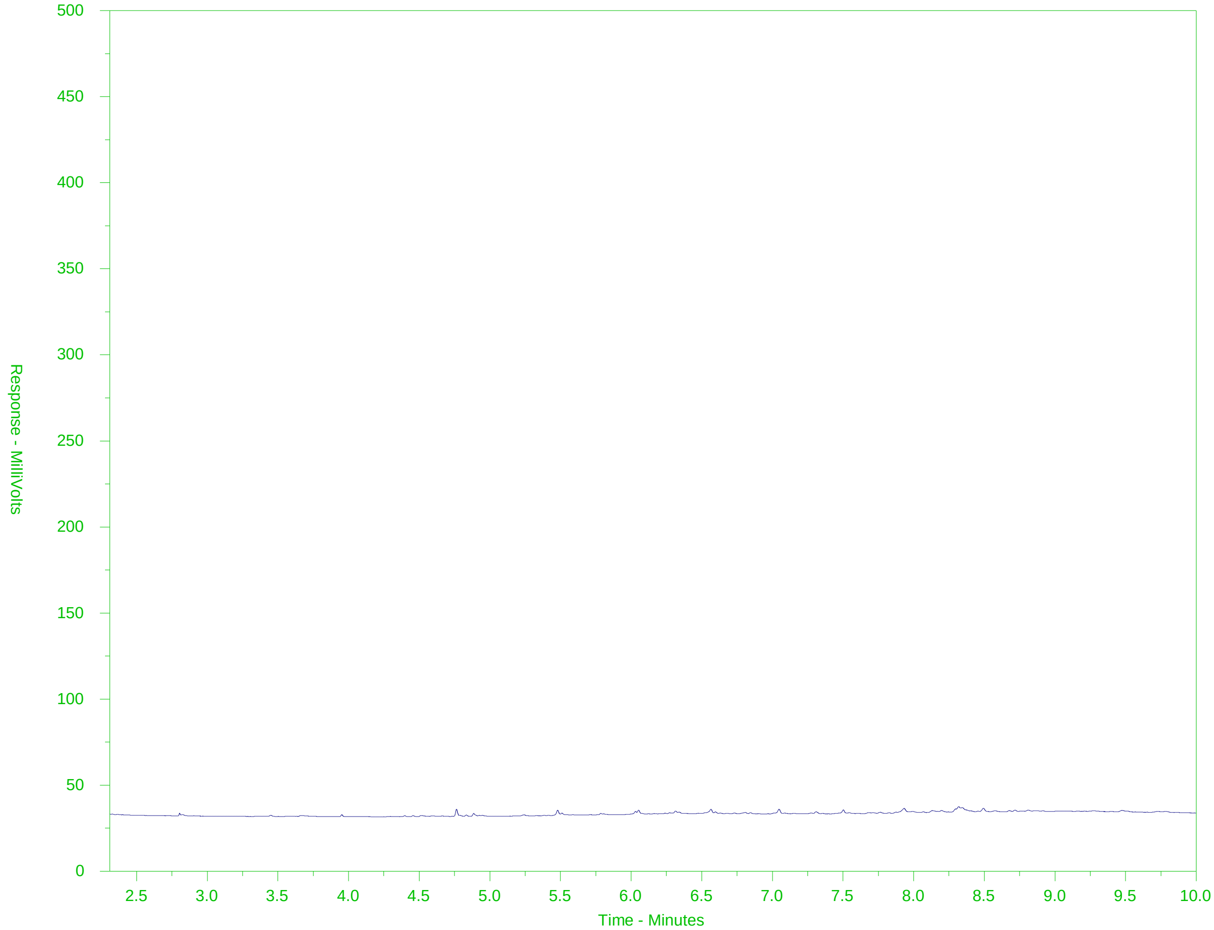
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2338125-42
Client Sample ID: DS1-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

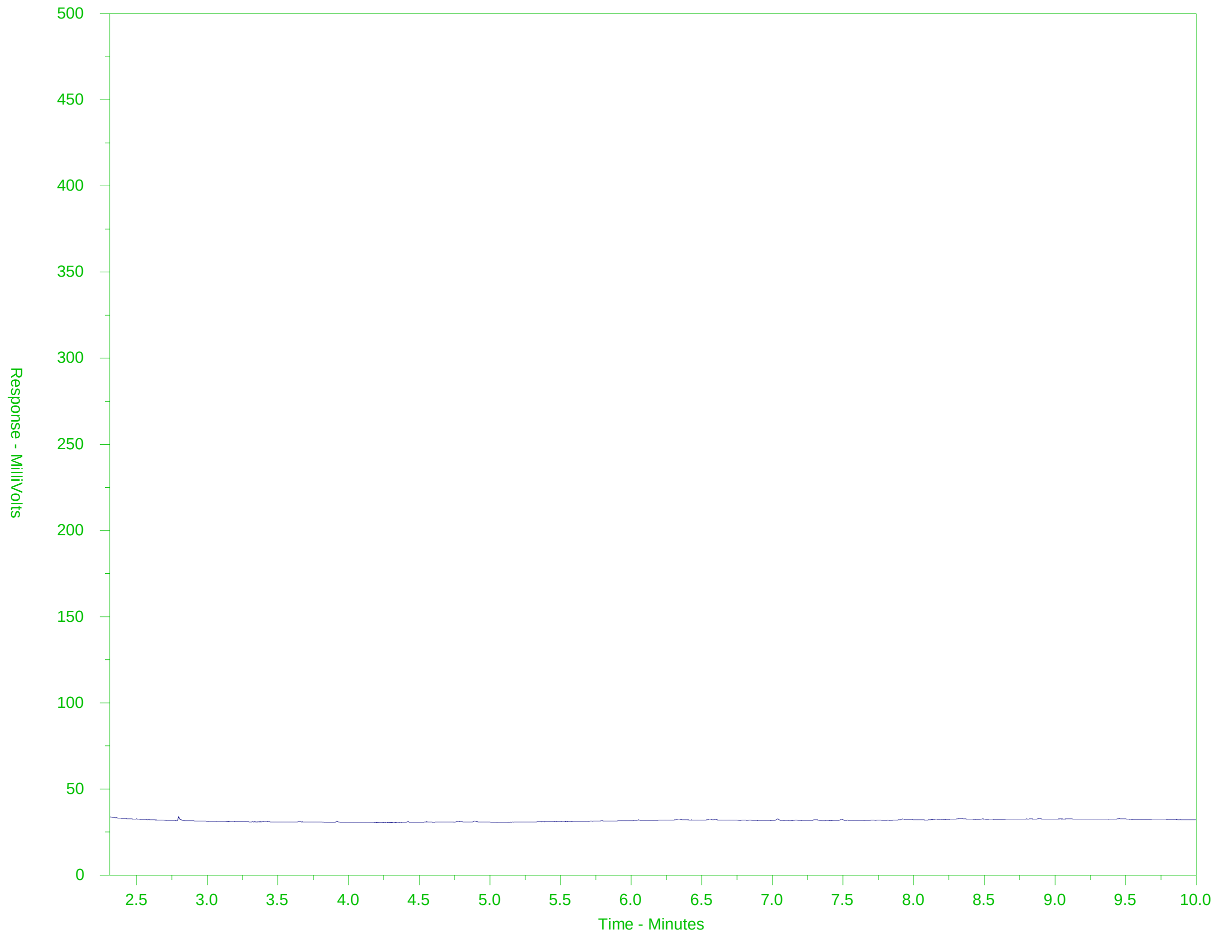
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2338125-48
Client Sample ID: LK1-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

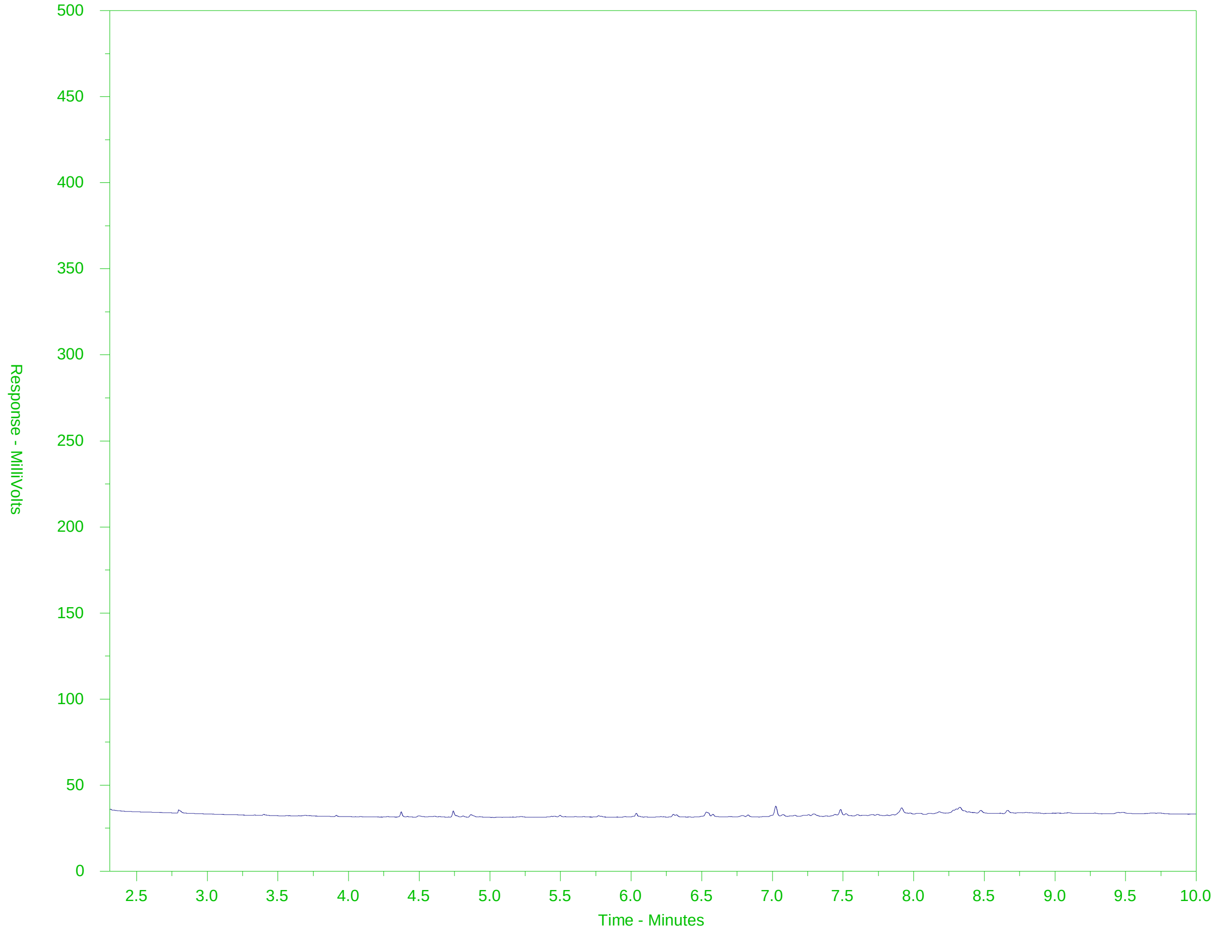
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2338125-54
Client Sample ID: LK5-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

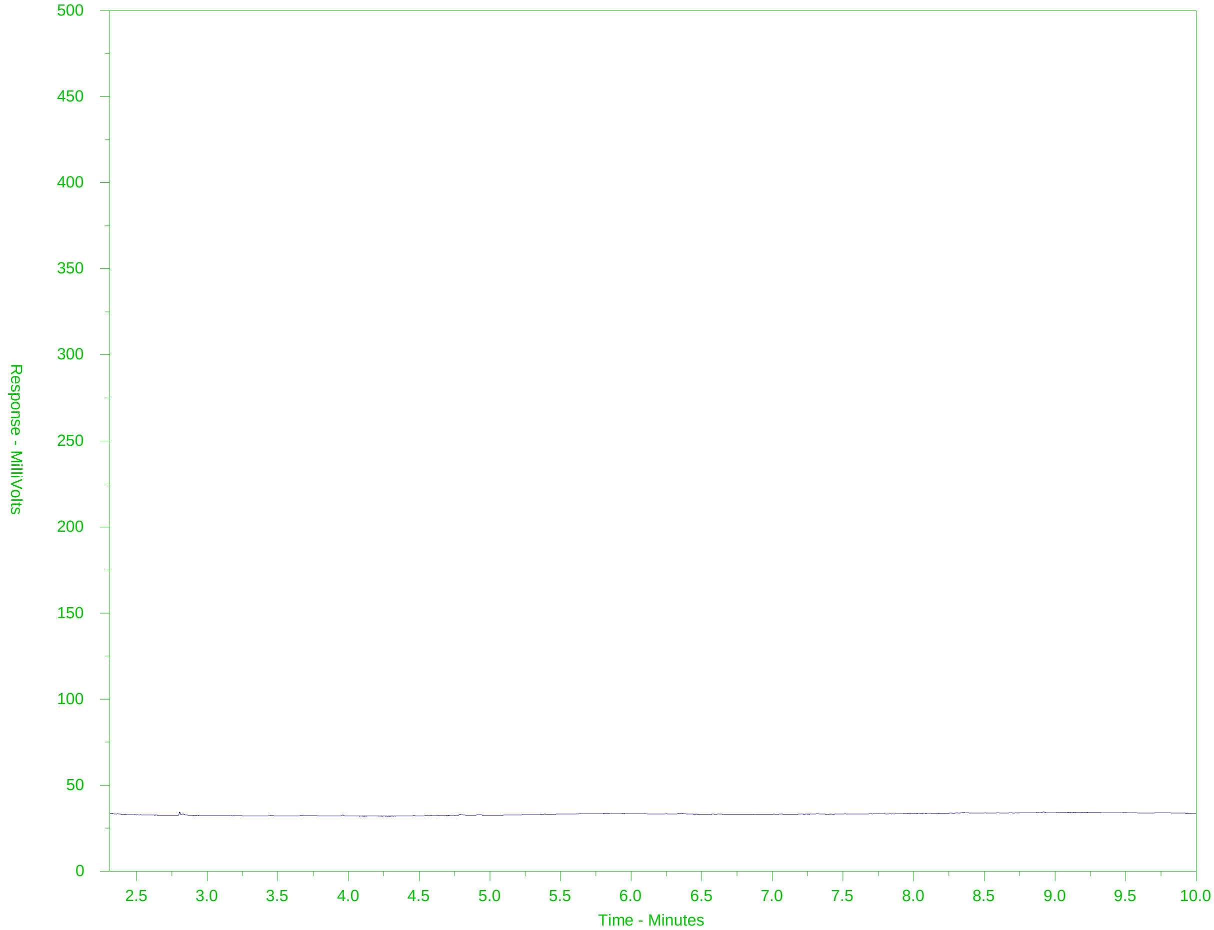
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2338125-60
Client Sample ID: LK8-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

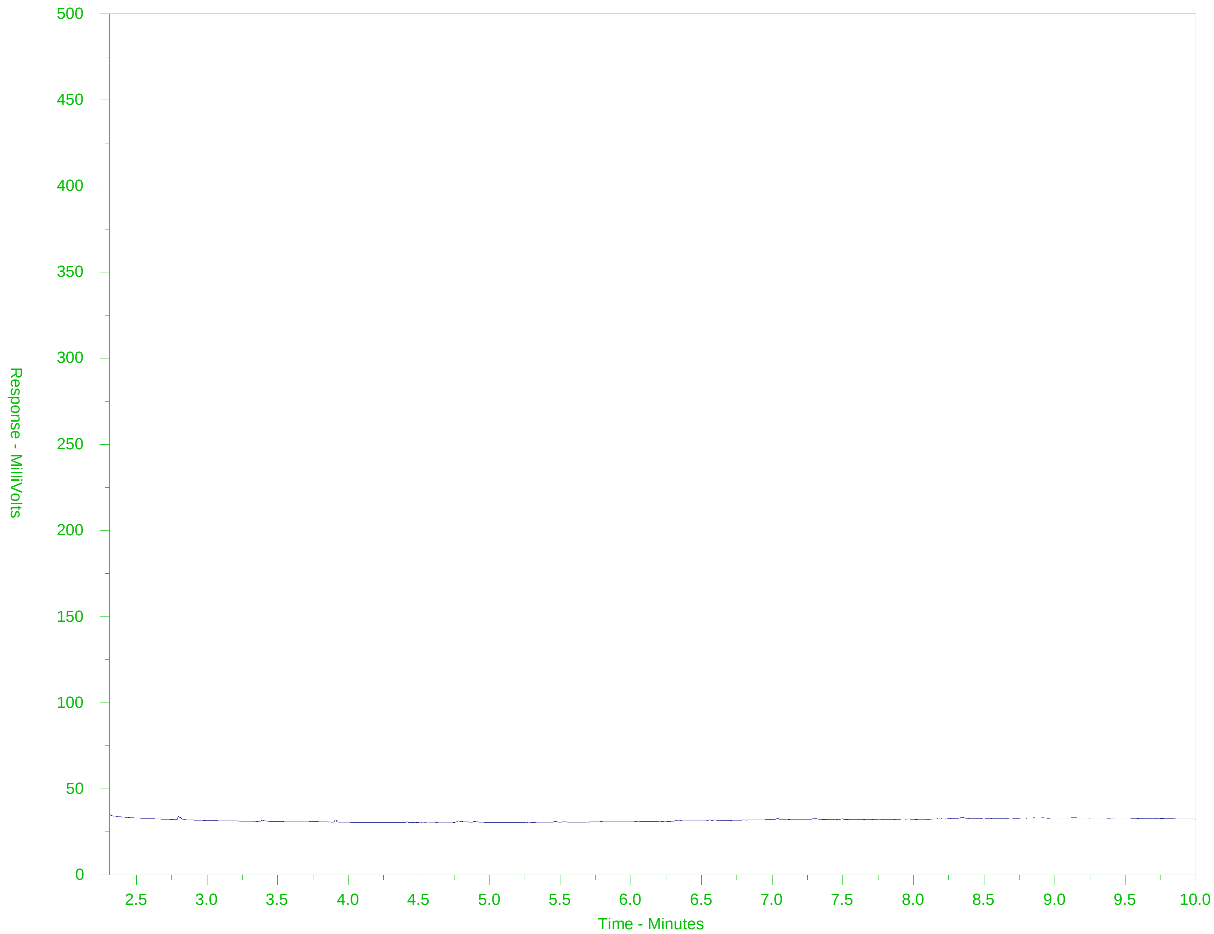
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2338125-68
Client Sample ID: COMP-DUP-1



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

L2338125-COFC

ALS Environmental

of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To		**Report Format / Distribution**	
Company:	Azimuth Consulting Group	☐ Standard ☐ Other	
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	CREMP Sediment
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q38011
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: Azimuth

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG									Number of Containers
	SWIPE-1	15-Aug-19	-	Other	X												1
	SWIPE-4	-	-	Other	X												1
	SWIPE-5	15-Aug-19	-	Other	X												1
	DUP-7	-	-	Sediment	X	X	X										3
	DUP-8	-	-	Sediment	X	X	X										3
	DUP-9	-	-	Sediment	X	X	X										3
	DUP-10	-	-	Sediment	X	X	X										3
	COMP-DUP-1	-	-	Sediment				X									1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

SWIPE-5 = blank

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JG	Date: 27Aug19	Time: 8:50AM	Temperature: 21 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

ALS Environn

L2338125-COFC

ıain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

...t Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	mfinley@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	CREMP Sediment
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Azimuth

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG	Number of Containers
	LK5-1	16-Aug-19	11:30	Sediment	X	X	X		3
	LK5-2	16-Aug-19	11:50	Sediment	X	X	X		3
	LK5-3	16-Aug-19	12:15	Sediment	X	X	X		3
	LK5-4	16-Aug-19	12:45	Sediment	X	X	X		3
	LK5-5	16-Aug-19	13:15	Sediment	X	X	X		3
	LK5-COMP	16-Aug-19	-	Sediment				X	1
	LK8-1	16-Aug-19	-	Sediment	X	X	X		3
	LK8-2	17-Aug-19	-	Sediment	X	X	X		3
	LK8-3	17-Aug-19	-	Sediment	X	X	X		3
	LK8-4	17-Aug-19	-	Sediment	X	X	X		3
	LK8-5	17-Aug-19	-	Sediment	X	X	X		3
	LK8-COMP	17-Aug-19	-	Sediment				X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JG	Date: 29Aug19	Time: 8:50AM	Temperature: 21 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

ALS Environmental

L2338125-COFC

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☐ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	CREMP Sediment	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q38011	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: Azimuth

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG									Number of Containers
	A20-1	16-Aug-19	-	Sediment	X	X	X										3
	A20-2	16-Aug-19	-	Sediment	X	X	X										3
	A20-3	16-Aug-19	-	Sediment	X	X	X										3
	A20-4	16-Aug-19	-	Sediment	X	X	X										3
	A20-5	16-Aug-19	-	Sediment	X	X	X										3
	A20-COMP	16-Aug-19	-	Sediment				X									1
	A76-1	15-Aug-19	-	Sediment	X	X	X										3
	A76-2	15-Aug-19	-	Sediment	X	X	X										3
	A76-3	15-Aug-19	-	Sediment	X	X	X										3
	A76-4	15-Aug-19	-	Sediment	X	X	X										3
	A76-5	15-Aug-19	-	Sediment	X	X	X										3
	A76-COMP	15-Aug-19	-	Sediment				X									1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
			TK	29Aug19	8:50 AM	21 °C				

ALS Environm

L2338125-COFC

in of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To		Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☐ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Analysis Request
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	CREMP Sediment	Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q38011	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: Azimuth

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG									Number of Containers
	DS1-1	17-Aug-19	-	Sediment	X	X	X										3
	DS1-2	17-Aug-19	-	Sediment	X	X	X										3
	DS1-3	17-Aug-19	-	Sediment	X	X	X										3
	DS1-4	17-Aug-19	-	Sediment	X	X	X										3
	DS1-5	17-Aug-19	-	Sediment	X	X	X										3
	DS1-COMP	17-Aug-19	-	Sediment				X									1
	LK1-1	17-Aug-19	-	Sediment	X	X	X										3
	LK1-2	17-Aug-19	-	Sediment	X	X	X										3
	LK1-3	17-Aug-19	-	Sediment	X	X	X										3
	LK1-4	17-Aug-19	14:50	Sediment	X	X	X										3
	LK1-5	17-Aug-19	15:15	Sediment	X	X	X										3
	LK1-COMP	17-Aug-19	-	Sediment				X									1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JG	Date: 29 Aug 19	Time: 8:50AM	Temperature: 2°C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L2338125-COFC

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☐ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	mfinley@azimuthgroup.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	CREMP Sediment	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q38011	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: Azimuth

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG									Number of Containers
	NEM-1	18-Aug-19	15:45	Sediment	X	X	X										3
	NEM-2	18-Aug-19	16:05	Sediment	X	X	X										3
	NEM-3	18-Aug-19	16:35	Sediment	X	X	X										3
	NEM-4	18-Aug-19	17:15	Sediment	X	X	X										3
	NEM-5	18-Aug-19	18:00	Sediment	X	X	X										3
	NEM-COMP	18-Aug-19	-	Sediment				X									1
	MAM-1	19-Aug-19	11:06	Sediment	X	X	X										3
	MAM-2	19-Aug-19	-	Sediment	X	X	X										3
	MAM-3	19-Aug-19	-	Sediment	X	X	X										3
	MAM-4	19-Aug-19	-	Sediment	X	X	X										3
	MAM-5	19-Aug-19	-	Sediment	X	X	X										3
	MAM-COMP	19-Aug-19	-	Sediment				X									1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by: JG	Date: 29Aug19	Time: 8:50AM	Temperature: 21 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

ALS Environmental

L2338125-COFC

...ustody / Analytical Request Form
...da Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

... Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	mfinley@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	CREMP Sediment
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Azimuth

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Grain size	PAHs, LEPHs, HEPHs, MOG									Number of Containers
	INUG-1	15-Aug-19	11:15	Sediment	X	X	X										3
	INUG-2	15-Aug-19	12:10	Sediment	X	X	X										3
	INUG-3	15-Aug-19	12:35	Sediment	X	X	X										3
	INUG-4	15-Aug-19	13:15	Sediment	X	X	X										3
	INUG-5	15-Aug-19	13:40	Sediment	X	X	X										3
	INUG-COMP	15-Aug-19	-	Sediment				X									1
	WTS-1	18-Aug-19	16:40	Sediment	X	X	X										3
	WTS-2	18-Aug-19	-	Sediment	X	X	X										3
	WTS-3	18-Aug-19	-	Sediment	X	X	X										3
	WTS-4	18-Aug-19	-	Sediment	X	X	X										3
	WTS-5	18-Aug-19	-	Sediment	X	X	X										3
	WTS-COMP	18-Aug-19	-	Sediment				X									1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Homogenize the sediment from each of the 3 jars before subsampling for metals, TOC, and PSA.

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Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy) 22-Aug-19	Time (hh-mm) 8:00	Received by: JG	Date: 29Aug19	Time: 8:50AM	Temperature: 21 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 17-SEP-19
Report Date: 01-OCT-19 12:02 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2348992

Project P.O. #:	NOT SUBMITTED
Job Reference:	MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:	
Legal Site Desc:	

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2348992-1	L2348992-2	L2348992-3	L2348992-4	L2348992-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	07-SEP-19	07-SEP-19	07-SEP-19	07-SEP-19	08-SEP-19
	Sampled Time	09:45	10:18	16:20	17:00	15:00
	Client ID	LK8-15	LK8-16	DS1-37	DS1-38	A76-39
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	13.5	13.4	20.5	21.4	43.7
	Hardness (as CaCO3) (mg/L)	5.02	5.12	7.40	8.66	15.2
	pH (pH)	6.84	6.82	6.84	7.00	6.96
	Total Suspended Solids (mg/L)	<1.0	<1.0	1.1	<1.0	<1.0
	Total Dissolved Solids (mg/L)	9.4	9.5	20.7	19.2	33
	Turbidity (NTU)	0.18	0.16	0.75	0.60	0.13
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	4.3	4.7	5.6	7.4	6.1
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	4.3	4.7	5.6	7.4	6.1
	Ammonia, Total (as N) (mg/L)	0.156	0.0321	<0.0050	0.0053	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	0.073
	Chloride (Cl) (mg/L)	0.60	0.59	1.77	1.18	6.63
	Fluoride (F) (mg/L)	0.031	0.031	0.047	0.059	0.033
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.282	0.125	0.164	0.161	0.122
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	0.0033	0.0033	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0020	0.0132	0.0051	0.0021
	Silicate (as SiO2) (mg/L)	0.63	0.63	1.19	0.88	0.99
	Sulfate (SO4) (mg/L)	1.58	1.47	1.56	1.30	3.89
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.74	1.78	3.10	3.50	1.80
	Total Organic Carbon (mg/L)	1.86	1.83	3.09	3.68	1.85
Total Metals	Aluminum (Al)-Total (mg/L)	0.0085	0.0069	0.0283	0.0292	0.0048
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00016	0.00017	0.00017	0.00026	0.00024
	Barium (Ba)-Total (mg/L)	0.00243	0.00244	0.00379	0.00391	0.00797
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	1.15	1.08	1.97	2.08	4.23
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2348992-6	L2348992-7	L2348992-8	L2348992-9	L2348992-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	08-SEP-19	09-SEP-19	09-SEP-19	09-SEP-19	09-SEP-19
	Sampled Time	15:40	10:22	09:40	16:15	15:40
	Client ID	A76-40	LK5-15	LK5-16	LK1-15	LK1-16
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	42.4	27.0	26.9	15.3	15.3
	Hardness (as CaCO3) (mg/L)	14.9	10.4	11.0	5.40	5.26
	pH (pH)	6.96	7.21	7.26	6.91	6.91
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	1.1	<1.0
	Total Dissolved Solids (mg/L)	30.0	19.4	18.0	13.0	11.8
	Turbidity (NTU)	0.12	0.22	0.18	0.46	0.45
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	6.1	8.8	9.1	4.4	4.2
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	6.1	8.8	9.1	4.4	4.2
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0077	0.133	0.0051	<0.0050
	Bromide (Br) (mg/L)	0.067	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	6.33	0.69	0.68	0.75	0.75
	Fluoride (F) (mg/L)	0.032	0.039	0.039	0.043	0.043
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.090	0.130	0.279	0.154	0.126
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	0.0028	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0025	0.0032	0.0026	0.0112	0.0031
	Silicate (as SiO2) (mg/L)	0.93	1.01	0.98	0.55	0.57
	Sulfate (SO4) (mg/L)	3.80	2.13	2.12	1.08	1.09
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.64	2.08	2.17	2.28	2.15
	Total Organic Carbon (mg/L)	1.84	2.14	2.19	2.23	2.03
Total Metals	Aluminum (Al)-Total (mg/L)	0.0046	0.0055	0.0078	0.0227	0.0177
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00023	0.00020	0.00020	0.00014	0.00015
	Barium (Ba)-Total (mg/L)	0.00791	0.00274	0.00279	0.00307	0.00306
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	4.28	2.53	2.51	1.26	1.25
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2348992-1	L2348992-2	L2348992-3	L2348992-4	L2348992-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	07-SEP-19	07-SEP-19	07-SEP-19	07-SEP-19	08-SEP-19
	Sampled Time	09:45	10:18	16:20	17:00	15:00
	Client ID	LK8-15	LK8-16	DS1-37	DS1-38	A76-39
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00013	<0.00010	0.00013	0.00014	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00054	<0.00050
	Iron (Fe)-Total (mg/L)	0.014	0.011	0.073	0.107	0.011
	Lead (Pb)-Total (mg/L)	0.000053	<0.000050	<0.000050	0.000062	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	0.602	0.591	0.609	0.862	1.20
	Manganese (Mn)-Total (mg/L)	0.00141	0.00131	0.00149	0.00317	0.00120
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00060
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.318	0.312	0.391	0.319	0.762
	Rubidium (Rb)-Total (mg/L)	0.00054	0.00053	0.00057	0.00057	0.00113
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.32	0.31	0.60	0.45	0.47
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.484	0.462	0.901	0.720	0.695
	Strontium (Sr)-Total (mg/L)	0.00530	0.00513	0.00947	0.00779	0.0244
	Sulfur (S)-Total (mg/L)	0.79	0.79	0.77	0.60	1.53
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	0.00054	0.00059	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000020	0.000019	0.000060	0.000072	0.000021
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0037	0.0035	0.0101	0.0124	0.0012
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00011	0.00011	0.00010	0.00018	0.00019
	Barium (Ba)-Dissolved (mg/L)	0.00225	0.00224	0.00344	0.00364	0.00771
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2348992-6	L2348992-7	L2348992-8	L2348992-9	L2348992-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	08-SEP-19	09-SEP-19	09-SEP-19	09-SEP-19	09-SEP-19
	Sampled Time	15:40	10:22	09:40	16:15	15:40
	Client ID	A76-40	LK5-15	LK5-16	LK1-15	LK1-16
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	0.00011	0.00014	0.00011	0.00012
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.010	0.018	0.020	0.037	0.030
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.20	1.07	1.07	0.542	0.536
	Manganese (Mn)-Total (mg/L)	0.00123	0.00188	0.00194	0.00253	0.00249
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.768	0.321	0.325	0.281	0.274
	Rubidium (Rb)-Total (mg/L)	0.00108	0.00040	0.00037	0.00042	0.00039
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.46	0.48	0.48	0.32	0.28
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.699	0.614	0.618	0.587	0.570
	Strontium (Sr)-Total (mg/L)	0.0239	0.00943	0.00980	0.00715	0.00714
	Sulfur (S)-Total (mg/L)	1.48	1.13	0.90	0.71	0.61
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	0.00067	0.00048
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000018	0.000022	0.000023	0.000066	0.000060
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0037	0.0064	0.0031	0.0096	0.0051
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00017	0.00018	0.00016	0.00011	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.00751	0.00281	0.00271	0.00307	0.00285
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2348992-1	L2348992-2	L2348992-3	L2348992-4	L2348992-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	07-SEP-19	07-SEP-19	07-SEP-19	07-SEP-19	08-SEP-19
	Sampled Time	09:45	10:18	16:20	17:00	15:00
	Client ID	LK8-15	LK8-16	DS1-37	DS1-38	A76-39
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	1.03	1.04	1.95	2.02	4.06
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00040	0.00038	0.00041	0.00049	0.00033
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.028	0.054	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.592	0.612	0.613	0.878	1.24
	Manganese (Mn)-Dissolved (mg/L)	0.00035	0.00029	0.00056	0.00042	0.00054
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00052
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.304	0.310	0.380	0.306	0.809
	Rubidium (Rb)-Dissolved (mg/L)	0.00060	0.00058	0.00051	0.00055	0.00124
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.314	0.290	0.538	0.442	0.460
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.461	0.469	0.924	0.737	0.723
	Strontium (Sr)-Dissolved (mg/L)	0.00527	0.00517	0.00995	0.00788	0.0261
	Sulfur (S)-Dissolved (mg/L)	<0.50	0.59	0.60	<0.50	1.27
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000021	0.000020	0.000061	0.000072	0.000018
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)	<0.020		<0.020		<0.020
	Arsenite (As III) (ug/L)	0.047		0.021		0.095

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2348992-6 Water 08-SEP-19 15:40 A76-40	L2348992-7 Water 09-SEP-19 10:22 LK5-15	L2348992-8 Water 09-SEP-19 09:40 LK5-16	L2348992-9 Water 09-SEP-19 16:15 LK1-15	L2348992-10 Water 09-SEP-19 15:40 LK1-16
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	3.94	2.40	2.51	1.25	1.21
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00011	0.00010	0.00015	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00035	0.00029	0.00025	0.00029	0.00027
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.011	<0.010	0.013	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	DTMF 0.000226	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.22	1.07	1.14	0.555	0.540
	Manganese (Mn)-Dissolved (mg/L)	0.00054	0.00042	0.00040	0.00077	0.00049
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	0.00054	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.795	0.315	0.342	0.284	0.269
	Rubidium (Rb)-Dissolved (mg/L)	0.00125	0.00042	0.00039	0.00038	0.00036
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	0.000055	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.439	0.421	0.478	0.257	0.249
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.707	0.611	0.685	0.601	0.566
	Strontium (Sr)-Dissolved (mg/L)	0.0258	0.0102	0.00958	0.00724	0.00702
	Sulfur (S)-Dissolved (mg/L)	1.24	0.74	1.13	0.79	0.60
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	0.00059	<0.00030	0.00033	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000019	0.000023	0.000020	0.000054	0.000054
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0012	<0.0010	0.0027	0.0015
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)		<0.020		<0.020	
	Arsenite (As III) (ug/L)		0.053		<0.020	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2348992-1	L2348992-2	L2348992-3	L2348992-4	L2348992-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	07-SEP-19	07-SEP-19	07-SEP-19	07-SEP-19	08-SEP-19
	Sampled Time	09:45	10:18	16:20	17:00	15:00
	Client ID	LK8-15	LK8-16	DS1-37	DS1-38	A76-39
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	<0.020		<0.020		<0.020
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020		<0.020		<0.020
	Arsenobetaine (AsB, as As) (ug/L)	<0.050		<0.050		<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2348992-6	L2348992-7	L2348992-8	L2348992-9	L2348992-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	08-SEP-19	09-SEP-19	09-SEP-19	09-SEP-19	09-SEP-19
	Sampled Time	15:40	10:22	09:40	16:15	15:40
	Client ID	A76-40	LK5-15	LK5-16	LK1-15	LK1-16
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)		<0.020		<0.020	
	Monomethylarsonic Acid (MMA, as As) (ug/L)		<0.020		<0.020	
	Arsenobetaine (AsB, as As) (ug/L)		<0.050		<0.050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Total	MS-B	L2348992-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Total	MS-B	L2348992-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Silicate (as SiO2)	MS-B	L2348992-1, -10, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Reference Information

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

Reference Information

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L2348992-COFC

COC # ______________

Page 1 of 1

ALS Environmental

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☑ Standard		Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		◯ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	◯ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com	◯ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q39503	
Lab Work Order # (lab use only)	[redacted]	ALS Contact:	Brent Mack	Sampler: Eric Franz

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a	Arsenic speciation		Number of Containers
							P	F/P	P	P	F/P	P	F/P	F	F/P		
[redacted]	LK8-15	07-Sep-19	9:45	water	x	x	x	x	x	x	x	x	x		X		10
[redacted]	LK8-16	07-Sep-19	10:18	Water	x	x	x	x	x	x	x	x	x				9
[redacted]	DS1-37	07-Sep-19	16:20	Water	x	x	x	x	x	x	x	x	x		X		10
[redacted]	DS1-38	07-Sep-19	17:00	Water	x	x	x	x	x	x	x	x	x				9
[redacted]	A76-39	08-Sep-19	15:00	Water	x	x	x	x	x	x	x	x	x		X		10
[redacted]	A76-40	08-Sep-19	15:40	Water	x	x	x	x	x	x	x	x	x				9
[redacted]	LK5-15	09-Sep-19	10:22	Water	x	x	x	x	x	x	x	x	x		X		10
[redacted]	LK5-16	09-Sep-19	9:40	Water	x	x	x	x	x	x	x	x	x				9
[redacted]	LK1-15	09-Sep-19	16:15	Water	x	x	x	x	x	x	x	x	x		X		10
[redacted]	LK1-16	09-Sep-19	15:40	Water	x	x	x	x	x	x	x	x	x				9

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Samuel Tapp	10-Sep-19	7:30	HO	9/17	P2150p	16 °C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 19-SEP-19
Report Date: 30-SEP-19 11:52 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2350681

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-1	L2350681-2	L2350681-3	L2350681-4	L2350681-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	07-SEP-19	07-SEP-19	08-SEP-19	08-SEP-19	12-SEP-19
	Sampled Time	16:20	17:00	15:00	15:40	15:30
	Client ID	DS1-37	DS1-38	A76-39	A76-40	A20-39
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	1.07	1.11	0.595	0.502	0.779

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-6	L2350681-7	L2350681-8	L2350681-9	L2350681-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-SEP-19	12-SEP-19	12-SEP-19	11-SEP-19	11-SEP-19
	Sampled Time	14:30	16:20	16:00	14:45	15:10
	Client ID	A20-40	WTS-45	WTS-46	MAM-45	MAM-46
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.915	3.13	2.74	2.93	3.99

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-11	L2350681-12	L2350681-13	L2350681-14	L2350681-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	13-SEP-19	13-SEP-19	09-SEP-19	09-SEP-19	09-SEP-19
	Sampled Time	15:00	15:30	18:25	15:40	10:22
	Client ID	NEM-45	NEM-46	LK1-15	LK1-16	LK5-15
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.896	1.02	0.635	0.652	0.551

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-16	L2350681-17	L2350681-18	L2350681-19	L2350681-20
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	09-SEP-19	07-SEP-19	07-SEP-19	11-SEP-19	13-SEP-19
	Sampled Time	09:40	09:45	10:18	14:45	15:00
	Client ID	LK5-16	LK8-15	LK8-16	SEPT DUP-3	SEPT DUP-4
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.532	0.546	0.594	3.19	1.08

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-5	L2350681-6	L2350681-7	L2350681-8	L2350681-9
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-SEP-19	12-SEP-19	12-SEP-19	12-SEP-19	11-SEP-19
	Sampled Time	15:30	14:30	16:20	16:00	14:45
	Client ID	A20-39	A20-40	WTS-45	WTS-46	MAM-45
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	15.5	14.5	73.7	73.7	138
	Hardness (as CaCO3) (mg/L)	4.97	4.76	27.0	27.6	50.3
	pH (pH)	6.91	6.89	7.24	7.25	7.36
	Total Suspended Solids (mg/L)	1.1	<1.0	1.9	1.7	1.4
	Total Dissolved Solids (mg/L)	10.1	10.8	56	61	115
	Turbidity (NTU)	0.36	0.38	1.42	1.65	0.72
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	4.5	4.1	10.1	10.0	13.1
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	4.5	4.1	10.1	10.0	13.1
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.125	0.158	0.154
	Bromide (Br) (mg/L)	<0.050	<0.050	0.179	0.185	0.264
	Chloride (Cl) (mg/L)	1.05	0.82	14.4	14.5	24.0
	Fluoride (F) (mg/L)	0.031	0.029	0.041	0.040	0.050
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.440
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0111
	Total Kjeldahl Nitrogen (mg/L)	0.111	0.099	0.323	0.361	0.362
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0026	<0.0020	0.0020	<0.0020	0.0022
	Phosphorus (P)-Total (mg/L)	0.0042	0.0034	0.0052	0.0058	0.0051
	Silicate (as SiO2) (mg/L)	1.02	1.05	0.78	0.79	1.29
	Sulfate (SO4) (mg/L)	1.27	1.11	2.69	2.67	11.8
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.41	2.37	3.93	4.02	2.54
	Total Organic Carbon (mg/L)	2.23	1.92	3.66	3.56	2.35
Total Metals	Aluminum (Al)-Total (mg/L)	0.0162	0.0155	0.0612	0.0576	0.0153
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00022
	Arsenic (As)-Total (mg/L)	0.00012	0.00010	0.00067	0.00070	0.00109
	Barium (Ba)-Total (mg/L)	0.00356	0.00350	0.0162	0.0156	0.0242
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	1.35	1.26	8.27	8.19	15.1
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	0.000015	0.000015	0.000011

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-10	L2350681-11	L2350681-12	L2350681-19	L2350681-20
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	11-SEP-19	13-SEP-19	13-SEP-19	11-SEP-19	13-SEP-19
	Sampled Time	15:10	15:00	15:30	14:45	15:00
	Client ID	MAM-46	NEM-45	NEM-46	SEPT DUP-3	SEPT DUP-4
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	101	78.3	75.6	139	77.9
	Hardness (as CaCO3) (mg/L)	36.5	29.2	29.2	51.2	28.3
	pH (pH)	7.22	7.23	7.16	7.32	7.17
	Total Suspended Solids (mg/L)	1.3	<1.0	<1.0	1.1	<1.0
	Total Dissolved Solids (mg/L)	85	68	70	119	64
	Turbidity (NTU)	0.48	0.43	0.38	0.80	0.46
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.0	8.5	8.3	13.1	8.7
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.0	8.5	8.3	13.1	8.7
	Ammonia, Total (as N) (mg/L)	0.0504	0.0462	0.290	0.170	0.0409
	Bromide (Br) (mg/L)	0.223	0.125	0.119	0.278	0.117
	Chloride (Cl) (mg/L)	19.6	15.6	15.3	24.0	15.6
	Fluoride (F) (mg/L)	0.039	0.030	0.031	0.049	0.031
	Nitrate (as N) (mg/L)	0.0885	0.156	0.151	0.458	0.162
	Nitrite (as N) (mg/L)	0.0031	<0.0010	0.0015	0.0125	0.0017
	Total Kjeldahl Nitrogen (mg/L)	0.205	0.173	0.411	0.340	0.149
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	0.0030	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0037	<0.0020	<0.0020	0.0039	<0.0020
	Silicate (as SiO2) (mg/L)	0.65	<0.50	<0.50	1.27	<0.50
	Sulfate (SO4) (mg/L)	7.54	3.91	3.88	12.1	3.91
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.27	2.00	1.92	2.36	1.75
	Total Organic Carbon (mg/L)	2.17	1.83	2.03	2.45	1.89
Total Metals	Aluminum (Al)-Total (mg/L)	0.0073	0.0124	0.0132	0.0131	0.0143
	Antimony (Sb)-Total (mg/L)	0.00011	<0.00010	<0.00010	0.00021	<0.00010
	Arsenic (As)-Total (mg/L)	0.00062	0.00051	0.00052	0.00107	0.00049
	Barium (Ba)-Total (mg/L)	0.0167	0.0138	0.0136	0.0243	0.0141
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	11.0	8.84	8.72	14.4	9.02
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	0.000012	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-21	L2350681-22	L2350681-23		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	13-SEP-19	13-SEP-19	13-SEP-19		
	Sampled Time	17:00	14:00	13:00		
	Client ID	SEPT EB	SEPT TB	SEPT DI		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	<2.0	<2.0	<2.0		
	Hardness (as CaCO3) (mg/L)	<0.50	<0.50	<0.50		
	pH (pH)	5.54	5.42	5.43		
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0		
	Total Dissolved Solids (mg/L)	<3.0	<3.0	<3.0		
	Turbidity (NTU)	<0.10	<0.10	0.18		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Ammonia, Total (as N) (mg/L)	0.154 RRV		<0.0050		
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050		
	Chloride (Cl) (mg/L)	<0.10	<0.10	<0.10		
	Fluoride (F) (mg/L)	<0.020	<0.020	<0.020		
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050		
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010		
	Total Kjeldahl Nitrogen (mg/L)	0.179		<0.050		
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010		
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020		<0.0020		
	Phosphorus (P)-Total (mg/L)	<0.0020		<0.0020		
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50		
	Sulfate (SO4) (mg/L)	<0.30	<0.30	<0.30		
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50		<0.50		
	Total Organic Carbon (mg/L)	<0.50		<0.50		
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	<0.0030		
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Barium (Ba)-Total (mg/L)	0.00034 RRV	<0.00010	<0.00010		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010		
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Calcium (Ca)-Total (mg/L)	0.189 RRV	<0.050	<0.050		
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-5	L2350681-6	L2350681-7	L2350681-8	L2350681-9
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-SEP-19	12-SEP-19	12-SEP-19	12-SEP-19	11-SEP-19
	Sampled Time	15:30	14:30	16:20	16:00	14:45
	Client ID	A20-39	A20-40	WTS-45	WTS-46	MAM-45
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	0.00042	0.00040	0.00022
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00014
	Copper (Cu)-Total (mg/L)	<0.00050	0.00075	0.00067	0.00072	0.00061
	Iron (Fe)-Total (mg/L)	0.029	0.029	0.099	0.100	0.087
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000052
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	0.0027	0.0027	0.0024
	Magnesium (Mg)-Total (mg/L)	0.493	0.463	1.69	1.68	3.30
	Manganese (Mn)-Total (mg/L)	0.00188	0.00205	0.0137	0.0133	0.0330
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	0.000365	0.000366	0.00108
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	0.00167	0.00182	0.00164
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.393	0.376	1.60	1.61	3.08
	Rubidium (Rb)-Total (mg/L)	0.00051	0.00043	0.00275	0.00266	0.00356
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000145
	Silicon (Si)-Total (mg/L)	0.49	0.50	0.49	0.48	0.61
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.616	0.612	1.11	1.11	2.03
	Strontium (Sr)-Total (mg/L)	0.00729	0.00704	0.0781	0.0763	0.102
	Sulfur (S)-Total (mg/L)	<0.50	<0.50	0.86	0.91	4.24
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	0.00032	<0.00030	0.00194	DLM <0.0018	0.00048
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000053	0.000050	0.000114	0.000113	0.000210
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	0.00036	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0074	0.0078	0.0187	0.0161	0.0029
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00020
	Arsenic (As)-Dissolved (mg/L)	<0.00010	0.00015	0.00063	0.00068	0.00089
	Barium (Ba)-Dissolved (mg/L)	0.00346	0.00321	0.0151	0.0149	0.0246
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-10	L2350681-11	L2350681-12	L2350681-19	L2350681-20
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	11-SEP-19	13-SEP-19	13-SEP-19	11-SEP-19	13-SEP-19
	Sampled Time	15:10	15:00	15:30	14:45	15:00
	Client ID	MAM-46	NEM-45	NEM-46	SEPT DUP-3	SEPT DUP-4
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	0.00015	0.00016	0.00016	0.00014	0.00018
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00014	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00059	<0.00050
	Iron (Fe)-Total (mg/L)	0.034	0.029	0.027	0.085	0.031
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	0.000053	<0.000050
	Lithium (Li)-Total (mg/L)	0.0022	0.0013	0.0013	0.0023	0.0013
	Magnesium (Mg)-Total (mg/L)	2.33	1.66	1.69	3.26	1.68
	Manganese (Mn)-Total (mg/L)	0.00702	0.00831	0.00812	0.0331	0.00837
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000545	0.000203	0.000201	0.00111	0.000213
	Nickel (Ni)-Total (mg/L)	0.00106	0.00118	0.00116	0.00155	0.00120
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	2.02	1.13	1.12	3.04	1.14
	Rubidium (Rb)-Total (mg/L)	0.00257	0.00156	0.00143	0.00363	0.00155
	Selenium (Se)-Total (mg/L)	0.000070	<0.000050	<0.000050	0.000185	<0.000050
	Silicon (Si)-Total (mg/L)	0.35	0.21	0.19	0.61	0.20
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.42	0.842	0.870	2.02	0.873
	Strontium (Sr)-Total (mg/L)	0.0790	0.0581	0.0555	0.102	0.0570
	Sulfur (S)-Total (mg/L)	2.63	1.18	1.20	4.14	1.19
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	0.00037	<0.00030	0.00046	0.00050
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000070	0.000045	0.000045	0.000207	0.000046
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0013	0.0043	0.0045	0.0034	0.0041
	Antimony (Sb)-Dissolved (mg/L)	0.00010	<0.00010	<0.00010	0.00020	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00054	0.00048	0.00047	0.00083	0.00046
	Barium (Ba)-Dissolved (mg/L)	0.0173	0.0138	0.0138	0.0248	0.0136
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-21	L2350681-22	L2350681-23		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	13-SEP-19	13-SEP-19	13-SEP-19		
	Sampled Time	17:00	14:00	13:00		
	Client ID	SEPT EB	SEPT TB	SEPT DI		
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010		
	Lead (Pb)-Total (mg/L)	0.000137 RRV	<0.000050	<0.000050		
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Magnesium (Mg)-Total (mg/L)	0.0289 RRV	<0.0050	<0.0050		
	Manganese (Mn)-Total (mg/L)	0.00023 RRV	<0.00010	<0.00010		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.000050 DLM	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	<0.050	<0.050	<0.050		
	Rubidium (Rb)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Total (mg/L)	<0.10	<0.10	<0.10		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	<0.050	<0.050	<0.050		
	Strontium (Sr)-Total (mg/L)	0.00096 RRV	<0.00020	<0.00020		
	Sulfur (S)-Total (mg/L)	<0.50	<0.50	<0.50		
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030		
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Uranium (U)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030		
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	LAB	FIELD		
	Dissolved Metals Filtration Location	FIELD	LAB	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0023 RRV	<0.0010	<0.0010		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Barium (Ba)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-5	L2350681-6	L2350681-7	L2350681-8	L2350681-9
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-SEP-19	12-SEP-19	12-SEP-19	12-SEP-19	11-SEP-19
	Sampled Time	15:30	14:30	16:20	16:00	14:45
	Client ID	A20-39	A20-40	WTS-45	WTS-46	MAM-45
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	1.26	1.22	8.32	8.57	14.4
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	0.000011
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	0.00020	0.00020	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00012
	Copper (Cu)-Dissolved (mg/L)	0.00034	0.00031	0.00060	0.00058	0.00056
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.026	0.025	0.030
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	0.0029	0.0029	0.0026
	Magnesium (Mg)-Dissolved (mg/L)	0.440	0.415	1.51	1.50	3.47
	Manganese (Mn)-Dissolved (mg/L)	0.00176	0.00199	0.00524	0.00599	0.0296
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	0.000404	0.000385	0.00120
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.00145	0.00156	0.00150
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.377	0.346	1.49	1.47	3.03
	Rubidium (Rb)-Dissolved (mg/L)	0.00046	0.00042	0.00244	0.00251	0.00345
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000144
	Silicon (Si)-Dissolved (mg/L)	0.463	0.466	0.356	0.355	0.603
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.565	0.532	1.04	1.05	2.07
	Strontium (Sr)-Dissolved (mg/L)	0.00730	0.00666	0.0751	0.0766	0.100
	Sulfur (S)-Dissolved (mg/L)	<0.50	<0.50	1.02	1.07	4.12
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	0.00037	0.00036	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000047	0.000044	0.000098	0.000100	0.000175
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)	<0.020		<0.020		0.073
	Arsenite (As III) (ug/L)	0.029		0.357		0.408

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-10	L2350681-11	L2350681-12	L2350681-19	L2350681-20
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	11-SEP-19	13-SEP-19	13-SEP-19	11-SEP-19	13-SEP-19
	Sampled Time	15:10	15:00	15:30	14:45	15:00
	Client ID	MAM-46	NEM-45	NEM-46	SEPT DUP-3	SEPT DUP-4
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	10.9	8.96	9.01	15.1	8.68
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000011	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00011	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00044	0.00031	0.00031	0.00056	0.00029
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.010	0.010	0.025	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	0.000054	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0023	0.0014	0.0014	0.0027	0.0014
	Magnesium (Mg)-Dissolved (mg/L)	2.26	1.66	1.63	3.31	1.60
	Manganese (Mn)-Dissolved (mg/L)	0.00346	0.00638	0.00607	0.0288	0.00602
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000547	0.000200	0.000196	0.00117	0.000211
	Nickel (Ni)-Dissolved (mg/L)	0.00099	0.00113	0.00108	0.00149	0.00110
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	2.01	1.16	1.13	3.00	1.11
	Rubidium (Rb)-Dissolved (mg/L)	0.00241	0.00159	0.00141	0.00348	0.00148
	Selenium (Se)-Dissolved (mg/L)	0.000090	<0.000050	<0.000050	0.000140	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.325	0.172	0.172	0.647	0.169
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.50	0.880	0.860	2.08	0.857
	Strontium (Sr)-Dissolved (mg/L)	0.0803	0.0569	0.0554	0.101	0.0572
	Sulfur (S)-Dissolved (mg/L)	2.53	1.27	1.41	4.39	1.49
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000058	0.000039	0.000039	0.000167	0.000038
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	0.0025	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)	0.038	0.026			0.029
	Arsenite (As III) (ug/L)	0.286	0.211			0.212

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2350681-21 Surface Water 13-SEP-19 17:00 SEPT EB	L2350681-22 Surface Water 13-SEP-19 14:00 SEPT TB	L2350681-23 Surface Water 13-SEP-19 13:00 SEPT DI		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Lead (Pb)-Dissolved (mg/L)	RRV 0.000061	<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Magnesium (Mg)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050		
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Rubidium (Rb)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Strontium (Sr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Sulfur (S)-Dissolved (mg/L)	<0.50	<0.50	<0.50		
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Uranium (U)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
Speciated Metals	Arsenate (As V) (ug/L)	<0.020		<0.020		
	Arsenite (As III) (ug/L)	<0.020		<0.020		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-5	L2350681-6	L2350681-7	L2350681-8	L2350681-9
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	12-SEP-19	12-SEP-19	12-SEP-19	12-SEP-19	11-SEP-19
	Sampled Time	15:30	14:30	16:20	16:00	14:45
	Client ID	A20-39	A20-40	WTS-45	WTS-46	MAM-45
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	<0.020		0.067		0.116
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020		<0.020		<0.020
	Arsenobetaine (AsB, as As) (ug/L)	<0.050		<0.050		<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2350681-10	L2350681-11	L2350681-12	L2350681-19	L2350681-20
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	11-SEP-19	13-SEP-19	13-SEP-19	11-SEP-19	13-SEP-19
	Sampled Time	15:10	15:00	15:30	14:45	15:00
	Client ID	MAM-46	NEM-45	NEM-46	SEPT DUP-3	SEPT DUP-4
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	0.048	0.064			0.066
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020	<0.020			<0.020
	Arsenobetaine (AsB, as As) (ug/L)	<0.050	<0.050			<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2350681-21 Surface Water 13-SEP-19 17:00 SEPT EB	L2350681-22 Surface Water 13-SEP-19 14:00 SEPT TB	L2350681-23 Surface Water 13-SEP-19 13:00 SEPT DI		
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)	<0.020		<0.020		
	Monomethylarsonic Acid (MMA, as As) (ug/L)	<0.020		<0.020		
	Arsenobetaine (AsB, as As) (ug/L)	<0.050		<0.050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Cyanide, Total	B	L2350681-10, -19, -9
Method Blank	Sodium (Na)-Dissolved	B	L2350681-5
Matrix Spike	Total Organic Carbon	MS-B	L2350681-20
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2350681-6, -7, -8
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2350681-10, -11, -12, -19, -20, -21, -23, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2350681-22
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2350681-6, -7, -8
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2350681-10, -11, -12, -19, -20, -21, -23, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2350681-22
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2350681-6, -7, -8
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2350681-10, -11, -12, -19, -20, -21, -23, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2350681-22
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2350681-10, -11, -12, -19, -20, -21, -23, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2350681-22
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2350681-10, -11, -12, -19, -20, -21, -23, -9
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2350681-22
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2350681-10, -11, -12, -19, -20, -21, -23, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2350681-6, -7, -8
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2350681-10, -11, -12, -19, -20, -21, -23, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2350681-22
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2350681-6, -7, -8
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2350681-10, -11, -12, -19, -20, -21, -23, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2350681-22
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2350681-10, -11, -12, -19, -20, -21, -23, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2350681-22
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2350681-10, -11, -12, -19, -20, -21, -23, -9
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2350681-22

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

Reference Information

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Reference Information

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Ch

L2350681-COFC

COC #

Page 1 of 1

Report To		Report				
Company:	Azimuth Consulting Group	☑ Standard				
Contact:	Eric Franz	☑ PDF	☑ Excel	☐ Digital	☐ Fax	
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca			
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com			
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com			
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information				
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater			
Company:		PO / AFE:				
Contact:		LSD:				
Address:						
Phone:	Fax:	Quote #:	Q39503			
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler:	Eric Franz	

...d (Rush for routine analysis subject to availability)

... Turnaround Times - Business Days)

Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT

Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT

Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)	Arsenic speciation		Number of Containers
	DS1-37	07-Sep-19	16:20	Surface Water										X			1
	DS1-38	07-Sep-19	17:00	Surface Water										X			1
	A76-39	08-Sep-19	15:00	Surface Water										X			1
	A76-40	08-Sep-19	15:40	Surface Water										X			1
	A20-39	12-Sep-19	15:30	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	A20-40	12-Sep-19	14:30	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	WTS-45	12-Sep-19	16:20	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	WTS-46	12-Sep-19	16:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	MAM-45	11-Sep-19	14:45	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	MAM-46	11-Sep-19	15:10	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	NEM-45	13-Sep-19	15:00	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	NEM-46	13-Sep-19	15:30	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	LK1-15	09-Sep-19	18:25	Surface Water										X			1
	LK1-16	09-Sep-19	15:40	Surface Water										X			1
	LK5-15	09-Sep-19	10:22	Surface Water										X			1
	LK5-16	09-Sep-19	9:40	Surface Water										X			1
	LK8-15	07-Sep-19	9:45	Surface Water										X			1
	LK8-16	07-Sep-19	10:18	Surface Water										X			1
	Sept DUP-3	11-Sep-19	14:45	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	Sept DUP-4	13-Sep-19	15:00	Surface Water	X	X	X	X	X	X	X	X	X	X	X		11
	Sept EB	13-Sep-19	17:00	Surface Water	X	X	X	X	X	X	X	X	X		X		10
	Sept TB	13-Sep-19	14:00	Surface Water	X	X	X	X	X	X	X	X	X				9
	Sept DI	13-Sep-19	13:00	Surface Water	X	X	X	X	X	X	X	X	X		X		10

2 [illegible] coolers

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Fanny Laporte	16-Sep-19	7:00	LHN	9/19	12 PM	15 °C				

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 26-SEP-19
Report Date: 03-OCT-19 19:05 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2354972

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-1	L2354972-2	L2354972-3	L2354972-4	L2354972-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-SEP-19	14-SEP-19	14-SEP-19	14-SEP-19	14-SEP-19
	Sampled Time	10:00	12:09	11:18	10:04	15:43
	Client ID	TPN-128	TPN-129	TPE-128	TPE-129	WAL-97
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.601	0.776	0.803	0.696	0.690

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-6	L2354972-7	L2354972-8	L2354972-9	L2354972-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	14-SEP-19	14-SEP-19	12-SEP-19	12-SEP-19	18-SEP-19
	Sampled Time	16:28		12:10	12:50	10:30
	Client ID	WAL-98	SEP DUP-1	PDL-81	PDL-82	BBD-65
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.777	0.673	0.493	0.413	1.35

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-11	L2354972-12	L2354972-13	L2354972-14	L2354972-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-SEP-19	18-SEP-19	18-SEP-19	18-SEP-19	18-SEP-19
	Sampled Time	11:05	12:30	13:10	14:30	15:00
	Client ID	BBD-66	BPJ-65	BPJ-66	BAP-65	BAP-66
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	1.29	1.40	1.72	1.73	1.57

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-16	L2354972-17	L2354972-18	L2354972-19	L2354972-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-SEP-19	18-SEP-19	18-SEP-19	15-SEP-19	15-SEP-19
	Sampled Time		13:20	14:20	10:30	11:00
	Client ID	SEP DUP-2	INUG-116	INUG-117	SEP-128	SEP-129
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	1.45	0.663	0.654	0.685	0.725

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-1	L2354972-2	L2354972-3	L2354972-4	L2354972-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-SEP-19	14-SEP-19	14-SEP-19	14-SEP-19	14-SEP-19
	Sampled Time	10:00	12:09	11:18	10:04	15:43
	Client ID	TPN-128	TPN-129	TPE-128	TPE-129	WAL-97
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	26.7	26.8	28.9	29.1	39.5
	Hardness (as CaCO3) (mg/L)	9.27	8.92	9.98	10.6	16.7
	pH (pH)	7.08	7.06	7.13	7.14	7.31
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	17.0	18.5	20.6	19.5	26.8
	Turbidity (NTU)	0.19	0.19	0.25	0.28	0.23
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	6.9	6.7	8.0	8.1	13.7
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	6.9	6.7	8.0	8.1	13.7
	Ammonia, Total (as N) (mg/L)	0.0053	0.0061	<0.0050	<0.0050	0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.79	0.78	0.77	0.77	0.69
	Fluoride (F) (mg/L)	0.076	0.074	0.081	0.081	0.053
	Nitrate (as N) (mg/L)	0.0055	0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.096	0.087	0.083	0.083	0.117
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	0.0028
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	0.80
	Sulfate (SO4) (mg/L)	4.64	4.63	4.80	4.77	4.67
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.57	1.43	1.54	1.39	2.16
	Total Organic Carbon (mg/L)	1.35	1.13	1.36	1.50	1.96
Total Metals	Aluminum (Al)-Total (mg/L)	0.0068	0.0066	0.0083	0.0087	0.0039
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00018	0.00017	0.00035	0.00039	0.00031
	Barium (Ba)-Total (mg/L)	0.00287	0.00286	0.00284	0.00279	0.00211
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.26	2.20	2.58	2.68	4.58
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	0.000015	0.000017	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2354972-6 Water 14-SEP-19 16:28 WAL-98	L2354972-7 Water 14-SEP-19 SEP DUP-1	L2354972-8 Water 12-SEP-19 12:10 PDL-81	L2354972-9 Water 12-SEP-19 12:50 PDL-82	L2354972-10 Water 18-SEP-19 10:30 BBD-65
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	38.6	26.8	22.2	22.0	49.9
	Hardness (as CaCO3) (mg/L)	16.1	9.15	9.04	9.32	13.0
	pH (pH)	7.30	7.02	7.12	7.11	7.18
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	27.4	18.0	15.9	12.1	33.1
	Turbidity (NTU)	0.26	0.25	0.20	0.15	0.51
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	13.2	6.8	8.5	8.5	9.7
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	13.2	6.8	8.5	8.5	9.7
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.68	0.78	0.66	0.66	7.88
	Fluoride (F) (mg/L)	0.053	0.071	0.042	0.042	0.064
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0163
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.109	0.112	0.082	0.092	0.156
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	0.0022
	Phosphorus (P)-Total (mg/L)	0.0034	<0.0020	<0.0020	<0.0020	0.0043
	Silicate (as SiO2) (mg/L)	0.78	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	4.56	4.64	1.86	1.86	1.58
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.21	1.42	1.46	1.52	3.51
	Total Organic Carbon (mg/L)	2.12	1.21	1.51	1.41	5.89
Total Metals	Aluminum (Al)-Total (mg/L)	0.0050	0.0063	0.0060	0.0077	0.0182
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00032	0.00018	0.00018	0.00015	0.00015
	Barium (Ba)-Total (mg/L)	0.00211	0.00278	0.00204	0.00205	0.0200
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	4.45	2.28	2.39	2.39	2.77
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-11	L2354972-12	L2354972-13	L2354972-14	L2354972-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-SEP-19	18-SEP-19	18-SEP-19	18-SEP-19	18-SEP-19
	Sampled Time	11:05	12:30	13:10	14:30	15:00
	Client ID	BBD-66	BPJ-65	BPJ-66	BAP-65	BAP-66
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	78.5	286	345	364	379
	Hardness (as CaCO3) (mg/L)	15.3	32.7	37.8	40.8	43.9
	pH (pH)	7.20	7.16	7.17	7.18	7.19
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	46.2	159	173	194	216
	Turbidity (NTU)	0.34	0.22	0.19	0.18	0.21
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.5	9.9	10.6	10.4	10.5
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.5	9.9	10.6	10.4	10.5
	Ammonia, Total (as N) (mg/L)	0.0056	0.0058	0.0057	0.0063	0.0055
	Bromide (Br) (mg/L)	0.061	0.249	0.306	0.322	0.336
	Chloride (Cl) (mg/L)	15.3	69.7	85.3	90.0	94.2
	Fluoride (F) (mg/L)	0.061	0.072	0.075	0.078	0.077
	Nitrate (as N) (mg/L)	0.0182	0.0173	0.0165	0.0146	0.0157
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.165	0.155	0.171	0.158	0.157
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0022	<0.0020	<0.0020	0.0023	0.0022
	Phosphorus (P)-Total (mg/L)	0.0050	0.0048	0.0039	0.0035	0.0038
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	2.67	10.7	13.0	13.7	14.4
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.37	3.63	3.18	3.24	3.26
	Total Organic Carbon (mg/L)	3.28	3.74	3.51	3.26	3.25
Total Metals	Aluminum (Al)-Total (mg/L)	0.0136	0.0082	0.0066	0.0053	0.0055
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00013	0.00015	0.00014	0.00012	0.00015
	Barium (Ba)-Total (mg/L)	0.0202	0.0201	0.0195	0.0189	0.0192
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	0.018	0.021	0.024	0.024
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.92	4.19	4.35	4.58	4.69
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-16	L2354972-17	L2354972-18	L2354972-19	L2354972-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-SEP-19	18-SEP-19	18-SEP-19	15-SEP-19	15-SEP-19
	Sampled Time		13:20	14:20	10:30	11:00
	Client ID	SEP DUP-2	INUG-116	INUG-117	SEP-128	SEP-129
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	289	15.4	15.4	39.0	38.6
	Hardness (as CaCO3) (mg/L)	34.6	5.87	6.00	15.6	15.6
	pH (pH)	7.18	6.95	6.91	7.10	7.13
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	149	14.0	13.7	26.7	18.5
	Turbidity (NTU)	0.25	0.34	0.33	0.19	<0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	10.1	5.8	5.5	11.7	11.7
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	10.1	5.8	5.5	11.7	11.7
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	0.252	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	69.6	0.85	0.82	0.87	0.87
	Fluoride (F) (mg/L)	0.070	0.067	0.069	0.072	0.071
	Nitrate (as N) (mg/L)	0.0173	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.173	0.114	0.113	0.098	0.115
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0021	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0040	0.0028	0.0023	0.0022	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	10.7	0.99	1.01	5.39	5.39
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.29	1.95	1.88	1.91	1.70
	Total Organic Carbon (mg/L)	3.30	1.81	2.23	1.98	1.95
Total Metals	Aluminum (Al)-Total (mg/L)	0.0086	0.0120	0.0116	0.0060	0.0064
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00016	0.00012	0.00013	0.00027	0.00024
	Barium (Ba)-Total (mg/L)	0.0195	0.00182	0.00180	0.00265	0.00252
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.020	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	4.16	1.23	1.22	4.13	4.06
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2354972-1	L2354972-2	L2354972-3	L2354972-4	L2354972-5
	Sample ID	L2354972-1	L2354972-2	L2354972-3	L2354972-4	L2354972-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-SEP-19	14-SEP-19	14-SEP-19	14-SEP-19	14-SEP-19
	Sampled Time	10:00	12:09	11:18	10:04	15:43
	Client ID	TPN-128	TPN-129	TPE-128	TPE-129	WAL-97
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	DLB <0.00050	DLB <0.00050	DLB <0.00050	0.00494	DLB <0.00040
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00051	0.00087
	Iron (Fe)-Total (mg/L)	0.010	<0.010	0.015	0.042	0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	0.000055	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	0.905	0.864	0.980	0.970	1.32
	Manganese (Mn)-Total (mg/L)	0.00101	0.00097	0.00154	0.00153	0.00122
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000124	0.000118	0.000150	0.000245	0.000183
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00067	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.487	0.484	0.516	0.512	0.490
	Rubidium (Rb)-Total (mg/L)	0.00075	0.00073	0.00084	0.00080	0.00065
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.10	0.11	0.12	0.12	0.38
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.06	1.02	1.04	1.04	0.594
	Strontium (Sr)-Total (mg/L)	0.0100	0.00981	0.0107	0.0109	0.0219
	Sulfur (S)-Total (mg/L)	1.80	1.56	1.73	1.84	1.59
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	0.00034	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000037	0.000034	0.000041	0.000044	0.000045
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0038	0.0022	0.0027	0.0025	0.0021
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00015	0.00014	0.00028	0.00030	0.00028
	Barium (Ba)-Dissolved (mg/L)	0.00286	0.00276	0.00266	0.00271	0.00217
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-6	L2354972-7	L2354972-8	L2354972-9	L2354972-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	14-SEP-19	14-SEP-19	12-SEP-19	12-SEP-19	18-SEP-19
	Sampled Time	16:28		12:10	12:50	10:30
	Client ID	WAL-98	SEP DUP-1	PDL-81	PDL-82	BBD-65
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	DLB <0.00040	DLB <0.00050	DLB <0.00050	DLB <0.00040	DLB <0.00040
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00091	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.016	<0.010	<0.010	<0.010	0.018
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0010
	Magnesium (Mg)-Total (mg/L)	1.28	0.882	0.796	0.797	1.53
	Manganese (Mn)-Total (mg/L)	0.00191	0.00094	0.00097	0.00094	0.00171
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000156	0.000109	<0.000050	0.000059	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	0.00063	0.00068	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.451	0.481	0.360	0.353	0.571
	Rubidium (Rb)-Total (mg/L)	0.00070	0.00072	0.00045	0.00051	0.00082
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.38	0.12	0.16	0.15	0.15
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.590	1.05	0.498	0.487	4.40
	Strontium (Sr)-Total (mg/L)	0.0204	0.00985	0.00921	0.00912	0.0201
	Sulfur (S)-Total (mg/L)	1.51	1.47	0.76	0.78	0.54
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000057	0.000035	0.000027	0.000026	0.000040
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	0.0045	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0016	0.0024	0.0019	0.0023	0.0060
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00026	0.00016	0.00016	0.00013	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.00207	0.00283	0.00193	0.00188	0.0190
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-11	L2354972-12	L2354972-13	L2354972-14	L2354972-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-SEP-19	18-SEP-19	18-SEP-19	18-SEP-19	18-SEP-19
	Sampled Time	11:05	12:30	13:10	14:30	15:00
	Client ID	BBD-66	BPJ-65	BPJ-66	BAP-65	BAP-66
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	DLB <0.00040	DLB <0.00050	DLB <0.00050	DLB <0.00050	DLB <0.00050
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.020	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0011	0.0016	0.0017	0.0017	0.0018
	Magnesium (Mg)-Total (mg/L)	2.04	6.09	6.96	7.46	7.67
	Manganese (Mn)-Total (mg/L)	0.00186	0.00110	0.00094	0.00065	0.00062
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000052	0.000086	0.000100	0.000093	0.000108
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.727	1.84	2.05	2.21	2.30
	Rubidium (Rb)-Total (mg/L)	0.00090	0.00129	0.00127	0.00137	0.00145
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	0.000051	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.15	0.15	0.17	0.16	0.17
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	8.83	41.6	48.0	52.5	54.9
	Strontium (Sr)-Total (mg/L)	0.0229	0.0464	0.0505	0.0539	0.0561
	Sulfur (S)-Total (mg/L)	0.87	3.40	4.61	4.41	4.44
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000041	0.000042	0.000047	0.000041	0.000043
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0059	0.0044	0.0040	0.0028	0.0036
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00010	0.00012	0.00011	0.00012	0.00012
	Barium (Ba)-Dissolved (mg/L)	0.0190	0.0187	0.0195	0.0188	0.0188
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

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	Sample ID	L2354972-16	L2354972-17	L2354972-18	L2354972-19	L2354972-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-SEP-19	18-SEP-19	18-SEP-19	15-SEP-19	15-SEP-19
	Sampled Time		13:20	14:20	10:30	11:00
	Client ID	SEP DUP-2	INUG-116	INUG-117	SEP-128	SEP-129
Grouping	**Analyte**					
WATER						
Total Metals	Chromium (Cr)-Total (mg/L)	DLB <0.00040	DLB <0.00050	DLB <0.00040	DLB <0.00040	DLB <0.00040
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00064	0.00062
	Iron (Fe)-Total (mg/L)	<0.010	0.016	0.014	0.012	0.013
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0016	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	6.22	0.735	0.733	1.33	1.31
	Manganese (Mn)-Total (mg/L)	0.00113	0.00125	0.00120	0.00095	0.00104
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000085	<0.000050	<0.000050	0.000169	0.000170
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	1.87	0.395	0.406	0.556	0.552
	Rubidium (Rb)-Total (mg/L)	0.00128	0.00052	0.00057	0.00082	0.00084
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.16	0.18	0.18	0.21	0.22
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	41.9	0.601	0.591	0.896	0.870
	Strontium (Sr)-Total (mg/L)	0.0463	0.00629	0.00630	0.0181	0.0178
	Sulfur (S)-Total (mg/L)	3.83	<0.50	<0.50	1.90	1.72
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	0.00032	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	0.000044	0.000053	0.000060	0.000042	0.000042
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0050	0.0042	0.0043	0.0023	0.0030
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00013	<0.00010	<0.00010	0.00019	0.00020
	Barium (Ba)-Dissolved (mg/L)	0.0194	0.00167	0.00175	0.00269	0.00254
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-1	L2354972-2	L2354972-3	L2354972-4	L2354972-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-SEP-19	14-SEP-19	14-SEP-19	14-SEP-19	14-SEP-19
	Sampled Time	10:00	12:09	11:18	10:04	15:43
	Client ID	TPN-128	TPN-129	TPE-128	TPE-129	WAL-97
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.25	2.16	2.47	2.66	4.47
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	0.000015	0.000014	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00038	0.00037	0.00041	0.00040	0.00085
	Iron (Fe)-Dissolved (mg/L)	0.013	<0.010	0.014	0.011	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.889	0.858	0.926	0.956	1.35
	Manganese (Mn)-Dissolved (mg/L)	0.00058	0.00049	0.00060	0.00056	0.00034
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000139	0.000140	0.000154	0.000167	0.000199
	Nickel (Ni)-Dissolved (mg/L)	<0.0015 DLB	<0.0015 DLB	<0.0015 DLB	<0.0020 DLB	<0.0010 DLB
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.525	0.490	0.520	0.523	0.501
	Rubidium (Rb)-Dissolved (mg/L)	0.00071	0.00069	0.00072	0.00079	0.00068
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.071	0.075	0.091	0.080	0.390
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.10	1.08	1.04	1.07	0.633
	Strontium (Sr)-Dissolved (mg/L)	0.0107	0.0107	0.0115	0.0123	0.0230
	Sulfur (S)-Dissolved (mg/L)	1.68	1.59	1.65	1.72	1.42
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000033	0.000029	0.000034	0.000037	0.000045
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)					
	Arsenite (As III) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-6	L2354972-7	L2354972-8	L2354972-9	L2354972-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	14-SEP-19	14-SEP-19	12-SEP-19	12-SEP-19	18-SEP-19
	Sampled Time	16:28		12:10	12:50	10:30
	Client ID	WAL-98	SEP DUP-1	PDL-81	PDL-82	BBD-65
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	4.32	2.22	2.32	2.40	2.75
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00091	0.00038	0.00041	0.00037	0.00025
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.28	0.876	0.791	0.806	1.48
	Manganese (Mn)-Dissolved (mg/L)	0.00033	0.00045	0.00016	0.00011	0.00035
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000191	0.000135	0.000056	0.000053	0.000051
	Nickel (Ni)-Dissolved (mg/L)	DLB <0.0010	DLB <0.0010	DLB <0.0010	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.484	0.513	0.372	0.383	0.595
	Rubidium (Rb)-Dissolved (mg/L)	0.00070	0.00068	0.00048	0.00048	0.00080
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	DTSE 0.000436	DTSE 0.000237
	Silicon (Si)-Dissolved (mg/L)	0.374	0.062	0.147	0.127	0.105
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.629	1.09	0.514	0.498	4.15
	Strontium (Sr)-Dissolved (mg/L)	0.0223	0.0109	0.00984	0.00903	0.0209
	Sulfur (S)-Dissolved (mg/L)	1.61	1.64	<0.50	0.63	<0.50
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000051	0.000032	0.000022	0.000031	0.000040
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)			<0.020		
	Arsenite (As III) (ug/L)			0.049		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-11	L2354972-12	L2354972-13	L2354972-14	L2354972-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-SEP-19	18-SEP-19	18-SEP-19	18-SEP-19	18-SEP-19
	Sampled Time	11:05	12:30	13:10	14:30	15:00
	Client ID	BBD-66	BPJ-65	BPJ-66	BAP-65	BAP-66
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	0.019	0.023	0.024	0.026
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.87	4.06	4.36	4.56	4.71
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00024	0.00027	0.00025	0.00027	0.00027
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0010	0.0015	0.0016	0.0016	0.0017
	Magnesium (Mg)-Dissolved (mg/L)	1.97	5.48	6.54	7.14	7.81
	Manganese (Mn)-Dissolved (mg/L)	0.00064	0.00030	0.00022	0.00016	DTMF 0.00124
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000059	0.000097	0.000091	0.000104	0.000109
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.730	1.82	2.10	2.34	2.43
	Rubidium (Rb)-Dissolved (mg/L)	0.00094	0.00126	0.00137	0.00158	0.00148
	Selenium (Se)-Dissolved (mg/L)	DTSE 0.000172	0.000135	0.000134	0.000091	0.000132
	Silicon (Si)-Dissolved (mg/L)	0.098	0.121	0.122	0.139	0.131
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	8.49	38.5	46.1	51.9	54.5
	Strontium (Sr)-Dissolved (mg/L)	0.0228	0.0457	0.0491	0.0554	0.0542
	Sulfur (S)-Dissolved (mg/L)	0.83	3.50	3.72	4.44	4.61
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000039	0.000049	0.000043	0.000046	0.000041
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)					
	Arsenite (As III) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-16	L2354972-17	L2354972-18	L2354972-19	L2354972-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-SEP-19	18-SEP-19	18-SEP-19	15-SEP-19	15-SEP-19
	Sampled Time		13:20	14:20	10:30	11:00
	Client ID	SEP DUP-2	INUG-116	INUG-117	SEP-128	SEP-129
Grouping	**Analyte**					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.020	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	4.10	1.13	1.15	4.03	4.05
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00028	0.00032	0.00035	0.00055	0.00059
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0015	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	5.92	0.742	0.756	1.34	1.33
	Manganese (Mn)-Dissolved (mg/L)	0.00034	0.00022	0.00032	0.00029	0.00026
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000089	<0.000050	<0.000050	0.000169	0.000152
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	1.93	0.411	0.410	0.553	0.549
	Rubidium (Rb)-Dissolved (mg/L)	0.00132	0.00054	0.00062	0.00085	0.00082
	Selenium (Se)-Dissolved (mg/L)	0.000105	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.118	0.126	0.141	0.174	0.187
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	40.7	0.592	0.600	0.879	0.876
	Strontium (Sr)-Dissolved (mg/L)	0.0471	0.00600	0.00596	0.0173	0.0177
	Sulfur (S)-Dissolved (mg/L)	3.46	0.54	<0.50	1.78	1.77
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000043	0.000046	0.000050	0.000039	0.000045
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0017	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals	Arsenate (As V) (ug/L)		<0.020			
	Arsenite (As III) (ug/L)		<0.020			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-1	L2354972-2	L2354972-3	L2354972-4	L2354972-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	10-SEP-19	14-SEP-19	14-SEP-19	14-SEP-19	14-SEP-19
	Sampled Time	10:00	12:09	11:18	10:04	15:43
	Client ID	TPN-128	TPN-129	TPE-128	TPE-129	WAL-97
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)					
	Monomethylarsonic Acid (MMA, as As) (ug/L)					
	Arsenobetaine (AsB, as As) (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-6	L2354972-7	L2354972-8	L2354972-9	L2354972-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	14-SEP-19	14-SEP-19	12-SEP-19	12-SEP-19	18-SEP-19
	Sampled Time	16:28		12:10	12:50	10:30
	Client ID	WAL-98	SEP DUP-1	PDL-81	PDL-82	BBD-65
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)			<0.020		
	Monomethylarsonic Acid (MMA, as As) (ug/L)			<0.020		
	Arsenobetaine (AsB, as As) (ug/L)			<0.050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2354972-11 Water 18-SEP-19 11:05 BBD-66	L2354972-12 Water 18-SEP-19 12:30 BPJ-65	L2354972-13 Water 18-SEP-19 13:10 BPJ-66	L2354972-14 Water 18-SEP-19 14:30 BAP-65	L2354972-15 Water 18-SEP-19 15:00 BAP-66
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)					
	Monomethylarsonic Acid (MMA, as As) (ug/L)					
	Arsenobetaine (AsB, as As) (ug/L)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354972-16	L2354972-17	L2354972-18	L2354972-19	L2354972-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-SEP-19	18-SEP-19	18-SEP-19	15-SEP-19	15-SEP-19
	Sampled Time		13:20	14:20	10:30	11:00
	Client ID	SEP DUP-2	INUG-116	INUG-117	SEP-128	SEP-129
Grouping	**Analyte**					
WATER						
Speciated Metals	Dimethylarsinic Acid (DMA, as As) (ug/L)		<0.020			
	Monomethylarsonic Acid (MMA, as As) (ug/L)		<0.020			
	Arsenobetaine (AsB, as As) (ug/L)		<0.050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Nickel (Ni)-Dissolved	MB-LOR	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Method Blank	Chromium (Cr)-Total	MB-LOR	L2354972-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L2354972-12
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L2354972-17, -18, -19, -20
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2354972-17, -18, -19, -20
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2354972-10, -11, -12, -13, -14, -15, -16, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2354972-17, -18, -19, -20
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2354972-10, -11, -12, -13, -14, -15, -16, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2354972-17, -18, -19, -20
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2354972-10, -11, -12, -13, -14, -15, -16, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2354972-17, -18, -19, -20
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2354972-17, -18, -19, -20
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2354972-10, -11, -12, -13, -14, -15, -16, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2354972-17, -18, -19, -20
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2354972-10, -11, -12, -13, -14, -15, -16, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2354972-17, -18, -19, -20
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2354972-10, -11, -12, -13, -14, -15, -16, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2354972-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2354972-10, -11, -12, -13, -14, -15, -16, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
DTSE	Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ALS Test Code	Matrix	Test Description	Method Reference**
AS-SPEC-HPLC/CCMS-VA	Water	Arsenic Species in Water by HPLC/CCMS	USGS WRIR 02-4144

Speciated Arsenic (As) Analysis is by reverse phase HPLC-ICPMS. Sample handling, preservation and holding times outlined in USGS Report 02-4144 and AWWA Preservation of Arsenic Species, 2006. Instrumental analysis based on Afton et al, Journal of Chromatography A, 1208 (2008) 156-163 and Agilent Technologies application notes. Filtration is conducted prior to preservation. Results for unfiltered, preserved samples may be elevated due to extraction of arsenic species from particulate matter in the samples.
Elevated iron (~100+ ppm) concentrations or sulfidic water can introduce biases to the reported results for some arsenic species.

ALS Test Code	Matrix	Test Description	Method Reference**
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA Water Dissolved organic carbon by combustion APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA Filter Chlorophyll a by Fluorometer (Filter) EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA Water Chloride in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA Water Low Level Free Cyanide in water by CFA ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA Water Low Level Total Cyanide in water by CFA ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L2354972-COFC

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC #

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Report To		Report Format / Distribution	
Company:	Azimuth Consulting Group	☑ Standard ☐ Other	
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q39503
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: Eric Franz

Service Requested (Rush for routine analysis subject to availability)
- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)	Arsenic speciation (F/P)		Number of Containers
	TPN-128	10-Sep-19	10:00	water	x	x	x	x	x	x	x	x	x	x			10
	TPN-129	14-Sep-19	12:09	Water	x	x	x	x	x	x	x	x	x	x			10
	TPE-128	14-Sep-19	11:18	Water	x	x	x	x	x	x	x	x	x	x			10
	TPE-129	14-Sep-19	10:04	Water	x	x	x	x	x	x	x	x	x	x			10
	WAL-97	14-Sep-19	15:43	Water	x	x	x	x	x	x	x	x	x	x			10
	WAL-98	14-Sep-19	16:28	Water	x	x	x	x	x	x	x	x	x	x			10
	SEP DUP-1	14-Sep-19		Water	x	x	x	x	x	x	x	x	x	x			10
	PDL-81	12-Sep-19	12:10	Water	x	x	x	x	x	x	x	x	x	x	x		11
	PDL-82	12-Sep-19	12:50	Water	x	x	x	x	x	x	x	x	x	x			10
	BBD-65	18-Sep-19	10:30	Water	x	x	x	x	x	x	x	x	x	x			10
	BBD-66	18-Sep-19	11:05	Water	x	x	x	x	x	x	x	x	x	x			10
	BPJ-65	18-Sep-19	12:30	Water	x	x	x	x	x	x	x	x	x	x			10
	BPJ-66	18-Sep-19	13:10	Water	x	x	x	x	x	x	x	x	x	x			10
	BAP-65	18-Sep-19	14:30	Water	x	x	x	x	x	x	x	x	x	x			10
	BAP-66	18-Sep-19	15:00	Water	x	x	x	x	x	x	x	x	x	x			10
	SEP DUP-2	18-Sep-19		Water	x	x	x	x	x	x	x	x	x	x			10
	INUG-116	18-Sep-19	13:20	Water	x	x	x	x	x	x	x	x	x	x	x		11
	INUG-117	18-Sep-19	14:20	Water	x	x	x	x	x	x	x	x	x	x			10
	SEP-128	15-Sep-19	10:30	Water	x	x	x	x	x	x	x	x	x	x			10
	SEP-129	15-Sep-19	11:00	Water	x	x	x	x	x	x	x	x	x	x			10

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4. TPN-128, TPN-129, TPE-128, TPE-129, WAL-98, PDL-81, PDL-82 metals were preserved on site

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Nicolas Saucier	23-Sep-19	8:00	RD	Sep 26,19	11:30	14 °C				

GENF 20.00 Front

APPENDIX G
SEDIMENT TOXICITY TESTING METHODS AND RESULTS

Freshwater sediment toxicity testing using *H. azteca* and *C. dilutus*

August 2019 Sediment Samples

Final Report

December 13, 2019

Submitted to: **Azimuth Consulting**
Vancouver, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

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NAUTILUS ENVIRONMENTAL

SIGNATURE PAGE

Report By:
Karen Lee, B. Sc.
Biologist – Project Manager

Reviewed By:
Armando Tang, R.P.Bio.
Senior Reviewer

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

SUMMARY

Sample and Test Type Information

Sample ID	PDL and TPE
Sample collection date	August 10 and 14, 2019
Sample receipt date	August 22, 2019
Sample receipt temperature	19.6 and 18.3°C
Test types	14-d *Hyalella azteca* survival and growth 10-d *Chironomus dilutus* survival and growth

Results

Sample ID	*Hyalella azteca* Survival (%) (Mean ± SD)	*Hyalella azteca* Dry Weight (mg) (Mean ± SD)	*Chironomus dilutus* Survival (%) (Mean ± SD)	*Chironomus dilutus* Dry Weight (mg) (Mean ± SD)
Control Sediment	98.0 ± 4.5	0.14 ± 0.03	94.0 ± 8.9	2.15 ± 0.33
PDL	90.0 ± 10.0	0.14 ± 0.02	96.0 ± 5.5	2.31 ± 0.28
TPE	30.0 ± 44.7$^{*, \alpha}$	0.08 ± 0.01$^{*, \alpha}$	98.0 ± 4.5	1.87 ± 0.17 $^{\alpha}$

SD = Standard Deviation

* indicates a statistical significant difference compared to the Control Sediment

$^{\alpha}$ indicates a statistical significant difference compared to the reference sample PDL

1.0 INTRODUCTION

Nautilus Environmental conducted freshwater sediment toxicity tests for Azimuth Consulting on samples identified as PDL and TPE. Samples were collected on August 10 and 14, 2019; each sample was transported in two 1-L containers. The samples were delivered to the laboratory in Burnaby, BC on August 22, 2019 at a temperature of 19.6 and 18.3°C and were stored in the dark at 4 ± 2°C prior to testing. A 14-d *Hyalella azteca* and a 10-d *Chironomus dilutus* survival and growth sediment toxicity tests were conducted on the samples and the test results are provided in this report. Copies of laboratory data sheets and printouts of statistical analyses for the tests are provided in Appendices A and B, analytical chemistry is provided in Appendix C and the chain-of-custody forms are provided in Appendix D.

2.0 METHODS

Methods for the toxicity tests are summarized in Tables 1 and 2. Testing was conducted according to procedures described by Environment Canada (1997 and 2013). Statistical analyses for all tests were performed using CETIS (Tidepool Scientific Software, 2013).

Ammonia concentrations were measured in-house three times per week on reference sediment sample PDL to ensure that un-ionized ammonia was below 0.2 mg/L (Environment Canada, 2013). Samples of overlying water were also collected at test initiation and termination and sent to ALS Environmental, Burnaby, BC for measurements of total ammonia concentration. Analytical results are provided in Appendix C.

Mini-peepers were deployed into the sediments for each field replicate during the *H. azteca* test and allowed to equilibrate for the duration of the test exposure (*i.e.*, 14 days). Mini-peepers were designed following protocols outlined in the USGS CERC protocol (Brumbaugh *et al.* 2013 and Brumbaugh 2014). Peepers were deployed into a sacrificial test jar for each sediment field replicate at test initiation. The 2.9-mL volume from each peeper was removed at the termination of the test and preserved with one drop of nitric acid. The porewater was sent to Brooks Applied Labs, Bothell, WA for measurements of arsenic, chromium, iron, manganese, lead, uranium and zinc. Analytical results are provided in Appendix D.

Table 1. Summary of test conditions: *Hyalella azteca* survival and growth test.

Test species	*Hyalella azteca*
Organism source	Aquatic BioSystems, Fort Collins, CO
Organism age	2- to 9-days old
Test type	Static
Test duration	14 days
Test vessel	375-mL glass container
Test volume	100 mL sediment; 175 mL overlying water
Test replicates	5 field replicates per sample
Number of organisms	10 per replicate
Control/dilution water	Reconstituted water
Test solution renewal	None
Test temperature	23 ± 1°C
Feeding	0.75 mL of YCT and 1.35 mg of Tetramin per replicate daily
Light intensity	500 to 1000 lux at water surface
Photoperiod	16 hours light/8 hours dark
Aeration	Continuous gentle aeration
Test measurements	Temperature, dissolved oxygen, pH and conductivity of overlying water measured daily; hardness, alkalinity and total ammonia of overlying water measured at test initiation and termination; unionized ammonia measured three times weekly in overlying water of reference sample
Test protocol	Environment Canada (2013), EPS 1/RM/33
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival and dry weight
Test acceptability criteria for controls	≥80% survival and ≥0.1 mg/amphipod dry weight
Reference toxicant	Sodium chloride (NaCl)

Table 2. Summary of test conditions: *Chironomus dilutus* survival and growth test.

Test species	*Chironomus dilutus*
Organism source	Aquatic BioSystems, Fort Collins, CO
Organism age	Third instar
Test type	Static
Test duration	10 days
Test vessel	375-mL glass container
Test volume	100 mL sediment; 175 mL overlying water
Test replicates	5 field replicates per sample
Number of organisms	10 per replicate
Control/dilution water	Reconstituted water
Test solution renewal	None
Test temperature	23 ± 1°C
Feeding	6 mg of Tetramin per replicate daily
Light intensity	500 to 1000 lux at water surface
Photoperiod	16 hours light/8 hours dark
Aeration	Continuous gentle aeration
Test measurements	Temperature, dissolved oxygen, pH and conductivity of overlying water measured daily; hardness, alkalinity and total ammonia of overlying water measured at test initiation and termination
Test protocol	Environment Canada (1997), EPS 1/RM/32
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival and dry weight
Test acceptability criteria for controls	≥70% survival and ≥0.6 mg/organism dry weight
Reference toxicant	Potassium chloride (KCl)

3.0 RESULTS

A statistically significant effect was observed on survival and dry weight of *H. azteca* in sample TPE compared to the control sediment and reference sediment PDL (Table 3). There was no statistically significant effect observed on survival of *C. dilutus* when compared to either the control sediment or reference sediment PDL; dry weight of *C. dilutus* in TPE was statistically significant when compared to the reference sediment (Table 4).

Measured total overlying ammonia concentrations in the *H. azteca* and *C. dilutus* tests are summarized in Table 5. These concentrations were at levels that are not expected to cause adverse effects to either species. Un-ionized ammonia measurements on the reference sediment sample were below 0.2 mg/L throughout the *H. azteca* test; therefore, renewal of the overlying water was not required (Environment Canada 2013).

Analytical results from peeper porewater are presented in Table 6.

Table 3. Results: *Hyalella azteca* survival and growth test.

Sample ID	Mean ± SD	
	Survival (%)	Average Dry Weight (mg)
Control Sediment	98.0 ± 4.5	0.14 ± 0.03
PDL	90.0 ± 10.0	0.14 ± 0.02
TPE	30.0 ± 44.7$^{*, \alpha}$	0.08 ± 0.01$^{*, \alpha}$

SD = Standard Deviation

* indicates a statistical significant difference compared to the Control Sediment

$^{\alpha}$ indicates a statistical significant difference compared to the reference sample PDL

Table 4. Results: *Chironomus dilutus* survival and growth test.

Sample ID	Mean ± SD	
	Survival (%)	Average Dry Weight (mg)
Control Sediment	94.0 ± 8.9	2.15 ± 0.33
PDL	96.0 ± 5.5	2.31 ± 0.28
TPE	98.0 ± 4.5	1.87 ± 0.17$^{\alpha}$

SD = Standard Deviation

$^{\alpha}$ indicates a statistical significant difference compared to the reference sample PDL

Table 5. **Summary of total overlying ammonia concentrations (mg/L N) measured in the toxicity tests.**

Sample ID	*Hyalella azteca*		*Chironomus dilutus*	
	Day 0	Day 14	Day 0	Day 10
Control Sediment	0.219	0.129	0.219	2.98
PDL	0.305	1.14	0.305	3.34
TPE	0.189	3.68	0.189	1.81

Table 6. **Summary of peeper porewater metal concentrations (µg/L) measured in the *H. azteca* test.**

Sample ID	Analyte						
	As	Cr	Fe	Mn	Pb	U	Zn
Blank Control	≤0.12	≤0.25	≤4.0	0.323	≤0.05	≤0.19	23.4
Control Sediment	6.97	1.16	771	35.3	0.243	≤0.19	49.7
PDL-1	6.40	≤0.25	4900	192	0.126	≤0.19	3.85
PDL-3	15.2	3.09	13300	520	0.939	0.544	10.5
PDL-4	3.93	23.4	9550	546	5.24	5.37	40.5
TPE-1	3.37	≤0.25	1030	23000	0.09	0.381	2.4
TPE-2	14.3	4.09	25200	19900	1.26	2.0	15.2
TPE-3	2.03	1.38	2070	24700	0.388	1.30	3.51
TPE-4	0.344	1.01	665	2570	0.396	0.379	7.65
TPE-5	0.261	0.591	433	4380	0.261	0.344	6.96

4.0 QA/QC

The health histories of the test organisms used in the exposures were acceptable and met the requirements of the Environment Canada protocols. The tests met all control acceptability criteria and water quality parameters remained within ranges specified in the protocols throughout the tests. Uncertainty associated with these tests is best described by the standard deviations around the means.

Results of the reference toxicant tests conducted during the testing program are summarized in Table 7. Results for these tests fell within the acceptable range for organism performance of mean and two standard deviations, based on historical results obtained by the laboratory with these tests. Thus, the sensitivity of the organisms used in these tests was appropriate.

Table 7. Reference toxicant test results.

Test Species	Endpoint	Historical Mean (2 SD Range)	CV (%)	Test Date
H. azteca	Survival (LC50): 6.9 g/L NaCl	5.8 (4.3 – 7.8) g/L NaCl	15	September 6, 2019
C. dilutus	Survival (LC50): 6.6 g/L KCl	5.7 (3.7 – 9.0) g/L KCl	23	September 6, 2019

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration

5.0 REFERENCES

Brumbaugh B, Besser JM, Ingersoll CG, May TW, Ivey CD, Schlekat CE, Garman ER. 2013. Preparation and characterization of nickel-spiked freshwater sediments for toxicity tests: Toward more environmentally realistic nickel partitioning, *Environmental Toxicology and Chemistry*, 32 (11): 2482–2494

Brumbaugh B. 2014. USGS CERC peeper method for in-situ sampling of sediment pore water. Revised on January 8, 2014.

Environment Canada. 2013. Biological test method: test for survival and growth in sediment and water using the freshwater amphipod, *Hyalella azteca*. EPS 1/RM/33, Second Edition, January 2013. Environment Canada, Method Development and Application Section, Environmental Technology Centre, Ottawa, ON. 150 pp.

Environment Canada. 1997. Biological test method: test for survival and growth in sediment using the larvae of freshwater midges (*Chironomus tentans* and *Chrironomus riparius*). Environmental Protection Series EPS 1/RM/32. December 1997. Environment Canada, Method Development and Application Section, Environmental Technology Centre, Ottawa, ON. 131 pp.

Tidepool Scientific Software. 2013. CETIS comprehensive environmental toxicity information system, version 1.9.4.11 Tidepool Scientific Software, McKinleyville, CA. 222 pp.

APPENDIX A – *Hyalella azteca* Toxicity Test Data

Hyalella azteca Sediment Test Summary Sheet

Client: Azimuth
Work Order No.: 191667

Start Date: Sept 6/19
Set up by: KJL

Sample Information:

Sample ID: Various - see below
Sample Date: Aug 10 and 14/19
Date Received: Aug 22/19
Sample Volume: 2x1L per sample

Test Organism Information:

Species: *Hyalella azteca*
Supplier: Aquatic Biosystems, CO
Date received: Sept 5/19
Age or size (Day 0): 7-9 days
% Mortality in 24 h prior to testing 0%

NaCl Reference Toxicant Results:

Reference Toxicant ID: HA177
Stock Solution ID: n/a
Date Initiated: Sept 6/19

96-h LC50 (95% CL): 6.9 (5.6 - 8.4) g/L NaCl

96-h LC50 Reference Toxicant Mean and Range: 5.8 (4.3 - 7.8) g/L NaCl CV (%): 15

Test Results:

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
Control Sediment	98.0 ± 4.5	0.14 ± 0.03
PDL	90.0 ± 10.0	0.14 ± 0.02
TPE	30.0 ± 44.7 *,α	0.08 ± 0.01 *,α
	±	±
	±	±
	±	±
	±	±
	±	±

* significantly different compared to control sediment
α significantly different compared to reference sediment PDL

Reviewed by: JOu

Date reviewed: Oct. 22/19

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
Freshwater Sediment Water Quality

Client: Azimuth
Work Order No.: 191667

Start Date: Sept 6/19
Termination Date: Sept 20/19
CER #: 9
Test Organism: *Hyalella azteca*

Temperature (°C)

Sample ID	Day 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control Sediment	23.0	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
PDL	23.0	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
TPE	23.0	22.5	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Technician Initials	CMP	UUU	JD	CMP	CMP	CMP	UU	CMP	UUU	JD	CMP	CMP	CMP	CMP	CMP

Thermometer: CER#9

Conductivity (µS)

Sample ID	Day 0	1	2	3	4	5	6	7	8	JD 9	10	11	① 12	13	14
Control Sediment	395	398	408	443	457	466	483	479	485	~~8~~ 492	497	494	~~551~~	504	509
PDL	341	279	265	344	321	338	329	341	344	345	350	347	~~342~~	357	362
TPE	376	368	361	369	381	383	404	401	404	414	394	396	~~442~~	399	394
													CP		
Technician Initials	CMP	UUU	JP	CMP	CMP	CMP	UU	CMP	UUU	JD	CMP	CMP	CMP	CMP	CMP

Conductivity meter/probe: 3 / 3

Comments: CP ~~F Ref Reading Differently than other 5 Refs (FPE)~~
① C-3 Meter Reading high - Remeasured: 506, 351, 392

Reviewed by: JCh

Date Reviewed: Oct. 16/19

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
Freshwater Sediment Water Quality

Client: Azimuth
Work Order No.: 191667

Start Date: Sept 6/19
Termination Date: Sept 20/19
CER #: 9
Test Organism: *Hyalella azteca*

Dissolved oxygen (mg/L)

Sample ID	Day														
	0	1	2	3①	4	5	6	7	8	9	10	11	12	13	14
Control Sediment	7.5	7.4	7.8	~~6.7~~	5.4	7.9	8.0	7.8	7.5	7.9	7.3	7.8	7.9	7.8	7.9
PDL	7.6	7.6	7.8	~~6.9~~	5.1	8.0	8.0	7.7	7.6	8.0	7.4	7.9	7.9	7.8	7.8
TPE	7.6	7.5	7.9	~~6.7~~	5.1	7.9	8.0	7.8	7.6	8.0	7.4	8.0	8.0	7.9	8.0
Technician Initials	CMP	MW	JD	CMP	CMP	CMP	KL	CMP	MW	JD	CMP	CMP	CMP	CMP	CMP

DO meter/probe: 3 / 3

① DO=6.7mg/L

pH

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control Sediment	7.5	7.6	8.0	7.5	7.6	7.7	7.7	7.8	8.0	8.0	8.1	8.0	~~8~~ 7.8	7.7	7.7
PDL	7.7	7.5	8.0	7.4	7.5	7.5	7.9	7.4	7.6	7.7	7.6	7.5	7.5	7.5	7.4
TPE	7.6	7.5	7.8	7.6	7.5	7.7	7.8	7.7	7.8	8.0	8.0	7.9	7.8	7.7	7.6
Technician Initials	CMP	MW	JD	CMP	CMP	CMP	KL	CMP	MW	JD	CMP	CMP	CMP	CMP	CMP

pH meter/probe: 3 / 3

Light meter: Lit-1

Light intensity (Lux): 210-770

Comments:

Reviewed by: JCh

Date Reviewed: Oct-22/19

H. azteca Sediment Toxicity Test Data Sheet

Freshwater Sediment 14-d Survival and Weight

Client: Azimuth
Work Order No: 191667
Sample ID: See below

Start Date: Sept 6/19
Termination Date: Sept 20/19
Test Organism: *Hyalella azteca*
Balance: |

Ref.

Sample ID	Pan No. AZ blue	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment	1	A	10	0	0	CMP	1027.72	1029.12	10	MM/CMP
	2	B	~~10~~ 9	0	~~0~~ 1		1032.32	1033.91	9	
	3	C	10	0	0		1047.09	1048.31	10	
	4	D	10	0	0		1022.87	1023.97	10	
	5	E	10	0	0		1023.85	1025.34	10	
PDL	6	A	10	0	0	ST	1014.34	1015.67	10	
	7	B	8	0	2	JL	1049.12	1050.42	8	
	8	C	8	1	1	ST	1053.53	1054.53	8	
	9	D	10	0	0	JL	1040.10	1041.73	10	
	10	E	9	0	1	JL	1047.12	1048.28	9	
TPE	11	A	0 ①	0	10	JL	1049.77	—	0	
	12	B	0 ①	0	10	ST	1022.33	—	0	
	13	C	0 ①	0	10	JL	1040.42	—	0	
	14	D	~~14~~ 10	0	0	JL	1041.51	1042.35	10	
	15	E	5 ~~4~~ ①	~~0~~ 1	4	ST	1048.97	1049.31	5	
		A								
		B								
		C								
		D								
		E								

Comments: ① QA checked CMP. 10% RW: Pan #9 = 1041.69, Pan #3 = 1048.27

Reviewed by: JOM

Date Reviewed: Oct 22/19

CETIS Summary Report

Report Date:	22 Oct-19 16:05 (p 1 of 2)
Test Code/ID:	191667 / 04-8379-3263

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Batch ID:	17-6720-3191	**Test Type:**	Growth-Survival (10d) 14	**Analyst:**	Karen Lee		
Start Date:	06 Sep-19	**Protocol:**	EC/EPS 1/RM/33 14	**Diluent:**	Reconstituted Water		
Ending Date:	20 Sep-19	**Species:**	Hyalella azteca	**Brine:**			
Test Length:	14d 0h	**Taxon:**	Malacostraca	**Source:**	Aquatic Biosystems, CO	**Age:**	7-9d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control Sedime	12-2498-8444	06 Sep-19	06 Sep-19	n/a	Azimuth	
PDL	08-2406-0510	14 Aug-19	22 Aug-19 09:00	23d 0h (19.6 °C)		
TPE	19-1773-9066	10 Aug-19	22 Aug-19 09:00	27d 0h (18.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control Sedime	Sediment Sample	Azimuth	Control Sediment	
PDL	Sediment Sample	Azimuth	PDL	
TPE	Sediment Sample	Azimuth	TPE	

Single Comparison Summary

JG

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
19-0421-9003	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2044	Control Sedime passed 10d survival rate	1
19-0421-9003	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2044	PDL passed 10d survival rate	1
19-0421-9003	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.2044	TPE passed 10d survival rate	1
19-0421-9003	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	5.7E-14	Control Sedime failed 10d survival rate	1
19-0421-9003	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	5.7E-14	PDL failed 10d survival rate	1
19-0421-9003	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	5.7E-14	TPE failed 10d survival rate	1
18-5804-1990	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.7665	Control Sedime passed mean dry weight-	1
18-5804-1990	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.7665	PDL passed mean dry weight-mg	1
18-5804-1990	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.7665	TPE passed mean dry weight-mg	1
18-5804-1990	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.0061	Control Sedime failed mean dry weight-mg	1
18-5804-1990	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.0061	PDL failed mean dry weight-mg	1
18-5804-1990	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.0061	TPE failed mean dry weight-mg	1

10d Survival Rate Summary

14

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control Sedime	N	5	0.9800	0.9245	1.0000	0.9000	1.0000	0.0200	0.0447	4.56%	0.00%
PDL		5	0.9000	0.7758	1.0000	0.8000	1.0000	0.0447	0.1000	11.11%	8.16%
TPE		5	0.3000	0.0000	0.8553	0.0000	1.0000	0.2000	0.4472	149.07%	69.39%

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control Sedime	N	5	0.1395	0.1076	0.1715	0.11	0.1767	0.01151	0.02573	18.44%	0.00%
PDL		5	0.1425	0.1192	0.1657	0.125	0.163	0.008373	0.01872	13.14%	-2.11%
TPE		2	0.07601	-0.02551	0.1775	0.06802	0.084	0.007989	0.0113	14.87%	45.53%

10d Survival Rate Detail

14

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedime	N	1.0000	0.9000	1.0000	1.0000	1.0000
PDL		1.0000	0.8000	0.8000	1.0000	0.9000
TPE		0.0000	0.0000	0.0000	1.0000	0.5000

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedime	N	0.14	0.1767	0.122	0.11	0.149
PDL		0.133	0.1625	0.125	0.163	0.1289
TPE					0.084	0.06802

Hyalella 14-d Survival and Growth Sediment Test | **Nautilus Environmental**

~~10d~~ 14d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedime	N	10/10	9/10	10/10	10/10	10/10
PDL		10/10	8/10	8/10	10/10	9/10
TPE		0/10	0/10	0/10	10/10	5/10

CETIS Analytical Report

Report Date:	22 Oct-19 15:57 (p 1 of 1)	**Test Code/ID:**	191667 / 04-8379-3263

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	19-0421-9003	**Endpoint:**	~~10d~~ 14d Survival Rate	**CETIS Version:**	CETISv1.9.4
Analyzed:	22 Oct-19 15:57	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1

Batch ID:	17-6720-3191	**Test Type:**	Growth-Survival (~~10d~~ 14d)	**Analyst:**	Karen Lee
Start Date:	06 Sep-19	**Protocol:**	EC/EPS 1/RM/33	**Diluent:**	Reconstituted Water
Ending Date:	20 Sep-19	**Species:**	Hyalella azteca	**Brine:**	
Test Length:	14d 0h	**Taxon:**	Malacostraca	**Source:**	Aquatic Biosystems, CO **Age:** 7-9d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control Sedime	12-2498-8444	06 Sep-19	06 Sep-19	n/a	Azimuth	
PDL	08-2406-0510	14 Aug-19	22 Aug-19 09:00	23d 0h (19.6 °C)		
TPE	19-1773-9066	10 Aug-19	22 Aug-19 09:00	27d 0h (18.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control Sedime	Sediment Sample	Azimuth	Control Sediment	
PDL	Sediment Sample	Azimuth	PDL	
TPE	Sediment Sample	Azimuth	TPE	

Fisher Exact/Bonferroni-Holm Test

Sample I vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control	PDL	0.1022	Exact	0.2044	Non-Significant Effect
	TPE*	0.0000	Exact	5.7E-14	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control Sedime	N	49	1	50	0.98	0.02	-8.89%
PDL		45	5	50	0.9	0.1	0.0%
TPE		15	35	50	0.3	0.7	66.67%

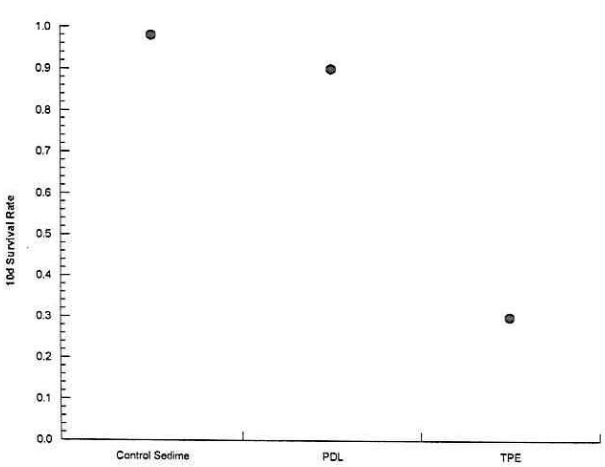
~~10d~~ 14d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedime	N	1.0000	0.9000	1.0000	1.0000	1.0000
PDL		1.0000	0.8000	0.8000	1.0000	0.9000
TPE		0.0000	0.0000	0.0000	1.0000	0.5000

~~10d~~ 14d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedime	N	10/10	9/10	10/10	10/10	10/10
PDL		10/10	8/10	8/10	10/10	9/10
TPE		0/10	0/10	0/10	10/10	5/10

Graphics



Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	18-5804-1990	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	22 Oct-19 16:05	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

Batch ID:	17-6720-3191	**Test Type:**	Growth-Survival (~~10d~~ 14d)	**Analyst:**	Karen Lee
Start Date:	06 Sep-19	**Protocol:**	EC/EPS 1/RM/33	**Diluent:**	Reconstituted Water
Ending Date:	20 Sep-19	**Species:**	Hyalella azteca	**Brine:**	
Test Length:	14d 0h	**Taxon:**	Malacostraca	**Source:**	Aquatic Biosystems, CO **Age:** 7-9d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control Sedime	12-2498-8444	06 Sep-19	06 Sep-19	n/a	Azimuth	
PDL	08-2406-0510	14 Aug-19	22 Aug-19 09:00	23d 0h (19.6 °C)		
TPE	19-1773-9066	10 Aug-19	22 Aug-19 09:00	27d 0h (18.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control Sedime	Sediment Sample	Azimuth	Control Sediment	
PDL	Sediment Sample	Azimuth	PDL	
TPE	Sediment Sample	Azimuth	TPE	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	PDL passed mean dry weight-mg	28.46%
		TPE failed mean dry weight-mg	28.46%

Dunnett Multiple Comparison Test

Sample I vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control	PDL	-0.2159	2.202	0.030	8	CDF	0.7665	Non-Significant Effect
	TPE*	3.524	2.202	0.04	5	CDF	0.0061	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0070635	0.0035318	2	7.606	0.0116	Significant Effect
Error	0.0041788	0.0004643	9			
Total	0.0112423		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	0.808	9.21	0.6676	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9645	0.8025	0.8457	Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control Sedime	N	5	0.1395	0.1076	0.1715	0.14	0.11	0.1767	0.01151	18.44%	0.00%
PDL		5	0.1425	0.1192	0.1657	0.133	0.125	0.163	0.008373	13.14%	-2.11%
TPE		2	0.07601	-0.02551	0.1775	0.07601	0.06802	0.084	0.007989	14.87%	45.53%

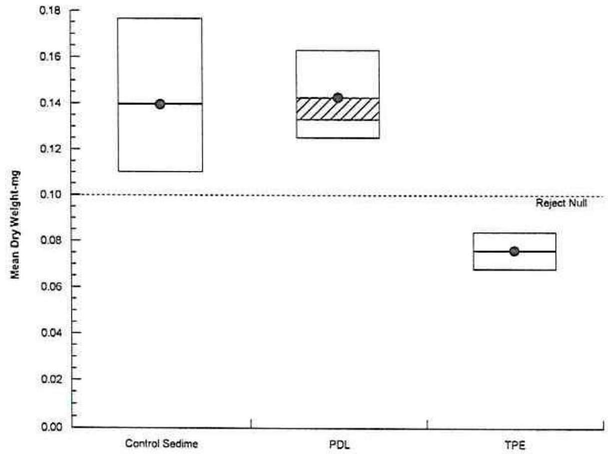
Mean Dry Weight-mg Detail

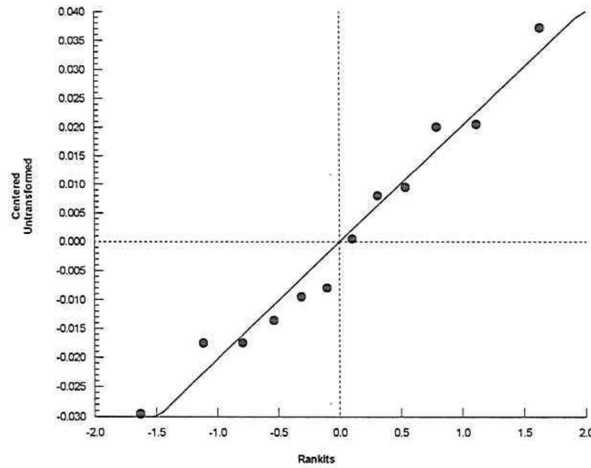
Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedime	N	0.14	0.1767	0.122	0.11	0.149
PDL		0.133	0.1625	0.125	0.163	0.1289
TPE		0.084	0.06802			

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	18-5804-1990	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	22 Oct-19 16:05	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

Graphics





CETIS Analytical Report

Report Date:	22 Oct-19 15:58 (p 1 of 1)	**Test Code/ID:**	191667 / 04-8379-3263

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	01-8796-5153	**Endpoint:**	~~10~~14d Survival Rate	**CETIS Version:**	CETISv1.9.4
Analyzed:	22 Oct-19 15:58	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1

Batch ID:	17-6720-3191	**Test Type:**	Growth-Survival (~~10~~14d)	**Analyst:**	Karen Lee
Start Date:	06 Sep-19	**Protocol:**	EC/EPS 1/RM/33	**Diluent:**	Reconstituted Water
Ending Date:	20 Sep-19	**Species:**	Hyalella azteca	**Brine:**	
Test Length:	14d 0h	**Taxon:**	Malacostraca	**Source:**	Aquatic Biosystems, CO **Age:** 7-9d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
PDL	08-2406-0510	14 Aug-19	22 Aug-19 09:00	23d 0h (19.6 °C)	Azimuth	
TPE	19-1773-9066	10 Aug-19	22 Aug-19 09:00	27d 0h (18.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
PDL	Sediment Sample	Azimuth	PDL	
TPE	Sediment Sample	Azimuth	TPE	

Fisher Exact Test

Sample I vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Reference Sed	TPE*	0.0000	Exact	3.6E-10	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
PDL	RS	45	5	50	0.9	0.1	0.0%
TPE		15	35	50	0.3	0.7	66.67%

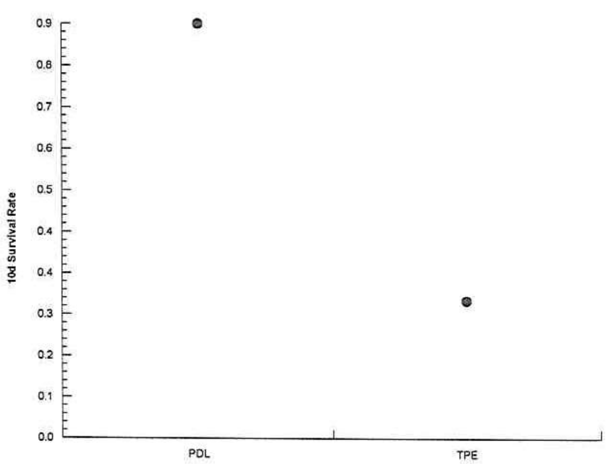
~~10~~14d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
PDL	RS	1.0000	0.8000	0.8000	1.0000	0.9000
TPE		0.0000	0.0000	0.0000	1.0000	0.5000

10d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
PDL	RS	10/10	8/10	8/10	10/10	9/10
TPE		0/10	0/10	0/10	10/10	5/10

Graphics



Analyst: KJL QA: JGL Oct-22/19

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	00-8357-0882	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	10 Oct-19 9:14	**Analysis:**	Parametric-Two Sample	**Status Level:**	1

Batch ID:	17-6720-3191	**Test Type:**	Growth-Survival (10d) 14	**Analyst:**	Karen Lee
Start Date:	06 Sep-19	**Protocol:**	EC/EPS 1/RM/33 14	**Diluent:**	Reconstituted Water
Ending Date:	20 Sep-19	**Species:**	Hyalella azteca	**Brine:**	
Test Length:	14d 0h	**Taxon:**	Malacostraca	**Source:**	Aquatic Biosystems, CO **Age:** 7-9d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
PDL	08-2406-0510	14 Aug-19	22 Aug-19 09:00	23d 0h (19.6 °C)	Azimuth	
TPE	19-1773-9066	10 Aug-19	22 Aug-19 09:00	27d 0h (18.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
PDL	Sediment Sample	Azimuth	PDL	
TPE	Sediment Sample	Azimuth	TPE	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	TPE failed mean dry weight-mg	20.70%

Equal Variance t Two-Sample Test

Sample I vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Reference Sed	TPE*	4.542	2.015	0.029	5	CDF	0.0031	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0063122	0.0063122	1	20.63	0.0062	Significant Effect
Error	0.0015299	0.000306	5			
Total	0.0078421		6			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	2.746	22500	0.8425	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8627	0.5629	0.1600	Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
PDL	RS	5	0.1425	0.1192	0.1657	0.133	0.125	0.163	0.008373	13.14%	0.00%
TPE		2	0.07601	-0.02551	0.1775	0.07601	0.06802	0.084	0.007989	14.87%	46.65%

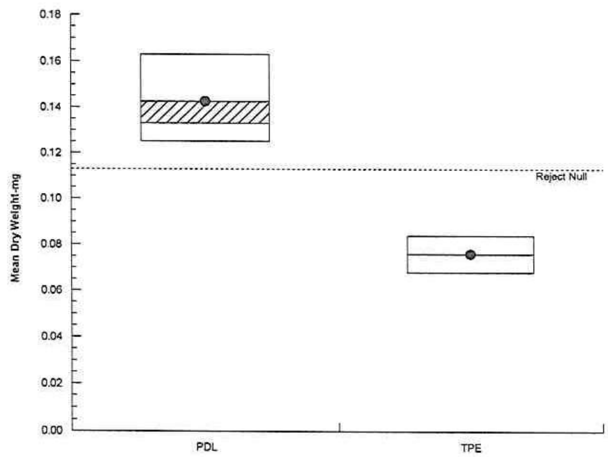
Mean Dry Weight-mg Detail

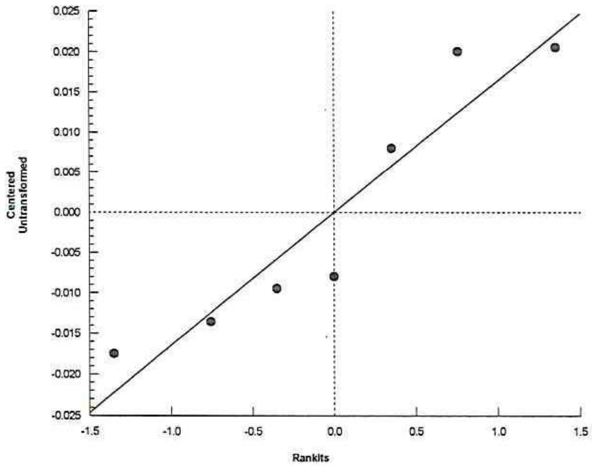
Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
PDL	RS	0.133	0.1625	0.125	0.163	0.1289
TPE		0.084	0.06802			

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	00-8357-0882	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	10 Oct-19 9:14	**Analysis:**	Parametric-Two Sample	**Status Level:**	1

Graphics





Client : Azimuth
W.O.: 191667
Date see below

Table of PKa values

	TDS (mg/L)			Salinity (g/kg)		
Temperature (°C)	*0*	*250*	*2000*	*10*	*20*	*30*
12	9.662	9.699	9.754	9.788	9.819	9.837
15	9.564	9.601	9.655	9.688	9.719	9.737
18	9.465	9.502	9.557	9.588	9.619	9.636
20	9.401	9.438	9.492	9.523	9.554	9.571
22		9.391				
23	9.307	9.344	9.398	9.426	9.459	9.476
25	9.246	9.283	9.337	9.366	9.397	9.414

Date	Sample ID	Temperature (C)	pH	Salinity (ppt)	Total Ammonia as N (mg/L)	pKa	Unionized Ammonia (mg/L N)
6-Sep-19	**PDL**	**23**	**7.7**		**0.53**	9.344	**0.011763**
9-Sep-19	**PDL**	**23**	**7.4**		**1.20**	9.344	**0.013498**
11-Sep-19	**PDL**	**23**	**7.5**		**2.00**	9.344	**0.028239**
13-Sep-19	**PDL**	**23**	**7.4**		**2.30**	9.344	**0.025871**
16-Sep-19	**PDL**	**23**	**7.6**		**2.60**	9.344	**0.046048**
18-Sep-19	**PDL**	**23**	**7.5**		**1.20**	9.344	**0.016944**

JGb
Oct. 16/19

Nautilus Environmental
Water Quality Data For Ammonia

Client : Azimuth

Species : H. azteca

Work Order No: 191667

Sample Type: Overlying ammonia

Date Measured: Various - see below

Date	Sample ID	Temperature (°C)	pH	Total Ammonia as N (mg/L)	Unionized Ammonia (mg/L)	Tech. Init.
Sept 6/19	PDL	23.0	7.7	0.53	0.01	CMP
Sept 9/19	↓	23.0	7.4	1.2	0.01	CMP
Sept 11/19	↓	23.0	7.5	2.0	0.03	CMP
Sept 13/19	↓	23.0	7.4	2.3	0.03	CMP
Sept 16/19	↓	23.0	7.6	2.6	0.05	CMP
Sept 18/19	↓	23.0	7.5	1.2	0.02	CMP

Ammonia Salicylate Lot #: A9099

Ammonia Cyanurate Lot #: A9049

Comments:

Reviewed by: JGr

Date Reviewed: Oct-16/19

Client: Azimuth

W.O.#: 191667-668

Hardness and Alkalinity Datasheet

		Alkalinity						Hardness			
	Sample ID	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H_2SO_4 used to pH 4.5	(mL) of 0.02N HCL/H_2SO_4 used to pH 4.2	Total Alkalinity (mg/L$CaCO_3$)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L $CaCO_3$)	Technician
Day 0	Control Sediment	Sept 6/19	Sept 18/19	50	3.0	3.2	~~58~~ 56	50	5.3	106	SPT
	PDL	↓		50	2.0	2.1	38	50	4.5	90	SPT
	TPE	↓		50	1.9	2.0	36	50	4.6	92	MD
Day 10	Control Sediment	Sept 16/19	Sept 19/19	50	3.5	3.7	66	50	5.0	100	MD
	PDL	↓		50	~~1.7~~ 1.65	1.7	32	50	3.9	78	MD
	TPE	↓		50	4.4	4.5	36	50	4.4	88	MD
Day 14	Control Sediment	Sept 20/19	Oct 11/19	100 (1)	1.1	1.2	100	100 (1)	1.4	140	[illegible]
	PDL	↓	↓	100 (1)	0.4	0.5	30	100 (1)	0.9	90	↓
	TPE	↓	↓	100 (1)	1.0	1.1	90	100 (1)	1.1	110	↓

Notes: (1) diluted to 100 mL with DI water

Reviewed by: JGh   Date Reviewed: Oct. 15/19

Sediment Description Data Sheet

Client: Azimuth
Work Order No.: i91667-668

Date: Sept 5/19
Test Organism: *Hyalella azteca* / Chironomus dilutus

Sample ID	Grain Size	Colour	Odour	Debris	Other	Initials
Control Sediment	sand	grey	none	—	—	KJV
PDL-1	~~sand~~ clay	grey	none	–	overlaying water	g
PDL-2	~~sand~~ clay	grey	none	–	↓	g
PDL-3	~~sand~~ clay	~~light brown~~ grey	none	–	↓	g
PDL-4	~~sand~~ clay	light brown	none	–	↓	g
PDL-5	~~sand~~ clay	grey	none	–	↓	g
TPE-1	clay	grey	none		overlaying water	ct
TPE-2	clay	grey	none		↓	ct
TPE-3	clay	grey	none		↓	ct
TPE-4	thick clay	~~medium~~ light brown	none	–	↓	ct
TPE-5	clay	light brown	none		↓	ct

Reviewed by: JGL

Date Reviewed: Oct. 15/19

APPENDIX B – *Chironomus dilutus* Toxicity Test Data

Chironomus dilutus Sediment Test Summary Sheet

Client: Azimuth
Work Order No.: 191668

Start Date: Sept 6/19
Set up by: KJL

Sample Information:

Sample ID: Various - see below
Sample Date: ~~Aug 22/19~~ Aug 10 and 14/19
Date Received: Aug 22/19
Sample Volume: 2x1L per sample

Test Organism Information:

Species: *C. dilutus*
Supplier: Aquatic Biosystems, CO
Date received: Sept 5/19
Age or size (Day 0): 3rd in-star

KCl Reference Toxicant Results:

Reference Toxicant ID: CT79
Stock Solution ID: n/a
Date Initiated: Sept 6/19

96-h LC50 (95% CL): 6.6 (5.8 - 7.5) g/L KCl

96-h LC50 Reference Toxicant Mean and Range: 5.7 (3.7 - 9.0) g/L KCl CV (%): 23

Test Results:

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
Control Sediment	94.0 ± 8.9	2.15 ± 0.33
PDL	96.0 ± 5.5	2.31 ± 0.28
TPE	98.0 ± 4.5	1.87 ± 0.17*
	±	±
	±	±
	±	±
	±	±

*significantly different compared to reference sediment PDL

Reviewed by: [signature]

Date reviewed: Oct-22/19

10-d Chironomid Sediment Toxicity Test Data Sheet
Freshwater Sediment 10-d Water Quality

Client: Azimuth
W.O #: 191668

Start Date: Sept 6/19
Termination Date: ~~Sept 20~~ Sept 16/19
CER #: 9
Test Organism: *Chironomus dilutus*

Temperature (°C)

Sample ID	Day 0	1	2	3	4	5	6	7	8	9	10
Control Sediment	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	22.5	23.0	23.0
PDL	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	22.5	23.0	23.0
TPE	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	22.5	23.0	23.0
Technician Initials	CMP	hm	JD	CMP	CMP	CMP	hm	CMP	hm	JD	CMP

Thermometer: CER#9

Conductivity (µS)

Sample ID	Day 0	1	2	3	4	5	6	7	8	9	10
Control Sediment	397	427	442	445	426	435	463	445	448	462	466
PDL	300	357	342	340	267	275	280	286	293	302	313
TPE	381	396	393	391	357	353	357	352	348	341	~~430~~ 343
Technician Initials	CMP	hm	JD	CMP	CMP	CMP	hm	CMP	hm	JD	CMP

Conductivity meter/probe: 3 / 3

Comments: CP ~~Feed Rarely differently than other 5 tests (TPE)~~

Reviewed by: JBh

Date Reviewed: Oct. 16/19

10-d Chironomid Sediment Toxicity Test Data Sheet

Freshwater Sediment 10-d Water Quality

Client: Azimuth

W.O. #: 191668

Start Date: Sept 6/19

Termination Date: Sept 16/19

CER #: 9

Test Organism: *Chironomus dilutus*

Dissolved oxygen (mg/L)

Sample ID	Day										
	0	1	2	3 ①	4	5	6	7	8	9	10
Control Sediment	7.5	7.7	7.9	~~6.8~~ CP	6.2	7.7	8.0	7.8	7.6	8.0	7.7
PDL	7.6	7.5	7.9	~~6.6~~ CP	6.2	7.8	7.9	7.7	7.7	8.0	7.6
TPE	7.6	7.6	7.8	~~6.7~~ CP	6.1	7.7	7.9	7.8	7.5	7.8	7.7
Technician Initials	CMP	uw	JD	CMP	CMP	CMP	ic	CMP	uw	JD	CMP

DO meter/probe: 3 / 3

① DO = 6.8, 6.6, 6.7

pH

Sample ID	Day										
	0	1	2	3	4	5	6	7	8	9	10
Control Sediment	7.6	7.6	7.8	7.6	7.7	7.8	7.7	7.7	7.8	8.0	7.9
PDL	7.2	7.3	7.8	7.6	7.1	7.0	7.1	6.9	6.9	6.9	7.0
TPE	7.5	7.3	7.7	7.3	7.4	7.5	7.5	7.4	7.4	7.5	7.5
Technician Initials	CMP	uw	JD	CMP	CMP	CMP	ic	CMP	uw	JD	CMP

pH meter/probe: 3 / 3

Light meter: Lit-1

Light intensity (Lux): 210-770

Comments:

Reviewed by: JOU

Date Reviewed: Oct. 22/19

10-d Chironomid Sediment Toxicity Test Data Sheet

Freshwater Sediment 10-d Survival and Weight

Client: Azimuth
W.O. #: 191668
Sample ID: see below

Start Date: Sept 6/19
Termination Date: ~~Sept~~ 16/19 @ 1130
Test Organism: *Chironomus dilutus*
Balance: 1

Sample ID	Az Pan No. red	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment	1	A	10 (1)	0	0	CMP	1064.28	1077.29	~~5~~ 5	MN/CMP
	2	B	10 (2)	0	0		1056.66	1065.13	~~4~~ 4	
	3	C	10 (3)	0	0		1041.36	1053.58	~~7~~ 7	
	4	D	8 (5)	0	2	JW	1051.93	1063.67	6	
	5	E	9	0	1	~~JW~~ MD	1050.55	1071.55	9	
PDL	6	A	9 (4)	0	1	CMP	1019.70	1031.76	~~6~~ 6	
	7	B	10 (6)	0	0		1049.01	1073.87	9	
	8	C	10 (7)	0	0		1022.85	1042.76	9	
	9	D	10	0	0	MD	1023.48	1046.69	10	
	10	E	9	0	1	MD	1024.00	1044.13	9	
TPE	11	A	10	0	0	JW	1026.16	1044.21	10	
	12	B	10	0	0	ST	1048.79	1067.71	10	
	13	C	10 (7)	0	0	CMP	1035.98	1050.62	9	
	14	D	9 (8)	0	1	ST	1031.65	1045.76	7	
	15	E	10	0	0	MD	1062.15	1082.42	10	
		A								
		B								
		C								
		D								
		E								

Ref.

Comments: (1) 5 ~~Husks~~ Midges (2) 6 ~~Husks~~ Midges (3) 3 pupae (4) 2 pupae + 1 Midge 10% RW: Pan #11 = 1044.28, Pan #9 = 1046.73
(5) 2 midges (6) 1 Midge (7) 1 pupae (8) 2 pupae

Reviewed by: JOY
Date Reviewed: Oct-16/19

Version 1.1; Issued May 19, 2017

Nautilus Environmental Company Inc.

CETIS Summary Report

Report Date: 22 Oct-19 16:21 (p 1 of 2)
Test Code/ID: 191668 / 11-4257-7256

Chironomus 10-d Survival and Growth Sediment Test — Nautilus Environmental

Batch ID:	06-6856-9732	**Test Type:**	Growth-Survival (10d)	**Analyst:**	Karen Lee
Start Date:	06 Sep-19	**Protocol:**	EC/EPS 1/RM/32	**Diluent:**	Reconstituted Water
Ending Date:	16 Sep-19	**Species:**	Chironomus tentans	**Brine:**	
Test Length:	10d 0h	**Taxon:**	Insecta	**Source:**	Aquatic Biosystems, CO **Age:** 3rd

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control Sedime	12-2498-8444	06 Sep-19	06 Sep-19	n/a	Azimuth	
PDL	08-2406-0510	14 Aug-19	22 Aug-19 09:00	23d 0h (19.6 °C)		
TPE	19-1773-9066	10 Aug-19	22 Aug-19 09:00	27d 0h (18.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control Sedime	Sediment Sample	Azimuth	Control Sediment	
PDL	Sediment Sample	Azimuth	PDL	
TPE	Sediment Sample	Azimuth	TPE	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
19-1385-4562	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Control Sedime passed 10d survival rate	1
19-1385-4562	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	PDL passed 10d survival rate	1
19-1385-4562	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	TPE passed 10d survival rate	1
19-1385-4562	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9413	Control Sedime passed 10d survival rate	1
19-1385-4562	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9413	PDL passed 10d survival rate	1
19-1385-4562	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.9413	TPE passed 10d survival rate	1
14-7109-2007	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.9201	Control Sedime passed mean dry weight-	1
14-7109-2007	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.9201	PDL passed mean dry weight-mg	1
14-7109-2007	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.9201	TPE passed mean dry weight-mg	1
14-7109-2007	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.1078	Control Sedime passed mean dry weight-	1
14-7109-2007	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.1078	PDL passed mean dry weight-mg	1
14-7109-2007	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.1078	TPE passed mean dry weight-mg	1

10d Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control Sedime	N	5	0.9400	0.8289	1.0000	0.8000	1.0000	0.0400	0.0894	9.52%	0.00%
PDL	RS	5	0.9600	0.8920	1.0000	0.9000	1.0000	0.0245	0.0548	5.71%	-2.13%
TPE		5	0.9800	0.9245	1.0000	0.9000	1.0000	0.0200	0.0447	4.56%	-4.26%

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control Sedime	N	5	2.151	1.739	2.563	1.746	2.602	0.1483	0.3316	15.42%	0.00%
PDL	RS	5	2.308	1.963	2.654	2.01	2.762	0.1244	0.2782	12.05%	-7.32%
TPE		5	1.873	1.668	2.079	1.627	2.027	0.07408	0.1656	8.84%	12.91%

10d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedime	N	1.0000	1.0000	1.0000	0.8000	0.9000
PDL	RS	0.9000	1.0000	1.0000	1.0000	0.9000
TPE		1.0000	1.0000	1.0000	0.9000	1.0000

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedime	N	2.602	2.117	1.746	1.957	2.333
PDL	RS	2.01	2.762	2.212	2.321	2.237
TPE		1.805	1.892	1.627	2.016	2.027

Analyst: KL QA: JG Oct.22/19

Chironomus 10-d Survival and Growth Sediment Test — Nautilus Environmental

10d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedime	N	10/10	10/10	10/10	8/10	9/10
PDL	RS	9/10	10/10	10/10	10/10	9/10
TPE		10/10	10/10	10/10	9/10	10/10

CETIS Analytical Report

Report Date:	22 Oct-19 16:16 (p 1 of 1)
Test Code/ID:	191668 / 11-4257-7256

Chironomus 10-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	19-1385-4562	**Endpoint:**	10d Survival Rate	**CETIS Version:**	CETISv1.9.4
Analyzed:	22 Oct-19 16:16	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1

Batch ID:	06-6856-9732	**Test Type:**	Growth-Survival (10d)	**Analyst:**	Karen Lee
Start Date:	06 Sep-19	**Protocol:**	EC/EPS 1/RM/32	**Diluent:**	Reconstituted Water
Ending Date:	16 Sep-19	**Species:**	Chironomus tentans	**Brine:**	
Test Length:	10d 0h	**Taxon:**	Insecta	**Source:**	Aquatic Biosystems, CO **Age:** 3rd

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control Sedime	12-2498-8444	06 Sep-19	06 Sep-19	n/a	Azimuth	
PDL	08-2406-0510	14 Aug-19	22 Aug-19 09:00	23d 0h (19.6 °C)		
TPE	19-1773-9066	10 Aug-19	22 Aug-19 09:00	27d 0h (18.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control Sedime	Sediment Sample	Azimuth	Control Sediment	
PDL	Sediment Sample	Azimuth	PDL	
TPE	Sediment Sample	Azimuth	TPE	

Fisher Exact/Bonferroni-Holm Test

Sample I vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control	PDL	0.8189	Exact	1.0000	Non-Significant Effect
	TPE	0.9413	Exact	0.9413	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control Sedime	N	47	3	50	0.94	0.06	2.08%
PDL		48	2	50	0.96	0.04	0.0%
TPE		49	1	50	0.98	0.02	-2.08%

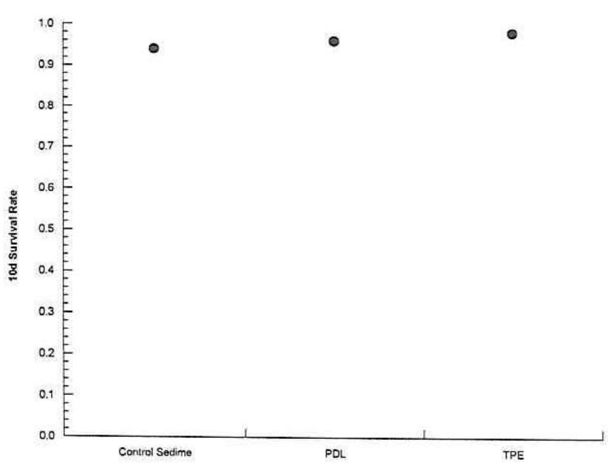
10d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedime	N	1.0000	1.0000	1.0000	0.8000	0.9000
PDL		0.9000	1.0000	1.0000	1.0000	0.9000
TPE		1.0000	1.0000	1.0000	0.9000	1.0000

10d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedime	N	10/10	10/10	10/10	8/10	9/10
PDL		9/10	10/10	10/10	10/10	9/10
TPE		10/10	10/10	10/10	9/10	10/10

Graphics



CETIS Analytical Report

Report Date: 22 Oct-19 16:16 (p 1 of 2)
Test Code/ID: 191668 / 11-4257-7256

Chironomus 10-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	14-7109-2007	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	22 Oct-19 16:16	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

Batch ID:	06-6856-9732	**Test Type:**	Growth-Survival (10d)	**Analyst:**	Karen Lee
Start Date:	06 Sep-19	**Protocol:**	EC/EPS 1/RM/32	**Diluent:**	Reconstituted Water
Ending Date:	16 Sep-19	**Species:**	Chironomus tentans	**Brine:**	
Test Length:	10d 0h	**Taxon:**	Insecta	**Source:**	Aquatic Biosystems, CO **Age:** 3rd

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control Sedime	12-2498-8444	06 Sep-19	06 Sep-19	n/a	Azimuth	
PDL	08-2406-0510	14 Aug-19	22 Aug-19 09:00	23d 0h (19.6 °C)		
TPE	19-1773-9066	10 Aug-19	22 Aug-19 09:00	27d 0h (18.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control Sedime	Sediment Sample	Azimuth	Control Sediment	
PDL	Sediment Sample	Azimuth	PDL	
TPE	Sediment Sample	Azimuth	TPE	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	PDL passed mean dry weight-mg	16.58%
		TPE passed mean dry weight-mg	16.58%

Dunnett Multiple Comparison Test

Sample I vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control	PDL	-0.93	2.108	0.357	8	CDF	0.9201	Non-Significant Effect
	TPE	1.641	2.108	0.357	8	CDF	0.1078	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.485463	0.242731	2	3.391	0.0680	Non-Significant Effect
Error	0.859095	0.0715912	12			
Total	1.34456		14			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	1.628	9.21	0.4431	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9563	0.8328	0.6292	Normal Distribution

Mean Dry Weight-mg Summary

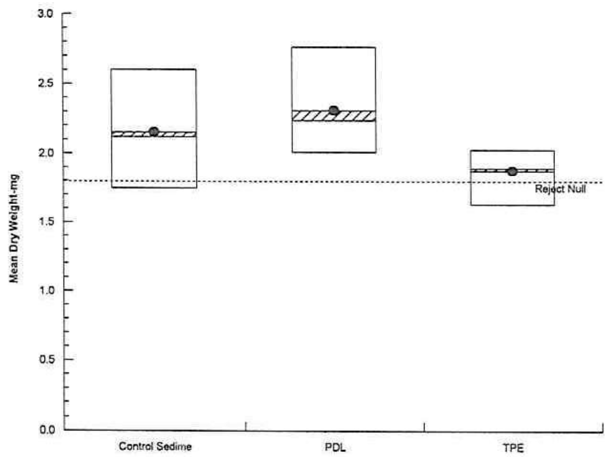
Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control Sedime	N	5	2.151	1.739	2.563	2.117	1.746	2.602	0.1483	15.42%	0.00%
PDL		5	2.308	1.963	2.654	2.237	2.01	2.762	0.1244	12.05%	-7.32%
TPE		5	1.873	1.668	2.079	1.892	1.627	2.027	0.07408	8.84%	12.91%

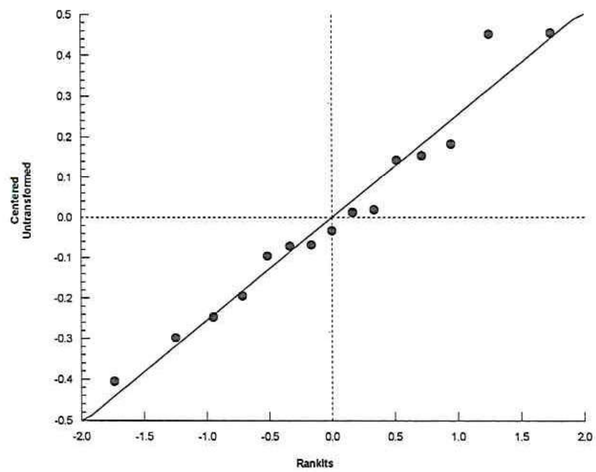
Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedime	N	2.602	2.117	1.746	1.957	2.333
PDL		2.01	2.762	2.212	2.321	2.237
TPE		1.805	1.892	1.627	2.016	2.027

Chironomus 10-d Survival and Growth Sediment Test				**Nautilus Environmental**	
Analysis ID:	14-7109-2007	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	22 Oct-19 16:16	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

Graphics





Chironomus 10-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	18-2038-7921	**Endpoint:**	10d Survival Rate	**CETIS Version:**	CETISv1.9.4
Analyzed:	22 Oct-19 16:17	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1

Batch ID:	06-6856-9732	**Test Type:**	Growth-Survival (10d)	**Analyst:**	Karen Lee
Start Date:	06 Sep-19	**Protocol:**	EC/EPS 1/RM/32	**Diluent:**	Reconstituted Water
Ending Date:	16 Sep-19	**Species:**	Chironomus tentans	**Brine:**	
Test Length:	10d 0h	**Taxon:**	Insecta	**Source:**	Aquatic Biosystems, CO **Age:** 3rd

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
PDL	08-2406-0510	14 Aug-19	22 Aug-19 09:00	23d 0h (19.6 °C)	Azimuth	
TPE	19-1773-9066	10 Aug-19	22 Aug-19 09:00	27d 0h (18.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
PDL	Sediment Sample	Azimuth	PDL	
TPE	Sediment Sample	Azimuth	TPE	

Fisher Exact Test

Sample I vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Reference Sed	TPE	0.8788	Exact	0.8788	Non-Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
PDL	RS	48	2	50	0.96	0.04	0.0%
TPE		49	1	50	0.98	0.02	-2.08%

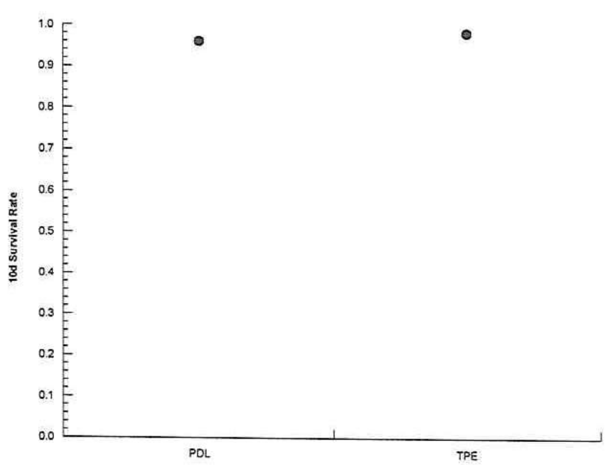
10d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
PDL	RS	0.9000	1.0000	1.0000	1.0000	0.9000
TPE		1.0000	1.0000	1.0000	0.9000	1.0000

10d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
PDL	RS	9/10	10/10	10/10	10/10	9/10
TPE		10/10	10/10	10/10	9/10	10/10

Graphics



Analyst: KL QA: JGu Oct. 22/19

CETIS Analytical Report

Chironomus 10-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	00-7331-8118	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	22 Oct-19 16:17	**Analysis:**	Parametric-Two Sample	**Status Level:**	1

Batch ID:	06-6856-9732	**Test Type:**	Growth-Survival (10d)	**Analyst:**	Karen Lee
Start Date:	06 Sep-19	**Protocol:**	EC/EPS 1/RM/32	**Diluent:**	Reconstituted Water
Ending Date:	16 Sep-19	**Species:**	Chironomus tentans	**Brine:**	
Test Length:	10d 0h	**Taxon:**	Insecta	**Source:**	Aquatic Biosystems, CO **Age:** 3rd

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
PDL	08-2406-0510	14 Aug-19	22 Aug-19 09:00	23d 0h (19.6 °C)	Azimuth	
TPE	19-1773-9066	10 Aug-19	22 Aug-19 09:00	27d 0h (18.3 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
PDL	Sediment Sample	Azimuth	PDL	
TPE	Sediment Sample	Azimuth	TPE	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	TPE failed mean dry weight-mg	11.66%

Equal Variance t Two-Sample Test

Sample I vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Reference Sed	TPE*	3.005	1.86	0.269	8	CDF	0.0085	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.473385	0.473385	1	9.032	0.0169	Significant Effect
Error	0.419298	0.0524122	8			
Total	0.892683		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	2.821	23.15	0.3393	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9429	0.7411	0.5853	Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
PDL	RS	5	2.308	1.963	2.654	2.237	2.01	2.762	0.1244	12.05%	0.00%
TPE		5	1.873	1.668	2.079	1.892	1.627	2.027	0.07408	8.84%	18.85%

Mean Dry Weight-mg Detail

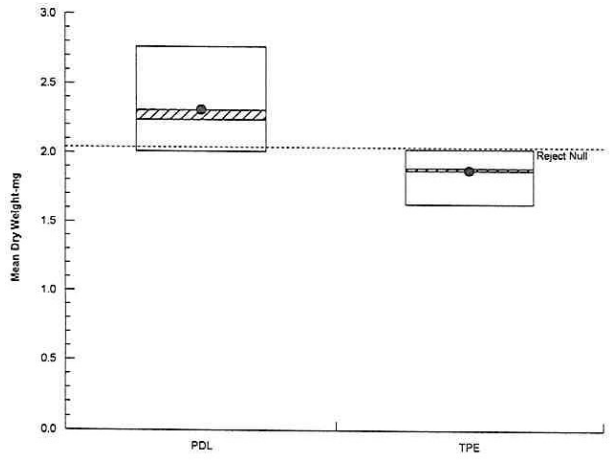
Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
PDL	RS	2.01	2.762	2.212	2.321	2.237
TPE		1.805	1.892	1.627	2.016	2.027

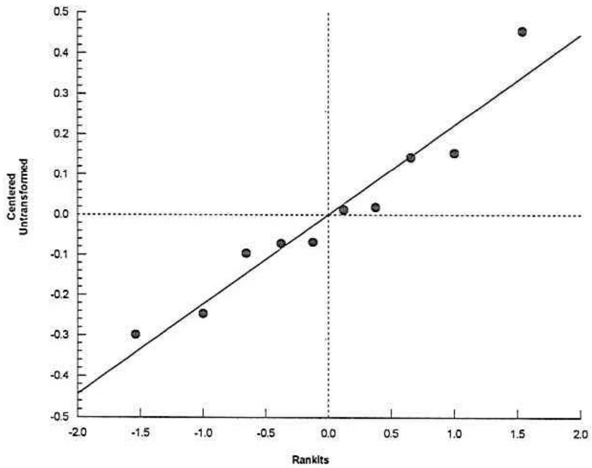
Analyst: KJL QA: JCh Oct. 22/19

Chironomus 10-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	00-7331-8118	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	22 Oct-19 16:17	**Analysis:**	Parametric-Two Sample	**Status Level:**	1

Graphics





APPENDIX C – Analytical Chemistry

NAUTILUS ENVIRONMENTAL
ATTN: Karen Lee
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 26-SEP-19
Report Date: 01-OCT-19 17:14 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L2354960

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

HWoods

Hilary Woods
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354960-1	L2354960-2	L2354960-3		
	Description					
	Sampled Date	06-SEP-19	06-SEP-19	06-SEP-19		
	Sampled Time					
	Client ID	CONTROL SEDIMENT	TPE	PDL		
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Ammonia, Total (as N) (mg/L)	0.219	0.189	0.305		

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

NAUTILUS ENVIRONMENTAL

TESTING LOCATION (Please Circle)

Burnaby [✓]
8664 Commerce Court
Burnaby, British Columbia,
V5A 4N7
Phone 604.420.8773

L2354960-COFC

Chain of Custody

Date Sept 6/19 Page 1 of 1

Report to:

Company: Nautilus Environmental
Address:
City/Prov/PC:
Contact: Karen
Phone:
Email: karen@nautilusenvironmental.ca

Invoice To:

Company: Same
Address:
City/Prov/PC:
Contact:
Phone:
Email:
PO No.:

Sample Collection By:

Sample Type: Grab OR Composite

	SAMPLE ID	DATE (DD/MM/YY)	TIME	MATRIX	# OF CONTAINERS AND VOLUME (e.g. 1 x 20 L)	COMMENTS	Overlying ammonia										Receipt Temperature (°C)
1	Control Sediment	06/09/19				Day 0	✓										14
2	TPE	06/09/19					✓										
3	PDL	06/09/19					✓										
4																	
5																	
6																	
7																	
8																	
9																	
10																	

SPECIAL INSTRUCTIONS/COMMENTS (CLIENT)

Samples are preserved with sulphuric acid.
Hyalella and Chironomid Day 0.

SAMPLE RECEIPT DETAILS (LABORATORY)

1. Total No. of Containers		4. Ice Present in Cooler?	Y / N
2. Courier		5. Seal Present?	Y / N
3. Good Condition?	Y / N	6. Initials Present on Seal?	Y / N

SAMPLE DESCRIPTION AND COMMENTS (LABORATORY)

RELINQUISHED BY (CLIENT)

Karen Lee (Printed Name) [illegible] (Signature)
Nautilus Environmental (Company) Sept ~~6/09~~ 7/6/19 1800h (Date DD/MM/YY and Time)

RECEIVED BY (LABORATORY)

[illegible] (Printed Name) (Signature)
(Company) 9/26 11:30 (Date DD/MM/YY and Time)

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling, or transport of the sample, application or interpretation of the test data or results in part or in whole.

Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

Form 020; Version 1.2; Revised by CC 2016/10/06

NAUTILUS ENVIRONMENTAL
ATTN: Karen Lee
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 26-SEP-19
Report Date: 01-OCT-19 17:15 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L2354961

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Hilary Woods
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354961-1	L2354961-2	L2354961-3		
	Description					
	Sampled Date	16-SEP-19	16-SEP-19	16-SEP-19		
	Sampled Time					
	Client ID	CONTROL SEDIMENT	TPE	PDL		
Grouping	**Analyte**					
WATER						
Anions and Nutrients	Ammonia, Total (as N) (mg/L)	2.98	1.81	3.34		

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

NAUTILUS ENVIRONMENTAL

TESTING LOCATION (Please Circle)

Burnaby ◉
8664 Commerce Court
Burnaby, British Columbia, C
V5A 4N7
Phone 604.420.8773

L2354961-COFC

Chain of Custody

Date Sept 16/19 Page 1 of 1

Report to:

Company	Nautilus Environmental
Address	
City/Prov/PC	
Contact	Karen
Phone	
Email	karen@nautilusenvironmental.ca

Invoice To:

Company	Same
Address	
City/Prov/PC	
Contact	
Phone	
Email	
PO No.	

Sample Collection By:

Sample Type: Grab OR Composite

	SAMPLE ID	DATE (DD/MM/YY)	TIME	MATRIX	# OF CONTAINERS AND VOLUME (e.g. 1 x 20 L)	COMMENTS	ANALYSES REQUIRED: Overlying ammonia										Receipt Temperature (°C)
1	Control Sediment	16/09/19				Day 10	✓										14
2	TPE	16/09/19					✓										
3	PDL	16/09/19					✓										
4																	
5																	
6																	
7																	
8																	
9																	
10																	

SPECIAL INSTRUCTIONS/COMMENTS (CLIENT)

Samples are preserved with sulphuric acid.
Chironomid Day 10.

SAMPLE RECEIPT DETAILS (LABORATORY)

1. Total No. of Containers		4. Ice Present in Cooler?	Y / N
2. Courier		5. Seal Present?	Y / N
3. Good Condition?	Y / N	6. Initials Present on Seal?	Y / N

SAMPLE DESCRIPTION AND COMMENTS (LABORATORY)

RELINQUISHED BY (CLIENT)

Karen Lee (Printed Name) (Signature)

Nautilus Environmental (Company) Sept ~~16~~ 26/19 1800 (Date DD/MM/YY and Time)

RECEIVED BY (LABORATORY)

HA (Printed Name) (Signature)

(Company) 9/26 11:30am (Date DD/MM/YY and Time)

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling, or transport of the sample, application or interpretation of the test data or results in part or in whole.

Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

Form 020; Version 1.2; Revised by CC 2016/10/06

NAUTILUS ENVIRONMENTAL
ATTN: Karen Lee
8664 Commerce Court
Imperial Square Lake City
Burnaby BC V5A 4N7

Date Received: 26-SEP-19
Report Date: 01-OCT-19 17:17 (MT)
Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L2354962

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Hilary Woods
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2354962-1	L2354962-2	L2354962-3		
		Description					
		Sampled Date	20-SEP-19	20-SEP-19	20-SEP-19		
		Sampled Time					
		Client ID	CONTROL SEDIMENT	TPE	PDL		
Grouping	**Analyte**						
WATER							
Anions and Nutrients	Ammonia, Total (as N) (mg/L)		0.129	3.68	1.14		

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

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Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
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mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

NAUTILUS ENVIRONMENTAL

TESTING LOCATION (Please Circle)

Burnaby (circled) — 8664 Commerce C
Burnaby, British Co
V5A 4N7
Phone 604.420.877

Calgary

L2354962-COFC

Chain of Custody

la

Date Sept 2019 Page 1 of 1

Report to:		**Invoice To:**	
Company	Nautilus Environmental	Company	Same
Address		Address	
City/Prov/PC		City/Prov/PC	
Contact	Karen	Contact	
Phone		Phone	
Email	karen@nautilusenvironmental.ca	Email	
		PO No.	

Sample Collection By: **Sample Type:** Grab OR Composite

	SAMPLE ID	DATE (DD/MM/YY)	TIME	MATRIX	# OF CONTAINERS AND VOLUME (e.g. 1 x 20 L)	COMMENTS	Overlying ammonia										Receipt Temperature (°C)
1	Control Sediment	20/09/19				Day 14	✓										14
2	TPE	20/09/19					✓										
3	PDL	20/09/19					✓										
4																	
5																	
6																	
7																	
8																	
9																	
10																	

(ANALYSES REQUIRED)

SPECIAL INSTRUCTIONS/COMMENTS (CLIENT)

Samples are preserved with sulphuric acid.
Hyalella Day 14.

SAMPLE RECEIPT DETAILS (LABORATORY)

1. Total No. of Containers		4. Ice Present in Cooler?	Y / N
2. Courier		5. Seal Present?	Y / N
3. Good Condition?	Y / N	6. Initials Present on Seal?	Y / N

SAMPLE DESCRIPTION AND COMMENTS (LABORATORY)

RELINQUISHED BY (CLIENT)

Karen Lee (Printed Name) [signature] (Signature)
Nautilus Environmental (Company) Sept 26/19 [illegible] (Date DD/MM/YY and Time)

RECEIVED BY (LABORATORY)

HA (Printed Name) (Signature)
(Company) 9/26 11:30am (Date DD/MM/YY and Time)

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling, or transport of the sample, application or interpretation of the test data or results in part or in whole.

Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

December 10, 2019

Karen Lee
Nautilus Environmental Company Inc.
8664 Commerce Court
Burnaby, BC, Canada V5A 4N7
karen@nautilusenvironmental.ca

RE: Project NAU-BC1905

Ms. Lee,

On November 8, 2019, Brooks Applied Labs (BAL) received ten (10) aqueous samples, in a sealed cooler. The aqueous samples were logged-in for the analyses of dissolved arsenic (As), chromium (Cr), iron (Fe), manganese (Mn), lead (Pb), uranium (U) and zinc (Zn) in accordance with the chain-of-custody (COC) forms. All samples were filtered and preserved prior to receipt at BAL. All samples were received and stored according BAL SOPs and EPA methodology.

Trace Metals [As, Cr, Fe, Pb, U & Zn] Quantitation by ICP-QQQ-MS

All samples were preserved with nitric acid upon receipt. Then, trace metals were analyzed via direct analysis using inductively coupled plasma triple quadrupole mass spectrometry (ICP-QQQ-MS) direct analysis. The ICP-QQQ-MS uses advanced interference removal techniques to ensure accuracy of the sample results. For more information, please visit the Interference Reduction Technology section on our website, brooksapplied.com.

In instances when either the native sample concentration was non-detectable (reported as less than or equal to the MDL) and/or the corresponding matrix duplicate (DUP) result was also non-detectable, the RPD between the two values was not calculated (**N/C**).

Due to limited sample volume intermittent QC was performed.

B193309:

Sample *Blank Control* (1945084-02) was identified as blank with a Zn recovery above the MRL. The sample was re-analyzed, and the elevation was confirmed. No further action was taken.

All results were *not* method blank corrected, as described in the calculations section of the relevant BAL SOP(s). All results were evaluated using reporting limits adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details.

Aside from concentration qualifiers, all data was reported without qualification, and all associated quality control results met the acceptance criteria.

BAL, an accredited laboratory, certifies that the reported results of all analyses for which BAL is NELAP accredited meet all NELAP requirements. For more information please see the *Report Information* page. Please feel free to contact us if you have any questions regarding this report.

Sincerely,

Lauren Blaiwes
Project Manager
Lauren@brooksapplied.com

Project ID: NAU-BC1905
PM: Lauren Blaiwes

Client PM: Karen Lee

Report Information

Laboratory Accreditation

BAL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BAL is also certified by many other states to perform environmental analyses. For a current list of our accreditations /certifications, please visit our website at <http://www.brooksapplied.com/resources/certificates-permits/>. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

AR	as received	**MS**	matrix spike
BAL	Brooks Applied Labs	**MSD**	matrix spike duplicate
BLK	method blank	**ND**	non-detect
BS	blank spike	**NR**	non-reportable
CAL	calibration standard	**N/C**	not calculated
CCB	continuing calibration blank	**PS**	post preparation spike
CCV	continuing calibration verification	**REC**	percent recovery
COC	chain of custody record	**RPD**	relative percent difference
D	dissolved fraction	**SCV**	secondary calibration verification
DUP	duplicate	**SOP**	standard operating procedure
IBL	instrument blank	**SRM**	reference material
ICV	initial calibration verification	**T**	total fraction
MDL	method detection limit	**TR**	total recoverable fraction
MRL	method reporting limit		

Definition of Data Qualifiers

(Effective 9/23/09)

E	An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
H	Holding time and/or preservation requirements not met. Please see narrative for explanation.
J	Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
J-1	Estimated value. A full explanation is presented in the narrative.
M	Duplicate precision (RPD) was not within acceptance criteria. Please see narrative for explanation.
N	Spike recovery was not within acceptance criteria. Please see narrative for explanation.
R	Rejected, unusable value. A full explanation is presented in the narrative.
U	Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
X	Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.

These qualifiers are based on those previously utilized by Brooks Applied Labs, those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review; USEPA; January 2010. These supersede all previous qualifiers ever employed by BAL.

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
Control Sediment	1945084-01	Water	Sample	09/20/2019	11/08/2019
Blank Control	1945084-02	Water	Field Blank	09/20/2019	11/08/2019
TPE-1	1945084-03	Water	Sample	09/20/2019	11/08/2019
TPE-2	1945084-04	Water	Sample	09/20/2019	11/08/2019
TPE-3	1945084-05	Water	Sample	09/20/2019	11/08/2019
TPE-4	1945084-06	Water	Sample	09/20/2019	11/08/2019
TPE-5	1945084-07	Water	Sample	09/20/2019	11/08/2019
PDL-1	1945084-08	Water	Sample	09/20/2019	11/08/2019
PDL-3	1945084-09	Water	Sample	09/20/2019	11/08/2019
PDL-4	1945084-10	Water	Sample	09/20/2019	11/08/2019

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
As	Water	EPA 1638 Mod	11/18/2019	11/20/2019	B193309	1901499
Cr	Water	EPA 1638 Mod	11/18/2019	11/20/2019	B193309	1901499
Fe	Water	EPA 1638 Mod	11/18/2019	11/20/2019	B193309	1901499
Mn	Water	EPA 1638 Mod	11/18/2019	11/20/2019	B193309	1901499
Mn	Water	EPA 1638 Mod	11/27/2019	11/28/2019	B193476	1901557
Pb	Water	EPA 1638 Mod	11/18/2019	11/20/2019	B193309	1901499
U	Water	EPA 1638 Mod	11/18/2019	11/20/2019	B193309	1901499
Zn	Water	EPA 1638 Mod	11/18/2019	11/20/2019	B193309	1901499

Project ID: NAU-BC1905
PM: Lauren Blaiwes

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
Control Sediment										
1945084-01	As	Water	D	6.97		0.120	0.400	µg/L	B193309	1901499
1945084-01	Cr	Water	D	1.16		0.250	0.750	µg/L	B193309	1901499
1945084-01	Fe	Water	D	771		4.00	8.50	µg/L	B193309	1901499
1945084-01	Mn	Water	D	35.3		0.210	0.630	µg/L	B193309	1901499
1945084-01	Pb	Water	D	0.243		0.050	0.150	µg/L	B193309	1901499
1945084-01	U	Water	D	≤ 0.190	U	0.190	0.570	µg/L	B193309	1901499
1945084-01	Zn	Water	D	49.7		2.00	4.00	µg/L	B193309	1901499
Blank Control										
1945084-02	As	Water	D	≤ 0.120	U	0.120	0.400	µg/L	B193309	1901499
1945084-02	Cr	Water	D	≤ 0.250	U	0.250	0.750	µg/L	B193309	1901499
1945084-02	Fe	Water	D	≤ 4.00	U	4.00	8.50	µg/L	B193309	1901499
1945084-02	Mn	Water	D	0.323	J	0.210	0.630	µg/L	B193309	1901499
1945084-02	Pb	Water	D	≤ 0.050	U	0.050	0.150	µg/L	B193309	1901499
1945084-02	U	Water	D	≤ 0.190	U	0.190	0.570	µg/L	B193309	1901499
1945084-02	Zn	Water	D	23.4		2.00	4.00	µg/L	B193309	1901499
TPE-1										
1945084-03	As	Water	D	3.37		0.120	0.400	µg/L	B193309	1901499
1945084-03	Cr	Water	D	≤ 0.250	U	0.250	0.750	µg/L	B193309	1901499
1945084-03	Fe	Water	D	1030		4.00	8.50	µg/L	B193309	1901499
1945084-03	Mn	Water	D	23000		10.5	31.5	µg/L	B193476	1901557
1945084-03	Pb	Water	D	0.090	J	0.050	0.150	µg/L	B193309	1901499
1945084-03	U	Water	D	0.381	J	0.190	0.570	µg/L	B193309	1901499
1945084-03	Zn	Water	D	2.40	J	2.00	4.00	µg/L	B193309	1901499
TPE-2										
1945084-04	As	Water	D	14.3		0.120	0.400	µg/L	B193309	1901499
1945084-04	Cr	Water	D	4.09		0.250	0.750	µg/L	B193309	1901499
1945084-04	Fe	Water	D	25200		4.00	8.50	µg/L	B193309	1901499
1945084-04	Mn	Water	D	19900		10.5	31.5	µg/L	B193476	1901557
1945084-04	Pb	Water	D	1.26		0.050	0.150	µg/L	B193309	1901499
1945084-04	U	Water	D	2.00		0.190	0.570	µg/L	B193309	1901499
1945084-04	Zn	Water	D	15.2		2.00	4.00	µg/L	B193309	1901499

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
TPE-3										
1945084-05	As	Water	D	2.03		0.120	0.400	µg/L	B193309	1901499
1945084-05	Cr	Water	D	1.38		0.250	0.750	µg/L	B193309	1901499
1945084-05	Fe	Water	D	2070		4.00	8.50	µg/L	B193309	1901499
1945084-05	Mn	Water	D	24700		10.5	31.5	µg/L	B193476	1901557
1945084-05	Pb	Water	D	0.388		0.050	0.150	µg/L	B193309	1901499
1945084-05	U	Water	D	1.30		0.190	0.570	µg/L	B193309	1901499
1945084-05	Zn	Water	D	3.51	J	2.00	4.00	µg/L	B193309	1901499
TPE-4										
1945084-06	As	Water	D	0.344	J	0.120	0.400	µg/L	B193309	1901499
1945084-06	Cr	Water	D	1.01		0.250	0.750	µg/L	B193309	1901499
1945084-06	Fe	Water	D	665		4.00	8.50	µg/L	B193309	1901499
1945084-06	Mn	Water	D	2570		10.5	31.5	µg/L	B193476	1901557
1945084-06	Pb	Water	D	0.396		0.050	0.150	µg/L	B193309	1901499
1945084-06	U	Water	D	0.379	J	0.190	0.570	µg/L	B193309	1901499
1945084-06	Zn	Water	D	7.65		2.00	4.00	µg/L	B193309	1901499
TPE-5										
1945084-07	As	Water	D	0.261	J	0.120	0.400	µg/L	B193309	1901499
1945084-07	Cr	Water	D	0.591	J	0.250	0.750	µg/L	B193309	1901499
1945084-07	Fe	Water	D	433		4.00	8.50	µg/L	B193309	1901499
1945084-07	Mn	Water	D	4380		10.5	31.5	µg/L	B193476	1901557
1945084-07	Pb	Water	D	0.261		0.050	0.150	µg/L	B193309	1901499
1945084-07	U	Water	D	0.344	J	0.190	0.570	µg/L	B193309	1901499
1945084-07	Zn	Water	D	6.96		2.00	4.00	µg/L	B193309	1901499
PDL-1										
1945084-08	As	Water	D	6.40		0.120	0.400	µg/L	B193309	1901499
1945084-08	Cr	Water	D	≤ 0.250	U	0.250	0.750	µg/L	B193309	1901499
1945084-08	Fe	Water	D	4900		4.00	8.50	µg/L	B193309	1901499
1945084-08	Mn	Water	D	192		0.210	0.630	µg/L	B193309	1901499
1945084-08	Pb	Water	D	0.126	J	0.050	0.150	µg/L	B193309	1901499
1945084-08	U	Water	D	≤ 0.190	U	0.190	0.570	µg/L	B193309	1901499
1945084-08	Zn	Water	D	3.85	J	2.00	4.00	µg/L	B193309	1901499

Project ID: NAU-BC1905
PM: Lauren Blaiwes

Client PM: Karen Lee

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
PDL-3										
1945084-09	As	Water	D	15.2		0.120	0.400	µg/L	B193309	1901499
1945084-09	Cr	Water	D	3.09		0.250	0.750	µg/L	B193309	1901499
1945084-09	Fe	Water	D	13300		4.00	8.50	µg/L	B193309	1901499
1945084-09	Mn	Water	D	520		0.210	0.630	µg/L	B193309	1901499
1945084-09	Pb	Water	D	0.939		0.050	0.150	µg/L	B193309	1901499
1945084-09	U	Water	D	0.544	J	0.190	0.570	µg/L	B193309	1901499
1945084-09	Zn	Water	D	10.5		2.00	4.00	µg/L	B193309	1901499
PDL-4										
1945084-10	As	Water	D	3.93		0.120	0.400	µg/L	B193309	1901499
1945084-10	Cr	Water	D	23.4		0.250	0.750	µg/L	B193309	1901499
1945084-10	Fe	Water	D	9550		4.00	8.50	µg/L	B193309	1901499
1945084-10	Mn	Water	D	546		0.210	0.630	µg/L	B193309	1901499
1945084-10	Pb	Water	D	5.24		0.050	0.150	µg/L	B193309	1901499
1945084-10	U	Water	D	5.37		0.190	0.570	µg/L	B193309	1901499
1945084-10	Zn	Water	D	40.5		2.00	4.00	µg/L	B193309	1901499

Project ID: NAU-BC1905
PM: Lauren Blaiwes

Client PM: Karen Lee

Accuracy & Precision Summary

Batch: B193309
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B193309-SRM1	**Reference Material (1938015, T221 (Batch SRM))**								
	As		17.70	18.49	µg/L	104%	75-125		
	Cr		1.710	1.936	µg/L	113%	75-125		
	Fe		328.0	339.9	µg/L	104%	75-125		
	Mn		33.60	34.96	µg/L	104%	75-125		
	Pb		0.4900	0.533	µg/L	109%	75-125		
	U		1.490	1.554	µg/L	104%	75-125		
	Zn		25.20	27.41	µg/L	109%	75-125		
B193309-SRM2	**Reference Material (1939008, NIST 1643f (Batch QC))**								
	As		57.42	59.60	µg/L	104%	75-125		
	Cr		18.50	19.67	µg/L	106%	75-125		
	Fe		93.44	96.61	µg/L	103%	75-125		
	Mn		37.14	37.77	µg/L	102%	75-125		
	Pb		18.49	19.66	µg/L	106%	75-125		
	Zn		74.40	79.45	µg/L	107%	0-200		
B193309-DUP1	**Duplicate, (1945084-03)**								
	As	3.368		3.252	µg/L			3%	20
	Cr	ND		0.281	µg/L			N/C	20
	Fe	1032		1036	µg/L			0.3%	20
	Pb	0.090		0.084	µg/L			7%	20
	U	0.381		0.362	µg/L			5%	20
	Zn	2.40		2.41	µg/L			0.5%	20
B193309-MS1	**Matrix Spike, (1945084-07)**								
	As	0.261	100.0	96.67	µg/L	96%	75-125		
	Cr	0.591	100.0	103.1	µg/L	103%	75-125		
	Fe	433.5	1000	1434	µg/L	100%	75-125		
	Pb	0.261	10.00	9.270	µg/L	90%	75-125		
	U	0.344	10.00	9.649	µg/L	93%	75-125		
	Zn	6.96	100.0	101.5	µg/L	95%	75-125		

Project ID: NAU-BC1905
PM: Lauren Blaiwes

Client PM: Karen Lee

Accuracy & Precision Summary

Batch: B193309
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B193309-MSD1	**Matrix Spike Duplicate, (1945084-07)**								
	As	0.261	100.0	96.85	µg/L	97%	75-125	0.2%	20
	Cr	0.591	100.0	105.3	µg/L	105%	75-125	2%	20
	Fe	433.5	1000	1432	µg/L	100%	75-125	0.1%	20
	Pb	0.261	10.00	9.351	µg/L	91%	75-125	0.9%	20
	U	0.344	10.00	9.659	µg/L	93%	75-125	0.1%	20
	Zn	6.96	100.0	102.4	µg/L	95%	75-125	0.9%	20

Project ID: NAU-BC1905
PM: Lauren Blaiwes

Client PM: Karen Lee

Accuracy & Precision Summary

Batch: B193476
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B193476-SRM1	**Reference Material (1938015, T221 (Batch SRM))**								
	Mn		33.60	33.52	µg/L	100%	75-125		
B193476-SRM2	**Reference Material (1939008, NIST 1643f (Batch QC))**								
	Mn		37.14	36.09	µg/L	97%	75-125		
B193476-DUP1	**Duplicate, (1945084-04)**								
	Mn	19860		20550	µg/L			3%	20
B193476-MS1	**Matrix Spike, (1945084-06)**								
	Mn	2571	5000	7180	µg/L	92%	75-125		
B193476-MSD1	**Matrix Spike Duplicate, (1945084-06)**								
	Mn	2571	5000	7079	µg/L	90%	75-125	1%	20

Method Blanks & Reporting Limits

Batch: B193309
Matrix: Water
Method: EPA 1638 Mod
Analyte: As

Sample	Result	Units
B193309-BLK1	0.0001	µg/L
B193309-BLK2	0.0007	µg/L
B193309-BLK3	0.0004	µg/L
B193309-BLK4	-0.0000001	µg/L

Average: 0.000 **MDL:** 0.012
Limit: 0.040 **MRL:** 0.040

Analyte: Cr

Sample	Result	Units
B193309-BLK1	-0.0009	µg/L
B193309-BLK2	-0.003	µg/L
B193309-BLK3	-0.004	µg/L
B193309-BLK4	-0.0005	µg/L

Average: -0.002 **MDL:** 0.025
Limit: 0.075 **MRL:** 0.075

Analyte: Fe

Sample	Result	Units
B193309-BLK1	0.46	µg/L
B193309-BLK2	-0.004	µg/L
B193309-BLK3	0.007	µg/L
B193309-BLK4	-0.002	µg/L

Average: 0.12 **MDL:** 0.40
Limit: 0.85 **MRL:** 0.85

Method Blanks & Reporting Limits

Analyte: Mn

Sample	Result	Units
B193309-BLK1	0.0009	µg/L
B193309-BLK2	-0.002	µg/L
B193309-BLK3	-0.001	µg/L
B193309-BLK4	0.0004	µg/L

Average: 0.000 **MDL:** 0.021
Limit: 0.063 **MRL:** 0.063

Analyte: Pb

Sample	Result	Units
B193309-BLK1	0.0003	µg/L
B193309-BLK2	0.0003	µg/L
B193309-BLK3	0.0003	µg/L
B193309-BLK4	0.0002	µg/L

Average: 0.000 **MDL:** 0.005
Limit: 0.015 **MRL:** 0.015

Analyte: U

Sample	Result	Units
B193309-BLK1	0.00	µg/L
B193309-BLK2	0.00	µg/L
B193309-BLK3	0.00	µg/L
B193309-BLK4	0.00	µg/L

Average: 0.000 **MDL:** 0.019
Limit: 0.057 **MRL:** 0.057

Analyte: Zn

Sample	Result	Units
B193309-BLK1	0.01	µg/L
B193309-BLK2	0.01	µg/L
B193309-BLK3	0.05	µg/L
B193309-BLK4	0.06	µg/L

Average: 0.03 **MDL:** 0.20
Limit: 0.40 **MRL:** 0.40

Project ID: NAU-BC1905
PM: Lauren Blaiwes

Client PM: Karen Lee

Method Blanks & Reporting Limits

Batch: B193476
Matrix: Water
Method: EPA 1638 Mod
Analyte: Mn

Sample	Result	Units
B193476-BLK1	-0.00007	µg/L
B193476-BLK2	0.0003	µg/L
B193476-BLK3	0.001	µg/L
B193476-BLK4	-0.00008	µg/L

Average: 0.000 **MDL:** 0.021
Limit: 0.063 **MRL:** 0.063

Sample Containers

Lab ID: 1945084-01 **Report Matrix:** Water **Collected:** 09/20/2019
Sample: Control Sediment **Sample Type:** Sample **Received:** 11/08/2019

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL	15 mL	n/a	Unk. HNO3 (Client)	n/a	n/a	Cooler - 1945084

Lab ID: 1945084-02 **Report Matrix:** Water **Collected:** 09/20/2019
Sample: Blank Control **Sample Type:** Field Blank **Received:** 11/08/2019

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL	15 mL	n/a	Unk. HNO3 (Client)	n/a	n/a	Cooler - 1945084

Lab ID: 1945084-03 **Report Matrix:** Water **Collected:** 09/20/2019
Sample: TPE-1 **Sample Type:** Sample **Received:** 11/08/2019

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL	15 mL	n/a	Unk. HNO3 (Client)	n/a	n/a	Cooler - 1945084

Lab ID: 1945084-04 **Report Matrix:** Water **Collected:** 09/20/2019
Sample: TPE-2 **Sample Type:** Sample **Received:** 11/08/2019

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL	15 mL	n/a	Unk. HNO3 (Client)	n/a	n/a	Cooler - 1945084

Lab ID: 1945084-05 **Report Matrix:** Water **Collected:** 09/20/2019
Sample: TPE-3 **Sample Type:** Sample **Received:** 11/08/2019

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL	15 mL	n/a	Unk. HNO3 (Client)	n/a	n/a	Cooler - 1945084

Lab ID: 1945084-06 **Report Matrix:** Water **Collected:** 09/20/2019
Sample: TPE-4 **Sample Type:** Sample **Received:** 11/08/2019

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL	15 mL	n/a	Unk. HNO3 (Client)	n/a	n/a	Cooler - 1945084

Project ID: NAU-BC1905
PM: Lauren Blaiwes

Client PM: Karen Lee

Sample Containers

Lab ID: 1945084-07
Sample: TPE-5
Report Matrix: Water
Sample Type: Sample
Collected: 09/20/2019
Received: 11/08/2019

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL	15 mL	n/a	Unk. HNO3 (Client)	n/a	n/a	Cooler - 1945084

Lab ID: 1945084-08
Sample: PDL-1
Report Matrix: Water
Sample Type: Sample
Collected: 09/20/2019
Received: 11/08/2019

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL	15 mL	n/a	Unk. HNO3 (Client)	n/a	n/a	Cooler - 1945084

Lab ID: 1945084-09
Sample: PDL-3
Report Matrix: Water
Sample Type: Sample
Collected: 09/20/2019
Received: 11/08/2019

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL	15 mL	n/a	Unk. HNO3 (Client)	n/a	n/a	Cooler - 1945084

Lab ID: 1945084-10
Sample: PDL-4
Report Matrix: Water
Sample Type: Sample
Collected: 09/20/2019
Received: 11/08/2019

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL	15 mL	n/a	Unk. HNO3 (Client)	n/a	n/a	Cooler - 1945084

Shipping Containers

Cooler - 1945084

Received: November 8, 2019 8:05
Tracking No: 8109 3976 8209 0412 via FedEx
Coolant Type: None
Temperature: 8.6 °C

Description: Cooler
Damaged in transit? No
Returned to client? No
Comments: IR#19

Custody seals present? No
Custody seals intact? No
COC present? Yes

NAUTILUS ENVIRONMENTAL

Chain of Custody

TESTING LOCATION (Please Circle)

Burnaby (circled)
8664 Commerce Court
Burnaby, British Columbia, Canada
V5A 4N7
Phone 604.420.8773

Calgary
#4, 6125 12 Street SE
Calgary, Alberta, Canada
T2H 2K1
Phone 403.253.7121

Date Nov 7/19 Page 1 of 1

Report to:

Company	Nautilus Environmental
Address	
City/Prov/PC	
Contact	Karen
Phone	
Email	karen@nautilusenvironmental.ca

Invoice To:

Company	Same
Address	
City/Prov/PC	
Contact	
Phone	
Email	
PO No.	

Sample Collection By:

Sample Type: Grab OR Composite

	SAMPLE ID	DATE (DD/MM/YY)	TIME	MATRIX	# OF CONTAINERS AND VOLUME (e.g. 1 x 20 L)	COMMENTS	Arsenic	Chromium	Iron	Manganese	Lead	Uranium	Zinc				Receipt Temperature (°C)
1	Control Sediment	20/09/19			1x3mL		✓	✓	✓	✓	✓	✓	✓				
2	Blank Control						✓	✓	✓	✓	✓	✓	✓				
3	TPE-1						✓	✓	✓	✓	✓	✓	✓				
4	TPE-2						✓	✓	✓	✓	✓	✓	✓				
5	TPE-3						✓	✓	✓	✓	✓	✓	✓				
6	TPE-4						✓	✓	✓	✓	✓	✓	✓				
7	TPE-5						✓	✓	✓	✓	✓	✓	✓				
8	PDL-1						✓	✓	✓	✓	✓	✓	✓				
9	PDL-3						✓	✓	✓	✓	✓	✓	✓				
10	PDL-4						✓	✓	✓	✓	✓	✓	✓				

SPECIAL INSTRUCTIONS/COMMENTS (CLIENT)

Samples are preserved with nitric acid.

SAMPLE RECEIPT DETAILS (LABORATORY)

1. Total No. of Containers		4. Ice Present in Cooler?	Y / N
2. Courier		5. Seal Present?	Y / N
3. Good Condition?	Y / N	6. Initials Present on Seal?	Y / N

SAMPLE DESCRIPTION AND COMMENTS (LABORATORY)

RELINQUISHED BY (CLIENT)

Karen Lee (Printed Name) (Signature)

Nautilus Environmental (Company) Nov 7/19 1000h (Date DD/MM/YY and Time)

RECEIVED BY (LABORATORY)

(Printed Name) (Signature)

(Company) 11/8/19 0805 (Date DD/MM/YY and Time)

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling, or transport of the sample, application or interpretation of the test data or results in part or in whole.

Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

Form 020; Version 1.2; Revised by CC 2016/10/06

APPENDIX D – Chain-of-Custody Form

NAUTILUS ENVIRONMENTAL

TESTING LOCATION (Please Circle)

Burnaby (X)
8664 Commerce Court
Burnaby, British Columbia, Canada
V5A 4N7
Phone 604.420.8773

Calgary ( )
#4, 6125 12 Street SE
Calgary, Alberta, Canada
T2H 2K1
Phone 403.253.7121

Chain of Custody

Date______ Page 1 of 1

Report to:

Company: Azimuth
Address:
City/Prov/PC:
Contact:
Phone:
Email:

Invoice To:

Company: Azimuth
Address: 218 - 2902 West Broadway
City/Prov/PC: Vancouver / BC
Contact: Eric Franz
Phone: 604 730 1220
Email: efranz@azimuthgroup.ca
PO No.: Meadowbank CREMP

Sample Collection By:

Sample Type: Grab (X) OR Composite ( )

	SAMPLE ID	DATE (DD/MM/YY)	TIME	MATRIX	# OF CONTAINERS AND VOLUME (e.g. 1 x 20 L)	COMMENTS	14-d Hyalella	10-d C. dilutus	Mini peepers	Receipt Temperature (°C)
1	TPE-1	16/08/19		Sediment	2 x 1L	Top 3-5cm of sediment				18.3
2	TPE-2	"		"	"	collected from petite				19.6
3	TPE-3	"		"	"	ponar grabs.				
4	TPE-4	"		"	"	Homogenized in the				
5	TPE-5	"		"	"	field.	7	8		
6	PDL-1	14/08/19		"	"	3-4 grabs per	6	6		
7	PDL-2	"		"	"	field replicate.	6	6		
8	PDL-3	"		"	"		1	1		
9	PDL-4	"		"	"		6	6		
10	PDL-5	"		"	"		1	1		

SPECIAL INSTRUCTIONS/COMMENTS (CLIENT)

See email on Aug 6 regarding study design for the pore water collection.
Homogenize the 2x1L jars before setting up the tests.

SAMPLE RECEIPT DETAILS (LABORATORY)

1. Total No. of Containers	20x1L	4. Ice Present in Cooler?	Y / (N)
2. Courier	Purolator	5. Seal Present?	Y / (N)
3. Good Condition?	(Y) / N	6. Initials Present on Seal?	Y / (N)

SAMPLE DESCRIPTION AND COMMENTS (LABORATORY)

RELINQUISHED BY (CLIENT)

Eric Franz (Printed Name) (Signature)
Azimuth (Company) 29/08/19 (Date DD/MM/YY and Time)

RECEIVED BY (LABORATORY)

Tyme Hamilton (Printed Name) Tyme (Signature)
Nautilus (Company) Aug. 22/19 @ 9:00 (Date DD/MM/YY and Time)

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling, or transport of the sample, application or interpretation of the test data or results in part or in whole.

Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

PDL = field control

END OF REPORT

APPENDIX H
LIMNOLOGY DATA COLLECTED IN 2019

Water Sampling - CREMP Meadowbank

AREA INFORMATION

Area: Third Portage
Sample ID: TPL East January profile
Crew: SAUCIER N et NEWBERRY K
Date/ Time: 2019-01-10 14:50
Weather/Obervations: Clear

UTM Coordinates: 14 W Easting: 639157 Waypoint:
Northing: 7211915

Photo #s:
Field DUP collected? (Circle one): Yes No

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0						
1	0,11	49,1	18,10	7,28		
2	0,61	43,9	18,09	7,27		
3	~~X~~ 1,36	37,9	17,65	7.25		
4	1,66	35,2	17,28	7.23		
5	1,82	34,7	16,82	7.20		
6	1,90	34,2	16,73	7.18		
7	1,96	33,6	15,33	7.14		
8	2,04	33,1	14,80	7.12		
9	2,08	32,8	14,02	7.09		
10	2,13	33,0	13,52	7.04		
11	2,17	33,4	12,98	6,99		
12	2,21	33,5	12,70	6,96		
13	2,25	33,7	12,34	6.93		
14	2,28	33,9	12,11	6.90		
15	2,35	34,1	11,85	6.87		
16	2,45	34,0	11,40	6.81		
17	2,54	34,0	10,82	6,75		
18	2,62	34,1	10,32	6,69		
19	2,69	34,7	9,76	6,62		
20	2,78	35,2.	9,33	6,55.		

BOTTLE CHECKLIST

ALS - send Express	1 x 1 L plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 1 L plastic	TSS (low level), TDS (low level)
ALS - send Ground	1 x 250 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 250 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **3 drops** of **Lugol's** back at the lab)

Total Water Depth: >24 m
Secchi Depth: /

Phytoplankton collected? (Circle one): Yes No
Volume Filtered: /
Field Notes: Profile only

Equipment Blank Collection Notes? /

Water Sampling and Limnology

AREA INFORMATION

Area: Whale Tail Lake
Sample ID: WT January profil
Crew: LD - KM
Date: 2019-01-15
Time: 11h20
Weather: -33 Ice Crystals
Observations:

UTM Coordinates: **Easting:** 7254178 **Northing:** 607565 **Waypoint:**

Total Water Depth: 6.91 m
Secchi Depth: X

Phytoplankton collected?: No
Volume Filtered: X

Field DUP collected?: No
Arsenic speciation collected?: No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1	0.13	7.24	61.2	16.38	0	
2	0.95	7.18	55.1	16.28	0	
3	1.45	7.08	52.2	17.36	0	
4	1.79	6.98	50.5	17.08	0	
5	1.96	6.91	48.4	16.83	0	
6	2.12	6.84	46.9	16.41	0	
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Mammoth Lake
Sample ID: Mammoth January profile
Crew: KM - LD
Date: 2019-01-17
Time: 13h30
Weather: - 36 Drifting Snow
Observations:

UTM Coordinates: **Easting:** 7255062 **Northing:** 605412 **Waypoint:**

Total Water Depth:
Secchi Depth: No

Phytoplankton collected?: No
Volume Filtered: No

Field DUP collected?: No
Arsenic speciation collected?: No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.84	6.79	152.5	16.19	0.1	
3	6.68	6.76	147	16.91	0.06	
4	2.01	6.68	150.5	16.83	0.12	
5	2.26	6.51	174.6	15.7	0.2	
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TPL
Sample ID: JAN - TPN
Crew: TT + KM
Date: 2019-01-20
Time: 14:04
Weather: Clear - 27
Observations:

UTM Coordinates: Easting: 14W 0636814 Northing: 7214945 Waypoint:

Total Water Depth: 9.5m
Secchi Depth: —
Phytoplankton collected?: Yes No
Volume Filtered: —
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.24	7.38	37.6	18.32	—	
3	0.50	7.35	34.3	18.40	—	
4	0.65	7.33	32.9	18.39	—	
5	0.75	7.29	31.6	18.20	—	
6	0.84	7.25	30.5	18.04	—	
7	0.90	7.23	30	17.60	—	
8	0.96	7.21	29.8	17.29	—	
9	1.01	7.18	29.6	16.86	—	
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Profiles Only

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Nemo Lake

Sample ID: Nemo January Profile

Crew: L.D K.M

Date: 2019/01/21

Time: 10:20

Weather: -37 Sunny

Observations:

UTM Coordinates: Easting: 725 7303 Northing: 60 65 46 Waypoint:

Total Water Depth: 6.92

Secchi Depth: Ø

Volume Filtered: Ø

Phytoplankton collected?: Yes No

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.09	7.05	37.9	15.93	0	
3	1.45	6.98	35	16.09	0	
4	1.56	6.91	33.9	16.12	0	
5	1.66	6.88	33.3	15.96	0	
6	1.68	6.85	33.1	15.75	0	
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Second Portage Lake
Sample ID:
Crew: Jamie K / Isabelle C
Date: 2019-01-27
Time: 14:14
Weather: partly cloudy, no wind
Observations:
UTM Coordinates: 14W Easting: 0639734
Northing: 7214120
Waypoint:
Total Water Depth: 8.75 meters
Secchi Depth:
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0						
1	0.30	57.5	15.18	7.41		
2	0.66	53.9	15.97	7.48		
3	1.42	48.1	15.91	7.50		
4	1.79	45.8	15.29	7.48		
5	1.91	44.9	15.02	7.46		
6	1.98	45.0	14.47	7.43		
7	2.02	45.1	13.91	7.40		
8	2.04	45.7	13.15	7.37		
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:
Profile

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Wally Lake

Sample ID:

Crew: Jamie K / Isabelle C

Date: 2019-01-27

Time: 11:00

Weather: partly sunny, light snow

Observations:

UTM Coordinates: 15W Easting: 0360872

Northing: 7211498

Waypoint: WAL JAN19

Total Water Depth: 6.5m

Secchi Depth:

Phytoplankton collected?: Yes No

Volume Filtered:

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0			15.34			
1	0.18	64.2	14.29	6.98		
2	1.23	62.8	13.05	7.05		
3	2.05	60.5	15.80	7.06		
4	2.92	57.5	13.79	6.91		
5	3.74	55.2	10.74	6.79		
6	4.24	61.1	7.60	6.62		
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:

Profile only

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Mammoth Lake
Sample ID: February Profile
Crew: L.D, K.M
Date: 2019-02-07
Time: 15:11
Weather: Ice crystals, -30°c
Observations:
UTM Coordinates: Easting: 725 4747 Northing: 604984 Waypoint:
Total Water Depth: 6.85 Secchi Depth: 0
Phytoplankton collected?: Yes No Volume Filtered: 0
Field DUP collected?: Yes No Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.36	6.78	159	13.40	0	
3	1.57	6.60	148	16.26	0	
4	2.38	6.47	143.1	15.14	0	
5	2.64	6.38	144.1	15.02	0	
6	2.76	6.26	149.4	13.65	0	
7						
8						
9						
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11						
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13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: WT
Sample ID: February Profile
Crew: L.D, K.M
Date: 2019-02-07
Time: 13:40
Weather: Ice crystals, -30 °C
Observations:
UTM Coordinates: Easting: 725275 7
Northing: 607449
Waypoint:
Total Water Depth: 6.06
Secchi Depth: Ø
Volume Filtered: Ø
Phytoplankton collected?: Yes No
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.25	6.65	58.7	16.13	0	
3	2.69	6.55	54.7	16.02	0	
4	3.12	6.44	54.4	14.32	0	
5	3.36	6.21	54.9	13.63	0	
6	3.43	6.08	53.6	12.29	0	
7						
8						
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16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Nemo Lake

Sample ID: Nemo February Profile

Crew: L.D KM

Date: 2019-02-10

Time: 13.50

Weather: -20 Mostly Cloudy

Observations:

UTM Coordinates: Easting: 725 7468 Northing: 60 65 51 Waypoint:

Total Water Depth: 10.08

Secchi Depth: Ø

Volume Filtered: Ø

Phytoplankton collected?: Yes No

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.99	7.01	38.5	15.96		
3	1.44	6.96	35	16.53		
4	1.65	6.93	33	16.65		
5	1.76	6.9	32.8	16.5		
6	1.78	6.87	32.2	16.28		
7	1.85	6.83	32.3	15.83		
8	1.89	6.77	32	15.52		
9	1.92	6.75	32.5	15.15		
10	1.95	6.73	33.6	15.03		
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: S-PL
Sample ID:
Crew: NS/KN
Date: 2019-02-12
Time: 13:30
Weather: clear.
Observations:
UTM Coordinates: 14W
Easting: 0639669
Northing: 7214588
Waypoint: #215
Total Water Depth: 9.75 meters
Secchi Depth:
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	~~0.01~~	~~59.1~~	~~16.43~~	~~7.12~~		
1	0.01	59.1	16.43	7.12		
2	0.80	54.0	17.15	7.12		
3	1.39	51.1	17.29	7.10		
4	1.71	49.4	17.09	7.09		
5	1.90	49.4	16.95	7.08		
6	1.97	49.8	16.60	7.06		
7	2.06	49.0	16.05	7.05		
8	2.20	49.8	15.32	6.98		
9	2.77	52.1	13.72	6.85		
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes: Profile only

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage Lake
Sample ID: TPE
Crew: Jamie K. Kathleen N.
Date: 2019-02-14
Time: 15:02
Weather: Clear sky, wind east 20km/h
Observations:
UTM Coordinates: 14W Easting: 0637794
Northing: 7211735
Waypoint: TPE-FEB
Total Water Depth: 10 meters
Secchi Depth:
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1	0.04	7.16	44.4	15.98		
2	0.06	7.13	38.5	16.44		
3	1.30	7.09	36.0	16.40		
4	1.70	7.05	35.5	16.04		
5	1.89	7.03	34.1	15.61		
6	2.02	7.00	33.7	15.03		
7	2.20	6.97	33.5	14.52		
8	2.37	6.94	33.3	13.92		
9	2.45	6.90	33.5	13.04		
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Profile only.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage Lake
Sample ID: TPN
Crew: Jamie K. Kathleen N Andrade
Date: 2019-02-14
Time: 15:49
Weather: clear sky, light winds
Observations:
UTM Coordinates: 14W Easting: 0635149 Northing: 7212737 Waypoint: TPN-FEB
Total Water Depth: 14 meters
Secchi Depth:
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1	0	8.15	42.6	19.05		
2	0.22	8.02	39.1	19.42		
3	0.52	7.94	35.1	18.96		
4	0.66	7.88	33.2	18.40		
5	0.77	7.83	31.8	17.69		
6	0.86	7.77	31.3	16.81		
7	0.93	7.73	30.2	16.28		
8	1.00	7.68	30.1	15.64		
9	1.03	7.63	30.0	15.20		
10	1.08	7.55	31.7	14.90		
11	1.15	7.51	30.7	14.67		
12	1.22	7.45	31.4	14.46		
13	1.44	7.37	30.8	13.73		
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Profile only

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Wally Lake
Sample ID:
Crew: Jamie K / Isabelle C
Date: 2019-02-21
Time: 14:32
Weather: clear skies, light winds
Observations:
UTM Coordinates: 15W Easting: 0360835
Northing: 7220772
Waypoint:
Total Water Depth: 12.5 meters
Secchi Depth:
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1	0.12	6.78	67.1	17.15		
2	0.90	6.72	62.6	17.01		
3	2.02	6.67	58.4	16.75		
4	2.47	6.61	56.7	16.27		
5	2.63	6.57	56.0	16.02		
6	2.74	6.51	55.1	15.48		
7	2.80	6.49	55.2	14.67		
8	2.89	6.46	54.7	13.58		
9	2.95	6.43	54.4	11.97		
10	3.01	6.43	55.4	10.40		
11	3.06	6.42	57.3	9.54		
12	3.17	6.42	59.0	8.88		
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes: Profile only

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Whale tail South
Sample ID: WTS-37
Crew: FANNY L. & JOE A
Date: 2019-03-02
Time: 13:30
Weather: WINDY - low visibility
Observations:
UTM Coordinates: Easting: Northing: Waypoint: WTS-37
Total Water Depth: 15.6
Secchi Depth: Ø
Phytoplankton collected?: Yes No
Volume Filtered: 500ML
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	/	/	/	/	/	
1						
2	0.88		57.5	17.40	0	
3	1.47	6.36	54	17.72	0	
4	1.92		50.4	17.43	0	
5	2.21		48.6	17.07	0	
6	2.36		47.1	16.47	0	
7	2.46		46	15.50	0	
8	2.54		46.2	14.67	0	
9	2.57		46.5	13.24	0	
10	2.61		48	12.67	0	
11	2.64		49.7	12.05	0	
12	2.67		49.8	10.86	0	
13	2.75		49.6	10.08	0	
14	2.79		51.1	9.54	0	
15	2.90		50.9	8.87	0	
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. Fill with NO HEADSPACE.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes: * our Eureka probe PH did not work, we took PH at the office with OAKTON from the water treatement plant.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Whaletail South
Sample ID: WTS-38
Crew: FANNY L. & JOE A
Date: 2019-03-02
Time: 15:00
Weather: WINDY - BAD VISIBILITY
Observations:
UTM Coordinates: Easting: Northing: Waypoint: WTS-38
Total Water Depth: 5.90
Secchi Depth: Ø
Phytoplankton collected?: Yes No — Yes
Volume Filtered: 500mL
Field DUP collected?: Yes No — No
Arsenic speciation collected?: Yes No — No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.76		57.8	18.04	1.6	
3	1.25	6.52	53.9	17.95	1.1	
4	1.92		53.2	17.94	0	
5	2.15		51.9	17.91	0	
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: * our PH Did Not work on EUREKA probe, taken at the office with OAKTON probe from WTP.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LAKE A-20
Sample ID: A20-31
Crew: Fanny L. Sam Q.
Date: 2019-03-04
Time: 12:30
Weather:
Observations: SUNNY - 26
UTM Coordinates: Easting:
Northing: /
Waypoint: /
Total Water Depth: 5,85
Secchi Depth: Ø
Phytoplankton collected?: Yes No
Volume Filtered: 500 mL
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.27	7.08	22.7	17.68		
3	1.89	6.99	19.6	18.01		
4	2.21	6.93	18.3	17.60		
5	2.27	6.83	17.7	16.88		
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. Fill with **NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter **500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of Lugol's back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LAKE A-20
Sample ID: A20-32
Crew: Fanny L., SAMQ
Date: 2019-03-04
Time: 13:00
Weather: SUNNY -26
Observations:
UTM Coordinates: Easting: Northing: Waypoint: A20-32
Total Water Depth:
Secchi Depth: 8
Phytoplankton collected?: Yes No
Volume Filtered: 500ML
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.99	6.8	23.2	18.56		
3	1.81	6.69	19.7	19.11		
4	2.17	6.67	18.4	18.68		
5	2.27	6.6	17.6	16.42		
6	2.29	6.53	17.2	16.03		
7	2.3	6.45	17.7	15.03		
8	2.31	6.43	17.9	14.46		
9	2.32	6.38	18.1	14.15		
10	2.34	6.41	18.1	14.06		
11	2.35	6.4	18.1	14.04		
12	2.36	6.42	18.5	14.06		
13	2.37	6.43	18.5	14.22		
14	2.38	6.41	18.5	14.16		
15	2.4	6.4	18.4	14.11		
16	2.43	6.38	17.8	13.91		
17	2.44	6.32	18	13.38		
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level)
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. Fill with **NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter **500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Mammoth Lake Sample ID: MAM-38

Crew: Fanny & SAM Q Date: 2019-03-04 Time: 15:40

Weather:

Observations: Sunny -26°C

UTM Coordinates: Easting: Northing: Waypoint:

Total Water Depth: 6.3 Secchi Depth: 8

Phytoplankton collected?: Yes No Volume Filtered: 500ML

Field DUP collected?: Yes No Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.54	6.43	107.0	16.09		
3	2.26	6.44	100	16.29		
4	2.69	6.43	96.5	16.36		
5	2.79	6.36	95.5	16		
6	2.84	6.29	98	15.27		
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of Lugol's back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Mammoth Lake
Crew: Fanny L. Sam Q.
Weather:
Observations: SUNNY -26°C
UTM Coordinates: Easting: / Northing: /
Total Water Depth: 8.7
Phytoplankton collected?: Yes No
Field DUP collected?: Yes No
Sample ID: MAM-37
Date: 2019-03-04
Time: 15:15
Waypoint: /
Secchi Depth: 8
Volume Filtered: 500ML
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.97	6.48	179.8	15.27		
3	1.92	6.54	174.8	16.12		
4	2.46	6.52	172.4	16.63		
5	2.79	6.40	186.4	16.07		
6	2.88	6.32	187.4	14.79		
7	2.99	6.28	195.7	13.60		
8	3.74	6.21	210.1	12.38		
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

March DUP-3

Area: Nemo Lake

Sample ID: NEM-37

Crew: L.D - N.S

Date: 2019-03-07

Time: 12h18

Weather: -25 cloudy

Observations:

UTM Coordinates: Easting: 725 7398 Northing: 606220 Waypoint:

Total Water Depth: 9,30

Secchi Depth:

Phytoplankton collected?: Yes No

Volume Filtered: 500 mL

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1	0,9	7,34	43,5	18,65	more than 2	
2	0,85	7,25	41,2	18,93	m of Ice	
3	1,78	7,22	36,7	18,68		
4	2,11	7,19	34,2	18,34		
5	2,26	7,15	33,2	17,88		
6	2,37	7,09	32,3	17,12		
7	2,41	6,98	33,6	16,70		
8	2,44	6,89	36,6	16,38		
9	2,53	6,85	37,4	16,47		
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Nemo Lake
Sample ID: NFM-38
Crew: LD-NS
Date: 2019-03-07
Time: 13h11
Weather: -25 cloudy
Observations:

UTM Coordinates: Easting: 7 257303 Northing: 606559 Waypoint: Ø
Total Water Depth: 5,35 Secchi Depth: Ø

Phytoplankton collected?: **Yes** No
Volume Filtered: 500 mL
Field DUP collected?: Yes **No**
Arsenic speciation collected?: Yes **No**

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1	0	7,29	45,4	18,53	more	than
2	0,73	7,20	41,4	18,91	2M of	Ice
3	1,72	7,14	35,7	18,44		
4	2	7,11	33,1	18,28		
5	2,05	7,06	32,9	18,26		
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D5 (LK5)
Crew: N.S, K.M
Weather: -30°C, Sunny
Observations:

Sample ID: LK5-7
Date: 2019/03/09
Time: 12:30

UTM Coordinates: Easting: 725 2001
Northing: 61 28 29
Waypoint:
Total Water Depth: 8.1
Secchi Depth: /
Volume Filtered: /

Phytoplankton collected?: Yes No (Yes circled)
Field DUP collected?: Yes No (No circled)
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.8	7.13	44.5	18.32		
3	1.86	7.07	39.4	18.26		
4	2.61	7.01	36.7	17.47		
5	2.82	6.91	36	16.66		
6	2.88	6.79	36.4	15.11		
7	2.94	6.68	36.9	14.16		
8	2.95	6.60	38.3	13.37		
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D5 (LK5)

Sample ID: LK5-8 (LK5)

Crew: N.S, K.M

Date: 2019/03/09

Time: 13:28

Weather: -30°C, Sunny

Observations: /

UTM Coordinates: Easting: 612883 Northing: 7252082 Waypoint:

Total Water Depth: 15.2

Secchi Depth: /

Phytoplankton collected?: Yes (circled) No

Volume Filtered: /

Field DUP collected?: Yes No (circled)

Arsenic speciation collected?: Yes No (circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.52	7.15	45.6	19.80		
3	1.75	7.06	40.1	19.12		
4	2.57	6.96	37	17.38		
5	2.74	6.90	36	16.80		
6	2.88	6.81	35.2	15.54		
7	2.93	6.71	35.8	12.21		
8	2.96	6.59	35.8	11.31		
9	2.97	6.56	35.8	10.70		
10	2.99	6.53	36.5	9.96		
11	3.02	6.5	37.3	9.43		
12	3.10	6.48	37.7	9.30		
13	3.03	6.45	41.2	9.14		
14	3.05	6.43	42.9	8.81		
15	3.06	6.41	46.6	8.26		
16	3.07	6.43	[illegible]	7.73		
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TPL
Sample ID: TPS-62
Crew: NS/KN
Date: 2019-03-12
Time: 13:50
Weather: Sunny
Observations:
UTM Coordinates: 14W **Easting:** 0633467 **Northing:** 7208427 **Waypoint:**
Total Water Depth: 15.70 m
Secchi Depth: /
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.35	7,45	40,5	18.20		
3	0,64	7,49	36,7	16,88		
4	0.77	7.54	34,1	15,90		
5	0,87	7,57	32,9	15,24		
6	0.95	7,60	31.8	14.72		
7	1.01	7.61	31.3	14.58		
8	1.06	7.63	30.9	14.42		
9	1.11	7.66	30,0	14.40		
10	1.14	7.68	29.6	14.47		
11	1.16	7.70	29,8	14.52		
12	1.20	7.72	29.9	14,64		
13	1,24	7.75	29,7	14,77		
14	1.27	7.78	30	15,03		
15	1,27	7.81	30,8	15,32		
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes: samples collected.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D1
Crew: L.D - KM
Weather: -20 cloudy
Observations:

Sample ID: LK1-7
Date: 2019-03-14
Time: 13:50

UTM Coordinates: Easting: 724966
Northing: 6675 48
Waypoint:

Total Water Depth: 9.53 m
Secchi Depth: Ø

Phytoplankton collected?: Yes No
Volume Filtered: 500 ml

Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.37	7.11	30.9	16.83	0	
3	1.49	6.77	25.5	17.21	0	
4	2.4	6.36	22.7	16.85	0	
5	2.28	6.0	20.7	16.03	0	
6	2.58	5.69	19.6	15.16	0	
7	2.74	5.34	19.5	14.25	0	
8	2.98	4.92	19.7	12.88	0	
9	3.10	5.47	20.9	10.92	0	
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D1
Crew: L.D - KM
Weather: -20 cloudy
Observations:

Sample ID: LK1-8
Date: 2019-03/14.
Time: 13:24

UTM Coordinates: Easting: 724942 Northing: 607114 Waypoint:

Total Water Depth: 8.27m

Secchi Depth: Ø

Phytoplankton collected?: Yes No — Yes

Volume Filtered: 500 ml

Field DUP collected?: Yes No — No

Arsenic speciation collected?: Yes No — No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2						
3	1.3	6.64	25.6	17.3	0	
4	1.87	6.85	23.3	17.62	0	
5	2.25	6.87	21.8	17.53	0	
6	2.94	6.85	20.2	16.45	0	
7	3.23	6.76	20.5	15.21	0	
8	3.81	6.65	24	13.28	0	
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D8
Sample ID: LK8-8
Crew: L.D., K.M.
Date: 2019-03-15
Time: 15:30
Weather: -26 Sunny
Observations:

UTM Coordinates: Easting: 7 25 86 34
Northing: 610686
Waypoint:
Total Water Depth: 10.15m
Secchi Depth: Ø
Phytoplankton collected?: Yes No
Volume Filtered: 500 mL
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1			~~23.4~~			
2	1.14	7.94	23.4	12.28		
3	1.82	7.69	18.9	15.22		
4	2.12	7.57	16.9	15.5		
5	2.16	7.4	16.7	15.02		
6	2.18	7.31	17	14.91		
7	2.21	7.21	16.5	14.6		
8	2.23	7.10	16.5	14.16		
9	2.25	6.98	16.6	13.52		
10	2.27	6.86	16.6	13.7		
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LAke D8
Crew: L.D - KM
Weather: -26 Sunny
Observations:

Sample ID: LK8-7
Date: 2019-03-15
Time: 14:50

UTM Coordinates: Easting: 7258792 Northing: 612110 Waypoint:

Total Water Depth: 14.23m
Secchi Depth: Ø

Phytoplankton collected?: Yes No
Volume Filtered: 500 ml

Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.70	7.26	26.3	19		
3	1.69	7.16	21.7	19.21		
4	2.08	7.11	18.6	18.88		
5	2.22	7.2	17.3	17.51		
6	2.22	6.94	17.3	16.4		
7	2.23	6.87	17.2	15.29		
8	2.25	6.8	17.1	14.8		
9	2.28	6.49	16.9	12.18		
10	2.31	6.5	17	12.6		
11	2.37	6.52	17.4	13.01		
12	2.48	6.52	17.5	13.26		
13	2.69	6.48	17.9	13.3		
14	2.95	6.39	18.2	12.75		
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake A76

Sample ID: A76-32

Crew: L.D. S.T.

Date: 2019/03/16

Time: 11:50

Weather: SUNNY

Observations:

UTM Coordinates: Easting: 725 6840

Northing: 60 1682

Waypoint:

Total Water Depth: 8.65m

Secchi Depth: Ø

Phytoplankton collected?: Yes No

Volume Filtered: 500ML

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.83	7.37	71.3	17.72		
3	2.27	7.28	63.8	17.71		
4	2.52	7.23	61.5	17.88		
5	2.60	7.19	61.2	17.99		
6	2.67	7.12	61.7	17.66		
7	2.70	7.05	63.0	17.25		
8	2.78	7.01	63.0	17.07		
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake A76
Sample ID: A76-31
Crew: L-D ST
Date: 2019-03-16
Time: 12h17
Weather: SUNNY
Observations:
UTM Coordinates: Easting: 7256840 Northing: 601682 Waypoint:
Total Water Depth: 7,06
Secchi Depth: Ø
Phytoplankton collected?: Yes No
Volume Filtered: 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0,92	7,34	67,5	18,46		
3	1,97	7,30	61,3	18,2		
4	2,48	7,25	57,2	17,85		
5	2,63	7,15	58,3	17,61		
6	2,69	7,06	60,1	17,10		
7	2,77	7,00	59,9	16,66		
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake DSI
Sample ID: DSI-30
Crew: I.D. ST
Date: 2019-03-16
Time: 10:00
Weather: Sunny
Observations:

UTM Coordinates: Easting: 725 8291
Northing: 59 80 28
Waypoint:
Total Water Depth: 7,74 m
Secchi Depth: Ø
Phytoplankton collected?: Yes No
Volume Filtered: 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1	0,97	6,65	48	17,33		
2						
3	2,10	6,60	45,7	17,14		
4	2,73	6,61	43,9	17,11		
5	2,95	6,56	42,4	16,99		
6	2,96	6,49	43,2	16,18		
7	2,98	6,45	44,4	15,4		
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: NEW COORDINATES Ø 5m AROUND THE ORIGINAL STATION

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake DSI

Crew: ST - LD

Weather: SUNNY

Observations:

Sample ID: DSI - 29

Date: 16/03/2019

Time: 9:30

UTM Coordinates:

Easting: 7 26 0997

Northing: 59 75 01

Waypoint:

Total Water Depth: 20M+

Secchi Depth: Ø

Phytoplankton collected?: Yes No

Volume Filtered: 500 ml

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.48	6.87	25.5	13.83		
3	1.63	6.80	25.7	13.81		
4	1.64	6.77	25.6	13.79		
5	1.65	6.77	25.7	13.76		
6	1.65	6.75	25.7	13.72		
7	1.65	6.74	25.7	13.69		
8	1.64	6.72	25.7	13.68		
9	1.65	6.69	25.6	13.67		
10	1.65	6.70	25.7	13.66		
11	1.65	6.69	25.7	13.65		
12	1.65	6.67	25.7	13.61		
13	1.65	6.65	25.7	13.57		
14	1.65	6.64	25.7	13.58		
15	1.65	6.63	25.8	13.58		
16	1.65	6.62	25.8	13.58		
17	1.65	6.62	25.8	13.58		
18	1.65	6.61	25.8	13.59		
19	1.65	6.61	25.9	13.59		
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TPE

Sample ID: TPE-120

Crew: TT, KN, KM

Date: 2019-03-17

Time: 10:35

Weather: Clear

Observations:

UTM Coordinates: Easting: 14W 0638969 Northing: 7211487 Waypoint: –

Total Water Depth: 7.5 m

Secchi Depth: –

Phytoplankton collected?: **Yes** No

Volume Filtered: 500 ml

Field DUP collected?: Yes **No**

Arsenic speciation collected?: Yes **No**

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.78	6.85	43.2	18.32		
3	1.10	6.82	42.2	17.58		
4	0.99	6.77	43	17.47		
5	2	6.73	39.3	16.78		
6	2.11	6.69	38.1	16.17		
7	2.20	6.66	37.3	15.83		
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Approx 2m of ice. 1st Reading @ 2.5m

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TPE
Sample ID: TPE - 121
Crew: K.N., K.M
Date: 2019-03-17
Time: 13:35
Weather: Clear
Observations:
UTM Coordinates: Easting: 14W 0637282 Northing: 7212026 Waypoint: —
Total Water Depth: 7.90m
Secchi Depth: —
Phytoplankton collected?: Yes No
Volume Filtered: 500 mL
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.49	7.04	38.3	17.06		
3	0.58	6.97	36.7	17.12		
4	0.77	6.93	35.1	16.82		
5	0.89	6.90	34.0	16.36		
6	0.91	6.84	36.5	16.15		
7	1.0	6.81	33.9	15.71		
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Approx. 2m of ice. 1st reading @ 2.5m

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TPL
Sample ID: TPN-120
Crew: Kevin M. Kathleen N.
Date: 2019-03-17
Time: 16:10
Weather: Clear
Observations:
UTM Coordinates: 14W
Easting: 0636658
Northing: 7214370
Waypoint: TPN-120
Total Water Depth: 12.5m
Secchi Depth: /
Phytoplankton collected?: Yes No
Volume Filtered: 500 mL
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.40	7.04	39.9	18.01		
3	0.51	7.0	38.1	18.21		
4	0.75	6.96	35.6	18.02		
5	0.88	6.94	33.6	17.46		
6	0.96	6.88	32.2	17.15		
7	0.99	6.75	31.9	15.25		
8	1.04	6.72	31.2	14.98		
9	1.10	6.70	30.9	14.63		
10	1.15	6.69	30.5	14.39		
11	1.18	6.67	30.4	14.15		
12	1.21	6.65	30.4	14.02		
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Approx. 2m of ice. 1st reading @ 2.5m

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage Lake
Sample ID: TPN-121
Crew: KN LD
Date: 2019-03-18
Time: 11h45
Weather: Cloudy. Light Snowfall
Observations:

UTM Coordinates: Easting: 0634919 Northing: 7213954 Waypoint:

Total Water Depth: 12,90
Secchi Depth: —

Phytoplankton collected?: **Yes** No
Volume Filtered: 500 mL

Field DUP collected?: Yes **No**
Arsenic speciation collected?: Yes **No**

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0,20	6,60	41,7	19,09		
3	0,51	6,60	37,8	18,59		
4	0,75	6,61	35,5	18,21		
5	0,85	6,60	34,6	17,78		
6	0,91	6,60	34,2	16,88		
7	1,02	6,59	33,9	16,41		
8	1,07	6,57	32,19	15,92		
9	1,11	6,56	32,4	15,61		
10	1,14	6,54	32,7	15,22		
11	1,17	6,53	32,3	14,90		
12	1,21	6,51	32,3	14,65		
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Waldy **Sample ID:** WAL-89
Crew: NS/JJ **Date:** 2019-03-28 **Time:** 16:00
Weather: Sunny / windy / blizzard
Observations:

UTM Coordinates: **Easting:** **Northing:** **Waypoint:**
Total Water Depth: 8.1 m **Secchi Depth:** —
Phytoplankton collected?: Yes No **Volume Filtered:** 500 ml
Field DUP collected?: Yes No **Arsenic speciation collected?:** Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0	7.66	71.3	16.61		
3	2.10	7.55	64.8	16.07		
4	2.51	7.39	62.9	15.27		
5	2.70	7.31	61.9	14.73		
6	2.72	7.24	62.1	14.24		
7	2.74	7.18	62.5	13.93		
8	2.76	7.12	63.0	13.64		
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Wally **Sample ID:** WAL-90
Crew: NS / Joseph **Date:** 2019-03-28 **Time:** 14:30
Weather: sunny / windy / blizzard
Observations:

UTM Coordinates: **Easting:** **Northing:** **Waypoint:**
Total Water Depth: 7.4 M **Secchi Depth:** /
Phytoplankton collected?: Yes (circled) No **Volume Filtered:** 500 ml
Field DUP collected?: Yes No (circled) **Arsenic speciation collected?:** Yes No (circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.1	6.75	67.6	15.96	—	
3	1.08	6.69	63.7	15.87		
4	2.64	6.65	58.7	15.40		
5	2.82	6.61	58.0	15.22		
6	2.98	6.59	57.5	15.21		
7	3.01	6.55	57.2	14.73		
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Second Portage
Crew: NS / JA
Weather: Sunny / light wind
Observations:

Sample ID: SPL-120
Date: 2019-03-29
Time: 9:30

UTM Coordinates: **Easting:** **Northing:** **Waypoint:**

Total Water Depth: 11.30 M
Secchi Depth: /

Phytoplankton collected?: Yes (circled) No
Volume Filtered: 500 ml

Field DUP collected?: Yes No (circled)
Arsenic speciation collected?: Yes No (circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
– 2	0.38	6.85	53.2	18.27		
3	1.19	6.82	49.6	18.27		
4	1.97	6.81	46.9	17.27		
5	2.22	6.79	46.1	16.50		
6	2.29	6.77	46.8	15.74		
7	2.33	6.74	47.2	15.23		
8	2.36	6.70	47.4	14.66		
9	2.40	6.68	47.4	14.42		
10	2.45	6.66	48.7	14.56		
11	2.58	6.63	49.1	14.55		
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Second Portage
Crew: NS / JA
Weather: Sunny / windy
Observations:

Sample ID: SPL-121
Date: 2019-03-29
Time: 10:20

UTM Coordinates: Easting: Northing: Waypoint:

Total Water Depth: 5.1 m
Secchi Depth: —

Phytoplankton collected?: Yes No
Volume Filtered: 500 ml

Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.60	7.22	48.7	17.43		
3	1.23	7.12	50.9	17.81		
4	1.81	7.08	50.0	17.38		
5	2.08	7.07	49.4	17.10		
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage
Sample ID: TBS-61
Crew: NS / JA
Date: 2019-03-30
Time: 15:10
Weather: Blowing snow / Sun
Observations:
UTM Coordinates: Easting: Northing: Waypoint:
Total Water Depth: 9.4M
Secchi Depth:
Phytoplankton collected?: Yes No (Yes)
Volume Filtered: 500ml
Field DUP collected?: Yes No (Yes)
Arsenic speciation collected?: Yes No (No)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.34	6.79	41.6	18.70		
3	0.59	6.81	34.3	19.01		
4	0.82	6.79	32.5	18.61		
5	0.91	6.78	31.5	17.84		
6	0.98	6.76	30.5	17.30		
7	1.04	6.74	29.5	16.71		
8	1.09	6.74	29.2	16.20		
9	1.15	6.72	29.5	15.74		
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes? Done

Water Sampling and Limnology

AREA INFORMATION

Area: Pipe Dream Lake
Sample ID: PDL-73
Crew: NS / JA
Date: 2019-03-31
Time: 12:05
Weather: Wind, blowing snow
Observations:
UTM Coordinates: Easting:
Northing:
Waypoint:
Total Water Depth: >20 m
Secchi Depth: /
Phytoplankton collected?: Yes No — Yes
Volume Filtered: 500 ml
Field DUP collected?: Yes No — No
Arsenic speciation collected?: Yes No — No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.48	7.18	25.5	14.95		
3	0.60	7.18	24.5	15.14		
4	0.69	7.14	24.2	14.98		
5	0.69	7.11	24.2	14.89		
6	0.77	7.1	24.5	14.83		
7	0.80	7.08	24.5	14.79		
8	0.83	7.07	24.7	14.71		
9	0.86	7.04	24.8	14.66		
10	0.87	7.0	24.9	14.62		
11	0.91	6.98	24.7	14.58		
12	0.94	6.94	25	14.51		
13	0.96	6.91	25.4	14.49		
14	0.98	6.89	25.5	14.64		
15	1	6.87	25.7	14.66		
16	1.03	6.85	25.2	14.63		
17	1.06	6.84	25.2	14.44		
18	1.11	6.82	24.8	14.18		
19	1.16	6.81	24.4	13.91		
20	1.2	6.79	24.3	13.68		

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Pipe Dream Lake
Sample ID: PDL-74
Crew: NS / JA
Date: 2019-03-31
Time: 11:10
Weather: Windy, blowing snow
Observations:
UTM Coordinates: Easting:
Northing:
Waypoint:
Total Water Depth: 14.20 m
Secchi Depth: \
Phytoplankton collected?: Yes No
Volume Filtered: 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.25	6.81	25.7	16.69		
3	0.60	6.81	24.5	16.58		
4	0.69	6.8	24.1	15.95		
5	0.70	6.79	24.1	15.64		
6	0.75	6.77	24.4	15.35		
7	0.80	6.76	24.4	15.18		
8	0.83	6.73	24.8	15.06		
9	0.85	6.72	25.1	14.97		
10	0.88	6.69	25.2	14.90		
11	0.91	6.67	25.6	14.90		
12	0.92	6.66	25.4	14.91		
13	0.94	6.64	25.5	14.88		
14	0.96	6.63	25.2	14.80		
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Tehek Lake
Sample ID: TE - 96
Crew: NS / JA
Date: 2019-03-31
Time: 15:35 16:20
Weather:
Observations:
UTM Coordinates: 15 W Easting: 0360143
Northing: 7212302
Waypoint:
Total Water Depth: 10.7 m
Secchi Depth: /
Phytoplankton collected?: Yes No
Volume Filtered: 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	\					
1	\					
2	0.14	7.11	42.6	20.49		
3	0.51	7.08	40.1	20.74		
4	0.82	7.04	39.4	20.53		
5	1.01	7.0	41.2	20.43		
6	1.44	6.92	40.1	19.33		
7	1.71	6.83	45.5	17.23		
8	1.97	6.81	43.9	15.87		
9	2.31	6.77	41.9	14.44		
10	2.61	6.73	42.4	13.23		
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Original location was too shallow, see coordinates

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: INUG
Sample ID: INUG-108
Crew: NS / JA
Date: 2019-04-01
Time: 14:54
Weather:
Observations:
UTM Coordinates: Easting:
Northing:
Waypoint: ~~[illegible]~~
Total Water Depth: 6.25 m
Secchi Depth: /
Phytoplankton collected?: Yes No
Volume Filtered: 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.88	6.68	31.7	16.45		
3	1.94	6.71	25.2	14.65		
4	2.37	6.74	22	13.65		
5	2.48	6.84	20.8	13.30		
6	2.48	6.86	21.2	13.54		
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: INUG | Sample ID: INUG-109
Crew: NS / JA | Date: 2019-04-01 | Time: 14:05
Weather: Cloudy / light snow
Observations:

UTM Coordinates: Easting: | Northing: | Waypoint:
Total Water Depth: 14.70 m | Secchi Depth: /
Phytoplankton collected?: Yes No — Yes | Volume Filtered:
Field DUP collected?: Yes No — No | Arsenic speciation collected?: Yes No — No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.21	6.63	23.5	14.24		
3	1.76	6.59	21.4	14.50		
4	2.21	6.57	20	14.38		
5	2.39	6.54	19.6	13.65		
6	2.51	6.51	19.9	13.09		
7	2.63	6.43	20.8	12.21		
8	2.77	6.37	21.8	11.71		
9	2.90	6.29	21.3	11.05		
10	2.96	6.20	22.7	10.35		
11	3.13	6.14	22.5	9.21		
12	3.22	6.03	23.2	8.30		
13	3.35	5.95	26	6.31		
14	3.49	5.87	29.9	5.74		
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Tehek
Sample ID: TE-97
Crew: NS / JA
Date: 2019-04-01
Time: 10:50
Weather: Cloudy / light snow
Observations:
UTM Coordinates: **Easting:** **Northing:** **Waypoint:**
Total Water Depth: 13.9 m
Secchi Depth: /
Phytoplankton collected?: Yes No
Volume Filtered: 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.36	6.63	38.1	19.55		
3	0.66	6.65	37.9	18.15		
4	0.92	6.64	34.3	16.68		
5	1.16	6.68	41.5	15.28		
6	1.37	6.55	44.2	14.05		
7	1.75	6.55	41.4	11.91		
8	2.24	6.55	38.3	10.77		
9	2.56	6.54	37.2	9.46		
10	2.68	6.56	36.5	8.69		
11	2.77	6.56	36.8	7.32		
12	2.94	6.56	38.1	6.42		
13	3.13	6.57	39.1	6.10		
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

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AREA INFORMATION

Area: Tehek

Sample ID: TEFF-48

Crew: NS / JA

Date: 2019-04-01

Time: 9.55

Weather: Cloudy / light snow

Observations:

UTM Coordinates: Easting:

Northing:

Waypoint:

Total Water Depth: 10 20m

Secchi Depth: /

Volume Filtered: 500 ml

Phytoplankton collected?: Yes No

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.38	6.55	29.7	18.85		
3	0.66	6.52	26.1	18.95		
4	0.86	6.49	29.5	18.98		
5	1.11	6.50	26.7	18.88		
6	1.47	6.45	27.4	18.25		
7	1.82	6.42	28.1	17.43		
8	2.20	6.38	27	14.82		
9	2.49	6.26	27.1	13.41		
10	2.75	6.16	27.6	11.25		
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Tehek Lake

Sample ID: TEFF-49

Crew: NS / JA

Date: 2019-04-01

Time: 9:10

Weather: Cloudy / light snow

Observations:

UTM Coordinates: Easting: Northing: Waypoint:

Total Water Depth: 10.50 m

Secchi Depth: ∅

Phytoplankton collected?: Yes No — Yes

Volume Filtered: 500 ml

Field DUP collected?: Yes No — No

Arsenic speciation collected?: Yes No — No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.35	6.83	29.2	18.23		
3	0.60	6.61	27.1	18.77		
4	0.85	6.58	24.3	18.50		
5	1.13	6.55	23	18.26		
6	1.48	6.50	24.6	17.80		
7	1.99	6.46	24.3	16.26		
8	2.19	6.42	23.6	15.05		
9	2.45	6.36	23.6	13.21		
10	2.73	6.26	23.5	11.51		
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Mammoth Lake
Crew: L.D, & K.M
Weather: ~S Sunny
Observations:

Sample ID: APRIL Profile
Date: 2019/04/13
Time: 10:30

UTM Coordinates: 14W
Easting: 7254852
Northing: 605074
Waypoint:

Total Water Depth: 8.18 M
Secchi Depth: Ø
Volume Filtered: Ø

Phytoplankton collected?: Yes No
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	2.18	6.56	155.5	14.75		
3	3.72	6.51	160	15.15		
4	3.85	6.46	159.8	15.18		
5	4.03	6.47	161	15.41		
6	4.18	6.49	169.8	16.09		
7	4.15	6.52	176.5	17.37		
8	4.12	6.44	177.5	17.97		
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Nemo Lake

Sample ID: April Profile

Crew: L.D. & K.M

Date: 2019/04/13 Time: 11:07

Weather: -5 Sunny

Observations:

UTM Coordinates: 14W Easting: 7257463 Northing: 606661 Waypoint:

Total Water Depth: 6.3m

Secchi Depth: Ø

Phytoplankton collected?: Yes No

Volume Filtered: Ø

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	2.42	6.93	34.9	15.31		
3	2.71	6.88	33.8	15.12		
4	2.79	6.88	33.5	15.05		
5	2.84	6.88	33.5	15.03		
6	2.85	6.89	32.6	15.03		
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage East

Sample ID:

Crew: Jamie K / Jonathan P

Date: 2019-04-13

Time: 16:08

Weather: Sunny, partly cloudy

Observations:

UTM Coordinates: Easting: 14W 0637969 Northing: 7210205 Waypoint:

Total Water Depth: 16 meters

Secchi Depth: N/A

Phytoplankton collected?: Yes No

Volume Filtered:

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1	0.09	6.90	53.6	18.54		
2	0.29	6.85	50.3	18.78		
3	1.34	6.81	42.9	18.21		
4	1.92	6.80	39.2	17.57		
5	2.19	6.77	37.6	17.07		
6	2.30	6.74	37.0	16.51		
7	2.37	6.72	36.4	16.05		
8	2.42	6.68	35.9	15.47		
9	2.47	6.64	36.4	14.39		
10	2.50	6.62	36.8	13.74		
11	2.55	6.59	37.0	13.37		
12	2.57	6.55	37.1	12.85		
13	2.59	6.51	37.4	12.23		
14	2.63	6.47	37.5	11.59		
15	2.67	6.44	37.5	11.18		
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes: CREMP Profile only

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TPN
Crew: Jonathan / Kathleen
Weather: cloudy
Observations:

Sample ID: TPN
Date: 2019-04-14
Time: 10:42

UTM Coordinates: Easting: 0635899 Northing: 7215137 Waypoint:

Total Water Depth: > 25 m
Secchi Depth: –

Phytoplankton collected?: Yes No
Volume Filtered: –

Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.46	6.91	39.6	18.59		
3	0.69	6.89	37.3	18.10		
4	0.83	6.87	36.2	17.63		
5	0.96	6.87	34.6	17.08		
6	1.05	6.85	33.8	16.5		
7	1.12	6.84	32.6	15.87		
8	1.16	6.81	32.4	15.39		
9	1.20	6.78	32.6	14.99		
10	1.23	6.77	32.5	14.75		
11	1.27	6.74	32.3	14.52		
12	1.29	6.73	32.9	14.38		
13	1.32	6.71	33.5	14.37		
14	1.37	6.69	33.1	14.36		
15	1.42	6.67	32.5	14.26		
16	1.45	6.64	33.4	14.05		
17	1.5	6.63	34	14.16		
18	1.55	6.61	33.6	14.20		
19	1.59	6.59	34.1	14.14		
20	1.62	6.58	33.6	14.14		

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: CREMP PROFILE ONLY

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: SP lake
Sample ID: SP
Crew: Jonathan / kathleen
Date: 2019-04-16
Time: 9:15
Weather: Clear Sky
Observations:
UTM Coordinates: Easting: 0640080 Northing: 7214080 Waypoint:
Total Water Depth: 11 meters
Secchi Depth: /
Phytoplankton collected?: Yes ~~No~~
Volume Filtered: /
Field DUP collected?: Yes ~~No~~
Arsenic speciation collected?: Yes ~~No~~

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	0.85	7.01	60	16.98		
3	1.55	7.09	56.9	16.99		
4	2.24	7.07	53.9	16.62		
5	2.45	7.04	52.9	15.90		
6	2.52	7.01	53.3	15.30		
7	2.57	6.98	53.3	14.67		
8	2.58	6.94	53.6	14.40		
9	2.60	6.92	53.8	14.20		
10	2.64	6.88	54.0	14.13		
11	2.86	6.85	54.4	13.83		
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: CREMP PROFILE ONLY.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: WALLY LAKE
Sample ID: Wally
Crew: Jonathan P / Kathleen
Date: 2019-04-16
Time: 14:30
Weather: /
Observations:
UTM Coordinates: 15W
Easting: 0361805
Northing: 7222824
Waypoint:
Total Water Depth: 5.5 meters
Secchi Depth: /
Phytoplankton collected?: Yes ~~No~~
Volume Filtered: /
Field DUP collected?: Yes ~~No~~
Arsenic speciation collected?: Yes ~~No~~

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.43	6.78	66.3	14.76		
3	2.08	6.76	64.3	14.73		
4	2.66	6.72	62.5	14.49		
5	2.84	6.68	61.7	14.06		
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: 2 meters of ice
CREMP PROFILE ONLY

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake A76

Sample ID: A76-33

Crew: F.L. & K.M

Date: 2019-05-06

Time: 12:50

Weather:

Observations: Overcast - Drill at 1km away

UTM Coordinates: Easting: 602554 Explo

Northing: 7257152

Waypoint: ∅

Total Water Depth: 13.9 m

Secchi Depth: ∅

Phytoplankton collected?: Yes No

Volume Filtered: 500 mL

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	3.04	6.64	61.7	15.54	0.74	
3	4.17	6.62	61.8	15.66	0.75	
4	4.18	6.61	61.8	15.73	0.79	
5	4.18	6.61	61.8	15.87	0.8	
6	4.17	6.61	61.8	15.98	0.78	
7	4.17	6.61	61.8	16.07	0.81	
8	4.17	6.61	61.9	16.16	0.74	
9	4.15	6.61	61.9	16.21	0.82	
10	4.15	6.61	62.0	16.23	0.8	
11	4.15	6.61	62	16.23	0.83	
12	4.15	6.62	61.9	16.24	0.73	
13	4.17	6.62	61.9	16.27	0.74	
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake A76
Sample ID: A76-34
Crew: F.L. & K.M
Date: 2019/05/06
Time: 12:15
Weather: Overcast
Observations: Drill explo @ 1KM
UTM Coordinates: Easting: 604383
Northing: 7252617
Waypoint: Ø
Total Water Depth: 11.40 m
Secchi Depth: Ø
Phytoplankton collected?: Yes No
Volume Filtered: 500M
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	2.36	6.61	62.9	16.40	0.79	
3	3.89	6.59	60.7	16.20	0.81	
4	3.96	6.59	61.0	16.19	0.76	
5	4.15	6.58	62.3	16.22	0.75	
6	4.16	6.58	62.5	16.26	0.78	
7	4.14	6.58	62.3	16.37	0.70	
8	4.03	6.58	62.0	16.47	0.69	
9	4.09	6.58	62.7	16.48	0.69	
10	4.10	6.58	63.7	16.50	0.76	
11	4.10	6.56	65.7	16.58	0.7	
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake DS1
Sample ID: DS1-31
Crew: F.L. & K.M.
Date: 2019/05/06
Time: 10:40
Weather: overcast light snow
Observations:
UTM Coordinates: 14W Easting: 597517
Northing: 7260741
Waypoint: Ø
Total Water Depth: 12.10m
Secchi Depth: Ø
Phytoplankton collected?: Yes No
Volume Filtered: 500M
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.13	6.86	28.3	14.48	0	
3	2.17	6.72	27.8	14.58	0	
4	2.19	6.70	27.8	14.65	0	
5	2.20	6.68	27.8	14.55	0	
6	2.2	6.65	27.7	14.5	0	
7	2.2	6.66	27.7	14.49	0	
8	2.2	6.67	27.7	14.49	0	
9	2.2	6.67	27.8	14.48	0	
10	2.2	6.66	27.8	14.47	0	
11	2.2	6.65	27.8	14.46	0	
12	2.2	6.65	27.8	14.46	0	
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: overcast.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake DS1
Crew: F.L. & K.M.
Weather: Overcast
Observations: light Snow
Sample ID: DS1-32
Date: 2019/05/06
Time: 11:20
UTM Coordinates: Easting: 602554
Northing: 7257152
Waypoint: 8
Total Water Depth: 9.20 m
Secchi Depth: 8
Phytoplankton collected?: (Yes) No
Volume Filtered: 500 ML
Field DUP collected?: Yes (No)
Arsenic speciation collected?: Yes (No)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	2.40	6.51	41.3	16.31	0	
3	4.13	6.43	45.1	15.91	0	
4	4.16	6.42	45.3	16.19	0	
5	4.17	6.42	45.3	16.38	0	
6	4.17	6.42	45.3	16.58	0	
7	4.17	6.43	45.4	16.78	0	
8	4.18	6.42	46.2	16.91	0	
9	4.15	6.41	46.3	16.89	0	
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

2

AREA INFORMATION

Area: TPL
Sample ID: TPN-122
Crew: TT, NS, EF
Date: 2019-05-06
Time: 4:55
Weather: Sunny w/clouds
Observations:
UTM Coordinates: Easting: 14W 0635389 Northing: 7212917 Waypoint: –
Total Water Depth: 10.4m
Secchi Depth: –
Phytoplankton collected?: Yes No
Volume Filtered: 500ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2						
3	0.63	6.81	40.7	16.68		
4	0.80	6.77	38.3	17.11		
5	1.13	6.74	33.9	16.34		
6	1.21	6.71	33.3	15.93		
7	1.25	6.68	33.9	15.25		
8	1.28	6.65	34.2	15.03		
9	1.32	6.62	34.3	14.97		
10	1.36	6.65	36.9	14.06		
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)	

Field Notes: DO (%) 119.8% (3m)

Equipment Blank Collection Notes?

Water Sampling and Limnology

1

AREA INFORMATION

Area: ~~TPN~~ TPL
Sample ID: TPN-123
Crew: EF, NS, TT
Date: 2019-05-06
Time: 16:15
Weather: Sunny + clouds (~5°C)
Observations:
UTM Coordinates: Easting: 14W 0634710
Northing: 7216091
Waypoint: —
Total Water Depth: 14.3m
Secchi Depth: —
Phytoplankton collected?: Yes No
Volume Filtered: 500ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2						
3	0.85	6.71	44	17.9		
4	1.12	6.69	41.2	18.10		
5	1.23	6.67	39.3	17.89		
6	1.30	6.65	38.6	17.79		
7	1.37	6.63	39.9	17.89		
8	1.43	6.62	~~[illegible]~~ 40.4	18.00		
9	1.5	6.60	39.3	17.81		
10	1.6	6.55	37.6	~~17~~ 16.81		
11	1.66	6.51	36.8	16.22		
12	1.70	6.48	39.2	16.10		
13	1.74	6.47	38.2	16.35		
14	1.77 ~~1.80~~ ~~[illegible]~~	6.46	37.3	14.26		
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: 128.3% (3m)

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TPL
Sample ID: TPE-122
Crew: EF, NS, MA, SM
Date: 2019-05-07
Time: 2:00pm
Weather: Snowing, foggy
Observations:
UTM Coordinates: Easting: Northing: Waypoint:
Total Water Depth: 11.6 m
Secchi Depth: 0
Phytoplankton collected?: Yes No
Volume Filtered: 500
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2						
3	1.82	6.58	41.8	96.10	—	
4	2.21	6.54	39.9	15.32		
5	2.33	6.49	39.2	14.03		
6	2.40	6.44	39.2	13.72		
7	2.48	6.4	40.9	13.23		
8	2.53	6.38	42.4	98.5		
9	2.59	6.36	42.4	13.23		
10	2.63	6.35	41.8	13.26		
11	2.69	6.31	42.7	12.84		
12	~~3.04~~	~~6.24~~	~~54~~	~~12.26~~		
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TPL
Sample ID: TPF-128
Crew: MA, SM, GF, N
Date: 07.05.19
Time: 1544
Weather:
Observations:
UTM Coordinates: Easting: Northing: Waypoint:
Total Water Depth: 14.74 m
Secchi Depth: /
Phytoplankton collected?: Yes (circled) No
Volume Filtered: 500
Field DUP collected?: Yes (circled) No
DUP-1
Arsenic speciation collected?: Yes No (circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2						
3	1.61	6.51	43.1	15.82		
4	2.03	6.49	41.4	15.73		
5	2.25	6.46	41.6	15.58		
6	2.47	6.43	42.2	15.31		
7	2.55	6.42	41.8	15.03		
8	2.54	6.41	42	14.88		
9	2.31	6.39	42.2	14.60		
10	2.06	6.38	41.9	14.55		
11	2.79	6.37	42.7	14.58		
12	2.79	6.37	42.3	14.51		
13	2.83	6.36	42.7	14.52		
14	2.96	6.37	42.4	14.54		
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D1
Sample ID: LK1-9
Crew: L.D, & K.M
Date: 2019-05-10
Time: 12:35
Weather: -5°C
Observations:
UTM Coordinates: 14W Easting: 7249512 Northing: 607086 Waypoint:
Total Water Depth: 8.39m Secchi Depth: 8
Phytoplankton collected?: (Yes) No
Volume Filtered: 500
Field DUP collected?: Yes No
Arsenic speciation collected?: (Yes) No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.31	6.53	31.3	15.7	0	
3	2.47	6.48	28	14.53	0	
4	3.60	6.44	25.2	14.03	0	
5	3.95	6.44	24.1	14.16	0	
6	4	6.46	24	14.62	0	
7	4.09	6.49	24	15.11	0	
8	4.02	6.53	24	15.42	0	
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D1
Sample ID: LK1-10
Crew: L.D. & K.M.
Date: 2019-05-10
Time: 13:10
Weather: -5°C
Observations:
UTM Coordinates: 14 W Easting: 7250092
Northing: 607906
Waypoint:
Total Water Depth: 10.29 m
Secchi Depth: 0
Phytoplankton collected?: Yes No
Volume Filtered: 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2						* more then
3	2.64	6.5	26.6	14.4	0	2 meters
4	3.02	6.5	25.7	14.25	0	of ice.
5	3.11	6.5	25.3	14.24	0	
6	3.15	6.52	25.3	14.34	0	
7	3.17	6.53	25.3	14.51	0	
8	3.19	6.56	25.4	14.66	0	
9	3.25	6.69	25.3	15.21	0	
10	3.29	6.77	25.6	15.45	0	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: ~~[illegible]~~ Lake DS
Sample ID: LKS-9
Crew: LD - KM
Date: 2019-05-10
Time: 14:10
Weather: -5
Observations: 7252527 612605
UTM Coordinates: Easting: ~~7252560~~ Northing: ~~612627~~ Waypoint:
Total Water Depth: 15.55
Secchi Depth: Ø
Phytoplankton collected?: Yes No
Volume Filtered: 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2						* More then
3	3.89	6.81	39.2	13.46	0	2 meters
4	4.02	6.81	39.4	12.95	0	of ice
5	4.06	6.81	39.6	12.49	0	
6	4.07	6.81	39.9	11.73	0	
7	4.05	6.81	40	10.83	0	
8	3.98	6.82	40.6	10.17	0	
9	3.89	6.83	42.7	9.08	0	
10	3.86	6.88	44.4	7.99	0	
11	3.78	6.93	45.2	6.4	0	
12	3.59	7.02	45.7	5.23	0	
13	3.6	7.11	46.3	4.64	0	
14	3.5	7.14	57.3	5.44	0	
15	3.48	6.88	87.2	15.03	0	
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D5
Crew: LD - KM
Weather: -5
Observations:

Sample ID: LKS-10
Date: 2019-06-10
Time: 14.35

UTM Coordinates: Easting: 7252583
Northing: 612440
Waypoint:

Total Water Depth: 6.47 m
Secchi Depth: Ø

Volume Filtered: 500 ml

Phytoplankton collected?: Yes No
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
					NTU	
units:	°C		µS/cm	mg/L		
0						
1						* more
2						then 2
3	3.72	6.87	40.02	15.02	0	meters of
4	3.99	6.88	39.7	15.05	0	ice.
5	4	6.89	39.7	15.19	0	
6	4	6.89	39.8	15.25	0	
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Mammoth Lake
Crew: LD - KM
Weather: -5
Observations: Close to a dymond drill ≈ 50m
UTM Coordinates: 14W Easting: 7255109
Total Water Depth: 9.47m
Phytoplankton collected?: Yes No
Field DUP collected?: Yes No

Sample ID: MAM-39
Date: 2019-05-10
Time: 9:40
Northing: 6053354
Waypoint:
Secchi Depth: Ø
Volume Filtered: 500 ml
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	3.23	6.58	178.2	18.16	17.2	
3	4.05	6.59	177.4	17.92	16.3	
4	4.19	6.57	180.2	17.82	16.9	
5	4.37	6.54	186.1	17.53	18.5	
6	4.49	6.51	195.5	17.27	20.5	
7	4.69	6.5	204.1	16.99	21.3	
8	4.67	6.52	205.8	16.76	20.3	
9	4.66	6.56	205.8	16.31	13.35	
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Mammoth Lake
Crew: L.D - KM
Weather: -S
Observations:

Sample ID: Mam-40
Date: 2019-05-10
Time: 10:30

UTM Coordinates: 14W
Easting: 72 54 478
Northing: 60 40 68
Waypoint:

Total Water Depth: 13.23m
Secchi Depth: ∅

Phytoplankton collected?: Yes No
Volume Filtered: 500 ml

Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.75	6.49	115	16.88	0	
3	3.96	6.48	108.8	16.58	0	
4	3.96	6.48	108.8	16.44	0	
5	3.95	6.47	108.8	16.26	0	
6	3.98	6.46	109	16.26	0	
7	4.03	6.45	109.1	16.03	0	
8	4.05	6.42	110	15.72	0	
9	4.04	6.37	110.3	15.3	0	
10	4.05	6.31	110.6	14.58	0	
11	3.84	6.26	110.3	14.27	0	
12	3.79	6.31	111.5	13.85	0	
13	3.8	6.35	112.3	14.8	0	
14				15.47		
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake A20

Sample ID: A20 - 33

Crew: LD- KM

Date: 2019-05-11

Time: 12:00

Weather: -4 Cloudy

Observations:

UTM Coordinates: Easting: 60 5204 Northing: 7 252788 Waypoint:

Total Water Depth: 5.58

Secchi Depth: Ø

Phytoplankton collected?: Yes No

Volume Filtered: 500 ml

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	4.10	6.6	32.5	18.24	0	
3	4.10	6.62	32.6	17.99	0	
4	4.09	6.66	32.6	17.58	0	
5	4.09	6.73	32.6	16.9	0	
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake A20
Crew: I.D - KM
Weather: -4 Cloudy
Observations:
UTM Coordinates: 14 W Easting: 7252617
Total Water Depth: More then 19m.
Phytoplankton collected?: Yes No
Field DUP collected?: Yes No

Sample ID: A20-34
Date: 2019-05-11 Time: 12:25
Northing: 604383 Waypoint:
Secchi Depth: Ø
Volume Filtered: 500
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	3.86	6.72	19.6	15.67	0	
3	4	6.72	19.4	15.54	0	
4	4	6.7	19.3	15.55	0	
5	3.99	6.71	19.3	15.56	0	
6	3.99	6.71	19.3	15.56	0	
7	3.99	6.72	19.3	15.58	0	
8	3.98	6.73	19.3	15.58	0	
9	3.99	6.74	19.3	15.58	0	
10	3.98	6.74	19.3	15.59	0	
11	3.98	6.75	19.3	15.64	0	
12	3.98	6.78	19.4	15.7	0	
13	3.98	6.79	19.4	15.74	0	
14	3.98	6.8	19.4	15.78	0	
15	3.95	6.82	19.3	15.87	0	
16	3.94	6.84	19.3	15.83	0	
17	3.92	6.86	19.3	16.05	0	
18	3.91	6.89	19.3	16.19	0	
19	3.89	6.93	19.4	16.41	0	
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D8
Crew: LD - KM
Weather: -4 Cloudy
Observations:

Sample ID: 2K8-10
Date: 2015-05-11
Time: 10:25

UTM Coordinates: 14 W Easting: 61 06 86
Northing: 72 58 63 4
Waypoint:
Total Water Depth: 8.33m
Secchi Depth: 8
Phytoplankton collected?: Yes No
Volume Filtered: 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	2.95	6.77	18.2	13.9		
3	3.18	6.8	18	13.83	0	
4	3.20	6.82	18	13.83	0	
5	3.23	6.94	18	13.83	0	
6	3.25	6.97	18	13.83	0	
7	3.25	7.01	18	13.91	0	
8	3.26	7.06	18	13.79	0	
9			17.9	13.79	0	
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D8
Sample ID: LK8-9
Crew: LD - KM
Date: 2015-05-11
Time: 9:50
Weather: -4 Cloudy
Observations:
UTM Coordinates: 14W Easting: 612110
Northing: 7258792
Waypoint:
Total Water Depth: 13.83m
Secchi Depth: 0
Phytoplankton collected?: Yes No (Yes circled)
Volume Filtered: 500 ml
Field DUP collected?: Yes No (No circled)
Arsenic speciation collected?: Yes No (Yes circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		μS/cm	mg/L	NTU	
0						
1						
2	2.34	6.66	24.6	15.25	0	
3	3.40	6.69	18.7	14.73	0	
4	3.47	6.69	18.9	14.68	0	
5	3.53	6.68	18.6	14.64	0	
6	3.55	6.67	18.5	14.57	0	
7	3.56	6.67	18.5	14.52	0	
8	3.56	6.66	18.5	14.42	0	
9	3.58	6.65	18.4	14.32	0	
10	3.63	6.64	18.4	14.17	0	
11	3.71	6.63	18.4	13.91	0	
12	3.77	6.61	18.4	13.67	0	
13	3.88	6.58	18.6	13.30	0	
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Second Portage
Sample ID: ~~7b~~ SP-122
Crew: TT MBA SM
Date: 2019/05/111
Time: 19:36
Weather: Clear
Observations: None
UTM Coordinates: 14W
Easting: 0640557
Northing: 7212857
Waypoint: —
Total Water Depth: 12m
Secchi Depth: —
Phytoplankton collected?: Yes No
Volume Filtered: 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.9 ↓	6.49 ↓	51.2 ↓	16.68 ↓		122.9 ↓
3						
4	2.63	6.48	49.9	16.94		
5	2.82	6.46	81.1	17.3		
6	3.04	6.45	53	17.37		
7	3.14	6.44	52.8	17.66		
8	3.20	6.41	52.17	17.52		
9	3.33	6.39	52.5	17.07		
10	3.41	6.39	52	16.71		
11	3.49	6.38	52.5	16.61		
12	~~3.41~~	—	—	—	-	
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes: 12 meter deep

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Second Portage **Sample ID:** SP - 123
Crew: TOM Michael BB Steph M **Date:** 2019-05-11 **Time:** 13:52
Weather: Sunny
Observations:
UTM Coordinates: 14W **Easting:** 0640103 **Northing:** 7210448 **Waypoint:** —
Total Water Depth: 6m **Secchi Depth:** —
Phytoplankton collected?: Yes No **Volume Filtered:** 500 ml
Field DUP collected?: Yes No **Arsenic speciation collected?:** Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2						
3	7.07	6.62	50.5	15.6		% 116.4
4	7.77	6.6	48.3	15.5		
5	7.88	6.59	48.7	15.17		
6	—	—				
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: NEMO
Crew: KM LD
Weather: -3 LIGHT SNOW
Observations:

Sample ID: NEM-39
Date: 2019/05/13
Time: 10:35

UTM Coordinates: 14W Easting: 606617
Northing: 7257602
Waypoint:

Total Water Depth: 10.5m
Secchi Depth: Ø

Phytoplankton collected?: Yes (circled) No
Volume Filtered: 500ML

Field DUP collected?: Yes No (circled)
Arsenic speciation collected?: Yes (circled) No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	3.61	6.88	35.5	16.32	0	
3	3.91	6.87	35.4	16.02	0	
4	3.92	6.87	35.4	15.92	0	
5	3.94	6.86	35.4	15.86	0	
6	3.93	6.86	35.3	15.75	0	
7	3.93	6.85	35.4	15.64	0	
8	3.9	6.84	35.6	15.48	0	
9	3.86	6.83	35.8	15.19	0	
10	3.88	6.79	35.9	14.88	0	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: NEMO
Crew: KM LD
Weather: -3 LIGHT SNOW
Observations:

Sample ID: NEM-40
Date: 2019/05/13
Time: 10:15

UTM Coordinates: 14W Easting: 606571
Northing: 7257957
Waypoint:

Total Water Depth: 15.8m
Secchi Depth: Ø

Phytoplankton collected?: Yes (circled) No
Volume Filtered: 500ML

Field DUP collected?: Yes No (circled)
Arsenic speciation collected?: Yes No (circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	3.98	6.89	35.4	16.18	0	
3	4	6.89	35.4	16.10	0	
4	4.01	6.89	35.3	16.08	0	
5	4.02	6.88	35.4	16	0	
6	4.02	6.88	35.5	15.91	0	
7	4.03	6.88	35.5	15.81	0	
8	4.03	6.87	35.5	15.71	0	
9	4.03	6.87	35.5	15.58	0	
10	4.02	6.87	35.5	15.28	0	
11	4.02	6.86	35.4	14.95	0	
12	4.03	6.85	35.4	14.66	0	
13	4.06	6.85	35.4	14.39	0	
14	4.06	6.86	35.5	14.24	0	
15	4.10	6.9	35.1	14.25	0	
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: UTS
Sample ID: UTS-39
Crew: LD - KM
Date: 2019-05-13
Time: 9:15
Weather: -3 light snow windy
Observations:
UTM Coordinates: 14W
Easting: 607574
Northing: 7254084
Waypoint:
Total Water Depth: 7.97m
Secchi Depth:
Phytoplankton collected?: (Yes) No
Volume Filtered: 500 ml
Field DUP collected?: Yes (No)
Arsenic speciation collected?: (Yes) No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.40	6.63	156	14.35		
3	1.6	6.63	156.7	14.33	1	
4	1.61	6.63	156.1	14.34	1.3	
5	1.62	6.63	155.9	14.33	1.46	
6	1.64	6.63	154.7	14.34	1.33	
7	1.69	6.64	152.8	14.31	2.09	
8					1.38	
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: UtS
Crew: LD-KM
Weather: -3 light snow windy
Observations:
Sample ID: UtS-40
Date: 2019-05-13
Time: 8:45
UTM Coordinates: 14W
Easting: 607163
Northing: 7253609
Waypoint:
Total Water Depth: 9.95m
Secchi Depth: 0
Phytoplankton collected?: Yes No — Yes
Volume Filtered: 500 ml
Field DUP collected?: Yes No — No
Arsenic speciation collected?: Yes No — No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1						
2	1.39	6.63	135.2	15.07	1	
3	1.68	6.62	136.8	15.12	0.25	
4	1.94	6.62	135.2	15.21	0	
5	1.93	6.58	138.6	15.20	0.20	
6	1.95	6.58	139.1	15.12	0.11	
7	1.98	6.59	137.8	15.04	0.15	
8	2.01	6.59	136.9	14.96	0.29	
9	2.06	6.58	137.3	14.81	0.20	
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Wally Lake
Sample ID: WAL-92
Crew: Isabelle Couture, Stephanie Mercier, Gabriel Joedee
Date/ Time: 2019 - 05-16 15h46.
Weather: ~~Clou~~ overcast, little windy. Added to EQuIS 2)
Observations:

UTM Coordinates: 15W **Easting:** 0361425 **Northing:** 7222234 **Waypoint:** –
Total Water Depth: 5.5 m **Secchi Depth:** –
Phytoplankton collected? (Circle one): Yes No **Volume Filtered:**
Field DUP collected? (Circle one): Yes No **Photo #s:** –

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen		pH	Turbidity	
units:	°C	µS/cm	~~mg/L~~ %	mg/L		NTU	
0							
1	0.17	72.9	104.7	14.82	6.93		
2	0.59	71.3	105.5	14.66	6.93		
3	0.98	77.4	111.7	14.11	6.92		
4	2.60	76.4	103.4	13.95	6.89		
5	2.90	66	115.1	14.24	6.83		
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:
We moved the station as we were very close from the ground.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: WALLY LAKE
Sample ID: WAL-91
Crew: Isabelle Couture, Stéphanie Mercier, Gabriel J. on EQuiS=)
Date/ Time: May 16th 2019, 17:00
Weather: overcast, little windy.
Observations:

UTM Coordinates: 15W **Easting:** 0361932 **Northing:** 7222655 **Waypoint:** –
Total Water Depth: 13 meters **Secchi Depth:** –
Phytoplankton collected? (Circle one): Yes No **Volume Filtered:**
Field DUP collected? (Circle one): Yes No **Photo #s:** –

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	Daa					
1	0.2	36.4	15.98	7.05		
2	0.01	37.1	15.48	6.94		
3	1.09	60.8	15.75	6.93		
4	2.16	58.6	15.07	6.85		
5	2.99	58.5	14.61	6.79		
6	3.09	58.3	14.21	6.74		
7	3.14	58	13.73	6.70		
8	3.25	57.1	13.26	6.65		
9	3.43	57.5	12.40	6.6		
10	3.5	58.2	11.43	6.56		
11	3.6	58.4	10.38	6.5		
12	3.76	61.5	9.13	6.41		
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes: The GPS point was on the shore.
We moved it 3 times and we had 2.5 meters of water.
We had to move further away.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: INUG
Sample ID: INUG-110
Crew: Isabelle Couture, Stéphanie Mercier
Date/ Time: 2019-05-18 / 10h55
Weather: Sunny, little windy, -5 °C
Observations: no.

UTM Coordinates: 14W Easting: 0622672 Northing: 7214948 Waypoint: —

Total Water Depth: 8m Secchi Depth: —

Phytoplankton collected? (Circle one): Yes (circled) No Volume Filtered: 500ml: Chloro | 225ml with disc filter

Field DUP collected? (Circle one): Yes No (circled) Photo #s: —

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen		pH	Turbidity	
units:	°C	µS/cm	mg/L	%		NTU	
0							
1	0.06	25.5	16.88	117.9	7.22		
2	0.08	25.3	17.23	120.7	7.21		
3	1.64	20.1	17.32	124.8	7.20		
4	2.46	18.6	16.96	126.3	7.15		
5	2.71	18.9	16.70	125.2	7.08		
6	2.84	20.3	16.36	122.8	7.00		
7	3.02	21.4	15.64	117.8	6.92		
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of Lugol's back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: INUG
Sample ID: INUG-111
Crew: Isabelle Couture, Stéphanie Mercier
Date/ Time: 2019-05-18 / 11:50 am
Weather: Sunny, little windy -5 °C
Observations:

UTM Coordinates: 14W Easting: 0622715 Northing: 7216489 Waypoint: —

Total Water Depth: 11 m Secchi Depth: —

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500ml Chloro | 225ml with disc filter

Field DUP collected? (Circle one): Yes No Photo #s: —

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen		pH	Turbidity	
units:	°C	µS/cm	mg/L	%		NTU	
0							
1	0.02	26.5	17.07	119.2	7.17		
2	0.14	26.7	17.17	120.5	7.17		
3	1.6	22.7	16.94	125.5	7.09		
4	2.56	21.6	17.87	135	6.93		
5	2.74	21	18.79	140.4	6.83		
6	2.92	20.1	18.93	143.5	6.76		
7	3.09	19.6	19.15	145.4	6.68		
8	3.22	20.4	18.92	143.6	6.56		
9	3.37	22.0	18.33	139.5	6.45		
10	3.60	23.9	16.72	128.8	6.30		
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Pipe dream lake
Sample ID: PDl-75
Crew: Stephanie M., Isabelle Couture
Date/ Time: 2019-05-18 1:30 pm
Weather: Sunny, windy -1°C
Observations:

UTM Coordinates: 14W **Easting:** 0630635 **Northing:** 7222999 **Waypoint:** —

Total Water Depth: 5.3m **Secchi Depth:** —

Phytoplankton collected? (Circle one): Yes No **Volume Filtered:** 500ml: chloro | 225ml | with disc. filter

Field DUP collected? (Circle one): Yes No **Photo #s:** —

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen		pH	Turbidity	
units:	°C	µS/cm	mg/L	%		NTU	
0							
1	-0.01	33.9	14.5	108.8	6.89		
2	0.04	33.7	16.34	115	6.82		
3	0.74	31	17.61	126.9	6.79		
4	1.15	29.4	18.73	135.2	6.77		
4.5	1.16	28.7	19.16	138	6.77		
5	1.21	28	19.04	137.1	6.76		
7							
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9							
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18							
19							
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber ✓	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass ✓	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic ✓	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes: ~~We~~ At the original GPS point, we had only 4 meters of water. We moved 20m away to do another hole and to get our samples.

* 2 bottles (500ml) were missing in our kit. We took a 1L chloro bottle that were rinsed several times before to fill up. Back at the office, we transfered the water in 2 bottles of 500ml. *

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Pipedream Lake
Sample ID: PDL-76
Crew: Stephanie Mercier, Isabelle Couture
Date/ Time: 2019-05-18 / 12h45
Weather: Sunny, little windy -1°C
Observations:

UTM Coordinates: 14W **Easting:** 0629784 **Northing:** 7224749 **Waypoint:**

Total Water Depth: 15m **Secchi Depth:** —

Phytoplankton collected? (Circle one): Yes No **Volume Filtered:** 500ml : Chloro | 225 ml with disc filter.

Field DUP collected? (Circle one): Yes No **Photo #s:** —

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen		pH	Turbidity	
units:	°C	µS/cm	mg/L	%		NTU	
0							
1	-0.03	39.6	16.90	[illegible]	6.86		
2	0.01	31.7	17.19	120.3	6.79		
3	0.6	26	17.51	124.5	6.8		
4	1.04	25.9	17.74	127.3	6.79		
5	1.16	27	17.56	126	6.76		
6	1.26	27.4	17.3	124.6	6.75		
7	1.33	27.6	17.03	123.1	6.74		
8	1.37	27.7	16.83	121.7	6.73		
9	1.43	27.1	16.61	120.1	6.71		
10	1.44	29.9	16.31	117.9	6.68		
11	1.48	28.9	16.06	116.5	6.68		
12	1.50	28.9	16.0	116.2	6.66		
13	1.55	28.7	15.98	116.2	6.66		
14	1.60	28.0	15.58	113.5	6.65		
15							
16							
17							
18							
19							
20							

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: NEMO
Sample ID: NEM-41
Crew: ST LD
Date/ Time: 16:00 2019-07-05
Weather: CLOUDY
Observations: LIGHT RAIN

UTM Coordinates: Easting: 14W 606131 Northing: 7257409 Waypoint: NEM-41

Total Water Depth: 11.93 m Secchi Depth: 7m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 ml

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	5.13	31.5	13.42	7.01	0	
1	5.06	31.4	13.43	7.02	0	
2	5.07	31.5	13.43	6.99	0	
3	5.07	31.5	13.43	6.98	0	
4	5.05	31.5	13.43	6.97	0	
5	5.07	31.5	13.43	6.95	0	
6	5.06	31.5	13.41	6.94	0	
7	5.06	31.4	13.39	6.93	0	
8	5.06	31.5	13.38	6.92	0	
9	5.05	31.5	13.33	6.92	0	
10	5.03	31.4	13.27	6.92	0	
11	5.01	31.5	13.10	6.92	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:
Ø

Equipment Blank Collection Notes?
Ø

Water Sampling and Limnology

AREA INFORMATION

Area: NEMO
Sample ID: NEM-92
Crew: ST LD
Date/ Time: 16:20 2019-07-05
Weather: CLOUDY
Observations: LIGHT RAIN

UTM Coordinates: Easting: 14W 606634 Northing: 7257813 Waypoint: NEM-92
Total Water Depth: 10.30 Secchi Depth: 7m
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500ml
Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	5.06	31.9	13.61	6.96	0	
1	5.05	31.9	13.62	6.94	0	
2	5.07	31.9	13.62	6.94	0	
3	5.03	31.8	13.61	6.94	0	
4	5.05	31.9	13.63	6.91	0	
5	5.02	31.9	13.61	6.91	0	
6	5.00	31.8	13.57	6.90	0	
7	4.93	31.8	13.58	6.90	0	
8	4.94	31.8	13.54	6.89	0	
9	4.92	31.8	13.51	6.89	0	
10	4.92	31.9	13.44	6.88	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: ARSENIC SPECIATION COLLECTED

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: UUTS
Sample ID: UUTS-41
Crew: LD-ST
Date/ Time: 2019-07-06 11h45
Weather: 17°C mostly Cloudy
Observations: Windy and waves

UTM Coordinates: Easting: 60 72 69 Northing: 7 25 3699 Waypoint: UUTS-41
Total Water Depth: 15,85 Secchi Depth: 5 m
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 ml
Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

pH cOm

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	7,87	103,3	11,48	6,86	0	
1	8,03	102,7	11,99	6,88	0	
2	8	102,2	12,42	6,88	0	
3	7,94	102,6	12,44	6,87	0	
4	7,84	103,3	12,45	6,87	0	
5	7,82	103,4	12,47	6,88	0	
6	7,75	103,5	12,48	6,88	0	
7	7,34	104,1	12,59	6,88	0	
8	7,04	105,2	12,68	6,89	0	
9	6,87	105,6	12,70	6,90	0	
10	6,75	105,7	12,66	6,90	0	
11	6,30	109,0	12,77	6,92	0	
12	6,03	106,3	12,59	6,82	0	
13	5,79	106,2	12,58	6,81	0	
14	5,65	106,3	12,51	6,80	0	
15	5,55	106,3	12,56	6,79	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Arsenic speciation collected

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: UTS
Sample ID: UTS-42
Crew: Louis Dubois / Samuel Tozzo
Date/ Time: 2019-07-06 12h15
Weather: 17° mostly cloudy
Observations: Windy and waves

UTM Coordinates: Easting: 60 74 88 Northing: 725 43536 Waypoint: UTS-42

Total Water Depth: 12,09 Secchi Depth: 5,5 m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 ml

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	6,99	105,8	12,69	6,89		
1	6,97	105,8	12,60	6,88		
2	6,95	105,8	12,57	6,88		
3	6,90	105,8	12,50	6,86		
4	6,85	105,8	12,46	6,85		
5	6,82	105,8	12,35	6,84		
6	6,75	105,9	12,24	6,83		
7	6,66	105,9	12,10	6,82		
8	6,80	105,6	11,73	6,80		
9	6,69	105,9	11,27	6,78		
10	6,55	106,0	10,71	6,77		
11	6,33	106,0	6,59 9,40	6,64		
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Mammoth Lake
Sample ID: Mam-41
Crew: Louis D. Alice B. A.
Date/ Time: 2019-07-07 14h50
Weather: 17° cloudy
Observations:

UTM Coordinates: Easting: 60 72 69 Northing: 7 25 36 59 Waypoint: Mam-41

Total Water Depth: 8.38 Secchi Depth: 5m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 ml

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	8.14	81.8	12.48	6.87	0	
1	8.14	81.9	12.65	6.85	0	
2	8.01	82.1	12.73	6.84	0	
3	7.62	82.1	12.83	6.84	0	
4	7.47	82.1	12.83	6.83	0	
5	7.32	82.1	12.88	6.84	0	
6	7.27	82.1	12.90	6.84	0	
7	7.03	82	12.97	6.84	0	
8	6.74	81.8	13.06	6.84	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Arsenic speciation

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Mammoth Lake
Sample ID: Mam-42
Crew: Louis D. Alice BA
Date/ Time: 2019-07-07 15h00
Weather: 17° cloudy
Observations:

UTM Coordinates: Easting: 60 52 85 Northing: 725 49 40 Waypoint: Mam-42

Total Water Depth: 5,08 Secchi Depth: 4.5m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 ml

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	10,60	107,9	12,01	6,88	0	
1	10,61	108,1	12,02	6,89	0	
2	10,58	107,9	12,04	6,89	0	
3	10,55	107,8	12,06	6,89	0	
4	9,73	106,6	12,20	6,91	0	
5	9,57	105,1	12,21	6,91	0	
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18						
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20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: * New UTM coordinates. Not enough water Depth.

Equipment Blank Collection Notes?

Water Sampling and Limnology

Drive

AREA INFORMATION

Area: LAKE DS1
Sample ID: DS1-33
Crew: ST KM FE
Date/ Time: 2019/07/09 15H30
Weather: CLOUDY / SUNNY
Observations: Ø

UTM Coordinates: Easting: 14W 597504 Northing: 7260925 Waypoint: DS1-33

Total Water Depth: 16 e+ + Secchi Depth: 8 m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 ML

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	9,87	16,6	11,48	6,71	0	
1	9,84	16,6	11,49	6,69	0	
2	9,77	16,6	11,50	6,66	0	
3	9,71	16,6	11,51	6,62	0	
4	9,68	16,7	11,52	6,66	0	
5	9,42	16,9	11,57	6,62	0	
6	9,10	17,3	11,68	6,62	0	
7	8,95	17,5	11,69	6,62	0	
8	8,90	17,5	11,67	6,62	0	
9	8,79	17,7	11,62	6,62	0	
10	8,62	18,7	11,69	6,63	0	
11	8,75	18,9	11,78	6,62	0	
12	7,97	18,8	11,76	6,62	0	
13	7,47	17,5	12,64	6,64	0	
14	6,05	17,7	12,16	6,63	0	
15	5,69		12,15	6,59	0	
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes:

Arsenic speciation collected

Equipment Blank Collection Notes?

Ø

Water Sampling and Limnology

Drive

AREA INFORMATION

Area: LAKE DS1

Sample ID: DS-24

Crew: ST KM FE

Date/ Time: 2019/07/09 15H15

Weather: CLOUDY /SUNNY

Observations: Ø

UTM Coordinates: Easting: KW 597332 Northing: 7259597 Waypoint: DS1-34

Total Water Depth: 10,67 Secchi Depth: 8 m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 ml

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	pH ~~Specific Conductivity~~	CONDUCTIVITY ~~Dissolved Oxygen~~	DISSOLVED ~~pH~~ OXYGEN	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	10,90	7,8	15,1	10,54	0	
1	10,84	7,4	15,1	10,68	0	
2	10,85	6,96	15,0	10,85	0	
3	10,84	7,93	15,1	10,96	0	
4	10,82	6,90	15,1	11,02	0	
5	10,82	6,86	15,1	11,07	0	
6	10,83	6,83	15,1	11,14	0	
7	10,62	6,81	15,7	11,31	0	
8	9,95	6,79	15,8	11,21	0	
9	9,88	6,78	15,9	11,35	0	
10	9,69	6,76	16,1	11,41	0	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Ø

Water Sampling and Limnology

AREA INFORMATION

Area: SP 125
Sample ID: SP-125
Crew: SM TT MBA
Date: 2019-07-10
Time: 2:47
Weather: sunny + overcast / wind NW
Observations: ✓
UTM Coordinates: 14W Easting: 0640121
Northing: 7213919
Waypoint: SP125
Total Water Depth: 7.2 m
Secchi Depth:
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity
units:	°C		µS/cm	mg/L	NTU
0					
1	8.21	7	38.7	12.61	
2	7.94	7	38.6	12.~~67~~	
3	7.71	7	38.8	12.77	
4	7.62	7	38.8	12.74	
5	7.8A	7	38.8	12.75	
6	7.59	6.99	38.8	12.73	
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. Fill with
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes: 166m from waypoint to meet criteria

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: SP124
Sample ID: SP124
Crew: SM TT MRA
Date: 2019-07-10
Time: 3:08pm
Weather: Sunny, overcast + wind NW
Observations:
UTM Coordinates: 14W
Easting: 640332
Northing: 7213475
Waypoint: SP124
Total Water Depth: 6.8 m
Secchi Depth:
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity
units:	°C		µS/cm	mg/L	NTU
0	—	—	—	—	
1	7.98	6.97	38.8	12.62	
2	7.90	6.91	38.8	12.64	
3	7.98	6.91	38.7	12.66	
4	7.88	6.92	38.9	12.69	
5	7.89	6.93	38.9	12.69	
6	7.84	6.93	38.8	12.71	
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LAKE 8
Sample ID: LK8-12
Crew: SH, JL
Date/ Time: 2019-07-12 16:40
Weather: cloudy
Observations:

UTM Coordinates: Easting: 14W 611897 Northing: 7258575 Waypoint: LK8-12

Total Water Depth: 12.20 m Secchi Depth: 8.0 m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L	—	NTU	
0	6.92	17.7	12.25	6.89	0	
1	6.92	17.7	12.64	6.84	0	
2	6.91	17.7	12.83	6.79	0	
3	6.87	17.7	12.91	6.75	0	
4	6.86	17.6	12.95	6.74	0	
5	6.82	17.7	13.00	6.73	0	
6	6.81	17.7	13.03	6.72	0	
7	6.72	17.7	13.04	6.72	0	
8	6.72	17.7	13.04	6.71	0	
9	6.72	17.6	13.04	6.72	0	
10	6.71	17.6	13.04	6.71	0	
11	6.71	17.6	13.05	6.71	0	
12	6.70	17.6	13.05	6.71	0	
13					0	
14					0	
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes: No As speciation.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LAKE 8
Sample ID: LK8-11
Crew: ST, JL
Date/ Time: 2019-07-12 16:00
Weather: cloudy
Observations:

UTM Coordinates: Easting: 9W 611093 Northing: 7258549 Waypoint: LK8-11

Total Water Depth: 714m (14m) Secchi Depth: 10m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	6.74	17.6	11.67	7.27	0	
1	6.72	17.6	12.59	7.16	0	
2	6.60	17.7	12.77	7.06	0	
3	6.60	17.7	13.00	6.99	0	
4	6.58	17.7	13.07	6.95	0	
5	6.58	17.7	13.10	6.90	0	
6	6.57	17.7	13.11	6.87	0	
7	6.41	17.7	13.14	6.84	0	
8	6.21	17.7	13.19	6.82	0	
9	6.14	17.7	13.21	6.80	0	
10	6.08	17.7	13.23	6.78	0	
11	6.00	17.7	13.26	6.76	0	
12	6.00	17.7	13.27	6.76	0	
13	5.95	17.7	13.28	6.75	0	
14	5.89	17.7	13.20	6.74	0	
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes: Arsenic speciation done

Equipment Blank Collection Notes?

Water Sampling and Limnology

Drive.

AREA INFORMATION

Area: LAKE 76
Sample ID: A76-35
Crew: ST JL
Date/ Time: 12:20 2019-07-12
Weather: CLOUDY/Rain
Observations:

UTM Coordinates: Easting: 14W 601939 Northing: 7256732 Waypoint: A76-35
Total Water Depth: >14 m (14m +) Secchi Depth: 8m
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500ML
Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	9.86	49.8	11.09	8.02	-2.34	
1	9.86	49.7	11.55	7.86	-2.86	
2	9.75	49.7	11.70	7.64	-2.51	
3	9.76	49.7	11.74	7.52	-2.52	
4	9.77	49.7	11.74	7.48	-2.66	
5	9.72	49.7	11.74	7.40	-2.48	
6	9.71	49.6	11.75	7.36	-2.59	
7	9.71	49.7	11.76	7.33	-2.49	
8	9.76	49.7	11.76	7.31	-2.51	
9	9.68	49.7	11.75	7.29	-2.62	
10	9.70	49.7	11.77	7.25	-2.59	
11	9.63	49.7	11.79	7.21	-2.53	
12	9.62	49.7	11.79	7.19	-2.47	
13	9.62	49.7	11.79	7.17	~~-2.48~~	-2.59
14	9.57	49.7	11.80	7.16	-2.46	
15	X					
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes: ARSENIC SPECIATION COLLECTED

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake 76
Sample ID: A76-36
Crew: LT, JL
Date/ Time: 13:00 2019-07-12
Weather: cloudy
Observations: calm water

UTM Coordinates: Easting: 14W 602129 Northing: 7256983 Waypoint: A76-36
Total Water Depth: 5.20m Secchi Depth: 6.5 m
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL
Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	9.82	49.6	11.15	7.22	0	
1	9.83	49.6	11.58	7.17	0	
2	9.78	49.7	11.72	7.13	0	
3	9.75	49.7	11.75	7.10	0	
4	9.75	49.7	11.77	7.08	0	
5	9.76	49.6	11.78	7.07	0	
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19						
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes: No Ar speciation, collected at A76-36

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake 20

Sample ID: A20-35

Crew: [illegible]

Date/ Time: 2015-07-13 13:30

Weather: windy, cloudy

Observations:

UTM Coordinates: Easting: 14W 604524 Northing: 7252545 Waypoint: A20-35

Total Water Depth: ~11m Secchi Depth: 6.0m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	10.31	16.8	11.48	7.13	0	
1	10.30	16.8	11.48	7.01	0	
2	10.31	16.8	11.48	6.95	0	
3	10.30	16.90	11.49	6.90	0	
4	10.29	16.90	11.49	6.90	0	
5	10.29	16.90	11.49	6.89	0	
6	10.29	16.90	11.49	6.85	0	
7	10.29	16.90	11.49	6.82	0	
8	10.26	16.80	11.50	6.83	0	
9	10.26	16.80	11.51	6.82	0	
10	9.45	17.90	11.58	6.57	0	
11	8.60	16.90	10.03	6.23	0	
12						
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17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level)
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter **500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes: Arsenic speciation taken

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake LC

Sample ID: A20-36

Crew: [illegible]

Date/ Time: 2019-07-15 14:20

Weather: cloudy windy

Observations:

UTM Coordinates: Easting: 14W 605157 Northing: 7252791 Waypoint: A20-36

Total Water Depth: 5.5 m Secchi Depth: 5.0m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL

Field DUP collected? (Circle one): Yes No Photo #s: [illegible]

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	[illegible]	16.7	10.99	6.54	0	
1	11.45	16.7	10.98	6.56	0	
2	[illegible]	16.7	10.99	6.58	0	
3	[illegible]	16.7	10.99	6.57	0	
4	11.45	16.7	11.01	6.61	0	
5	11.44	16.7	11.02	6.62	0	
6					0	
7					0	
8						
9						
10						
11						
12						
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16						
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19						
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage Lake
Sample ID: TPE-125
Crew: TK/FH
Date/ Time: 2019-07-13 16:35
Weather: partly cloudy NE 25km/h
Observations:

UTM Coordinates: Easting: 14W 0639033 Northing: 7211517 Waypoint:

Total Water Depth: 7.5m Secchi Depth: N/A

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0						
1	7.73	12.56	28.5	6.84		
2	7.73	12.50	28.5	6.75		
3	7.73	12.51	28.5	6.78		
4	7.72	12.53	28.5	6.76		
5	7.68	12.55	29.0	6.74		
6	7.63	12.57	29.2	6.73		
7	7.60	12.59	29.5	6.73		
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage Lake
Sample ID: TPE-124
Crew: JK/FH
Date/ Time: 2019-07-13 16:20
Weather: partly cloudy, wind 25 km/h NE
Observations:

UTM Coordinates: Easting: 14N 0639377 Northing: 7212747 Waypoint:

Total Water Depth: 10m Secchi Depth: N/A

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0						
1	7.23	30.1	12.74	6.74		
2	7.22	30.1	12.73	6.77		
3	7.22	30.1	12.73	6.78		
4	7.21	30.1	12.73	6.77		
5	7.20	30.1	12.74	6.75		
6	7.20	30.1	12.74	6.75		
7	7.20	30.1	12.75	6.73		
8	7.19	30.1	12.75	6.74		
9	7.20	30.1	12.75	6.73		
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D1
Sample ID: LK1-11
Crew: ST CP
Date/ Time: 19-07-2019 12:35 PM
Weather: Cloudy ; Sunny
Observations: light rain

UTM Coordinates: Easting: 14W 607564 Northing: 7249611 Waypoint: LK1-11
Total Water Depth: 8.18 m Secchi Depth: 4.50 m
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL
Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	9.31	19.6	11.48	6.99	0	
1	9.32	19.6	11.55	6.94	0	
2	9.31	19.6	11.60	6.89	0	
3	9.31	19.6	11.62	6.86	0	
4	9.30	19.6	11.64	6.84	0	
5	9.31	19.6	11.63	6.84	0	
6	9.28	19.6	11.64	6.84	0	
7	9.27	19.5	11.64	6.83	0	
8	9.26	19.5	11.64	6.83	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes:
Arsenic collected
July Dup-4 collected

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D1
Sample ID: LK1-12
Crew: ST CP
Date/ Time: 14-07-2019 12:00 PM
Weather: Cloudy ; Sunny
Observations: light rain

UTM Coordinates: Easting: 14W 606930 Northing: 7242542 Waypoint: LK1-12
Total Water Depth: 5.60 m Secchi Depth: 4.00m
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL
Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	9.25	19.5	11.19	7.62	0	
1	9.26	19.5	11.56	7.40	0	
2	9.25	19.5	11.65	7.30	0	
3	9.22	19.5	11.68	7.23	0	
4	9.21	19.5	11.69	7.13	0	
5	9.18	19.5	11.70	6.97	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level)
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Wally Lake
Sample ID: WAL-93
Crew: JK/JK
Date/ Time: 2019-07-16
Weather: partly cloudy 20km/hr NE
Observations:

UTM Coordinates: Easting: 15W0361752 Northing: 7221412 Waypoint:

Total Water Depth: 6.25m Secchi Depth: N/A

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0						
1	11.09	35.1	11.30	7.16		
2	11.8	35.1	11.33	7.13		
3	11	35.1	11.58	7.15		
4	10.96	35.1	11.39	7.14		
5	10.78	35.1	11.45	7.15		
6	10.43	35.2	11.55	7.16		
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: GPS coordinates are on land, moved 450 meters NW of original point

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Walli Lake
Sample ID: WAL-94
Crew: JK/KA
Date/ Time: 2019-07-16
Weather: partly cloudy, 20km/hr NW
Observations:

UTM Coordinates: Easting: 15W 0361546 Northing: 7221570 Waypoint: WAL-94

Total Water Depth: 7m Secchi Depth: N/A

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0						
1	10.99	35.2	11.08	6.96		
2	10.96	35.2	11.31	7.03		
3	10.91	35.2	11.39	7.09		
4	10.89	35.2	11.44	7.12		
5	10.82	35.2	11.48	7.14		
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19						
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes: GPS coordinates – too shallow, moved 130 meters south of original point

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TPN
Sample ID: TPN - 124 (#2)
Crew: NS JA
Date: 2019-07-23
Time: 15:20
Weather: Cloudy light rain
Observations:
UTM Coordinates: 14W
Easting: 0636958
Northing: 7212174
Waypoint:
Total Water Depth: 6.20
Secchi Depth: /
Phytoplankton collected?: **Yes** No
Volume Filtered: 500 m
Field DUP collected?: **Yes** No
Arsenic speciation collected?: Yes **No**

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	6.32	6.94	25.8	12.92	106.5	
1	6.22	6.91	25.8	12.95	106.4	
2	6.04	6.87	25.7	13.01	106.6	
3	6.03	6.85	25.8	13.04	106.9	
4	6.02	6.85	25.7	13.05	106.9	
5	5.99	6.88	25.8	13.05	106.8	
6	6.01	6.83	25.7	13.04	106.8	
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18						
19						
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: New location, the original one was on TPE

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TPN
Crew: NS JA
Weather: Cloudy
Observations:
UTM Coordinates: 14W Easting: 0635454
Total Water Depth: 12.15

Sample ID: TPN-125
Date: 2019-07-23 Time: 14:10

Northing: 7215501 Waypoint:

Secchi Depth:

Phytoplankton collected?: Yes No
Field DUP collected?: Yes No

Volume Filtered: 500 ml
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	6.83	7.09	26.1	12.85	107.5	
1	6.84	7.04	26.1	12.87	107.6	
2	6.83	6.96	26.1	12.90	107.8	
3	6.83	6.94	26.1	12.90	107.8	
4	6.85	6.91	26.1	12.91	107.9	
5	6.82	6.92	26.1	12.91	107.9	
6	6.83	6.88	26.1	12.92	107.9	
7	6.82	6.88	26.1	12.91	107.8	
8	6.82	6.87	26.1	12.90	107.8	
9	6.71	6.87	26.1	12.93	107.7	
10	6.78	6.87	26.1	12.95	107.8	
11	6.41	6.86	26.1	13.00	107.7	
12	6.41	6.85	26.0	1302	107.7	
13						
14						
15						
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19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: BL
Sample ID: BAP-62
Crew: NS, LA, EF
Date: 2019-07-24
Time: 13:56
Weather: Sunny, cloud 8°C ~~wind~~ No wind
Observations:
UTM Coordinates: Easting: 15W0363938 Northing: 7131674 Waypoint:
Total Water Depth: 15.65 m
Secchi Depth:
Phytoplankton collected?: Yes (circled) No
Volume Filtered:
Field DUP collected?: Yes (circled) No
Arsenic speciation collected?: Yes No (circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	D.O. %
units:	°C		µS/cm	mg/L	NTU	
0 0.22	4.39	7.00	55.6	13.58		106.6
1	4.20	7.01	56.2	13.57		106.4
2	4.22	6.98	56.2	13.57		106.1
3	4.06	6.98	56.4	13.55		105.7
4	3.93	7.00	58.7	13.59		105.4
5	3.84	7.01	61.9	13.59		105.2
6	3.52	7.00	88.3	13.57		104.2
7	3.51	6.98	116.1	13.57		104.1
8	3.59	6.97	123.1	13.51		103.9
9	3.62	6.96	137.4	13.47		103.6
10	3.45	6.94	167.7	13.49		103.4
11	3.56	6.93	185.9	13.41		103.1
12	3.64	6.90	232.3	13.37		103.0
13	3.68	6.89	250.1	13.36		103.0
14	3.68	6.87	282.2	13.36		103.0
15	3.64	6.86	280.7	13.37		103.0
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: BL
Sample ID: BAP61
Crew: NS, LA, EF
Date: 2019-07-24
Time: 13:26
Weather: clouds, sunny 8°C wind: NW
Observations:
UTM Coordinates:
Easting: 15W 0362925
Northing: 7131047
Waypoint:
Total Water Depth: more than 24m
Secchi Depth:
Phytoplankton collected?: Yes No (Yes circled)
Volume Filtered:
Field DUP collected?: Yes No (No circled)
Arsenic speciation collected?: Yes No (No circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	D.O %
units:	°C		µS/cm	mg/L	NTU	
0 0.25	3.52	7.00	60.8	13.70		105.2
1	3.51	7.01	60.7	13.71		105.2
2	3.47	7.02	60.9	13.71		105.1
3	3.48	7.01	61.0	13.71		105.0
4	3.41	7.02	61.4	13.71		104.9
5	3.40	7.03	61.4	13.70		104.9
6	3.31	7.03	62.7	13.72		104.8
7	3.35	7.04	61.3	13.69		104.7
8	3.23	7.06	62.0	13.67		104.5
9	3.31	7.07	64.4	13.65		104.2
10	3.28	7.10	65.0	13.56		103.5
11	3.23	7.00	154.7	13.47		102.7
12	3.20	7.02	157.5	13.42		102.2
13	3.12	7.03	180.8	13.37		101.6
14	3.04	6.94	236.4	13.16		100.0
15	2.40	6.93	355.8	12.97		98.3
16	2.64	6.87	511.2	12.40		96.9
17	2.14	6.83	641.0	12.85		95.3
18	1.00	6.73	962.5	13.66		93.8
19 -	0.85	6.68	1013	13.41		95.3
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: ~~BBD61~~ BL **Sample ID:** BBD-61
Crew: NS, LA, EF **Date:** 2019-07-24 **Time:** 11:20 AM
Weather: Windy 20km/h NW 8°C
Observations: ~~windy, clear weather~~ sunny with cloud
UTM Coordinates: **Easting:** 14W 0644586 **Northing:** 7135194 **Waypoint:**
Total Water Depth: 12.60m **Secchi Depth:**
Phytoplankton collected?: Yes (circled) / No **Volume Filtered:**
Field DUP collected?: Yes / No (circled) **Arsenic speciation collected?:** Yes / No (circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen (%)	Turbidity	D.O mg/L
units:	°C		µS/cm	mg/L	NTU	
0 0.24	4.15	7.06	~~106~~ 47.4	106.6%		13.66
1 1.01	4.11	7.07	48.5	106.4%		13.68
2 2.08	4.01	7.10	52.4	106.2%		13.68
3 3.02	4.02	7.10	51	106.1%		13.70
4 4.03	4.01	7.12	51.5	105.8%		13.69
5 5.04	3.97	7.10	58	105.3%		13.71
6 6.01	3.79	7.08	74.5	~~111.4~~ 104.5%		13.71
7 7.06	3.59	7.07	92	103.1%		13.78
8	3.50	7.04	153.7	102%		13.87
9	3.44	7.05	158.5	100.5%		13.88
10	3.17	7.02	260	98%		13.86
11	2.13	6.81	636.5	94.5%		14.08
12 12.02	1.84	6.79	~~406.5~~ 744.4	~~73%~~ 89.7%		14.11
13 12.50	1.94	6.72	406.5	73%		13.62
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: RL **Sample ID:** BBD-62
Crew: NS, LA, EF **Date:** 2019-07-24 **Time:** 11:40 am
Weather: Wind: 20km/h NW 8°C
Observations: Sunny + cloud
UTM Coordinates: **Easting:** 14W0644485 **Northing:** 7135375 **Waypoint:**
Total Water Depth: 6.44 **Secchi Depth:**
Phytoplankton collected?: Yes No **Volume Filtered:**
Field DUP collected?: Yes No **Arsenic speciation collected?:** Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	D.O %
units:	°C		µS/cm	mg/L	NTU	
0 0.23	4.13	7.02	50.2	13.63		106.4
1	4.13	7.05	51.3	13.63		106.3
2	3.98	7.00	53 ~~[illegible]~~	13.64	~~[illegible]~~	106.1
3	3.98	6.97	53.4	13.62		105.8
4	3.85	6.97	64	13.61		105.5
5	3.78	6.94	80.5	13.64	~~[illegible]~~	105.4
6 ~~6.44~~	3.74	6.93	97.5	13.66		~~10.5~~ 105.4
7 6.44						
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: BL **Sample ID:** BPJ-62
Crew: NS, LA, EF **Date:** 2019-07-24 **Time:** 12:47
Weather: 8°C clouds wind: NW
Observations:
UTM Coordinates: **Easting:** 15W 0357104 **Northing:** 7134072 **Waypoint:**
Total Water Depth: 15.57 m **Secchi Depth:**
Phytoplankton collected?: (Yes) No **Volume Filtered:**
Field DUP collected?: Yes (No) **Arsenic speciation collected?:** Yes (No)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	D.O %
units:	°C		µS/cm	mg/L	NTU	
0 0.30	3.91	6.98	129.4	13.54		105.0
1	3.91	6.99	127.6	13.52		104.8
2	3.81	7.07	137.6	13.52~~53~~		104.7
3	3.72	7.00	139.6	13.54		104.4
4	3.61 ~~[illegible]~~	7.00	143.6	13.50		104.1
5	3.55	7.01	158.0	13.53		103.9
6	3.53	7.02	156.8	13.49		103.6
7	3.47	7.01	162.1	13.46		103.4
8	3.43	7.02	183.1	13.36		102.4
9	3.29	6.98	206	13.23		101.3
10	3.21	6.97	267.9	13.16		100.4
11	2.83	6.90	403.6	13.16		99.3
12	2.70	6.88	459 ~~445~~	13.10		~~9~~ 98.4
13	2.31	6.83	572.5	13.02		96.9
14	2.29	6.81	622.5	13.04		97.0
15	~~15~~ 1.02	6.67	992.3	13.27		95.5
16 ~~15.57~~						
17						
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Close to BL port

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: BL　　Sample ID: BPJ-61

Crew: NS, CA, EF　　Date: 2019-07-24　　Time: 12:20

Weather: 80C sunny, clouds wind: NW

Observations:

UTM Coordinates:　Easting: 15W0356445　　Northing: 7134082　　Waypoint:

Total Water Depth: more then 24 m　　Secchi Depth:

Phytoplankton collected?: Yes (circled) No　　Volume Filtered:

Field DUP collected?: Yes No (circled)　　Arsenic speciation collected?: Yes No (circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	D.O %
units:	°C		µS/cm	mg/L	NTU	
0 0.22	3.88	7.02	34.1	13.65		105.8
1	3.83	7.05	34.5	13.67		105.7
2	3.80	7.06	35.6	13.67		105.7
3	3.83	7.08	36.4	13.65		105.6
4	3.84	7.09	39.0	13.62		105.4
5	3.84	7.10	38.1	13.61		105.4
6	3.85	7.13	38.5	13.59		105.2
7	3.85	7.13	40.9	13.58		105.1
8	3.82	7.13	43.4	13.57		105.0
9	3.80	7.15	46.6	13.54		104.7
10	3.77	7.18	53 ~~[illegible]~~	13.48		104.3
11	3.73	7.20	57.8	13.30		102.7
12	3.16	7.07	237	13.04		99.4
13	2.56	6.95	446.1	12.89		97.3
14	2.24	6.92	509	12.90		95.9
15	1.26	6.83	919.7	12.85		93.0
16	1.08	6.82	976.3	12.88		92.8
17	0.78	6.79	1073	13.02		92.9%
18	0.74	6.76	1097	13.16		92.9%
19						
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: ~~[illegible]~~ ~~GA~~ Barge passé à côté.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake - D5
Sample ID: LKS-11
Crew: L.D - FL
Date: 2019-07-24
Time: 13H20
Weather: WIND - overcast
Observations:

UTM Coordinates: Easting: 613019 Northing: 7251823 Waypoint: LKS-11

Total Water Depth: 7,41
Secchi Depth: 5,5 m

Phytoplankton collected?: Yes No (Yes)
Volume Filtered: 500M

Field DUP collected?: Yes No (No)
Arsenic speciation collected?: Yes No (Yes)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	12,25	7,43	32,9	10,47	0	
1	12,19	7,41	32,1	10,51	0	
2	12,12	7,41	32,7	10,68	0	
3	12,12	7,43	32,7	10,41	0	
4	12,00	7,51	32,7	10,55	0	
5	12,08	7,47	32,7	10,54	0	
6	11,94	7,51	32,C	10,25	0	
7	12,11	7,47	33	9,47	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level)
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake D5
Sample ID: LKS-12
Crew: L.D - FL
Date: 2019-07-24
Time: 13H50
Weather: overcast - wind
Observations:
UTM Coordinates: Easting: 612 213
Northing: 7252
Waypoint: LKS-12
Total Water Depth: 5.06 M
Secchi Depth: 5.00
Phytoplankton collected?: Yes (circled) No
Volume Filtered: 500 ML
Field DUP collected?: Yes No (circled)
Arsenic speciation collected?: Yes No (circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	12.29	7.35	32.8	10.28	0	
1	12.28	7.32	32.8	10.33	0	
2	12.29	7.30	32.8	10.36	0	
3	12.29	7.25	32.8	10.37	0	
4	12.29	7.24	32.8	10.38	0	
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12	5.06 Bottom					
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol**'s back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Ploodream Lake
Sample ID: PDL 78
Crew: FL, ABA, KM
Date: 2019-07-28
Time: 14:40
Weather: Cloud & Sun
Observations:
UTM Coordinates: Easting: 630 752
Northing: 722 3098
Waypoint:
Total Water Depth: 7.15
Secchi Depth: 7
Phytoplankton collected?: **Yes** No
Volume Filtered: 500 mL
Field DUP collected?: Yes **No**
Arsenic speciation collected?: Yes **No**

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	6.97	7.12	22.9	12.37	0	
1	6.95	7.11	22.9	12.27	0	
2	6.93	7.09	22.9	12.39	0	
3	6.95	7.07	22.9	12.38	0	
4	6.94	7.07	22.9	12.39	0	
5	6.91	7.06	22.9	12.41	0	
6	6.96	7.05	22.9	12.43	0	
7	6.96	7.06	22.9	12.44	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, ~~low level~~ chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Pipe Dream Lake
Sample ID: 77PDL
Crew: Alia B Allard, Fanny Lapine, Kevin Martel
Date: 2019-07-28
Time: 14 00
Weather: Cloud & Sun
Observations:
UTM Coordinates: Easting: 0629713 Northing: 7224760 Waypoint:
Total Water Depth: 7.33
Secchi Depth: 7
Phytoplankton collected?: Yes No — Yes
Volume Filtered: 500ML
Field DUP collected?: Yes No — No
Arsenic speciation collected?: Yes No — Yes

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	7.10	7.25	23	12.27	0	
1	7.10	7.20	22.9	12.11	0	
2	7.08	7.15	23	12.29	0	
3	7.07	7.14	22.9	12.32	0	
4	7.08	7.12	22.9	12.31	0	
5	7.05	7.11	22.9	12.32	0	
6	7.05	7.11	22.9	12.32	0	
7	7.08	7.07	23	12.32	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes: Moved location a bit as it was almost on shore and not deep enough.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: INUG
Crew: LD - ABA - KM
Weather: 11°C Cloudy
Observations:

Sample ID: INUG-112
Date: 2018-07-29
Time: 15:19

UTM Coordinates: Easting: 622716
Northing: 7216899
Waypoint: INUG-112

Total Water Depth: 5.15
Secchi Depth: 5.15

Phytoplankton collected?: Yes No
Volume Filtered: 500ml

Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	9.95	6.97	14.7	11.42	0	
1	9.94	6.96	16.3	11.44	0	
2	9.93	6.97	16.3	11.45	0	
3	9.93	6.91	16.3	11.45	0	
4	9.9	6.9	16.3	11.47	0	
5	9.85	6.9	16.3	11.47	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: INUG
Crew: ZD-ABA-KM
Weather: 11°C cloudy
Observations:

Sample ID: INUG-113
Date: 2015-07-29
Time: 14:55

UTM Coordinates: Easting: 622463 Northing: 7215544 Waypoint: INUG-113

Total Water Depth: 10.22
Secchi Depth: 7.5

Phytoplankton collected?: Yes (circled) No
Volume Filtered: 500 ml

Field DUP collected?: Yes No (circled)
Arsenic speciation collected?: Yes No (circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	9.81	7.75	16.3	11.02	0	
1	9.77	7.20	16.3	11.16	0	
2	9.77	7.13	16.3	11.29	0	
3	9.77	7.09	16.3	11.33	0	
4	9.75	7.02	16.3	11.37	0	
5	9.73	7.05	16.3	11.40	0	
6	9.73	7.03	16.3	11.41	0	
7	9.71	7.02	16.3	11.41	0	
8	9.7	7	16.3	11.41	0	
9	9.7	6.99	16.2	11.4	0	
10	9.7	6.97	16.3	11.4	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: DS1
Sample ID: DS1-36
Crew: MF - JS
Date/ Time: AUG 17, 2019 13:44
Weather:
Observations:

UTM Coordinates: Easting: 14W0597755 Northing: 7258637 Waypoint: 026
Total Water Depth: 7.9 Secchi Depth: 2.1
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL ?
Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	13.5	21.7	10.33	7.0	
1	13.5	21.7	10.3	7.0	
2	13.4	21.7	10.3	7.0	
3	13.4	21.8	10.3	6.9	
4	13.4	21.8	10.28	6.9	
5	13.3	21.6	10.29	6.9	
6	12.7	21.5	10.31	6.9	
7	12.5	21.5	10.34	6.9	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: ~~harder~~ secchi to filter
* Confirm which DS1 sample was filtered 280 mL for chla

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: WTS
Sample ID: WTS 44
Crew: MF - JS
Date/ Time: AUG 18, 2019 15:37
Weather/Obervations:

UTM Coordinates: Easting: 14W0607232 Northing: 7253566 Waypoint: ~~7253566~~ 033
Photo #s: —
Field DUP collected? (Circle one): Yes **No**

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	13.4	80.2	10.71	7.3	
1	13.4	80.2	10.71	7.3	
2	13.4	80.0	10.7	7.3	
3	13.4	80.3	10.7	7.2	
4	13.1	80.3	10.1	7.2	
5	13.1	80.3	10.1	7.1	
6	13.1	80.3	10.1	7.1	
7	13.1	80.1	10.06	7.1	
8	12.9	80.3	9.94	7.1	
9	12.8	80.0	9.84	7.1	
10	12.2	81.0	9.8	7.0	
11	12.1	81.3	9.82	7.1	
12	12.1	81.2	9.73	7.1	
13	12.0	81.3	9.74	7.1	
14	12.0	81.3	9.80	7.1	
15	12.0	81.3	9.87	7.1	
16	12.0	81.4	9.93	7.1	
17					
18					
19					
20					

BOTTLE CHECKLIST

ALS - send Express	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
ALS - send Ground	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 125 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **3 drops** of **Lugol's** back at the lab)

Total Water Depth: 17 m
Secchi Depth: 2.6

Phytoplankton collected? (Circle one): **Yes** No
Volume Filtered: 500mL

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: INUG
Sample ID: INUG-114
Crew: E. Franz, M. DiMauro
Date/ Time: 15 Aug 19 14:00
Weather: Sunny 16-18°, No wind
Observations:

UTM Coordinates: Easting: 14W 0622565 Northing: 7215133 Waypoint: 032

Total Water Depth: 10.9 Secchi Depth: 10.2 m

Phytoplankton collected? (Circle one): Yes No — Yes (circled) Volume Filtered: 500 mL

Field DUP collected? (Circle one): Yes No — No (circled) Photo #s: –

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	13.2	15.7	9.71	7.03	
1	12.4	15.6	9.77	7.03	
2	12.2	15.6	10.01	7.00	
3	12.0	15.7	10.09	7.01	
4	12.0	15.6	10.04	6.98	
5	11.9	15.6	10.05	7.00	
6	11.9	15.6	10.06	6.98	
7	11.9	15.6	10.03	7.00	
8	11.9	15.6	9.90	6.99	
9	11.9	15.6	10.07	6.98	
10	11.8	15.7	9.76	6.97	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Calibration: SpCond: 1381 uS/cm ✓ pH 7 = 7.04 ✓ pH 4 = 4.04 ✓ pH 10 = 10.36 ✓

No need to anchor. No As Speciation.

Equipment Blank Collection Notes?

–

Water Sampling and Limnology

AREA INFORMATION

Area: A20
Sample ID: A20-38
Crew: MF + JC
Date/ Time: Aug 16, 2019 10:46 am
Weather: sunny winds SE 10-15
Observations:

UTM Coordinates: **Easting:** 14W0604136 **Northing:** 7252591 **Waypoint:** 012

Total Water Depth: 10.8 **Secchi Depth:** 6.0 m

Phytoplankton collected? (Circle one): Yes No **Volume Filtered:** 500 mL

Field DUP collected? (Circle one): Yes No **Photo #s:** -

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	13.0	12.9	10.5	6.8	
1	13.0	12.9	10.5	6.8	
2	13.0	12.9	10.5	6.8	
3	13.0	12.9	10.5	6.8	
4	12.9	12.9	10.4	6.7	
5	12.5	12.9	10.5	6.7	
6	12.4	12.9	10.4	6.7	
7	12.3	12.9	10.5	6.7	
8	12.3	13.0	10.5	6.6	
9	12.1		10.5	6.7	
10	12.1	13.0	10.6	6.6	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: SPECIATION.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage Lake - East Basin
Sample ID: TPE-127
Crew: F. Franz L. Archambault
Date/ Time: 13 Aug 2019 17:20
Weather: See Previous
Observations: -

UTM Coordinates: Easting: KW 639569 Northing: 7210471 Waypoint: 012 76CX

Total Water Depth: 16.0 m Secchi Depth: 9 m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL

Field DUP collected? (Circle one): Yes No Photo #s: —

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	11.6	30.5	10.47	7.44	
1	11.6	30.5	10.39	7.44	
2	11.6	30.5	10.34	7.44	
3	11.6	30.6	10.31	7.44	
4	11.6	30.5	10.33	7.45	
5	11.6	30.5	10.31	7.44	
6	11.6	30.5	10.38	7.44	
7	11.6	30.6	10.28	7.44	
8	11.6	30.5	10.37	7.43	
9	11.6	30.6	10.36	7.44	
10	11.6	30.6	10.33	7.43	
11	11.6	30.5	10.15	7.44	
12	11.6	30.5	10.34	7.43	
13	11.5	30.5	~~30~~ 10.26	7.43	
14	11.5	30.5	10.41	7.43	
15	11.5	30.4	10.12	7.43	
16					
17					
18					
19					
20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes? —

Water Sampling and Limnology

AREA INFORMATION

Area: Wally Lake (WAL)
Sample ID: WAL 95
Crew: EF, IT
Date/ Time: 11 Aug 2019 12:50
Weather: Overcast, rain, winds N @ 30-40 km/hr. Unpleasant!
Observations:

UTM Coordinates: Easting: 15W 360993 Northing: 7221919 Waypoint: 006 (260)
Total Water Depth: 6.8m Secchi Depth: 400 windy
Phytoplankton collected? (Circle one): Yes No — Yes (circled) Volume Filtered: 500 mL
Field DUP collected? (Circle one): Yes No — No (circled) Photo #s: –

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	12.1	36.1	10.62	7.28	
1	12.1	36.1	10.42	7.28	
2	12.1	36.0	10.53	7.27	
3	12.1	36.1	10.46	7.26	
4	12.1	36.1	10.56	7.26	
5	12.1	36.1	10.53	7.24	
6	12.1	36.1	10.55	7.24	
7					
8					
9					
10					
11					
12					
13					
14					
15					
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17					
18					
19					
20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Random coordinate was on land. Moved to a new location.
Unhooked the anchor and nylon line here (wedged in rocks).

Equipment Blank Collection Notes?

–

Water Sampling and Limnology

AREA INFORMATION

Area: Baker Lake.
Sample ID: BBD-63
Crew: MF, MD, CD
Date/ Time: AUG 12 16:51
Weather: NNW 20-25
Observations:

UTM Coordinates: **Easting:** 14W 0614694 **Northing:** 7135113 **Waypoint:** 054

Total Water Depth: 13.1 **Secchi Depth:** See BBD-64

Phytoplankton collected? (Circle one): Yes No **Volume Filtered:** 500 mL

Field DUP collected? (Circle one): Yes No **Photo #s:** —

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	7.6	44.2	12.03	7.04	
1	7.6	43.9	11.95	7.09	
2	7.6	43.6	11.92	7.10	
3	7.6	42.0	11.94	7.11	
4	7.6	41.8	11.92	7.12	
5	7.5	41.8	11.91	7.13	
6	7.5	40.9	11.99	7.15	
7	7.4	41.4	11.79	7.18	
8	7.2	64.4	11.89	7.14	
9	6.9	76.2	11.91	7.13	
10	6.9	105.2	12.04	7.06	
11	6.9	109.8	12.34	7.07	
12	6.9	112.8	12.29	7.08	
13					
14					
15					
16					
17					
18					
19					
20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes? —

Water Sampling and Limnology

AREA INFORMATION

Area: Baker Lake
Sample ID: BPJ-63
Crew: MF, CF, MD.
Date/ Time: Aug 12 2019. 16:11
Weather: winds NNW 20-25.
Observations:

UTM Coordinates: Easting: 15W 0357218 Northing: 7134078 Waypoint: 52
Total Water Depth: 11.0 Secchi Depth: See BPJ-64
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL
Field DUP collected? (Circle one): Yes No Photo #s: —

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	7.9	63.6	12.26	7.05		
1	7.7	64.0	12.25	7.02		
2	7.6	64.6	12.24	7.01		
3	7.5	65.6	12.22	7.01		
4	7.5	66.6	12.23	7.01		
5	7.4	68.0	12.32	7.01		
6	7.3	70.6	12.23	7.02		
7	7.2	81.2	12.25	7.01		
8	7.2	86.3	12.26	7.01		
9	7.1	90.6	12.43	7.00		
10	7.1	99.0	12.43	7.06		
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Specific cond. double checked.

Equipment Blank Collection Notes? —

Water Sampling and Limnology

AREA INFORMATION

Area: BAP-63 Baker Lake
Sample ID: BAP-63
Crew: MF MD EF
Date/ Time: Aug 12 2019 @ 13:20
Weather: Cloudy, light wind
Observations:

UTM Coordinates: Easting: ~~[illegible]~~ 0363015 Northing: 7131130 Waypoint: 046 13:20

Total Water Depth: 33.4 m Secchi Depth: 3.5 m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL

Field DUP collected? (Circle one): Yes No Photo #s: None

DUP-1

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	μS/cm	mg/L		NTU
0	8.4	34.5	11.95	7.03	
1	8.4	34.5	12.01	7.02	
2	8.4	33.6	~~11.93~~ 11.93	7.02	
3	8.4	33.6	11.95	7.03	
4	8.4	33.6	11.91	7.03	
5	8.3	34.1	11.86	7.03	
6	8.4	33.7	12.00	7.01	
7	8.3	33.7	11.92	7.01	
8	8.3	33.8	11.86	7.01	
9	8.3	34.2	11.89	7.00	
10	8.2	34.5	11.97	7.00	
11	8.1	34.7	11.94	7.01	
12	8.1	34.5	11.77	6.98	
13	7.9	32.7	11.91	6.97	
14	7.8	31.8	11.93	6.90	
15	7.6	38.0	12.02	6.87	
16	7.6	46.9	11.98	6.80	
17	7.6	49.4	11.98	6.78	
18	7.6	54.6	11.96	6.78	
19	7.5	58.9	12.04	6.79	
20	7.4	60.7	12.04	6.81	

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

NA

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage Lake – NorTh Basin
Sample ID: TPN-127
Crew: E. Franz L. Archambault
Date/ Time: 13 Aug 2019 10:00
Weather: overcast, dead calm, 12°C
Observations: Didn't need to anchor

UTM Coordinates: **Easting:** 14W 635568 **Northing:** 7216056 **Waypoint:** 008 76Cx
Total Water Depth: 14.7 m **Secchi Depth:** 10.5 m (very clear)
Phytoplankton collected? (Circle one): Yes No **Volume Filtered:** 500 mL
Field DUP collected? (Circle one): Yes No **Photo #s:** –

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	9.7	26.5	11.03	7.76	
1	9.5	26.5	11.22	7.79	
2	9.5	26.4	11.16	7.76	
3	9.4	26.4	11.04	7.71	
4	9.4	26.4	11.25	7.66	
5	9.3	26.4	11.35	7.65	
6	8.9	26.5	11.47	7.67	
7	8.8	26.4	11.44	7.60	
8	8.7	26.4	11.57	7.57	
9	8.6	26.4	11.40	7.53	
10	8.5	26.4	11.60	7.51	
11	8.4	26.4	11.65	7.48	
12	8.4	26.3	11.71	7.45	
13	8.4	26.3	11.53	7.43	
14					
15					
16					
17					
18					
19					
20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:
DUP-2 collected here
pH at 3m => 7.62 ✓
Spill response boat 50 yamaha quit (wouldn't start) paddled to shore.

Equipment Blank Collection Notes?
–

Water Sampling and Limnology

AREA INFORMATION

Area: SP (South Portag Lake)
Sample ID: SP-127
Crew: MD, LA, IT, DM.
Date/ Time: AUG 14, 2019. 11:30
Weather/Obervations: Overcast, wind SE @ ~10 km/hr (or less)

UTM Coordinates: **Easting:** 14W 0640599 **Waypoint:** 018
Northing: 7213413

Photo #s: None **Field DUP collected? (Circle one):** Yes No

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	12.2	038.0	10.54	8.39		
1	12.1	38.1	10.62	8.20		
2	12.0	37.9	10.52	8.07		
3	12.0	38.0	10.43	7.81		
4	12.0	38.0	10.36	7.75		
5	12.0	38.0	10.42	7.64		
6	12.0	38.0	10.32	7.60		
7	12.0	38.0	10.124	7.50		
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS - send Express	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
ALS - send Ground	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 125 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **3 drops** of **Lugol's** back at the lab)

Total Water Depth: 7.7 **Secchi Depth:** 4.0

Phytoplankton collected? (Circle one): Yes No **Volume Filtered:** 500 mL
Field Notes:

Equipment Blank Collection Notes? NA

Water Sampling and Limnology

AREA INFORMATION

Area: PDL
Sample ID: PDL-79
Crew: E. Franz, M. Finley
Date/ Time: 14 Aug 2019 14:45
Weather: Overcast, flat calm, 15 °C
Observations:

UTM Coordinates: Easting: 14W 631488 Northing: 7224214 Waypoint: 062

Total Water Depth: ~21.0 m Secchi Depth: –

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL

Field DUP collected? (Circle one): Yes No Photo #s: –

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	10.9	21.6	11.54	7.20	
1	10.5	21.6	11.64	7.21	
2	10.1	21.6	11.73	7.17	
3	9.8	21.4	11.81	7.17	
4	9.8	21.5	11.82	7.14	
5	9.7	21.5	11.82	7.15	
6	9.7	21.6	11.81	7.12	
7	9.7	21.5	11.81	7.11	
8	9.6	21.5	11.82	7.11	
9	9.6	21.5	11.80	7.10	
10	9.5	21.5	11.83	7.08	
11	9.3	21.4	11.87	7.09	
12	9.3	21.5	11.87	7.08	
13	9.3	21.4	11.88	7.08	
14	9.2	21.5	11.88	7.07	
15	9.2	21.5	11.88	7.07	
16	9.2	21.5	11.90	7.06	
17	9.1	21.5	11.90	7.06	
18	9.1	21.5	11.91	7.06	
19	9.1	21.5	11.92	7.05	
– 20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:
~~DUP~~ DUP-4 collected here.
The manta probe is too short to safely collect 20m measurements.

Equipment Blank Collection Notes?
–

Water Sampling and Limnology

AREA INFORMATION

Area: NSM - 44
Sample ID:
Crew: MF MD
Date/ Time: AUG 20, 2019 1430
Weather: calm
Observations:

UTM Coordinates: Easting: 14W 0606987 Northing: 7257841 Waypoint: 86
Total Water Depth: 13.8 Secchi Depth: -
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL
Field DUP collected? (Circle one): Yes No Photo #s: Na

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	12.8	59.4	11.36	7.35	
1	12.8	59.4	11.23	7.34	
2	12.7	59.4	11.52	7.33	
3	12.7	59.5	11.28	7.33	
4	12.7	59.4	11.34	7.33	
5	12.6	59.5	11.64	7.32	
6	12.6	59.5	11.42	7.32	
7	12.6	59.5	11.16	7.3	
8	12.5	59.4	11.39	7.3	
9	12.5	59.3	11.06	7.3	
10	12.5	59.1	11.22	7.29	
11	12.3	59.3	11.11	7.25	
12	12.1	59.1	10.98	7.24	
13	12.1	59.1	10.80	7.24	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: - EB + DI collected in boat after water collected for NSM 44
- DI from April + July, mostly July.
- arsenic speciation here

Equipment Blank Collection Notes? see above

Water Sampling and Limnology

AREA INFORMATION

Area: A76
Sample ID: A76-37
Crew: MF - J
Date/ Time: Aug 15, 2019 11:46
Weather: Very calm + clear
Observations:

UTM Coordinates: Easting: 14W 0601738 Northing: 7256860 Waypoint: 063
Total Water Depth: 12.5 m Secchi Depth: 9.2 m
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL
Field DUP collected? (Circle one): Yes No DUP 3 Photo #s: ~

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	12.7	39.2	10.7	7.2	
1	12.5	39.2	10.7	7.1	
2	12.5	39.2	10.7	7.1	
3	12.5	39.2	10.7	7.1	
4	12.4	39.3	10.7	7.1	
5	12.4	39.3	10.7	7.1	
6	12.4	39.3	10.7	7.1	
7	12.4	39.3	10.7	7.1	
8	12.4	39.2	10.7	7.0	
9	12.4	39.2	10.7	7.0	
10	12.4	39.1	10.7	7.0	
11	12.4	39.2	10.7	7.0	
12	12.3	39.2	10.7	7.0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: As speciation + As speciation DUP

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LK8
Sample ID: LK8-13
Crew: MK + JS
Date/ Time: AUG 16, 2019
Weather:
Observations:

UTM Coordinates: Easting: 14W0612076 Northing: 7258446 Waypoint: 020
Total Water Depth: 5.8 Secchi Depth:
Phytoplankton collected? (Circle one): Yes No Volume Filtered: ~~500 mL~~ 250 mL !!!
Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	12.3	13.4	11.0	6.9		
1	12.3	13.4	11.0	6.9		
2	12.3	13.4	11.0	6.9		
3	12.3	13.4	11.0	6.8		
4	12.3	13.4	11.0	6.8		
5	12.2	13.4	11.0	6.7		
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: ARSENIC SPECIATION

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake 5
Sample ID: LK5-14
Crew: E. Franz M. DiMauro
Date/ Time: 16 Aug 2019 13:40
Weather: Overcast light wind SW @ 5-10 km/hr, 13°C
Observations:

UTM Coordinates: Easting: 14W 612569 Northing: 7251400 Waypoint: 039
Total Water Depth: 6.9 m Secchi Depth: —
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL
Field DUP collected? (Circle one): Yes No Photo #s: —

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	13.1	24.6	9.93	7.38	
1	13.1	24.6	9.82	7.39	
2	13.1	24.6	9.83	7.38	
3	13.1	24.6	9.79	7.38	
4	13.0	24.6	9.80	7.37	
5	12.9	24.6	9.89	7.36	
6	12.8	24.7	9.70	7.37	
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19					
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	✓	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	✓	TSS (low level), TDS (low level)
	1 x 125 mL amber	✓	TOC, total P, NH3, TKN
	1 x 125 mL amber	✓	DOC
	1 x 145 mL plastic	✓	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	✓	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	✓	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	✓	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass		Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

No As. Speciation
Anchored to Stay on station

Equipment Blank Collection Notes?

—

Water Sampling and Limnology

AREA INFORMATION

Area: MM
Sample ID: MM-43
Crew: MF + MD
Date/ Time: Aug 20 11:14
Weather: winds ENE 15km
Observations: - Dust blowing into this end of lake from mine.

UTM Coordinates: Easting: 14W0605793 Northing: 7255097 Waypoint: 84

Total Water Depth: 8.3 Secchi Depth: 3.5 m

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL

Field DUP collected? (Circle one): Yes No Photo #s: —

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	13.1	111.1	12.03	7.49	
1	13.1	111.1	12.01	7.49	
2	13.1	111.1	11.50	7.48	
3	13.1	111.2	11.37	7.48	
4	13.1	112.0	11.26	7.47	
5	13.0	113.1	11.13	7.46	
6	13.0	113.3	10.91	7.46	
7	12.9	117.4	10.81	7.44	
8					
9					
10					
11					
12					
13					
14		No stratification so no second sample.			
15					
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: calibrated pH, DO, + cond this morning

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LK1
Sample ID: LK1-13
Crew: E. Franz, M. DiMauro
Date/ Time: 17 AUG 2019 16:15
Weather: Partly cloudy, 15°C, light SE wind @ < 15 Km/hr
Observations:

UTM Coordinates: Easting: 14W 0609501 Northing: 7249256 Waypoint: 046
Total Water Depth: 5.6 m Secchi Depth: 4.5 m
Phytoplankton collected? (Circle one): Yes No — Volume Filtered: 500 ml
Field DUP collected? (Circle one): Yes No — Photo #s: —

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	13.6	13.6	10.19	6.95	
1	13.6	13.7	10.16	6.95	
2	13.6	13.7	10.07	6.94	
3	13.6	13.7	10.17	6.95	
4	13.6	13.7	10.18	6.94	
5	13.6	13.7	10.11	6.94	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:
YSI ProPlus Cal. pH7 = 7.01, pH4 = 4.08, pH10 = 10.24 ✓ SpCond = 1427 ✓
The entire NE basin is quite shallow. Past the island depths were generally < 5 m. Only a few areas > 5 m.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LK1
Sample ID: LK1-14
Crew: E. Franz, M. DiMaura
Date/ Time: 17 Aug 2019 17:00
Weather:
Observations:

UTM Coordinates: Easting: 14W 06060080 Northing: 7244204 Waypoint: 047 76CK

Total Water Depth: 6.1 m Secchi Depth: –

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL

Field DUP collected? (Circle one): Yes No Photo #s: –

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	12.9	13.7	10.31	6.98	
1	12.9	13.7	10.37	6.97	
2	12.9	13.7	10.46	6.97	
3	12.8	13.7	10.34	6.96	
4	12.8	13.7	10.41	6.97	
5	12.8	13.7	10.38	6.97	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

As Spec. collected here

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: MSM
Sample ID: MSM-44
Crew: MF + MD
Date/ Time: AUG 20 10:51
Weather: winds ENE 15km. sunny
Observations:

UTM Coordinates: Easting: 14W 0604145 Northing: 7253925 Waypoint: 83
Total Water Depth: 6.0 Secchi Depth: –
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL
Field DUP collected? (Circle one): Yes No Photo #s: –

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	13.1	81.5	11.85	7.39	
1	13.1	81.4	12.01	7.40	
2	13.1	81.5	11.47	7.39	
3	13.1	81.4	11.38	7.39	
4	13.1	81.4	11.12	7.39	
5	13.1	81.4	10.93	7.39	
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19					
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Arsenic speciation collected here

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LK5
Sample ID: LK5-13
Crew: E Franz, M. DiMauro
Date/ Time: 16 Aug 2019, 14:15 pm
Weather: overcast, S wind @ 10 km/hr gusting to 15 km/hr. 10-12°C
Observations:

UTM Coordinates: Easting: 14W 0612337 Northing: 7252518 Waypoint: 040

Total Water Depth: 8.3 m Secchi Depth: NA

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL

Field DUP collected? (Circle one): Yes No Photo #s: —

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	13.0	24.9	9.91	7.41	
1	13.0	24.9	9.92	7.42	
2	13.0	24.9	9.85	7.40	
3	13.0	24.9	9.76	7.41	
4	13.0	24.9	9.65	7.41	
5	12.9	24.8	9.67	7.40	
6	12.9	24.9	9.70	7.36	
7	12.8	24.9	9.76	7.34	
8	12.5	25.0	9.63	7.35	
9					
10					
11					
12					
13					
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15					
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17					
18					
19					
20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

pH confirmation: pH7 = stable at 6.96 to 6.97 ✓ DO calibration = 94.5%
Arsenic speciation collected here

Equipment Blank Collection Notes? —

Water Sampling and Limnology

AREA INFORMATION

Area: LK8-
Sample ID: LK8-14
Crew: MF + JF
Date/ Time: AUG 16, 2019 15:24
Weather: winds S 15km
Observations:

UTM Coordinates: Easting: 14W 0610646 Northing: 7258723 Waypoint: 019

Total Water Depth: 12.2 Secchi Depth: 8.5

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	12.5	13.5	10.9	6.9	
1	12.4	13.5	10.9	7.0	
2	12.4	13.5	10.9	6.9	
3	12.4	13.5	10.9	6.9	
4	12.2	13.5	10.9	6.9	
5	12.1	13.5	10.9	6.8	
6	11.8	13.4	11.0	6.8	
7	11.8	13.4	11.0	6.8	
8	11.8	13.4	11.0	6.8	
9	11.7	13.4	11.0	6.8	
10	11.7	13.4	11.0	6.8	
11	10.8	13.4	11.0	6.8	
12					
13					
14					
15					
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18					
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: A76

Sample ID: A76-38

Crew:

Date/ Time: AUG 15, 2019 12:35

Weather: calm

Observations:

UTM Coordinates: Easting: 14W 0602656 Northing: 7257095 Waypoint: 064

Total Water Depth: 10.2 Secchi Depth: –

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL

Field DUP collected? (Circle one): Yes No Photo #s: –

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	12.8	39.7	10.7	7.2	
1	12.6	39.8	10.7	7.2	
2	12.5	39.8	10.7	7.1	
3	12.5	39.9	10.7	7.1	
4	12.4	39.9	10.7	7.1	
5	12.4	39.9	10.7	7.1	
6	12.4	39.9	10.7	7.1	
7	12.4	39.7	10.7	7.1	
8	12.3	39.7	10.7	7.1	
9	12.3	40.3	10.7	7.0	
10					
11					
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Nemo Lake
Sample ID: NEM - 43
Crew: M. Finley, M. DiMauro
Date/ Time: Aug 20, 15:09
Weather:
Observations:

UTM Coordinates: Easting: 14W 0606234 Northing: 7257496 Waypoint: 087
Total Water Depth: 14.2 Secchi Depth: 8 m
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL
Field DUP collected? (Circle one): Yes No Photo #s: Na.

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	12.9	59.3	11.53	7.39	
1	12.9	59.3	11.61	7.39	
2	12.9	59.4	11.61	7.38	
3	12.9	59.4	11.52	7.39	
4	12.9	59.4	11.43	7.39	
5	12.9	59.4	11.50	7.39	
6	12.9	59.3	11.43	7.38	
7	12.8	59.3	11.43	7.38	
8	12.8	59.3	10.95	7.38	
9	12.8	59.4	11.42	7.38	
10	12.8	59.4	11.25	7.38	
11	12.8	59.4	11.26	7.39	
12	12.8	59.4	11.27	7.39	
13	12.8	59.4	11.18	7.4	
14					
15					
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: PDL
Sample ID: PDL-80
Crew: E. Franz, M. Findley
Date/ Time: 14 Aug 2019 14:30
Weather:
Observations:

UTM Coordinates: Easting: 14W 631876 Northing: 7223965 Waypoint: 060
Total Water Depth: 7.0 m Secchi Depth: To bottom
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL
Field DUP collected? (Circle one): ~~Yes~~ No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	10.6	21.6	11.60	7.30	
1	10.6	21.6	11.60	7.22	
2	10.1	21.6	11.68	7.22	
3	9.9	21.5	11.72	7.17	
4	9.9	21.5	11.72	7.16	
5	9.9	21.6	11.70	7.14	
6	9.7	21.5	11.68	7.12	
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19					
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:
~~DUP-3 collected here.~~ Dup not collected here.
Arsenic Speciation collected here.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: SP (South Portage Lake)
Sample ID: SP-126
Crew: MD, LA, IT, DM
Date/ Time: AUG 14, 2019, 12:18
Weather/Obervations: overcast, winds SE @ 10 km/hr (or less)

#218

UTM Coordinates: Easting: 14W 0639972 Waypoint: 19
Northing: 7213665

Photo #s: None

Field DUP collected? (Circle one): Yes No

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	12.2	37.8	10.54	7.94	
1	12.1	38.2	10.47	7.89	
2	12.0	38.3	10.42	7.84	
3	12.0	38.3	10.34	7.81	
4	12.0	38.3	10.33	7.78	
5	12.0	38.3	10.26	7.75	
6	12.0	38.3	10.19	7.73	
7	12.0	38.4	10.20	7.71	
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19					
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BOTTLE CHECKLIST

ALS - send Express	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
ALS - send Ground	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 125 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **3 drops** of **Lugol's** back at the lab)

Total Water Depth: 7.0 Secchi Depth: 4.25

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL

Field Notes: Location was too deep ~18 m, so moved closer to land.

Equipment Blank Collection Notes? — NA

Calibration AUG 14, 2019

PH	Sp.C	DO (mg/L)
7.10	~~1443~~	8.59
3.77	1360	
10.02		

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage Lake - North Basin
Sample ID: TPN-126
Crew: E. Franz, L. Archambault
Date/ Time: 13 Aug 2019 15:15
Weather: Overcast, light wind SE (<5 km/hr).
Observations: -

UTM Coordinates: **Easting:** 14W 636309 **Northing:** 7214389 **Waypoint:** 010 76Cx

Total Water Depth: 10.1 m **Secchi Depth:** 9.0 m light ripples

Phytoplankton collected? (Circle one): Yes (circled) No **Volume Filtered:** 500 mL

Field DUP collected? (Circle one): Yes No (circled) **Photo #s:**

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	9.0	27.8	11.69	7.15	
1	9.0	27.7	11.76	7.15	
2	9.0	27.8	11.50	7.16	
3	8.9	27.8	11.65	7.15	
4	8.9	27.8	11.67	7.14	
5	8.8	27.8	11.61	7.11	
6	8.8	27.7	14.67	7.10	
7	8.8	27.7	11.69	7.04	
8	8.6	27.7	11.83	7.04	
9	8.6	27.7	11.84	7.02	
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19					
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Calibration values: Sp: 1386 uS/cm, pH 7 = 6.77, pH 4 = 3.99, pH10 = 9.38
DO% =

Equipment Blank Collection Notes? —

Water Sampling and Limnology

AREA INFORMATION

Area: BAP - 64
Sample ID:
Crew: MF . MP . CF
Date/ Time: AUG 12 2019.
Weather: overcast. winds NNW 15 km.
Observations:

UTM Coordinates: Easting: 15W. 0363816 Northing: 7131188 Waypoint: 048
Total Water Depth: 10.4 m Secchi Depth: 3.5 m
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL
Field DUP collected? (Circle one): Yes No Photo #s: None

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	8.5	58.4	11.95	7.00		
1	8.5	57.9	11.78	7.00		
2	8.5	57.7	11.92	6.99		
3	8.4	~~507~~ 46.80	11.85	7.03		
4	8.2	44.4	11.89	6.97		
5	8.1	41.2	11.81	6.96		
6	8.0	39.8	11.82	6.92		
7	8.0	39.2	12.00	6.89		
8	7.9	40.4	11.93	6.85		
9	7.8	51.0	11.92	6.80		
10	7.8	50.1	11.93	6.80		
11						
12						
13						
14						
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18						
19						
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

NA.

Water Sampling and Limnology

AREA INFORMATION

Area: Baker Lake.
Sample ID: BPJ-64
Crew: MF, MD, ET
Date/ Time: Aug 12 2019
Weather: wind 15-20
Observations:

UTM Coordinates: Easting: 15W0356709 Northing: 7134281 Waypoint: 053
Total Water Depth: 15.0 Secchi Depth: ~~4.25~~ 5 m
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL
Field DUP collected? (Circle one): Yes No Photo #s: —

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	7.6	64.6	12.08	7.06	
1	7.6	65.1	12.02	7.07	
2	7.6	65.4	12.04	7.07	
3	7.6	65.8	12.06	7.07	
4	7.6	65.6	12.07	7.07	
5	7.5	65.7	12.16	7.07	
6	7.5	65.7	12.02	7.09	
7	7.4	66.0	11.96	7.08	
8	7.2	70.3	~~12~~ 11.82	7.07	
9	7.1	82.6	12.08	7.03	
10	7.0	89.4	12.21	7.02	
11	6.9	98.2	12.22	7.02	
12	6.9	104.8	12.19	7.01	
13	6.9	108.1	12.22	7.01	
14	6.9	110.1	12.31	7.04	
15					
16					
17					
18					
19					
20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes? —

Water Sampling and Limnology

AREA INFORMATION

Area: Baker Lake.
Sample ID: BBD-K4
Crew: MF, JF, MD
Date/ Time: Aug 12, 2019 17:07
Weather:
Observations:

UTM Coordinates: **Easting:** 14W0643975 **Northing:** 7135329 **Waypoint:** 055
Total Water Depth: 9.6 **Secchi Depth:** 4.0m
Phytoplankton collected? (Circle one): Yes No **Volume Filtered:** 500 mL
Field DUP collected? (Circle one): Yes No **Photo #s:**

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	7.5	64.5	12.07	7.04	
1	7.5	65.2	12.05	7.04	
2	7.5	65.9	11.98	7.03	
3	7.5	65.6	12.00	7.03	
4	7.5	64.7	12.05	7.05	
5	7.5	64.6	12.01	7.06	
6	7.5	64.2	12.00	7.07	
7	7.4	65.2	11.96	7.09	
8	7.1	78.5	11.94	7.07	
9	7.0	98.7	12.1	7.05	
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes? —

Water Sampling and Limnology

AREA INFORMATION

Area: WAL

Sample ID: WAL-96 NA

Crew:

Date/ Time:

Weather:

Observations:

UTM Coordinates: Easting: Northing: Waypoint:

Total Water Depth: Secchi Depth:

Phytoplankton collected? (Circle one): Yes No Volume Filtered:

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Attempted sampling on Aug 11, but too windy. Plus we had to disconnect the anchor at WAL-95 because it was lodged in the rocks.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage Lake - East Basin
Sample ID: TPE-126
Crew: E. Franz L. Archambault
Date/ Time: 13 Aug 2019 16:45
Weather: Overcast, 15°C wind SE at < 10 Km/hr.
Observations: ~ 75 m from the BG Pike

UTM Coordinates: **Easting:** 14W 639088 **Northing:** 7212521 **Waypoint:** 011 76CX
Total Water Depth: 7.3 m **Secchi Depth:** to bottom
Phytoplankton collected? (Circle one): Yes No **Volume Filtered:** 500 mL
Field DUP collected? (Circle one): Yes No **Photo #s:** –

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	11.6	31.2	10.50	7.44	
1	11.6	31.2	10.36	7.45	
2	11.6	31.2	10.34	7.45	
3	11.6	31.1	10.41	7.45	
4	11.5	31.1	10.47	7.45	
5	11.5	31.1	10.39	7.45	
6	11.4	31.1	10.40	7.45	
7	11.4	31.4	10.56	7.44	
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10					
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12					
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

–

Equipment Blank Collection Notes?

–

Water Sampling and Limnology

AREA INFORMATION

Area: A20
Sample ID: A20-37
Crew: MF + OE
Date/ Time: AUG 16
Weather: winds 5 10km.
Observations:

UTM Coordinates: Easting: 14W0604657 Northing: 7252410 Waypoint: 011

Total Water Depth: 5.9 m Secchi Depth: ~~[illegible]~~ Bottom

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL

Field DUP collected? (Circle one): Yes No Photo #s:

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	12.6	13.8	10.6	7.0	
1	12.6	13.0	10.6	7.0	
2	12.6	13.0	10.5	7.8	
3	12.5	13.0	10.6	7.0	
4	12.3	12.9	10.59	7.0	
5	12.3	12.9	10.58	6.9	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: SC seems low? reading confirmed in field but may need to double check ~~cond~~ calibration

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: INUG
Sample ID: INUG-115
Crew: E. Franz, M. DiMauro
Date/ Time: Aug 15, 2019 14:35
Weather: Sun, light wind
Observations:

UTM Coordinates: Easting: 14W 622366 Northing: 7216336 Waypoint: 033

Total Water Depth: 5m Secchi Depth: to bottom

Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500mL

Field DUP collected? (Circle one): Yes No Photo #s: NA

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	12.7	16.0	9.72	7.01	
1	12.4	15.7	10.04	7.08	
2	12.2	15.6	10.14	7.09	
3	12.2	15.6	10.17	7.09	
4	12.1	15.6	10.00	7.07	
5	12.1	15.6	9.89	7.07	
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20					

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Arsenic Speciation

Equipment Blank Collection Notes? NA

Water Sampling and Limnology

AREA INFORMATION

Area: WT3
Sample ID: WT3-43
Crew: MF + JS
Date/ Time: AUG 18 16:07
Weather/Obervations: winds NE - 15 Km

UTM Coordinates: **Easting:** 14W0607696 **Waypoint:** 034
Northing: 7254008

Photo #s: **Field DUP collected? (Circle one):** Yes No

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity	
units:	°C	µS/cm	mg/L		NTU	
0	13.1	80.2	10.42	7.2		
1	13.1	80.2	10.4	7.2		
2	13.1	80.2	10.32	7.2		
3	13.0	80.2	10.22	7.2		
4	13.0	80.2	10.09	7.1		
5	12.9	80.1	9.96	7.1		
6	12.5	80.1	9.83	7.1		
7	12.5	80.5	9.72	7.1		
8	12.5	80.4	9.57	7.1		
9	12.0	81.0	9.58	7.1		
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BOTTLE CHECKLIST

ALS - send Express	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
ALS - send Ground	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 125 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **3 drops** of **Lugol's** back at the lab)

Total Water Depth: 9.6 **Secchi Depth:**

Phytoplankton collected? (Circle one): Yes No **Volume Filtered:** 500 mL.

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: DS1
Sample ID: DS1 - 35
Crew: MF - JE
Date/ Time: AUG 17, 2019 14 25
Weather:
Observations:

UTM Coordinates: Easting: 14W 0597622 Northing: 7261052. Waypoint: 027
Total Water Depth: 11.4 Secchi Depth: 4.6
Phytoplankton collected? (Circle one): Yes No Volume Filtered: 500 mL ?
Field DUP collected? (Circle one): Yes No Photo #s: -

FIELD MEASUREMENTS

Depth	Temperature	Specific Conductivity	Dissolved Oxygen	pH	Turbidity
units:	°C	µS/cm	mg/L		NTU
0	13.3	14.7	10.6	6.9	
1	13.3	14.8	10.6	6.9	
2	13.3	14.8	10.6	6.8	
3	13.2	14.8	10.6	6.8	
4	13.2	15.8	10.58	6.8	
5	13.2	14.9	10.57	6.8	
6	13.2	15.0	10.55	6.8	
7	13.2	15.1	10.5	6.7	
8	12.4 ~~13.2~~	17.0	10.60	6.7	
9	12.3	17.2	10.52	6.8	
10	12.1	17.4	10.53	6.8	
11	12.1	17.4	10.56	6.8	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: arsenic speciation
Confirm which DS1 sample was filtered 250mL for chla

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: A20
Sample ID: A20-40
Crew: JA, JL, FL
Date: 2019-09-12
Time: 14:30
Weather: windy and clear / waves
Observations:
UTM Coordinates: Easting: 0604520 Northing: 7252584 Waypoint:
Total Water Depth: >15
Secchi Depth: 4.5 m
Phytoplankton collected?: Yes No
Volume Filtered: 500mL
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	6.20	6.75	16.2	12.49	0	
1	6.2	6.74	16.1	12.51	0	
2	6.18	6.73	16.1	12.5	0	
3	6.18	6.72	16.2	12.5	0	
4	6.18	6.72	16.2	12.5	0	
5	6.19	6.72	16.1	12.49	0	
6	6.19	6.72	16.2	12.5	0	
7	6.18	6.72	16.2	12.5	0	
8	6.21	6.71	16.2	12.5	0	
9	6.20	6.71	16.2	12.52	0	
10	6.22	6.71	16.2	12.52	0	
11	6.21	6.72	16.2	12.52	0	
12	6.21	6.71	16.3	12.53	0	
13	6.21	6.71	16.3	12.53	0	
14	6.21	6.71	16.2	12.53	0	
15	6.20	6.72	16.2	12.54	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes: ~~50~~ Moved away from CREMP coordinates that were given. See new coordinate where Cremp was done above.

Equipment Blank Collection Notes? Probe is drifting a bit

Water Sampling and Limnology

AREA INFORMATION

Area: Lake A20
Sample ID: A20-39
Crew: FL, IA, IL
Date: 2019-09-12
Time: 15:30
Weather: windy, dry (warm)
Observations:
UTM Coordinates: Easting: 605263 Northing: 7252781 Waypoint: 1
Total Water Depth: 5.94
Secchi Depth:
Phytoplankton collected?: Yes No — Yes
Volume Filtered: 500 mL
Field DUP collected?: Yes No — No
Arsenic speciation collected?: Yes No — Yes

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	6.22	6.79	17.2	12.66	0	
1	6.24	6.77	17.2	12.65	0	
2	6.26	6.72	17.2	12.65	0	
3	6.28	6.72	17.2	12.65	0	
4	6.26	6.71	17.1	12.64	0	
5	6.23	6.70	17.2	12.64	0	
6	~~6.~~		~~17.2~~	~~12.~~	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. Fill with **NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:
- Arsenic
- We moved from initial point → Not deep enough!

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: WTS
Sample ID: WTS-46
Crew: JA, FL, JL
Date: 2019-09-12
Time: 16:00
Weather: sunny, windy
Observations:
UTM Coordinates: Easting: 607263
Northing: 7253518
Waypoint:
Total Water Depth: 6.90
Secchi Depth: 4.5m
Phytoplankton collected?: Yes No — Yes
Volume Filtered: 500mL
Field DUP collected?: Yes No — No
Arsenic speciation collected?: Yes No — No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	6.37	6.75	84.8	12.02	2.40	
1	6.36	6.80	84.8	12.09	2.24	
2	6.36	6.82	84.8	12.13	2.51	
3	6.37	6.84	84.8	12.13	2.19	
4	6.37	6.87	84.7	12.13	2.27	
5	6.38	6.89	84.8	12.13	2.33	
6	6.38	6.90	84.8	12.13	2.17	
7	~~6.~~	~~6.~~			~~2.~~	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: WTS
Sample ID: WTS -45
Crew: JA, JL, EL
Date: 2019-09-12
Time: 16:20
Weather: windy, sunny, dry
Observations:
UTM Coordinates: Easting: 607571
Northing: 7254136
Waypoint:
Total Water Depth: 7.20
Secchi Depth: 3.5 m
Phytoplankton collected?: Yes No
Volume Filtered: 500mL
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	10.52	7.02	84.8	12.06	2.19	
1	10.55	7.03	84.8	12.11	2.63	
2	6.52	7.02	84.9	12.15	2.09	
3	10.52	7.02	84.7	12.16	2.25	
4	1.53	7.03	84.9	12.15	2.35	
5	10.53	7.02	84.9	12.14	2.76	
6	1.53	7.02	84.8	12.14	2.14	
7	10.53	7.02	84.9	12.15	2.12	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of Lugol's back at the lab)

Field Notes: As. done here

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Mammoth Lake
Sample ID: MAM-46
Crew: EL, SL, JA
Date: 2019-09-11
Time: 15:10
Weather: partly cloudy, dry, no wind
Observations:

UTM Coordinates: Easting: 604389 Northing: 7254398 Waypoint: 8
Total Water Depth: 8.10
Secchi Depth: 5.5m
Phytoplankton collected?: **Yes** No
Volume Filtered: 500mL
Field DUP collected?: Yes **No**
Arsenic speciation collected?: **Yes** No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	5.55	7.32	113.2	12.62	0.22	
1	5.64	7.22	113.0	12.83	0.19	
2	5.62	7.31	113.2	12.92	0.75	
3	5.62	7.31	113.2	12.99	0.11	
4	5.60	7.31	113.2	13.04	0.18	
5	5.55	7.31	113.2	13.05	0.14	
6	5.52	7.31	114.0	13.07	0.29	
7	5.50	7.30	116.1	13.08	0.33	
8	5.50	7.30	114.3	13.10	0.33	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes: Arsenic collected

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Mammoth Lake Sample ID: MAM-45
Crew: FL, JL, JA Date: 2019-09-11 Time: 14:45
Weather: partly cloudy, no wind
Observations:

UTM Coordinates: Easting: 605355 Northing: 7255089 Waypoint:
Total Water Depth: 9.68 Secchi Depth: 4.0m

Phytoplankton collected?: Yes No Volume Filtered: 500mL
Field DUP collected?: Yes No Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	5.62	7.32	154.2	12.83	0.98	
1	5.59	7.32	154.2	12.95	0.74	
2	5.56	7.32	154.1	13.00	0.83	
3	5.53	7.32	154.1	13.03	0.88	
4	5.52	7.33	154.2	13.04	1.29	
5	5.51	7.33	154.1	13.05	0.92	
6	5.51	7.33	154.1	13.05	0.75	
7	5.51	7.33	154.1	13.06	0.75	
8	5.45	7.34	154.0	13.07	0.66	
9	5.44	7.34	154	13.07	1.56	
10	bottom					
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:
- Did MD #3 Arsenic collected
- ID: Sept-DUP-3
- We moved from initial point → Not Deep enough

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Nemo

Sample ID: Nemo-46

Crew: JL, EL

Date: 2019-09-13

Time: 15:30

Weather: sunny, dry, no wind

Observations:

UTM Coordinates: **Easting:** 606152 **Northing:** 7257527 **Waypoint:**

Total Water Depth: 13.17

Secchi Depth: 8.0m

Phytoplankton collected?: Yes No

Volume Filtered: 500mL

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	7.32	7.20	87.0	12.34	0.22	
1	6.91	7.20	87.0	12.41	0.20	
2	6.76	7.19	87.1	12.46	0.05	
3	6.73	7.18	87.2	12.46	0.11	
4	6.71	7.18	86.9	12.46	0.03	
5	6.71	7.17	87.2	12.47	0.05	
6	6.71	7.16	87.1	12.48	0.05	
7	6.72	7.16	86.8	12.48	0.03	
8	6.77	7.16	86.7	12.49	0.14	
9	6.60	7.15	87.1	12.50	0.08	
10	6.59	7.15	87.2	12.49	0.07	
11	6.58	7.15	87.1	12.47	0.00	
12	6.57	7.15	86.8	12.46	0.00	
13	6.57	7.11	86.7	12.45	0.08	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of Lugol's back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Nemo
Sample ID: Nemo-45
Crew: KL, EL
Date: 2019-09-13
Time: 15:00
Weather: sunny, warm, no wind CALM
Observations:
UTM Coordinates: Easting: 606671
Northing: 7257916
Waypoint:
Total Water Depth: 16.60m
Secchi Depth: 8.0m
Phytoplankton collected?: Yes No
Volume Filtered: 500ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	7.15	7.54	88	11.98	0.44	
1	6.94	7.51	88.4	12.27	0.35	
2	6.79	7.48	88.4	12.36	0.20	
3	6.74	7.46	88.4	12.41	0.16	
4	6.70	7.45	88.40	12.42	0.20	
5	6.68	7.43	88.50	12.44	0.14	
6	6.68	7.42	88.40	12.44	0.19	
7	6.65	7.41	88.60	12.45	0.15	
8	6.64	7.39	88.9	12.46	0.33	
9	6.63	7.38	89.0	12.46	0.23	
10	6.63	7.37	89.0	12.47	0.24	
11	6.63	7.36	89.0	12.47	0.17	
12	6.62	7.35	89.0	12.46	0.21	
13	6.62	7.34	88.9	12.46	0.18	
14	6.63	7.33	88.9	12.44	0.08	
15	6.62	7.33	88.9	12.44	0.15	
16	6.59	7.32	89.3	12.45	0.25	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level)
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic Speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. Fill with NO HEADSPACE.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton R-Us	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes: SEPT-DUP4-

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake A76
Sample ID: A76-40
Crew: ST, MA
Date: 2019-09-08
Time: 15:40
Weather: Sunny
Observations:
UTM Coordinates: 14W Easting: 601716
Northing: 7256892
Waypoint: A76-40
Total Water Depth: 11.50 m
Secchi Depth:
Phytoplankton collected?: Yes No — Yes
Volume Filtered: 500 ml
Field DUP collected?: Yes No — No
Arsenic speciation collected?: Yes No — No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	5.88	6.97	46.5	12.23	0	
1	5.87	6.96	46.5	12.22	0	
2	5.86	6.95	46.5	12.22	0	
3	5.86	6.94	46.5	12.21	0	
4	5.85	6.94	46.5	12.22	0	
5	5.85	6.95	46.5	12.22	0	
6	5.85	6.95	46.5	12.23	0	
7	5.85	6.94	46.5	12.22	0	
8	5.85	6.95	46.5	12.22	0	
9	5.85	6.95	46.5	12.22	0	
10	5.84	6.95	46.5	12.22	0	
11	5.84	6.95	46.6	12.22	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level)
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake A76
Crew: ST, MA
Weather: Sunny
Observations:

Sample ID: A76-39
Date: 2019-09-08
Time: 15:00

UTM Coordinates: 19W Easting: 602920
Northing: 7257014
Waypoint: A76-39

Total Water Depth: 7.23 m
Secchi Depth: 4.54 m

Phytoplankton collected?: Yes No
Volume Filtered: 500 ml

Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	5.92	7.06	47.9	12.10	0	
1	5.92	7.05	47.8	12.18	0	
2	5.91	7.04	47.9	12.18	0	
3	5.92	7.03	48.0	12.20	0	
4	5.93	7.02	48.0	12.22	0	
5	5.92	7.02	47.9	12.22	0	
6	5.91	7.01	48.0	12.23	0	
7	5.99	7.02	48.0	12.22	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake DS1
Sample ID: DS1-38
Crew: ST, MA
Date: 2019-09-07
Time: 17:00
Weather: Sunny / Cloudy
Observations: WINDY
UTM Coordinates: 14W Easting: 597176 Northing: 7262183 Waypoint: DS1-38
Total Water Depth: 19m+
Secchi Depth: 4m
Phytoplankton collected?: Yes No — Yes
Volume Filtered: 500ml
Field DUP collected?: Yes No — No
Arsenic speciation collected?: Yes No — No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	6.94	6.94	23.7	12.03	0.65	
1	6.94	6.99	23.7	11.96	0.66	
2	6.94	6.93	23.7	11.95	0.57	
3	6.94	6.91	23.7	11.96	0.62	
4	6.95	6.93	23.7	11.95	0.59	
5	6.93	6.94	23.8	11.97	0.94	
6	6.93	6.94	23.8	11.93	0.62	
7	6.94	6.94	23.7	11.93	0.56	
8	6.93	6.93	23.7	11.92	0.59	
9	6.93	6.95	23.8	11.93	0.47	
10	6.93	6.99	23.7	11.99	0.57	
11	6.93	6.94	23.8	11.93	0.51	
12	6.92	6.93	23.8	11.94	0.62	
13	6.91	6.94	23.8	11.94	0.55	
14	6.91	6.94	23.8	11.93	0.53	
15	6.91	6.94	23.8	11.93	0.60	
16	6.90	6.94	23.8	11.93	0.57	
17	6.89	6.94	24.2	11.96	0.71	
18	6.90	6.95	24.3	11.95	0.68	
19	6.91	6.95	24.3	11.96	0.69	
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. Fill with **NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes: DIDN'T REACH BOTTOM OF THE LAKE

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Lake, DS1

Sample ID: DS1-37

Crew: ST, MA

Date: 2019-09-07

Time: 16:20

Weather: Sunny/Cloudy

Observations: & WINDY

UTM Coordinates: 14W Easting: 597748

Northing: 7258536

Waypoint: DS1-37

Total Water Depth: 12.88

Secchi Depth: 4m

Phytoplankton collected?: Yes (circled) No

Volume Filtered: 500 ml

Field DUP collected?: Yes No (circled)

Arsenic speciation collected?: Yes (circled) No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	5.12	7.16	22.9	12.87	0.53	
1	5.12	6.97	22.9	12.85	0.57	
2	5.12	6.90	22.9	12.86	0.98	
3	5.10	6.88	22.9	12.86	0.87	
4	5.11	6.87	22.9	12.87	0.43	
5	5.11	6.85	22.9	12.86	0.46	
6	5.10	6.88	22.9	12.87	0.39	
7	5.09	6.85	22.9	12.87	0.49	
8	5.09	6.86	22.9	12.87	0.41	
9	5.09	6.85	22.9	12.87	0.44	
10	5.09	6.85	22.9	12.85	0.38	
11	5.09	6.85	22.9	12.86	0.48	
12	5.10	6.85	22.9	12.86	0.43	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LAKE D-8

Sample ID: LK8-15

Crew: ST MA

Date: 2019-09-07

Time: 9:45

Weather: SUNNY/CLOUDY

Observations:

UTM Coordinates: Easting: 612510 Northing: 7258689 Waypoint: LK8-15

Total Water Depth: 10.08 m

Secchi Depth: 3 m

Phytoplankton collected?: Yes No

Volume Filtered: 500 mL

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	7.17	7.37	15.2	12.04	0	
1	7.19	7.26	15.2	11.81	0	
2	7.19	7.16	15.2	11.78	0	
3	7.19	7.11	15.2	11.75	0	
4	7.18	7.08	15.2	11.74	0	
5	7.17	7.06	15.2	11.75	0	
6	7.16	7.03	15.2	11.75	0	
7	7.16	7.01	15.2	11.75	0	
8	7.16	6.98	15.2	11.75	0	
9	7.14	6.98	15.2	11.75	0	
10	7.14	6.97	15.2	11.76	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of Lugol's back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LAKE 08 | Sample ID: LK8-16
Crew: ST MA | Date: 2019-09-07 | Time: 10:18
Weather: SUNNY CLOUDY
Observations:
UTM Coordinates: Easting: 611287 | Northing: 7258246 | Waypoint: LK8-16
Total Water Depth: 14.34 m | Secchi Depth: 3m
Phytoplankton collected?: Yes No | Volume Filtered: 500 ML
Field DUP collected?: Yes No | Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	7.44	6.89	15.2	11.65	0	
1	7.44	6.90	15.1	11.65	0	
2	7.49	6.87	15.2	11.64	0	
3	7.44	6.85	15.2	11.64	0	
4	7.44	6.89	15.2	11.64	0	
5	7.44	6.81	15.2	11.63	0	
6	7.40	6.83	15.2	11.64	0	
7	7.42	6.81	15.1	11.64	0	
8	7.42	6.83	15.1	11.65	0	
9	7.41	6.91	15.2	11.65	0	
10	7.40	6.92	15.2	11.65	0	
11	7.40	6.91	15.2	11.65	0	
12	7.40	6.81	15.2	11.64	0	
13	7.40	6.87	15.2	11.64	0	
14	7.39	6.92	15.2	11.65	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LK5
Sample ID: LK5-16
Crew: ST MA
Date: 2019-09-09
Time: 9:40
Weather: SUNNY
Observations:
UTM Coordinates: 14W Easting: 612892
Northing: 7252053
Waypoint: LK5-16
Total Water Depth: 14.08 m
Secchi Depth: 9.5 m
Phytoplankton collected?: Yes No
Volume Filtered: 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	5.06	6.99	27.5	12.09	0.00	
1	5.06	7.02	27.5	12.09	0	
2	5.05	7.00	27.5	12.57	0	
3	5.04	7.01	27.5	12.59	0	
4	5.04	7.02	27.5	12.61	0	
5	5.09	7.02	27.5	12.60	0	
6	5.05	7.03	27.5	12.60	0	
7	5.04	7.03	27.5	12.61	0	
8	5.04	7.09	27.5	12.61	0	
9	5.04	7.04	27.5	12.62	0	
10	5.01	7.05	27.5	12.62	0	
11	5.06	7.06	27.5	12.61	0	
12	5.05	7.05	27.5	12.62	0	
13	5.01	7.06	27.5	12.62	0	
14	~~4.97~~	~~6.93~~	~~36.5~~			
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LAKE DS
Sample ID: LK1 - 15
Crew: ST MA
Date: 2019-09-09
Time: 10:22
Weather: SUNNY
Observations:
UTM Coordinates: 14W Easting: 612599 Northing: 7252979 Waypoint: LK1-15
Total Water Depth: 12.62m
Secchi Depth: 5m
Phytoplankton collected?: Yes No — Yes
Volume Filtered: 500ml
Field DUP collected?: Yes No — No
Arsenic speciation collected?: Yes No — Yes

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	4.98	7.02	27.5	12.55	0	
1	4.98	7.04	27.6	12.60	0	
2	4.96	7.01	27.6	12.62	0	
3	4.95	7.01	27.6	12.62	0	
4	4.94	7.02	27.5	12.62	0	
5	4.93	7.02	27.5	12.62	0	
6	4.93	7.01	27.6	12.62	0	
7	4.92	7.02	27.6	12.63	0	
8	4.92	7.02	27.6	12.63	0	
9	4.92	7.03	27.6	12.63	0	
10	4.91	7.05	27.5	12.63	0	
11	4.91	7.04	27.6	12.63	0	
12	4.92	7.04	27.6	12.63	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LAKE D1
Sample ID: LK1-15
Crew: ST JA
Date: 2019-09-09
Time: 10:15
Weather: SUNNY
Observations: WINDY
UTM Coordinates: 19W
Easting: 607299
Northing: 7295819
Waypoint: LK1-15
Total Water Depth: 11.75m
Secchi Depth: 3.75m
Phytoplankton collected?: Yes No (Yes circled)
Volume Filtered: 500ml
Field DUP collected?: Yes No (No circled)
Arsenic speciation collected?: Yes No (Yes circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	5.79	6.72	15.5	12.31	0.56	
1	5.73	6.72	15.4	12.32	0.70	
2	5.73	6.70	15.4	12.32	0.73	
3	5.73	6.69	15.4	12.33	0.50	
4	5.73	6.68	15.4	12.33	0.58	
5	5.72	6.67	15.4	12.34	0.62	
6	5.73	6.67	15.4	12.33	0.68	
7	5.73	6.67	15.4	12.33	0.68	
8	5.73	6.68	15.4	12.33	0.84	
9	5.73	6.66	15.4	12.33	0.58	
10	5.73	6.67	15.4	12.33	0.56	
11	5.73	6.67	15.4	12.33	0.68	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: LAKE D1
Sample ID: LK1-15
Crew: ST JA
Date: 2019-09-09
Time: 1540
Weather: SUNNY
Observations: WINDY
UTM Coordinates: 14W Easting: 608269
Northing: 7297633
Waypoint: LK1-15
Total Water Depth: 9.70m
Secchi Depth: 9m
Phytoplankton collected?: Yes No
Volume Filtered: 500
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	5.88	6.98	15.5	12.25	0.40	
1	5.88	6.96	15.5	12.26	0.37	
2	5.87	6.91	15.4	12.26	0.42	
3	5.87	6.89	15.5	12.27	0.36	
4	5.86	6.85	15.5	12.27	0.33	
5	5.86	6.83	15.5	12.27	0.37	
6	5.86	6.81	15.5	12.28	0.25	
7	5.85	6.79	15.5	12.29	0.33	
8	5.85	6.76	15.5	12.29	0.47	
9	5.85	6.76	15.5	12.29	0.41	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level)
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Baker lake
Sample ID: BAP-66
Crew:
Date: 2019-09-18
Time: 1:45
Weather: cloudy, windy
Observations:
UTM Coordinates: 15W **Easting:** 0363626 **Northing:** 7131222 **Waypoint:**
Total Water Depth: 9.5m
Secchi Depth:
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	7.40	7.22	375.6	12.19	103.4	
1	7.39	7.21	375.3	12.19	103.4	
2	7.34	7.21	358.8	12.19	103.3	
3	7.37	7.20	375.5	12.18	103.3	
4	7.33	7.20	377.0	12.20	103.3	
5	7.32	7.20	386	12.18	103.3	
6	7.30	7.19	390	12.19	103.2	
7	7.30	7.19	391	12.19	103.2	
8	7.29	7.19	391.4	12.19	103.2	
9	7.28	7.17	391	12.19	103.3	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter **500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Baker Lake **Sample ID:** BAP 65
Crew: NS/AR **Date:** **Time:** 12:45
Weather: medium wind / cloudy
Observations: O:
UTM Coordinates: 15W **Easting:** 0364105 **Northing:** 7130697 **Waypoint:**
Total Water Depth: ~~0 cm~~ **Secchi Depth:**
Phytoplankton collected?: Yes No **Volume Filtered:**
Field DUP collected?: Yes No **Arsenic speciation collected?:** Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	7.37	7.15	368	12.16	103.1	
1	7.37	7.16	367.5	12.14	103.0	
2	7.39	7.17	367.5	12.16	103.1	
3	7.36	7.17	367.1	12.16	103.2	
4	7.37	7.18	364	12.17	103.2	
5	7.32	7.18	363.8	12.16	103.2	
6	7.34	7.18	363.5	12.17	103.2	
7	7.34	7.18	363	12.17	103.2	
8	7.38	7.18	365	12.18	103.2	
9	7.29	7.18	373.1	12.19	103.2	
10	7.30	7.18	365	12.19	103.2	
11	7.28	7.18	366	12.21	103.2	
12	7.25	7.17	364.9	12.19	103.2	
13	7.22	7.17	365.7	12.20	103.1	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes: Big current/waves probe went not full depth. [illegible]

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: BBD-65/Baker Lake
Sample ID: BBD-65
Crew: NS/AB
Date: 2019-09-18
Time: 9:30
Weather: Clear, light fog
Observations:
UTM Coordinates: 14W
Easting: 0644260
Northing: 7135291
Waypoint:
Total Water Depth: 9.98
Secchi Depth: ——
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

O2 %

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	~~Turbidity~~	
units:	°C		µS/cm	mg/L	NTU	
0	7.09	7.02	49.9	12.07	101.6	
1	7.09	7.09	49.4	12.08	101.2	
2	7.09	7.04	48.1	12.08	101.4	
3	7.08	7.03	48.6	12.08	101.6	
4	7.06	7.03	49.3	12.07	101.6	
5	7.09	7.05	49.8	12.09	101.6	
6	7.07	7.04	53.9	12.06	101.6	
7	7.11	7.03	58.7	12.03	101.2	
8	7.32	6.95	139.1	11.97	101.4	
9	7.37	6.99	139.4	11.93	101.1	
10	~~7.37~~	7.01	160.5	10.63	90.2	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Baker Lk / BBD 6G
Sample ID: BBD 6G
Crew: NS / AB
Date: 2019-09-18
Time: 10:05
Weather: Clear / light wind
Observations:
UTM Coordinates: 14W
Easting: 0644731
Northing: 7135230
Waypoint:
Total Water Depth: 9.75m
Secchi Depth:
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	~~Turbidity~~ O2 %	
units:	°C		µS/cm	mg/L	NTU	
0	7.39	7.08	74.6	12.01	102.0	
1	7.39	7.08	77.7	12.01	101.9	
2	7.39	7.06	79.1	12.02	101.9	
3	7.39	7.05	85.7	12.03	102.0	
4	7.39	7.06	82.4	12.03	101.9	
5	7.38	7.05	86.6	12.02	101.9	
6	7.38	7.05	94.0	12.02	101.9	
7	7.36	7.01	100.5	12.02	101.8	
8	7.37	7.03	134.5	12.02	101.4	
9	7.36	7.03	135	12.01	101.4	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Baker Lake
Sample ID: BP 5-66
Crew:
Date:
Time: 11:15
Weather:
Observations:
UTM Coordinates: 15W Easting: 0357320 Northing: 7133874 Waypoint:
Total Water Depth:
Secchi Depth:
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	7.32	7.32	330	12.13	102.7	
1	7.31	7.31	3504	12.13	102.7	
2	7.30	7.28	334.1	12.14	102.7	
3	7.31	7.26	332.5	12.14	102.9	
4	7.30	7.25	331.7	12.15	102.9	
5	7.29	7.23	332	12.14	102.8	
6	7.31	7.23	333	12.15	102.9	
7	7.30	7.22	335	12.15	102.9	
8	7.28	7.20	363	12.16	102.9	
9	7.28	7.20	355	12.17	103	
10	7.29	7.21	356	12.19	103.1	
11	7.28	7.20	360	12.20	103.2	
12	7.26	7.20	355	12.19	103.2	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Baker Lake
Sample ID: BPJ-65
Crew: NS/AB
Date: 2019-09-18
Time: 10:45
Weather: overcast/windy
Observations:
UTM Coordinates: 15W
Easting: 0356923
Northing: 7134114
Waypoint:
Total Water Depth: 17.10m
Secchi Depth:
Phytoplankton collected?: Yes No
Volume Filtered:
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	7.24	7.22	289.6	12.14	102.6	
1	7.25	7.21	289.2	12.15	102.7	
2	7.24	7.20	289.9	12.16	102.8	
3	7.24	7.20	290.2	12.16	102.8	
4	7.24	7.19	290	12.16	102.8	
5	7.24	7.19	289.9	12.16	102.9	
6	7.25	7.18	288.1	12.16	102.7	
7	7.24	7.18	289.7	12.15	102.7	
8	7.19	7.18	289.6	12.17	102.7	
9	7.20	7.17	290	12.16	102.7	
10	7.21	7.17	288	12.15	102.6	
11	7.13	7.16	295	12.18	102.7	
12	7.16	7.15	300	12.18	102.7	
13	7.10	7.15	310	12.20	102.7	
14	7.10	7.14	326	12.19	102.6	
15	7.11	7.14	336.0	12.17	102.6	
16	7.20	7.10	363	12.15	102.7	
17	7.09	7.07	395		102.8	
18						
19						
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: INUG
Crew: LD - FL
Weather: Cloudy
Observations:
UTM Coordinates: Easting: 622177 Northing: 7216033 Waypoint:
Total Water Depth: 7,58 Secchi Depth: 6 m
Phytoplankton collected?: Yes (circled) No
Volume Filtered: 500 ml
Field DUP collected?: Yes No (circled)
Arsenic speciation collected?: Yes (circled) No
Sample ID: INUG-416
Date: 2019-09-18 Time: 13h20

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	6,82	7,37	16,6	12,16	0,23	
1	6,82	7,29	16,6	12,19	0,29	
2	6,82	7,24	16,6	12,21	0,25	
3	6,81	7,21	16,6	12,23	0,16	
4	6,81	7,17	16,6	12,25	0,25	
5	6,81	7,14	16,6	12,25	0,26	
6	6,80	7,11	16,6	12,24	0,21	
7	6,81	7,09	16,6	12,24	0,22	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level)
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. Fill with NO HEADSPACE.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and filter 500 mL back at Site. Place filter in 15 mL black tube
Plankton-B-Fs	1 x 50 mL glass	Phytoplankton (add 5 drops of Lugol's back at the lab)

Field Notes:

Equipment Problems/Other Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TNUG
Sample ID: TNUG-117
Crew: LD - FL
Date: 2018-09-18
Time: 1420
Weather: Cloudy, windy
Observations:

UTM Coordinates: Easting: 62 26 09 Northing: 7 21 54 51 Waypoint:
Total Water Depth: 7,05
Secchi Depth: 6,5
Phytoplankton collected?: Yes No — Yes
Volume Filtered: 500
Field DUP collected?: Yes No — No
Arsenic speciation collected?: Yes No — Yes

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	6,81	7,05	16,5	12,24	0,20	
1	6,81	6,96	16,5	12,25	0,11	
2	6,81	6,91	16,5	12,25	0	
3	6,80	6,88	16,5	12,25	0	
4	6,81	6,88	16,5	12,25	0	
5	6,79	6,87	16,5	12,26	0	
6	6,79	6,84	16,5	12,27	0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level):
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Boat engin problem /we took this point instead of the initial Tnug-117 coordinates.

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: PDL **Sample ID:** PDL - 81
Crew: NS. IC **Date:** 2019-09-12 **Time:** 12:50
Weather:
Observations: Sunny, windy
UTM Coordinates: 14W **Easting:** 0630457 **Northing:** 7223629 **Waypoint:**
Total Water Depth: 14m **Secchi Depth:** —
Phytoplankton collected?: Yes / No (Yes circled) **Volume Filtered:** 500ml (chloro)
Field DUP collected?: Yes / No (No circled) **Arsenic speciation collected?:** Yes / No (Yes circled)

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen		Turbidity	
units:	°C		µS/cm	mg/L	%	NTU	
0	7.30	7.10	23.2	11.93	100.9		
1	7.28	7.06	23.3	11.97	100.9		
2	7.28	7.05	23.2	11.94	100.9		
3	7.34	7.02	23.2	11.92	100.8		
4	7.40	7.03	23.3	11.90	100.7		
5	7.35	7.02	23.2	11.87	100.6		
6	7.39	7.02	23.2	11.86	100.5		
7	7.34	7.01	23.2	11.83	100.4		
8	7.37	7.02	23.2	11.86	100.4		
9	7.39	7.02	23.1	11.85	100.4		
10	7.40	7.01	23.2	11.86	100.4		
11	7.35	7.04	23.1	11.84	100.4		
12	7.38	7.01	23.1	11.86	100.4		
13	7.34	7.01	23.1	11.85	100.4		
14	~~7.36~~	~~7.01~~	~~23.2~~	~~11.86~~	~~[illegible]4~~		
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:
24m from station

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Pipedream lake
Sample ID: PDL-82
Crew: N.S / IC
Date: 2019-09-12
Time: 12:10
Weather: Sunny, windy.
Observations:
UTM Coordinates: 14W
Easting: 0630201
Northing: 7222713
Waypoint:
Total Water Depth: 12 m.
Secchi Depth: —
Phytoplankton collected?: **Yes** No
Volume Filtered: 500 ml (chloro)
Field DUP collected?: Yes **No**
Arsenic speciation collected?: **Yes** No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen		Turbidity	
units:	°C		µS/cm	mg/L	%	NTU	
0	7.27	7.10	11.92	11.92	100.8		
1	7.12	7.13	23.3	11.99	100.9		
2	7.12	7.10	23.3	11.99	101.0		
3	7.08	7.10	23.3	12.01	101.0		
4	7.07	7.07	23.3	12.01	101.0		
5	7.11	7.07	23.3	12.01	101.1		
6	7.08	7.06	23.3	12.01	101.1		
7	7.07	7.04	23.3	12.02	101.1		
8	7.09	7.04	23.3	12.01	101.1		
9	7.08	7.02	23.3	12.00	100.9		
10	7.08	7.00	23.3	12.00	100.9		
11	7.09	6.86	24.0	11.88	99.7		
12							
13							
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: SP
Sample ID: SP-128
Crew: NS AB
Date: 2019-09-15
Time: 10:30
Weather: Rain / wind
Observations:
UTM Coordinates: 14W **Easting:** 0640477 **Northing:** 7213746 **Waypoint:**
Total Water Depth: 8.41 m
Secchi Depth: —
Phytoplankton collected?: Yes No
Volume Filtered: —
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	~~Turbidity~~ O2 %	
units:	°C		µS/cm	mg/L	~~NTU~~	
0	6.96	7.26	392	12.32	103.3	
1	6.96	7.27	392	12.32	103.3	
2	6.97	7.24	39.2	12.33	103.3	
3	6.97	7.24	39.2	12.32	103.3	
4	6.96	7.23	39.1	12.32	103.3	
5	6.96	7.22	39.0	12.32	103.3	
6	6.96	7.22	39.2	12.33	103.3	
7	6.96	7.21	39.1	12.32	103.3	
8	6.93	7.22	39.1	12.33	103.3	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: SP

Sample ID: SP-129

Crew: NS AB

Date: 2019-09-15

Time: 11:00AM

Weather: windy, moderate rain

Observations:

UTM Coordinates: 4W

Easting: 0640664

Northing: 4213045

Waypoint:

Total Water Depth: 9.68 m

Secchi Depth: —

Phytoplankton collected?: Yes No

Volume Filtered: —

Field DUP collected?: Yes No

Arsenic speciation collected?: Yes No

62%

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0	6.86	7.3	39.2	12.36	103.4	
1	6.86	7.29	39.2	12.37	103.5	
2	6.86	7.27	39.2	12.37	103.5	
3	6.86	7.26	39.2	12.37	103.4	
4	6.86	7.24	39.1	12.36	103.4	
5	6.88	7.23	39.0	12.36	103.4	
6	6.88	7.24	39.2	12.35	103.4	
7	6.88	7.23	39.0	12.35	103.4	
8	6.89	7.23	39.1	12.36	103.4	
9	6.89	7.23	39.1	12.35	103.4	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TPE
Sample ID: TPE 128
Crew: NS/AB
Date: September 19/19
Time: 11:18
Weather: foggy, light wind
Observations:
UTM Coordinates: 14W Easting: 0638278 Northing: 7211367 Waypoint: —
Total Water Depth: 6.25
Secchi Depth: —
Phytoplankton collected?: **Yes** No
Volume Filtered: 500ml (chloro)
Field DUP collected?: Yes **No**
Arsenic speciation collected?: Yes **No**

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	~~Turbidity~~ O2%	
units:	°C		µS/cm	mg/L	NTU	
0	7.05	7.13	30.0	12.15	102.0	
1	7.07	7.10	30.0	12.13	101.9	
2	6.79	7.08	29.9	12.14	101.9	
3	7.04	7.07	29.8	12.15	101.9	
4	7.00	7.07	29.9	12.14	102.0	
5	7.00	7.08	29.9	12.16	102.0	
6	6.95	7.07	29.8	12.16	102.0	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: TPE
Sample ID: TPE-129
Crew: NS / AJB
Date: 2019-09-14
Time: 10:04
Weather: Foggy, light wind
Observations:
UTM Coordinates: 14W
Easting: 0639626
Northing: 7211729
Waypoint:
Total Water Depth: 11.70
Secchi Depth:
Phytoplankton collected?: Yes / No — Yes
Volume Filtered: 500 ml-(Chloro)
Field DUP collected?: Yes / No — No
Arsenic speciation collected?: Yes / No — No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Dissolved % ~~Turbidity~~	
units:	°C		µS/cm	mg/L	~~NTU~~ %	
0	6.9	7.22	30.0	12.14	101.7	
1	6.89	7.19	30.1	12.14	101.7	
2	6.91	7.19	30.1	12.14	101.7	
3	6.90	7.18	30.1	12.14	101.6	
4	6.91	7.16	30.1	12.14	101.6	
5	6.88	7.16	30.1	12.14	101.6	
6	6.88	7.15	30.1	12.14	101.6	
7	6.89	7.14	30.1	12.14	101.6	
8	6.83	7.15	30.0	12.16	101.6	
9	6.83	7.13	30.1	12.16	101.6	
10	6.82	7.12	30.1	12.16	101.6	
11	6.82	7.12	30.0	12.15	101.6	
12 (11.70)						
13						
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage Lake **Sample ID:** TPN-128
Crew: Isabelle Tétrault, Isabelle Couture **Date:** 2019-09-10 **Time:** 10:00
Weather:
Observations: little windy, partly cloudy
UTM Coordinates: 14W **Easting:** 0635528 **Northing:** 7214208 **Waypoint:**
Total Water Depth: 19m **Secchi Depth:** –
Phytoplankton collected?: Yes No **Volume Filtered:** 500ml (chloro)
Field DUP collected?: Yes No **Arsenic speciation collected?:** Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen		Turbidity	
units:	°C		µS/cm	mg/L	%	NTU	
0							
1 m	Not working	5.80	27.4	12.35	101.1	–	
2		6.00	27.3	12.31	100.9	–	
3		6.14	27.4	12.31	100.9	–	
4		6.36	27.4	12.32	100.9	–	
5		6.53	27.4	12.32	100.9	–	
6		6.67	27.4	12.32	100.9	–	
7		6.88	27.4	12.32	100.9	–	
8		6.98	27.4	12.33	100.9	–	
9		7.65	27.4	12.34	101.1	–	
10		7.65	27.4	12.34	101.1	–	
11		7.65	27.4	12.34	101.1	–	
12		5.74	38.2	8.36	69	–	
13		6.18	38.2	7.11	58.9	–	
14		6.35	38.2	6.94	56.5	–	
15		6.41	38.2	6.78	55.2	–	
16		6.44	38.2	6.49	52.9	–	
17		6.51	38.2	6.34	51.8	–	
18		6.58	38.2	6.19	50.4	–	
19						–	
20						–	

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:
Conductivity at surface: 26.7
pH: 6.94
Temperature: 8.5°C

* Trouble with the Eureka *
switched probe after that station.

Equipment Blank Collection Notes?
↑ these readings taking with oakton pctb 50.

Water Sampling and Limnology

AREA INFORMATION

Area: TPM
Sample ID: TPM-129
Crew: NS / AB
Date: Sept. 14/19
Time: 12:09
Weather: fog / light wind
Observations:
UTM Coordinates: 14W
Easting: 0636540
Northing: 7214965
Waypoint:
Total Water Depth: 18m
Secchi Depth: —
Phytoplankton collected?: Yes No
Volume Filtered: 500ml (chloro)
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	~~Turbidity~~ O2 %	
units:	°C		µS/cm	mg/L	NTU	
0	7.41	7.09	27.6	11.88	100.8	
1	7.40	7.05	27.6	11.90	100.9	
2	7.40	7.02	27.6	11.91	101.0	
3	7.40	7.00	27.6	11.91	101.0	
4	7.39	6.99	27.6	11.91	101.0	
5	7.39	7.00	27.6	11.91	100.9	
6	7.39	6.99	27.6	11.90	100.9	
7	7.39	6.98	27.6	11.90	100.9	
8	7.40	6.98	27.6	11.90	100.9	
9	7.40	6.98	27.6	11.90	100.9	
10	7.40	6.99	27.6	11.91	100.9	
11	7.41	6.98	27.6	11.90	100.9	
12	7.40	6.99.	27.6	11.90	100.9	
13	7.40	6.99	27.6	11.90	100.9	
14	7.39	6.99	27.6	11.90	100.9.	
15	7.40	6.98	27.6	11.90	100.9	
16	7.39	6.99	27.6	11.90	100.9	
17	7.37	6.99	27.6	11.90	100.8	
18						
19						
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes: Sep DUP-1

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: WAL
Sample ID: WAL 97
Crew: NS/AB
Date: Sept 14/19
Time: 3:43
Weather: Clear, light wind
Observations:
UTM Coordinates: 13W Easting: 0360443 Northing: 7221214 Waypoint:
Total Water Depth: 5.21m Secchi Depth: —
Phytoplankton collected?: Yes No
Volume Filtered: 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	~~Turbidity~~ O2 %	
units:	°C		µS/cm	mg/L	NTU	
0	6.96	7.24	40.0	12.36	103.6	
1	6.96	7.27	39.9	12.38	103.8	
2	6.90	7.27	40.0	12.39	103.8	
3	6.91	7.27	40.0	12.40	103.8	
4	6.81	7.27	39.8	12.42	103.8	
5	6.80	7.26	39.9	12.41	103.8	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: WAL
Sample ID: WAL 98
Crew: NS/AB
Date: ~~Sept~~ 9/14/19
Time: 4:28
Weather: clear, light wind
Observations:
UTM Coordinates: 15W
Easting: 0361804
Northing: 7222670
Waypoint:
Total Water Depth: 9.8m
Secchi Depth: —
Phytoplankton collected?: Yes No
Volume Filtered: ~~1000~~ 500 ml
Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

@22

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C	7	µS/cm	mg/L	NTU	
0	6.79	7.38	39.2	12.38	103.4	
1	6.77	7.36	39.2	12.39	103.4	
2	6.78	7.31	39.2	12.39	103.4	
3	6.77	7.33	39.2	12.39	103.4	
4	6.75	7.31	39.2	12.40	103.4	
5	6.72	7.31	39.2	12.40	103.5	
6	6.72	7.31	39.2	12.41	103.4	
7	6.60	7.31	39.1	12.44	103.4	
8	6.56	7.32	39.2	12.43	103.3	
9	6.54	7.31	39.1	12.44	103.3	
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE.**
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops of Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

AREA INFORMATION

Area: WTS
Sample ID: November WTS CREMP
Crew: JL - FL - AB
Date: 08/11/2019
Time: 15:00
Weather: Windy, overcast
Observations: Discharging water from WTN

UTM Coordinates:
Easting: 607646
Northing: 7254594
Waypoint: NA
Total Water Depth: 6.4 m
Secchi Depth: NA

Phytoplankton collected?: No
Volume Filtered: NA
Field DUP collected?: No
Arsenic speciation collected?: No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0.5	0.74	6.99	81	14.1		
1	0.82	6.96	79	14.17		
2	0.84	6.95	78.4	14.08		
3	0.84	6.93	78.2	14.05		
4	0.85	6.93	78.8	14		
5	0.84	6.92	80.6	13.97		
6	0.89	6.91	82.5	13.91		
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

AREA INFORMATION

Area: Third Portage Lake
Sample ID: TPE Profile
Crew: NS/AB
Date: 12/11/2019
Time: 13:39 PM
Weather: -17C Clear
Observations:

UTM Coordinates: **Easting:** 639029 **Northing:** 7211365 **Waypoint:** NA
Total Water Depth: 16.7m **Secchi Depth:** NA

Phytoplankton collected?: No **Volume Filtered:** NA
Field DUP collected?: No **Arsenic speciation collected?:** No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Dissolved Oxygen	
units:	°C		µS/cm	mg/L	%	
0.5	0.29	6.71	32.7	31.88	95	
1	0.4	6.74	31.1	14.3	100.9	
2	0.39	6.75	30.8	14.44	101.8	
3	0.44	6.77	30.4	14.42	101.8	
4	0.46	6.8	30.3	14.4	101.6	
5	0.5	6.8	30.5	14.36	101.5	
6	0.53	6.81	30.6	14.32	101.3	
7	0.56	6.82	30.5	14.27	101	
8	0.6	6.82	30.5	14.22	100.8	
9	0.63	6.82	30.6	14.2	100.7	
10	0.66	6.83	30.8	14.19	100.8	
11	0.69	6.81	30.8	14.17	100.7	
12	0.72	6.81	31	14.12	100.4	
13	0.77	6.82	31	14.06	100.1	
14	0.83	6.8	30.9	13.98	99.5	
15	0.89	6.8	30.7	13.79	98.4	
16	0.98	6.78	31.2	13.68	98	
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

AREA INFORMATION

Area: Second Portage Lake
Sample ID: SPL Profile
Crew: NS/IT
Date: 10/11/2019
Time: 15:30 PM
Weather: -28c Sunny/wind N 25 kph
Observations:

UTM Coordinates:
Easting: 639819
Northing: 7213985
Waypoint: NA
Total Water Depth: 16.7m
Secchi Depth: NA

Phytoplankton collected?: No
Volume Filtered: NA
Field DUP collected?: No
Arsenic speciation collected?: No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Dissolved Oxygen	
units:	°C		µS/cm	mg/L	%	
0.5	0.07	6.44	38.9	14.93	104.8	
1	0.7	6.93	38	13.97	99.3	
2	1.12	6.9	39	13.84	96.6	
3	1.19	6.89	38.3	13.67	98.5	
4	1.21	6.88	38.1	13.62	98.2	
5	1.25	6.85	38.9	13.55	97.8	
6	1.19	6.84	39.2	13.42	97.1	
7	1.33	8.82	39.3	13.27	96.2	
8	1.37	6.79	39.4	13.1	94.9	
9	1.44	6.78	39.8	12.79	92.9	
10	1.55	6.75	40.3	12.46	90.8	
11	1.73	6.72	41.7	12.15	88.9	
12	1.85	6.72	42.1	11.92	87.5	
13	1.97	6.72	42.2	11.73	86.5	
14	2.04	6.72	42.8	11.51	85	
15	2.11	6.67	43.4	11.24	83.1	
16	2.16	6.66	45.2	11.01	81.5	
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes: Profile only

Equipment Blank Collection Notes?

AREA INFORMATION

Area: Third Portage Lake
Sample ID: TPN Profile
Crew: NS/AB
Date: 12/11/2019
Time: 14:30 PM
Weather: -17C Clear
Observations:

UTM Coordinates:
Easting: 636156
Northing: 7213962
Waypoint: NA
Total Water Depth: 24+ m
Secchi Depth: NA

Phytoplankton collected?: No
Volume Filtered: NA
Field DUP collected?: No
Arsenic speciation collected?: No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Dissolved Oxygen	
units:	°C		µS/cm	mg/L	%	
0.5	0.29	6.63	37	17.32	121.6	
1	0.61	6.67	29.5	16.23	114.9	
2	0.67	6.74	28	15.12	107.2	
3	0.67	6.74	27.8	14.81	105	
4	0.69	6.72	28.3	14.68	104.2	
5	0.72	6.76	27.8	14.48	102.9	
6	0.9	6.75	27.1	14.7	100.7	
7	1	6.74	27.1	13.85	99.2	
8	1.09	6.76	27.1	13.65	98	
9	1.16	6.76	27.1	13.51	97.2	
10	1.21	6.77	27	13.41	96.6	
11	1.23	6.77	26.9	13.35	96.2	
12	1.24	6.77	26.9	13.32	96.1	
13	1.26	6.75	26.9	13.3	96	
14	1.28	6.75	26.9	13.26	95.7	
15	1.29	6.75	26.9	13.19	95.2	
16	1.29	6.76	26.9	13.17	95.1	
17	1.3	6.75	26.9	13.15	95	
18	1.32	6.74	26.9	13.13	95	
19	1.33	6.74	26.9	13.12	94.8	
20	1.34	6.77	26.9	13.1	94.7	

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

AREA INFORMATION

Area: Wally
Sample ID: WAL Profile
Crew: NS/AB
Date: 12/11/2019
Time: 13:39 PM
Weather: -17C Clear
Observations:

UTM Coordinates: **15W** **Easting:** 361757
Northing: 7222628
Waypoint: NA
Total Water Depth: 9.3
Secchi Depth: NA

Phytoplankton collected?: No
Volume Filtered: NA
Field DUP collected?: No
Arsenic speciation collected?: No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Dissolved Oxygen	
units:	°C		µS/cm	mg/L	%	
0.5	0.94	6.62	43.4	14.45	89.1	
1	1.11	6.74	43.9	14.34	103.8	
2	1.68	6.73	40.9	14.33	104.7	
3	1.91	6.75	41.6	14.7	103.9	
4	2.05	6.8	42.1	13.9	102.5	
5	2.16	6.82	42.1	13.71	101.2	
6	2.26	6.82	41.7	13.52	100	
7	2.39	6.83	41.1	13.12	97.3	
8	2.49	6.8	41.9	12.45	95	
9	2.6	6.78	42.1	12.38	92.3	
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18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

AREA INFORMATION

Area: Mammoth Lake
Sample ID: November Mammoth CREMP
Crew: LD - FL
Date: 13/11/2019
Time: 15:00
Weather: -22 Ice crystals
Observations: Discharging water from WTS

UTM Coordinates:
Easting: 604084
Northing: 7254456
Waypoint: NA
Total Water Depth: 14.4
Secchi Depth: NA

Phytoplankton collected?: No
Volume Filtered: NA
Field DUP collected?: No
Arsenic speciation collected?: No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1	1	6.93	183.1	13.67		
2	1.54	6.81	177.1	13.18		
3	1.68	6.79	179.7	12.95		
4	1.76	6.78	181	12.75		
5	1.8	6.76	181.6	12.5		
6	1.89	6.75	181.5	12.27		
7	1.95	6.74	181.8	12.02		
8	1.99	6.73	181.7	11.91		
9	2.05	6.72	182	11.68		
10	2.11	6.72	181.8	11.44		
11	2.17	6.71	181.7	11.26		
12	2.23	7.05	182.7	11.2		
13	2.29	6.86	182.5	11.26		
14	2.42	6.77	181.4	11.65		
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes:

Equipment Blank Collection Notes?

AREA INFORMATION

Area: Nemo Lake
Crew: LD - FL
Weather: -18 Snowy
Observations:

Sample ID: November Nemo CREMP
Date: 17/11/2019
Time: 15:15

UTM Coordinates: **Easting:** 606669 **Northing:** 7257708 **Waypoint:** NA
Total Water Depth: 16.58 **Secchi Depth:** NA

Phytoplankton collected?: No
Field DUP collected?: No
Volume Filtered: NA
Arsenic speciation collected?: No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0.5	0.9	7.1	108	15.48		
1	1.15	7.01	105.2	15.6		
2	1.23	7.01	103.3	15.57		
3	1.25	7.02	102.7	15.44		
4	1.29	7.03	102	15.32		
5	1.34	7.04	100.6	15.18		
6	1.4	7.05	99.2	15.01		
7	1.46	7.04	99.1	14.79		
8	1.49	7.04	99.4	14.61		
9	1.53	7.03	99.3	14.49		
10	1.58	7.01	100	14.35		
11	1.63	7	99.8	14.2		
12	1.67	6.98	99.8	14		
13	1.72	6.96	100.1	13.82		
14	1.78	6.93	100.3	13.63		
15	1.83	6.89	100.9	13.31		
16	1.81	6.87	101	13.11		
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes:

Equipment Blank Collection Notes?

AREA INFORMATION

Area: WTS
Sample ID: November WTS CREMP
Crew: JL, FL
Date: 06/12/2019
Time: 10:00
Weather: Sunny, cold, dry, no wind, -30C
Observations: Water discharging from water treatment plant

UTM Coordinates:
Easting: 607648
Northing: 7254502
Waypoint: NA
Total Water Depth: 6.77m
Secchi Depth: NA

Phytoplankton collected?: No
Volume Filtered: NA
Field DUP collected?: No
Arsenic speciation collected?: No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	% DO
units:	°C		µS/cm	mg/L	NTU	
0.5	frozen	frozen	frozen	frozen	frozen	frozen
1	frozen	frozen	frozen	frozen	frozen	frozen
2	0.45	7.12	91.4	14		97.8
3	0.77	7.05	91.4	14.26		99.8
4	0.9	7.04	90.9	14.22		99.7
5	0.92	7.01	98.5	14.09		98.7
6	1.01	7	99.5	13.92		97.8
7	1.16	6.98	99.4	13.74		97
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19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes: St-dd-8 taken nearby
Turbidity sensor is broken

Equipment Blank Collection Notes?

AREA INFORMATION

Area: Mammoth Lake
Sample ID: December Mammoth Profile
Crew: LD - KM
Date: 12/12/2019
Time: 11:50
Weather: -29 Mainly sunny
Observations: Water discharging from WTS lake

UTM Coordinates:
Easting: 604084
Northing: 725456
Waypoint: NA
Total Water Depth: 14.61
Secchi Depth: NA

Phytoplankton collected?: No
Volume Filtered: NA
Field DUP collected?: No
Arsenic speciation collected?: No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	% DO
units:	°C		µS/cm	mg/L	NTU	
0	frozen	frozen	frozen	frozen	frozen	frozen
1	0.67	6.78	180	13.59		
2	1.28	6.76	194.4	12.67		
3	1.85	6.73	195.8	12.7		
4	1.96	6.72	195.4	11.8		
5	2.1	6.71	195.4	11.25		
6	2.16	6.75	195.3	10.9		
7	2.22	6.74	195.2	10.65		
8	2.29	6.76	195.1	10.31		
9	2.34	6.8	195.2	9.98		
10	2.43	6.83	194.7	9.63		
11	2.48	6.93	194.6	9.11		
12	2.52	7.01	196.4	9.05		
13	2.64	7.11	196.3	9.18		
14	2.79	7.22	195	10		
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes: St-dd-8 taken nearby
Turbidity sensor is broken

Equipment Blank Collection Notes?

AREA INFORMATION

Area: Nemo Lake
Sample ID: December Nemo Profile
Crew: LD - KM
Date: 12/12/2019
Time: 14:20
Weather: -29 Mainly sunny
Observations:

UTM Coordinates:
Easting: 606542
Northing: 7257427
Waypoint: NA
Total Water Depth: 9.27
Secchi Depth: NA

Phytoplankton collected?: No
Volume Filtered: NA
Field DUP collected?: No
Arsenic speciation collected?: No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	% DO
units:	°C		µS/cm	mg/L	NTU	
0	frozen	frozen	frozen	frozen	frozen	frozen
1	0.73	7.68	129.4	15.5		
2	1.28	7.7	116.6	15.02		
3	1.38	7.82	114.7	14.82		
4	1.42	7.84	113.3	14.67		
5	1.47	7.88	112.6	14.49		
6	1.53	7.93	111.5	14.34		
7	1.56	7.97	111.4	14.2		
8	1.61	8.02	112.1	14		
9	1.67	8.06	112.8	13.69		
10						
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BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP	
	1 x 500 mL plastic	TSS (low level), TDS (low level)	
	1 x 125 mL amber	TOC, total P, NH3, TKN	
	1 x 125 mL amber	DOC	
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).	
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.	
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.	
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.	
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube	
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)	

Field Notes: St-dd-8 taken nearby
Turbidity sensor is broken

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage East (TPE)
Sample ID: 2019-12-14 TPE CREMP PROFILE
Crew: NS/AB/DN
Date: 14/12/2019 **Time:** 11:30
Weather: -25
Observations: Ice thickness: 1 m

UTM Coordinates: 14W **Easting:** 636194 **Northing:** 7214914 **Waypoint:**

Total Water Depth: 12.21m **Secchi Depth:**

Phytoplankton collected?: Yes No **Volume Filtered:**

Field DUP collected?: Yes No **Arsenic speciation collected?:** Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Dissolved Oxygen	
units:	°C		µS/cm	mg/L	%	
0						
1	0.04	6.2	34.8	17.26	118.3	
2	0.5	6.35	33.7	17.23	119.3	
3	0.65	6.43	33.3	17.33	120.7	
4	0.77	6.55	31.9	16.48	114.8	
5	0.9	6.59	30.5	16.05	111.3	
6	0.96	6.62	30.3	15.6	109.1	
7	1.03	6.63	31.2	15.25	107.4	
8	1.08	6.65	31	15.1	106.3	
9	1.13	6.66	30.7	14.99	105.7	
10	1.16	6.67	31.2	14.81	104.6	
11	1.18	6.68	31.7	14.73	104.1	
12	1.24	6.69	31.7	14.66	103.9	
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Profile only

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: Third Portage North (TPN) **Sample ID:** 2019-12-14 TPN CREMP PROFILE
Crew: NS/AB/DN **Date:** 14/12/2019 **Time:** 10:50
Weather: -22
Observations: Ice Thickness - 1m

UTM Coordinates: **14W** **Easting:** 638041 **Northing:** 7210108 **Waypoint:**

Total Water Depth: 24+ m **Secchi Depth:**

Phytoplankton collected?: Yes No **Volume Filtered:**

Field DUP collected?: Yes No **Arsenic speciation collected?:** Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Dissolved Oxygen	
units:	°C		µS/cm	mg/L	%	
0						
1	0.58	6.71	32.9	15.43	107.7	
2	0.74	6.58	30.5	15.79	110.4	
3	0.79	6.63	29.4	15.7	109.8	
4	0.85	6.67	28.4	15.58	109	
5	0.97	6.71	27.5	15.28	106.7	
6	1	6.73	27.4	14.9	104.5	
7	1.07	6.74	27.3	14.6	102.8	
8	1.13	6.75	27.3	14.45	101.9	
9	1.18	6.76	27.4	14.31	101.1	
10	1.24	6.77	27.3	14.2	100.5	
11	1.27	6.78	27.3	14.14	100.1	
12	1.28	6.79	27.3	14.07	99.7	
13	1.3	6.8	27.4	14.02	99.4	
14	1.32	6.81	27.4	13.97	99.1	
15	1.34	6.81	27.4	13.91	98.7	
16	1.36	6.81	27.4	13.83	98.3	
17	1.39	6.82	27.5	13.81	98.2	
18	1.42	6.82	27.5	17.76	97.9	
19	1.44	6.81	27.6	13.68	97.3	
20	1.46	6.8	27.7	13.61	96.9	

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Profile only

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: WAL
Sample ID: 2019-12-14 WAL CREMP PROFILE
Crew: NS/AB/DN
Date: 14/12/2019
Time: 3:05
Weather: -29
Observations: Ice Thickness: 1m

UTM Coordinates: 15W Easting: 362431
Northing: 7221417
Waypoint:

Total Water Depth: 5.88m
Secchi Depth:

Phytoplankton collected?: Yes No
Volume Filtered:

Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1	1	6.71	41.1	16.87	16.6	
2	1.4	6.61	37.1	16.78	119.5	
3	1.64	6.7	34.7	16.51	118.2	
4	1.68	6.72	35.5	16.02	114.1	
5	1.73	6.73	36.3	15.47	110.8	
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Profile only

Equipment Blank Collection Notes?

Water Sampling and Limnology

AREA INFORMATION

Area: SPLE
Sample ID: 2019-12-15 SPLE Profile
Crew: NS/AB
Date: 15/12/2019
Time: 2:00
Weather: -25
Observations:

UTM Coordinates: 14W Easting: 639488 Northing: 7213898 Waypoint:

Total Water Depth: 19.2m
Secchi Depth:

Phytoplankton collected?: Yes No
Volume Filtered:

Field DUP collected?: Yes No
Arsenic speciation collected?: Yes No

FIELD MEASUREMENTS

Depth	Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity	
units:	°C		µS/cm	mg/L	NTU	
0						
1	0.41	6.66	41.9	16.28	112.8	
2	0.85	6.68	40.8	16.2	113.6	
3	1.25	6.7	40.9	16.02	113.3	
4	1.4	6.73	40.2	15.72	111.6	
5	1.47	6.74	39.9	15.39	109.2	
6	1.51	6.76	40.1	15.06	107	
7	1.55	6.77	40.4	14.76	105.1	
8	1.59	6.78	40.6	14.5	103.4	
9	1.63	6.79	40.7	14.06	100.5	
10	1.73	6.79	41.7	13.58	100.3	
11	1.93	6.79	42.7	13.53	97.3	
12	2.18	6.74	43	13.14	95.2	
13	2.35	6.7	44.1	12.35	89.7	
14	2.43	6.66	45.2	11.83	86.1	
15	2.52	6.63	46.3	11.03	80.4	
16	2.62	6.61	47.6	10.5	76.9	
17	2.78	6.57	48.7	9.62	70.6	
18	3	6.53	49.9	8.91	65.8	
19	3.22	6.45	50.6	7.79	58.2	
20						

BOTTLE CHECKLIST

ALS	1 x 500 mL plastic	Alkalinity species, pH, turbidity, EC, conductivity, anions, low level chloride, silicate, ortho-PO4, TDP
	1 x 500 mL plastic	TSS (low level), TDS (low level)
	1 x 125 mL amber	TOC, total P, NH3, TKN
	1 x 125 mL amber	DOC
	1 x 145 mL plastic	Cyanide: One bottle for total cyanide (low level) and free cyanide (low level).
	2 x 40 mL glass	Mercury: One vial for total mercury. One bottle for dissolved mercury.
	2 x 60 mL plastic	Metals: One bottle for total metals. One bottle for dissolved metals.
	1 x 60 mL brown HDPE	Arsenic speciation: filter sample (bottle precharged with EDTA). Add acetic acid in the field. **Fill with NO HEADSPACE**.
	1 x 1 L plastic	Chlorophyll-a: Collect 1 L of water and **filter 500 mL** back at Site. Place filter in 15 mL black tube
Plankton-R-Us	1 x 50 mL glass	Phytoplankton (add **5 drops** of **Lugol's** back at the lab)

Field Notes: Profile only

Equipment Blank Collection Notes?

APPENDIX I
UPDATES TO TRIGGERS AND THRESHOLDS IN 2019

Report Version

Document	Date
Appendix A – Statistical Analyses for Water Chemistry. In: *Core Receiving Environment Monitoring Program (CREMP): Design Document 2012* -> First iteration of the water chemistry triggers for Meadowbank and Baker Lake study areas	December 2012
Appendix A – Updated Threshold and Trigger Development for CREMP Water Parameters. In *CREMP 2013 Annual Report*. -> Triggers developed specifically for Wally Lake -> Minor updates to the triggers	March 2014
Appendix A – Updated Threshold and Trigger Development for CREMP Water Parameters. In *CREMP 2014 Annual Report*. -> Minor updates to include more recent water chemistry data -> New thresholds added from other jurisdictions for parameters not covered by the CCME freshwater aquatic life guidelines	March 2015
Appendix D – Updated threshold and trigger development for CREMP water parameters. In: *Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update* -> No change from previous version. Re-packed for the updated CREMP Design Document	November 2015
Appendix I – Water Quality Triggers – 2019 Update. In *CREMP 2019 Annual Report* -> New triggers for the Whale Tail Pit study area lakes -> Revised triggers for Meadowbank, Wally, and Baker Lake study areas based on updated thresholds published since 2015.	March 2020

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I.1 INTRODUCTION

Updates to the water quality triggers and thresholds were completed in 2019, coinciding with the first year of *before-after / control-impact* (BACI) data analysis for the Whale Tail Pit project.

I.2 THRESHOLDS AND TRIGGERS

I.2.1 Data

The data used to develop triggers were the standard control ("baseline") samples – duplicates and depth replicates were excluded as they are pseudo-replicates of standard samples. All baseline samples through September 2019 were used. The number of baseline samples collected for each system was 351 for Meadowbank, 34 for Wally, 64 for Baker, and 306 for WTP. The development of triggers was based on baseline data specific to each system (Meadowbank, Wally, Baker, and WTP). The control/impact status of all CREMP sampling areas since the beginning of monitoring is outlined in **Table I-1.**

I.2.2 Methods

The main text has described the rationale and approach for development of thresholds and triggers. There were three basic methods of trigger development as follows:

1. When a threshold (e.g., CCME guideline) was established, the trigger was set as the maximum of either (a) the value halfway between the baseline median and the threshold (*Method A*), or (b) the 95th percentile of the baseline data (*Method B*).
2. When a threshold was not established, the trigger was set equal to the maximum of either the 95th percentile of the baseline data (*Method B*) or two times the current detection limit (*Method C*).

Medians and 95th percentiles were chosen as metrics rather than means, standard deviations, or maximums, because the former are generally robust to skewed distributions and potential outliers. When required, robust methods were used to estimate medians and 95th percentiles to account for values below detection limits (i.e., censored data; Helsel 2012). The analytical procedures for a given variable were as follows. First, all data reported detection limits greater than the maximum observed value were removed (such values contain no information regarding summary statistics of the data distribution; Helsel 2012). Next, classical estimates of medians and 95th percentiles were computed if possible (i.e., when there was the required number of observations exceeding detection limits). When there was insufficient data to compute a classical estimate, the median and/or 95th percentile were estimated using the robust "Regression on Order Statistics" (ROS) method as recommended by Helsel (2012) and implemented in the function "cenros" in the R package NADA. However, Helsel (2012) suggests that estimates of summary statistics such as the median are typically unreliable when more than 80% of the observations are censored (below detection limits). Thus, ROS estimates were only used when at least 20% of the observations were above detection limits. When a threshold was established but there was no viable estimate of the median, the current detection limit was used in *Method A* above. When a threshold was not established and there was no viable estimate of the 95th percentile, *Method C* was used.

There were special considerations for several variables, specifically t-Al, t-Cd, t-Mn, t-Zn, d-Al, ammonia-N, t-P, pH and TSS. These cases are explained in detail below.

I.2.3 Results

Thresholds for the 2019 trigger update are summarized in **Table I-2**. For comparative purposes, the previous threshold values from the 2014 update are included in the table, along with updated references for those parameters with threshold values that have changed. In most cases, the threshold was equal to a given guideline, but there were exceptions for a few variables as discussed below. Note that in cases where a water quality guideline exists but Method B was used for trigger development (i.e., cases where baseline data already exceed the guideline for > 5% of cases), it is possible for the trigger to equal or exceed the guideline (e.g., this occurs for total phosphorus, several lower pH triggers, and the Baker triggers for chloride and total/dissolved strontium). In such cases, the guideline is reported as the threshold but is not used as a criterion for action; rather, the trigger is the only criterion for action as is the case for variables lacking water quality guidelines.

There are three variables (t-Cu, t-Pb, t-Ni) for which the water quality guidelines are specific to water hardness ranges below 82, 60, and 60 mg/L $CaCO_3$, respectively. Hardness levels for baseline samples were consistently below 60 mg/L $CaCO_3$ in all four systems. For example, as reported in Table I-3, Table I-6, Table I-12, and **Table I-9** , the 95th percentiles for hardness were 9.5, 16.7, 64.7, and 17.4 mg/L $CaCO_3$ for Meadowbank, Wally, Baker, and WTP samples, respectively. Thus, for these three variables, the guidelines associated with low hardness ranges were used as thresholds.

There were several variables that warranted special consideration in the development of thresholds and/or triggers. These are discussed in the following sections.

I.2.3.1 Ammonia (as N)

The CCME guideline for total ammonia in freshwater is pH and temperature dependent, with more stringent guidelines applying at higher pH and higher temperature. The proposed threshold for Ammonia-N (all systems) was conservatively derived using two discrete CCME guidelines corresponding to specific pH and temperature values. Note that the maximum pH among baseline data for Meadowbank/Wally/Baker/WTP is 8.85, while maximum temperatures in the lakes are around 16 to 18 degrees. The two CCME guidelines that span these maximum (i.e., worst-case) conditions are as follows: (1) total ammonia = 0.239 mg/L for pH = 8.5 and temperature = 15 degrees; and (2) total ammonia = 0.067 mg/L for pH = 9.0 and temperature = 20 degrees. The mid-point of these two values is 0.153 mg/L, which when converted from total ammonia to total ammonia as N is 0.126 mg/L.

Thus, the proposed threshold for ammonia-N is 0.126 mg/L. Application of this threshold provided trigger values of 0.065, 0.067, 0.066, and 0.065 mg/L respectively for Meadowbank (**Table I-3**), Wally (**Table I-6.**), WTP (**Table I-9.**), and Baker Lake (**Table I-12.**). Only at extreme pH and temperature would this trigger potentially exceed the CCME guideline. Whenever the trigger is exceeded, the concentrations of ammonia-N should be compared to the CCME guideline based on the specific pH and field temperature of each sample.

I.2.3.2 Total Phosphorus

The CCME does not specify a particular guideline for total phosphorus, but instead establishes a guidance framework for site-specific application. Under that framework, the specification for ultra-oligotrophic lakes is for total-P of <0.004 mg/L. The framework notes that up to a 50% increase in total-P over baseline is generally considered acceptable. Regardless, the 95th percentiles for Total-P exceeded 0.004 mg/L for Meadowbank, Wally, Baker, and WTP samples (Table I-3, Table I-6, Table I-12, and **Table I-9**). Consequently, the proposed lake-specific triggers were set equal to these 95th percentiles (Method B, Table I-3, Table I-6, **Table I-9**, and Table I-12).

I.2.3.3 pH

The CCME guideline for pH in freshwater is a range from 6.5 to 9.0. Thus, for pH, there is both an upper threshold (9.0) and a lower threshold (6.5), with associated upper and lower triggers (Tables 3A & 3B). In all cases except for laboratory pH at Wally Lake, the lower trigger was based on Method B because the 5th percentiles of the baseline data were close to or less than the lower threshold of 6.5 (Table I-3, Table I-6, **Table I-9**, and Table I-12).

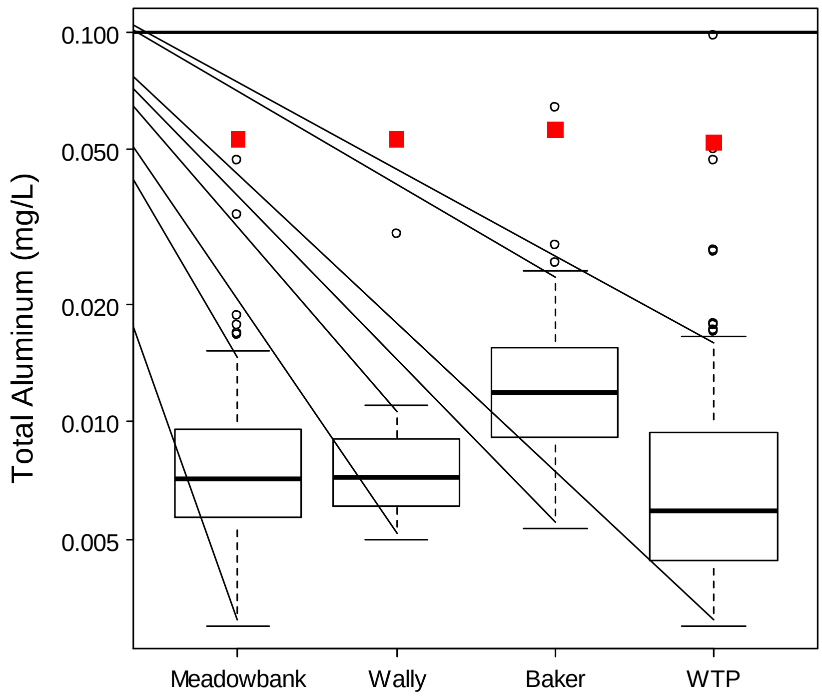
I.2.3.4 Total Suspended Solids

For water bodies with low natural TSS, the CCME guideline is a maximum increase of 25 mg/L over background for short periods (e.g., 24h) and a maximum increase of 5 mg/L over background for longer periods (e.g., 24h to 30 days). If we conservatively assume a background TSS of 0 mg/L, then thresholds of 25 mg/L and 5 mg/L would apply for short-term and long-term exposures, respectively. However, because sampling occurs at most once per month, it will be unknown whether a given TSS measure is a short-term (< 24 h) or longer term (> 24 h) phenomenon. We therefore propose a TSS trigger based on the lower threshold of 5 mg/L, which thereby addresses both short and long durations. The resulting triggers, based on Method A, were 3.0 mg/L for all four systems (Table I-3, Table I-6, **Table I-9**, and Table I-12).

I.2.3.5 Total Aluminum

The CCME guideline for t-Al in water is 0.005 mg/L when pH < 6.5, and 0.1 mg/L when pH ≥ 6.5. Across baseline samples for Meadowbank/Wally/Baker/WTP (n = 648), there were 29 cases of pH < 6.5, and 19 of these occurred during the months of July, August, and September in 2014 (at stations INUG, PDL, TPS, and TEFF). Since September 2014, there was only one baseline sample with pH < 6.5 (pH = 6.41 at station A20 in April 2016, with t-Al = 0.0033 mg/L).

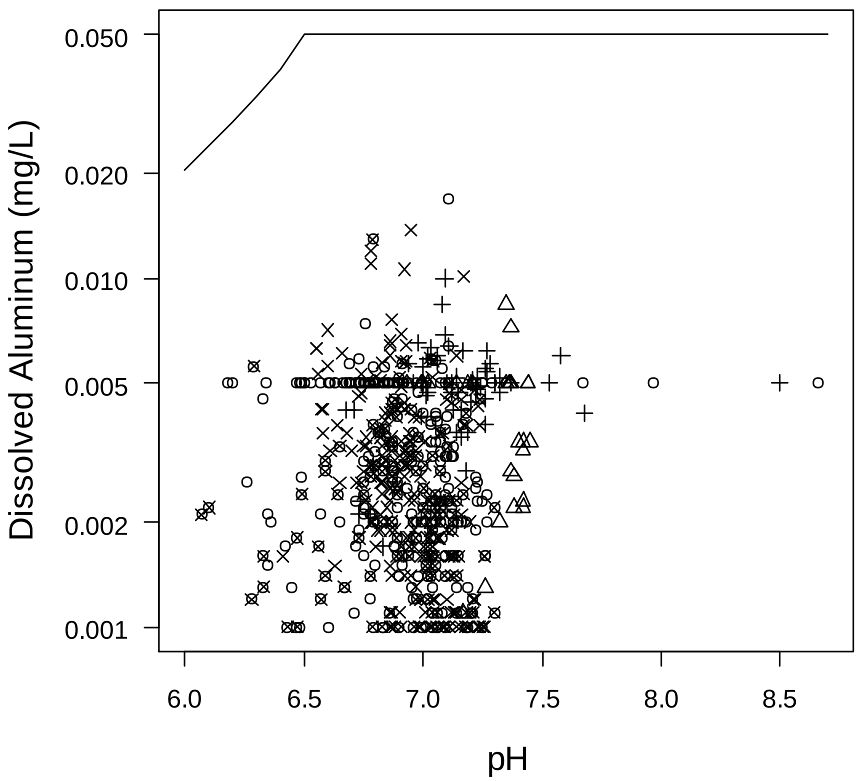
Given the strong tendency for pH to equal or exceed 6.5 across baseline samples, the CCME guideline of 0.1 mg/L was adopted as the threshold for t-Al, and triggers were computed for each system based on Method A (**Table I-4.** [Meadowbank], **Table I-7.** [Wally], **Table I-10.** [WTP], **Table I-13.** [Baker]). For example, across the 351 Meadowbank samples, the median t-Al was 0.006 mg/L and the 95th percentile was 0.013 mg/L (**Table I - 4**). Based on Method A, the value halfway between the median t-Al and the threshold is 0.053 mg/L (i.e., [0.1 – 0.006]/2 = 0.053), which is larger than the 95% percentile (Method B), and thus the proposed trigger for Meadowbank t-Al is 0.053 mg/L. Similar trigger values were computed for Wally, Baker, and WTP. As an example, the following figure shows box-plots of t-Al values (> DL; in log scale) for each system, as well as the guideline (solid line) and proposed triggers (solid red squares).



I.2.3.6 Dissolved Aluminum

There is no CCME guideline for d-Al in water. However, a pH-dependent water quality guideline for d-Al (mg/L) has been developed by BC MOE for protection of freshwater aquatic life. For pH < 6.5, the guideline is as follows: d-Al = $e^{(1.6-3.327*pH + 0.402*K)}$ where K = pH^2. For pH ≥ 6.5, the guideline is 0.05 mg/L. This relationship is illustrated in the figure below (solid curve) across the range of baseline observations of pH for Meadowbank (circles), Wally (triangles), Baker (“+”), and WTP (“x”). The BC MOE guideline greatly exceeds all observed values of d-Al.

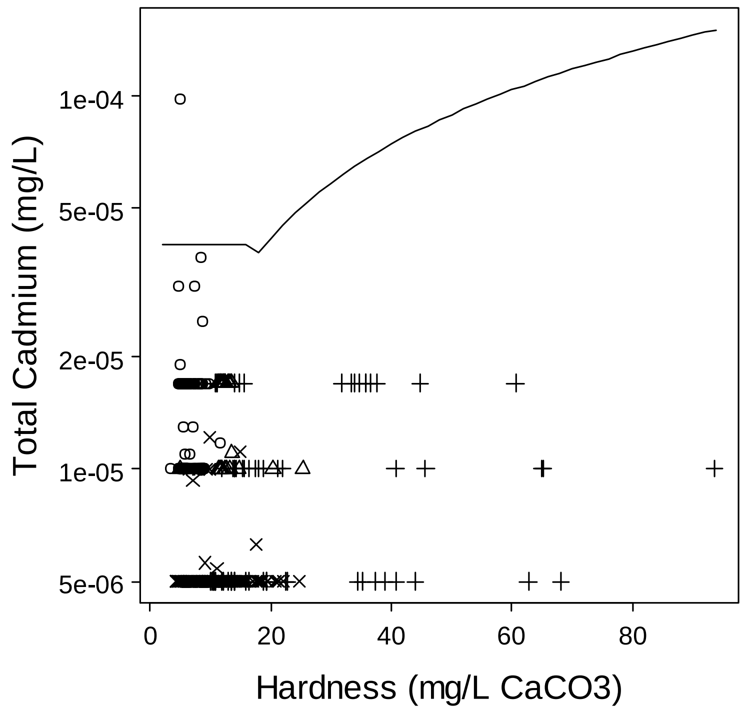
Again, we propose a single d-Al trigger for each system. Based on the median lab pH observed for Meadowbank (6.90), Wally (7.35), Baker (7.14), and WTP (6.94), the corresponding BC MOE guideline for d-Al is 0.05 mg/L in each case. The proposed triggers for d-Al (based on Method A and ROS estimates for median d-Al) are 0.026 mg/L for Meadowbank (**Table I-5.**), 0.026 mg/L for Wally (**Table I-8.**), 0.026 mg/L for WTP (**Table I-11.**), and 0.027 mg/L for Baker (**Table I-14.**).



I.2.3.7 Total Cadmium

The hardness-dependent CCME guideline for t-Cd (mg/L) is 0.00004 when water hardness (mg/L $CaCO_3$) is less than 17.0, and equal to 0.001*100.83*log10(H)-2.46 (where H = hardness) when water hardness is ≥ 17.0 and ≤ 280. The relationship is illustrated in the figure below (solid curve) across the range of baseline observations of hardness for Meadowbank (circles), Wally (triangles), Baker ("+"), and WTP ("x"). Note that measurements of t-Cd exceeded detection limits for 20 of 648 baseline samples, and just one measure exceeded the CCME guideline (station TPE, hardness = 5.05, t-Cd = 0.000098 mg/L).

The median sample values of hardness for Meadowbank (6.19), Wally (12.20), and WTP (9.10) were all less than 17.0 mg/L $CaCO_3$, and hence, the CCME guideline of 0.00004 mg/L was set as the threshold for each system. For Baker, median hardness (17.65) was slightly above 17.0 mg/L $CaCO_3$; however, the corresponding guideline (0.000038 mg/L; see equation above) is below the intended lower limit of 0.00004 mg/L due to numerical imprecision (e.g., see the slight reduction in the curve below for hardness values slightly above 17.0 mg/L $CaCO_3$). Thus, the CCME lower limit for t-Cd (0.00004 mg/L) applies to Baker as well. Because there were insufficient data to compute medians or 95th percentiles for t-Cd, the trigger was computed via Method A using the current detection limit (i.e., halfway between 0.000005 and 0.00004), providing a trigger value of 0.000023 for all four study areas (Meadowbank, Wally Lake, Whale Tail, and Baker Lake).



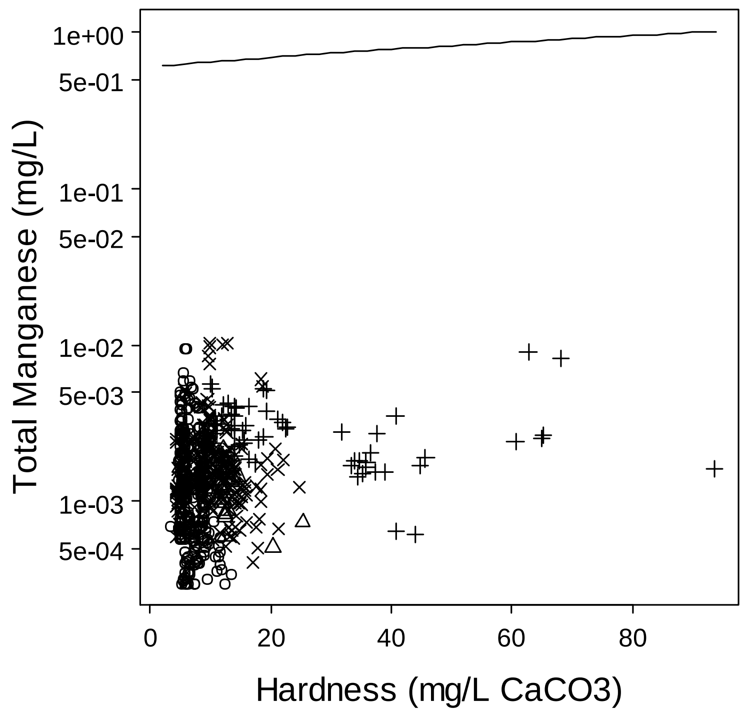
I.2.3.8 Total Manganese[1]

The hardness-dependent BC MOE guideline for t-Mn (mg/L) is 0.0044*H + 0.605, where H = hardness (mg/L $CaCO_3$). This guideline is based on numerous studies for fish, invertebrates and plants. The relationship is illustrated in the figure below (solid curve) across the range of baseline observations of hardness for Meadowbank (circles), Wally (triangles), Baker ("+"), and WTP ("x"). The guideline greatly exceeds observed t-Mn values for all samples.

For simplicity, we propose a single t-Mn trigger for each system. To compute the t-Mn trigger, we first computed the guidelines corresponding to the median values of hardness observed for Meadowbank samples (median hardness = 6.19 mg/L, t-Mn guideline = 0.63 mg/L), Wally

[1] CCME derived short- and long-term freshwater aquatic life water quality guidelines for dissolved manganese in 2019. The update to the triggers were completed prior to the release of the CCME WQGs, so for the current iteration of the CREMP WQG triggers, the threshold for total manganese published by BC MOE was adopted as the threshold for total and dissolve manganese. The dissolved manganese CCME WQG will be incorporated into the next update of the CREMP water quality triggers.

samples (median hardness = 12.2 mg/L $CaCO_3$, t-Mn guideline = 0.66 mg/L), Baker samples (median hardness = 17.65 mg/L $CaCO_3$, t-Mn guideline = 0.68 mg/L), and WTP samples (median hardness = 9.10 mg/L $CaCO_3$, t-Mn guideline = 0.65 mg/L). The corresponding lake-specific triggers for t-Mn (using Method A) are 0.32 mg/L for Meadowbank (**Table I - 4**), 0.33 mg/L for Wally (**Table I-7.**), 0.032 mg/L for WTP (**Table I-10.**) and 0.34 mg/L for Baker (**Table I-13.**).



I.2.3.9 Total Zinc

As discussed below, a long-term freshwater aquatic life WQG was recently developed for dissolved zinc (d-Zn). However, the triggers developed for d-Zn were lower than the current DL for total zinc (t-Zn; 0.003 mg/L) for all systems except Baker. Given this problem, and because d-Zn best represents the bioavailable fraction, we did not develop a trigger for t-Zn for any of the four systems. Instead, monitoring and trigger evaluations for zinc will focus on d-Zn.

I.2.3.10 Dissolved Zinc

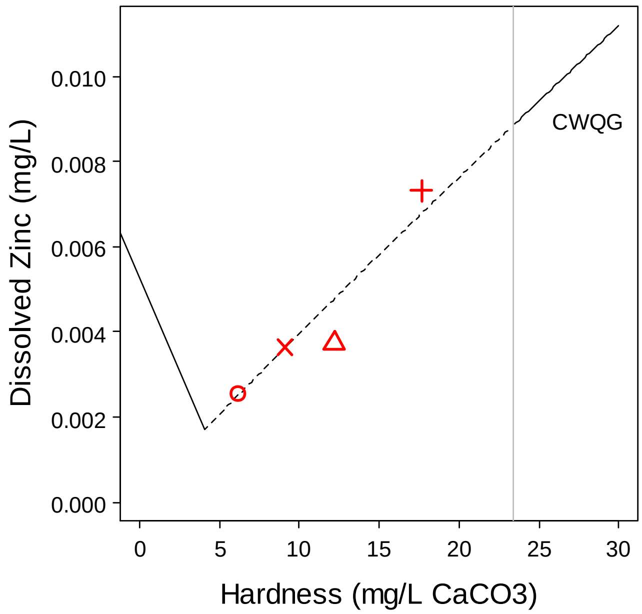
The new 2018 long-term freshwater aquatic life WQG for dissolved zinc (d-Zn; mg/L) is calculated as:

$$\text{Zinc WQG} = 0.001 \times e^{0.947*\ln(H) - 0.815*pH + 0.398*\ln(DOC) + 4.625}$$

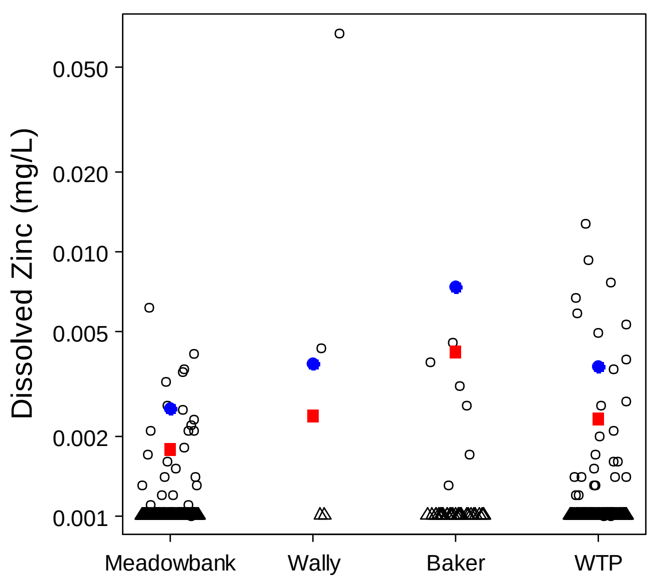
where H = hardness (mg/L $CaCO_3$), pH is in standard units, and DOC = dissolved organic carbon (mg/L). As for t-Mn, we propose a single d-Zn trigger for each system. To compute the d-Zn trigger, we first computed the d-Zn guideline corresponding to the median values of hardness, pH, and DOC observed for baseline samples within each system, as summarized in the table below. Triggers were then computed using Method A with the current DL = 0.001 mg/L for d-Zn (i.e., too few d-Zn values were above detection limits to estimate a median d-Zn value for any system), as reported in the table below and in **Table I-5.** (Meadowbank) **Table I-8.** (Wally) **Table I-11.** (WTP), and **Table I-14.** (Baker).

Metric	Meadowbank	Wally	WTP	Baker
Median hardness (mg/L)	6.19	12.20	9.10	17.65
Median pH (lab)	6.90	7.35	6.94	7.14
Median DOC (mg/L)	1.67	2.20	1.79	3.23
Computed CWQG	0.00254	0.00375	0.00365	0.00732
Current d-Zn DL (mg/L)	0.001	0.001	0.001	0.001
Trigger d-Zn (mg/L) (Method A)	0.0018	0.0024	0.0023	0.0042

It is important to note that these triggers for d-Zn are uncertain and perhaps overly conservative because they occur at hardness levels that are often much lower than the data range used to develop the long-term CWQG for d-Zn (i.e., hardness between 23.4 and 399 mg/L $CaCO_3$; CCME 2018). CCME (2018) states: *Where users want a more stringent WQG for waters below the DOC and hardness limits or above the pH limit, they should extrapolate with caution and contact their local authority for advice*. The following figure depicts the extrapolated CWDG for d-Zn as a function of hardness (with pH set to 7.0 and DOC set to 2 mg/L), and illustrates the extent to which the system-specific median hardness values fall below the lower limit for hardness (23.4 mg/L). In this figure, the solid-line portion of the curve is within the hardness range of data used to derive the CWQC (≥ 23.4 mg/L), the dashed line extrapolates below the lower hardness limit (23.4 mg/L; grey vertical line), and red symbols denote the CWQG computed for each system based on the median values for hardness, pH, and DOC across baseline samples (circle = Meadowbank; triangle = Wally; "+" = Baker; "x" = WTP). It is clear that the median-based CWQGs for d-Zn reported in the table above are largely determined by differences in hardness – when a symbol is off the dashed curve, it is due to slight differences in median pH or DOC values (table above) relative to the specified values (pH = 7.0; DOC = 2.0 mg/L) used to compute the curve.



The next figure shows the baseline measurements of d-Zn for each system that were either above (open circles) or at the current detection limit (0.001 mg/L; open triangles). Data are jittered along the x-axis to aid visualization. The median-based CWQGs (blue solid circles) and triggers (red solid squares) are shown for each system. Across baseline measurements examined for Meadowbank (n=172), Wally (13), Baker (46), and WTP (199), there were few exceedances of the CWQG (6, 2, 0, and 8, respectively) and proposed triggers (13, 2, 1, and 11, respectively).



TABLES

Table I-1. Status of all CREMP sampling areas since the beginning of monitoring.

Area	Meadowbank Areas									Baker Lake Areas				Whale Tail Pit Areas					
Designation	**REF**	**REF**	**NF**	**NF**	**NF**	**NF**	**MF**	**MF**	**FF**	**REF**	**REF**	**NF**	**NF**	**NF**	**NF**	**NF**	**MF**	**MF**	**FF**
Station	**INUG**	**PDL**	**TPN**	**SP**	**TPE**	**WAL**	**TPS**	**TE**	**TEFF**	**BAP**	**BES**	**BBD**	**BPJ**	**WTS**	**MAM**	**NEM**	**A20**	**A76**	**DS1**
2006	C		C	C	C	C	C	C											
2007	C		C	C	C	C	C	C											
2008	C		C	I (Aug)	C	C	C	I (Aug)		C		I	I						
2009	C	C	I (Mar)	I	I (Aug)	C	C	I	C	C		I	I						
2010	C	C	I	I	I	C	C	I	C	C		I	I						
2011	C	C	I	I	I	C	C	I	C	C	C	I	I						
2012	C	C	I	I	I	C	C	I	C	C	C	I	I						
2013	C	C	I	I	I	I (Jul)	C	I	C	C	C	I	I						
2014	C	C	I	I	I	I	C	I	C	C	C	I	I	C	C	C			
2015	C	C	I	I	I	I	C	I	C	C	C	I	I	C	C	C			
2016	C	C	I	I	I	I	C	I	C	C	C	I	I	C	C	C	C	C	C
2017	C	C	I	I	I	I	C	I	C	C	C	I	I	C	C	C	C	C	C
2018	C	C	I	I	I	I	C	I	C	C	C	I	I	I (Aug)	I (Nov)	C	C	C	C
2019	C	C	I	I	I	I	C	I	C	C	C	I	I	I	I	I (Aug)	I	I	I

Notes:

Area designations:

C=Control; I=Impact; REF=reference (in grey shading); NF=near-field (in blue shading); MF=mid-field (in pink shading); FF=far-field (in teal shading)

Blank cells indicate the area was not part of the monitoring program that year.

Area IDs:

Meadowbank and Whale Tail Pit Reference areas: INUG = Inuggugayualik Lake; PDL = Pipedream Lake

Meadowbank areas: TPN, TPE, TPS = Third Portage Lake - North, East, South basins; SP = Second Portage Lake; WAL = Wally Lake; TE,TEFF = Tehek Lake (Mid-field and Far-field)

Baker Lake areas: BAP, BES, BBD, BPJ=Baker Lake - Akilahaarjuk Point, East Shore, Barge Dock, Proposed Jetty.

Whale Tail Pit areas: WTS = Whale Tail Lake South Basin; MAM = Mammoth Lake; NEM = Nemo Lake; A20 = Lake A20; A76 = Lake A76; DS1 = Lake DS1

Table I-2. Thresholds for the Core Receiving Environment Monitoring Program.

Analyte	Threshold (2014)				Threshold (2019)				
	Value	Source	Year	Comments	Value	Direction	Source	Year	Comments
Anions & Nutrients (mg/L)									
Ammonia	0.126	CCME	2001	The proposed threshold for Ammonia-N (Meadowbank and Baker) was conservatively derived using two discrete CCME guidelines corresponding to specific pH and temperature values. Note that the maximum pH among baseline data for Meadowbank/Wally/Baker is 8.66, while maximum temperatures in the lakes are around 16 to 18 degrees. The two CCME guidelines that span these maximum (i.e., worst-case) conditions are as follows: (1) total ammonia = 0.239 mg/L for pH = 8.5 and temperature = 15 degrees; and (2) total ammonia = 0.067 mg/L for pH = 9.0 and temperature = 20 degrees. The mid-point of these two values is 0.153 mg/L, which when converted from total ammonia to total ammonia as N is 0.126 mg/L.	0.126	No change	CCME	2001	
pH	6.5-9	CCME	1987	Upper and lower thresholds	6.5-9	No change	CCME	1987	
TSS	5	CCME	1999		5	No change	CCME	1999	
Chloride	120	CCME	2011		120	No change	CCME	2011	
Fluoride	0.120	CCME	2002		0.120	No change	CCME	2002	
Nitrate (as N)	3.0	CCME	2012		3.0	No change	CCME	2012	
Nitrite	0.06	CCME	1987		0.06	No change	CCME	1987	
Total Phosphate (as P)	*<50% above baseline*	CCME	2004	CCME describes using trigger value, if not exceeded then need to assess if >50% increase above baseline or not.	*<50% above baseline*	No change	CCME	2004	
Sulphate (SO_4)	128	BC MOE	2013	From BC MOE, approved WQG, 2013; for very soft water (hardness=0-30 mg/L); 218 mg/L for soft to moderate (hardness=31-75 mg/L); 309 mg/L for moderate to hard (hardness=76-180).	128	No change	BC MOE	2013	
Total Metals (mg/L)									
Aluminum (T)	0.1	CCME	1987	The CCME guideline for t-Al in water is 0.005 mg/L when pH < 6.5, and 0.1 mg/L when pH ≥ 6.5. See text for details.	0.1	No change	CCME	1987	
Antimony (T)	0.020	BC MOE	2017	From BC MOE, working WQ guidelines, BC adopted from Ontario.	0.009	Lower	BC MOE	2017	Working WQG; Reference to ANZECC (2000b); for Sb(III)
Arsenic (T)	0.005	CCME	1997		0.025	Higher	Golder	2019	Site-specific number derived for the Whale Tail Pit Study areas (Addendum Volume 6, Appendix 6-I, Figure 6-I-2)
					0.005	No change	CCME	1997	Applies to Meadowbank, Wally, and Baker Lake study areas.
Barium (T)	1	BC MOE	2017	Working guideline (30-d average aka LT); Working WQG; Reference to Haywood and Drinnin (1983)	1	No change	BC MOE	2017	

Analyte	Threshold (2014)				Threshold (2019)				
	Value	Source	Year	Comments	Value	Direction	Source	Year	Comments
Beryllium (T)	0.0053	BC MOE	2000	Working guideline (short-term guideline)	0.00013	Lower	BC MOE	2000	Working WQG; Reference to ANZECC (2000a); Correction made to threshold (changed from short-term to long-term)
Boron (T)	1.5	CCME	2009		1.5	No change	CCME	2009	
Cadmium (T)	0.00004	CCME	2014	The hardness-dependent CCME guideline for t-Cd (mg/L) is 0.00004 mg/L when hardness > 0 to < 17 mg/L $CaCO_3$ and is 0.001*100.83*log(H)-2.46 where H = hardness (mg/L $CaCO_3$) when hardness is >= 17 to <= 280 mg/L $CaCO_3$. For hardness > 280 mg/L $CaCO_3$, the guideline is 0.00037 mg/L.	0.00004	No change	CCME	2014	
Chromium (T)	0.001	CCME	1997	The CCME guideline for hexavalent chromium (the most common form in surface waters) is 0.001 mg/L.	0.005	Higher	FEQG	2018	FEQG for Cr(VI)
Cobalt (T)	NA				0.00077	Lower	FEQG	2017	Hardness-dependent guideline: WQG=exp{(0.414[ln(hardness)] – 1.887} Value shown for hardness of 50 mg/L
Copper (T)	0.002	CCME	1987	The CCME guideline for t-Cu is 0.002 mg/L for hardness < 82 mg/L CaCO3.	0.002	No change	CCME	1987	*** Draft FEQG is out for public comment (July 2019) BLM
Iron (T)	0.3	CCME	1987	The CCME guideline for t-Fe is 0.3 mg/L.	0.3	No change	CCME	1987	*** Draft FEQG is out for public comment (July 2019) FEQG = 0.604 mg/L
Lead (T)	0.001	CCME	1987	The CCME guideline for t-Pb is 0.001 mg/L for hardness < 60 mg/L $CaCO_3$.	0.001	No change	CCME	1987	*** Draft FEQG is out for public comment (July 2019) FEQG = exp(0.684[ln(DOC)] + 0.924[pH] – 7.323)
Lithium (T)	0.096	BC MOE	2013	From BC MOE, working WQ guidelines, final chronic value, used in Michigan. Updated to 0.44 in 2013.	None	-	None	None	No CCME, BC MOE, or other applicable WQG for lithium; Previous BC MOE Working WQG is no longer listed
Manganese (T)	See text	BC MOE	2001	There is no CCME guideline for t-Mn in water. The hardness-dependent BC MOE guideline for t-Mn in mg/L is 0.0044*H + 0.605, where H = hardness (mg/L $CaCO_3$). See text for details.	See text	No change	BC MOE	2001	
Mercury (T)	0.000026	CCME	2003		0.000026	No change	CCME	2003	
Molybdenum (T)	0.073	CCME	1999		0.073	No change	CCME	1999	
Nickel (T)	0.025	CCME	1987	The CCME guideline for t-Ni is 0.025 mg/L for hardness < 60 mg/L $CaCO_3$.	0.025	No change	CCME	1987	
Selenium (T)	0.001	CCME	1987		0.001	No change	CCME	1987	

Analyte	Threshold (2014)				Threshold (2019)				
	Value	Source	Year	Comments	Value	Direction	Source	Year	Comments
Silver (T)	0.0001	CCME	1987		0.00025	Higher	CCME	2015	
Strontium (T)	0.049	Birge et al. 1979	2018	From the species sensitivity distribution in this De Beers report (Birge et al. 1979);	1.7	Higher	FEQG	2018	
Thallium (T)	0.0008	CCME	1999		0.0008	No change	CCME	1999	
Titanium (T)	2	BC MOE	2013	Working WQGs, median threshold level: *Scenedesmus.*	None	-	None	None	No CCME, BC MOE, or other applicable WQG for titanium; Previous BC MOE Working WQG is no longer listed
Uranium (T)	0.015	CCME	2011		0.015	No change	CCME	2011	
Vanadium (T)	0.006	BC MOE	2013	From BC MOE, working WQ guidelines, BC adopted from Ontario.	0.12	Higher	FEQG	2016	
Zinc (T)	See text	CCME Ekati	2018	The CCME water quality guideline for t-Zn is 0.030 mg/L. However, this guideline does not take into account hardness, and zinc toxicity is known to be hardness-dependent. An assessment for Ekati by EVS (2004) compiled data on species applicable to oligotrophic systems with low hardness, and developed a chronic benchmark for t-Zn that was hardness dependent. See text for details.	Apply the dissolved guideline as recommended by CCME	Variable/lower	CCME	2018	See comment for dissolved zinc below
Dissolved Metals (mg/L)									
Aluminum	0.05	BC MOE	2001	A pH-dependent water quality guideline for d-Al (mg/L) has been developed by BC MOE for protection of freshwater aquatic life when pH <6.5 as follows: d-Al = e(1.6-3.327*pH + 0.402*K) where K = pH2. For pH >= 6.5 the guideline is 0.05 mg/L See text for details.	0.05	No change	BC MOE	2001	Same approach as outlined in the trigger appendix document
Antimony	0.020		See above		0.009	Lower	See above	See above	Same as total
Arsenic	0.005		See above		0.025	Higher	See above	See above	Same as total
Barium	1		See above		1	No change	See above	See above	Same as total
Beryllium	0.0053		See above		0.00013	Lower	See above	See above	Same as total
Boron	1.5		See above		1.5	No change	See above	See above	Same as total
Cadmium	0.00004		See above		0.00004	No change	See above	See above	Same as total
Chromium	0.001		See above		0.005	Higher	See above	See above	Same as total
Cobalt	0.004		See above		0.00077	Lower	See above	See above	Same as total
Copper	0.002		See above		0.002	No change	See above	See above	Same as total
Iron	0.3		See above		0.3	No change	See above	See above	Same as total
Lead	0.001		See above		0.001	No change	See above	See above	Same as total
Lithium	0.096		See above		None	-	See above	See above	No threhsold for dissolved lithium as of 2019

Analyte	Threshold (2014)				Threshold (2019)				
	Value	Source	Year	Comments	Value	Direction	Source	Year	Comments
Manganese	same as Total		See above		See text	No change	See above	See above	** New CCME long-term WQG for dissolved manganese was published in 2019. The existing guideline from BC was carried forward for the 2019 update.
Mercury	0.000026		See above		0.000026	No change	See above	See above	Same as total
Molybdenum	0.073		See above		0.073	No change	See above	See above	Same as total
Nickel	0.025		See above		0.025	No change	See above	See above	Same as total
Selenium	0.001		See above		0.001	No change	See above	See above	Same as total
Silver	0.0001		See above		0.00025	Higher	See above	See above	Same as total
Strontium	0.049		See above		1.7	Higher	See above	See above	Same as total
Thallium	0.0008		See above		0.0008	No change	See above	See above	Same as total
Titanium	2		See above		None	-	See above	See above	No threhsold for dissolved titanium as of 2019
Uranium	0.015		See above		0.015	No change	See above	See above	Same as total
Vanadium	0.006		See above		0.12	Higher	See above	See above	Same as total
Zinc	same as Total		2018		0.004	Lower (0.004 vs 0.011) *** quick comparison assuming hardness of 10 under the old formula	CCME	2018	The long-term CWQG is for dissolved zinc and is calculated using the following equation: CWQG = exp(0.947[ln(hardness mg·L-1)] - 0.815[pH] + 0.398[ln(DOC mg·L-1)] + 4.625). *** WQG of 0.004 mg/L at hardness = 10, pH = 7, and DOC = 2

Table I-3. Meadowbank Water Quality Triggers – Nutrients and Conventional Parameters

Variable	Threshold	DL	Meadowbank Study Areas					
			N	>DL	Median	95th %ile	Trigger	Method
Ammonia-N	0.126	0.005	351	125	0.004	0.046	0.065	A
TKN	NA	0.05	323	295	0.101	0.172	0.17	B
Nitrate-N	3	0.005	351	48	NA	0.046	1.5	A
Nitrite-N	0.06	0.001	351	10	NA	NA	0.031	A
Ortho-phosphate	NA	0.001	339	24	NA	0.0011	0.002	C
T. phosphorous	0.004	0.002	339	128	0.0015	0.0051	0.0051	B
TOC	NA	0.5	351	351	1.73	2.6	2.6	B
DOC	NA	0.5	351	351	1.67	2.46	2.46	B
Reactive silica	NA	0.5	332	56	0.25	0.44	1	C
Bicarb. alkalinity	NA	1	311	311	5.8	8.7	8.7	B
Chloride	120	0.1	351	288	0.61	0.97	60.3	A
Fluoride	0.12	0.02	323	323	0.055	0.079	0.088	A
Carb. alkalinity	NA	1	339	0	NA	NA	2	C
Conductivity	NA	2	351	351	17.7	27.4	27.4	B
Hardness	NA	0.5	351	351	6.2	9.5	9.5	B
Calcium	NA	0.05	351	351	1.42	2.39	2.39	B
Potassium	NA	0.05	351	226	0.38	0.58	0.58	B
Magnesium	NA	0.005	351	351	0.71	0.93	0.93	B
Sodium	NA	0.05	351	226	0.56	1.16	1.16	B
Sulphate	128	0.3	351	351	1.44	4.83	64.7	A
pH Field (Upper)	9	0.1	321	321	7.12	8.15	8.15	B
pH Field (Lower)	6.5	0.1	321	321	7.12	6.40[a]	6.4	B
pH Lab (Upper)	9	0.1	351	351	6.9	7.25	7.95	A
pH Lab (Lower)	6.5	0.1	351	351	6.9	6.47[a]	6.47	B
Total Alkalinity	NA	1	311	311	5.8	8.7	8.7	B
TDS	NA	3	323	253	12.6	19	19	B
TSS	5	1	351	24	NA	NA	3	A

Notes: For each variable, thresholds (guidelines) are shown if applicable (see text for discussion); DL = current detection limit; N = sample measurements; >DL = number of measurements above DL; 95th %ile = 95th percentile if estimable; Method = method used to determine the trigger, where A = halfway from median (or DL if median not estimable) to threshold, B = 95th percentile, and C = 2-times the DL, NA = not applicable (thresholds) or not measured (summary statistics)

Table I-4. Meadowbank Water Quality Triggers – Total Metals

Variable	Threshold	DL	Meadowbank Study Areas					
			N	>DL	Median	95th %ile	Trigger	Method
Aluminum (T)	0.1	0.003	351	283	0.006	0.013	0.053	A
Antimony (T)	0.009	0.0001	350	1	NA	NA	0.0046	A
Arsenic (T)	0.005	0.0001	351	125	0.00013	0.00021	0.00257	A
Barium (T)	1	0.0001	351	226	0.002	0.0033	0.5	A
Beryllium (T)	0.00013	0.0001	351	0	NA	NA	0.000115	A
Boron (T)	1.5	0.01	351	1	NA	NA	0.76	A
Cadmium (T)	0.00004	0.000005	351	13	NA	NA	0.000023	A
Chromium (T)	0.005	0.0001	350	50	0.00006	0.00017	0.0025	A
Copper (T)	0.002	0.0005	351	83	0.00044	0.00064	0.0012	A
Iron (T)	0.3	0.01	351	78	0.0086	0.022	0.15	A
Lead (T)	0.001	0.00005	351	13	NA	NA	0.00053	A
Lithium (T)	NA	0.001	351	10	NA	NA	0.002	C
Manganese (T)	See text	0.0001	351	345	0.0013	0.0042	0.32	A
Mercury (T)	0.000026	0.000005	351	2	NA	NA	0.000016	A
Molybdenum (T)	0.073	0.00005	351	51	0.00003	0.00019	0.037	A
Nickel (T)	0.025	0.0005	351	71	0.0004	0.0008	0.013	A
Selenium (T)	0.001	0.00005	351	2	NA	NA	0.00053	A
Silicon (T)	NA	0.1	232	224	0.15	0.2	0.2	B
Silver (T)	0.00025	0.00001	351	5	NA	NA	0.00013	A
Strontium (T)	1.7	0.0002	339	335	0.0075	0.0108	0.028	A
Thallium (T)	0.0008	0.00001	351	1	NA	NA	0.00041	A
Tin (T)	NA	0.0001	351	3	NA	NA	0.0002	C
Titanium (T)	NA	0.0003	351	19	NA	NA	0.0006	C
Uranium (T)	0.015	0.00001	351	167	0.000039	0.000053	0.0075	A
Vanadium (T)	0.12	0.0005	351	0	NA	NA	0.06	A
Zinc (T)	See text	0.003	351	6	NA	NA	NA	NA

Notes: For each variable, thresholds (guidelines) are shown if applicable (see text for discussion); DL = current detection limit; N = sample measurements; >DL = number of measurements above DL; 95th %ile = 95th percentile if estimable; Method = method used to determine the trigger, where A = halfway from median (or DL if median not estimable) to threshold, B = 95th percentile, and C = 2-times the DL, NA = not applicable (thresholds) or not measured (summary statistics)

Table I-5. Meadowbank Water Quality Triggers – Dissolved Metals

Variable	Threshold	DL	Meadowbank Study Areas					
			N	>DL	Median	95th %ile	Trigger	Method
Aluminum (D)	0.05	0.001	311	205	0.002	0.005	0.026	A
Antimony (D)	0.009	0.0001	311	0	NA	NA	0.0046	A
Arsenic (D)	0.005	0.0001	311	89	0.00012	0.00018	0.00256	A
Barium (D)	1	0.0001	311	226	0.002	0.0033	0.5	A
Beryllium (D)	0.00013	0.0001	311	0	NA	NA	0.000115	A
Boron (D)	1.5	0.01	311	0	NA	NA	0.76	A
Cadmium (D)	0.00004	0.000005	311	5	NA	NA	0.000023	A
Chromium (D)	0.005	0.0001	310	9	NA	NA	0.00026	A
Copper (D)	0.002	0.0002	311	222	0.00037	0.00052	0.0012	A
Iron (D)	0.3	0.01	311	3	NA	NA	0.16	A
Lead (D)	0.001	0.00005	311	13	NA	NA	0.00053	A
Lithium (D)	NA	0.001	311	2	NA	NA	0.002	C
Manganese (D)	See text	0.0001	311	254	0.0004	0.0028	0.32	A
Mercury (D)	0.000026	0.000005	299	2	NA	NA	0.000016	A
Molybdenum (D)	0.073	0.00005	311	52	0.00005	0.00018	0.037	A
Nickel (D)	0.025	0.0005	311	42	NA	NA	0.013	A
Selenium (D)	0.001	0.00005	311	1	NA	NA	0.00053	A
Silicon (D)	NA	0.05	232	216	0.12	0.18	0.18	B
Silver (D)	0.00025	0.00001	311	0	NA	NA	0.00013	A
Strontium (D)	1.7	0.0002	311	308	0.0075	0.011	0.85	A
Thallium (D)	0.0008	0.00001	311	0	NA	NA	0.00041	A
Tin (D)	NA	0.0001	311	1	NA	NA	0.0002	C
Titanium (D)	NA	0.0003	311	1	NA	NA	0.0006	C
Uranium (D)	0.015	0.00001	310	166	0.00003	0.00004	0.0075	A
Vanadium (D)	0.12	0.0005	311	0	NA	NA	0.06	A
Zinc (D)	See text	0.001	311	25	NA	NA	0.0018	A

Notes: For each variable, thresholds (guidelines) are shown if applicable (see text for discussion); DL = current detection limit; N = sample measurements; >DL = number of measurements above DL; 95th %ile = 95th percentile if estimable; Method = method used to determine the trigger, where A = halfway from median (or DL if median not estimable) to threshold, B = 95th percentile, and C = 2-times the DL, NA = not applicable (thresholds) or not measured (summary statistics)

Table I-6. Wally Lake Water Quality Triggers – Nutrients and Conventional Parameters

Variable	Threshold	DL	Wally Lake					
			N	>DL	Median	95th %ile	Trigger	Method
Ammonia-N	0.126	0.005	34	12	0.007	0.024	0.067	A
TKN	NA	0.05	34	31	0.111	0.163	0.16	B
Nitrate-N	3	0.005	34	2	NA	NA	1.5	A
Nitrite-N	0.06	0.001	34	2	NA	NA	0.031	A
Ortho-phosphate	NA	0.001	34	3	NA	0.001	0.002	C
T. phosphorous	0.004	0.002	34	21	0.0028	0.0067	0.0067	B
TOC	NA	0.5	34	34	2.18	4.11	4.11	B
DOC	NA	0.5	34	34	2.2	3.21	3.21	B
Reactive silica	NA	0.5	32	14	0.74	1.08	1.08	B
Bicarb. alkalinity	NA	1	34	34	10	17.8	17.8	B
Chloride	120	0.1	34	15	0.47	0.64	60.2	A
Fluoride	0.12	0.02	30	30	0.039	0.053	0.08	A
Carb. alkalinity	NA	1	34	0	NA	NA	2	C
Conductivity	NA	2	34	34	28.7	36.6	36.6	B
Hardness	NA	0.5	34	34	12.2	16.7	16.7	B
Calcium	NA	0.05	34	34	3.34	4.88	4.88	B
Potassium	NA	0.05	34	14	0.37	0.59	0.59	B
Magnesium	NA	0.005	34	34	0.96	1.36	1.36	B
Sodium	NA	0.05	34	14	0.48	0.72	0.72	B
Sulphate	128	0.3	34	34	2.34	3.38	65.2	A
pH Field (Upper)	9	0.1	32	32	7.67	8.26	8.34	A
pH Field (Lower)	6.5	0.1	32	32	7.67	6.54[a]	6.54	B
pH Lab (Upper)	9	0.1	34	34	7.35	7.44	8.17	A
pH Lab (Lower)	6.5	0.1	34	34	7.35	7.00[a]	6.92	A
Total Alkalinity	NA	1	34	34	10	17.8	17.8	B
TDS	NA	3	34	34	18	25.3	25.3	B
TSS	5	1	34	1	NA	NA	3	A

Notes: For each variable, thresholds (guidelines) are shown if applicable (see text for discussion); DL = current detection limit; N = sample measurements; >DL = number of measurements above DL; 95th %ile = 95th percentile if estimable; Method = method used to determine the trigger, where A = halfway from median (or DL if median not estimable) to threshold, B = 95th percentile, and C = 2-times the DL, NA = not applicable (thresholds) or not measured (summary statistics)

Table I-7. Wally Lake Water Quality Triggers – Total Metals

Variable	Threshold	DL	Wally Lake					
			N	>DL	Median	95th %ile	Trigger	Method
Aluminum (T)	0.1	0.003	34	23	0.006	0.011	0.053	A
Antimony (T)	0.009	0.0001	34	0	NA	NA	0.0046	A
Arsenic (T)	0.005	0.0001	34	14	0.00025	0.00029	0.00263	A
Barium (T)	1	0.0001	34	14	0.0019	0.003	0.5	A
Beryllium (T)	0.00013	0.0001	34	0	NA	NA	0.000115	A
Boron (T)	1.5	0.01	34	0	NA	NA	0.76	A
Cadmium (T)	0.00004	0.000005	34	1	NA	NA	0.000023	A
Chromium (T)	0.005	0.0001	34	0	NA	NA	0.0026	A
Copper (T)	0.002	0.0005	34	16	0.00098	0.00129	0.0015	A
Iron (T)	0.3	0.01	34	6	0.015	0.025	0.16	A
Lead (T)	0.001	0.00005	34	2	NA	0.00015	0.00053	A
Lithium (T)	NA	0.001	34	2	0.00085	NA	0.002	C
Manganese (T)	See text	0.0001	34	34	0.0014	0.002	0.33	A
Mercury (T)	0.000026	0.000005	34	0	NA	NA	0.000016	A
Molybdenum (T)	0.073	0.00005	34	3	0.00013	0.00019	0.037	A
Nickel (T)	0.025	0.0005	34	0	NA	NA	0.013	A
Selenium (T)	0.001	0.00005	34	0	NA	NA	0.00053	A
Silicon (T)	NA	0.1	14	14	0.42	0.65	0.65	B
Silver (T)	0.00025	0.00001	34	0	NA	NA	0.00013	A
Strontium (T)	1.7	0.0002	32	32	0.016	0.022	0.033	A
Thallium (T)	0.0008	0.00001	34	0	NA	NA	0.00041	A
Tin (T)	NA	0.0001	34	0	NA	NA	0.0002	C
Titanium (T)	NA	0.0003	34	3	0.00013	0.00049	0.0006	C
Uranium (T)	0.015	0.00001	34	2	0.000044	NA	0.0075	A
Vanadium (T)	0.12	0.0005	34	0	NA	NA	0.06	A
Zinc (T)	See text	0.003	34	2	NA	NA	NA	NA

Notes: For each variable, thresholds (guidelines) are shown if applicable (see text for discussion); DL = current detection limit; N = sample measurements; >DL = number of measurements above DL; 95^{th} %ile = 95th percentile if estimable; Method = method used to determine the trigger, where A = halfway from median (or DL if median not estimable) to threshold, B = 95th percentile, and C = 2-times the DL, NA = not applicable (thresholds) or not measured (summary statistics)

Table I-8. Wally Lake Water Quality Triggers – Dissolved Metals

Variable	Threshold	DL	Wally Lake					
			N	>DL	Median	95th %ile	Trigger	Method
Aluminum (T)	0.05	0.001	27	13	0.003	0.006	0.026	A
Antimony (T)	0.009	0.0001	27	0	NA	NA	0.0046	A
Arsenic (T)	0.005	0.0001	27	13	0.00024	0.00034	0.00262	A
Barium (T)	1	0.0001	27	13	0.0018	0.003	0.5	A
Beryllium (T)	0.00013	0.0001	27	0	NA	NA	0.000115	A
Boron (T)	1.5	0.01	27	0	NA	NA	0.76	A
Cadmium (T)	0.00004	0.000005	27	0	NA	NA	0.000023	A
Chromium (T)	0.005	0.0001	27	0	NA	NA	0.00026	A
Copper (T)	0.002	0.0002	27	15	0.00087	0.00148	0.0015	B
Iron (T)	0.3	0.01	27	0	NA	NA	0.16	A
Lead (T)	0.001	0.00005	27	2	NA	0.00015	0.00053	A
Lithium (T)	NA	0.001	27	2	0.00099	NA	0.002	C
Manganese (T)	See text	0.0001	27	22	0.0004	0.0015	0.33	A
Mercury (T)	0.000026	0.000005	25	0	NA	NA	0.000016	A
Molybdenum (T)	0.073	0.00005	27	8	0.00011	0.00019	0.037	A
Nickel (T)	0.025	0.0005	27	1	NA	NA	0.013	A
Selenium (T)	0.001	0.00005	27	0	NA	NA	0.00053	A
Silicon (T)	NA	0.05	13	13	0.42	0.67	0.67	B
Silver (T)	0.00025	0.00001	27	0	NA	NA	0.00013	A
Strontium (T)	1.7	0.0002	27	27	0.016	0.023	0.86	A
Thallium (T)	0.0008	0.00001	27	0	NA	NA	0.00041	A
Tin (T)	NA	0.0001	27	0	NA	NA	0.0002	C
Titanium (T)	NA	0.0003	27	0	NA	NA	0.0006	C
Uranium (T)	0.015	0.00001	27	2	0.00004	NA	0.0075	A
Vanadium (T)	0.12	0.0005	27	0	NA	NA	0.06	A
Zinc (T)	See text	0.001	27	2	NA	NA	0.0024	A

Notes: For each variable, thresholds (guidelines) are shown if applicable (see text for discussion); DL = current detection limit; N = sample measurements; >DL = number of measurements above DL; 95th %ile = 95th percentile if estimable; Method = method used to determine the trigger, where A = halfway from median (or DL if median not estimable) to threshold, B = 95th percentile, and C = 2-times the DL, NA = not applicable (thresholds) or not measured (summary statistics)

Table I-9. Whale Tail Pit Water Quality Triggers – Nutrients and Conventional Parameters

Variable	Threshold	DL	Whale Tail Pit Study Areas					
			N	>DL	Median	95th %ile	Trigger	Method
Ammonia-N	0.126	0.005	306	121	0.004	0.022	0.065	A
TKN	NA	0.05	283	281	0.116	0.171	0.17	B
Nitrate-N	3	0.005	306	29	NA	0.007	1.5	A
Nitrite-N	0.06	0.001	306	2	NA	NA	0.031	A
Ortho-phosphate	NA	0.001	306	54	NA	0.0022	0.0022	B
T. phosphorous	0.004	0.002	306	111	0.0013	0.0045	0.0045	B
TOC	NA	0.5	306	306	1.85	2.42	2.42	B
DOC	NA	0.5	306	306	1.79	2.43	2.43	B
Reactive silica	NA	0.5	306	150	0.5	1.33	1.33	B
Bicarb. alkalinity	NA	1	290	290	6.3	9.6	9.6	B
Chloride	120	0.1	306	306	0.9	7.8	60.4	A
Fluoride	0.12	0.02	306	306	0.034	0.067	0.077	A
Carb. alkalinity	NA	1	306	0	NA	NA	2	C
Conductivity	NA	2	306	306	23.5	48.6	48.6	B
Hardness	NA	0.5	306	306	9.1	17.4	17.4	B
Calcium	NA	0.05	306	306	2.24	4.6	4.6	B
Potassium	NA	0.05	306	306	0.45	0.84	0.84	B
Magnesium	NA	0.005	306	306	0.83	1.41	1.41	B
Sodium	NA	0.05	306	306	0.6	1	1	B
Sulphate	128	0.3	306	306	1.7	4.04	64.8	A
pH Field (Upper)	9	0.1	302	302	6.88	7.59	7.94	A
pH Field (Lower)	6.5	0.1	302	302	6.88	6.34	6.34	B
pH Lab (Upper)	9	0.1	306	306	6.94	7.19	7.97	A
pH Lab (Lower)	6.5	0.1	306	306	6.94	6.57	6.57	B
Total Alkalinity	NA	1	290	290	6.25	9.61	9.61	B
TDS	NA	3	290	290	17.3	38.5	38.5	B
TSS	5	1	306	17	NA	1	3	A

Notes: For each variable, thresholds (guidelines) are shown if applicable (see text for discussion); DL = current detection limit; N = sample measurements; >DL = number of measurements above DL; 95th %ile = 95th percentile if estimable; Method = method used to determine the trigger, where A = halfway from median (or DL if median not estimable) to threshold, B = 95th percentile, and C = 2-times the DL, NA = not applicable (thresholds) or not measured (summary statistics)

Table I-10. Whale Tail Pit Water Quality Triggers – Total Metals

Variable	Threshold	DL	Whale Tail Pit Study Areas					
			N	>DL	Median	95th %ile	Trigger	Method
Aluminum (T)	0.1	0.003	306	241	0.005	0.015	0.052	A
Antimony (T)	0.009	0.0001	305	4	NA	NA	0.0046	A
Arsenic (T)	0.025	0.0001	306	258	0.00017	0.00041	0.013	A
Barium (T)	1	0.0001	306	306	0.0037	0.0089	0.5	A
Beryllium (T)	0.00013	0.0001	306	0	NA	NA	0.000115	A
Boron (T)	1.5	0.01	306	0	NA	NA	0.76	A
Cadmium (T)	0.00004	0.000005	306	7	NA	NA	0.000023	A
Chromium (T)	0.005	0.0001	303	87	0.00006	0.0002	0.0025	A
Copper (T)	0.002	0.0005	306	38	NA	0.00058	0.0013	A
Iron (T)	0.3	0.01	306	173	0.011	0.037	0.16	A
Lead (T)	0.001	0.00005	302	36	NA	0.00016	0.00053	A
Lithium (T)	NA	0.001	306	28	NA	0.0013	0.002	C
Manganese (T)	See text	0.0001	306	306	0.0015	0.0048	0.32	A
Mercury (T)	0.000026	0.000005	306	2	NA	NA	0.000016	A
Molybdenum (T)	0.073	0.00005	306	43	NA	NA	0.037	A
Nickel (T)	0.025	0.0005	306	181	0.00055	0.00096	0.013	A
Selenium (T)	0.001	0.00005	306	4	NA	NA	0.00053	A
Silicon (T)	NA	0.1	306	306	0.26	0.61	0.61	B
Silver (T)	0.00025	0.00001	306	2	NA	NA	0.00013	A
Strontium (T)	1.7	0.0002	306	306	0.26	0.61	0.61	B
Thallium (T)	0.0008	0.00001	306	2	NA	NA	0.00013	A
Tin (T)	NA	0.0001	306	306	0.01	0.033	0.033	B
Titanium (T)	NA	0.0003	306	1	NA	NA	0.00041	A
Uranium (T)	0.015	0.00001	306	1	NA	NA	0.0002	C
Vanadium (T)	0.12	0.0005	306	9	NA	NA	0.0006	C
Zinc (T)	See text	0.003	306	263	0.000025	0.000048	0.0075	A

Notes: For each variable, thresholds (guidelines) are shown if applicable (see text for discussion); DL = current detection limit; N = sample measurements; >DL = number of measurements above DL; 95th %ile = 95th percentile if estimable; Method = method used to determine the trigger, where A = halfway from median (or DL if median not estimable) to threshold, B = 95th percentile, and C = 2-times the DL, NA = not applicable (thresholds) or not measured (summary statistics)

Table I-11. Whale Tail Pit Water Quality Triggers – Dissolved Metals

Variable	Threshold	DL	Whale Tail Pit Study Areas					
			N	>DL	Median	95th %ile	Trigger	Method
Aluminum (D)	0.05	0.001	306	276	0.002	0.006	0.026	A
Antimony (D)	0.009	0.0001	303	3	NA	NA	0.005	A
Arsenic (D)	0.025	0.0001	306	216	0.00014	0.00036	0.013	A
Barium (D)	1	0.0001	306	306	0.0037	0.0088	0.5	A
Beryllium (D)	0.00013	0.0001	306	1	NA	NA	0.000115	A
Boron (D)	1.5	0.01	306	0	NA	NA	0.76	A
Cadmium (D)	0.00004	0.000005	300	2	NA	NA	0.000023	A
Chromium (D)	0.005	0.0001	306	20	NA	0.00011	0.0026	A
Copper (D)	0.002	0.0002	305	286	0.00033	0.00054	0.0012	A
Iron (D)	0.3	0.01	306	23	NA	0.013	0.16	A
Lead (D)	0.001	0.00005	300	37	NA	0.00009	0.00053	A
Lithium (D)	NA	0.001	306	28	NA	0.0012	0.002	C
Manganese (D)	See text	0.0001	306	290	0.0005	0.0032	0.32	A
Mercury (D)	0.000026	0.000005	305	4	NA	NA	0.000016	A
Molybdenum (D)	0.073	0.00005	306	29	NA	0.00006	0.037	A
Nickel (D)	0.025	0.0005	306	145	0.00047	0.0009	0.013	A
Selenium (D)	0.001	0.00005	306	3	NA	NA	0.00053	A
Silicon (D)	NA	0.05	306	306	0.23	0.57	0.57	B
Silver (D)	0.00025	0.00001	306	0	NA	NA	0.00013	A
Strontium (D)	1.7	0.0002	306	306	0.01	0.034	0.034	B
Thallium (D)	0.0008	0.00001	306	0	NA	NA	0.00041	A
Tin (D)	NA	0.0001	306	4	NA	NA	0.0002	C
Titanium (D)	NA	0.0003	306	1	NA	NA	0.0006	C
Uranium (D)	0.015	0.00001	305	259	0.00002	0.000041	0.0075	A
Vanadium (D)	0.12	0.0005	306	0	NA	NA	0.06	A
Zinc (D)	See text	0.001	306	42	NA	0.0021	0.0023	A

Notes: For each variable, thresholds (guidelines) are shown if applicable (see text for discussion); DL = current detection limit; N = sample measurements; >DL = number of measurements above DL; 95th %ile = 95th percentile if estimable; Method = method used to determine the trigger, where A = halfway from median (or DL if median not estimable) to threshold, B = 95th percentile, and C = 2-times the DL, NA = not applicable (thresholds) or not measured (summary statistics)

Table I-12. Baker Lake Water Quality Triggers – Nutrients and Conventional Parameters

Variable	Threshold	DL	Baker Lake					
			N	>DL	Median	95th %ile	Trigger	Method
Ammonia-N	0.126	0.005	64	29	0.005	0.056	0.066	A
TKN	NA	0.05	59	55	0.163	0.222	0.22	B
Nitrate-N	3	0.005	64	58	0.018	0.04	1.51	A
Nitrite-N	0.06	0.001	64	3	NA	NA	0.031	A
Ortho-phosphate	NA	0.001	64	9	NA	0.0014	0.002	C
T. phosphorous	0.004	0.002	64	47	0.0035	0.0075	0.0075	B
TOC	NA	0.5	64	64	3.25	4	4	B
DOC	NA	0.5	64	64	3.23	3.89	3.89	B
Reactive silica	NA	0.5	61	12	0.32	0.5	1	C
Bicarb. alkalinity	NA	1	59	59	9.2	10.6	10.6	B
Chloride	120	0.1	64	64	26.2	168.9	168.9	B
Fluoride	0.12	0.02	61	59	0.056	0.073	0.088	A
Carb. alkalinity	NA	1	64	0	NA	NA	2	C
Conductivity	NA	2	64	64	119.5	642.4	642.4	B
Hardness	NA	0.5	64	64	17.7	64.7	64.7	B
Calcium	NA	0.05	64	64	3.04	6.17	6.17	B
Potassium	NA	0.05	64	53	0.95	3.89	3.89	B
Magnesium	NA	0.005	64	64	2.66	12.44	12.44	B
Sodium	NA	0.05	64	64	14.2	88.5	88.5	B
Sulphate	128	0.3	64	64	4.1	24.4	66.1	A
pH Field (Upper)	9	0.1	59	59	7.15	8.15	8.15	B
pH Field (Lower)	6.5	0.1	59	59	7.15	6.55[a]	6.55	B
pH Lab (Upper)	9	0.1	64	64	7.14	7.57	8.07	A
pH Lab (Lower)	6.5	0.1	64	64	7.14	6.75[a]	6.75	B
Total Alkalinity	NA	1	59	59	9.2	10.6	10.6	B
TDS	NA	3	59	59	64.8	245.3	245.3	B
TSS	5	1	64	9	NA	NA	3	A

Notes: For each variable, thresholds (guidelines) are shown if applicable (see text for discussion); DL = current detection limit; N = sample measurements; >DL = number of measurements above DL; 95th %ile = 95th percentile if estimable; Method = method used to determine the trigger, where A = halfway from median (or DL if median not estimable) to threshold, B = 95th percentile, and C = 2-times the DL, NA = not applicable (thresholds) or not measured (summary statistics)

Table I-13. Baker Lake Water Quality Triggers – Total Metals

Variable	Threshold	DL	Baker Lake					
			N	>DL	Median	95th %ile	Trigger	Method
Aluminum (T)	0.1	0.003	64	63	0.012	0.024	0.056	A
Antimony (T)	0.009	0.0001	64	0	NA	NA	0.0046	A
Arsenic (T)	0.005	0.0001	64	37	0.00013	0.00017	0.0.00257	A
Barium (T)	1	0.0001	64	47	0.018	0.02	0.51	A
Beryllium (T)	0.00013	0.0001	64	0	NA	NA	0.000115	A
Boron (T)	1.5	0.01	64	21	0.007	0.046	0.75	A
Cadmium (T)	0.00004	0.000005	64	0	NA	NA	0.000023	A
Chromium (T)	0.005	0.0001	64	8	0.00004	0.0002	0.0025	A
Copper (T)	0.002	0.0005	64	12	0.00043	0.00054	0.0012	A
Iron (T)	0.3	0.01	64	40	0.017	0.038	0.16	A
Lead (T)	0.001	0.00005	64	3	NA	NA	0.00053	A
Lithium (T)	NA	0.001	64	25	0.001	0.0033	0.003	B
Manganese (T)	See text	0.0001	64	64	0.0027	0.0053	0.34	A
Mercury (T)	0.000026	0.000005	64	0	NA	NA	0.000016	A
Molybdenum (T)	0.073	0.00005	64	28	0.00007	0.00016	0.037	A
Nickel (T)	0.025	0.0005	64	0	NA	NA	0.013	A
Selenium (T)	0.001	0.00005	64	2	NA	NA	0.00053	A
Silicon (T)	NA	0.1	47	47	0.19	0.28	0.28	B
Silver (T)	0.00025	0.00001	64	0	NA	NA	0.00013	A
Strontium (T)	1.7	0.0002	64	64	0.025	0.083	0.083	B
Thallium (T)	0.0008	0.00001	64	0	NA	NA	0.00041	A
Tin (T)	NA	0.0001	64	0	NA	NA	0.0002	C
Titanium (T)	NA	0.0003	64	6	0.00019	0.00039	0.0006	C
Uranium (T)	0.015	0.00001	64	37	0.000048	0.000065	0.0075	A
Vanadium (T)	0.12	0.0005	64	0	NA	NA	0.06	A
Zinc (T)	See text	0.003	64	1	NA	NA	NA	NA

Notes: For each variable, thresholds (guidelines) are shown if applicable (see text for discussion); DL = current detection limit; N = sample measurements; >DL = number of measurements above DL; 95th %ile = 95th percentile if estimable; Method = method used to determine the trigger, where A = halfway from median (or DL if median not estimable) to threshold, B = 95th percentile, and C = 2-times the DL, NA = not applicable (thresholds) or not measured (summary statistics)

Table I-14. Baker Lake Water Quality Triggers – Dissolved Metals

Variable	Threshold	DL	Baker Lake					
			N	>DL	Median	95th %ile	Trigger	Method
Aluminum (D)	0.05	0.001	61	49	0.005	0.006	0.027	A
Antimony (D)	0.009	0.0001	61	0	NA	NA	0.0046	A
Arsenic (D)	0.005	0.0001	61	34	0.00011	0.00014	0.00256	A
Barium (D)	1	0.0001	61	47	0.0178	0.02	0.51	A
Beryllium (D)	0.00013	0.0001	61	0	NA	NA	0.000115	A
Boron (D)	1.5	0.01	61	15	0.007	0.042	0.75	A
Cadmium (D)	0.00004	0.000005	60	0	NA	NA	0.000023	A
Chromium (D)	0.005	0.0001	61	3	NA	0.00013	0.00026	A
Copper (D)	0.002	0.0002	61	45	0.00029	0.00042	0.0011	A
Iron (D)	0.3	0.01	61	4	NA	NA	0.16	A
Lead (D)	0.001	0.00005	61	2	NA	NA	0.00053	A
Lithium (D)	NA	0.001	61	22	0.0011	0.0022	0.0022	B
Manganese (D)	See text	0.0001	61	57	0.0008	0.0036	0.34	A
Mercury (D)	0.000026	0.000005	59	0	NA	NA	0.000016	A
Molybdenum (D)	0.073	0.00005	61	27	0.00006	0.00014	0.037	A
Nickel (D)	0.025	0.0005	61	0	NA	NA	0.013	A
Selenium (D)	0.001	0.00005	61	3	NA	NA	0.00053	A
Silicon (D)	NA	0.05	47	46	0.16	0.25	0.25	B
Silver (D)	0.00025	0.00001	61	0	NA	NA	0.00013	A
Strontium (D)	1.7	0.0002	61	61	0.025	0.078	0.86	B
Thallium (D)	0.0008	0.00001	61	0	NA	NA	0.00041	A
Tin (D)	NA	0.0001	61	0	NA	NA	0.0002	C
Titanium (D)	NA	0.0003	61	0	NA	NA	0.0006	C
Uranium (D)	0.015	0.00001	61	36	0.00004	0.000054	0.0075	A
Vanadium (D)	0.12	0.0005	61	0	NA	NA	0.06	A
Zinc (D)	See text	0.001	61	6	NA	0.003	0.0042	A

Notes: For each variable, thresholds (guidelines) are shown if applicable (see text for discussion); DL = current detection limit; N = sample measurements; >DL = number of measurements above DL; 95th %ile = 95th percentile if estimable; Method = method used to determine the trigger, where A = halfway from median (or DL if median not estimable) to threshold, B = 95th percentile, and C = 2-times the DL, NA = not applicable (thresholds) or not measured (summary statistics)

APPENDIX J
WATER QUALITY EFFECTS ASSESSMENT

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J.1 INTRODUCTION

This technical document was prepared by Azimuth Consulting Group Partnership (Azimuth) to provide context on the potential for adverse effects to lower trophic biota (i.e., phytoplankton, zooplankton and benthic invertebrates) due to changes in water parameters that do not have effects-based thresholds (e.g., water quality standards, guidelines or criteria).

J.1.1 Background

The decision framework for the CREMP incorporates the use of *thresholds* (i.e., typically CCME water quality guidelines or effects-based equivalents from other jurisdictions) and *triggers* (i.e., early warning limits typically set between baseline/reference conditions and the threshold for parameters with effects-based guidelines, or set at the 95th percentile of the baseline/reference conditions; see **Appendix I** for details). To date, for parameters with effects-based thresholds, CREMP monitoring has shown that receiving environment water quality in the Meadowbank and Whale Tail Pit study lakes meets both the trigger and threshold values (i.e., well below water quality guidelines).

Mining-related increases, particularly at NF study areas, have been observed for some parameters without water quality guidelines, including total dissolved solids (TDS), total alkalinity, conductivity, hardness, and certain major ions (i.e., calcium, magnesium, potassium, and sodium). Most of these parameters also exceed predicted concentrations presented in the Meadowbank Final Environment Impact Statement (FEIS) (Cumberland, 2005). In addition, total silicon, which was not routinely measured during the baseline period and shows little in the way of temporal trends, exceeds FEIS predictions. Because silicon was not routinely included in the suite of analyses in the baseline water chemistry samples, the baseline water quality values for Third Portage Lake, Second Portage Lake, and Wally Lake were set to 0 mg/L. This approach resulted in an underestimate of future concentrations for Third Portage Lake, Second Portage Lake, and Wally Lake. Silicon is not recommended as a parameter for evaluating the accuracy of the water quality model predictions for the Meadowbank study area lakes given the underestimate in baseline water chemistry.

As described in the main report, biological monitoring conducted under the CREMP targets the phytoplankton and benthic invertebrate communities. Results to date indicate that communities in the NF areas are functionally intact, with major indices such as taxonomic richness and abundance remaining relatively stable across the more than a decade of events. Thus, the biological data indicate that current water quality in the NF study areas is not adversely affecting the health of phytoplankton and benthic invertebrate communities compared to baseline or reference conditions.

J.1.2 Rationale

Notwithstanding the evidence showing phytoplankton and benthos communities are similar to baseline/reference conditions, the Kivalliq Inuit Association (KIA), in their review of the 2018 annual report, recommended[1] that Agnico Eagle complete the following:

i. *Investigate the source of these parameter increases, their spatial extent and the reversibility of these trends.*
ii. *Discuss the implications of increased conductivity, calcium, magnesium, potassium, sodium, TDS and alkalinity at the near-field sites on lower trophic levels, specifically in terms of the community composition of phytoplankton, zooplankton and benthic invertebrates.*
iii. *In accordance with AEM Management Response Plan for the Meadowbank Mine Aquatic Environment Monitoring Program, that AEM increase monitoring frequency at the mid-field sites to determine the spatial extent of exceedances observed in the near-field during the open water season.*
iv. *Conduct an investigation of cause study for the observed changes in water chemistry and determine possible management strategies.*

This technical memorandum is meant to address recommendations i) and ii) above by providing a review of available literature on the effects of selected conventional and ionic compounds on lower trophic level community composition. The outcome of this technical review will help determine if increased monitoring frequency (point iii) and/or investigation of cause studies (point iv) should be considered to help inform adaptive management decisions.

J.1.3 Approach

As described in **Section J.1.1**, the following parameters have been shown to be exceeding baseline/reference conditions and/or FEIS predictions: total dissolved solids (TDS), total alkalinity, conductivity, hardness, certain major ions (i.e., calcium, magnesium, potassium, and sodium), and total silicon. Apart from total silicon, the rest of these parameters are inter-related to some extent or are not parameters of toxicological concern. Rationale for the approach used herein to cover the range of parameters is as follows:

[1] Recommendation 22 in the 2018 Annual Report Comments.

- *TDS* – this parameter is a measure of all dissolved constituents in water, but is comprised primarily of inorganic salts (mainly calcium, potassium, magnesium, sodium, bicarbonates, chlorides, and sulphates). Consequently, it essentially includes total alkalinity (the measure of a solution's ability to neutralize acid inputs), hardness (the sum of multivalent ions in solution), conductivity (the measure of a solution's ability to conduct electricity; correlated to dissolved salts), and major ions (concentrations of individual ions in solution). While a site-specific approach that considers the ratios of individual major ions is preferred from a technical perspective, it is not practical for a literature approach due to the sheer number of permutations across these constituents. Consequently, the literature review for the parameters mentioned herein focused on primarily on TDS.
- *Conductivity* – as mentioned above, this parameter is related to TDS and could therefore be excluded for singular focus. However, as there is some effects-based information available (e.g., US EPA 2016), we have included it for additional context.
- *Total silicon* – this parameter plays an important role as an essential dissolved element consumed by the phytoplankton group of algae called diatoms. Relative abundance of this primary producer can have effects on higher trophic level organisms and as community changes occur in response to elevated or reduced silicon.

J.2 LITERATURE REVIEW

A literature review was completed to assess the potential effects of TDS, conductivity and total silicon at different concentrations on fresh water aquatic life (e.g., phytoplankton, zooplankton, benthic invertebrates, and fish species) that may either reasonably be found in the Meadowbank study area lakes or be reasonably comparable. Preference was given to peer-reviewed literature and government sources including articles, studies, effects assessments, published guidance, and literature reviews. Other sources (e.g., unpublished "grey" literature) were also used where relevant.

J.2.1 Total Dissolved Solids

Solids in water can be measured as total solids, total suspended solids (TSS), or total dissolved solids. Total solids is the measure of all both TSS and TDS. TDS is the measure of all dissolved constituents of a solution which may be of anthropogenic origin such as mining activities or road salt-contaminated runoff or natural influences such as soils or geology (Weber-Scannel & Duffy 2007). The measurement of TDS is conducted by the removal of suspended solids by filtration through a 0.7-micron glass fiber filter followed by drying of the filtrate at 180 degrees Celsius. The dried filtrate residue is divided by the volume of water filtered to determine the concentration of TDS which is usually reported in mg/L (APHA 2017). TDS is comprised mainly of inorganic ions but can also include dissolved organic matter. The potential biological effects of TDS are, therefore, related to the specific composition of the ions, their speciation, and other solids present in water. TDS may also exhibit toxicity through osmotic stress (i.e., where cell desiccation occurs due to leakage Davies & Hall 2007). Except in conditions where ratios and speciation of ionic components are fairly stable, TDS may be a poor predictor of toxicity (Chapman & McPherson 2016).

Similar to conductivity, TDS may be used as a surrogate measure for salinity because this measure tends to provide an estimate of the ionic compounds present (USEPA 1999). While elevated concentrations of TDS may change the osmotic conditions whereby elevated concentrations of TDS leads to potential osmotic stress especially in ultra-oligotrophic lakes with naturally low TDS, the ratios of ions present in solution are important due to the presence of essential macro and micro-minerals (EPA 2002). Meadowbank and Whale Tail study areas feature ultra-oligotrophic lakes with naturally low TDS. Increased chemical density influences the osmotic regulation of metabolism and biotic distribution in aquatic communities (BC MOE 2013).

Due to the complex and variable composition of ions and dissolved solids measured as TDS, a generic TDS guideline for the protection of aquatic life must be overly protective to account for the most toxic potential combination to the most sensitive organisms and life stage (Weber-Scannell and Duffy 2007). Assigning a threshold concentration for TDS is difficult because the high site specificity of this parameter. This challenge is reflected in the absence of any federal water quality guideline, with the exception of an aesthetic objective of less than or equal to 500 mg/L, for TDS (Health Canada 1991). Regulation of TDS is also limited in other jurisdictions with few exceptions such as Alaska, where TDS may not exceed 500 mg/L without a special permit and 1,000 mg/L at any time (ADEC 2012).

The presence of dissolved ions in solution is essential for the survival of aquatic organisms and provides the basis for the lowest trophic residents in the form of mineral uptake. Macro-mineral uptake is required for the support of biochemical functions such as magnesium and potassium (EPA 2002). Another example of the important biological role of dissolved ions is the importance of chloride in osmoregulation (Elphick et al. 2010). Many communities have low sensitivity to TDS these may be more readily detected through biological monitoring which can detect the overall impact of changes of water quality in a system (Buikema et al. 1982). Toxicity is highly dependent upon both the composition of the residents of the system and the components, speciation, and ratios of the dissolved analytes.

Weber-Scannell and Duffy (2007) reviewed TDS toxicity to aquatic life and recommend deriving ion-specific limits for aquatic life (i.e., rather than for TDS) although this may not satisfy the potential osmotic regulation concerns. Mount et al. (1997) prepared and tested the toxicity of over 2,900 ionic solutions on Daphnids (*Ceriodaphnia dubia* and *Daphnia magna*). Their results suggested the following descending relative ion toxicity: potassium, bicarbonate and magnesium, chloride, sulphate. Neither sodium nor calcium resulted in significant effects (Mount et al., 1997). However, Mount et al. (1997) also found that the potential toxicity of chloride, sulphate, and potassium were reduced in solutions enriched with more than one cation. The inability to identify to attribute the toxicity of a specific constituent of TDS is inherent to the nature of the complex mixture this parameter measures with potential for effect masking, additive toxic effects, and synergistic toxic effects (Goodfellow et al. 2009). Timpano et al. (2010) examined the relationship between benthic macroinvertebrate community metrics in coal field streams and TDS. They caution that impacts from mine-related TDS is confounded because elevated TDS rarely occurs independently of other stressors. This study indicated several benthic macroinvertebrate richness measures were inversely correlated with TDS. Relative species abundance showed no correlation to TDS. Concentrations of TDS in the study streams ranged from 27.8 to 791.6 mg/L. The dominance of sulphate as a constituent in this study may reduce its relevance given the historically low sulphate concentrations in the Meadowbank study area lakes; in addition, the TDS concentrations are also notably higher than those found in the Meadowbank study area lakes.

The TDS review paper by Weber-Scannel and Duffy (2007) showed effects at concentrations less than 250 mg/L with a reported global mean in rivers of 120 mg/L. A TDS receiving environment benchmark 500 mg/L was adopted at Diavik (WLWB, 2013). Scannell and Jacobs (2001) completed a detailed review on the effects of TDS on aquatic life including fish, aquatic invertebrates, and algae focusing on Alaskan waters and TDS components that would be similar to those found in mine effluent. They found no effects to invertebrate growth and survival at concentrations below 1500 mg/L, that there was no reported range of concentrations that caused a toxic response in algae, and that fertilization and hatching rates in salmonids was the most sensitive life stage with affects at concentrations around 750 mg/L. They also concluded that toxicity was due primarily to ionic properties rather than osmotic effects. Chapman, Bailey, and Canaria (1999) completed an assessment of TDS toxicity associated with two mine effluents on chironomid (midge) larvae and early life stages of rainbow trout. They found no toxicity for rainbow trout at concentrations below 2,000 mg/L but did observe effects on chironomids at concentrations greater than 1,100 mg/L. A 2013 Effects Assessment report for the Snap Lake

Mine for De Beers Canada Inc. included results from a site-specific toxicity testing on phytoplankton, zooplankton, benthic invertebrates, and fish species and concluded that *Ceriodaphnia dubia* (a planktonic flea species) was the most sensitive test species and was affected by concentrations of 560 mg/L. A statistical review of the relationship between TDS in the range of 128 to 1,545 mg/L and phytoplankton (chlorophyll-a) in 25 Canadian Lakes by Prepas (1983) did not find a correlation.

Laboratory analysis for the 2019 CREMP water chemistry was completed by ALS Environmental, Burnaby, BC. As reported in the 2019 CREMP (Azimuth 2020), the maximum reported concentration in 2019 was 52.2 mg/L at WAL in March, consistent with the magnitude of concentrations reported in 2018. TDS concentrations in 2019 at other Meadowbank NF stations were as follows: TPE had a maximum of 23.9 mg/L; TPN a maximum of 24.1 mg/L; and SP had a maximum of 32.6 mg/L. The literature cited above suggests that the concentrations of TDS observed in the Meadowbank study area lakes are well below the concentrations where effects will occur. Furthermore, phytoplankton biomass and taxa richness have remained stable as has benthic invertebrate biomass and taxa richness confirming that primary productivity within the study area lakes is not exhibiting adverse effects from elevated TDS.

J.2.2 Conductivity

Much like TDS, specific conductivity has been used as a measurement of ionic strength (Cormier et al., 2012; USEPA, 2016). Conductivity is measured by passing an electrical current through a solution to determine conductance, or the reciprocal of resistance of a solution; therefore, it serves as an indirect measure of only ionic inorganic constituents. It does not have a relationship to dissolved organic compounds because these rarely dissociate (APHA 2018). The TDS method is applicable to waters that mostly contain calcium, magnesium, sodium, potassium, chlorate, sulphate, and chloride and TDS less than 2500 mg/L (APHA 2018). The concentration of all dissociated ions is inversely correlated to the electrical resistance of a solution. Because of the broad nature of TDS, the toxicity potential of a specific conductivity value depends on the toxicity of the ionic composition (USEPA 2016). There is no threshold for specific conductivity at the Meadowbank study area lakes and no federal guidelines.

Water quality parameters are useful indicators of potential effects of local environmental changes on freshwater ecosystems. Anthropogenic influences to water quality such as decreased dissolved oxygen is often correlated with a change in pH and an increase in conductivity, and nutrient concentrations (Leszczynska et al. 2019). The effects of these changes, especially if measured over time may not be detectable through biological monitoring. This is because aquatic communities acclimate to changes in water quality, especially those featuring natural seasonally or daily variability. Conductivity is an example of a naturally variable parameter that not only includes highly variable toxicity but also varies in measured value in response to natural system input fluctuations (i.e. freshet, rainfall, groundwater influence) (USEPA, 2016; Hood et al. 2006).

As indicated in the 2019 CREMP, some Meadowbank study area lakes have exhibited an increase in conductivity relative to baseline/reference conditions. The mean conductivity in WAL in 2019 was 47.1 µS/cm which was the highest mean value from the Meadowbank study area. The US EPA provided a draft field-based method for developing aquatic life criteria for specific conductivity in 2016. Cormier et al. used this approach and reviewed the relationship between specific conductivity in West Virginia coal field stream systems and macroinvertebrate health to create a species sensitivity distribution and derive a benchmark relationship. The authors determined that a bench mark of 300 µS/cm was appropriate to prevent the extirpation of 95% of invertebrate genera in the study area. These results were confirmed in a separate study by Clements and Kotalik (2015).

Michelutti et al. (2002) examined the limnological conditions in 34 lakes and ponds on Victoria Island (arctic Canada) and provided a mean specific conductance of 96.4 µS/cm. Dranga et al. (2017) reviewed and compiled limnological data from 1489 shallow lakes and ponds in northern Canada and found a range of conductivity with a low of 2.5 µS/cm and a mean specific conductivity of 166 µS/cm. The authors did not find an association between trophic level or vegetation cover and conductivity but did find conductivity was affected by geological area. In comparison, Ruhland et al. (2003) summarized limnological results from 21 Canadian arctic tundra lakes and found specific conductivity ranged from 7.3 to 98.8 µS/cm with a mean of 17.8 µS/cm. The results reported in the 2019 CREMP suggests that although conductivity in the near-field Meadowbank study area lakes may be elevated compared to baseline and reference, the conductivity remains relatively low compared to other arctic lakes.

J.2.3 Silicon

Elemental silicon is highly abundant. It is relative stable and does not occur in its free form in nature but combines with oxygen and other elements to form oxides or silicates (CCME 2008). The term “silica” is often used to refer to silicon in natural waters and is usually represented by the hydrated form of the oxide (CCME 2008). It is also an essential micronutrient, particularly for diatoms. Silicon limitations can play an important role in phytoplankton dynamics (Shatwell et al. 2013; Saros et al. 2013). A change in the silicon concentrations may impact the succession of different phytoplankton species and the ratio of silicon with different nutrients may influence the ratio of cyanobacteria to diatoms. However, phytoplankton dynamics are also heavily influenced by other factors including temperature and photoperiod (Shatwell et al. 2013). As a primary producer, diatom abundance has cascading effects to higher trophic levels and in some aquatic food chains silicon availability plays a significant role in energy transfer through effects on diatom productivity (Krause et al. 2018).

This literature review did not find any reports on potential toxic effects to aquatic receptors from low silicon concentrations similar to the concentrations observed in the Meadowbank study area lakes. In general, the conclusion of this the literature review was that there was little data to suggest potential toxicological effects from silicon to aquatic receptors at the range of concentrations that may reasonably be found in Canadian surface freshwater. There are no Canadian federal or provincial guidelines specifically for silicon in water to protect aquatic life. There are, however, several studies that report on the silica concentrations in Canadian surface waters including arctic regions. Natural silicon concentrations in Canadian surface waters are normally less than 5 mg/L silica but are highly variable ranging from 0.02 mg/L to 40 mg/L depending on region (CCME 2008). Antoniades et al. (2003) reported on chemical limnology of 24 ponds and one arctic lake from the Canadian high arctic. The authors did not report on silicon but did report that concentrations of silica (SiO_2) ranged from 0.01 to 4.05 mg/L with a mean of 1.42 mg/L and a median of 1.18 mg/L. Hamilton et al. (2001) report the physical and chemical limnology of 204 Canadian arctic lakes. They report silicate (SiO_2) concentrations for n=174 ranged from 0.05 to 6.7 mg/L with a mean of 1.1 mg/L.

The mean and median values from the arctic lake studies referenced above are higher than the silicon and silicate (SiO_2) trigger concentrations for the Meadowbank study area lakes. The concentrations in the Meadowbank lakes have remained low despite a statistically significant increase over baseline/reference conditions. The range of silicon concentrations was generally below the trigger of 0.2 mg/L with the exception of SP, which ranged up to 0.23 mg/L, and INUG, which ranged up to 0.21 mg/L. Silicate as SiO_2 was consistently below the trigger of 1.0 mg/L. Importantly, neither silicon nor silicate showed strong temporal trends associated with mining activity (see main report). Thus, the observed differences are more likely due to inherent spatial heterogeneity rather than to actual temporal changes.

The lack of substantial changes in total silicon (or silicate) suggest that changes to lower trophic communities at Meadowbank are unlikely. Based on this literature review the most likely impact from increases in total silicon would be to the phytoplankton assemblage. An increase in concentrations of silicon may favor diatoms whereas a decrease in silicon may favor cyanophytes. The species richness in the Meadowbank study area has remained relatively stable for all sample years, with no obvious changes in diatom biomass. Thus, the results of site-specific biological monitoring support the findings of the literature review that suggest changes to lower trophic communities are unlikely.

J.3 CONCLUSIONS

This literature review was conducted to provide some additional context to help assess the ecological significance of mining-related changes to water quality for parameters without effects-based water quality guidelines. The review results corroborate the findings of site-specific biological monitoring conducted under the CREMP. While changes in the parameters of interest (TDS, conductivity and total silicon) can affect lower trophic level communities, concentrations of these parameters at Meadowbank and Whale Tail remain well below concentrations associated with adverse effects reported in the literature.

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APPENDIX K
HABITAT COMPENSATION MONITORING PROGRAM: 2019

Report Version

Version	Dates	Distribution
Draft (revision 0)	February 24, 2020	Agnico Eagle (e-copy)
Final (revision 1)	March 31, 2020	Agnico Eagle (e-copy)

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K.1. INTRODUCTION

K.1.1. Overview of the Habitat Compensation Monitoring Program

Under terms of the Department of Fisheries and Oceans Canada Fisheries Act Authorization (NU-03-0191), long-term monitoring following the Habitat Compensation Monitoring Program (HCMP) is designed to document the functionality of habitat compensation features (HCFs) constructed to offset habitat losses associated with development of the Meadowbank Mine. The monitoring strategy of the HCMP (Azimuth, 2008) describes both the physical and ecological monitoring requirements and presents the schedule for monitoring implementation and decision criteria for evaluating the success of HCF functionality. The monitoring strategy for ecological components follows a tiered framework consisting of both quantitative and qualitative tools (**Figure K-1**). The first tier focuses on identifying constraints to HCF functionality (e.g., metals release); higher tiers involve more specialized tools that are only triggered if the success criteria specified in the HCMP are not met.

In 2019, tier 1 quantitative and qualitative ecological components were monitored for both the East Dike HCF (year C+11) and for the Bay-Goose Dike HCF (year C+9). Note that C denotes year of construction completion; 2008 for the East Dike and 2010 for the Bay-Goose Dike. Azimuth was contracted to support Agnico Eagle with reporting on the periphyton component of the program (i.e., qualitative periphyton community monitoring in shallow [rock sampling] zones only); the results of which are documented herein.

K.1.2. Objectives

Periphyton species composition and biomass are indirect indicators of lake productivity, reflecting nutrient concentrations in the lake, and may sometimes indicate the presence of contaminants. This community serves as the base of the hard-bottom benthic food chain, which ultimately leads up to fish. As described in the HCMP (Azimuth, 2008), success criteria for periphyton monitoring focus on the capability of HCFs to function as fish habitat. The HCFs are expected to provide good substrate for periphyton to colonize. The intent of this component is to document periphyton community colonization and development on the dike face HCFs. This technical memorandum focuses on the 2019 and historical results related to periphyton monitoring of shallow habitat (0 – 1 m) along the dike faces. The periphyton community was directly sampled (i.e., scraped off the rocks) and analyzed for density (cells/cm^2) and biomass (µg/cm^2); with a greater emphasis placed on the latter as it is more ecologically relevant and is derived from the density counts (See **Methods Section K.2**). The results are compared to the baseline community data and reference sites to determine whether there are any gross differences in composition.

K.2. METHODS

K.2.1. Periphyton Community Sampling – Shallow Zone

Periphyton community sampling was completed by Azimuth and Agnico Eagle staff on August 9th, 10th and 14th in 2019. Periphyton samples were collected in the following areas in relation to each dike HCF (sampling locations are shown in **Figure K-2**):

- East Dike HCF (Second Portage Lake)
  - East Dike (SP-ED)
  - Drilltrail Arm reference area (SP-DT)
- Bay-Goose Dike HCF (Third Portage Lake – East basin)
  - Bay-Goose Dike – North section (TPE-BGN)
  - Bay-Goose Dike – South section (TPE-BGS)
  - Reference area (TPE-G)

Five replicate samples were collected from each area and analyzed independently. Universal Transverse Mercator (UTM) coordinates for each replicate sample are reported in **Table K-1**. Sampling locations were chosen according to the following criteria; a sufficient number of large, flat rocks from a water depth of approximately 0.5 m with a flat surface facing upwards as much as possible, and with uniform algal coverage, not particularly dense or sparse. Periphyton growth is naturally variable due to differences in wave action, aspect to sun, water depth and clarity, nutrient availability, rock type, water temperature and other factors.

Periphyton samples were collected using a specially-designed algae 'scrubber'. The procedures for collecting the samples are outlined in detail in the standard operating procedure (SOP) for periphyton sampling (**Appendix K2**). In general, the scrubbers were used to remove and retain periphyton from a 20 cm^2 area on each rock; three rocks were composited for each replicate sample (i.e., each of the five replicates at a sampling area consisted of three rocks). Periphyton samples were preserved in the field with a small amount of Lugol's solution and sent to Plankton R Us Inc. (Winnipeg, MB) for taxonomic identification and biomass (µg/cm^2) estimation.

In the laboratory, each periphyton sample was well mixed and 2 mL sub-samples of suspension were sonicated for 10 to 20 seconds using a Sonifer Cell Disruptor (model w140) and gravity settled for 24 hours in an Ütermohl chamber (Findlay et al., 1999). Counts were performed on an inverted microscope at magnifications of 125X, 400X, and 1200X with phase contrast illumination. Cells were identified, counted and measured from random fields until 100 cells of the dominant species were found. Cell counts were converted to wet weight biomass by approximating cell volume. Estimates of cell volume for each species were obtained by measurements of up to 50 cells of an individual species and applying the geometric formula best fitted to the shape of the cell (Vollenweider, 1968; Rott, 1981). For comparison between stations and among years, the individual species density (cells/cm^2) and biomass (µg/cm^2) data were summarized at the level of major taxa group (cyanobacteria, chlorophytes, chrysophytes, diatoms, and dinoflagellates). The laboratory data are included in **Appendix K3**.

Simpson's diversity index was calculated for each replicate sample to quantify periphyton species diversity among areas and replicates (Washington, 1984). Simpson's diversity index takes into account both the abundance patterns and taxonomic richness of the community. It measures the probability that two individuals randomly selected from a sample will belong to the same species. This is calculated by determining, for each taxonomic group at a site, the proportion of individuals that it contributes to the total at the site. This diversity index can range from 0 to 1, with a value of 1 representing the highest diversity. Simpson's diversity (D) is calculated as follows:

$$\mathrm{D} = 1 - \sum \frac{n_i(n_i - 1)}{N(N - 1)}$$

where:

N is the total number of organisms/replicate sample;

n_i is the total number of organisms of the i^{th} taxa/replicate sample.

The number of species occurring per replicate sample was calculated to measure the species richness among replicates, areas and sampling events.

K.2.2. Quality Assurance / Quality Control

The 'scrubber' and other sampling equipment was rinsed in lake water to ensure that no debris remained in the bristles between stations and between replicates.

As a measure of laboratory QA/QC on the enumeration method, replicate counts were performed on 10% of the samples. Laboratory replicate samples were chosen at random and processed at different times from the original analysis to reduce biases. The laboratory replicate is a new aliquot (10 ml) from the sample jar and is counted from the start in the same manner as the original aliquot (10 ml) taken from the jar. An RPD of 25% for total density and total biomass concentrations is considered acceptable.

K.3. RESULTS

K.3.1. Quality Assurance / Quality Control

Periphyton samples collected from prescribed areas of rock surface were quantified by density (cells/cm^2), biomass (µg/cm^2), taxa richness (# taxa/sample), and Simpson's Diversity. RPDs for total density, taxa richness and Simpson's Diversity met the data quality objectives (DQO's) for laboratory duplicates (**Table K-2**). However, the RPD for total biomass for one of the three duplicate samples (28.5%) slightly exceeded the DQOs (**Table K-2**). While there was a slight DQO exceedance for biomass in one of the three duplicates, overall data quality is deemed acceptable for the purposes of this study.

K.3.2. East Dike HCF

Periphyton samples were collected from rock surfaces at 5 locations each along the East Dike face (SP-ED) and at the reference location (SP-DT). Density and biomass were both highly variable within each location in 2019, but mean estimates of cell density and biomass were both approximately 2-fold and 3-fold lower at the SP-ED area compared to SP-DT, respectively (**Table K-3**, **Figure K-3** and **Figure K-4**). Relative to the 2017 survey, in 2019 the mean cell density across East Dike stations increased by 35% (i.e., from 469,000 to 635,359 cells/cm^2) and the mean biomass increased by 63% (i.e., from 152 to 247 µg/cm^2).

Despite absolute differences in cell density and total biomass between the East Dike and the reference areas, the proportion of cell densities and the proportion of biomass by major taxa group was similar between SP-ED and SP-DT in 2019 (**Table K-3**, **Figure K-3** and **Figure K-4**). Cyanobacteria and diatoms accounted for nearly 100% of the cell density at SP-ED and SP-DT. At SP-ED, cyanobacteria comprised 61% of the periphyton community compared with 67% at SP-DT (**Table K-3**). Diatoms were the next most abundant major taxon, accounting for 38% of the cell density at SP-ED compared with 31% at SP-DT. In 2019, the biomass was comprised almost equally of cyanobacteria (49%) and diatoms (46%) at SP-ED. Similarly, the biomass at SP-DT was comprised mostly of cyanobacteria (49%) and diatoms (34%).

In 2015 and 2017, diatoms were the dominant major taxon at SP-ED (see **Figure K-3** and **Figure K-4**). 2019 is the first study year where cyanobacteria colonization at SP-ED reached a proportionally comparable level in terms of density and biomass to SP-DT (see **Appendix K4** for information on the species cell volumes and presence/absence by replicate area). In 2019, the community composition at SP-ED is similar to the composition at the reference station SP-DT. Differences in species composition within major taxa groups (i.e., cyanobacteria) suggest community succession at SP-ED is now comparable to the reference station SP-DT.

Community diversity indices (Simpson's Diversity and taxa richness) were similar at all sampling areas (**Table K-3**). Taxa richness in 2019 was between 14 and 18 at SP-ED and between 15 and 20 at SP-DT, consistent with the number of taxa observed in 2017 (Azimuth, 2018). The mean Simpson's Diversity was also similar between the two areas; 0.81 at SP-ED and 0.77 at SP-DT.

K.3.3. Bay-Goose Dike HCF

Periphyton samples were collected from rock surfaces at 5 locations each along the north and south sections of the Bay-Goose Dike (TPE-BGN; TPE-BGS) and at the reference location TPE-G (**Table K-4**, **Figure K-5** and **Figure K-6**). The 2019 event was the fourth cycle of habitat compensation monitoring along the Bay-Goose Dike, with the first, second and third conducted in 2011, 2015 and 2017, respectively (**Table K-5**). Periphyton total cell density at TPE-BGN and TPE-BGS in 2019 was approximately 73,000 cells/cm^2 and 80,800 cell/cm^2, respectively. In 2019, both Bay-Goose Dike locations were approximately 10-fold lower in cell density compared to the reference area (TPE-G), consistent with the ratio that was observed in the 2017 and 2015 surveys (**Figure K-5**). In 2019, the periphyton community at both TPE-BGN and TPE-BGS was composed mainly of diatoms (64% and 61% by cell density, respectively). In contrast, the community at TPE-G was composed primarily of cyanobacteria (83%) and diatoms (14%), which was similar to what was observed in 2017 (**Table K-4**).

The proportion of biomass observed in 2019 was highest for cyanobacteria at TPE-BGN (60%) which was similar to the proportion of cyanobacteria observed at TPE-G (67%) (**Table K-4**). However, there were more taxa contributing to biomass at TPE-G than at TPE-BGN (e.g., there were no chlorophytes at TPE-BGN compared to 12% at TPE-G). The chlorophyte results for biomass at TPE-BGS were heavily influenced by one replicate (replicate 5) which highlights the within-station variability (**Table K-4**). Mean total biomass was similar between 2017 and 2019 at TPE-BGN (17 µg/cm^2 in 2017 and 24 µg/cm^2 in 2019) and was lower at TPE-BGS than in 2017 (57 µg/cm^2 in 2017 and 22.4 µg/cm^2 2019) (**Figure K-6**).

Compared to the 2015 and 2017 results, the 2019 periphyton community data along the Bay-Goose Dike impact stations had similar proportions of diatoms in terms of cell density. The relative density of cyanobacteria was higher at TPE-BGN than TPE-BGS due to the presence of chlorophytes at TPE-BGS. In 2019, the biomass at TPE-BGS was more or less evenly distributed between cyanobacteria (30%), chlorophytes (30%) and diatoms (37%), unlike in 2017, where chlorophytes dominated the station with nearly 66% of total biomass. In 2019, relative biomass for cyanobacteria was proportionally higher at both TPE-BGN and TPE-BGS compared to 2017

(**Figure K-5**). Furthermore, the relative biomass for chlorophytes appeared to be proportionally lower at TPE-BGN and TPE-BGS in 2019 compared to 2017(**Figure K-5**).

The periphyton community at the Bay-Goose Dike was less diverse than the reference area as indicated by lower Simpson's Diversity scores and fewer taxa (**Table K-4**). Mean taxa at TPE-BGN (11 taxa) and TPE-BGS (10 taxa) were lower than the mean number of taxa at TPE-G (15 taxa). In 2019, the taxa richness at both TPE-BGN and TPE-BGS were comparable to 2017 data. Simpson's Diversity scores were higher at both TPE-BGN and TPE-BGS in 2019 compared with 2017. At TPE-BGN, richness was 11 in 2019 compared to 12 in 2017, and Simpson's Diversity was 0.63 in 2019 compared to 0.55 in 2017. Overall, TPE-BGN had slightly higher Simpson's Diversity, species richness and biomass but lower cell density, compared to TPE-BGS in 2019.

Relative to SP-ED, the patterns of colonization and succession seen at TPE-BGN and TPE-BGS have been generally slower and more variable. For 2015, 2017, and 2019 the relative biomass and relative density at TPE-G has been dominated by cyanobacteria (**Figure K-5** and **Figure K-6**). The 2019 results show progress along the Bay-Goose Dike towards a more heterogeneous periphyton community comprised of cyanobacteria and diatom species (e.g., similar to the reference area). The relative biomass of cyanobacteria has increased at TPE-BGN and to a lesser extent at TPE-BGS compared to proportions observed in 2017. Temporal changes at the reference area (TPE-G) relative to 2017 show overall increased biomass but a slight decrease in the Simpson's Diversity index. In comparison, TPE-BGN showed increased biomass, slightly lower mean total taxa and an increase in Simpson's Diversity. In 2019, TPE-BGS decreased in biomass but had a higher Simpson's Diversity index relative to 2017. These results highlight both the temporal and spatial variability in the periphyton communities. A full list of periphyton species with a presence/absence matrix for the Third Portage sampling locations in 2019 is presented in **Appendix K4**.

K.4. OVERALL DISCUSSION AND CONCLUSIONS

Periphyton monitoring under the HCMP tracks the development of attached algal communities on the faces of the East Dike HCF (since 2009) and Bay-Goose Dike HCF (since 2011). Periphyton community development is dependent on a number of factors, including nutrient availability (Bonilla et al., 2005), light (Kiffney et al., 2003) and the capacity of different taxa to colonize, grow, compete, tolerate stress, and resist loss processes (Cox, 1990). In early-stage periphyton communities at the East Dike and Bay-Goose Dike HCFs, diatoms were the predominant taxa group colonizing the new substrate. However, this has shifted over the years to a more heterogeneous mix of cyanobacteria, diatoms, and to a lesser extent, chlorophyte taxa at both the East Dike and Bay-Goose Dike HCFs.

Biomass steadily increased on the HCFs in Second Portage and Third Portage Lakes in the post-dike construction phase up to 2017. In 2019, a slight decrease in biomass was observed on all the HCFs in Second Portage and Third Portage Lakes except at TPE-G, which showed an increase in biomass compared to previous sampling years. In 2019, the total biomass at each site was still lower compared to the reference areas (particularly at the Bay-Goose Dike HCFs). It is apparent that these communities take time to develop and it appears that a decade is not sufficient for full colonization of new barren rock surfaces to background levels of biomass. The presence of a structurally similar periphyton community at each of the HCFs relative to their respective reference areas indicates a healthy periphyton community. While total biomass growth is still expected as periphyton community succession progresses, there may be variation from year to year, due to factors aforementioned.

Overall, the progress at the Bay-Goose Dike towards a heterogenous periphyton community has been slower than what has been observed for SP-ED; however, in 2019 some progress was made at each area (i.e., higher diversity at TPE-BGN and TPE-BGS and higher biomass at TPE-BGN). At the East Dike HCF, taxa richness and Simpson's Diversity values are nearly identical to the reference area in Second Portage Lake indicating the presence of a community similar to background conditions, as was the case in 2017.

While in previous years a more abundant (biomass and density) and diverse (taxa richness and Simpson's Diversity) periphyton community was observed at the southern extent of Bay-Goose Dike compared to the northern portion of the Dike, the same pattern was not observed in 2019. While this does not align with the 2017 suggestion that the southern aspect at TPE-BGS provides better growing conditions (i.e., exposure to sunlight) than the eastern aspect at TPE-BGN, it may be attributed to natural variability in the data. Furthermore, as was observed in 2017, the temporal biomass trajectory seen at the SP-ED (eastern aspect) is similar to that seen at TPE-BGS (southern aspect) **(Appendix K1)**. Interestingly, while mean diversity metrics at TPE-BGS were lower than at TPE-BGN, some of the results for individual replicates were actually higher, highlighting the influence of high natural variability in periphyton data.

K.5. REFERENCES

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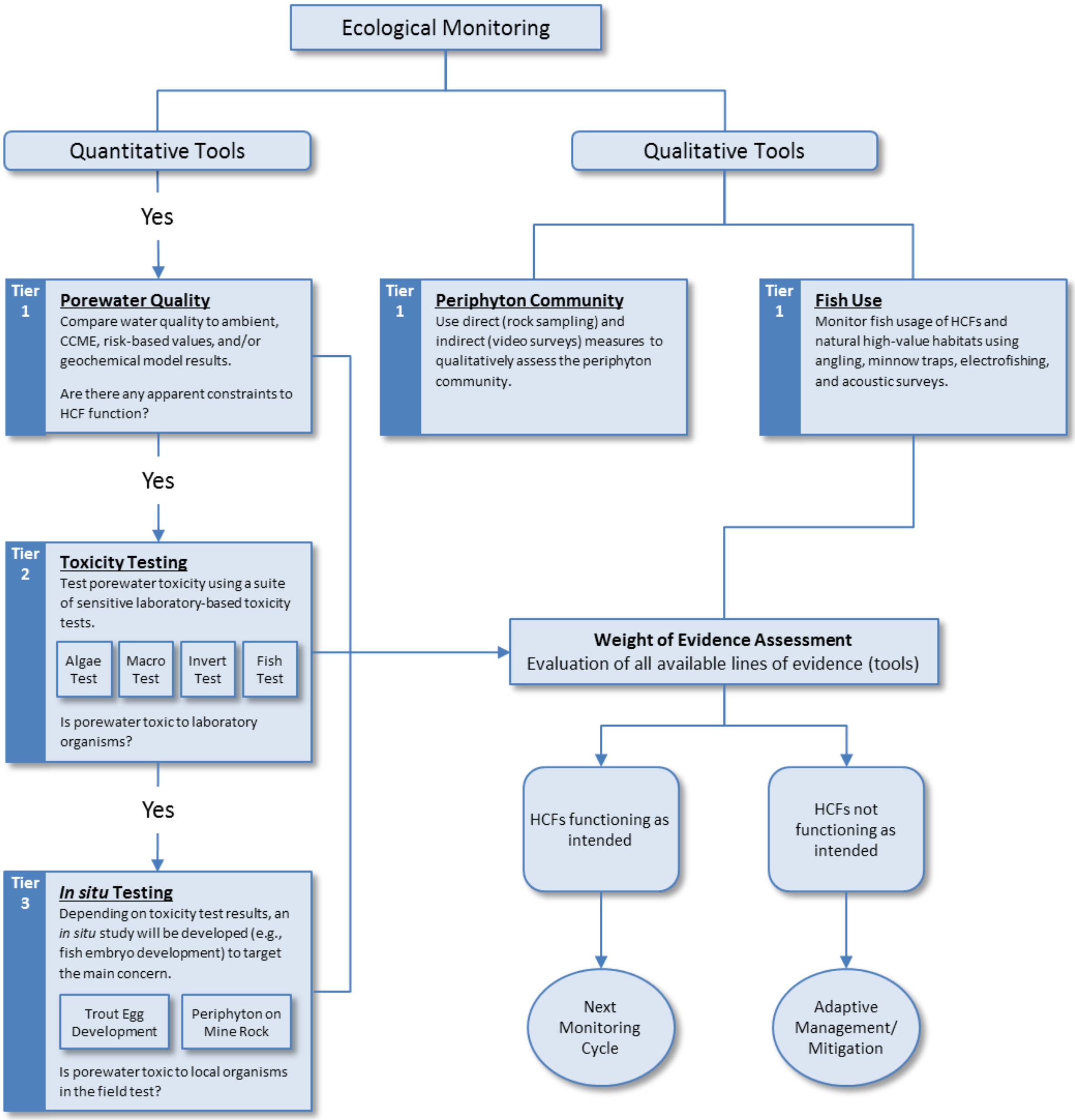
FIGURES AND TABLES

Figure K-1. Ecological monitoring strategy for habitat compensation features (HCFs), Meadowbank Mine (adapted from Azimuth, 2008).



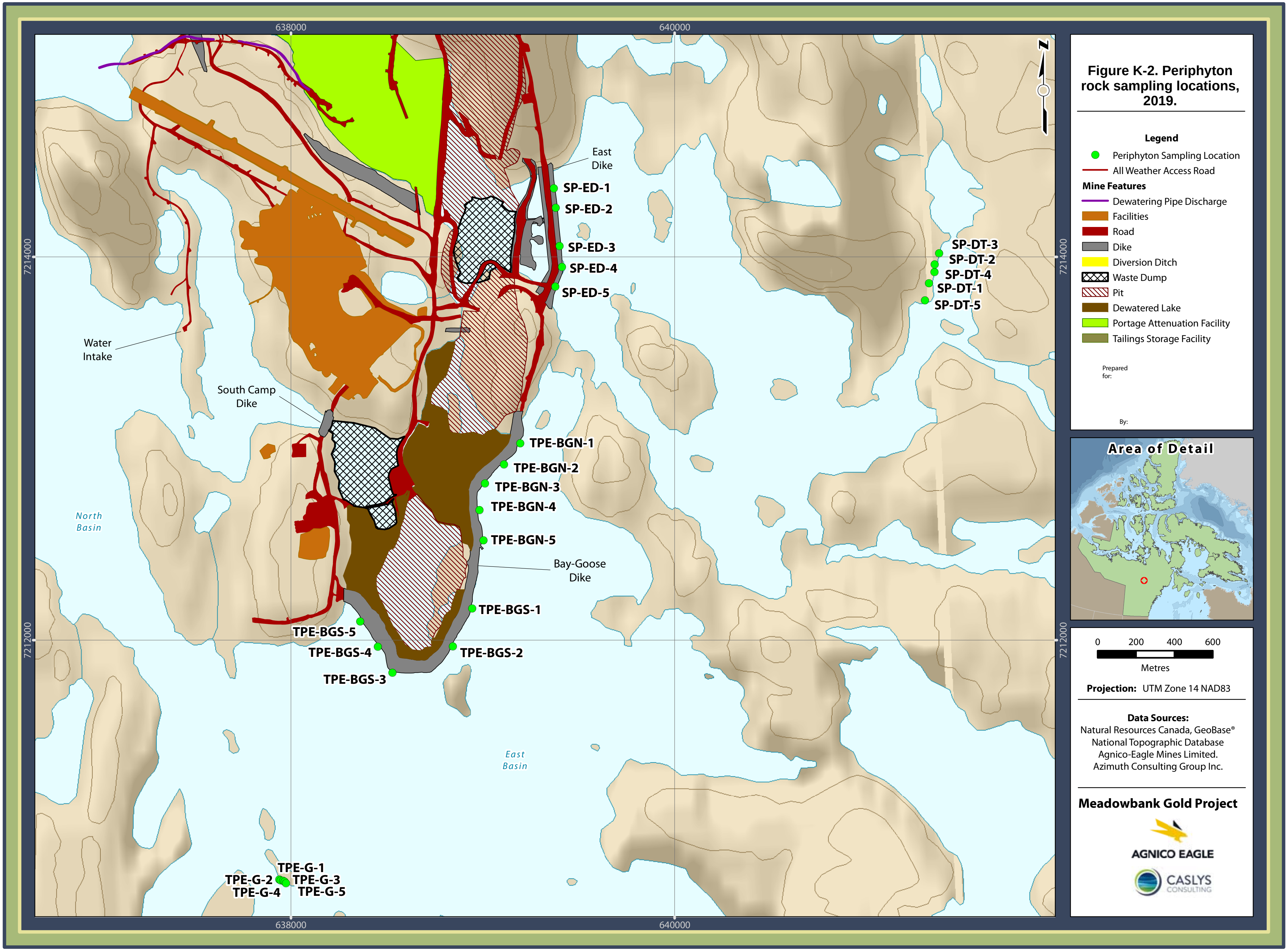


Figure K-2. Periphyton rock sampling locations, 2019.
Legend
Periphyton Sampling Location
All Weather Access Road
Mine Features
Dewatering Pipe Discharge
Facilities
Road
Dike
Diversion Ditch
Waste Dump
Pit
Dewatered Lake
Portage Attenuation Facility
Tailings Storage Facility
Prepared for:
By:
Area of Detail
0 200 400 600
Metres
Projection: UTM Zone 14 NAD83
Data Sources:
Natural Resources Canada, GeoBase® National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.
Meadowbank Gold Project
AGNICO EAGLE
CASLYS CONSULTING
638000
640000
7214000
7212000
East Dike
SP-ED-1
SP-ED-2
SP-ED-3
SP-ED-4
SP-ED-5
SP-DT-3
SP-DT-2
SP-DT-4
SP-DT-1
SP-DT-5
Water Intake
South Camp Dike
North Basin
TPE-BGN-1
TPE-BGN-2
TPE-BGN-3
TPE-BGN-4
TPE-BGN-5
Bay-Goose Dike
TPE-BGS-1
TPE-BGS-5
TPE-BGS-4
TPE-BGS-2
TPE-BGS-3
East Basin
TPE-G-1
TPE-G-2
TPE-G-3
TPE-G-4
TPE-G-5

Figure K-3. Mean and relative periphyton biomass (µg/cm²) for major taxa groups at East Dike HCF sampling areas.

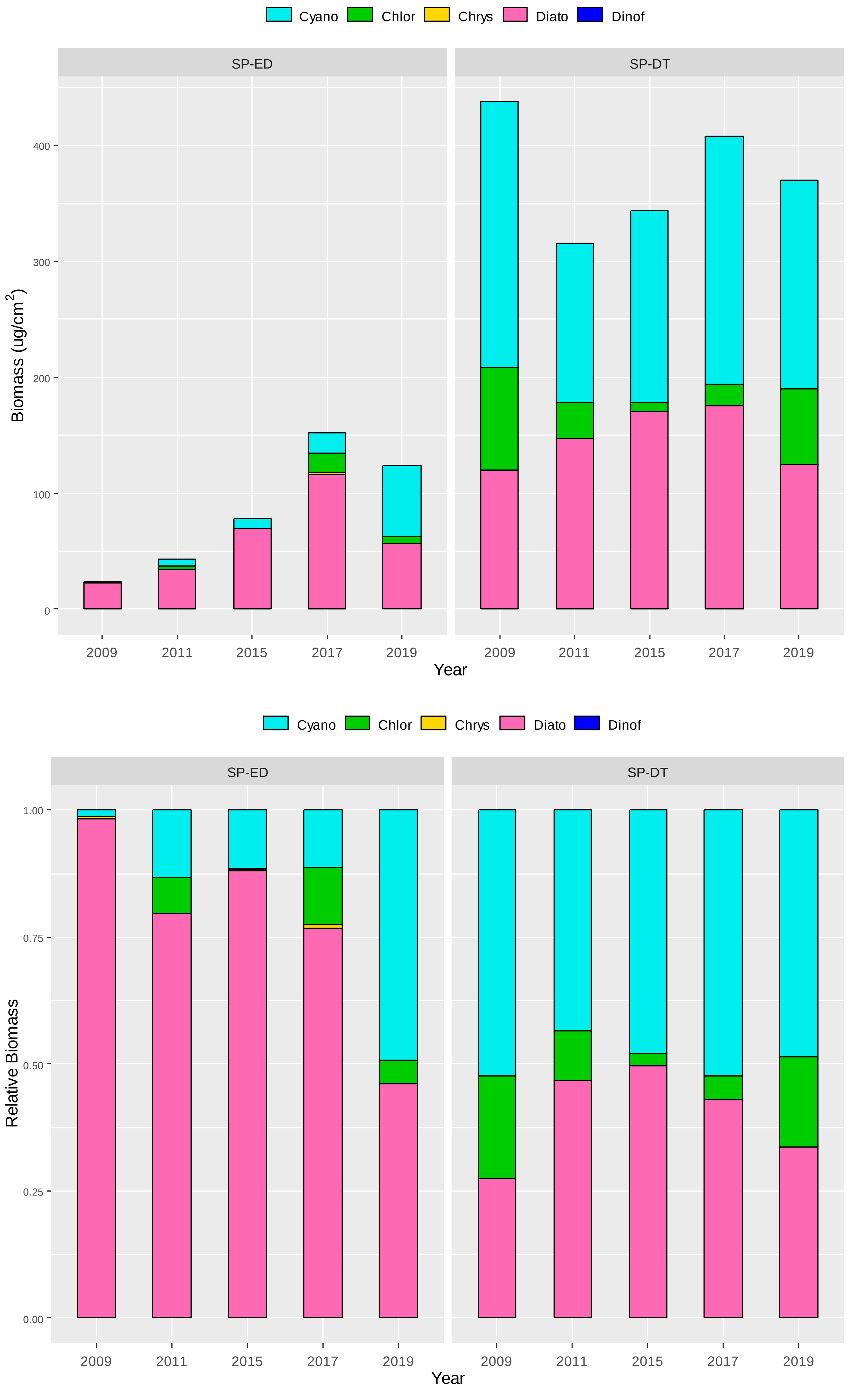


Figure K-4. Mean and relative periphyton density (cells/cm²) for major taxa groups at East Dike HCF sampling areas.

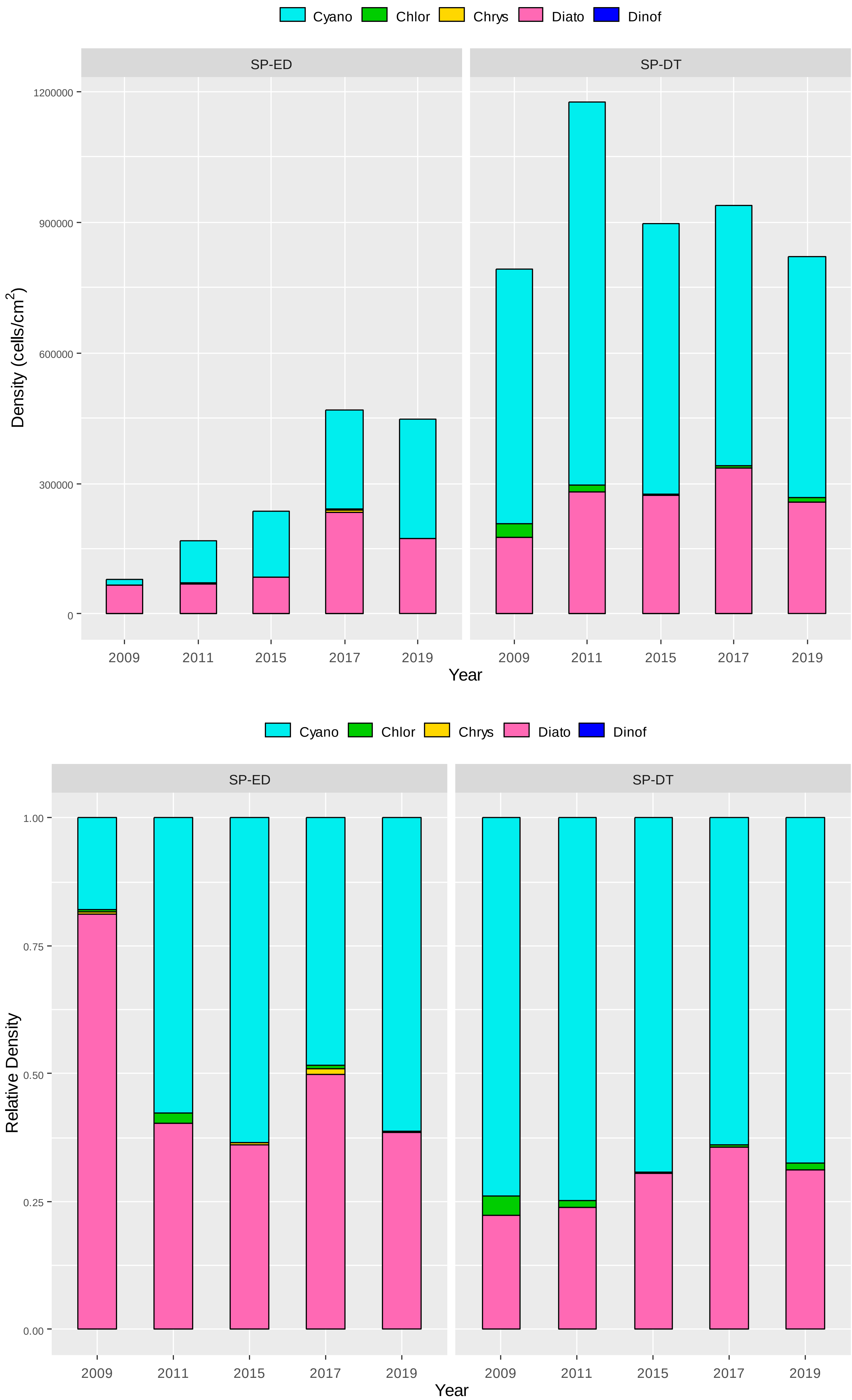
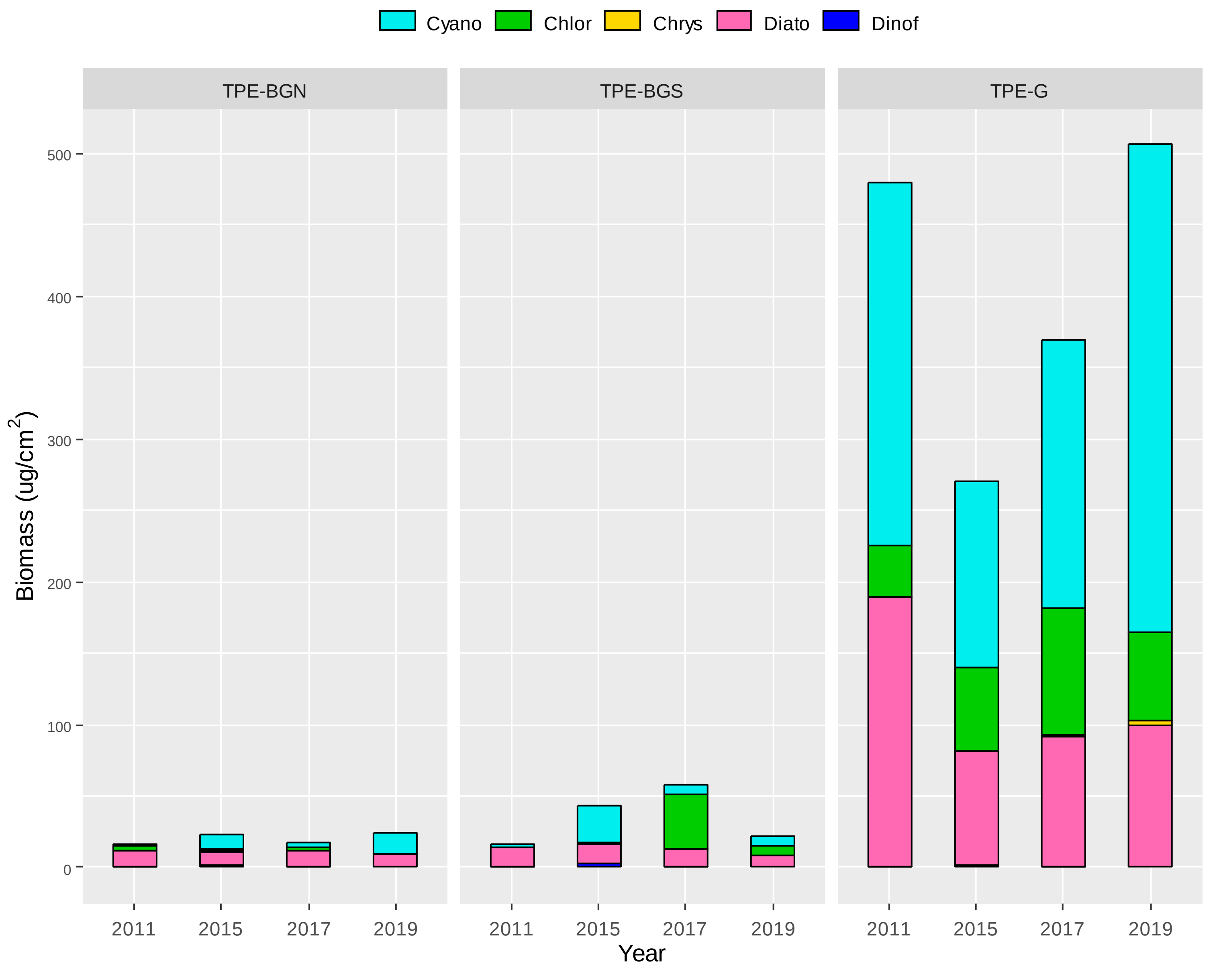


Figure K-5. Mean and relative periphyton biomass (μg/cm²) for major taxa groups at Bay-Goose Dike HCF sampling areas.



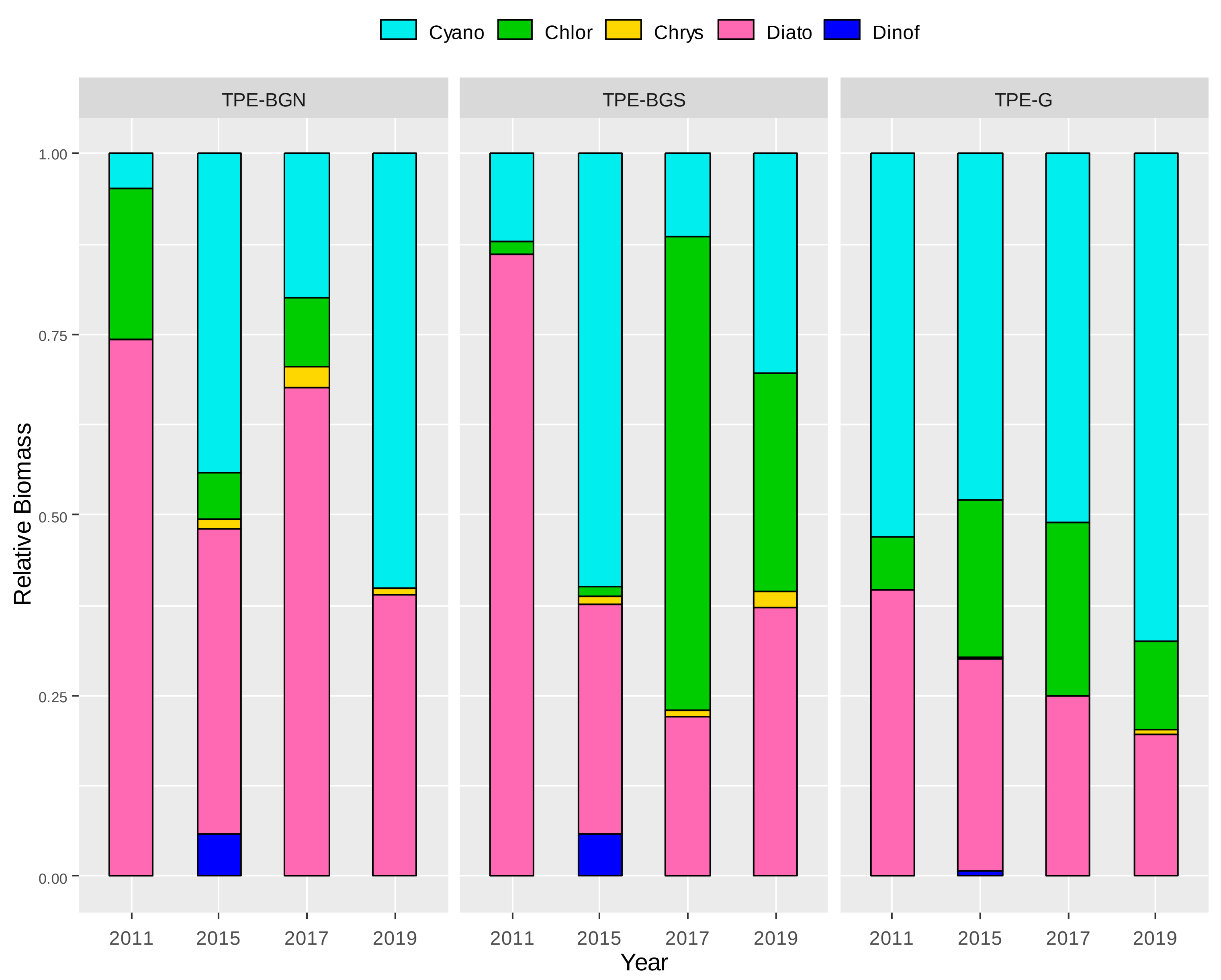
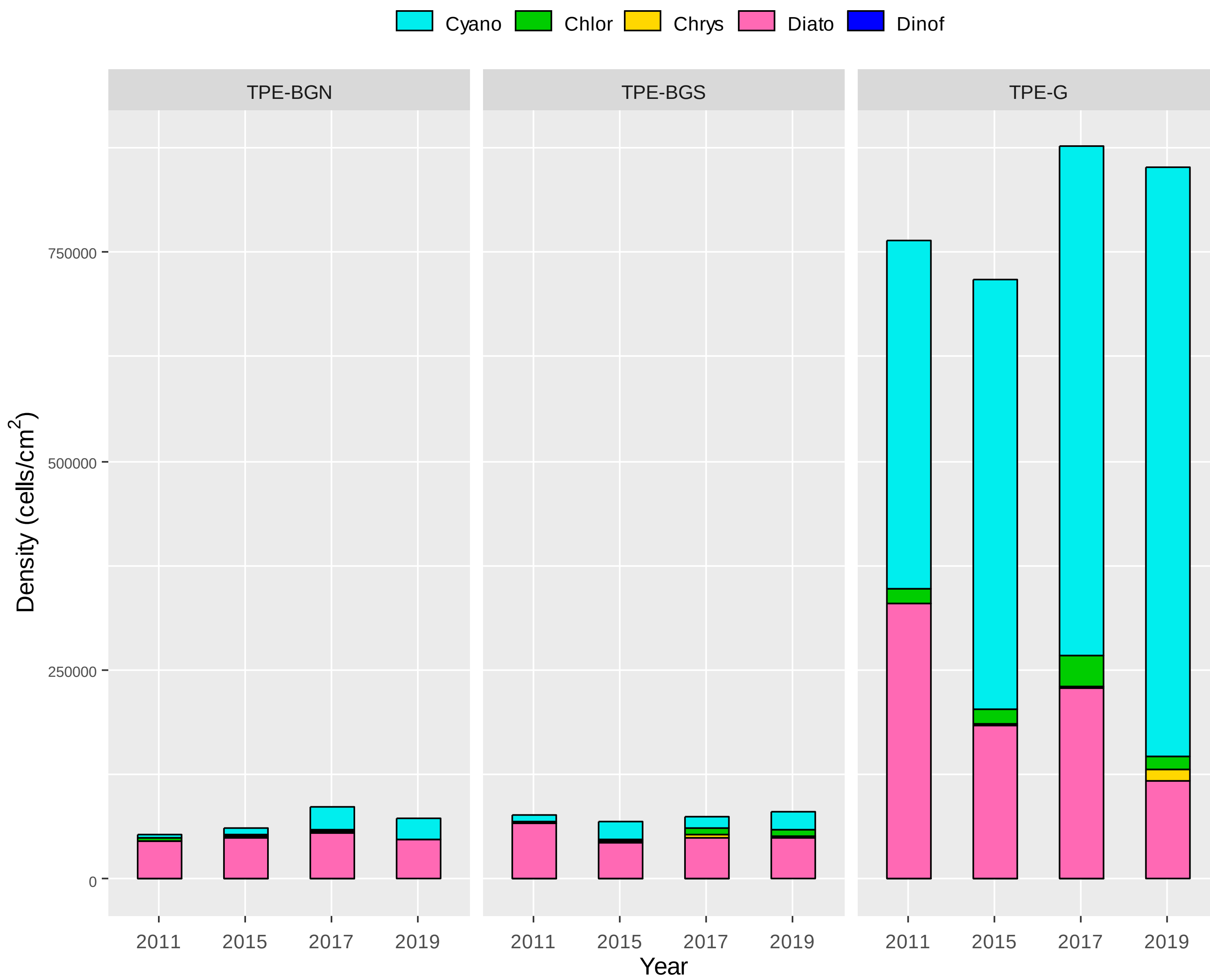


Figure K-6. Mean and relative periphyton density (cells/cm²) for major taxa groups at Bay-Goose Dike HCF sampling areas.



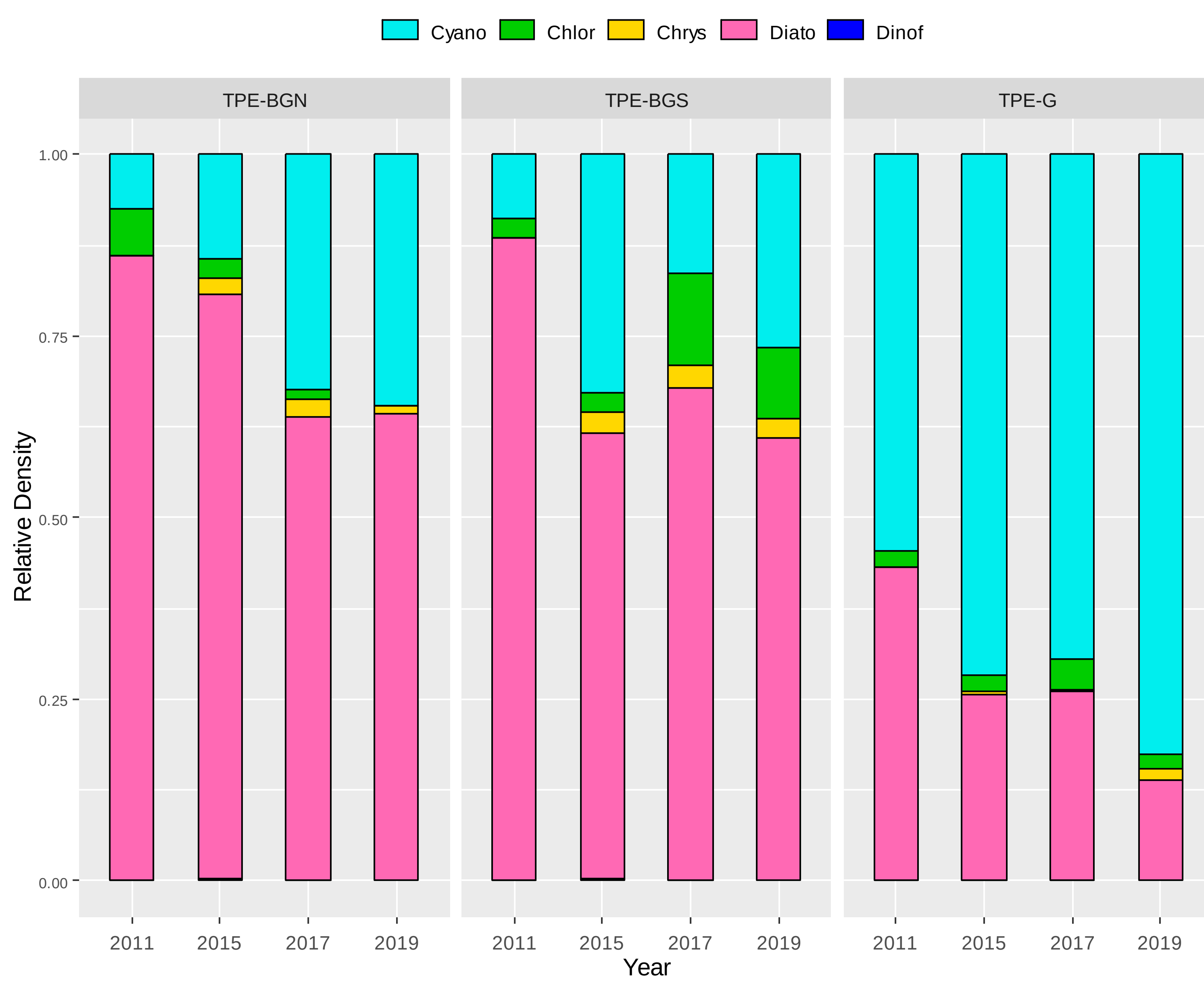


Table K-1. Periphyton rock sampling locations, 2019.

HCF	Sampling Area ID	Date	Replicate #	UTM Coordinates Easting	UTM Coordinates Northing
East Dike HCF	SP-ED	14-Aug-19	1	14W 63937[1]	7214346
			2	14W 639379	7214291
			3	14W 639398	7214086
			4	14W 639414	7213945
			5	14W 639383	7213854
	SP-DT	14-Aug-19	1	15W 358683	7213915
			2	15W 358703	7213952
			3	15W 358729	7214021
			4	14W 641324	7213847
			5	14W 641314	7213780
Bay-Goose Dike HCF	TPE-BGN	9-Aug-19	1	14W 639188	7213013
			2	14W 639100	7212914
			3	14W 639040	7212848
			4	14W 638982	7212651
			5	14W 639003	7212499
	TPE-BGS	10-Aug-19	1	14W 638943	7212160
			2	14W 638838	7211954
			3	14W 638515	7211834
		9-Aug-19	4	14W 638448	7211978
			5	14W 638352	7212101
	TPE-G	10-Aug-19	1	14W 637932	7210750
			2	14W 637951	7210745
			3	14W 637963	7210734
			4	14W 637974	7210730
			5	14W 637980	7210727

Notes:

1 Missing last digit of coordinate.

Table K-2. QA/QC results for the laboratory duplicate periphyton samples.

	Laboratory Duplicates								
	SP-DT-3 14-Aug-19	**Lab Duplicate**	**RPD (%)**	**SP-ED-4 14-Aug-19**	**Lab Duplicate**	**RPD (%)**	**TPE-BGN-2 09-Aug-19**	**Lab Duplicate**	**RPD (%)**
Total Density	1013853	942076	7.3	516244	478975	7.5	54910	62087	-12.3
Total Biomass	444	409	8.0	159.4	159.5	0.0	15	20	-28.5
# Taxa	15	18	-18.2	17	19	-11.1	11	11	0.0
Simpsons Diversity	0.83	0.79	5.0	0.94	0.82	14.4	0.58	0.59	-0.6

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

Shaded RPDs exceed 25% (lab duplicates).

NA = Not Applicable for rare species.

Table K-3. Density (cells/cm²), biomass (µg/cm²) and diversity of major periphyton taxa groups for East Dike HCF sampling areas.

Area-Replicate ID	Date	Cyanobacteria	Chlorophyte	Chrysophyte	Diatom	Dinoflagellate	Total	# Taxa	Simpson's Diversity
Periphyton Density (cells/cm²)									
SP-ED-1	14-Aug-19	367858	0	0	139966	0	507824	15	0.75
SP-ED-2	14-Aug-19	231781	0	0	167480	0	399261	16	0.81
SP-ED-3	14-Aug-19	88341	2761	0	241558	0	332660	18	0.76
SP-ED-4	14-Aug-19	285728	6902	0	223614	0	516244	17	0.94
SP-ED-5	14-Aug-19	398916	0	0	89722	0	488637	14	0.79
	station mean	***274525***	***1932***	***0***	***172468***	***0***	***448925***	***16***	***0.81***
	as %	***61%***	***0.43%***	***0.0%***	***38%***	***0%***			
SP-DT-1	14-Aug-19	541918	21533	0	330175	0	893626	18	0.72
SP-DT-2	14-Aug-19	610106	15381	0	76904	0	702391	15	0.76
SP-DT-3	14-Aug-19	756651	11963	0	245239	0	1013853	15	0.83
SP-DT-4	14-Aug-19	424682	5981	0	424682	0	855345	20	0.76
SP-DT-5	14-Aug-19	437392	0	0	206359	0	643752	15	0.80
	station mean	***554150***	***10972***	***0***	***256672***	***0***	***821793***	***17***	***0.77***
	as %	***67%***	***1.3%***	***0%***	***31%***	***0%***			
Periphyton Biomass (µg/cm²)									
SP-ED-1	14-Aug-19	127	0.0	0.0	46	0	173		
SP-ED-2	14-Aug-19	35	0	0.0	48	0	83		
SP-ED-3	14-Aug-19	40.3	4.8	0.0	95	0	140		
SP-ED-4	14-Aug-19	74.2	23.9	0.0	61	0	159		
SP-ED-5	14-Aug-19	29.2	0.0	0.0	35	0	64		
	station mean	***61.2***	***5.7***	***0.0***	***57***	***0***	***124***		
	as %	***49%***	***4.6%***	***0.0%***	***46%***	***0%***			
SP-DT-1	14-Aug-19	104	146.1	0.0	98	0	348		
SP-DT-2	14-Aug-19	233	163.4	0.0	52	0	448		
SP-DT-3	14-Aug-19	257	12.2	0.0	175	0	444		
SP-DT-4	14-Aug-19	84	7.8	0.0	208	0	299		
SP-DT-5	14-Aug-19	221	0.0	0.0	90	0	310		
	station mean	***180***	***65.9***	***0***	***124***	***0***	***370***		
	as %	***49%***	***17.8%***	***0%***	***34%***	***0%***			

Table K-4. Density (cells/cm²), biomass (µg/cm²) and diversity of major periphyton taxa groups for Bay-Goose Dike HCF sampling areas.

Area-Replicate ID	Date	Cyanobacteria	Chlorophyte	Chrysophyte	Diatom	Dinoflagellate	Total	# Taxa	Simpson's Diversity
Periphyton Density (cells/cm²)									
TPE-BGN-1	09-Aug-19	22,879	0	0	50,693	0	73,572	10	0.57
TPE-BGN-2	09-Aug-19	12,920	0	2,153	39,836	0	54,910	11	0.58
TPE-BGN-3	09-Aug-19	40,823	0	0	51,141	0	91,965	11	0.70
TPE-BGN-4	09-Aug-19	24,763	0	2,153	42,349	0	69,265	13	0.68
TPE-BGN-5	09-Aug-19	24,763	0	0	50,603	0	75,366	11	0.60
	station mean	***25,230***	***0***	***861***	***46,924***	***0***	***73,015***	***11***	***0.63***
	as %	***35%***	***0.0%***	***1.2%***	***64%***	***0.0%***			
TPE-BGS-1	10-Aug-19	7895	0	0	44502	0	52397	5	0.29
TPE-BGS-2	10-Aug-19	17585	0	3230	50603	0	71418	13	0.72
TPE-BGS-3	09-Aug-19	6819	0	2153	36606	0	45579	9	0.54
TPE-BGS-4	09-Aug-19	19021	4307	1436	44143	0	68906	11	0.66
TPE-BGS-5	09-Aug-19	56225	35290	3589	70581	0	165686	14	0.79
	station mean	***21509***	***7919***	***2082***	***49287***	***0***	***80797***	***10***	***0.60***
	as %	***27%***	***9.8%***	***2.6%***	***61%***	***0.0%***			
TPE-G-1	10-Aug-19	333764	3589	16150	37683	0	391186	15	0.63
TPE-G-2	10-Aug-19	488982	13458	0	87478	0	589919	13	0.78
TPE-G-3	10-Aug-19	568236	2991	29907	119629	0	720763	14	0.78
TPE-G-4	10-Aug-19	954039	35889	0	209350	0	1199277	17	0.56
TPE-G-5	10-Aug-19	1173557	28711	21533	132788	0	1356589	15	0.80
	station mean	***703716***	***16927***	***13518***	***117386***	***0***	***851547***	***15***	***0.71***
	as %	***83%***	***2.0%***	***1.6%***	***14%***	***0.00%***			

Area-Replicate ID	Date	Cyanobacteria	Chlorophyte	Chrysophyte	Diatom	Dinoflagellate	Total
Periphyton Biomass (µg/cm²)							
TPE-BGN-1	09-Aug-19	8.7	0.0	0.0	7.8	0.0	16.4
TPE-BGN-2	09-Aug-19	8.9	0.0	0.5	5.8	0.0	15.2
TPE-BGN-3	09-Aug-19	36.9	0.0	0.0	15.4	0.0	52.3
TPE-BGN-4	09-Aug-19	14.2	0.0	0.5	9.7	0.0	24.4
TPE-BGN-5	09-Aug-19	3.5	0.0	0.0	8.1	0.0	11.7
	station mean	***14.4***	***0.0***	***0.2***	***9.4***	***0.0***	***24.0***
	as %	***60%***	***0.0%***	***0.8%***	***39%***	***0.0%***	
TPE-BGS-1	10-Aug-19	0.6	0.0	0.0	6.4	0.0	7.0
TPE-BGS-2	10-Aug-19	1.4	0.0	0.7	14.7	0.0	16.8
TPE-BGS-3	09-Aug-19	0.7	0.0	0.5	4.1	0.0	5.3
TPE-BGS-4	09-Aug-19	8.2	5.8	0.3	5.2	0.0	19.6
TPE-BGS-5	09-Aug-19	23.1	28.0	0.8	11.4	0.0	63.3
	station mean	***6.8***	***6.8***	***0.5***	***8.4***	***0.0***	***22.4***
	as %	***30%***	***30.2%***	***2.1%***	***37%***	***0.0%***	
TPE-G-1	10-Aug-19	295.5	12.1	3.7	15.0	0.0	326.3
TPE-G-2	10-Aug-19	239.7	72.9	0.0	97.9	0.0	410.6
TPE-G-3	10-Aug-19	154.2	12.0	6.8	91.9	0.0	264.9
TPE-G-4	10-Aug-19	345.2	93.0	0.0	173.0	0.0	611.2
TPE-G-5	10-Aug-19	671.0	124.6	4.9	118.6	0.0	919.1
	Station mean	***341.1***	***62.9***	***3.1***	***99.3***	***0.0***	***506.4***
	as %	***67%***	***12%***	***0.6%***	***20%***	***0.0%***	

Table K-5. Mean total (± SD) periphyton biomass (µg/cm²) at both dike HCF areas since 2007.

Year [1]	East Dike HCF Areas			Bay-Goose Dike HCF Areas			
	SP-ED	SP-CREMP	SP-DT	TPE- BGN	TPE-BGS	TPE-CREMP	TPE-G
2007		628 ± 352				482 ± 235	
2008		546 ± 183				372 ± 148	
2009	23 ± 13	549 ± 256	438 ± 265				
2010		270 ± 98	308 ± 113				
2011	43 ± 16	316 ± 35	316 ± 61	16 ± 13	16 ± 15	855 ± 332	480 ± 138
2012							
2013							
2014							
2015	79 ± 57		344 ± 147	22 ± 19	44 ± 46		270 ± 124
2017	152 ± 63		408 ± 110	17 ± 10	57 ± 88		370 ± 227
2019	124 ± 48		370 ± 72	24 ± 16	22 ± 24		506 ± 265

Notes:

Red dashed line indicates when dike construction was finished in each area (i.e., the year above the red line).

1 Starting in 2015, the HCMP program was only conducted every two years.

APPENDIX K1
HISTORICAL PERIPHYTON RESULTS

LIST OF FIGURES – APPENDIX K1

Figure K1-1. Mean and relative periphyton biomass (µg/cm²) for major taxa groups at East Dike HCF sampling areas, 2007-2019.

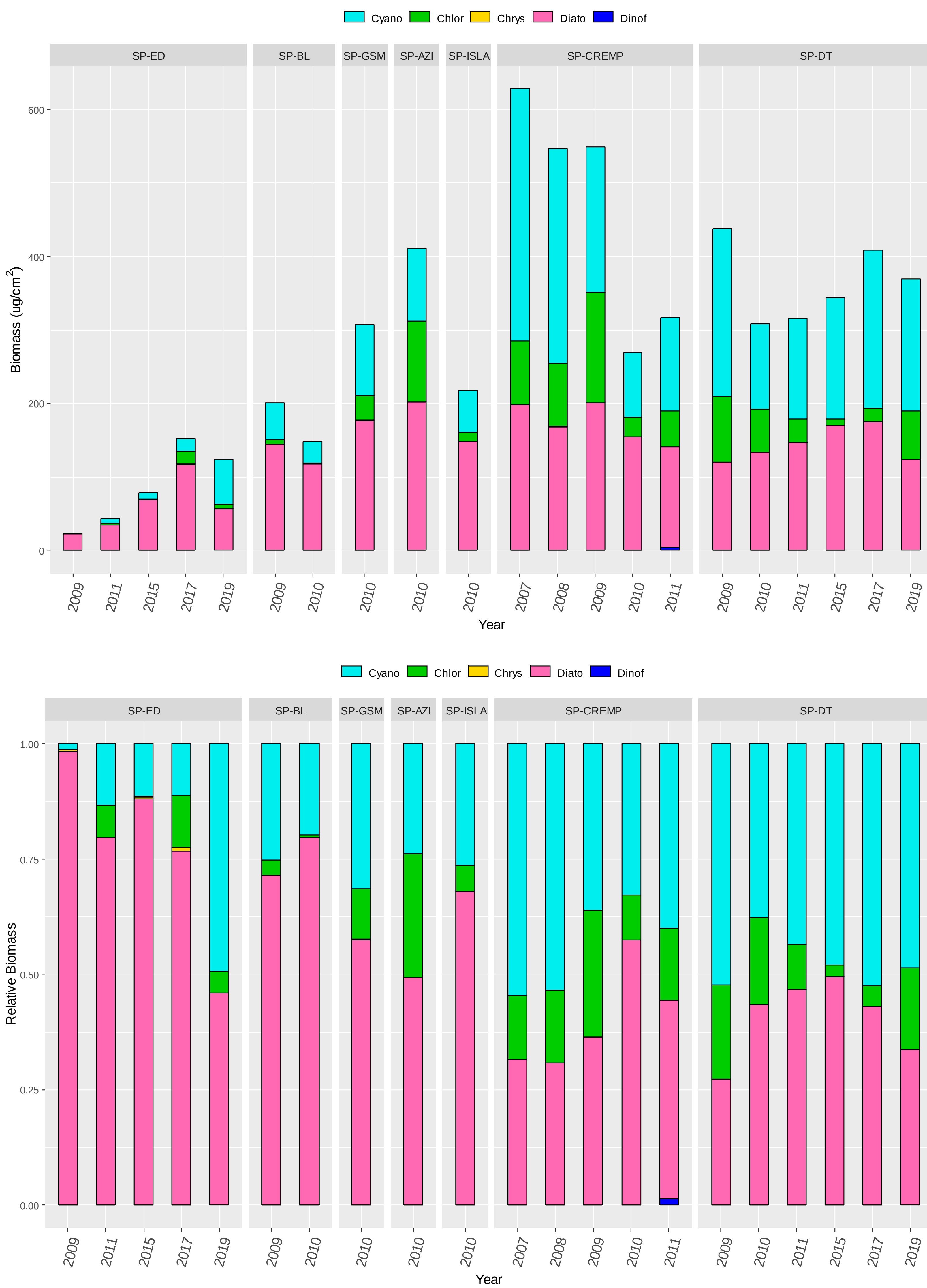


Figure K1-2. Mean and relative periphyton density (cells/cm²) for major taxa groups at East Dike HCF sampling areas, 2007-2019.

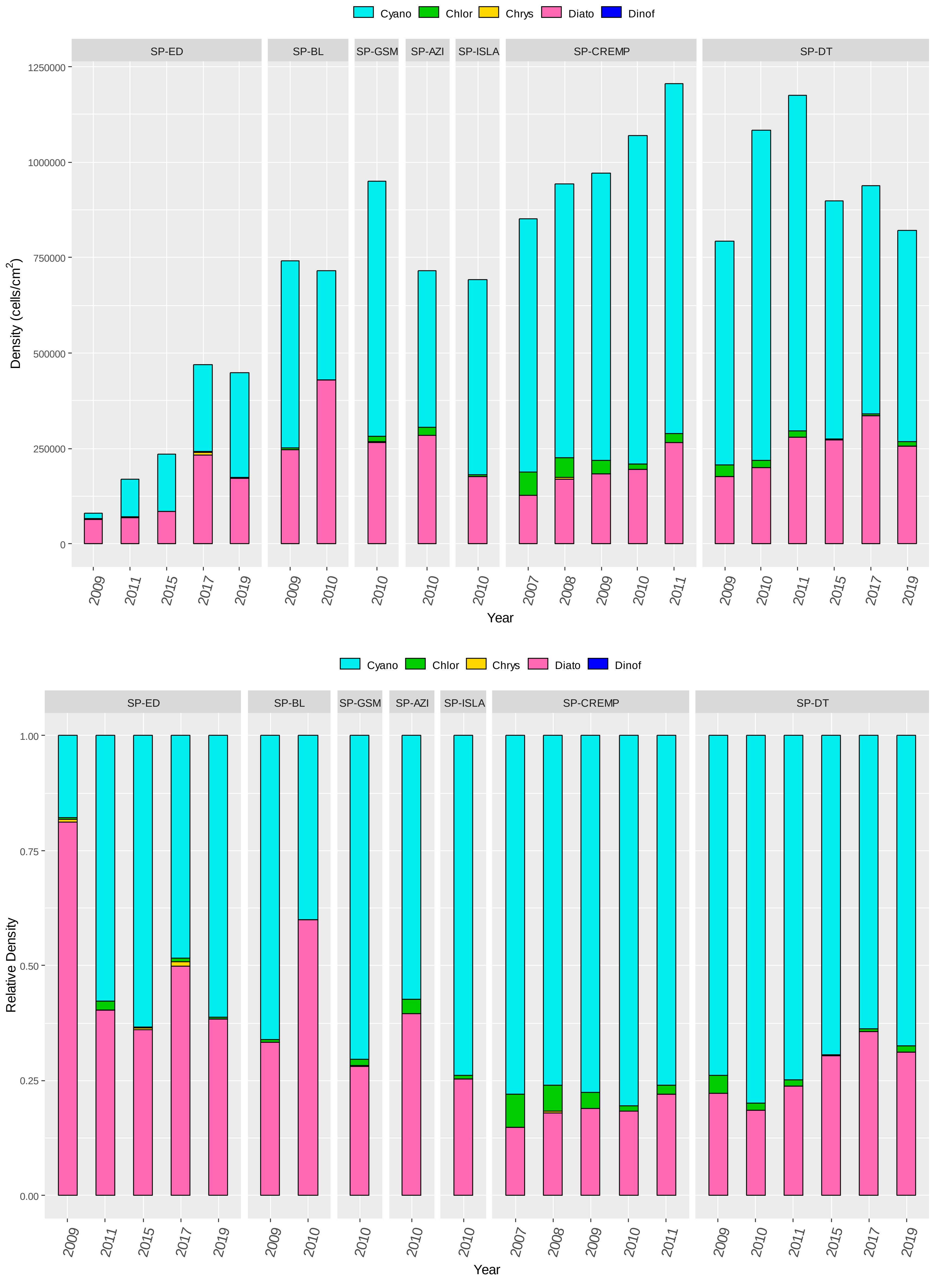


Figure K1-3. Mean and relative periphyton biomass (µg/cm²) for major taxa groups at Bay-Goose Dike HCF sampling areas, 2007-2019.

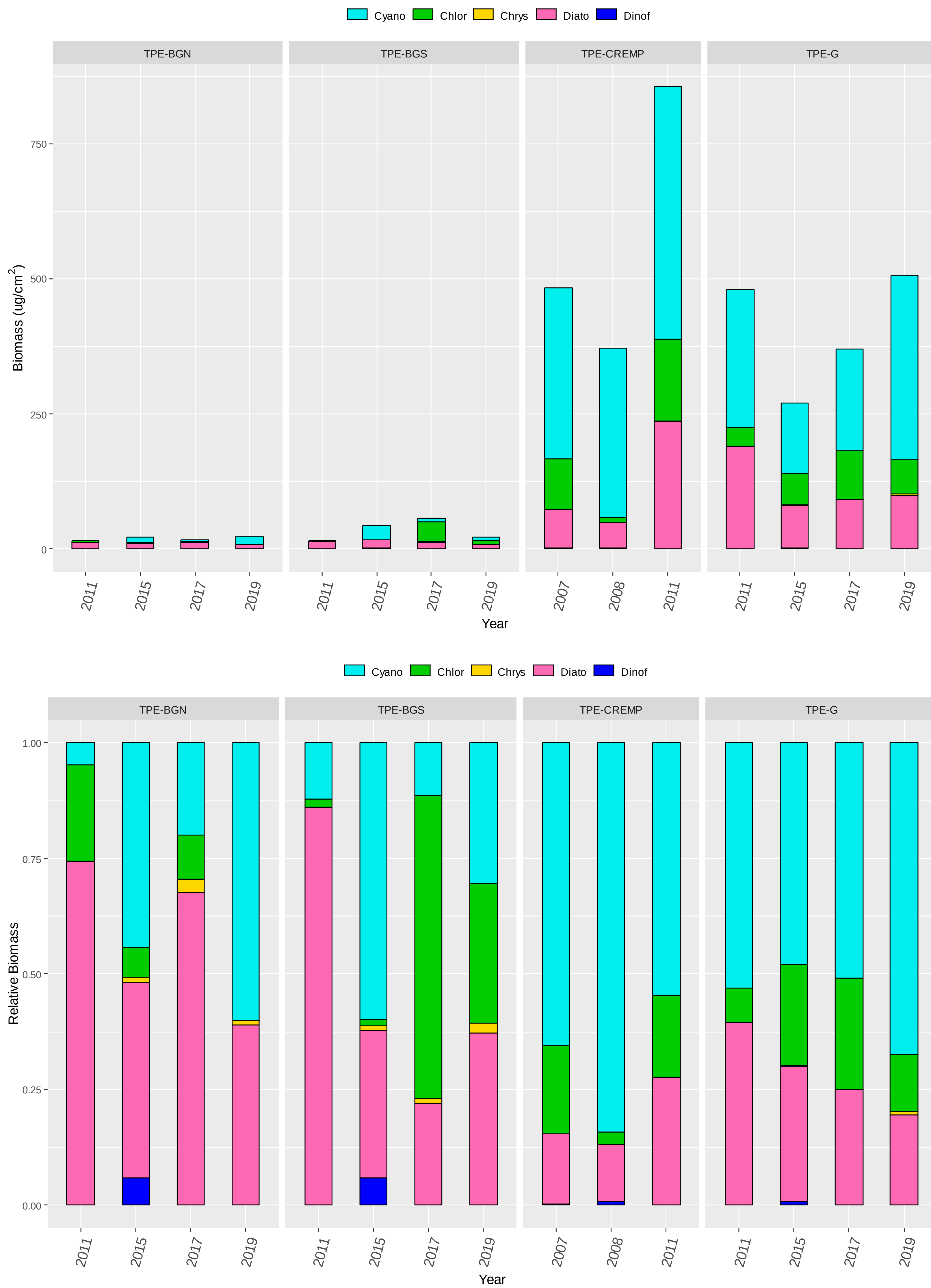
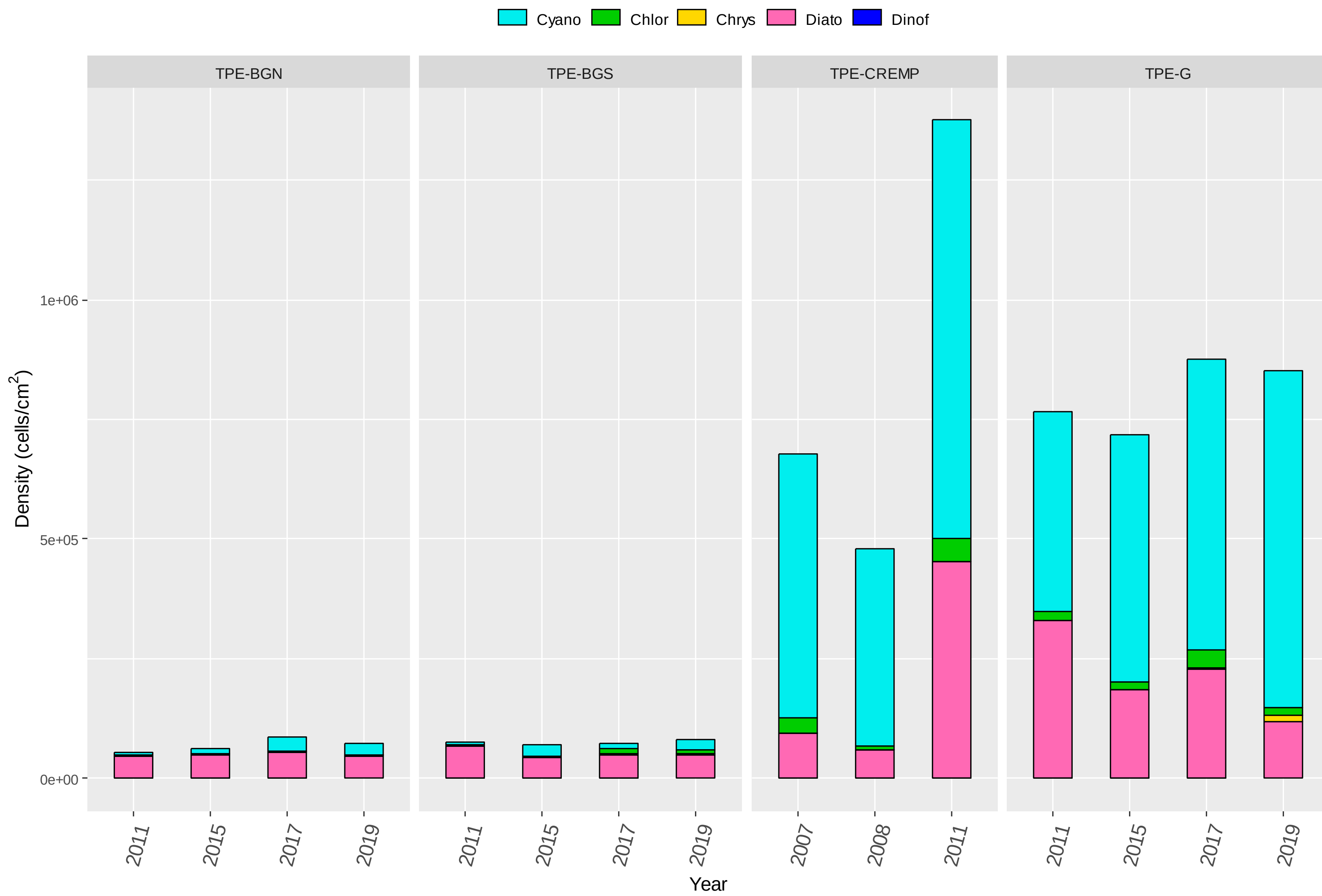
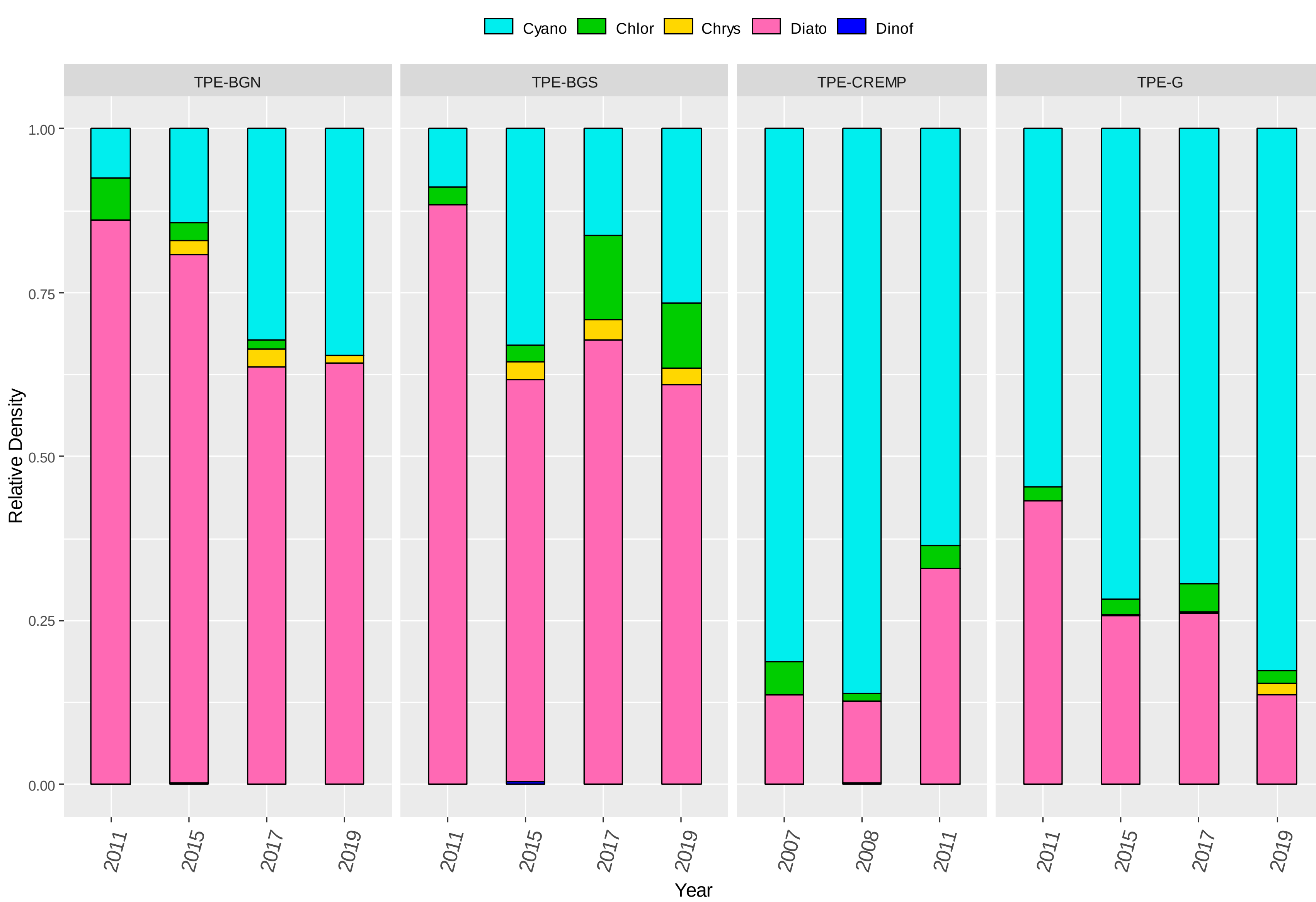


Figure K1-4. Mean and relative periphyton density (cells/cm²) for major taxa groups at Bay-Goose Dike HCF sampling areas, 2007-2019.





APPENDIX K2
HCMP PERIPHYTON SAMPLING - STANDARD OPERATING PROCEDURES

Standard Operating Procedure
Meadowbank Lakes Project
HCM Periphyton Sampling

Equipment

- Field collection data forms (printed on waterproof paper), pencils, waterproof markers & clipboard
- GPS unit, batteries
- Periphyton sampler, syringes & plastic tubes
- Binder clips (to pinch tubes on periphyton sampler)
- Shoulder gloves (with 5 cm increments marked from fingertip to shoulder)
- Large tote
- Field sample bottles & preservative (per replicate):
- 1 – 500 mL plastic jar
- 1 syringe & Lugol's solution
- Cooler(s) or action packer(s) (for storing and shipping samples)
- Address labels for cooler(s)/action packer(s)
- Chain-of-custody forms
- Large Ziploc bag (for sending chain-of-custody form in cooler)
- Packing tape (for sealing cooler)

General Procedures

Before going into the field, label all sampling containers. Using a permanent waterproof marker, print the following information directly onto both the jar and jar lid:

- Azimuth company name
- Station abbreviation (e.g. SP-ED) and replicate number (e.g. SP-ED -1, SP-ED-2)
- Date of sample collection

Before and during sampling, fill in the requested information on the field data form using a lead pencil or Rite-in-the-rain pen.

Access to the area may be by boat or foot; in either event, ensure the sampling area is not impacted by boat (launch) or other anthropogenic activities. Record the UTM coordinates for each sampling station, measured using a GPS unit in NAD 83, on the field data form. In future sampling events, sample periphyton from the same locations.

Select a rock with a flat surface, **no more than 0.5 meter below the water surface**, with the following criteria:

- Facing up as much as possible; if not, with a small slope[1]
- Uniform algal coverage, not uniformly dense or sparse

The periphyton sampler is a specially designed scrubber, consisting of a plexiglass tube with a plunger that fits snugly inside and a distal wire brush that comes in direct contact with the rock surface. Press the tube against the rock to form a tight seal. To detach the periphyton colonies, depress the plunger and twist for approximately 30 half turns. The periphyton mixture is suspended by opening the plunger approximately ¼ of the device volume and drawn into a syringe that is attached to the tube. Pinch intake tube closed when drawing suspension into syringe. Empty the syringe, pinch output tube closed prior to detaching the syringe, into the pre-labeled replicate 1 sampling container (i.e., TPE-CREMP-1). Continue scraping and syringing (approximately two times: another 20 half turns of the sampler, then 10 half turns, then a final rinse of sampler) until all visible periphyton are completely removed from the rock surface. This procedure works well with two people; one to scrub the rocks and clamp the intake tube, the other to operate the syringe and clamp the output tube. The number of turns in this SOP is conservative and may be too many for the average sampling site. Use discretion and examine each sampled rock to ensure it has been fully cleaned where the scrubber was used.

Repeat rock selection and scrubbing steps two more times, selecting undisturbed flat rocks in less than 0.5 meter of water. Put the collected periphyton samples from each rock into the same pre-labeled replicate 1 sampling container (i.e. TPE-1) as above. These three rocks are composited into one replicate sample; approximately 500 mL of water/periphyton are collected in total.

Repeat above steps for each replicate required at the station. For every 125 mL of periphyton mixture in each sampling container, add 1 mL of Lugol's solution to preserve the sample (the sample should look the colour of weak tea). Seal the sampling containers and store in a cooler at room temperature.

Fill out a chain-of-custody form completely and place into a sealed Ziploc plastic bag inside the shipping container. If using digital COC form, print two copies of the document in the field, one copy for the laboratory and one for Azimuth. Questions about COCs can be directed to Eric Franz.

Meadowbank HCM Periphyton Scrubbing

- Collect periphyton scrubbing samples from 5 stations within SP and TPE
- Revisit the following SP stations: SP-DT and SP-ED

[1] Along the dike face it may be necessary to set up a tote to receive the rock. If the aspect of the dike face is too steep to safely or properly sample in-situ place the rock in the tote in the boat. It must hold enough water to cover the sampled rock so that the plunger works properly. Make sure the tote is clean after each sample.

- Include the following TPE stations: TPE-BGN, TPE-BGS and TPE-G (reference site)
- Each station consists of 5 replicate samples (four stations are close together and the two dike stations are close together more spread out)
- Each sample replicate will consist of scrubbings from three rocks and will be placed in a 500 mL jar and preserved with Lugol's solution
- Ship samples and COC to David Findlay at Plankton R Us

  Plankton R Us Inc.
  39 Alburg Drive
  Winnipeg, MB R2N 1M1
  Tel: 204-254-7952

APPENDIX K3
PERIPHYTON LABORATORY DATA

Epilithic (EI) algal species data for CREMP 2019 (for Azimuth consulting group)

**** 1st number in species code = group 1=cyanobacteria 2=chlorophyte 5=diatoms 7=Dinoflagellates**

**** total daily biomass is sum of all species on a given date**

**********R specifies a replicate count for QA/QC**

Location	Station	Date	Species code	Species name	density cells/cm^2	biomass µg/cm^2	length µ	width µ	cell volume µ^3
SP - DT	1	14-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	39477	14.76	119.00	2.00	373.80
SP - DT	1	14-Aug-19	1084	Gloeocapsa punctata	93310	3.13	4.00	4.00	33.50
SP - DT	1	14-Aug-19	1086	Calothrix sp.	3589	15.41	82.00	10.00	4293.50
SP - DT	1	14-Aug-19	1124	Petalonema alatum Berk	21533	42.01	69.00	6.00	1950.90
SP - DT	1	14-Aug-19	1131	Heteroleibeinia profunda Komarek	369653	25.10	21.60	2.00	67.90
SP - DT	1	14-Aug-19	1136	Lyngbya mucicola Lemmermann	10767	0.48	57.00	1.00	44.80
SP - DT	1	14-Aug-19	1239	Homoeothrix varians Komarek & Kalina	3589	2.77	96.00	3.20	772.10
SP - DT	1	14-Aug-19	2205	Mougeotia sp.	21533	146.12	60.00	12.00	6785.80
SP - DT	1	14-Aug-19	5513	Tabellaria fenestrata (Lyngbye) Kutzing	3589	2.77	82.00	6.00	772.80
SP - DT	1	14-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	17944	36.08	30.00	16.00	2010.60
SP - DT	1	14-Aug-19	5519	Synedra acus v. radians (Kutzing) Hustedt	3589	0.21	56.00	2.00	58.60
SP - DT	1	14-Aug-19	5702	Achnanthes minutissima Kutzing	269165	22.56	20.00	4.00	83.80
SP - DT	1	14-Aug-19	5820	Eunotia arcus Ehrenberg	10767	16.24	40.00	12.00	1508.00
SP - DT	1	14-Aug-19	5854	Pinnularia borealis Ehrenberg	3589	6.11	65.00	10.00	1701.70
SP - DT	1	14-Aug-19	5860	Diatoma vulgare Bory	3589	2.36	31.00	9.00	657.40
SP - DT	1	14-Aug-19	5870	Navicula radiosa Kutzing	3589	6.67	71.00	10.00	1858.80
SP - DT	1	14-Aug-19	5873	Gomphonema minutum	3589	1.56	26.00	8.00	435.60
SP - DT	1	14-Aug-19	5882	Anomoenies vitrea Ross	10767	3.65	36.00	6.00	339.30
SP - DT	2	14-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	258911	12.19	15.00	2.00	47.10
SP - DT	2	14-Aug-19	1086	Calothrix sp.	35889	125.08	90.00	8.60	3485.30
SP - DT	2	14-Aug-19	1124	Petalonema alatum Berk	25635	57.26	79.00	6.00	2233.70
SP - DT	2	14-Aug-19	1131	Heteroleibeinia profunda Komarek	207641	12.65	19.40	2.00	60.90
SP - DT	2	14-Aug-19	1136	Lyngbya mucicola Lemmermann	38452	1.66	55.00	1.00	43.20
SP - DT	2	14-Aug-19	1239	Homoeothrix varians Komarek & Kalina	43579	24.18	69.00	3.20	554.90
SP - DT	2	14-Aug-19	2205	Mougeotia sp.	15381	163.37	69.00	14.00	10621.70
SP - DT	2	14-Aug-19	5311	Cymbella minuta Kutzing	2563	1.01	15.60	8.00	392.10
SP - DT	2	14-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	17944	25.78	28.00	14.00	1436.80
SP - DT	2	14-Aug-19	5519	Synedra acus v. radians (Kutzing) Hustedt	5127	0.34	63.00	2.00	66.00
SP - DT	2	14-Aug-19	5702	Achnanthes minutissima Kutzing	41016	3.61	21.00	4.00	88.00
SP - DT	2	14-Aug-19	5726	Eucocconeis sp.	2563	10.74	40.00	20.00	4188.80
SP - DT	2	14-Aug-19	5836	Encyonema silesiacum (Bleisch) D.G. Mann	2563	3.02	30.00	10.00	1178.10
SP - DT	2	14-Aug-19	5875	Cocconies disculus Schum.	2563	6.52	30.00	18.00	2544.70
SP - DT	2	14-Aug-19	5910	Navicula exigua (Greg.) Muller	2563	0.97	40.00	6.00	377.00
SP - DT	3	14-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	119629	44.72	119.00	2.00	373.80
SP - DT	3	14-Aug-19	1070	Anabaenopsis sp.	29907	0.42	3.00	3.00	14.10
SP - DT	3	14-Aug-19	1084	Gloeocapsa punctata	47851	1.60	4.00	4.00	33.50
SP - DT	3	14-Aug-19	1086	Calothrix sp.	23926	120.26	96.00	10.00	5026.50
SP - DT	3	14-Aug-19	1124	Petalonema alatum Berk	20935	35.52	60.00	6.00	1696.50
SP - DT	3	14-Aug-19	1131	Heteroleibeinia profunda Komarek	334960	24.22	23.00	2.00	72.30
SP - DT	3	14-Aug-19	1136	Lyngbya mucicola Lemmermann	137573	6.81	63.00	1.00	49.50
SP - DT	3	14-Aug-19	1239	Homoeothrix varians Komarek & Kalina	41870	23.23	69.00	3.20	554.90
SP - DT	3	14-Aug-19	2205	Mougeotia sp.	11963	12.18	36.00	6.00	1017.90
SP - DT	3	14-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	71777	103.13	28.00	14.00	1436.80
SP - DT	3	14-Aug-19	5547	Frustulia rhomboides (Ehrenberg) de Toni	2991	8.10	69.00	10.00	2709.60
SP - DT	3	14-Aug-19	5551	Cyclotella michiganiana Skvortzow	8972	0.44	5.00	5.00	49.10
SP - DT	3	14-Aug-19	5702	Achnanthes minutissima Kutzing	119629	9.67	19.30	4.00	80.80
SP - DT	3	14-Aug-19	5720	Cyclotella bodanica Eulenst.	2991	46.16	34.00	34.00	15434.60
SP - DT	3	14-Aug-19	5860	Diatoma vulgare Bory	23926	2.80	27.90	4.00	116.90
SP - DT	3	14-Aug-19	5873	Gomphonema minutum	2991	1.30	26.00	8.00	435.60
SP - DT	3	14-Aug-19	5882	Anomoenies vitrea Ross	5981	0.92	65.00	3.00	153.20
SP - DT	3	14-Aug-19	5910	Navicula exigua (Greg.) Muller	5981	2.14	38.00	6.00	358.10
SP - DT	3R	14-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	92712	34.66	119.00	2.00	373.80
SP - DT	3R	14-Aug-19	1070	Anabaenopsis sp.	17944	0.25	3.00	3.00	14.10
SP - DT	3R	14-Aug-19	1086	Calothrix sp.	29907	150.33	96.00	10.00	5026.50
SP - DT	3R	14-Aug-19	1124	Petalonema alatum Berk	17944	30.44	60.00	6.00	1696.50
SP - DT	3R	14-Aug-19	1131	Heteroleibeinia profunda Komarek	364867	26.38	23.00	2.00	72.30
SP - DT	3R	14-Aug-19	1136	Lyngbya mucicola Lemmermann	122619	6.07	63.00	1.00	49.50
SP - DT	3R	14-Aug-19	1239	Homoeothrix varians Komarek & Kalina	29907	16.60	69.00	3.20	554.90
SP - DT	3R	14-Aug-19	2205	Mougeotia sp.	26916	27.40	36.00	6.00	1017.90
SP - DT	3R	14-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	53833	77.35	28.00	14.00	1436.80
SP - DT	3R	14-Aug-19	5519	Synedra acus v. radians (Kutzing) Hustedt	2991	0.20	65.00	2.00	68.10
SP - DT	3R	14-Aug-19	5547	Frustulia rhomboides (Ehrenberg) de Toni	2991	8.10	69.00	10.00	2709.60
SP - DT	3R	14-Aug-19	5551	Cyclotella michiganiana Skvortzow	2991	0.15	5.00	5.00	49.10
SP - DT	3R	14-Aug-19	5702	Achnanthes minutissima Kutzing	146545	11.84	19.30	4.00	80.80
SP - DT	3R	14-Aug-19	5726	Eucocconeis sp.	2991	12.53	40.00	20.00	4188.80
SP - DT	3R	14-Aug-19	5860	Diatoma vulgare Bory	11963	1.40	27.90	4.00	116.90
SP - DT	3R	14-Aug-19	5873	Gomphonema minutum	5981	2.61	26.00	8.00	435.60
SP - DT	3R	14-Aug-19	5882	Anomoenies vitrea Ross	5981	1.97	35.00	6.00	329.90
SP - DT	3R	14-Aug-19	5910	Navicula exigua (Greg.) Muller	2991	1.07	38.00	6.00	358.10
SP - DT	4	14-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	17944	6.37	113.00	2.00	355.00
SP - DT	4	14-Aug-19	1084	Gloeocapsa punctata	47851	1.60	4.00	4.00	33.50
SP - DT	4	14-Aug-19	1086	Calothrix sp.	5981	32.26	103.00	10.00	5393.10
SP - DT	4	14-Aug-19	1124	Petalonema alatum Berk	8972	20.55	81.00	6.00	2290.20

Epilithic (El) algal species data for CREMP 2019 (for Azimuth consulting group)

**** 1st number in species code = group 1=cyanobacteria 2=chlorophyte 5=diatoms 7=Dinoflagellates**

**** total daily biomass is sum of all species on a given date**

**********R specifies a replicate count for QA/QC**

Location	Station	Date	Species code	Species name	density cells/cm^2	biomass µg/cm^2	length µ	width µ	cell volume µ^3
SP - DT	4	14-Aug-19	1131	Heteroleibeinia profunda Komarek	343932	22.80	21.10	2.00	66.30
SP - DT	4	14-Aug-19	2205	Mougeotia sp.	5981	7.82	26.00	8.00	1306.90
SP - DT	4	14-Aug-19	5306	Navicula minima Grunow	44861	2.07	11.00	4.00	46.10
SP - DT	4	14-Aug-19	5311	Cymbella minuta Kutzing	20935	8.37	15.90	8.00	399.60
SP - DT	4	14-Aug-19	5507	Cyclotella stelligera Cleve and Grunow	2991	10.88	21.00	21.00	3636.80
SP - DT	4	14-Aug-19	5513	Tabellaria fenestrata (Lyngbye) Kutzing	2991	2.48	88.00	6.00	829.40
SP - DT	4	14-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	68786	98.83	28.00	14.00	1436.80
SP - DT	4	14-Aug-19	5546	Gyrosigma sp	2991	4.04	79.00	6.60	1351.40
SP - DT	4	14-Aug-19	5547	Frustulia rhomboides (Ehrenberg) de Toni	2991	8.34	71.00	10.00	2788.20
SP - DT	4	14-Aug-19	5551	Cyclotella michiganiana Skvortzow	17944	0.88	5.00	5.00	49.10
SP - DT	4	14-Aug-19	5702	Achnanthes minutissima Kutzing	218322	18.30	20.00	4.00	83.80
SP - DT	4	14-Aug-19	5726	Eucocconeis sp.	5981	25.06	40.00	20.00	4188.80
SP - DT	4	14-Aug-19	5836	Encyonema silesiacum (Bleisch) D.G. Mann	17944	21.14	30.00	10.00	1178.10
SP - DT	4	14-Aug-19	5873	Gomphonema minutum	8972	4.36	29.00	8.00	485.90
SP - DT	4	14-Aug-19	5882	Anomoenies vitrea Ross	5981	1.92	34.00	6.00	320.40
SP - DT	4	14-Aug-19	5910	Navicula exigua (Greg.) Muller	2991	1.10	39.00	6.00	367.60
SP - DT	5	14-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	20187	7.55	119.00	2.00	373.80
SP - DT	5	14-Aug-19	1077	Pseudanabaena sp.	22430	0.28	2.50	2.50	12.30
SP - DT	5	14-Aug-19	1084	Gloeocapsa punctata	35889	1.20	4.00	4.00	33.50
SP - DT	5	14-Aug-19	1086	Calothrix sp.	13458	60.60	86.00	10.00	4502.90
SP - DT	5	14-Aug-19	1124	Petalonema alatum Berk	69534	116.00	59.00	6.00	1668.20
SP - DT	5	14-Aug-19	1131	Heteroleibeinia profunda Komarek	237762	15.69	21.00	2.00	66.00
SP - DT	5	14-Aug-19	1239	Homoeothrix varians Komarek & Kalina	38132	19.32	63.00	3.20	506.70
SP - DT	5	14-Aug-19	5306	Navicula minima Grunow	8972	0.56	9.60	5.00	62.80
SP - DT	5	14-Aug-19	5507	Cyclotella stelligera Cleve and Grunow	2243	8.16	21.00	21.00	3636.80
SP - DT	5	14-Aug-19	5513	Tabellaria fenestrata (Lyngbye) Kutzing	13458	10.65	84.00	6.00	791.70
SP - DT	5	14-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	35889	51.56	28.00	14.00	1436.80
SP - DT	5	14-Aug-19	5702	Achnanthes minutissima Kutzing	134582	11.28	20.00	4.00	83.80
SP - DT	5	14-Aug-19	5836	Encyonema silesiacum (Bleisch) D.G. Mann	4486	5.29	30.00	10.00	1178.10
SP - DT	5	14-Aug-19	5882	Anomoenies vitrea Ross	4486	1.52	36.00	6.00	339.30
SP - DT	5	14-Aug-19	5910	Navicula exigua (Greg.) Muller	2243	0.76	36.00	6.00	339.30
SP - ED	1	14-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	19739	5.52	89.00	2.00	279.60
SP - ED	1	14-Aug-19	1077	Pseudanabaena sp.	25122	0.59	3.10	3.10	23.40
SP - ED	1	14-Aug-19	1124	Petalonema alatum Berk	3589	8.63	85.00	6.00	2403.30
SP - ED	1	14-Aug-19	1131	Heteroleibeinia profunda Komarek	190210	12.92	21.60	2.00	67.90
SP - ED	1	14-Aug-19	1239	Homoeothrix varians Komarek & Kalina	129199	99.75	96.00	3.20	772.10
SP - ED	1	14-Aug-19	5509	Cyclotella ocellata Pant.	10767	3.74	9.60	9.60	347.40
SP - ED	1	14-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	5383	7.73	28.00	14.00	1436.80
SP - ED	1	14-Aug-19	5519	Synedra acus v. radians (Kutzing) Hustedt	3589	0.24	65.00	2.00	68.10
SP - ED	1	14-Aug-19	5523	Synedra ulna (Nitzsch) Ehrenberg	1794	4.06	240.00	6.00	2261.90
SP - ED	1	14-Aug-19	5702	Achnanthes minutissima Kutzing	98694	8.69	21.00	4.00	88.00
SP - ED	1	14-Aug-19	5726	Eucocconeis sp.	1794	7.89	42.00	20.00	4398.20
SP - ED	1	14-Aug-19	5836	Encyonema silesiacum (Bleisch) D.G. Mann	5383	6.34	30.00	10.00	1178.10
SP - ED	1	14-Aug-19	5854	Pinnularia borealis Ehrenberg	1794	3.57	76.00	10.00	1989.70
SP - ED	1	14-Aug-19	5881	Diatoma elongatum Agardh	1794	0.46	61.00	4.00	255.50
SP - ED	1	14-Aug-19	5882	Anomoenies vitrea Ross	8972	3.30	39.00	6.00	367.60
SP - ED	2	14-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	76263	26.11	109.00	2.00	342.40
SP - ED	2	14-Aug-19	1077	Pseudanabaena sp.	19440	0.27	2.60	2.60	13.80
SP - ED	2	14-Aug-19	1102	Gloeothece sp.	22430	0.09	2.00	2.00	4.20
SP - ED	2	14-Aug-19	1131	Heteroleibeinia profunda Komarek	113647	8.57	24.00	2.00	75.40
SP - ED	2	14-Aug-19	5306	Navicula minima Grunow	1495	0.10	10.00	5.00	65.40
SP - ED	2	14-Aug-19	5509	Cyclotella ocellata Pant.	11963	3.20	8.80	8.80	267.60
SP - ED	2	14-Aug-19	5513	Tabellaria fenestrata (Lyngbye) Kutzing	7477	6.20	88.00	6.00	829.40
SP - ED	2	14-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	10468	15.04	28.00	14.00	1436.80
SP - ED	2	14-Aug-19	5523	Synedra ulna (Nitzsch) Ehrenberg	1495	2.96	210.00	6.00	1979.20
SP - ED	2	14-Aug-19	5551	Cyclotella michiganiana Skvortzow	2991	0.15	5.00	5.00	49.10
SP - ED	2	14-Aug-19	5702	Achnanthes minutissima Kutzing	101684	8.95	21.00	4.00	88.00
SP - ED	2	14-Aug-19	5768	Nitzschia linearis W. Smith	1495	1.93	77.00	8.00	1290.10
SP - ED	2	14-Aug-19	5860	Diatoma vulgare Bory	7477	1.76	25.00	6.00	235.60
SP - ED	2	14-Aug-19	5873	Gomphonema minutum	4486	2.01	26.70	8.00	447.40
SP - ED	2	14-Aug-19	5881	Diatoma elongatum Agardh	1495	0.67	61.00	5.30	448.60
SP - ED	2	14-Aug-19	5882	Anomoenies vitrea Ross	14954	5.35	38.00	6.00	358.10
SP - ED	3	14-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	42790	15.59	116.00	2.00	364.40
SP - ED	3	14-Aug-19	1124	Petalonema alatum Berk	5521	12.64	81.00	6.00	2290.20
SP - ED	3	14-Aug-19	1131	Heteroleibeinia profunda Komarek	27607	1.86	21.40	2.00	67.20
SP - ED	3	14-Aug-19	1239	Homoeothrix varians Komarek & Kalina	12423	10.20	96.00	3.30	821.10
SP - ED	3	14-Aug-19	2205	Mougeotia sp.	2761	4.76	61.00	6.00	1724.70
SP - ED	3	14-Aug-19	5306	Navicula minima Grunow	1380	0.06	10.00	4.10	44.00
SP - ED	3	14-Aug-19	5509	Cyclotella ocellata Pant.	8282	1.27	7.30	7.30	152.80
SP - ED	3	14-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	42790	61.48	28.00	14.00	1436.80
SP - ED	3	14-Aug-19	5519	Synedra acus v. radians (Kutzing) Hustedt	5521	0.35	60.00	2.00	62.80
SP - ED	3	14-Aug-19	5551	Cyclotella michiganiana Skvortzow	4141	0.16	4.60	4.60	38.20
SP - ED	3	14-Aug-19	5702	Achnanthes minutissima Kutzing	147695	12.38	20.00	4.00	83.80

Epilithic (El) algal species data for CREMP 2019 (for Azimuth consulting group)

**** 1st number in species code = group 1=cyanobacteria 2=chlorophyte 5=diatoms 7=Dinoflagellates**

**** total daily biomass is sum of all species on a given date**

************R specifies a replicate count for QA/QC**

Location	Station	Date	Species code	Species name	density cells/cm^2	biomass µg/cm^2	length µ	width µ	cell volume µ^3
SP - ED	3	14-Aug-19	5726	Eucocconeis sp.	1380	5.78	40.00	20.00	4188.80
SP - ED	3	14-Aug-19	5750	Navicula subtilissima Cleve	2761	2.59	56.00	8.00	938.30
SP - ED	3	14-Aug-19	5768	Nitzschia linearis W. Smith	1380	1.64	71.00	8.00	1189.60
SP - ED	3	14-Aug-19	5860	Diatoma vulgare Bory	2761	0.34	29.40	4.00	123.20
SP - ED	3	14-Aug-19	5873	Gomphonema minutum	5521	2.41	26.00	8.00	435.60
SP - ED	3	14-Aug-19	5882	Anomoenies vitrea Ross	4141	1.37	35.00	6.00	329.90
SP - ED	3	14-Aug-19	5910	Navicula exigua (Greg.) Muller	13803	4.94	38.00	6.00	358.10
SP - ED	4	14-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	52453	22.41	136.00	2.00	427.30
SP - ED	4	14-Aug-19	1084	Gloeocapsa punctata	35889	1.20	4.00	4.00	33.50
SP - ED	4	14-Aug-19	1102	Gloeothece sp.	82820	0.40	2.10	2.10	4.80
SP - ED	4	14-Aug-19	1124	Petalonema alatum Berk	9662	23.22	85.00	6.00	2403.30
SP - ED	4	14-Aug-19	1131	Heteroleibeinia profunda Komarek	67636	4.17	19.60	2.00	61.60
SP - ED	4	14-Aug-19	1239	Homoeothrix varians Komarek & Kalina	37269	22.79	81.00	3.10	611.40
SP - ED	4	14-Aug-19	2205	Mougeotia sp.	6902	23.85	44.00	10.00	3455.80
SP - ED	4	14-Aug-19	5509	Cyclotella ocellata Pant.	2761	0.79	9.00	9.00	286.30
SP - ED	4	14-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	24846	35.70	28.00	14.00	1436.80
SP - ED	4	14-Aug-19	5519	Synedra acus v. radians (Kutzing) Hustedt	13803	0.91	63.00	2.00	66.00
SP - ED	4	14-Aug-19	5551	Cyclotella michiganiana Skvortzow	9662	0.45	4.90	4.90	46.20
SP - ED	4	14-Aug-19	5702	Achnanthes minutissima Kutzing	153217	13.48	21.00	4.00	88.00
SP - ED	4	14-Aug-19	5857	Nitzschia filiformis (W. Smith) Hustedt	2761	0.86	33.00	6.00	311.00
SP - ED	4	14-Aug-19	5873	Gomphonema minutum	1380	0.67	29.00	8.00	485.90
SP - ED	4	14-Aug-19	5882	Anomoenies vitrea Ross	6902	2.47	38.00	6.00	358.10
SP - ED	4	14-Aug-19	5884	Gomphonema angustum Agardh	4141	4.44	41.00	10.00	1073.40
SP - ED	4	14-Aug-19	5910	Navicula exigua (Greg.) Muller	4141	1.60	41.00	6.00	386.40
SP - ED	4R	14-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	77299	31.33	129.00	2.00	405.30
SP - ED	4R	14-Aug-19	1084	Gloeocapsa punctata	22085	0.74	4.00	4.00	33.50
SP - ED	4R	14-Aug-19	1102	Gloeothece sp.	27607	0.13	2.10	2.10	4.80
SP - ED	4R	14-Aug-19	1124	Petalonema alatum Berk	5521	13.27	85.00	6.00	2403.30
SP - ED	4R	14-Aug-19	1131	Heteroleibeinia profunda Komarek	84200	5.56	21.00	2.00	66.00
SP - ED	4R	14-Aug-19	1239	Homoeothrix varians Komarek & Kalina	26226	17.82	90.00	3.10	679.30
SP - ED	4R	14-Aug-19	2205	Mougeotia sp.	4141	14.31	44.00	10.00	3455.80
SP - ED	4R	14-Aug-19	5306	Navicula minima Grunow	2761	0.13	10.00	4.30	48.40
SP - ED	4R	14-Aug-19	5507	Cyclotella stelligera Cleve and Grunow	1380	5.77	22.00	22.00	4181.50
SP - ED	4R	14-Aug-19	5509	Cyclotella ocellata Pant.	1380	0.40	9.00	9.00	286.30
SP - ED	4R	14-Aug-19	5513	Tabellaria fenestrata (Lyngbye) Kutzing	2761	2.29	88.00	6.00	829.40
SP - ED	4R	14-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	31748	45.61	28.00	14.00	1436.80
SP - ED	4R	14-Aug-19	5519	Synedra acus v. radians (Kutzing) Hustedt	8282	0.53	61.00	2.00	63.90
SP - ED	4R	14-Aug-19	5551	Cyclotella michiganiana Skvortzow	5521	0.26	4.90	4.90	46.20
SP - ED	4R	14-Aug-19	5702	Achnanthes minutissima Kutzing	161499	14.21	21.00	4.00	88.00
SP - ED	4R	14-Aug-19	5873	Gomphonema minutum	1380	0.67	29.00	8.00	485.90
SP - ED	4R	14-Aug-19	5882	Anomoenies vitrea Ross	12423	4.45	38.00	6.00	358.10
SP - ED	4R	14-Aug-19	5884	Gomphonema angustum Agardh	1380	1.48	41.00	10.00	1073.40
SP - ED	4R	14-Aug-19	5910	Navicula exigua (Greg.) Muller	1380	0.53	41.00	6.00	386.40
SP - ED	5	14-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	23466	8.18	111.00	2.00	348.70
SP - ED	5	14-Aug-19	1084	Gloeocapsa punctata	95243	3.19	4.00	4.00	33.50
SP - ED	5	14-Aug-19	1102	Gloeothece sp.	132512	0.64	2.10	2.10	4.80
SP - ED	5	14-Aug-19	1124	Petalonema alatum Berk	1380	1.91	49.00	6.00	1385.40
SP - ED	5	14-Aug-19	1131	Heteroleibeinia profunda Komarek	138033	9.37	21.60	2.00	67.90
SP - ED	5	14-Aug-19	1239	Homoeothrix varians Komarek & Kalina	8282	5.88	94.00	3.10	709.50
SP - ED	5	14-Aug-19	5509	Cyclotella ocellata Pant.	1380	0.40	9.00	9.00	286.30
SP - ED	5	14-Aug-19	5519	Synedra acus v. radians (Kutzing) Hustedt	6902	0.48	66.00	2.00	69.10
SP - ED	5	14-Aug-19	5702	Achnanthes minutissima Kutzing	66256	5.00	18.00	4.00	75.40
SP - ED	5	14-Aug-19	5720	Cyclotella bodanica Eulenst.	1380	19.48	33.00	33.00	14112.40
SP - ED	5	14-Aug-19	5726	Eucocconeis sp.	1380	5.78	40.00	20.00	4188.80
SP - ED	5	14-Aug-19	5768	Nitzschia linearis W. Smith	1380	1.78	77.00	8.00	1290.10
SP - ED	5	14-Aug-19	5860	Diatoma vulgare Bory	6902	0.75	26.00	4.00	108.90
SP - ED	5	14-Aug-19	5910	Navicula exigua (Greg.) Muller	4141	1.52	39.00	6.00	367.60
TPE - BGN	1	9-Aug-19	1086	Calothrix sp.	449	1.95	83.00	10.00	4345.90
TPE - BGN	1	9-Aug-19	1122	Phormidium autumnale Agardh	1346	5.56	146.00	6.00	4128.10
TPE - BGN	1	9-Aug-19	1131	Heteroleibeinia profunda Komarek	13907	0.94	21.60	2.00	67.90
TPE - BGN	1	9-Aug-19	1223	Chamaesiphon incrustans Smith	7178	0.23	6.80	3.00	32.00
TPE - BGN	1	9-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	1794	2.39	26.00	14.00	1334.10
TPE - BGN	1	9-Aug-19	5519	Synedra acus v. radians (Kutzing) Hustedt	1346	0.08	60.00	2.00	62.80
TPE - BGN	1	9-Aug-19	5546	Gyrosigma sp	449	0.45	71.00	6.00	1003.70
TPE - BGN	1	9-Aug-19	5702	Achnanthes minutissima Kutzing	45309	3.80	20.00	4.00	83.80
TPE - BGN	1	9-Aug-19	5874	Nitzschia palea (Kutzing) W. Smith	449	0.58	77.00	8.00	1290.10
TPE - BGN	1	9-Aug-19	5882	Anomoenies vitrea Ross	1346	0.46	36.00	6.00	339.30
TPE - BGN	2	9-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	5024	1.37	136.00	1.60	273.40
TPE - BGN	2	9-Aug-19	1122	Phormidium autumnale Agardh	2153	7.06	116.00	6.00	3279.80
TPE - BGN	2	9-Aug-19	1131	Heteroleibeinia profunda Komarek	5742	0.42	23.00	2.00	72.30
TPE - BGN	2	9-Aug-19	4388	Dinobryon sertularia Ehrenberg	2153	0.49	12.00	6.00	226.20
TPE - BGN	2	9-Aug-19	5306	Navicula minima Grunow	718	0.04	12.00	4.00	50.30
TPE - BGN	2	9-Aug-19	5509	Cyclotella ocellata Pant.	1077	0.37	9.60	9.60	347.40

Epilithic (EI) algal species data for CREMP 2019 (for Azimuth consulting group)

**** 1st number in species code = group 1=cyanobacteria 2=chlorophyte 5=diatoms 7=Dinoflagellates**

**** total daily biomass is sum of all species on a given date**

*************R specifies a replicate count for QA/QC**

Location	Station	Date	Species code	Species name	density cells/cm^2	biomass µg/cm^2	length µ	width µ	cell volume µ^3
TPE - BGN	2	9-Aug-19	5551	Cyclotella michiganiana Skvortzow	359	0.02	5.00	5.00	49.10
TPE - BGN	2	9-Aug-19	5702	Achnanthes minutissima Kutzing	34453	2.74	19.00	4.00	79.60
TPE - BGN	2	9-Aug-19	5873	Gomphonema minutum	1436	0.70	29.00	8.00	485.90
TPE - BGN	2	9-Aug-19	5874	Nitzschia palea (Kutzing) W. Smith	1436	1.85	77.00	8.00	1290.10
TPE - BGN	2	9-Aug-19	5882	Anomoenies vitrea Ross	359	0.12	34.60	6.00	326.10
TPE - BGN	2R	9-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	3589	0.98	136.00	1.60	273.40
TPE - BGN	2R	9-Aug-19	1122	Phormidium autumnale Agardh	2153	7.06	116.00	6.00	3279.80
TPE - BGN	2R	9-Aug-19	1131	Heteroleibeinia profunda Komarek	11125	0.80	23.00	2.00	72.30
TPE - BGN	2R	9-Aug-19	5306	Navicula minima Grunow	1794	0.09	12.00	4.00	50.30
TPE - BGN	2R	9-Aug-19	5311	Cymbella minuta Kutzing	359	0.14	16.00	8.00	402.10
TPE - BGN	2R	9-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	1436	2.06	28.00	14.00	1436.80
TPE - BGN	2R	9-Aug-19	5547	Frustulia rhomboides (Ehrenberg) de Toni	718	3.37	83.00	12.00	4693.50
TPE - BGN	2R	9-Aug-19	5551	Cyclotella michiganiana Skvortzow	359	0.02	5.00	5.00	49.10
TPE - BGN	2R	9-Aug-19	5702	Achnanthes minutissima Kutzing	38042	3.03	19.00	4.00	79.60
TPE - BGN	2R	9-Aug-19	5873	Gomphonema minutum	718	0.35	29.00	8.00	485.90
TPE - BGN	2R	9-Aug-19	5874	Nitzschia palea (Kutzing) W. Smith	1794	2.31	77.00	8.00	1290.10
TPE - BGN	3	9-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	21533	9.09	210.00	1.60	422.20
TPE - BGN	3	9-Aug-19	1084	Gloeocapsa punctata	7178	0.24	4.00	4.00	33.50
TPE - BGN	3	9-Aug-19	1086	Calothrix sp.	4037	19.87	94.00	10.00	4921.80
TPE - BGN	3	9-Aug-19	1124	Petalonema alatum Berk	2692	7.15	94.00	6.00	2657.80
TPE - BGN	3	9-Aug-19	1131	Heteroleibeinia profunda Komarek	5383	0.51	30.00	2.00	94.20
TPE - BGN	3	9-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	2243	2.99	26.00	14.00	1334.10
TPE - BGN	3	9-Aug-19	5702	Achnanthes minutissima Kutzing	44412	3.63	19.50	4.00	81.70
TPE - BGN	3	9-Aug-19	5726	Eucocconeis sp.	897	3.85	41.00	20.00	4293.50
TPE - BGN	3	9-Aug-19	5873	Gomphonema minutum	449	0.22	29.00	8.00	485.90
TPE - BGN	3	9-Aug-19	5874	Nitzschia palea (Kutzing) W. Smith	1794	4.28	91.00	10.00	2382.40
TPE - BGN	3	9-Aug-19	5882	Anomoenies vitrea Ross	1346	0.44	35.00	6.00	329.90
TPE - BGN	4	9-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	1077	0.34	159.00	1.60	319.70
TPE - BGN	4	9-Aug-19	1086	Calothrix sp.	1436	6.46	86.00	10.00	4502.90
TPE - BGN	4	9-Aug-19	1122	Phormidium autumnale Agardh	1077	3.07	101.00	6.00	2855.70
TPE - BGN	4	9-Aug-19	1124	Petalonema alatum Berk	1077	2.89	86.00	6.30	2680.80
TPE - BGN	4	9-Aug-19	1131	Heteroleibeinia profunda Komarek	20098	1.41	22.30	2.00	70.10
TPE - BGN	4	9-Aug-19	4388	Dinobryon sertularia Ehrenberg	2153	0.49	12.00	6.00	226.20
TPE - BGN	4	9-Aug-19	5306	Navicula minima Grunow	718	0.03	10.50	4.00	44.00
TPE - BGN	4	9-Aug-19	5311	Cymbella minuta Kutzing	1077	0.39	14.30	8.00	359.40
TPE - BGN	4	9-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	3589	5.16	28.00	14.00	1436.80
TPE - BGN	4	9-Aug-19	5551	Cyclotella michiganiana Skvortzow	1794	0.09	5.00	5.00	49.10
TPE - BGN	4	9-Aug-19	5702	Achnanthes minutissima Kutzing	33376	2.60	18.60	4.00	77.90
TPE - BGN	4	9-Aug-19	5875	Cocconies disculus Schum.	359	0.94	31.00	18.00	2629.50
TPE - BGN	4	9-Aug-19	5882	Anomoenies vitrea Ross	1436	0.50	37.00	6.00	348.70
TPE - BGN	5	9-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	3948	0.94	119.00	1.60	239.30
TPE - BGN	5	9-Aug-19	1084	Gloeocapsa punctata	11125	0.37	4.00	4.00	33.50
TPE - BGN	5	9-Aug-19	1086	Calothrix sp.	359	1.60	85.00	10.00	4450.60
TPE - BGN	5	9-Aug-19	1131	Heteroleibeinia profunda Komarek	9331	0.62	21.30	2.00	66.90
TPE - BGN	5	9-Aug-19	5311	Cymbella minuta Kutzing	359	0.14	16.00	8.00	402.10
TPE - BGN	5	9-Aug-19	5509	Cyclotella ocellata Pant.	359	0.11	9.10	9.10	295.90
TPE - BGN	5	9-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	1077	1.49	27.00	14.00	1385.40
TPE - BGN	5	9-Aug-19	5547	Frustulia rhomboides (Ehrenberg) de Toni	718	2.11	75.00	10.00	2945.20
TPE - BGN	5	9-Aug-19	5551	Cyclotella michiganiana Skvortzow	1436	0.07	5.00	5.00	49.10
TPE - BGN	5	9-Aug-19	5702	Achnanthes minutissima Kutzing	45220	3.52	18.60	4.00	77.90
TPE - BGN	5	9-Aug-19	5873	Gomphonema minutum	1436	0.70	29.00	8.00	485.90
TPE - BGS	1	10-Aug-19	1077	Pseudanabaena sp.	2153	0.02	2.40	2.40	10.90
TPE - BGS	1	10-Aug-19	1131	Heteroleibeinia profunda Komarek	5742	0.53	29.30	2.00	92.00
TPE - BGS	1	10-Aug-19	5519	Synedra acus v. radians (Kutzing) Hustedt	718	0.05	71.00	2.00	74.40
TPE - BGS	1	10-Aug-19	5551	Cyclotella michiganiana Skvortzow	359	0.02	5.20	5.20	55.20
TPE - BGS	1	10-Aug-19	5702	Achnanthes minutissima Kutzing	36247	2.73	18.00	4.00	75.40
TPE - BGS	1	10-Aug-19	5726	Eucocconeis sp.	359	2.16	40.00	24.00	6031.90
TPE - BGS	1	10-Aug-19	5767	Nitzschia fonticola Grunow	1077	0.08	18.00	4.00	75.40
TPE - BGS	1	10-Aug-19	5860	Diatoma vulgare Bory	3230	0.79	26.00	6.00	245.00
TPE - BGS	1	10-Aug-19	5910	Navicula exigua (Greg.) Muller	2512	0.57	24.00	6.00	226.20
TPE - BGS	2	10-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	718	0.46	316.00	1.60	635.40
TPE - BGS	2	10-Aug-19	1084	Gloeocapsa punctata	7537	0.25	4.00	4.00	33.50
TPE - BGS	2	10-Aug-19	1131	Heteroleibeinia profunda Komarek	9331	0.72	24.60	2.00	77.30
TPE - BGS	2	10-Aug-19	4388	Dinobryon sertularia Ehrenberg	3230	0.73	12.00	6.00	226.20
TPE - BGS	2	10-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	4307	6.19	28.00	14.00	1436.80
TPE - BGS	2	10-Aug-19	5518	Synedra acus Kutzing	359	0.04	110.00	2.00	115.20
TPE - BGS	2	10-Aug-19	5546	Gyrosigma sp	359	0.36	71.00	6.00	1003.70
TPE - BGS	2	10-Aug-19	5551	Cyclotella michiganiana Skvortzow	3589	0.25	5.60	5.60	69.00
TPE - BGS	2	10-Aug-19	5702	Achnanthes minutissima Kutzing	34812	3.06	21.00	4.00	88.00
TPE - BGS	2	10-Aug-19	5726	Eucocconeis sp.	718	3.01	40.00	20.00	4188.80
TPE - BGS	2	10-Aug-19	5860	Diatoma vulgare Bory	4307	1.03	25.50	6.00	240.30
TPE - BGS	2	10-Aug-19	5882	Anomoenies vitrea Ross	1794	0.64	38.00	6.00	358.10
TPE - BGS	2	10-Aug-19	5916	Fragilaria capucina Grunow	359	0.10	65.00	4.00	272.30

Table K3-1. Habitat Compensation Monitoring Program Periphyton Laboratory Data, 2019.

Epilithic (EI) algal species data for CREMP 2019 (for Azimuth consulting group)

**** 1st number in species code = group 1=cyanobacteria 2=chlorophyte 5=diatoms 7=Dinoflagellates**

**** total daily biomass is sum of all species on a given date**

**********R specifies a replicate count for QA/QC**

Location	Station	Date	Species code	Species name	density cells/cm^2	biomass µg/cm^2	length µ	width µ	cell volume µ^3
TPE - BGS	3	9-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	1077	0.43	200.00	1.60	402.10
TPE - BGS	3	9-Aug-19	1077	Pseudanabaena sp.	3589	0.08	3.10	3.10	23.40
TPE - BGS	3	9-Aug-19	1131	Heteroleibeinia profunda Komarek	2153	0.18	25.90	2.00	81.40
TPE - BGS	3	9-Aug-19	4388	Dinobryon sertularia Ehrenberg	2153	0.49	12.00	6.00	226.20
TPE - BGS	3	9-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	359	0.52	28.00	14.00	1436.80
TPE - BGS	3	9-Aug-19	5551	Cyclotella michiganiana Skvortzow	2871	0.14	5.00	5.00	49.10
TPE - BGS	3	9-Aug-19	5702	Achnanthes minutissima Kutzing	30146	2.53	20.00	4.00	83.80
TPE - BGS	3	9-Aug-19	5860	Diatoma vulgare Bory	2153	0.52	25.50	6.00	240.30
TPE - BGS	3	9-Aug-19	5882	Anomoenies vitrea Ross	1077	0.39	38.00	6.00	358.10
TPE - BGS	4	9-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	1077	0.32	149.00	1.60	299.60
TPE - BGS	4	9-Aug-19	1086	Calothrix sp.	718	3.72	99.00	10.00	5183.60
TPE - BGS	4	9-Aug-19	1124	Petalonema alatum Berk	1077	2.83	93.00	6.00	2629.50
TPE - BGS	4	9-Aug-19	1131	Heteroleibeinia profunda Komarek	16150	1.37	27.00	2.00	84.80
TPE - BGS	4	9-Aug-19	2205	Mougeotia sp.	4307	5.84	27.00	8.00	1357.20
TPE - BGS	4	9-Aug-19	4388	Dinobryon sertularia Ehrenberg	1436	0.32	12.00	6.00	226.20
TPE - BGS	4	9-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	1077	1.44	26.00	14.00	1334.10
TPE - BGS	4	9-Aug-19	5551	Cyclotella michiganiana Skvortzow	5024	0.25	5.00	5.00	49.10
TPE - BGS	4	9-Aug-19	5702	Achnanthes minutissima Kutzing	36247	2.82	18.60	4.00	77.90
TPE - BGS	4	9-Aug-19	5873	Gomphonema minutum	359	0.16	25.90	8.00	434.00
TPE - BGS	4	9-Aug-19	5882	Anomoenies vitrea Ross	1436	0.50	37.00	6.00	348.70
TPE - BGS	5	9-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	24524	6.85	139.00	1.60	279.50
TPE - BGS	5	9-Aug-19	1084	Gloeocapsa punctata	9570	0.32	4.00	4.00	33.50
TPE - BGS	5	9-Aug-19	1086	Calothrix sp.	1196	6.64	106.00	10.00	5550.10
TPE - BGS	5	9-Aug-19	1124	Petalonema alatum Berk	2991	7.95	94.00	6.00	2657.80
TPE - BGS	5	9-Aug-19	1131	Heteroleibeinia profunda Komarek	17944	1.35	24.00	2.00	75.40
TPE - BGS	5	9-Aug-19	2205	Mougeotia sp.	4785	11.06	46.00	8.00	2312.20
TPE - BGS	5	9-Aug-19	2231	Bulbochaete sp.	30505	16.91	19.60	6.00	554.20
TPE - BGS	5	9-Aug-19	4388	Dinobryon sertularia Ehrenberg	3589	0.81	12.00	6.00	226.20
TPE - BGS	5	9-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	598	0.80	26.00	14.00	1334.10
TPE - BGS	5	9-Aug-19	5547	Frustulia rhomboides (Ehrenberg) de Toni	598	3.68	80.00	14.00	6157.50
TPE - BGS	5	9-Aug-19	5551	Cyclotella michiganiana Skvortzow	3589	0.18	5.00	5.00	49.10
TPE - BGS	5	9-Aug-19	5702	Achnanthes minutissima Kutzing	61609	5.16	20.00	4.00	83.80
TPE - BGS	5	9-Aug-19	5873	Gomphonema minutum	1196	0.58	29.00	8.00	485.90
TPE - BGS	5	9-Aug-19	5882	Anomoenies vitrea Ross	2991	1.01	36.00	6.00	339.30
TPE - G	1	10-Aug-19	1014	Chroococcus limneticus Lemmermann	3589	0.13	4.10	4.10	36.10
TPE - G	1	10-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	25122	15.78	200.00	2.00	628.30
TPE - G	1	10-Aug-19	1084	Gloeocapsa punctata	28711	0.96	4.00	4.00	33.50
TPE - G	1	10-Aug-19	1086	Calothrix sp.	48450	256.22	101.00	10.00	5288.30
TPE - G	1	10-Aug-19	1131	Heteroleibeinia profunda Komarek	227893	22.40	31.30	2.00	98.30
TPE - G	1	10-Aug-19	2205	Mougeotia sp.	3589	12.12	43.00	10.00	3377.20
TPE - G	1	10-Aug-19	4388	Dinobryon sertularia Ehrenberg	16150	3.65	12.00	6.00	226.20
TPE - G	1	10-Aug-19	5507	Cyclotella stelligera Cleve and Grunow	1794	6.53	21.00	21.00	3636.80
TPE - G	1	10-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	1794	2.58	28.00	14.00	1436.80
TPE - G	1	10-Aug-19	5551	Cyclotella michiganiana Skvortzow	8972	0.44	5.00	5.00	49.10
TPE - G	1	10-Aug-19	5702	Achnanthes minutissima Kutzing	10767	0.95	21.00	4.00	88.00
TPE - G	1	10-Aug-19	5860	Diatoma vulgare Bory	5383	1.42	28.00	6.00	263.90
TPE - G	1	10-Aug-19	5873	Gomphonema minutum	3589	1.62	27.00	8.00	452.40
TPE - G	1	10-Aug-19	5910	Navicula exigua (Greg.) Muller	1794	0.61	36.00	6.00	339.30
TPE - G	1	10-Aug-19	5916	Fragilaria capucina Grunow	3589	0.84	56.00	4.00	234.60
TPE - G	2	10-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	91965	48.82	169.00	2.00	530.90
TPE - G	2	10-Aug-19	1086	Calothrix sp.	103180	175.83	82.00	6.30	1704.10
TPE - G	2	10-Aug-19	1102	Gloeothece sp.	69534	0.29	2.00	2.00	4.20
TPE - G	2	10-Aug-19	1131	Heteroleibeinia profunda Komarek	224304	14.80	21.00	2.00	66.00
TPE - G	2	10-Aug-19	2205	Mougeotia sp.	13458	72.93	69.00	10.00	5419.20
TPE - G	2	10-Aug-19	5507	Cyclotella stelligera Cleve and Grunow	2243	9.38	22.00	22.00	4181.50
TPE - G	2	10-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	35889	49.54	26.90	14.00	1380.30
TPE - G	2	10-Aug-19	5519	Synedra acus v. radians (Kutzing) Hustedt	2243	0.15	64.00	2.00	67.00
TPE - G	2	10-Aug-19	5551	Cyclotella michiganiana Skvortzow	17944	0.88	5.00	5.00	49.10
TPE - G	2	10-Aug-19	5702	Achnanthes minutissima Kutzing	22430	1.88	20.00	4.00	83.80
TPE - G	2	10-Aug-19	5720	Cyclotella bodanica Eulenst.	2243	34.62	34.00	34.00	15434.60
TPE - G	2	10-Aug-19	5882	Anomoenies vitrea Ross	2243	0.78	37.00	6.00	348.70
TPE - G	2	10-Aug-19	5910	Navicula exigua (Greg.) Muller	2243	0.72	34.00	6.00	320.40
TPE - G	3	10-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	74768	34.30	146.00	2.00	458.70
TPE - G	3	10-Aug-19	1084	Gloeocapsa punctata	92712	3.11	4.00	4.00	33.50
TPE - G	3	10-Aug-19	1086	Calothrix sp.	23926	95.26	96.00	8.90	3981.50
TPE - G	3	10-Aug-19	1102	Gloeothece sp.	77759	0.33	2.00	2.00	4.20
TPE - G	3	10-Aug-19	1131	Heteroleibeinia profunda Komarek	299072	21.23	22.60	2.00	71.00
TPE - G	3	10-Aug-19	2205	Mougeotia sp.	2991	11.98	51.00	10.00	4005.50
TPE - G	3	10-Aug-19	4388	Dinobryon sertularia Ehrenberg	29907	6.77	12.00	6.00	226.20
TPE - G	3	10-Aug-19	5513	Tabellaria fenestrata (Lyngbye) Kutzing	5981	4.62	82.00	6.00	772.80
TPE - G	3	10-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	47851	63.84	26.00	14.00	1334.10
TPE - G	3	10-Aug-19	5702	Achnanthes minutissima Kutzing	47851	3.69	18.40	4.00	77.10
TPE - G	3	10-Aug-19	5726	Eucocconeis sp.	2991	12.53	40.00	20.00	4188.80

Epilithic (El) algal species data for CREMP 2019 (for Azimuth consulting group)

**** 1st number in species code = group 1=cyanobacteria 2=chlorophyte 5=diatoms 7=Dinoflagellates**

**** total daily biomass is sum of all species on a given date**

**********R specifies a replicate count for QA/QC**

Location	Station	Date	Species code	Species name	density cells/cm^2	biomass µg/cm^2	length µ	width µ	cell volume µ^3
TPE - G	3	10-Aug-19	5728	Epithemia argus Kutzing	2991	4.96	44.00	12.00	1658.80
TPE - G	3	10-Aug-19	5857	Nitzschia filiformis (W. Smith) Hustedt	8972	1.20	53.00	3.10	133.30
TPE - G	3	10-Aug-19	5882	Anomoenies vitrea Ross	2991	1.07	38.00	6.00	358.10
TPE - G	4	10-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	149536	93.95	200.00	2.00	628.30
TPE - G	4	10-Aug-19	1084	Gloeocapsa punctata	239257	8.02	4.00	4.00	33.50
TPE - G	4	10-Aug-19	1086	Calothrix sp.	71777	218.88	91.00	8.00	3049.40
TPE - G	4	10-Aug-19	1102	Gloeothece sp.	107666	0.45	2.00	2.00	4.20
TPE - G	4	10-Aug-19	1131	Heteroleibeinia profunda Komarek	340942	22.50	21.00	2.00	66.00
TPE - G	4	10-Aug-19	1223	Chamaesiphon incrustans Smith	44861	1.37	6.50	3.00	30.60
TPE - G	4	10-Aug-19	2205	Mougeotia sp.	35889	93.02	33.00	10.00	2591.80
TPE - G	4	10-Aug-19	5306	Navicula minima Grunow	8972	1.18	14.00	6.00	131.90
TPE - G	4	10-Aug-19	5509	Cyclotella ocellata Pant.	5981	2.14	9.70	9.70	358.40
TPE - G	4	10-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	71777	103.13	28.00	14.00	1436.80
TPE - G	4	10-Aug-19	5551	Cyclotella michiganiana Skvortzow	5981	0.29	5.00	5.00	49.10
TPE - G	4	10-Aug-19	5702	Achnanthes minutissima Kutzing	77759	5.89	18.10	4.00	75.80
TPE - G	4	10-Aug-19	5720	Cyclotella bodanica Eulenst.	2991	50.35	35.00	35.00	16837.00
TPE - G	4	10-Aug-19	5857	Nitzschia filiformis (W. Smith) Hustedt	14954	2.44	39.00	4.00	163.40
TPE - G	4	10-Aug-19	5873	Gomphonema minutum	2991	1.35	27.00	8.00	452.40
TPE - G	4	10-Aug-19	5882	Anomoenies vitrea Ross	14954	5.21	37.00	6.00	348.70
TPE - G	4	10-Aug-19	5910	Navicula exigua (Greg.) Muller	2991	0.99	35.00	6.00	329.90
TPE - G	5	10-Aug-19	1057	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	394775	262.92	212.00	2.00	666.00
TPE - G	5	10-Aug-19	1084	Gloeocapsa punctata	261987	8.78	4.00	4.00	33.50
TPE - G	5	10-Aug-19	1086	Calothrix sp.	78955	376.20	91.00	10.00	4764.70
TPE - G	5	10-Aug-19	1102	Gloeothece sp.	57422	0.24	2.00	2.00	4.20
TPE - G	5	10-Aug-19	1131	Heteroleibeinia profunda Komarek	362475	22.22	19.50	2.00	61.30
TPE - G	5	10-Aug-19	1223	Chamaesiphon incrustans Smith	17944	0.67	6.50	3.30	37.10
TPE - G	5	10-Aug-19	2205	Mougeotia sp.	21533	99.78	59.00	10.00	4633.80
TPE - G	5	10-Aug-19	2216	Zygnema sp.	7178	24.80	44.00	10.00	3455.80
TPE - G	5	10-Aug-19	4388	Dinobryon sertularia Ehrenberg	21533	4.87	12.00	6.00	226.20
TPE - G	5	10-Aug-19	5306	Navicula minima Grunow	10767	0.82	11.60	5.00	75.90
TPE - G	5	10-Aug-19	5514	Tabellaria flocculosa (Roth) Kutzing	78955	113.44	28.00	14.00	1436.80
TPE - G	5	10-Aug-19	5551	Cyclotella michiganiana Skvortzow	10767	0.36	4.40	4.40	33.50
TPE - G	5	10-Aug-19	5702	Achnanthes minutissima Kutzing	21533	1.63	18.10	4.00	75.80
TPE - G	5	10-Aug-19	5857	Nitzschia filiformis (W. Smith) Hustedt	7178	1.17	39.00	4.00	163.40
TPE - G	5	10-Aug-19	5882	Anomoenies vitrea Ross	3589	1.22	36.00	6.00	339.30

APPENDIX K4
PRESENCE /ABSENCE MATRIX OF PERIPHYTON SPECIES

Table K4-1. Presence (+) /absence (-) matrix of periphyton species, 2019.

Taxon Code	Taxon Name	Cell Measurements			Second Portage Lake												Third Portage Lake - East Basin					
					Drilltrail Arm (Reference Area) SP-DT						East Dike SP-ED						Bay-Goose Dike - North Section TPE-BGN					
		length (μ)	width (μ)	volume (μ^3)	1	2	3	3R	4	5	1	2	3	4	4R	5	1	2	2R	3	4	5
	Cyanobacteria																					
1014	*Chroococcus limneticus Lemmermann*	4.1	4.1	36.1	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+
1057	*Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek*	145.6	1.9	389.3	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1070	*Anabaenopsis sp.*	3.0	3.0	14.1	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-
1077	*Pseudanabaena sp.*	2.7	2.7	16.8	+	-	+	-	+	+	-	-	-	+	+	+	-	-	-	+	-	+
1084	*Gloeocapsa punctata*	4.0	4.0	33.5	+	+	+	+	+	+	-	-	-	-	-	-	+	-	-	+	+	+
1086	*Calothrix sp.*	92.2	9.5	4439.5	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	-	-	-
1102	*Gloeothece sp.*	2.0	2.0	4.4	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	+	-
1122	*Phormidium autumnale Agardh*	119.8	6.0	3385.9	+	+	+	+	+	+	+	-	+	+	+	+	-	-	-	+	+	-
1124	*Petalonema alatum Berk*	77.3	6.0	2203.2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
1131	*Heteroleibeinia profunda Komarek*	23.1	2.0	72.5	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1136	*Lyngbya mucicola Lemmermann*	59.5	1.0	46.8	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
1223	*Chamaesiphon incrustans Smith*	6.6	3.1	33.2	+	+	+	+	-	+	+	-	+	+	+	+	-	-	-	-	-	-
1239	*Homoeothrix varians Komarek & Kalina*	82.3	3.2	653.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chlorophyte																					
2205	*Mougeotia sp.*	46.9	9.2	3538.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2216	*Zygnema sp.*	44.0	10.0	3455.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2231	*Bulbochaete sp.*	19.6	6.0	554.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chrysophyte																					
4388	*Dinobryon sertularia Ehrenberg*	12.0	6.0	226.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Diatom																					
5306	*Navicula minima Grunow*	11.1	4.5	61.9	-	+	-	-	+	-	-	-	-	-	-	-	-	-	+	-	+	+
5311	*Cymbella minuta Kutzing*	15.6	8.0	391.1	-	-	-	-	+	+	-	-	-	-	+	-	-	-	-	-	-	-
5507	*Cyclotella stelligera Cleve and Grunow*	21.4	21.4	3854.7	-	-	-	-	-	-	+	+	+	+	+	+	-	+	-	-	-	+
5509	*Cyclotella ocellata Pant.*	9.0	9.0	292.0	+	-	-	-	+	+	-	+	-	-	+	-	-	-	-	-	-	-
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*	85.3	6.0	804.3	+	+	+	+	+	+	+	+	+	+	+	-	+	-	+	+	+	+
5514	*Tabellaria flocculosa (Roth) Kutzing*	27.6	14.1	1434.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5518	*Synedra acus Kutzing*	110.0	2.0	115.2	+	+	-	+	-	-	+	-	+	+	+	+	+	-	-	-	-	-
5519	*Synedra acus v. radians (Kutzing) Hustedt*	63.1	2.0	66.1	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-
5523	*Synedra ulna (Nitzsch) Ehrenberg*	225.0	6.0	2120.6	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-
5546	*Gyrosigma sp*	73.7	6.2	1119.6	-	-	+	+	+	-	-	-	-	-	-	-	-	-	+	-	-	+
5547	*Frustulia rhomboides (Ehrenberg) de Toni*	74.5	11.0	3667.3	-	-	+	+	+	-	-	+	+	+	+	-	-	+	+	-	+	+
5551	*Cyclotella michiganiana Skvortzow*	5.0	5.0	48.8	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
5702	*Achnanthes minutissima Kutzing*	19.6	4.0	82.2	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
5720	*Cyclotella bodanica Eulenst.*	34.0	34.0	15454.7	-	+	-	+	+	-	+	-	+	-	-	+	-	-	-	+	-	-
5726	*Eucocconeis sp.*	40.3	20.4	4404.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5728	*Epithemia argus Kutzing*	44.0	12.0	1658.8	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
5750	*Navicula subtilissima Cleve*	56.0	8.0	938.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5767	*Nitzschia fonticola Grunow*	18.0	4.0	75.4	-	-	-	-	-	-	-	+	+	-	-	+	-	-	-	-	-	-
5768	*Nitzschia linearis W. Smith*	75.0	8.0	1256.6	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5820	*Eunotia arcus Ehrenberg*	40.0	12.0	1508.0	-	+	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-
5836	*Encyonema silesiacum (Bleisch) D.G. Mann*	30.0	10.0	1178.1	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
5854	*Pinnularia borealis Ehrenberg*	70.5	10.0	1845.7	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
5857	*Nitzschia filiformis (W. Smith) Hustedt*	41.0	4.3	192.8	+	-	+	+	-	-	-	+	+	-	-	+	-	-	-	-	-	-
5860	*Diatoma vulgare Bory*	27.2	5.5	234.8	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5870	*Navicula radiosa Kutzing*	71.0	10.0	1858.8	+	-	+	+	+	-	-	+	+	+	+	-	-	+	+	+	-	+
5873	*Gomphonema minutum*	27.7	8.0	463.5	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-
5874	*Nitzschia palea (Kutzing) W. Smith*	80.5	8.5	1563.2	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
5875	*Cocconies disculus Schum.*	30.5	18.0	2587.1	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-
5881	*Diatoma elongatum Agardh*	61.0	4.7	352.1	+	-	+	+	+	+	+	+	+	+	+	-	+	+	-	+	+	-
5882	*Anomoenies vitrea Ross*	37.9	5.9	336.2	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-
5884	*Gomphonema angustum Agardh*	41.0	10.0	1073.4	-	+	+	+	+	+	-	-	+	+	+	+	-	-	-	-	-	-
5910	*Navicula exigua (Greg.) Muller*	36.8	6.0	347.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5916	*Fragilaria capucina Grunow*	60.5	4.0	253.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Richness				**17**	**14**	**17**	**17**	**18**	**14**	**15**	**15**	**16**	**16**	**17**	**14**	**10**	**9**	**10**	**11**	**11**	**11**

Table K4-1. Presence (+) /absence (-) matrix of periphyton species, 2019.

Taxon Code	Taxon Name	Cell Measurements			Third Portage Lake - East Basin									
					Reference Area TPE-G					Bay-Goose Dike - South Section TPE-BGS				
		length (μ)	width (μ)	volume (μ^3)	1	2	3	4	5	1	2	3	4	5
	Cyanobacteria													
1014	*Chroococcus limneticus Lemmermann*	4.1	4.1	36.1	-	+	+	+	+	+	+	+	+	+
1057	*Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek*	145.6	1.9	389.3	-	-	-	-	-	-	-	-	-	-
1070	*Anabaenopsis sp.*	3.0	3.0	14.1	+	-	+	-	-	-	-	-	-	-
1077	*Pseudanabaena sp.*	2.7	2.7	16.8	-	+	-	-	+	+	-	+	+	+
1084	*Gloeocapsa punctata*	4.0	4.0	33.5	-	-	-	+	+	+	+	+	+	+
1086	*Calothrix sp.*	92.2	9.5	4439.5	-	-	-	-	-	-	+	+	+	+
1102	*Gloeothece sp.*	2.0	2.0	4.4	-	-	-	-	-	-	-	-	-	-
1122	*Phormidium autumnale Agardh*	119.8	6.0	3385.9	-	-	-	+	+	-	-	-	-	-
1124	*Petalonema alatum Berk*	77.3	6.0	2203.2	+	+	+	+	+	+	+	+	+	+
1131	*Heteroleibeinia profunda Komarek*	23.1	2.0	72.5	-	-	-	-	-	-	-	-	-	-
1136	*Lyngbya mucicola Lemmermann*	59.5	1.0	46.8	-	-	-	-	-	-	-	-	+	+
1223	*Chamaesiphon incrustans Smith*	6.6	3.1	33.2	-	-	-	-	-	-	-	-	-	-
1239	*Homoeothrix varians Komarek & Kalina*	82.3	3.2	653.7	-	-	-	-	-	-	-	-	-	-
	Chlorophyte													
2205	*Mougeotia sp.*	46.9	9.2	3538.9	-	-	-	-	-	-	-	-	-	+
2216	*Zygnema sp.*	44.0	10.0	3455.8	-	-	-	-	+	-	-	-	-	-
2231	*Bulbochaete sp.*	19.6	6.0	554.2	-	-	-	-	-	-	-	-	-	-
	Chrysophyte													
4388	*Dinobryon sertularia Ehrenberg*	12.0	6.0	226.2	-	-	-	-	-	-	-	-	-	-
	Diatom													
5306	*Navicula minima Grunow*	11.1	4.5	61.9	-	-	-	-	-	-	-	-	-	-
5311	*Cymbella minuta Kutzing*	15.6	8.0	391.1	-	-	-	-	-	+	+	-	-	-
5507	*Cyclotella stelligera Cleve and Grunow*	21.4	21.4	3854.7	-	-	-	-	-	-	-	-	+	-
5509	*Cyclotella ocellata Pant.*	9.0	9.0	292.0	-	-	-	-	-	-	-	+	-	-
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*	85.3	6.0	804.3	-	+	+	+	+	+	+	+	+	+
5514	*Tabellaria flocculosa (Roth) Kutzing*	27.6	14.1	1434.9	-	+	-	-	-	-	-	-	-	-
5518	*Synedra acus Kutzing*	110.0	2.0	115.2	+	-	-	-	-	-	+	-	-	-
5519	*Synedra acus v. radians (Kutzing) Hustedt*	63.1	2.0	66.1	-	-	-	-	-	-	-	-	-	-
5523	*Synedra ulna (Nitzsch) Ehrenberg*	225.0	6.0	2120.6	-	+	-	-	-	-	-	-	-	-
5546	*Gyrosigma sp*	73.7	6.2	1119.6	-	-	-	-	+	-	-	-	-	-
5547	*Frustulia rhomboides (Ehrenberg) de Toni*	74.5	11.0	3667.3	+	+	+	+	+	+	+	-	+	+
5551	*Cyclotella michiganiana Skvortzow*	5.0	5.0	48.8	+	+	+	+	+	+	+	+	+	+
5702	*Achnanthes minutissima Kutzing*	19.6	4.0	82.2	-	-	-	-	-	-	+	-	+	-
5720	*Cyclotella bodanica Eulenst.*	34.0	34.0	15454.7	+	+	-	-	-	-	-	+	-	-
5726	*Eucocconeis sp.*	40.3	20.4	4404.5	-	-	-	-	-	-	-	+	-	-
5728	*Epithemia argus Kutzing*	44.0	12.0	1658.8	-	-	-	-	-	-	-	-	-	-
5750	*Navicula subtilissima Cleve*	56.0	8.0	938.3	+	-	-	-	-	-	-	-	-	-
5767	*Nitzschia fonticola Grunow*	18.0	4.0	75.4	-	-	-	-	-	-	-	-	-	-
5768	*Nitzschia linearis W. Smith*	75.0	8.0	1256.6	-	-	-	-	-	-	-	-	-	-
5820	*Eunotia arcus Ehrenberg*	40.0	12.0	1508.0	-	-	-	-	-	-	-	-	-	-
5836	*Encyonema silesiacum (Bleisch) D.G. Mann*	30.0	10.0	1178.1	-	-	-	-	-	-	-	-	-	-
5854	*Pinnularia borealis Ehrenberg*	70.5	10.0	1845.7	-	-	-	-	-	-	-	+	+	+
5857	*Nitzschia filiformis (W. Smith) Hustedt*	41.0	4.3	192.8	+	+	+	-	-	+	-	-	-	-
5860	*Diatoma vulgare Bory*	27.2	5.5	234.8	-	-	-	-	-	-	-	-	-	-
5870	*Navicula radiosa Kutzing*	71.0	10.0	1858.8	-	-	-	+	+	+	-	-	+	-
5873	*Gomphonema minutum*	27.7	8.0	463.5	-	-	-	-	-	-	-	-	-	-
5874	*Nitzschia palea (Kutzing) W. Smith*	80.5	8.5	1563.2	-	-	-	-	-	-	-	-	-	-
5875	*Cocconies disculus Schum.*	30.5	18.0	2587.1	-	-	-	-	-	-	-	-	-	-
5881	*Diatoma elongatum Agardh*	61.0	4.7	352.1	-	+	+	+	+	-	+	+	+	+
5882	*Anomoenies vitrea Ross*	37.9	5.9	336.2	-	-	-	-	-	-	-	-	-	-
5884	*Gomphonema angustum Agardh*	41.0	10.0	1073.4	+	-	-	-	-	+	+	-	+	-
5910	*Navicula exigua (Greg.) Muller*	36.8	6.0	347.3	-	+	-	-	-	+	-	-	-	-
5916	*Fragilaria capucina Grunow*	60.5	4.0	253.5	-	-	-	-	-	-	-	-	-	-
	Total Richness				**9**	**12**	**8**	**9**	**12**	**12**	**12**	**12**	**15**	**12**

APPENDIX L
WHALE TAIL 2019 MERCURY MONITORING REPORT

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ACKNOWLEDGEMENTS

The following people were involved in the Mercury Monitoring Program for the Whale Tail Pit project were:

- Gary Mann (Azimuth) – Gary was responsible for overall management of this project. He also provided oversight and was the primary reviewer.
- Laura Bekar and Marianna DiMauro (Azimuth) – Laura tabulated the data and was the principal author of the report. Marianna was responsible for plotting the water and sediment chemistry data.
- Eric Franz (Azimuth) – Eric was responsible for overall coordination of the Meadowbank and While Tail programs Azimuth is involved with. Eric assisted in preparing the data and reviewed the report.
- North/South Consultants for providing the fish data from the 2018 fish-out.
- Jared Ellenor and Ryan Vanengen (Swanson Lab) at the University of Waterloo for providing mercury data collected during the 2018 and 2019 research studies. Jared collected the water samples for total and methylmercury analysis in 2018 and 2019.
- Wen Xu at the University of Western Ontario for analysis of water and fish tissue samples for total and methylmercury. Data were reported to Dr. Heidi Swanson's research group at the University of Waterloo.

ACRONYMS

CCME	Canadian Council of Ministers of the Environment
CREMP	Core Receiving Environment Monitoring Program
CRM	Certified Reference Material
DQO(s)	Data Quality Objective(s)
dw	dry weight
FEIS	Final Environmental Impact Statement
ISQG	Interim sediment quality guidelines (CCME sediment quality guidelines)
LKTR	Lake Trout
MAM	Mammoth Lake
MB	Method blank
MDL	Method detection limit
MRL	Method Reporting Limit
MS	Matrix spike
NEM	Nemo Lake
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
PEL	Probable effect level (CCME sediment quality guidelines)
QA/QC	Quality Assurance / Quality Control
RPD	Relative percent difference
SOP	Standard Operating Procedure
US EPA	United States Environmental Protection Agency
WTS	Whale Tail Lake South Basin
ww	wet weight

L.1 INTRODUCTION

L.1.1 Background

The Amaruq Exploration Property is a 408-square kilometer area located on Inuit Owned Land, approximately 150 kilometers north of Baker Lake and approximately 50 kilometers northwest of the Meadowbank mine. Approval for development of the Whale Tail Project was issued in 2018 (NIRB Project Certificate No. 008). The Project, located on the Amaruq site, is operated as an extension to the operational Meadowbank Mine.

Construction of the dike separating the north and south basins of Whale Tail Lake began in 2018 and of the Whale Tail Lake diversion occurred in 2019. At peak water levels, the diversion channel to Mammoth Lake will act as the outflow from Whale Tail Lake south basin. Inputs from the 2020 freshet are expected to discharge to Mammoth Lake south basin via the diversion channel, thus maintaining water levels in Whale Tail Lake at operational levels.

Mercury is a naturally occurring element that is found in low levels everywhere- in air, water, soil, plants, animals, and humans. In aquatic environments, bacteria turn naturally occurring inorganic mercury into methylmercury, a highly bioavailable form of mercury. Methylmercury is readily bioaccumulated and biomagnified through the food chain, meaning it is found in the highest concentrations in long lived animals near the top of the food chain (e.g., lake trout). When terrestrial substrate is flooded, such is the case for the Whale Tail Lake south basin and sub-watershed lakes, there can be an elevated rate of bacterial conversion of mercury to methylmercury, potentially resulting in increased concentrations of mercury and methylmercury in all components of the ecosystem.

Further background information on mercury in the environment, and the physical, chemical and ecological factors that drive mercury methylation dynamics in aquatic environments following flooding and soil inundation, is described in Azimuth (2017).

L.1.2 Mercury Monitoring Program Overview

In accordance with Condition 63 of NIRB Project Certificate No. 008 and NWB Water License 2AM WTP1826 Part I, Condition 5, a Mercury Monitoring Plan (MMP) was developed by Agnico Eagle (2019) to assess changes in concentrations of mercury in the Whale Tail Lake south basin and sub-watershed lakes as a result of Project-related flooding. Briefly, the core elements of the MMP are water chemistry, sediment chemistry, and fish tissue chemistry. Dr. Heidi Swanson (University of Waterloo) is leading the MMP sampling; Azimuth is providing support for sampling (sediment) and reporting (i.e., as a supplemental component of the *Core Receiving Environment Monitoring Program* [CREMP]).

This 2019 MMP report is a compendium of the mercury chemistry data that has been collected to-date in relation to the impoundment of the south basin of Whale Tail Lake and it includes data collected prior to (i.e., baseline) and subsequent to impoundment. Sampling areas include locations within and downstream of the impoundment, as well as reference lakes. Water chemistry and fish data from 2018 are reported here for the first time.[1]

While dike construction was finished by early July 2018, the degree of flooding would have been minor when samples were collected in August 2018 (estimated < 25,000 m^2 of flooded terrestrial habitat [Attachment 1 in Azimuth 2019]). By August 2019, flooding was much more advanced, with > 1 million m^2 of terrestrial habitat expected to be flooded (Attachment 1 in Azimuth 2019).

While this 2019 MMP report presents 2019 (i.e., post-impoundment) data for surface water and bulk sediment, a more detailed discussion is planned for 2020, coinciding with the first year of fish chemistry data from the *after* period.

L.1.3 Report Structure

This memorandum is organized by the following sections:

- **Section L.1**: Introduction
- **Section L.2**: Overview of Mercury Data
- **Section L.3**: Water concentrations of mercury
- **Section L.4**: Sediment concentrations of mercury
- **Section L.5**: Fish concentrations of mercury

[1] In 2018 water, sediment and fish data were collected. Of these, only the sediment data was available by the 2018 reporting deadline (Agnico Eagle 2019).

L.2 MERCURY DATA OVERVIEW

MMP sampling locations are shown in **Figure L2-1** and a summary of the mercury-related data by media and year is provided in **Table L2-1.**

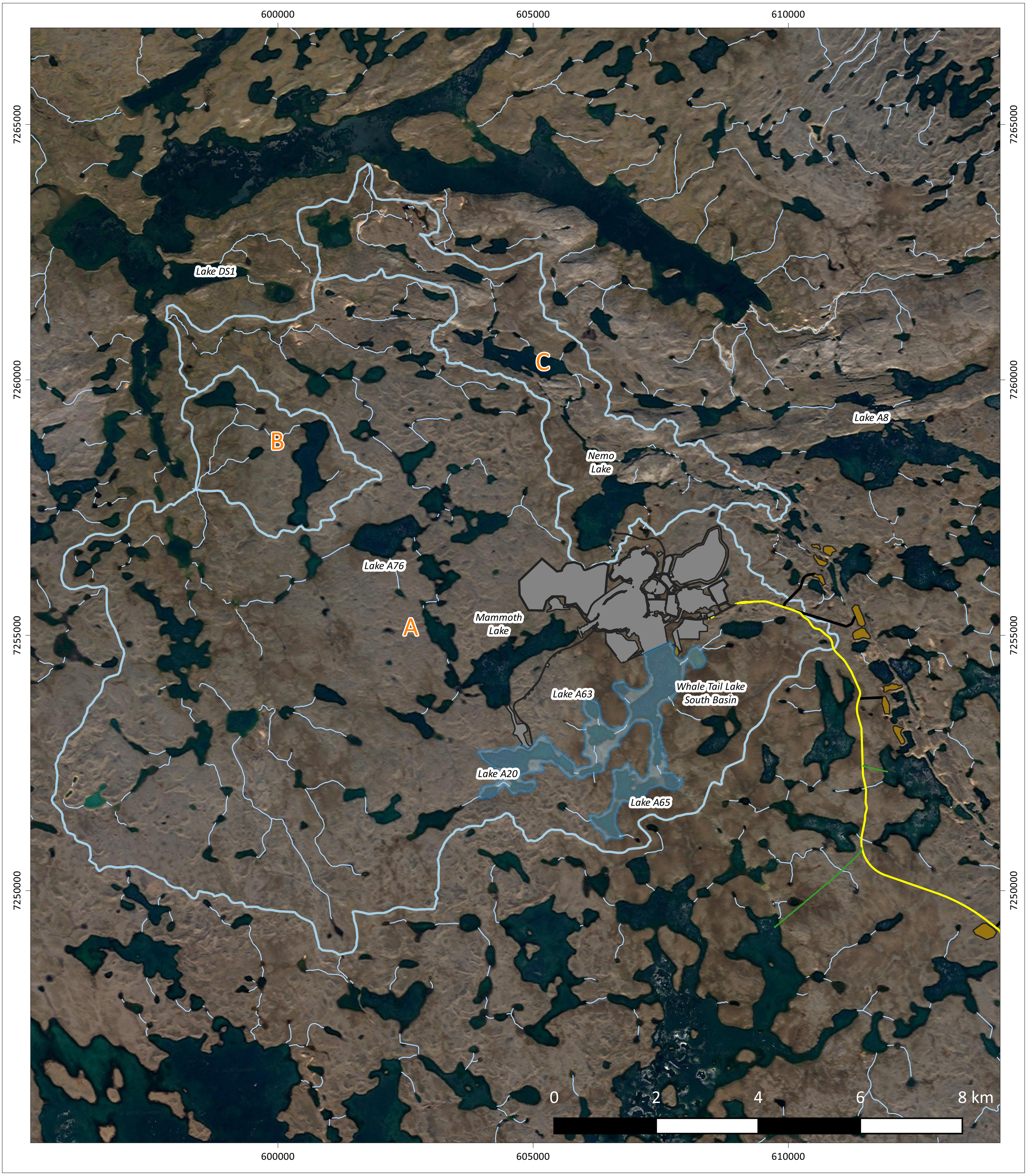
Mercury samples in various media types have been collected at the following lakes:

- Whale Tail Lake south basin (WTS/WTL) – impounded in 2018 (only minor flooding by August 2018, but much more extensive by August 2019) and is expected to be fully flooded by June 2020. Note that the diversion channel will not be operational until spring 2020, so there would have been no connectivity from WTS to downstream stations in either 2018 or 2019.
- Lakes A20, A63, A65 – inside the full-flood zone of the impoundment. All would still have been independent from WTS in August 2018, but part of the contiguous impoundment in August 2019.
- Mammoth Lake (MAM/MMT) – immediately downstream of the diversion channel serving as an outlet from the impoundment.
- Lake A76 – downstream of MAM.
- Lake DS-1 – the furthest downstream station in the watershed.
- Nemo Lake (NEM), Lake 8, Inuggugayualik Lake (INUG) and Pipedream Lake (PDL) – reference lakes not connected to the Whale Tail Lake watershed.

The scope of the 2019 MMP was limited to surface water and sediment. Lake trout captured from the north basin of Whale Tail during the fish-out in August and September 2018 were analyzed for total mercury in February 2020. Moving forward, large-bodied fish tissue sampling for the MMP will be synchronized with the EEM Biological Monitoring program which is next scheduled for 2020. Small-bodied fish tissue sampling also occurred in 2018 with approximately 30 to 50 slimy sculpin (*Cottus cognatus*) caught and preserved for mercury analysis for each of the following lakes: Whale Tail Lake – South Basin, Mammoth Lake, A20, A65, A63, Lake 8. These samples are currently archived and will be analyzed with the fish captured for MMP in 2020.

Benthic invertebrates and zooplankton were sampled during the baseline period; under the MMP, additional sampling of these media are only planned if impact assessment predictions are exceeded.

Locations of soil sampling in 2016 (baseline year) are now flooded and categorized as sediment sampling locations.



Legend

Watershed Boundaries

Project Features

Max Impoundment Area

Site Plan - August 2019 version

Esker / Quarry

Infrastructure

Amaruq haul road

Proposed Road

All-weather Access Road (AWPAR)

AZIMUTH

Client	Agnico Eagle Mines Limited - Meadowbank Division
Figure L2-1	Study areas included in the Mercury Monitoring Program
Project	Whale Tail 2019 Mercury Monitoring Report

Date: March 27, 2020
Datum: NAD 83 UTM Zone 14N
Scale: 1:100,000
Software: QGIS version 3.4.13-Maderia

REFERENCES:
1. Study area layers from Agnico Eagle.
2. Basemap imagery from Google.

Table L2-1. Summary of available mercury-related data for the Mercury Monitoring Program.

		Station Area:	Near-Field		Mid-Field				Far-Field	Reference					
Sampling Media	**Year**	**Mercury parameters** (MeHg = methylmercury; Hg = mercury)	**WTL - South**	**Mammoth Lake**	**Lake A20**	**Lake A63**	**Lake A65**	**Lake A76**	**DS1**	**WTL - north**	**Nemo Lake**	**Lake 8**	**INUG**	**Pipedream Lake**	**Reference / Data Source**
Surface Water	2016	MeHg and Ultra-low DL total Hg	n=1	-	-	-	-	-	-	-	-	-	-	-	Azimuth 2018
	2017		n=1	n=1	-	-	-	-	-	-	-	-	-	-	Azimuth 2018
	2018		n=2	n=2	n=2	n=2	n=2	n=2	-	-	n=2	n=2	-	-	Appendix L2
	2019		n=2	n=2	n=2	-	n=2	n=2	n=2	-	-	n=2	-	-	Appendix L1
	2014-2019	Regular DL total Hg	✓	✓	✓	-	-	✓	✓	-	✓	-	✓	✓	Annual CREMP Reports
Sediment	2016	Total Hg (grab)	n=5	n=5	n=5	-	-	n=5	n=5	-	n=5	-	n=5	n=5	Azimuth 2018
	2017	MeHg and total Hg (core)[1]	n=3	-	-	-	-	-	-	-	-	-	-	-	Azimuth 2018
		Total Hg (grab)	n=5	n=5	n=5	-	-	n=5	n=5	-	n=5	-	n=5	n=5	Azimuth 2017 CREMP
	2018	Total Hg (core)	n=9	-	-	-	-	-	-	-		n=8	-	-	Azimuth database
		Total Hg (grab)	n=5	n=5	n=5	-	-	n=5	n=5	-	n=5	n=5	n=5	n=4	Azimuth 2018 CREMP
	2019	Total Hg (grab)	n=5	n=5	n=5	-	-	n=5	n=5	-	n=5	n=5	n=5	n=5	Table L4-1
		MeHg (grab)	n=5	n=5	n=5	-	-	-	n=5	-	-	-	n=5	n=5	Table L4-1
Benthos Tissue	2017	MeHg and total Hg	n=3	-	-	-	-	-	-	-	-	-	-	-	Azimuth 2018
Zooplankton Tissue	2017	MeHg and total Hg	n=1	n=1	-	-	-	-	-	-	-	-	-	-	Azimuth 2018
Large-Bodied Fish Tissue	2015	MeHg and total Hg	-	n=8	-	-	-	-	-	n=21	-	-	-	-	Portt and Associates 2015
	2018	total Hg	-	-	-	-	-	-	-	n=17	-	n=8	-	-	Appendix L3

Notes:
☑ = methods and data available; cited in the annual CREMP reports.
"-" = data do not exist
"n = " = number of samples collected/analyzed.
1. Samples were planned to be collected with a core sampler; however, due to core sampler being lost in the field, core sampling methods were simulated by collecting the top 1.5 cm from a Petite Ponar grab.

L.3 WATER CHEMISTRY

L.3.1 Overview

Mercury data for the MMP were collected as part of the routine CREMP, carried out jointly by Azimuth and Agnico Eagle, and as part of on-going studies carried out by researchers in Dr. Heidi Swanson's lab at the University of Waterloo.

Monthly mercury water quality data collected in March, May, July, August, and September as part of the routine CREMP water quality program from are reported in the main CREMP report (see figures and tables in **Appendix B2**). Routine mercury water quality data were collected and analyzed according to established SOPs for the CREMP.

Specifics of the mercury sampling for the MMP are provided below.

L.3.1.1 Sample Collection

Researchers in Dr. Swanson's lab collected surface water samples from the following areas in 2018 and 2019:

- 2018 – Eight study area lakes were sampled from August 15 to 20th: Whale Tail Lake South Basin (WTS / WTL), Mammoth Lake (MAM / MMT), Nemo Lake (NEM), Lake A20, Lake A76, Lake A63, Lake A65, and Lake 8. With the exception of Lakes A63 and A65, sampling was completed at the same time, and at the same locations as the CREMP water quality sampling locations.
- 2019 – Seven study area lakes were sampled from August 15 to 20th: Whale Tail Lake South Basin (WTS), Mammoth Lake (MAM), Lake A20, Lake A76, Lake DS1, Lake A65, and Lake 8. With the exception of Lake A65, sampling was completed at the same time, and at the same locations as the CREMP water quality sampling locations.

Samples were collected using *clean-hands / dirty hands* protocols developed by the lab. Methylmercury and ultra-low mercury surface water samples were collected as surface level-grabs. Sample bottles were double-bagged from the lab and returned to lab in the same double-bags. Samples were collected by a sampling team of two people, one team member designated the *clean hands* to handle inner bag, sample container, and filtering, and the second team member designated the *dirty hands* to handle the outer bag, but never contact the sample container or inner bag. Samples for total (unfiltered) and dissolved (filtered) methylmercury analysis were preserved with HCl in the field. While the results for unfiltered samples are reported herein, the results for filtered samples will be reported elsewhere by the University of Waterloo (Dr. Heidi Swanson).

L.3.1.2 Laboratory Methods

In 2019, water samples were analyzed for methylmercury and total[2] mercury using an ultra-low detection limit at Biotron, at the University of Western Ontario. This is a CALA accredited laboratory, with detection limits for mercury that are lower than those available from commercial analytical labs. The samples were transported in coolers with ice packs and shipped to Biotron at the earliest convenience to minimize the possibility of exceeding the recommended hold-times between collection and analysis. Samples were analyzed using ultra-low detection methods for total mercury (Cold Vapour Atomic Fluorescence – Digestion, Method Ref. modified from EPA 1631, Lab Method ID - TM.0811) and methyl mercury (Cold Vapour Atomic Fluorescence Spectrophotometry, Method Ref. modified from EPA 1630, Lab Method ID - TM.0812).

L.3.2 Quality Assurance/Quality Control

The objective of quality assurance / quality control (QA/QC) is to assure that the chemical data collected are representative of the material or populations being sampled, are of known quality, have sufficient laboratory precision to be highly repeatable, are properly documented, and are scientifically defensible. Data quality was assured throughout the collection and analysis of samples using specified standardized procedures, by the employment of laboratories that have been certified for all applicable methods, and by staffing the program with experienced technicians.

The QA/QC summary for the routine mercury water samples collected as part of the CREMP are reported in **Appendix A** of the 2019 CREMP report. QA/QC results reported by the University of Western Ontario are provided in **Appendix L-1** and summarized below.

- 2019 laboratory duplicate samples analyzed for methylmercury and ultra-low trace mercury had an RPD of 19% and 7%, respectively.
- Matrix spike RPD for methylmercury and ultra-low trace mercury was 4% and 2% respectively.

[2] The “total” in total mercury refers to the inclusion of all species of mercury (i.e., both inorganic and organic forms). To avoid confusion, we use the term “unfiltered” rather than “total” when addressing partitioning between particulate-bound and dissolved phases.

- The method blank (MB) was less than method detection limit for both methylmercury and ultra-low trace mercury analyses.

There were no flags on quality control violations for Biotron.

L.3.3 Water Mercury Data

As discussed in **Section L.1.1**, dike construction was completed by early July 2018 and only minor flooding would have been expected by August of that year. By August 2019, flooding was extensive within the impoundment, resulting in connectivity between Whale Tail Lake south basin and lakes A20, A63 and A65. However, at that time, the diversion channel to Mammoth Lake was not operational, so there would not have been any connectivity to the downstream lakes.

Surface water methylmercury and total mercury in unfiltered samples collected in 2016 through 2019 are presented in **Table L3-1** and shown in **Figure L3-1**. The figure includes the CCME water quality guidelines for the protection of aquatic life for both total mercury (26 ng/L) and methylmercury (4 ng/L); the total mercury plot includes the CREMP trigger value, which was set between the CCME guideline (CREMP threshold) and the baseline/reference conditions (CCME 2020a). Note that the 2019 results appear somewhat anomalous for both total mercury and methylmercury. For total mercury, results jumped from around 0.5 ng/L or lower to nearly 20 ng/L across all stations. While less pronounced, similar changes were observed for methylmercury, but less consistently across stations. Assuming that data quality objectives have been met (see **Section L.3.2**), the observed results suggest the possibility of either the a regional climate-influenced change in mercury concentrations in 2019 (e.g., due to higher rainfall and associated runoff to all lakes) or of some other influence on data quality. At the time of this report, we are currently working with Agnico Eagle, the lab (Biotron) and researchers at the University of Waterloo about the accuracy of the 2019 results.

In situ water quality parameters collected by Azimuth as part of the routine CREMP (temperature, DO, Sp. Conductivity, pH) are provided in the main document. There was no evidence of stratification in the 2019 limnology profiles at the CREMP study area lakes. The lakes are typically well-mixed throughout the open-water period as evidenced by consistent DO, Sp. Conductivity, and temperature readings from the surface of the lakes to near-bottom.

Table L3-1. Total and methylmercury concentrations in unfiltered surface water, Whale Tail MMP 2016 – 2019.

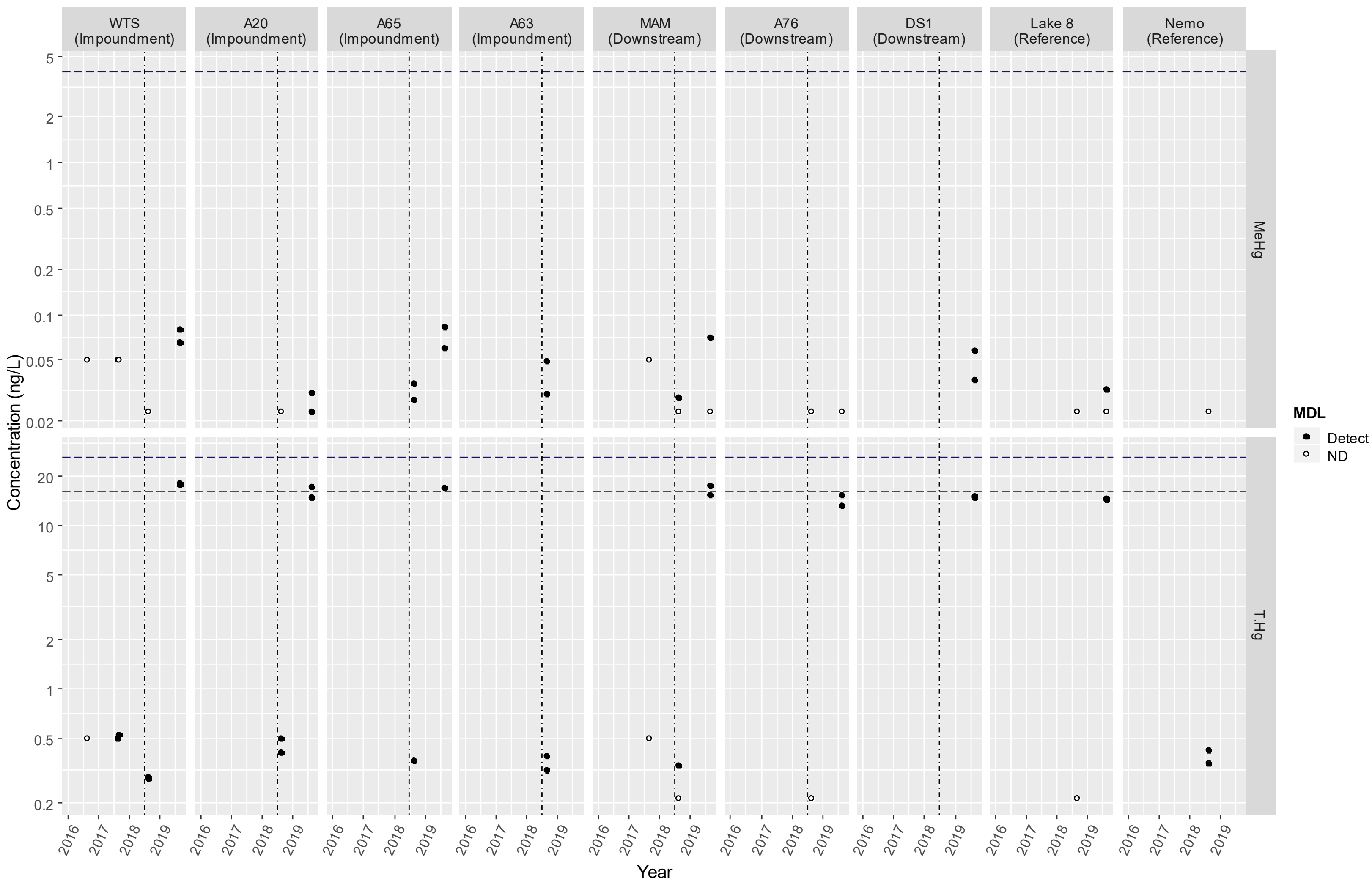
Area	Lake	Year	Area-Replicate ID	Date	Mercury (ng/L)	
					MeHg	THg
Impoundment	**Whale Tail Lake – South Basin**	2016	WTS-12	17-Aug-16	<0.05	<0.50
		2017	WTS-23	14-Aug-17	<0.05	0.50
		2017	WTS-23	28-Aug-17	<0.05	0.52
		2018	WTL-01	16-Aug-18	<0.023	0.29
		2018	WTL-02	16-Aug-18	<0.023	0.28
		2019	WTL-01	18-Aug-19	0.066	18.1
		2019	WTL-02	18-Aug-19	0.080	17.8
	Lake A20	2018	A20-01	17-Aug-18	<0.023	0.50
		2018	A20-02	17-Aug-18	<0.023	0.41
		2019	A20-01	16-Aug-19	0.030	17.2
		2019	A20-02	16-Aug-19	0.023	14.9
	Lake A63	2018	A63-01	20-Aug-18	0.030	0.32
		2018	A63-02	20-Aug-18	0.049	0.39
	Lake A65	2018	A65-01	20-Aug-18	0.027	0.36
		2018	A65-02	20-Aug-18	0.035	0.36
		2019	A65-01	19-Aug-19	0.083	17.1
		2019	A65-02	19-Aug-19	0.060	16.8
Downstream	**Mammoth Lake**	2017	MAM-23	28-Aug-17	<0.05	<0.5
		2018	MMT-01	16-Aug-18	<0.023	0.34
		2018	MMT-02	16-Aug-18	0.029	<0.215
		2019	MMT-01	20-Aug-19	0.071	17.4
		2019	MMT-02	20-Aug-19	<0.023	15.3
	Lake A76	2018	A76-WQ01	18-Aug-18	<0.023	<0.215
		2018	A76-WQ02	18-Aug-18	<0.023	<0.215
		2019	A76-01	15-Aug-19	<0.023	13.2
		2019	A76-02	15-Aug-19	<0.023	15.3
	Lake DS1	2019	DS1-01	17-Aug-19	0.058	14.8
		2019	DS1-02	17-Aug-19	0.037	15.0
Reference	**Nemo Lake [a]**	2018	NEM-WQ01	17-Aug-18	<0.023	0.42
		2018	NEM-WQ02	17-Aug-18	<0.023	0.35
	Lake 8	2018	LK8-WQ01	21-Aug-18	<0.023	<0.215
		2018	LK8-WQ02	21-Aug-18	<0.023	<0.215
		2019	LK8-WQ01	16-Aug-19	0.032	14.6
		2019	LK8-WQ02	16-Aug-19	<0.023	14.3

Notes

[a] Nemo Lake is located north of the site, in a sub-watershed that is not impacted by the impoundment. Nemo was dropped as a sampling area by researchers at the U of Waterloo in favor of DS1 in 2019.

Figure L3-1. Total mercury and methylmercury (ng/L) in unfiltered surface water samples, Whale Tail MMP 2016 – 2019.

Notes: The red dashed line = trigger value. The blue dashed lines = freshwater quality guideline for the protection of aquatic life (CCME 2020a). The vertical black dashed line indicates the date when the Whale Tail dike was completed, and the impoundment began filling.



L.4 SEDIMENT CHEMISTRY

L.4.1 Overview

The MMP consists of both grab samples and core samples. Grab samples integrate sediment chemistry across the top 3 to 5 cm, so provide a good understanding of sediment chemistry within the biologically active zone. However, in these headwater lakes with little natural sedimentation, they are less useful for quantifying changes in sediment chemistry in the most active layer close to the sediment-water interface. As in the CREMP, the MMP (Agnico Eagle) includes sediment coring to obtain higher resolution samples at specific depths (e.g., 1 to 1.5-cm thick slices). Grab samples will be collected each year, while cores will be collected every three years moving forward (i.e., coinciding with environmental effects monitoring [EEM] under the *Metal and Diamond Mining Effluent Regulations*; the first cycle is planned for 2020).

Baseline sediment coring was conducted in 2017/2018 following the SOP used for the Meadowbank and WTP CREMP. As discussed above, coring will be conducted next in 2020.

Sediment samples were collected by grab sampler for the analysis of methylmercury and total mercury from nine sampling locations in 2019 (**Table L2-1** and **Figure L2-1**). This section provides an overview of the MMP collection and analysis methods for methylmercury and total mercury in sediment grabs.

L.4.1.1 Sample Collection

Sediment samples were collected using a Petite Ponar grab sampler (6" x 6"). Each sample was a composite of two grabs. Sediment was collected by lowering the grab to within 1 m of the sediment, at which point the rate of descent was slowed to minimize disruption of the surficial layer of sediment. Upon retrieval, the grab was placed in a large stainless-steel bowl and inspected according to the acceptability criteria outlined in the SOP, namely: the absence of large foreign objects, adequate penetration depth, the grab is not overfilled, the jaws closed completely (i.e., well-sealed), and the sediment surface in the grab is undisturbed. Grabs that failed the acceptability criteria were discarded into a 20-L bucket and retained until sampling was completed at the station.

The top 3 to 5 cm was collected, consistent with Meadowbank and WTP CREMP protocols and analyzed for metals (including total mercury), TOC, and particle size.

L.4.1.2 Laboratory Methods

Sediment samples were submitted to ALS (Burnaby, BC) for analysis. The samples were transported in coolers with ice packs and shipped to ALS at the earliest convenience to minimize the possibility of exceeding the recommended hold-times between collection and analysis.

Analysis of methylmercury in sediment was completed by ALS following methodology prepared for the US Geological Survey; methylmercury is extracted from the sample and analyzed by cold vapour atomic fluorescence spectrophotometry. Total mercury in sediment is also analyzed by cold vapour atomic fluorescence spectrophotometry, following US EPA methods. Moisture content was determined gravimetrically.

L.4.2 Quality Assurance / Quality Control

A complete list of the sediment parameters, detection limits, data quality objectives, and method references is present in Table 1 of the SOP (Azimuth 2015). This QA/QC assessment is limited to the sediment samples collected in 2019 for methylmercury and total mercury analysis.

L.4.2.1 QA/QC Methods

Field QA/QC

Field QA to avoid cross-contamination consisted of taking precautions between sampling areas by rinsing and cleaning the sampling gear for sediment grabs (Petite Ponar grab, stainless steel compositing bowls and spoons) and using site water and phosphate-free cleaning detergent.

Field QC measures for sediment grab and core sampling conducted as part of the regular WTP Baseline CREMP were conducted on approximately 10% of original samples. These measures included field duplicates to characterize spatial heterogeneity and assess consistency in field methodology, and also filter swipes of the sampling equipment or coring tube to assess cleaning procedures.

Laboratory QC

The laboratory QC program for the methylmercury analysis in sediment consisted of method blanks and CRM/LCS. One laboratory duplicate was analyzed for the two batches of samples submitted to ALS in 2019 (L2333924 & L2338125).

L.4.2.2 QA/QC Results

QA/QC results for mercury analyzed in sediment as part of the CREMP are provided in **Appendix A**. QA/QC results were acceptable with the equipment blank (filter swipe) having no detectable levels of total mercury and all the mercury field duplicate RPDs were < 50%.

QA/QC results for the laboratory duplicate of the methylmercury/mercury sample are included in the lab data reports in **Appendix F** (L2333924 and L2338125). The RPDs met the lab-specified DQOs of 30% for methylmercury and 40% for total mercury.

The DL for total mercury was higher than previous years. The lab has been asked to provide the lower analytical DL (0.005 mg/kg) to match previous years.

L.4.3 Sediment Mercury Data

Methylmercury and total mercury concentrations in sediment samples collected between 2016 and 2019 are presented in **Table L4-2** (grabs) and **Table L4-3** (cores) and shown in **Figure L4-1**. Raw data are provided in **Appendix B** of the main CREMP report.

Sediment chemistry collected for the MMP show that total mercury in sediment at WTS is below CCME's (2020b) interim sediment quality guidelines (ISQGs) and probable effect level (PEL) in all sediment grab and core samples collected between 2016 and 2019. Further, there was no observed change in sediment total mercury concentrations, which is not unexpected given that the sampling focused on locations that were inundated prior to impoundment.

Methylmercury concentrations at WTS in 2019 ranged between less than DL (0.0005 mg/kg) and 0.00072 mg/kg. These results are consistent with baseline data from 2016, when methylmercury concentrations measured between 0.00033 and 0.00061 mg/kg.

The 2019 mercury concentrations in sediment grabs from WTS are similar to baseline conditions prior to flooding activities in 2018. Sediment coring planned for 2020 should also include locations within the flood zone to allow spatial comparison between flooded and original substrates within the impoundment.

Table L4-1. Total mercury and methylmercury concentrations in sediment grabs from the Whale Tail Pit Study Area Lakes in 2019.

Area-Rep	Date	ALS Sample ID	Phys Parameters		Particle Size				Total Organic Carbon	Mercury (mg/kg dw)	
			Moisture	pH	% Gravel	% Sand	% Silt	% Clay		Total	MeHg
			%	pH	%	%	%	%	%	mg/kg	mg/kg
INUG-1	15-Aug-2019	L2338125-1	82.1	4.64	<1.0	6.9	72.0	21.2	3.22	<0.050	0.000142
INUG-2	15-Aug-2019	L2338125-2	80.7	5.40	<1.0	13.0	68.6	18.5	2.64	<0.050	0.000117
INUG-3	15-Aug-2019	L2338125-3	84.7	5.32	<1.0	4.9	71.3	23.7	3.42	<0.050	0.000160
INUG-4	15-Aug-2019	L2338125-4	82.5	5.03	<1.0	2.8	73.2	24.0	3.36	<0.050	0.000149
INUG-5	15-Aug-2019	L2338125-5	83.5	4.87	<1.0	2.4	74.8	22.7	3.58	<0.050	0.000301
									Average	<0.05	**0.000174**
PDL-1	14-Aug-2019	L2333924-25	84.4	5.22	<1.0	12.5	76.5	11	3.52	<0.050	0.000129
PDL-2	14-Aug-2019	L2333924-26	85.3	5.19	<1.0	9.8	80	10.3	4.2	<0.050	0.000167
PDL-3	14-Aug-2019	L2333924-27	70.4	5.6	<1.0	29.7	65.8	4.5	1.75	<0.050	0.000113
PDL-4	14-Aug-2019	L2333924-28	72.7	6.02	<1.0	8.5	75	16.5	1.88	<0.050	<0.000050
PDL-5	14-Aug-2019	L2333924-29	78.1	5.75	<1.0	12.5	76.2	11.4	2.59	<0.050	0.000068
									Average	<0.050	**0.000119**
WTS-1	18-Aug-2019	L2338125-7	82.1	4.99	<1.0	6.3	75.1	18.7	3.66	<0.050	0.000228
WTS-2	18-Aug-2019	L2338125-8	83.0	4.95	<1.0	5.6	78.9	15.5	4.04	0.051	0.000484
WTS-3	18-Aug-2019	L2338125-9	87.2	5.65	<1.0	3.7	77.0	19.3	6.11	0.056	0.000713
WTS-4	18-Aug-2019	L2338125-10	87.6	4.90	<1.0	2.0	81.5	16.5	5.54	0.063	0.000723
WTS-5	18-Aug-2019	L2338125-11	78.1	5.64	<1.0	7.2	71.7	21.1	2.7	<0.050	<0.000050
									Average	**0.057**	**0.000537**
MAM-1	19-Aug-2019	L2338125-19	90.8	5.22	<1.0	<1.0	84.9	14.6	9.87	0.081	0.000639
MAM-2	19-Aug-2019	L2338125-20	91.0	5.61	<1.0	<1.0	83.0	16.3	9.74	0.067	0.000658
MAM-3	19-Aug-2019	L2338125-21	90.2	5.80	<1.0	<1.0	83.2	16.0	9.85	0.078	0.00104
MAM-4	19-Aug-2019	L2338125-22	89.8	5.09	<1.0	<1.0	82.5	16.7	8.84	0.068	0.000500
MAM-5	19-Aug-2019	L2338125-23	89.5	5.38	<1.0	<1.0	81.4	17.9	10.4	0.093	0.00134
									Average	**0.077**	**0.000835**

Area-Rep	Date	ALS Sample ID	Phys Parameters		Particle Size				Total Organic Carbon	Mercury (mg/kg dw)	
			Moisture	pH	% Gravel	% Sand	% Silt	% Clay		Total	MeHg
			%	pH	%	%	%	%	%	mg/kg	mg/kg
A20-1	16-Aug-2019	L2338125-25	87.3	4.92	<1.0	<1.0	67.8	31.6	4.68	<0.050	0.000299
A20-2	16-Aug-2019	L2338125-26	72.0	5.41	1.5	7.6	50.9	40.0	1.29	<0.050	0.000107
A20-3	16-Aug-2019	L2338125-27	90.9	5.37	<1.0	<1.0	69.0	30.3	7.78	<0.050	0.000462
A20-4	16-Aug-2019	L2338125-28	87.7	4.93	<1.0	1.2	66.1	32.7	4.74	<0.050	0.000482
A20-5	16-Aug-2019	L2338125-29	86.5	5.74	<1.0	2.1	62.3	35.6	4.58	<0.050	0.00117
									Average	<0.05	**0.000504**
DS1-1	17-Aug-2019	L2338125-37	73.2	6.57	<1.0	1.3	79.1	19.7	1.62	0.053	0.000084
DS1-2	17-Aug-2019	L2338125-38	68.6	6.71	<1.0	1.3	77.4	21.3	1.45	<0.050	0.000158
DS1-3	17-Aug-2019	L2338125-39	72.9	6.01	<1.0	1.0	76.5	22.5	1.88	0.064	0.000283
DS1-4	17-Aug-2019	L2338125-40	65.7	6.68	<1.0	1.8	75.7	22.5	1.28	<0.050	<0.000050
DS1-5	17-Aug-2019	L2338125-41	70.3	6.09	<1.0	<1.0	76.0	23.0	1.82	0.064	0.000330
									Average	**0.060**	**0.000214**

Notes
Total mercury concentrations in sediment from Nemo Lake (NEM) and Lake A76 are reported in tables in the main CREMP report.

Table L4-2. Sediment grab sample chemistry data for WTS, Whale Tail MMP 2016–2019.

Year	Sample ID	Depth (cm)	Date	Moisture (%)	pH	TOC (% dw)	% Gravel (>2mm)	% Sand (2.00mm - 0.063mm)	% Silt (0.063mm - 4µm)	% Clay (<4µm)	Available Sulfate-S	Mercury (mg/kg dw)	Methyl Mercury (mg/kg dw)
2016	WTS-1	3 to 5	12-Aug-16	84	6.3	4.9	*<0.10*	3.29	79.7	17	32	0.0788	0.00059
	WTS-2	3 to 5	12-Aug-16	85	5.9	4.3	*<0.10*	4.36	78.9	16.8	22	0.0675	0.00033
	WTS-3	3 to 5	12-Aug-16	88	5.8	6.8	*<0.10*	4.15	77.6	18.2	26	0.0816	0.00010
	WTS-4	3 to 5	12-Aug-16	89	5.9	7.9	*<0.10*	2.2	78	19.8	21	0.0683	0.00046
	WTS-5	3 to 5	12-Aug-16	86	6.4	4.7	*<0.10*	4.02	75.6	20.3	44	0.0932	0.00061
2017	WTS-1	3 to 5	12-Aug-17	88	5.6	6.1	*<1.0*	3.2	82.1	14.7	-	0.0890	-
	WTS-2	3 to 5	12-Aug-17	84	5.1	4.2	*<1.0*	7.7	77.1	15.2	-	0.0526	-
	WTS-3	3 to 5	12-Aug-17	87	5.6	6.7	*<1.0*	3.3	76.9	19.8	-	0.0721	-
	WTS-4	3 to 5	12-Aug-17	88	5.8	7.3	*<1.0*	3.2	76.7	20.1	-	0.0657	-
	WTS-5	3 to 5	12-Aug-17	85	5.6	4.8	*<1.0*	4.3	73.5	22.2	-	0.0569	-
2018	WTS-1	3 to 5	13-Aug-18	82	5.9	4.0	*<1.0*	5	79.8	15.2	-	0.0518	-
	WTS-2	3 to 5	13-Aug-18	83	5.8	3.7	*<1.0*	4.4	84.3	11.4	-	0.0560	-
	WTS-3	3 to 5	13-Aug-18	81	5.2	4.4	*<1.0*	2.9	91.6	5.5	-	0.0381	-
	WTS-4	3 to 5	13-Aug-18	89	5.7	7.5	*<1.0*	1.9	79.7	18.4	-	0.0695	-
	WTS-5	3 to 5	13-Aug-18	84	5.3	4.2	*<1.0*	3.5	86.2	10.4	-	0.0568	-
2019	WTS-1	3 to 5	18-Aug-19	82.1	4.99	3.66	*<1.0*	6.3	75.1	18.7	-	*<0.050*	0.00023
	WTS-2	3 to 5	18-Aug-19	83.0	4.95	4.04	*<1.0*	5.6	78.9	15.5	-	0.051	0.00048
	WTS-3	3 to 5	18-Aug-19	87.2	5.65	6.11	*<1.0*	3.7	77.0	19.3	-	0.056	0.00071
	WTS-4	3 to 5	18-Aug-19	87.6	4.90	5.54	*<1.0*	2.0	81.5	16.5	-	0.063	0.00072
	WTS-5	3 to 5	18-Aug-19	78.1	5.64	2.7	*<1.0*	7.2	71.7	21.1	-	*<0.050*	*<0.000050*

Notes
Italicized numbers are below detection limits.
'-' Not measured

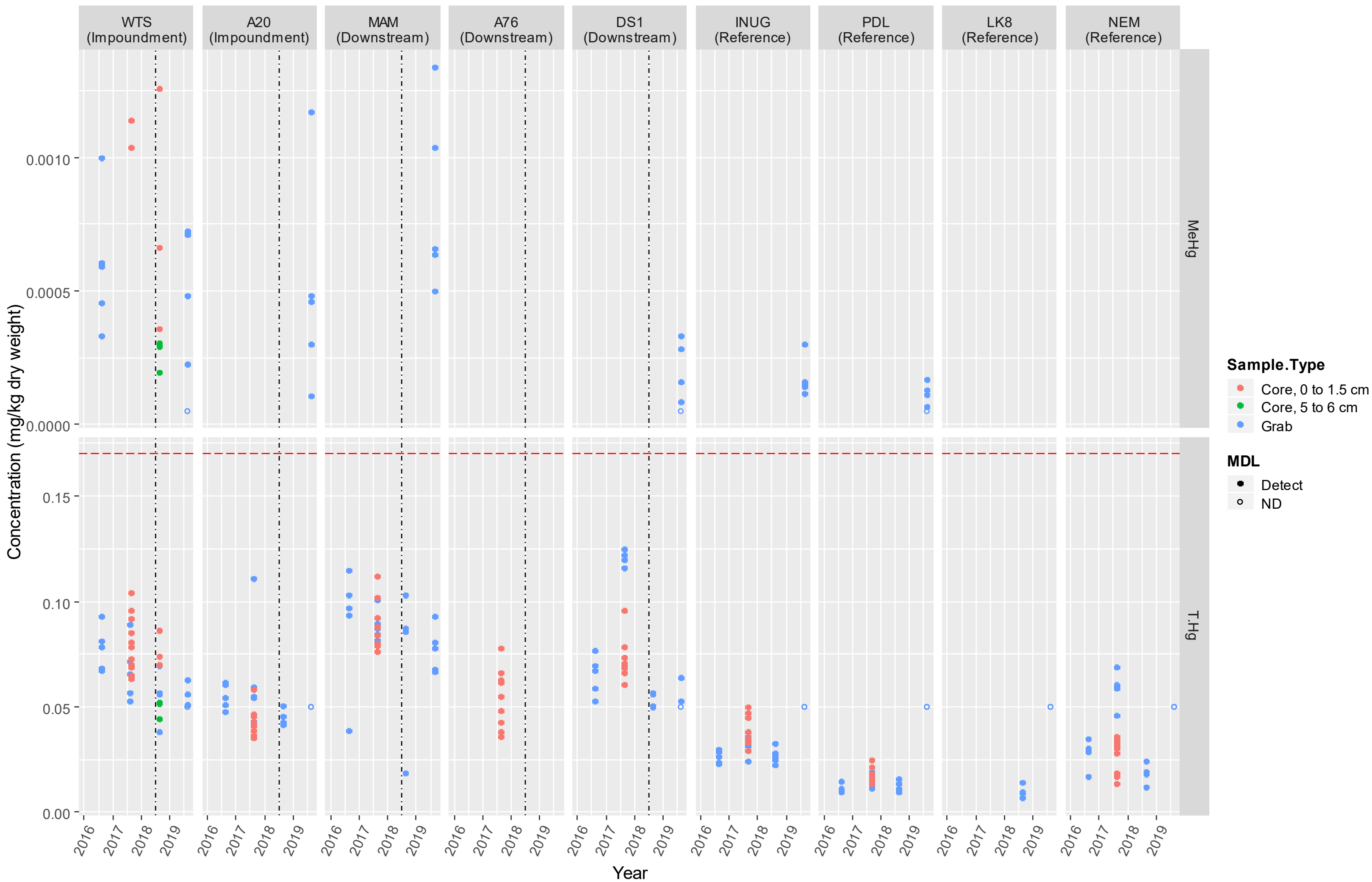
Table L4-3. Sediment core sample chemistry data for WTS, Whale Tail MMP 2017–2018.

	CCME (2020) Guideline[a]		Lake	Whale Tail Lake South Basin (WTS) -CORES											
			Year		2017					2018					
			Sample ID	WTS-SC-1	WTS-SC-5	WTS-SC-9		WTS-1			WTS-2			WTS-3	
			Sample Type	core	core	Core	core	core	core	core	core	core	core	core	core
			Depth (cm)	top 1.5	top 1.5	top 1.5	0 to 1	5 to 6	10 to 11	0 to 1	5 to 6	10 to 11	0 to 1	5 to 6	10 to 11
Parameter	**ISQG**	**PEL**	**Date**	15-Aug-17	15-Aug-17	15-Aug-17	18-Aug-18	18-Aug-18	18-Aug-18	18-Aug-18	18-Aug-18	18-Aug-18	18-Aug-18	18-Aug-18	18-Aug-18
Physical & Organic Parameters															
Moisture (%)				87.2	88.9	89.3	-	-	-	-	-	-	-	-	-
pH				6.2	5.9	6.0	-	-	-	-	-	-	-	-	-
Total Organic Carbon (% dw)				5.9	10.3	9.2	-	-	-	-	-	-	-	-	-
Total Metals (mg/kg dw)															
Mercury	0.17	0.486		0.069	0.096	0.081	0.0861	0.052	0.042	0.070	0.052	0.049	0.070	0.045	0.041
Speciated Metals (mg/kg dw)															
Methyl Mercury				0.0010	0.0011	0.0011	0.0013	0.00030	0.0014	0.00036	0.00029	0.000084	0.00066	0.00020	0.00030

Notes
Italicized numbers are below detection limits.
'-' Not measured
[a] CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999; updated up to 2020.
ISQG = Interim freshwater Sediment Quality Guideline. ISQG = Interim sediment quality guideline; PEL = probable effect level.

Figure L4-1. Total mercury and methylmercury (mg/kg dry weight) in sediment samples from Whale Tail Study lakes 2016 - 2019.

Note: The red dashed line = interim sediment quality guideline (CCME 2020b). The vertical black dashed lines indicate the date when the Whale Tail dike was completed, and the impoundment began filling.



L.5 LARGE-BODIED FISH TISSUE CHEMISTRY

L.5.1 Overview

Fish sampling was completed in 2018 from the North Basin of Whale Tail Lake. Lake trout, Arctic char, and round whitefish were captured during the fish-out, and a select number of each fish species were retained for baseline characterization of metals concentrations in muscle tissue. Additional fish collections were completed at Lake A8 in 2018 to characterize baseline mercury concentrations in fish from a reference lake located closer to the Project than INUG and PDL, the two existing reference areas for the CREMP.

L.5.1.1 Sample Collection

Fish-out of the North Basin of Whale Tail Lake – The fish-out was conducted by North/South Consultants (Winnipeg, MB). Results of the fish-out were submitted to the *Department of Fisheries and Oceans* in accordance with project requirements. Fish were filleted in the field, tissue samples were placed in labelled whirlpak bags (labelled according to fish-out IDs), frozen, and shipped to University of Waterloo. All fish tissue samples collected by North/ South had skin and muscle tissue taken from the caudal peduncle.

The fish tissue sample sizes varied between samples; to maximize the preservation of baseline samples, University of Waterloo selected 20 of the largest tissue samples from each species (Round Whitefish, Arctic Char and Lake Trout) of samples taken from the 2018 Whale Tail Lake fish-out.

Lake A8 Reference – In 2018, University of Waterloo researchers collected eight lake trout tissue samples from Reference Lake 8. Fish were filleted in the field, tissue samples were placed in labelled whirlpak bags (labelled according to the Swanson lab IDs), frozen, and shipped to University of Waterloo. Tissue samples were collected following *Swanson Lab SOP – Fish sampling for chemical parameters*; tissue samples were taken from the muscle located above the lateral line and anterior to the dorsal fin. These eight samples were selected as a reference or control for this work and future productivity studies.

L.5.1.2 Laboratory Methods

Freeze Dry Sample Preparation – Tissue samples were partially or completely thawed (depending on the size of the fillet) and a sufficient portion of the fillet tissue (half of the fillet), without fish skin were extracted. Half of the fillet was extracted using sterilized scissors and placed with sterilized tweezers into labelled vials. The remaining samples were kept in the whirlpack bags, placed back in the freezer in labelled larger ziplock bags that separated samples by species to be archived and used for future analysis. Scissors, tweezers and surfaces were cleaned with MilliQ and ethanol prior to sample preparation; a clean work area was maintained. All vials were acid washed prior to receiving fish tissue samples.

Tissue collected from the Reference Lake 8 were generally larger and therefore only partially thawed. Only 1/3 of the fillet was extracted.

Freeze Drying – Sample vials were covered with Kimtech tissues, placed back in the freezer and froze overnight. Following the *Swanson lab SOP for freeze drying*, lake trout and Arctic char from Whale Tail Lake were partially freeze dried on Thursday January 16th and on January 20th, 2020.

Capping and CoC preparation note: During preparation of samples, an error occurred in labelling sample from fish ID 501B-21. Both samples were submitted for analysis: 501B-21 dup and 501B-21. Based on the total mercury concentrations reported by Biotron, it is recommended these results are not used for analysis due to the uncertainty.

Analysis of total mercury in fish tissue was completed Biotron at the University of Western Ontario using a Milestone® DMA-80 Direct Mercury Analyzer in accordance with U.S. EPA method 7473 (U.S. EPA, 2007). Moisture content of tissues was not provided and was assumed to be 78%.

Mercury results were reported by Biotron as wet weight concentrations. The certificate of analysis is provided in **Appendix L-3**.

L.5.2 Quality Assurance/Quality Control

L.5.2.1 QA/QC Methods

See **Section 3.2** for discussion of laboratory QA/QC method types.

Samples were collected according to standard care and QA/QC procedures:

- Samples were labelled with sample ID and date and placed in a cooler with ice in the field. Samples were refrigerated until shipping to ALS laboratory in an ice-filled cooler.
- Gloved hands were used for handling the fillet and care was taken to avoid introducing foreign particles with the fillet.
- The equipment (fillet knife and cutting board) were washed with phosphate-free cleaning detergent and site water and wiped dry with paper towel between samples. Nitrile gloves were also changed between samples.

Seventeen (17) lake trout tissue samples from the Whale Tail Lake fish-out and eight samples from Lake 8 were analyzed in January 2020. Field quality control samples in 2018 consisted of collecting a field duplicate for mercury analysis. DQOs for field duplicate is a Relative percent difference (RPD) between original and duplicate sample of <40% when concentrations are higher than 10x MDL.

Laboratory quality controls included laboratory duplicates, CRM recovery, and average MS and MSD recovery.

L.5.2.2 QA/QC Results

Laboratory QA/QC results for the fish tissue mercury sample are included in the lab data report in **Appendix L-3.** The 2018 field duplicate for fish tissue exceeded the DQO by a small margin when comparing the wet weight measurements (RPD = -40% and >10x MDL) but when comparing the dw measurements (no 78% moisture conversion) the DQO is met (RPD = -34%). All laboratory QC tests for tissue analyses met DQOs. Laboratory duplicates tested for total mercury had an average RDP = 2%. Average CRM recovery was 100%, average MS recovery was 106%, and average MS RDP = 1%.

L.5.3 Lake Trout Tissue Mercury Data

Summary meristic data and total mercury tissue concentrations for lake trout captured in 2018 (Whale Tail Lake and Lake 8) as well as 2015 (Whale Tail Lake and MAM) are presented in **Table L5-1**. Meristic and chemistry data from lake trout captured for the Whale Tail Pit Project as well as fish captured for programs at Meadowbank are provided in **Appendix L-4**.

Lake trout caught from Whale Tail Lake during the baseline period in 2015 were larger on average than fish captured during the baseline fish-out in 2018. Consequently, given the known strong relationship between fish size and tissue mercury concentrations, little emphasis should be placed on the mean mercury concentrations reported in **Table L5-1**. Once the 2020 post-impoundment data are available a quantitative assessment of size-mercury relationships will be conducted for all data to remove the size bias noted above.

Table L5-1. Lake trout meristic data and mercury concentrations in muscle tissue, 2015 and 2018.

Lake	Year	Length (mm)	Weight (g)	Condition (K)	Age-Otolith (yrs)	Age-Fin Ray (yrs)	Hg (ppm ww)
WTL	2015	n=21; 469 (159-860)	n=21; 1412 (37.4-7320)	n=21; 1.05 (0.86-1.28)	n=20; 21 (9-44)	n=21; 18 (4-39)	n=21; 0.505 (0.0771-2.19)
WTL	2018	n=17; 367 (225-570)	n=17; 641 (150-1900)	n=17; 1.13 (0.84-1.48)	n=0; NA (NA)	n=0; NA (NA)	n=17; 0.248 (0.07-0.498)
MAM	2015	n=25; 360 (215-700)	n=25; 661 (96.2-4670)	n=25; 1.07 (0.91-1.36)	n=23; 12 (5-37)	n=25; 11 (5-32)	n=25; 0.209 (0.0722-1.07)
Lake 8	2018	n=8; 431 (204-583)	n=8; 988 (83.3-1980)	n=8; 0.99 (0.72-1.13)	n=0; NA (NA)	n=0; NA (NA)	n=8; 0.428 (0.084-1.162)

Note: 1. Cells contain sample size (n), followed by the mean (range) for all metrics.
2. NA = not available (age data were not available for the 2018 lake trout samples at the time of the report preparation).

L.6 REFERENCES

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Azimuth. 2019. Technical Memorandum: Whale Tail Permitting Support – Revised Predictions of Fish Mercury Concentrations in Whale Tail Lake (South Basin) FINAL. Prepared for Agnico Eagle Mines Ltd., Baker Lake, NU. August 2019

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Health Canada. 2014. Guidelines for Canadian Drinking Water Quality – Summary Table. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.

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APPENDICES

APPENDIX L-1
CERTIFICATE OF ANALYSIS – 2019 MERCURY WATER CHEMISTRY RESULTS

Date submitted: 4-Nov-19
Client COC:
Report ID: 2019-11-006

Heidi Swanson

University of Waterloo
200 University Ave W.
Waterloo, Ontario

Via email : heidi.swanson@uwaterloo.ca

CERTIFICATE OF ANALYSIS

Sample type & number of samples: 15 aqueous samples

<u>THg (Tekran model 2600)</u>

1. R^2: > 0.9975
2. RPD in Sample Duplicates avg: 2 %
3. IPR & OPR avg: 98 & 100 %
4. % Recovery MS & MSD avg: 94 % & 92 %
5. RPD in MS & MSD avg: 1 %

<u>MeHg (Tekran model 2700) Water</u>

1. R^2: > 0.9950
2. RPD in Sample Duplicates ave: 11 %
3. IPR & OPR avg: 100 & 97 %
4. % Recovery MS & MSD avg: 100 % & 100 %
5. RPD in MS & MSD avg: 0 %
6. % Recovery of QCS avg: 93 %

ACRONYMS:
R2: Coefficient of determination, **MS**: Matrix spike, **MSD**: Matrix spike duplicate, **RPD**: Relative percentage difference, **IPR** & **OPR**: initial & on-going precision & recovery, **QCS**: Quality Control Sample, **MDL**: Method detection limit, **MRL**: Method reporting limit

<u>Notes:</u> *Calculations for MDL and MRL have been revised to comply with EPA MDL revision 2 (Dec 2016). As a result, these values are different than those reported prior to Feb, 2018. Please contact the lab if further information is required. Reporting limit is set to MRL. Summarized QA/QC available upon request.*

COMMENTS REGARDING THIS REPORT: None.

x________________________________

Wen Xu

Lab Supervisor / Quality Manager

Date: 29-Nov-19

Client Name: **Heidi Swanson**
University of Waterloo

Biotron WO#: 2019-11-006
Report date: 29-Nov-2019

Total Mercury (THg) - Analytical Results

Analytical Method: TM.0811

Sample ID	Lab ID	Prep Code	Date Collected	Analysis Period	Parameter Code	Sample Vol (L)	THg (ng)	Concentration (ng/L)
A76-WQ01-UF	1	n/a	15-Aug-19	14-Nov-19	Total Hg	0.025	0.329	13.18
A76-WQ02-UF	2	n/a	15-Aug-19	14-Nov-19	Total Hg	0.025	0.382	15.26
A20-WQ01-UF	3	n/a	16-Aug-19	14-Nov-19	Total Hg	0.025	0.431	17.23
A20-WQ02-UF	4	n/a	16-Aug-19	14-Nov-19	Total Hg	0.025	0.372	14.87
LK8-WQ01-UF	5	n/a	16-Aug-19	14-Nov-19	Total Hg	0.025	0.365	14.60
LK8-WQ02-UF	6	n/a	16-Aug-19	14-Nov-19	Total Hg	0.025	0.357	14.26
DS1-WQ01-UF	7	n/a	17-Aug-19	14-Nov-19	Total Hg	0.025	0.369	14.77
DS1-WQ02-UF	8	n/a	17-Aug-19	14-Nov-19	Total Hg	0.025	0.375	15.01
WTL-WQ01-UF	9	n/a	18-Aug-19	14-Nov-19	Total Hg	0.025	0.453	18.11
WTL-WQ02-UF	10	n/a	18-Aug-19	14-Nov-19	Total Hg	0.025	0.446	17.82
A65-WQ01-UF	11	n/a	19-Aug-19	14-Nov-19	Total Hg	0.025	0.427	17.08
A65-WQ02A-UF	12	n/a	19-Aug-19	14-Nov-19	Total Hg	0.025	0.420	16.81
A65-WQ02B-UF	13	n/a	19-Aug-19	14-Nov-19	Total Hg	0.025	0.441	17.62
MMT-WQ01-UF	14	n/a	20-Aug-19	14-Nov-19	Total Hg	0.025	0.436	17.45
MMT-WQ02-UF	15	n/a	20-Aug-19	14-Nov-19	Total Hg	0.025	0.382	15.28
MDL							0.002	
MRL							0.005	

NA : Not Available

Comments: The above listed parameters are currently on the reporting laboratory's scope of accreditation. Values < MRL are solely left to the discretion of the client.

APPENDIX L-2
CERTIFICATE OF ANALYSIS – 2018 MERCURY WATER CHEMISTRY RESULTS

		Date submitted:	15-Feb-19
Jared Ellenor		Client COC:	
University of Waterloo		Report ID:	2019-02-008

200 University Ave W.
Waterloo, Ontario

Via email : jared.ellenor@gmail.com

CERTIFICATE OF ANALYSIS

Sample type & number of samples: 48 water samples
The following analytical analyses were requested: Total mercury and Methyl mercury

THg (Tekran model 2600)

1. R^2: > 0.9975
2. RPD in Sample Duplicates avg: 7 %
3. IPR & OPR avg: 98 & 109 %
4. % Recovery MS & MSD avg: 113 % & 112 %
5. RPD in MS & MSD avg: 2 %

MeHg (Tekran model 2700) Water

1. R^2: > 0.9950
2. RPD in Sample Duplicates avg: 19 %
3. IPR & OPR avg: 97 & 98 %
4. % Recovery MS & MSD avg: 83 % & 84 %
5. RPD in MS & MSD avg: 4 %

ACRONYMS:
R2: Coefficient of determination, **MS**: Matrix spike, **MSD**: Matrix spike duplicate, **RPD**: Relative percentage difference, **IPR** & **OPR**: initial & on-going precision & recovery, **QCS**: Quality Control Sample, **MDL**: Method detection limit, **MRL**: Method reporting limit

Notes: *Calculations for MDL and MRL have been revised to comply with EPA MDL revision 2 (Dec 2016). As a result, these values are different than those reported prior to Feb, 2018. Please contact the lab if further information is required. Reporting limit is set to MRL. Summarized QA/QC available upon request.*

COMMENTS REGARDING THIS REPORT: **A)** Samples in THg analysis have passed the EPA method 1631 recommended holding time (90 days). **B)** In THg analysis, filtered samples (lab ID 2, 6, 10, 38, 40 and 48) are higher than their counterparts (lab ID1, 5, 9, 37, 39 and 47). However, samples 1&2, 37&38, 39&40 and 47&48 are not significantly difference (%RPD < 20%). Samples 5&6 and 9&10 were re-run and there is no matric effect.

x WenXu

Wen Xu
Lab Supervisor / Quality Manager

Date: 15-Mar-19

Client Name: **Jared Ellenor**
University of Waterloo

Biotron WO#: 2019-02-008
Report date: 15-Mar-2019

Total Mercury (THg) - Analytical Results

Analytical Method: TM.0811

Sample ID	Lab ID	Prep Code	Date Collected	Analysis Period	Parameter Code	Sample Vol (L)	THg (ng)	Concentration (ng/L)
WTL-WQ01-U	1	n/a	16-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.007	0.287
WTL-WQ01-F	2	n/a	16-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.008	0.321
WTL-WQ02-U	3	n/a	16-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.007	0.284
WTL-WQ02-F	4	n/a	16-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.006	0.246
MMT-WQ01-U	5*	n/a	16-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.008	0.337
MMT-WQ01-F	6*	n/a	16-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.011	0.428
MMT-WQ02-U	7	n/a	16-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.004	<MRL
MMT-WQ02-F	8	n/a	16-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.007	0.289
NEM-WQ01-U	9‡	n/a	17-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.010	0.419
NEM-WQ01-F	10‡	n/a	17-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.017	0.665
NEM-WQ02-U	11	n/a	17-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.009	0.352
NEM-WQ02-F	12	n/a	17-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.004	<MRL
A20-WQ01-U	13	n/a	17-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.012	0.498
A20-WQ01-F	14	n/a	17-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.004	<MRL
A20-WQ02-U	15	n/a	17-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.010	0.407
A20-WQ02-F	16	n/a	17-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.005	<MRL
A76-WQ01-U	17	n/a	18-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.003	<MRL
A76-WQ01-F	18	n/a	18-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.002	<MRL
A76-WQ02-A-U	19	n/a	18-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.001	<MRL
A76-WQ02-A-F	20	n/a	18-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.002	<MRL
A76-WQ02-B-U	21	n/a	18-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.010	0.381
A76-WQ02-B-F	22	n/a	18-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.002	<MRL
A63-WQ01-A-U	23	n/a	20-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.008	0.319
A63-WQ01-A-F	24	n/a	20-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.007	0.272
A63-WQ01-B-U	25	n/a	20-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.008	0.325
A63-WQ01-B-F	26	n/a	20-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.008	0.306
A63-WQ02-U	27	n/a	20-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.010	0.385
A63-WQ02-F	28	n/a	20-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.007	0.300
A65-WQ01-U	29	n/a	20-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.009	0.364
A65-WQ01-F	30	n/a	20-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.007	0.265

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Client Name: **Jared Ellenor**
University of Waterloo

Biotron WO#: 2019-02-008
Report date: 15-Mar-2019

Total Mercury (THg) - Analytical Results

Analytical Method: TM.0811

Sample ID	Lab ID	Prep Code	Date Collected	Analysis Period	Parameter Code	Sample Vol (L)	THg (ng)	Concentration (ng/L)
A65-WQ02-U	31	n/a	20-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.009	0.361
A65-WQ02-F	32	n/a	20-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.006	0.241
LK8-WQ01-U	33	n/a	21-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.003	<MRL
LK8-WQ01-F	34	n/a	21-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.006	0.241
LK8-WQ02-U	35	n/a	21-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.005	<MRL
LK8-WQ02-F	36	n/a	21-Aug-18	Feb 22- Mar 14, 2019	Total Hg	0.025	0.008	0.322
MDL							0.0020	
MRL							0.0050	

NA : Not Available

Comments: The above listed parameters are currently on the reporting laboratory's scope of accreditation. Values < MRL are solely left to the discretion of the client.

APPENDIX L-3
CERTIFICATE OF ANALYSIS – BASELINE MERCURY CONCENTRATIONS IN FISH COLLECTED IN 2018

Date submitted:	29-Jan-20
Client COC:	
Report ID:	2020-01-012

Agnico Eagle Mines Limited

Environment Department, Meadowbank
Rouyn-Noranda QC J0Y1C0

Via email : marie-pier.marcil@agnicoeagle.com; leilan.baxter@agnicoeagle.com; ryan.vanengen@gmail.com

CERTIFICATE OF ANALYSIS

Sample type & number of samples: 67 fish samples
The following analytical analyses were requested: DMA Total mercury

THg (TM 0813, DMA-80)

1. R^2: > 0.995
2. IPR: 99 %
3. RPD in Sample Duplicates avg: 2 %
4. % Recovery CRM avg: 100 %
5. % Recovery MS & MSD avg: 106 %, 106 %
6. RPD in Spike Duplicates avg: 1 %

ACRONYMS:
R2: Coefficient of determination, **MS**: Matrix spike, **MSD**: Matrix spike duplicate, **RPD**: Relative percentage difference, **IPR** & **OPR**: initial & on-going precision & recovery, **MDL**: Method detection limit, **MRL**: Method reporting limit

Notes: *Calculations for MDL and MRL have been revised to comply with EPA MDL revision 2 (Dec 2016). As a result, these values are different than those reported prior to Feb, 2018. Please contact the lab if further information is required. Reporting limit is set to MRL. Summarized QA/QC available upon request.*

COMMENTS REGARDING THIS REPORT: Elevated RPD (40%) when comparing submitted sample duplicates, spike data on 21 and duplicate data on "21-dup" confirm this variability.

x________________________________

Jeff Warner
Technical Specialist

Date: Wednesday, February 12, 2020

Client Name: **Agnico Eagle Mines Limited**
Environment Department, Meadowbank

Biotron WO#: 2020-01-012
Report date: 12-Feb-2020

Total Mercury (THg) by DMA- Analytical Results

Analytical Method: TM.0813

Sample ID	Lab ID	Prep Code	Date Collected	Date analyzed	Parameter Code	Sample Weight (g)	THg from Original Sample (ng)	Concentration (mg/kg)
002-1	1	n/a	8/10/2018	Feb 10-11, 2020	sTHg	0.0204	5.77	0.283
002-3	2	n/a	8/10/2018	Feb 10-11, 2020	sTHg	0.0216	4.96	0.230
003-5	3	n/a	8/10/2018	Feb 10-11, 2020	sTHg	0.0195	8.37	0.429
003-7	4	n/a	8/10/2018	Feb 10-11, 2020	sTHg	0.0208	11.39	0.548
003-9	5	n/a	8/10/2018	Feb 10-11, 2020	sTHg	0.0211	6.05	0.287
31a-4	6	n/a	8/17/2018	Feb 10-11, 2020	sTHg	0.0190	8.88	0.467
500a-7	7	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0199	10.12	0.508
500b-3	8	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0215	13.67	0.636
500A-20	9	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0223	12.34	0.553
500a-18	10	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0196	6.23	0.318
500a-25	11	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0221	15.10	0.683
500b-25	12	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0217	25.79	1.189
500b-27	13	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0228	24.21	1.062
500b-28	14	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0214	7.30	0.341
501A-1	15	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0214	28.16	1.316
501A-5	16	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0215	20.27	0.943
501a-12	17	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0219	19.37	0.885
501b-15	18	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0210	19.37	0.922
501a-19	19	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0203	29.18	1.437
501b-21	20	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0238	26.02	1.093
501B-21 dup	21	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0223	36.75	1.648
502A-1	22	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0210	11.55	0.550
502b-5	23	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0262	28.39	1.083
502a-9	24	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0223	6.76	0.303
502a-11	25	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0220	15.03	0.683
502A-14	26	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0203	8.62	0.425
502A-15	27	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0207	33.02	1.595
502A-16	28	n/a	8/13/2018	Feb 10-11, 2020	sTHg	0.0180	14.77	0.821
503A-19	29	n/a	14-Aug-18	Feb 10-11, 2020	sTHg	0.0210	10.68	0.509
513A-1	30	n/a	16-Aug-18	Feb 10-11, 2020	sTHg	0.0214	17.46	0.816
519a-14	31	n/a	18-Aug-18	Feb 10-11, 2020	sTHg	0.0217	24.66	1.137
522-4	32	n/a	18-Aug-18	Feb 10-11, 2020	sTHg	0.0223	10.58	0.475
524-3	33	n/a	19-Aug-18	Feb 10-11, 2020	sTHg	0.0221	11.29	0.511
531-2	34	n/a	20-Aug-18	Feb 10-11, 2020	sTHg	0.0181	280.61	15.504
1000-1	35	n/a	10-Aug-18	Feb 10-11, 2020	sTHg	0.0225	6.33	0.281
1000-13	36	n/a	10-Aug-18	Feb 10-11, 2020	sTHg	0.0205	35.95	1.754
1001-7	37	n/a	10-Aug-18	Feb 10-11, 2020	sTHg	0.0211	5.73	0.272
1001-12	38	n/a	10-Aug-18	Feb 10-11, 2020	sTHg	0.0235	7.76	0.330
1001-14	39	n/a	10-Aug-18	Feb 10-11, 2020	sTHg	0.0222	7.39	0.333
1002-3	40	n/a	10-Aug-18	Feb 10-11, 2020	sTHg	0.0216	4.66	0.216
1002-4	41	n/a	10-Aug-18	Feb 10-11, 2020	sTHg	0.0219	7.43	0.339
1002-7	42	n/a	10-Aug-18	Feb 10-11, 2020	sTHg	0.0209	4.39	0.210

Client Name: **Agnico Eagle Mines Limited**
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Sample ID	Lab ID	Prep Code	Date Collected	Date analyzed	Parameter Code	Sample Weight (g)	THg from Original Sample (ng)	Concentration (mg/kg)
1002-8	43	n/a	10-Aug-18	Feb 10-11, 2020	sTHg	0.0210	5.46	0.260
1002-10	44	n/a	10-Aug-18	Feb 10-11, 2020	sTHg	0.0234	27.03	1.155
1003-2	45	n/a	11-Aug-18	Feb 10-11, 2020	sTHg	0.0218	33.92	1.556
1005-9	46	n/a	11-Aug-18	Feb 10-11, 2020	sTHg	0.0213	26.36	1.237
1009a-1	47	n/a	14-Aug-18	Feb 10-11, 2020	sTHg	0.0215	48.65	2.263
1020A-2	48	n/a	16-Aug-18	Feb 10-11, 2020	sTHg	0.0213	20.95	0.983
1020A-3	49	n/a	16-Aug-18	Feb 10-11, 2020	sTHg	0.0201	7.97	0.397
1020A-4	50	n/a	16-Aug-18	Feb 10-11, 2020	sTHg	0.0224	5.48	0.245
1020b-7	51	n/a	16-Aug-18	Feb 10-11, 2020	sTHg	0.0221	8.83	0.400
1021-7	52	n/a	16-Aug-18	Feb 10-11, 2020	sTHg	0.0233	11.20	0.481
1024-3	53	n/a	16-Aug-18	Feb 10-11, 2020	sTHg	0.0209	23.31	1.115
1024-11	54	n/a	17-Aug-18	Feb 10-11, 2020	sTHg	0.0237	7.88	0.333
1027-5	55	n/a	17-Aug-18	Feb 10-11, 2020	sTHg	0.0230	9.22	0.401
1032-1	56	n/a	18-Aug-18	Feb 10-11, 2020	sTHg	0.0206	8.83	0.428
1038A-5	57	n/a	20-Aug-18	Feb 10-11, 2020	sTHg	0.0217	5.31	0.245
1057-8	58	n/a	25-Aug-18	Feb 10-11, 2020	sTHg	0.0219	21.74	0.993
1075-6	59	n/a	27-Aug-18	Feb 10-11, 2020	sTHg	0.0211	3.24	0.154
14241	60	n/a	22-Aug-18	Feb 10-11, 2020	sTHg	0.0216	13.25	0.613
14242	61	n/a	22-Aug-18	Feb 10-11, 2020	sTHg	0.0197	72.48	3.679
14243	62	n/a	22-Aug-18	Feb 10-11, 2020	sTHg	0.0211	21.62	1.025
14244	63	n/a	22-Aug-18	Feb 10-11, 2020	sTHg	0.0227	53.20	2.343
14245	64	n/a	22-Aug-18	Feb 10-11, 2020	sTHg	0.0214	32.22	1.506
14246	65	n/a	22-Aug-18	Feb 10-11, 2020	sTHg	0.0193	101.94	5.282
14247	66	n/a	22-Aug-18	Feb 10-11, 2020	sTHg	0.0224	8.57	0.383
14248	67	n/a	22-Aug-18	Feb 10-11, 2020	sTHg	0.0192	14.15	0.737
MDL							0.07	
MRL							0.22	

NA : Not Available

Comments: The above listed parameters are currently on the reporting laboratory's scope of accreditation.

Values < MRL are solely left to the discretion of the client. Final results significant to 3 digits.

APPENDIX L-4
WHALE TAIL PIT LARGE-BODIED FISH DATABASE

Year	Lake	Fish number	Species code	Species	Fork Length (mm)	Weight (g)	Sex	Maturity	Reproductive Status	Fin-ray age	Otolith age	Sample ID	Lab Sample ID	Moisture (%)	Tissue Hg (mg/kg dw)	Tissue Hg (mg/kg ww)
2018	Lake 8	14241	LKTR	lake trout	375	596	F	I		na	archived		60	0.78	0.613	0.135
2018	Lake 8	14242	LKTR	lake trout	583	1980	M	U		na	archived		61	0.78	3.679	0.809
2018	Lake 8	14243	LKTR	lake trout	491	1170	F	U		na	archived		62	0.78	1.025	0.225
2018	Lake 8	14244	LKTR	lake trout	490	1320	M	G		na	archived		63	0.78	2.343	0.516
2018	Lake 8	14245	LKTR	lake trout	480	1210	F	G		na	archived		64	0.78	1.506	0.331
2018	Lake 8	14246	LKTR	lake trout	582	1410	F	U		na	archived		65	0.78	5.282	1.162
2018	Lake 8	14247	LKTR	lake trout	204	83.3	M	I		na	archived		66	0.78	0.383	0.084
2018	Lake 8	14248	LKTR	lake trout	246	134.7	M	I		na	archived		67	0.78	0.737	0.162
2018	WT-N	1000-13	LKTR	lake trout	390	600	M	IM	GR	na	archived	1000	36	0.78	1.754	0.386
2018	WT-N	1002-10	LKTR	lake trout	490	1350	F	MA	RI	na	archived	1002	44	0.78	1.155	0.254
2018	WT-N	1003-2	LKTR	lake trout	395	600	F	MA	RI	na	archived	1003	45	0.78	1.556	0.342
2018	WT-N	1005-9	LKTR	lake trout	304	300	F	IM	GR	na	archived	1005	46	0.78	1.237	0.272
2018	WT-N	1009a-1	LKTR	lake trout	570	1900	M	MA	RI	na	archived	1009a	47	0.78	2.263	0.498
2018	WT-N	500a-18	LKTR	lake trout	225	150	M	IM	GR	na	archived	500a	10	0.78	0.318	0.070
2018	WT-N	500a-7	LKTR	lake trout	260	200	M	IM	GR	na	archived	500a	7	0.78	0.508	0.112
2018	WT-N	500b-27	LKTR	lake trout	375	600	F	MA	RI	na	archived	500b	13	0.78	1.062	0.234
2018	WT-N	500b-3	LKTR	lake trout	295	300	F	IM	GR	na	archived	500b	8	0.78	0.636	0.140
2018	WT-N	501A-1	LKTR	lake trout	440	800	M	IM	GR	na	archived	501a	15	0.78	1.316	0.289
2018	WT-N	501a-12	LKTR	lake trout	272	250	M	IM	GR	na	archived	501a	17	0.78	0.885	0.195
2018	WT-N	501a-19	LKTR	lake trout	390	825	M	MA	RI	na	archived	501a	19	0.78	1.437	0.316
2018	WT-N	501b-21	LKTR	lake trout	355	375	F	IM	GR	na	archived	501b	20	0.78	1.093	0.240
2018	WT-N	501B-21 dup	LKTR	lake trout	355	375	F	IM	GR	na	archived	501b	21	0.78	1.648	0.363
2018	WT-N	502A-1	LKTR	lake trout	300	400	F	IM	GR	na	archived	502a	22	0.78	0.550	0.121
2018	WT-N	502a-11	LKTR	lake trout	403	800	M	MA	RI	na	archived	502a	25	0.78	0.683	0.150
2018	WT-N	502A-15	LKTR	lake trout	480	1200	M	MA	RI	na	archived	502a	27	0.78	1.595	0.351
2018	WT-N	502b-5	LKTR	lake trout	300	250	F	IM	GR	na	archived	502b	23	0.78	1.083	0.238
2015	WT	46	LKTR	lake trout	568	1830	f	m		28	28	WHALE TAIL LAKE LAKE TROUT 46	L1677176-1	80.4	3.01	0.59
2015	WT	47	LKTR	lake trout	661	3110	m	m		26	24	WHALE TAIL LAKE LAKE TROUT 47	L1677176-2	78.3	3.84	0.831
2015	WT	48	LKTR	lake trout	581	2210	f	m		25	27	WHALE TAIL LAKE LAKE TROUT 48	L1677176-3	79.1	4.13	0.863
2015	WT	49	LKTR	lake trout	608	2230	f	m		25	26	WHALE TAIL LAKE LAKE TROUT 49	L1677176-4	80.1	4.84	0.965
2015	WT	50	LKTR	lake trout	481	1090	m	i		24	25	WHALE TAIL LAKE LAKE TROUT 50	L1677176-5	78.4	2.2	0.474
2015	WT	52	LKTR	lake trout	445	1130	m	m		15	15	WHALE TAIL LAKE LAKE TROUT 52	L1677176-6	69.6	0.444	0.135
2015	WT	53	LKTR	lake trout	472	970	m	i		18	18	WHALE TAIL LAKE LAKE TROUT 53	L1677176-7	78.5	1.71	0.368
2015	WT	56	LKTR	lake trout	407	775	m	m		16	23	WHALE TAIL LAKE LAKE TROUT 56	L1677176-10	74.8	1.3	0.328
2015	WT	57	LKTR	lake trout	388	607	m	m		12	13	WHALE TAIL LAKE LAKE TROUT 57	L1677176-11	72.7	1.03	0.281
2015	WT	58	LKTR	lake trout	469	987	m	i		14	18	WHALE TAIL LAKE LAKE TROUT 58	L1677176-12	75.3	1.49	0.37
2015	WT	59	LKTR	lake trout	380	655	m	m		11	12	WHALE TAIL LAKE LAKE TROUT 59	L1677176-13	76	0.727	0.175
2015	WT	60	LKTR	lake trout	430	687	f	m		12	13	WHALE TAIL LAKE LAKE TROUT 60	L1677176-14	78.7	2.13	0.453
2015	WT	61	LKTR	lake trout	860	7320	m	m		39	44	WHALE TAIL LAKE LAKE TROUT 61	L1677176-15	77	9.52	2.19
2015	WT	62	LKTR	lake trout	585	2110	m	m		22	26	WHALE TAIL LAKE LAKE TROUT 62	L1677176-16	77.3	3.52	0.798
2015	WT	63	LKTR	lake trout	475	1020	m	m		20	25	WHALE TAIL LAKE LAKE TROUT 63	L1677176-17	77.1	2.12	0.486
2015	WT	64	LKTR	lake trout	410	745	f	m		22	25	WHALE TAIL LAKE LAKE TROUT 64	L1677176-18	78.6	1.36	0.292
2015	WT	65	LKTR	lake trout	423	693	f	m		11	14	WHALE TAIL LAKE LAKE TROUT 65	L1677176-19	75.7	1.26	0.306
2015	WT	66	LKTR	lake trout	335	427	m	i		11	12	WHALE TAIL LAKE LAKE TROUT 66	L1677176-20	77.5	0.614	0.138

Year	Lake	Fish number	Species code	Species	Fork Length (mm)	Weight (g)	Sex	Maturity	Reproductive Status	Fin-ray age	Otolith age	Sample ID	Lab Sample ID	Moisture (%)	Tissue Hg (mg/kg dw)	Tissue Hg (mg/kg ww)
2015	WT	68	LKTR	lake trout	319	348	m	i		9	9	WHALE TAIL LAKE LAKE TROUT 68	L1677176-21	77.8	0.711	0.158
2015	WT	69	LKTR	lake trout	159	37.4	u	i		4	na	WHALE TAIL LAKE LAKE TROUT 69	L1677176-22	76.9	0.334	0.0771
2015	WT	70	LKTR	lake trout	390	672	f	r		15	19	WHALE TAIL LAKE LAKE TROUT 70	L1677176-23	75.3	1.29	0.318
2015	MAM	97	LKTR	lake trout	370	510	f	m		13	13	MAMMOTH LAKE LAKE TROUT 97	L1677176-24	74.8	0.902	0.227
2015	MAM	98	LKTR	lake trout	369	501	f	m		12	13	MAMMOTH LAKE LAKE TROUT 98	L1677176-25	75.1	0.625	0.156
2015	MAM	99	LKTR	lake trout	373	550	f	m		9	11	MAMMOTH LAKE LAKE TROUT 99	L1677176-26	76	0.655	0.157
2015	MAM	100	LKTR	lake trout	363	542	m	m		9	na	MAMMOTH LAKE LAKE TROUT 100	L1677176-27	74.8	0.504	0.127
2015	MAM	101	LKTR	lake trout	343	460	f	m		9	9	MAMMOTH LAKE LAKE TROUT 101	L1677176-28	75.9	0.566	0.136
2015	MAM	102	LKTR	lake trout	353	433	f	m		9	10	MAMMOTH LAKE LAKE TROUT 102	L1677176-29	76.1	0.578	0.138
2015	MAM	103	LKTR	lake trout	373	474	f	m		13	16	MAMMOTH LAKE LAKE TROUT 103	L1677176-30	75.7	0.739	0.18
2015	MAM	105	LKTR	lake trout	385	612	f	m		10	11	MAMMOTH LAKE LAKE TROUT 105	L1677176-31	75.4	0.7	0.172
2015	MAM	106	LKTR	lake trout	395	692	f	m		11	12	MAMMOTH LAKE LAKE TROUT 106	L1677176-32	80	1.34	0.268
2015	MAM	108	LKTR	lake trout	351	474	m	m		8	na	MAMMOTH LAKE LAKE TROUT 108	L1677176-33	77.4	0.531	0.12
2015	MAM	110	LKTR	lake trout	346	478	f	m		9	10	MAMMOTH LAKE LAKE TROUT 110	L1677176-34	74	0.602	0.156
2015	MAM	111	LKTR	lake trout	365	504	m	m		12	12	MAMMOTH LAKE LAKE TROUT 111	L1677176-35	75.9	0.785	0.189
2015	MAM	112	LKTR	lake trout	365	504	f	m		13	13	MAMMOTH LAKE LAKE TROUT 112	L1677176-36	74.8	0.693	0.175
2015	MAM	114	LKTR	lake trout	590	2110	m	m		24	24	MAMMOTH LAKE LAKE TROUT 114	L1677176-37	80	2.91	0.583
2015	MAM	115	LKTR	lake trout	369	511	m	m		12	12	MAMMOTH LAKE LAKE TROUT 115	L1677176-38	77.2	0.572	0.13
2015	MAM	116	LKTR	lake trout	354	472	m	m		12	13	MAMMOTH LAKE LAKE TROUT 116	L1677176-39	77	0.811	0.187
2015	MAM	117	LKTR	lake trout	366	534	m	i		13	13	MAMMOTH LAKE LAKE TROUT 117	L1677176-40	74.6	0.845	0.215
2015	MAM	118	LKTR	lake trout	316	319	m	i		10	10	MAMMOTH LAKE LAKE TROUT 118	L1677176-41	77.8	0.986	0.219
2015	MAM	119	LKTR	lake trout	290	269	m	i		8	8	MAMMOTH LAKE LAKE TROUT 119	L1677176-42	75.4	0.523	0.129
2015	MAM	120	LKTR	lake trout	290	287	f	i		8	8	MAMMOTH LAKE LAKE TROUT 120	L1677176-43	75.3	0.492	0.122
2015	MAM	121	LKTR	lake trout	285	239	u	i		8	8	MAMMOTH LAKE LAKE TROUT 121	L1677176-44	74.6	0.531	0.135
2015	MAM	122	LKTR	lake trout	254	181	u	i		6	6	MAMMOTH LAKE LAKE TROUT 122	L1677176-45	76.1	0.325	0.0777
2015	MAM	123	LKTR	lake trout	215	96.2	u	i		5	5	MAMMOTH LAKE LAKE TROUT 123	L1677176-46	78	0.34	0.0747
2015	MAM	124	LKTR	lake trout	700	4670	f	m		32	37	MAMMOTH LAKE LAKE TROUT 124	L1677176-47	78.7	4.99	1.07
2015	MAM	126	LKTR	lake trout	218	111	u	i		6	5	MAMMOTH LAKE LAKE TROUT 126	L1677176-48	78.1	0.329	0.0722
1998	Pipe Dream	203	LKTR	lake trout	915	7050	F	3			37	98Pipe-5				1.48
1998	Pipe Dream	138	LKTR	lake trout	726	3925	M	10			30+	98Pipe-2				1.2
1998	Pipe Dream	123	LKTR	lake trout	586	2075	F	2			22	98Pipe-1				0.44
1998	INUG	251	LKTR	lake trout	590	2175	F	5			26	98Aqun-1				0.32
1998	AMARULIK	431	LKTR	lake trout	665	3125	M	6			23	98Amar-1				0.57
1998	FARSIDE	932	LKTR	lake trout	602	2350	F	5			17	98last-2				0.46
1998	FARSIDE	997	LKTR	lake trout	619	2650	M	8			28	98last-5				0.41
1998	INUG	272	LKTR	lake trout	563	2025	M	6			21	98Aqun-2				0.31
1998	AMARULIK	554	LKTR	lake trout	786	5600	M	8			24	98Amar-4				0.69
1998	INUG	300	LKTR	lake trout	660	3350	F	3				98Aqun-3				0.5
1998	FARSIDE	906	LKTR	lake trout	700	4200	F	5			26	98last-1				0.74
1998	FARSIDE	995	LKTR	lake trout	670	3700	M	6			24	98last-5				0.57
1998	AMARULIK	465	LKTR	lake trout	749	5225	F	3				98Amar-2				0.74
1998	INUG	250	LKTR	lake trout	620	2975	M	8			22	98Aqun-1				0.42
1998	INUG	273	LKTR	lake trout	845	7625	F	5			32	98Aqun-2				1.03
1998	Pipe Dream	194	LKTR	lake trout	641	3450	M	8				98Pipe-4				0.61

Year	Lake	Fish number	Species code	Species	Fork Length (mm)	Weight (g)	Sex	Maturity	Reproductive Status	Fin-ray age	Otolith age	Sample ID	Lab Sample ID	Moisture (%)	Tissue Hg (mg/kg dw)	Tissue Hg (mg/kg ww)
1998	FARSIDE	964	LKTR	lake trout	610	2975	F	3				98last-3				0.69
1998	Pipe Dream	126	LKTR	lake trout	518	2050	F	2			19	98Pipe-1				0.26
1998	AMARULIK	551	LKTR	lake trout	832	8575	M	8			28	98Amar-4				0.74
1998	AMARULIK	410	LKTR	lake trout	305	5800	F	5			40	98Amar-1				0.84
1997	TP	62	LKTR	lake trout	686	2875	M	10				973PN-6				0.506
1997	SP	17	LKTR	lake trout	545	1450	F	5			21	972P-1				0.376
1997	TEHEK	45	LKTR	lake trout	523	1400	F	1			18	97T-4				0.218
1997	TEHEK	62	LKTR	lake trout	646	2650	F	5			35+	97T-3				0.523
1997	TP	73	LKTR	lake trout	715	3800	M	10			38 ?	973PN-7				0.538
1997	TP	53	LKTR	lake trout	544	1700	F	5			18	973PN-6				0.209
1997	TP	83	LKTR	lake trout	493	1275	F	1			16	973PS-8				0.095
1997	TP	64	LKTR	lake trout	560	1900	F	5			22	973PN-7				0.211
1997	SP	91	LKTR	lake trout	585	2225	M	6			21	972P-4				0.37
1997	SP	95	LKTR	lake trout	545	1800	M	6			16	972P-4				0.4
1997	SP	73	LKTR	lake trout	822	6300	F	5				972P-3				1.17
1997	TP	49	LKTR	lake trout	612	2625	F	3				973PN-6				0.601
1997	SP	39	LKTR	lake trout	513	1550	F	3			26	972P-2				0.71
1997	TP	42	LKTR	lake trout	572	2150	F	2			18	973PN-5				0.093
1997	TEHEK	63	LKTR	lake trout	590	2575	M	8			20	97T-3				0.2
1997	SP	57	LKTR	lake trout	463	1325	F	2			19	972P-4				0.269
1997	TP	61	LKTR	lake trout	563	2425	F	3			23	973PN-6				0.307

Notes
Otolith age data from fish collected in 2018 were archived when the 2019 Mercury Monitoring Program Report was prepared.