Appendix 26

Meadowbank and Whale Tail 2023 CREMP Report

2023 Core Receiving Environment Monitoring Program

Meadowbank Complex

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EXECUTIVE SUMMARY

This report presents findings from the 2023 Core Receiving Environment Monitoring Program (CREMP). The purpose of the CREMP is to determine if activities at Meadowbank, Whale Tail, and Baker Lake are causing changes in water quality, sediment chemistry, phytoplankton, and benthic invertebrates. Changes within the study area lakes are identified using early warning triggers and statistical analyses. The assessment includes the use of early warning *triggers* and action *thresholds* to support management decisions within the Aquatic Effects Management Program (AEMP). The AEMP is the overarching 'umbrella' program that integrates results of individual, but related, monitoring programs for the purpose of implementing management actions before unacceptable adverse impacts occur to aquatic life.

Meadowbank

Results for the Meadowbank study area lakes are presented below and summarized in **Table ES-1**.

Water Quality (Limnology & Water Chemistry)

Water quality monitoring for limnology and chemistry was completed in March, July, August, and September 2023 according to the CREMP study design. The May sampling event was cancelled due to unsafe ice conditions. Limnology profiles were taken at the Near-Field (NF) areas—Third Portage Lake (TPN, TPE), Second Portage Lake (SP), and Wally Lake (WAL)—in the winter months when ice conditions were safe (January, February, April, November, and December).

The NF areas close to the mine have higher concentrations of dissolved solids and constituent major ions such as calcium and magnesium compared to baseline/reference conditions. This observation is consistent with previous findings. 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 2023 for any water quality parameters with CCME water quality guidelines (WQG), including metals. In the context of the 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 2023 was considered *low* (i.e., less than the CCME WQGs) and consistent with the original predictions. **Routine water quality monitoring is recommended for 2024.**

Phytoplankton Community

Water samples for phytoplankton taxonomy were collected during each sampling event. From the 2023 BACI analysis, the phytoplankton community showed significant reductions relative to baseline for

richness at TPE, however this reduction was less than the 20% trigger. Phytoplankton biomass increased above the 20% trigger at TPN and WAL, though this was not significant in the BACI analysis. The observed fluctuations in phytoplankton richness and biomass fall within the range of historical baseline/reference conditions and are likely due to natural variability. Ultimately, the long-term phytoplankton monitoring data demonstrates that mining operations have not contributed to pervasive changes in primary productivity among the NF areas. **The trends in phytoplankton biomass and richness will be reviewed again in 2024.**

Sediment Chemistry

The 2023 sediment program focused on NF and reference areas only and consisted of the routine grab sampling (particle size, total organic carbon [TOC], and organics analysis on the top 3–5 cm of sediment) and a sediment coring program (metals analysis on the top 1.5 cm of sediment).

Sediment core metals for which the 2023 mean exceeded the trigger value at the NF areas were formally assessed in the statistical BA model to assess whether concentrations are increasing over time. In 2023, mean sediment concentrations exceeded the trigger for chromium at TPE. There have been temporal changes in sediment chromium concentrations at TPE which were attributable to activities at the mine, but levels appear to have peaked in 2017 and have since declined. Current conditions do not pose risks to the benthos at TPE.

Sediment grab sampling was conducted at the NF and reference areas to support the benthic invertebrate community monitoring component of the CREMP. Sediment was analyzed for grain size and total organic carbon. **The next sediment coring program will be conducted in August 2026 to review trends in chemistry. In 2024, grab samples will be collected to support the benthic invertebrate community sampling program.**

Benthos Community

There were no statistically significant changes to the benthic invertebrate community at Meadowbank relative to baseline/reference conditions identified by the 2023 BACI assessment, except for an increase in richness at SP during the 2020-2023 time period. Richness at SP was within the range of reference area INUG in 2023. **The trends in benthos abundance and richness will be reviewed again in 2024.**

Whale Tail

The 2023 CREMP results for the Whale Tail study area are presented below and summarized in **Table ES-2**.

Overview of the Whale Tail CREMP

Data analysis for Whale Tail study areas follows the same methods and framework as Meadowbank. 2023 was the fifth full year where most Whale Tail study area lakes were classified as *impact*. Whale Tail South (WTS) and Kangislulik Lake[1] (KAN/MAM) switched from *control* to *impact* in 2018 coinciding with construction of the Whale Tail Dike. The status of Lake A20, Lake A76, and Lake DS1 switched to *impact* in January 2019. Nemo Lake (NEM) transitioned to *impact* after July 2019.

Water Quality (Limnology & Water Chemistry)

Surface water monitoring for limnology and water chemistry were completed in March, July, August, and September according to the CREMP study design for the Whale Tail study area. Sampling planned for May was cancelled due to unsafe ice conditions so an abbreviated sampling event took place at WTS and KAN/MAM in November [2]. Supplemental limnology profiles were taken at Whale Tail South (WTS), Kangislulik Lake (KAN/MAM), Nemo Lake (NEM), and Lake A20 in select winter months to verify that water quality is broadly within the range of expected values, particularly for conductivity and dissolved oxygen.

Changes in water quality in lakes downstream from the mine were predicted to occur during construction and operations. Water quality within the Whale Tail study area lakes exhibited fairly stable conditions during the baseline period. Consequently, when interpreting time series plots to examine spatial-temporal trends in water quality, the *signal* of development-related inputs was expected to be easily observed relative to the low *noise* levels of the baseline period. The following parameters have increased relative to baseline/reference conditions:

- *Ionic Compounds* – total dissolved solids and constituent ions such as calcium, magnesium, potassium, and sodium were elevated in the NF lakes and downstream of KAN/MAM to Lake A76.
- *Nutrients* – total Kjeldahl nitrogen, total phosphorus, total organic carbon, and dissolved organic carbon were elevated at NF area WTS and at MF area A20. These same parameters were elevated at KAN/MAM, though mean annual total phosphorus level declined in 2023 and did not exceed the trigger value. The elevated parameters are likely the result of inputs from flooded terrestrial habitats following impoundment, dewatering inputs from WTN, and the joining of WTS to A20.

[1] Previously referred to as Mammoth Lake (MAM).

[2] Sampling only occurred at WTS and KAN/MAM, therefore the November water chemistry was screened against FEIS predictions but not included in the formal BACI analysis.

- *Metals/metalloids* – total and dissolved lithium was elevated at WTS and KAN/MAM and dissolved silicon was elevated at DS1. These parameters do not have an effects-based guideline for protection of freshwater aquatic life.

Of the parameters with trigger exceedances, FEIS predictions were exceeded for total phosphorus at WTS and total alkalinity, TDS, total lithium, and several ionic compounds at WTS and KAN/MAM in one or more sampling events. Importantly, the absolute concentrations of these parameters remain *low*. Total phosphorus and arsenic at WTS and KAN/MAM are within the normal operating ranges and Level 0 water management strategy is in effect in 2024 as per the *Adaptive Management Plan*. **Routine water quality monitoring will continue in 2024 to track emerging spatial and temporal trends.**

Phytoplankton Community

Phytoplankton community sampling was completed at the same time as the water chemistry sampling program in 2023. Phytoplankton communities vary naturally throughout the year in total biomass (and density) and community composition (taxa richness). The primary stressors for the phytoplankton community include nutrients and metals in surface contact water discharged to KAN/MAM and WTS. Nutrient loading can manifest as an increase in total biomass or a change in community structure, while increasing metals concentrations would be expected to cause lower biomass and taxa diversity.

Increased total biomass was reported at WTS (102%), KAN/MAM (17%), A20 (243%), and NEM (19%) relative to control/baseline conditions with statistically significant ($p < 0.1$) results at WTS and A20. Phytoplankton biomass has increased above the 20% effect size at WTS since 2022 (not significant) and at A20 (significant in 2021) since 2021. These increases have corresponded to nutrient increases (total phosphorus trigger exceedances at both WTS and A20 since 2021), suggesting that phytoplankton enrichment at WTS and A20 is occurring. Despite this, the BACI results have not consistently demonstrated significant results in previous years. Furthermore, phytoplankton communities respond to a host of natural seasonal factors such as sunlight, and water temperature. According to the FEIS, phosphorus and nitrate levels are predicted to increase at both WTS and KAN/MAM until 2026, after which concentrations are predicted to decline. With these predicted increases in nutrients, phytoplankton biomass is expected to increase over the next three years of CREMP sampling. Phytoplankton productivity, biomass and richness, as well as associated patterns in key nutrients will continue to be tracked in 2024. **Phytoplankton community monitoring is scheduled for 2024 according to the CREMP Plan.**

Sediment Chemistry

Sediment chemistry in the Whale Tail study area is naturally elevated in several metals. Concentrations of these metals can be highly variable as the sediment chemistry of the lakes is spatially heterogenous. In 2023, mean sediment core concentrations of arsenic and chromium exceeded triggers and were

significantly higher than the baseline period at WTS, KAN/MAM, and A20 when compared using the BA statistical model. Though mean arsenic concentrations exceeded triggers, concentrations generally remain within baseline ranges at all of the study lakes. Potential increasing trends were noted for chromium at WTS and KAN/MAM. Despite this, trigger exceedances for chromium were marginal at KAN/MAM and concentrations at WTS ranged well above the trigger value during baseline sampling. Mean copper concentrations exceeded the trigger at A20, however, this is likely attributed to spatial heterogeneity rather than mining activities. These potential changes in arsenic, chromium, and copper will be monitored in 2024.

TOC proportions, while naturally differing across the study lakes, have remained stable within each lake. These findings show that mining activity has not caused an increase in TOC. **The next sediment coring program will be conducted in August 2026 to review trends in chemistry. In 2024, grab samples will be collected for chemistry and to support the benthic invertebrate community sampling program.**

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). Significant increases in abundance occurred at KAN/MAM and NEM across all time periods, as well as WTS in 2022-23. Significant increases in richness were also found at A20 in 2022-23, 2021-23, and 2020-23 as well as DS1 in 2022-23. These increases may be occurring due to an enrichment effect; however, there are a number of factors not related to mining activities (e.g., water temperature) that could have an important influence on the Whale Tail benthos community. Further, the densities observed in 2021, under a similar nutrient and primary production regime, were among the lowest observed across the Whale Tail impact lakes since 2015. Additional monitoring data should help understand the cause of the increased densities observed in 2023. **Benthos community monitoring will be conducted in 2024 according to the CREMP Plan.**

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. Water quality sampling was conducted at two NF areas (BBD, BPJ) and one reference area (BAP) in Baker Lake in July, August, and September 2023. As 2023 was a sediment coring year, sediment and benthos sampling occurred at the NF (BBD, BPJ) and reference area (BAP) mentioned above, and at an additional reference area (Baker Lake East Shore [BES]) to better characterize sediment and benthos conditions.

The number of barge shipments in 2023 were down from 2021 and 2022 which reported the highest shipments since monitoring began in 2008. On June 3rd 2023, a turbid water runoff release to Baker Lake was identified. Efforts were made to divert the runoff and remedial steps were taken including installing

silt fences, wood-chip booms, and maritime curtains to contain the TSS plume in the receiving environment. There were no elevated TSS concentrations observed in the Baker Lake sampling areas in subsequent sampling events.

Water Quality

The mean concentrations for dissolved organic carbon (DOC) exceeded their respective triggers in 2023 at all three areas (BBD, BPJ, and BAP). Additionally, for the first time since monitoring began, pH (field measured) dropped below the lower trigger threshold at reference location BAP. The BACI showed no statistically significant increase above baseline/reference for BBD or BPJ. There was no evidence of any barge-related impacts to water quality at *impact* areas in Baker Lake. **Monitoring in 2024 will follow the scope and schedule of the CREMP Plan.**

Phytoplankton Community

There was an apparent increase in total biomass at NF areas BPJ and BBD along with richness at BBD, however this may be attributed to the decrease observed at reference area BAP. Overall, the phytoplankton community in Baker Lake was similar to previous years and has not exhibited any changes attributable to Agnico Eagle's activities in Baker Lake. **Monitoring in 2024 will follow the scope and schedule of the CREMP Plan.**

Sediment Chemistry

The mean sediment core concentration of arsenic exceeded the trigger at BPJ in 2023, however this exceedance was not found to be statistically significant when compared to baseline conditions using the BA statistical model. No evidence was found to suggest that Agnico Eagle's activities are influencing sediment quality at Baker Lake. **The next sediment coring program will be conducted in August 2026 to review trends in chemistry.**

Benthic Community

There was an apparent increase in both abundance and richness at BBD and BPJ across all years since 2020. However, none of these results were found to be significant in the BACI analysis except for richness at BBD in 2023 and 2021-23 time periods. There has been a general decline in both abundance and richness at BAP and BES since 2020. The apparent increases at BBD and BPJ may reflect the declines occurring at the reference locations. There is no indication that Agnico Eagle's activities are influencing the benthic community at Baker Lake. **The next benthic sampling program will be conducted in August 2026.**

Table ES-1. Summary of key findings from the 2023 Meadowbank CREMP.

Notes:
1. Temporal and spatial trends are outlined for monitoring components and variables that exceeded trigger or effects-based thresholds (i.e., apparent change from baseline).
2. Spatial scale ratings are: localized = small area within the lake/area; widespread = 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, 3]	**Annual CREMP Results Compared to FEIS Predictions** (Cumberland, 2005)
Limnology Section 4.2	Temperature and Dissolved Oxygen	The limnology profiles collected in 2023 indicated dissolved oxygen and readings were consistent with range of conditions typical of previous monitoring cycles. Temperature readings in lakes with larger basins were at the upper end of typical range, however, maximum temperatures at SP in 2023 exceeded the historical maximum by around 3°C.	There is no evidence to suggest seasonal fluctuation in dissolved oxygen and temperature among the NF study area lakes is attributed to mining or 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 spatial and temporal trends appear to be consistent with previous years.	No predictions in the FEIS.
Water Chemistry Section 4.3	Conventional Parameters and Major Ions	Conductivity, hardness, TDS, alkalinity, and major cations exceeded their trigger values at one or more NF areas in 2023. These results are consistent with recent years. The trigger value for these parameters is set at the 95th percentile of concentrations measured during the baseline period. There are no effects-based thresholds for most of 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 2023 are similar to 2022, 2021, 2020, etc.) **Causality – high**; the spatial pattern and temporal trend of increasing concentrations in the *after* period is plausibly attributed to activities at the mine, though concentrations are consistently below effects-based thresholds for the few parameters with thresholds (**Figure 4-7**, **Figure 4-8**).	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	Minor trigger exceedance of TKN at TPE and reactive silica at WAL, concentrations of nutrients are similar to baseline.	**Spatial scale – localized**; TKN and reactive silica are only elevated at TPE and WAL. **Temporal trend – none**. **Causality – low**; no evidence of mine-related source.	*Low* (i.e., < CCME water quality guidelines).
	Metals	The yearly mean for total and dissolved silicon exceeded the trigger value at SP, similar to 2022 and 2021 as well as a marginal trigger exceedance for total silicon at WAL. There are no *before* data to use in the BACI statistical analysis of changes over time for silicon, but concentrations appear stable throughout the monitoring period. All other metals concentrations (total and dissolved) were consistently low or below their respective MDLs at the NF, MF, and FF locations in 2023.	**Spatial scale – localized, silicon (Si)**; Si is elevated at WAL only. **Temporal trend – stable (Si)**; 2023 Si concentrations appear to be unchanged over all sample years in WAL. **Causality – low (Si)**; the long-term stability and the monthly stability in 2023 of Si concentrations in WAL suggest conditions are not mine related.	Recent temporal water quality analysis for areas 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 show 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. For reference area PDL and NF areas, chlorophyll-a concentrations remained below 1 µg/L in 2023.	Concentrations in the reference area samples typically range between 0.2 and 0.9 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, 3]	**Annual CREMP Results Compared to FEIS Predictions** (Cumberland, 2005)
Phytoplankton (cont'd) Section 4.4	Total Biomass	Increases in phytoplankton biomass were detected at NF areas in 2023 relative to baseline/reference conditions but were not confirmed by the time-series plots. The magnitude of the BACI analysis increase ranged up to 54% at WAL, however no increases were significant (**Table 4-7**). Nutrient concentrations (i.e., nitrogen and total phosphorus) were similar to baseline (**Section 4.3**).	**Spatial scale – localized**; phytoplankton biomass increased in the BACI analysis at NF areas relative to baseline/reference conditions in 2023, though the increases were not significant. **Temporal trend – stable**; historical biomass and richness levels for the NF areas do not show obvious visual signs of temporal trends for individual NF study areas (**Figure 4-14**). **Causality – low**; SP was the only NF area that received effluent discharge in 2023. The magnitude of the change in biomass at the NF areas TPN, SP, and WAL suggests the observed pattern of increase/decrease in phytoplankton biomass/richness is likely annual variability in the community rather than mine-related.	The absolute biomass values at the NF are comparable to 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	Based on the BACI analysis, the estimated changes in NF areas relative to baseline/reference were small (< 20% effect size) and changes were statistically significant solely at TPE (**Table 4-7**).	**Spatial scale – localized**; slight reductions in taxa richness relative to reference/baseline conditions at TPN, TPE, SP, and WAL. **Temporal trend – stable**; richness has remained stable during the *after* period (**Figure 4-17**). **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	Core samples for sediment chemistry were collected at NF and reference areas in 2023 as part of the coring cycle (i.e., every 3 years with EEM). The results were compared to triggers/thresholds. Parameters with mean concentrations exceeding the trigger value were formally tested using a before-after (BA) statistical model to assess whether concentrations are increasing over time. The mean sediment concentrations exceeded the trigger for chromium at TPE. These increases were all statistically significant. Grab samples were collected alongside benthic invertebrate samples. Grab sample results were analyzed for grain size, moisture, and TOC. Grab sample results are used to support benthic invertebrate interpretation.	**Spatial scale – localized**; The only trigger exceedance was for chromium at TPE. **Temporal trend – stable;** Chromium concentrations at TPE consistently trended higher from 2009-2013 (i.e., onset of the mine development) (**Figure 4-23**). The pattern since 2013 has been variable, but appears to have been decreasing since 2017. **Causality – high (Cr)**; increasing concentrations of Cr 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.*
	Hydrocarbons	Sediment hydrocarbon concentrations in grab samples were below detection for all sampling areas in 2023.	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, 3]	**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 2023. Decreased abundance at TPE, TPN, and WAL relative to reference/baseline conditions in 2023. No statistically significant differences were reported in the BACI. Abundance at TPE and TPN showed reductions in annual comparisons back to 2020, however variability was consistent with baseline sampling results.	**Spatial scale – localized**; lower abundance (based on the BACI analysis) observed at TPE, TPN, and WAL. Changes exceed 20% effect size, but were not significant. **Temporal trend – stable**; abundance (absolute values) at TPE, TPN, and WAL was lower in 2023 compared to the last three years but was consistent with the range observed in baseline (**Figure 4-28**). **Causality – low**; the 'apparent' reduction in abundance in the BACI analysis was not significant.	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 in 2023, but the results were not significant in the BACI analysis (**Figure 4-28**).
	Total Richness	Apparent increases above the 20% effect size at SP in all time periods back to 2020 and at TPN for periods from 2022-23. The only change that was statistically significant was the 2020-23 time period at SP. Taxa richness in 2023 at the NF areas are still within the range of baseline.	Richness continues to track higher for most areas. The benthic communities are dominated by chironomids, and the relative proportion of major taxa remains stable at all areas.	No predictions in the FEIS.

Table ES-2. Summary of key findings from the 2023 Whale Tail CREMP.

Notes:
1. Temporal and spatial trends are outlined for monitoring components and variables that exceeded trigger or effects-based thresholds (i.e., apparent change from baseline).
2. Spatial scale ratings are: localized = small area within the lake/area; widespread = 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, 3]	**Monitoring Results Compared to FEIS Predictions (Golder, 2019) and AMP Thresholds**
Limnology Section 5.2	Temperature and Dissolved Oxygen	The limnology profiles collected in 2023 show dissolved oxygen readings are consistent with range of conditions observed in previous monitoring cycles (2015 –2022). The maximum reported temperatures in 2023 were elevated at all of the study lakes, including reference. The shallower headwater lakes surrounding Whale Tail (e.g., WTS and KAN/MAM) generally demonstrated the highest increases compared to previous year, while the larger, deeper reference lakes showed muted increases.	For dissolved oxygen, spatial and temporal trends were stable in 2023. In 2023, the maximum reported temperatures in 2023 were elevated at all of the study lakes, including reference.	No predictions in the FEIS.
	Field Measured Conductivity	WTS, KAN/MAM, A20, A76, and NEM all demonstrated conductivity profiles elevated above baseline conditions. The 2023 conductivity profiles for WTS were comparable to 2022 with highest conductivities during discharge periods (i.e., March and May). The conductivity in KAN/MAM indicated a spatial trend with higher conductivity readings in the east basin compared to the west basin. Conductivity readings in KAN/MAM increased from a range of 100-225 to 155-231 µS/cm in 2022 and 2023 respectively. Conductivity in the MF lakes and NEM were comparable to 2022.	**Spatial scale – localized**; Slight spatial trend observed within KAN/MAM (east basin elevated compared to west basin), which appeared to become more well mixed by July. The spatial trend extended to Lake A76, though not to further downstream area DS1. NEM is within a separate watershed and there is no spatial trend to review. **Temporal trend – increasing (WTS, KAN/MAM); stable (A20, A76, NEM, DS1);** similar to 2022, conductivity in WTS appeared to trend upwards during the ice-covered months and during discharge. Apparent increase in conductivity observed in KAN/MAM since late 2018 with conductivities increasing slightly in 2023. Conductivities at NEM, the MF lakes, and DS1 appear to be stable in 2023. **Causality – high (WTS, KAN/MAM);** Spatial and temporal trends at WTS and KAN/MAM suggest mine activities are influencing conductivity. While laboratory conductivity measurements at WTS and KAN/MAM exceeded the trigger in 2023, there is no effects-based threshold for this parameter (**Figure 5-9**).	No predictions in the FEIS.
Water Chemistry Section 5.3	Major Ions and Conventional Parameters	Statistically significant increases above trigger values were observed at all NF areas for TDS, the cations Ca, Mg, K, Na as well as the HCO_3 anion (alkalinity). The effects-based triggers for the remaining anions (Cl, SO_4) were not exceeded, though concentrations track with increases in the other major ions. Statistically significant increases extended to MF areas A20 and A76 for all these parameters.	**Spatial scale – widespread**; the 2023 results indicated changes to WTS and KAN/MAM and to a lesser extent A20 and A76 as well as NEM which is located in a separate watershed. **Temporal trend – increasing (WTS, KAN/MAM); stable (NEM, A20, A76, DS1)**; Conditions at WTS have been increasing most markedly, at KAN/MAM increases occurred but were mostly muted. Conditions at NEM have remained stable since 2019. Conditions at A20 and A76 have generally remained stable in 2023 compared to 2022. **Causality – high**; these parameters 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 2023 follows a similar trend and with more samples in the *after* period, it is easier to assign causality.	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. FEIS predictions are for Kangislulik Lake and Whale Tail South. Monthly mean concentrations for several parameters exceeded FEIS predictions but all conform with the *low* effect rating predicted in the FEIS.

Monitoring Component (and report Section)	**Variable**	**Summary**	**Temporal and Spatial Trend Assessment**[1, 2, 3]	**Monitoring Results Compared to FEIS Predictions (Golder, 2019) and AMP Thresholds**
Water Chemistry (cont'd) Section 5.3	Nutrients	Statistically significant increases above trigger values were observed at WTS, KAN/MAM, and A20 for TKN. Statistically significant increases of total phosphorus occurred at WTS and A20.	**Spatial scale – widespread**; the 2023 results indicated changes at NF and MF locations. **Temporal trend – variable**; Comparing 2022 to 2023, TKN and total phosphorus was increasing at WTS and stable at KAN/MAM and A20. **Causality – moderate**; the changes in TKN and total phosphorus concentrations were restricted to NF and MF areas of the Whale Tail study area lakes, which suggests the apparent changes may be due to mine activities in 2023.	The yearly mean for total phosphorus at WTS and KAN/MAM fell below the FEIS predictions. The AMP Level 0 is in effect for both WTS and KAN/MAM. The full suite of CREMP water sampling is scheduled for 2024.
	TOC and DOC	The yearly mean for TOC and DOC exceeded the trigger in WTS, KAN/MAM, A20, and DS1 in 2023. The BACI analysis indicated that the increases were significant at each of the lakes except for at DS1.	**Spatial scale – widespread**; TOC and DOC were over the trigger at NF (WTS and KAN/MAM), MF (A20), and FF (DS1) areas. **Temporal trend – increasing**; there were apparent increases in TOC and DOC at WTS, KAN/MAM, A20, and DS1 in 2023. **Causality – moderate**; while mining activity and flooded terrestrial areas may be responsible in part for changes in TOC and DOC at the NF and MF lakes, reference locations (INUG and PDL) also indicate an increasing trend in 2023. This trend is also visible in the Meadowbank and Baker Lake study areas. Natural regional factors may be at play in addition to the spatially isolated effects of mining at WTS, KAN/MAM, and A20.	No predictions in the FEIS. The observed trends may be in part due to natural variability. These parameters will be monitored in 2024.
	Metals	Statistically significant increases of total and dissolved lithium were observed at the NF areas WTS and KAN/MAM. These were the only metals where mean annual concentrations exceeded triggers with the exception of dissolved silicon at DS1. Arsenic has not exceeded its trigger value since sampling began, however it has trended upwards in recent years. This parameter is monitored in the receiving environment on a monthly basis under the AMP (**Section 5.3.4**) and also in effluent via the MDMER and Water Licence limits (**Section 5.1**).	**Spatial scale – localized**; mean lithium concentrations exceeded the trigger value at KAN/MAM and WTS, but elevated concentrations did not extend to Lakes A20 or A76. **Temporal trend – decreasing or stable**; lithium concentrations appear to be relatively stable in 2023 relative to 2022. **Causality (Figure 5-12):** **Lithium – high**; the exceedances of lithium have historically occurred at both NF locations (KAN/MAM and WTS). There is a marked increase in this parameter following the start of mining activity in 2018.	*Low* (i.e., < CCME water quality guidelines). For total arsenic, the AMP Level 0 is in effect for WTS and KAN/MAM.
Phytoplankton Section 5.4	Chlorophyll-a	There is no trigger for chlorophyll-a for the CREMP. Chlorophyll-a concentrations varied in 2023 with larger seasonal fluctuations at the NF and MF lakes. Mean annual concentrations at the NF and MF lakes were higher relative to reference.	**Spatial scale – localized**; chlorophyll-a appeared to have increased in WTS and A20 in 2023. There was no formal BACI analysis on this parameter. **Temporal trend – Increase (WTS, A20), variable (KAN/MAM, A76)**; The 2023 mean annual concentration of chlorophyll-a at WTS and A20 exceeded 1 µg/L which is considered characteristic of oligotrophic systems. **Causality – moderate (WTS, KAN/MAM, A20)**; A spatial trend did extend into MF lake A20. Correspondence exists between elevated nutrients and chlorophyll-a at the WTS and A20, though large seasonal fluctuations make interpreting temporal trends challenging.	No predictions in the FEIS. Chlorophyll-a appears to have increased at WTS and A20 in 2023. An increase in productivity is normally indicative of an increase in nutrient concentrations. Nutrients are discussed above with increases also influenced by natural variability in 2023. Nutrients and primary productivity in the water column will be monitored in 2024.

Monitoring Component (and report Section)	**Variable**	**Summary**	**Temporal and Spatial Trend Assessment**[1, 2, 3]	**Monitoring Results Compared to FEIS Predictions (Golder, 2019) and AMP Thresholds**
	Total Biomass	WTS, KAN/MAM, A20, and NEM results showed an increase in biomass compared to baseline conditions. The BACI analysis showed significant increases at WTS and A20 with effect sizes of 102% to 243% respectively.	**Spatial scale – localized**; an increase in phytoplankton biomass was observed at WTS, KAN/MAM, A20, and NEM. **Temporal trend – increase/variable**; statistical analysis indicated a significant increase in biomass at WTS and A20 over baseline/control with signs of increase since 2021. **Causality – moderate**; the increases in biomass were only observed at NF and MF area lakes where mining activities would likely be an influence. An increase in nutrients as shown by the water chemistry data may have influenced phytoplankton growth. The trends observed were similar in terms of seasonal variability but the magnitude of change appeared to be greater at the NF and MF area lakes compared to the reference areas PDL and INUG a further indication of mining influence.	No predictions in the FEIS. The increase in total biomass at NF and MF area lakes but not FF and corresponding increases in nutrient concentrations in water suggest the changes may be attributed to mining activities. Biomass and nutrient patterns will be re-examined in 2024.
	Taxa Richness	Slight decreases in taxa richness were observed at the study lakes, though the changes were not statistically significant (**Table 5-11**).	**Spatial scale – localized**; Though slight decreases were observed relative to baseline/reference, the changes were small and not statistically significant. **Temporal trend – variable**; richness has been variable during the *after* period (**Figure 5-18**). The apparent decreased in richness relative to baseline/reference conditions may be attributed to natural variability due to similar observed trends at reference areas INUG and PDL. **Causality – low**; the decrease in richness relative to baseline suggests there may be influences from mine activities. However, there is uncertainty due the lack of significance.	No predictions in the FEIS. Taxa richness for the phytoplankton communities has been variable throughout the *after* period, however it appears there may be a slight loss in community diversity compared to the baseline period.
Sediment Chemistry Section 5.5	Metals	Core samples for sediment chemistry were collected at WTS, KAN/MAM, NEM, A20, A76 and DS1 in 2023 as part of the coring cycle (i.e., every 3 years with EEM). The results were compared to triggers/thresholds. Parameters with mean concentrations exceeding the trigger value were formally tested using a before-after (BA) statistical model to assess whether concentrations are increasing over time. The mean sediment concentrations exceeded the trigger for arsenic and chromium at WTS, KAN/MAM, and A20, and for copper at A20. These increases were all statistically significant. Grab samples were collected alongside benthic invertebrate samples and analysed for grain size to support interpretation of benthos results.	**(1.) Spatial scale – localized, arsenic (As)**; As concentrations exceeded the trigger at WTS, KAN/MAM, and A20 in 2023. As appears to be higher than in 2020. **Temporal trend – increasing (As)**; Though results are highly variable within years due to spatial heterogeneity, As appears to be higher at WTS, KAN/MAM, and A20 in 2023 compared to 2020 (**Figure 5-22**). **Causality – moderate (As)**; Apparent increases in As in sediment at WTS, KAN/MAM, and A20 in 2023 may be attributed to mining activities. The elevated As concentrations were not seen at lakes further from the mining activities or at reference lakes. Note that arsenic is not demonstrating increasing trend in water chemistry at the Whale Tail lakes. **(2.) Spatial scale – localized, chromium (Cr)**; Cr is elevated at A20, A76 and DS1. **Temporal trend– increasing (Cr)**; mean Cr concentrations at WTS and KAN/MAM may be trending higher since baseline (**Figure 5-24**). At A20, the Cr concentrations were still within baseline. **Causality – moderate (Cr)**; apparent increases in Cr in sediment at WTS, KAN/MAM, and A20 in 2023 may be attributed to mining activities. The elevated Cr concentrations were not seen at lakes further from the mining activities or at reference lakes. **(3.) Spatial scale – localized, copper (Cu)**; Cu is elevated at A20. **Temporal trend – stable (Cu)**; there is an apparent slight increasing trend in Cu at A20. Concentrations in 2023 were within the range of baseline Cu concentrations (**Figure 5-25**).	No predictions in the FEIS for grab sample chemistry.

Monitoring Component (and report Section)	**Variable**	**Summary**	**Temporal and Spatial Trend Assessment**[1, 2, 3]	**Monitoring Results Compared to FEIS Predictions (Golder, 2019) and AMP Thresholds**
			Causality – low (Cu); it appears that the observed pattern of sediment Cu at A20 is due to natural spatial heterogeneity.	
	Hydrocarbons	Sediment hydrocarbon concentrations were below detection for all parameters except mineral oil and grease at A76. There are no ISQG or PEL screening values for this parameter.	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 for grab sample chemistry.
Benthos Section 5.6	Total Abundance	Benthic abundance was highly variable between replicates and was variable between areas. The BACI showed significant increases for KAN/MAM and NEM across all time periods and significant increases for WTS only in the 2022-23 time period.	**Spatial scale – localized**; in 2023 higher abundance observed at NF and MF locations. **Temporal trend – increasing**; abundance at the NF and MF lakes increased markedly in 2023, though this increase was only significant relative to baseline conditions at KAN/MAM and NEM (**Figure 5-29**). **Causality – moderate**; increases were observed across the NF and MF study lakes in 2023, however this does not necessarily indicate a response to mining. Increases in mine derived nutrients could have a cascading effect on phytoplankton and in turn benthic communities, however natural limnological factors or population cycles can also influence results. Abundance will be monitored in 2024 for sustained increases at the NF and MF lakes.	No predictions in the FEIS.
	Total Richness	The BACI analysis indicated a statistically significant increases at KAN/MAM and NEM in all time-periods. A20 significant in 2022-23, 2021-23 and 2020-23. DS1 significant in 2022-23 only.	**Spatial scale – localized**; significant increases in taxa richness only observed at KAN/MAM, NEM, and A20. **Temporal trend – variable;** taxa richness has been highly variable since the baseline period, though there appears to be an upward trend at KAN/MAM and NEM. **Causality – low;** the benthic communities are dominated by chironomids, and the relative proportion of major taxa remains stable at all areas. There is also little correspondence across the NF study lakes (no significant increasing trends at WTS).	No predictions in the FEIS.

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APPENDIX D PHYTOPLANKTON TAXONOMY DATA AND SUPPLEMENTAL PLOTS
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- Appendix D3 Phyto Data – Baker Lake

APPENDIX E BENTHOS TAXONOMY DATA AND SUPPLEMENTAL PLOTS
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- Appendix E2 Benthos Data – Whale Tail Study Area Lakes
- Appendix E3 Benthos Data – Baker Lake

APPENDIX F 2019 WATER QUALITY EFFECTS ASSESSMENT

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ACRONYMS

AEMP	Aquatic effects monitoring program
AMP	Adaptive management plan
AIC	Akaike information criterion
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
COPC	Contaminant of potential concern
CREMP	Core receiving environment monitoring program
CRM	Certified reference material
DFO	Fisheries and Oceans Canada
DI	Deionized blank
DOC	Dissolved organic carbon
DQO	Data quality objective
DW	Dry weight
EAS	Effects assessment strategy
EB	Equipment blank
EEM	Environmental effects monitoring
EIA	Environmental impact assessment
FEIS	Final environmental impact statement
FF	Far-field
FWAL	Freshwater aquatic life guidelines (e.g., CCME)
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
KAN	Kangislulik Lake ([KAN]; formerly Mammoth Lake [MAM]; referred to as KAN or MAM)
LCS	Laboratory control sample
LEPH	Light extractable petroleum hydrocarbons
MDL	Method detection limit
MDMER	Metal and Diamond Mining Effluent Regulations
MF	Mid-field area
NEM	Nemo Lake
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
SP	Second Portage Lake
SQG	Sediment quality guidelines
SSD	Species sensitive distribution
SSWQO	Site specific water quality objective
TDS	Total dissolved solids
TE, TEFF	Tehek Lake sampling areas
TIA	Tailings impoundment area
TKN	Total Kjeldahl nitrogen
TOC	Total organic carbon
TP	Total phosphorus
TPE, TPN, TPS	Third Portage Lake sampling areas
TSF	Tailings Storage Facility (North and South Cells)
TSS	Total suspended solids
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 2023 Core Receiving Environment Monitoring Program (CREMP) report is organized into a main document and six appendices (A through F). 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 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), 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 2024 CREMP for Meadowbank, Whale Tail, and Baker Lake study areas.

1 INTRODUCTION

This CREMP report documents the methods and results of aquatic receiving environment monitoring activities completed at Meadowbank, Whale Tail, and Baker Lake study areas in 2023. 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 (since 2006), Whale Tail (since 2018), or in Baker Lake (since 2008).

1.1 Development of the Aquatic Monitoring Program

Agnico Eagle Mines Ltd.'s (Agnico Eagle) Meadowbank Complex 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 Complex are described below:

AEMP

The AEMP acronym was first used in the 2005 report *(Aquatic Effects Management Program*[3]; 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[4].

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 Licence 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

[3] 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.

[4] 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.

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. The AEMP Plan was updated in 2022 (Version 5). The report was included in Agnico Eagle's Annual Report for review by the NWB.

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 reviewed and formalized in 2012 (*Core Receiving Environment Monitoring Program (CREMP): Design Document 2012*; Azimuth, 2012d), but has its origins in the AEMP (Azimuth, 2005a). 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.

The *CREMP Plan*, which is the "how-to" manual for conducting aquatic receiving environment monitoring at the Meadowbank Complex, is updated from time to time to adapt the program to reflect the state of development of the site. The 2022 update (*CREMP: 2022 Plan Update*; Azimuth, 2022b) involved integrating the 2015 version of the *CREMP Plan* (Azimuth, 2015b) with an addendum that focused on the Whale Tail Expansion Project. The only notable technical change in the 2022 version of the *CREMP Plan* is in the frequency of benthic invertebrate and sediment chemistry monitoring in Baker Lake, which moved to a three-year cycle rather than annually, coinciding with the sediment coring program starting in August 2023. This change is supported by the long-term data that clearly shows the benthic invertebrate communities are stable relative to baseline and reference conditions.

1.2 Environmental Setting

1.2.1 Meadowbank and Whale Tail Study Areas

The Meadowbank and Whale Tail mines (collectively termed the Meadowbank Complex) 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 mine (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 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 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 typically 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 area 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 fifth 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 except for 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 saltwater 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 postulated 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 Complex 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**.

1.3.1 Meadowbank

The construction phase of the Meadowbank mine officially started in June 2008, upon receipt of the NWB A Water Licence (2AM-MEA0815; renewed to 2AM-MEA1525 in 2015, amended to 2AM-MEA1526 in 2018 and to 2AM-MEA1530 in 2020) 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 of operations: North Portage, South Portage, Bay-Goose, Vault Phaser, and BB Phaser. Mining operation ceased in 2019 at Meadowbank Site but the mill is still in operation and processes the ore from Whale Tail mine. In addition to mill operations, key ongoing activities involve reclaim water use and tailings discharge, monitoring for seepage into Portage, as well as management of East Dike seepage.

1.3.2 Whale Tail

The Whale Tail mine is situated within the Amaruq property, a 408 km^2 exploration area on Inuit and federal crown land. The Whale Tail mine 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 Whale Tail mine is permitted under a separate NWB license, 2AM-WTP1830, with ore being trucked to Meadowbank to take advantage of the existing infrastructure (e.g., mill, tailings storage, air strip). The Whale Tail mine is made up of three locations of active ore extraction. These include the Whale Tail Pit,

IVR Pit, and the underground mine. Major in-water construction activities at Whale Tail from 2018 to 2023 included:

- Dike construction in Whale Tail Lake
- Mammoth Dike Construction
- Fishout of the isolated north basin of Whale Tail Lake
- Road construction around Kangislulik Lake (KAN/MAM)[5]
- Dewatering and surface water management at Whale Tail Lake (South Basin; WTS) and KAN
- Construction and completion of the diversion channel between WTS and KAN
- Dewatering and fishout of lakes in the footprint of the IVR Pit and IVR WRSF and the future attenuation pond
- Completion of the IVR diversion channel
- Construction of Whale Tail Dike Thermal Berm in 2023.

1.3.3 Baker Lake

The hamlet of Qamani'tuaq (aka Baker Lake) located on the northwest shore of Baker Lake is the 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 connects 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 an 80-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**.

1.4 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

[5] Kangislulik Lake (KAN) was previously referred to as Mammoth Lake (MAM).

may be associated with mine development activities. This is accomplished through the application of a temporal/spatial trend assessment that includes the 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 Plan* (Azimuth, 2015b) and *Whale Tail Pit Addendum* (Azimuth, 2018b), and the *CREMP Plan Update* (Azimuth, 2022b). 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 – 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; Azimuth, 2020a).

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 for 2023; in 2019 this study area transitioned from the baseline 'before' period to the 'after' period.

The 2012 AEMP (Azimuth, 2012c) with updates in 2022 (Azimuth, 2022b) 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 as 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 effects-based threshold) or statistical criteria (e.g., statistically significant trend that predicts exceedances of a threshold within 3 years).
- **Effects-based 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 effects-based thresholds (if available[6]). Details regarding the derivation of trigger and threshold values for the CREMP are presented in the *CREMP: Design Document 2012* (Azimuth, 2012d).

In addition to triggers and effects-based thresholds, the results are also compared to water quality predictions developed as part of the Federal Environmental Impact Statement (FEIS) process (see **Section 2.3.1** for more details). The FEIS predictions provide context for whether any observed changes in water quality are consistent with expectations for the approved projects at two levels:

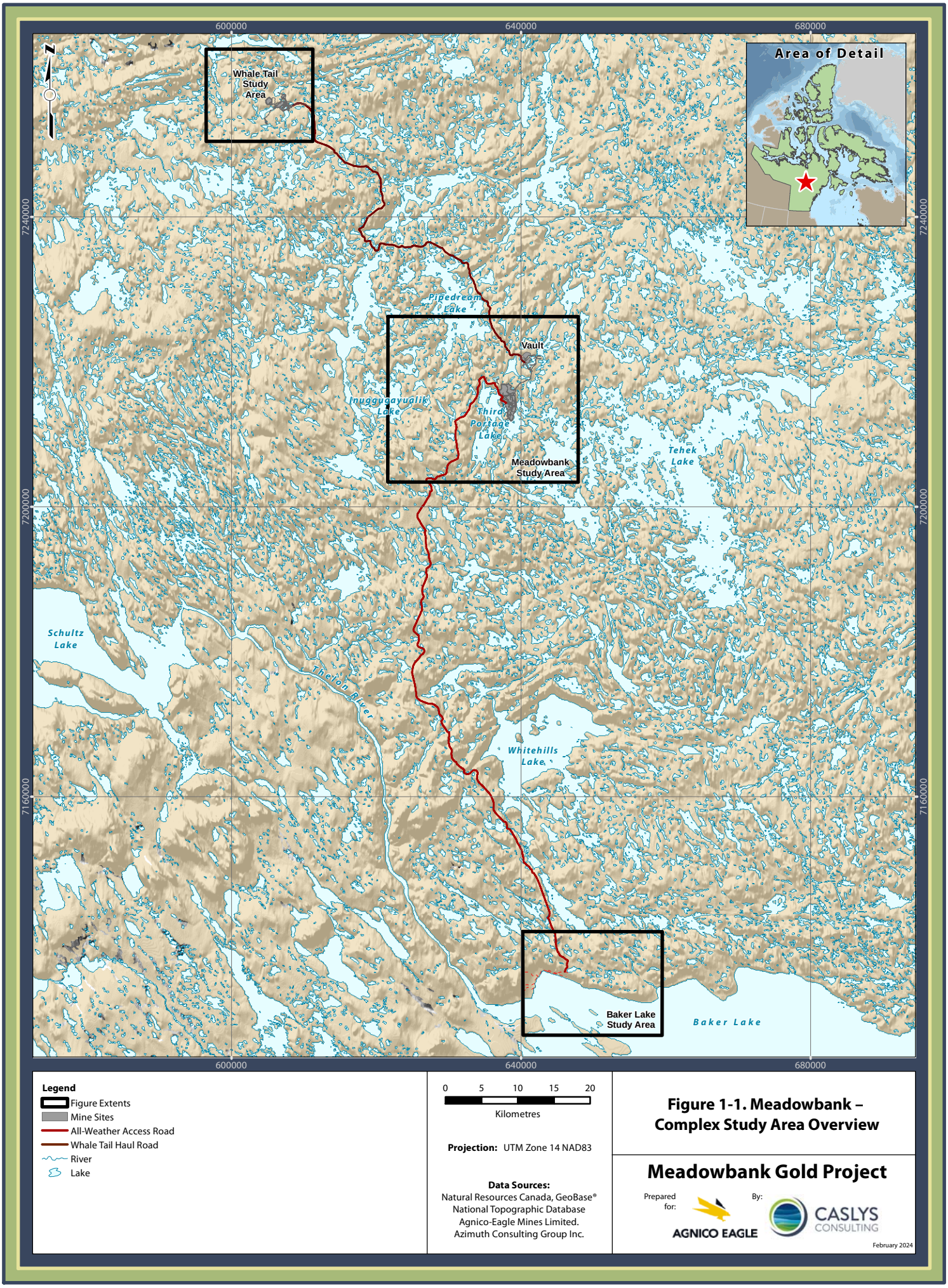
1. Numerical predictions – the actual concentrations predicted to occur for a suite of parameters. Given the uncertainties associated with water quality model development, these predictions are provided as a guide only.
2. Narrative predictions – these were categorical predictions used to classify the expected magnitude of change, typically relative to baseline conditions and water quality guidelines (see **Section 2.3.1**).

[6] For water and sediment quality, effects-based 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).

The application of trigger and effects-based 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) were examined to set expectations for a parameter (e.g., water or sediment metal concentration) in the absence of mining activity (see **Table 2-3**). 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?).
- **Provide Context for Magnitude of Change** – As discussed above, site-specific triggers and effects-based thresholds and FEIS predictions 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

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

0 5 10 15 20

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 – Complex Study Area Overview

Meadowbank Gold Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

February 2024

Table 1-1. Chronology of major mine development and operational activities, along with corresponding receiving environment findings since 2008.

Note: The summary provided here pertains to Meadowbank (since 2008) and Whale Tail (since 2018) study areas.

Year	Major Mine-Related Activities	Receiving Environment Overview
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 several 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 several water chemistry parameters at near-field areas: conductivity, sulphate and total dissolved solids. • Spill-related monitoring shows 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 several 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 Overview
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 7 to September 10. No TSS treatment needed. • East dike (North-South) discharge to SP all year except from June 16 to August 10. 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 26 to September 10 and September 15 to October 4. • Phaser Lake fishout from August 13 to 31 and September 10 to 25. • 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 12 to September 5. Discharge was also stopped from September 23 to October 29. 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 Overview
2018	*Meadowbank* • East dike (North-South) discharge to SP all year except from June 4 to August 21. 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. • No discharge to Wally in 2018.	• 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 2018. • Phytoplankton and benthic invertebrate community results for the impact areas were within the range of reference/baseline conditions. • Core chemistry was collected for TPE and WAL to follow-up on 2017 results. The 2018 results showed an overall improvement though concentrations for Chromium in TPE and Arsenic in WAL remain slightly above background concentrations.
	Whale Tail • 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 October 28. • Whale Tail North fishout August 13 - September 28. • Newterra Wastewater treatment system at AMQ operational in March. • Crusher activities started on the waste rock storage facility (WRSF) on October 21. • Quarry 2 overburden stripping. • Snow removal in preparation of dike construction near Kangislulike Lake (WRSF dike and Kangislulik Dike).	• 2018 was a transition year for the Whale Tail Mine study area. Only WTS was considered *impact* from August onwards and impacts to water quality, sediments, and biota were not found for 2018.
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, BB Phaser Pit, Vault (Q1), and 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 areas showed an increase in biomass and taxa richness in 2019 compared to 2018. • Benthic invertebrate community results for the impact areas 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.
	Whale Tail • Mining from the Whale Tail Pit (WTP) began in 2019. • Dewatering/Diversion pumping into Whale Tail Lake South Basin (WTS) started April 1 and is ongoing. • Dewatering of Whale Tail Lake North Basin (WTN) to WTS occurred from April 1 to April 9, May 3 to May 17 and again from May 24 to May 29. • Dewatering/Diversion pumping into Kangislulik Lake (KAN/MAM) 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 watershed June 21 to September 27. • Dewatering of WTN to KAN/MAM occurred from June 22 to June 30 and August 1 to October 26. • Water transfer from Quarry 1 pond to KAN/MAM 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 WTN to WTS through WTP November 7 is ongoing. • Whale Tail Dike Grouting project started on November 14 is ongoing. • Pumping from WTS to KAN/MAM occurred October 24 to December 9. • Lake A45 dewatering to the tundra near KAN/MAM shoreline occurred from November 25 to November 27. • Construction in the South Whale Tail Channel (SWTC) between A20 and KAN/MAM 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 WTS. • Phytoplankton community results for WTS and KAN/MAM showed an increase in biomass in 2019 compared to 2018. • Benthic invertebrate community results for the impact areas 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.

Year	Major Mine-Related Activities	Receiving Environment Overview
2020	*Meadowbank* • East Dike seepage discharge to SP was stopped on June 5 and restarted on October 23. • No seepage water from Portage RSF to NP2; monitoring ongoing. • Tailings discharge to Goose Pit up to July 2020 and the in-pit deposition started at Pit E started in August. • Reclaim water set up in Pit A completed in October. • No discharge to Wally in 2020.	• Study focused on monitoring changes in the near field study areas in TPN, TPE, SP and WAL. • 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, TDS, and alkalinity. Other minor trends were identified for reactive silica, total & dissolved silicon, and dissolved zinc which were not mine-related. • Phytoplankton community results for the impact areas showed a slight decrease in biomass and an increase in taxa richness in 2020 compared to 2019. • The sediment coring program focused on NF and reference areas only. The mean sediment concentrations exceeded the trigger for arsenic at WAL, for chromium at TPE, and for zinc at SP and TPE. Concentrations were similar or less than those in 2019. • Benthic invertebrate community data for impact areas were within the range of reference/baseline conditions.
	Whale Tail • South Whale Tail Channel (SWTC) Construction between Lake A20 and Kangislulik Lake is completed. • Whale Tail Dike Remedial Grouting Project January 11 to March 25. • WRSF Dike Mitigation Work from April 8 to April 28. • NE Dike dismantling occurred in September. • IVR Diversion construction. • Temporary diffuser installation in WTS occurred in October. • Fishout occurred from August 1 to September 8. • Dewatering of fishout lakes and installation of dewatering line from July to September. • Construction of IVR Ring Road and IVR Waste Dump in September. • Mining from IVR Pit began September 20. • IVR Attenuation Pond jetty occurred in October. • Dewatering completed and WTN became attenuation pond on May 20. • Water transfer from WTN to WTS from January 1 to January 26, February 11 to February 23, February 29 to March 8, March 15 to March 22, March 30 to April 3, April 15 to April 20, April 25 to April 30, and May 7 to May 15. • Water transfer from Quarry 1 to KAN/MAM from April 13 to April 15 and April 25 to April 29. • Water transfer from attenuation pond to KAN/MAM from May 20 to May 28, June 14 to July 5, July 7 to July 22, July 25 to August 5, August 7 to September 20, September 15 to October 7. • Water transfer from attenuation pond to WTS from May 28 to June 16 and October 12 to November 1, November 6 to December 2, December 5 to December 14, December 27 to December 31.	• All Whale Tail study area lakes designated as *impact* in 2020. • Minor mine-related trends identified for about 18 water chemistry parameters at WTS and KAN/MAM, about 10 parameters at NEM, and 2-7 parameters at the MF/FF areas. • Phytoplankton community results for WTS and KAN/MAM showed a decrease in biomass and total species in 2020 compared to 2019. • Sediment chemistry results showed exceedances of As, Cr and Cu in 2020; however, it is uncertain whether these changes are related to mining activities. • Benthic invertebrate community results for the impact areas were within the range of baseline conditions.
2021	*Meadowbank* • East Dike seepage discharge to SPL (MMER-3) stopped on May 6 and restarted on December 9. • No seepage water from Portage RSF to NP2; monitoring ongoing. • Tailings discharge to Pit E all year long, with a hiatus in July and August when tailings were discharged in the North Cell. • Reclaim water from Pit A all year. • Reclaim water from Pit E ongoing November to December. • Aerial application of dust suppression on the Tailings Storage Facility in August. • No discharge to Wally Lake or Third Portage Lake in 2021.	• Overall, results from NF areas were consistent with the previous 5 years demonstrating stabilization since mine activities ceased. • Minor water chemistry trigger exceedances identified for physical/ionic parameters (conductivity, hardness, TDS, alkalinity Ca/Mg/K) at NF areas TPN, TPE, SP, and WAL. Minor trigger exceedances for Si and reactive silica at SP and WAL respectively. • Long-term trend analysis on physical/ionic parameters supported the hypothesis that concentrations had increased during mine activity (2009-2013) and have now stabilized since 2014. • Phytoplankton community results for the impact areas showed a slight increase in biomass and taxa richness in 2021 compared to 2020. • Only sediment grabs were collected in 2021. A laboratory error resulted in a subset of the grab samples that were collected in 2021 to be discarded prior to analysis. Sediment chemistry results for samples that were analyzed showed no mining related temporal and spatial patterns. Sediment concentrations for a few replicates at TPE and SP exceeded the trigger for Cr (TPE only) and Zn. Concentrations were similar to 2020. • Benthic invertebrate community data for impact areas were within the range of reference/baseline conditions.

Year	Major Mine-Related Activities	Receiving Environment Overview
2022	*Whale Tail* • First year of operation - IVR diversion ditch. • Construction of IVR Dike D1. • Commissioning of IVR attenuation pond. • Excavation IVR West Pit began October 22. • Start of IVR WRSF. • Discharge to WTS through MDMER-5 between March 1 and June 8. • Discharge to WTS through MDMER-11 between January 1 to February 13, June 6 to June 17 and October 2 to November 23. • Discharge to KAN/MAM through MDMER-7 between June 9 and September 28. • Discharge to KAN/MAM through MDMER-8 between June 18 and August 26.	• Greatest magnitude of exceedances at NF area KAN/MAM where physical/ionic parameters (conductivity, hardness, TDS, alkalinity Ca/Mg/K), anions/nutrients (TKN, reactive silica), metals (Li and Si), and TOC/DOC exceeded triggers. • Increasing mine influence on MF areas A76 (down gradient of KAN/MAM) and A20 (inundated in summer 2019 and now connected to NF area WTS) where physical/ionic and TOC/DOC trigger exceedances occur, in addition to a threshold exceedance for P. • Phytoplankton community results for KAN/MAM, A76, and A20 showed an increase in biomass in 2021 compared to 2020. Taxa richness was similar to 2020. • A laboratory oversight upon sample receipt resulted in a subset of the grab samples that were collected in 2021 to be discarded prior to analysis. Sediment chemistry results for samples that were analyzed showed trigger exceedances in individual replicates for As, Cr, Cu, and Zn in 2021. Formal statistical assessment is planned for the next coring event in 2023. • Benthic invertebrate community results for the impact areas were within the range of baseline conditions.
	Meadowbank • Construction of additional 3.3ML fuel tank, completed in January 2023. • All Weather Access Road bridge repair/ maintenance ongoing (at KM 62 and 69). • East Dike seepage discharge to SPL (MMER-3) from January 1 to January 25, from April 7 to April 30, and from November 20 until the end of the year. • Reclaim water from Pit A from January 1 to mid-April. • Reclaim water from Pit E from mid-April until the end of 2022. • Aerial application of dust suppression on the Tailings Storage Facility in August. • Tailings discharge to Pit E all year long. • No discharge to Wally or Third Portage Lake in 2022.	• Overall, results from NF areas were consistent with the previous six years demonstrating stabilization since mine activities ceased. • Minor water chemistry trigger exceedances were identified for physical/ionic parameters (conductivity, alkalinity, hardness, TDS, Ca/Mg/K) at one or more NF areas TPN, TPE, SP, and WAL. Minor trigger exceedances identified for reactive silica at WAL and total and dissolved silicon at SP. • Phytoplankton community results for the impact areas in 2022 showed that total biomass was higher than reference/baseline conditions, though results were not statistically significant. Only slight changes reported for taxa richness compared to baseline/reference. • Sediment grabs were collected in 2022 and analyzed for grain size, and TOC. Remaining sediment was archived for chemistry analysis. The next sediment coring program to review trends in chemistry is planned for August 2023. • Benthic invertebrate community data for impact areas were within the range of reference/baseline conditions except for taxa richness at SP in the 2019-2022 time period which showed an apparent increase relative to reference/baseline conditions.
	Whale Tail • Commercial production from the underground mine began in 2022. • Landfarm construction completed on September 30. • Discharge to WTS through MDMER-11: sporadic in January, February and April, from May 22 to June 16, and from October 3 to October 29. • Discharge to KAN/MAM through MDMER-8 between June 16 and September 20. • Construction of a thermal berm at the West abutment of Whale Tail Dike (upstream) from September 24 to September 30.	• Greatest magnitude of exceedances at MF area A20 where physical/ionic parameters (conductivity, hardness, TDS, alkalinity, Ca/Mg/K/Na), anions/nutrients (TKN, total phosphorus), and TOC/DOC exceeded triggers. Only metals that exceeded the trigger in 2022 were lithium at NF area KAN/MAM and titanium at WTS. Total phosphorus, a parameter with an effects-based threshold exceeded the trigger at WTS, KAN/MAM, and A20. • Increasing mine influence on MF areas A76 (downgradient of KAN/MAM) and A20 (inundated in summer 2019 and now connected to NF area WTS). • Phytoplankton community results for WTS, KAN/MAM, A20, and A76 showed an increase in biomass in 2022 compared to reference/baseline, but results were not significant. Taxa richness was similar to 2021. • Sediment chemistry results for samples that were analyzed showed trigger exceedances in individual replicates for As, Cu, Cd, and Zn in 2022. Formal statistical assessment is planned for the next coring event in 2023. • Benthic invertebrate abundance and taxa richness increased at KAN/MAM and NEM compared to baseline/reference. Taxa richness also increased compared to baseline/reference at A20, however only in some of the time periods assessed.
2023	*Meadowbank* • All Weather Access Road bridge repair from March 31 to April 11 at KM 8 and bridge repair at KM 69 ongoing. • Tailings discharge to Pit E all year except in August and September when it was discharged to South Cell. • Pit A discharge to Goose Pit from September 22 to October 6 and from October 15 to November 7. • East Dike seepage discharge to SPL (MMER-3) from January 1 to April 29. • Reclaim water from Pit E from January to mid-June and from mid-September to December. • Reclaim water from Pit A from mid-June to mid-September. • Resurfacing Airstrip from July 7 to 14.	• Overall, results from NF areas were consistent with the previous seven years demonstrating stabilization since mine activities ceased. • Minor water chemistry trigger exceedances were identified for physical/ionic parameters (conductivity, alkalinity, hardness, TDS, Ca/Mg) at one or more NF areas TPN, TPE, SP, and WAL. Minor trigger exceedance for TKN at TPE and for total and dissolved silicon at SP. Minor trigger exceedances identified for reactive silica and total silicon at WAL. • Phytoplankton community results for the impact areas showed that total biomass was higher than reference/baseline conditions, though results were not statistically significant. Only slight changes reported for

Year	Major Mine-Related Activities	Receiving Environment Overview
	• Resurfacing SD1/SD2, East Dike, and Goose Dike in 2023. • Ditch capping at RF1 and RF2. • No seepage water from Portage RSF to NP2; monitoring ongoing. • No discharge to Wally Lake in 2023.	taxa richness compared to baseline/reference. Small reduction at TPE was found to be statistically significant though taxa richness still within range of baseline/reference. • The sediment coring program focused on NF and reference areas only. The mean sediment concentrations exceeded the trigger for chromium at TPE. Concentrations were less than those in 2020. • Benthic invertebrate community data for impact areas were within the range of reference/baseline conditions except for taxa richness at SP in the 2020-2023 time period which showed an apparent increase relative to reference/baseline conditions.
	Whale Tail • Effluent water sent to IVR-1 Pit from October to December. • Landfarm became operational in 2023. • Discharge to WTS through MDMER-11: sporadic from January 8 to 15, February 20 to 27, March 19 to 24, April 10 to 15, April 24, April 26 to 29, May 10 to 22, September 18 and19, and October 8 to 11. • Discharge to Kangislulik Lake MDMER-8 from June 4 to July 7, July 16 to 18, July 21 to 22, August 6 to 18 and September 3 to 14. • Discharge to Kangislulik Lake MDMER-7 from June 11 to 28. • Whale Tail Dike Thermal Berm construction upstream from April 12 to 17.	• Greatest magnitude of exceedances at MF area A20 where physical/ionic parameters (conductivity, hardness, TDS, alkalinity, Ca/Mg/K/Na), anions/nutrients (TKN, total phosphorus), and TOC/DOC exceeded triggers. Only metals that exceeded the trigger in 2023 were lithium at NF areas KAN/MAM and WTS and dissolved silicon at FF area DS1. • Increasing mine influence on MF areas A76 (downgradient of KAN/MAM) and A20 (inundated in summer 2019 and now connected to NF area WTS). • Phytoplankton community results for WTS, KAN/MAM, A20, and NEM showed an increase in biomass in 2023 compared to reference/baseline with statistically significant results at WTS and A20. Taxa richness showed slight decreases at all areas in 2023. • Sediment chemistry results showed exceedances of As and Cr at WTS, KAN/MAM, and A20 in 2023. Copper exceeded the trigger slightly at A20 in 2023. • Benthic invertebrate abundance increased at KAN/MAM and NEM compared to baseline/reference in all time periods assessed. Benthos abundance increased at WTS in the 2022-2023 time period. Taxa richness also increased compared to baseline/reference at KAN/MAM, A20, and NEM in most time periods assessed. Taxa richness increased at DS1 compared to baseline/reference in the 2022-2023 time period.

2 CREMP STUDY DESIGN

2.1 Overview

To streamline the annual report and reduce redundancy, aspects of the CREMP study design presented in the *CREMP Plan* 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 (2022b). A summary of the CREMP study design is included to guide the reader.

Normally the CREMP includes five sampling events at Meadowbank and Whale Tail, however, the May sampling event in 2023 was canceled due to unsafe ice conditions on the lakes. An abbreviated sampling event took place in November at Whale Tail area lakes KAN/MAM and WTS. A full sampling event was not recommended because 1) preliminary results from the first four sampling events in 2023 suggested the water quality in the NF areas was within the range of previous months and 2) no discharge was planned after September and the water quality was therefore not expected to change significantly between September and December. The number of sampling events in 2023 were in accordance with the *CREMP Plan Update*, i.e., the Meadowbank and Whale Tail CREMP is conducted up to five times per year at reference and exposure areas (Azimuth, 2022b).

2.2 Routine CREMP Sampling

2.2.1 Sampling Areas

The CREMP is designed to detect spatial and temporal changes in water quality, sediment chemistry, or biological communities (phytoplankton and benthos) at the scale of the lake or basin, in the case of large lakes such as Third Portage Lake. A common element for the Meadowbank and Whale Tail 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. Brief descriptions of the Meadowbank, Whale Tail, and Baker Lake study areas are provided below.

Meadowbank

There are nine 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. Starting in 2023, MF areas Tehek Lake (TE), the South Basin of Third Portage Lake (TPS), and FF area Tehek Lake far-field (TEFF) are monitored only if *moderate changes*[7] are detected upstream at the NF locations consistent with the strategy outline in **Section 2.2.3** (Azimuth, 2022b). Two reference areas are shared for the Meadowbank and Whale Tail 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 its utility limited in the BACI statistical analyses, it provides insights into the strength of regional patterns (i.e., how well it matches INUG).

The 2023 sampling areas for the Meadowbank CREMP are shown in **Figure 4-1** (water and phytoplankton) and **Figure 4-2** (sediment and benthos).

Whale Tail

There are six lakes currently included in the Whale Tail CREMP study design. Whale Tail Lake South Basin (WTS) and Kangislulik Lake[8] (KAN/MAM) are NF areas designed to detect changes related to dike construction in Whale Tail Lake and Kangislulik Lake and 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 located downstream from KAN/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 2023 sampling areas for the Whale Tail CREMP are shown in **Figure 5-1** (water and phytoplankton) and **Figure 5-2** (sediment and benthos).

Baker Lake

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 Agnico's fuel storage facility (Baker Proposed Jetty[9] [BPJ]). The primary reference area for Baker Lake is located approximately 10 kilometers east of the hamlet along the north shore of the lake (Baker Akilahaarjuk Point [BAP]). A second reference area on the East Shore of Baker

[7] *Moderate changes* in water quality are defined as statistically significant increases exceeding the early warning trigger for parameters with effects-based thresholds (i.e., CCME FWAL).

[8] Kangislulik Lake (KAN) was previously referred to as Mammoth Lake (MAM).

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

Lake (BES) between BAP and BPJ was added in 2011 to provide additional context for interpreting sediment chemistry and benthic invertebrate data.

The 2023 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 2023 program. Sampling was undertaken according to SOPs provided in the *CREMP Plan* (Azimuth, 2022b). 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 study area lakes are smaller and more variable in depth compared to the Meadowbank project lakes. Fixed water quality monitoring locations are used for the Whale Tail study area lakes to avoid selecting locations in less than 5 m of water. Two fixed locations were randomly selected for water quality and phytoplankton community monitoring in each full event. Water sampling was completed in March, July, August, and September as per the study design[10]. A single limnology profile is taken at the NF areas during the remaining winter months, when travel on ice is safe, to verify water quality is within the range of expected conditions. In 2023, limnology only monitoring occurred in January, February, April, November, and December[11].

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.

Table 2-1 lists the monitoring components sampled at the various study areas in 2023. Global Positioning System (GPS) Universal Transverse Mercator (UTM) coordinates (in NAD 83) are shown in **Table 2-2** for all CREMP study areas.

Samples from the 2023 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)

2.2.3 Sampling Effort

A results-driven sampling strategy for the Meadowbank study lakes was developed as part of the *CREMP Plan* (Azimuth, 2015b) which was then updated in 2022 (Azimuth, 2022b). Minor revisions were made to

[10] The May sampling event was cancelled due to unsafe ice conditions. After reviewing the results of the first four sampling events, an abbreviated event took place in November at WTS and KAN.

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

the *CREMP Plan* in 2023 (Azimuth, 2022b). The strategy was developed to increase the efficiency of the CREMP by focusing resources on monitoring in the areas most likely to be affected by mining-related activities. The decision framework outlines when the frequency of monitoring at MF and FF areas can safely be reduced. The annual decision framework presented in the *CREMP Plan Update* applies to MF and FF areas at Meadowbank (Azimuth, 2022b; **Figure 2-1** [below]). More specifically, the framework applies to 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 (which is 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., five water chemistry/phytoplankton planned sampling events).

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, 2022b for more details):

- 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). No further sampling required at MF and FF areas unless moderate changes (see below) are identified in NF 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 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 2022 CREMP (Azimuth, 2023a). Following the strategy outlined above, these results meant there was no sampling required at MF (TPS and TE) and FF (TEFF) areas in 2023.

Table 2-1. CREMP sampling summary, 2023.

Sampling Month	Sampling Crew	Conditions	Components[2]	Meadowbank Areas									Baker Lake Areas				Whale Tail Areas					
				INUG	PDL	TPN	SP	TPE	WAL	TPS	TE	TEFF	BAP	BES	BBD	BPJ	WTS	KAN/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 [1]	Agnico	Ice	L,W,P	***Ice not safe***																		
June	***Ice not safe***																					
July	Agnico	Open-water	L,W,P	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓	✓	✓	✓	✓
August	Azimuth	Open-water	L,W,P	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓	✓	✓	✓	✓
			B,S	✓	✓	✓	✓	✓	✓								✓	✓	✓	✓	✓	✓
September	Agnico	Open-water	L,W,P	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓	✓	✓	✓	✓
October	***Ice not safe***																					
November [1]	Agnico	Ice	L, W			✓	✓	✓	✓								✓	✓	✓	✓		
December	Agnico	Ice	L			✓	✓	✓	✓								✓	✓	✓	✓		

Notes:
Components: L=Limnology; W=Water chemistry; P=Phytoplankton; B=Benthic invertebrates; S=Sediment grab 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 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 areas: WTS = Whale Tail Lake South Basin; KAN/MAM = Kangislulik Lake; NEM = Nemo Lake; A20 = Lake A20; A76 = Lake A76; DS1 = Lake DS1.
[1] Monitoring in May was cancelled due to unsafe ice conditions. Abbreviated sampling event took place in November at WTS and KAN/MAM.
2 Phytoplankton samples collected at Meadowbank lakes in winter months (March and May) are archived as per the *CREMP Plan Update*.

Table 2-2. CREMP sampling coordinates for Meadowbank, Whale Tail, and Baker Lake study areas, 2023.

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)	Zone	Easting	Northing
Meadowbank													
TPE	NF	TPE-limno	January	9.7	14W	638115	7211665	TPE-1	B & C	7.5	14W	639058	7211518
		TPE-limno	February	11.9	14W	639286	7211733	TPE-2	B & C	8.2	14W	639089	7211537
		TPE-limno	April	5.4	14W	638488	7211649	TPE-3	B & C	7.6	14W	639114	7211558
		TPE-limno	November	17.7	14W	638005	7214099	TPE-4	B & C	6.5	14W	639113	7211743
		TPE-limno	December	>20	14W	639100	7212159	TPE-5	B & C	6.6	14W	639144	7211710
		TPE-160	March	15.4	14W	638729	7210194	TPE-COMP	C	-	-	-	-
		TPE-161	March	16.8	14W	637811	7211609	TPE-SC-1	C	9.2	14W	639066	7211492
		TPE-162	July	6.2	14W	639689	7211639	TPE-SC-2	C	8.2	14W	639059	7211500
		TPE-163	July	7.5	14W	637558	7210921	TPE-SC-3	C	8.3	14W	639091	7211534
		TPE-164	August	14.0	14W	639140	7211825	TPE-SC-4	C	8.2	14W	639091	7211537
		TPE-165	August	6.9	14W	638987	7210897	TPE-SC-5	C	7.9	14W	639107	7211551
		TPE-166	September	18.0	14W	639180	7211607	TPE-SC-6	C	7.8	14W	639114	7211560
		TPE-167	September	10.8	14W	639912	7211662	TPE-SC-7	C	7.4	14W	639138	7211735
								TPE-SC-8	C	7.3	14W	639138	7211743
								TPE-SC-9	C	7.3	14W	639148	7211632
								TPE-SC-10	C	6.8	14W	639148	7211630
TPN	NF	TPN-limno	January	9.8	14W	636234	7213420	TPN-1	B & C	9.5	14W	636347	7215513
		TPN-limno	February	>20	14W	636458	7213307	TPN-2	B & C	8.6	14W	636350	7215527
		TPN-limno	April	14.9	14W	636560	7213687	TPN-3	B & C	7.5	14W	636407	7215535
		TPN-limno	November	18.9	14W	636941	7213414	TPN-4	B & C	7.7	14W	636422	7215519
		TPN-limno	December	>20	14W	636750	7213160	TPN-5	B & C	9.1	14W	636372	7215531
		TPN-160	March	6.5	14W	635857	7215527	TPN-COMP	C	-	-	-	-
		TPN-161	March	18.4	14W	636540	7214965	TPN-SC-1	C	9.5	14W	636343	7215516
		TPN-162	July	11.7	14W	636060	7213547	TPN-SC-2	C	9.5	14W	636349	7215516
		TPN-163	July	21.3	14W	636485	7214251	TPN-SC-3	C	8.5	14W	636348	7215526
		TPN-164	August	8.8	14W	634783	7214815	TPN-SC-4	C	8.6	14W	636344	7215528

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)	Zone	Easting	Northing
TPN	NF	TPN-165	August	21.5	14W	635899	7215417	TPN-SC-5	C	7	14W	636406	7215540
		TPN-166	September	10.5	14W	635320	7213182	TPN-SC-6	C	7.3	14W	636404	7215537
		TPN-167	September	5.6	14W	636487	7213921	TPN-SC-7	C	8	14W	636424	7215518
								TPN-SC-8	C	7.7	14W	636426	7215517
								TPN-SC-9	C	9.3	14W	636377	7215533
								TPN-SC-10	C	9.1	14W	636377	7215536
SP	NF	SP-limno	January	12.4	14W	639711	7214076	SP-1	B & C	9.3	14W	640014	7214087
		SP-limno	February	9.2	14W	639530	7213685	SP-2	B & C	8.3	14W	640042	7214115
		SP-limno	April	11.5	14W	640075	7213701	SP-3	B & C	7	14W	640050	7214151
		SP-limno	November	7.5	14W	639728	7214072	SP-4	B & C	7.7	14W	640066	7214181
		SP-limno	December	13.1	14W	639720	7214015	SP-5	B & C	9.3	14W	640081	7214196
		SP-160	March	8.5	14W	639706	7214142	SP-COMP	C	-	-	-	-
		SP-161	March	9.2	14W	640412	7213511	SP-SC-1	C	8.6	14W	640012	7214090
		SP-162	July	10.0	14W	640096	7214009	SP-SC-2	C	8.7	14W	640002	7214088
		SP-163	July	10.9	14W	640766	7213386	SP-SC-3	C	7.1	14W	640032	7214126
		SP-164	August	7.1	14W	640699	7213143	SP-SC-4	C	7.6	14W	640034	7214117
		SP-165	August	7.3	14W	639964	7212945	SP-SC-5	C	8.5	14W	640066	7214155
		SP-166	September	7.5	14W	640286	7212785	SP-SC-6	C	7.6	14W	640057	7214151
		SP-167	September	9.6	14W	640144	7214297	SP-SC-7	C	7.5	14W	640071	7214181
								SP-SC-8	C	7.4	14W	640067	7214184
								SP-SC-9	C	8.9	14W	640079	7214202
								SP-SC-10	C	8.9	14W	640078	7214195
WAL	NF	WAL-limno	January	8.8	15W	360906	7220520	WAL-1	B & C	7.9	15W	360957	7220392
		WAL-limno	February	10.6	15W	360853	7220706	WAL-2	B & C	9.5	15W	360927	7220458
		WAL-limno	April	6.9	15W	361477	7222326	WAL-3	B & C	8.8	15W	360905	7220478
		WAL-limno	November	10.0	15W	360855	7220696	WAL-4	B & C	7.5	15W	360884	7220476
		WAL-limno	December	7.5	15W	360449	7221522	WAL-5	B & C	7.1	15W	360895	7220522
		WAL-129	March	7.2	15W	361739	7222782	WAL-COMP	C	-	-	-	-
		WAL-130	March	6.1	15W	360993	7221919	WAL-SC-1	C	7.6	15W	360953	7220383

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)	Zone	Easting	Northing
WAL	NF	WAL-131	July	5.5	15W	360980	7222482	WAL-SC-2	C	7.4	15W	360956	7220384
		WAL-132	July	11.5	15W	360862	7220723	WAL-SC-3	C	9.3	15W	360925	7220449
		WAL-133	August	5.0	15W	360859	7221790	WAL-SC-4	C	9.5	15W	360933	7220453
		WAL-134	August	6.0	15W	361775	7222872	WAL-SC-5	C	8.4	15W	360901	7220470
		WAL-135	September	5.2	14W	360585	7221358	WAL-SC-6	C	9.1	15W	360908	7220472
		WAL-136	September	5.5	14W	360747	7221223	WAL-SC-7	C	7.5	15W	360881	7220479
								WAL-SC-8	C	7.8	15W	360886	7220479
								WAL-SC-9	C	7	15W	360891	7220528
								WAL-SC-10	C	7.1	15W	360897	7220527
INUG	Ref	INUG-148	March	6.7	14W	622805	7216273	INUG-1	B & C	7.8	14W	622826	7216811
		INUG-149	March	14.9	14W	622199	7214963	INUG-2	B & C	8	14W	622780	7216793
		INUG-150	July	7.5	14W	622088	7215966	INUG-3	B & C	8	14W	622754	7216784
		INUG-151	July	5.6	14W	621873	7216651	INUG-4	B & C	8.4	14W	622710	7216793
		INUG-152	August	17.2	14W	622321	7215739	INUG-5	B & C	7.5	14W	622761	7216764
		INUG-153	August	11.2	14W	622635	7216219	INUG-COMP	C	-	-	-	-
		INUG-154	September	13.5	14W	622303	7215864	INUG-SC-1	C	9.1	14W	622833	7216788
		INUG-155	September	11.2	14W	622635	7214637	INUG-SC-2	C	8	14W	622828	7216788
								INUG-SC-3	C	8.2	14W	622792	7216779
								INUG-SC-4	C	7.6	14W	622776	7216800
								INUG-SC-5	C	8	14W	622757	7216794
								INUG-SC-6	C	8.1	14W	622747	7216793
								INUG-SC-7	C	8.5	14W	622718	7216797
								INUG-SC-8	C	8.4	14W	622702	7216797
								INUG-SC-9	C	8.5	14W	622778	7216756
								INUG-SC-10	C	8	14W	622765	7216758
PDL	Ref	PDL-113	March	11.9	14W	629786	7225081	PDL-1	B & C	8.6	14W	630738	7223076
		PDL-114	March	>20	14W	631975	7225233	PDL-2	B & C	9	14W	630752	7223001
		PDL-115	July	13.7	14W	631723	7224108	PDL-3	B & C	8.5	14W	630762	7222974

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)	Zone	Easting	Northing
PDL	Ref	PDL-116	July	16.9	14W	629837	7224004	PDL-4	B & C	8.9	14W	630764	7222949
		PDL-117	August	11.5	14W	632733	7224737	PDL-5	B & C	8.8	14W	630775	7222933
		PDL-118	August	21.8	14W	631206	7225225	PDL-COMP	C	-	-	-	-
		PDL-119	September	13.5	14W	632818	7224165	PDL-SC-1	C	8.5	14W	630740	7223079
		PDL-120	September	14.5	14W	630055	7223533	PDL-SC-2	C	8.4	14W	630738	7223080
								PDL-SC-3	C	8.8	14W	630753	7223004
								PDL-SC-4	C	8.1	14W	630757	7223002
								PDL-SC-5	C	9.3	14W	630757	7222972
								PDL-SC-6	C	8.1	14W	630765	7222971
								PDL-SC-7	C	8.8	14W	630770	7222944
								PDL-SC-8	C	7.9	14W	630772	7222954
								PDL-SC-9	C	7.8	14W	630780	7222933
								PDL-SC-10	C	7.9	14W	630779	7222939
Baker Lake													
BBD	NF	BBD-85	July	16.6	14W	644620	7134168	BBD-1	B & C	8.4	14W	644601	7135284
		BBD-86	July	12.0	14W	643904	7135247	BBD-2	B & C	7.9	14W	644577	7135293
		BBD-87	August	9.0	14W	644005	7135333	BBD-3	B & C	8.5	14W	644540	7135308
		BBD-88	August	9.4	14W	644731	7135236	BBD-4	B & C	8.2	14W	644494	7135316
		BBD-89	September	9.2	14W	644367	7135336	BBD-5	B & C	8.4	14W	644431	7135345
		BBD-90	September	12.5	14W	644785	7135131	BBD-COMP	C	-	-	-	-
								BBD-SC-1	C	8.6	14W	644516	7135274
								BBD-SC-2	C	8.6	14W	644601	7135288
								BBD-SC-3	C	8.2	14W	644579	7135298
								BBD-SC-4	C	7.9	14W	644581	7135305
								BBD-SC-5	C	8	14W	644536	7135313
								BBD-SC-6	C	9	14W	644535	7135303
								BBD-SC-7	C	8.3	14W	644508	7135325
								BBD-SC-8	C	8.5	14W	644509	7135314

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)	Zone	Easting	Northing
BBD	NF							BBD-SC-9	C	7.6	14W	644437	7135352
								BBD-SC-10	C	8.3	14W	644439	7135351
BPJ	NF	BPJ-85	July	>20	15W	356696	7134054	BPJ-1	B & C	8.2	15W	357188	7134152
		BPJ-86	July	13.0	15W	357390	7133940	BPJ-2	B & C	8.2	15W	357231	7134124
		BPJ-87	August	19.2	15W	356725	7134197	BPJ-3	B & C	7.4	15W	357065	7134220
		BPJ-88	August	14.5	15W	357300	7133955	BPJ-4	B & C	8.8	15W	357017	7134218
		BPJ-89	September	17.6	15W	356871	7134082	BPJ-5	B & C	7.9	15W	357281	7134101
		BPJ-90	September	12.9	15W	357456	7133919	BPJ-COMP	C	-	-	-	-
								BPJ-SC-1	C	7.8	15W	357189	7134163
								BPJ-SC-2	C	7.3	15W	357198	7134164
								BPJ-SC-3	C	7.8	15W	357241	7134124
								BPJ-SC-4	C	8.2	15W	357227	7134124
								BPJ-SC-5	C	7.9	15W	357053	7134216
								BPJ-SC-6	C	7.8	15W	357047	7134215
								BPJ-SC-7	C	8.5	15W	357015	7134221
								BPJ-SC-8	C	7.1	15W	357023	7134235
								BPJ-SC-9	C	8.4	15W	357281	7134092
								BPJ-SC-10	C	7.7	15W	357287	7134101
BAP	Ref	BAP-85	July	10.2	15W	364437	7130901	BAP-1	B & C	6.9	15W	363995	7131224
		BAP-86	July	12.5	15W	363875	7131157	BAP-2	B & C	7.5	15W	364039	7131190
		BAP-87	August	9.2	15W	362921	7131482	BAP-3	B & C	7.9	15W	364075	7131159
		BAP-88	August	14.3	15W	364149	7130958	BAP-4	B & C	9.1	15W	364126	7131125
		BAP-89	September	>20	15W	356871	7134082	BAP-5	B & C	8.9	15W	364142	7131049
		BAP-90	September	7.5	15W	363782	7313223	BAP-COMP	C	-	-	-	-
								BAP-SC-1	C	6.5	15W	364001	7131223
								BAP-SC-2	C	7.1	15W	363991	7131219
								BAP-SC-3	C	7.2	15W	364040	7131186
								BAP-SC-4	C	7.7	15W	364034	7131191

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)	Zone	Easting	Northing
BAP	Ref							BAP-SC-5	C	8	15W	364070	7131164
								BAP-SC-6	C	7.8	15W	364071	7131161
								BAP-SC-7	C	8.9	15W	364130	7131120
								BAP-SC-8	C	8.9	15W	364131	7131125
								BAP-SC-9	C	8.3	15W	364150	7131045
								BAP-SC-10	C	8.8	15W	364145	7131050
BES	Ref							BES-1	B & C	7.4	15W	361226	7132391
								BES-2	B & C	9.4	15W	361245	7132371
								BES-3	B & C	8.5	15W	361305	7132359
								BES-4	B & C	8.5	15W	361372	7132326
								BES-5	B & C	8.7	15W	361439	7132289
								BES-COMP	C	-	-	-	-
								BES-SC-1	C	8.5	15W	361231	7132394
								BES-SC-2	C	7.8	15W	361225	7132402
								BES-SC-3	C	9.5	15W	361266	7132368
								BES-SC-4	C	9.6	15W	361256	7132369
								BES-SC-5	C	8.1	15W	361301	7132361
								BES-SC-6	C	8.5	15W	361310	7132355
								BES-SC-7	C	8	15W	361369	7132330
								BES-SC-8	C	8.2	15W	361359	7132330
								BES-SC-9	C	8	15W	361433	7132296
								BES-SC-10	C	7.6	15W	361441	7132302
Whale Tail													
WTS	NF	WTS-limno	January	5.2	14W	607730	7254309	WTS-1	B & C	9	14W	607142	7253550
		WTS-limno	February	9.4	14W	607564	7254153	WTS-2	B & C	8.9	14W	607183	7253510
		WTS-limno	April	5.4	14W	607734	7254285	WTS-3	B & C	8.7	14W	607071	7253588
		WTS-limno	December	7.6	14W	607535	7254373	WTS-4	B & C	8.7	14W	607097	7253662
		WTS-77	March	8.7	14W	607686	7254010	WTS-5	B & C	9.3	14W	607168	7253664

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)	Zone	Easting	Northing
WTS	NF	WTS-78	March	10.9	14W	607163	7253609	WTS-COMP	C	-	-	-	-
		WTS-79	July	8.7	14W	607686	7254012	WTS-SC-1	C	9	14W	607139	7253546
		WTS-80	July	9.8	14W	607116	7253595	WTS-SC-2	C	9	14W	607141	7253544
		WTS-81	August	11.9	14W	607197	7253626	WTS-SC-3	C	8.3	14W	607182	7253506
		WTS-82	August	13.2	14W	607489	7254164	WTS-SC-4	C	8.7	14W	607184	7253506
		WTS-83	September	7.3	14W	607540	7254403	WTS-SC-5	C	8.9	14W	607067	7253590
		WTS-84	September	15.4	14W	607241	7253710	WTS-SC-6	C	8.7	14W	607066	7253591
		WTS-85	November	7.9	14W	607170	7253393	WTS-SC-7	C	8.2	14W	607091	7253661
		WTS-86	November	9.9	14W	607686	7254018	WTS-SC-8	C	8.4	14W	607094	7253663
								WTS-SC-9	C	9.3	14W	607158	7253664
								WTS-SC-10	C	9.3	14W	607162	7253662
KAN/MAM	NF	MAM-limno	January	9.2	14W	605035	7254845	MAM-1	B & C	7.9	14W	605071	7254877
		MAM-limno	February	12.1	14W	604072	7254464	MAM-2	B & C	7.5	14W	605041	7254891
		MAM-limno	April	5.0	14W	604392	7254204	MAM-3	B & C	7.6	14W	605019	7254884
		MAM-limno	December	5.8	14W	604931	7254744	MAM-4	B & C	7.9	14W	604973	7254889
		MAM-77	March	8.9	14W	605076	7254879	MAM-5	B & C	8.9	14W	605025	7254860
		MAM-78	March	13.7	14W	604032	7254411	MAM-COMP	C	-	-	-	-
		MAM-79	July	5.5	14W	605290	7254935	MAM-SC-1	C	7.6	14W	605060	7254887
		MAM-80	July	7.1	14W	604137	7254410	MAM-SC-2	C	7.5	14W	605066	7254883
		MAM-81	August	7.0	14W	604185	7253849	MAM-SC-3	C	7.2	14W	605035	7254895
		MAM-82	August	8.5	14W	605379	7255108	MAM-SC-4	C	7.4	14W	605042	7254885
		MAM-83	September	7.5	14W	605377	7255079	MAM-SC-5	C	7.8	14W	605021	7254880
		MAM-84	September	5.0	14W	604144	7254320	MAM-SC-6	C	7.9	14W	605023	7254877
		MAM-85	November	5.3	14W	605211	7254891	MAM-SC-7	C	7.8	14W	604970	7254892
		MAM-86	November	5.9	14W	604068	7254478	MAM-SC-8	C	8.2	14W	604974	7254878
								MAM-SC-9	C	9.2	14W	605023	7254847
								MAM-SC-10	C	9.2	14W	605033	7254839
NEM	NF	NEM-limno	January	9.3	14W	606412	7257118	NEM-1	B & C	9	14W	606560	7257375

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)	Zone	Easting	Northing
NEM	NF	NEM-limno	February	7.3	14W	606628	7257648	NEM-2	B & C	9.2	14W	606542	7257375
		NEM-limno	April	5.1	14W	606586	7257353	NEM-3	B & C	9	14W	606525	7257300
		NEM-limno	November	10.8	14W	606533	7257483	NEM-4	B & C	7.4	14W	606561	7257331
		NEM-limno	December	10.1	14W	606412	7257135	NEM-5	B & C	8	14W	606556	7257344
		NEM-77	March	11.9	14W	606617	7257602	NEM-COMP	C	-	-	-	-
		NEM-78	March	10.1	14W	606408	7257020	NEM-SC-1	C	8.5	14W	606560	7257369
		NEM-79	July	13.2	14W	606166	7257529	NEM-SC-2	C	9	14W	606558	7257367
		NEM-80	July	14.6	14W	606695	7257682	NEM-SC-3	C	9.5	14W	606539	7257365
		NEM-81	August	18.5	14W	606800	7257682	NEM-SC-4	C	9.5	14W	606541	7257369
		NEM-82	August	9.5	14W	606133	7257405	NEM-SC-5	C	9.2	14W	606527	7257308
		NEM-83	September	13.5	14W	606202	7257451	NEM-SC-6	C	9.2	14W	606526	7257303
		NEM-84	September	>20	14W	606823	7257733	NEM-SC-7	C	7.2	14W	606557	7257323
								NEM-SC-8	C	6.9	14W	606558	7257318
								NEM-SC-9	C	6.5	14W	606572	7257344
								NEM-SC-10	C	7	14W	606570	7257351
A20	MF	A20-limno	January	17.6	14W	604597	7252624.13	A20-1	B & C	8.6	14W	604605	7252542
		A20-limno	February	18.4	14W	604452	7252590	A20-2	B & C	8	14W	604652	7252550
		A20-limno	April	18.7	14W	604535	7252616	A20-3	B & C	7.7	14W	604613	7252501
		A20-limno	November	6.8	14W	604085	7252544	A20-4	B & C	8.4	14W	604669	7252521
		A20-limno	December	5.3	14W	604389	7252534	A20-5	B & C	8.2	14W	604611	7252561
		A20-71	March	6.7	14W	605222	7252786	A20-COMP	C	-	-	-	-
		A20-72	March	>20	14W	604376	7252620	A20-SC-1	C	7.9	14W	604601	7252545
		A20-73	July	5.3	14W	605270	7252769	A20-SC-2	C	8.8	14W	604604	7252547
		A20-74	July	9.4	14W	604136	7252591	A20-SC-3	C	8.4	14W	604652	7252555
		A20-75	August	5.8	14W	605234	7252752	A20-SC-4	C	8.6	14W	604647	7252540
		A20-76	August	5.3	14W	604657	7252413	A20-SC-5	C	7.7	14W	604611	7252502
		A20-77	September	5.3	14W	605165	7252752	A20-SC-6	C	7.9	14W	604614	7252508
		A20-78	September	6.7	14W	604541	7252533	A20-SC-7	C	8.4	14W	604669	7252516

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)	Zone	Easting	Northing
A20	NF							A20-SC-8	C	8.7	14W	604669	7252514
								A20-SC-9	C	8.3	14W	604604	7252562
								A20-SC-10	C	8.5	14W	604607	7252559
A76	MF	A76-69	March	13.9	14W	602555	7257139	A76-1	B & C	9	14W	602274	7256914
		A76-70	March	9.9	14W	601682	7256840	A76-2	B & C	8	14W	602223	7256920
		A76-71	July	10.9	14W	601789	7256745	A76-3	B & C	8.2	14W	602277	7256944
		A76-72	July	13.3	14W	602477	7257147	A76-4	B & C	8	14W	602289	7256969
		A76-73	August	9.8	14W	602617	7257218	A76-5	B & C	8	14W	602237	7256975
		A76-74	August	4.2	14W	601794	7257012	A76-COMP	C	-	-	-	-
		A76-75	September	8.9	14W	601819	7256882	A76-SC-1	C	8.9	14W	602277	7256914
		A76-76	September	7.4	14W	602345	7257028	A76-SC-2	C	8.9	14W	602272	7256919
								A76-SC-3	C	8	14W	602227	7256923
								A76-SC-4	C	8	14W	602222	7256928
								A76-SC-5	C	7.8	14W	602271	7256948
								A76-SC-6	C	7.8	14W	602275	7256947
								A76-SC-7	C	8	14W	602297	7256969
								A76-SC-8	C	7.9	14W	602293	7256976
								A76-SC-9	C	7.8	14W	602223	7256957
								A76-SC-10	C	8	14W	602226	7256966
DS1	FF	DS1-67	March	19.8	14W	597582	7260651	DS1-1	B & C	6.8	14W	598005	7262009
		DS1-68	March	10.1	14W	598035	7258247	DS1-2	B & C	7.9	14W	598078	7262011
		DS1-69	July	9.1	14W	598032	7258282	DS1-3	B & C	9.5	14W	598112	7262065
		DS1-70	July	7.8	14W	597598	7261080	DS1-4	B & C	9.5	14W	598129	7262018
		DS1-71	August	9.4	14W	597424	7261005	DS1-5	B & C	8.4	14W	598128	7262002
		DS1-72	August	9.3	14W	598034	7258279	DS1-COMP	C	-	-	-	-
		DS1-73	September	>20	15W	597494	7260475	DS1-SC-1	C	7.1	14W	598013	7262008
		DS1-74	September	5.7	15W	598001	7258251	DS1-SC-2	C	7.2	14W	598012	7262006
								DS1-SC-3	C	7.1	14W	598086	7262012

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)	Zone	Easting	Northing
DS1	FF							DS1-SC-4	C	7.3	14W	598081	7262010
								DS1-SC-5	C	9	14W	598109	7262010
								DS1-SC-6	C	9	14W	598115	7262010
								DS1-SC-7	C	9.2	14W	598123	7262019
								DS1-SC-8	C	9.5	14W	598128	7262021
								DS1-SC-9	C	7.5	14W	598118	7261990
								DS1-SC-10	C	7.5	14W	598122	7261998

Notes:

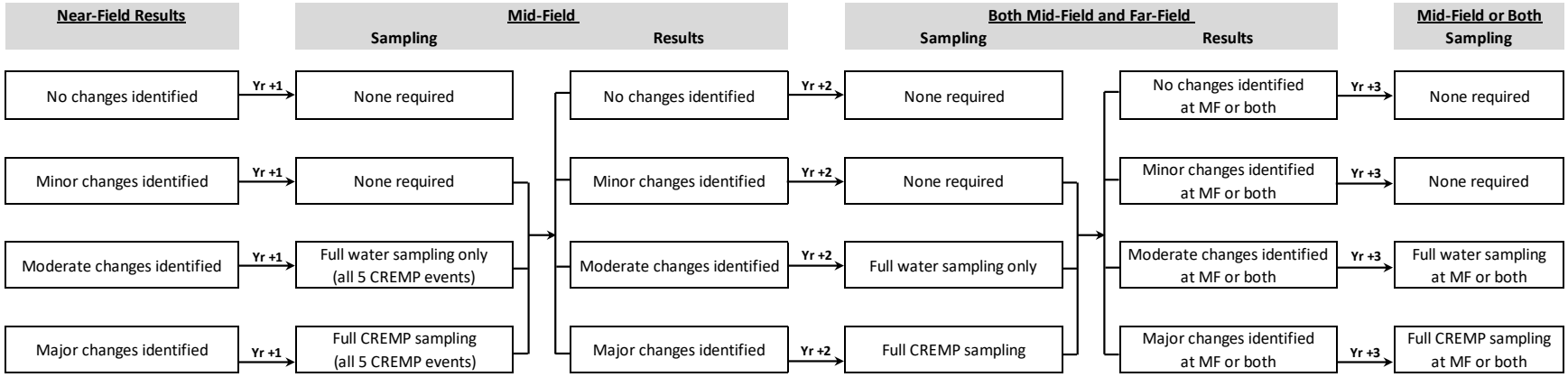
1. Area IDs are as follows: TPE, TPN, TPS=Third Portage Lake - East, North, South basins; SP=Second Portage Lake; TE, TEFF=Tehek Lake - Farfield; INUG=Inuggugayualik Lake; WAL=Wally Lake; PDL=Pipedream Lake; BBD, BPJ, BES, BAP=Baker Lake - Barge Dock, Proposed Jetty, East Shore, Akilahaarjuk Point. WTS = Whale Tail Lake – South Basin; KAN/MAM = Kangislulik Lake (previously 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; Comp = composite sample of all 5 replicate samples from each area (no coordinates).
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, 2022b).

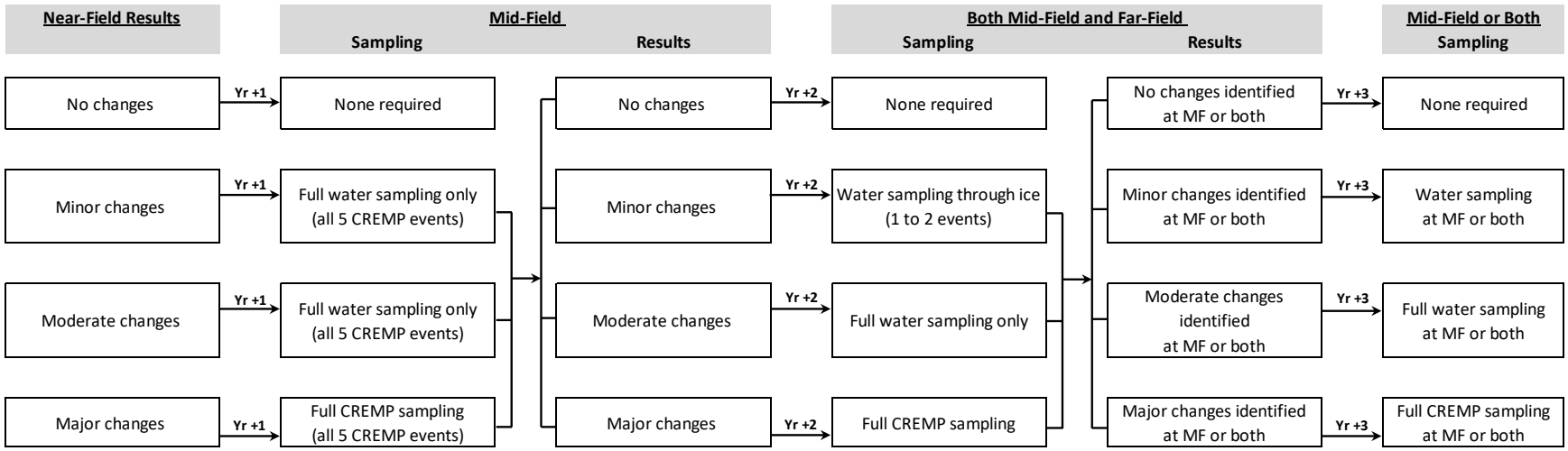
N/R = depth not recorded (no limnology data for this sample).

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

Meadowbank Study Area Lakes



Whale Tail Study Area Lakes



2.3 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 effects-based thresholds. Consequently, methods for applying numerical decision criteria focus on triggers only, but apply equally to threshold values.

2.3.1 Water Chemistry

An iterative process was utilized to identify water chemistry parameters of primary concern at the Meadowbank, Whale Tail, and Baker Lake project areas. For each water chemistry parameter analyzed, the yearly mean concentration for each lake or basin was compared to its respective trigger value. Parameters where the yearly mean was equal to or exceeded the trigger value were formally tested using the Before-After-Control-Impact (BACI) statistical model. In addition to BACI analysis, a trigger screening assessment was conducted to evaluate the extent of changes in water quality as a guide for decision making (See **Section 2.2.3**). Finally, a conservative three-step assessment process was used to identify parameters to include in the formal trend assessment to streamline the interpretation process. In this assessment, water chemistry trends were examined broadly for all parameters meeting detection limits (> 10% of samples > method detection limit [MDL]), control-impact, and mine-related criteria outlined below.

Trigger Evaluation

Water quality data collected in 2023 were evaluated against triggers and effects-based thresholds consistent with the two-tiered approach outlined in **Section 1.5**. Formal comparison of the water quality data for decision-making purposes was done by comparing the yearly mean[12] parameter concentrations to the trigger values developed separately for the Meadowbank area lakes, Wally Lake[13], Baker Lake areas, and the Whale Tail area lakes[14]. The derivation methods and a full list of triggers and effects-based thresholds for each study area are provided in the *CREMP Plan*[15] (Azimuth, 2022b).

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[16] (significance level of p=0.05) using the Before-After-

[12] 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.

[13] 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.

[14] Water quality triggers specific to the Whale Tail study area lakes were developed in 2019 (Azimuth, 2020a).

[15] The CREMP plan was revised in April 2022 and was formally implemented in August 2022.

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

Control-Impact (BACI) statistical model. The BACI model is *paired* (i.e., BACIP) when multiple *before* and *after* events are available. Across each of the study areas, the following BACI components were included in the analysis:

- **Meadowbank Study Area Lakes and Wally Lake**: In the BACI model, INUG was used as the reference (*control*) area[17], with the other areas tested as exposure (*impact*) areas. True *pre-impact* data, when both INUG and the test area had *control* ("C") status, were used for the *before* data (see **Table 2-3**). Only events when both INUG and the test area were sampled in 2023 were used as the *after* data.
- **Whale Tail**: BACI analysis followed the approaches outlined for Meadowbank including INUG as the reference (*control*) area.
- **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 2019 were considered in the before period, while the results since 2020 were considered after period data (i.e., allowing the more robust BACI analysis). The BACI analyses specifically looked at changes in 2023 at the two impact areas relative to previous years.

In addition to BACI analysis, a trigger screening assessment was conducted to evaluate the extent of changes in water quality as a guide for decision making. This approach falls into the framework outlined in **Section 2.2.3** and involved evaluating the extent and magnitude of trigger exceedances to direct the level of sampling intensity in proceeding years.

Parameter Assessment

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 three-step assessment 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**):

[17] 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).

- **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. In 2023, over half the parameters exceeded MDLs at least 10% of the time in Meadowbank lakes (54%), Whale Tail (71%), and Baker Lake (64%) study areas. These parameters are included in this discussion. Overall, there were no changes in detection frequency between 2022 and 2023.
- **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 at Meadowbank and Whale Tail study area lakes, 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.

FEIS Model Comparisons

In addition to the trigger/threshold BACI evaluation, the 2023 CREMP water quality data at Meadowbank and Whale Tail study area lakes were compared to water quality predictions developed as part of the FEIS process introduced in **Section 1.5**.

- **Meadowbank Study Area Lakes and Wally Lake** – Annual Meadowbank CREMP water quality 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).
- **Whale Tail** – Monthly Whale Tail CREMP water quality data for Whale Tail Lake (South Basin) and Kangislulik Lake were compared to their respective water quality monthly modeled predictions presented in the revised FEIS for the Expansion Project (see Golder, 2019).

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 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.

Adaptive Management Strategy

Agnico Eagle developed an adaptive management strategy in 2021 to guide water management decisions at KAN/MAM and WTS[18] for two key contaminants of potential concern (COPCs): arsenic and phosphorus (Agnico Eagle, 2021). The strategy uses 'Levels' linked to specific criteria for total phosphorus and arsenic, and each Level has prescribed management actions. The Levels range from 0 (normal operating conditions) to 4 (emergency situation). The 'Level' for each lake is based on the concentration of total phosphorus and arsenic relative to predictions in the FEIS (Golder, 2019) and relative to the CCME water quality guidelines (WQG) of 0.01 mg/L for total phosphorus and the site-specific water quality objective (SSWQO) of 0.025 mg/L for arsenic. The adaptive management thresholds and corresponding adaptive management levels and strategies are summarized in **Table 2-4**. A detailed description of the adaptive management thresholds and management strategies is provided in Table 3 of the Adaptive Management Plan (AMP; Agnico Eagle, 2021).

Water quality data collected as part of the annual CREMP are used in the assessment. Results of the water quality comparison to AMP thresholds are provided in **Section 5.3.4**.

2.3.2 Sediment Chemistry

Sediment grab samples at Meadowbank and Whale Tail lakes are collected annually with the benthic invertebrate samples (2023[19]). In addition to characterizing physical conditions (e.g., grain size and organic carbon content), samples provide information on temporal changes in concentrations of metals and organics 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

[18] Mitigation measures include but are not limited to targeted studies, implementing activities to prevent, stabilize or reverse a change in environmental conditions or to protect the receiving environment.

[19] The frequency of benthic invertebrate and sediment chemistry monitoring was reduced from annually to once every three years in the 2022 *CREMP Plan Update* (Azimuth, 2022b).

[approximately]). In sediment coring years, metals analyses from the core samples replaces metals analyses from the grab samples. Sediment cores were collected in 2023, the next full coring program is scheduled for 2026 (coinciding with the EEM program).

Trends in sediment chemistry are evaluated by comparing the yearly mean parameter concentrations in the core samples to the trigger[20] 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[21]. 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 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 lakes was implemented for the 2023 sediment coring program that took place August 2023 (see **Section 5.5**). Evaluation of the data followed 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 lakes:

- Method A: the value halfway between the baseline median and the effects-based 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.

2.3.3 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 triggers or thresholds, there are no universal

[20] The trigger values for the Meadowbank project lakes were updated in the 2017 CREMP report (Azimuth, 2018c).

[21] 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.

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 – Regardless of effect size, even if statistically-significant changes are documented 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.

Phytoplankton Taxonomy

Total phytoplankton biomass and taxa richness are the metrics used to assess changes in the phytoplankton community using the BACI framework. The BACI analysis compares paired monthly sampling events at control area (INUG or BAP) and impact areas (i.e., NF or MF areas) over two periods (before and after), with months as the unit for temporal replication. 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 yearly area means were not directly comparable to triggers (i.e., since the triggers/thresholds are based on the relative 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

For benthos, trigger and threshold values are set to relative changes (increases or decreases of 20% and 50%) in total biomass and species richness at test areas using the BACI framework. 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 lakes were conducted on four *after* data period lengths: one year (2023 only), two years (2022–2023), three years (2021–2023), and four years (2020–2023) and for the Whale Tail lakes for either one year (2023 only) or for WTS and KAN/MAM both one year and two years (2022–2023). Two-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) did not change. The alternative hypothesis is that the

endpoint increased or decreased. A p-value of 0.1 or less was considered significant to help improve statistical power for the benthic invertebrate endpoints.

Benthic invertebrate community monitoring was completed at Baker Lake in 2023 as outlined in the *CREMP Plan Update* (Azimuth, 2022b). 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 are conducted using a series of four temporal scenarios using all years of data (i.e., 2023 compared to 2008–2022; 2022/2023 compared to 2008–2021 and so on). These series of comparisons are a more robust method for identifying 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).

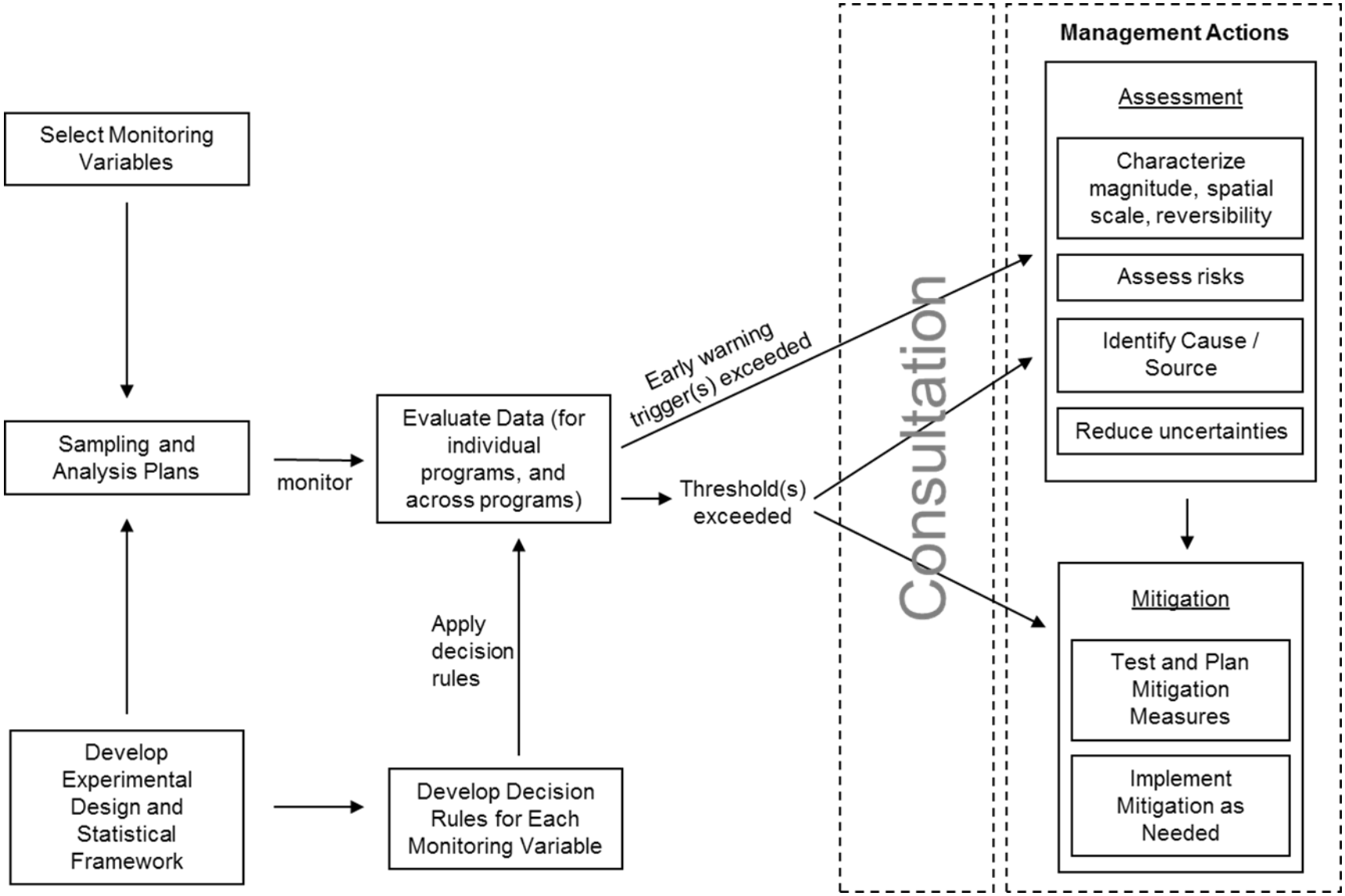


Table 2-3. Status of all CREMP sampling areas since the beginning of monitoring.

	Meadowbank Areas									Baker Lake Areas				Whale Tail 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**	**KAN/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
2020	C	C	I	I	I	I	C	I	C	C	C	I	I	I	I	I	I	I	I
2021	C	C	I	I	I	I	C	I	C	C	C	I	I	I	I	I	I	I	I
2022	C	C	I	I	I	I	C	I	C	C	C	I	I	I	I	I	I	I	I
2023	C	C	I	I	I	I	C	I	C	C	C	I	I	I	I	I	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 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 areas: WTS = Whale Tail Lake South Basin; KAN/MAM = Kangislulik Lake (previously Mammoth Lake); NEM = Nemo Lake; A20 = Lake A20; A76 = Lake A76; DS1 = Lake DS1.

Table 2-4. Adaptive Management Strategy for contaminants of potential concern (COPCs) in water from Whale Tail Lake (South Basin) and Kangislulik Lake.

Adaptive Management Level*	Threshold (Total Phosphorus and Arsenic)	Management Strategy[1]
Level 0 (Normal operating condition)	Within 20% of FEIS predicted concentrations.	No changes – continue with CREMP monitoring plan.
Level 1 (Area of concern)	Concentrations equal to or greater than 20% FEIS predicted concentrations AND less than 80% of the WQG or SSWQO.	Continue with Level 0 management strategy. Analyze site wide water quantity and quality data to identify and assess cause(s) of the difference(s) and reported to the NWB. Report results of data review in annual reporting to the NWB including implications on the Water Management Plan and evaluation of potential mitigation strategies (e.g., enhance water treatment plant efficiency and reduce maximum effluent discharge concentration by 10%).
Level 2 (Area of concern)	Concentrations equal to or greater than 20% FEIS predicted concentrations AND between 80% and 100% of the WQG or SSWQO.	Continue with Level 1 management strategy. Report results of data review to the NWB in the Annual Report, including implications on the Water Management Plan and the evaluation of potential mitigation strategies (e.g., enhance water treatment plant efficiency and reduce maximum effluent discharge concentration by 20%). Move discharge location to KAN/MAM or WTS. Assess potential discharge in lakes D1 or D5 in case level 3 is reached, with approval from the NWB as per NIRB Project Certificate Conditions.
Level 3 (High risk situation)	Concentrations equal to or greater than 20% FEIS predicted concentrations AND between 100% and 120% of the WQG or SSWQO.	Continue Level 2 management strategy. Report results of data review in the Annual Report to the NWB including implications on the Water management plan and the evaluation of potential mitigation strategies (e.g., review overall water management strategy to stay within assimilative capacity of the receivers). Continue monitoring in the original receiving area to evaluate if they recover and define threshold to restart using them.
Level 4 (Emergency situation)	Concentrations equal to or greater than 20% FEIS predicted concentrations AND greater than 120% of the WQG or SSWQO.	Continue Level 3 management strategy. Report results of detailed data review in the Annual Report to the NWB, including implications on the Water management plan and the evaluation of potential mitigation strategies (e.g., move discharge location to an approved location). Continue monitoring in the original receiving area to evaluate if they recover and define thresholds to restart using them. Evaluate potential new discharge location to resume operation.

Notes:

* Agnico Eagle will consult with the NWB on the required approval process, execution, and implementation prior to initiating the adaptive management strategy items for Adaptive Management Levels 3 and 4.

[1] See Table 3 in the Adaptive Management Plan for more details on management strategies for each Adaptive Management Level (Agnico Eagle, 2021).

Acronyms

FEIS = Final environmental impact statement.

SSWQO = Site-specific water quality objective.

WQG = Water quality guideline.

3 QUALITY ASSURANCE / QUALITY CONTROL

3.1 Overview of CREMP QA/QC

The objective of quality assurance/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 sample collection and analysis using specified standardized operating procedures, by using 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 Plan* (Azimuth, 2022b), which includes a description of the established SOPs. The plan update document is the foundation for assessing data quality for each routine component of the CREMP (e.g., water, sediment) and was adopted for the Whale Tail mine baseline sampling program (Azimuth, 2018b). 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 2023 QA/QC program is provided in the subsections below.

3.2 Sample Shipping and Handling

Sample shipping and handling concerns documented in earlier CREMP reports have largely been rectified in recent years. ALS's QA/QC summary results from each laboratory report are integrated into **Appendix A**.

The sample shipping and handling QA/QC for 2023 was comparable to 2022. 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.

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 2023 were very good and were comparable to the results from the previous year:

1. Sample integrity was very good in 2023. No samples were lost from breakage or mislabeling, which was an improvement over 2022. Sample temperatures received at the laboratory were variable depending on season and reflect the challenges with shipping from a remote mine site. Holding times were routinely exceeded for alkalinity, turbidity, laboratory pH, nitrate, nitrite, total dissolved solids (TDS), TSS, and dissolved orthophosphate (as P). Very occasionally hold times were exceeded for cyanides (free and total), total Kjeldahl nitrogen (TKN), ammonia, total mercury, and chlorophyll-a. These hold-time exceedances are not considered likely to impact data analysis and interpretation.
2. Travel, deionized (DI) water, and equipment (EB) blank results for 2023 were similar to 2022 and indicated reliable sample handling and that systematic cross-contamination related to sampling equipment is unlikely. The DI blanks and travel blanks did not warrant flagging any parameters as unreliable in the 2023 analyses.
3. The implication of possible cross-contamination (i.e., where analytes were detected in the EBs) on interpretation of the 2023 water quality data was evaluated by comparing the sample concentrations with the EB results from the same event. Sample results were given a cautionary flag (shown in tables using underlining; e.g., <u>0.001</u>) when the measured concentration was less than 5-times the concentration detected in the EB. Several analytes were occasionally given cautionary flags, including ammonia, aluminum, copper, lead, and manganese. None of the results had concentrations were > 10 times the DL. Sample results, including results with cautionary flags, are reported in **Appendix B1** (Meadowbank), **Appendix B2** (Whale Tail), and **Appendix B3** (Baker Lake).
4. It should be noted that isolated instances of trigger exceedances for individual water chemistry 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 for which the results appear to be influenced by laboratory anomalies or cross-contamination rather than by mining activities. Overall, potential cross-contamination is considered unlikely to bias interpretation of the 2023 water quality analysis.
5. There were a few cases where planned method detection limits (MDL) were not met by the laboratory. The MDL for chromium was adjusted by the laboratory from 0.0001 to 0.0005 mg/L in May 2021 and for beryllium in 2018 from 0.00002 to 0.00001 mg/L due to method re-validation (Pers. Comm. Brent Mack, ALS November 28, 2022). For both parameters, the revised MDLs still meet the lowest available Canadian quality guidelines (0.1 µg/L for beryllium, 0.5 µg/L for

chromium; Pers. Comm. Brent Mack, ALS November 28, 2022). Beryllium has consistently remained below MDL since baseline and is not a parameter of concern for the Site. Furthermore, the revised MDL is below the trigger and threshold values for the Meadowbank, Whale Tail, and Baker Lake study areas. As such, the revised MDL is sufficient to detect changes in concentrations of beryllium at the Site. There is no lower MDL analysis available for beryllium. For chromium, concentrations above MDL have been detected during operations and the revised MDL was higher than those detected concentrations. Starting in 2023, low-level chromium (DL = 0.1 µg/L) was analyzed in order to ensure any potential changes in chromium concentrations due to mining activities are detected. The 2023 results for beryllium were less than the revised DL. There were a few samples above the revised MDL for chromium at NF areas and reference areas (INUG and PDL).

6. The 2023 field duplicate results were very good, with <1% of the calculated RPDs not meeting DQOs. There was one field duplicate collected in September for chlorophyll-a that did not meet the RPD DQO with a concentration greater than 10 times the DL. The other samples collected during the same sampling event do were not affected.
7. Laboratory QC results for water chemistry were also very good in 2023, with very few laboratory data quality qualifiers and none that were deemed likely to impact data interpretation.
8. Two QC screening steps comparing total to dissolved fractions and examining disparities between paired sample results were also utilized. The first analysis compared the total and dissolved concentrations for a given parameter in each sample. Samples for which dissolved concentrations were greater than total concentrations and which had a relative percent difference (RPD) of more than 30% were flagged for review. The second analysis compared parameter concentrations of samples collected within a given area in each sampling event; parameters within a given area and sampling event that had concentrations that differed by more than a factor of 5 (or a factor of 10, if at least one of the samples was within a factor of 10 from the MDL) were flagged for review. All samples that were flagged for further validation are summarized by sampling event in **Appendix A**. Based on these screening steps, a few of the 2023 water quality results were removed from the analysis due to data quality issues (i.e., *unreliable* flags). For transparency, the results are shown in the water quality tables provided in **Appendix B**.

Unless discussed as unreliable above, the water quality QA/QC assessment verified that data are reliable for 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 samples submitted in 2023. Key results of the sediment chemistry QA/QC, presented in **Appendix A**, are as follows:

- For the sediment QA/QC samples, there were no sample integrity concerns.
- Several analytes were detected in the sediment grab equipment filter swipes. However, none were estimated to affect sediment chemistry results by more than 0.01%, suggesting negligible cross contamination.
- There were nine grab and 15 core sample field duplicates collected in 2023. Out of the RPDs calculated, 97% met the DQOs for sediment cores and 91% met the DQOs for sediment grabs. For the composite sample duplicates, all RPDs met the DQOs for hydrocarbon/PAHs in sediment. Overall, field duplicate results indicate good field collection methods and a high degree of replicability in sampling.
- 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. The only qualifiers assigned to the sediment grab chemistry results were for polycyclic aromatic hydrocarbon (PAH) detection limits in composite samples due to high moisture content, however these results are unlikely to impact data interpretation.

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 total density and total 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 2023 was good, indicating reproducible results across both sampling and taxonomic analysis process. Except for a few RPDs that exceeded DQOs in the field duplicates, the majority of phytoplankton taxonomy results for 2023 met project DQOs and are considered 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). While field duplicates are not collected, inferences regarding within-area variability are gained by directly looking at results across replicate samples (see **Section 4.6** and **Section 5.6**). The laboratory (ZEAS) QA/QC procedures include re-sorting and re-counting 10% of the samples targeting a DQO of > 90% recovery. Details of the benthos taxonomy data quality assessment is included in **Appendix A**. Percent recovery was above 95% in all re-sorted samples, with an average percent recovery of 97.4%.

The 2023 benthos taxonomy metrics met DQOs and are considered reliable for data analysis and interpretation of spatial and temporal trends.

4 MEADOWBANK

4.1 Overview of the Meadowbank CREMP

This section summarizes the 2023 CREMP results for monitoring water quality, sediment chemistry, phytoplankton community, and benthic invertebrate communities at the Meadowbank study area lakes. Relevant figures and tables are included at the end of the section.

The CREMP monitoring plan for routine CREMP sampling years is outlined in **Section 2.2**. The 2023 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. Beginning in 2022, routine water sampling was suspended at TE, TEFF, and TPS unless results in NF areas showed moderate changes (Azimuth, 2022b). Based on the results of the 2022 CREMP[22] , no routine water sampling, sediment chemistry, or benthic invertebrate community sampling was required at the MF (TE, TPS) and FF (TEFF) stations (Azimuth, 2023a). CREMP sampling locations for water and sediment/benthos are shown in **Figure 4-1** and **Figure 4-2**, respectively.

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[23] (June and October). Two profiles were completed along with water sampling for chemistry and phytoplankton taxonomy in March, July, August, and September. No samples were collected at Meadowbank area lakes in May due to unsafe ice conditions. Limnology profiles, without paired water chemistry or phytoplankton sampling, were also collected in January, February, April, November, and December. Qualitative evaluation of the limnology data was completed using plots of the deepest sample within each lake for a given event. Samples used for plotting and interpreting the 2023 limnology data are specified in **Table 4-1**.

[22] There were no trigger exceedances for parameters with effects-based thresholds at the NF areas in 2022 (Azimuth, 2023a). Consistent with the adaptive monitoring strategy implemented in 2015 (summarized in Azimuth, 2022b), sediment chemistry or benthic invertebrate community sampling was not required at MF and FF areas in 2023.

[23] In 2023, the May sampling event was cancelled due to unsafe ice conditions.

Table 4-1. Samples included in the limnology profiles in 2023.

Area[1]	Jan	Feb	Mar	Apr	May[2]	Jun	Jul	Aug	Sep	Oct	Nov	Dec
INUG			INUG-149		Ice not safe for travel	Ice not safe for travel	INUG-151	INUG-152	INUG-155	Ice not safe for travel		
PDL			PDL-114				PDL-116	PDL-118	PDL-119			
TPN	☑	☑	TPN-161	☑			TPN-163	TPN-165	TPN-167		☑	☑
TPE	☑	☑	TPE-161	☑			TPE-163	TPE-164	TPE-167		☑	☑
SP	☑	☑	SP-160	☑			SP-162	SP-164	SP-167		☑	☑
WAL	☑	☑	WAL-129	☑			WAL-132	WAL-133	WAL-136		☑	☑
TPS												
TE												
TEFF												

Notes:
Empty cells indicate no limnology profiles were collected, consistent with the study design.
☑ = One profile is collected from the near-field areas (and occasionally one mid-field area) in months where water sampling is not completed.
The sample IDs shown represent the deeper of the two locations sampled each month.
1. Routine water sampling at TPS, TE, and TEFF was not completed in 2023 as per the *CREMP Plan Update* (Azimuth, 2022b).
2. The May sampling event was cancelled due to unsafe ice conditions.

4.2.1 General Observations

The ice-free season on the Meadowbank study area 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 between 3°C and 5 °C at depth.

The maximum temperature measured during the open-water sampling events in 2023 was 17.34 °C at SP in mid-August, which was approximately 3°C warmer than in 2022 and the highest reported since sampling began in 2006. During open-water events, maximum water temperatures may typically reach 15°C in the summer 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

Water temperatures and oxygen concentrations in the Meadowbank study area lakes in 2023 followed similar patterns of seasonal change compared to previous monitoring cycles. Surface water (3 m) temperatures in 2023 showed substantial differences between winter and summer events, like previous years (**Figure 4-3**).

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 (**Figure 4-4**). Oxygen concentrations in winter generally decrease slightly with increasing depth, with occasional values measured above theoretical limits of air saturation[24] (14.6 mg/L at 0°C; **Figure 4-5**). 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 study area 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 the 2023 depth profiles were mostly typical of historical temperature patterns aside from slightly warmer temperature profiles reported in August at TPE and SP (**Figure 4-4**). There was slight stratification at INUG, SP, and WAL in July, and at PDL, TPN, and TPE in August. There was no evidence of vertical stratification from July through September in the other lakes and basins. In November, the study lakes froze and became slightly stratified, with surface waters near 0°C and bottom waters ranging up to 2.2°C at TPN. With vertical mixing, oxygen concentrations were high, and the water was fully saturated in November and December (**Figure 4-5**).

Temperature and oxygen concentrations in 2023 were mostly 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, aside from slightly warmer temperatures in TPE and SP in August compared to previous years.

[24] 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[25] is an indicator of stratification in the water column and is an effective way of assessing changes in water quality that may be related to mining activities such as the discharge of treated water and seeps. From a monitoring perspective, uniform conductivity provides confidence that the water column is well-mixed and that a water sample collected at a discrete depth represents conditions from the surface to near the bottom of the lake. In contrast, variable conductivity in areas close to mining activity may indicate the presence of water with different chemical properties. Surface water sampling is done at 3 m below the surface, but conductivity profiles can help identify if additional samples should be collected at other depth intervals. Conductivity of oligotrophic systems with low concentrations of dissolved solids is typically less than 50 µS/cm and 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.

Field-measured conductivity was unstratified for most of the 2023 limnology profiles. Minor fluctuations in conductivity were evident during some of the winter sampling events due to cryo-concentration (see **Figure 4-6**).

Conductivity at SP in 2023 was generally within the range of historical values dating back to 2009. Field collected conductivity at SP was typically between 20 µS/cm and 30 µS/cm prior to 2014. More recent results from 2014–2022 have trended between 30 µS/cm and 50 µS/cm. The change in laboratory reported conductivity at SP was identified in the water chemistry BACI analysis but has not been linked to any adverse effects to the biological community (see **Section 4.3** and **Figure 4-7** for more details).

Conductivity at WAL was within the range observed in previous years. WAL had higher conductivity observed in the winter months (between 40 and 50 µS/cm) compared to the summer months (between 30 and 40 µS/cm). Baseline results for WAL during the open-water period were between 30 and 40 µS/cm. As with SP, laboratory reported conductivity at WAL has been identified in the BACI analysis but has not been linked to any adverse effects to the biological community (see **Section 4.3** and **Figure 4-7** for more details).

4.3 Water Chemistry

Tabulated water quality data for 2023 are presented in **Appendix B1**. Water chemistry samples were collected simultaneously with limnology samples in March, July, August, and September (see **Section 4.2**

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

for limnology results). In May, the sampling event was cancelled due to unsafe ice conditions (see **Section 2.1** for details).

4.3.1 Key Findings from the 2023 Water Chemistry Monitoring Program

- There are no major mining activities taking place at Meadowbank and effluent discharge only occurred at SP from January to April in 2023.
- There were no trigger exceedances for parameters with effect-based thresholds. Water quality in the Meadowbank study area lakes is safe for aquatic life.
- Mining activities have contributed to higher concentrations of dissolved solids and some major ions in the Meadowbank area lakes.

4.3.2 Temporal and Spatial Trends

Annual mean concentrations for each parameter were compared to triggers and effects-based thresholds according to the approach outlined in **Section 2.3.1**. If the annual mean concentration for a given parameter exceeds the trigger, BACI statistical comparisons to baseline conditions and reference location INUG were conducted.

Given the number of parameters routinely below laboratory MDLs, a conservative three-step assessment process was used to identify parameters to include in the formal trend assessment to streamline the interpretation of the results. Details of the three-step assessment process are provided in **Section 2.3.1** and the results are summarized in **Table 4-2**. The results of the water chemistry parameter assessment process are presented in **Table 4-2**; shaded parameters were retained for further analysis. 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 4-7** to **Figure 4-11**. The red dashed line is the trigger value specific to the parameter and area. Blue dashed lines have been added for TPN, TPE, SP, and WAL for parameters that have FEIS model predictions (see **Section 2.3.1**). Parameters with no clear spatial or temporal trends related to mining activities or natural variability were excluded from further consideration (see **Table 4-2**). For completeness and transparency, water chemistry plots for all parameters are included in **Appendix B1**.

Parameters for which the 2023 yearly mean exceeded the trigger values in NF areas are shown in **Table 4-3**. Parameter/area trigger exceedances were similar to 2022 and included measures and indicators of conductivity, hardness, alkalinity, major ions, and silicon. The results of BACI analyses for exceeding parameter/area combinations are provided in **Table 4-4**. BACI analysis results in 2023 were largely the same as last year, with statistically significant increases relative to baseline/reference conditions ($p < 0.05$) in conductivity, hardness, major ions, and other non-threshold parameters for at least one NF lake.

A literature review was completed in 2019 focusing on toxicity studies for major ions and other parameters that have routinely exceeded the 95th percentile of baseline concentrations during the operations phase. That summary report was prepared as a technical appendix in the 2020 CREMP report (Azimuth, 2021). Water chemistry results for parameters that exceeded their respective trigger values are discussed in the sections that follow.

Conventional Parameters (Conductivity, Hardness, and Alkalinity)

Conductivity and Hardness – Conductivity is a composite variable that increases in response to higher concentrations of ionic compounds such as chlorides, sulphates, carbonates, sodium, magnesium, calcium, potassium, and metallic ions. Conductivity and hardness at all areas were slightly lower than 2022. At TPE, TPN, and WAL these parameters appear to be stable which is consistent with results from previous years and expected, given that discharge to these lakes stopped in 2014 at TPE and TPN, and 2017 at WAL. In 2023, conductivity and hardness were elevated at TPN, TPE, SP, and WAL (hardness only) relative to baseline/reference conditions (**Figure 4-7**).

Alkalinity – The concentrations of bicarbonate and total alkalinity were elevated in SP in 2023 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. The trigger value for both bicarbonate and total alkalinity is 8.7 mg/L. Bicarbonate alkalinity at SP has consistently exceeded the trigger since 2011 and in 2023 the mean concentration at SP was .10.9 mg/L (as $CaCO_3$), which is within the range of around 11 to 13 mg/L observed in 2016–2022. No other areas exceeded triggers for mean bicarbonate concentrations.

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 MOE, 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 the potential sensitivity of TPE and SP to acidic inputs (e.g., low pH snow melt and rain).

Total Dissolved Solids and Major Ions

Total Dissolved Solids – Concentrations of total dissolved solids (TDS) were elevated at SP, TPE, and WAL in 2023 relative to baseline/reference conditions but have been stable for the past several years (**Figure 4-8**). In a review of TDS toxicity to aquatic life, Weber-Scannell and Duffy (2007) recommended deriving ion-specific limits for aquatic life (i.e., rather than for TDS). However, none of the literature studies they compiled showed effects to aquatic life 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 concentrations may not exceed 500 mg/L without a special permit and may not exceed 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 TDS concentrations measured at SP, TPE, and WAL ranging from around 22 to 28 mg/L are, therefore, very low and unlikely to pose risks to aquatic receptors.

Major Ions – Similar to 2022, concentrations of the major ions calcium and magnesium were elevated relative to baseline/reference conditions at Meadowbank study area lakes in 2023 (**Table 4-3**, **Table 4-4**, and **Figure 4-8**). Concentrations appeared to be stable and were consistent with the ranges observed in 2022. At the NF areas TPN, TPE, and SP, mean 2023 concentrations were similar to 2022, with calcium ranging from 2.5 to 4.0 mg/L, and magnesium ranging from 0.98 to 1.3 mg/L. In 2023, the mean concentration of TKN exceeded the trigger value of 0.17 mg/L at TPE, whereas concentrations at SP and TPN were below the trigger. The BACI result showed an increase in TKN at TPE, however, this was not significant (p-value > 0.05).

Slight increases of these cations above triggers in the Meadowbank study lakes for 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 because of acidification and logging (Arnott et al., 2017).

Metals

Silicon – In absence of *control* data and a threshold, an early warning trigger for silicon was derived for the Meadowbank study area lakes in 2019 based on data from all lakes (except WAL). There is evidence of temporal trends in silicon concentrations across all Meadowbank study area lakes, (i.e., peak concentrations in 2012 followed by a decrease through 2017 and then have remained stable since then) including reference areas that suggest regional influence. There also appears to be differences in concentrations among lakes. This is clear at SP where concentrations have always been relatively high compared to reference area INUG yet the temporal patterns are very similar between the two areas (**Figure 4-10**). Given the similar trends observed in reference area INUG and distinct difference in concentrations among lakes, it is unlikely that elevated silicon concentrations compared to the trigger are related to mining activities. In 2023, the BACI result showed a statistically significant increase in total

silicon at WAL (p-value > 0.05) with the yearly mean concentration of 0.67 mg/L marginally exceeding the 0.65-mg/L trigger value.

Other metals – Concentrations of other metals (total and dissolved) were consistently low or below their respective MDLs at the NF locations in 2023 (**Appendix B1**). None of these parameters have exceeded trigger or effects-based threshold values in the formal BACI analysis. In 2023, 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.

In 2020, dissolved zinc[26] showed unusual annual mean trigger exceedances in TPN, TPE, and SP, however, the annual mean has been below the trigger in the years since. In 2023, dissolved zinc showed two discrete samples slightly exceeding the trigger in March at TPE and SP (**Figure 4-11**). This parameter will continue to be monitored in 2024.

Reactive Silica

The first trigger exceedance for reactive silica occurred in 2020 at WAL. The yearly mean concentrations of reactive silica have exceeded the trigger since then (**Figure 4-9**). Given that the mean concentration of reactive silica at WAL (1.4 mg/L) in 2023 was only slightly over the trigger value (1.08 mg/L) and that the exceedance occurred in a NF area that was not exposed to any mining activity since 2020, it is unlikely mine-related and will continue to be monitored in 2024.

Long-term Trend Analysis

In addition to the routine BACI analysis, a more detailed statistical analysis of temporal changes for key physical/ionic parameters in NF areas was completed in 2021 (Azimuth, 2022a). The assessment used a mixed-effects modelling approach to compare three different long-term patterns in conductivity, hardness, calcium, magnesium, total alkalinity, and TDS, which have consistently exceeded triggers and/or FEIS predictions. The BACI analysis is designed to test for changes in parameters for a particular year relative to baseline/reference conditions; it is not designed to test for longer-term trends in key parameters over time. The mixed-effects trend analysis was conducted to provide a statistically supported understanding of long-term trends in key water chemistry parameters. While we will continue to implement the BACI analysis each year to test for changes relative to baseline/reference conditions, the mixed-effects analysis will only be repeated periodically to address specific concerns.

The analysis specifically looked at relative differences between NF areas TPN, TPE, and SP and the reference lake INUG for each of the analytes. The three patterns tested were: (1) a constant linear trend

[26] It is worth noting that the trigger for dissolved zinc is uncertain and perhaps overly conservative because the hardness levels used to calculate the WQG for trigger development are often much lower than the data range used to develop the long-term WQG (CCME, 2018; see Appendix I in Azimuth, 2020a).

over time (*Trend* model), (2) variable, year-specific differences without an increasing trend (*Year* model), or (3) an increasing, but variable, trend during operations to a peak followed by stabilized conditions since 2014 (*Stable* model). The *Stable* model fit the data best for nearly all area-analyte combinations; the except for total alkalinity at TPN where the *Trend* model showed a slightly better fit. These results indicate that concentrations of conductivity, hardness, calcium, magnesium, total alkalinity, and TDS have generally been stable from 2014 to 2021. A full description of the long-term trend analysis and results was included in the *2021 CREMP report* (Azimuth, 2022a).

4.3.3 Comparison to FEIS Model Predictions

The CREMP continues to detect changes in some general water quality parameters related to mining activities. These changes are also reflected in higher concentrations of some parameters when compared to the model predictions in the 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.

As discussed in the 2019 report, the assessment of Meadowbank water chemistry results against FEIS predictions only includes comparison to mean concentrations (Azimuth, 2020a). The full screening results are for Third Portage Lake, Second Portage Lake, and Wally Lake and are 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 hardness, total alkalinity, and ionic compounds (calcium and magnesium; **Appendix B1**). Concentrations for most metals are below the predictions for Third Portage Lake, Second Portage Lake, and Wally Lake, except for total silicon at SP and WAL. Constituents such as silicon that were not reported in the 2003 baseline dataset were assumed to not be present in the receiving environment in the FEIS mixing models (V. Bertrand, pers comm, March 30, 2020). The full

suite of analytes currently included in the CREMP water quality analysis were not available in the early stages of the program, hence, the absence of concentration data for silicon during the baseline phase. As a result, the predicted silicon concentrations are an underestimate of the actual baseline concentrations. Silicon is therefore not suitable for evaluating the accuracy of the FEIS predictions (see Azimuth, 2020a).

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 2023 data are 0.0001 mg/L and 0.000005 mg/L, respectively. All the samples collected in 2023 from Meadowbank study area lakes were below the MDL for cadmium, except one sample collected at TPE in March which was reported at twice the MDL (**Appendix B1**). In the case of arsenic, the concentrations are below the trigger values for the Meadowbank study area lakes, and at least 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 2.3.1** for more details on the decision criteria for effect magnitude). It is important to note that none of the parameters that exceeded trigger values or FEIS model predictions in 2023 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).

4.3.4 Summary and Recommendations

Water quality results were evaluated according 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 2024. The assessment strategy interprets the water quality assessment results from the NF areas in the current year (in this case 2023) to inform sampling at MF and FF areas the following year (i.e., 2024) (**Figure 4-12**).

Trigger screening results for the Meadowbank study areas are presented in **Table 4-5** according to the degree of change interpretation framework:

- 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 effects-based threshold.

The 2023 water quality results from Meadowbank area lakes do not require additional management actions as per the *CREMP Plan Update* (Azimuth, 2022b). The outcome of the assessment for sampling at NF, MF, and FF areas[27] in 2023 is summarized below.

Reference Areas (INUG, PDL)

- Trigger exceedances of the mean concentrations were documented for total and dissolved silicon at INUG and for hardness, calcium, total silicon, and magnesium at PDL. INUG and PDL are reference areas located beyond the influence of activities at the Mine.
- The full CREMP program will be completed at reference areas in 2024.

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

- Trigger exceedances were documented for parameters without effects-based thresholds (i.e., conductivity, hardness, TDS, alkalinity, and cations).
- The mean reactive silica concentration exceeded the trigger in WAL.
- The mean total and dissolved silicon concentrations exceeded the trigger in SP.
- The full CREMP program will be completed at the NF areas in 2024.

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

- No sampling was conducted at MF and FF areas TPS, TE, and TEFF in 2023 based on the results of the 2022 CREMP and as per the *CREMP Plan Update* (Azimuth, 2023a and 2022b).
- Given there were no trigger exceedances for parameters with effects-based thresholds at the NF areas in 2023, no sampling is required at the MF and FF areas in 2024. No other sampling (e.g., sediment chemistry or benthic invertebrate community) is required at MF and FF areas in 2024.

4.4 Phytoplankton Community

In 2023, phytoplankton samples collected during winter sampling events[28] were archived as per the *CREMP Plan Update* (Azimuth, 2022b). Results of the open-water season are discussed below and did not warrant analysis of the winter phytoplankton samples (see text for more details).

[27] No samples were collected at MF and FF areas TPS, TE, and TEFF as per the *CREMP Plan Update* (Azimuth, 2022b).

[28] Phytoplankton samples were not collected in May due to unsafe ice conditions.

4.4.1 Key Findings from the 2023 Phytoplankton Monitoring Program

- Chlorophyll-a concentrations at the NF areas were consistent with baseline and reference, generally remaining less than 1 µg/L.
- Increases in phytoplankton biomass were observed at NF areas TPE, TPN and WAL compared to reference area INUG, however, increases in 2023 are likely due to environmental variability as biomass at the NF areas is consistent with historical results.
- Phytoplankton taxa richness at the NF areas in 2023 was similar to previous years and to reference areas. There were small reductions in taxa richness at all NF areas which is likely attributed to environmental variability rather than mining activities, particularly since effluent discharge at the Meadowbank site only occurred in Second Portage Lake in 2023 where there was no significant decrease in richness.

4.4.2 General Observations

The diversity in types and sizes of phytoplankton in the study lakes is large and their abundance is great. In summer, abundance typically exceeds 1 million individuals per liter with a total biomass of approximately 200 mg/m^3. 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 study area lakes. Chrysophytes also dominate phytoplankton biomass in all study area 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 study area 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 study 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 Kivalliq Region 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).

4.4.3 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 annual data to test for changes relative to baseline/reference conditions using the BACI model (see **Section 2.3.3** for details). Both methods look for evidence of temporal-spatial patterns that might be associated with the mine-related activities.

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). The trigger and threshold effect sizes for total biomass and species richness are 20% and 50%.

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 NF areas SP, TPE, TPN, and WAL).

An important 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) provided a detailed description of historical trends in phytoplankton-related metrics. The current report emphasizes results for 2023, 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 4-13** to **Figure 4-17**. Plots for all other phytoplankton metrics are presented in **Appendix D1**. The BACI statistical test results of changes in the phytoplankton community in 2023 compared to baseline/reference conditions are provided in **Table 4-7**; key results are described below.

Key Results for the Visual and BACI Analyses

Chlorophyll-a

Concentrations in the reference area samples typically range between 0.11 and 0.72 µg/L in summer months, reflecting the oligotrophic, nutrient poor condition of these lakes. Temporal patterns at the reference areas INUG and PDL have been fairly consistent, with some inter-annual variability but no apparent trends. This suggests a lack of regional changes in this metric.

Chlorophyll-a concentrations at the NF exposure areas TPN, TPE, SP, and WAL show no evidence of abnormal seasonal or longer-term temporal trends (**Figure 4-13**) and generally remain less than 1 µg/L, which is consistent with oligotrophic conditions (Kasprzak et al. 2008). The 2023 results are consistent with this conclusion.

Total Biomass

The total phytoplankton biomass results for 2023 were very similar to 2017–2022. Starting in 2023 chlorophyll-a collected in the winter is only analyzed depending on the results from the summer month (July to September; Azimuth, 2022b). Biomass results for the summer months were similar to 2022:

- For reference lakes, summer biomass estimates at INUG in 2023 ranged from 74 to 290 mg/m^3, which were lower than in 2022 while still within the range observed historically. The peak biomass at PDL was 190 mg/m^3 in July, which was similar to 2022. Overall, these results are consistent with the range of total biomass observed in previous years for the reference areas (**Figure 4-14**).
- Peak total biomass in 2023 for NF areas TPE, TPN, and WAL ranged lower than in 2022. For all NF areas, total biomass was largely within the range observed historically.
- BACI analysis demonstrated apparent increases ranging from 19% to 54% at the NF areas in 2023 relative to reference area INUG. The increases in total biomass exceeded the trigger (> 20% effect size) at TPN (49%) and WAL (54%). None of the observed increases at NF areas were statistically significant (**Table 4-7**). As the results are similar to previous years, the increases in 2023 are likely due to natural variability as biomass at the NF areas is consistent with historical results.

Major Taxa Composition

Chrysophytes tend to dominate in the study lakes in all open-water months, a pattern that has been consistent since monitoring began in 2006 (**Figure 4-15**). 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 respond 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 (**Figure 4-16**).

Taxa Richness

Taxa richness was similar to previous years for the open-water season in 2023[29] (**Appendix D1**). The taxa richness at the exposure areas was similar to the reference areas and consistent with previous years (**Figure 4-17**). The estimated changes relative to baseline/reference conditions showed small reductions (< 20% effect size) and only results from TPE were found to be significant (p-values < 0.1; **Table 4-7**). Taxa richness appeared to be similar to historical results at all NF areas.

4.4.4 Summary and Recommendations

The phytoplankton community taxa biomass and taxa richness data from 2023 are generally similar to previous years and largely appear within the range of historical baseline/reference conditions.

Total biomass was significantly higher at NF areas TPN, TPE and WAL, while total richness showed only minor decreases relative to historical baseline/reference conditions. Results for 2023 for NF areas were within the historical range for both metrics. It is difficult to determine in a single year whether these changes are related to mining but when compared to the trends observed over the years, but natural variability is considered to be the most likely driver. Notwithstanding, monitoring will continue in 2024 to verify whether future patterns are consistent with observed patterns or whether they provide stronger evidence of mine-related causality.

4.5 Sediment Chemistry

4.5.1 Key Findings from the 2023 Sediment Chemistry Monitoring Program

- Chromium exceeded the trigger at TPE in 2023. Chromium concentrations have been stable since 2017. Current conditions do not pose risks to the benthos at TPE.

4.5.2 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

[29] Samples collected during the winter months were archived as per the CREMP Plan Update (Azimuth, 2022b).

heavy rain events, or from dust deposition. The only site discharge in 2023 was from East Dike seepage into Second Portage Lake (**Table 1-1**).

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 water 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 (MDMER).

In 2023, sediment grab and core sampling were completed at the NF and reference areas. Samples were spaced throughout each basin (**Figure 4-2**). Grabs for sediment chemistry and habitat characteristics and benthic invertebrates were collected at the same locations. 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. Sediment grab samples for habitat characteristics were analyzed for moisture, total organic carbon (TOC), and grain size; composite grab samples for chemistry were analyzed for aggregate organics, hydrocarbons, and polycyclic aromatic hydrocarbons (PAHs). Core samples were analyzed for moisture, pH, and total metals.

Grain size and organic content (TOC) are important sediment analytes relevant for benthic invertebrate community habitat characteristics. Results from this year's CREMP are provided in **Appendix C1**. Grain size results were similar to previous years, with generally finer-grained sediment often dominated by the silt fraction (**Figure 4-19**). There is an apparent difference in TOC across Meadowbank study lakes (**Figure 4-18**). WAL consistently has the highest proportions of TOC (approximately 5 to 10 %), while TPN has the lowest (< 5% TOC). These results reflect differences in productivity levels across the lakes, with shallow, lower-volume lakes tending to be more productive relative to deeper, high-volume lakes. In

2023, TOC concentrations across Meadowbank study area lakes were similar to previous results, with most areas having < 5 % TOC except WAL (4.6 to 11 % in 2023).

The results for organic compounds analyzed in grab composite samples are provided in **Appendix C1**. There were no detectable concentrations of organic compounds in 2023.

An overview of the various sediment sampling programs at Meadowbank dating back to baseline sampling in 2008 is provided in **Appendix C1**.

4.5.3 Temporal and Spatial Trend Interpretation

The 2023 sediment core chemistry and grab particle size and moisture content results for Meadowbank, screened relative to the lake-specific trigger values, are presented in **Appendix C1**.

To help interpret long-term temporal and spatial trends, concentrations of individual metals have been plotted in **Figure 4-20** to **Figure 4-27**. 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.

2023 Trigger Exceedances and Effects Assessment

Sediment core metals for which the 2023 mean exceeded the trigger value at the NF areas are shown in **Table 4-8**. Results of the statistical before-after (BA) analysis for metals that exceeded their respective trigger values are provided in **Table 4-9**.

Chromium

- The mean sediment chromium concentration at TPE exceeded the trigger value in 2023 (mean value = 136 mg/kg dw; trigger value = 135 mg/kg dw). This is lower than the 2017–2020 means of 193 mg/kg dw and which ranged from 150 to 205 mg/kg dw (**Figure 4-23**). The observed increase in sediment chromium concentration in 2023 compared to the 'before' period at TPE was statistically significant and represents a proportional increase of just under 2 times (**Table 4-9**).
- Other sediment chromium trigger exceedances were observed at WAL in 2023, but only for individual replicates and not for overall area means: 2 replicate exceedances at WAL (ranging from 63 and 64 mg/kg dw; note the trigger at WAL is 61 mg/kg dw).
- Sediment chromium levels at TPE have been elevated in past coring programs and were further investigated in 2018 and 2019 (Azimuth, 2019a and 2020a). These studies concluded that while concentrations of chromium have increased relative to the baseline period and have continued to exceed the trigger, chromium concentrations at TPE appear to have stabilized relative to the

increasing temporal trend that was apparent prior to approximately 2013. It is likely that increasing concentrations of chromium in sediment at TPE were related to the use of ultramafic rock for dike construction. The 2018 and 2019 studies also concluded that current conditions do not pose risks to the benthos at TPE. These conclusions were confirmed in the 2020 study (Azimuth, 2021a).

In addition to chromium, there were single trigger exceedances for arsenic, cadmium, and zinc at one or more NF areas. These exceedances were generally reflective of natural spatial variability rather than mining-related changes as supported by the lack of temporal changes relative to baseline conditions, the lack of a corresponding change in water quality, and by the lack of co-located mine discharges (except at SP). Core sampling results, except for chromium at TPE, showed no mining-related temporal or spatial patterns. Grab sampling results for organics analysis did not identify detectable concentrations of any chemicals. Confirmation of the observed trends using sediment grabs will be conducted in 2024.

4.6 Benthos Community

4.6.1 Key Findings from the 2023 Benthos Community Monitoring Program

- In 2023, there were decreases in abundance at all Meadowbank areas, though none of the changes were statistically significant.
- Taxa richness increased at SP in the 2020-23 time period. No differences were observed at the other Meadowbank area lakes.
- Overall, taxa richness and abundance remain within the range of baseline/reference.

4.6.2 General Observations

The abundance and species composition of benthic invertebrates are influenced by water depth, substrate grain 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 4-10** and **Figure 4-28**). Despite abundance generally being low at the study area 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 mine 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 2022, as well as more recent baseline data from the Whale Tail 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 4-31**). 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 4-29** and **Figure 4-32**). 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.

4.6.3 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 2023 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 4-10**.

Time-series plots showing abundance and richness endpoints are presented in **Figure 4-28** to **Figure 4-33**. 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 2.3.3** for details). The BACI comparisons involved testing for single-year (i.e., 2023) and multi-year (i.e., up to four years) trends and focused on benthic invertebrate total abundance and taxa richness. This report focuses on the 2023 results and discusses temporal and spatial trends over the last four years (i.e., dating back to 2020). As discussed in **Section 2.2.3**, MF (TPS and TE) and FF (TEFF) areas were not sampled in 2023. BACI model results for benthic invertebrate abundance and richness are presented in **Table 4-11** and **Table 4-12**. Key results are described below.

Total Abundance

Total abundance at INUG was higher in 2023 compared to 2022. INUG is the main reference area used for the BACI comparisons, so it is noteworthy that total abundance has been generally higher for INUG from 2015 to 2023 compared to earlier years (**Table 4-10**). However, the range in abundance since monitoring began 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 4-28**. Visually, the plots suggest slightly lower abundance at TPN and WAL and similar abundance at TPE and SP compared to 2022. Overall, the BACI results in **Table 4-11** show negative effect sizes (i.e., reduction) in abundances for all NF sampling areas (i.e., TPN, TPE, SP, and WAL) compared to reference area INUG in 2023, although none of the changes are statistically significant ($p > 0.1$). The observed effect sizes exceeded the 20% trigger at TPN (62%), TPE (65%), and WAL (27%), but not at SP (-8%); the 50% threshold was also exceeded at TPN and TPE. These results appear to be influenced by natural inter-annual variability rather than mining activities.

Interpreting the BACI analysis results can be challenging for two reasons: 1) because natural variability exists between years and areas and 2) because there is heterogeneity within areas. For example, total abundance at TPE continues to be fairly stable with relatively minor variability between years (**Figure 4-28**). However, the 2023 BACI results for total abundance at TPE in each time period assessed over the past four years showed a relative reduction ranging from 42% to 65% compared to INUG, though none of these changes was statistically significant (**Table 4-11**). These results are driven by a number of years with higher abundance at INUG rather than on any actual reduction in abundance at TPE.

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 2023, abundance at replicate TPE-4 had a low total abundance of 630 organisms/m^2 compared to replicate TPE-3 which had a high abundance of 2,848 organisms/m^2. An even larger difference between replicates was observed in 2020, where the lowest total abundance was 2,065 organisms/m^2 at replicate WAL-4 compared to the highest total abundance of 24,261 organisms/m^2 at replicate WAL-5.

In recent years, estimated effect sizes have fluctuated but generally remained small for total abundance at the Meadowbank study area lakes. In 2023, effect sizes were often > 20% (reduced abundance), though not statistically significant for all *after* periods up to four years except for TPE in the 2020-2023 time period (i.e., reduced abundance, see **Table 4-11**). As discussed previously, the apparent reductions in abundance are not supported by the temporal trends for total benthic abundance for TPE shown in **Figure 4-28**. The time-series plots highlight that abundance at TPE has remained fairly consistent over the last seven years and is similar to 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). 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 that there are changes to benthic invertebrate abundance in the NF areas that are attributable to mining activity.

Major Taxa Abundance

Insects were the dominant taxon with generally over 60% relative abundance followed by molluscs with roughly between 10–25% relative abundance (**Figure 4-29** and **Figure 4-30**). While there were no apparent trends in composition changes related to mining at most areas, 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 2020 and 2022, or TPE in 2008. Given the large inter-annual changes in total abundance, it is not unexpected to see a change in the relative dominance of major taxa groups.

Taxa Richness

Taxa richness in 2023 was generally within the range of other sampling years (**Figure 4-31**). Mean taxa values at the reference areas were 11.7 at INUG and 8.5 at PDL, which were around the mid-range of reported number of taxa since monitoring began in 2006 (INUG) and 2009 (PDL) (**Table 4-10**). Results of 2023 BACI suggested there was an apparent increase in taxa richness at all areas and in all time periods,

except for WAL in 2023 with a slight reduction (-3%). These changes were not statistically significant p-value > 0.1), except for SP during the 2020-23 period. At SP and TPN the 20% effect size was exceeded in all time periods, except TPN in 2023 (**Table 4-12**). Overall, taxa richness was within the range observed across all sampling years. Despite some within-year variability in taxa richness, the NF areas show either stable or increasing taxa richness.

Major Taxa Richness

Insects were dominant in terms of absolute and proportional richness (generally from 6 to 8 taxa), followed by molluscs (~ 2 taxa) (**Figure 4-32** and **Figure 4-33**). The 2023 results are similar to previous years and show that there were no apparent trends in composition related to mining.

4.6.4 Summary and Recommendations

The benthic invertebrate metrics (total abundance and taxa richness) for the NF and reference areas were generally within the range reported for previous years. Furthermore, other than an apparent increase in richness at SP in the 2020-23 time period, the BACI analysis did not detect any significant changes in abundance or taxa richness in 2023, nor in the three longer-term time periods assessed (i.e., 2022-23, 2021-23, and 2020-23). There were apparent reductions in abundance at TPN, TPE, and WAL relative to INUG, however, the reductions were not statistically significant. Total abundance at TPE has been remarkably stable over the past 11 years. Importantly, the richness 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 2023 are likely due to natural variability rather than to mining activities, and will continue to be monitored in 2024.

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 benthic invertebrates).

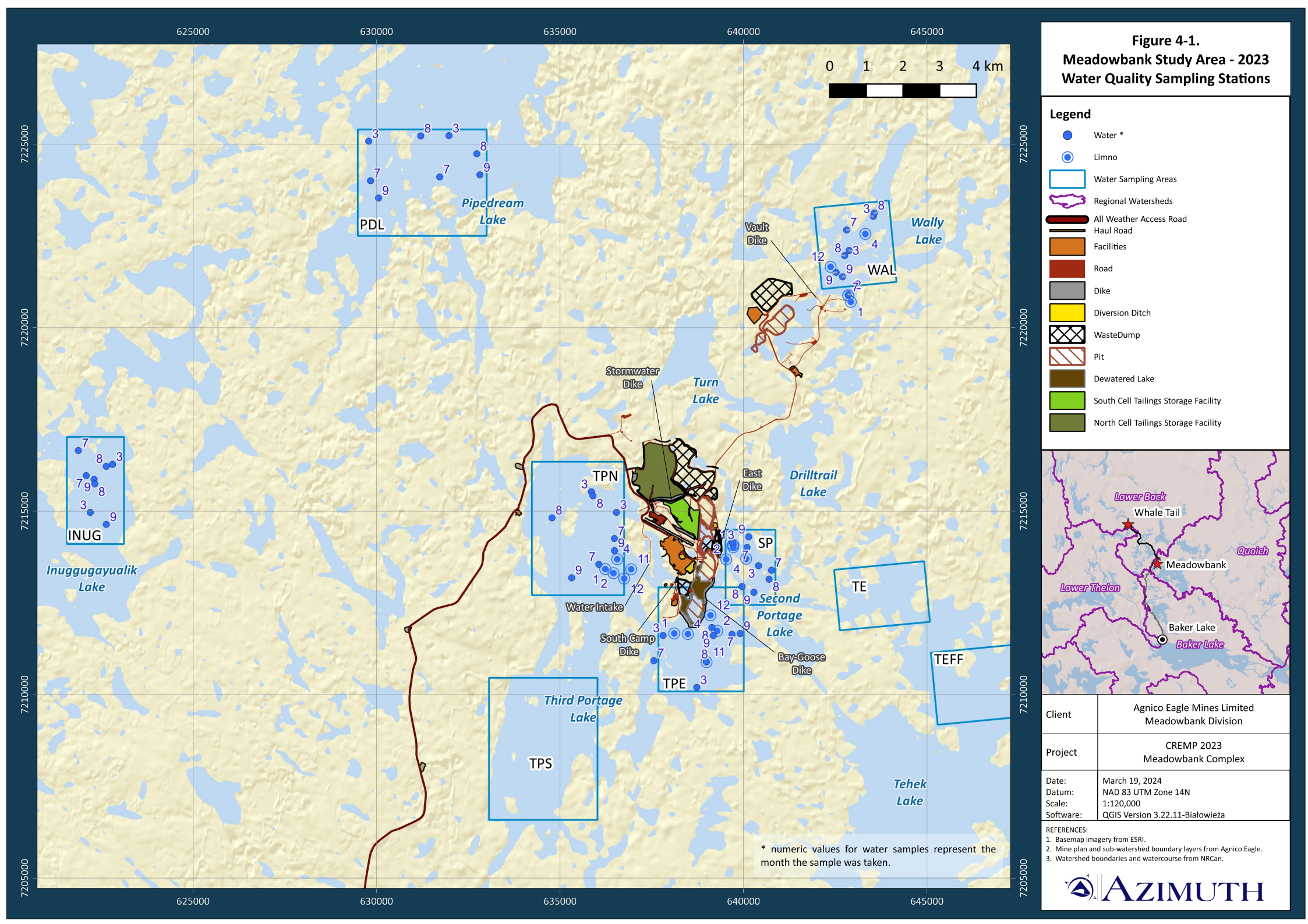


Figure 4-1.
Meadowbank Study Area - 2023
Water Quality Sampling Stations

Legend

- Water *
- Limno
- Water Sampling Areas
- Regional Watersheds
- All Weather Access Road
- Haul Road
- Facilities
- Road
- Dike
- Diversion Ditch
- WasteDump
- Pit
- Dewatered Lake
- South Cell Tailings Storage Facility
- North Cell Tailings Storage Facility

Client	Agnico Eagle Mines Limited Meadowbank Division
Project	CREMP 2023 Meadowbank Complex
Date:	March 19, 2024
Datum:	NAD 83 UTM Zone 14N
Scale:	1:120,000
Software:	QGIS Version 3.22.11-Białowieża

REFERENCES:
1. Basemap imagery from ESRI.
2. Mine plan and sub-watershed boundary layers from Agnico Eagle.
3. Watershed boundaries and watercourse from NRCan.

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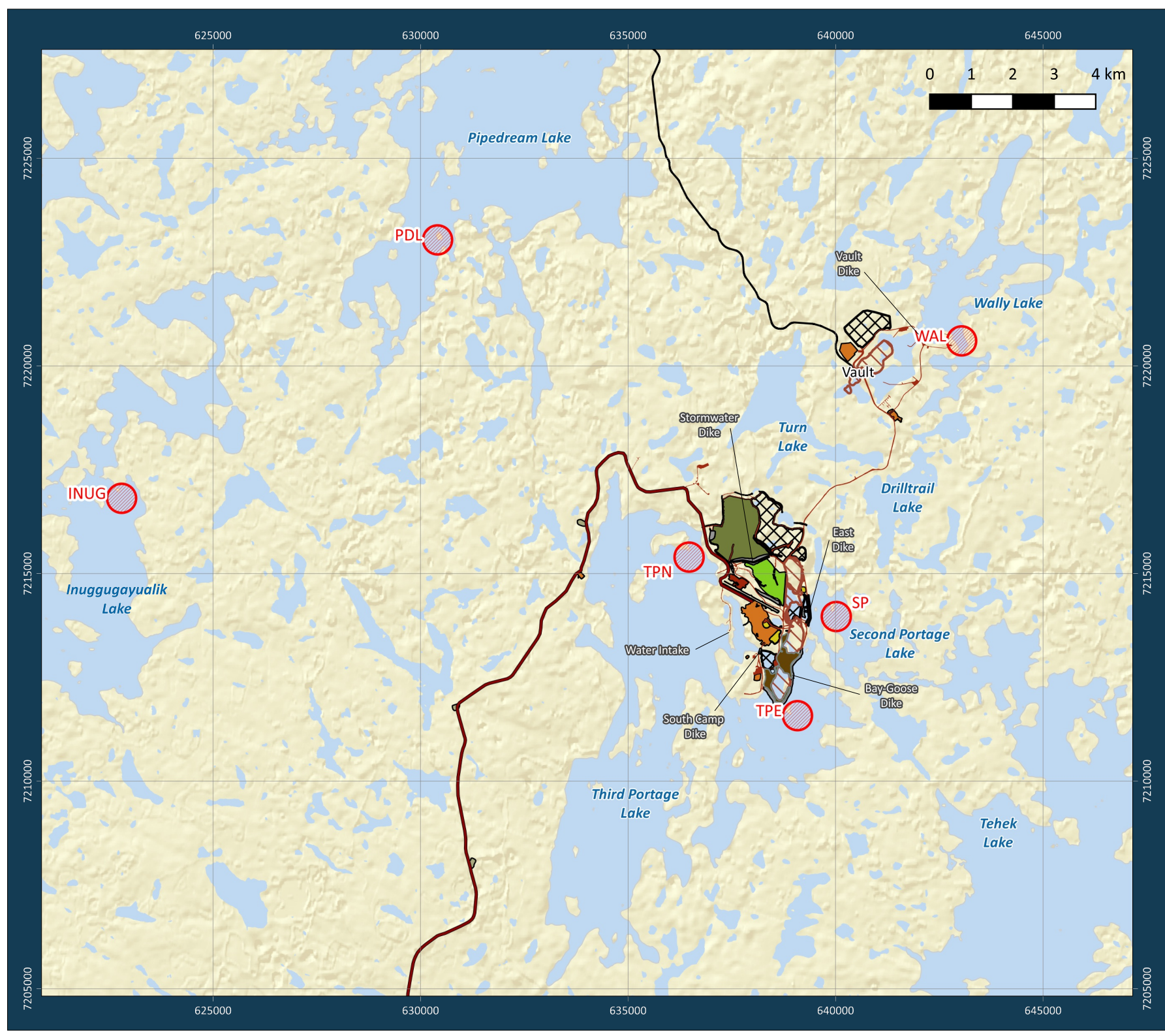


Figure 4-2. Meadowbank Study Area - 2023 Sediment and Benthic Invertebrate Monitoring Areas

- Benthic Invertebrate & Sediment Chemistry Sampling Areas
- Regional Watersheds
- All Weather Access Road
- Haul Road
- Facilities
- Road
- Dike
- Diversion Ditch
- WasteDump
- Pit
- Dewatered Lake
- South Cell Tailings Storage Facility
- North Cell Tailings Storage Facility



Client	Agnico Eagle Mines Limited Meadowbank Division
Project	CREMP 2023 Meadowbank Complex
Date:	March 19, 2024
Datum:	NAD 83 UTM Zone 14N
Scale:	1:120,000
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REFERENCES:
1. Basemap imagery from ESRI.
2. Mine plan and sub-watershed boundary layers from Agnico Eagle.
3. Watershed boundaries and watercourse from NRCan.

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Limnology Tables and Figures

Figure 4-3. Mean monthly field-measured temperature (°C) at 3 m depth since 2006, Meadowbank study area lakes.

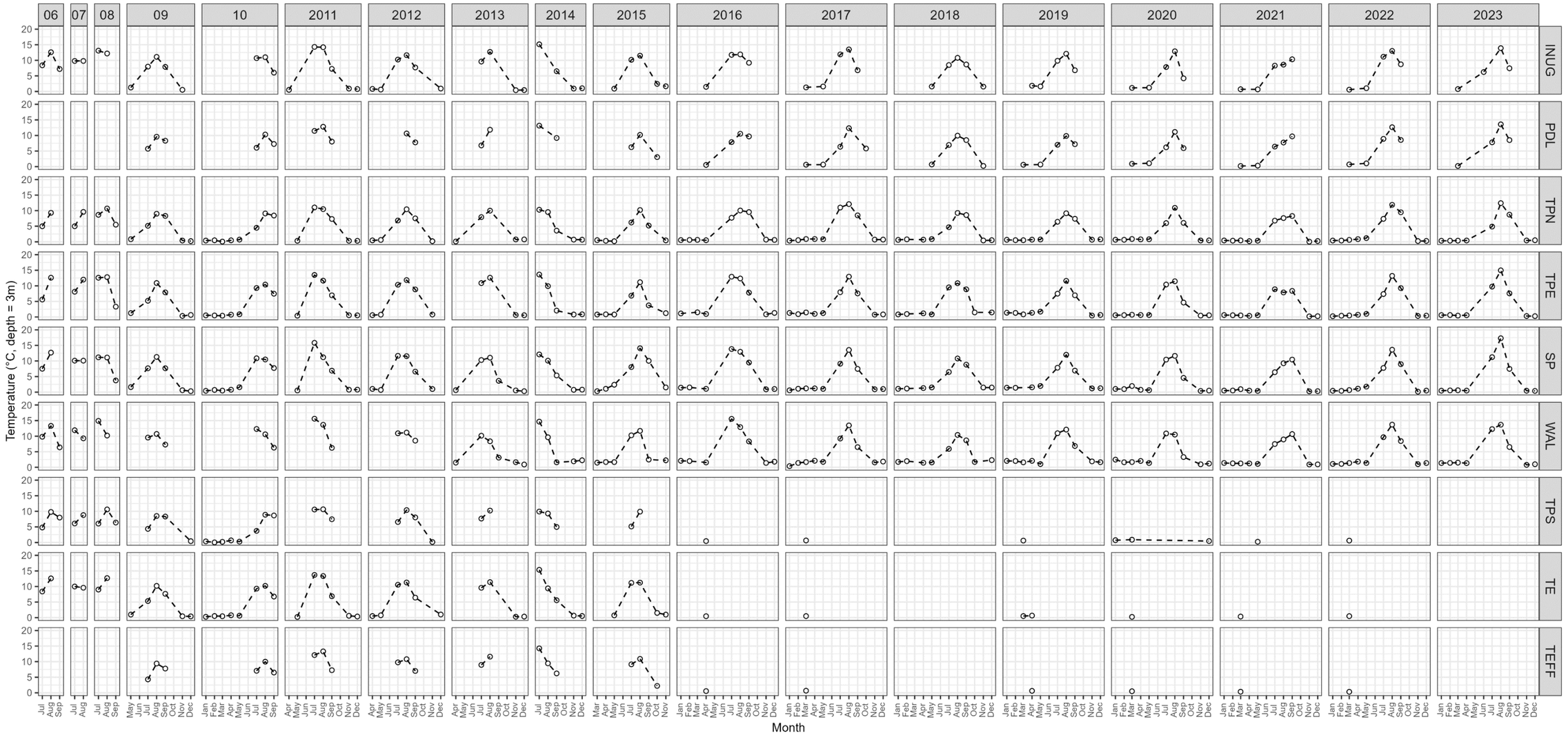


Figure 4-4. Meadowbank – Field-measured temperature profiles, 2023.

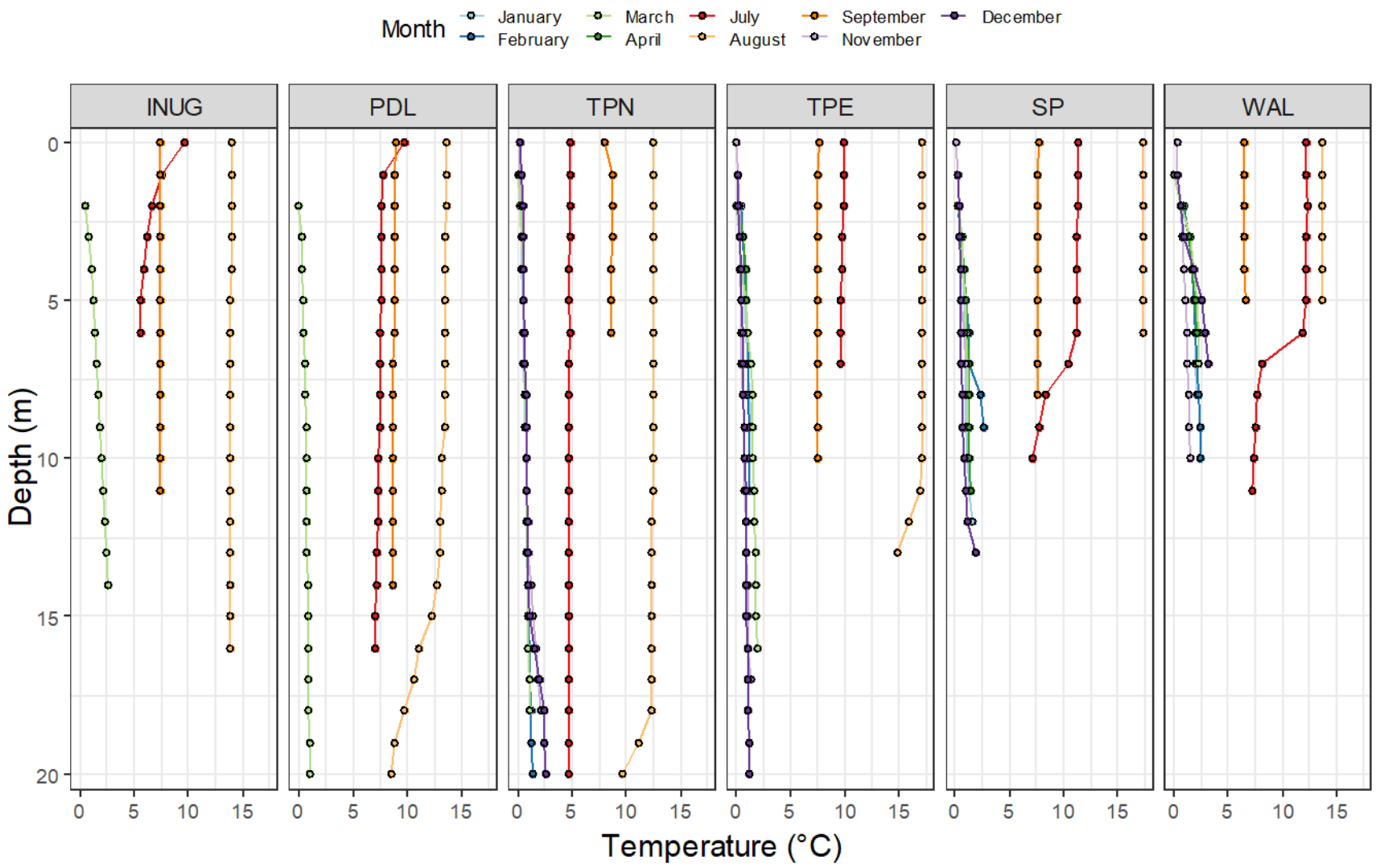


Figure 4-5. Meadowbank – Field-measured dissolved oxygen profiles, 2023.

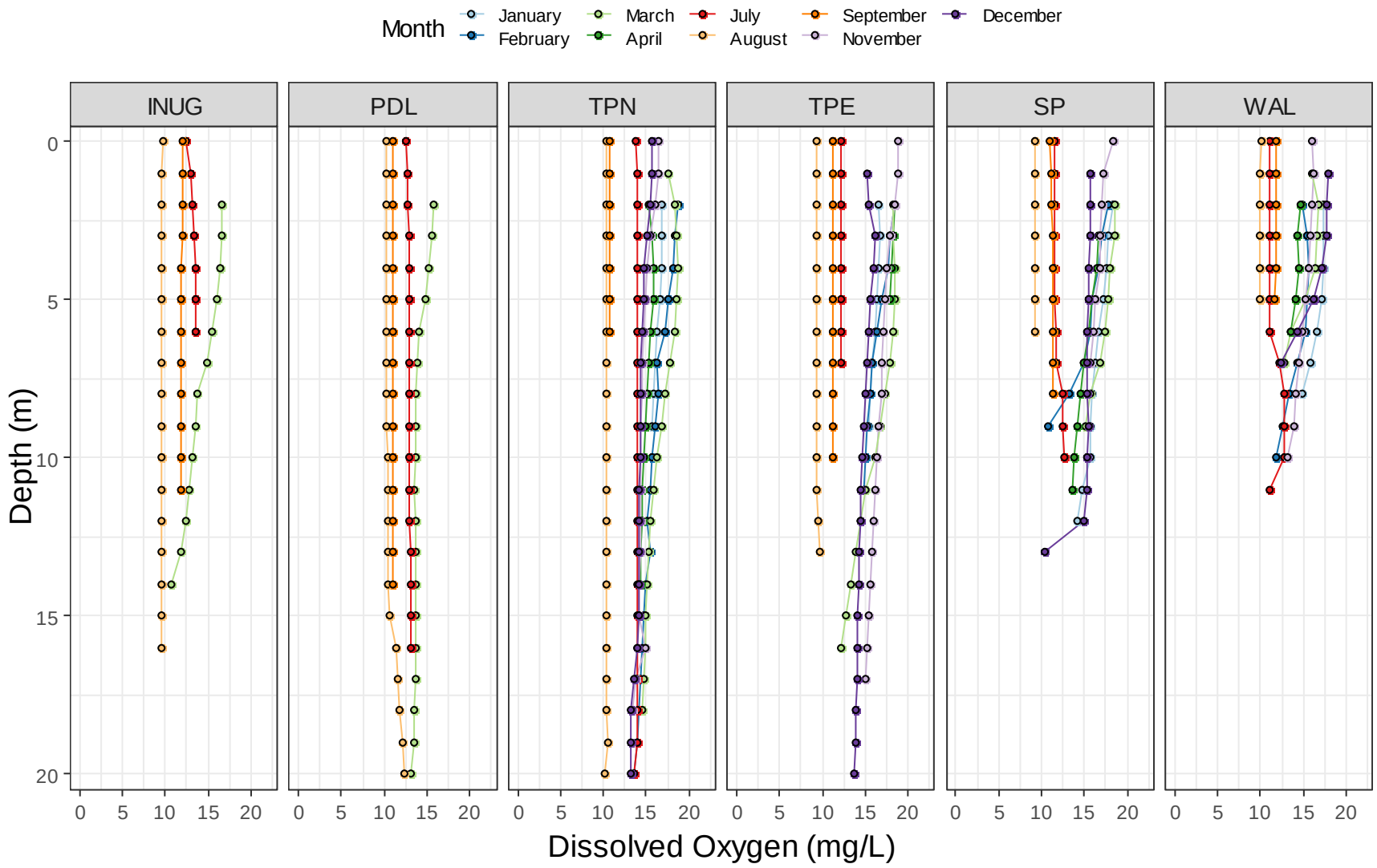
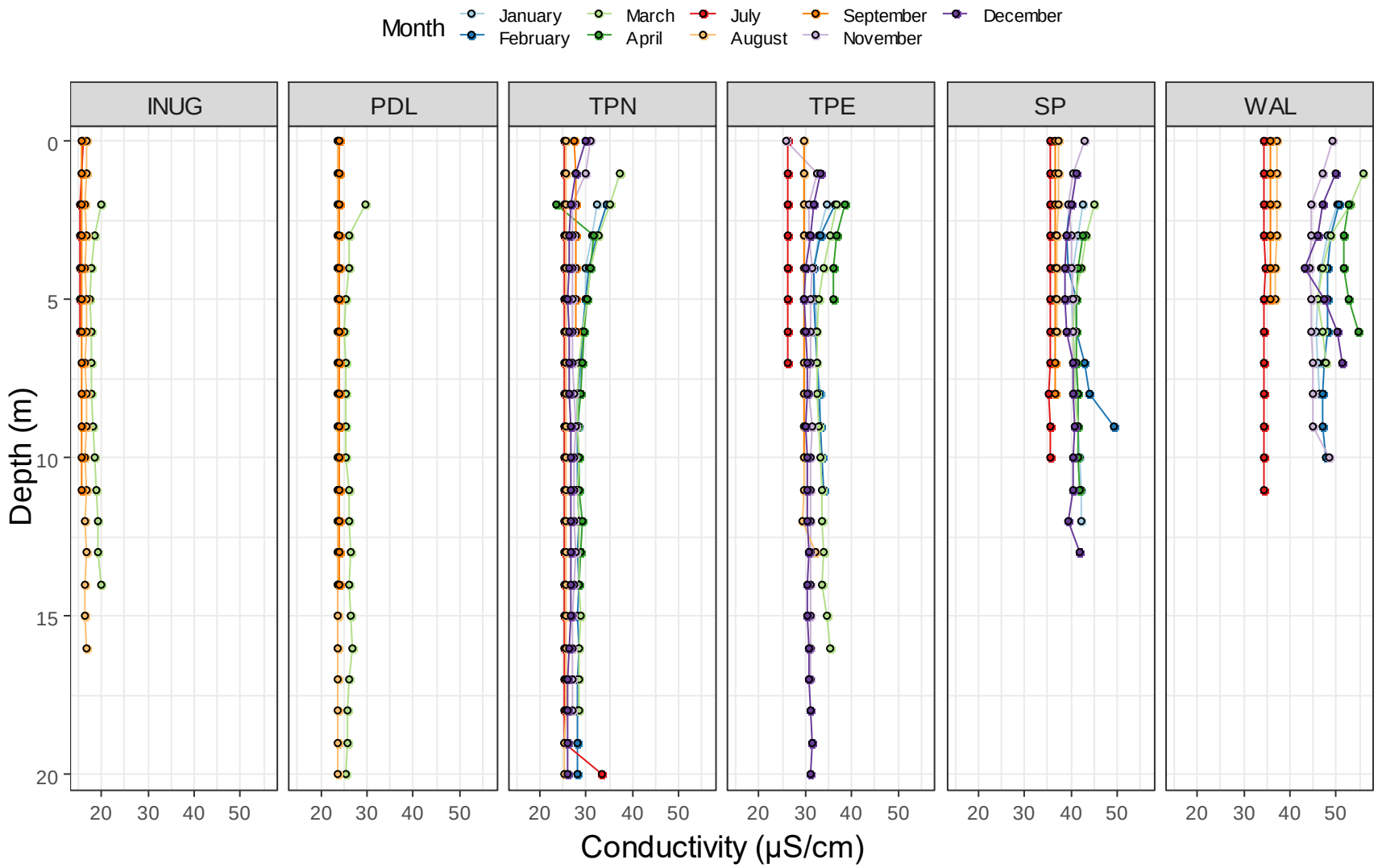


Figure 4-6. Meadowbank – Field-measured conductivity profiles, 2023.



Water Chemistry Tables and Figures

Table 4-2. Assessment process for water quality parameters, Meadowbank study area lakes, 2023.

Parameters	Trigger Exceedance[2]	Screening Level and Rule[1] 1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency	3 Pattern = Activity
CONVENTIONALS				
Conductivity	All stations except INUG	**Yes**		
TSS	-	**Yes**		
Hardness	All stations except INUG	**Yes**		
T-Alkalinity	All stations except INUG and TPN	**Yes**		
B-Alkalinity	All stations except INUG and TPN	**Yes**		
C-Alkalinity	-	No	No	No
pH -Field	All stations	**Yes**		
pH -Lab	-	**Yes**		
TDS & MAJOR IONS				
TDS	All stations	**Yes**		
Calcium	All stations except INUG	**Yes**		
Chloride	-	**Yes**		
Fluoride	SP, TPE, TPN	**Yes**		
Magnesium	All stations except INUG	**Yes**		
Potassium	All stations except INUG and PDL	**Yes**		
Sodium	All stations except INUG and PDL	**Yes**		
Sulphate	-	**Yes**		
NUTRIENTS & OTHERS				
Ammonia-N	-	**Yes**		
Nitrate-N	-	**Yes**		
Nitrite-N	-	No	No	No
TKN	PDL	**Yes**		
T-phosphorus	WAL	**Yes**		
Ortho-phosphate	-	No	No	No
DOC	INUG, PDL, SP	**Yes**		
TOC	-	**Yes**		
Reactive silica	WAL	**Yes**		
T-Cyanide	-	No	No	No
Free Cyanide	-	No	No	No

Parameters	Trigger Exceedance[2]	Screening Level and Rule[1] 1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency	3 Pattern = Activity
TOTAL METALS				
Aluminum	-	**Yes**		
Antimony	-	No	No	No
Arsenic	-	**Yes**		
Barium	-	**Yes**		
Beryllium	-	No	No	No
Boron	-	No	No	No
Cadmium	-	No	No	No
Chromium	-	**Yes**		
Copper	-	**Yes**		
Iron	-	**Yes**		
Lead	WAL	No	No	No
Lithium	-	No	No	No
Manganese	-	**Yes**		
Mercury	-	No	No	No
Molybdenum	-	**Yes**		
Nickel	-	**Yes**		
Selenium	-	No	No	No
Silicon	INUG, PDL, SP, WAL	**Yes**		
Silver	-	No	No	No
Strontium	-	**Yes**		
Thallium	-	No	No	No
Tin	-	No	No	No
Titanium	-	No	No	No
Uranium	-	**Yes**		
Vanadium	-	No	No	No
Zinc	-	No	No	No

Parameters	Trigger Exceedance[2]	Screening Level and Rule[1] 1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency	3 Pattern = Activity
DISSOLVED METALS				
Aluminum	-	**Yes**		
Antimony	-	No	No	No
Arsenic	-	**Yes**		
Barium	-	**Yes**		
Beryllium	-	No	No	No
Boron	-	No	No	No
Cadmium	-	No	No	No
Chromium	-	No	No	No
Copper	-	**Yes**		
Iron	-	No	No	No
Lead	-	No	No	No
Lithium	-	No	No	No
Manganese	-	**Yes**		
Mercury	-	No	No	No
Molybdenum	-	**Yes**		
Nickel	-	**Yes**		
Selenium	-	No	No	No
Silicon	INUG, SP, WAL	**Yes**		
Silver	-	No	No	No
Strontium	-	**Yes**		
Thallium	-	No	No	No
Tin	-	No	No	No
Titanium	-	No	No	No
Uranium	-	**Yes**		
Vanadium	-	No	No	No
Zinc	TPE and SP	No	No	No

Notes:

1. A three-step assessment process was used to identify parameters to include in the formal temporal and spatial trend assessment (**Section 2.3.1** and **Section 4.3.2**).
   Parameters were assigned a "Yes" if the following assessment was true:

(1) **>DL ≥ 10% Frequency**: parameters that exceeded MDLs in at least 10% of the samples.
(2) **C-I > 0.1 Frequency**: parameters that were detected more often in impact areas and the proportion of detected values increased by 0.1 or more.
(3) **Pattern = Activity**: additional step to avoid screening out potentially important parameters. Based on the trend plots, is there a trend for infrequently detected parameters and/or are there values > 5 x DL in at least one sampling event at NF areas?

2. Indicates that a trigger exceedance occurred at the listed Whale Tail study area lakes in one or more sampling event.

Shaded parameters are included in the temporal and spatial trend assessment.

Plots for all individual parameters are presented in **Appendix B1**.

Table 4-3. Water quality variables at the Meadowbank study areas for which the 2023 mean concentration exceeded the trigger.

Meadowbank Study Areas

Parameter	Trigger	2023 Mean		
		TPN	TPE	SP
		NF	NF	NF
Conductivity	27.4	28.8	31.4	38.4
Hardness	9.5	10.1	11.2	15.3
TDS	19.0	-	21.8	26.4
Total alkalinity	8.7	-	-	10.9
HCO_3 alkalinity	9	-	-	10.9
Calcium	2.39	2.5	2.8	4.0
Magnesium	0.93	0.98	1.1	1.3
TKN	0.17	-	0.26	-
T. Silicon	0.2	-	-	0.34
D. Silicon	0.180	-	-	0.30

Wally Lake

Parameter	Trigger	2023 Mean
Conductivity	36.6	41.6
Hardness	16.7	17.2
TDS	25.3	28.1
Magnesium	1.36	1.4
Reactive silica	1.08	1.4
T. Silicon	0.65	0.67

Notes:

"-" indicates no threshold available, and/or mean annual concentration was < the trigger value.
Reported mean values are all in units of mg/L except for conductivity (µS/cm).

Table 4-4. Results of BACI tests for selected water variables at Meadowbank study areas in 2023.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	P-value[1]	Proportional change		
							exp(Est)	LCI	UCI
Conductivity	TPN	6	4	0.48	0.012	**< 0.001**	1.6	1.6	1.7
	TPE	8	4	0.54	0.048	**< 0.001**	1.7	1.6	1.9
	SP	5	4	0.34	0.029	**< 0.001**	1.4	1.3	1.5
	WAL	18	4	0.088	0.071	0.12	1.1	0.94	1.3
Hardness	TPN	6	4	0.47	0.024	**< 0.001**	1.6	1.5	1.7
	TPE	8	4	0.55	0.048	**< 0.001**	1.7	1.6	1.9
	SP	5	4	0.35	0.024	**< 0.001**	1.4	1.3	1.5
	WAL	18	4	0.13	0.063	**0.024**	1.1	1.0	1.3
Bicarbonate alkalinity	SP	5	4	0.28	0.058	**< 0.001**	1.3	1.2	1.5
Total alkalinity	SP	5	4	0.28	0.058	**< 0.001**	1.3	1.2	1.5
TDS	TPE	8	4	0.28	0.082	**0.0040**	1.3	1.1	1.6
	SP	5	4	0.39	0.15	**0.016**	1.5	1.1	2.1
	WAL	18	4	-0.038	0.16	0.59	0.96	0.69	1.3
Calcium	TPN	6	4	0.53	0.024	**< 0.001**	1.7	1.6	1.8
	TPE	8	4	0.61	0.050	**< 0.001**	1.8	1.6	2.1
	SP	5	4	0.37	0.030	**< 0.001**	1.5	1.4	1.6
Magnesium	TPN	6	4	0.40	0.028	**< 0.001**	1.5	1.4	1.6
	TPE	8	4	0.46	0.048	**< 0.001**	1.6	1.4	1.8
	SP	5	4	0.32	0.020	**< 0.001**	1.4	1.3	1.5
	WAL	18	4	0.13	0.036	**< 0.001**	1.1	1.1	1.2
TKN	TPE	8	4	0.27	0.31	0.21	1.3	0.65	2.6
T. Silicon	WAL	6	4	0.34	0.12	**0.012**	1.4	1.1	1.9
Reactive silica	WAL	16	4	0.66	0.25	**0.0080**	1.9	1.1	3.3

Notes:

1. Bolded P-values are statistically significant ($p < 0.05$).

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 2023).

Estimate = BACI model estimate of the 2023 change in mean for log-transformed data.

SE = standard error of the estimate.

DF = degrees of freedom.

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 Meadowbank study area lakes, 2023.

Areas	Area Designation	Triggers Exceeded?	Minor Changes [1]		Moderate Changes [2]		Major Changes [3]		Plan for 2024
		Yes/No	Yes/No	Parameters	Yes/No	Parameters	Yes/No	Parameters	
Sampling Strategy for Reference Areas									
INUG	Ref	Yes	Yes	T.&D. Silicon	No	-	No	-	Full CREMP (reference area)
PDL	Ref	Yes	Yes	Hard., Ca, Mg, T. Silicon	No		No	-	Full CREMP (reference area)
Sampling Strategy for Near-field Areas									
TPE	NF	Yes	Yes	TKN, Cond., Hard., Ca, Mg, TDS	No	-	No	-	Full CREMP (near-field area)
TPN	NF	Yes	Yes	Cond., Hard., Ca, Mg	No	-	No	-	Full CREMP (near-field area)
SP	NF	Yes	Yes	Cond., Hard., TDS, Alkalinity (HCO_3 & Total), Ca, Mg, T.&D. Silicon	No	-	No	-	Full CREMP (near-field area)
WAL	NF	Yes	Yes	Cond., Hard., TDS, Mg, Reactive silica, T. Silicon	No	-	No	-	Full CREMP (near-field area)
Sampling Strategy for Mid-field and Far-field Areas									
TE	MF	NA	NA	-	NA	-	NA	-	Sampling suspended
TEFF	FF	NA	NA	-	NA	-	NA	-	Sampling suspended
TPS	MF	NA	NA	-	NA	-	NA	-	Sampling suspended

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 = Routine water sampling at MF and FF areas was suspended in 2023. Sampling will be conducted at MF and FF areas if monitoring data from the NF areas suggest there are "moderate" changes in water quality. See *CREMP Plan Update* for details (Azimuth, 2022b).

Table 4-6. Meadowbank study area FEIS screening predictions compared to 2023 mean concentrations.

Parameter	Meadowbank Study Area							
	FEIS Screening Prediction				2023 Annual Mean			
	TPN	TPE	SP	WAL	TPN	TPE	SP	WAL
Hardness	5.7	5.7	8.9	17.2	10.1	11.2	15.3	17.2
Total Alkalinity	4.1	4.1	7.0	13.2	-	-	10.9	-
Calcium	1.3	1.3	2.3	4.7	2.5	2.8	4.0	-
Magnesium	0.60	0.60	0.80	1.3	0.98	1.1	1.3	1.4
Silicon (T)	0.010	0.010	0.010	0.040	-	-	0.34	0.67

Notes:
Reported mean concentrations are all in units of mg/L.
"-" indicates mean annual concentration was < the trigger value.

Figure 4-7. Conventional parameters in water samples from Meadowbank study area lakes since 2006.

Note: Conductivity data from 2014 should be interpreted with caution (See Azimuth [2015c] for more details).

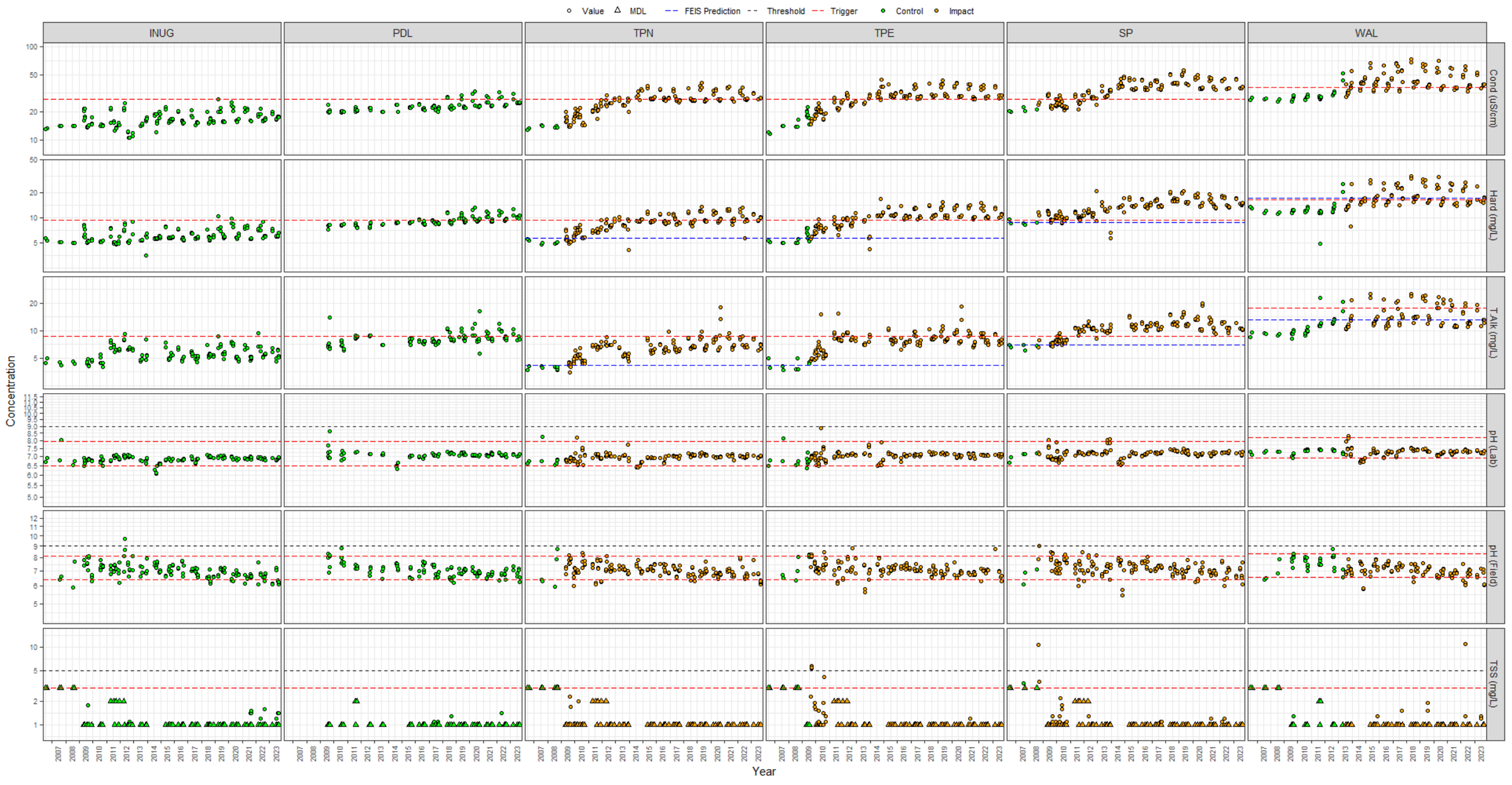


Figure 4-8. Major ions in water samples from Meadowbank study area lakes since 2006.

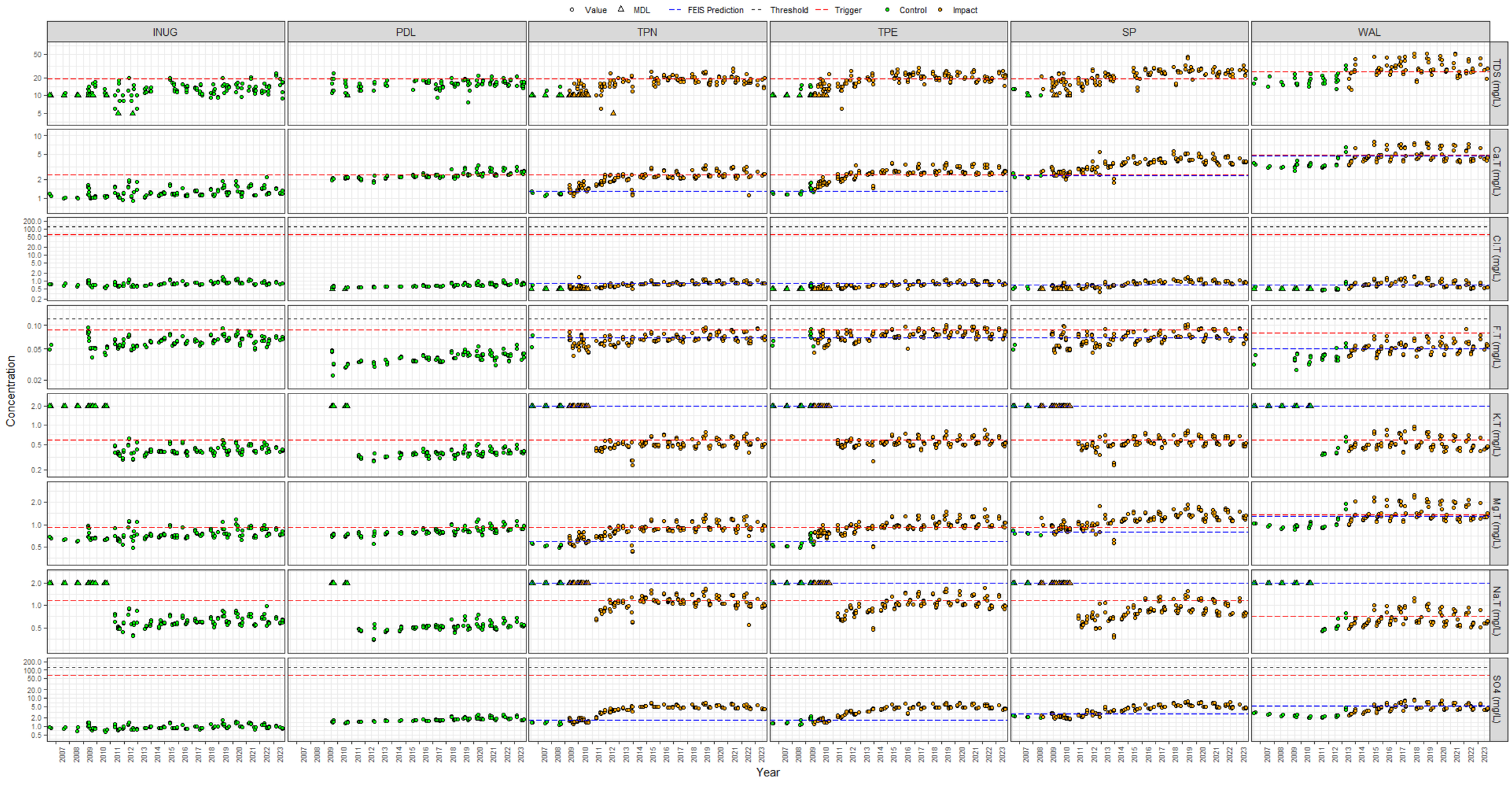


Figure 4-9. Nutrients in water samples from Meadowbank study area lakes since 2006.

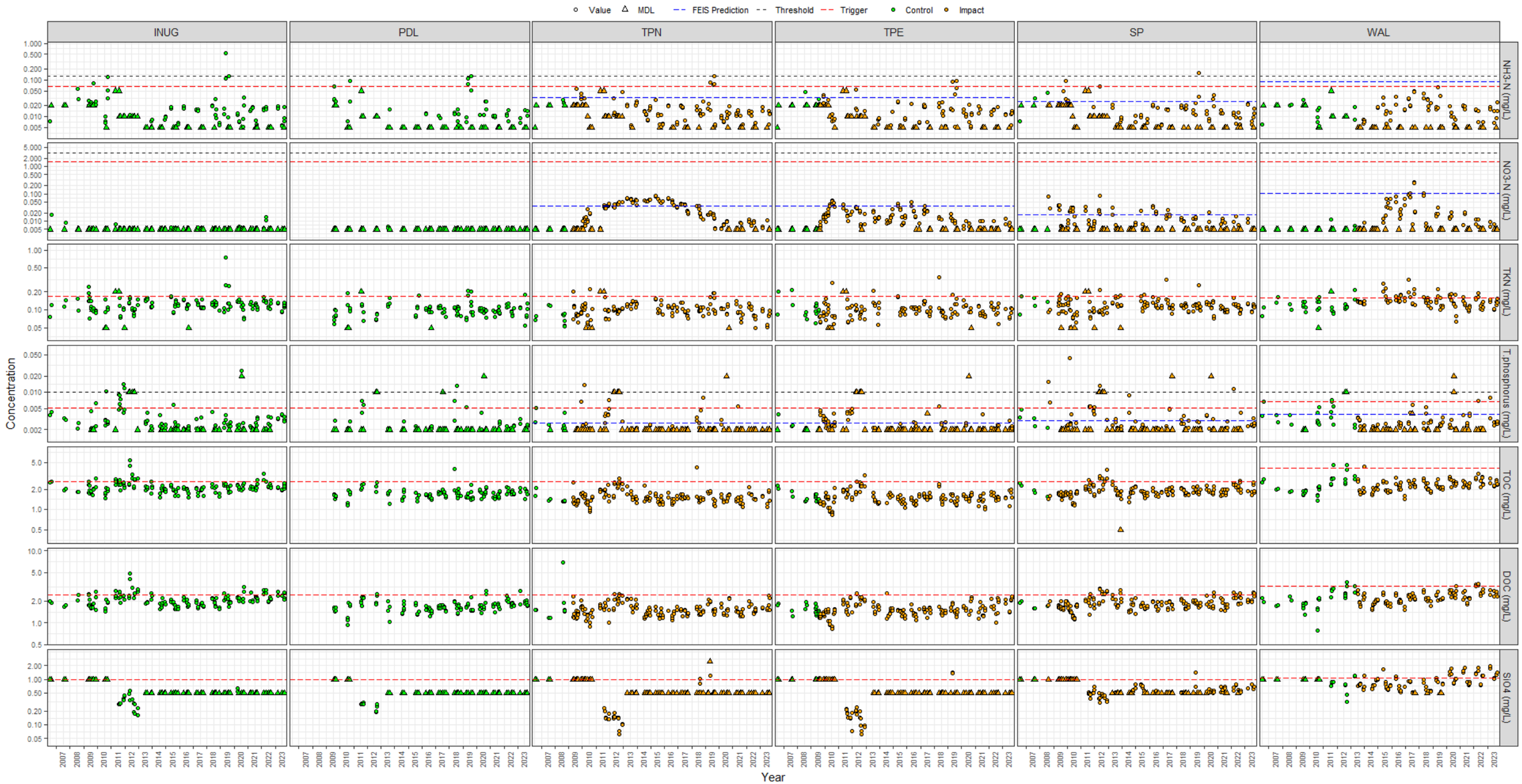


Figure 4-10. Metals in water samples from Meadowbank study area lakes since 2006.

Note: The FEIS prediction is equal to the threshold value for total arsenic at WAL.

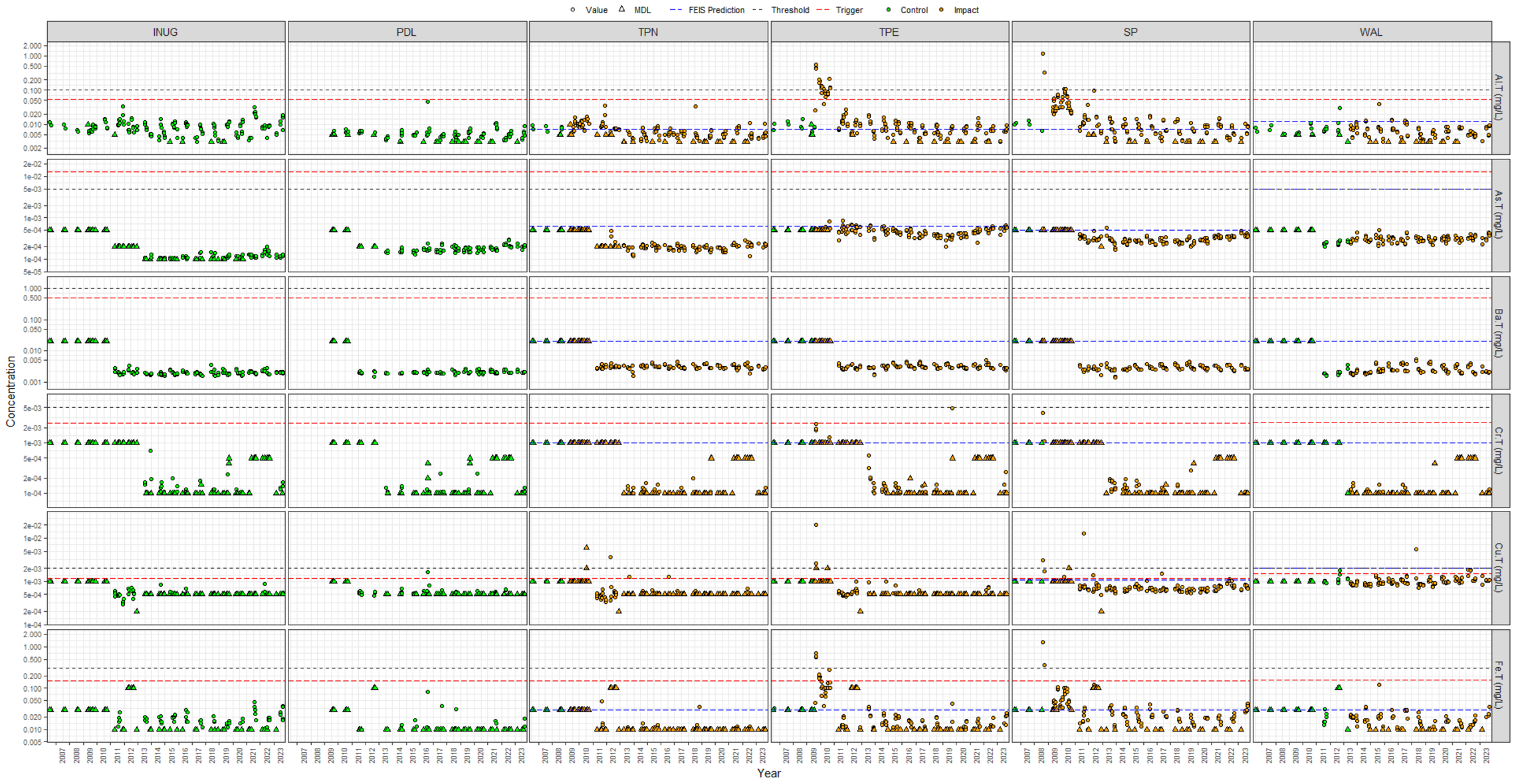


Figure 4-11. Metals in water samples from Meadowbank study lakes since 2006.

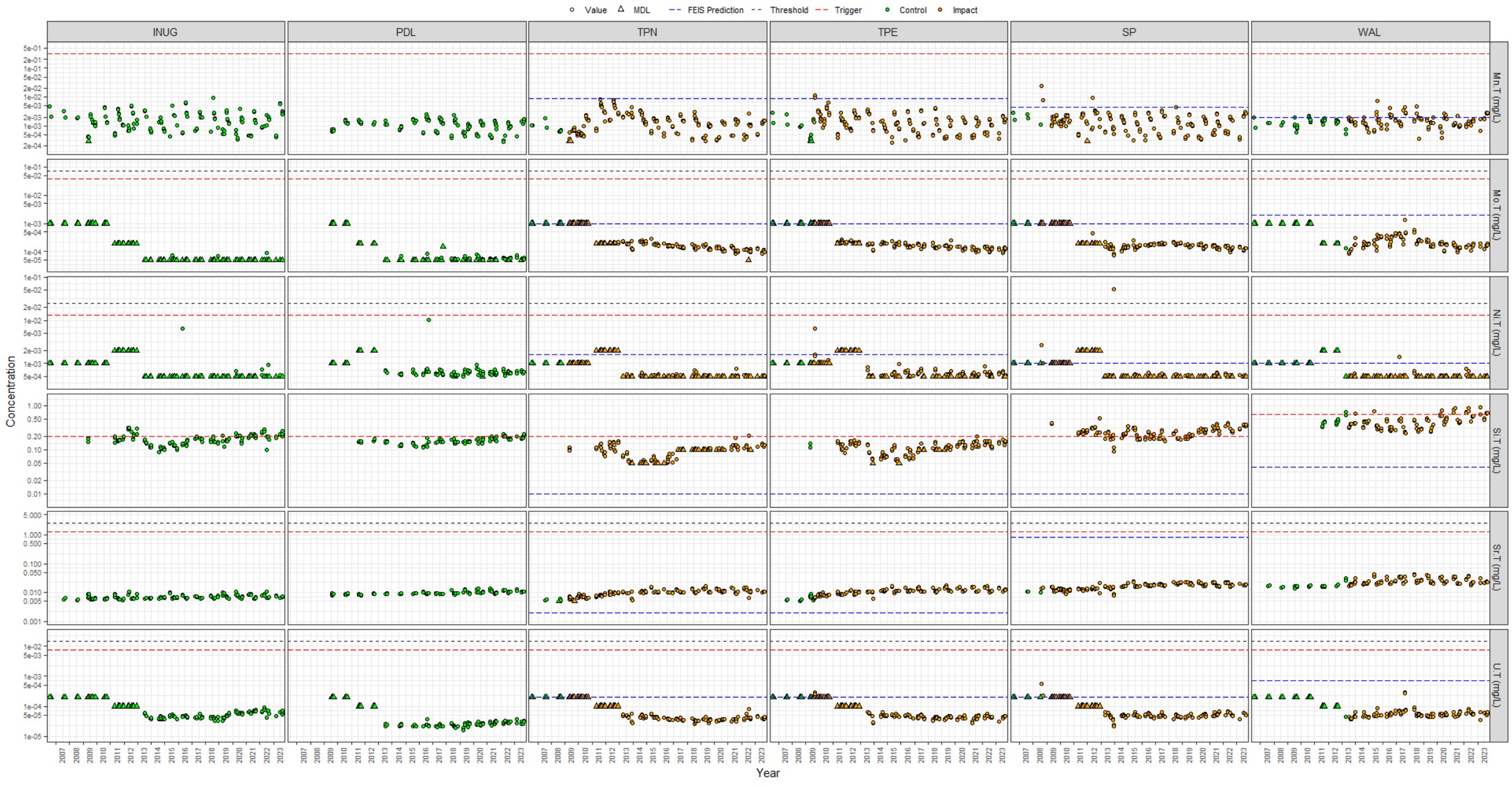
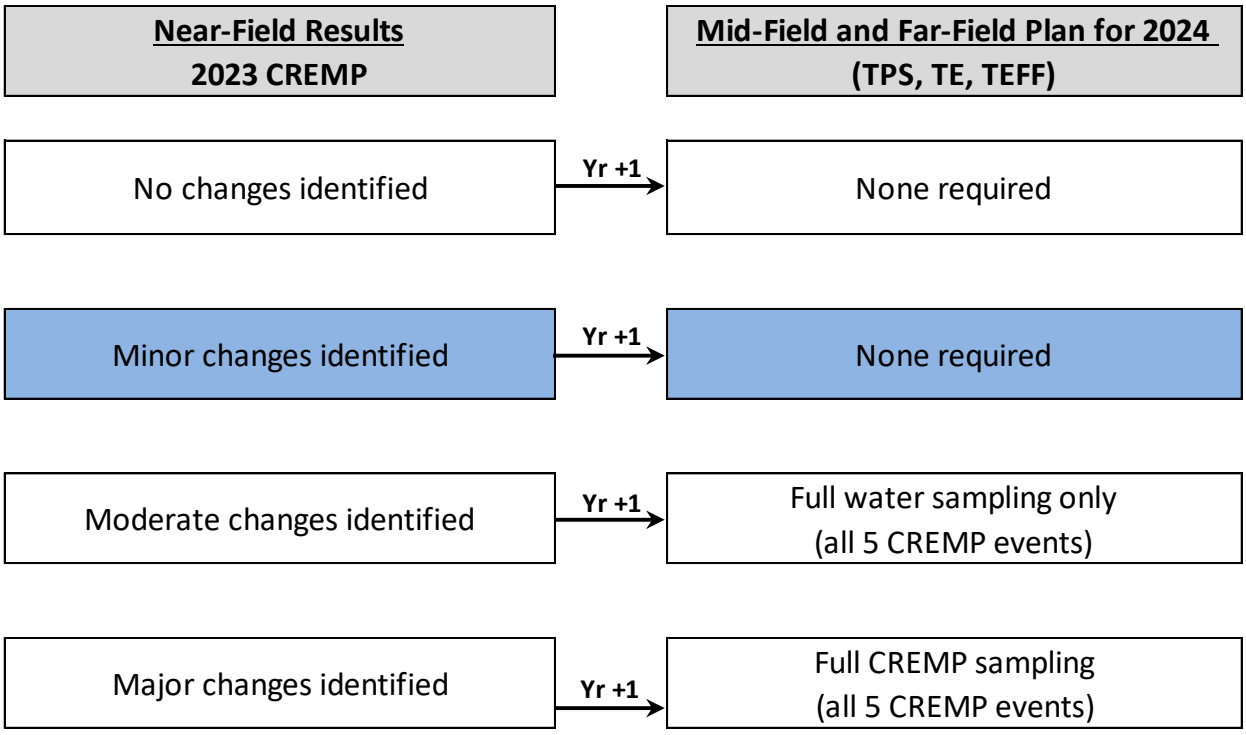


Figure 4-12. Flow chart showing sampling effort and frequency plan for mid-field and far-field sampling in 2024.

Note: Blue-shaded cells show the linkage between 2023 CREMP results and the sampling effort and frequency for mid-field and far-field sampling in 2024. *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.



Phytoplankton Tables and Figures

Table 4-7. Results of the BACI test for phytoplankton variables at Meadowbank areas, 2023.

Parameter Measured	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
Total Biomass	TPN	7	2	0.66	0.29	**0.054**	94	-1	282
	TPE	8	2	0.44	0.20	**0.062**	56	-3	150
	SP	6	2	0.38	0.33	0.295	46	-35	230
	WAL	19	2	0.62	0.30	**0.050**	86	0	248
Taxa Richness	TPN	7	2	-0.09	0.12	0.471	-9	-31	21
	TPE	8	2	-0.07	0.06	0.290	-7	-19	7
	SP	6	2	-0.07	0.12	0.581	-7	-30	24
	WAL	19	2	-0.03	0.09	0.726	-3	-20	17

Notes:

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

Shaded cells indicate positive (increased) 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 2023).

Estimate = BACI model estimate of the 2023 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 4-13. Chlorophyll-a (µg/L) in water samples from Meadowbank study area lakes since 2006.

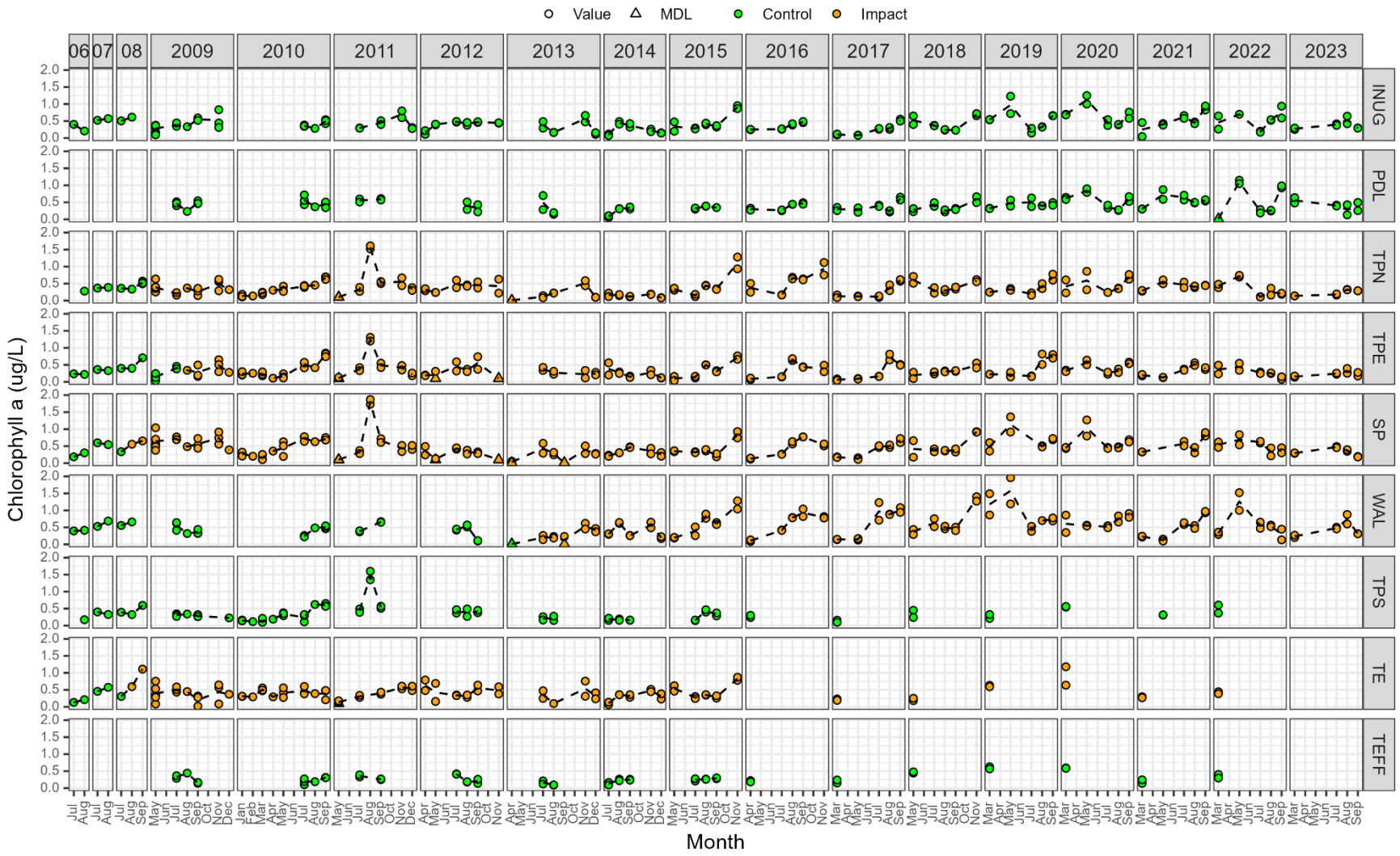


Figure 4-14. Total phytoplankton biomass (mg/m^3) from Meadowbank study area lakes since 2006.

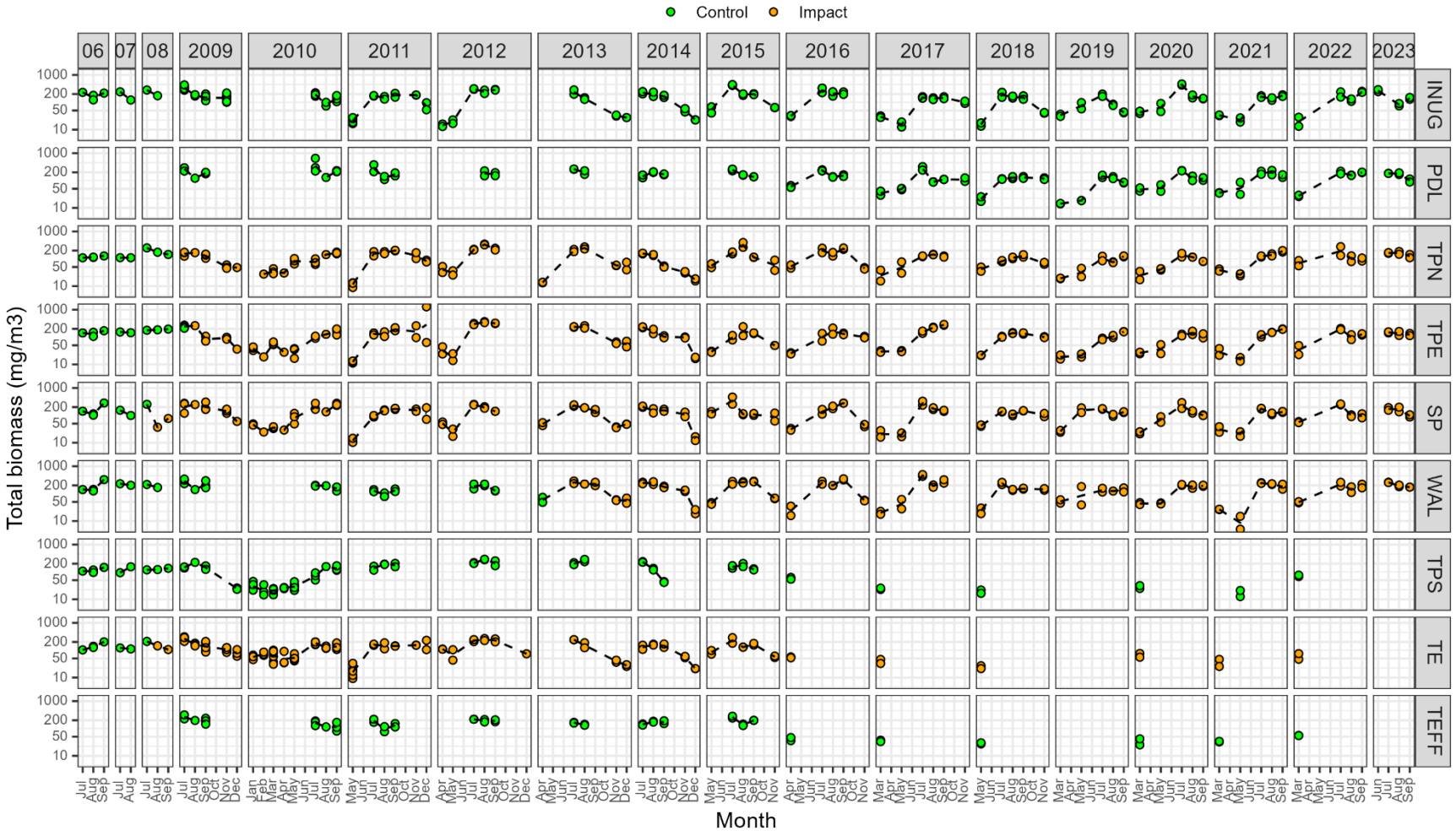


Figure 4-15. Phytoplankton biomass (mg/m^3) by major taxa from Meadowbank study area lakes since 2006.

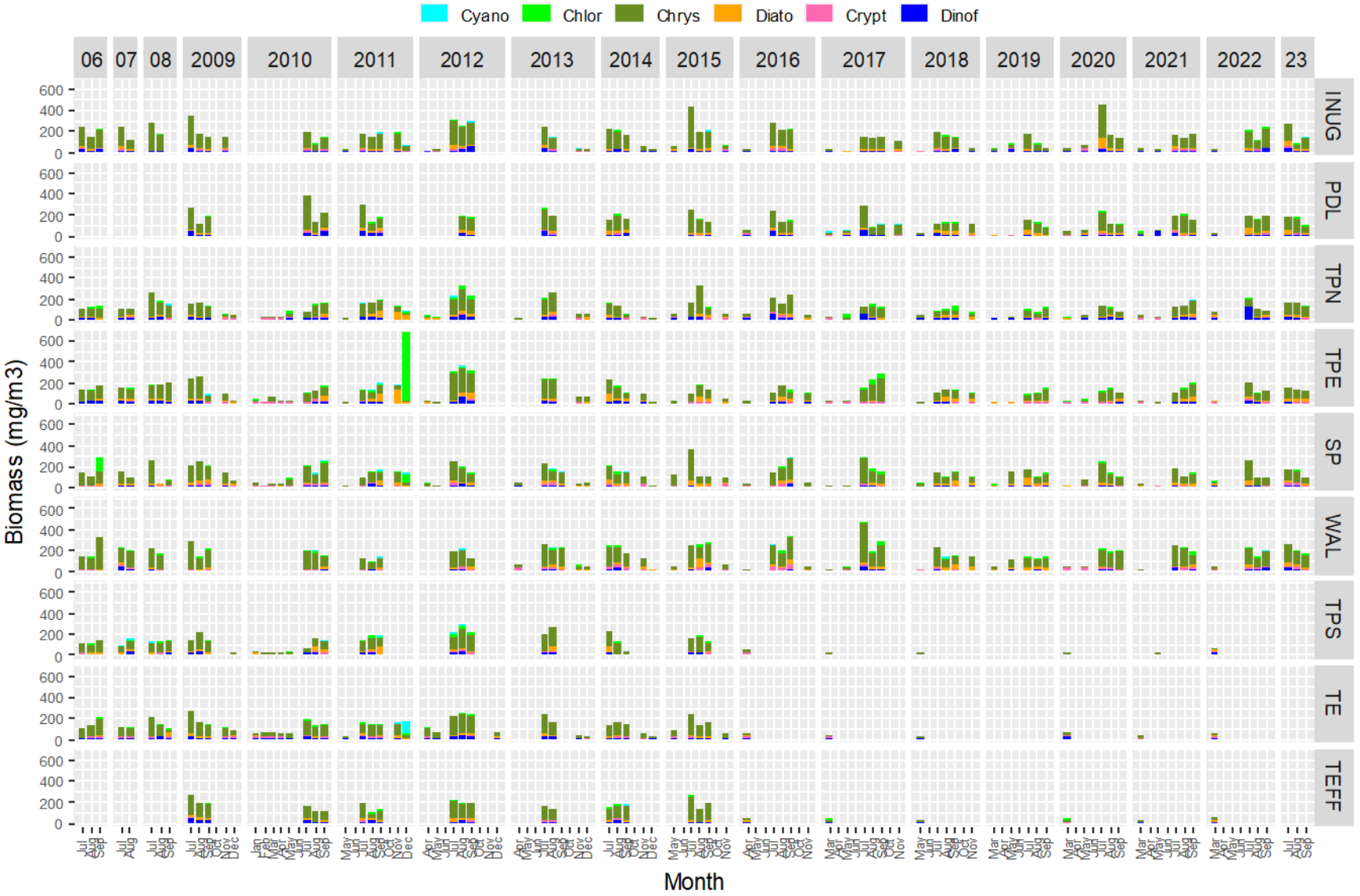


Figure 4-16. Relative phytoplankton biomass by major taxa group from Meadowbank study area lakes since 2006.

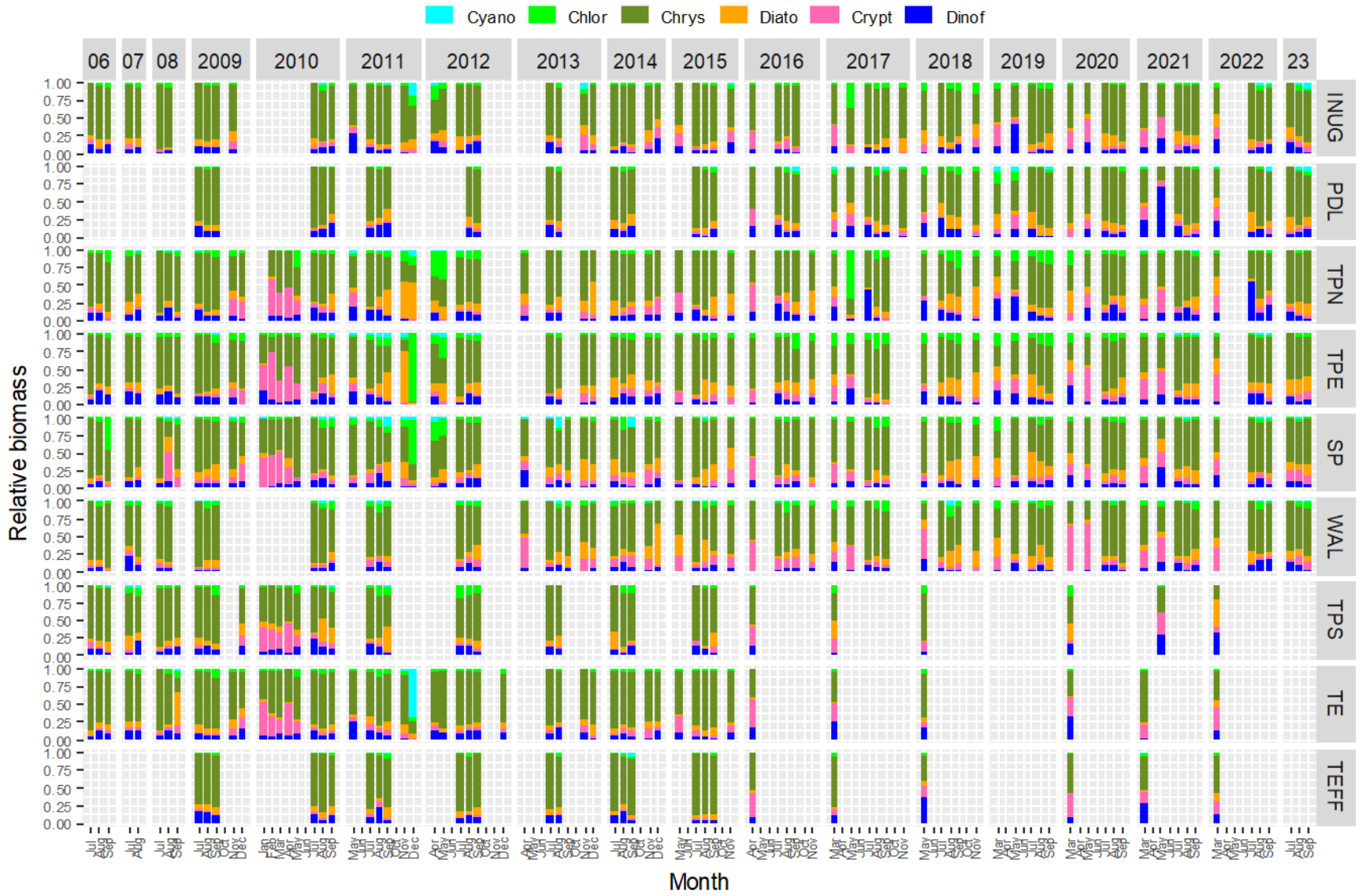
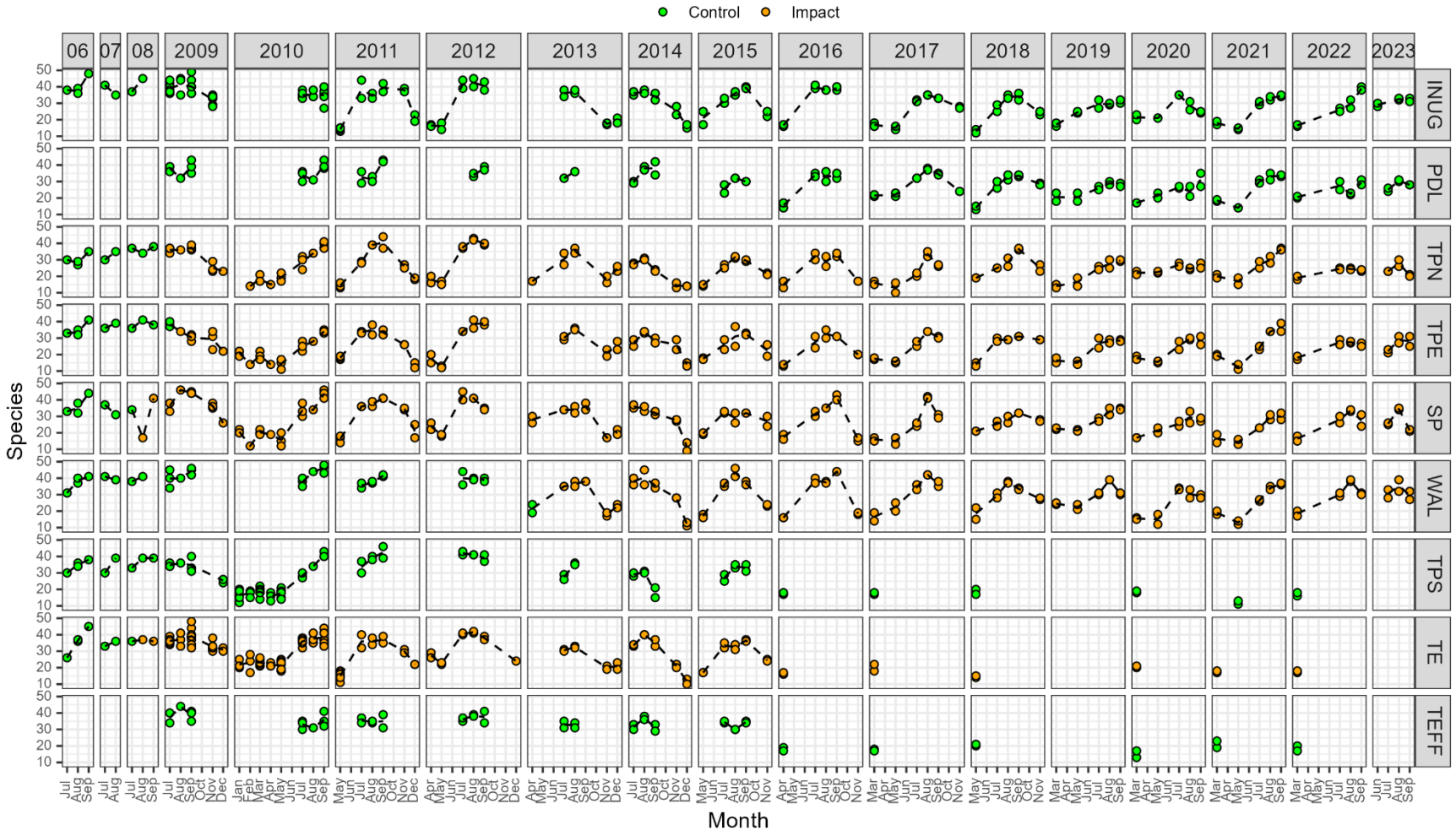


Figure 4-17. Phytoplankton species richness from Meadowbank study area lakes since 2006.



Sediment Chemistry Tables and Figures

Table 4-8. Sediment core metals at the Meadowbank study area lakes for which the 2023 mean concentration exceeded the trigger.

Meadowbank Study Areas [1]

Parameter	Trigger	2023 Mean		
		TPN	TPE	SP
		NF	NF	NF
Arsenic	121	-	-	-
Cadmium	1.1	-	-	-
Chromium	135	-	136	-
Copper	83	-	-	-
Lead	25	-	-	-
Mercury	0.10	-	-	-
Zinc	114	-	-	-

Wally Lake

Parameter	Trigger	2023 Mean
Arsenic	45	-
Cadmium	0.66	-
Chromium	61	-
Copper	257	-
Lead	37	-
Mercury	0.12	-
Zinc	142	-

Notes:

"-" indicates mean annual concentration was < the trigger value.

Reported mean values are all in units of mg/kg dw (mean of 10 replicate sediment core samples).

Table 4-9. Results of the before-after statistical analysis of sediment core chemistry data at the Meadowbank study area lakes, 2023.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	P-value[1]	DF	Proportional change		
								exp(Est)	LCI	UCI
Chromium	TPE	30	10	0.45	0.073	**<0.001**	38	1.6	1.4	1.8

Notes:

1. **Bolded** values are p-values < 0.05.

Test area in 2023 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 2023).

Estimate = BA model estimate of the 2023 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 2023 relative to the *before* period.

DF = degrees of freedom.

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

Figure 4-18. TOC (%) in sediment from Meadowbank study lakes since 2007.

Notes: In 2021, a batch of sediment samples were not analyzed due to a sample receipt error by the laboratory. Missing results in 2021 correspond to samples that were discarded prior to analysis. No TOC was analyzed for INUG and PDL in 2022 due to high moisture content in the samples.

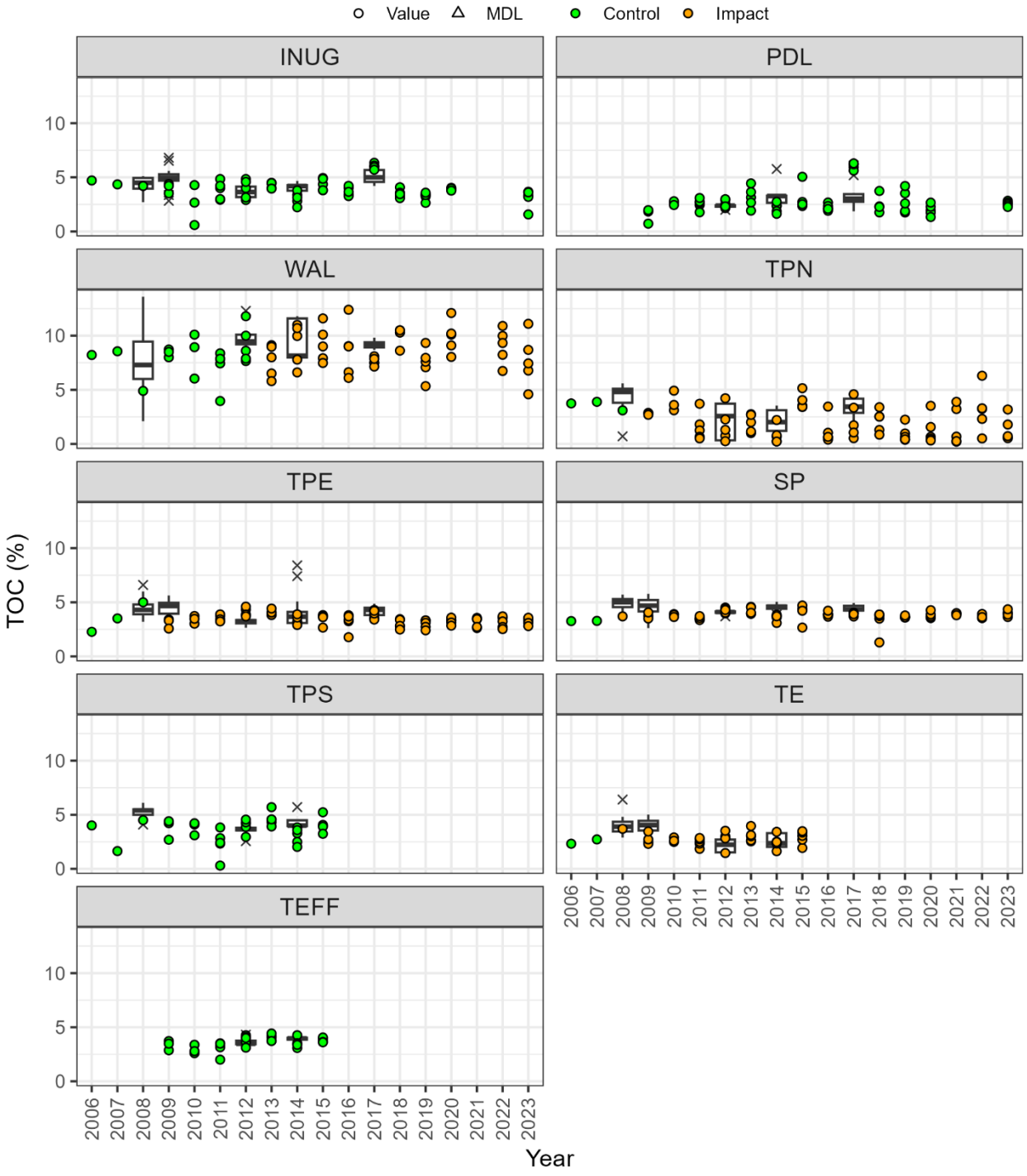


Figure 4-19. Sediment grain size in sediment samples from Meadowbank study lakes since 2007.

Notes: No grain size was analyzed for INUG and PDL in 2022 due to high moisture content in the samples. Grain size was not analyzed in WAL in 2021 as the sediment was discarded prior to analysis (see **Appendix A2** in Azimuth, 2023a).

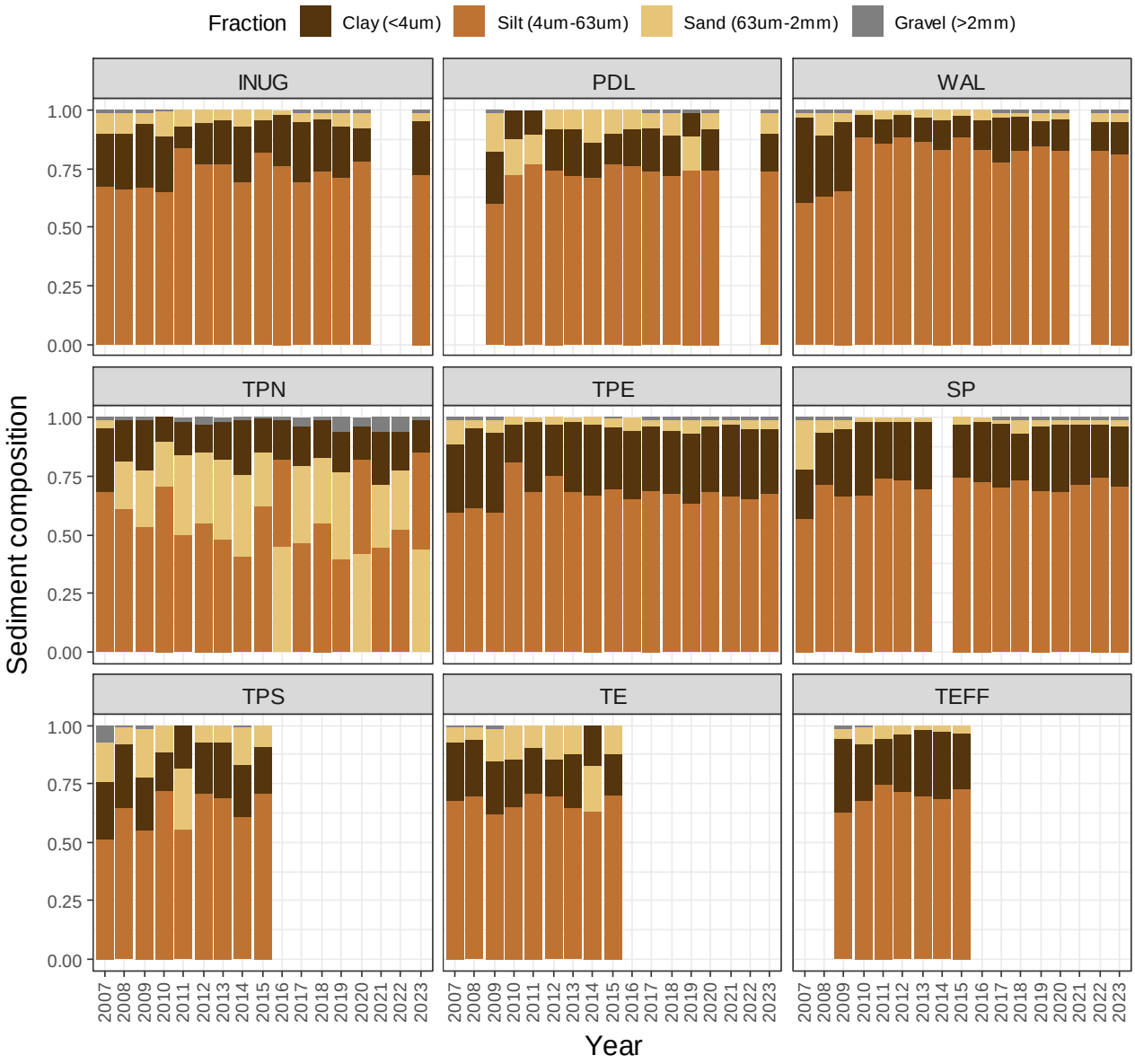


Figure 4-20. Total aluminum (mg/kg dw) in sediment samples (grabs & cores) from Meadowbank study area lakes since 2006.

Note: Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

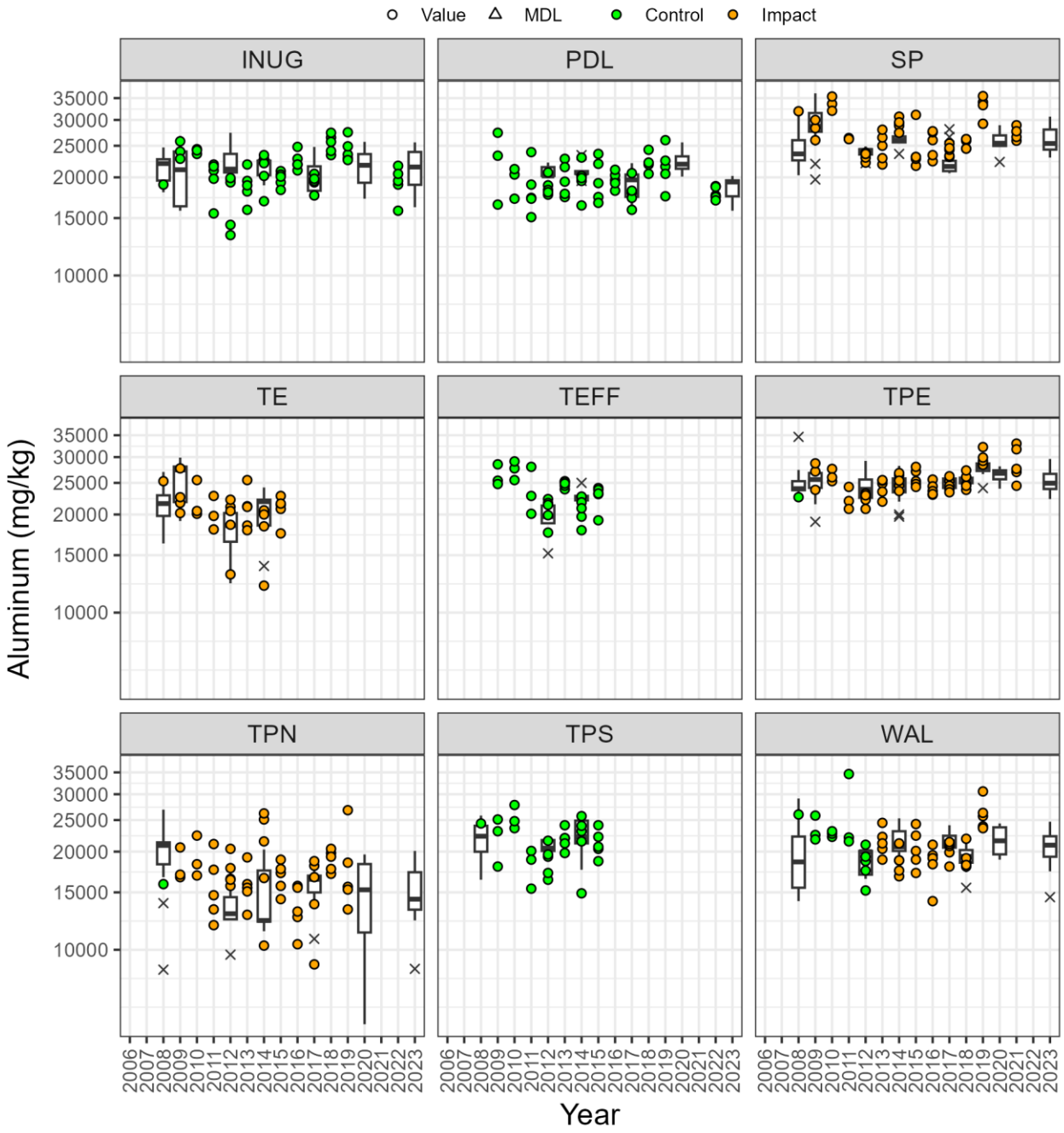


Figure 4-21. Total arsenic (mg/kg dw) in sediment samples (grabs & cores) from Meadowbank study area lakes since 2006.

Note: The red dashed line = trigger value. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

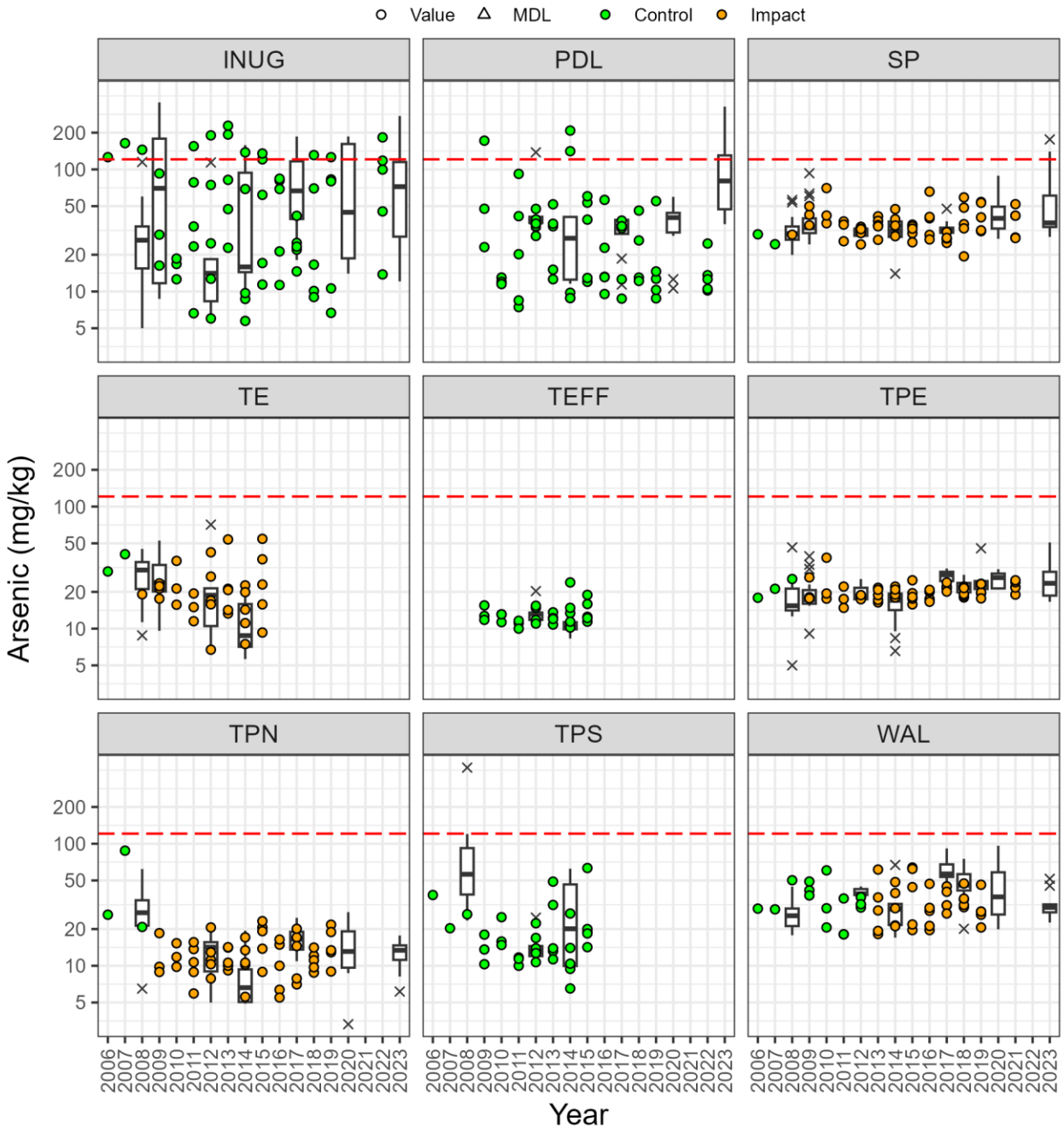


Figure 4-22. Total cadmium (mg/kg dw) in sediment samples (grabs & cores) from Meadowbank study area lakes since 2006.

Note: The red dashed line = trigger value. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

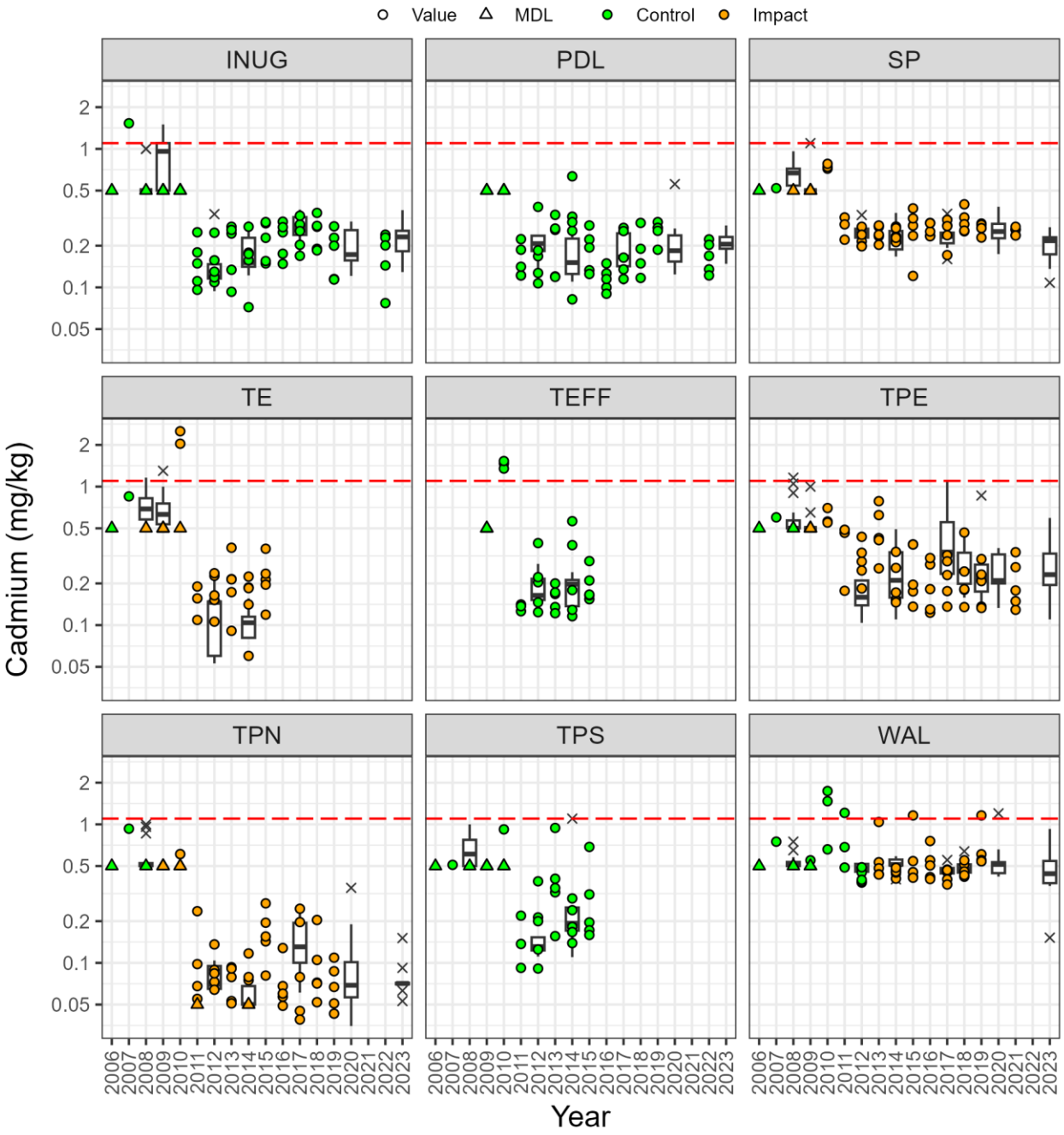


Figure 4-23. Total chromium (mg/kg dw) in sediment samples (grabs & cores) from Meadowbank study area lakes since 2006.

Note: The red dashed line = trigger value. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

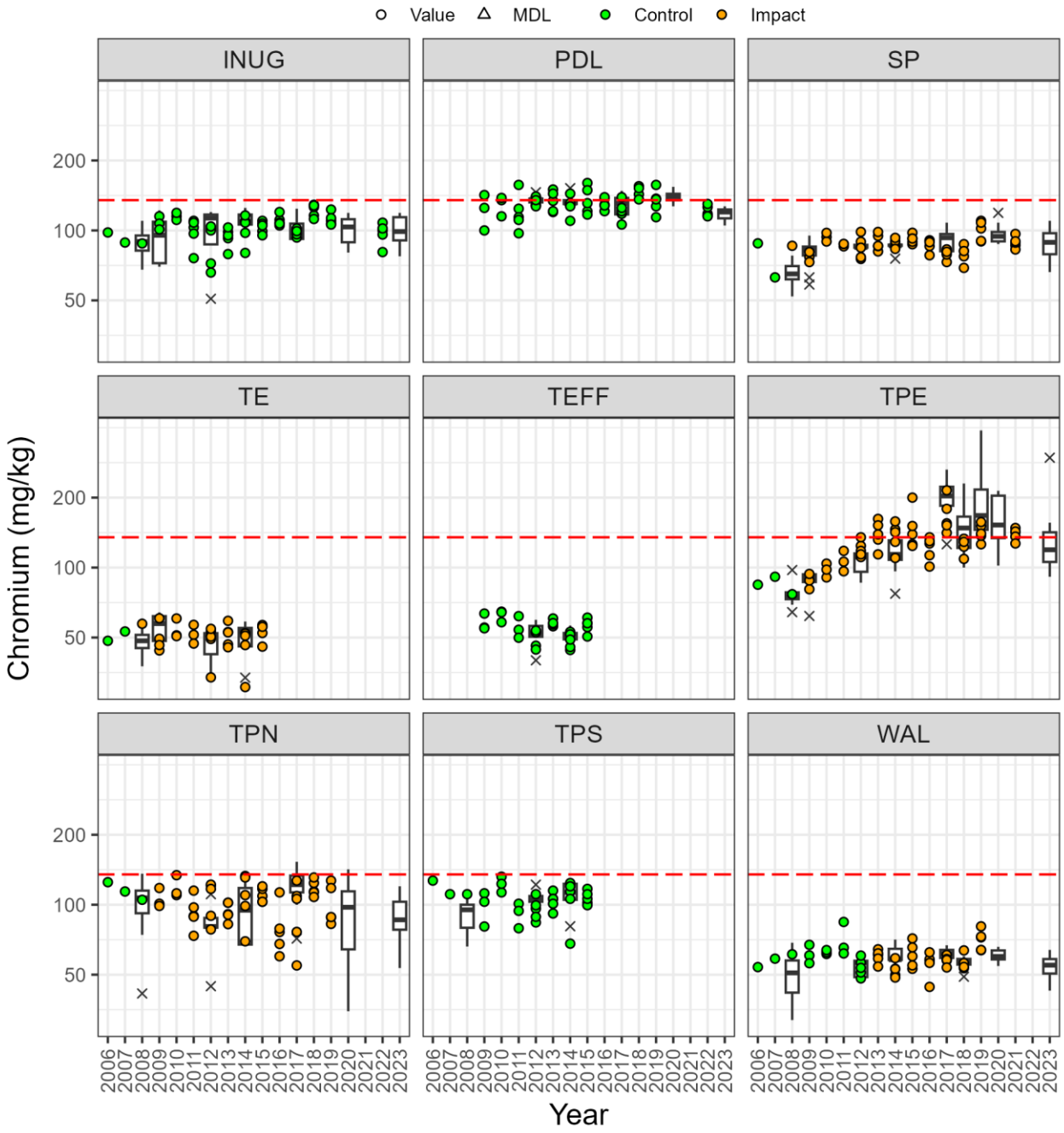


Figure 4-24. Total copper (mg/kg dw) in sediment samples (grabs & cores) from Meadowbank study area lakes since 2006.

Note: The red dashed line = trigger value. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

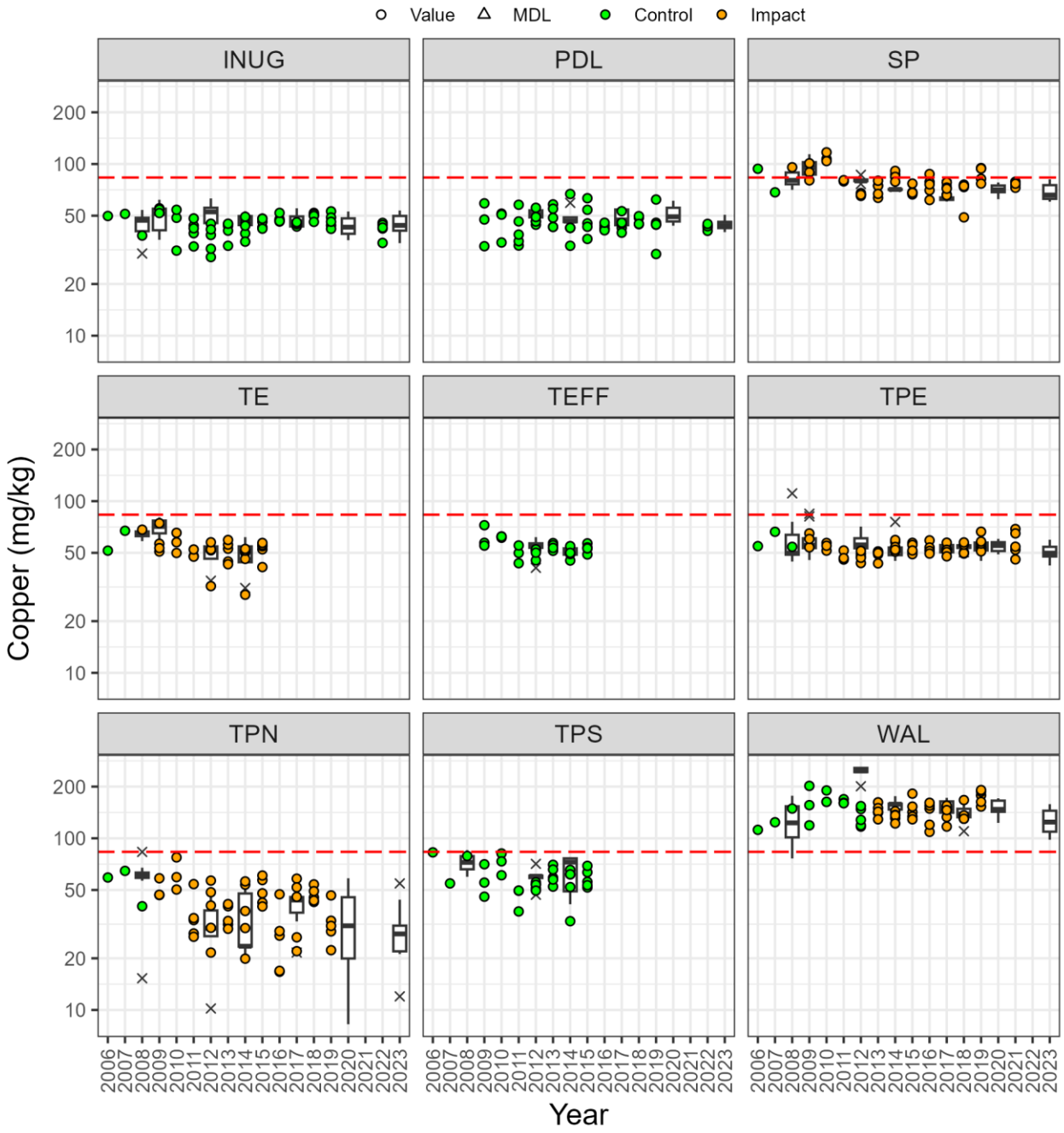


Figure 4-25. Total lead (mg/kg dw) in sediment samples (grabs & cores) from Meadowbank study area lakes since 2006.

Note: The red dashed line = trigger value. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

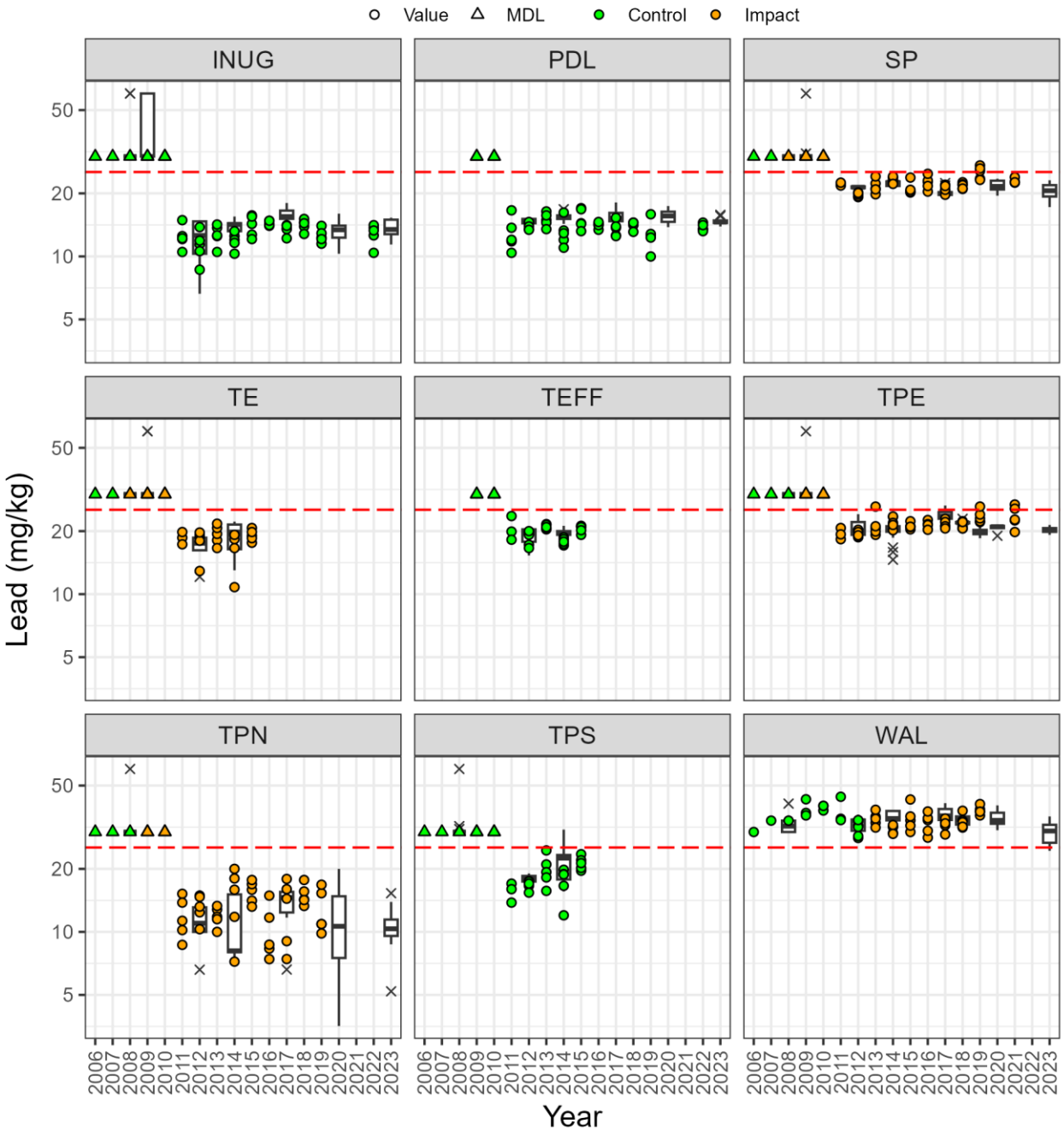


Figure 4-26. Total mercury (mg/kg dw) in sediment samples (grabs & cores) from Meadowbank study area lakes since 2006.

Note: The red dashed line = trigger value. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations. The detection limit for mercury was adjusted in 2019 from 0.005 mg/L to 0.05 mg/L. These changes are notable on this plot for all study areas if mercury concentrations are below 0.05 mg/L. This adjustment does not impact trigger screening.

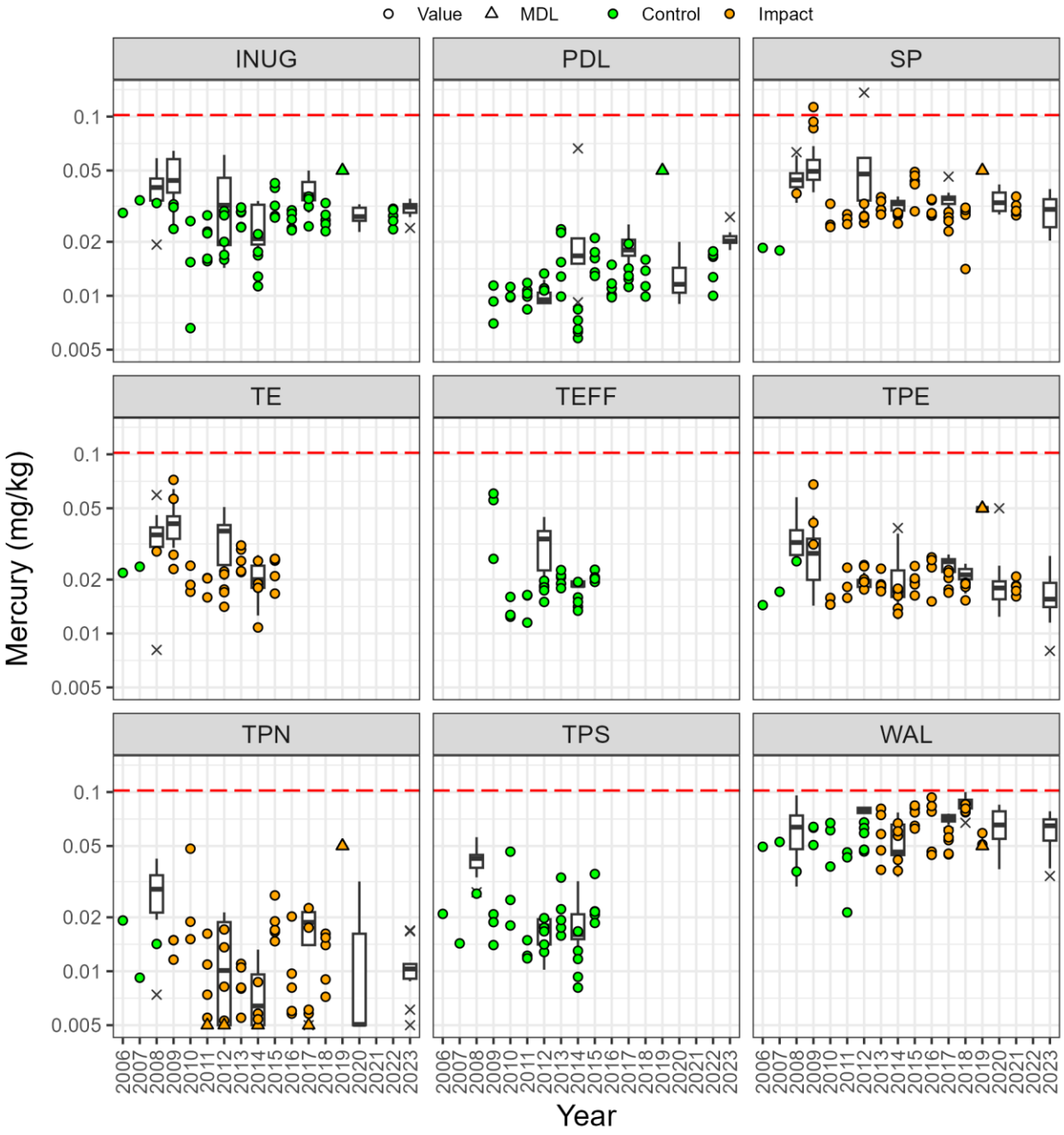
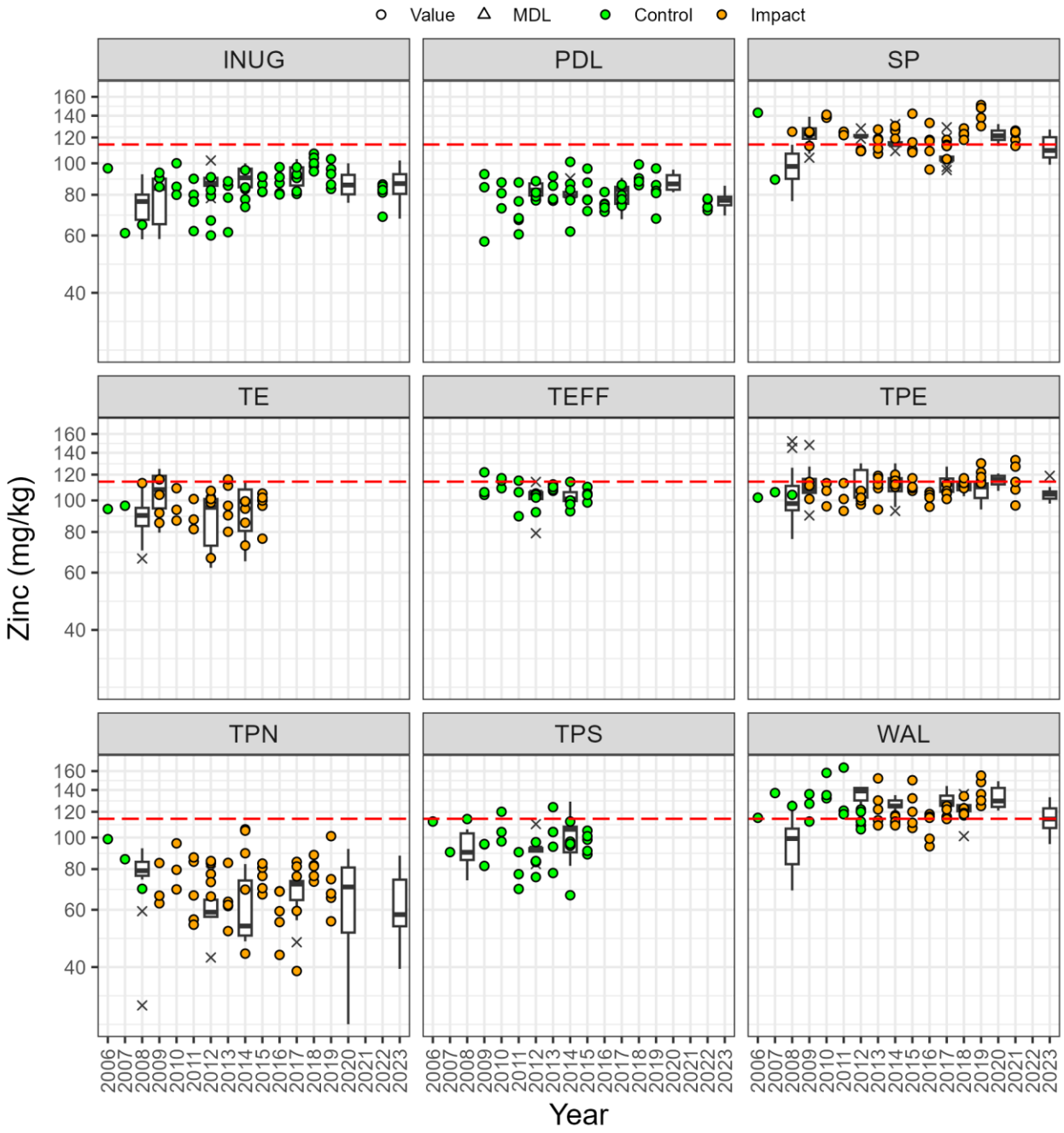


Figure 4-27. Total zinc (mg/kg dw) in sediment samples (grabs & cores) from Meadowbank study area lakes since 2006.

Note: The red dashed line = trigger value. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.



Benthic Invertebrate Tables and Figures

Table 4-10. Geometric means for total abundance and total richness, Meadowbank study lakes.

Geometric means for total abundance[1]																		
Test Area	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
INUG	731 (16)	975 (14)	1300 (10)	1129 (11)	628 (17)	881 (15)	1042 (13)	1975 (3)	621 (18)	1648 (6)	2100 (1)	1712 (4)	1497 (7)	1452 (8)	2055 (2)	1398 (9)	1070 (12)	1656 (5)
PDL	NA	NA	NA	1522 (1)	776 (13)	927 (10)	942 (9)	1279 (3)	473 (15)	1127 (4)	1373 (2)	748 (14)	779 (12)	990 (6)	951 (8)	829 (11)	963 (7)	1045 (5)
WAL	12894 (2)	4357 (6)	1057 (17)	1834 (11)	1727 (13)	800 (18)	1874 (10)	1445 (16)	2222 (9)	1568 (14)	14253 (1)	4942 (5)	12035 (3)	1761 (12)	6117 (4)	1524 (15)	4065 (7)	2798 (8)
TPN	NA	1359 (6)	864 (13)	1214 (8)	1029 (11)	498 (16)	1141 (9)	1407 (5)	373 (17)	3025 (1)	1696 (4)	1309 (7)	2051 (3)	594 (15)	1075 (10)	2283 (2)	917 (12)	610 (14)
TPE	3220 (6)	1563 (17)	5556 (1)	1663 (15)	1126 (18)	1584 (16)	3915 (2)	2244 (13)	2827 (8)	2765 (10)	2787 (9)	3147 (7)	2485 (11)	3490 (4)	3224 (5)	3505 (3)	2379 (12)	1767 (14)
SP	619 (15)	842 (12)	395 (17)	771 (14)	241 (18)	563 (16)	1169 (10)	2279 (2)	2796 (1)	1927 (4)	1420 (6)	2058 (3)	1298 (8)	842 (13)	1631 (5)	1222 (9)	1055 (11)	1299 (7)
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	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	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	NA	NA	NA	NA

Geometric means for total richness																		
Test Area	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
INUG	11 (16)	12 (12)	14 (6)	14 (7)	9 (18)	11 (15)	11 (14)	16 (3)	10 (17)	13 (10)	16 (2)	14 (5)	15 (4)	14 (8)	17 (1)	13 (9)	13 (11)	12 (13)
PDL	NA	NA	NA	11 (1)	9 (9)	10 (5)	8 (12)	10 (3)	5 (15)	9 (6)	11 (2)	10 (4)	6 (14)	9 (10)	9 (11)	8 (13)	9 (7)	9 (8)
WAL	12 (7)	14 (4)	8 (17)	11 (12)	11 (15)	7 (18)	12 (8)	11 (13)	11 (11)	11 (16)	15 (3)	14 (4)	15 (2)	12 (10)	16 (1)	12 (9)	14 (6)	11 (14)
TPN	NA	10 (10)	8 (16)	9 (12)	11 (8)	8 (15)	11 (9)	13 (3)	6 (17)	11 (7)	13 (3)	13 (5)	13 (2)	9 (13)	10 (11)	15 (1)	12 (6)	9 (14)
TPE	9 (18)	11 (15)	15 (4)	12 (13)	10 (16)	10 (17)	13 (10)	14 (6)	11 (14)	15 (5)	14 (7)	13 (10)	13 (9)	16 (1)	16 (2)	15 (3)	13 (8)	13 (12)
SP	7 (17)	10 (14)	8 (16)	8 (15)	5 (18)	11 (13)	13 (6)	12 (7)	14 (4)	13 (5)	16 (1)	12 (8)	11 (10)	11 (12)	15 (2)	14 (3)	11 (11)	12 (9)
TPS	11 (5)	10 (8)	11 (3)	11 (3)	9 (9)	8 (10)	11 (6)	11 (7)	11 (2)	17 (1)	NA	NA	NA	NA	NA	NA	NA	NA
TE	5 (10)	9 (5)	10 (2)	8 (7)	6 (9)	6 (8)	9 (4)	8 (6)	9 (3)	13 (1)	NA	NA	NA	NA	NA	NA	NA	NA
TEFF	NA	NA	NA	11 (3)	11 (2)	9 (6)	9 (7)	10 (5)	11 (3)	12 (1)	NA	NA	NA	NA	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 4-11. 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
2023	TPN	2	1	-0.96	0.47	0.29	-62	-100	14,048
	TPE	3	1	-1.05	0.67	0.26	-65	-98	517
	SP	2	1	-0.09	0.30	0.82	-8	-98	3,939
	WAL	7	1	-0.32	0.98	0.76	-27	-93	700
2022-23	TPN	2	2	-0.54	0.40	0.31	-42	-90	229
	TPE	3	2	-0.68	0.51	0.28	-50	-90	159
	SP	2	2	0.03	0.26	0.93	3	-66	212
	WAL	7	2	0.09	0.69	0.90	9	-79	457
2021-23	TPN	2	3	-0.18	0.57	0.77	-17	-86	405
	TPE	3	3	-0.52	0.43	0.30	-40	-82	98
	SP	2	3	0.02	0.24	0.93	2	-52	120
	WAL	7	3	-0.19	0.58	0.75	-18	-78	212
2020-23	TPN	2	4	-0.29	0.49	0.59	-25	-81	193
	TPE	3	4	-0.55	0.36	0.19	-42	-77	47
	SP	2	4	0.00	0.22	0.99	0	-45	82
	WAL	7	4	-0.08	0.52	0.88	-8	-72	201

Notes:

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

Shaded cells indicate positive (increased) or negative (reduced) effect sizes 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 = 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.

Table 4-12. 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
2023	TPN	2	1	0.10	0.25	0.76	10	-95	2,469
	TPE	3	1	0.12	0.15	0.51	13	-41	117
	SP	2	1	0.32	0.21	0.37	38	-91	1,913
	WAL	7	1	-0.03	0.31	0.94	-3	-54	107
2022-23	TPN	2	2	0.23	0.19	0.36	26	-45	188
	TPE	3	2	0.14	0.12	0.34	14	-22	68
	SP	2	2	0.27	0.16	0.23	31	-34	159
	WAL	7	2	0.07	0.22	0.75	7	-36	80
2021-23	TPN	2	3	0.33	0.21	0.21	39	-28	171
	TPE	3	3	0.16	0.11	0.22	17	-13	57
	SP	2	3	0.31	0.14	0.12	37	-13	116
	WAL	7	3	0.03	0.18	0.89	3	-32	55
2020-23	TPN	2	4	0.21	0.23	0.42	23	-35	132
	TPE	3	4	0.13	0.09	0.24	13	-11	44
	SP	2	4	0.29	0.13	**0.08**	34	-5	91
	WAL	7	4	0.03	0.16	0.85	3	-28	47

Notes:

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

Shaded cells indicate positive (increased) or negative (reduced) effect sizes 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 = 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 4-28. Benthic invertebrate total abundance (#/m^2) from Meadowbank study area lakes since 2006.

Notes: Meadowbank areas TPS, TE, and TEFF have not been sampled since 2015. For results from these areas from 2006 to 2015 see Azimuth 2021.

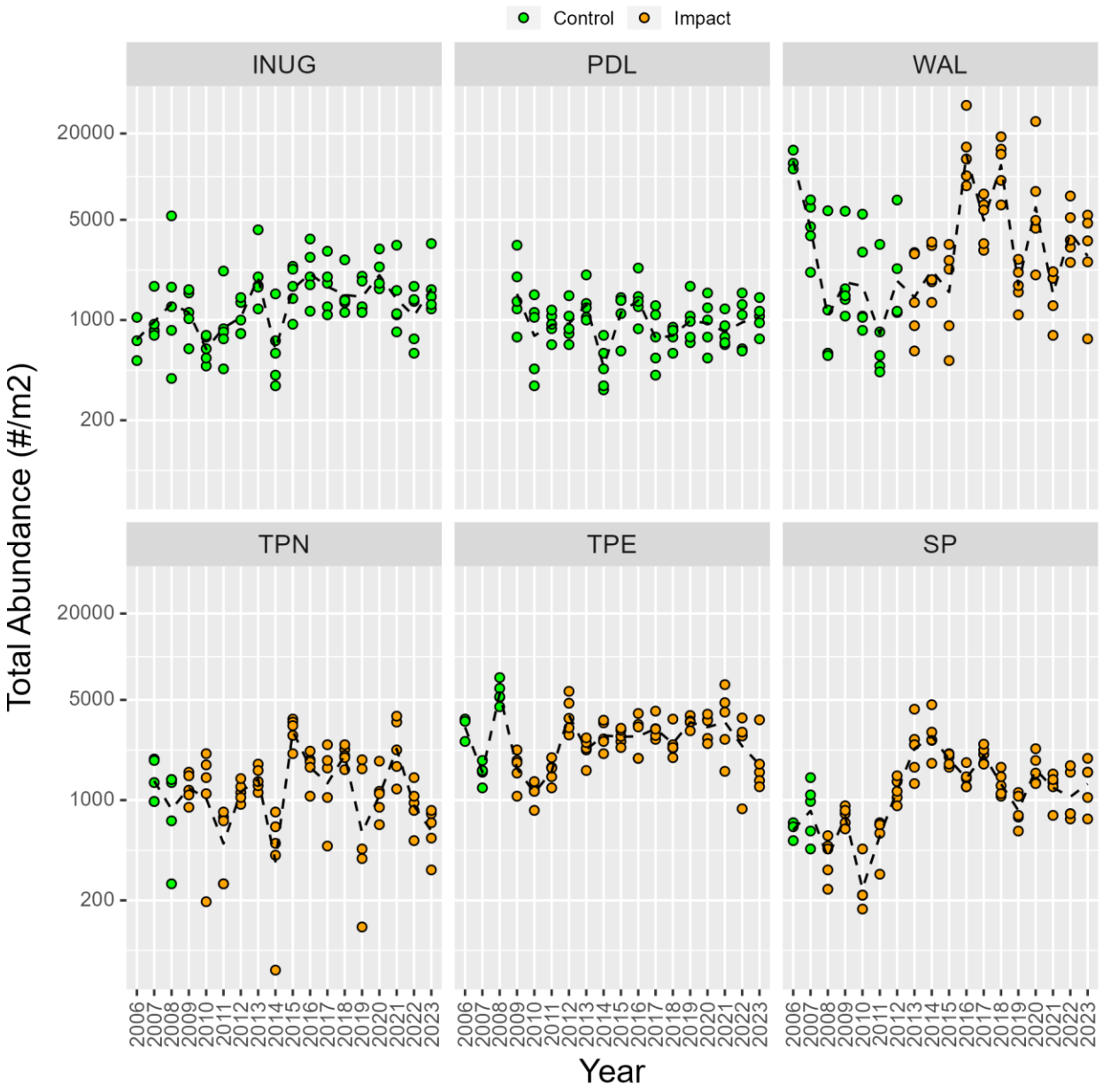


Figure 4-29. Benthic invertebrate abundance (#/m²) by major taxa from Meadowbank study area lakes since 2006.

Notes: Meadowbank areas TPS, TE, and TEFF have not been sampled since 2015. For results from these areas from 2006 to 2015 see Azimuth 2021.

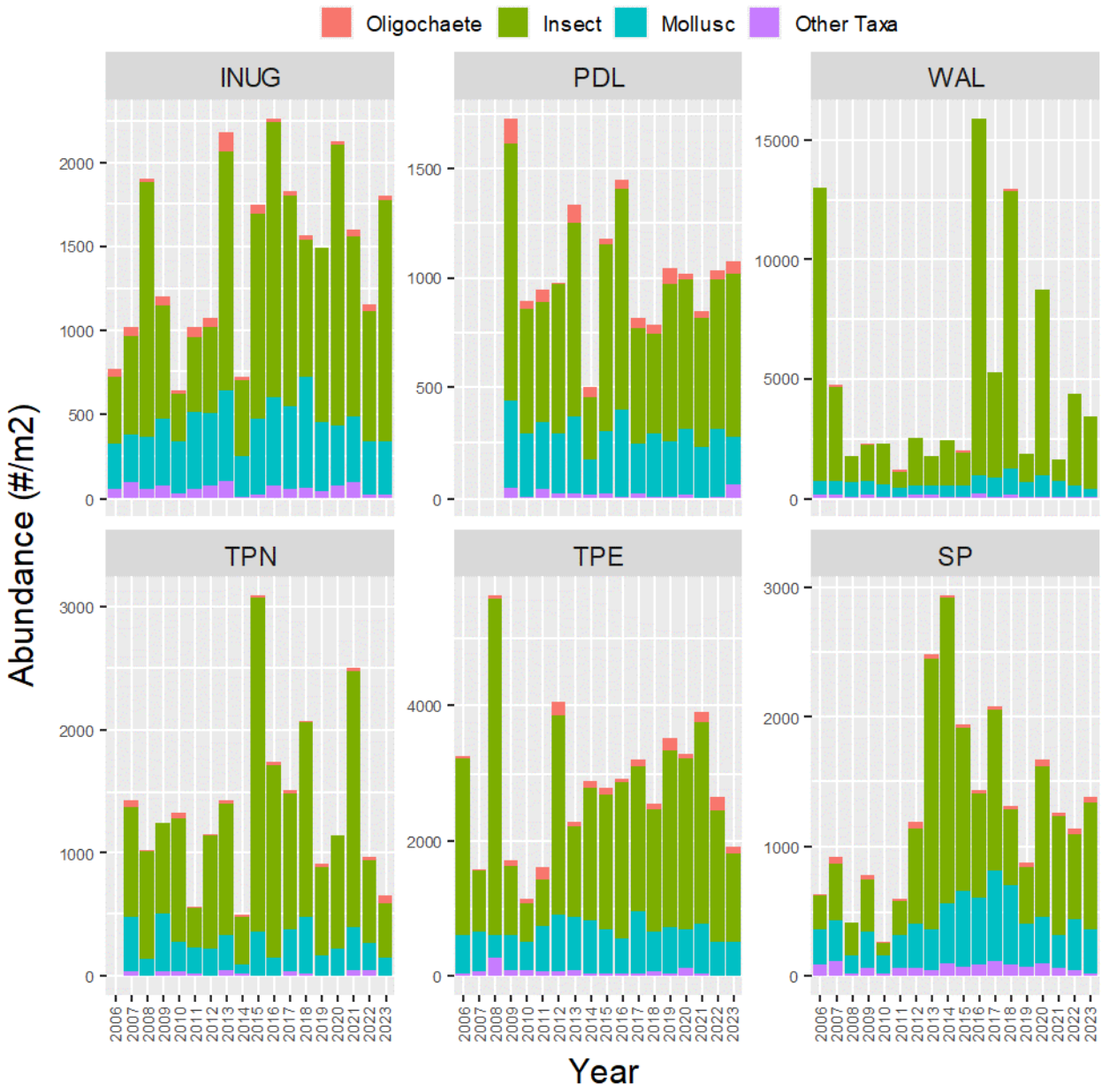


Figure 4-30. Benthic invertebrate relative abundance by major taxa from Meadowbank study area lakes since 2006.

Notes: Meadowbank areas TPS, TE, and TEFF have not been sampled since 2015. For results from these areas from 2006 to 2015 see Azimuth 2021.

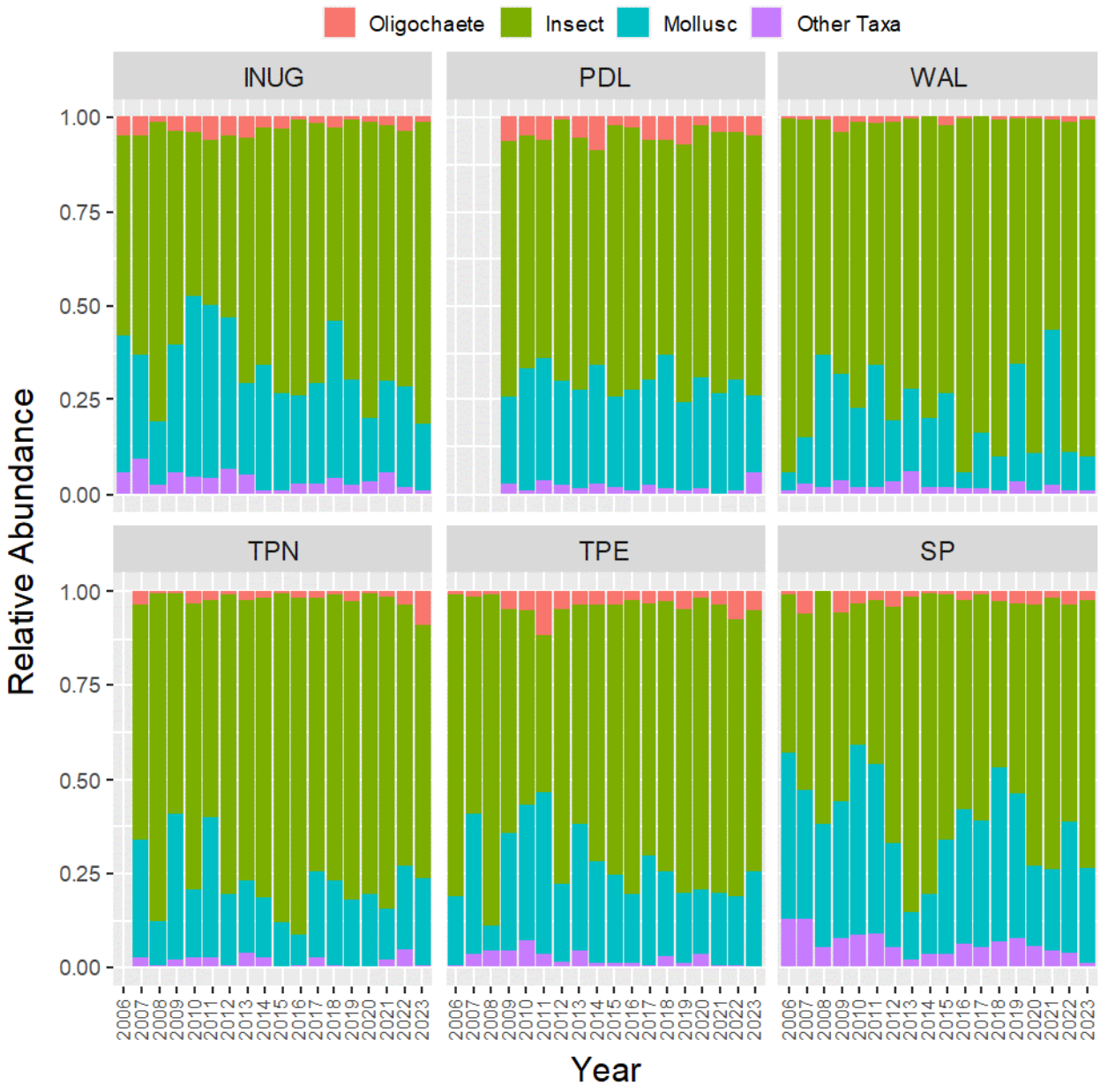


Figure 4-31. Benthic invertebrate total richness (# taxa) from Meadowbank study area lakes since 2006.

Notes: Meadowbank areas TPS, TE, and TEFF have not been sampled since 2015. For results from these areas from 2006 to 2015 see Azimuth 2021.

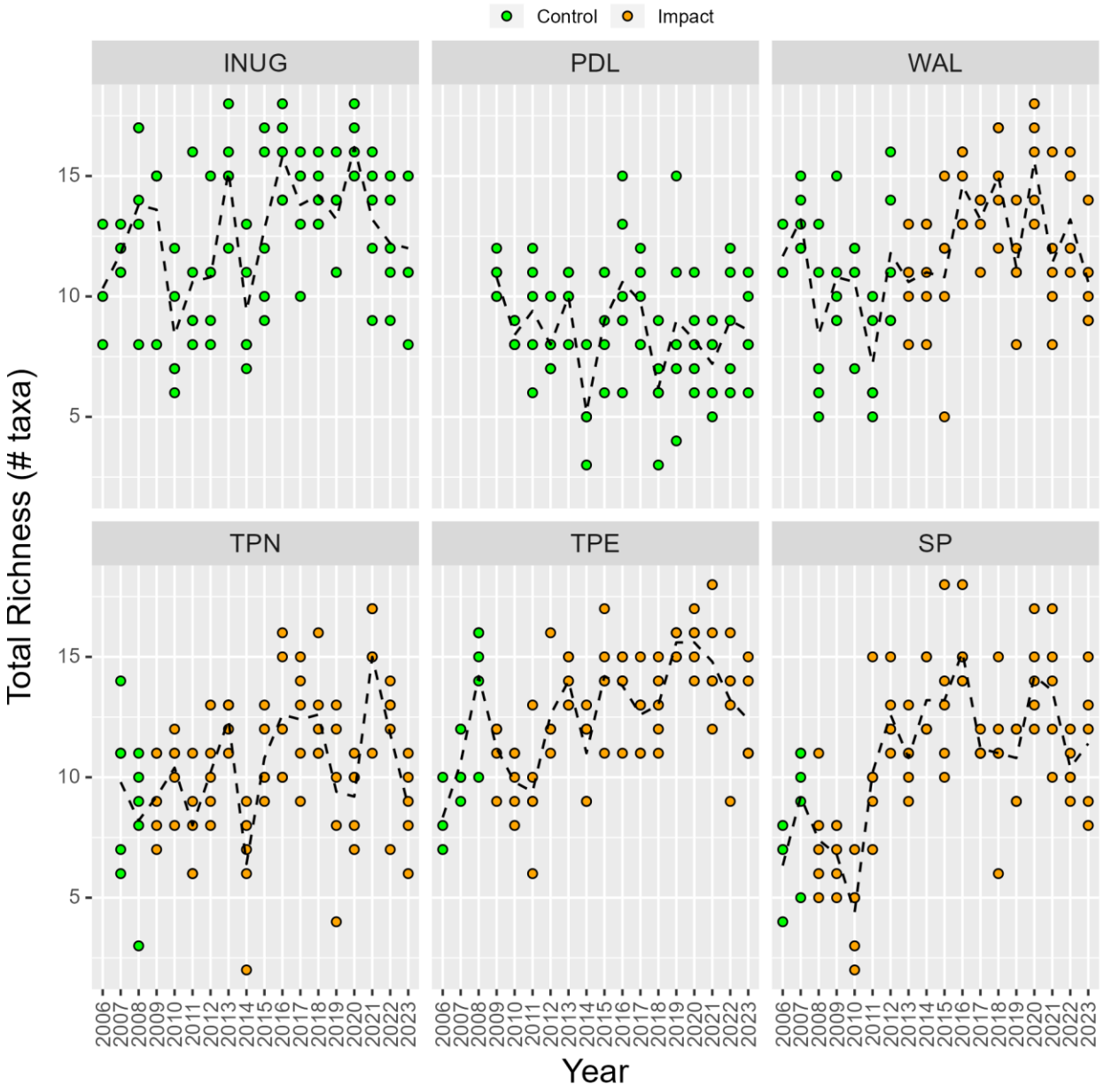


Figure 4-32. Benthic invertebrate richness (# taxa) by major taxa from Meadowbank study area lakes since 2006.

Notes: Meadowbank areas TPS, TE, and TEFF have not been sampled since 2015. For results from these areas from 2006 to 2015 see Azimuth 2021.

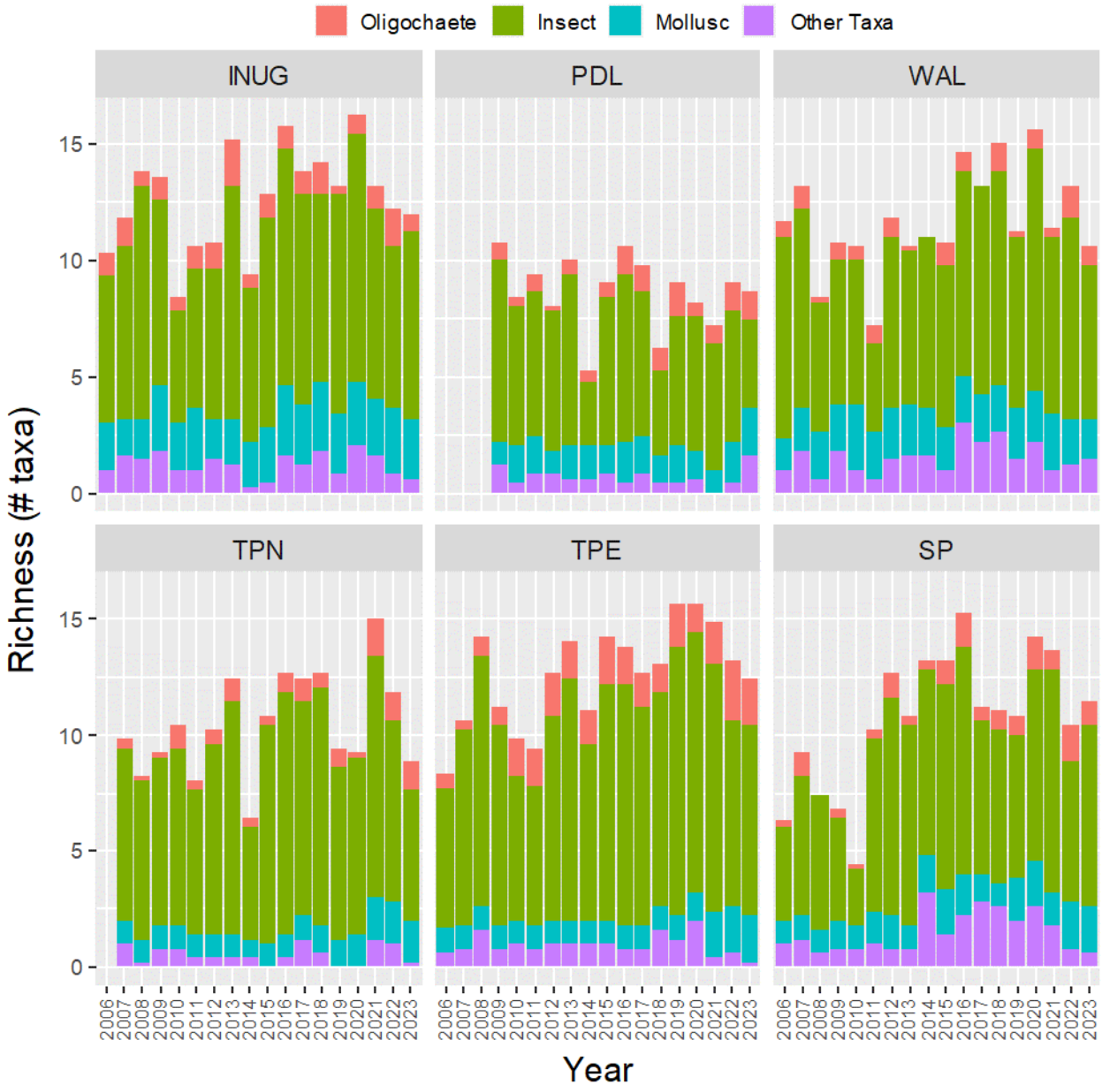
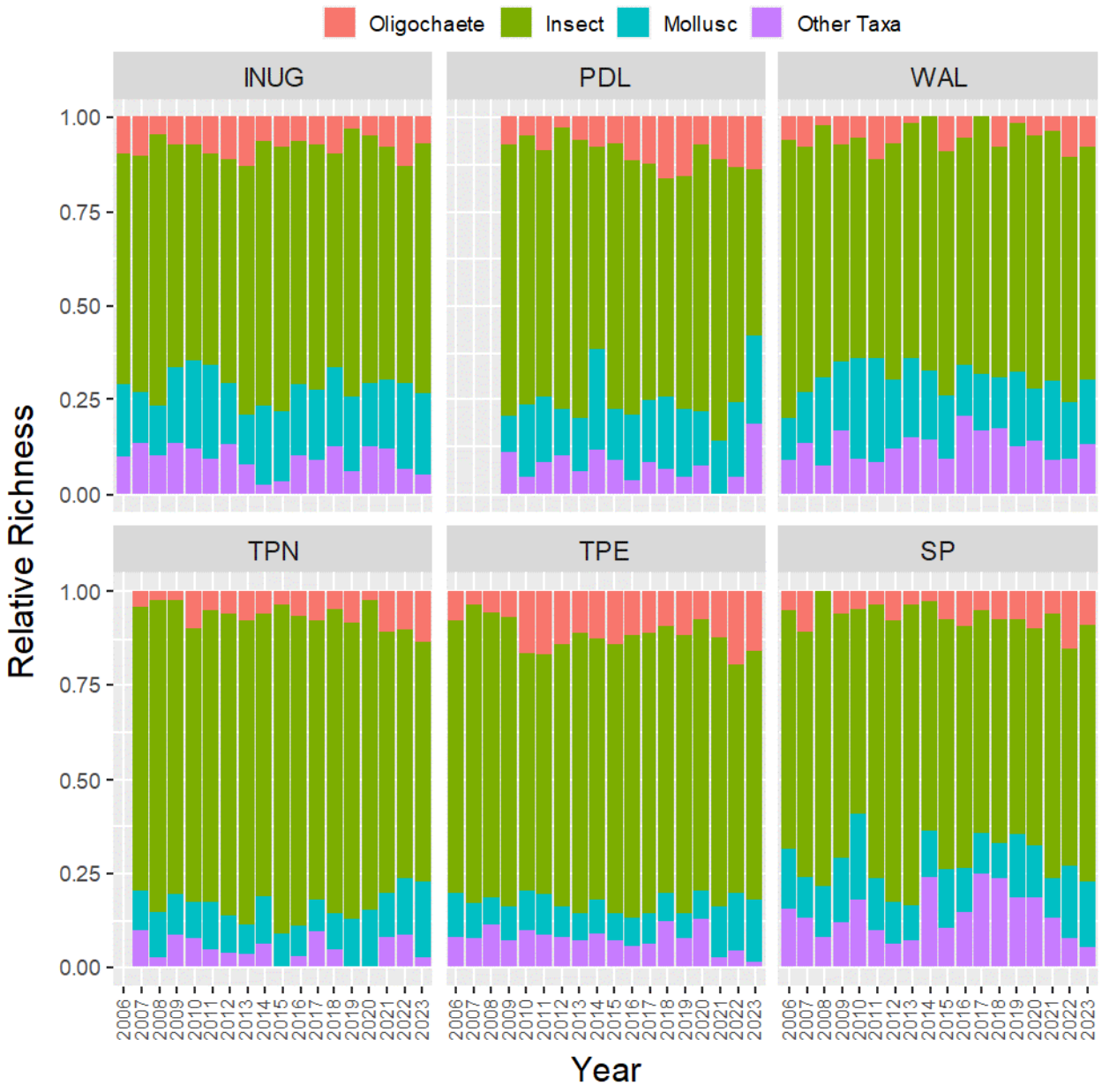


Figure 4-33. Benthic invertebrate relative richness by major taxa from Meadowbank study area lakes since 2006.

Notes: Meadowbank areas TPS, TE, and TEFF have not been sampled since 2015. For results from these areas from 2006 to 2015 see Azimuth 2021.



5 WHALE TAIL

5.1 Overview of the Whale Tail CREMP

This section presents findings from the 2023 CREMP for the Whale Tail study area lakes. The scope of the 2023 program included water quality, sediment chemistry, phytoplankton community, and benthic invertebrate community monitoring. Relevant figures and tables are organized at the end of the section, by study component.

Six lakes are currently included in the study design for monitoring mining-related changes downstream of the Whale Tail mine:

- **Near-field**: Whale Tail Lake – South Basin (WTS), Kangislulik Lake[30] (KAN/MAM), and Nemo Lake (NEM)
- **Mid-field**: Lake A20 and Lake A76
- **Far-field**: Lake DS1.

INUG and PDL are the primary reference areas for the Whale Tail CREMP. Locations where water sampling was done in 2023 are shown in **Figure 5-1**. Sediment and benthic invertebrate sampling areas are shown in **Figure 5-2**.

The landscape around the Whale Tail mine 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. Except for 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 Whale Tail mine in Watershed *C*, separated from WTS and KAN/MAM by a drainage divide to the north of Whale Tail Lake.

Construction of the Whale Tail Dike in 2018 to develop the Whale Tail Pit deposit altered the flow path and hydrology in the area to the south of Whale Tail Lake. Prior to construction of the Whale Tail Dike, water flowed from Lake A20 through WTS, KAN/MAM, Lake A76, and into Lake DS1. Construction of the dike and ensuing changes in the local hydrology raised the level of the south basin of Whale Tail Lake. Higher water levels flooded tributary lakes A20, A65, and A63, among others, and created an impoundment. 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

[30] Kangislulik Lake (KAN) was previously referred to as Mammoth Lake (MAM). The acronym MAM will still be used in some tables and figures in the document for consistency with previous reports.

A20 likely limits water exchange. To regulate water level in the impoundment, a diversion channel was constructed in 2019/2020 for water to flow from the north end Lake A20 to the south end of KAN/MAM. The changes to Whale Tail Lake and Lake A20 are shown in **Figure 5-1**.

Area designations changed from *control* to *impact* for WTS and KAN/MAM in 2018 as a result of the onset of construction activities. The other four lakes were unaffected by construction activities in 2018 and remained in the baseline (*control*) designation. Lakes A20, A76, and DS1 changed from *control* to *impact* at the start of 2019 as mine construction and mine activities continued to expand. Nemo Lake switched to *impact* after the July 2019 sampling event when heavy precipitation necessitated dewatering AP5 (sump) onto the tundra within the Nemo Lake watershed.

A chronology of construction activities relevant for interpreting results from the Whale Tail CREMP are provided in **Table 1-1**. Construction activities and onsite water management in 2023 are summarized below:

- **Whale Tail Impoundment** – Currently, seepage water is directed to the Whale Tail Attenuation Pond and managed as part of this infrastructure. In 2023, construction of a thermal berm at the western abutment of Whale Tail Dike (Upstream) occurred in April.
- **Effluent Discharge to Kangislulik Lake** – Treated effluent meeting MDMER and Water License limits was discharged to Kangislulik Lake between June 4 and September 14.
- **Effluent Discharge to Whale Tail South Basin** – Treated water was discharged intermittently to WTS between January 8 and October 11. During this time, water met the MDMER and Water License limits.

5.2 Limnology

Limnology data provide an initial assessment of whether conditions are changing within a sampling area to a degree that may require additional investigation. The timing of the limnology and water sampling program for Whale Tail coincided with the Meadowbank CREMP sampling program. 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., 1 = January). Results for each lake focus on the deepest location sampled per event; matching water chemistry sample IDs (where available) for 2023 are listed in **Table 5-1** for cross-reference.

Table 5-1. Samples included in the limnology profiles for the Whale Tail study area lakes in 2023.

Area	Jan	Feb	Mar	Apr	May[1]	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WTS	☑	☑	WTS-78	☑	Ice not safe for travel	Ice not safe for travel	WTS-80	WTS-82	WTS-84	Ice not safe for travel	WTS-86	☑
MAM	☑	☑	MAM-78	☑			MAM-80	MAM-82	MAM-83		MAM-86	☑
NEM	☑	☑	NEM-77	☑			NEM-80	NEM-81	NEM-84		☑	☑
A20	☑	☑	A20-72	☑			A20-74	A20-75	A20-78		☑	☑
A76			A76-69				A76-72	A76-73	A76-75			
DS1			DS1-67				DS1-69	DS1-71	DS1-73			

Notes:
☑ = One profile is collected from the near-field areas (and occasionally one mid-field area) in months where water sampling is not completed.
The sample IDs shown represent the deeper of the two locations sampled each month.
[1] The May sampling event was cancelled due to unsafe ice conditions. An abbreviated sampling event took place in November at WTS and KAN/MAM.

5.2.1 General Observations

Except for Lake DS1, the lakes in the Whale Tail study area are shallow. 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 study area 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 depth typically reach a yearly high between 10°C and 15°C sometime in August before cooling in the fall (**Figure 5-4**). As with Meadowbank, water temperatures in 2023 were higher than in previous years. The maximum surface water temperature measured across the Whale Tail study lakes was 17.3°C at A76 during the August 13 sampling event, about 2°C higher than temperatures measured in August 2022.

Temperature, dissolved oxygen, and specific conductivity profiles for each of the 2023 sample events are shown in **Figure 5-5** to **Figure 5-7**. Profiles for reference areas INUG and PDL are included where available.

5.2.2 Temporal and Spatial Trends

Temperature and Dissolved Oxygen

Lakes in the Whale Tail study area are typically unstratified for temperature and oxygen during the open-water season due to strong winds and shallow depths. Thermal stratification, if any, is brief and water temperatures typically only differ 4°C to 5°C between surface and bottom during these times. In

2023, the strongest evidence of thermal stratification occurred at NEM (August), DS1 (July), and A20 (June) where water temperatures differed by 5°C to 9°C between surface and bottom; this pattern was no longer evident by September (**Figure 5-5**). The maximum reported temperatures in 2023 were elevated at all of the study lakes, including reference. The shallower headwater lakes surrounding Whale Tail (e.g., WTS and KAN/MAM) generally demonstrated the highest increases compared to previous year, while the larger, deeper reference lakes showed muted increases (**Figure 5-4**).

The lakes are well oxygenated throughout the year, with DO generally above 10 mg/L (**Figure 5-6**). In 2023, the lakes were mostly unstratified, with slight stratification observed during the spring ice-covered months: March and April. Conditions were well mixed in the summer months (July, August, and September). DO concentrations in 2023 were consistent with previous years, and the seasonal patterns were typical of this Arctic area. Further, patterns were similar between the control lakes (INUG and PDL) and the NF and MF monitoring areas.

Conductivity

The conductivity results from the limnology profiles collected throughout the year at Whale Tail study area lakes are shown in **Figure 5-7** and discussed below by lake.

Whale Tail Lake – South Basin – In 2023, conductivity in WTS ranged from approximately 115 to 180 µS/cm with no evidence of vertical stratification across each month of sampling. The ice-covered months demonstrated the highest conductivities which increased from January to April. The ice-free months (July to September) showed very similar profiles and were characterized by the lowest conductivities. Overall conductivities were comparable to 2022 except that peak conductivities in April were somewhat higher in 2023 (180 µS/cm versus 150 µS/cm in May 2022). Higher conductivities corresponded to discharging periods at WTS (January to June).

Kangislulik Lake – Prior to November 2018, conductivity in KAN/MAM was characteristically unstratified, measuring below 60 µS/cm (Azimuth, 2019a). In November and December 2018, the conductivity in KAN/MAM increased to 150 µS/cm, following the discharge of treated contact water into KAN/MAM. Through 2021, there was an overall increase in conductivity with concentrations often exceeding 175 µS/cm and as high as 360 µS/cm.

Conductivities in 2023 generally ranged between 125 and 200 µS/cm. Since 2020, the highest conductivities have occurred during the winter months followed by declines during open-water periods (**Figure 5-7**). From July to December, monthly conductivity profiles were higher than in 2022 (125-210 versus 110-175 µS/cm), which roughly corresponded to discharging periods (June to end of August). The remainder of the year was comparable to 2022. In May 2023 (the month in which maximum conductivities typically occur), conductivity profiles were not collected due to unsafe ice conditions. A

comparison of maximum conductivity readings from each sampling event in 2022 and 2023 is provided in **Table 5-2**.

Kangislulik Lake is fairly shallow and somewhat hourglass shaped, with distinct east and west basins. Water chemistry sampling and limnology profiling targets water depths of more than 5 m. To meet these requirements, samples are collected in the deeper east and west basins of the lake. This practice provides good spatial coverage while meeting minimum depth requirements. For paired water samples, the conductivity observed in the east basin was consistently higher than the conductivity in the west basin (**Table 5-2**). The narrow portion in the middle of the lake is relatively shallow and creates a natural sill that slows water exchange between the basins, particularly during winter when ice cover further limits water exchange between the basins. Thus, mine influences on water quality are temporarily concentrated in the east basin closest to the effluent discharge point, a pattern which has been confirmed by plume delineation surveys (Portt and Associates and Kilgour & Associates, 2021).

Conductivity readings in both the east and west basins of Kangislulik Lake increased in 2023 compared to 2022. During discharging periods (June to mid-September) in 2023, conductivities in the east basin increased by 14 to 37% compared to 2022 (**Table 5-2**). These findings are corroborated by the major ion water chemistry results (**Section 5.3.2**).

Table 5-2. Maximum conductivity readings from each sampling event in Kangislulik Lake and relative percent difference (RPD) between readings from 2022 and 2023.

Month	West Basin			East Basin		
	2022	2023	RPD	2022	2023	RPD
January	-	-	na	189	195	3%
February	-	200	na	187	-	na
March	198	196	1%	253	231	9%
April	-	206	na	220	-	na
May[1]	183	-	na	295	-	na
July	121	124	2%	113	155	31%
August	116	137	17%	135	167	21%
September	129	144	11%	170	194	13%
November	166	177	7%	-	193	na
December	-	-	na	181	207	14%
ANNUAL MEAN[2]	**146**	**156**	**6%**	**174**	**191**	**10%**

Notes:
[1] In May 2023 sampling was not conducted due to unsafe ice conditions.
[2] Mean calculated only where data was available for a given month across both years.
"-" no sample collected; na = RPD not calculated.

Nemo Lake, Lake A20, Lake A76, and Lake DS1 – In 2019, field conductivity measurements at NEM after August showed evidence of an upward trend in response to temporary discharge of contact water to

NEM. Since then, conductivities have demonstrated somewhat amplified seasonal fluctuations ranging from 100 µS/cm up to 140 µS/cm near the end of the ice-covered period (April/May). More pronounced seasonal fluctuations in conductivities appear to be a characteristic of the mine-affected lakes and can be seen to the greatest extent at WTS and KAN/MAM (**Figure 5-7**).

Lakes A20, A76, and DS1 demonstrated a much smaller seasonal range in conductivities compared to WTS and KAN/MAM. Conductivities at Lake A20, A76, and DS1 ranged close to 60, 100, and <50 µS/cm, respectively.

5.3 Water Chemistry

This was the fifth year of formal BACI analyses to assess spatial and temporal changes in water quality at the Whale Tail study area lakes. Water chemistry results for the study area lakes were also compared to predictions in the FEIS for the Approved Expansion Project (Golder, 2019) and triggers for arsenic and phosphorus in the *Adaptive Management Plan* (Agnico Eagle, 2021).

5.3.1 Key Findings from the 2023 Water Chemistry Monitoring Program

- There were no trigger exceedances for parameters with effect-based thresholds (e.g., aquatic life guidelines).
- In 2023, there were a number of parameters for which concentrations at NF and MF Whale Tail area lakes increased relative to baseline/reference conditions: major ions (TDS, Ca, Mg, K, Na, HCO_3 [alkalinity]), hardness, conductivity, nutrients (TKN, total phosphorus, TOC, and DOC), and lithium (only at WTS and KAN/MAM).
- Some parameters have increased in WTS, A20, KAN/MAM, and A76 coinciding with construction of the impoundment and discharge of treated contact water.
- Total phosphorus and arsenic concentrations at WTS and KAN/MAM were within the normal operating ranges in 2023 and Level 0 water management strategy is in effect in 2024 as per the *Adaptive Management Plan* (Agnico Eagle, 2021).

5.3.2 Temporal and Spatial Trends

Parameters included in the temporal and spatial trends assessment are listed in **Table 5-6**. A total of 56 parameters out of 79 (approximately 71%) were retained for further examination in 2023. Of these, 55 were retained because the frequency of detected concentrations exceeded 10%. Dissolved selenium detection frequencies were less than 10%, but were retained for discussion because they were detected more frequently at impact areas compared to control (reference) areas.

Parameters retained in the analysis are plotted in **Figure 5-9** through **Figure 5-13**. Trigger values[31] are shown on the time series plots as a red dashed line. Water quality predictions were developed as part of the FEIS process for some parameters in Kangislulik Lake and Whale Tail Lake – South Basin (see **Section 2.3.1** and Golder, 2019); these are depicted as a blue dashed line in the plots. Water chemistry figures and raw data for all parameters, including those that were not retained for discussion based on the trend assessment are presented in **Appendix B2**.

BACI analyses were conducted for parameter/area combinations if the mean concentration in 2023 exceeded the trigger value. The BACI model tests for statistically significant increases (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 2023 (*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 for which the yearly mean exceeded the trigger are listed in **Table 5-7** and were carried forward for BACI analysis (**Table 5-8**). The results are discussed in terms of ecological significance and spatial context below, by parameter type.

Major Ions and Conventional Parameters

Major ions (dissolved salts) are the seven ionic compounds found in greatest abundance in freshwater systems. They include the cations: calcium, magnesium, potassium, and sodium; as well as the anions: chloride, bicarbonate, and sulphate. These seven ions are measured directly or are important in a number of composite conventional measures (e.g., total alkalinity, conductivity, TDS, and hardness) **Figure 5-9**. Collectively, these parameters have shown the greatest proportional changes in water chemistry since mining operations began (**Table 5-8**). However, it is worth noting that while major ion concentrations (along with associated parameters) increased at the NF lakes (WTS and KAN/MAM) between 2022 to 2023, year-over-year changes were marginal or absent at the MF lakes (A20 and A76).

Most of the parameters in this group do not have effects-based thresholds (e.g., CCME water quality guidelines). As discussed in detail in **Section 4.3.2**, major ions 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 uptake of 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; Arnott et al., 2017).

[31] Refer to Appendix I in the 2019 CREMP report (Azimuth, 2020a) for a description of the methods used to establish triggers for each parameter.

The only parameters in this group to have an effects-based threshold are chloride, fluoride, and sulphate. While these parameters have shown increased concentrations since mining activities started, none have had mean annual concentrations exceeding their respective triggers at any sampling area.

These results indicate that mine-related changes have occurred, but that these changes would not be expected to result in adverse effects to aquatic life (see similar discussion in **Section 4.3.2**).

Nutrients

Four nutrient-related parameters had mean annual concentrations exceeding their respective triggers (**Table 5-7**): Total Kjeldahl Nitrogen (TKN), total phosphorus, and total and dissolved carbon (TOC and DOC). All of these parameters were significantly ($p < 0.05$) higher at WTS and A20 in 2023 compared to baseline/reference conditions. At KAN/MAM, only TKN and TOC were found at concentrations significantly higher than baseline/reference conditions (**Table 5-8**).

Nitrogen-containing compounds – TKN is one of four nitrogen-containing compounds in the CREMP. It is a composite parameter that includes both organic and inorganic forms including ammonia, nitrate, nitrite, and organic nitrogen compounds. While TKN does not have an effects-based threshold, all three of the other nitrogen-containing compounds in the CREMP do. Although each of these compounds have increased due to mining activity, they are generally stable with all annual mean concentrations below their respective triggers. March samples from WTS and a few samples from KAN/MAM exceeded ammonia (NH_3) triggers in 2023, however these did not represent an increasing trend (**Figure 5-11**). Nitrogen-containing compounds are not a concern at the Whale Tail study lakes.

Total phosphorus – Total phosphorus is one of the main constituents of concern for the Whale Tail mine. It is important as a key macronutrient for plants and is often limiting in freshwater ecosystems, making it one of the most important nutrients for primary productivity. The CCME provides guidance for site-specific application rather than a particular effects-based guideline for total phosphorus. While the CCME framework specifies <0.004 mg/L of total phosphorus for ultra-oligotrophic lakes, up to a 50% increase in concentrations over baseline is considered acceptable (Azimuth, 2020; see Appendix I). Since the 95th percentile baseline concentrations of total phosphorus for Meadowbank, Wally, Baker, and Whale Tail exceeded 0.004 mg/L, the lake-specific triggers were set to those 95th percentile concentrations and the 0.01 mg/L threshold was used (higher end of the range for oligotrophic lakes; CCME 2004).

The trigger was exceeded in all *impact* Whale Tail study area lakes at least once in 2023, except for A76 and NEM (**Figure 5-11**). The annual mean total phosphorus concentrations at WTS and A20 exceeded the trigger (**Table 5-7**) and the BACI analysis indicated that observed changes were statistically significant at these lakes (**Table 5-8**). Since 2021, total phosphorus concentrations have been stable at WTS and A20. At KAN/MAM in 2023, total phosphorus concentrations were below the trigger.

The increase in nutrients at WTS, KAN/MAM, and A20 since 2019/2020 combined with occasional exceedances in other lakes downstream is likely contributing towards an increase in primary productivity, as predicted in the FEIS (**Table 5-3**; Golder, 2018). Phosphorus is discussed further as it relates to the Adaptive Management Plan (AMP) in **Section 5.3.4**.

Table 5-3. FEIS predictions and trigger values compared to mean concentrations of total phosphorus in Kangislulik Lake and Whale Tail Lake (South Basin), 2023.

Area	2023 FEIS predictions		Trigger	2023 Mean [1]
	Minimum	Maximum		
KAN/MAM	0.0074	0.0077	0.0045	0.004
WTS	0.008	0.01	0.0045	0.0067

Notes:

Reported values are all in units of mg/L.
[1] WTS and KAN/MAM 2023 means include data from Mar, Jul, Aug, Sep sampling events for trigger comparisons. Results from abbreviated sampling in Nov are included in plots and compared to FEIS predictions.

TOC and DOC – In 2023, TOC and DOC concentrations exceeded the triggers for all samples collected in WTS, KAN/MAM, and A20. Triggers were also exceeded at least once in all of the other *impact* lakes (**Figure 5-9**). Mean annual concentrations exceeded the triggers (TOC trigger = 2.42 mg/L; DOC trigger = 2.43 mg/L) in WTS, KAN/MAM, A20, and DS1 (**Table 5-7**). The increases in mean TOC and DOC were statistically significant for WTS, KAN/MAM, and A20, but not significant for DS1.

Increasing TOC and DOC in WTS at the end of 2019 was likely related to the flooding of terrestrial habitat with the impoundment of the south basin and dewatering inputs from WTN; this also explains the increases in Lake A20, which experienced flooding and has been joined to WTS since 2019. KAN/MAM and A76 occur downstream of WTS and increases in TOC/DOC at these locations may be the results of inputs from WTS.

Since 2018, a muted increase in TOC and DOC also appears to be occurring in reference lake INUG. This pattern suggests organic carbon inputs to lakes in the region may be increasing which would also contribute to the changes observed at the mine influenced lakes. In a pan-Arctic assessment of lake DOC, Stolpmann and colleagues (2021) linked higher DOC levels to rates of evaporation, lake connectivity, and permafrost extent. It is possible that regional multi-year climactic changes or global climate change could contribute to broad changes in organic carbon across the study lakes over time. Parallel increases in TOC/DOC in the Meadowbank lakes may also be occurring, with increasing patterns at WAL and SP most evident (**Figure 4-9**). Regional changes in organic carbon are further discussed for Baker Lake in **Section 6.3.3**.

There are no effects-based thresholds for TOC or DOC, but increases in these parameters can be related to increased productivity or allochthonous carbon inputs. 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).

Metals

A number of metals show trends of increasing concentrations associated with mining activities. These include: antimony (Sb), arsenic (As), barium (Ba), copper (Cu), iron (Fe), lithium (Li), manganese (Mn), molybdenum (Mo), nickel (Ni), selenium (Se), silicon (Si), strontium (Sr), titanium (Ti), and uranium (U) (**Figure 5-12** and **Figure 5-13**). Of these, lithium, silicon, titanium, and uranium exceeded triggers at least once in 2023. Only lithium and silicon, which do not have effects-based thresholds, had annual mean concentration exceeding triggers (**Table 5-7**).

Lithium – Total and dissolved lithium, were the only metal parameters where annual mean concentrations exceeded trigger values at WTS and KAN/MAM in 2023 (total and dissolved lithium trigger = 0.0020 mg/L). Peak concentrations occurred in 2019 and since 2022 concentrations appear to have stabilized at both lakes. The BACI analysis indicated that the change in total and dissolved lithium relative to INUG was statistically significant at both WTS and KAN/MAM (p-value < 0.05).

Note that lithium does not have an effects-based threshold. The US EPA does have a factsheet on lithium toxicity in freshwater (MDEQ, 2008), but does not have a formal water quality guideline. The factsheet includes chronic toxicity results for zooplankton (water flea *Ceriodaphnia dubia*) and fish (fathead minnow *Pimephales promelas*). The no observable effect concentration (NOEC) for a 6-day test targeting *C. dubia* reproduction was 1.97 mg/L, while 3.6 mg/L was the lowest observable effect concentration (LOEC). The NOEC for the 7-day *P. promelas* test targeting growth was 3.6 mg/L, while the LOEC was 6.9 mg/L. These toxicity test results are two to three orders of magnitude higher than the lithium concentrations observed in the Whale Tail study lakes.

Silicon – Silicon concentrations have historically been close to the trigger value for most Whale Tail study area lakes, even prior to the start of mining development (**Figure 5-12**). Dissolved silicon concentrations exceeded the trigger (0.57 mg/L) at WTS, KAN/MAM, and DS1. Concentrations in all impact lakes were higher during the first half of the year, however, the yearly mean concentrations exceeded the trigger solely at DS1 (0.59 mg/L; **Table 5-7**) but the change was not statistically significant (**Table 5-8**). However, while there is evidence of a mining-related trend at WTS and KAN/MAM (an increase coinciding with mine development followed by a downward trend since 2020), that is not the case at DS1, where results have been fairly consistent since the baseline period.

5.3.3 Comparison to FEIS Model Predictions

A number of water quality changes have been identified in the Whale Tail mine area as a result of development-related activities and/or effluent discharge to the downstream environment. The FEIS water quality predictions are estimates of water quality changes in Kangislulik Lake and Whale Tail Lake (South Basin). The monthly mean results for water quality parameters were screened against the FEIS monthly predictions for KAN/MAM and WTS and a summary of exceedances is provided in **Table 5-10**. Water quality data for 2023 were screened against the FEIS predictions and are tabulated in **Appendix B2**.

Often, parameters that exceed their trigger also exceed the FEIS predictions in one or more sampling events. In 2023, the yearly mean concentrations for total phosphorus, total alkalinity, TDS, lithium, and the ionic compounds calcium, magnesium, potassium, and sodium exceeded both their respective triggers and the monthly FEIS predictions in WTS. At KAN/MAM, the same parameters, except for total phosphorus, exceeded both the triggers and FEIS predictions. Of the parameters that exceeded their respective trigger values and FEIS model predictions in 2023, the absolute concentrations of these parameters remain *low*. Phosphorus, along with several other COPCs (e.g., nitrate, arsenic) were predicted by the FEIS to exceed baseline conditions following the discharge of treated effluent into WTS and KAN/MAM. Phosphorus was the only COPC that was also predicted to exceed water quality guidelines (Golder, 2018).

The FEIS predicted the magnitude of potential effects on water quality in each of the lakes as *low* (i.e., <1x CCME WQG) for all parameters; see **Section 2.3.1** for more details on the decision criteria for effects magnitude). Thus, the Whale Tail study area water quality results are generally consistent with FEIS predictions.

5.3.4 Comparison to Adaptive Management Thresholds

For parameters identified as the main COPCs for the Whale Tail mine (i.e., total phosphorus and arsenic), there are associated AMP water quality thresholds that correspond to adaptive management 'Levels' as described in **Section 2.3.1**. The adaptive management thresholds and corresponding adaptive management levels and strategies that are applied at mine discharge areas WTS and KAN/MAM are summarized in **Table 2-4**. The water quality data collected as part of the annual CREMP were used to assess adaptive management levels going into 2024. The mean concentrations of paired monthly sampling results were compared to AMP thresholds. Findings are summarized in **Table 5-4** and described below.

Whale Tail South

- Mean total phosphorus concentrations remained at Level 0 for each month of sampling at WTS in 2023.

- Mean total arsenic concentrations remained at Level 0 for each sampling event at WTS in 2023.
- Conclusion – Level 0 is in effect for both total phosphorus and total arsenic based on the results of the November 2023 sampling event.

Kangislulik Lake

- Mean total phosphorus concentrations remained at Level 0 for each month of sampling at KAN/MAM in 2023.
- Mean total arsenic remained at Level 0 for each sampling event at KAN/MAM in 2023.
- Conclusion – Kangislulik Lake is within the normal operating range and Level 0 water management strategy is in effect based on the results of the November 2023 sampling event.

Table 5-4. Water chemistry data compared to AMP thresholds for total phosphorus and arsenic for Whale Tail Lake (South Basin) and Kangislulik Lake, 2022 and 2023.

Lake & Area	AMP Benchmark[1]	WTS FEIS Predictions											Whale Tail Lake South Basin (Impoundment) – Mean Monthly Concentrations (mg/L)										Current Mgmt Level
Year		2022					2023						2022					2023						
Month		Mar	May	Jul	Aug	Sep	Mar	May	Jul	Aug	Sep	Nov	Mar	May	Jul	Aug	Sep	Mar	May[2]	Jul	Aug	Sep	Nov	
Phosphorus (mg/L)	0.01	0.0065	0.0067	0.0070	0.0074	0.0079	0.0081	0.0081	0.0096	0.010	0.010	0.010	0.0076	0.0051	0.0053	0.0063	0.0054	0.0067	-	0.0085	0.0057	0.0058	0.0034	Level 0
Arsenic (mg/L)	0.025	0.0047	0.0047	0.0067	0.0076	0.0087	0.0094	0.0093	0.011	0.012	0.013	0.013	0.00087	0.0022	0.0016	0.0011	0.00087	0.00089	-	0.00096	0.00094	0.00079	0.00092	Level 0

Lake & Area	AMP Benchmark[1]	MAM FEIS Predictions											Kangislulik Lake – Mean Monthly Concentrations (mg/L)										Current Mgmt Level
Month		2022					2023						2022					2023						
Area-Replicate ID		Mar	May	Jul	Aug	Sep	Mar	May	Jul	Aug	Sep	Nov	Mar	May	Jul	Aug	Sep	Mar	May[2]	Jul	Aug	Sep	Nov	
Phosphorus (mg/L)	0.01	0.0090	0.0090	0.0077	0.0077	0.0076	0.0075	0.0075	0.0075	0.0076	0.0076	0.0077	0.0083	0.0051	0.0037	0.0037	0.0029	0.0048	-	0.0044	0.0026	0.0041	0.0053	Level 0
Arsenic (mg/L)	0.025	0.0077	0.0077	0.0063	0.0063	0.0063	0.0063	0.0063	0.0069	0.0069	0.0071	0.0074	0.0013	0.0013	0.0011	0.0014	0.0013	0.0011	-	0.0011	0.0015	0.0014	0.00058	Level 0

Notes:

[1] The AMP Benchmark for phosphorus guideline is the upper limit of oligotrophic status from CCME (2004); The AMP Benchmark for arsenic is the site-specific water quality objective (Golder, 2019).

[2] Samples were not collected in May 2023 due to unsafe ice conditions.

Formatting aligns with the AMP thresholds in the *Whale Tail Expansion Project – Adaptive Management Plan* (Agnico Eagle, 2021):

Level 0	Normal conditions	<= 20% FEIS predictions.
Level 1	Area of concern	>= 20% FEIS predictions AND < 80% water quality guideline.
Level 2	Area of concern	>= 20% FEIS predictions AND between 80% and 100% water quality guideline.
Level 3	High risk	>= 20% FEIS predictions AND between 100% and 120% water quality guideline.
Level 4	Emergency situation	>= 20% FEIS predictions AND > 120% water quality guideline.

5.3.5 Summary and Recommendations

Following the assessment strategy for MF and FF areas outlined in the *CREMP Plan Update* (Azimuth, 2022b), the 2023 trigger exceedances were evaluated 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 2024. The assessment strategy interprets the water quality assessment results from the NF areas in the current year (in this case 2023) to inform sampling at MF and FF areas the following year (i.e., 2024) (**Figure 5-8**).

A summary of the trigger screening results for the Whale Tail study areas are presented in **Table 5-9** according to their corresponding degree of change based on mean annual concentrations:

- 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 effects-based threshold.

In 2023, observed water quality differences and trigger exceedances classified as *minor changes* (**Table 5-9**). The 2023 water quality results from Whale Tail area lakes do not require additional management actions as per the *CREMP Plan Update* and *Adaptive Management Plan* (Azimuth, 2022b, Agnico Eagle, 2021). **Routine water quality monitoring will continue in 2024 to track emerging spatial and temporal trends.**

5.4 Phytoplankton Community

2023 was the fourth full year in which all Whale Tail study area lakes were designated as *impact*. Areas WTS and KAN/MAM have been classified as *impact* areas since mid-2018. Areas A20, A76, and DS1 were classified as *impact* areas from the beginning of 2019, and NEM switched to *impact* in August 2019[32]. In 2023, winter phytoplankton samples collected in March were archived as per the *CREMP Plan Update* (Azimuth, 2022b). Phytoplankton collected at the reference and NF areas during open-water sampling in July, August, and September were analyzed.

5.4.1 Key Findings from the 2023 Phytoplankton Monitoring Program

- Mean annual Chlorophyll-a concentrations at the NF and MF lakes were higher relative to reference. Concentrations appear to have increased at WTS and A20, but were variable at KAN/MAM and A76. These observations are based on time series plots since no statistical

[32] 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.

analysis is completed for chlorophyll-a. It is important to note that chlorophyll-a is only an indicator of phytoplankton productivity; phytoplankton biomass (see next bullet) is a more direct measure of primary productivity.

- WTS, KAN/MAM, A20, and NEM results showed an increase in biomass compared to baseline conditions. The BACI analysis showed significant increases at WTS and A20 with effect sizes of 102% to 243% respectively. Phytoplankton biomass appears to be trending upwards at WTS and A20 since 2021. The increases in phytoplankton biomass identified at NF areas since the onset of mining activities are consistent with predictions made in the FEIS regarding increasing nutrient concentrations in these lakes (Golder, 2018).
- Slight decreases in taxa richness were observed at the study lakes, though the changes were not statistically significant.
- There is correspondence between increases in phytoplankton parameters and nutrient increases demonstrated in the water chemistry data. Nutrient increases and phytoplankton responses appear to roughly align over both temporal and spatial scales. However, phytoplankton communities respond to a host of seasonal factors such as sunlight and water temperature and therefore it is difficult to distinguish between seasonal fluctuations and influence of nutrients from to mining activities.

5.4.2 General Observations

The general description of phytoplankton taxa in Meadowbank project lakes (**Section 4.3.3**) applies equally to the lakes within the Whale Tail study area. Six major taxonomic groups of phytoplankton are present in the Whale Tail study lakes. These are blue-green algae (Cyanophyta), green algae (Chlorophyta), golden-brown algae (Chrysophyta), diatoms (Bacillariophyta), cryptophytes (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. In general, the biomass of the phytoplankton community during the baseline period or at the reference areas was comprised predominately of chrysophytes (golden-brown algae; **Figure 5-16**).

5.4.3 Temporal and Spatial Trends

The approach for identifying potential mine-related impacts involved visually searching for temporal-spatial patterns that might be associated with mine-related activities (outlined in **Section 5.1** and summarized in **Table 1-1**), augmented by statistical analyses of the 2023 data to test for changes relative to baseline/reference conditions using the BACI model (see **Section 2.3.3** for details). Both methods look for evidence of temporal-spatial patterns that might be associated with the mine-related activities.

Tabulated phytoplankton community data from the 2023 CREMP are presented in **Appendix D2**. The metrics used to assess changes in the community were chlorophyll-a (**Figure 5-14**), total phytoplankton biomass (**Figure 5-15** to **Figure 5-17**), and species richness (**Figure 5-18**). Supplemental plots showing major taxa biomass (mg/m^3) and density (mg/L) are included in **Appendix D2**. The BACI statistical test results of changes in the phytoplankton community (total biomass and total species richness) in 2023 relative to baseline/reference conditions are provided in **Table 5-11**; key results are discussed below.

Chlorophyll-a

Chlorophyll-a is an indicator of primary productivity and is often used as a surrogate for phytoplankton biomass. Given the direct measure of total phytoplankton biomass (see below), statistical analysis is not completed for chlorophyll-a. However, the time series plots provided in **Figure 5-14** show that chlorophyll-a concentrations in the latter half of 2023 were generally higher at WTS and A20 than in baseline samples. The 2023 mean annual concentration of chlorophyll-a at WTS and A20 exceeded 1 µg/L which is considered characteristic of oligotrophic systems (Kasprzak et al., 2008). At A76 and NEM chlorophyll-a concentrations were less than 1 µg/L throughout the year. At KAN/MAM and FF area DS1, chlorophyll-a concentrations fluctuated around 1 µg/L. Except for WTS and A20, chlorophyll-a concentrations in the Whale Tail area lakes were generally representative of baseline trophic status in the lakes. Possible factors influencing the patterns of chlorophyll-a and phytoplankton biomass are discussed in more detail below.

Total Biomass

Time series plots for total phytoplankton biomass (mg/m^3) are provided in **Figure 5-15**[33]. Overall, seasonal patterns are evident, with peak biomass occurring during the open water period. Total biomass remained comparable to 2022 findings, except for higher concentrations at A20 and lower concentrations at A76. The largest contributor to community biomass at each of the study lakes were chrysophytes, except at KAN/MAM where diatoms dominated in 2023 (**Figure 5-16** and **Figure 5-17**).

In the BACI analysis, the model interaction term (or BACI effect term) represents the change at the test area in 2023 (*after* period) relative to baseline (*before* period) after accounting for natural regional temporal changes observed at reference area INUG. For simplicity, changes are noted *relative to baseline/reference* conditions. Relative to baseline/reference conditions (**Table 5-11**), 2023 total phytoplankton biomass was higher in WTS (102%), KAN/MAM (17%), A20 (243%), and NEM (19%), but lower in A76 (-13%) and DS1 (-29%). None of these changes were statistically significant ($p > 0.1$), except

[33] The time series plot uses a log-scale for total biomass as mg/m^3. This is a common approach for data that ranges broadly within or across years. While the approach reduces emphasis on extreme values, it could also lessen the appearance of certain mine-related trends.

at WTS and A20. These results are discussed further in the summary at the end of the phytoplankton section.

The increases in phytoplankton biomass identified at NF and MF areas since the onset of mining activities are consistent with predictions made in the FEIS regarding increasing nutrient concentrations in these lakes (Golder, 2018).

Major Taxa Composition

The number of taxa varies by season, with a more diverse community typically present during the open-water season than when ice covers the lakes (**Figure 5-16**). Typically, more than 30 different species of phytoplankton are present during the open-water season. Chrysophytes dominated the community at most lakes with the exception of NEM (July), WTS (September), and KAN/MAM (July, August) when diatoms were the dominant taxa (**Figure 5-17**). During the baseline period, diatoms made up a small proportion of the community at KAN/MAM and WTS. The greater contributions to community biomass in 2023 could indicate mining influence, though a clear increasing trend is not evident. Furthermore, chlorophytes, which typically respond first to nutrient enrichment (Holmgren, 1984) have not demonstrated a clear response since the NF lakes transitioned to *impact*.

Taxa Richness

Taxa richness was similar to previous years with the exception of A20 in September which had the highest richness observed since monitoring began. The BACI results for 2023 showed that effect size estimates for taxa richness were below the trigger (20%) at all areas except A76 (-25%), although none of the changes were statistically significant (**Table 5-11**). Similarly, low September richness was documented during the baseline period at A76 (**Figure 5-18**). Further discussion related to the ecological significance of these results is presented in the summary below.

5.4.4 Summary and Recommendations

Statistically-significant changes in phytoplankton biomass in 2023 exceeding the 20% effect size trigger occurred only at A20 and WTS. For phytoplankton taxa richness, Lake A76 was 25% lower than baseline/reference conditions, but the result was not statistically significant.

The response patterns observed in phytoplankton biomass suggest a combination of mining influence and natural variability. As described in **Section 5.3**, mining-related changes in water quality have been identified at Whale Tail at all NF and MF areas. Nutrients are generally a limiting factor for phytoplankton growth in oligotrophic systems and any inputs can lead to changes in productivity. Since mining activity began, there has been a general correspondence between increases in nutrient levels at WTS, KAN/MAM, and A20 and increased phytoplankton biomass. According to the FEIS, phosphorus and nitrate levels are predicted to increase at both WTS and KAN/MAM until 2026, after which

concentrations are predicted to decline. With these predicted increases in nutrients, phytoplankton biomass is expected to increase over the next three years of CREMP sampling. Although FEIS predictions are limited to WTS and KAN/MAM, it is expected that effects will extend into the MF lakes. Despite these predictions, phytoplankton communities respond to a host of environmental seasonal factors such as sunlight and water temperature. The influence of nutrient inputs on the phytoplankton community is challenging to interpret given these natural seasonal fluctuations which contributes to lower statistical power (BACI results were not significant). Phytoplankton productivity, biomass, and richness, as well as associated patterns in key nutrients, will continue to be tracked in 2024.

The Whale Tail phytoplankton program will follow the same schedule as the routine water quality monitoring component of the program in 2024.

5.5 Sediment Chemistry

Sediment core and grab samples were collected from all of the study area lakes in August 2023. Grab samples were analyzed for moisture content, particle size, TOC, and select organic compounds. Core samples were analyzed for metals. Changes in sediment chemistry were formally tested using the statistical before-after (BA) analysis for metals that exceeded their respective trigger values. In addition, visual assessment of temporal-spatial patterns that might be associated with mine-related activities was conducted.

Tabulated sediment quality data for 2023 data are provided in **Appendix C**.

5.5.1 Key Findings from the 2023 Sediment Chemistry Monitoring Program

- The following parameters exceeded the trigger in 2023; arsenic (WTS, KAN/MAM, and A20), chromium (WTS, KAN/MAM and A20), and copper (A20). Except for chromium, the changes over time are most likely due to the variable metals concentrations in sediment that exist without the influence of mining.
- Chromium may be increasing at WTS. A similar change was observed at TPE after construction of Bay-Goose Dike. Similar increases were observed at Meadowbank's TPE related to dike construction, but it was concluded that the changes did not pose unacceptable risks to benthic invertebrates.
- TOC concentrations show variations across Lakes related to productivity levels, but within lakes concentrations have remained stable since monitoring began. The stability of TOC at the NF lakes shows that TOC is not being enriched by mining activity.

5.5.2 Temporal and Spatial Trends

For the purpose of interpreting the 2023 sediment data, Whale Tail study area lakes (KAN/MAM, NEM, A20, A76, DS1) were considered *impact* starting in 2019 except for WTS, which was designated as *impact* in 2018. Note that there are missing results for 2021 (INUG, PDL, KAN/MAM, A20, and DS1) across figures; these samples were inadvertently discarded prior to analysis due to a laboratory error (See Azimuth, 2022a for details).

Metals

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) in at least one sample collected during the baseline period. Lake-specific triggers were developed (due to strong natural spatial trends among the lakes) in 2019 based on the 2017 sediment core results.

Metals concentrations are shown by area/basin for the different sampling methods (grab [data points] vs core samples [box and whisker plots]) since 2015; **Figure 5-21** to **Figure 5-28**). The red dashed line represents the lake-specific trigger value, where available. The box and whisker plots illustrate the statistical distribution of core samples within each area.

While there were a number of trigger exceedances across the study lakes in 2023, the results are often driven by unrepresentative trigger values rather than by actual changes in sediment chemistry. Trigger values may be unrepresentative if the 2017 sediment coring data do not fully represent the prevailing conditions in a particular lake.

Arsenic, chromium, and copper were the only metals where the annual mean concentrations in sediment cores exceeded their respective trigger values in at least one study area (**Table 5-12**). Results of the statistical before-after (BA) analysis indicated that the majority of these exceedances were statistically significant (**Table 5-13**). The statistically significant sediment quality exceedances for arsenic, chromium, and copper are discussed below.

Arsenic

- Arsenic concentrations in sediment core samples exceeded lake-specific trigger values in 2023 at WTS and A20 (**Figure 5-22**).
- The apparent increase at WTS in 2023 (mean = 211 mg/kg dw) relative to baseline conditions (trigger value = 83.1 mg/kg dw), while statistically significant (**Table 5-13**), is most likely due to the variable arsenic concentrations in sediment that exist without the influence of mining. The majority of core sample results remain roughly within the grab sample ranges observed in 2017 baseline sampling. It should also be noted that baseline arsenic concentrations in the northern

part of Whale Tail Lake (WTN) ranged from about 500 to 1,800 mg/kg dw, indicating the presence of mineralization in the area (Azimuth, 2018a). Further, similar results were seen in reference lake PDL, where 2023 concentrations were substantially higher than those observed in either the 2017 or 2020 coring events, suggesting a 'change' in arsenic concentrations that was likely driven by spatial heterogeneity rather than any regional factors. Consequently, it is likely that the observed 'change' at WTS in 2023 is an artefact of natural spatial variability rather than a mine-related increase. Arsenic will be assessed with grab sampling in 2024 for clear divergence from baseline concentrations.

- The mean sediment core arsenic concentration at A20 exceeded the trigger and was approximately 1.7-fold above the mean baseline concentration in cores collected in 2017. However, similar to WTS, observed concentrations in 2023 were all within the range of baseline core and grab results (**Figure 5-22**), indicating that the change may be an artefact of natural spatial heterogeneity.

Chromium

- Mean sediment concentrations at WTS, KAN/MAM, and A20 exceeded their respective triggers in 2023. Chromium concentrations at each of these lakes in 2023 showed statistically significant increases of 1.2 to 1.5-fold above the 2017 baseline coring results (**Figure 5-24**).
- At WTS, there is conflicting information regarding the nature of these apparent changes. The range of concentrations observed in 2023 is roughly within the range of concentrations observed during the baseline period (Azimuth, 2018a), suggesting that natural spatial heterogeneity may be responsible for the apparent increase seen in 2023. However, excluding a single elevated grab sample result in 2016, chromium concentrations appear to have been on an increasing trend since the onset of mining activity. Similar results were observed at Meadowbank study area TPE after dike construction and are believed to be related to the use of chromium-rich ultramafic rock in the Bay Goose Dike. As discussed in **Section 4.5.3**, targeted studies over several years concluded that the observed changes were not posing unacceptable risks to the benthic community (see Azimuth, 2020a for more details).
- At KAN/MAM and A20, the 2023 results are most likely due to natural spatial variability. Chromium concentrations for most of the samples were within the range observed during the baseline period. KAN/MAM had slightly higher concentrations in 2023 than the baseline range, but has not shown much of a trend during operations.

Copper

- Lake A20 mean copper concentration in 2023 marginally exceeded the trigger (**Figure 5-25**) but were within the range of baseline concentrations, likely reflecting natural spatial heterogeneity rather than a mining-related increase.

In addition to the mean trigger exceedances for the above metals, there were trigger exceedances for individual samples (**Appendix C2**): three trigger exceedances for cadmium (two at KAN/MAM and one at A76), eight for zinc (two at A20, one at KAN/MAM and five at A76), and one for lead at KAN/MAM (57.5 mg/kg dw, considered an outlier as it is 1.5 times the interquartile range, see **Figure 5-26**). These exceedances in individual samples were generally reflective of natural spatial variability rather than mining-related changes. This is supported by the overall lack of temporal changes relative to baseline conditions for cadmium (**Figure 5-23**) and zinc (**Figure 5-28**) at the locations listed above.

Organic Compounds

Total Organic Carbon (TOC)

Since 2015, there is no evidence of an increasing trend in TOC at any of the study lakes (**Figure 5-19**). TOC varies slightly between years, but has remained remarkably stable within each of the Whale Tail study lakes. What is apparent, is the difference in TOC across the study lakes. KAN/MAM consistently has the highest proportions of TOC, while the reference lakes (INUG, PDL) have the lowest. These results reflect differences in productivity levels across the lakes, with shallow, lower-volume lakes tending to be more productive relative to deeper, high-volume lakes.

Hydrocarbons

All parameters with CCME screening values were below both detection limits and Probable Effects Levels (PEL) (**Appendix C2**). Hydrocarbons are not considered a significant COPC based on the mining activities occurring at either the Whale Tail or the Meadowbank sites.

5.5.3 Summary and Recommendations

Sediment chemistry in the Whale Tail study area is naturally elevated in several metals and their concentrations can be quite variable due to spatial heterogeneity. In 2023, several metals (arsenic [WTS, KAN/MAM, A20], chromium [WTS, KAN/MAM, A20] and copper [A20]) showed apparent increases in sediment concentrations relative to baseline conditions. However, the most likely explanation is natural spatial heterogeneity. The potential exception is chromium at WTS, where the increase could be related to mining activity; similar increases were observed at Meadowbank's TPE related to dike construction, but it was concluded that the changes did not pose unacceptable risks to benthic invertebrates.

The 2023 sediment chemistry results from Whale Tail area lakes do not require additional management actions as per the *CREMP Plan Update* (Azimuth, 2022b). **Routine sediment grabs will be collected and analyzed for chemistry in 2024 to track emerging spatial and temporal trends.**

5.6 Benthos Community

Summary results for abundance and richness of major taxa in 2023 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.

5.6.1 Key Findings from the 2023 Benthos Community Monitoring Program

- For the benthic invertebrate community abundance and taxa richness, four time periods were assessed using statistical analysis (2023, 2022-23, 2021-23, and 2020-23) to identify changes from baseline/reference.
- In 2023 there appeared to be large (45–166 %) increases in benthic invertebrate abundance at all NF and some MF areas. There were small decreases (8–22 %) observed at MF area A76 and FF area DS1. For taxa richness, there appeared to be large (34–59%) increases at all areas except DS1 which showed a comparatively small increase (10%) in 2023.
- For all time periods, there were significant increases in benthic invertebrate abundance at KAN/MAM and NEM compared to baseline/reference. In 2022-23, there was a significant increase at WTS. While nutrient inputs from mining activities may lead to an increase in benthic abundance, it is challenging to distinguish between mining-related changes and environmental variability.
- For all time periods, there were significant increases in benthic invertebrate taxa richness at KAN/MAM and NEM compared to baseline/reference. For 2022-23, 2021-23, and 2020-23 time periods, there were significant increases in benthic invertebrate taxa richness at MF area A20.

5.6.2 General Observations

Benthic invertebrate (benthos) abundance in the Whale Tail study area can vary widely for a given lake on an annual basis, though multiple years of baseline data helps to characterize variability in abundance among the areas. Richness tends to be relatively stable year-over-year. While the relative proportions of different taxa may vary, the number of total taxa was consistent throughout the baseline period and at the start of construction in the Whale Tail study area. Abundance (organisms/m^2) and richness (# unique taxa) is characteristic of depositional areas in northern lakes with low productivity and nutrient cycling with insects, primarily chironomids in the subfamilies Chironominae and Tanypodinae, and fingernail clams (Sphaeriidae) being the dominant benthic invertebrates.

Temporal and Spatial Trends

The methods and approaches used to assess benthos community metrics described for the Meadowbank CREMP also apply to the Whale Tail study area. Changes in benthos total abundance and

richness were evaluated in 2023 using the BACI study design outlined in **Section 2.3.3**. Dike construction in 2018 was the major mining event responsible for the transition of the Whale Tail lakes from *control* to *impact* due to the proximity of construction activities to the lakes (**Table 2-3**).

Time-series plots showing total abundance and richness endpoints were used to assess spatial and temporal trends for the Whale Tail lakes (**Figure 5-29** to **Figure 5-34**). Identifying potential mine-related impacts generally involved visually examining the data for spatial/temporal patterns that matched mine-related events. This was augmented with formal statistical analyses of the data to test for changes in total abundance and total taxa richness relative to baseline/reference conditions using the BACI model (see **Section 2.3.3** for details). Key results are described below.

Abundance (Density)

Total benthos abundance is highly variable within the lakes and among years (**Table 5-14**). However, in 2023 and 2022 high benthos abundance was reported in the NF lakes, where totals reached the highest abundances observed since monitoring started in 2015. In the reference lakes, these increasing patterns were not observed, rather levels have been more stable since 2015. The apparent changes in NF abundance compared to reference lakes could indicate the influence of mining activity, however, there are number of non-mining environmental factors (e.g., temperature) that could also result in the divergent patterns.

From a BACI context, where change is measured relative to baseline/reference conditions, higher abundance in a given year at the reference area could translate into a relative decrease at NF and MF lakes if annual abundance in those lakes remained stable. For clarity, we refer to those cases as *apparent* changes (increases or decreases). Abundances at WTS, KAN/MAM, A20, A76, and NEM in 2023 were all higher than reference in 2023 (**Figure 5-29**), but were only statistically significant (p-value < 0.1) at KAN/MAM and NEM (**Table 5-15**). These two areas also had significantly higher abundance in the 2022-23, 2021-23, and 2020-23 time periods. In the 2022-23 time period, WTS also had significantly higher abundance relative to baseline/reference conditions (**Table 5-15**). Note that the BACI analysis was run as a two-tailed test, to better define the significance of enriching effects (**Section 2.3.3**).

For the NF lakes, only KAN/MAM and NEM showed abundances ranging above what was observed during the baseline period (**Figure 5-29**). From 2022 to 2023 densities dropped from 13,066 to 9,285 organisms/m^2 at KAN/MAM and rose from 4,619 to 5,087 organisms/m^2 at NEM. During the baseline period, mean densities ranged from 3,050 to 4,236 organisms/m^2 at KAN/MAM and 1,712 to 2,897 organisms/m^2 at NEM. Densities similar to those reported at KAN/MAM in 2022 and 2023 have been observed at the Meadowbank study area lakes; Wally Lake (WAL), the shallowest of those lakes, has historically had the highest benthic densities, with measures up to 14,253 organisms/m^2.

Based on 17 years of monitoring benthic communities at the Meadowbank study lakes, the most likely explanation for the observed spike in density in 2022 and 2023 is a regional climate trend rather than a mine-related change. For example, maximum water temperatures recorded in 2023 and to a lesser extent in 2022 were higher than in previous years (**Section 5.2.2**). Alternatively, while increases in nutrients (**Section 5.3.2**) and primary productivity (**Section 5.4.3**) have been observed in water, these have not resulted in notable changes to sediment TOC (**Section 5.5.2**), which is an important pathway for nutrient enrichment in the benthic community and would help explain the sharp increased seen in 2022 and 2023 (Hyland et al., 2005; Pearson and Rosenburg, 1978). The potential influence of TOC on benthic communities is provided in **Table 5-5**, which shows the proportion of TOC may influence benthic abundance in an area. However, the changes in abundance observed in 2022 and 2023 are not corroborated by the sediment results which show that the proportions of TOC in Whale Tail lakes have been consistent since sampling began (**Figure 5-19**). Further, the densities observed in 2021, under a similar nutrient and primary production regime, were among the lowest observed across the Whale Tail impact lakes since 2015. As was the case for the elevated densities at WAL, additional monitoring data should help understand the cause of the increased densities observed in 2023.

Table 5-5. Comparison of TOC to benthic invertebrate abundance at the near- and mid-field Whale Tail study area lakes.

Area	Exposure	Mean 2015-2023	
		Abundance[1]	TOC[2]
INUG	Reference	1326 (6)	3.80 (6)
PDL	Reference	982 (7)	2.68 (7)
WTS	Near-field	3157 (4)	5.60 (5)
MAM	Near-field	6032 (1)	9.79 (1)
NEM	Near-field	3485 (3)	7.96 (2)
A20	Mid-field	3073 (5)	6.11 (4)
A76	Mid-field	4385 (2)	7.01 (3)

Notes:
Rank order of abundance and TOC shown in parentheses.
1. Mean value of abundance across years shown in **Table 5-14**.
2. Mean TOC across all lake samples within time period.

Taxa Richness

The same taxa observed at the Meadowbank lakes were documented during the baseline period for the Whale Tail lakes. Taxa richness is typically between 10 and 15 taxa in the Whale Tail lakes (**Figure 5-32**), with insects dominating in both number of taxa (**Figure 5-33**) and proportion of the total sample richness (**Figure 5-34**). Molluscs were the next most dominant taxonomic group in terms of the number species and relative richness.

The overall patterns observed at the NF and MF lakes are generally aligned with baseline conditions, but within-area temporal trends are quite variable across the lakes. In 2023, richness at all study lakes was within historical baseline ranges except for KAN/MAM where richness ranged from 16 to 20 (in 2023) compared to baseline levels ranging from 10 to 17 (2015 through 2018). Mean richness at both KAN/MAM and NEM appears to have consistently increased since mining activities began in 2019. Similar to total abundance, the BACI analysis found statistically significant (p-value < 0.1) increases in taxa richness at KAN/MAM and NEM in all time periods, at A20 in 2022-23, 2021-3, and 2020-23, and at DS1 in the 2022-23 time period (**Table 5-16**). While the results are likely due to natural variability, additional data should help verify the cause of the increased richness observed in 2023.

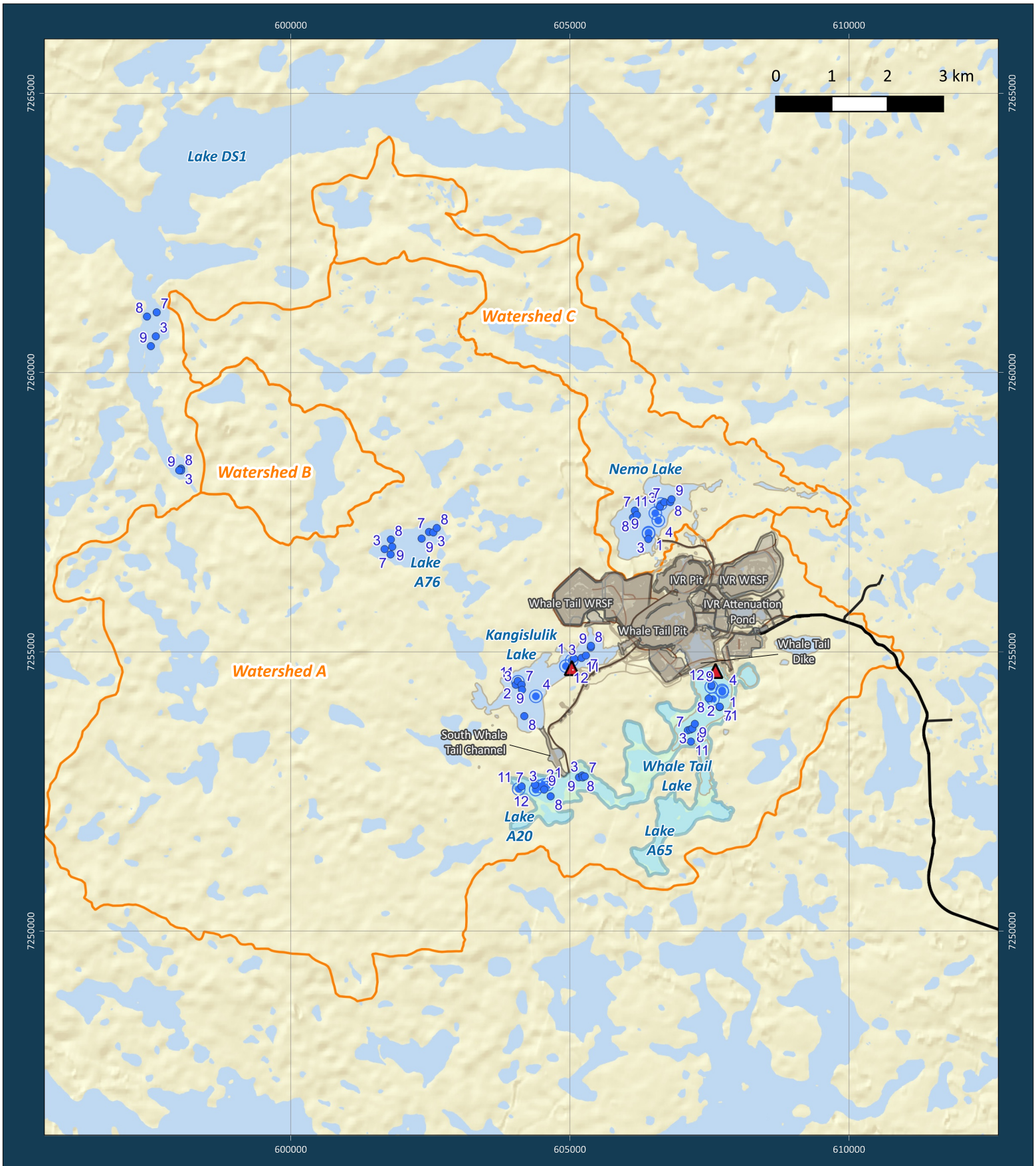
5.6.3 Summary and Recommendations

Increases in benthos abundance and taxa richness were observed at Whale Tail area lakes. For all time periods, there were significant increases in benthic invertebrate abundance at MAM and NEM compared to baseline/reference. In 2022-23, there was a significant increase at WTS. While nutrient inputs from mining activities may lead to an increase in benthic abundance, it is challenging to distinguish between mining related changes and environmental variability. For all time periods, there were significant increases in benthic invertebrate taxa richness at MAM and NEM compared to baseline/reference. For 2022-23, 2021-23, and 2020-23 time period, there were significant increases in benthic invertebrate taxa richness at MF area A20. While there has been some indication of episodic nutrient enrichment and increased phytoplankton production in the water column (**Section 5.4.3**), no notable increases in sediment TOC have occurred to suggest that any increases in benthic parameters indicate an enrichment effect (**Figure 5-19**). The apparent changes in the benthic community observed in 2023 are likely due to natural variability rather than to mining activities, and will continue to be monitored in 2024.

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).

Note: For Kangislulik lake, the acronyms MAM and/or KAN are used interchangeably in the Whale Tail figures and tables.



Legend

- Water *
- Limno
- Kangislulik & Whale Tail Lake Diffusers
- Whale Tail Lake (South Basin)
- Amaruq Watersheds
- Regional Watersheds
- Haul Road

Note:
* Water samples are collected from fixed monitoring locations in the project lakes where the water depth is at least 5 m.

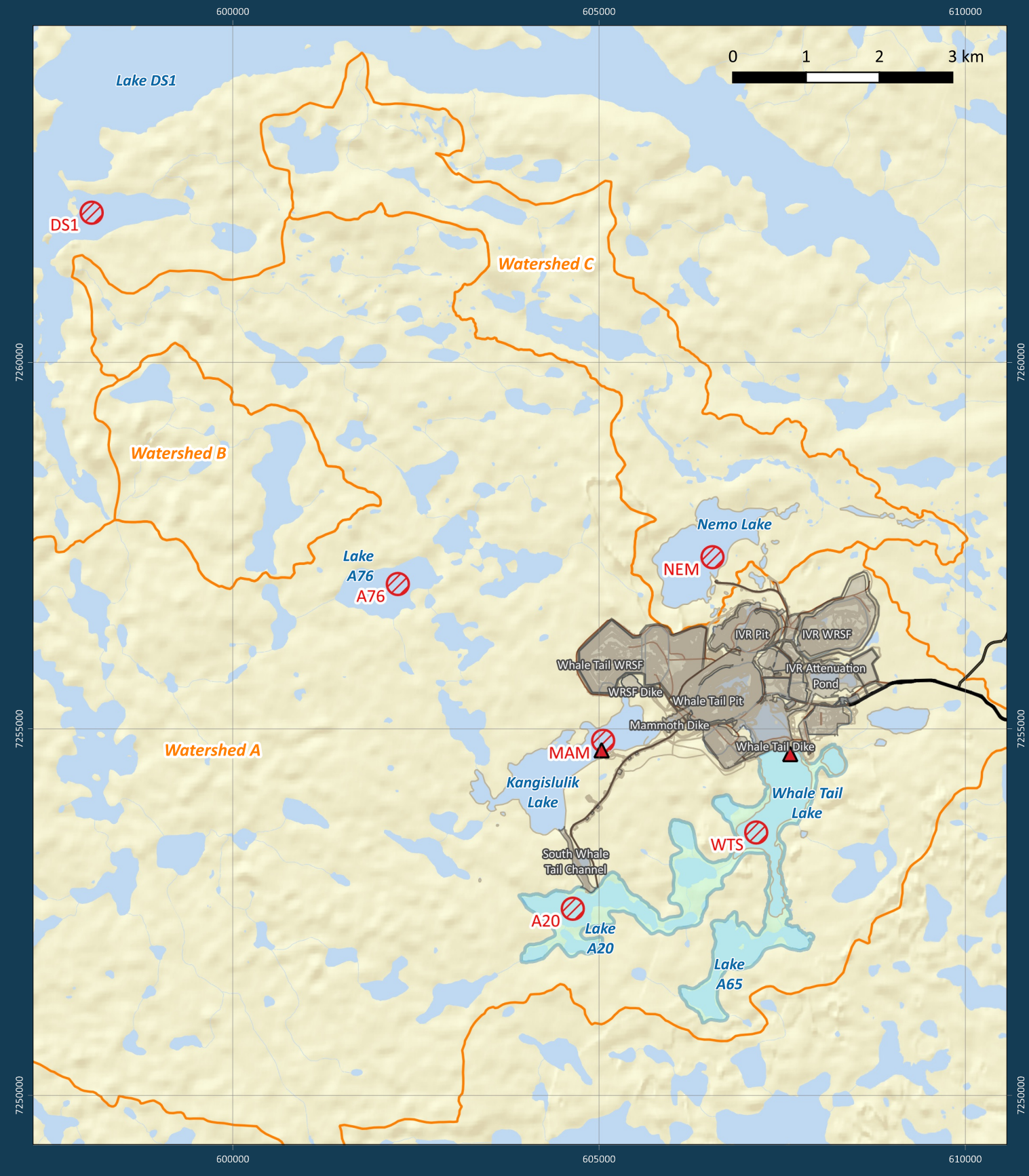


AZIMUTH

Client	Agnico Eagle Mines Limited Meadowbank Division
Figure 5-1	Whale Tail Study Area - 2023 Water Quality Sampling Stations
Project	CREMP 2023 Meadowbank Complex

Date: March 19, 2024
Datum: NAD 83 UTM Zone 14N
Scale: 1:90,000
Software: QGIS Version 3.22.11-Białowieża
By: M. DiMauro, E. Franz, I. McIvor

REFERENCES:
1. Basemap imagery from ESRI.
2. Mine plan and sub-watershed boundary layers from Agnico Eagle.
3. Watershed boundaries and watercourse from NRCan.



Legend

- Benthic Invertebrate & Sediment Chemistry Sampling Areas
- Kangislulik & Whale Tail Lake Diffusers
- Whale Tail Lake (South Basin)
- Amaruq Watersheds
- Regional Watersheds
- Haul Road



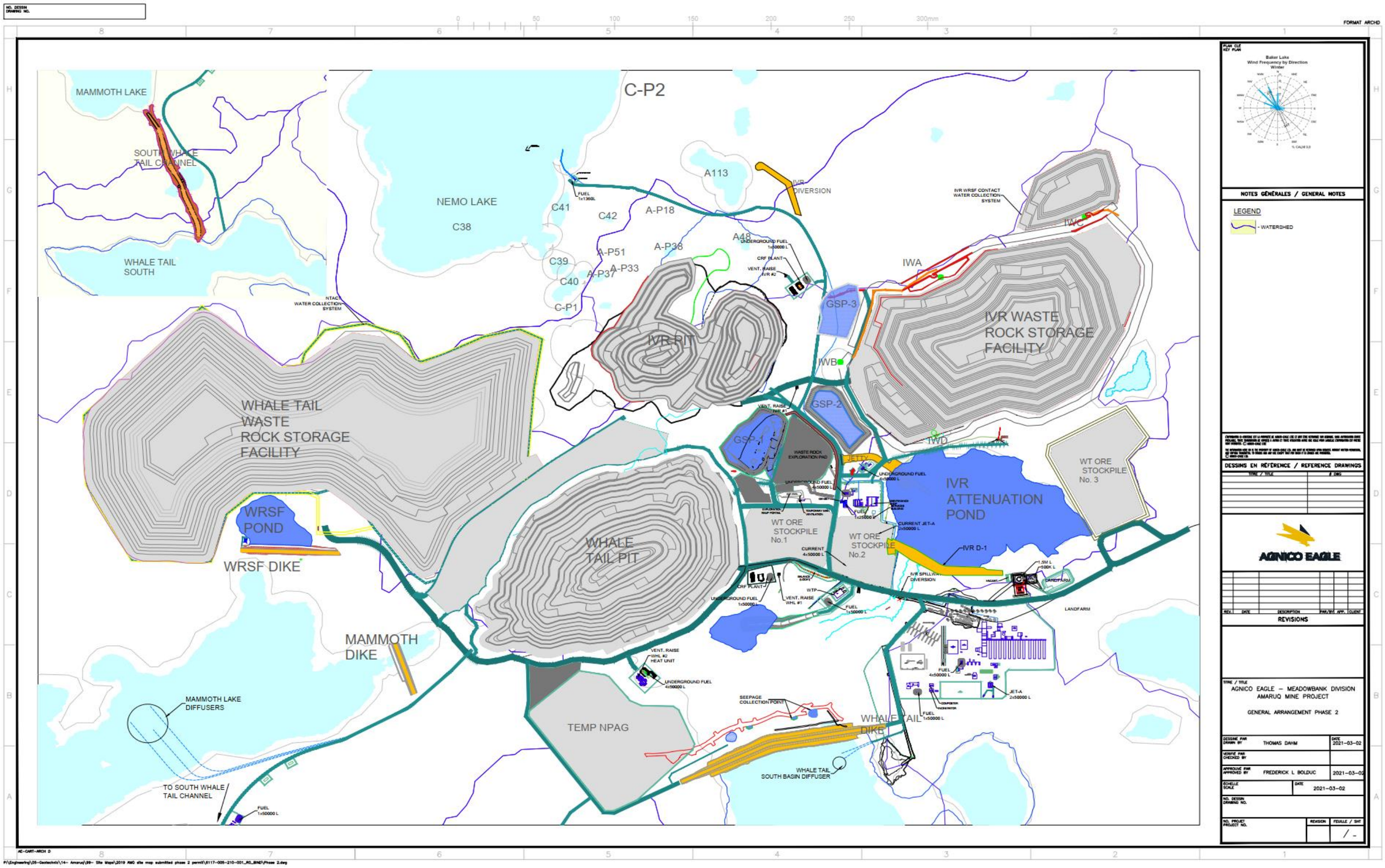
AZIMUTH

Client	Agnico Eagle Mines Limited Meadowbank Division
Figure 5-2	Whale Tail Study Area - 2023 Sediment and Benthic Invertebrate Monitoring Areas
Project	CREMP 2023 Meadowbank Complex

Date: March 19, 2024
Datum: NAD 83 UTM Zone 14N
Scale: 1:70,000
Software: QGIS Version 3.22.11-Białowieża
By: M. DiMauro, E. Franz, I. McIvor

REFERENCES:
1. Basemap imagery from ESRI.
2. Mine plan and sub-watershed boundary layers from Agnico Eagle.
3. Watershed boundaries and watercourse from NRCan.

Figure 5-3. Whale Tail mine plan showing the location of the Whale Tail Dike and other site infrastructure (Phase 2).



Limnology Tables and Figures

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

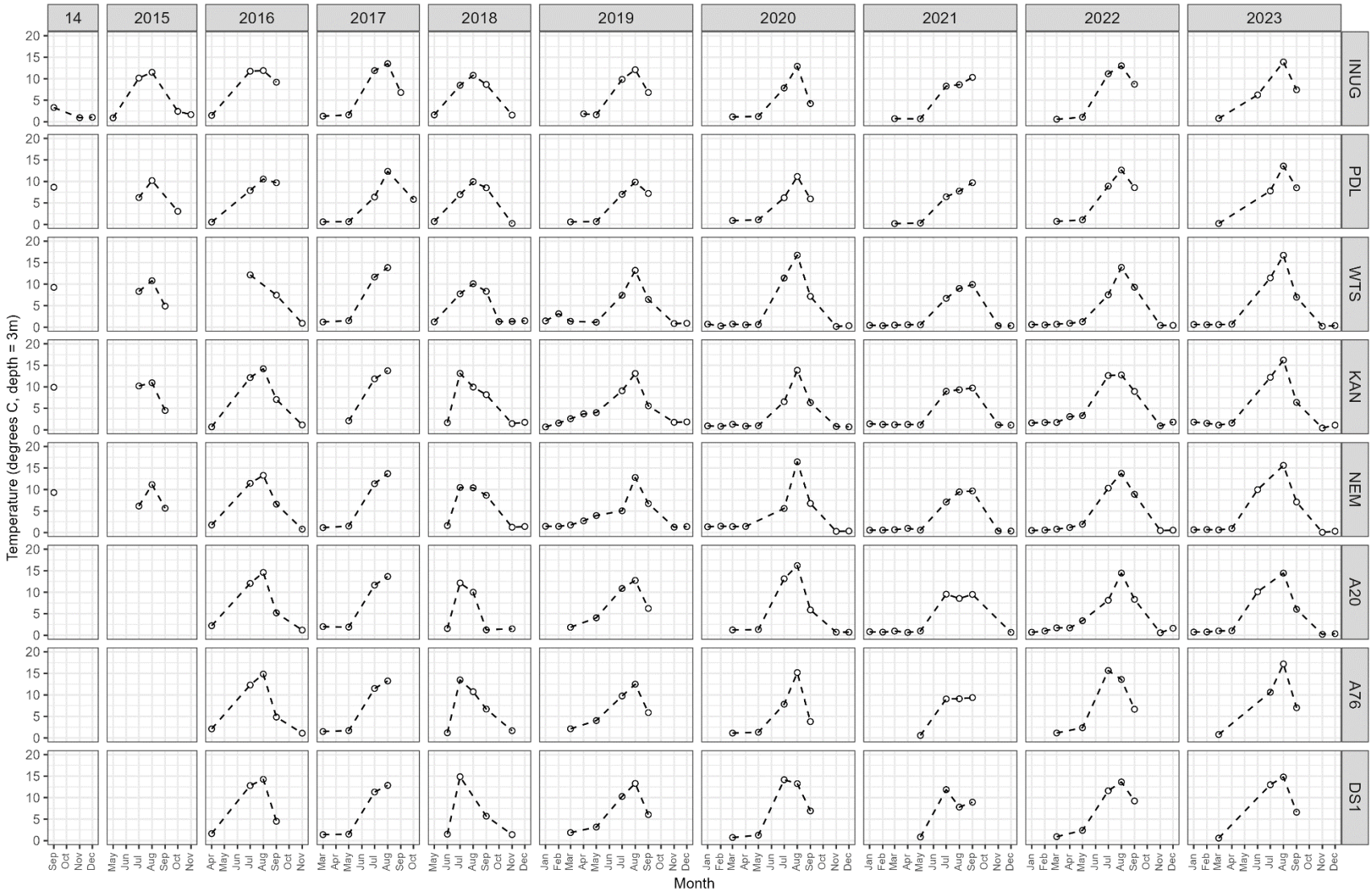


Figure 5-5. Whale Tail – Field-measured temperature profiles, 2023.

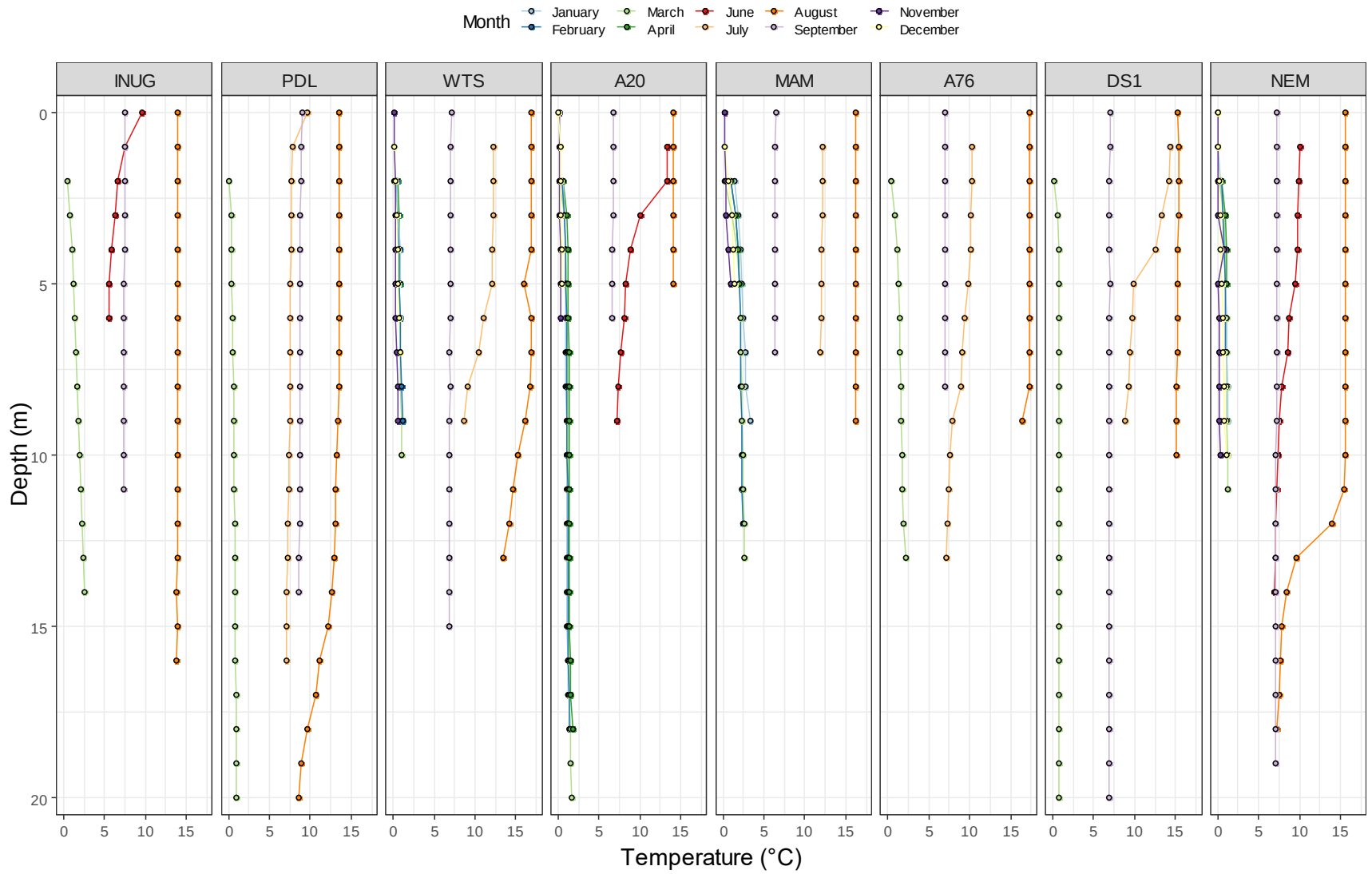


Figure 5-6. Whale Tail – Field-measured dissolved oxygen profiles, 2023.

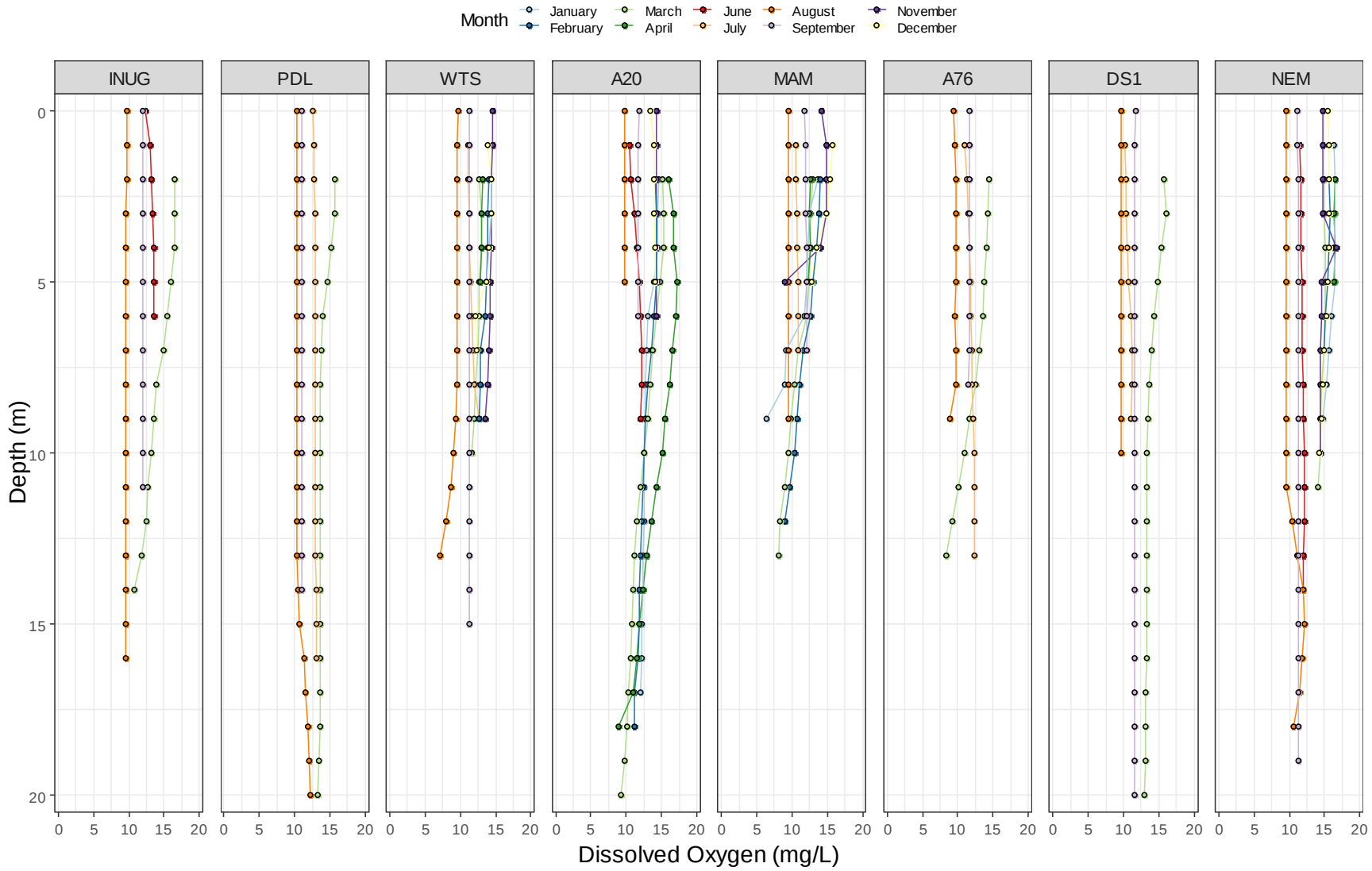
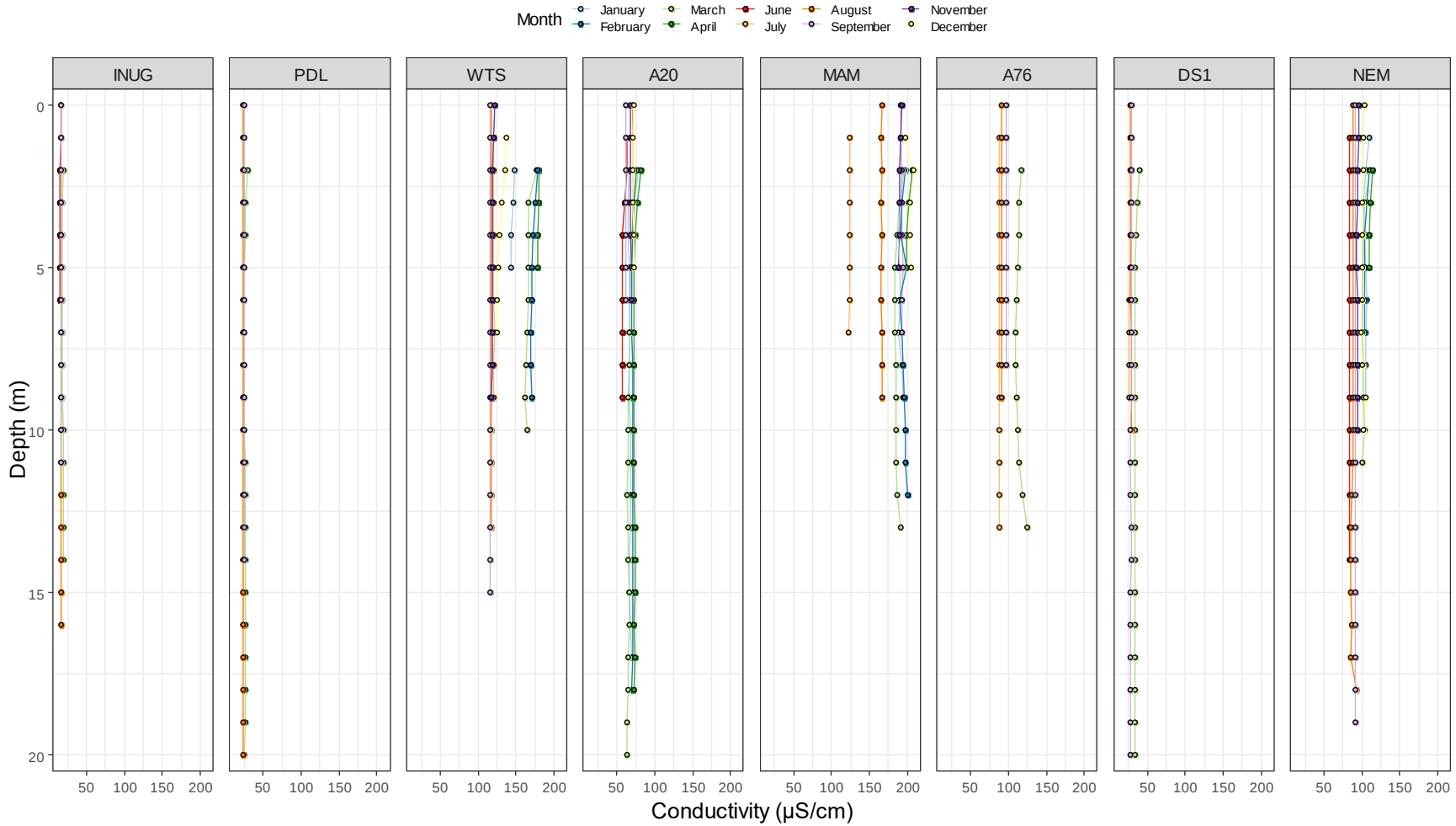


Figure 5-7. Whale Tail – Field-measured conductivity profiles, 2023.



Water Chemistry Tables and Figures

Table 5-6. Screening process for water quality parameters, Whale Tail study area lakes, 2023.

Parameters	Trigger Exceedance[2]	Screening Level and Rule[1] 1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency	3 Pattern = Activity
CONVENTIONALS				
Conductivity	All stations except INUG and PDL	**Yes**		
TSS	-	**Yes**		
Hardness	All stations except INUG and PDL	**Yes**		
T-Alkalinity	All stations except INUG	**Yes**		
B-Alkalinity	All stations except INUG	**Yes**		
C-Alkalinity	-	No	No	No
pH -Field	INUG and PDL	**Yes**		
pH -Lab		**Yes**		
TDS & MAJOR IONS				
TDS	WTS, KAN, A20, A76, and NEM	**Yes**		
Calcium	All stations except INUG and PDL	**Yes**		
Chloride	-	**Yes**		
Fluoride	WTS and KAN	**Yes**		
Magnesium	All stations except INUG and PDL	**Yes**		
Potassium	All stations except INUG and PDL	**Yes**		
Sodium	All stations except INUG and PDL	**Yes**		
Sulphate	-	**Yes**		
NUTRIENTS & OTHERS				
Ammonia-N	WTS and KAN	**Yes**		
Nitrate-N	-	**Yes**		
Nitrite-N	-	**Yes**		
TKN	WTS, KAN, A20, A76, DS1, PDL	**Yes**		
T-phosphorus	WTS, KAN, A20, DS1, PDL	**Yes**		
Ortho-phosphate	DS1	**Yes**		
DOC	All stations	**Yes**		
TOC	All stations except INUG and PDL	**Yes**		
Reactive silica	KAN and DS1	**Yes**		
T-Cyanide	-	No	No	No
Free Cyanide	-	No	No	No

Parameters	Trigger Exceedance[2]	Screening Level and Rule[1] 1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency	3 Pattern = Activity
TOTAL METALS				
Aluminum	-	**Yes**		
Antimony	-	**Yes**		
Arsenic	-	**Yes**		
Barium	-	**Yes**		
Beryllium	-	No	No	No
Boron	-	No	No	No
Cadmium	-	No	No	No
Chromium	-	**Yes**		
Copper	-	**Yes**		
Iron	-	**Yes**		
Lead	-	**Yes**		
Lithium	WTS and KAN	**Yes**		
Manganese	-	**Yes**		
Mercury	-	No	No	No
Molybdenum	-	**Yes**		
Nickel	-	**Yes**		
Selenium	-	**Yes**		
Silicon	WTS, KAN, DS1	**Yes**		
Silver	-	No	No	No
Strontium	-	**Yes**		
Thallium	-	No	No	No
Tin	-	No	No	No
Titanium	INUG, WTS, DS1, NEM	**Yes**		
Uranium	-	**Yes**		
Vanadium	-	No	No	No
Zinc	-	No	No	No

Parameters	Trigger Exceedance[2]	Screening Level and Rule[1] 1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency	3 Pattern = Activity
DISSOLVED METALS				
Aluminum	-	**Yes**		
Antimony	-	**Yes**		
Arsenic	-	**Yes**		
Barium	-	**Yes**		
Beryllium	-	No	No	No
Boron	-	No	No	No
Cadmium	-	No	No	No
Chromium	-	No	No	No
Copper	-	**Yes**		
Iron	-	**Yes**		
Lead	-	No	No	No
Lithium	WTS and KAN	**Yes**		
Manganese	-	**Yes**		
Mercury	-	No	No	No
Molybdenum	-	**Yes**		
Nickel	-	**Yes**		
Selenium	-	No	**Yes**	
Silicon	WTS, KAN, DS1	**Yes**		
Silver	-	No	No	No
Strontium	-	**Yes**		
Thallium	-	No	No	No
Tin	-	No	No	No
Titanium	-	No	No	No
Uranium	-	**Yes**		
Vanadium	-	No	No	No
Zinc	A76 and NEM	**Yes**		

Notes:

1. A three-step assessment process was used to identify parameters to include in the formal temporal and spatial trend assessment (**Section 2.3.1** and **Section 4.3.2**).
   Parameters were assigned a "Yes" if the following assessment was true:

(1) **>DL ≥ 10% Frequency**: parameters that exceeded MDLs in at least 10% of the samples.
(2) **C-I > 0.1 Frequency**: parameters that were detected more often in impact areas and the proportion of detected values increased by 0.1 or more.
(3) **Pattern = Activity**: additional step to avoid screening out potentially important parameters. Based on the trend plots, is there a trend for infrequently detected parameters and/or are there values > 5 x DL in at least one sampling event at NF areas?

2. Indicates that a trigger exceedance occurred at the listed Whale Tail study area lakes in one or more sampling event.

Shaded parameters are included in the temporal and spatial trend assessment.
Plots for all individual parameters are presented in **Appendix B2**.

Table 5-7. Water quality variables at the Whale Tail study area lakes for which 2023 mean concentrations exceeded the trigger.

Parameter	Trigger	Threshold	2023 Mean					
			WTS	MAM	NEM	A20	A76	DS1
			NF	NF	NF	MF	MF	FF
Conventionals								
Conductivity	48.6	-	129	166	92.6	71.1	99.0	-
Hardness	17.4	-	46.4	59.0	35.3	25.6	35.6	-
HCO_3 alkalinity	9.6	-	20.1	21.1	13.1	13.7	14.4	-
Total alkalinity	9.6	-	20.1	21.1	13.1	13.7	14.4	-
TDS & Major Ions								
TDS	38.5	-	96.3	120	76.7	55.4	67.1	-
Calcium	4.6	-	12.7	17.0	10.4	6.9	9.9	-
Magnesium	1.4	-	3.6	4.0	2.3	2.0	2.6	-
Potassium	0.84	-	3.2	3.9	1.7	1.8	2.2	-
Sodium	0.97	-	2.8	3.3	-	1.7	1.8	1.2
Nutrients								
TKN	0.17	-	0.31	0.26	-	0.22	-	-
Total phosphorus	0.0045	0.01	0.0067	-	-	0.0051	-	-
TOC	2.4	-	3.3	2.7	-	3.3	-	2.9
DOC	2.4	-	3.4	2.5	-	3.2	-	2.9
Metals								
Lithium (T)	0.0020	-	0.0021	0.0028	-	-	-	-
Lithium (D)	0.0020	-	0.0022	0.0028	-	-	-	-
Silicon (D)	0.57	-	-	-	-	-	-	0.59

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

Table 5-8. Results of BACI tests for selected water variables at the Whale Tail study area lakes in 2023.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	P-value[1]	Proportional change		
							exp(Est)	LCI	UCI
Conventionals									
Conductivity	WTS	14	4	1.4	0.16	**< 0.001**	4.2	3.0	6.0
	MAM	15	4	1.4	0.17	**< 0.001**	3.9	2.8	5.7
	A20	13	4	1.4	0.075	**< 0.001**	4.2	3.6	4.9
	A76	13	4	1.00	0.097	**< 0.001**	2.7	2.2	3.3
	NEM	20	4	1.1	0	**< 0.001**	3.2	3.2	3.2
Hardness	WTS	14	4	1.4	0.15	**< 0.001**	4.2	3.1	5.8
	MAM	15	4	1.4	0.16	**< 0.001**	3.9	2.8	5.4
	A20	13	4	1.5	0.085	**< 0.001**	4.4	3.6	5.2
	A76	13	4	0.97	0.089	**< 0.001**	2.6	2.2	3.2
	NEM	20	4	1.1	0	**< 0.001**	3.2	3.2	3.2
HCO_3 alkalinity	WTS	13	4	1.4	0.068	**< 0.001**	4.0	3.5	4.6
	MAM	14	4	1.3	0.085	**< 0.001**	3.7	3.1	4.4
	A20	13	4	0.90	0.089	**< 0.001**	2.5	2.0	3.0
	A76	13	4	0.74	0.058	**< 0.001**	2.1	1.8	2.4
	NEM	19	4	0.48	0.057	**< 0.001**	1.6	1.4	1.8
Total alkalinity	WTS	13	4	1.4	0.068	**< 0.001**	4.0	3.5	4.6
	MAM	14	4	1.3	0.085	**< 0.001**	3.7	3.1	4.4
	A20	13	4	0.90	0.089	**< 0.001**	2.5	2.0	3.0
	A76	13	4	0.74	0.058	**< 0.001**	2.1	1.8	2.4
	NEM	19	4	0.48	0.057	**< 0.001**	1.6	1.4	1.8
Nutrients & Others									
TKN	WTS	13	4	0.85	0.12	**< 0.001**	2.3	1.8	3.0
	MAM	14	4	0.76	0.098	**< 0.001**	2.1	1.7	2.6
	A20	13	4	0.73	0.13	**< 0.001**	2.1	1.6	2.8
Total phosphorus	WTS	14	4	0.59	0.25	**0.015**	1.8	1.1	3.0
	A20	13	4	0.36	0.17	**0.026**	1.4	1.0	2.1
TOC	WTS	14	4	0.32	0.067	**< 0.001**	1.4	1.2	1.6
	MAM	15	4	0.25	0.086	**0.0060**	1.3	1.1	1.5
	A20	13	4	0.50	0.090	**< 0.001**	1.7	1.4	2.0
	DS1	13	4	0.11	0.098	0.13	1.1	0.91	1.4
DOC	WTS	14	4	0.18	0.064	**0.0070**	1.2	1.0	1.4
	MAM	15	4	0.024	0.092	**0.40**	1.0	0.84	1.2
	A20	13	4	0.34	0.097	**0.0020**	1.4	1.1	1.7
	DS1	13	4	-0.013	0.11	0.55	0.99	0.79	1.2
TDS & Major Ions									
TDS	WTS	13	4	1.2	0.22	**< 0.001**	3.4	2.1	5.5
	MAM	14	4	1.2	0.24	**< 0.001**	3.2	1.9	5.3
	A20	13	4	1.1	0.17	**< 0.001**	3.2	2.2	4.6
	A76	13	4	0.78	0.16	**< 0.001**	2.2	1.6	3.1
	NEM	19	4	1.2	0.16	**< 0.001**	3.2	2.3	4.5
Calcium	WTS	14	4	1.5	0.20	**< 0.001**	4.4	2.9	6.7
	MAM	15	4	1.4	0.20	**< 0.001**	4.1	2.7	6.1
	A20	13	4	1.5	0.093	**< 0.001**	4.5	3.7	5.5
	A76	13	4	1.0	0.092	**< 0.001**	2.8	2.3	3.4
	NEM	20	4	1.4	0	**< 0.001**	4.0	4.0	4.0
Magnesium	WTS	14	4	1.3	0.12	**< 0.001**	3.8	3.0	4.9
	MAM	15	4	1.2	0.12	**< 0.001**	3.4	2.7	4.5
	A20	13	4	1.4	0.097	**< 0.001**	3.9	3.2	4.8
	A76	13	4	0.81	0.075	**< 0.001**	2.3	1.9	2.6
	NEM	20	4	0.64	0.048	**< 0.001**	1.9	1.7	2.1
Potassium	WTS	14	4	1.9	0.12	**< 0.001**	6.7	5.2	8.7
	MAM	15	4	1.7	0.12	**< 0.001**	5.6	4.3	7.2
	A20	13	4	1.5	0.11	**< 0.001**	4.5	3.6	5.6
	A76	13	4	1.1	0.078	**< 0.001**	3.0	2.5	3.5
	NEM	20	4	0.99	0.061	**< 0.001**	2.7	2.4	3.1
Sodium	WTS	14	4	1.5	0.096	**< 0.001**	4.3	3.5	5.3
	MAM	15	4	1.6	0.099	**< 0.001**	4.8	3.9	6.0
	A20	13	4	0.94	0.10	**< 0.001**	2.6	2.1	3.2
	A76	13	4	0.94	0.069	**< 0.001**	2.6	2.2	3.0
	DS1	13	4	0.27	0.12	**0.021**	1.3	1.0	1.7
Metals									
T. Lithium	WTS	14	4	0.66	0.079	**< 0.001**	1.9	1.6	2.3
	MAM	15	4	0.78	0.16	**< 0.001**	2.2	1.6	3.0
D. Lithium	WTS	14	4	0.73	0.052	**< 0.001**	2.1	1.9	2.3
	MAM	15	4	0.81	0.14	**< 0.001**	2.3	1.7	3.1
D. Silicon	DS1	13	4	-0.016	0.25	0.53	0.98	0.58	1.7

Notes:

1. Bolded P-values are statistically significant ($p < 0.05$).

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 2023).

Estimate = BACI model estimate of the 2023 change in mean for log-transformed data.

SE = standard error of the estimate.

DF = degrees of freedom.

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 5-9. Sampling effort and frequency assessment results for the Whale Tail study area lakes, 2023.

Areas	Area Designation	Triggers Exceeded?	Minor Changes [1]		Moderate Changes [2]		Major Changes [3]		Plan for 2024
		Yes/No	Yes/No	Parameters	Yes/No	Parameters	Yes/No	Parameters	
Sampling Strategy for Near-field Areas									
WTS	NF	Yes	Yes	Cond., Hard., TDS, Alkalinity (HCO_3 & Total), T.phosphorus, TKN, TOC, DOC, Ca, Mg, K, Na, T.&D. Lithium.	No	-	No	-	Full CREMP (near-field area)
MAM/KAN	NF	Yes	Yes	Cond., Hard., TDS, Alkalinity (HCO_3 & Total), TKN, TOC, DOC, Ca, Mg, K, Na, T.&D. Lithium.	No	-	No	-	Full CREMP (near-field area)
NEM	NF	Yes	Yes	Cond., Hard., TDS, Alkalinity (HCO_3 & Total), Ca, Mg, K.	No	-	No	-	Full CREMP (near-field area)
Sampling Strategy for Mid-field and Far-field Areas									
A20	MF	Yes	Yes	Cond., Hard., TDS, Alkalinity (HCO_3 & Total), T.phosphorus, TKN, TOC, DOC, Ca, Mg, K, Na.	No	-	No	-	Full water sampling
A76	MF	Yes	Yes	Cond., Hard., TDS, Alkalinity (HCO_3 & Total), Ca, Mg, K, Na.	No	-	No	-	Full water sampling
DS1	FF	Yes	Yes	TOC, DOC, Na, D. Silicon.	No	-	No	-	Full water 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 5-10. Number of monthly mean concentrations exceeding monthly FEIS screening predictions, annual mean trigger exceedances and trend directions for parameters in Kangislulik Lake and Whale Tail South in 2023.

	Number of Monthly Exceedances of FEIS Predictions [1]		Annual Mean Exceeds Trigger		Direction of Change [2]	
Parameter	**Whale Tail South**	**Kangislulik Lake**	**Whale Tail South**	**Kangislulik Lake**	**Whale Tail South**	**Kangislulik Lake**
Conventionals						
Total Alkalinity	5	5	**Yes**	**Yes**	=	↑
TDS & Major Ions						
TDS	5	5	**Yes**	**Yes**	=	=
Chloride	5	5	No	No	=	=
Fluoride	5	5	No	No	=	=
Calcium	5	5	**Yes**	**Yes**	=	=
Potassium	5	5	**Yes**	**Yes**	=	↑
Magnesium	5	5	**Yes**	**Yes**	↑	↑
Sodium	2	5	**Yes**	**Yes**	=	=
Sulphate	5	5	No	No	=	↑
Nutrients						
Ammonia (as N)	1	1	No	No	=	↓
Nitrate (as N)	2	2	No	No	=	=
Total Phosphorus	1	0	**Yes**	No	=	=
Total Metals						
Aluminum	5	4	No	No	↑	↓
Antimony	4	5	No	No	↓	=
Barium	5	5	No	No	=	=
Chromium	1	0	No	No	↓	=
Iron	2	0	No	No	↓	↓
Lithium	5	5	**Yes**	**Yes**	=	=
Molybdenum	5	5	No	No	↓	↓
Nickel	1	0	No	No	↓	=
Strontium	5	5	No	No	=	=
Uranium	0	1	No	No	=	↓
Total	**79**	**78**	-	-		

Notes:

1 In all cases, five months of data were available. May sampling was canceled due to unsafe ice conditions in 2023. An abbreviated sampling event was completed at WTS and KAN/MAM in November 2023.

2 Qualitative direction of trend according to 2023 water quality plots.

Shaded values indicate parameter exceeded FEIS prediction during all 2023 monthly sampling events.

Bolded and underlined values indicate yearly mean exceeded trigger.

Bolded arrows indicate parameter concentrations appeared to be increasing in last sampling events of 2023.

Figure 5-8. Flow chart showing sampling effort and frequency plan for mid-field and far-field sampling at the Whale Tail study area lakes in 2023.

Note: Blue-shaded cells show the linkage between 2023 CREMP results and the sampling effort and frequency for mid-field and far-field sampling in 2024. *Moderate changes* refer to statistically significant increased concentrations for parameters with effects-based threshold values that exceed the early warning trigger values. Refer to **Section 2.2.3** for more information.

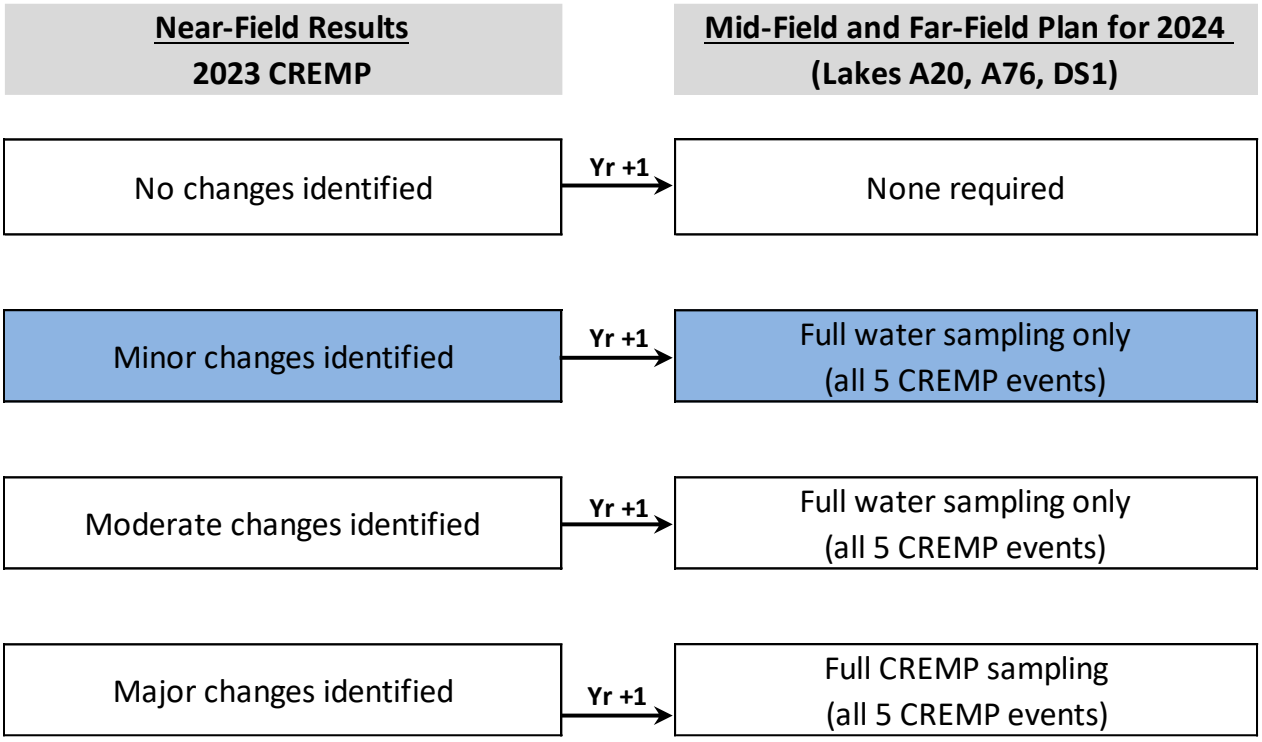


Figure 5-9. Conventional parameters measured in water samples from Whale Tail study area lakes since 2014.

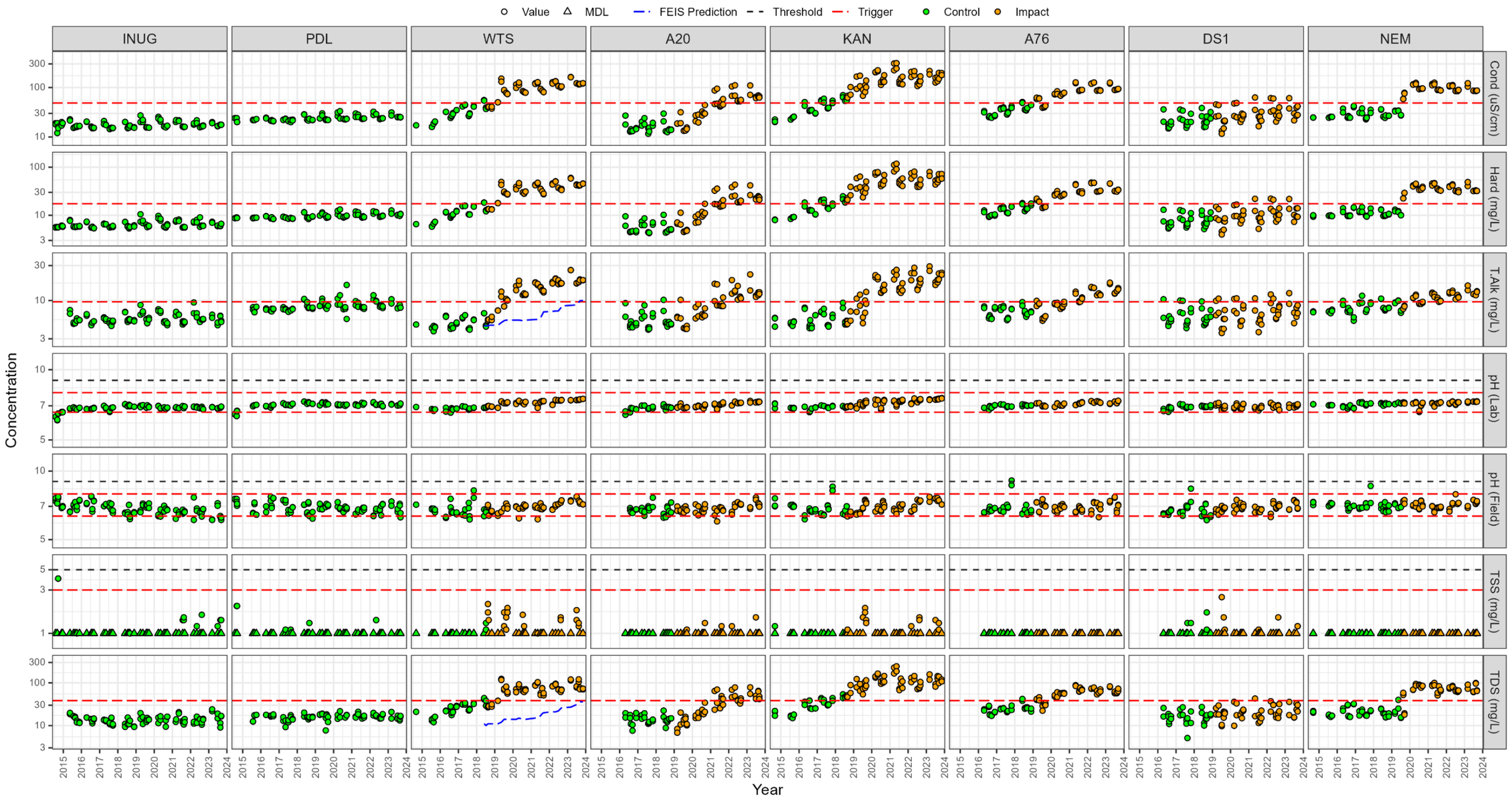


Figure 5-10. Major ions (mg/L) measured in water samples from Whale Tail study area lakes since 2014.

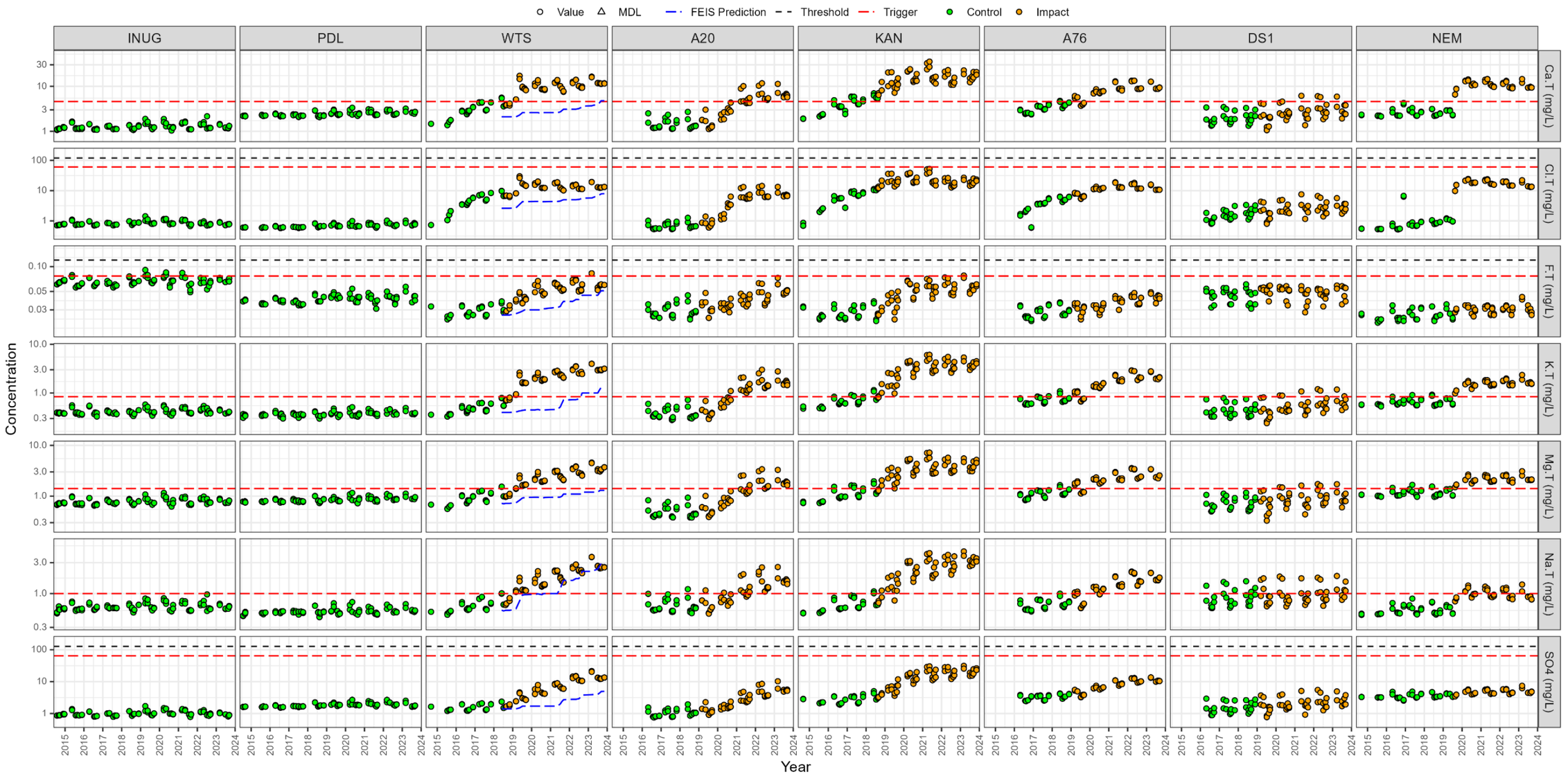


Figure 5-11. Nutrient parameters measured in water samples from Whale Tail study area lakes since 2014.

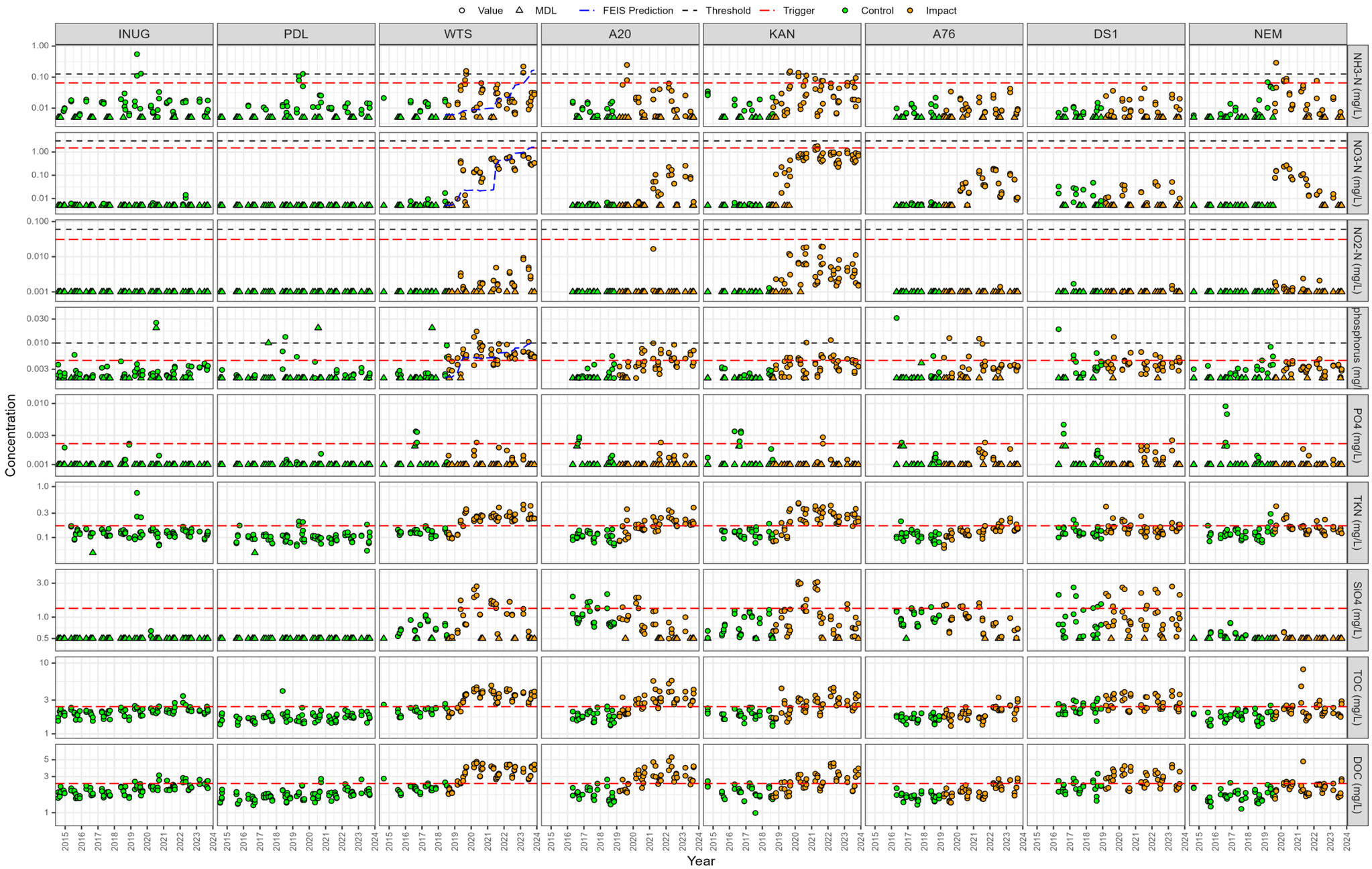


Figure 5-12. Metals measured in water samples from Whale Tail study area lakes since 2014.

Note: The detection limit for total chromium was adjusted from 0.0001 mg/L to 0.0005 mg/L for samples collected since May 2021.

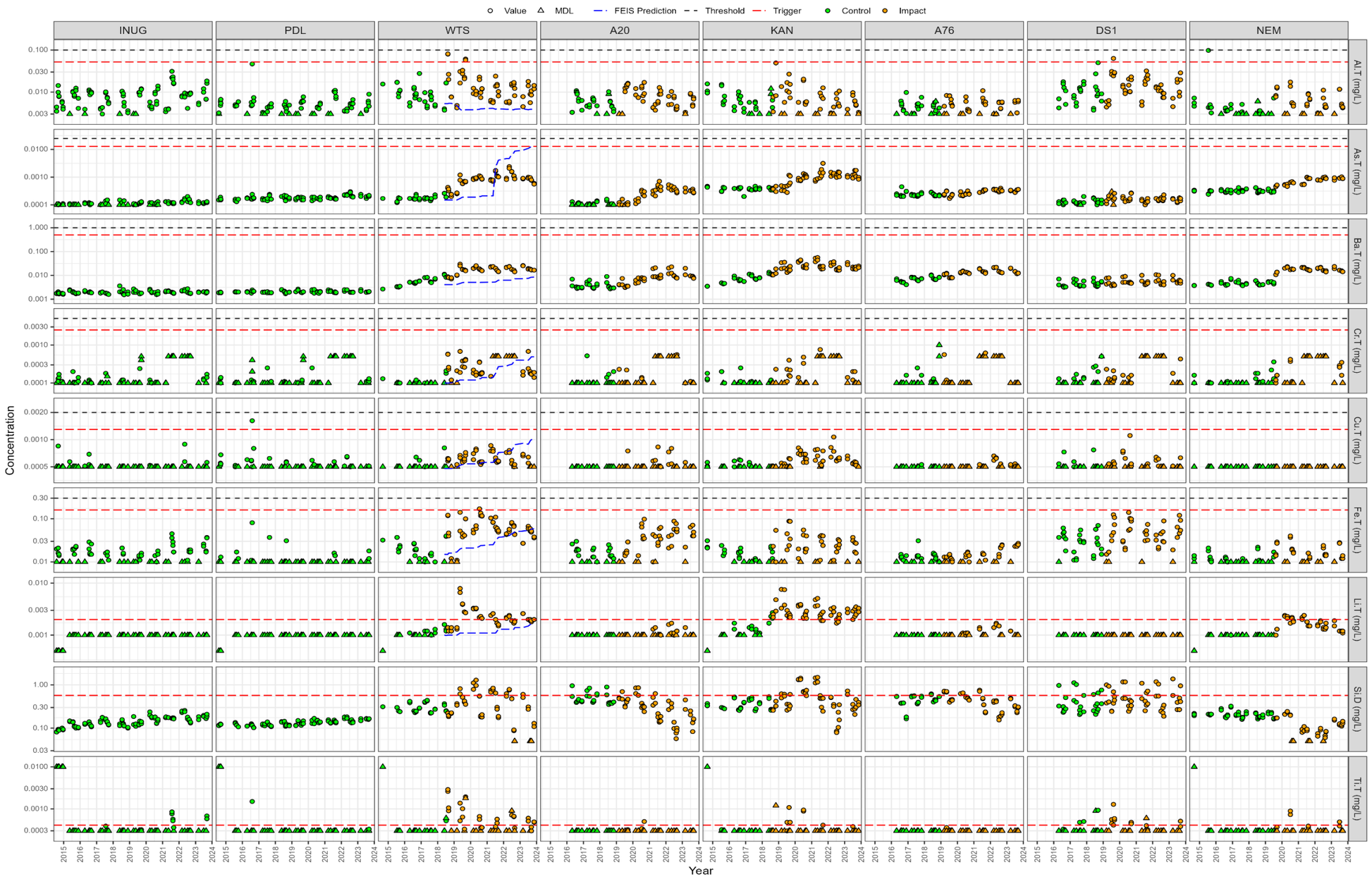
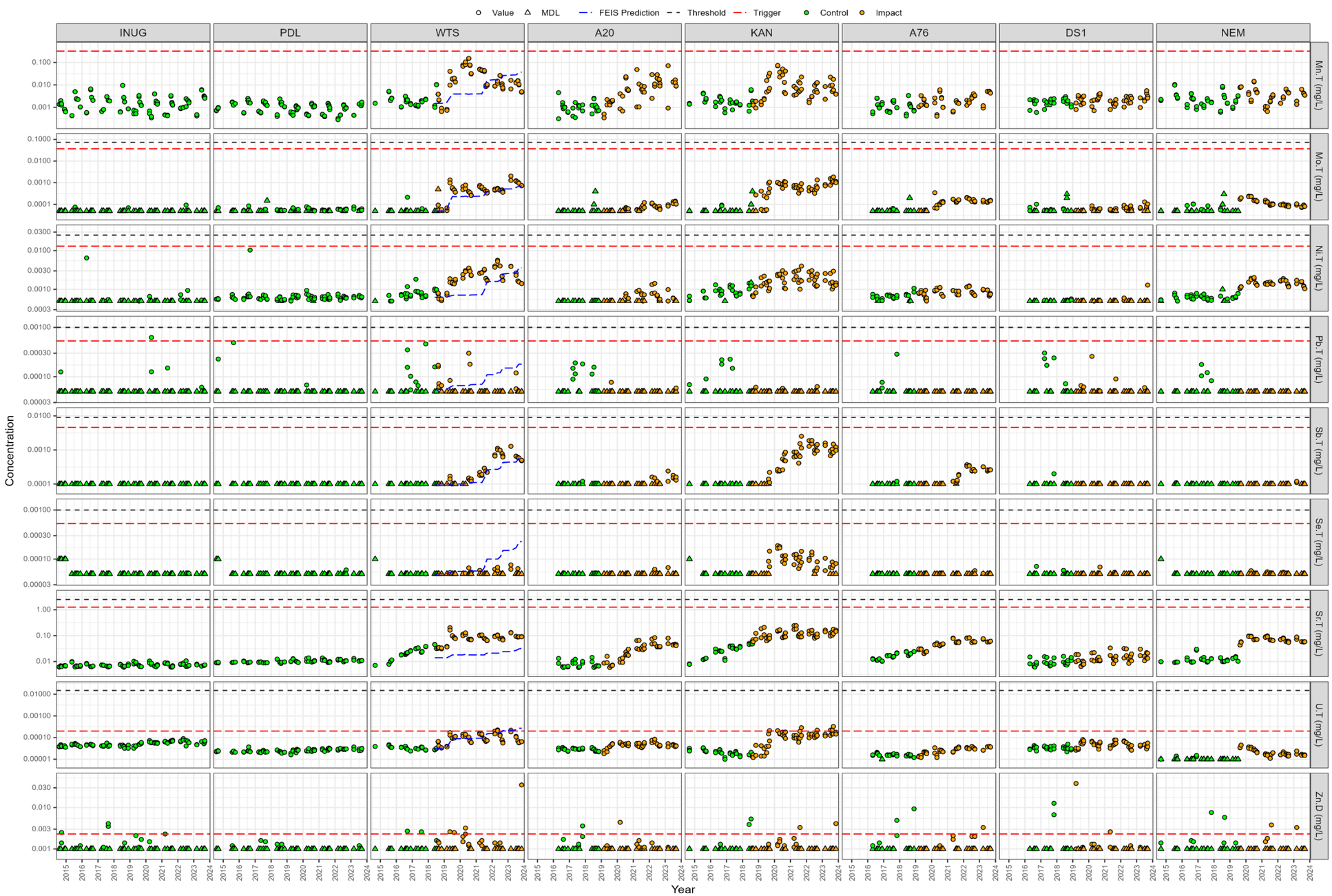


Figure 5-13. Metals measured in water samples from Whale Tail study area lakes since 2014.



Phytoplankton Tables and Figures

Table 5-11. Results of the BACI test for phytoplankton variables at Whale Tail study area lakes, 2023.

Parameter Measured	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
Total Biomass	WTS	15	3	0.71	0.40	**0.099**	102	-14	375
	KAN	16	3	0.15	0.62	0.808	17	-69	334
	A20	14	3	1.23	0.61	**0.062**	243	-7	1157
	A76	14	3	-0.14	0.60	0.814	-13	-76	210
	DS1	14	3	-0.35	0.66	0.610	-29	-83	192
	NEM	21	3	0.17	0.50	0.734	19	-58	237
Taxa Richness	WTS	15	3	-0.06	0.12	0.627	-6	-26	21
	KAN	16	3	-0.20	0.22	0.357	-18	-48	28
	A20	14	3	0.13	0.22	0.558	14	-29	82
	A76	14	3	-0.29	0.20	0.163	-25	-51	14
	DS1	14	3	-0.11	0.17	0.518	-11	-38	29
	NEM	21	3	-0.20	0.14	0.180	-18	-39	11

Notes:

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

Shaded cells indicate positive (increased) 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 2023).

Estimate = BACI model estimate of the 2023 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 5-14. Chlorophyll-a (µg/L) in water samples from Whale Tail study area lakes since 2014.

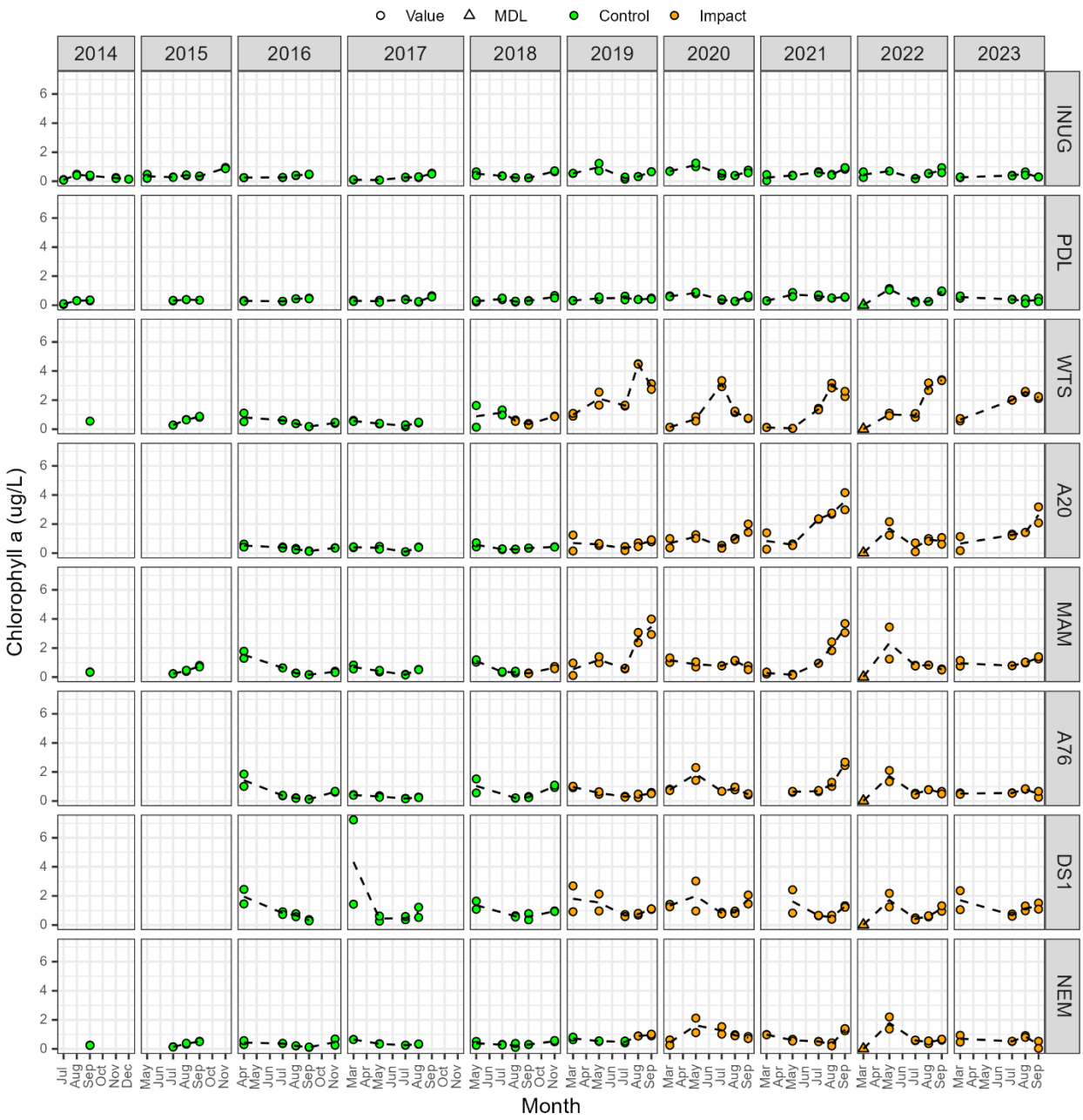


Figure 5-15. Total phytoplankton biomass (mg/m³) from Whale Tail study area lakes since 2014.

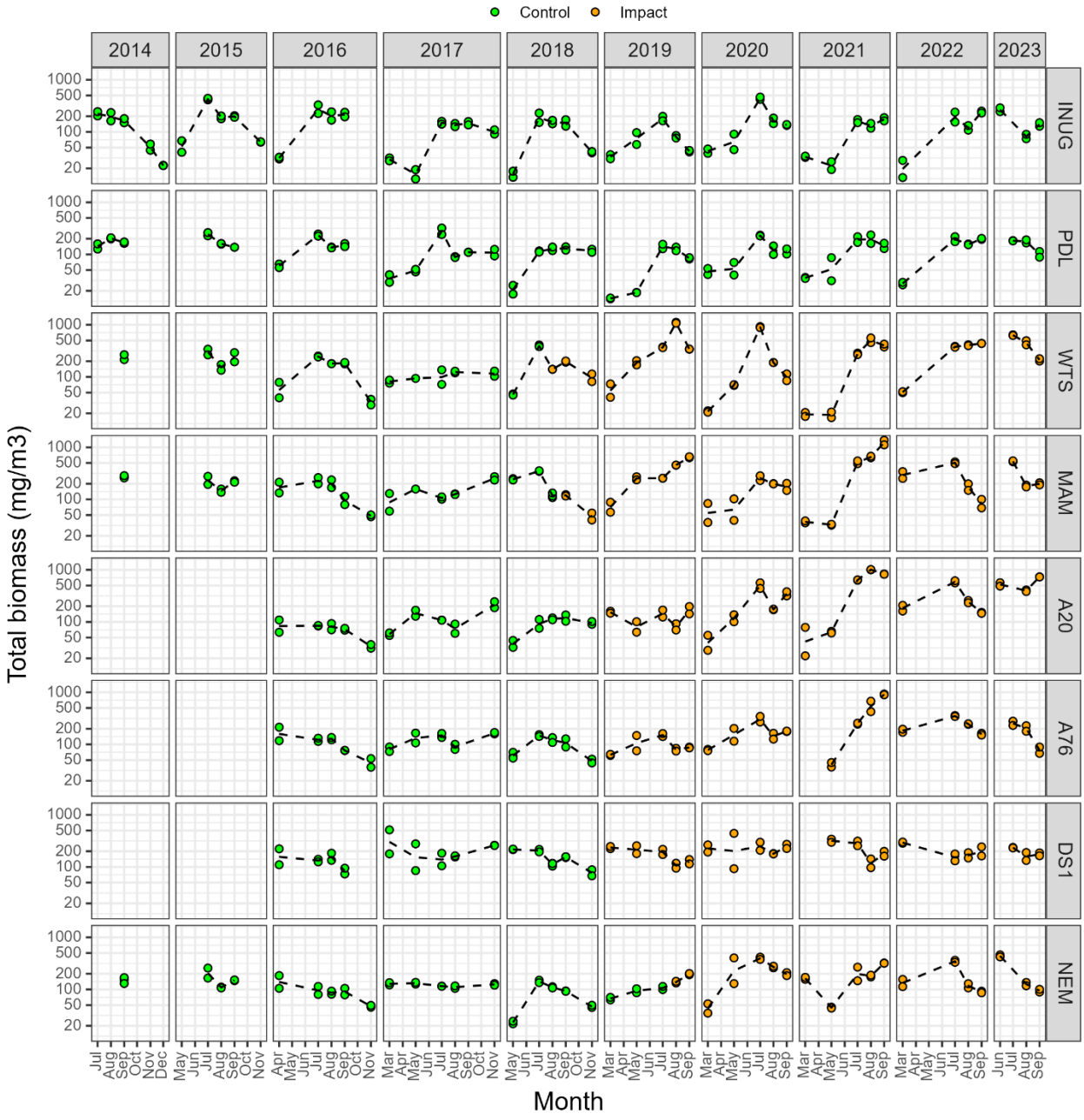


Figure 5-16. Phytoplankton biomass (mg/m³) by major taxa group from Whale Tail study area lakes since 2014.



Figure 5-17. Relative phytoplankton biomass by major taxa from Whale Tail study area lakes since 2014.

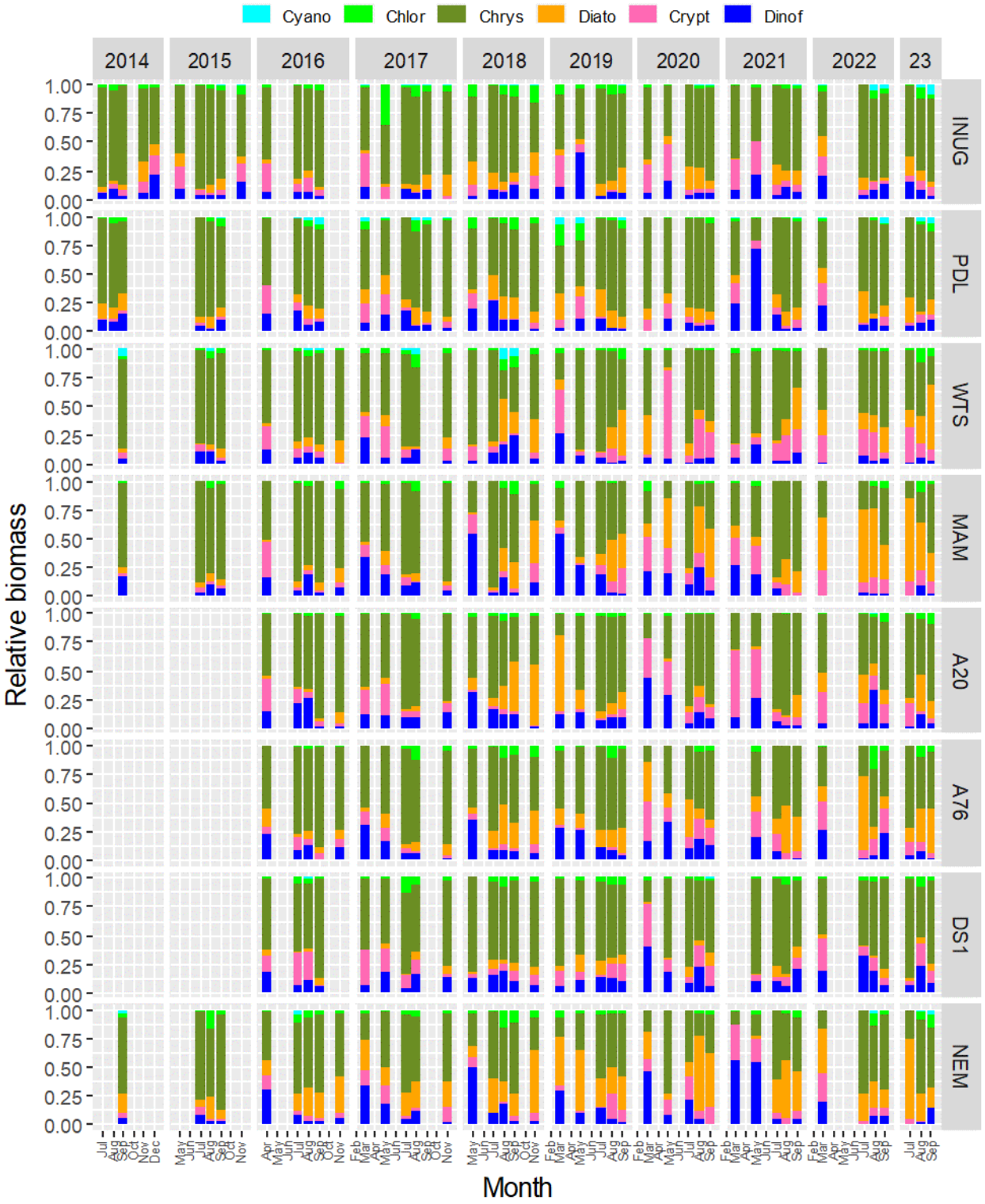
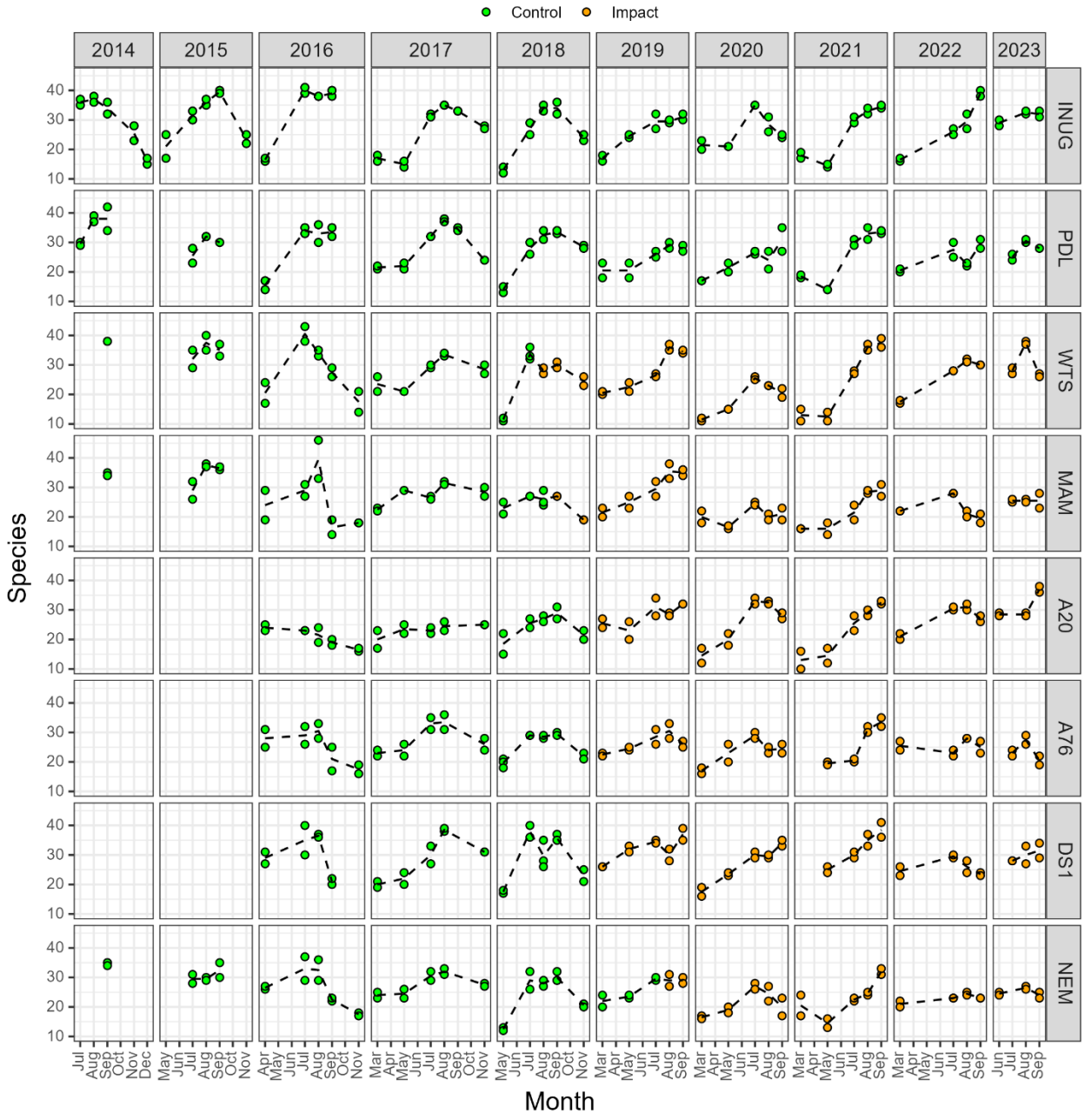


Figure 5-18. Phytoplankton species richness from Whale Tail study area lakes since 2014.



Sediment Chemistry Tables and Figures

Table 5-12. Sediment core metals at the Whale Tail monitoring areas for which the 2023 mean concentration exceeded the trigger.

Parameter	Triggers						2023 Mean					
							WTS	MAM/KAN	A20	A76	DS1	NEM
	WTS	MAM/KAN	A20	A76	DS1	NEM	NF	NF	MF	MF	FF	NF
Aluminum							15090	21860	22410	17520	18490	10924
Arsenic	83	140	43	461	198	61	211	143	57	-	-	-
Cadmium	0.93	0.43	0.37	0.44	0.45	0.41	-	-	-	-	-	-
Chromium	81	194	53	103	80	130	106	201	58	-	-	-
Copper	49	77	42	76	26	43	-	-	45	-	-	-
Lead	24	26	25	26	26	22	-	-	-	-	-	-
Mercury	0.12	0.13	0.11	0.11	0.12	0.10	-	-	-	-	-	-
Zinc	196	139	103	112	101	89	-	-	-	-	-	-

Notes:
"-" indicates mean annual concentration was < the trigger value.
Reported mean values are all in units of mg/kg dw (mean of 10 replicate sediment core samples).

Table 5-13. Results of the before-after statistical analysis of sediment core chemistry data at the Whale Tail monitoring areas, 2023.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	P-value[1]	DF	Proportional change		
								exp(Est)	LCI	UCI
Arsenic	WTS	10	10	1.6	0.43	**0.001**	18	4.8	1.9	12.0
	MAM/KAN	10	10	0.29	0.18	**0.061**	18	1.3	0.92	1.9
	A20	10	10	0.55	0.31	**0.044**	18	1.7	0.91	3.3
Chromium	WTS	10	10	0.43	0.12	**<0.001**	18	1.5	1.2	2.0
	MAM/KAN	10	10	0.22	0.039	**<0.001**	18	1.2	1.1	1.4
	A20	10	10	0.24	0.054	**<0.001**	18	1.3	1.1	1.4
Copper	A20	10	10	0.22	0.065	**0.002**	18	1.2	1.1	1.4

Notes:

1. **Bolded** values are p-values < 0.05.

Test area in 2023 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 2023).

Estimate = BA model estimate of the 2023 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 2023 relative to the *before* period.

DF = degrees of freedom.

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

Figure 5-19. TOC (%) in sediment from the Whale Tail study area lakes.

Note: In 2021, a batch of sediment samples were not analyzed due to a sample receipt error by the laboratory. Missing results in 2021 correspond to samples that were discarded prior to analysis.

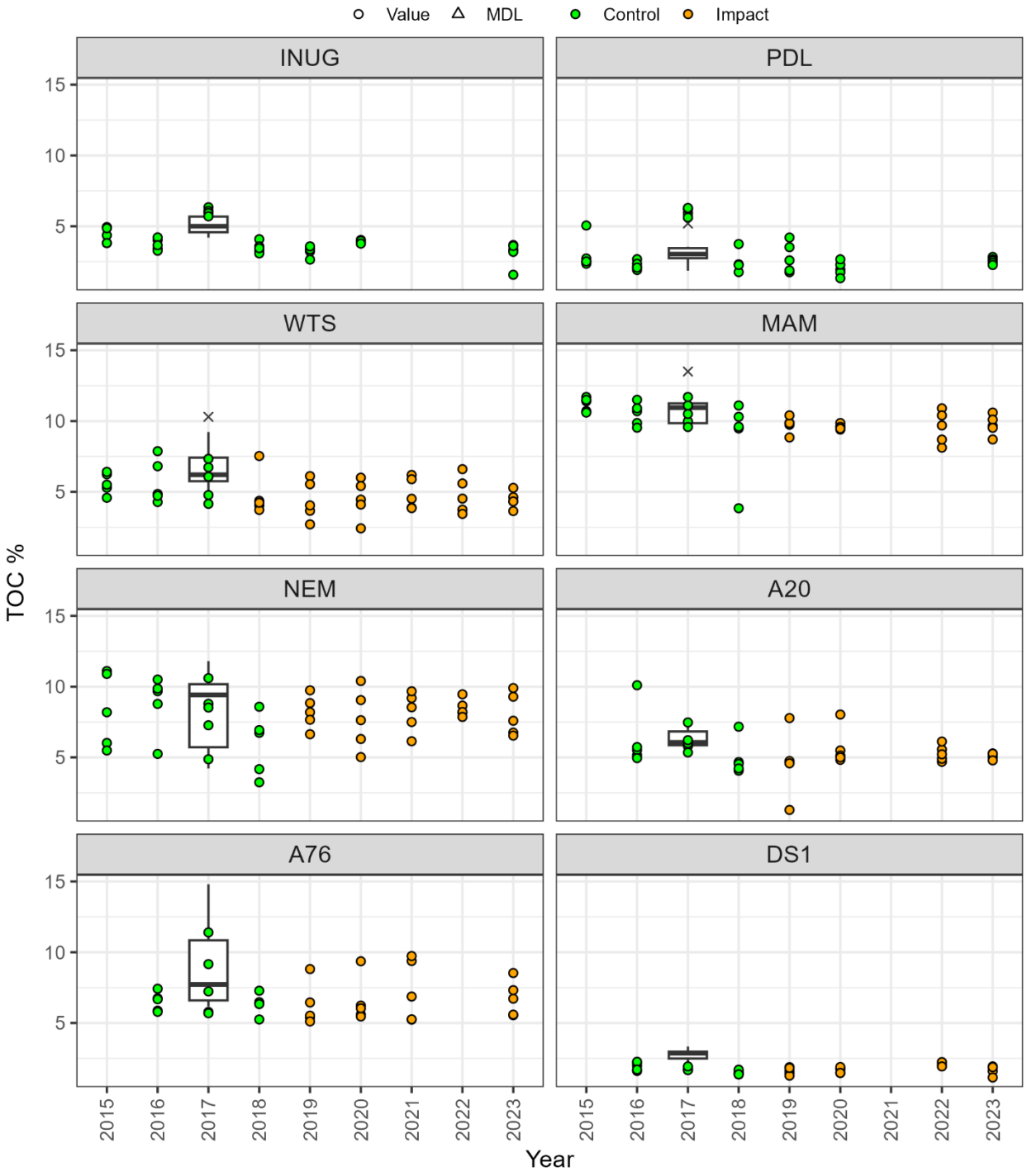


Figure 5-20. Grain size composition in sediment from the Whale Tail study area lakes since 2015.

Note: In 2021, a batch of sediment samples were not analyzed due to a sample receipt error by the laboratory. Missing results in 2021 correspond to samples that were discarded prior to analysis. In 2022, samples collected at INUG, PDL, and A76 had high water content so grain size composition could not be completed.

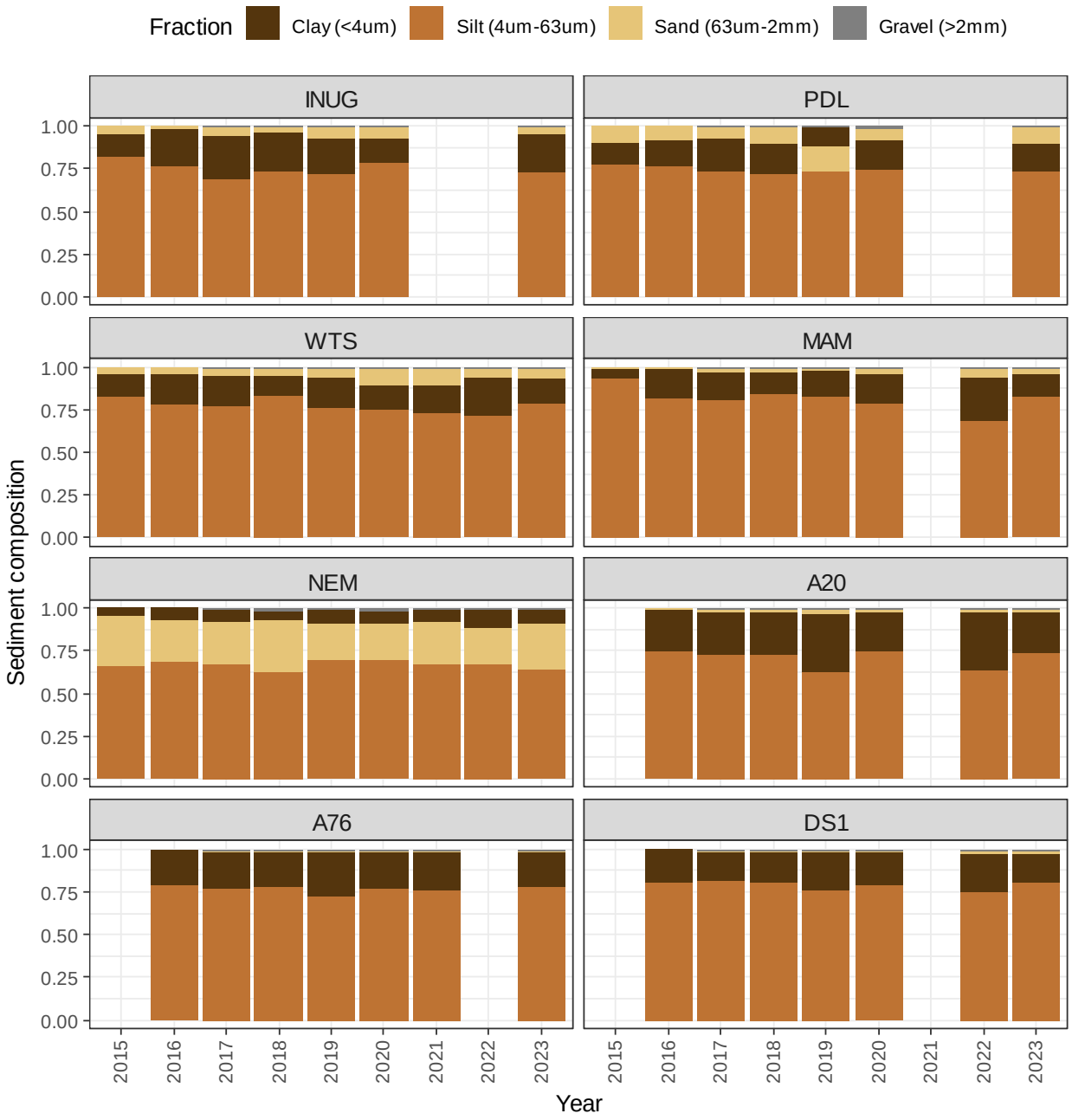


Figure 5-21. Aluminum (mg/kg dw) in sediment samples (grabs & cores) from Whale Tail study area lakes since 2015.

Note: Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

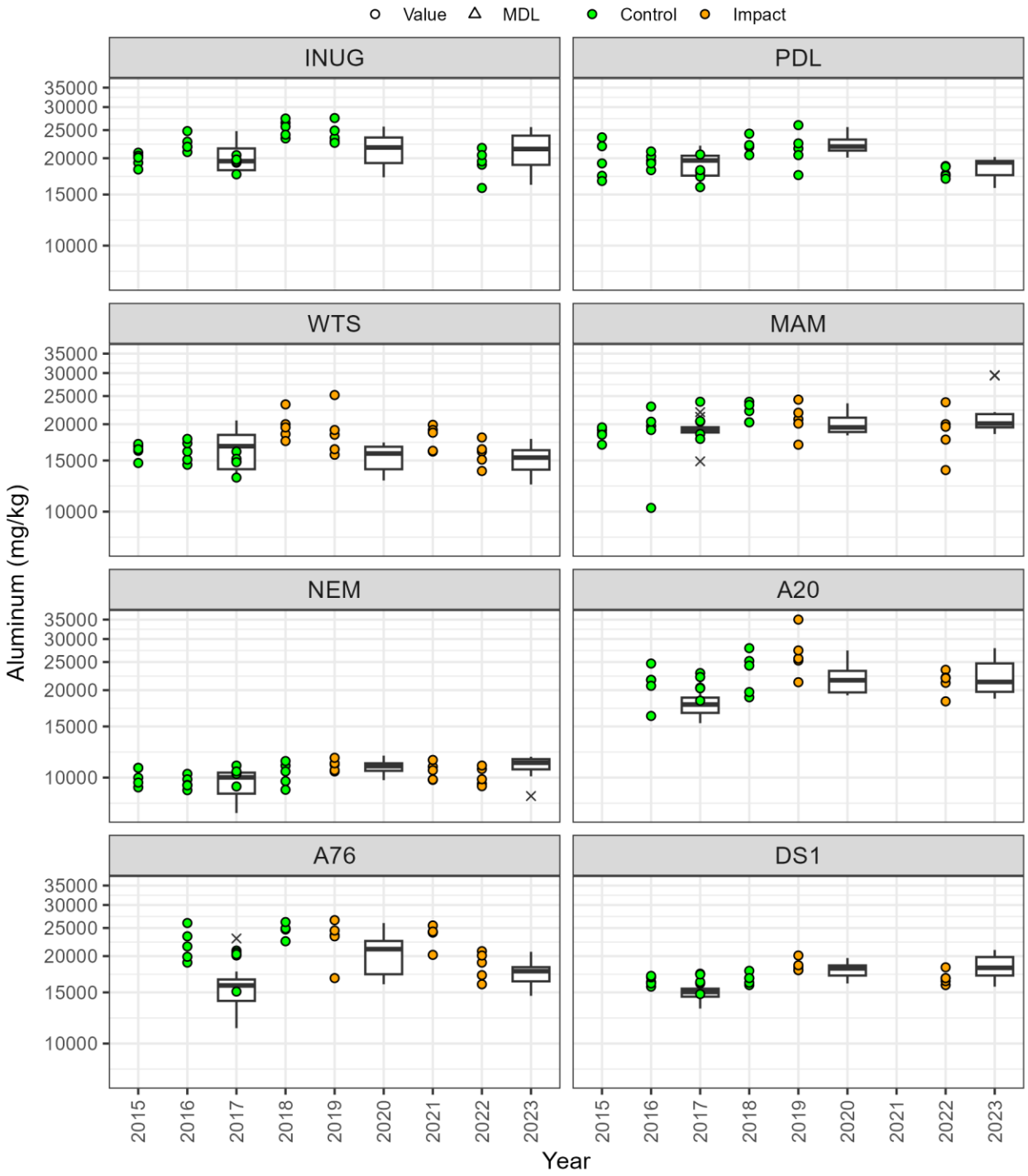


Figure 5-22. Arsenic (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.

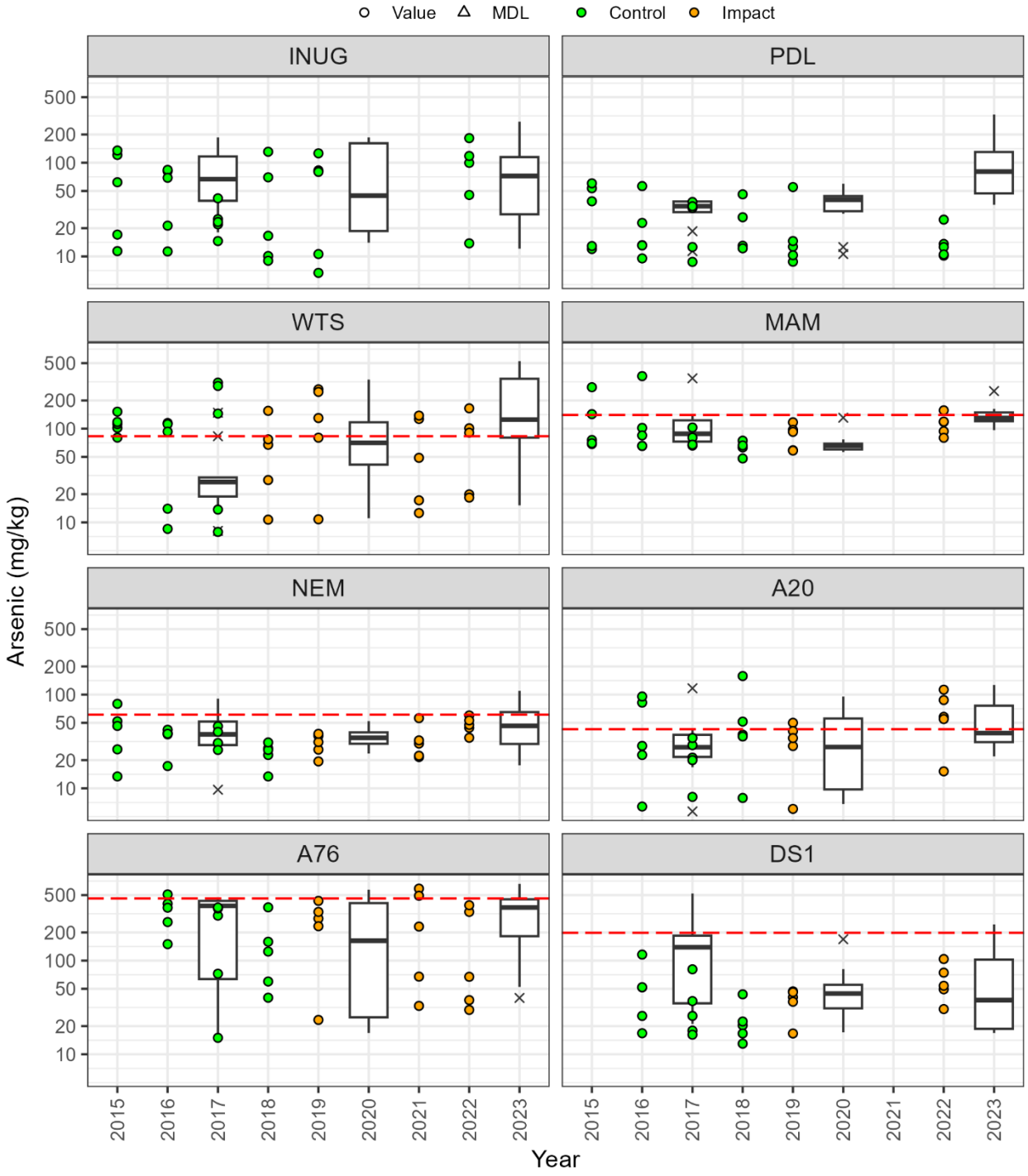


Figure 5-23. Cadmium (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.

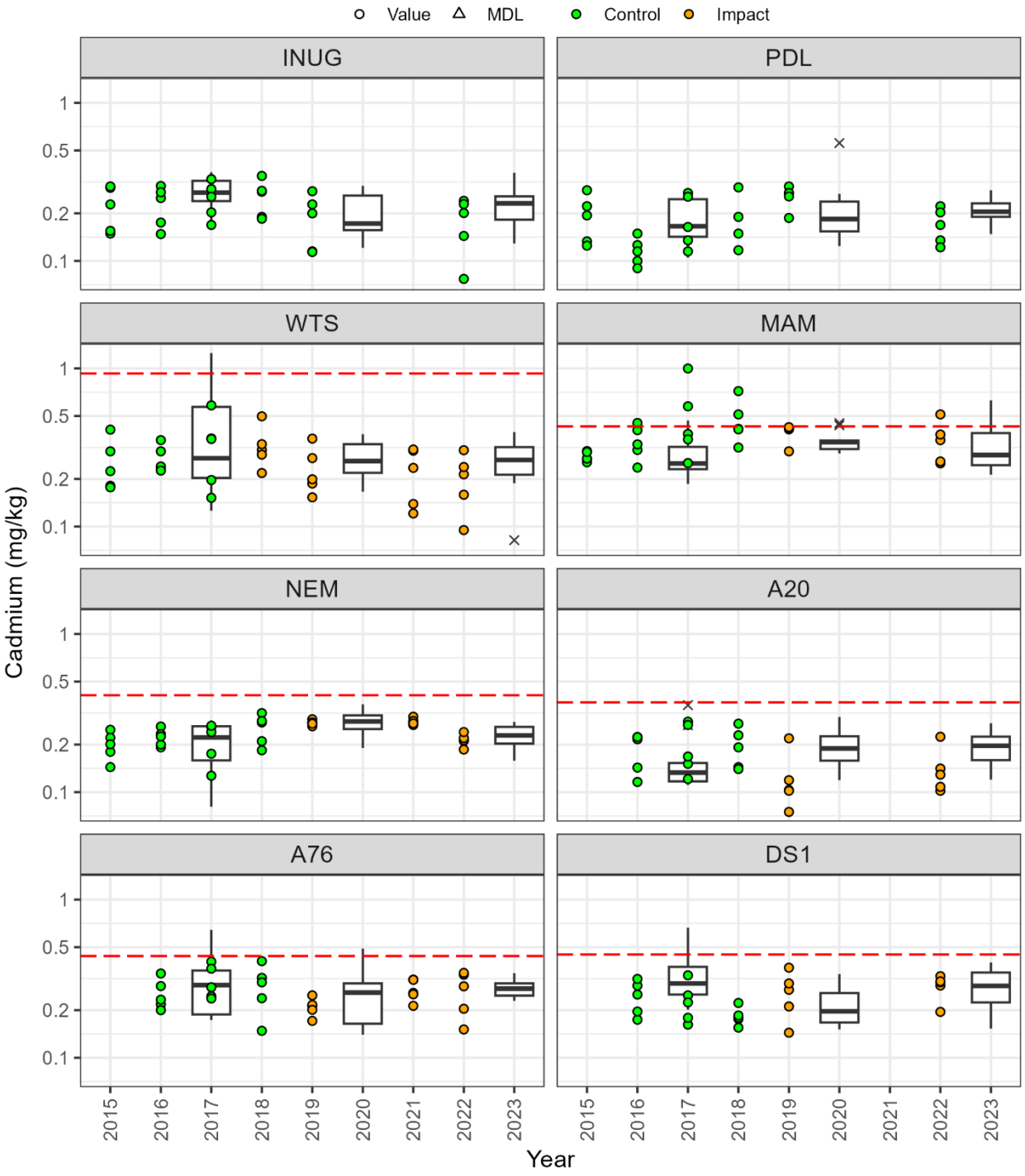


Figure 5-24. Chromium (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.

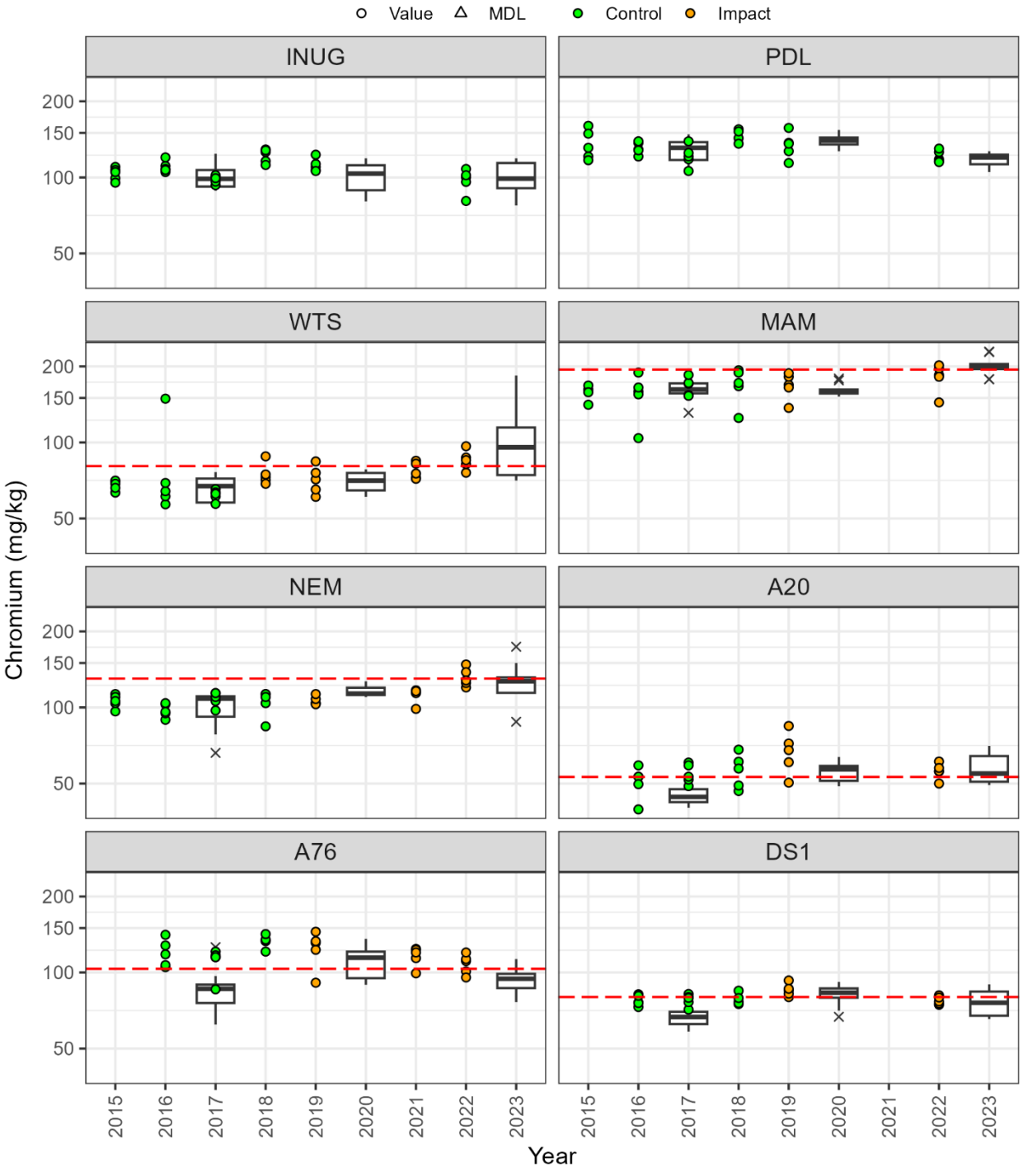


Figure 5-25. Copper (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.

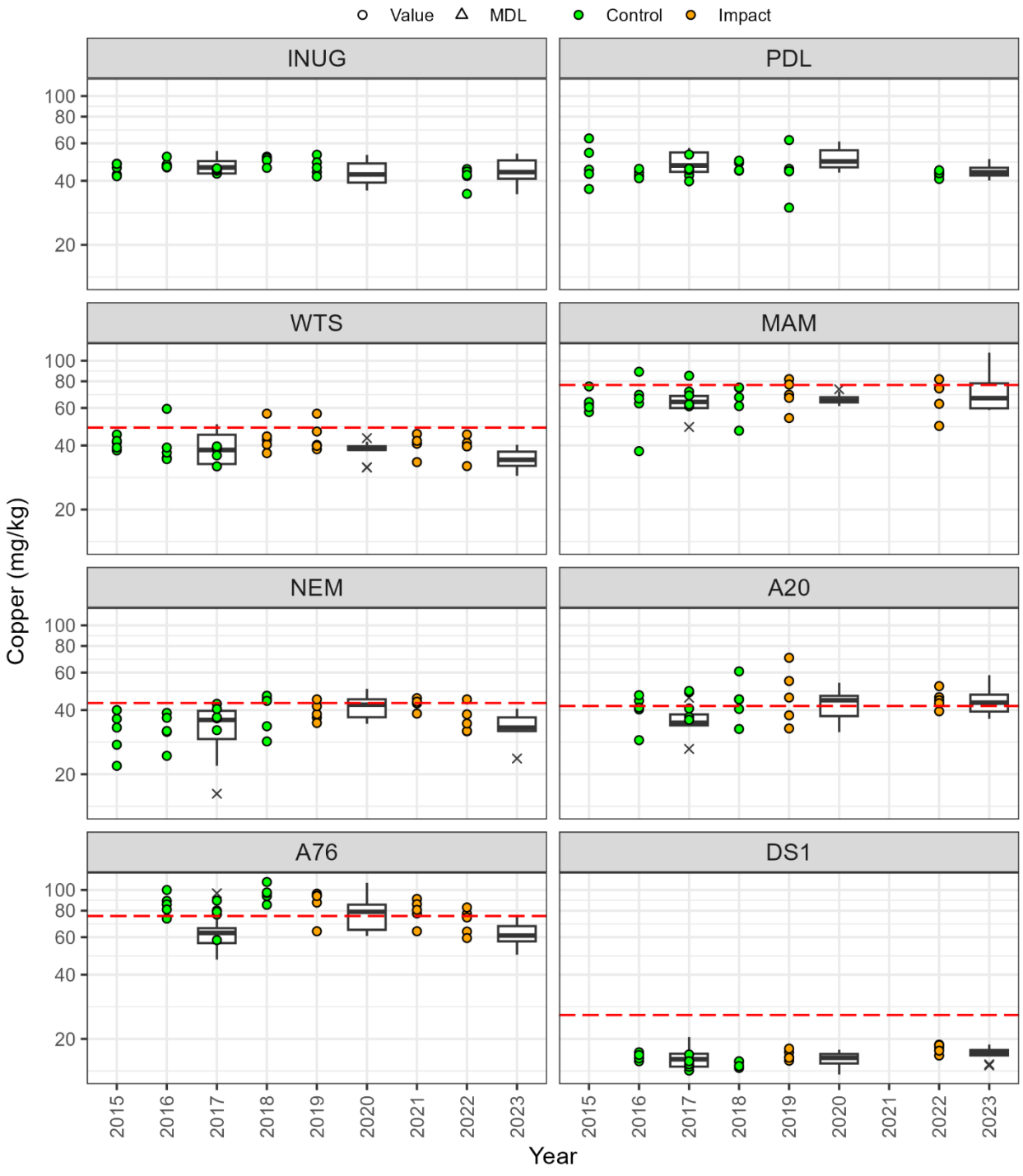


Figure 5-26. Lead (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.

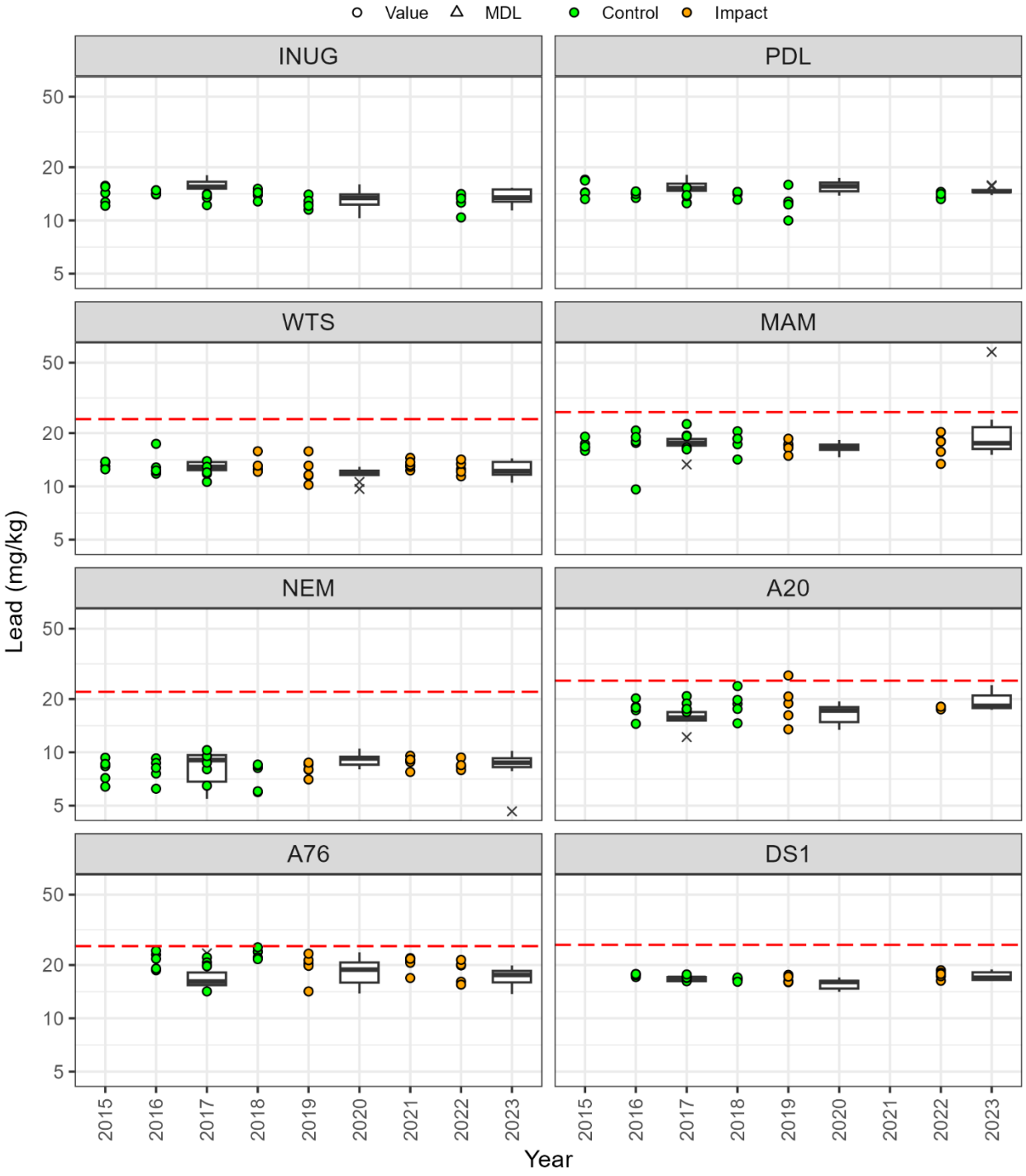


Figure 5-27. Mercury (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.

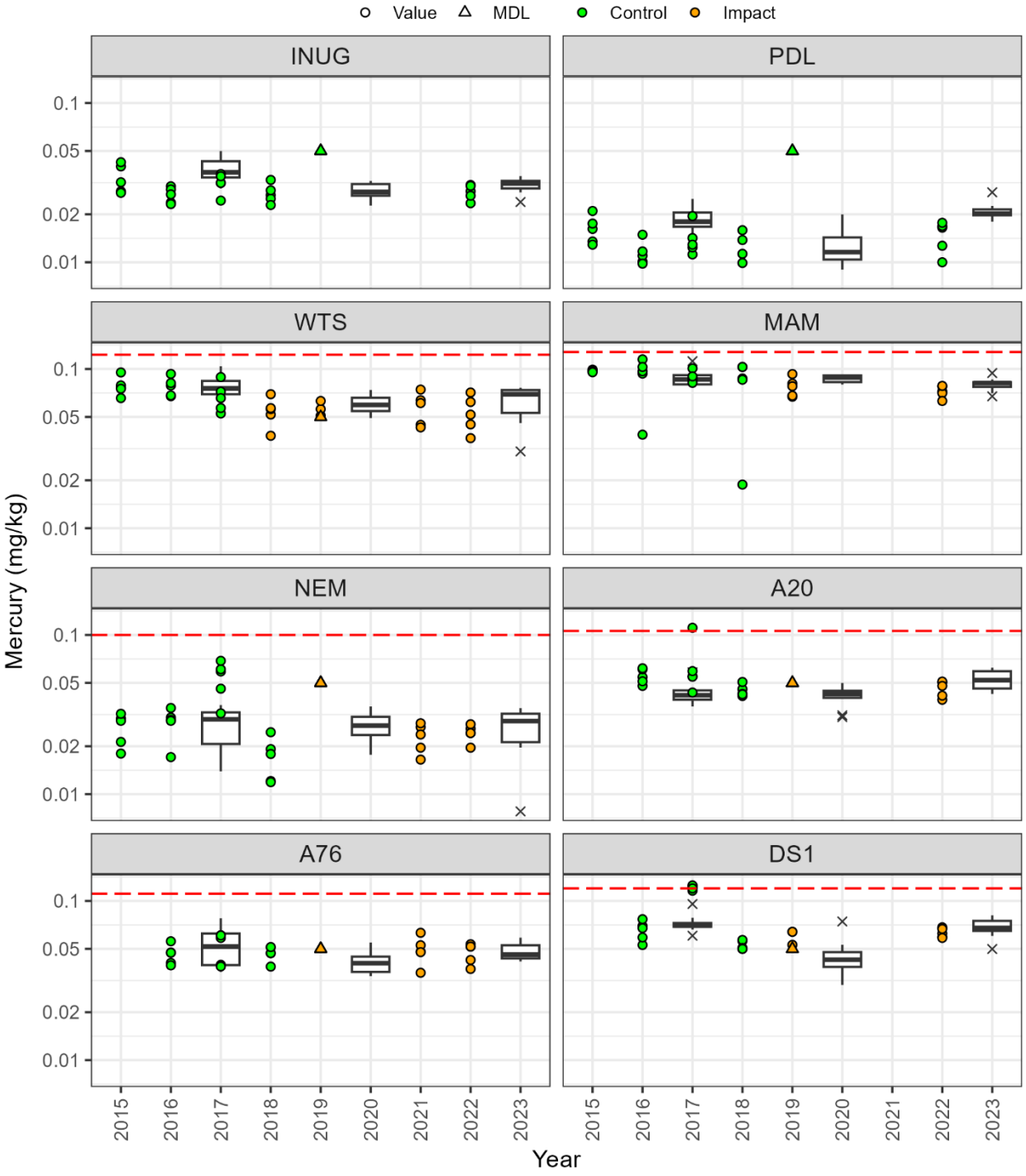
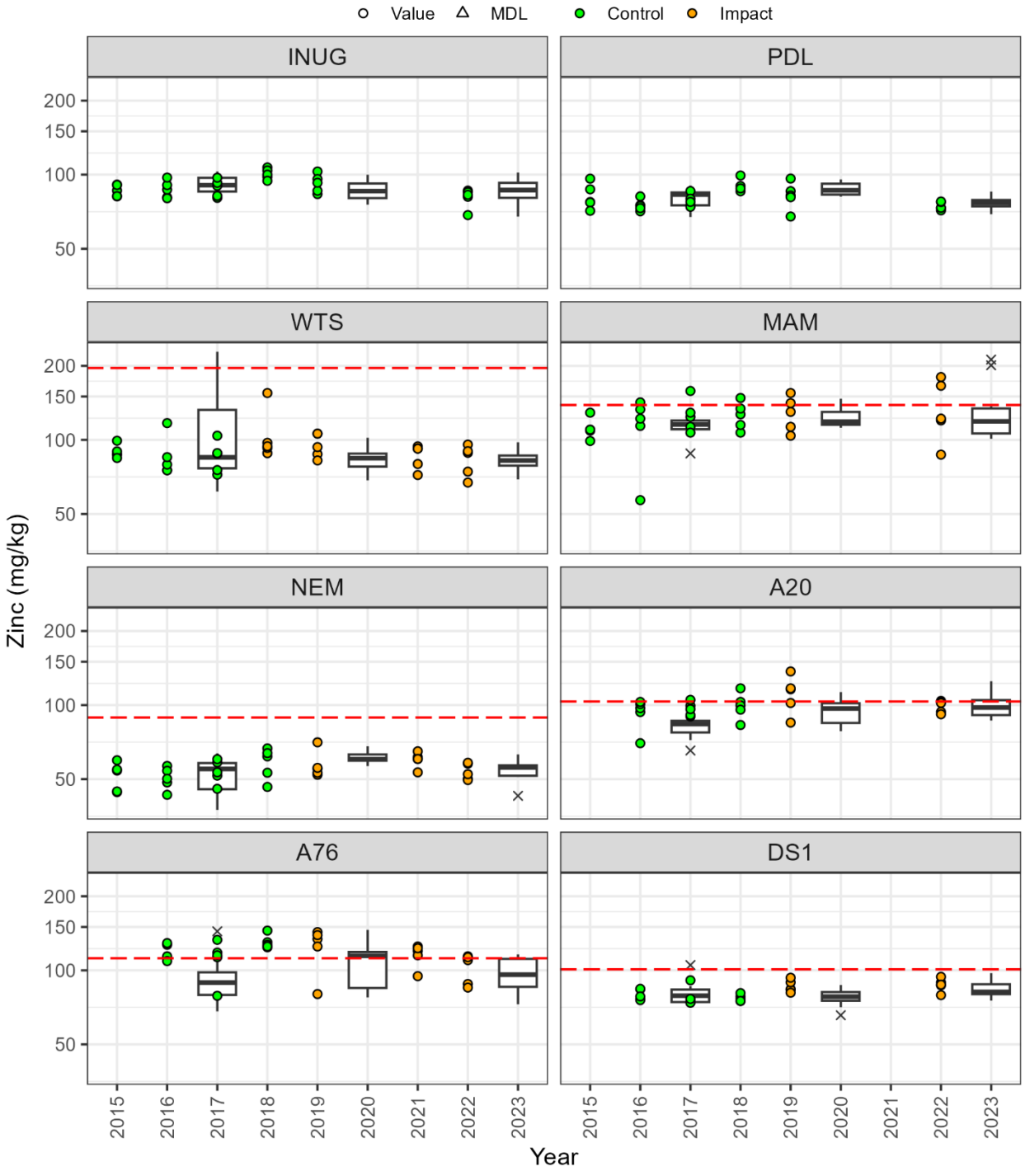


Figure 5-28. Zinc (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.



Benthic Invertebrate Tables and Figures

Table 5-14. Geometric means for total abundance and total richness, Whale Tail study area lakes since 2015.

Geometric means for total abundance[1]										
Control/Impact	Test Area	2015	2016	2017	2018	2019	2020	2021	2022	2023
Control	INUG	1648 (5)	2100 (1)	1712 (3)	1497 (6)	1452 (7)	2055 (2)	1398 (8)	1070 (9)	1656 (4)
	PDL	1127 (2)	1373 (1)	748 (9)	779 (8)	990 (4)	951 (6)	829 (7)	963 (5)	1045 (3)
Impact	WTS	1675 (9)	2102 (7)	3546 (4)	4005 (3)	2757 (5)	2356 (6)	1911 (8)	5017 (2)	5047 (1)
	MAM/KAN	3964 (6)	3050 (9)	4236 (5)	3444 (8)	7235 (3)	6133 (4)	3878 (7)	13066 (1)	9285 (2)
	A20	NA	2562 (6)	4246 (2)	2793 (4)	2546 (7)	2662 (5)	2146 (8)	3353 (3)	4274 (1)
	A76	NA	2525 (7)	6312 (2)	3094 (4)	2823 (5)	2794 (6)	2269 (8)	12072 (1)	3192 (3)
	DS1	NA	3090 (2)	1919 (7)	2564 (5)	2205 (6)	2619 (4)	3095 (1)	2969 (3)	1822 (8)
	NEM	2897 (5)	2744 (5)	1712 (8)	2708 (6)	5278 (1)	3945 (3)	2374 (7)	4619 (2)	5087 (2)

Geometric means for total richness										
Control/Impact	Test Area	2015	2016	2017	2018	2019	2020	2021	2022	2023
Control	INUG	13 (7)	16 (2)	14 (4)	15 (3)	14 (5)	17 (1)	13 (6)	13 (8)	12 (9)
	PDL	9 (3)	11 (1)	10 (2)	6 (9)	9 (6)	8 (7)	7 (8)	9 (4)	9 (5)
Impact	WTS	15 (5)	15 (4)	15 (7)	18 (1)	13 (8)	15 (6)	11 (9)	15 (3)	17 (2)
	MAM/KAN	13 (9)	14 (8)	15 (5)	15 (7)	15 (6)	19 (1)	17 (4)	18 (3)	19 (2)
	A20	NA	14 (7)	13 (8)	15 (5)	15 (6)	18 (1)	17 (2)	16 (4)	16 (3)
	A76	NA	16 (4)	17 (2)	15 (7)	15 (6)	17 (3)	15 (5)	18 (1)	14 (8)
	DS1	NA	12 (6)	15 (2)	14 (4)	14 (5)	10 (8)	11 (7)	16 (1)	15 (3)
	NEM	12 (7)	12 (5)	10 (9)	10 (8)	12 (6)	13 (4)	14 (2)	13 (3)	15 (1)

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 5-15. 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
2023	WTS	3	1	0.87	0.47	0.21	138	-68	1690
	MAM/KAN	4	1	0.98	0.33	**0.06**	166	-7	654
	A20	3	1	0.37	0.37	0.42	45	-70	609
	A76	3	1	-0.08	0.59	0.90	-8	-93	1064
	DS1	3	1	-0.25	0.30	0.49	-22	-78	180
	NEM	4	1	0.77	0.31	**0.09**	115	-20	482
2022-23	WTS	3	2	1.08	0.34	**0.05**	195	-1	781
	MAM/KAN	4	2	1.37	0.25	**0.01**	292	96	683
	A20	3	2	0.47	0.28	0.19	60	-34	284
	A76	3	2	0.80	0.65	0.30	123	-71	1641
	DS1	3	2	0.21	0.33	0.56	24	-57	252
	NEM	4	2	0.94	0.23	**0.02**	155	33	389
2021-23	WTS	3	3	0.74	0.42	0.15	110	-34	572
	MAM/KAN	4	3	1.00	0.34	**0.03**	172	13	557
	A20	3	3	0.26	0.30	0.43	30	-43	196
	A76	3	3	0.45	0.60	0.50	57	-71	736
	DS1	3	3	0.29	0.27	0.35	34	-37	185
	NEM	4	3	0.68	0.28	**0.06**	98	-4	308
2020-23	WTS	3	4	0.53	0.39	0.24	70	-38	367
	MAM/KAN	4	4	0.84	0.31	**0.04**	131	7	398
	A20	3	4	0.12	0.29	0.70	12	-46	134
	A76	3	4	0.23	0.54	0.69	26	-68	400
	DS1	3	4	0.19	0.26	0.49	21	-38	136
	NEM	4	4	0.59	0.26	**0.06**	80	-4	237

Notes:

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

Shaded cells indicate positive (increased) or negative (reduced) effect sizes 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 = 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.

Table 5-16. 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
2023	WTS	3	1	0.30	0.14	0.16	34	-25	140
	MAM/KAN	4	1	0.44	0.13	**0.04**	56	4	132
	A20	3	1	0.31	0.13	0.14	36	-23	141
	A76	3	1	0.10	0.15	0.59	10	-43	113
	DS1	3	1	0.31	0.17	0.21	36	-34	180
	NEM	4	1	0.46	0.13	**0.04**	59	6	138
2022-23	WTS	3	2	0.23	0.10	0.11	26	-10	75
	MAM/KAN	4	2	0.41	0.09	**0.01**	51	16	96
	A20	3	2	0.29	0.11	**0.07**	34	-5	89
	A76	3	2	0.20	0.12	0.20	22	-17	79
	DS1	3	2	0.33	0.11	**0.06**	39	-3	98
	NEM	4	2	0.41	0.09	**0.01**	50	16	94
2021-23	WTS	3	3	0.09	0.14	0.57	9	-26	60
	MAM/KAN	4	3	0.36	0.08	**0.01**	43	16	77
	A20	3	3	0.29	0.10	**0.04**	34	2	75
	A76	3	3	0.14	0.11	0.27	15	-15	57
	DS1	3	3	0.18	0.15	0.32	19	-22	82
	NEM	4	3	0.38	0.08	**0.01**	46	17	81
2020-23	WTS	3	4	0.03	0.14	0.87	3	-29	48
	MAM/KAN	4	4	0.30	0.09	**0.01**	36	10	67
	A20	3	4	0.26	0.09	**0.03**	29	4	62
	A76	3	4	0.09	0.11	0.42	10	-16	44
	DS1	3	4	0.02	0.18	0.93	2	-37	64
	NEM	4	4	0.28	0.10	**0.04**	32	3	71

Notes:

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

Shaded cells indicate positive (increased) or negative (reduced) effect sizes 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 = 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 5-29. Benthic invertebrate total abundance (#/m^2) from Whale Tail study area lakes since 2015.

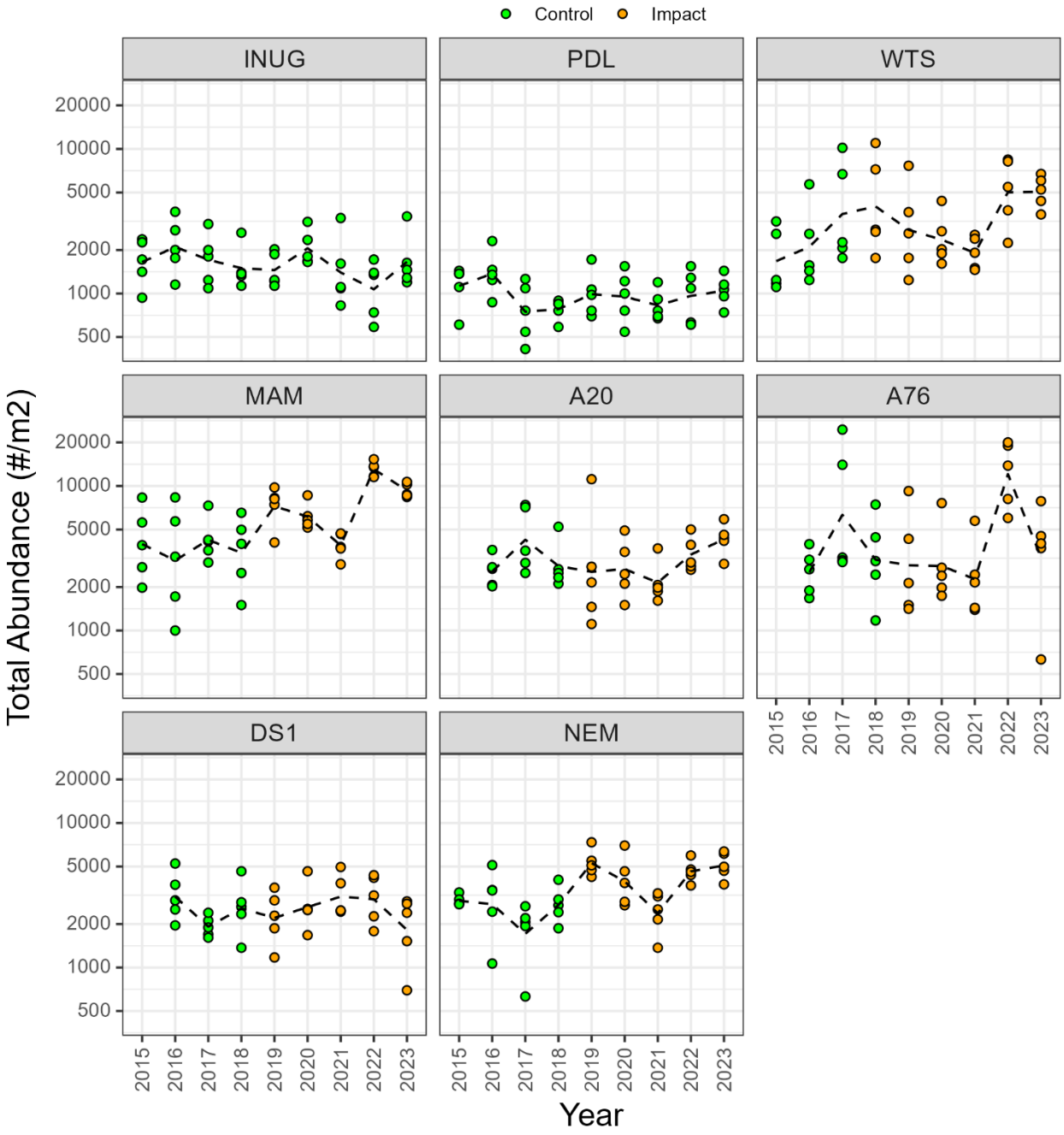


Figure 5-30. Benthic invertebrate abundance (#/m²) by major taxa group from Whale Tail study area lakes since 2015.

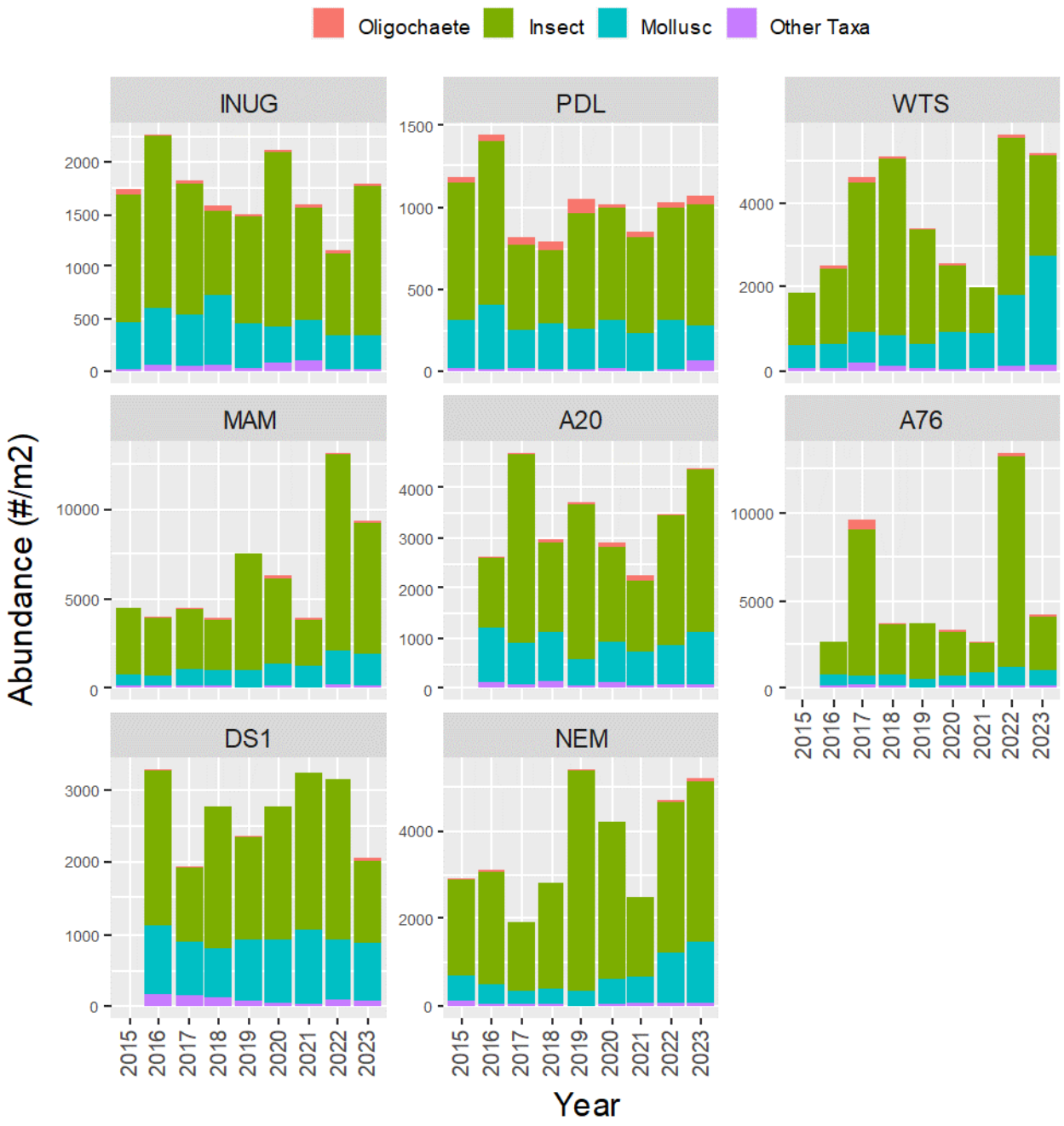


Figure 5-31. Benthic invertebrate relative abundance by major taxa from Whale Tail study area lakes since 2015.

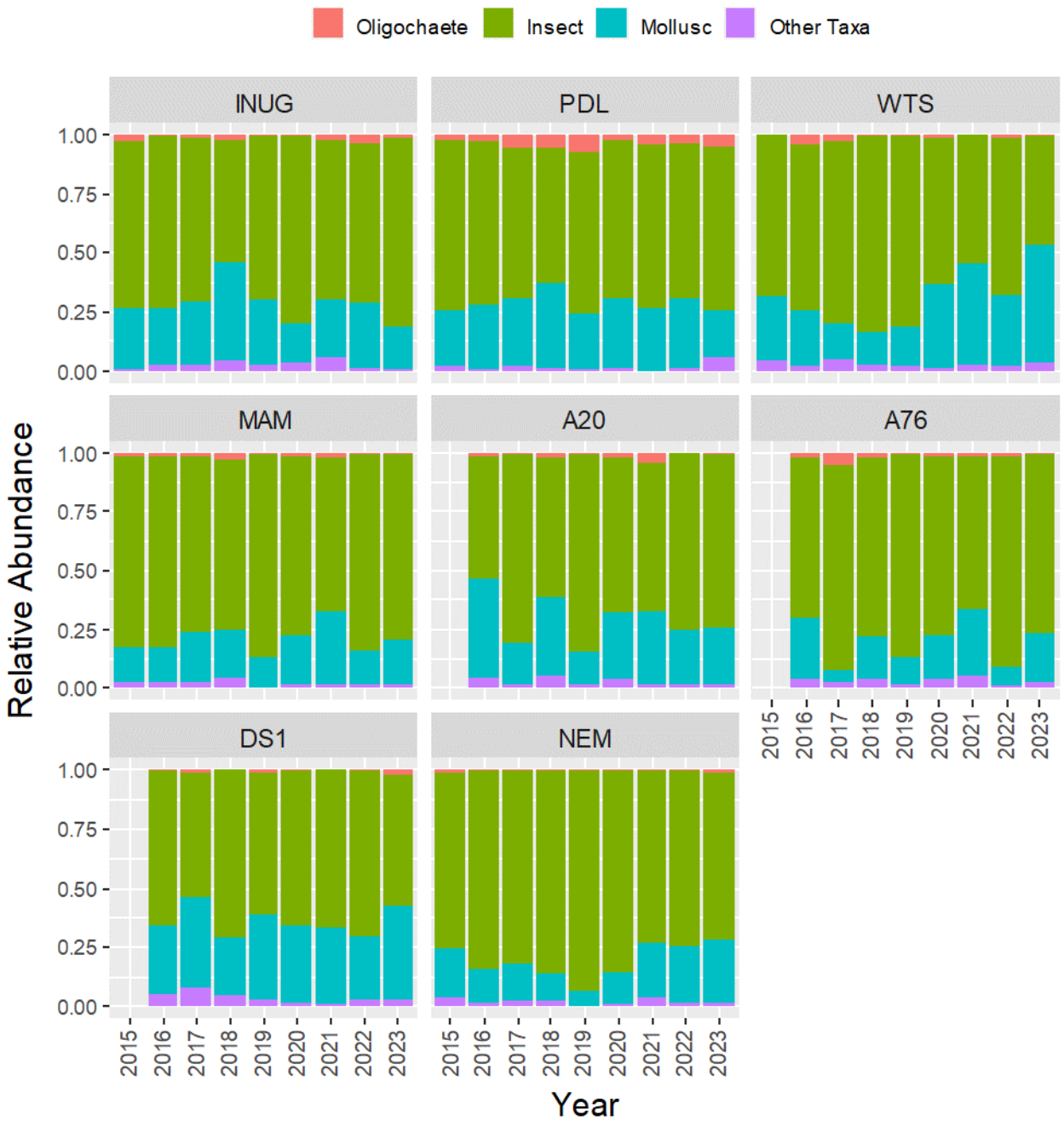


Figure 5-32. Benthic invertebrate total richness (# taxa) from Whale Tail study area lakes since 2015.

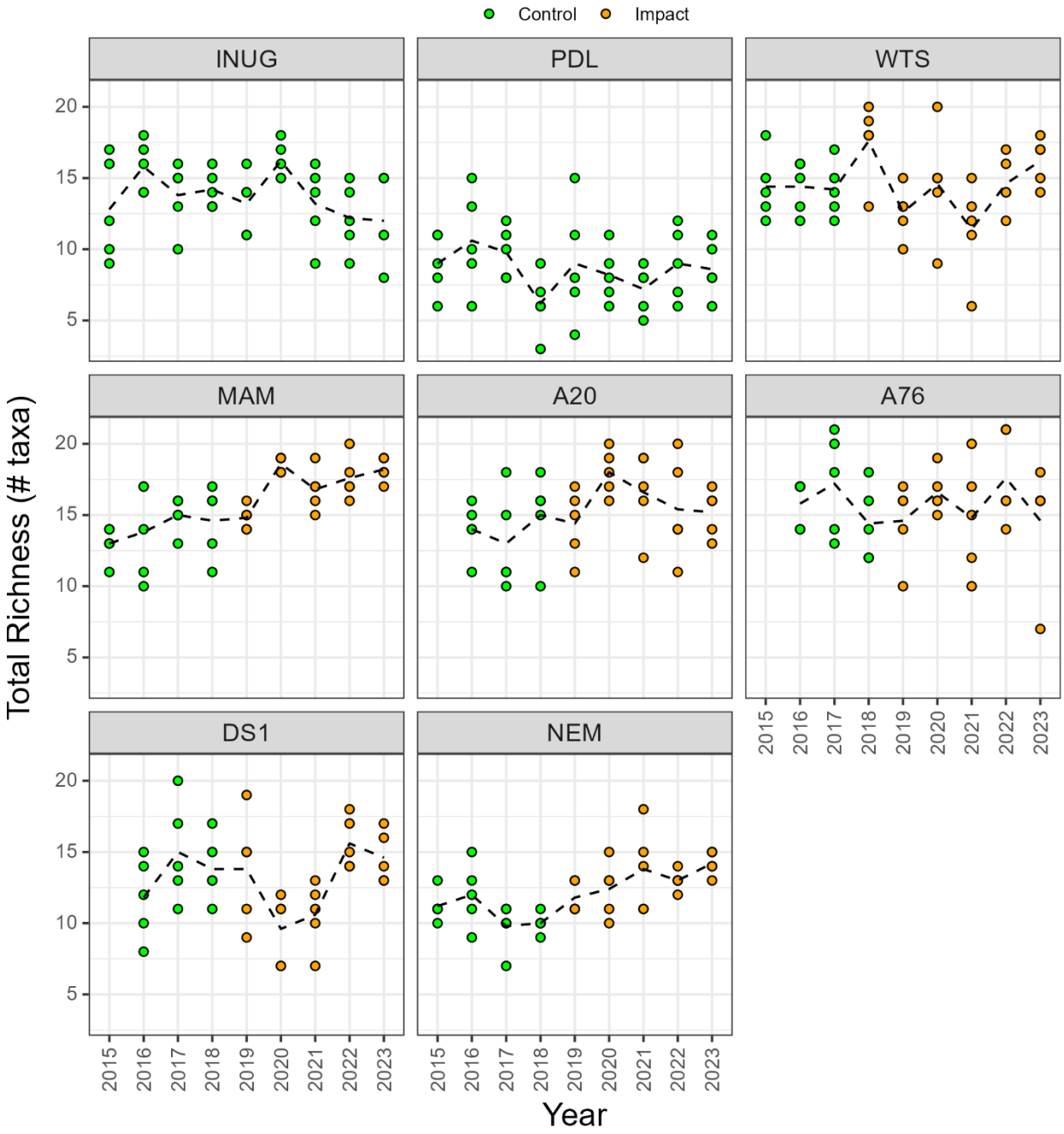


Figure 5-33. Benthic invertebrate richness (# taxa) by major taxa group from Whale Tail study area lakes since 2015.

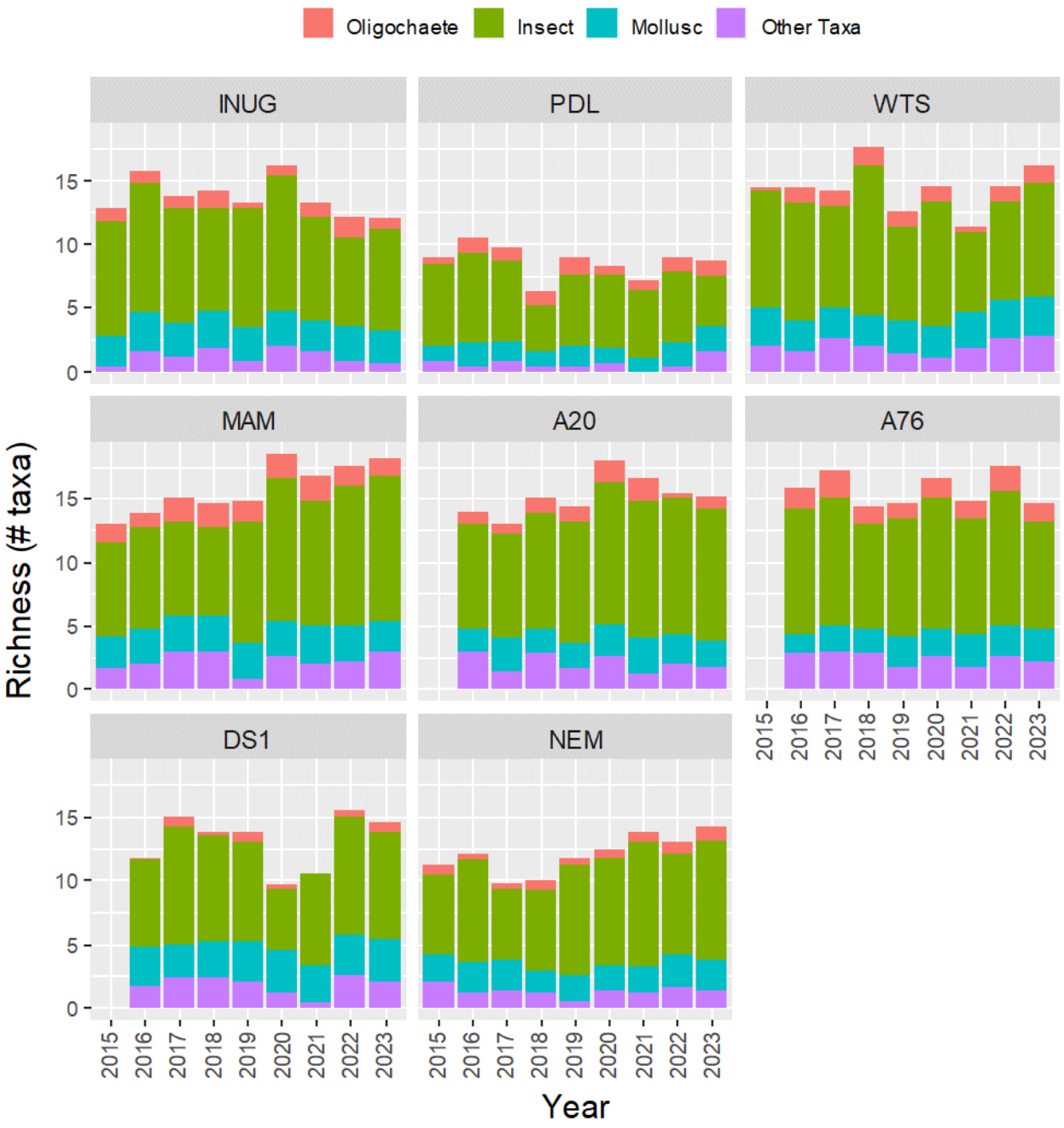
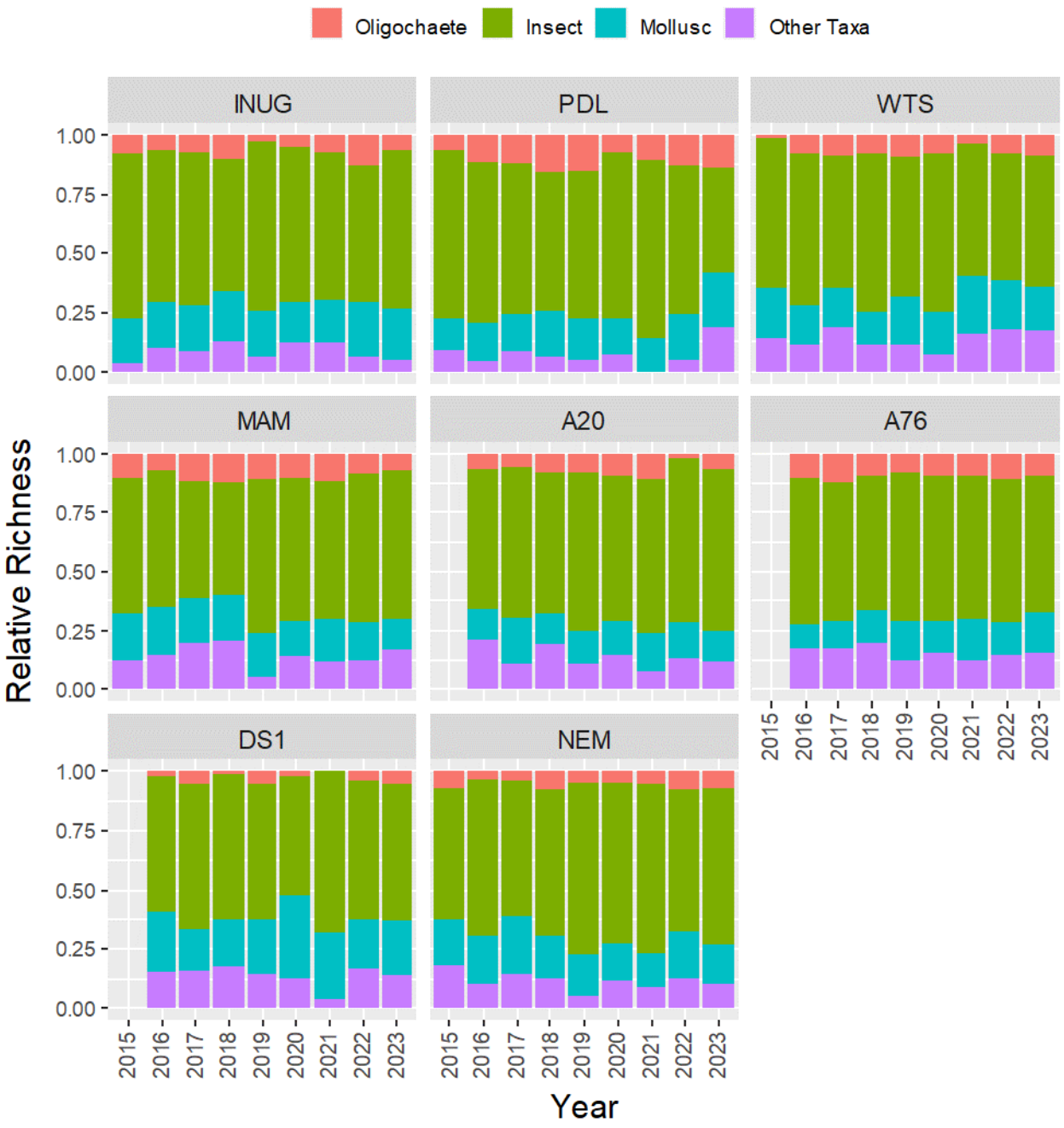


Figure 5-34. Benthic invertebrate relative richness by major taxa from Whale Tail study area lakes since 2015.



6 BAKER LAKE

6.1 Overview of the Baker Lake CREMP

This section summarizes the 2023 CREMP results for water chemistry and the phytoplankton community in Baker Lake. 2023 was a year in which sediment chemistry and benthos sampling was completed as per the *CREMP Plan Update* (Azimuth, 2022b). These results are also reported on below.

Baker Lake monitoring was added to the core program in 2008 to ensure activities related primarily to barge traffic and shipping in the area were tracked (**Table 1-1**). 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 to Baker Lake in 2023 numbered 35 for general cargo and 32 for fuel (**Figure 6-2**). With the expansion at the Whale Tail mine, traffic increased in 2018 and 2019 compared to previous years (e.g., from < 40 in 2016 and 2017 to ~ 55 in 2018). Trips were down in 2020 due to COVID 19, but increased sharply in 2021 and remained similar through 2023.

Since monitoring began in 2008, there has been no evidence of impacts to water, sediment, phytoplankton, or benthic communities attributed to barge traffic or other Agnico activities in Baker Lake. As such, sediment chemistry and benthos sampling has been reduced to occur on a three-year cycle, which coincides with the EEM program. Sediment chemistry and benthos sampling took place in 2023 and the next event is planned for 2026.

6.2 Limnology

6.2.1 General Observations

Baker Lake is large with much greater wind fetch than the Meadowbank or Whale Tail study area lakes and has a unique set of limnological characteristics. 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 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, and sulphate. 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 Trends

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 area lakes, except that water temperatures are cooler, typically reaching no more than 10°C in mid-summer. Mean temperatures at all locations ranged between 4.4 and 14.2°C (**Figure 6-3**).

In 2023, summer stratification is visible to varying degrees in August at each of the Baker Lake sampling areas. The August profile from BBD demonstrated the strongest thermal and saline stratification patterns due to its proximity to the Thelon River, similar to previous years. Warmer freshwater transitioned to colder saline water over a thermocline at approximately 6 m. This pattern progressively diminishes moving away from the river mouth at BPJ and BAP (**Figure 6-4**).

Although vertical stratification was absent from the July profiles, the relative influence of low salinity Thelon River water and Baker Lake deep water can be observed throughout the open-water season

(**Figure 6-4**). In September, the Thelon River influence is mostly isolated to BBD, with less stratification at BPJ and no stratification at BAP (furthest east from the Thelon River outflow).

6.3 Water Chemistry

6.3.1 Key Findings from the 2023 Water Chemistry Monitoring Program

- In 2023, there were trigger exceedances for total phosphorus, TOC, DOC, and pH (field measured) exceeded trigger values in at least one sample at Baker Lake sampling areas. Total phosphorus, only marginally exceeded the trigger during one sampling event in September at BPJ. Mean annual DOC exceeded the trigger values at both impact areas (BBD, BPJ) and reference (BAP) in 2023. For all other parameters, mean annual concentrations were below the triggers at Baker Lake.
- In 2023, for the first year since 2009, mean annual pH (field measured) fell below the lower trigger value (6.55) at reference location BAP.
- There was no statistically significant change in DOC concentrations compared to baseline/reference. This was expected since DOC concentrations at reference have increased in parallel to the exposure locations since 2008.

6.3.2 General Observations

As discussed in **Section 6.2**, Baker Lake is large and exposed to high winds 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 the *conventional* parameters (described above); in contrast, concentrations of metals in the Baker Lake samples are typically below laboratory MDLs.

On June 3rd 2023, a turbid water runoff release occurred from the Marshalling Facilities that reached the shore of Baker Lake. Silt fences and wood-chip booms, were utilized to intercept flows, while maritime curtains were used the contain the TSS plume in the receiving environment.

6.3.3 Temporal and Spatial Trends

CREMP monitoring results since 2008 were used to assess temporal and spatial trends related to mining activities (**Table 1-1**). 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 2023, screened against site-specific triggers and effects-based 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. Data screening at Baker Lake followed the same methodology as Meadowbank and Whale Tail (**Section 2.3.1**) except that matching patterns in mining activity was not conducted as it is not relevant to this study area.

The results for all parameters that were screened into the assessment process are summarized in **Table 6-1** and plotted in **Figure 6-5** through **Figure 6-9**. The red dashed line in each of these figures is the trigger value specific to Baker Lake for that parameter[34]. 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**).

During the three sampling events in 2023 (July, August, September) total phosphorus, TOC, DOC, and pH (field measured) exceeded trigger values in at least one sample. However, total phosphorus only marginally exceeded the trigger during one sampling event in September at BPJ with the paired sample showing no trigger exceedance. Mean annual DOC concentrations exceeded their respective trigger values at both impact areas (BBD, BPJ) and reference (BAP) in 2023 (**Figure 6-7**). For the first year since 2009, mean annual pH (field measured) fell below the lower trigger value (6.55) at reference location BAP. For all other parameters, mean annual concentrations were below the triggers at Baker Lake. The BACI analysis showed that increases in DOC were not significantly different from reference area BAP. This is expected since DOC concentrations at reference have increased in parallel to the exposure locations since 2008 (**Table 6-3**).

Across all three areas (BBD, BPJ, BAP), similar temporal trends occurred for the carbon parameters (TOC/DOC) in 2023. TOC concentrations at each sampling area peaked at a similar concentration (~4.75 mg/L) in August with DOC at each location also peaking in August. Since 2008, annual patterns in TOC/DOC concentrations have been notably similar between reference and exposure locations. The common patterns suggest that the carbon parameters are being influenced by regional environmental factors. If local anthropogenic activities were impacting TOC/DOC a distinct signature would be expected at impact areas (BBD, BPJ) compared to the reference area BAP.

Mean annual TOC/DOC concentrations have increased at all three Baker Lake sampling areas since 2018 and more broadly since sampling began in 2008. There are indications that longer term increasing trends are occurring. Similar patterns also exist between Baker Lake and the Meadowbank study area lakes (**Figure 4-9**). In 2012, a peak in TOC and DOC at all three Baker Lake areas corresponded to peaks across

[34] See Appendix I in the 2019 CREMP report (Azimuth, 2020a) for details on trigger updates and derivation for Baker Lake.

the Meadowbank study area lakes. The similar patterns observed across the study areas suggests that regional climactic factors, rather than mining activity, may be responsible for changes in TOC/DOC concentrations. The idea of a regional change is supported by various studies examining the effects of climate change on organic carbon fluxes in Arctic rivers and lakes. Permafrost thawing, primary production, increased precipitation, and atmospheric deposition have all been identified as contributing to enhanced organic carbon flux (Nguyen et al., 2022; Stolpmann et al., 2021).

Inversely to TOC/DOC concentrations, pH (field measured) appears to show a decreasing trend since 2009 across all Baker Lake areas (**Figure 6-5**). A similar pattern can be seen at the Meadowbank reference lakes (INUG and PDL; **Figure 4-7**) and even at lakes close to mining activities where alkalinity has stabilized (e.g. WAL; **Figure 4-7**). On the Wager Bay Plateau, lakes and other surface water bodies are distinctly characterised by their ultra-oligotrophic/oligotrophic status and low levels of TDS. The buffering capacity of the surface water is low, as evidenced by total alkalinity concentrations typically below 6 mg/L. Though influenced by a wide range of factors, there is evidence in the literature that increasing DOC concentrations can contribute to reductions in lake pH at a regional scale. Work by Erlandsson et al. (2010) on similarly weakly buffered northern lakes found that 1.4-fold DOC increases from 1990 to 2008 had increased acidity (reduced pH) by a median of 0.13 pH units and up to 1 pH unit in individual lakes. Thus, the increases of TOC/DOC observed at Baker Lake and across the broader region are unrelated to mining activity and may be influencing regional trends in pH. There are no follow-up measures for management beyond routine CREMP water quality sampling during the open-water season.

6.4 Phytoplankton Community

6.4.1 Key Findings from the 2023 Phytoplankton Monitoring Program

- There was an apparent increase in total biomass at NF areas BPJ and BBD along with richness at BBD, however this may be attributed to the decrease observed at reference area BAP.
- The phytoplankton community in Baker Lake was similar to previous years and has not exhibited any changes attributable to Agnico Eagle's activities in Baker Lake.

6.4.2 General Observations

The phytoplankton community of Baker Lake is relatively similar to the Meadowbank study area 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. Mean summer phytoplankton biomass in Baker Lake is generally similar to the Meadowbank study area lakes, reaching a maximum between 200 to 300 mg/m^3.

6.4.3 Temporal and Spatial Trends

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 substantial fuel or chemical spill) could influence the phytoplankton community of the whole lake.

The 2023 density and biomass results for phytoplankton are tabulated in **Appendix D3**. The results for the BACI model statistical tests of the 2023 results against baseline/reference conditions are provided in **Table 6-4**. Major findings at Baker Lake areas in 2023 for chlorophyll-a, total biomass, taxa richness, and group composition of major taxa were as follows:

- **Chlorophyll-a** – Concentrations at reference area BAP historically ranged between 0.4 to 1.5 µg/L (**Figure 6-10**). In 2023, the range and pattern of chlorophyll-a concentrations at the three Baker Lake areas were similar relative to previous years. Though concentrations appear to have generally declined since 2021, they remain within historical ranges.
- **Total biomass** – Annual patterns in biomass generally co-varies between the areas and in 2023, the lowest biomass was observed in September which has been seen historically. However, in 2023, September biomass at BAP and BPJ was lower than at any other time since monitoring began in 2008 (**Figure 6-11** to **Figure 6-13**). Because of a higher drop proportionately at BAP, the BACI analysis identified a statistically significant (p-value < 0.1) apparent increase in phytoplankton biomass at impact areas BBD and BPJ, both of which had effect sizes greater than 20% (**Table 6-4**). However, given that biomass at both impact areas was within historical levels and was the lowest ever seen at reference area BAP, this *change* is more reflective of natural variability at the reference area than of local activities at the impact areas.
- **Major taxa composition** – There were no apparent differences in relative composition of phytoplankton communities between BAP and impact areas BBD and BPJ in 2023, except that Chrysophytes were generally more dominant at BBD and BPJ (**Figure 6-13**). In September 2023, biomass was more evenly distributed across three taxa (chrysophytes, diatoms, cryptophytes) at BBD and BPJ. Chrysophytes are typically the dominant taxa at all sampling areas, making up from 46 to 60% of the total phytoplankton biomass in each area. diatoms and cryptophytes generally make up about 25 and 10%, respectively. The remainder of the biomass is made up of chlorophytes and dinoflagellates (**Appendix D3**).
- **Taxa richness** – Richness in Baker Lake phytoplankton samples was generally lower than historical ranges at both the impact and reference areas (**Figure 6-14**). However, mean richness

across the three open water sampling events showed little difference between BBD and BPJ relative to BAP in 2023. Results from 2023 BACI analysis (**Table 6-4**) showed an increase of 17% for BBD, which was statistically significant (p-value < 0.1), and an increase of 4% BPJ, which was not statically significant (p-value < 0.1).

Phytoplankton biomass will continue to be monitored for potential temporal trends, but no follow-up measures other than routine monitoring is recommended for 2024.

6.5 Sediment Chemistry

6.5.1 Key Findings from the 2023 Sediment Chemistry Monitoring Program

- The mean sediment core concentration of arsenic exceeded the trigger at BPJ in 2023, however this exceedance was not found to be statistically significant when compared to baseline conditions using the BA statistical model.
- No evidence was found to suggest that Agnico Eagle's activities are influencing sediment quality at Baker Lake.

6.5.2 General Observations

Baker Lake has multiple confounding influences with potential to affect water quality. These confounding influences include 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 concentrations of metals in sediment would be limited to ship propeller wash disturbing bottom sediments and possibly from introducing contaminants (e.g., discharges, leaks, or spills). In 2023, one spill was observed on August 27 at Baker Lake near shore at the Marshalling Facilities and Oil Handling Facility during a fuel transfer. It was estimated that less than 2L of fuel was spilled. A spill response plan was activated and absorbent booms and pads were used to clean up the spill.

Sediment core chemistry and grab chemistry data were collected from BAP, BES, BPJ, and BBD at the same time the benthic invertebrate samples were taken. Ten replicate core samples and five replicate grab samples were collected at each area. The sediment sampling areas are depicted in **Figure 6-1**.

Note that past sampling at Baker Lake has included sediment grab samples (at BBD, BPJ, BAP) on an annual basis and sediment coring (at BAP, BES, BPJ, BBD) on a 3-year cycle. Starting in 2022, sediment/benthos sampling was shifted to a three-year cycle. The first cycle was in 2023 to coincide with the sediment coring and EEM sampling program (Azimuth, 2022b).

6.5.3 Temporal and Spatial Trends

The 2023 sediment core chemistry and grab particle size and moisture content 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 6-16** to **Figure 6-23**. Metals concentrations are shown by area for the different sampling methods (grab [data points] vs core samples [box and whisker plots]). 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 6-16** to **Figure 6-23**). Consistent with previous years, arsenic concentrations at BPJ exceeded the Baker-specific trigger values in 2023 (**Table 6-5**). However, the lack of any temporal trend suggests that this reflects a combination of localized mineralization and an unrepresentative trigger value (set based on conditions at BAP) rather than changes to sediment quality at BPJ. This is corroborated by the results of the BA statistical analysis conducted in 2017 (Azimuth 2018c) and in 2023 on the core sample results, which confirmed that arsenic concentrations were not trending higher (**Table 6-6**).

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

Summary results for abundance and richness of major taxa in 2023 are presented in **Appendix E3**, along with supplemental plots showing abundance and richness at the major taxonomic group level since the start of baseline sampling.

6.6.1 Key Findings from the 2023 Benthos Community Monitoring Program

- There was an increase in richness at BBD in 2023 and 2021-2023 time periods. There was an increase in both abundance and richness at BBD and BPJ across all years since 2020.

- There has been a decline in both abundance and richness at reference areas BAP and BES since 2020. The increases at BBD and BPJ may reflect the decreases in abundance and richness at the reference locations.
- There is no indication that Agnico Eagle's activities are influencing the benthic community at Baker Lake.

6.6.2 General Observations

Benthic invertebrates have been collected from Baker Lake annually in August since 2008. In 2023, the benthic invertebrate and sediment monitoring frequency changed from annual to every three years (Azimuth, 2022b). Baker Lake monitoring is included in the core program to ensure that mining activities in that area related primarily to barge traffic and shipping were tracked. Sampling occurs at the same near-field (BBD, BPJ) and reference areas (BAP, BES) used for sediment chemistry and outlined in **Section 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 **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 6-24**), which is higher than typically-reported abundance at the Meadowbank study area lakes (**Figure 4-28**). Annual variability is sometimes high, as seen at BBD (e.g., from 2008 to 2009). There have also been 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 6-27** and **Figure 6-28**).

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 6-24** to **Figure 6-26**) and taxa richness (**Figure 6-27** to **Figure 6-29**). 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 for most area/year combinations.

6.6.3 Temporal and Spatial Trends

Benthic invertebrate abundance and richness results are tabulated in **Appendix E3**. Details regarding historical trends are discussed in the 2011 CREMP (Azimuth, 2012a). The 2023 report focuses on recent results and on trends over the last three years. Statistical test results for abundance and richness are presented in **Table 6-7** and **Table 6-8**, 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 are run that compare control and impact areas over a range of after periods (see **Section 2.3.3** for more details).

Summary results for abundance and richness of major taxa in 2023 are presented in **Appendix E3**, along with supplemental plots showing abundance and richness at the major taxonomic group level since the start of sampling. Time-series plots showing total abundance and richness endpoints were used to assess spatial and temporal trends for the Baker Lake study areas (**Figure 6-24** and **Figure 6-27**). Key results are presented for taxa abundance and richness in sections that follow.

Abundance (Density)

Mean abundance was generally consistent with 2020 and 2021 at all Baker Lake areas, except for reference area BAP which showed a large drop in 2023 (**Figure 6-24**). 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 6-7**). While the results were not statistically significant, the effect sizes for abundance at both BBD and BPJ were above 100% relative to before/reference conditions (**Table 6-7**), and this trend persists across all four after periods (i.e., up to four years in the after period) except at BPJ in the 2020-23 period (effect size 94%). The lower abundance at BAP in 2023 contributed to the higher relative effect sizes at BBD and BPJ. All of the observed trends are consistent with natural variability in the community.

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 different for the impact areas BBD and BPJ compared to reference area BAP (apart from 2008; **Figure 6-25** and **Figure 6-26**). 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). The differences observed in major taxa composition between the two reference areas, and likely both NF areas, appear to be natural.

Taxa Richness

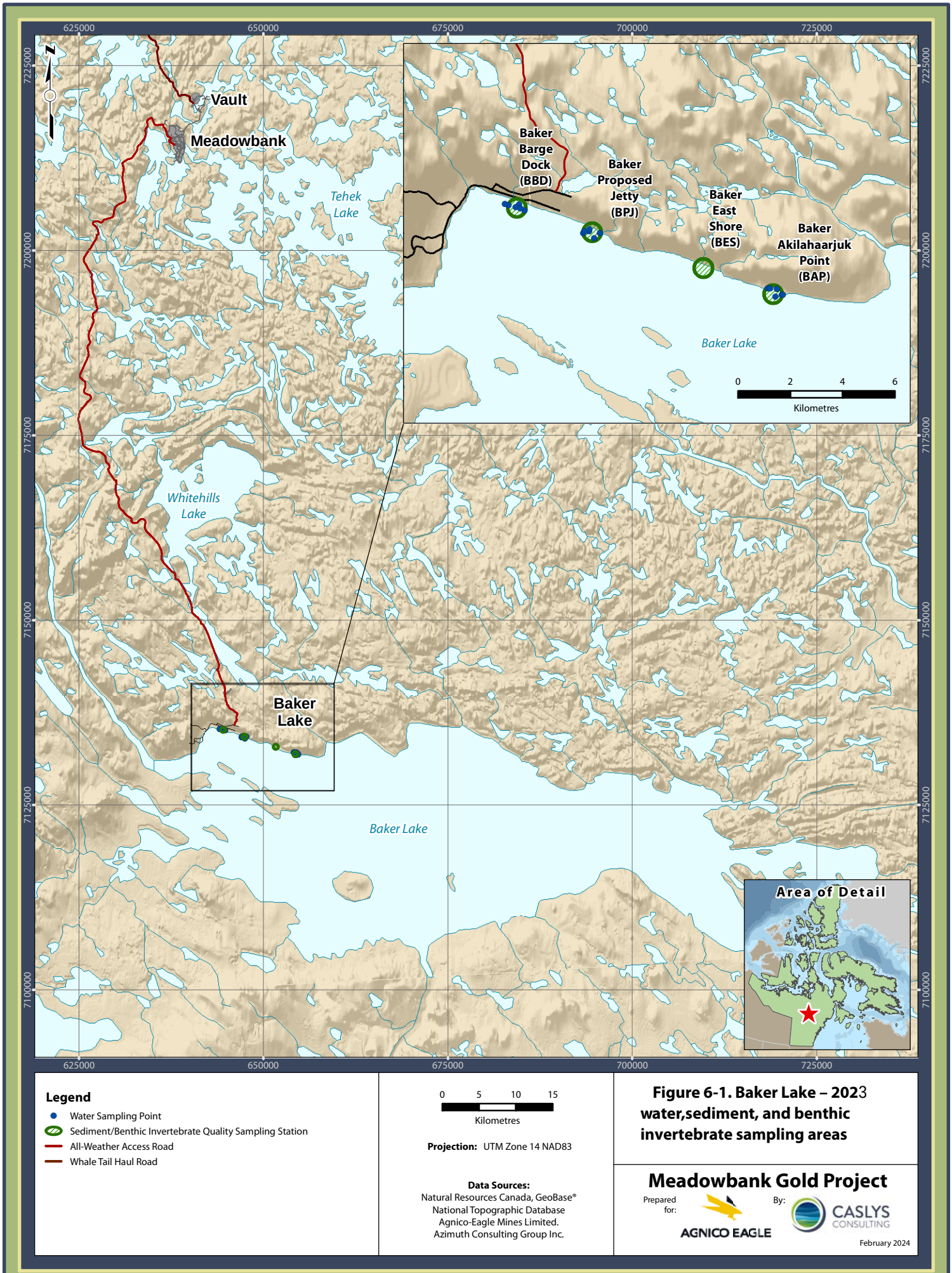
Mean taxa richness in 2023 was generally consistent with 2020 and 2021 across all Baker Lake areas except for reference area BAP which showed a big reduction (**Figure 6-27**). Due to the relative reduction in richness at BAP, the BACI model results showed positive and statistically significant (p-value < 0.1) effects sizes for total richness in 2023 and the 2021-23 time periods for BBD. BPJ results were similar in magnitude, but not statistically significant (p-value > 0.1) for all time periods (**Table 6-8**). All of the observed trends are consistent with natural variability in the benthic community.

Insects dominate the benthos the communities at the control and impact areas (**Figure 6-28** and **Figure 6-29**). There were no apparent trends in species composition, indicating the barge operations are not adversely affecting the community.

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, sediment chemistry, phytoplankton, 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 – 2023 water,sediment, and benthic invertebrate sampling areas

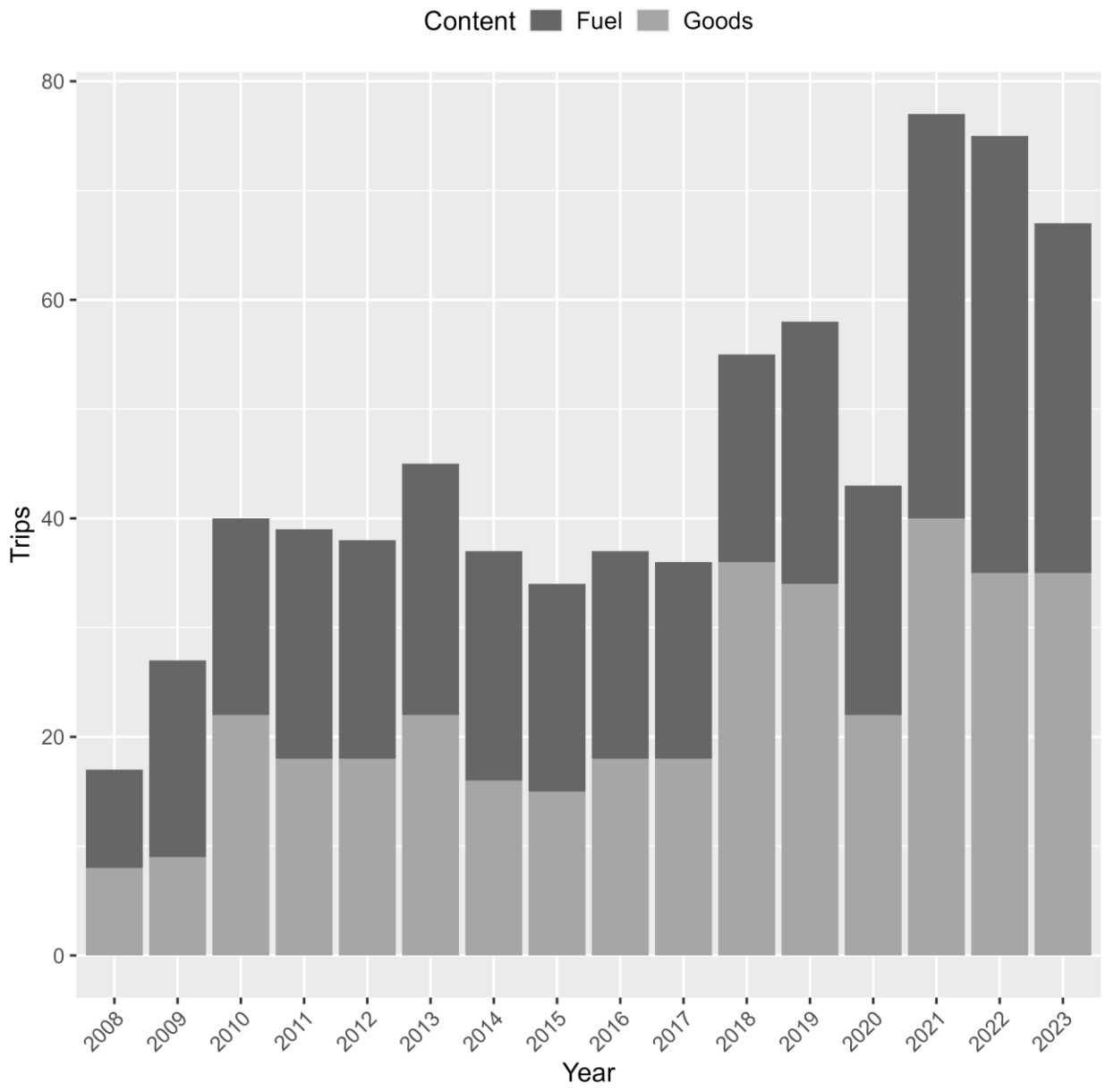
Meadowbank Gold Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

February 2024

Figure 6-2. Baker Lake barge traffic from Chesterfield Inlet since 2008.



Limnology Tables and Figures

Figure 6-3. Mean monthly field-measured temperature (°C) at 3 m depth since 2008, Baker Lake.

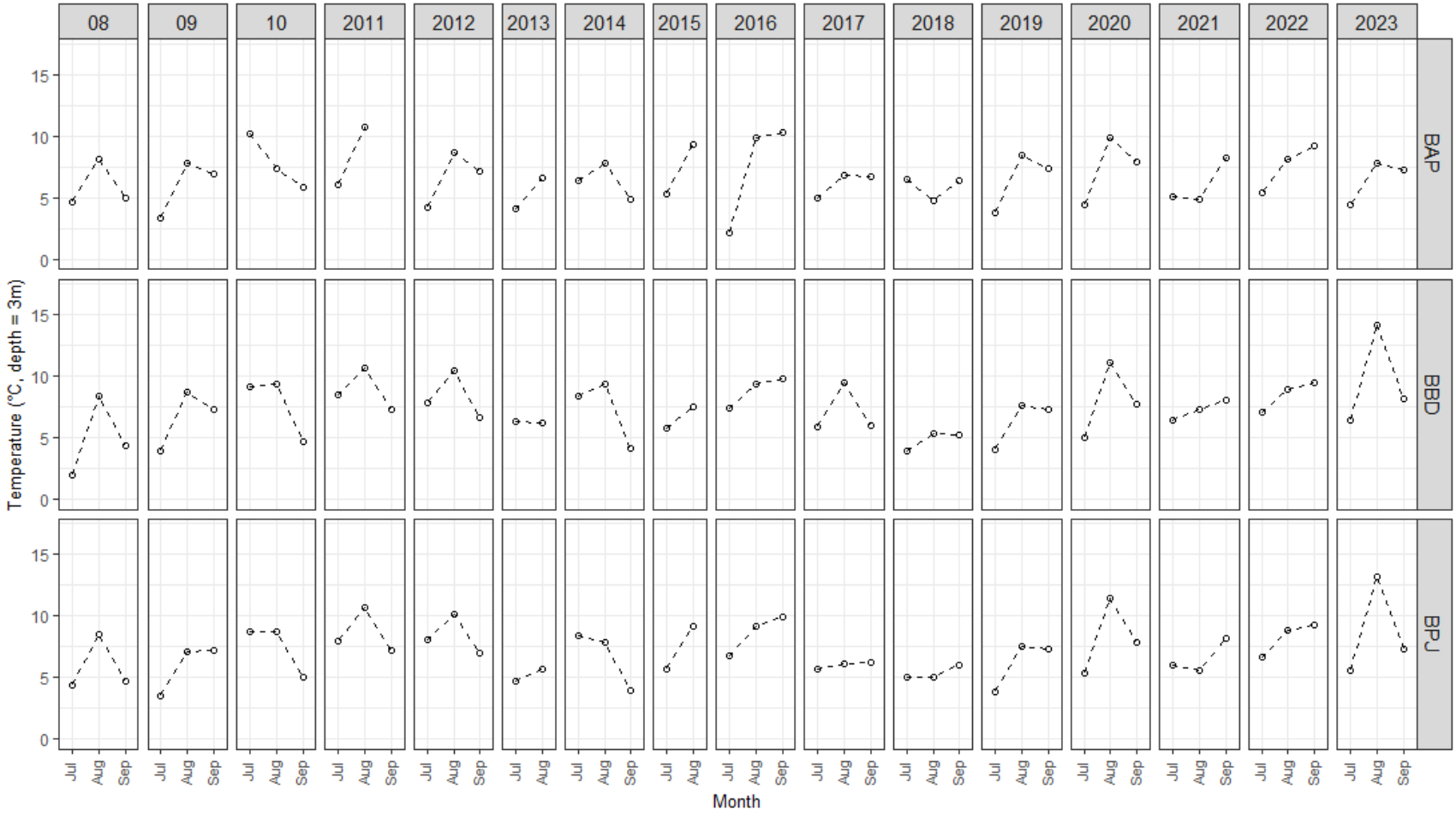
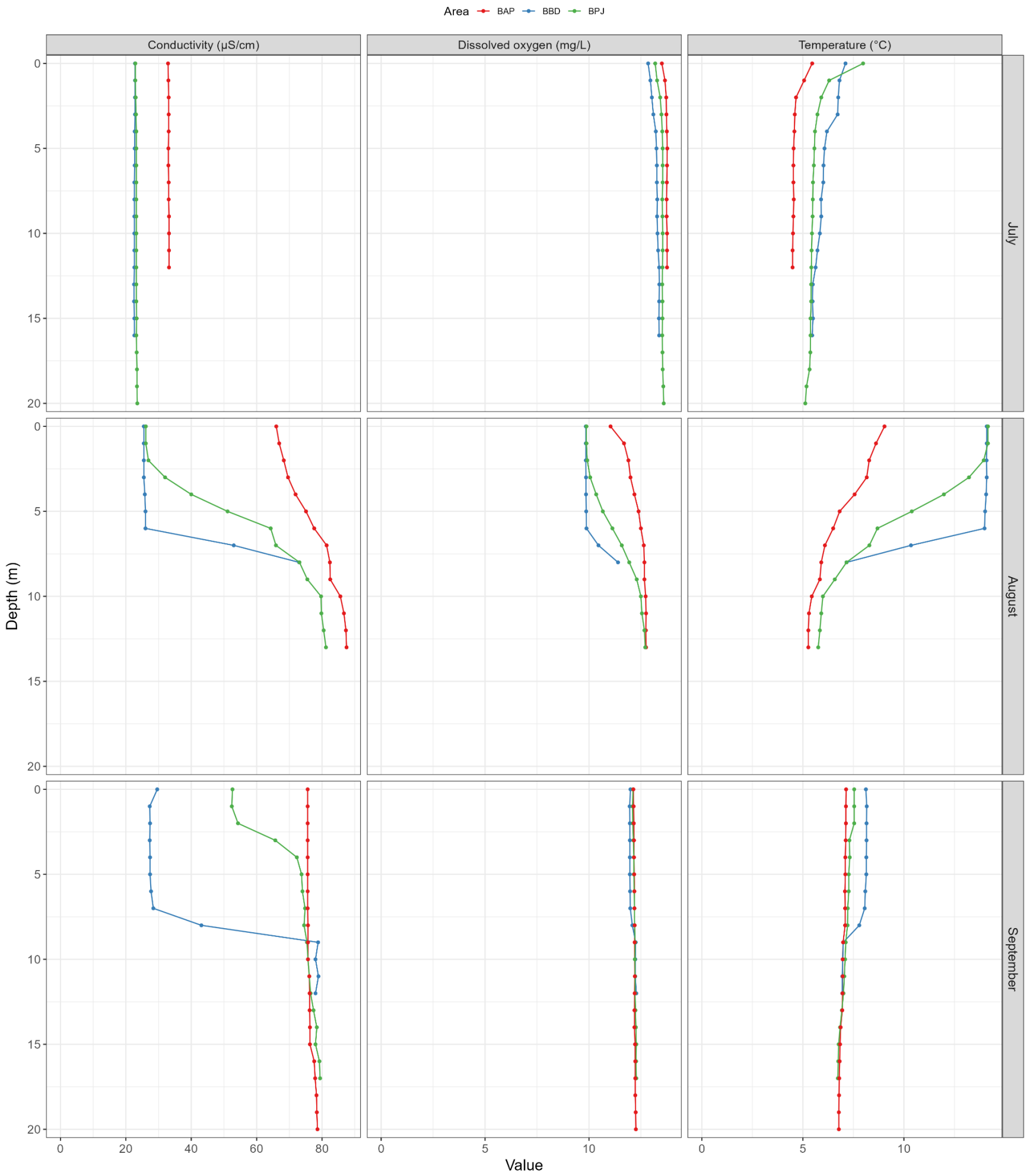


Figure 6-4. Baker Lake – Field-measured conductivity, dissolved oxygen, and temperature profiles, 2023.

Note: Only the field measured values up to 20 m depth shown in figure.



Water Chemistry Tables and Figures

Table 6-1. Screening process for water quality parameters, Baker Lake, 2023.

Parameters	Trigger Exceedance[2]	Screening Level and Rule[1] 1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency
CONVENTIONALS			
Conductivity	-	**Yes**	
TSS	-	**Yes**	
Hardness	-	**Yes**	
T-Alkalinity	-	**Yes**	
B-Alkalinity	-	**Yes**	
C-Alkalinity	-	No	No
pH-Field	BAP, BPJ	**Yes**	
pH-Lab	-	**Yes**	
MAJOR IONS			
TDS	-	**Yes**	
Calcium	-	**Yes**	
Chloride	-	**Yes**	
Fluoride	-	**Yes**	
Magnesium	-	**Yes**	
Potassium	-	**Yes**	
Sodium	-	**Yes**	
Sulphate	-	**Yes**	
NUTRIENTS & OTHERS			
Ammonia-N	-	**Yes**	
Nitrate-N	-	**Yes**	
Nitrite-N	-	No	No
TKN	BAP	**Yes**	
T-Phosphorus	BPJ	**Yes**	
Ortho-phosphate	-	**Yes**	
DOC	BAP, BBD, BPJ	**Yes**	
TOC	BAP, BBD, BPJ	**Yes**	
Reactive Silica	-	**Yes**	
T-Cyanide	*Not measured since 2019*		
Free Cyanide	*Not measured since 2019*		

Parameters	Trigger Exceedance[2]	Screening Level and Rule[1] 1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency
TOTAL METALS			
Aluminum	-	**Yes**	
Antimony	-	No	No
Arsenic	-	**Yes**	
Barium	-	**Yes**	
Beryllium	-	No	No
Boron	-	**Yes**	
Cadmium	-	No	No
Chromium	-	**Yes**	
Copper	-	**Yes**	
Iron	-	**Yes**	
Lead	-	No	No
Lithium	-	**Yes**	
Manganese	-	**Yes**	
Mercury	-	No	No
Molybdenum	-	**Yes**	
Nickel	-	No	No
Selenium	-	No	No
Silicon	-	**Yes**	
Silver	-	No	No
Strontium	-	**Yes**	
Thallium	-	No	No
Tin	-	No	No
Titanium	-	**Yes**	
Uranium	-	**Yes**	
Vanadium	-	No	No
Zinc	-	No	No

Parameters	Trigger Exceedance[2]	Screening Level and Rule[1] 1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency
DISSOLVED METALS			
Aluminum	-	**Yes**	
Antimony	-	No	No
Arsenic	-	**Yes**	
Barium	-	**Yes**	
Beryllium	-	No	No
Boron	-	**Yes**	
Cadmium	-	No	No
Chromium	-	No	No
Copper	-	**Yes**	
Iron	-	**Yes**	
Lead	-	No	No
Lithium	-	**Yes**	
Manganese	-	**Yes**	
Mercury	-	No	No
Molybdenum	-	**Yes**	
Nickel	-	No	No
Selenium	-	No	No
Silicon	-	**Yes**	
Silver	-	No	No
Strontium	-	**Yes**	
Thallium	-	No	No
Tin	-	No	No
Titanium	-	No	No
Uranium	-	**Yes**	
Vanadium	-	No	No
Zinc	-	No	No

Notes:
1. A three-step assessment process was used to identify parameters to include in the formal temporal and spatial trend assessment (**Section 2.3.1** and **Section 4.3.2**).
Parameters were assigned a "Yes" if the following assessment was true:
(1) **>DL ≥ 10% Frequency**: parameters that exceeded MDLs in at least 10% of the samples.
(2) **C-I > 0.1 Frequency**: parameters that were detected more often in impact areas and the proportion of detected values increased by 0.1 or more.
(3) **Pattern = Activity**: additional step to avoid screening out potentially important parameters. Based on the trend plots, is there a trend for infrequently detected parameters and/or are there values > 5 x DL in at least one sampling event at NF areas?
2. Indicates that a trigger exceedance occurred at the listed Whale Tail study area lakes in one or more sampling event.
Shaded parameters are included in the temporal and spatial trend assessment.
Plots for all individual parameters are presented in **Appendix B3**.

Table 6-2. Water quality variables at the Bake Lake monitoring areas for which 2023 mean concentration exceeded the trigger.

Parameter	Trigger	2023 Mean		
		BAP	BBD	BPJ
		Ref	NF	NF
DOC	3.9	4.1	3.9	4.0
Field pH (lower)	6.55	6.52	-	-

Notes:
"-" indicates mean annual concentration was < the trigger value.
Reported mean concentrations are all in units of mg/L.

Table 6-3. Results of BACI tests for selected water variables at Baker Lake monitoring areas in 2023.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	P-value[1]	Proportional change		
							exp(Est)	LCI	UCI
DOC	BBD	42	3	-0.058	0.037	0.94	0.94	0.87	1.0
	BPJ	42	3	-0.032	0.031	0.85	0.97	0.91	1.0

Notes:
Bolded P-values are statistically significant < 0.05.
Test area = area compared to control (BAP).
n(B) = number of paired months in the “before” period.
n(A) = number of paired months in the “after” period (i.e., in 2023).
Estimate = BACI model estimate of the 2023 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. Conventional parameters in water samples from Baker Lake since 2008.

Note: Laboratory-measured conductivity data from 2014 should be interpreted with caution, particularly at low concentrations (see Azimuth, 2015c for details).

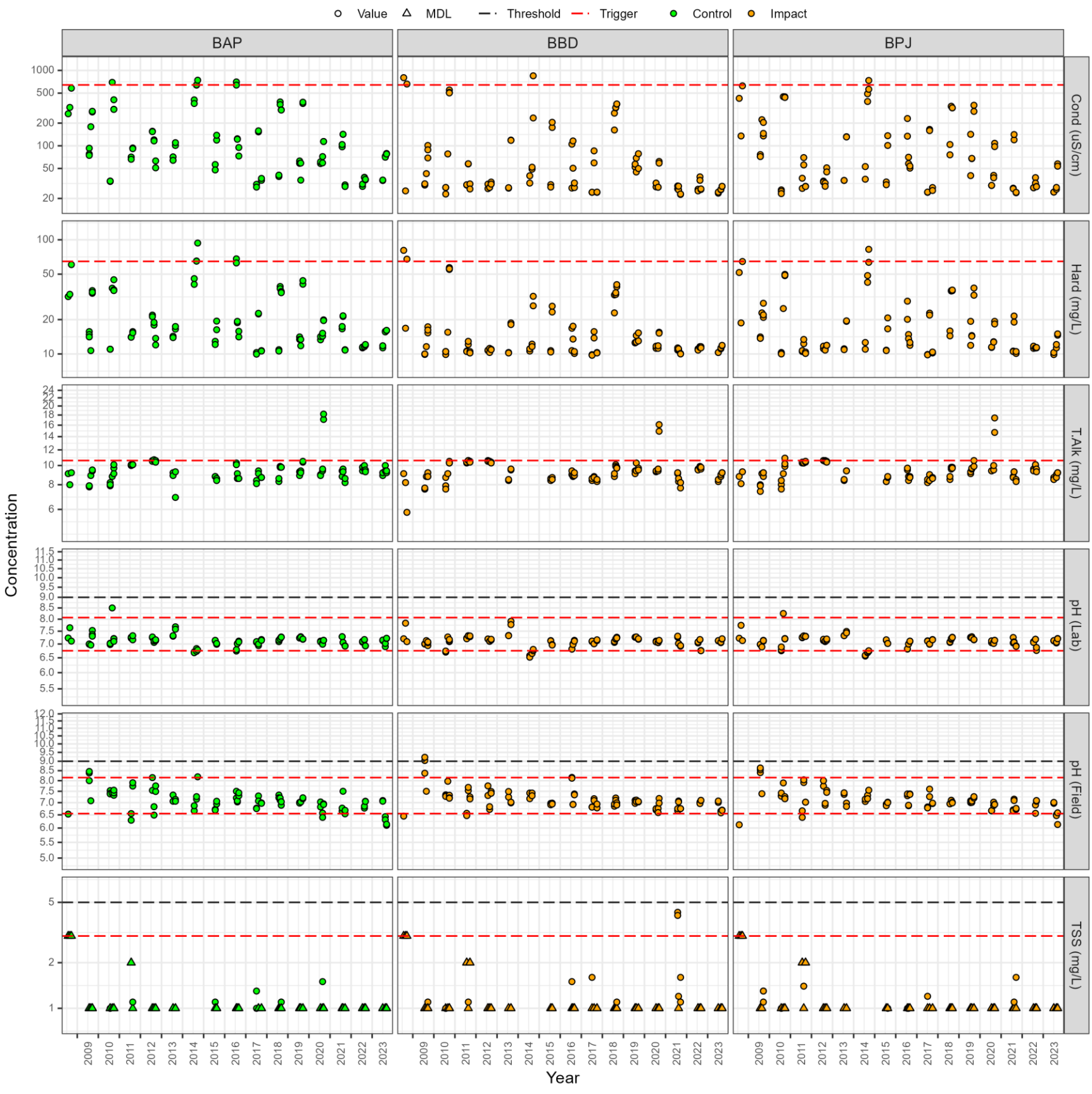


Figure 6-6. Major ions in water samples from Baker Lake since 2008.

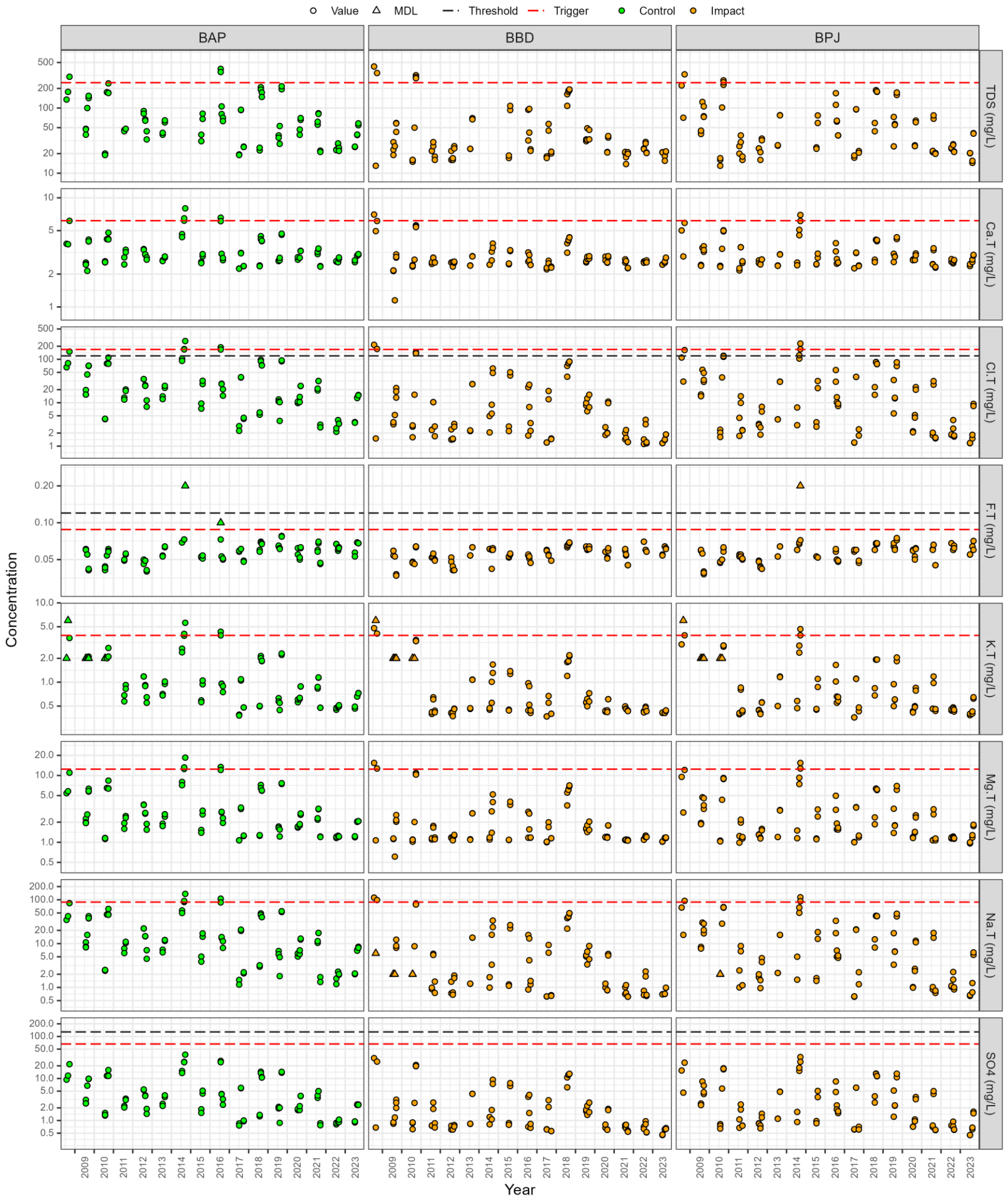


Figure 6-7. Nutrients in water samples from Baker Lake since 2008.

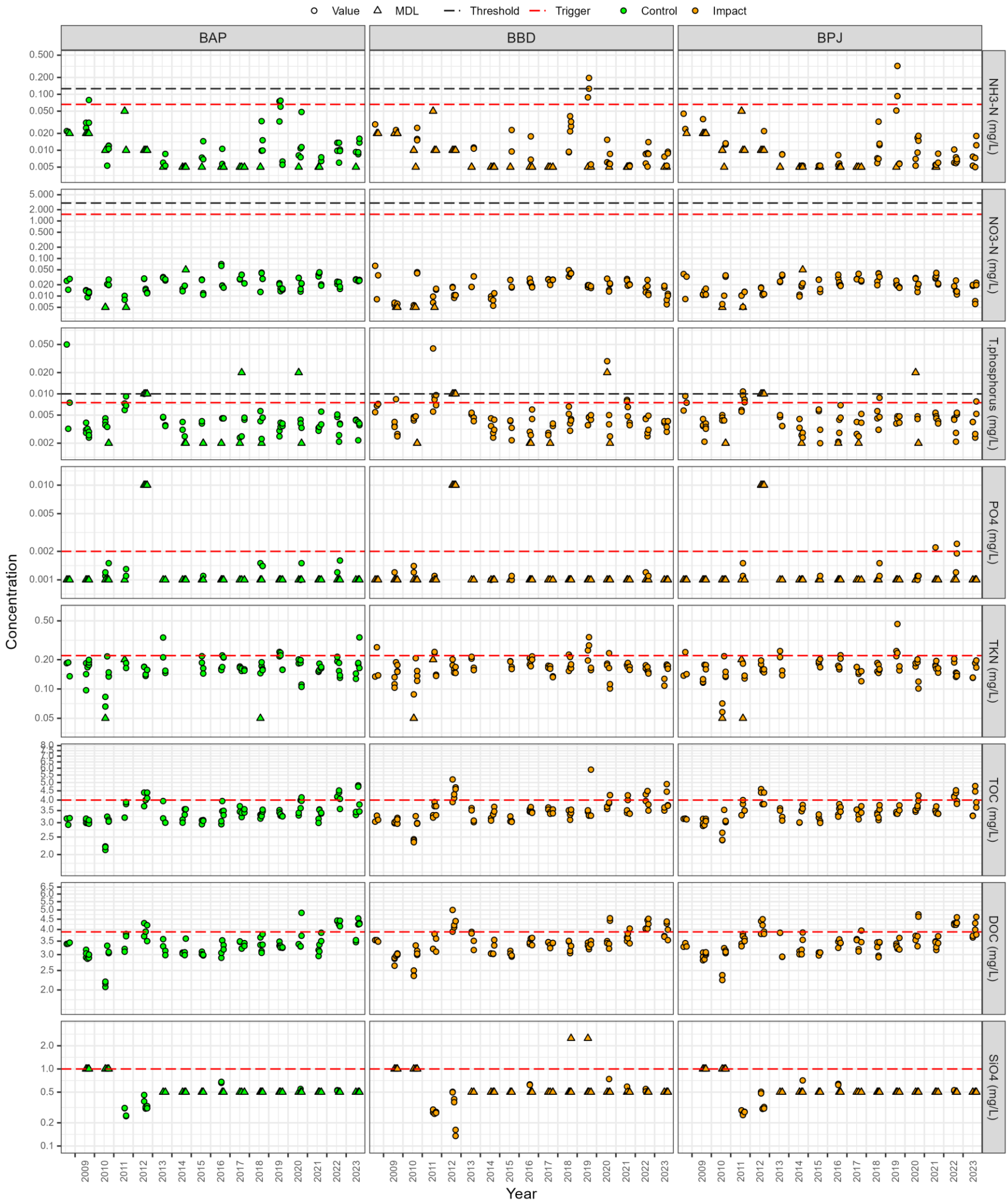


Figure 6-8. Metals in water samples from Baker Lake since 2008.

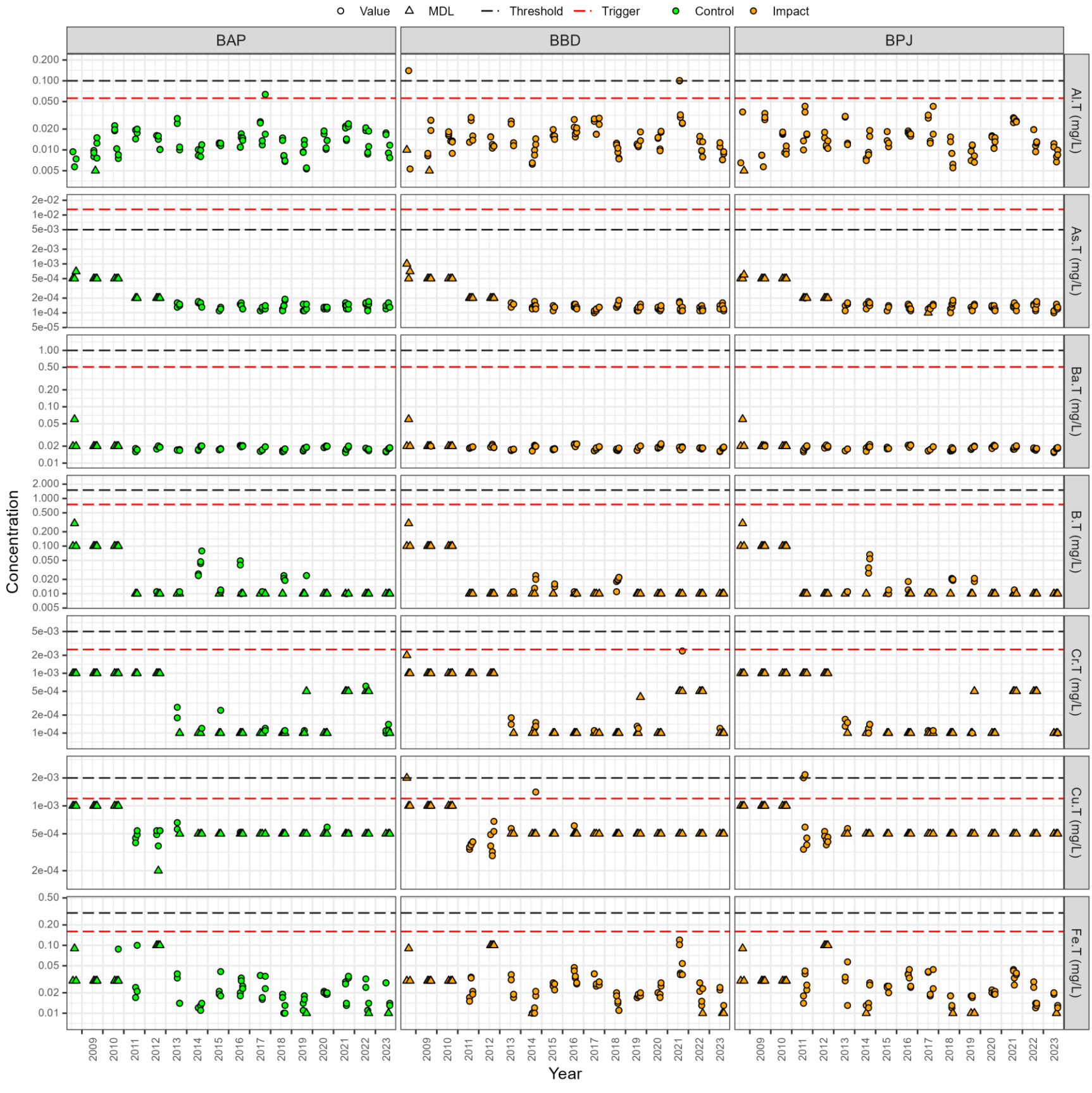
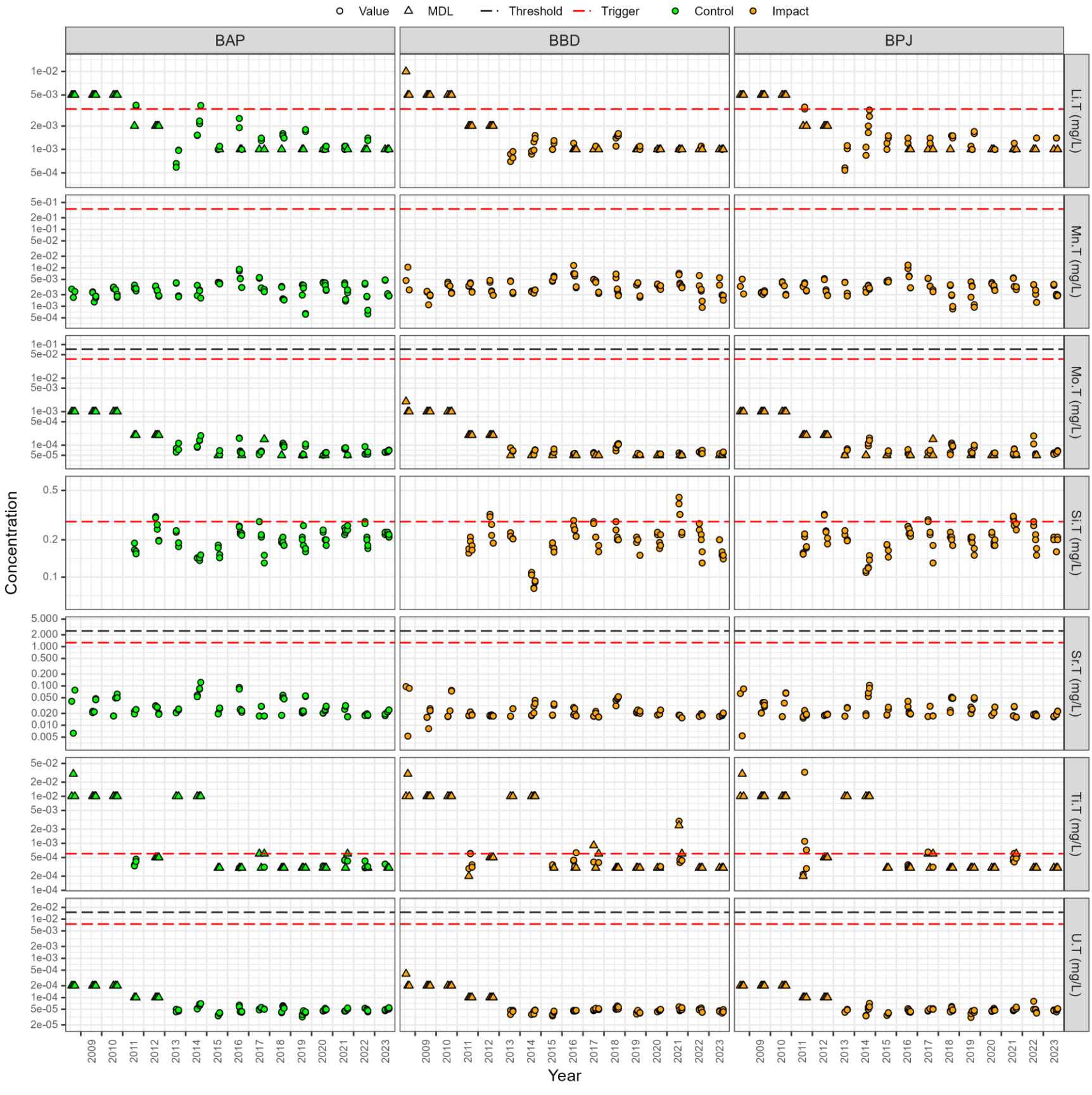


Figure 6-9. Metals in water samples from Baker Lake since 2008.



Phytoplankton Tables and Figures

Table 6-4. Results of the BACI tests for phytoplankton variables at Baker Lake areas, 2023.

Parameter Measured	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect Size (%)		
							ES	LCI	UCI
Total Biomass	BBD	42	3	0.44	0.25	**0.084**	56	-6	159
	BPJ	42	3	0.31	0.17	**0.070**	37	-3	93
Species	BBD	42	3	0.15	0.06	**0.018**	17	3	32
	BPJ	42	3	0.04	0.06	0.474	4	-7	17

Notes:

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

Shaded cells indicate positive (increased) 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 2023).

Estimate = BACI model estimate of the 2023 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 6-10. Chlorophyll-a (µg/L) in water samples from Baker Lake since 2008.

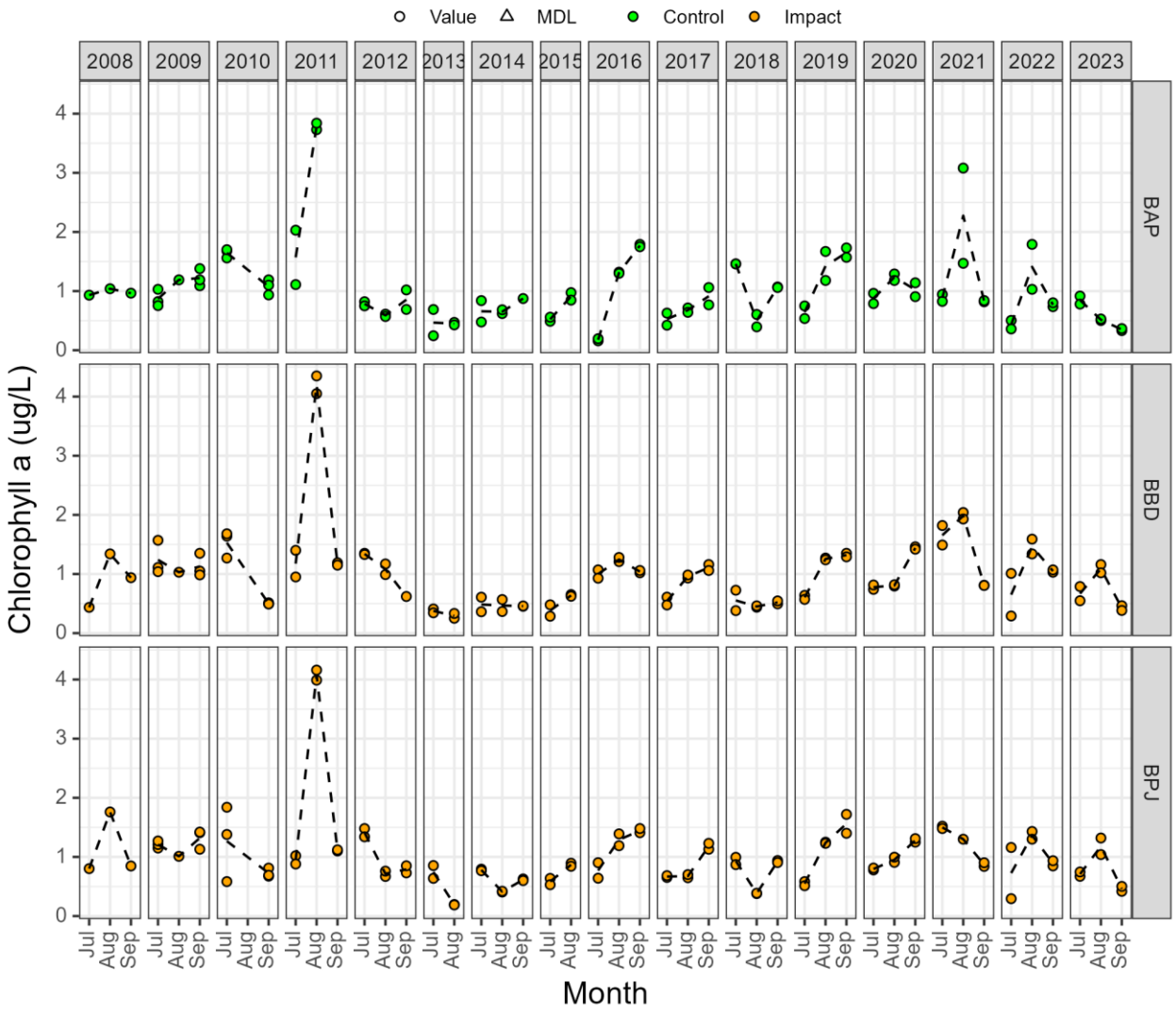


Figure 6-11. Total phytoplankton biomass (mg/m^3) from Baker Lake since 2008.

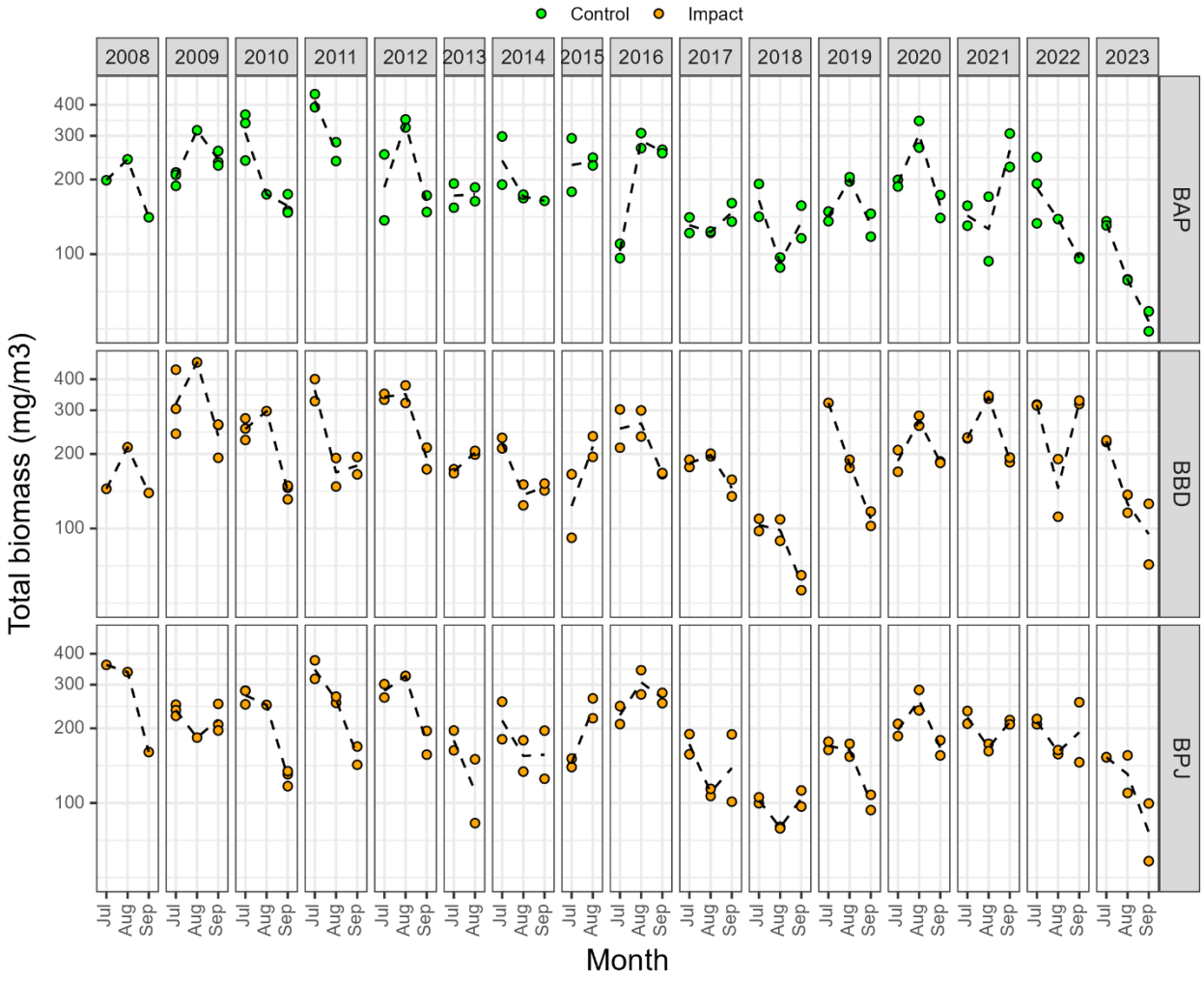


Figure 6-12. Phytoplankton biomass (mg/m^3) by major taxa from Baker Lake since 2008.

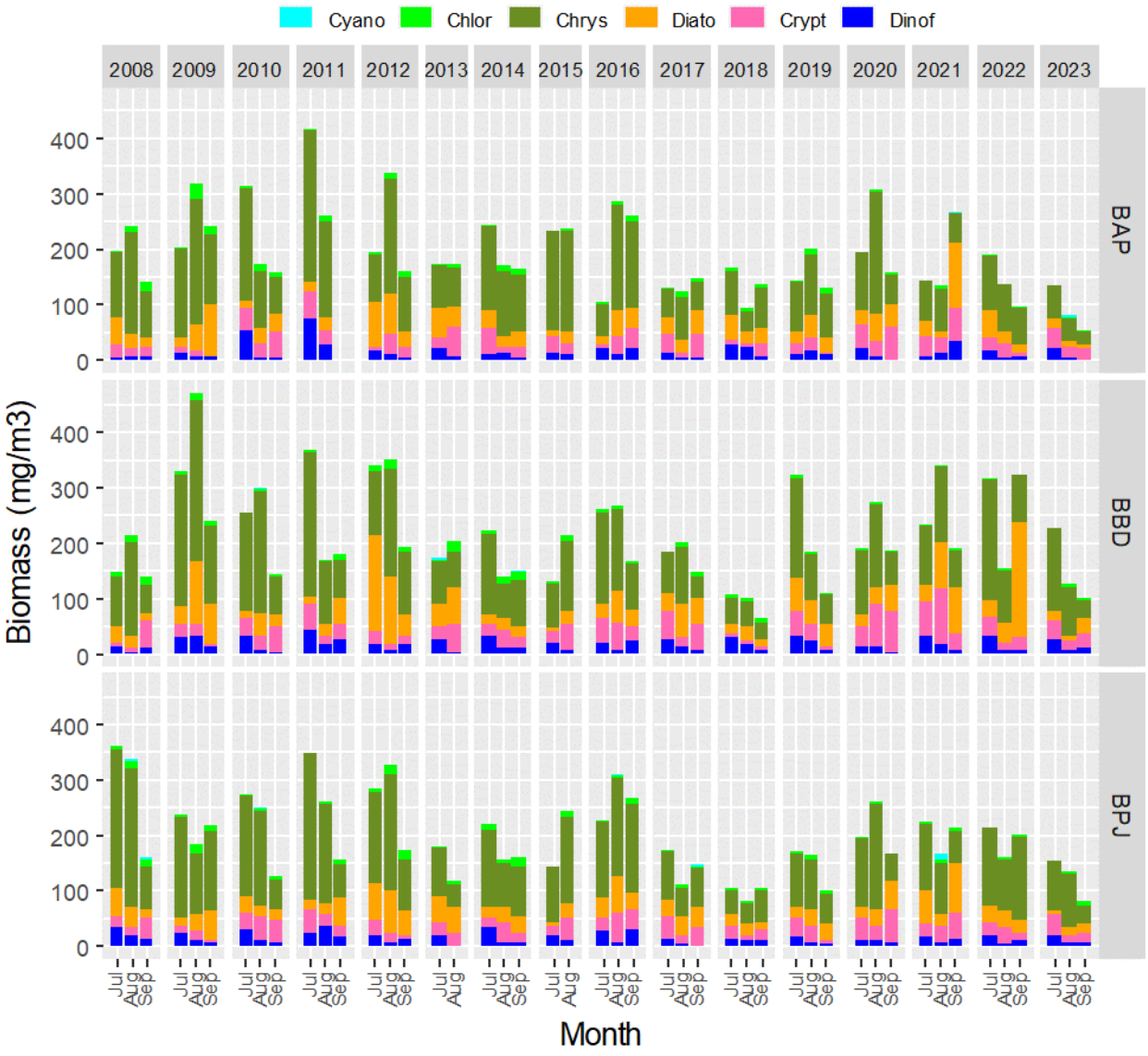


Figure 6-13. Relative phytoplankton biomass by major taxa from Baker Lake since 2008.

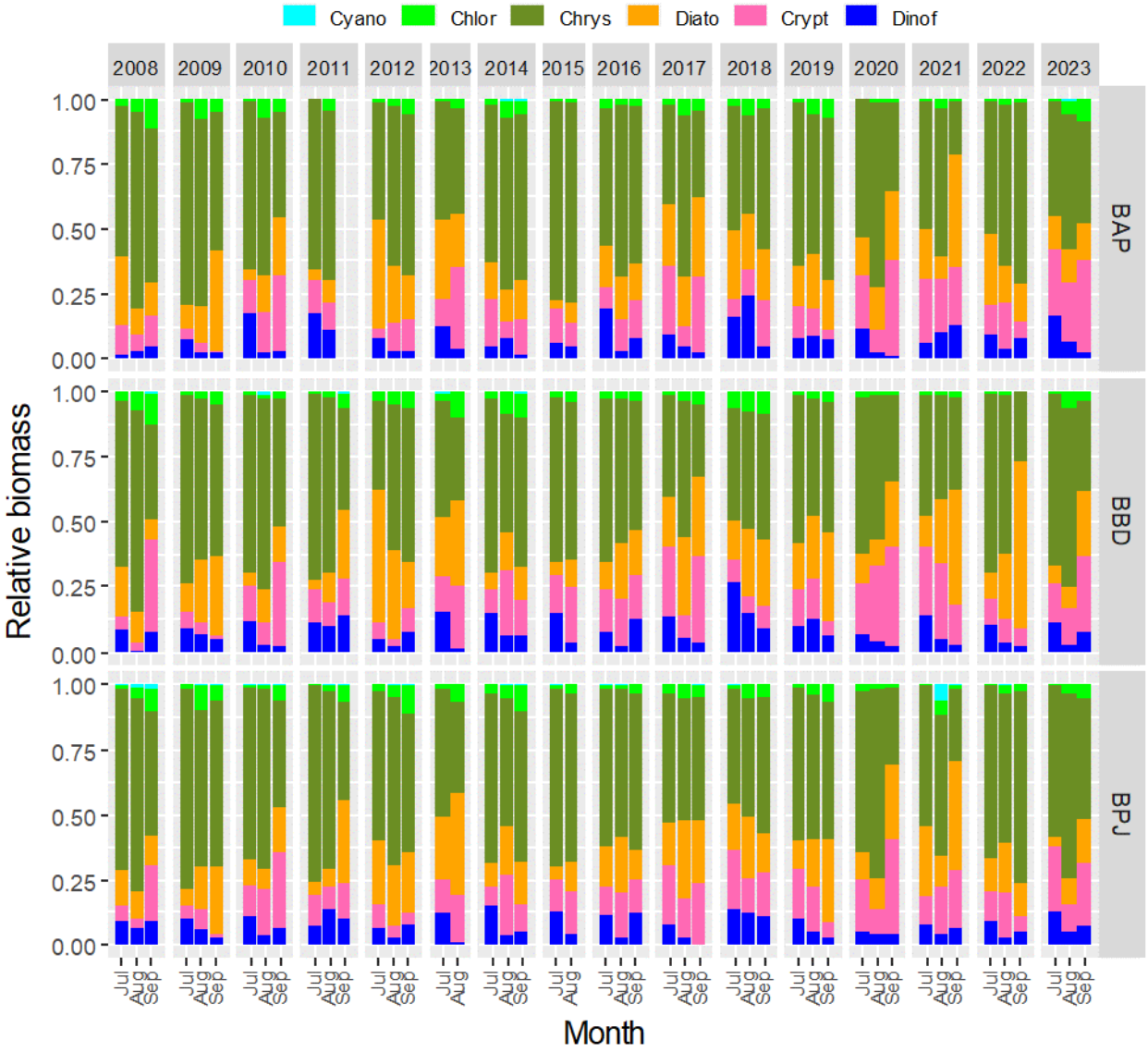
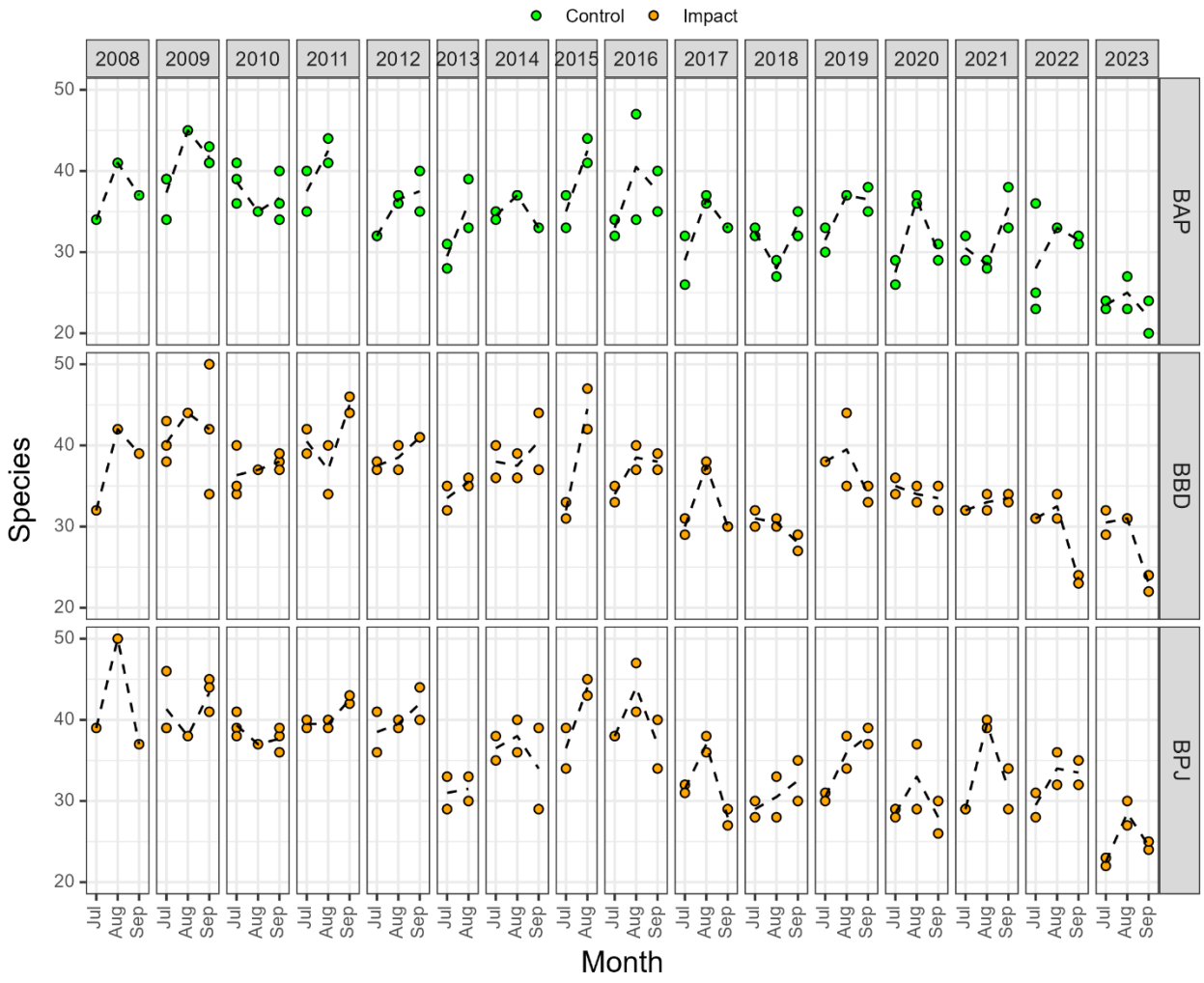


Figure 6-14. Phytoplankton species richness from Baker Lake since 2008.



Sediment Chemistry Tables and Figures

Table 6-5. Sediment core metals at the Baker Lake areas for which the 2023 mean concentration exceeded the trigger.

Parameter	Trigger	2023 Mean	
		BPJ	BBD
Arsenic	7.6	17.00	-
Cadmium	0.32	-	-
Chromium	27	-	
Copper	20	-	-
Lead	19	-	-
Mercury	0.088	-	-
Zinc	73	-	-

Notes:

"-" indicates mean annual concentration was < the trigger value.

Reported mean values are all in units of mg/kg dw (mean of 10 replicate sediment core samples).

Table 6-6. Results of the before-after statistical analysis of sediment core chemistry data at Baker Lake areas, 2023.

								Proportional change		
Parameter	**Test Area**	**n(B)**	**n(A)**	**Estimate**	**SE**	**P-value[1]**	**DF**	**exp(Est)**	**LCI**	**UCI**
Arsenic	BPJ	45	10	-0.44	0.27	0.94	53	0.6	0.4	1.1

Notes:

1. **Bolded** values are p-values < 0.05.

Test area in 2023 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 2023).

Estimate = BA model estimate of the 2023 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 2023 relative to the *before* period.

DF = degrees of freedom.

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

Figure 6-15. Sediment grain size composition in sediment samples from Baker Lake since 2008.

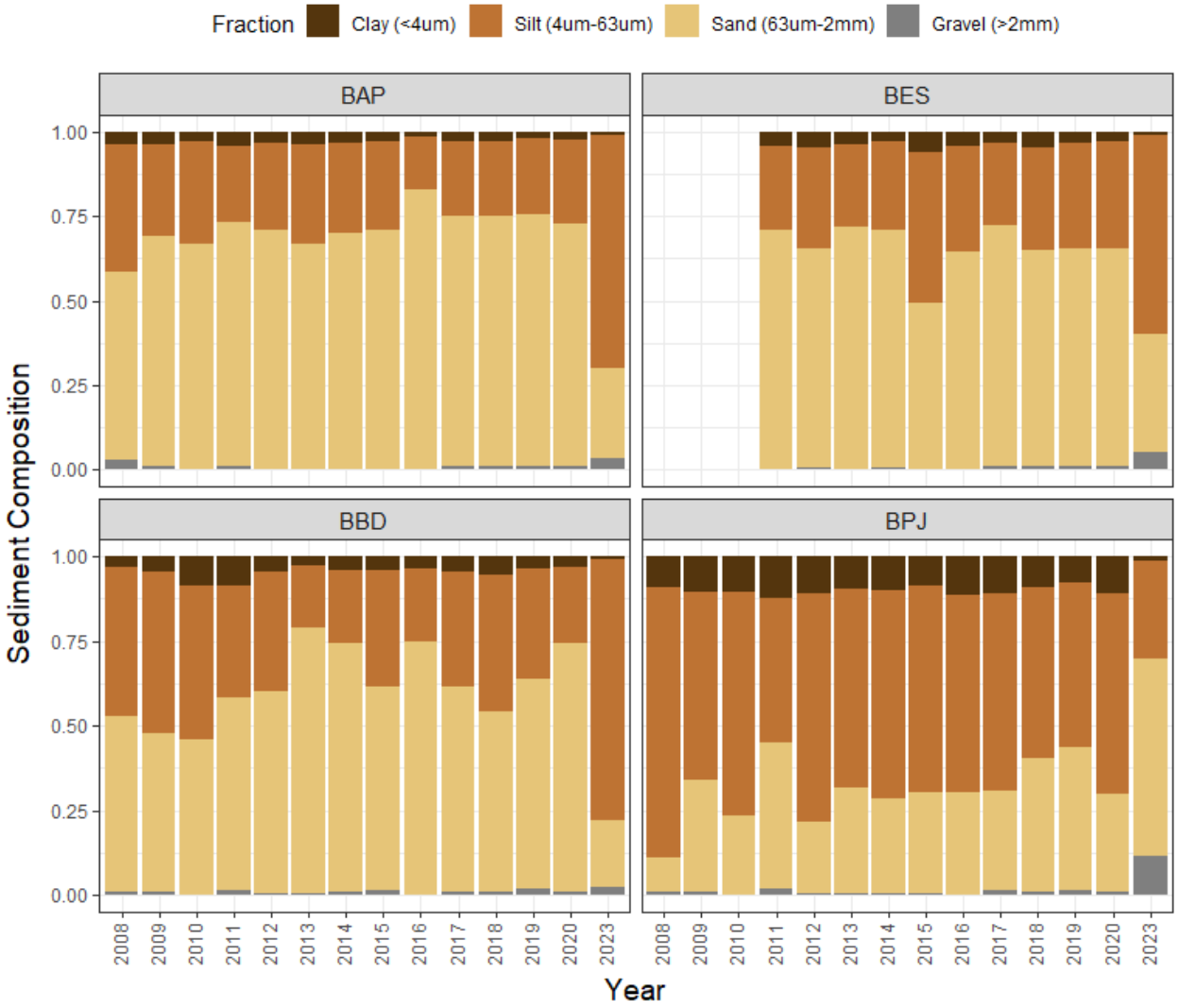


Figure 6-16. Total aluminum (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

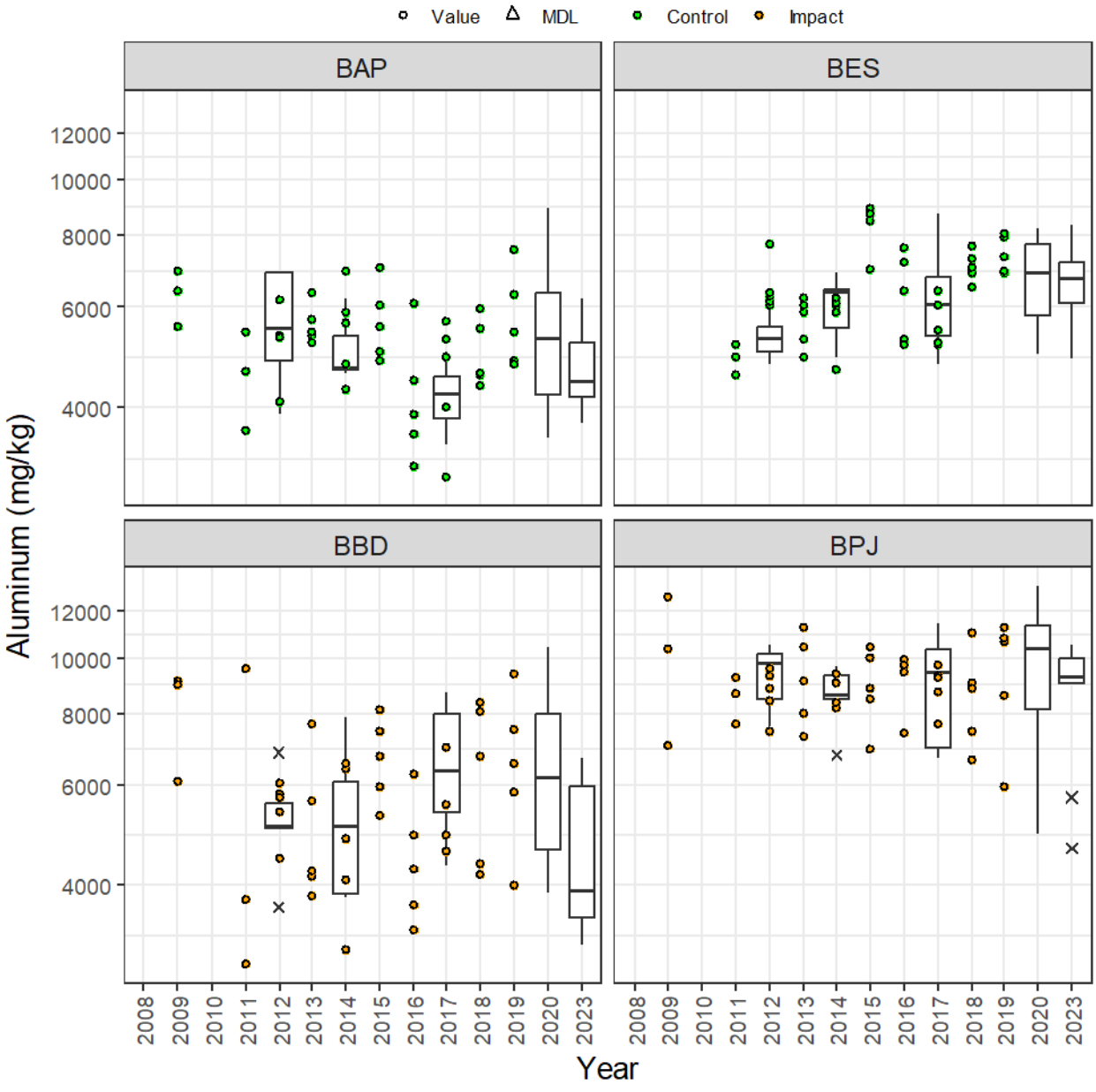


Figure 6-17. Total arsenic (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

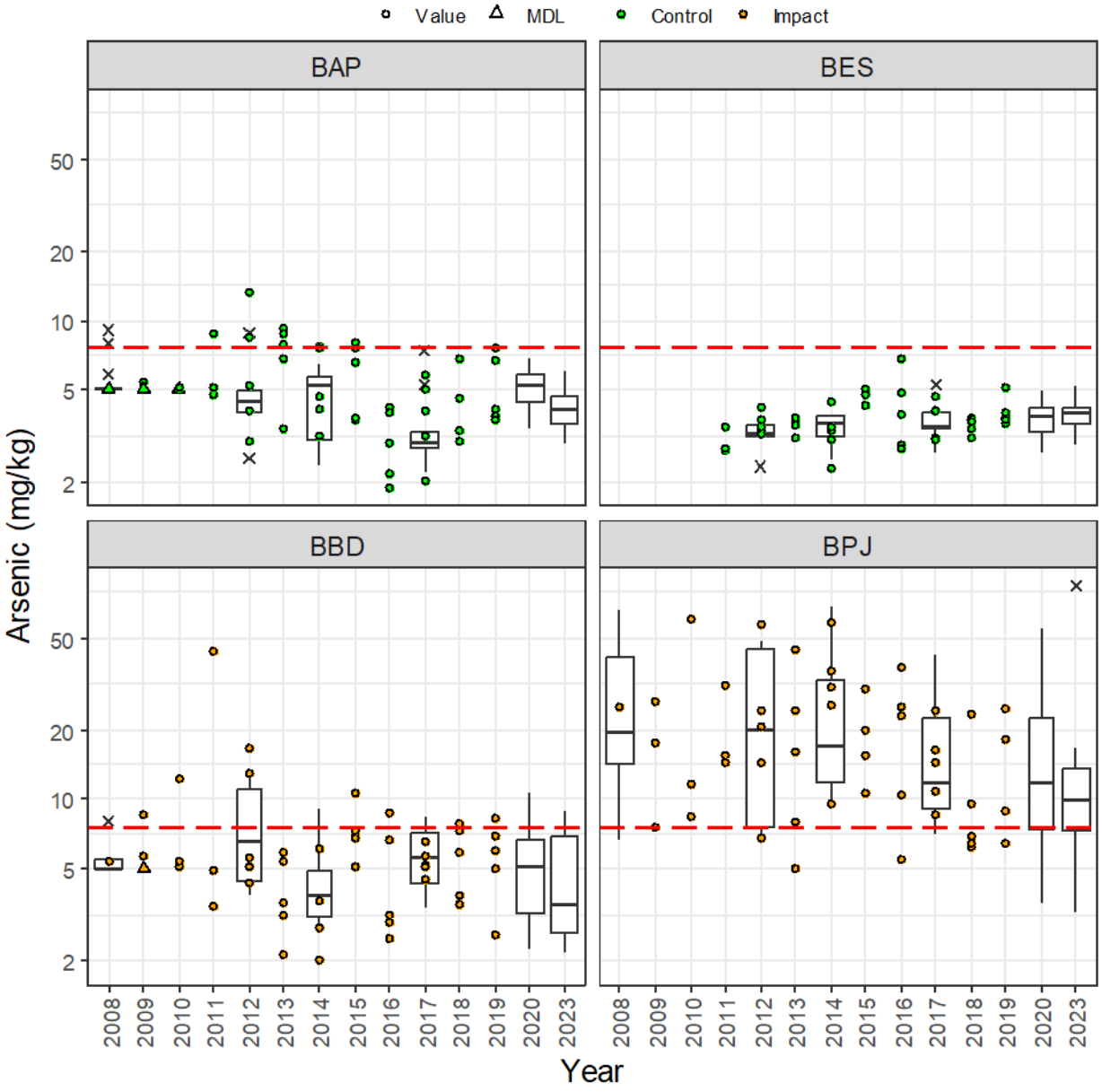


Figure 6-18. Total cadmium (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

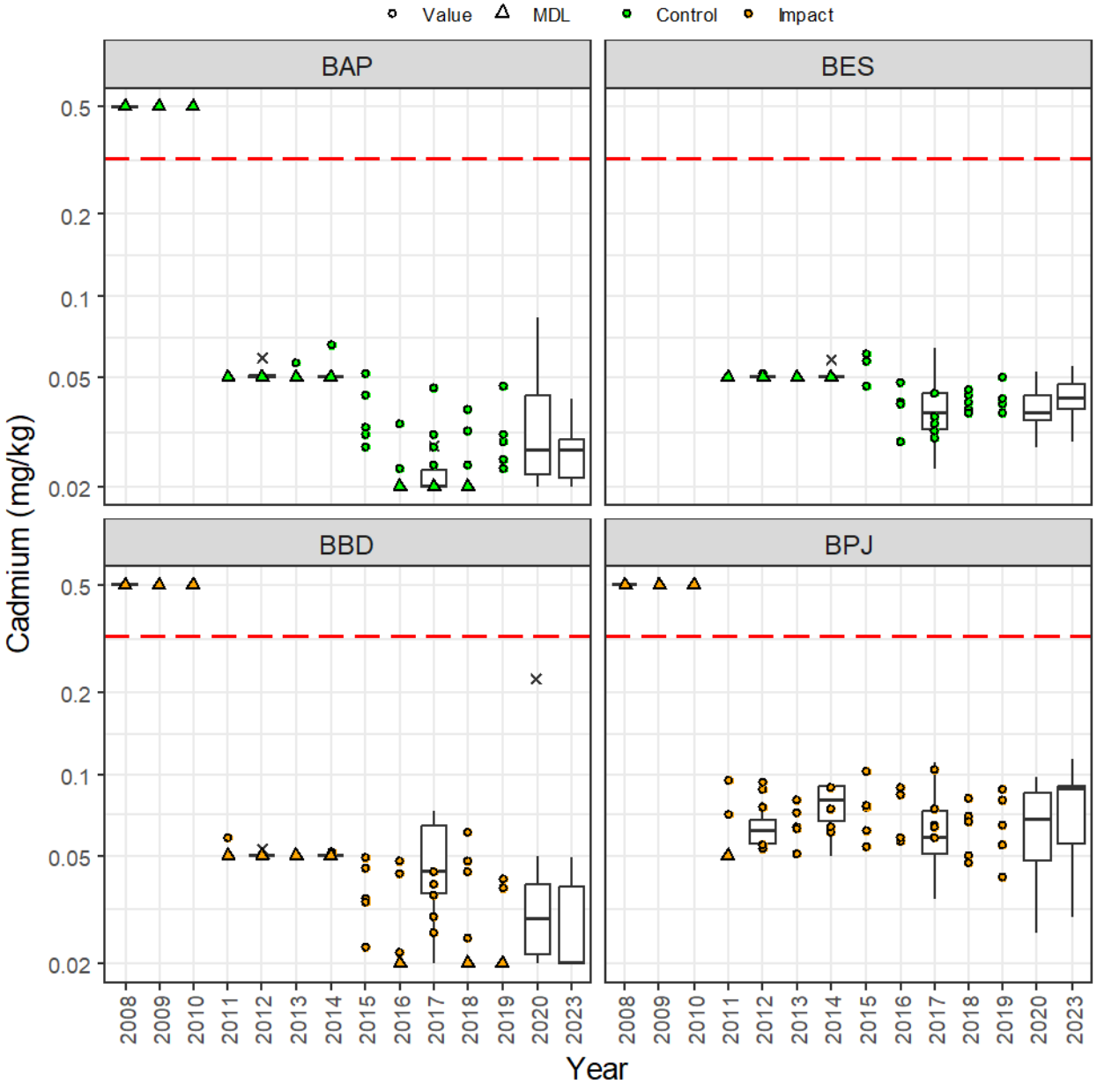


Figure 6-19. Total chromium (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

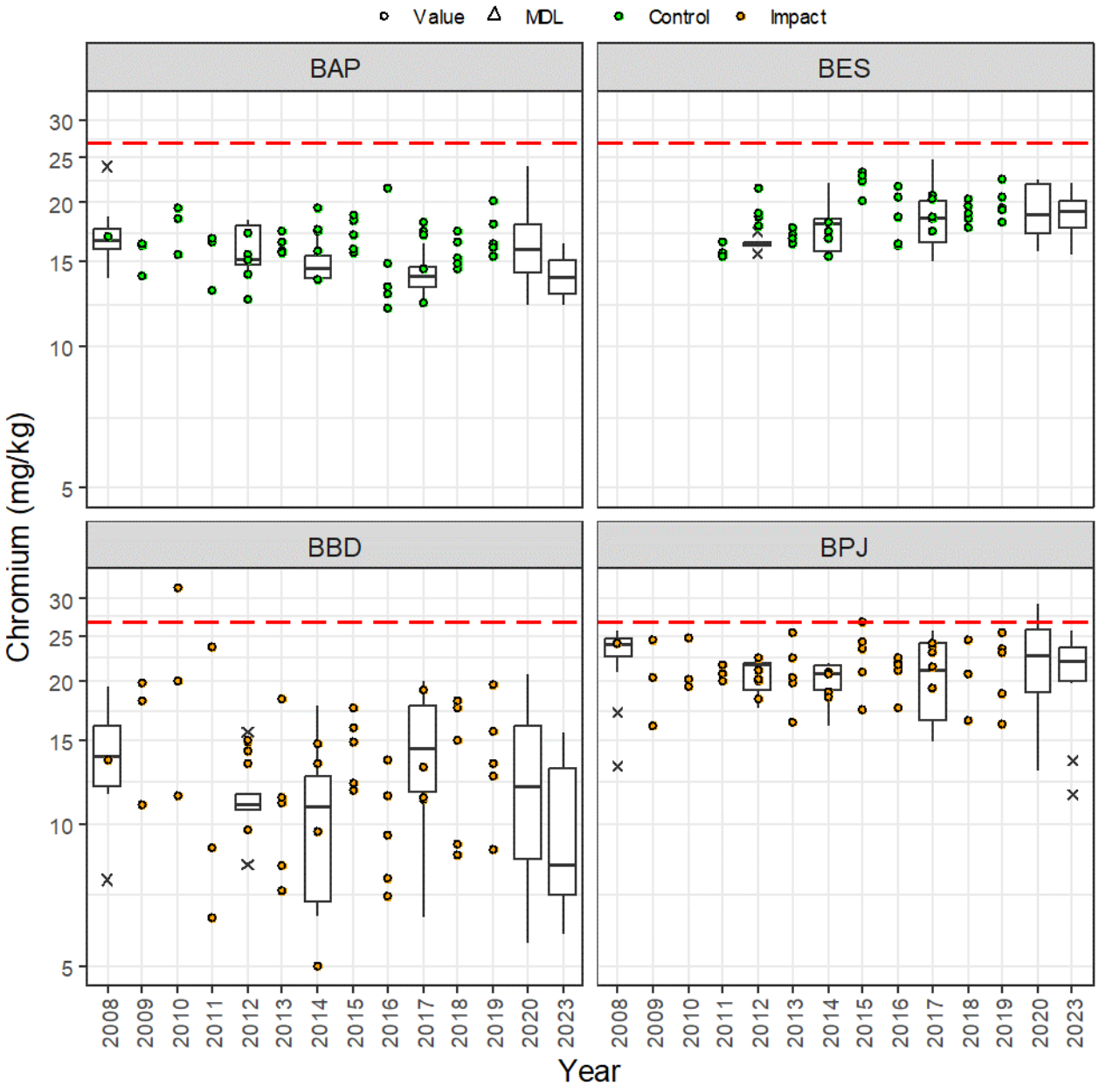


Figure 6-20. Total copper (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

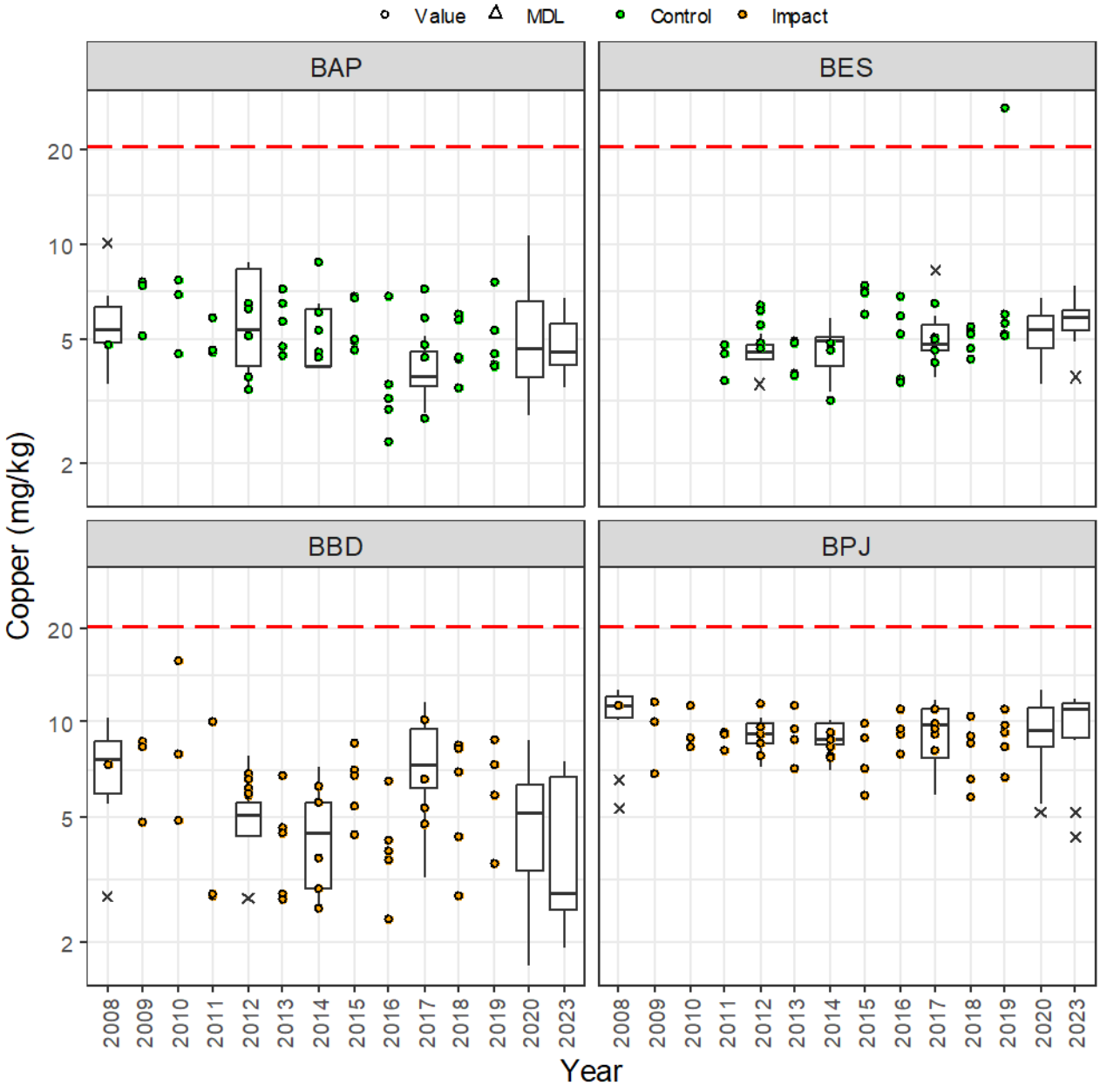


Figure 6-21. Total lead (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

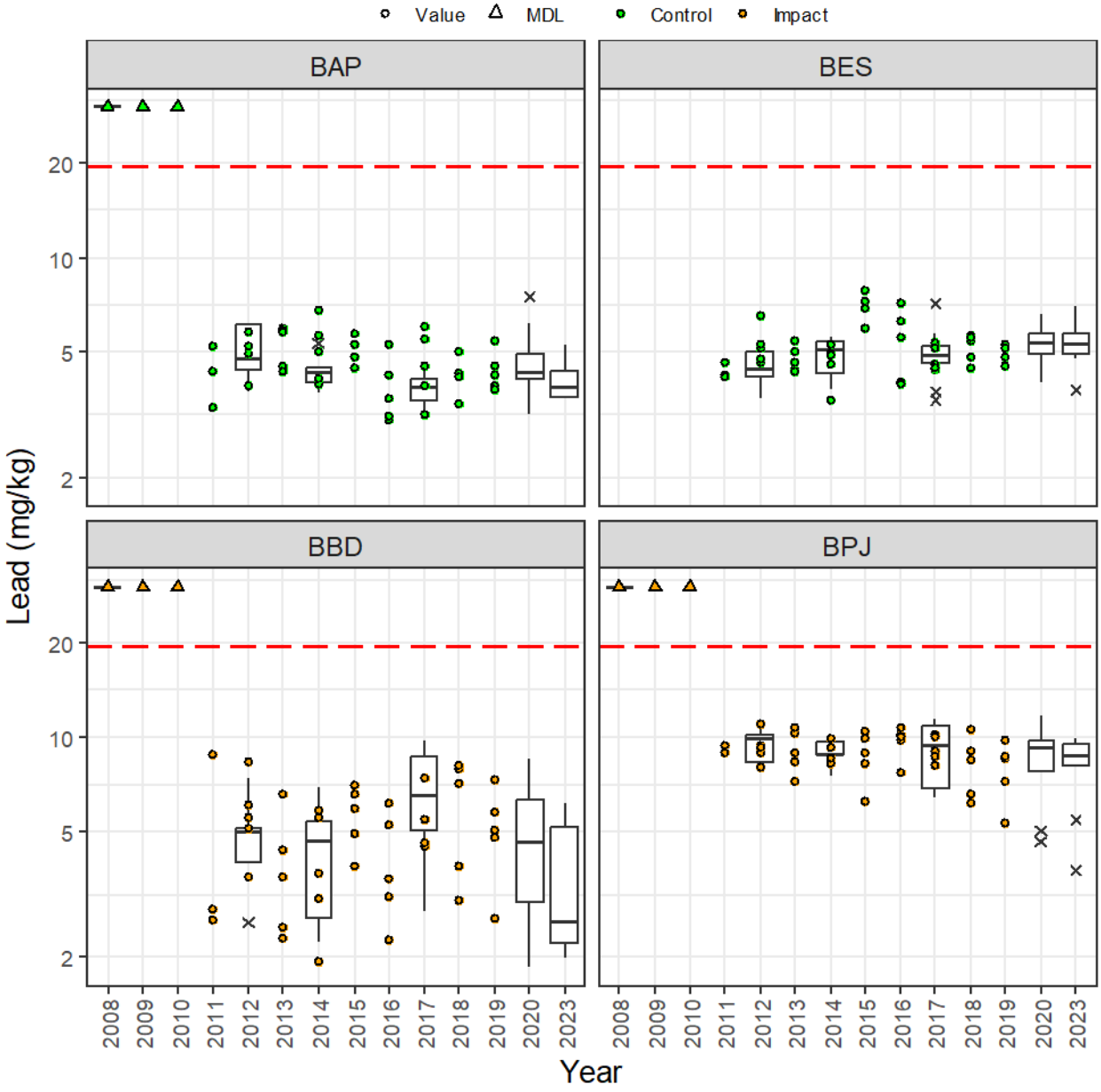


Figure 6-22. Total mercury (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

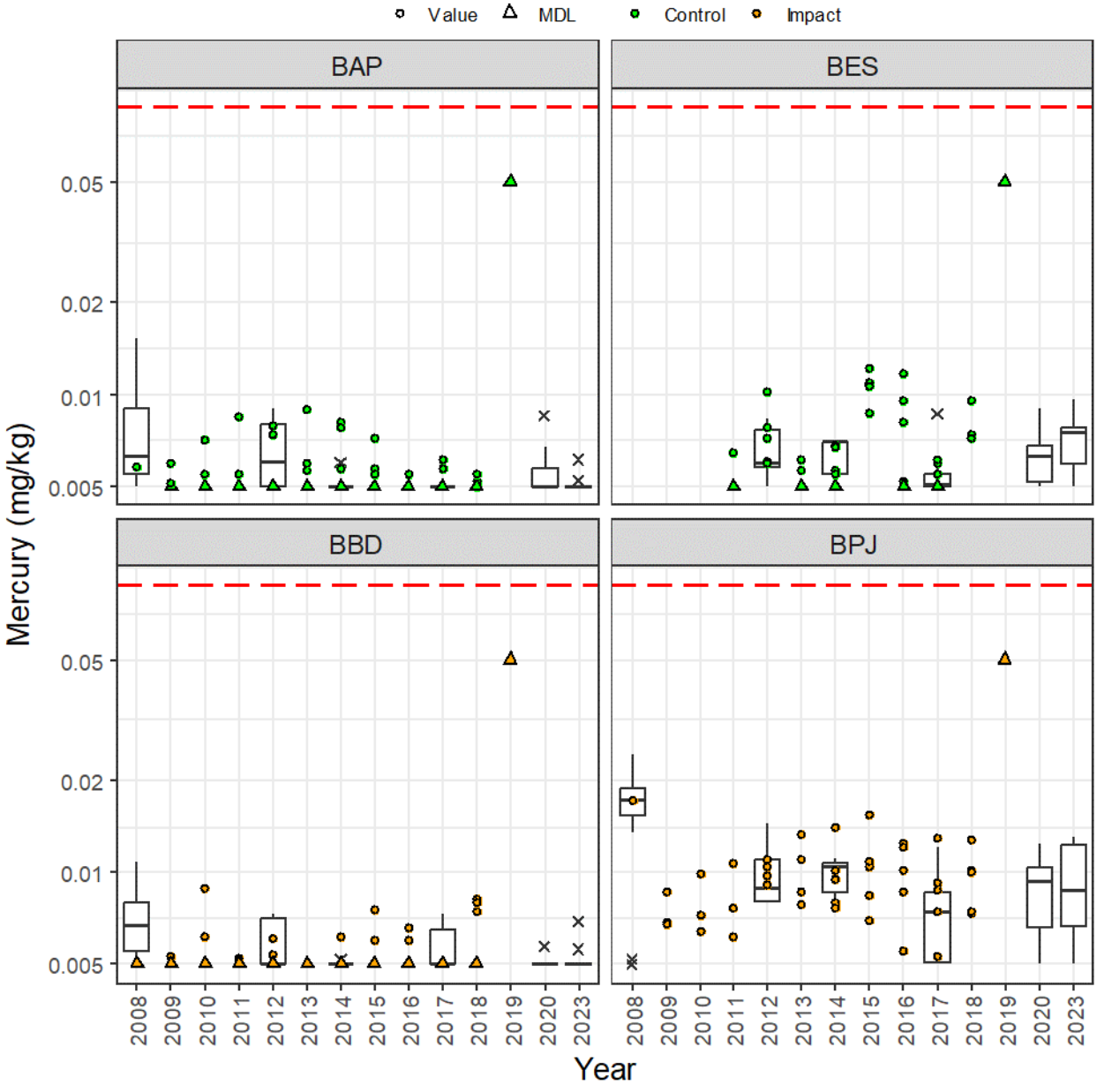
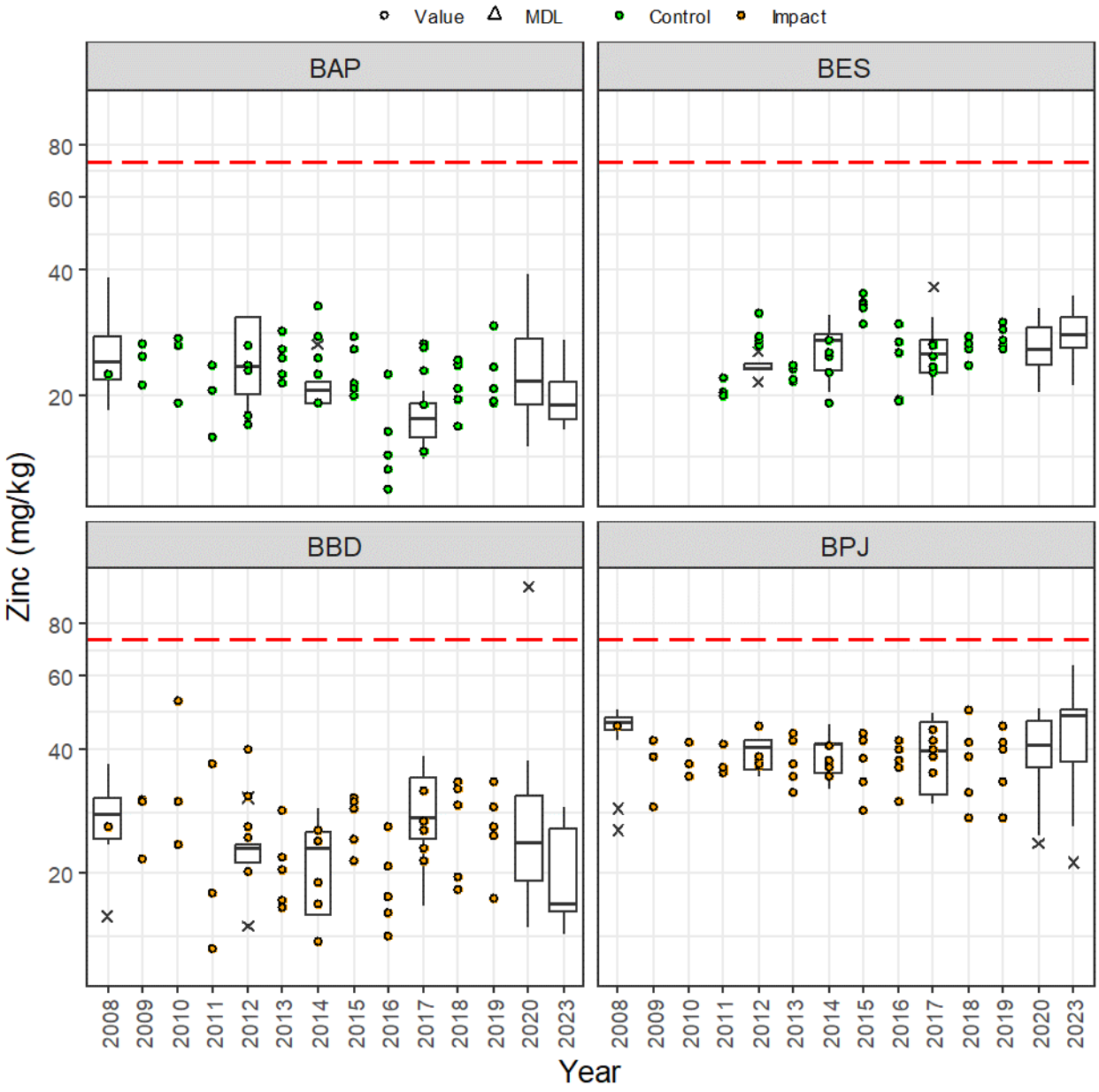


Figure 6-23. Total zinc (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.



Benthic Invertebrate Tables and Figures

Table 6-7. Results of BACI tests benthic invertebrate abundance at Baker Lake areas.

After Period[1]	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2023	BBD	14	1	0.97	0.91	0.31	163	-63	1,785
	BPJ	14	1	0.88	0.89	0.34	141	-65	1,549
2021-23	BBD	13	2	0.8	0.67	0.27	117	-49	829
	BPJ	13	2	0.8	0.64	0.25	118	-45	773
2020-23	BBD	12	3	0.8	0.56	0.18	122	-34	643
	BPJ	12	3	0.66	0.55	0.25	94	-40	531

Notes:

[1] No benthic invertebrate samples collected in 2022.

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

Shaded cells indicate positive (increased) or negative (reduced) effect sizes 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 = 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.

Table 6-8. Results of BACI tests benthic invertebrate taxa richness at Baker Lake areas.

After Period[1]	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2023	BBD	14	1	0.43	0.19	**0.04**	54	2	132
	BPJ	14	1	0.42	0.39	0.31	52	-35	256
2021-23	BBD	13	2	0.29	0.14	**0.07**	33	-3	82
	BPJ	13	2	0.36	0.28	0.23	43	-22	165
2020-23	BBD	12	3	0.17	0.13	0.23	18	-11	58
	BPJ	12	3	0.19	0.25	0.46	21	-30	108

Notes:

[1] No benthic invertebrate samples collected in 2022.

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

Shaded cells indicate positive (increased) or negative (reduced) effect sizes 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 = 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 6-24. Benthic invertebrate total abundance (#/m^2) from Baker Lake since 2008.

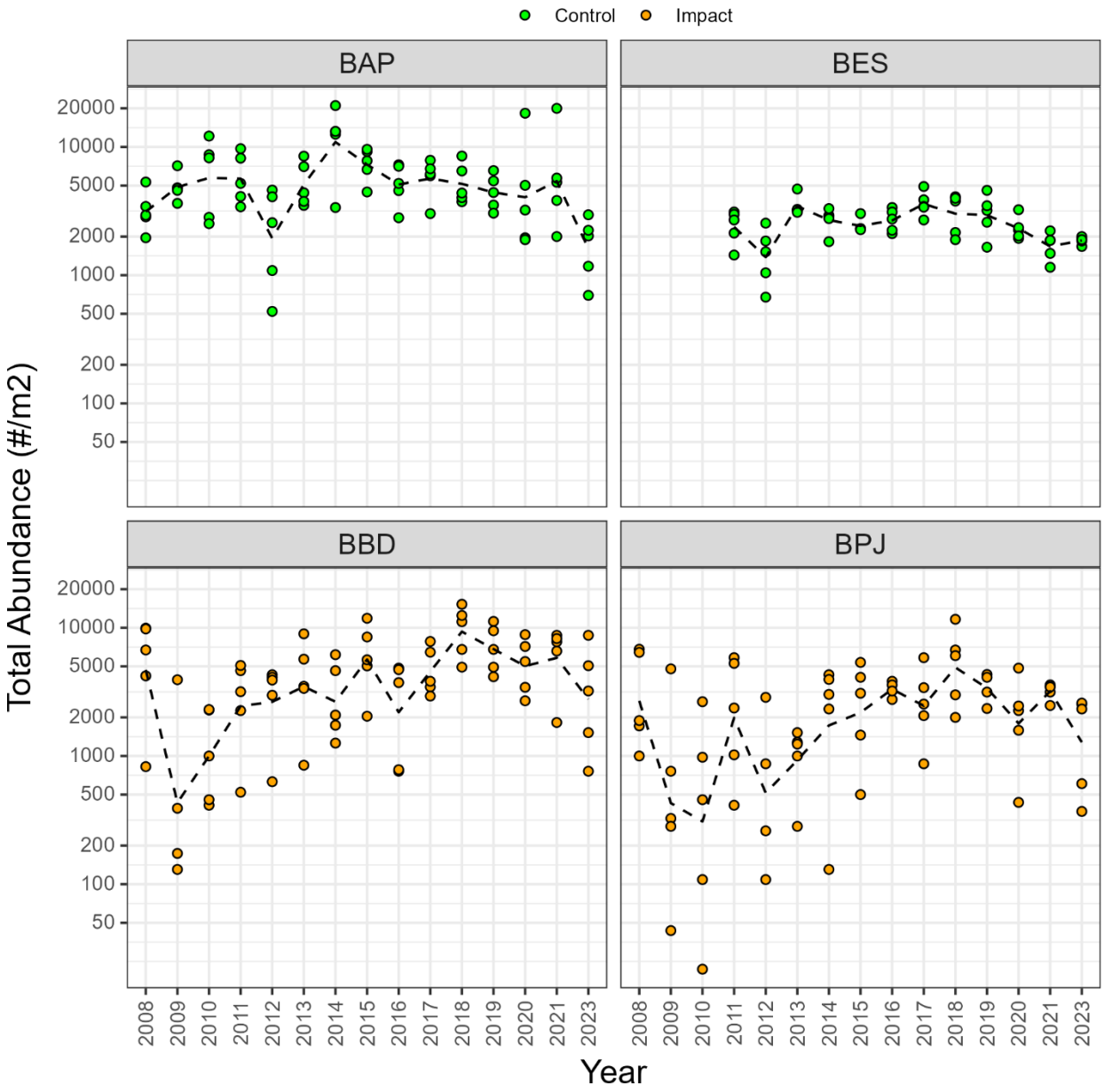


Figure 6-25. Benthic invertebrate total abundance (#/m^2) by major taxa from Baker Lake since 2008.



Figure 6-26. Benthic invertebrate relative abundance by major taxa from Baker Lake since 2008.

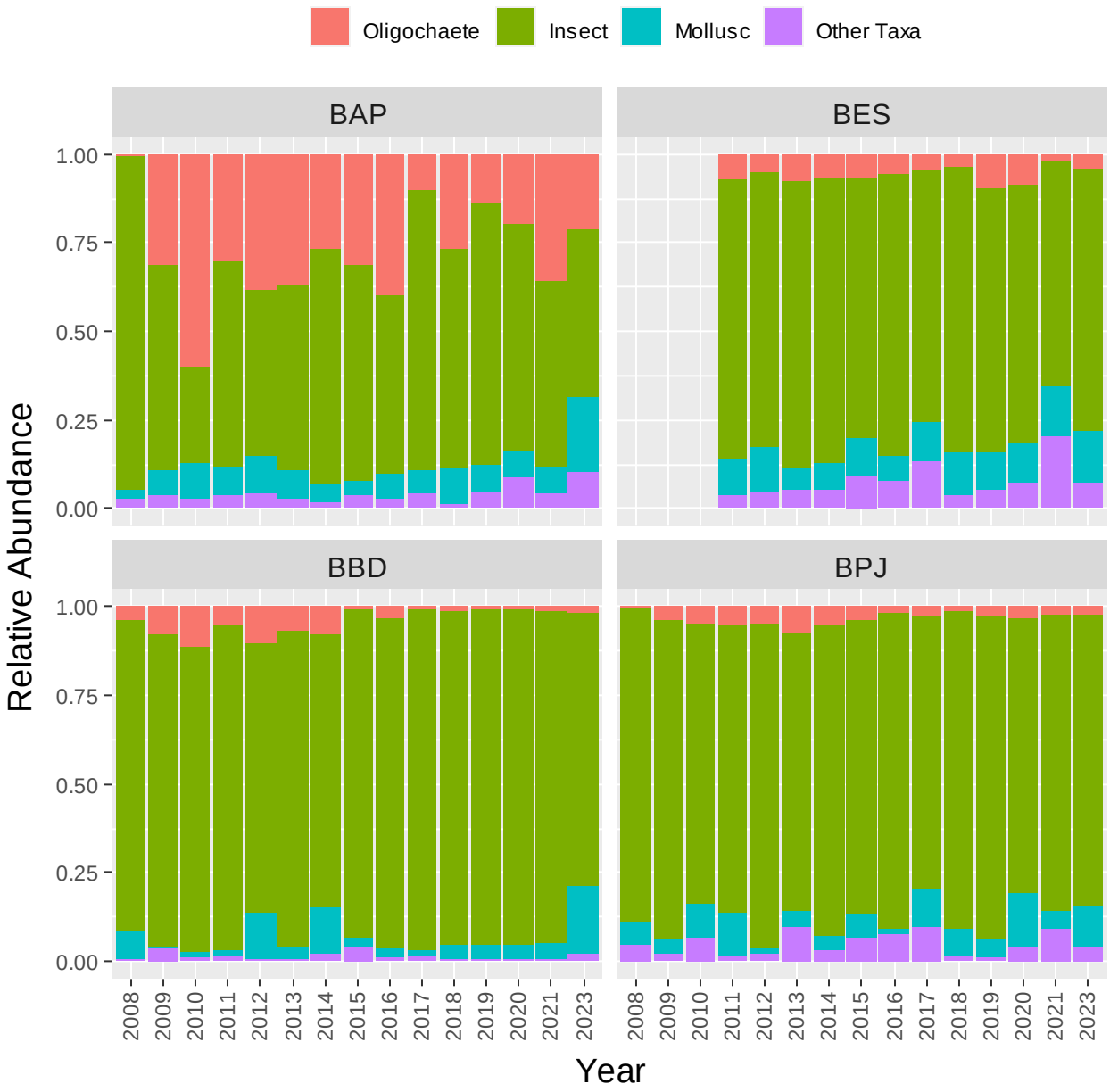


Figure 6-27. Benthic invertebrate total richness (# taxa) from Baker Lake since 2008.

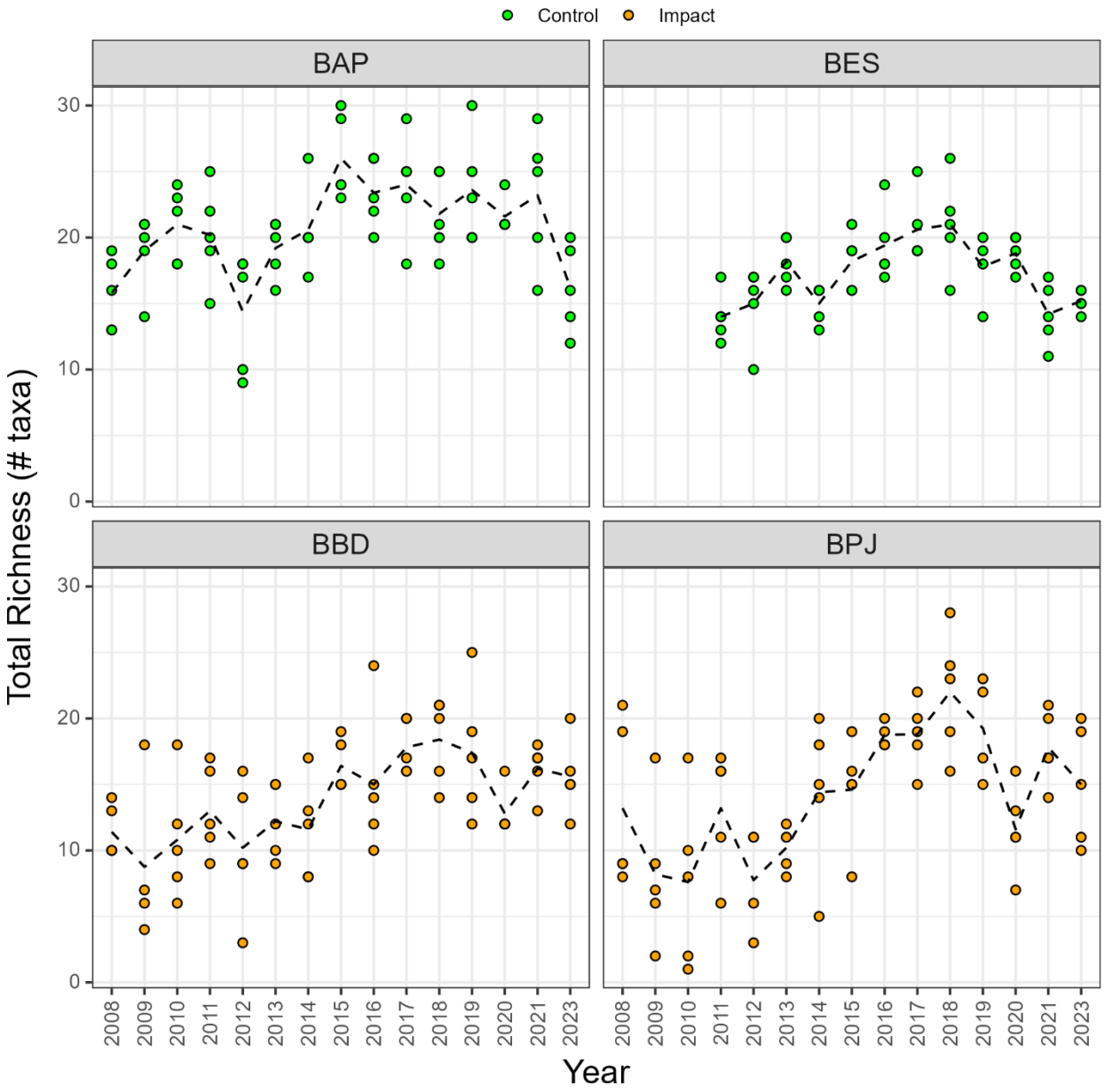


Figure 6-28. Benthic invertebrate total richness (# taxa) by major taxa from Baker Lake since 2008.



Figure 6-29. Benthic invertebrate relative richness by major taxa from Baker Lake since 2008.



7 SCOPE OF THE 2024 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 2024 CREMP are provided for Meadowbank, Whale Tail, and Baker Lake based on the 2023 monitoring results discussed in **Sections 4**, **5**, and **6**, respectively.

7.1 Meadowbank

Based on the 2023 results and the annual decision framework for the sampling strategy (**Section 2.2.3**), the components and schedule for the 2024 CREMP for the Meadowbank study area is summarized in **Table 7-1**. The scope of work proposed for 2024 includes:

- Water quality – Water sampling for three open-water and two through-ice sampling events is recommended at the NF and reference areas. Through-ice limnology and water chemistry sampling at TPS, TE, and TEFF will be suspended unless monitoring data from NF areas suggest there are "moderate changes" in water quality[35]. 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. Winter phytoplankton samples will be archived and may be submitted for analysis depending on the results from the open-water 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 and reference areas.
- Benthos – Routine benthos samples and supporting habitat data (TOC and grain size) will be collected by grab sampler at the NF and reference areas.

[35] "Moderate changes" in water quality are defined as statistically significant increases exceeding the early warning trigger for parameters with effects-based thresholds (i.e., CCME FWAL).

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**. The scope of work proposed for Whale Tail study area lakes in 2024 includes:

- Water quality – The full CREMP program (through-ice and open-water) is recommended at the NF, MF, FF, and reference areas. Through-ice limnology profiles are recommended at KAN/MAM, WTS, and NEM 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.
- Phytoplankton – Routine sampling with the full water quality sampling program.
- Sediment chemistry – Sediment chemistry samples will be collected by grab sampler with benthos at all NF areas and reference.
- Benthos – Benthos samples and supporting habitat data (TOC and grain size) will be collected by grab sampler at the NF, MF, FF, and reference areas on the same schedule as the Meadowbank study area lakes. Sampling at NF areas (WTS and KAN/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. Sampling at A20 to monitor potential changes related to the connectivity with WTS since the impoundment. Sampling at areas 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 2024 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 are currently planned for completion in August 2024. Sediment chemistry and benthos monitoring is not planned for 2024. Sediment chemistry and benthos monitoring frequency for this area will occur on a three-year cycle as per the *CREMP Plan Update* (Azimuth, 2022b).

Table 7-1. Monitoring components planned for 2024 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										
TPS, TE, and TEFF			Suspended[1]							

Notes:
1.Monitoring at MF and FF areas TPE, TE, and TEFF is only required if *moderate* changes are detected upstream at the NF locations consistent with the *CREMP Plan Update* (Azimuth, 2022b).
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) during the winter months; water chemistry will also be collected if profiling shows unusual results.
WQ: water quality - 2 replicate samples from 3 m depth and limno profiles at each location.
Phyto: 2 replicate samples from 3 m depth; same locations as limno.
Sed: 1 composite of grabs for organics (LEPH, HEPH, PAH (low), Mineral Oil and Grease); 5 replicates for grab physical (TOC, grain size, moisture); 10 replicates for core chemistry (metals, TOC, moisture).
Benthos: 5 replicate samples (2 grab composite/sample); same locations as sediment.

Table 7-2. Monitoring components planned for 2024 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	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
Mid- and Far-Field Areas										
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: water quality - 2 replicate samples from 3 m depth and limno profiles at each location.
Phyto: 2 replicate samples from 3 m depth; same locations as limno.
Sed: 1 composite of grabs for organics (LEPH, HEPH, PAH (low), Mineral Oil and Grease); 5 replicates for grab physical (TOC, grain size, moisture); 10 replicates for core chemistry (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 2024 Baker Lake CREMP.

Area ID	Open-Water		
	July	August	September
BBD	WQ	WQ	WQ
	Phyto	Phyto	Phyto
BPJ	WQ	WQ	WQ
	Phyto	Phyto	Phyto
BAP	WQ	WQ	WQ
	Phyto	Phyto	Phyto
BES	No sampling planned for 2024		

Notes:
WQ: water quality 2 replicate samples from 3 m depth and limno profiles at each location.
Phyto: 2 replicate samples from 3 m depth; same locations as limno.
Sed: 1 composite of grabs for organics (LEPH, HEPH, PAH (low), Mineral Oil and Grease); 5 replicates for grab physical (TOC, Grain Size, Moisture); 10 replicates for core chemistry (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 three sections: Annual CREMP Reports, guidance documents related to the CREMP, 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 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 sample collection and analysis using specified standardized procedures, by employing laboratories that have been certified for all applicable methods, and by staffing the program with experienced technicians.

Quality assurance and quality control practices are briefly described here.

- *Quality Assurance* (QA) are the practices used to collect scientifically defensible samples meeting pre-defined data quality objectives (DQOs). For example, employing experienced field staff, standard operating procedures (SOPs), field data sheets, and certified laboratories.
- *Quality Control* (QC) are measures taken to verify that the specific DQOs are met.

The 2023 CREMP QA/QC program was completed at the Meadowbank, Baker Lake, and Whale Tail sampling areas. The QA/QC program is completed at each area to refine the sample procedures and QA/QC protocols and ensure consistency between Meadowbank and Whale Tail Environment teams. An overview of the QA/QC program for each component is provided below; refer to the *CREMP 2022 Plan Update* (Azimuth, 2022) for a complete description.

The QA/QC results presented below for the 2023 CREMP program are summarized in **Section 3** of the main report.

Sample Integrity

The first step in the QC program involved documenting any issues with the sample submission. This step applies to all sampling components (e.g., water chemistry, sediment chemistry, phytoplankton, benthic invertebrates). ALS Environmental was the analytical laboratory used for water and sediment chemistry and who reported concerns surrounding sample submission as “Sample Integrity” issues in the Sample receipt confirmation (SRC) email after the samples were received. Plankton-R-Us Inc. (phytoplankton) and Zaranko Environmental Assessment Services (ZEAS; benthic invertebrates) also reported sample integrity concerns via email. For ALS reports, the results were 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 recommended hold time was exceeded prior to analysis. Sample integrity issues do not necessarily mean the data were unusable;

rather, this information is meant to help the client make an informed decision on how to proceed with analysis and use the results.

Data Quality Objectives - Duplicates

Quality control results of the laboratory and field duplicates were assessed by measuring the relative percent difference (RPD) as a percentage between original and duplicate measurements. The RPD serves as a 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 were parameter-specific and depended on the concentration in the sample. Laboratory duplicates were completed for water chemistry, sediment chemistry, phytoplankton, and benthic invertebrates. Field duplicate samples were collected for water and sediment chemistry, and phytoplankton. DQOs for the duplicate samples are discussed below.

The DQOs for field duplicates are equal to 1.5 times the laboratory RPDs. The laboratory RPDs for water and sediment chemistry for most analytes is 20% and the DQOs for field duplicate samples were ±30%. For parameters without a laboratory RPD DQO (e.g., for chlorophyll-a where the laboratory does not run duplicates), the field duplicate DQO was set to ±40% by default. Field DQOs were adjusted above laboratory RPD levels to reflect that field duplicates are inherently more variable compared to laboratory duplicates. This is partly because field duplicate samples are collected from a large sample volume (i.e., the lake or stream) as opposed to a small, well mixed sample volume (i.e., the single sample container in the laboratory). The use of a 1.5 times multiplier for field duplicates is based on guidance from the Canadian Council of Ministers of the Environment (CCME) that states 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).

The uncertainty in concentrations increases near to the detection limit and the acceptance criteria are relaxed for parameters measured < 5-times the DL. For parameters with concentrations measured at < 5-times the DL, the DQO is an absolute difference between duplicates < 2-times the DL (referred to in the tables as DIFF).

The RPD and DIFF values may be either positive or negative and ideally should provide a mix of the two, clustered around zero. RPDs and DIFF values 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 or DIFF value falls outside the field duplicate DQO it is flagged for review. The importance of reduced precision becomes more important when concentrations are near regulatory guidelines (CCME, 2016). Laboratory precision is reduced close to the DLs as smaller concentrations of analytes per volume tends to magnify variability between the original sample and the duplicate. These occurrences were still flagged, however, given the inherent analytical effects on precision, they were not weighted as heavily unless unusual RPD patterns were observed (e.g., relatively high percentage of RPD values not meeting DQOs or very high RPD values). Analyte concentrations that were greater than 10X DL and did not meet the DQOs were given more weight in the QA/QC assessment.

Phytoplankton DQOs did not change in 2023. The laboratory did not calculate RPD values though they did run duplicate samples. The DQOs for phytoplankton laboratory duplicates were less than ±25% RPD and for field duplicates were less than ±50% RPD.

There were no benthic invertebrate field duplicates and RPDs were not calculated for laboratory duplicates. For laboratory duplicates, ZEAS calculated 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 Overview

QA/QC procedures consisted of careful field collection and sample handling, collecting field duplicate samples and analyzing 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 components of the CREMP.

Sample Shipping and Handling

Sample shipping and handling concerns documented in previous CREMP reports have largely been rectified in recent years. The Meadowbank and Whale Tail Environment departments plan 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 laboratory regarding hold time exceedance has not led to establishing definitive benchmarks for data quality. ALS recommends using *professional judgement* when interpreting chemistry data for parameters that exceeded hold times for analysis.

The sample shipping and handling QA/QC for 2023 was similar to 2022. There were a few discrepancies between samples submitted and the chain of custodies (CoCs) but most were rectified without impacting the analytical results. **Table A-1** summarizes the sample integrity observations (e.g., broken

sample containers, mislabeled containers), the temperature in the shipping coolers upon arrival to the laboratory, and the parameters that exceeded their recommended hold times for analysis.

The target temperature for samples arriving at ALS is between 5°C and 10°C. The temperatures reported in 2023 ranged from a low of 1°C in March to a high of 21°C in July. This range was similar to past years and reflects the seasonal ambient temperatures. The effect on preserved samples is considered negligible, but for chlorophyll-a samples, the increase in temperature means samples may have arrived 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 were no broken containers or samples that spilled in 2023.

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 were identified and forwarded to CREMP project managers immediately after the laboratory received the samples. As such, these types of errors were often rectified shortly after ALS received the samples. The discrepancies are listed in **Table A-1**.

Recommended hold times were provided by the laboratory for analytes and water quality parameters. The times varied from a low of 0.25 days for pH to six months for metals. Hold times for water samples were routinely exceeded for alkalinity, turbidity, laboratory pH, nitrate, nitrite, total dissolved solids (TDS), total suspended solids (TSS), and dissolved orthophosphate (as P). Very occasionally hold times were exceeded for cyanides (free and total). Hold times for sediments were exceeded for pH, mercury, and methylmercury. Samples were 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 were affected for those parameters or analytes where hold times were not met in 2023.

A.2 WATER CHEMISTRY

A.2.1 Field Methods

The standard field QA procedures included 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 included collecting and analyzing field duplicates, and three types of *blank* samples: travel blanks, de-ionized water (DI) blanks, and equipment blanks. Collecting blank samples, particularly equipment blank samples, required careful planning, attention to detail, focus on the importance of cleanliness. Collecting blank samples also provided a good opportunity to assess QA procedures.

Blank samples were collected once per sample event and submitted *blind* to the laboratory to ensure they were treated the same as field-collected samples during analysis. Results from both the equipment and travel blanks were examined for detectable concentrations of any of the parameters measured; no parameter in either blank should exceed laboratory method DLs. If an analyte was detected in a blank, the results for the batch of samples submitted with the blank were compared to the measured concentration in the blank. Results that were less than five times the detected analyte concentration in the equipment blank were flagged to examine the potential for cross-contamination to affect the results. Results carried forward in the QA/QC assessment received either a cautionary flag or an unreliable flag. Cautionary flags were applied to sample results if the analyte was detected in the blank but the effect of potential cross-contamination was considered minor (e.g., the concentration in the equipment blank was a small percentage of the concentration in the samples). Unreliable data flags were applied to water quality results that were unrepresentative of the water quality (e.g., elevated metal concentrations in a sample that were not observed in other replicate sample(s) collected during the same event). The water chemistry data with *cautionary* and *unreliable* data flags were provided in **Appendix B** for clarity on which results should be examined further and/or excluded from decision-making.

A.2.2 Laboratory Methods

ALS is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Performance evaluations are conducted under CALA's accreditation program for laboratory methods, protocols, and QC samples. There are four types of QC samples components of the water chemistry laboratory QC program to assess analytical precision, bias, and completeness:

Laboratory Duplicate – duplicates provided insight into the precision of laboratory analyses. The laboratory randomly chose samples to re-run as duplicates. Duplicate aliquots were taken from the same sample and run through the laboratory analytical process. The difference between the concentrations in the two samples is a measure of the variability associated with duplicate analyses of the same sample in the laboratory.

Method Blank (MB) – samples were analyzed to assess background interference or contamination in the analytical system that could lead to elevated concentrations or false positive data. An analyte-free matrix, such as de-ionized water, was subjected to the entire analytical process to demonstrate that the analytical system itself did not introduce contamination.

Matrix Spike (MS) / Matrix Duplicate (MD) – a known amount of a compound that is chemically similar to the target analyte, was 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) – an LCS is a well-characterized sample of known analytes and concentrations. An LCS may be reference material (i.e., certified reference material) containing certified amounts of target analytes. Percent recovery of the target analytes in the LCS was compared to established control limits which helped determine whether the methodology was in control and whether the laboratory could make accurate and precise measurements at the required reporting limit.

Laboratory QC results are included in each laboratory report for CREMP water quality samples.

A.2.3 Results and Discussion

Field duplicates, laboratory duplicates, and blank samples were analyzed as part of the QA/QC program in each sampling event in 2023. The blank results and field duplicate samples have been fully integrated for all CREMP study areas. Similar to previous years, to better identify potential QA/QC weakness, each team (i.e., Meadowbank Environment and Whale Tail Environment) took turns collecting blank samples, and the field duplicate samples were split evenly between the Meadowbank/Baker Lake study areas and the Whale Tail study area. This approach ensured both teams were familiar with the QA/QC process and better appreciated the nuances of sample collection and handling methods. Blank sample collection, particularly equipment blank samples, required careful planning, attention to detail, focus on the importance of cleanliness, and generally provided an opportunity to assess QA procedures.

Results of the QA/QC analysis are discussed below, along with a discussion on the implications of the QA/QC assessment on the 2023 sample results.

Travel Blanks

Travel blanks should be included in sample bottle shipments, arrive directly from the analytical laboratory, and be stored in a cool place (e.g., refrigerator). A travel blank was submitted for each sampling event. Except for a detectable concentration of total organic carbon (TOC) in the August travel blank, there were no detectable concentrations of analytes.

Travel blank results are summarized in **Table A-2** and complete results are provided in **Table A-4**.

De-ionized Blanks

The goal of collecting de-ionized (DI) blanks was to test the quality of the DI water batch and variability in laboratory analytical methods. DI blanks with the full suite of analyses were submitted for each sampling event in 2023; results are reported in **Table A-4**.

In the DI blanks, there were no detectable concentrations of any analytes in September. In March, total dissolved phosphorus was detected above DL in the DI blank but not in the equipment blank. In July and

August, ammonia as N was detected in the DI blank and equipment blank. None of the parameters were detected above 10 times the DL.

Equipment Blanks

Equipment blanks (EBs) represent a good opportunity to assess the water sampling equipment and also the QA procedures employed by the sampling teams. Collecting these samples requires careful planning and close attention to detail in the sample collection methods which are updated yearly but underwent a notable review in 2015 (Azimuth, 2015).

Several analytes were detected for at least one of the EBs submitted in 2023; results are provided in **Table A-4**. In general, results were very good for most events and were comparable to past years:

- In March, lead was the only parameter detected in the EB sample.
- In July, total ammonia, total and dissolved lead, total and dissolved magnesium, total strontium, dissolved aluminum, and dissolved barium were detected in the EB sample at concentrations slightly above the DL.
- In August, total ammonia and total lead were detected in the EB sample at concentrations slightly above the DL.
- In September, total chromium, total iron, total and dissolved lead, total and dissolved manganese, and total and dissolved zinc were detected in the EB sample at concentrations slightly above the DL.

The implications of possible cross-contamination on the interpretation of the water quality data from the same event was considered inconsequential for all sampling events. Of the analytes that were detected in EBs in 2023, all concentrations were less than 10 times the DL; therefore, no additional scrutiny is warranted.

Field Duplicates

Field duplicate analysis combined results for the Meadowbank, Baker Lake, and Whale Tail study areas. One field duplicate is collected for approximately every 10 samples (i.e., 10% of the total number of samples). In 2023, there was a combined total of 16 duplicates collected between the Meadowbank Lakes, Baker Lake, and the Whale Tail Lakes, corresponding to approximately 13% of the total number of water samples (n=122). Across all CREMP study areas, one to four field duplicates were collected in each sampling event. The field duplicate assessment is provided in **Table A-6**.

As mentioned in **Section A.1.1**, the DQOs for field duplicates were 1.5 times the laboratory RPD for each analyte unless no RPD was available in which case a default 40% was used. The laboratory RPDs for water chemistry for most analytes is 20% therefore the DQOs for field duplicate were less than ±30%. In

2023, there were only 2 RPDs that did not meet DQOs out of the 1808 RPDs calculated[1], equal to less than 1% of the field duplicate comparisons. Of the two parameters that exceeded the DQOs, one of them was detected at a concentration greater than 10 times the DL (**Table A-6**):

- September DUP-3 (NEM-84): chlorophyll-a

Overall, less than 1% of field duplicate RPDs did not meet DQOs, suggesting that sample collection and sample handling in 2023 have maintained a high standard.

Laboratory QC Samples

ALS provided a thorough account of their QA assessment in each certificate of analysis (COA) report that was issued[2]. These results are provided in **Table A-3**. The various components of the QA assessment are provided to help make informed decisions when interpreting the data. The QA program was comprised of four main elements:

- **Laboratory Duplicates** – the laboratory DQO for most parameters was an RPD of less than 20%. All laboratory duplicates met the DQOs for water chemistry in 2023.
- **Method blanks (MB)** – the MB was a blank matrix sample that was taken through the entire analytical procedure to test variability in the analytical method and report any bias in the analysis. MB results were equal to the limit of reporting (LOR or DL[3] as termed here). MB qualifiers were either:
    - "B" – MB exceeded ALS DQO. Associated sample results which were less than DL or greater than 5X blank levels were considered reliable.
    - "MB-LOR" – MB exceeded ALS DQO. DLs were adjusted for samples with positive hits below 5x blank levels.
- For most sample analyses there were no flags or very few flags (e.g., one or two analytes in one sample may have been flagged for B) in the method blank results. However, the limited number

[1] Reporting an analyte does not necessarily calculate an RPD. See **Section A.1.2** for a description on how RPD values are not calculated when either the parent sample or the duplicate are below detection limits.

[2] 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.

[3] The DL is sometimes referred to as the MDL (method detection limit) in this appendix and the main report.

of cases with DQO flags for MB samples were nonetheless reviewed; the results did not affect the interpretation of the 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 generally rare, and typically associated with parameters such as major cations (e.g., magnesium) or certain metals with detected results above the DL (e.g., strontium in 2020).
- **Laboratory Control Samples (LCS) / Certified Reference Material (CRM) / Internal Reference Material (IRM)** – there was one exceedance of DQOs for the laboratory control samples in 2023.

Part of the QA assessment involved comparing the paired sampling events collected at each station within a given event to confirm the data were representative of current conditions and to determine whether the data required additional review. First, the dissolved and total concentrations for a given parameter were compared for each location. Samples where the dissolved concentrations were greater than the total with an RPD of more than 30% were reviewed further. The second analysis compared the concentrations of parameters from the paired samples located within each water body (lake or basin). Parameters for which the difference between the paired intra-lake samples was greater than a factor of 5 (or factor of 10 in cases where at least one of the samples was within a factor of 10 of the DL) were flagged for further review. The sample review resulted in a few results being flagged and removed from formal analysis. For transparency, the sample results that were removed from formal analysis are retained in the water chemistry tables provided in **Appendix B**.

A.2.4 Water Chemistry QA/QC Summary

The field and laboratory QA/QC results for the 2023 water chemistry were acceptable and comparable to the 2022 results:

Sample Integrity – there were no samples lost from breakage or mislabeling in 2023. Sample temperatures received at the laboratory were variable depending on the season and reflected the challenges with shipping from a remote mine site. Likewise, hold time exceedances for parameters and analytes with short hold times were unavoidable but were not considered likely to impact data analysis and interpretation. The detection limit for chromium was adjusted by the laboratory from 0.0001 to 0.0005 mg/L in May 2021 and for beryllium in 2018 from 0.00002 to 0.00001 mg/L due to method re-validation (Pers. Comm. Brent Mack, ALS November 28, 2022). For both parameters, the revised DLs still meet the lowest available Canadian quality guidelines (0.1 µg/L for beryllium, 0.5 µg/L for chromium; Pers. Comm. Brent Mack, ALS November 28, 2022). Beryllium has consistently remained below DL since baseline and is not a parameter of concern for the Site. Furthermore, the revised DL is below the trigger and threshold values for the Meadowbank, Whale Tail, and Baker Lake study areas. As such, the revised DL is sufficient to detect changes in concentrations of beryllium at the Site. There is no lower DL analysis

available for beryllium. For chromium, concentrations above DL have been detected during operations and the revised DL is higher than those detected concentrations. Starting in 2023, low-level chromium (DL = 0.1 µg/L) was analyzed in order to ensure any potential changes in chromium concentrations due to mining activities are detected. The 2023 results for beryllium were less than the revised DL. There were a few samples above the revised DL for chromium at NF areas and reference areas (INUG and PDL).

Blanks – blank results in 2023 indicated reliable sample handling and that cross-contamination related to sampling equipment was unlikely. Very few analytes were detected in blank samples from each event.

The implication of possible cross-contamination on interpretation of the 2023 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. Several analytes were occasionally given cautionary flags, including aluminum, iron, lead, molybdenum, manganese, and zinc. None of the water quality results with cautionary flags exceeded the trigger except for lead in one sample at WAL in March. Sample results, including results with cautionary flags, are reported in **Appendix B1** (Meadowbank), **Appendix B2** (Whale Tail), and **Appendix B3** (Baker Lake).

Overall, approximately 10% of parameters were assigned cautionary flags for one or more samples. Despite the assigned cautionary flags, potential cross-contamination is considered unlikely to bias interpretation of the 2023 water quality analysis.

Field Duplicates – overall, the field duplicate results were very good with only 1% of all the calculated RPDs not meeting their DQOs in 2023.

Laboratory QC Assessment – the laboratory QC assessment completed by ALS indicated the 2023 water quality data were typically within the established DQOs. In the few instances where a DQO was exceeded, the laboratory concluded the results were reliable and fit for use in the water quality assessment.

A.3 SEDIMENT

Field duplicates, and filter swipe samples were analyzed as part of the QA/QC program in the August sediment sampling event. 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.

A.3.1 Field Methods

Field QA consisted of taking care between sampling areas by rinsing and cleaning the sampling gear for sediment grabs (Petite Ponar grab, stainless steel bowls, and spoons) and sediment cores (coring kit) using site water and phosphate-free cleaning detergent, to avoid the possibility of cross-contamination. Field QC measures included collecting and analyzing field duplicates and filter swipes.

A filter swipe sample consisted of an ashless filter (QA/QC Filter) that was wiped over the pre-cleaned stainless-steel bowl and spoon and Petite Ponar to assess the cleaning procedures in the field. The significance of any metal detected on this filter was evaluated by comparing the detected amount on the filter to the minimum amount measured in the sediment samples. Where comparisons were required, the concentration of metals originating from any sampling equipment was estimated by dividing the amount detected on the filter (weight) by the surface area of two Petite Ponar grab samplers (assuming a thickness of 3 cm was collected from each) multiplied by the density of sediment (assumed to be 2 g/cm^3)[4].

A.3.2 Laboratory Methods

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 2022 Plan Update* (Azimuth, 2022).

A.3.3 Sediment Chemistry

Filter Swipes

Filter swipes were collected for various pieces of the sampling gear to quantify potential metals cross-contamination for grab samples. Ashless filters were wiped on the various sampling gear including the stainless-steel spoons and bowls, and the Petite Ponar, and analyzed for metals (µg/filter). The ashless filters themselves can sometimes pose a problem if they contain any trace metals. For example, in 2017 Whatman™ glass microfiber filters (47 mm) were used as swipe material. These filters were made entirely of borosilicate glass and were touted as “the industry standard for high purity filtration”; however, detectable amounts of copper, iron, magnesium, sodium, and zinc were found on the blank filters as well as the equipment swipes of the sampling equipment. A new filter swipe product was used in 2018, i.e., GhostWipes, which was an improvement from the prior year, and has been used in each

[4] Certain metals have been detected on blank filter swipes and should be used with caution when doing field QC for metals (Pers. Comm. Brent Mack from ALS Laboratory, 2023). Starting in 2024, the laboratory will provide metals-free swabs for analyzing the standard list of metals.

CREMP sampling event since 2018. Certain metals have been detected on the GhostWipes and should be used with caution when doing field QC for metals (Pers. Comm. Brent Mack from ALS Laboratory, 2023). Starting in 2024, the laboratory will provide metals-free swabs for analyzing the standard list of metals.

Several analytes were detected on the core equipment filter swipes including: aluminum, barium, chromium, manganese, nickel, and titanium. All detectable analytes were at concentrations less than 10 times the DL (**Table A-7**). 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 0.02% of the concentration present in the sediment cores for all detected parameters. The QA results show the potential for cross-contamination to affect the sediment chemistry results is negligible.

Field Duplicates

Nine grab sample field duplicates were collected for moisture content, TOC, and particle size. For cores, 15 field duplicates were collected for metals, moisture content, and pH. Additionally, two composite field duplicates were collected for moisture content, hydrocarbon and PAH chemistry. The field duplicates for core samples are provided in **Table A-8** (moisture content, pH, and metals). The field duplicates for grab samples are provided in **Table A-9** (moisture content, particle size, and TOC), and **Table A-10** (hydrocarbons and PAHs). The DQOs for sediment samples are outlined in **Section A.1.1**. Generally, the RPD limits were 1.5 times the laboratory RPDs unless no RPD was provided in which case a default ±40% was applied. For grab samples, RPDs are also calculated on particle size and moisture content where default DQOs of 40% and 30% were applied.

In 2023, only 28 parameters did not meet DQOs for sediment cores, equal to 3% of the field duplicate comparisons. For sediment grabs, six parameters did not meet DQOs, equal to 6% of the field duplicate comparisons. For composite grab samples all parameters met the DQOs. The field duplicate results indicate high precision for most parameters and the effect of the exceedances on interpreting data in the CREMP is negligible.

Parameters that exceeded the DQOs for the sediment core field duplicates in 2023

Sample ID	Duplicate	Parameters that exceeded DQOs	DQO based on[a]
Cores			
TPE-SC-7	DUP-SC-1	Arsenic Iron	**RPD** **RPD**
TPN-SC-5	DUP-SC-2	Arsenic Molybdenum	**RPD** **RPD**
BAP-SC-1	DUP-SC-5	Molybdenum	DIFF
BES-SC-4	DUP-SC-7	Manganese	**RPD**

Sample ID	Duplicate	Parameters that exceeded DQOs	DQO based on[a]
Cores			
A76-SC-4	DUP-SC-9	pH	**RPD**
		Manganese	**RPD**
		Phosphorus	**RPD**
MAM-SC-3	DUP-SC-10	Antimony	**RPD**
		Calcium	**RPD**
		Manganese	**RPD**
		Strontium	**RPD**
		Zirconium	DIFF
NEM-SC-8	DUP-SC-11	Cadmium	**RPD**
A20-SC-7	DUP-SC-12	Cadmium	**RPD**
		Cobalt	**RPD**
		Manganese	**RPD**
DS1-SC-4	DUP-SC-13	pH	**RPD**
		Arsenic	**RPD**
		Iron	**RPD**
		Manganese	**RPD**
		Molybdenum	**RPD**
		Phosphorus	**RPD**
		Zirconium	**RPD**
INUG-SC-1	DUP-SC-15	Arsenic	**RPD**
PDL-SC-2	DUP-SC-16	Manganese	**RPD**
Grabs			
TPE-4	Grab-DUP-1	Sand	DIFF
INUG-2	Grab-DUP-3	Sand	DIFF
		Clay	**RPD**
LK8-4	Grab-DUP-5	Sand	DIFF
		Clay	**RPD**
		TOC	**RPD**

Notes:

[a] RPD DQO is <30% difference between duplicate samples (applicable when concentrations are > 5-times DL). DIFF DQO is a difference between duplicate samples of < 2-times the DL.

Laboratory QC Samples

Laboratory QC for sediment samples included laboratory duplicates, method blanks, matrix spikes, and reference material. The summary for the laboratory QC is provided in **Table A-3**.

The laboratory QC assessment completed by ALS indicated the 2023 sediment quality data were typically within the established DQOs. In the few instances where a DQO was exceeded, the laboratory concluded the results were reliable and fit for use in the sediment quality assessment.

A.4 PHYTOPLANKTON

The phytoplankton QA/QC assessment included the Meadowbank, Baker Lake, and Whale Tail study areas. Three to four field duplicate samples were collected during each sampling event. Samples from the under-ice events (i.e., March and November) were archived as per the *CREMP 2022 Plan Update* (Azimuth, 2022). For total density and total biomass, RPDs were calculated between the original sample and the duplicate for both field and laboratory duplicates. While RPDs were also calculated for major taxa groups, these results were not relied on for QC purposes because small differences in abundance/biomass between the original and the duplicate tend to cause large differences in the RPD. As such, for field and laboratory duplicates, we evaluated the data quality based on total density and total biomass.

Results of the RPD analysis for all these parameters are presented in **Table A-11** (field) and **Table A-12** (laboratory) and are discussed below.

A.4.1 Field Methods

Water samples for phytoplankton were collected during monthly sampling events. Sampling gear was thoroughly rinsed between sampling areas to ensure that there was no inadvertent introduction (i.e., cross-contamination) from one area to another. Water samples were stored in a cooler with ice packs until returning to the camp. Water samples were processed back at camp within 6 hours of sampling. Processing involved preserving 50 mL of water with Lugol's iodine solution for phytoplankton taxonomy. The samples were stored in dark containers at room temperature.

Sample Shipping and Handling

The phytoplankton samples for taxonomy arrived at Plankton R Us (Winnipeg) without any sample integrity concerns.

Field Duplicates

Quality control procedures implemented during field operations during the 2023 sampling events included collecting duplicate phytoplankton samples using the same methods and collected at the same time as respective field samples.

Three to four field duplicate phytoplankton samples were collected during each sampling event alongside water sample duplicate collection. Duplicate samples were submitted *blind* to the laboratory for analysis in order to assess sampling variability and sample homogeneity. RPDs were calculated by comparing the original sample and the duplicate result for total density and total biomass. 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. For field duplicates, an RPD of 50% for total density and biomass concentrations is considered acceptable.

A.4.2 Laboratory Methods

Samples collected for taxonomic analysis of phytoplankton were submitted to Plankton-R-Us Inc., a reputable taxonomic laboratory. Overall, the reliability of the analytical results is considered high.

The first step in the QC program involves documenting any issues with the sample submission. This step applies to all sampling components. Plankton-R-Us reports sample integrity concerns via email. In 2023, there were no sample integrity concerns.

As a measure of laboratory QA/QC on the enumeration method, replicate counts are to be performed on 10% of the samples. In 2023, a total of 12 laboratory replicates (12 % of the total number of samples) were analyzed. Replicate samples are randomly chosen and processed at different times from the original analysis to reduce bias. The laboratory replicate is a new aliquot (10 mL) from the sample jar and is counted in the same manner as the original aliquot (10 mL) taken from the jar. An RPD of 25% for total density and biomass concentrations is considered acceptable for laboratory replicates.

A.4.3 Results and Discussion

Field duplicates – there were two RPDs that did not meet the DQO for total biomass: BAP-88 in August and NEM-84 in September, 2023. Three RPDs did not meet the DQO for total density: A-76 in July and BAP-88 and MAM-82 in August, 2023. More RPDs exceeded the DQO in 2023 compared to 2022. All other RPDs in 2023 for total biomass and total density were below 50% indicating good replicability in sample collection. Variability is expected in field collected phytoplankton samples and is mitigated in the study design by collecting two discrete samples from each sampling area. Therefore, the RPD exceedances are not expected to impact the findings of this report. See **Table A-11** for the field duplicate results, including RPDs calculated for major taxa groups.

Laboratory duplicates – In 2023, all laboratory RPDs for total density and total biomass met the DQOs. See **Table A-12** for the laboratory duplicate results, including RPDs calculated for major taxa groups.

A.4.4 Phytoplankton QA/QC Summary

Phytoplankton laboratory QA/QC in 2023 was good and overall results of the QA/QC analysis were similar to 2022. This indicates very good replicability and sample handling in the field and in the laboratory.

A.5 BENTHIC INVERTEBRATES

Standard procedures were used to collect phytoplankton and benthic invertebrate samples (Azimuth, 2022). 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.

A.5.1 Field QA/QC

Field replicates (5 per area) were collected for benthic invertebrates to determine natural variability and heterogeneity. Replicates were collected at least 20 m apart from one another within the defined sampling areas.

A.5.2 Laboratory QC

ZEAS re-sorted and re-counted approximately 10% of the samples, targeting greater than 90% recovery between the original and re-sorted sample.

No field duplicate samples were collected for benthic invertebrates. Laboratory replicate counts were performed on approximately 10% of all 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 97.4% (**Table A-13**). 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.

There were no QA/QC concerns for benthic invertebrates in 2023.

A.6 REFERENCES

Azimuth. 2022. Core Receiving Environment Monitoring Program (CREMP): 2022 Plan Update. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. April, 2022.

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 (CCME). 2016. Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment. PN 1557.

TABLES

Table A-1. Sample submission and integrity QA/QC summary for the water and phytoplankton for all CREMP study areas, 2023.

Event [1]	Lab ID(s)	Parameters Measured	Sample Integrity Observations	Temperature (°C)	Hold-time Exceedances
March	VA23A5518 VA23A5681 VA23A5826 VA23A6274 VA23A5397 VA23A7103	All parameters	None	1, 5, 9, 13	pH, Turbidity, TSS, TDS, Alkalinity, Nitrite, Nitrate, Total Phosphorus, and D. O-OP4. See lab reports.
July	VA23B5555 VA23B5686 VA23B6138	All parameters	Sample 1 (WTS-79): The arsenic speciation bottle related to this sample is listed on the submitted COC but not received. Testing will not be conducted. Sample 15 (July TB): The chl-a tube related to this sample is listed on the submitted COC but not received. Testing will not be conducted. The Nutrient bottles from sample 1 to 4 and the metal bottles sample 3 to 4 had no indication of total or dissolved. However, the black dot marked on the lids were assumed to be the dissolved ones as all bottles had this indication (even the ones with written indication). Chl-a containers not received. Analysis will not proceed. From the two samples received July DI and July EB, the COC mentions that the dissolved parameters were filtered, however there is no indication as to whether the Metals, Mercury, and Nutrients bottles are Total or dissolved (filtered or not) except for the mercury samples "-July EB". The bottles were marked at random.	19, 20.7, 21	pH, Turbidity, TSS, TDS, Alkalinity, Nitrite, Nitrate, and D. O-OP4, Total and Free Cyanide. See lab reports.
August	WP2320725 VA23B9333 VA23B9337 VA23B9996 VA23C0684 VA23C0547 VA23C0550	All parameters	Sample ID AUGUST-DUP-2 was not included on the COC. It has been added to the workorder as -008. Sample(s) INUG-152, PDL-117: Arsenic container not received at laboratory, but requested on COC; The requested analysis cannot be performed. For sample #4 AUG-EB, opaque HDPE (EDTA + Acetic acid) container not received but mentioned on COC. Analysis and container deleted.	14, 16, 17, 18	pH, Turbidity, Nitrite, Nitrate, Total Phosphorus, D. O-OP4, and TOC. See lab reports.
	VA23C0329 VA23C0344 WP2320790 WP2320803	Sediment - All parameters	Sample(s) 004-005, 007-011, 013-017, 025-028, 034, 037-041, 043-047, 049-053, 055-059, 061-065, 074-077, 080, 082, 085-091, 097-104: Limited sample was available for PSA (100g minimum is standard). Measurement uncertainty for PSA results may be higher than usual. For sample #121 and #122, the sample ID mentioned on received containers is SC-DUP-1 and SC-DUP-2 but on COC sample id for both samples mentioned as DUP-SC-1 and DUP-SC-2. Labeled as per COC. 1:2 ratio could not be met for samples VA23C0344-61, 63, 65, 68, 69, 72-74, 76-80 due to low dry weights and high moisture content. Samples were leached with a 1:4 ratio and #63 was leached with a 1:5 ratio.	11, 20	Hg, MeHg, PHCs, PAHs. See lab reports.
September	VA23C1680 VA23C1748	All parameters	Sample DUP 1: Labeling issue. D-metals bottle (with dot on lid consistent with the rest of dissolved bottles) marked as total metals on label, but also marked as filtered. The second metals bottle is unmarked. The filtered bottle will be treated as D-Metals, and the unmarked bottle will be treated as T-Metals. Sample Received with arsenic bottle, but arsenic speciation analyses not requested on COC. Container will be logged in on hold until tests are confirmed. Amendment (20/10/2023): This report has been amended following changes to the analytical data reported. The quality system is being utilised to resolve this issue. The specific data affected includes Chl-a for client sample ID BBD-89. Sample IDs have been updated for two samples as well, as requested. September TB Arsenic speciation bottle: Sample Received but not listed on submitted COC/analytical request form. Logged in on hold.	14, 15, 16	pH, Turbidity, TSS, TDS, Nitrite, Nitrate, and D. O-OP4. See lab reports.
November	VA23C7441	All parameters	Dissolved Arsenic speciation container: For Sample 001 and 004 requested Arsenic analysis but containers not received. For sample 002 and 003 arsenic analysis not requested, but containers received. Logged in as per container received. Please contact PM for analysis changes.	10	pH, Turbidity, Nitrite, Nitrate, and D. O-OP4. See lab reports.

Acronyms

COC = Chain of custody
CN = Cyanide
DI = De-ionized water blank
D. O-PO4 = Orthophosphate
EDTA = Ethylenediaminetetraacetic acid
EB = Equipment blank
HDPE = High Density Poly Ethylene
PSA = Particle size analysis
PTFE = Polytetrafluoroethylene
TB = Travel blank
TDS = Total dissolved solids
TKN = Total Kjeldahl nitrogen
T.Hg = Total mercury
TOC = Total organic carbon
TSS = Total suspended solids

Table A-2. Field QA/QC summary for the water and phytoplankton at CREMP study areas, 2023.

Event	Field QC summary [1]			
	Travel Blank	DI Blank	Equipment Blank	Duplicates
March	None	1 result failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.
July	None	1 result failed to meet DQO; see lab reports.	8 results failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.
August	1 result failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.	2 results failed to meet DQO; see lab reports.	None
September	None	2 results failed to meet DQO; see lab reports.	8 results failed to meet DQO; see lab reports.	8 results failed to meet DQO; see lab reports.
November	N/A	N/A	N/A	2 results failed to meet DQO; see lab reports.

Notes
1 - For more details on parameters that failed to meet DQOs, see lab reports.
N/A = No field QC sample collected during this sampling event.
DQO = Data quality objective.

Table A-3. Laboratory QC summary for the water, phytoplankton, and sediment for all CREMP study areas, 2023.

Event	Laboratory QC Summary [1]				
	Detection Limits	Duplicates	Method Blanks	Matrix Spike	LCS / CRM
March	None	None	2 results failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.	None
July	None	None	None	None	None
August	None	None	1 result failed to meet DQO; see lab reports.	None	None
August (Sediment)	DLHM for some PAHs	None	1 result failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.
September	None	None	None	None	1 result failed to meet DQO; see lab reports.
November[2]	None	None	None	None	None

Notes

[1] Data qualifiers referring to laboratory QC methods (e.g., Method Blanks, Matrix Spikes, and LCS/CRM) are flagged here.
[2] Abbreviated sampling event in November.

DLHM = Detection limit adjusted: Sample has high moisture content.

DQO = Data quality objectives.

LCS / CRM = laboratory control sample / certified reference material.

PAH = Polycyclic aromatic hydrocarbons.

Table A-4. Laboratory detection limits and blanks (travel, de-ionized, and equipment) for all CREMP study areas, 2023.

Month	March				July				August				September			
Blank (Travel, DI, or EB)		Travel Blank	DI Blank	Equip. Blank		Travel Blank	DI Blank	Equip. Blank		Travel Blank	DI Blank	Equip. Blank		Travel Blank	DI Blank	Equip. Blank
Date	Detection Limits	11-Mar-2023	09-Mar-2023	19-Mar-2023	Detection Limits	07-Jul-2023	04-Jul-2023	04-Jul-2023	Detection Limits	18-Aug-2023	22-Aug-2023	24-Aug-2023	Detection Limits	10-Sep-2023	10-Sep-2023	10-Sep-2023
ALS Sample ID		VA23A5681-004	VA23A5826-004	VA23A6274-001		VA23B5555-015	VA23B5686-002	VA23B5686-001		WP2320725-007	VA23C0550-005	VA23C0550-004		VA23C1748-021	VA23C1748-022	VA23C1748-020
Media		Water	Water	Water		Water	Water	Water		Water	Water	Water		Water	Water	Water
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*
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*	1.0	*<1.0*	*<1.0*	*<1.0*
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*	1.0	*<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*
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*
Hardness (mg/L), Dissolved	0.60	*<0.60*	*<0.60*	*<0.60*	0.60	*<0.60*	*<0.60*	*<0.60*	0.60	*<0.60*	*<0.60*	*<0.60*	0.60	*<0.60*	*<0.60*	*<0.60*
Hardness (as $CaCO_3$), from total Ca/Mg	0.60	*<0.60*	*<0.60*	*<0.60*	0.60	*<0.60*	*<0.60*	*<0.60*	0.60	*<0.60*	*<0.60*	*<0.60*	0.60	*<0.60*	*<0.60*	*<0.60*
pH (Laboratory)	0.10	5.4	5.4	5.5	0.10	5.5	5.1	5.2	0.10	5.4	5.4	5.4	0.10	5.3	5.3	5.4
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*
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*
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*
Anions and Nutrients (mg/L)																
Total Kjeldahl Nitrogen	0.050	*<0.050*	*<0.050*	*<0.0050*	0.050	*<0.050*	*<0.050*	*<0.050*	0.050	*<0.050*	*<0.050*	*<0.050*	0.050	*<0.050*	*<0.050*	*<0.050*
Ammonia, Total (as N)	0.0050	*<0.0050*	*<0.0050*	*<0.050*	0.0050	*<0.0050*	**0.0107**	**0.0201**	0.0050	*<0.0050*	**0.0079**	**0.0115**	0.0050	*<0.0050*	*<0.0050*	*<0.0050*
Bromide (Br)	0.050	*<0.050*	*<0.050*	*<0.10*	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*	*<0.020*	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*	*<0.050*	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*
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*
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*
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*
Phosphorus (P)-Total Dissolved	0.0020	*<0.0020*	**0.0045**	*<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*
Reactive Silica (as SiO_2)	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*
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*
Cyanides (mg/L)																
Free Cyanide	0.0010	*<0.0010*	-	-	0.0010	-	-	-	0.0010	-	-	*<0.0010*	0.0010	-	-	-
Total Cyanide	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	**0.94**	*<0.50*	*<0.50*	0.50	*<0.50*	*<0.50*	*<0.50*
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*
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*
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*
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*
Beryllium	0.00010	*<0.000100*	*<0.000100*	*<0.000100*	0.00010	*<0.000100*	*<0.000100*	*<0.000100*	0.00010	*<0.000020*	*<0.000100*	*<0.000100*	0.00010	*<0.000100*	*<0.000100*	*<0.000100*
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	*<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*
Cadmium	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.000005	*<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*
Cesium	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*
Chromium	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	0.00050	*<0.00010*	*<0.00010*	*<0.00010*	0.00050	*<0.00010*	*<0.00010*	*<0.00010*	0.00050	*<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*
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*
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*
Lead	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	**0.000057**	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	**0.000184**
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*
Magnesium	0.0050	*<0.0050*	*<0.0050*	*<0.0050*	0.0050	*<0.0050*	*<0.0050*	**0.0064**	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*	**0.00012**
Mercury	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	*<0.000050*
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*
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*
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*
Rubidium	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*
Selenium	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	*<0.000050*
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*
Silver	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*
Sodium	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*	**0.00021**	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*
Tellurium	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*
Thallium	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*
Thorium	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	0.00010	*<0.00010*	*<0.00010*	*<0.00010*
Tin	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	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*
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*
Uranium	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*
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*
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*	**0.009**
Zirconium	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*
Dissolved Metals (mg/L)																
Aluminum	0.0010	*<0.0010*	*<0.0010*	*<0.0010*	0.0010	*<0.0010*	*<0.0010*	**0.0015**	0.0010	*<0.0010*	*<0.0010*	*<0.0010*	0.0010	*<0.0010*	*<0.0010*	*<0.0010*
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*
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*
Barium	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	0.00010	*<0.00010*	*<0.00010*	**0.00022**	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	0.00010	*<0.00010*	*<0.00010*	*<0.00010*
Beryllium	0.00010	*<0.000100*	*<0.000100*	*<0.000100*	0.00010	*<0.000100*	*<0.000100*	*<0.000100*	0.00010	*<0.000020*	*<0.000100*	*<0.000100*	0.00010	*<0.000100*	*<0.000100*	*<0.000100*
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	*<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*
Cadmium	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.000005	*<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*
Cesium	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*
Chromium	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	0.00050	*<0.00010*	*<0.00010*	*<0.00010*	0.00050	*<0.00010*	*<0.00010*	*<0.00010*	0.00050	*<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*
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*
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*
Lead	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	**0.000057**	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	**0.000184**
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*
Magnesium	0.0050	*<0.0050*	*<0.0050*	*<0.0050*	0.0050	*<0.0050*	*<0.0050*	**0.0064**	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*	**0.00012**
Mercury	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.000005	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	*<0.000050*
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*
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*
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*
Rubidium	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*
Selenium	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	*<0.000050*	0.000050	*<0.000050*	*<0.000050*	*<0.000050*
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*
Silver	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*
Sodium	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*
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*
Tellurium	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*
Thallium	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*
Thorium	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	0.00010	*<0.00010*	*<0.00010*	*<0.00010*
Tin	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	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*
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*
Uranium	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*	0.000010	*<0.000010*	*<0.000010*	*<0.000010*
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*
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*	**0.0034**
Zirconium	0.00020	*<0.00020*	*<0.00020*	*<0.00020*	0.00020	*<0.00020*	*<0.00020*	*<0.00020*	0.00020	*<0.00030*	*<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*	-	-	0.020	-	-	-	0.020	*<0.020*	-	-
Arsenite (As III)	0.020	*<0.020*	-	-	0.020	*<0.020*	-	-	0.020	-	-	-	0.020	*<0.020*	-	-
Arsenobetaine (AsB)	0.050	*<0.050*	-	-	0.050	*<0.050*	-	-	0.050	-	-	-	0.050	*<0.050*	-	-
Dimethylarsinic Acid (DMA)	0.020	*<0.020*	-	-	0.020	*<0.020*	-	-	0.020	-	-	-	0.020	*<0.020*	-	-
Monomethylarsonic Acid (MMA)	0.020	*<0.020*	-	-	0.020	*<0.020*	-	-	0.020	-	-	-	0.020	*<0.020*	-	-

Notes:

Bolded Travel, DI, or Equipment Blank concentration exceeds laboratory DLs but < 10x DL.

Shaded Travel, DI, or Equipment Blank concentration is > 10x DL.

Italicized numbers are below detection limits.

"-" analyte not measured

Table A-5. Summary of parameters detected in blank samples for all CREMP study areas in 2023.

Event and Blank	Parameters Count	Count <DL	Count >DL	Parameters > 10*DL
March				
TB	112	112	0	0
DI	105	104	1	0
EB	105	104	1	0
July				
TB	110	110	0	0
DI	105	104	1	0
EB	105	97	8	0
August				
TB	105	104	1	0
DI	105	104	1	0
EB	107	105	2	0
September				
TB	110	110	0	0
DI	105	105	0	0
EB	105	97	8	0

Table A-6. Water quality field duplicate results for all CREMP study areas in 2023.

Month		Relative Percent Difference DQOs			March DUP-1 (PDL-113)					March DUP-2 (INUG-148)					March DUP-3 (MAM-77)					March DUP-4 (A76-69)				
Station					PDL-113	DUP				INUG-148	DUP				MAM-77	DUP				A76-69	DUP			
Date Sampled	Units			March DLs	09-Mar-2023	09-Mar-2023	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	11-Mar-2023	11-Mar-2023	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	07-Mar-2023	07-Mar-2023	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	26-Mar-2023	26-Mar-2023	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome
ALS Sample ID		Lab	Field		VA23A5826-001	VA23A5826-003				VA23A5681-001	VA23A5681-003				VA23A5397-003	VA23A5397-009				VA23A7103-003	VA23A7103-005			
Parameter					Water	Water				Water	Water				Water	Water				Water	Water			
Physical Tests																								
Conductivity	µS/cm	10	15	2.0	31.3	31.1	RPD	0.60	Pass RPD	20	20.6	RPD	-3.00	Pass RPD	216	214	RPD	0.9	Pass RPD	120	120	RPD	0	Pass RPD
Alkalinity, Bicarbonate		20	30	1.0	10.4	10.6	RPD	-1.90	Pass RPD	6.4	6.2	RPD	3.2	Pass RPD	29.2	29.1	RPD	0.3	Pass RPD	16.8	16.4	RPD	2.4	Pass RPD
Alkalinity, Carbonate		20	30	1.0	*<1.0*	*<1.0*	*DL*	*DL*	*DL*	*<1.0*	*<1.0*	*DL*	*DL*	*DL*	*<1.0*	*<1.0*	*DL*	*DL*	*DL*	*<1.0*	*<1.0*	*DL*	*DL*	*DL*
Alkalinity, Hydroxide		20	30	1.0	*<1.0*	*<1.0*	*DL*	*DL*	*DL*	*<1.0*	*<1.0*	*DL*	*DL*	*DL*	*<1.0*	*<1.0*	*DL*	*DL*	*DL*	*<1.0*	*<1.0*	*DL*	*DL*	*DL*
Alkalinity, Total (as $CaCO_3$)	mg/L	20	30	1.0	10.4	10.6	RPD	-1.90	Pass RPD	6.4	6.2	RPD	3.2	Pass RPD	29.2	29.1	RPD	0.3	Pass RPD	16.8	16.4	RPD	2.4	Pass RPD
Hardness (mg/L), Dissolved			40	0.60	12.4	11.7	RPD	5.8	Pass RPD	7.1	7.1	RPD	-0.700	Pass RPD	80.2	74.3	RPD	7.6	Pass RPD	46.6	47.8	RPD	-2.50	Pass RPD
Hardness (as $CaCO_3$), from total Ca/Mg			40	0.60	12.6	12.4	RPD	1.6	Pass RPD	7.3	7.3	RPD	1	Pass RPD	79.2	78	RPD	1.5	Pass RPD	45.3	44.8	RPD	1.1	Pass RPD
Total Dissolved Solids	mg/L		40	1.0	20.8	22.2	RPD	-6.50	Pass RPD	*<1.0*	*<1.0*	*DL*	*DL*	*DL*	158	141	RPD	11.4	Pass RPD	79.8	71.2	RPD	11.4	Pass RPD
Total Suspended Solids	mg/L		40	3.0	*<1.0*	*<1.0*	*DL*	*DL*	*DL*	21.7	23	RPD	-5.80	Pass RPD	*<1.0*	*<1.0*	*DL*	*DL*	*DL*	*<1.0*	*<1.0*	*DL*	*DL*	*DL*
Turbidity	NTU	15	23	0.10	*<0.10*	*<0.10*	*DL*	*DL*	*DL*	*<0.10*	*<0.10*	*DL*	*DL*	*DL*	0.12	0.12	DIFF	0	Pass Diff	*<0.10*	*<0.10*	*DL*	*DL*	*DL*
pH (Laboratory)	pH		40	0.10	7.1	7.2	RPD	-0.300	Pass RPD	6.9	6.9	RPD	-0.300	Pass RPD	7.5	7.5	RPD	0	Pass RPD	7.1	7.2	RPD	-0.400	Pass RPD
Anions and Nutrients																								
Ammonia, Total (as N)	mg/L	20	30	0.0050	0.0065	0.011	DIFF	-0.004700	Pass Diff	0.019	0.023	DIFF	-0.0034	Pass Diff	0.066	0.067	RPD	-1.80	Pass RPD	0.032	0.031	RPD	2.5	Pass RPD
Bromide (Br)	mg/L	20	30	0.050	*<0.050*	*<0.050*	*DL*	*DL*	*DL*	*<0.050*	*<0.050*	*DL*	*DL*	*DL*	0.30	0.30	RPD	-1.000	Pass RPD	0.15	0.16	DIFF	-0.008	Pass Diff
Chloride (Cl)	mg/L	20	30	0.10	1.0	0.99	RPD	3.0	Pass RPD	0.91	0.92	RPD	-1.10	Pass RPD	26.8	26.7	RPD	0.4	Pass RPD	15.2	15.1	RPD	0.7	Pass RPD
Fluoride (F)	mg/L	20	30	0.020	0.057	0.055	DIFF	0.0020	Pass Diff	0.073	0.074	DIFF	-0.001	Pass Diff	0.078	0.078	DIFF	0	Pass Diff	0.049	0.044	DIFF	0.005	Pass Diff
Total Kjeldahl Nitrogen	mg/L	20	30	0.050	0.11	0.12	DIFF	-0.006000	Pass Diff	0.13	0.14	DIFF	-0.011	Pass Diff	0.28	0.32	RPD	-12.40	Pass RPD	0.20	0.20	DIFF	0	Pass Diff
Nitrate (as N)	mg/L	20	30	0.0050	*<0.0050*	*<0.0050*	*DL*	*DL*	*DL*	*<0.0050*	*<0.0050*	*DL*	*DL*	*DL*	1.1	1.1	RPD	0	Pass RPD	0.12	0.12	RPD	0.9	Pass RPD
Nitrite (as N)	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*	0.0049	0.0063	DIFF	-0.0014	Pass Diff	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*
Orthophosphate-Dissolved (as P)	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*	0.0012	*<0.0010*	*DL*	*DL*	*DL*	0.0018	*<0.0010*	*DL*	*DL*	*DL*
Phosphorus (P)-Total	mg/L	20	30	0.0020	0.0026	0.0031	DIFF	-0.000500	Pass Diff	0.0032	0.0030	DIFF	0.0002	Pass Diff	0.0048	0.0052	DIFF	-0.0004	Pass Diff	0.0035	0.0030	DIFF	0.0005	Pass Diff
Phosphorus (P)-Total Dissolved	mg/L	25	38	0.0020	*<0.0020*	0.0025	*DL*	*DL*	*DL*	*<0.0020*	*<0.0020*	*DL*	*DL*	*DL*	0.0024	0.0025	DIFF	-0.0001	Pass Diff	*<0.0020*	*<0.0020*	*DL*	*DL*	*DL*
Silica, Reactive (as SiO2)	mg/L	20	30	0.50	*<0.50*	*<0.50*	*DL*	*DL*	*DL*	*<0.50*	*<0.50*	*DL*	*DL*	*DL*	1.5	1.5	DIFF	0.01	Pass Diff	0.97	0.99	DIFF	-0.02	Pass Diff
Sulfate (SO4)	mg/L	20	30	0.30	2.5	2.5	RPD	0	Pass RPD	1.1	1.1	DIFF	-0.01	Pass Diff	31.3	31.1	RPD	0.6	Pass RPD	13.2	13.2	RPD	0	Pass RPD
Cyanides																								
Cyanide, Free	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*			DIFF	0	Pass Diff			DIFF	0	Pass Diff
Cyanide, Total	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*			DIFF	0	Pass Diff			DIFF	0	Pass Diff
Organic / Inorganic Carbon																								
Dissolved Organic Carbon	mg/L	20	30	0.50	2.8	3.3	RPD	-19	Pass RPD	2.4	2.9	DIFF	-0.540	Pass Diff	2.9	2.8	RPD	2.8	Pass RPD	2.7	2.6	RPD	1.5	Pass RPD
Total Organic Carbon	mg/L	20	30	0.50	2.1	2.0	DIFF	0.11	Pass Diff	2.1	2.3	DIFF	-0.200	Pass Diff	2.9	3.0	RPD	-1.70	Pass RPD	2.5	2.3	DIFF	0.2	Pass Diff
Total Metals																								
Aluminum (Al)-Total	mg/L	20	30	0.0030	*<0.0030*	*<0.0030*	*DL*	*DL*	*DL*	0.0055	0.0056	DIFF	-0.0001	Pass Diff	0.0039	*<0.0030*	*DL*	*DL*	*DL*	*<0.0030*	*<0.0030*	*DL*	*DL*	*DL*
Antimony (Sb)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	0.0016	0.0017	RPD	-4.90	Pass RPD	0.00032	0.00030	DIFF	2E-05	Pass Diff
Arsenic (As)-Total	mg/L	20	30	0.00010	0.00024	0.00020	DIFF	0.000040	Pass Diff	0.00013	0.00012	DIFF	1E-05	Pass Diff	0.0012	0.0011	RPD	0.9	Pass RPD	0.00032	0.00029	DIFF	0.00003	Pass Diff
Barium (Ba)-Total	mg/L	20	30	0.00010	0.0026	0.0024	RPD	5.6	Pass RPD	0.0020	0.0020	RPD	1.5	Pass RPD	0.035	0.034	RPD	2.3	Pass RPD	0.020	0.020	RPD	-1.000	Pass RPD
Beryllium (Be)-Total	mg/L	20	30	0.000100	*<0.000100*	*<0.000100*	*DL*	*DL*	*DL*	*<0.000100*	*<0.000100*	*DL*	*DL*	*DL*	*<0.000100*	*<0.000100*	*DL*	*DL*	*DL*	*<0.000100*	*<0.000100*	*DL*	*DL*	*DL*
Bismuth (Bi)-Total	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*
Boron (B)-Total	mg/L	20	30	0.010	*<0.010*	*<0.010*	*DL*	*DL*	*DL*	*<0.010*	*<0.010*	*DL*	*DL*	*DL*	*<0.010*	*<0.010*	*DL*	*DL*	*DL*	*<0.010*	*<0.010*	*DL*	*DL*	*DL*
Cadmium (Cd)-Total	mg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*
Calcium (Ca)-Total	mg/L	20	30	0.050	3.2	3.2	RPD	0	Pass RPD	1.5	1.5	RPD	0.7	Pass RPD	22.6	22.6	RPD	2.7	Pass RPD	12.6	12.5	RPD	0.8	Pass RPD
Cesium (Cs)-Total	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	0.000024	0.000024	DIFF	0	Pass Diff	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*
Chromium (Cr)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	0.00014	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	0.00019	*DL*	*DL*	*DL*
Cobalt (Co)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*
Copper (Cu)-Total	mg/L	20	30	0.00050	*<0.00050*	*<0.00050*	*DL*	*DL*	*DL*	*<0.00050*	*<0.00050*	*DL*	*DL*	*DL*	0.00066	0.00066	DIFF	0	Pass Diff	0.00051	0.00052	DIFF	-1E-05	Pass Diff
Iron (Fe)-Total	mg/L	20	30	0.010	*<0.010*	*<0.010*	*DL*	*DL*	*DL*	*<0.010*	*<0.010*	*DL*	*DL*	*DL*	*<0.010*	*<0.010*	*DL*	*DL*	*DL*	*<0.010*	*<0.010*	*DL*	*DL*	*DL*
Lead (Pb)-Total	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*
Lithium (Li)-Total	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*	0.0032	0.0032	DIFF	0	Pass Diff	0.0012	0.0012	DIFF	0	Pass Diff
Magnesium (Mg)-Total	mg/L	20	30	0.0050	1.1	1.1	RPD	2.7	Pass RPD	0.90	0.88	RPD	1.2	Pass RPD	5.5	5.6	RPD	-1.10	Pass RPD	3.4	3.3	RPD	2.1	Pass RPD
Manganese (Mn)-Total	mg/L	20	30	0.00010	0.00044	0.00042	DIFF	0.0000020	Pass Diff	0.00041	0.00043	DIFF	-0.00002	Pass Diff	0.0085	0.0085	RPD	-0.200	Pass RPD	0.00093	0.00096	RPD	-3.20	Pass RPD
Mercury (Hg)-Total	µg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*
Molybdenum (Mo)-Total	mg/L	20	30	0.000050	0.000077	0.000072	DIFF	0.000005	Pass Diff	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	0.00083	0.00083	RPD	-0.400	Pass RPD	0.00013	0.00014	DIFF	-0.000008	Pass Diff
Nickel (Ni)-Total	mg/L	20	30	0.00050	0.00066	0.00068	DIFF	-0.0000020	Pass Diff	*<0.00050*	*<0.00050*	*DL*	*DL*	*DL*	0.0026	0.0026	RPD	0	Pass RPD	0.00096	0.00094	DIFF	2E-05	Pass Diff
Phosphorus (P)-Total	mg/L	20	30	0.050	*<0.050*	*<0.050*	*DL*	*DL*	*DL*	*<0.050*	*<0.050*	*DL*	*DL*	*DL*	*<0.050*	*<0.050*	*DL*	*DL*	*DL*	*<0.050*	*<0.050*	*DL*	*DL*	*DL*
Potassium (K)-Total	mg/L	20	30	0.050	0.49	0.48	RPD	2.9	Pass RPD	0.46	0.47	RPD	-1.30	Pass RPD	5.4	5.2	RPD	2.5	Pass RPD	2.7	2.7	RPD	-1.50	Pass RPD
Rubidium (Rb)-Total	mg/L	20	30	0.00020	0.0063	0.0059	DIFF	0.000040	Pass Diff	0.0062	0.0065	DIFF	-0.00003	Pass Diff	0.0054	0.0064	RPD	0.5	Pass RPD	0.0029	0.0029	RPD	2.8	Pass RPD
Selenium (Se)-Total	mg/L	20	30	0.000050	*<0.000050*	0.000060	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	0.00010	0.000092	DIFF	0.000012	Pass Diff	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*
Silicon (Si)-Total	mg/L	20	30	0.10	0.20	0.20	DIFF	0	Pass Diff	0.20	0.21	DIFF	-0.01	Pass Diff	0.74	0.76	RPD	-2.70	Pass RPD	0.47	0.47	DIFF	0	Pass Diff
Silver (Ag)-Total	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*
Sodium (Na)-Total	mg/L	20	30	0.050	0.69	0.67	RPD	2.4	Pass RPD	0.70	0.70	RPD	-0.300	Pass RPD	4.5	4.6	RPD	-1.80	Pass RPD	2.1	2.1	RPD	1.9	Pass RPD
Strontium (Sr)-Total	mg/L	20	30	0.00020	0.013	0.013	RPD	3.1	Pass RPD	0.0080	0.0078	RPD	2.3	Pass RPD	0.16	0.17	RPD	-2.40	Pass RPD	0.072	0.072	RPD	0.4	Pass RPD
Sulfur (S)-Total	mg/L	20	30	0.50	0.73	0.67	DIFF	0.060	Pass Diff	*<0.50*	*<0.50*	*DL*	*DL*	*DL*	10	9.8	RPD	2.3	Pass RPD	4.7	4.7	RPD	-0.400	Pass RPD
Tellurium (Te)-Total	mg/L	20	30	0.00020	*<0.00020*	*<0.00020*	*DL*	*DL*	*DL*	*<0.00020*	*<0.00020*	*DL*	*DL*	*DL*	*<0.00020*	*<0.00020*	*DL*	*DL*	*DL*	*<0.00020*	*<0.00020*	*DL*	*DL*	*DL*
Thallium (Tl)-Total	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*
Thorium (Th)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	0.00012	*<0.00010*	*DL*	*DL*	*DL*
Tin (Sn)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*
Titanium (Ti)-Total	mg/L	20	30	0.00030	*<0.00030*	*<0.00030*	*DL*	*DL*	*DL*	*<0.00030*	*<0.00030*	*DL*	*DL*	*DL*	*<0.00030*	*<0.00030*	*DL*	*DL*	*DL*	*<0.00030*	*<0.00030*	*DL*	*DL*	*DL*
Tungsten (W)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*
Uranium (U)-Total	mg/L	20	30	0.000010	0.000037	0.000032	DIFF	0.000005	Pass Diff	0.000048	0.000047	DIFF	0.000001	Pass Diff	0.00014	0.00014	RPD	-0.700	Pass RPD	0.000026	0.000025	DIFF	1E-06	Pass Diff
Vanadium (V)-Total	mg/L	20	30	0.00050	*<0.00050*	*<0.00050*	*DL*	*DL*	*DL*	*<0.00050*	*<0.00050*	*DL*	*DL*	*DL*	*<0.00050*	*<0.00050*	*DL*	*DL*	*DL*	*<0.00050*	*<0.00050*	*DL*	*DL*	*DL*
Zinc (Zn)-Total	mg/L	20	30	0.0030	*<0.0030*	*<0.0030*	*DL*	*DL*	*DL*	*<0.0030*	*<0.0030*	*DL*	*DL*	*DL*	*<0.0030*	*<0.0030*	*DL*	*DL*	*DL*	*<0.0030*	*<0.0030*	*DL*	*DL*	*DL*
Zirconium (Zr)-Total	mg/L	20	30	0.00020	*<0.00020*	*<0.00020*	*DL*	*DL*	*DL*	*<0.00020*	*<0.00020*	*DL*	*DL*	*DL*	*<0.00020*	*<0.00020*	*DL*	*DL*	*DL*	*<0.00020*	*<0.00020*	*DL*	*DL*	*DL*
Dissolved Metals																								
Aluminum (Al)-Dissolved	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*	0.0044	0.0035	DIFF	0.0009	Pass Diff	*<0.0010*	0.0075	*DL*	*DL*	*DL*	*<0.0010*	0.0011	*DL*	*DL*	*DL*
Antimony (Sb)-Dissolved	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	0.0016	0.0015	RPD	1.9	Pass RPD	0.00033	0.00032	DIFF	1E-05	Pass Diff
Arsenic (As)-Dissolved	mg/L	20	30	0.00010	0.00018	0.00018	DIFF	0	Pass Diff	0.00011	0.00010	DIFF	0.00001	Pass Diff	0.0011	0.0011	RPD	-5.40	Pass RPD	0.00029	0.00030	DIFF	-1E-05	Pass Diff
Barium (Ba)-Dissolved	mg/L	20	30	0.00010	0.0023	0.0024	RPD	-3.00	Pass RPD	0.0019	0.0019	RPD	1.6	Pass RPD	0.032	0.034	RPD	-7.30	Pass RPD	0.022	0.022	RPD	-1.40	Pass RPD
Beryllium (Be)-Dissolved	mg/L	20	30	0.000010	*<0.000100*	*<0.000100*	*DL*	*DL*	*DL*	*<0.000100*	*<0.000100*	*DL*	*DL*	*DL*	*<0.000100*	*<0.000100*	*DL*	*DL*	*DL*	*<0.000100*	*<0.000100*	*DL*	*DL*	*DL*
Bismuth (Bi)-Dissolved	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*
Boron (B)-Dissolved	mg/L	20	30	0.010	*<0.010*	*<0.010*	*DL*	*DL*	*DL*	*<0.010*	*<0.010*	*DL*	*DL*	*DL*	*<0.010*	*<0.010*	*DL*	*DL*	*DL*	*<0.010*	*<0.010*	*DL*	*DL*	*DL*
Cadmium (Cd)-Dissolved	mg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*
Calcium (Ca)-Dissolved	mg/L	20	30	0.050	3.2	3.0	RPD	8.4	Pass RPD	1.4	1.5	RPD	-2.80	Pass RPD	22.2	21.1	RPD	5.1	Pass RPD	12.8	13.1	RPD	-2.30	Pass RPD
Cesium (Cs)-Dissolved	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	0.000022	0.000024	DIFF	-0.000002	Pass Diff	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*
Chromium (Cr)-Dissolved	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	0.00018	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*
Cobalt (Co)-Dissolved	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*	*<0.00010*	*<0.00010*	*DL*	*DL*	*DL*
Copper (Cu)-Dissolved	mg/L	20	30	0.00020	0.00052	0.00048	DIFF	0.000040	Pass Diff	0.00040	0.00046	DIFF	-0.00006	Pass Diff	0.00061	0.00060	DIFF	0.00001	Pass Diff	0.00058	0.00060	DIFF	-2E-05	Pass Diff
Iron (Fe)-Dissolved	mg/L	20	30	0.010	*<0.010*	*<0.010*	*DL*	*DL*	*DL*	*<0.010*	*<0.010*	*DL*	*DL*	*DL*	*<0.010*	0.013	*DL*	*DL*	*DL*	*<0.010*	*<0.010*	*DL*	*DL*	*DL*
Lead (Pb)-Dissolved	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*
Lithium (Li)-Dissolved	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*	*<0.0010*	*<0.0010*	*DL*	*DL*	*DL*	0.0032	0.0032	DIFF	0	Pass Diff	0.0012	0.0012	DIFF	0	Pass Diff
Magnesium (Mg)-Dissolved	mg/L	20	30	0.0050	1.0	1.0	RPD	0	Pass RPD	0.86	0.85	RPD	1.3	Pass RPD	6.0	5.3	RPD	13.3	Pass RPD	3.6	3.7	RPD	-3.30	Pass RPD
Manganese (Mn)-Dissolved	mg/L	20	30	0.00010	0.00022	0.00031	DIFF	-0.000090	Pass Diff	0.00027	0.00023	DIFF	0.00004	Pass Diff	0.0031	0.0025	RPD	23	Pass RPD	0.00056	0.00060	RPD	-6.90	Pass RPD
Mercury (Hg)-Dissolved	µg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*	*<0.0000050*	*<0.0000050*	*DL*	*DL*	*DL*
Molybdenum (Mo)-Dissolved	mg/L	20	30	0.000050	0.000082	0.000065	DIFF	0.000017	Pass Diff	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	0.00078	0.00080	RPD	-2.80	Pass RPD	0.00016	0.00017	DIFF	-0.00001	Pass Diff
Nickel (Ni)-Dissolved	mg/L	20	30	0.00050	0.00065	0.00062	DIFF	0.000030	Pass Diff	*<0.00050*	*<0.00050*	*DL*	*DL*	*DL*	0.0025	0.0025	DIFF	-5E-05	Pass Diff	0.0011	0.0011	DIFF	-0.00001	Pass Diff
Phosphorus (P)-Dissolved	mg/L	20	30	0.050	*<0.050*	*<0.050*	*DL*	*DL*	*DL*	*<0.050*	*<0.050*	*DL*	*DL*	*DL*	*<0.050*	*<0.050*	*DL*	*DL*	*DL*	*<0.050*	*<0.050*	*DL*	*DL*	*DL*
Potassium (K)-Dissolved	mg/L	20	30	0.050	0.50	0.50	RPD	-0.200	Pass RPD	0.46	0.46	RPD	0.2	Pass RPD	5.5	5.1	RPD	6.2	Pass RPD	2.9	3.1	RPD	-4.70	Pass RPD
Rubidium (Rb)-Dissolved	mg/L	20	30	0.00020	0.00058	0.00056	DIFF	0.000020	Pass Diff	0.0062	0.0061	RPD	0.2	Pass Diff	0.0063	0.0061	RPD	3.9	Pass RPD	0.0031	0.0033	RPD	-5.90	Pass RPD
Selenium (Se)-Dissolved	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*	0.000082	0.000091	DIFF	-0.000009	Pass Diff	*<0.000050*	*<0.000050*	*DL*	*DL*	*DL*
Silicon (Si)-Dissolved	mg/L	20	30	0.050	0.17	0.16	DIFF	0.0060	Pass Diff	0.18	0.18	DIFF	0.005	Pass Diff	0.72	0.68	RPD	6.3	Pass RPD	0.49	0.51	RPD	-3.00	Pass RPD
Silver (Ag)-Dissolved	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*	*<0.000010*	*<0.000010*	*DL*	*DL*	*DL*
Sodium (Na)-Dissolved	mg/L	20	30	0.050	0.66	0.65	RPD	1.5	Pass RPD	0.69	0.69	RPD	0.1	Pass RPD	4.6	4.3	RPD	6	Pass RPD	2.3	2.4	RPD	-4.30	Pass RPD
Strontium (Sr)-Dissolved	mg/L	20	30	0.00020	0.013	0.012	RPD	8.7	Pass RPD	0.0078	0.0076	RPD	1.8	Pass RPD	0.17	0.16	RPD	4.3	Pass RPD	0.082	0.082	RPD	-0.500	Pass RPD
Sulfur (S)-Dissolved	mg/L	20	30	0.50	0.60	0.82	DIFF	-0.220	Pass Diff	*<0.50*	*<0.50*	*DL*	*DL*	*DL*	9.5	9.3	RPD	1.8	Pass RPD	5.0	5.1	RPD	-2.60	Pass RPD
Tellurium (Te)-Dissolved	mg/L	20	30	0.00020	*<0.00020*

Table A-6. Water quality field duplicate results for all CREMP study areas in 2023.

Month		Relative Percent Difference DQOs		July DUP-1 (WAL-131)						July DUP-2 (TPE-162)						July DUP-3 (NEM-80)						July DUP-4 (A76-71)					
Station					WAL-131	DUP-1				TPE-162	DUP-2					NEM-80	DUP-3					A76-71	DUP-4				
Date Sampled					06-Jul-2023	06-Jul-2023				03-Jul-2023	03-Jul-2023					30-Jun-2023	30-Jun-2023					01-Jul-2023	01-Jul-2023				
ALS Sample ID	Units	Lab	Field	July MDLs	VA23B6138-003	VA23B6138-019	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	VA23B6138-007	VA23B6138-020	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome		VA23B5555-012	VA23B5555-013	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome		VA23B5555-005	VA23B5555-014	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	
Parameter					Water	Water				Water	Water					Water	Water					Water	Water				
Physical Tests																											
Conductivity	µS/cm	10	15	2.0	36.1	35	RPD	3.1	Pass RPD	30	28.4	RPD	5.5	Pass RPD		86.1	86	RPD	0.1	Pass RPD		89.1	88.6	RPD	0.6	Pass RPD	
Alkalinity, Bicarbonate		20	30	1.0	11.3	11.7	RPD	-3.50	Pass RPD	7.7	7.4	RPD	4	Pass RPD		12.2	12.3	RPD	-0.8	Pass RPD		12.4	12.6	RPD	-1.60	Pass RPD	
Alkalinity, Carbonate		20	30	1.0	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*		*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*		*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	
Alkalinity, Hydroxide		20	30	1.0	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*		*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*		*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	
Alkalinity, Total (as $CaCO_3$)	mg/L	20	30	1.0	11.3	11.7	RPD	-3.50	Pass RPD	7.7	7.4	RPD	4	Pass RPD		12.2	12.3	RPD	-0.8	Pass RPD		12.4	12.6	RPD	-1.60	Pass RPD	
Hardness (mg/L), Dissolved			40	0.60	16.2	15.9	RPD	1.9	Pass RPD	10.8	10.6	RPD	1.9	Pass RPD		32.5	32.8	RPD	-0.9	Pass RPD		31.9	32	RPD	-0.300	Pass RPD	
Hardness (as $CaCO_3$), from total Ca/Mg			40	0.60	15.9	16.1	RPD	-1.30	Pass RPD	10.1	10.4	RPD	-2.90	Pass RPD		31.9	32.4	RPD	-1.6	Pass RPD		31.6	32.5	RPD	-2.80	Pass RPD	
Total Dissolved Solids	mg/L		40	3.0	26.6	22.8	RPD	15.4	Pass RPD	21.5	19.4	RPD	10.3	Pass RPD		62.5	59.8	RPD	4.4	Pass RPD		57.2	58.5	RPD	-2.20	Pass RPD	
Total Suspended Solids	mg/L		40	1.0	1.3	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*		*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*		*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	
Turbidity	NTU	15	23	0.10	0.25	0.28	DIFF	-0.03	Pass Diff	0.19	0.22	DIFF	-0.03	Pass Diff		0.38	0.35	DIFF	0.03	Pass Diff		0.26	0.25	DIFF	0.01	Pass Diff	
pH (Laboratory)	pH		40	0.10	7.2	7.3	RPD	-1.10	Pass RPD	7.2	7.1	RPD	0.8	Pass RPD		7.3	7.3	RPD	0	Pass RPD		7.3	7.3	RPD	-0.1	Pass RPD	
Anions and Nutrients																											
Ammonia, Total (as N)	mg/L	20	30	0.0050	0.014	0.0093	DIFF	0.0049	Pass Diff	*<0.0050*	*<0.0050*	*<DL*	*<DL*	*<DL*		*<0.0050*	0.021	*<DL*	*<DL*	*<DL*		*<0.0050*	0.015	*<DL*	*<DL*	*<DL*	
Bromide (Br)	mg/L	20	30	0.050	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*		0.082	0.081	DIFF	0.001	Pass Diff		0.094	0.093	DIFF	0.001	Pass Diff	
Chloride (Cl)	mg/L	20	30	0.10	0.51	0.48	DIFF	0.03	Pass Diff	0.73	0.70	RPD	4.2	Pass RPD		13.9	13.8	RPD	0.7	Pass RPD		10.6	10.6	RPD	0	Pass RPD	
Fluoride (F)	mg/L	20	30	0.020	0.049	0.042	DIFF	0.007	Pass Diff	0.068	0.066	DIFF	0.002	Pass Diff		0.030	0.032	DIFF	-0.002	Pass Diff		0.042	0.038	DIFF	0.004	Pass Diff	
Total Kjeldahl Nitrogen	mg/L	20	30	0.050	0.10	0.13	DIFF	-0.024	Pass Diff	0.071	0.061	DIFF	0.01	Pass Diff		0.13	0.14	DIFF	-0.014	Pass Diff		0.13	0.15	DIFF	-0.014	Pass Diff	
Nitrate (as N)	mg/L	20	30	0.0050	*<0.0050*	*<0.0050*	*<DL*	*<DL*	*<DL*	0.0091	0.0093	DIFF	-0.0002	Pass Diff		*<0.0050*	*<0.0050*	*<DL*	*<DL*	*<DL*		0.064	0.063	RPD	2	Pass RPD	
Nitrite (as N)	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*		*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*		*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	
Orthophosphate-Dissolved (as P)	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*		*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*		*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	
Phosphorus (P)-Total	mg/L	20	30	0.0020	0.0028	0.0033	DIFF	-0.0005	Pass Diff	*<0.0020*	0.0043	*<DL*	*<DL*	*<DL*		0.0037	0.0068	DIFF	-0.0031	Pass Diff		0.0036	0.0037	DIFF	-0.0001	Pass Diff	
Phosphorus (P)-Total Dissolved	mg/L	25	38	0.0020	*<0.0020*	*<0.0020*	*<DL*	*<DL*	*<DL*	*<0.0020*	*<0.0020*	*<DL*	*<DL*	*<DL*		0.0027	0.0026	DIFF	0.0001	Pass Diff		0.0030	0.0034	DIFF	-0.0004	Pass Diff	
Silica, Reactive (as SiO2)	mg/L	20	30	0.50	1.1	1.1	DIFF	0.01	Pass Diff	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*		*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*		0.65	0.65	DIFF	0	Pass Diff	
Sulfate (SO4)	mg/L	20	30	0.30	4.0	3.6	RPD	10.1	Pass RPD	4.0	3.9	RPD	1	Pass RPD		4.5	4.5	RPD	-0.2	Pass RPD		10.0	10.0	RPD	0.3	Pass RPD	
Cyanides																											
Cyanide, Free	mg/L	20	30	0.0010	*<0.0020*	*<0.0020*	*<DL*	*<DL*	*<DL*	*<0.0020*	*<0.0020*	*<DL*	*<DL*	*<DL*		-	-					-	-				
Cyanide, Total	mg/L	20	30	0.0010	*<0.0020*	*<0.0020*	*<DL*	*<DL*	*<DL*	*<0.0020*	*<0.0020*	*<DL*	*<DL*	*<DL*													
Organic / Inorganic Carbon																											
Dissolved Organic Carbon	mg/L	20	30	0.50	2.4	2.4	DIFF	-0.05	Pass Diff	1.4	1.5	DIFF	-0.110	Pass Diff		1.6	1.6	DIFF	-0.03	Pass Diff		1.8	1.7	DIFF	0.15	Pass Diff	
Total Organic Carbon	mg/L	20	30	0.50	2.2	2.1	DIFF	0.05	Pass Diff	1.1	1.2	DIFF	-0.110	Pass Diff		1.8	2.0	DIFF	-0.17	Pass Diff		1.6	2.0	DIFF	-0.420	Pass Diff	
Total Metals																											
Aluminum (Al)-Total	mg/L	20	30	0.0030	0.0085	0.0078	DIFF	0.0007	Pass Diff	0.0062	0.0068	DIFF	-0.0006	Pass Diff		0.012	0.011	DIFF	0.0009	Pass Diff		0.0057	0.0064	DIFF	-0.0007	Pass Diff	
Antimony (Sb)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		0.00024	0.00025	DIFF	-0.00001	Pass Diff	
Arsenic (As)-Total	mg/L	20	30	0.00010	0.00031	0.00032	DIFF	-0.00001	Pass Diff	0.00059	0.00057	RPD	3.4	Pass RPD		0.00091	0.00094	RPD	-3.2	Pass RPD		0.00030	0.00033	DIFF	-0.00003	Pass Diff	
Barium (Ba)-Total	mg/L	20	30	0.00010	0.0021	0.0022	RPD	-2.80	Pass RPD	0.0028	0.0029	RPD	-2.10	Pass RPD		0.016	0.017	RPD	-2.4	Pass RPD		0.015	0.015	RPD	0.7	Pass RPD	
Beryllium (Be)-Total	mg/L	20	30	0.000100	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*		*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*		*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	
Bismuth (Bi)-Total	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	
Boron (B)-Total	mg/L	20	30	0.010	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*		*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*		*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	
Cadmium (Cd)-Total	mg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*		*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*		*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	
Calcium (Ca)-Total	mg/L	20	30	0.050	2.6	2.5	RPD	0.5	Pass RPD	0.98	0.96	RPD	2.5	Pass RPD		0.89	0.90	RPD	-0.8	Pass RPD		1.7	1.7	RPD	-3.00	Pass RPD	
Cesium (Cs)-Total	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	0.0022	0.0021	RPD	1.4	Pass RPD		0.0063	0.0064	RPD	-1.4	Pass RPD		0.0052	0.0053	RPD	-1.50	Pass RPD	
Chromium (Cr)-Total	mg/L	20	30	0.00010	*<0.00010*	0.00012	*<DL*	*<DL*	*<DL*	0.00011	0.00015	DIFF	-0.00004	Pass Diff		0.00026	0.00024	DIFF	0.00002	Pass Diff		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	
Cobalt (Co)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	
Copper (Cu)-Total	mg/L	20	30	0.00050	0.0010	0.0011	DIFF	-2E-05	Pass Diff	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*		*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*		0.00054	*<0.00050*	*<DL*	*<DL*	*<DL*	
Iron (Fe)-Total	mg/L	20	30	0.010	0.020	0.021	DIFF	-0.001	Pass Diff	0.014	0.015	DIFF	-0.001	Pass Diff		0.027	0.027	DIFF	0	Pass Diff		0.023	0.023	DIFF	0	Pass Diff	
Lead (Pb)-Total	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	
Lithium (Li)-Total	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*		0.0012	0.0012	DIFF	0	Pass Diff		*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	
Magnesium (Mg)-Total	mg/L	20	30	0.0050	1.3	1.3	RPD	0.98	Pass RPD	0.95	0.98	RPD	-2.40	Pass RPD		2.1	2.1	RPD	-1.4	Pass RPD		2.4	2.4	RPD	-3.30	Pass RPD	
Manganese (Mn)-Total	mg/L	20	30	0.00010	0.0018	0.0019	RPD	-8.00	Pass RPD	0.0022	0.0021	RPD	1.4	Pass RPD		0.0063	0.0064	RPD	-1.4	Pass RPD		0.0052	0.0053	RPD	-1.50	Pass RPD	
Mercury (Hg)-Total	µg/L	20	30	0.000005	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	
Molybdenum (Mo)-Total	mg/L	20	30	0.000050	0.00013	0.00013	DIFF	-1E-06	Pass Diff	0.00091	0.00095	DIFF	-0.000004	Pass Diff		0.00077	0.00072	DIFF	0.000005	Pass Diff		0.00012	0.00011	DIFF	0.000011	Pass Diff	
Nickel (Ni)-Total	mg/L	20	30	0.00050	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	0.00068	0.00071	DIFF	-0.00003	Pass Diff		0.0016	0.0016	DIFF	0.00001	Pass Diff		0.00097	0.0010	DIFF	-0.00003	Pass Diff	
Phosphorus (P)-Total	mg/L	20	30	0.050	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*		*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*		*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	
Potassium (K)-Total	mg/L	20	30	0.050	0.42	0.44	RPD	-5.40	Pass RPD	0.50	0.52	RPD	-3.30	Pass RPD		1.6	1.6	RPD	-1.3	Pass RPD		2.0	2.0	RPD	-1.50	Pass RPD	
Rubidium (Rb)-Total	mg/L	20	30	0.00020	0.00061	0.00055	DIFF	6E-05	Pass Diff	0.00076	0.00075	DIFF	0.00001	Pass Diff		0.0025	0.0025	RPD	1.2	Pass RPD		0.0022	0.0022	RPD	-2.70	Pass RPD	
Selenium (Se)-Total	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	
Silicon (Si)-Total	mg/L	20	30	0.10	0.52	0.50	DIFF	0.02	Pass Diff	0.17	0.16	DIFF	0.01	Pass Diff		0.18	0.17	DIFF	0.01	Pass Diff		0.36	0.37	DIFF	-0.01	Pass Diff	
Silver (Ag)-Total	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*		*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*		*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	
Sodium (Na)-Total	mg/L	20	30	0.050	0.57	0.59	RPD	-3.40	Pass RPD	0.94	0.96	RPD	-2.20	Pass RPD		0.89	0.90	RPD	-1.1	Pass RPD		1.6	1.7	RPD	-1.80	Pass RPD	
Strontium (Sr)-Total	mg/L	20	30	0.00020	0.022	0.022	RPD	0.5	Pass RPD	0.011	0.011	RPD	-0.900	Pass RPD		0.058	0.059	RPD	-1	Pass RPD		0.057	0.058	RPD	-0.700	Pass RPD	
Sulfur (S)-Total	mg/L	20	30	0.50	1.4	1.5	DIFF	-0.1	Pass Diff	1.4	1.4	DIFF	-0.05	Pass Diff		1.4	1.4	DIFF	-0.05	Pass Diff		3.2	3.3	RPD	-2.70	Pass RPD	
Tellurium (Te)-Total	mg/L	20	30	0.00020	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*		*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*		*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	
Thallium (Tl)-Total	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*		*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*		*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	
Thorium (Th)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	
Tin (Sn)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	
Titanium (Ti)-Total	mg/L	20	30	0.00030	*<0.00030*	*<0.00030*	*<DL*	*<DL*	*<DL*	*<0.00030*	*<0.00030*	*<DL*	*<DL*	*<DL*		0.00039	0.00046	DIFF	-0.00007	Pass Diff		*<0.00030*	*<0.00030*	*<DL*	*<DL*	*<DL*	
Tungsten (W)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	
Uranium (U)-Total	mg/L	20	30	0.000010	0.000061	0.000063	RPD	-3.20	Pass RPD	0.000043	0.000041	DIFF	0.000002	Pass Diff		0.000015	0.000016	DIFF	-1E-06	Pass Diff		0.000038	0.000038	DIFF	0	Pass Diff	
Vanadium (V)-Total	mg/L	20	30	0.00050	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*		*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*		*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	
Zinc (Zn)-Total	mg/L	20	30	0.0030	*<0.0030*	*<0.0030*	*<DL*	*<DL*	*<DL*	*<0.0030*	*<0.0030*	*<DL*	*<DL*	*<DL*		*<0.0030*	*<0.0030*	*<DL*	*<DL*	*<DL*		*<0.0030*	*<0.0030*	*<DL*	*<DL*	*<DL*	
Zirconium (Zr)-Total	mg/L	20	30	0.00020	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*		*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*		*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	
Dissolved Metals																											
Aluminum (Al)-Dissolved	mg/L	20	30	0.0010	0.0036	0.0037	DIFF	-0.0001	Pass Diff	0.0032	0.0028	DIFF	0.0004	Pass Diff		0.0020	0.0019	DIFF	0.0001	Pass Diff		0.0018	0.0026	DIFF	-0.0008	Pass Diff	
Antimony (Sb)-Dissolved	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		0.00024	0.00022	DIFF	0.00002	Pass Diff	
Arsenic (As)-Dissolved	mg/L	20	30	0.00010	0.00028	0.00030	DIFF	-0.00002	Pass Diff	0.00058	0.00056	RPD	3.5	Pass RPD		0.00084	0.00084	RPD	0	Pass RPD		0.00025	0.00026	DIFF	-1E-05	Pass Diff	
Barium (Ba)-Dissolved	mg/L	20	30	0.00010	0.0021	0.0021	RPD	1	Pass RPD	0.0030	0.0029	RPD	2.7	Pass RPD		0.016	0.016	RPD	-2.5	Pass RPD		0.015	0.015	RPD	0	Pass RPD	
Beryllium (Be)-Dissolved	mg/L	20	30	0.000010	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*		*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*		*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	
Bismuth (Bi)-Dissolved	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	
Boron (B)-Dissolved	mg/L	20	30	0.010	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*		*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*		*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	
Cadmium (Cd)-Dissolved	mg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*		*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*		*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	
Calcium (Ca)-Dissolved	mg/L	20	30	0.050	4.4	4.3	RPD	2.1	Pass RPD	2.6	2.6	RPD	2.3	Pass RPD		9.6	9.7	RPD	-0.5	Pass RPD		9.0	8.9	RPD	0.3	Pass RPD	
Cesium (Cs)-Dissolved	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	0.000011	0.000011	DIFF	0	Pass Diff		0.000013	0.000014	DIFF	-0.000001	Pass Diff		*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	
Chromium (Cr)-Dissolved	mg/L	20	30	0.00010	0.00019	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	
Cobalt (Co)-Dissolved	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*		*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	
Copper (Cu)-Dissolved	mg/L	20	30	0.00020	0.0010	0.00098	DIFF	3E-05	Pass Diff	0.00041	0.00044	DIFF	-0.00003	Pass Diff		0.00028	0.00028	DIFF	0	Pass Diff		0.00040	0.00041	DIFF	-1E-05	Pass Diff	
Iron (Fe)-Dissolved	mg/L	20	30	0.010	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*		*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*		*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	
Lead (Pb)-Dissolved	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	
Lithium (Li)-Dissolved	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*		0.0012	0.0012	DIFF	0	Pass Diff		*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	
Magnesium (Mg)-Dissolved	mg/L	20	30	0.0050	1.3	1.3	RPD	0.8	Pass RPD	1.0	1.00	RPD	1.2	Pass RPD		2.1	2.1	RPD	-1.4	Pass RPD		2.3	2.4	RPD	-1.70	Pass RPD	
Manganese (Mn)-Dissolved	mg/L	20	30	0.00010	0.00072	0.00066	RPD	8.7	Pass RPD	0.0017	0.0016	RPD	7.4	Pass RPD		0.0029	0.0029	RPD	-0.7	Pass RPD		0.0033	0.0033	RPD	0.3	Pass RPD	
Mercury (Hg)-Dissolved	µg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*		*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*		*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	
Molybdenum (Mo)-Dissolved	mg/L	20	30	0.000050	0.00015	0.00013	DIFF	0.000022	Pass Diff	0.00010	0.000097	DIFF	0.000005	Pass Diff		0.000065	0.000062	DIFF	3E-06	Pass Diff		0.00012	0.00011	DIFF	0.000008	Pass Diff	
Nickel (Ni)-Dissolved	mg/L	20	30	0.00050	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	0.00070	0.00072	DIFF	-2E-05	Pass Diff		0.0014	0.0015	DIFF	-4E-05	Pass Diff		0.00089	0.00089	DIFF	0	Pass Diff	
Phosphorus (P)-Dissolved	mg/L	20	30	0.050	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*		*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*		*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	
Potassium (K)-Dissolved	mg/L	20	30	0.050	0.43	0.42	RPD	1.6	Pass RPD	0.54	0.53	RPD	3	Pass RPD		1.6	1.6	RPD	-1.3	Pass RPD		2.0	2.0	RPD	0	Pass RPD	
Rubidium (Rb)-Dissolved	mg/L	20	30	0.00020	0.00060	0.00056	DIFF	0.00004	Pass Diff	0.00084	0.00083	DIFF	0.00001	Pass Diff		0.0026	0.0026	RPD	-2.7	Pass RPD		0.0022	0.0023	RPD	-2.20	Pass RPD	
Selenium (Se)-Dissolved	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*		*<0.000050*

Table A-6. Water quality field duplicate results for all CREMP study areas in 2023.

Month		Relative Percent Difference DQOs			August DUP-1 (SP-165)					August DUP-2 (BAP-88)					August DUP-3 (MAM-82)					August DUP-4 (A20-75)				
Station					SP-165	DUP				BAP-88	DUP				MAM-82	DUP				A20-75	DUP			
Date Sampled	Units			August DLs	13-Aug-2023	13-Aug-2023	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	17-Aug-2023	17-Aug-2023	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	15-Aug-2023	15-Aug-2023	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	18-Aug-2023	18-Aug-2023	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome
ALS Sample ID		Lab	Field		VA23B9333-002	VA23B9333-004				WP2320725-002	WP2320725-008				VA23C0547-014	VA23C0547-027				VA23C0547-021	VA23C0547-028			
Parameter					Water	Water				Water	Water				Water	Water				Water	Water			
Physical Tests																								
Conductivity	µS/cm	10	15	2.00	35.7	36.7	RPD	-3	Pass RPD	70.5	71.3	RPD	-1.10	Pass RPD	162	162	RPD	0	Pass RPD	69.2	68.4	RPD	1.2	Pass RPD
Alkalinity, Bicarbonate		20	30	1.00	10.6	10.5	RPD	0.900	Pass RPD	9.40	9.10	RPD	3.2	Pass RPD	19.2	19.6	RPD	-2.10	Pass RPD	12.9	12.8	RPD	0.8	Pass RPD
Alkalinity, Carbonate		20	30	1.00	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*
Alkalinity, Hydroxide		20	30	1.00	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*
Alkalinity, Total (as $CaCO_3$)	mg/L	20	30	1.00	10.6	10.5	RPD	0.900	Pass RPD	9.40	9.10	RPD	3.2	Pass RPD	19.2	19.6	RPD	-2.10	Pass RPD	12.9	12.8	RPD	0.8	Pass RPD
Hardness (mg/L), Dissolved			40	0.600	13.9	13.8	RPD	0.700	Pass RPD	14.4	14.7	RPD	-2.10	Pass RPD	57.6	57.7	RPD	-0.200	Pass RPD	25.1	25.4	RPD	-1.20	Pass RPD
Hardness (as $CaCO_3$), from total Ca/Mg			40	0.600	14.5	14.0	RPD	3.50	Pass RPD	15.6	16.2	RPD	-3.80	Pass RPD	56.2	56.5	RPD	-0.500	Pass RPD	25.0	25.3	RPD	-1.20	Pass RPD
Total Dissolved Solids	mg/L		40	3.00	21.9	21.1	RPD	3.70	Pass RPD	39.2	36.2	RPD	8	Pass RPD	144	154	RPD	-6.70	Pass RPD	65.0	64.3	RPD	1.1	Pass RPD
Total Suspended Solids	mg/L		40	1.00	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*
Turbidity	NTU	15	23	0.100	0.300	0.230	DIFF	0.0700	Pass DIFF	0.210	0.170	DIFF	0.04	Pass DIFF	0.260	0.280	DIFF	-0.02	Pass DIFF	0.470	0.520	DIFF	-0.05	Pass DIFF
pH (Laboratory)	pH		40	0.100	7.09	7.13	RPD	-1	Pass RPD	7.02	7.08	RPD	-0.900	Pass RPD	7.49	7.50	RPD	-0.1	Pass RPD	7.30	7.28	RPD	0.3	Pass RPD
Anions and Nutrients																								
Ammonia, Total (as N)	mg/L	20	30	0.00500	*<0.0050*	*<0.0050*	*<DL*	*<DL*	*<DL*	0.00920	0.00820	DIFF	0.001	Pass Diff	0.0188	0.0189	DIFF	-0.0001	Pass Diff	*<0.0050*	0.00580	*<DL*	*<DL*	*<DL*
Bromide (Br)	mg/L	20	30	0.0500	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	0.191	0.215	DIFF	-0.024	Pass Diff	0.0740	0.0690	DIFF	0.005	Pass Diff
Chloride (Cl)	mg/L	20	30	0.100	0.880	0.880	RPD	0	Pass RPD	12.8	12.9	RPD	-0.800	Pass RPD	20.0	20.0	RPD	0	Pass RPD	7.33	7.34	RPD	-0.1	Pass RPD
Fluoride (F)	mg/L	20	30	0.0200	0.0740	0.0810	DIFF	0	Pass Diff	0.0690	0.0690	DIFF	0	Pass Diff	0.0590	0.0590	DIFF	0	Pass Diff	0.0510	0.0510	DIFF	0	Pass Diff
Total Kjeldahl Nitrogen	mg/L	20	30	0.0500	0.115	0.118	DIFF	0	Pass Diff	0.185	0.192	DIFF	-0.007	Pass Diff	0.286	0.280	RPD	2.1	Pass RPD	0.206	0.206	RPD	0	Pass Diff
Nitrate (as N)	mg/L	20	30	0.00500	*<0.0050*	*<0.0050*	*<DL*	*<DL*	*<DL*	0.0249	0.0252	DIFF	-0.0003	Pass Diff	0.530	0.530	RPD	0	Pass RPD	*<0.0050*	*<0.0050*	*<DL*	*<DL*	*<DL*
Nitrite (as N)	mg/L	20	30	0.00100	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	0.00410	0.00440	DIFF	-0.0003	Pass Diff	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*
Orthophosphate-Dissolved (as P)	mg/L	20	30	0.00100	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*
Phosphorus (P)-Total	mg/L	20	30	0.00200	0.00230	0.00200	DIFF	0.000300	Pass Diff	0.00400	0.00410	DIFF	-0.0001	Pass Diff	0.00270	0.00400	DIFF	-0.0013	Pass Diff	0.00360	0.00350	DIFF	1E-04	Pass Diff
Phosphorus (P)-Total Dissolved	mg/L	25	38	0.00200	*<0.0020*	*<0.0020*	*<DL*	*<DL*	*<DL*	*<0.0020*	*<0.0020*	*<DL*	*<DL*	*<DL*	0.00240	0.00230	DIFF	0.0001	Pass Diff	*<0.0020*	*<0.0020*	*<DL*	*<DL*	*<DL*
Silica, Reactive (as SiO2)	mg/L	20	30	0.500	0.620	0.620	DIFF	0	Pass Diff	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*	0.690	0.690	DIFF	0	Pass Diff	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*
Sulfate (SO4)	mg/L	20	30	0.300	4.82	4.83	RPD	0	Pass RPD	2.35	2.38	RPD	-1.30	Pass RPD	18.5	18.4	RPD	0.5	Pass RPD	5.49	5.49	RPD	0	Pass RPD
Cyanides																								
Cyanide, Free	mg/L	20	30	0.00100	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*	*<0.0010*	-	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*
Cyanide, Total	mg/L	20	30	0.00100	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*	*<0.0010*	-	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*
Organic / Inorganic Carbon																								
Dissolved Organic Carbon	mg/L	20	30	0.500	2.65	3.05	RPD	-14	Pass RPD	4.54	4.61	RPD	-1.50	Pass RPD	2.25	2.24	DIFF	0.01	Pass Diff	2.66	2.73	RPD	-2.60	Pass RPD
Total Organic Carbon	mg/L	20	30	0.500	2.54	2.32	DIFF	0.220	Pass Diff	4.74	3.89	RPD	19.7	Pass RPD	2.55	2.43	DIFF	0.12	Pass Diff	2.96	2.99	RPD	-1.000	Pass RPD
Total Metals																								
Aluminum (Al)-Total	mg/L	20	30	0.00300	0.00520	0.00460	DIFF	0.000600	Pass Diff	0.00900	0.00920	DIFF	-0.0002	Pass Diff	0.00620	0.00610	DIFF	0.0001	Pass Diff	0.00500	0.00500	DIFF	0	Pass Diff
Antimony (Sb)-Total	mg/L	20	30	0.000100	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	0.00106	0.00107	RPD	-0.900	Pass RPD	0.000140	0.000160	DIFF	-0.00002	Pass Diff
Arsenic (As)-Total	mg/L	20	30	0.000100	0.000420	0.000390	DIFF	0.000030	Pass Diff	0.000160	0.000150	DIFF	0.00001	Pass Diff	0.00176	0.00178	RPD	-1.10	Pass RPD	0.000370	0.000350	DIFF	0.00002	Pass Diff
Barium (Ba)-Total	mg/L	20	30	0.000100	0.00244	0.00225	RPD	8.10	Pass RPD	0.0181	0.0182	RPD	-0.600	Pass RPD	0.0219	0.0217	RPD	0.9	Pass RPD	0.00918	0.00919	RPD	-0.1	Pass RPD
Beryllium (Be)-Total	mg/L	20	30	0.000020	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	*<0.000020*	*<0.000020*	*<DL*	*<DL*	*<DL*	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*
Bismuth (Bi)-Total	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*
Boron (B)-Total	mg/L	20	30	0.0100	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*
Cadmium (Cd)-Total	mg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*
Calcium (Ca)-Total	mg/L	20	30	0.0500	3.78	3.72	RPD	1.60	Pass RPD	2.94	3.16	RPD	-7.20	Pass RPD	16.6	16.6	RPD	0	Pass RPD	6.81	6.91	RPD	-1.50	Pass RPD
Cesium (Cs)-Total	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	0.000026	0.000025	DIFF	0.000001	Pass Diff	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*
Chromium (Cr)-Total	mg/L	20	30	0.000100	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	0.000110	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00050*	*0.00020*	*<0.00050*	*0.00017*	*<DL*	*<DL*	*<DL*	*0.00050*	*<0.00010*	*0.00050*	*<0.00010*	*<DL*	*<DL*	*<DL*
Cobalt (Co)-Total	mg/L	20	30	0.000100	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*
Copper (Cu)-Total	mg/L	20	30	0.000500	0.000800	0.000750	DIFF	0.000050	Pass Diff	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	0.000570	0.000560	DIFF	0.000001	Pass Diff	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*
Iron (Fe)-Total	mg/L	20	30	0.0100	0.0290	0.0300	DIFF	0	Pass Diff	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	0.0280	0.0260	DIFF	0.002	Pass Diff	0.0710	0.0740	RPD	-4.10	Pass RPD
Lead (Pb)-Total	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*
Lithium (Li)-Total	mg/L	20	30	0.00100	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	0.00130	*<DL*	*<DL*	*<DL*	0.00320	0.00330	DIFF	-1E-04	Pass Diff	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*
Magnesium (Mg)-Total	mg/L	20	30	0.00500	1.24	1.14	RPD	8.40	Pass RPD	2.02	2.01	RPD	0.5	Pass RPD	3.58	3.66	RPD	-2.20	Pass RPD	1.94	1.95	RPD	-0.500	Pass RPD
Manganese (Mn)-Total	mg/L	20	30	0.000100	0.00307	0.00273	RPD	11.7	Pass RPD	0.00212	0.00211	RPD	0.5	Pass RPD	0.00972	0.00951	RPD	2.2	Pass RPD	0.0167	0.0166	RPD	0.6	Pass RPD
Mercury (Hg)-Total	µg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*
Molybdenum (Mo)-Total	mg/L	20	30	0.000050	0.000131	0.000132	DIFF	0	Pass Diff	0.000067	0.000062	DIFF	0.000005	Pass Diff	0.00156	0.00157	RPD	-0.600	Pass RPD	0.000143	0.000138	DIFF	5E-06	Pass Diff
Nickel (Ni)-Total	mg/L	20	30	0.000500	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	0.00154	0.00159	DIFF	-0.00005	Pass Diff	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*
Phosphorus (P)-Total	mg/L	20	30	0.0500	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*
Potassium (K)-Total	mg/L	20	30	0.0500	0.516	0.470	RPD	9.30	Pass RPD	0.658	0.659	RPD	-0.200	Pass RPD	3.83	3.87	RPD	-1.000	Pass RPD	1.79	1.79	RPD	0	Pass RPD
Rubidium (Rb)-Total	mg/L	20	30	0.000200	0.000840	0.000810	DIFF	0.000030	Pass Diff	0.000950	0.00104	DIFF	-9E-05	Pass Diff	0.00533	0.00528	RPD	0.9	Pass RPD	0.00262	0.00257	RPD	1.9	Pass RPD
Selenium (Se)-Total	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	0.000087	0.000074	DIFF	0.000013	Pass Diff	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*
Silicon (Si)-Total	mg/L	20	30	0.100	0.340	0.320	DIFF	0.0200	Pass Diff	0.220	0.220	DIFF	0	Pass Diff	0.320	0.330	DIFF	-0.01	Pass Diff	0.180	0.180	DIFF	0	Pass Diff
Silver (Ag)-Total	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*
Sodium (Na)-Total	mg/L	20	30	0.0500	0.797	0.724	RPD	9.60	Pass RPD	6.89	7.11	RPD	-3.10	Pass RPD	3.13	3.14	RPD	-0.300	Pass RPD	1.66	1.66	RPD	0	Pass RPD
Strontium (Sr)-Total	mg/L	20	30	0.000200	0.0177	0.0188	RPD	-6	Pass RPD	0.0221	0.0215	RPD	2.8	Pass RPD	0.138	0.138	RPD	0	Pass RPD	0.0468	0.0490	RPD	-4.60	Pass RPD
Sulfur (S)-Total	mg/L	20	30	0.500	1.72	1.48	DIFF	0.240	Pass Diff	0.920	0.920	DIFF	0	Pass Diff	6.51	6.53	RPD	-0.300	Pass RPD	2.13	2.05	DIFF	0.08	Pass Diff
Tellurium (Te)-Total	mg/L	20	30	0.000200	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*
Thallium (Tl)-Total	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*
Thorium (Th)-Total	mg/L	20	30	0.000100	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*
Tin (Sn)-Total	mg/L	20	30	0.000100	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*
Titanium (Ti)-Total	mg/L	20	30	0.000300	*<0.00030*	*<0.00030*	*<DL*	*<DL*	*<DL*	*<0.00030*	*<0.00030*	*<DL*	*<DL*	*<DL*	*<0.00030*	*<0.00030*	*<DL*	*<DL*	*<DL*	*<0.00030*	*<0.00030*	*<DL*	*<DL*	*<DL*
Tungsten (W)-Total	mg/L	20	30	0.000100	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*
Uranium (U)-Total	mg/L	20	30	0.000010	0.000057	0.000056	RPD	1.80	Pass RPD	0.000050	0.000047	DIFF	3E-06	Pass Diff	0.000214	0.000222	RPD	-3.70	Pass RPD	0.000043	0.000046	DIFF	-0.000003	Pass Diff
Vanadium (V)-Total	mg/L	20	30	0.000500	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*
Zinc (Zn)-Total	mg/L	20	30	0.00300	*<0.0030*	*<0.0030*	*<DL*	*<DL*	*<DL*	*<0.0030*	*<0.0030*	*<DL*	*<DL*	*<DL*	*<0.0030*	*<0.0030*	*<DL*	*<DL*	*<DL*	*<0.0030*	*<0.0030*	*<DL*	*<DL*	*<DL*
Zirconium (Zr)-Total	mg/L	20	30	0.000200	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*
Dissolved Metals																								
Aluminum (Al)-Dissolved	mg/L	20	30	0.00100	0.00300	0.00280	DIFF	0.000200	Pass Diff	0.00450	0.00440	DIFF	0.0001	Pass Diff	0.00270	0.00310	DIFF	-0.0004	Pass Diff	0.00140	0.00130	DIFF	0.0001	Pass Diff
Antimony (Sb)-Dissolved	mg/L	20	30	0.000100	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	0.00104	0.00105	RPD	-1.000	Pass RPD	0.000150	0.000140	DIFF	0.00001	Pass Diff
Arsenic (As)-Dissolved	mg/L	20	30	0.000100	0.000380	0.000390	DIFF	0	Pass Diff	0.000140	0.000120	DIFF	0.00002	Pass Diff	0.00158	0.00150	RPD	5.2	Pass RPD	0.000320	0.000320	DIFF	0	Pass Diff
Barium (Ba)-Dissolved	mg/L	20	30	0.000100	0.00249	0.00250	RPD	0	Pass RPD	0.0176	0.0179	RPD	-1.70	Pass RPD	0.0211	0.0216	RPD	-2.30	Pass RPD	0.00914	0.00928	RPD	-1.50	Pass RPD
Beryllium (Be)-Dissolved	mg/L	20	30	0.000020	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	*<0.000020*	*<0.000020*	*<DL*	*<DL*	*<DL*	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*
Bismuth (Bi)-Dissolved	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*
Boron (B)-Dissolved	mg/L	20	30	0.0100	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*
Cadmium (Cd)-Dissolved	mg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*
Calcium (Ca)-Dissolved	mg/L	20	30	0.0500	3.59	3.57	RPD	0.600	Pass RPD	2.80	2.77	RPD	1.1	Pass RPD	16.8	16.9	RPD	-0.600	Pass RPD	6.76	6.89	RPD	-1.90	Pass RPD
Cesium (Cs)-Dissolved	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	0.000023	0.000026	DIFF	-0.000003	Pass Diff	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*
Chromium (Cr)-Dissolved	mg/L	20	30	0.000100	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	0.000160	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00010*	*<0.00050*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00010*	*<0.00050*	*<0.00010*	*<DL*	*<DL*	*<DL*
Cobalt (Co)-Dissolved	mg/L	20	30	0.000100	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*
Copper (Cu)-Dissolved	mg/L	20	30	0.000200	0.000540	0.000530	DIFF	0.000010	Pass Diff	0.000360	0.000320	DIFF	0.00004	Pass Diff	0.000550	0.000510	DIFF	0.00004	Pass Diff	0.000300	0.000290	DIFF	1E-05	Pass Diff
Iron (Fe)-Dissolved	mg/L	20	30	0.0100	0.0100	0.0100	DIFF	0	Pass Diff	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	0.0200	0.0210	DIFF	-0.001	Pass Diff
Lead (Pb)-Dissolved	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*
Lithium (Li)-Dissolved	mg/L	20	30	0.00100	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	0.00330	0.00330	DIFF	0	Pass Diff	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*
Magnesium (Mg)-Dissolved	mg/L	20	30	0.00500	1.21	1.20	RPD	0.800	Pass RPD	1.80	1.89	RPD	-4.90	Pass RPD	3.79	3.77	RPD	0.5	Pass RPD	1.99	1.98	RPD	0.5	Pass RPD
Manganese (Mn)-Dissolved	mg/L	20	30	0.000100	0.000810	0.000810	RPD	0	Pass RPD	0.000340	0.000320	DIFF	0.00002	Pass Diff	0.00144	0.00140	RPD	2.8	Pass RPD	0.00155	0.00158	RPD	-1.90	Pass RPD
Mercury (Hg)-Dissolved	µg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*
Molybdenum (Mo)-Dissolved	mg/L	20	30	0.000050	0.000124	0.000120	DIFF	0.000004	Pass Diff	0.000076	0.000068	DIFF	0.000008	Pass Diff	0.00155	0.00156	RPD	-0.600	Pass RPD	0.000137	0.000129	DIFF	0.000008	Pass Diff
Nickel (Ni)-Dissolved	mg/L	20	30	0.000500	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	0.00148	0.00143	DIFF	5E-05	Pass Diff	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*
Phosphorus (P)-Dissolved	mg/L	20	30	0.0500	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*
Potassium (K)-Dissolved	mg/L	20	30	0.0500	0.534	0.524	RPD	1.90	Pass RPD	0.580	0.605	RPD	-4.20	Pass RPD	3.76	3.84	RPD	-2.10	Pass RPD	1.76	1.76	RPD	0	Pass RPD
Rubidium (Rb)-Dissolved	mg/L	20	30	0.000200	0.000820	0.000820	DIFF	0	Pass Diff	0.000940	0.000950	DIFF	-0.00001	Pass Diff	0.00523	0.00519	RPD	0.8	Pass RPD	0.00269	0.00258	RPD	4.2	Pass RPD
Selenium (Se)-Dissolved	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*
Silicon (Si)-Dissolved	mg/L	20	30	0.0500	0.291	0.296	RPD	-2	Pass RPD	0.170	0.182	DIFF	-0.012	Pass Diff	0.276	0.280	RPD	-1.40	Pass RPD	0.133	0.133	DIFF	0	Pass Diff
Silver (Ag)-

Table A-6. Water quality field duplicate results for all CREMP study areas in 2023.

Month		Relative Percent Difference DQOs			September DUP-1 (PDL-119)					September DUP-2 (BAP-89)					September DUP-3 (NEM-84)					November DUP-1 (MAM-86)				
Station					PDL-119	DUP				BAP-89	DUP				NEM-84	DUP				MAM-86	DUP			
Date Sampled					06-Sep-2023	06-Sep-2023	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	08-Sep-2023	08-Sep-2023	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	08-Sep-2023	08-Sep-2023	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	07-Nov-2023	07-Nov-2023	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome
ALS Sample ID	Units	Lab	Field	September DLs	VA23C1680-017	VA23C1680-019				VA23C1680-011	VA23C1680-020				VA23C1748-012	VA23C1748-019				VA23C7441-002	VA23C7441-005			
Parameter					Water	Water				Water	Water				Water	Water				Water	Water			
Physical Tests																								
Conductivity	µS/cm	10	15	2.0	24.8	25	RPD	-0.800000	Pass RPD	79.1	79	RPD	0.1	Pass RPD	86.5	87	RPD	-0.600	Pass RPD	178	176	RPD	1.1	Pass RPD
Alkalinity, Bicarbonate		20	30	1.0	8.0	8.1	RPD	-1.2	Pass RPD	9.2	9.5	RPD	-3.20	Pass RPD	13.1	13.1	RPD	0	Pass RPD	22.5	22.4	RPD	0.40	Pass RPD
Alkalinity, Carbonate		20	30	1.0	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*
Alkalinity, Hydroxide		20	30	1.0	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*
Alkalinity, Total (as $CaCO_3$)	mg/L	20	30	1.0	8.0	8.1	RPD	-1.2	Pass RPD	9.2	9.5	RPD	-3.20	Pass RPD	13.1	13.1	RPD	0	Pass RPD	22.5	22.4	RPD	0.40	Pass RPD
Hardness (mg/L), Dissolved			40	0.60	10.2	10.2	RPD	0	Pass RPD	15.7	15.4	RPD	1.9	Pass RPD	30.5	31.5	RPD	-3.2	Pass RPD	57.8	65.8	RPD	-13	Pass RPD
Hardness (as $CaCO_3$), from total Ca/Mg			40	0.60	10.7	10.5	RPD	1.9	Pass RPD	16	16	RPD	0	Pass RPD	32.1	33.7	RPD	-4.9	Pass RPD	63.6	66.3	RPD	-4.2	Pass RPD
Total Dissolved Solids	mg/L		40	3.0	16.2	15.8	RPD	2.5	Pass RPD	54.5	46.8	RPD	15.2	Pass RPD	64.8	66.8	RPD	-3.0	Pass RPD	108	114	RPD	-5.4	Pass RPD
Total Suspended Solids	mg/L		40	1.0	*<1.0*	1.6	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*
Turbidity	NTU	15	23	0.10	0.14	0.13	DIFF	0.010	Pass Diff	0.12	0.12	DIFF	0	Pass Diff	0.28	0.28	DIFF	0	Pass Diff	0.26	*<0.10*	*<DL*	*<DL*	*<DL*
pH (Laboratory)	pH		40	0.10	7.2	7.2	RPD	-0.100000	Pass RPD	7.2	7.2	RPD	-0.1	Pass RPD	7.3	7.3	RPD	-0.1	Pass RPD	7.5	7.5	RPD	0	Pass RPD
Anions and Nutrients																								
Ammonia, Total (as N)	mg/L	20	30	0.0050	0.014	0.0068	DIFF	0.0073	Pass Diff	0.014	0.015	DIFF	-0.0012	Pass Diff	*<0.0050*	*<0.0050*	*<DL*	*<DL*	*<DL*	0.018	0.015	DIFF	0.0033	Pass Diff
Bromide (Br)	mg/L	20	30	0.050	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	0.073	0.072	DIFF	0.001	Pass Diff	0.24	0.23	DIFF	0.011	Pass Diff
Chloride (Cl)	mg/L	20	30	0.10	0.81	0.76	RPD	6.4	Pass RPD	15.1	15.1	RPD	0	Pass RPD	13.4	13.4	RPD	0	Pass RPD	21	21	RPD	0	Pass RPD
Fluoride (F)	mg/L	20	30	0.020	0.044	0.037	DIFF	0.0070	Pass Diff	0.068	0.067	DIFF	0.001	Pass Diff	0.026	0.031	DIFF	-0.005	Pass Diff	0.061	0.057	DIFF	0.0040	Pass Diff
Total Kjeldahl Nitrogen	mg/L	20	30	0.050	0.13	0.097	DIFF	0.033	Pass Diff	0.16	0.16	DIFF	0.003	Pass Diff	0.12	0.13	DIFF	-0.007	Pass Diff	0.21	0.20	DIFF	0.0020	Pass Diff
Nitrate (as N)	mg/L	20	30	0.0050	*<0.0050*	*<0.0050*	*<DL*	*<DL*	*<DL*	0.027	0.027	RPD	0.7	Pass RPD	*<0.0050*	*<0.0050*	*<DL*	*<DL*	*<DL*	0.69	0.69	RPD	0	Pass RPD
Nitrite (as N)	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	0.0015	0.0014	DIFF	0.00010	Pass Diff
Orthophosphate-Dissolved (as P)	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*
Phosphorus (P)-Total	mg/L	20	30	0.0020	0.0023	*<0.0020*	*<DL*	*<DL*	*<DL*	0.0036	0.0044	DIFF	-0.0008	Pass Diff	0.0030	0.0035	DIFF	-0.0005	Pass Diff	0.0034	0.0032	DIFF	0.00020	Pass Diff
Phosphorus (P)-Total Dissolved	mg/L	25	38	0.0020	*<0.0020*	*<0.0020*	*<DL*	*<DL*	*<DL*	0.0024	0.0023	DIFF	1E-04	Pass Diff	0.0023	*<0.0020*	*<DL*	*<DL*	*<DL*	0.0024	0.0022	DIFF	0.00020	Pass Diff
Silica, Reactive (as SiO2)	mg/L	20	30	0.50	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*	0.82	0.84	DIFF	-0.020000	Pass Diff
Sulfate (SO4)	mg/L	20	30	0.30	1.8	1.8	RPD	0.60	Pass RPD	2.4	2.4	RPD	0	Pass RPD	4.8	4.8	RPD	0.2	Pass RPD	23.2	23.2	RPD	0	Pass RPD
Cyanides																								
Cyanide, Free	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*
Cyanide, Total	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*
Organic / Inorganic Carbon																								
Dissolved Organic Carbon	mg/L	20	30	0.50	1.7	2.6	DIFF	-0.940000	Pass Diff	4.3	4.1	RPD	5	Pass RPD	2.6	2.7	RPD	-3.70	Pass RPD	3.2	2.7	RPD	16	Pass RPD
Total Organic Carbon	mg/L	20	30	0.50	1.7	1.7	DIFF	-0.040000	Pass Diff	3.5	3.5	RPD	-1.70	Pass RPD	2.6	2.6	RPD	1.5	Pass RPD	2.6	2.7	RPD	-3.8	Pass RPD
Total Metals																								
Aluminum (Al)-Total	mg/L	20	30	0.0030	0.0046	0.0055	DIFF	-0.000900	Pass Diff	0.0077	0.0082	DIFF	-0.0005	Pass Diff	0.0044	0.0061	DIFF	-0.0017	Pass Diff	*<0.0030*	0.0034	*<DL*	*<DL*	*<DL*
Antimony (Sb)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	0.00097	0.00098	RPD	-1.0	Pass RPD
Arsenic (As)-Total	mg/L	20	30	0.00010	0.00020	0.00020	DIFF	0	Pass Diff	0.00013	0.00013	DIFF	0	Pass Diff	0.00089	0.00092	RPD	-3.3	Pass RPD	0.00084	0.00084	RPD	0	Pass RPD
Barium (Ba)-Total	mg/L	20	30	0.00010	0.0021	0.0021	RPD	-1.0000000	Pass RPD	0.018	0.018	RPD	1.1	Pass RPD	0.014	0.015	RPD	-1.4	Pass RPD	0.021	0.022	RPD	-1.9	Pass RPD
Beryllium (Be)-Total	mg/L	20	30	0.00010	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*
Bismuth (Bi)-Total	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*
Boron (B)-Total	mg/L	20	30	0.010	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*
Cadmium (Cd)-Total	mg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*
Calcium (Ca)-Total	mg/L	20	30	0.050	2.7	2.7	RPD	1.1	Pass RPD	3.0	2.9	RPD	0.3	Pass RPD	9.4	9.6	RPD	-2.9	Pass RPD	18	18.8	RPD	-4.3	Pass RPD
Cesium (Cs)-Total	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	0.000016	0.000016	DIFF	0	Pass Diff	0.000016	0.000015	DIFF	0.000001	Pass Diff
Chromium (Cr)-Total	mg/L	20	30	0.00050	0.00011	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	0.00015	*<DL*	*<DL*	*<DL*	*<0.00010*	0.00013	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*
Cobalt (Co)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*
Copper (Cu)-Total	mg/L	20	30	0.00050	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*
Iron (Fe)-Total	mg/L	20	30	0.010	0.012	*<0.010*	*<DL*	*<DL*	*<DL*	0.014	0.012	DIFF	0.002	Pass Diff	0.014	0.015	DIFF	-0.001	Pass Diff	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*
Lead (Pb)-Total	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*
Lithium (Li)-Total	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	0.0012	0.0012	DIFF	0	Pass Diff	0.0028	0.0030	DIFF	-0.000200	Pass Diff
Magnesium (Mg)-Total	mg/L	20	30	0.0050	0.95	0.93	RPD	1.5	Pass RPD	2.1	2.1	RPD	-0.500	Pass RPD	2.1	2.3	RPD	-9.0	Pass RPD	4.5	4.7	RPD	-3.9	Pass RPD
Manganese (Mn)-Total	mg/L	20	30	0.00010	0.0014	0.0014	RPD	2.9	Pass RPD	0.0018	0.0018	RPD	2.8	Pass RPD	0.0035	0.0038	RPD	-9.6	Pass RPD	0.0038	0.0040	RPD	-3.6	Pass RPD
Mercury (Hg)-Total	µg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*
Molybdenum (Mo)-Total	mg/L	20	30	0.000050	0.000063	0.000054	DIFF	0.000009	Pass Diff	0.000072	0.000075	DIFF	-3E-06	Pass Diff	0.000081	0.00010	DIFF	-0.0000023	Pass Diff	0.00010	0.00097	RPD	4.2	Pass RPD
Nickel (Ni)-Total	mg/L	20	30	0.00050	0.00063	0.00059	DIFF	0.000040	Pass Diff	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	0.0010	0.0011	DIFF	-0.00008	Pass Diff	0.0013	0.0013	DIFF	0.000010	Pass Diff
Phosphorus (P)-Total	mg/L	20	30	0.050	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*
Potassium (K)-Total	mg/L	20	30	0.050	0.39	0.38	RPD	1.0	Pass RPD	0.73	0.73	RPD	-0.300	Pass RPD	1.6	1.7	RPD	-5.6	Pass RPD	4.0	4.1	RPD	-1.0	Pass RPD
Rubidium (Rb)-Total	mg/L	20	30	0.00020	0.00048	0.00055	DIFF	-0.000070	Pass Diff	0.00095	0.00099	DIFF	-0.00004	Pass Diff	0.0025	0.0027	RPD	-6.2	Pass RPD	0.0050	0.0050	RPD	0.80	Pass RPD
Selenium (Se)-Total	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	0.000061	*<DL*	*<DL*	*<DL*
Silicon (Si)-Total	mg/L	20	30	0.10	0.21	0.21	DIFF	0	Pass Diff	0.21	0.21	DIFF	0	Pass Diff	0.18	0.20	DIFF	-0.02	Pass Diff	0.40	0.40	DIFF	0	Pass Diff
Silver (Ag)-Total	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*
Sodium (Na)-Total	mg/L	20	30	0.050	0.54	0.54	RPD	0	Pass RPD	8.5	8.2	RPD	3.2	Pass RPD	0.81	0.89	RPD	-9.4	Pass RPD	3.1	3.2	RPD	-2.2	Pass RPD
Strontium (Sr)-Total	mg/L	20	30	0.00020	0.011	0.011	RPD	1.8	Pass RPD	0.025	0.024	RPD	2.9	Pass RPD	0.058	0.060	RPD	-4.2	Pass RPD	0.15	0.14	RPD	0.70	Pass RPD
Sulfur (S)-Total	mg/L	20	30	0.50	0.80	0.71	DIFF	0.090	Pass Diff	1.0	1.1	DIFF	-0.05	Pass Diff	1.6	1.7	DIFF	-0.09	Pass Diff	8.4	8.3	RPD	0.60	Pass RPD
Tellurium (Te)-Total	mg/L	20	30	0.00020	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*
Thallium (Tl)-Total	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*
Thorium (Th)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*
Tin (Sn)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*
Titanium (Ti)-Total	mg/L	20	30	0.00030	*<0.00030*	*<0.00030*	*<DL*	*<DL*	*<DL*	*<0.00030*	*<0.00030*	*<DL*	*<DL*	*<DL*	*<0.00030*	*<0.00030*	*<DL*	*<DL*	*<DL*	*<0.00030*	*<0.00030*	*<DL*	*<DL*	*<DL*
Tungsten (W)-Total	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*
Uranium (U)-Total	mg/L	20	30	0.000010	0.000032	0.000029	DIFF	0.000003	Pass Diff	0.000051	0.000049	DIFF	0.000002	Pass Diff	0.000015	0.000016	DIFF	-1E-06	Pass Diff	0.00015	0.00015	RPD	0	Pass RPD
Vanadium (V)-Total	mg/L	20	30	0.00050	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*
Zinc (Zn)-Total	mg/L	20	30	0.0030	*<0.0030*	*<0.0030*	*<DL*	*<DL*	*<DL*	*<0.0030*	*<0.0030*	*<DL*	*<DL*	*<DL*	*<0.0030*	*<0.0030*	*<DL*	*<DL*	*<DL*	*<0.0030*	*<0.0030*	*<DL*	*<DL*	*<DL*
Zirconium (Zr)-Total	mg/L	20	30	0.00020	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*	*<0.00020*	*<0.00020*	*<DL*	*<DL*	*<DL*
Dissolved Metals																								
Aluminum (Al)-Dissolved	mg/L	20	30	0.0010	0.0020	0.0016	DIFF	0.00040	Pass Diff	0.0063	0.0059	RPD	6.6	Pass RPD	0.0019	0.0027	DIFF	-0.0008	Pass Diff	0.0080	*<0.0010*	*<DL*	*<DL*	*<DL*
Antimony (Sb)-Dissolved	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	0.0010	0.00099	RPD	1.0	Pass RPD
Arsenic (As)-Dissolved	mg/L	20	30	0.00010	0.00016	0.00018	DIFF	-0.0000020	Pass Diff	0.00012	0.00013	DIFF	-1E-05	Pass Diff	0.00079	0.00081	RPD	-2.50	Pass RPD	0.00078	0.00079	RPD	-1.3	Pass RPD
Barium (Ba)-Dissolved	mg/L	20	30	0.00010	0.0020	0.0020	RPD	-0.5000000	Pass RPD	0.017	0.018	RPD	-1.70	Pass RPD	0.015	0.015	RPD	1.3	Pass RPD	0.022	0.023	RPD	-2.7	Pass RPD
Beryllium (Be)-Dissolved	mg/L	20	30	0.00010	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*	*<0.000100*	*<0.000100*	*<DL*	*<DL*	*<DL*
Bismuth (Bi)-Dissolved	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*
Boron (B)-Dissolved	mg/L	20	30	0.010	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*
Cadmium (Cd)-Dissolved	mg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*
Calcium (Ca)-Dissolved	mg/L	20	30	0.050	2.6	2.6	RPD	-0.400000	Pass RPD	3.0	2.9	RPD	2.7	Pass RPD	8.8	9.1	RPD	-2.80	Pass RPD	16.6	18.8	RPD	-12	Pass RPD
Cesium (Cs)-Dissolved	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	0.000014	0.000014	DIFF	0	Pass Diff	0.000030	0.000015	DIFF	0.000015	Pass Diff
Chromium (Cr)-Dissolved	mg/L	20	30	0.00050	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	0.00010	0.00012	DIFF	-0.00002	Pass Diff	0.00029	*<0.00010*	*<DL*	*<DL*	*<DL*
Cobalt (Co)-Dissolved	mg/L	20	30	0.00010	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*	*<0.00010*	*<0.00010*	*<DL*	*<DL*	*<DL*
Copper (Cu)-Dissolved	mg/L	20	30	0.00020	0.00043	0.00045	DIFF	-0.000020	Pass Diff	0.00034	0.00032	DIFF	0.00002	Pass Diff	0.00026	0.00026	DIFF	0	Pass Diff	0.00049	0.00042	DIFF	0.000070	Pass Diff
Iron (Fe)-Dissolved	mg/L	20	30	0.010	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	*<0.010*	*<0.010*	*<DL*	*<DL*	*<DL*	0.014	*<0.010*	*<DL*	*<DL*	*<DL*
Lead (Pb)-Dissolved	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*
Lithium (Li)-Dissolved	mg/L	20	30	0.0010	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	*<0.0010*	*<0.0010*	*<DL*	*<DL*	*<DL*	0.0012	0.0012	DIFF	0	Pass Diff	0.0024	0.0030	DIFF	-0.000600	Pass Diff
Magnesium (Mg)-Dissolved	mg/L	20	30	0.0050	0.89	0.89	RPD	0.50	Pass RPD	2.0	2.0	RPD	2	Pass RPD	2.1	2.2	RPD	-4.30	Pass RPD	4.0	4.6	RPD	-14	Pass RPD
Manganese (Mn)-Dissolved	mg/L	20	30	0.00010	0.00020	0.00021	DIFF	-0.000010	Pass Diff	0.00052	0.00043	DIFF	0.00009	Pass Diff	0.00065	0.00072	RPD	-10.20	Pass RPD	0.00094	0.00077	RPD	19.9	Pass RPD
Mercury (Hg)-Dissolved	µg/L	20	30	0.000005	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*	*<0.0000050*	*<0.0000050*	*<DL*	*<DL*	*<DL*
Molybdenum (Mo)-Dissolved	mg/L	20	30	0.000050	0.000054	0.000060	DIFF	-0.000006	Pass Diff	0.000064	0.000066	DIFF	-2E-06	Pass Diff	0.000081	0.000084	DIFF	-3E-06	Pass Diff	0.0011	0.0010	RPD	6.5	Pass RPD
Nickel (Ni)-Dissolved	mg/L	20	30	0.00050	0.00055	0.00052	DIFF	0.000030	Pass Diff	*<0.00050*	*<0.00050*	*<DL*	*<DL*	*<DL*	0.00098	0.0011	DIFF	-0.00007	Pass Diff	0.0013	0.0013	DIFF	-0.000030	Pass Diff
Phosphorus (P)-Dissolved	mg/L	20	30	0.050	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*	*<0.050*	*<0.050*	*<DL*	*<DL*	*<DL*
Potassium (K)-Dissolved	mg/L	20	30	0.050	0.38	0.38	RPD	1.1	Pass RPD	0.72	0.71	RPD	1.1	Pass RPD	1.6	1.7	RPD	-2.50	Pass RPD	3.8	4.1	RPD	-7.4	Pass RPD
Rubidium (Rb)-Dissolved	mg/L	20	30	0.00020	0.00051	0.00048	DIFF	0.000030	Pass Diff	0.00090	0.00087	DIFF	0.00003	Pass Diff	0.0026	0.0028	RPD	-7.40	Pass RPD	0.0048	0.0048	RPD	-1.0	Pass RPD
Selenium (Se)-Dissolved	mg/L	20	30	0.000050	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	*<0.000050*	*<0.000050*	*<DL*	*<DL*	*<DL*	0.00011	*<0.000050*	*<DL*	*<DL*	*<DL*
Silicon (Si)-Dissolved	mg/L	20	30	0.050	0.16	0.17	DIFF	-0.003000	Pass Diff	0.17	0.16	DIFF	0.008	Pass Diff	0.14	0.15	DIFF	-0.008	Pass Diff	0.34	0.38	RPD	-9.2	Pass RPD
Silver (Ag)-Dissolved	mg/L	20	30	0.000010	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*<DL*	*<0.000010*	*<0.000010*	*<DL*	*<DL*	*

Table A-7. Swipe chemistry data for sediment grab analyses, 2023.

Analyte	Swipe DLs (µg)	Equipment Swipes [1] SWIPE-SC-1 FILTER	Equipment Swipes [1] SWIPE-SC-2 FILTER
		17-Aug-2023	18-Aug-2023
ALS Sample ID		WP2320790-044	WP2320790-045
Total Metals (µg)			
Aluminum	20	*<20*	**25**
Antimony	20	*<20*	*<20*
Arsenic	20	*<20*	*<20*
Barium	1.0	*<1.0*	**1.7**
Beryllium	0.50	*<0.50*	*<0.50*
Bismuth	20	*<20*	*<20*
Cadmium	1.0	*<1.0*	*<1.0*
Calcium	200	*<200*	*<200*
Chromium	2.0	**15**	**17**
Cobalt	1.0	*<1.0*	*<1.0*
Copper	1.0	*<1.0*	*<1.0*
Lead	0.40	*<0.40*	*<0.40*
Lithium	1.0	*<1.0*	*<1.0*
Manganese	0.50	**1.3**	**2.4**
Mercury	0.010	*<0.010*	*<0.010*
Molybdenum	3.0	*<3.0*	*<3.0*
Nickel	5.0	**6.3**	**8.5**
Phosphorus	30	*<30*	*<30*
Potassium	200	*<200*	*<200*
Selenium	20	*<20*	*<20*
Silver	1.0	*<1.0*	*<1.0*
Sodium	400	*<400*	*<400*
Strontium	0.50	*<0.50*	*<0.50*
Thallium	20	*<20*	*<20*
Tin	3.0	*<3.0*	*<3.0*
Titanium	1.0	*<1.0*	**1.7**
Vanadium	3.0	*<3.0*	*<3.0*

Notes:

Bold Filter Swipes	**concentration exceeds laboratory DLs, but < 10x DL.**
Shaded Filter Swipes	concentration is > 10x DL.

Table A-8. Field duplicate results for the sediment cores collected in 2023.

Month		Relative Percent Difference DQOs (%)			DUP-SC-1 (TPE-SC-7)					DUP-SC-2 (TPN-SC-5)					DUP-SC-3 (SP-SC-10)					DUP-SC-4 (BBD-SC-1)				
Station	Units			August DLs	TPE-SC-7	DUP-SC-1	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	TPN-SC-5	DUP-SC-2	Field Dup	Result [b]	Outcome	SP-SC-10	DUP-SC-3	Field Dup	Result [b]	Outcome	BBD-SC-1	DUP-SC-4	Field Dup	Result [b]	Outcome
Date Sampled					11-Aug-2023	11-Aug-2023				12-Aug-2023	12-Aug-2023				14-Aug-2023	16-Aug-2023				16-Aug-2023	16-Aug-2023			
ALS Sample ID		Lab	Field		VA23C0344-077	VA23C0344-121				VA23C0344-085	VA23C0344-122				VA23C0344-070	WP2320790-047				WP2320790-031	WP2320790-046			
Parameter					Sediment	Sediment				Sediment	Sediment				Sediment	Sediment				Sediment	Sediment			
Physical Tests																								
Moisture (%)	%	20	30	0.25	82	80.8	RPD	1.5	Pass RPD	68.7	61.4	RPD	11.2	Pass RPD	86	85.9	RPD	0.1	Pass RPD	37.5	44.5	RPD	-17.1	Pass RPD
pH (Laboratory)	pH units	5.0	7.5	0.10	5.7	6.1	RPD	-7.3	Pass RPD	5.8	6.0	RPD	-3.9	Pass RPD	6.1	6.2	RPD	-1.5	Pass RPD	5.8	5.8	RPD	-0.3	Pass RPD
Total Metals																								
Aluminum (Al)-Total	mg/kg	40	60	50	28600	31400	RPD	-9.3	Pass RPD	14500	12000	RPD	18.9	Pass RPD	29600	24800	RPD	17.6	Pass RPD	6670	6220	RPD	7	Pass RPD
Antimony (Sb)-Total	mg/kg	30	45	0.10	0.19	0.23	DIFF	-0.040000	Pass Diff	0.12	*<0.10*	*<DL*	*<DL*	*<DL*	0.24	0.30	DIFF	-0.06	Pass Diff	0.10	0.11	DIFF	-0.01	Pass Diff
Arsenic (As)-Total	mg/kg	30	45	0.10	41.2	20.3	RPD	68	Fail	13.2	6.8	RPD	63.7	Fail	33.5	30.8	RPD	8.4	Pass RPD	8.8	8.3	RPD	6.2	Pass RPD
Barium (Ba)-Total	mg/kg	40	60	0.50	131	145	RPD	-10	Pass RPD	55.7	46.1	RPD	18.9	Pass RPD	133	111	RPD	18	Pass RPD	99.1	105	RPD	-5.8	Pass RPD
Beryllium (Be)-Total	mg/kg	30	45	0.10	2.2	2.1	RPD	6.1	Pass RPD	0.80	0.60	RPD	28.6	Pass RPD	2.3	2.1	RPD	10.4	Pass RPD	0.29	0.29	DIFF	0	Pass Diff
Bismuth (Bi)-Total	mg/kg	30	45	0.20	2.5	2.7	RPD	-6.9	Pass RPD	0.84	0.63	DIFF	0.21	Pass Diff	2.5	2.3	RPD	10	Pass RPD	*<0.20*	*<0.20*	*<DL*	*<DL*	*<DL*
Boron (B)-Total	mg/kg	30	45	5.0	9.1	9.6	DIFF	-0.500000	Pass Diff	5.1	*<5.0*	*<DL*	*<DL*	*<DL*	11.9	8.1	DIFF	3.8	Pass Diff	5.8	6.0	DIFF	-0.2	Pass Diff
Cadmium (Cd)-Total	mg/kg	30	45	0.020	0.15	0.11	RPD	27.5	Pass RPD	0.070	0.063	DIFF	0.007	Pass Diff	0.23	0.20	RPD	15.2	Pass RPD	0.044	0.047	DIFF	-0.003	Pass Diff
Calcium (Ca)-Total	mg/kg	30	45	50	1910	2180	RPD	-13	Pass RPD	1260	1240	RPD	1.6	Pass RPD	2580	2620	RPD	-1.5	Pass RPD	2380	2450	RPD	-2.9	Pass RPD
Chromium (Cr)-Total	mg/kg	30	45	0.50	108	105	RPD	2.8	Pass RPD	88.8	79	RPD	11.7	Pass RPD	85	90	RPD	-5.7	Pass RPD	15.6	15.3	RPD	1.9	Pass RPD
Cobalt (Co)-Total	mg/kg	30	45	0.10	18.3	17	RPD	7.4	Pass RPD	7.5	6.4	RPD	16.7	Pass RPD	17.5	16.2	RPD	7.7	Pass RPD	5.1	5.2	RPD	-1.7	Pass RPD
Copper (Cu)-Total	mg/kg	30	45	0.50	59.6	61.2	RPD	-2.6	Pass RPD	31.6	25.5	RPD	21.4	Pass RPD	78.3	76.9	RPD	1.8	Pass RPD	7.4	7.7	RPD	-4	Pass RPD
Iron (Fe)-Total	mg/kg	30	45	50	85500	52700	RPD	47.5	Fail	23400	17800	RPD	27.2	Pass RPD	58300	55200	RPD	5.5	Pass RPD	14700	15400	RPD	-4.7	Pass RPD
Lead (Pb)-Total	mg/kg	40	60	0.50	20.3	24.4	RPD	-18	Pass RPD	11.3	8.9	RPD	23.3	Pass RPD	22.1	22.9	RPD	-3.6	Pass RPD	6.2	6.9	RPD	-10.8	Pass RPD
Lithium (Li)-Total	mg/kg	30	45	2.0	51.8	55.4	RPD	-6.7	Pass RPD	22.6	20	RPD	12.2	Pass RPD	49.2	46	RPD	6.7	Pass RPD	9.0	8.8	DIFF	0.2	Pass Diff
Magnesium (Mg)-Total	mg/kg	30	45	20	11200	11700	RPD	-4.4	Pass RPD	7200	6280	RPD	13.6	Pass RPD	10400	9340	RPD	10.7	Pass RPD	3780	3730	RPD	1.3	Pass RPD
Manganese (Mn)-Total	mg/kg	30	45	1.0	2200	1660	RPD	28	Pass RPD	226	203	RPD	10.7	Pass RPD	2700	2390	RPD	12.2	Pass RPD	295	335	RPD	-12.7	Pass RPD
Mercury (Hg)-Total	mg/kg	40	60	0.0050	0.012	0.012	DIFF	0	Pass Diff	0.010	0.0088	DIFF	0.0013	Pass Diff	0.029	0.035	RPD	-20.7	Pass RPD	0.0056	0.0075	DIFF	-0.0019	Pass Diff
Molybdenum (Mo)-Total	mg/kg	40	60	0.10	8.0	4.5	RPD	56.2	Pass RPD	2.4	1.2	RPD	67.8	Fail	6.5	6.3	RPD	2.5	Pass RPD	0.64	0.69	RPD	-7.5	Pass RPD
Nickel (Ni)-Total	mg/kg	30	45	0.50	64.3	66.7	RPD	-3.7	Pass RPD	42.6	40.5	RPD	5.1	Pass RPD	59.8	62.1	RPD	-3.8	Pass RPD	9.9	9.6	RPD	2.7	Pass RPD
Phosphorus (P)-Total	mg/kg	30	45	50	475	359	RPD	27.8	Pass RPD	312	280	RPD	10.8	Pass RPD	553	596	RPD	-7.5	Pass RPD	901	881	RPD	2.2	Pass RPD
Potassium (K)-Total	mg/kg	40	60	100	4640	5060	RPD	-8.7	Pass RPD	2020	1690	RPD	17.8	Pass RPD	4840	4220	RPD	13.7	Pass RPD	1100	1100	RPD	0	Pass RPD
Selenium (Se)-Total	mg/kg	30	45	0.20	0.35	0.22	DIFF	0.13	Pass Diff	*<0.20*	*<0.20*	*<DL*	*<DL*	*<DL*	0.54	0.61	DIFF	-0.07	Pass Diff	*<0.20*	*<0.20*	*<DL*	*<DL*	*<DL*
Silver (Ag)-Total	mg/kg	40	60	0.10	*<0.10*	*<0.10*	*<DL*	*<DL*	*<DL*	*<0.10*	*<0.10*	*<DL*	*<DL*	*<DL*	*<0.10*	0.12	*<DL*	*<DL*	*<DL*	*<0.10*	*<0.10*	*<DL*	*<DL*	*<DL*
Sodium (Na)-Total	mg/kg	40	60	50	147	166	DIFF	-19	Pass Diff	79	71	DIFF	8	Pass Diff	174	171	DIFF	3	Pass Diff	99	77	DIFF	22	Pass Diff
Strontium (Sr)-Total	mg/kg	40	60	0.50	16.4	20.2	RPD	-21	Pass RPD	11.5	11.7	RPD	-1.7	Pass RPD	21.3	21.1	RPD	0.9	Pass RPD	34.6	34.7	RPD	-0.3	Pass RPD
Sulfur (S)-Total	mg/kg	30	45	1000	*<1000*	1100	*<DL*	*<DL*	*<DL*	*<1000*	*<1000*	*<DL*	*<DL*	*<DL*	1300	1400	DIFF	-100	Pass Diff	*<1000*	*<1000*	*<DL*	*<DL*	*<DL*
Thallium (Tl)-Total	mg/kg	30	45	0.050	0.40	0.41	RPD	-3.7	Pass RPD	0.15	0.12	DIFF	0.021	Pass Diff	0.40	0.36	RPD	11.7	Pass RPD	*<0.050*	0.056	*<DL*	*<DL*	*<DL*
Tin (Sn)-Total	mg/kg	40	60	2.0	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*	*<2.0*	2.0	*<DL*	*<DL*	*<DL*	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*
Titanium (Ti)-Total	mg/kg	40	60	1.0	935	1070	RPD	-14	Pass RPD	446	410	RPD	8.4	Pass RPD	835	725	RPD	14.1	Pass RPD	337	337	RPD	0	Pass RPD
Tungsten (W)-Total	mg/kg	30	45	0.50	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*	*<0.50*	0.80	*<DL*	*<DL*	*<DL*	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*
Uranium (U)-Total	mg/kg	30	45	0.050	18.5	20.5	RPD	-10	Pass RPD	9.3	7.5	RPD	21.5	Pass RPD	21.4	20.8	RPD	2.8	Pass RPD	1.3	1.4	RPD	-8.8	Pass RPD
Vanadium (V)-Total	mg/kg	30	45	0.20	44.6	50.8	RPD	-13	Pass RPD	24.8	21	RPD	16.6	Pass RPD	41.6	40.7	RPD	2.2	Pass RPD	17.7	18.2	RPD	-2.8	Pass RPD
Zinc (Zn)-Total	mg/kg	30	45	2.0	119	124	RPD	-4.1	Pass RPD	58.9	50.7	RPD	15	Pass RPD	121	113	RPD	6.8	Pass RPD	29.1	27.4	RPD	6	Pass RPD
Zirconium (Zr)-Total	mg/kg	30	45	1.0	3.6	4.7	DIFF	-1.1	Pass Diff	2.2	1.7	DIFF	0.5	Pass Diff	2.0	2.1	DIFF	-0.1	Pass Diff	3.6	3.1	DIFF	0.5	Pass Diff
Speciated Metals (µg/kg)																								
Methylmercury (as MeHg)	mg/kg	30	45	1.0	-	-	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*

Notes:

[a] Field Dup Methods are based on the concentrations:

RPD = relative percent difference is used to compare field duplicates when the measured concentration is > 5x the DL

DIFF = when concentrations < 5* DL

[b] Results refer to the RPD or absolute difference in concentration

DQO for RPDs is < Field RPD values

DQO for DIFF is < 2x the DL

Italicized numbers are below detection limits.

Table A-8. Field duplicate results for the sediment cores collected in 2023.

Month		Relative Percent Difference DQOs (%)		DUP-SC-5 (BAP-SC-1)						DUP-SC-6 (BPJ-SC-3)					DUP-SC-7 (BES-SC-4)				
Station	Units			August DLs	BAP-SC-1	DUP-SC-5	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	BPJ-SC-3	DUP-SC-6	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	BES-SC-4	DUP-SC-7	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome
Date Sampled					17-Aug-2023	17-Aug-2023				19-Aug-2023	19-Aug-2023				18-Aug-2023	18-Aug-2023			
ALS Sample ID		Lab	Field		WP2320790-001	WP2320790-041				WP2320790-023	WP2320790-042				WP2320790-014	WP2320790-043			
Parameter					Sediment	Sediment					Sediment					Sediment			
Physical Tests																			
Moisture (%)	%	20	30	0.25	30.1	27.1	RPD	10.5	Pass RPD	50.8	56	RPD	-9.7	Pass RPD	51.2	46.5	RPD	9.6	Pass RPD
pH (Laboratory)	pH units	5.0	7.5	0.10	6.2	5.9	RPD	4.1	Pass RPD	6.6	6.6	RPD	0.6	Pass RPD	6.5	6.5	RPD	-1.1	Pass RPD
Total Metals																			
Aluminum (Al)-Total	mg/kg	40	60	50	4480	5000	RPD	-11	Pass RPD	10100	9320	RPD	8	Pass RPD	8330	7440	RPD	11.3	Pass RPD
Antimony (Sb)-Total	mg/kg	30	45	0.10	0.14	0.15	DIFF	-0.01	Pass Diff	0.15	0.15	DIFF	0	Pass Diff	0.16	0.16	DIFF	0	Pass Diff
Arsenic (As)-Total	mg/kg	30	45	0.10	2.9	3.8	RPD	-26.4	Pass RPD	9.6	9.0	RPD	6.4	Pass RPD	5.2	5.0	RPD	4.3	Pass RPD
Barium (Ba)-Total	mg/kg	40	60	0.50	325	330	RPD	-1.5	Pass RPD	164	145	RPD	12.3	Pass RPD	152	154	RPD	-1.3	Pass RPD
Beryllium (Be)-Total	mg/kg	30	45	0.10	0.29	0.33	DIFF	-0.04	Pass Diff	0.45	0.43	DIFF	0.02	Pass Diff	0.44	0.42	DIFF	0.02	Pass Diff
Bismuth (Bi)-Total	mg/kg	30	45	0.20	*<0.20*	*<0.20*	*<DL*	*<DL*	*<DL*	0.22	0.24	DIFF	-0.02	Pass Diff	*<0.20*	*<0.20*	*<DL*	*<DL*	*<DL*
Boron (B)-Total	mg/kg	30	45	5.0	6.4	6.3	DIFF	0.1	Pass Diff	9.1	8.6	DIFF	0.5	Pass Diff	8.6	8.2	DIFF	0.4	Pass Diff
Cadmium (Cd)-Total	mg/kg	30	45	0.020	0.027	0.030	DIFF	-0.003	Pass Diff	0.089	0.097	DIFF	-0.008	Pass Diff	0.054	0.063	DIFF	-0.009	Pass Diff
Calcium (Ca)-Total	mg/kg	30	45	50	1950	2470	RPD	-23.5	Pass RPD	2760	2800	RPD	-1.4	Pass RPD	2490	2700	RPD	-8.1	Pass RPD
Chromium (Cr)-Total	mg/kg	30	45	0.50	14.3	16.3	RPD	-13.1	Pass RPD	24.1	23.4	RPD	2.9	Pass RPD	22.1	21.5	RPD	2.8	Pass RPD
Cobalt (Co)-Total	mg/kg	30	45	0.10	3.6	3.9	RPD	-9.9	Pass RPD	8.9	8.2	RPD	7.3	Pass RPD	6.5	6.0	RPD	6.9	Pass RPD
Copper (Cu)-Total	mg/kg	30	45	0.50	5.7	5.4	RPD	4.7	Pass RPD	11.1	10.9	RPD	1.8	Pass RPD	7.4	7.1	RPD	4.6	Pass RPD
Iron (Fe)-Total	mg/kg	30	45	50	12100	13100	RPD	-7.9	Pass RPD	21900	19700	RPD	10.6	Pass RPD	17300	15200	RPD	12.9	Pass RPD
Lead (Pb)-Total	mg/kg	40	60	0.50	3.6	4.9	RPD	-31.5	Pass RPD	9.9	9.5	RPD	3.7	Pass RPD	6.9	6.8	RPD	2.6	Pass RPD
Lithium (Li)-Total	mg/kg	30	45	2.0	6.9	8.1	DIFF	-1.2	Pass Diff	13.1	13.1	RPD	0	Pass RPD	11.5	11.6	RPD	-0.9	Pass RPD
Magnesium (Mg)-Total	mg/kg	30	45	20	2800	3080	RPD	-9.5	Pass RPD	5540	5160	RPD	7.1	Pass RPD	4710	4410	RPD	6.6	Pass RPD
Manganese (Mn)-Total	mg/kg	30	45	1.0	124	129	RPD	-4	Pass RPD	4730	3490	RPD	30.2	Pass RPD	562	1160	RPD	-69.5	Fail
Mercury (Hg)-Total	mg/kg	40	60	0.0050	*<0.0050*	*<0.0050*	*<DL*	*<DL*	*<DL*	0.012	0.012	DIFF	0.0002	Pass Diff	0.0097	0.0089	DIFF	0.0008	Pass Diff
Molybdenum (Mo)-Total	mg/kg	40	60	0.10	0.33	0.58	DIFF	-0.25	Fail	2.2	2.3	RPD	-5.4	Pass RPD	0.75	1.2	RPD	-47.7	Pass RPD
Nickel (Ni)-Total	mg/kg	30	45	0.50	8.6	9.6	RPD	-11.7	Pass RPD	16	15.6	RPD	2.5	Pass RPD	13.5	13.2	RPD	2.2	Pass RPD
Phosphorus (P)-Total	mg/kg	30	45	50	679	838	RPD	-21	Pass RPD	1000	947	RPD	5.4	Pass RPD	800	754	RPD	5.9	Pass RPD
Potassium (K)-Total	mg/kg	40	60	100	1020	1210	RPD	-17	Pass RPD	1760	1760	RPD	0	Pass RPD	1670	1590	RPD	4.9	Pass RPD
Selenium (Se)-Total	mg/kg	30	45	0.20	*<0.20*	*<0.20*	*<DL*	*<DL*	*<DL*	*<0.20*	*<0.20*	*<DL*	*<DL*	*<DL*	*<0.20*	*<0.20*	*<DL*	*<DL*	*<DL*
Silver (Ag)-Total	mg/kg	40	60	0.10	*<0.10*	*<0.10*	*<DL*	*<DL*	*<DL*	*<0.10*	*<0.10*	*<DL*	*<DL*	*<DL*	*<0.10*	*<0.10*	*<DL*	*<DL*	*<DL*
Sodium (Na)-Total	mg/kg	40	60	50	71	66	DIFF	5	Pass Diff	140	139	DIFF	1	Pass Diff	134	117	DIFF	17	Pass Diff
Strontium (Sr)-Total	mg/kg	40	60	0.50	39.5	39.1	RPD	1	Pass RPD	46.6	47	RPD	-0.9	Pass RPD	46.9	44.5	RPD	5.3	Pass RPD
Sulfur (S)-Total	mg/kg	30	45	1000	*<1000*	*<1000*	*<DL*	*<DL*	*<DL*	*<1000*	*<1000*	*<DL*	*<DL*	*<DL*	*<1000*	*<1000*	*<DL*	*<DL*	*<DL*
Thallium (Tl)-Total	mg/kg	30	45	0.050	*<0.050*	0.060	*<DL*	*<DL*	*<DL*	0.085	0.081	DIFF	0.004	Pass Diff	0.079	0.078	DIFF	0.001	Pass Diff
Tin (Sn)-Total	mg/kg	40	60	2.0	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*
Titanium (Ti)-Total	mg/kg	40	60	1.0	277	318	RPD	-13.8	Pass RPD	443	411	RPD	7.5	Pass RPD	374	366	RPD	2.2	Pass RPD
Tungsten (W)-Total	mg/kg	30	45	0.50	*<0.50*	0.62	*<DL*	*<DL*	*<DL*	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*
Uranium (U)-Total	mg/kg	30	45	0.050	1.0	1.4	RPD	-29.5	Pass RPD	2.0	1.9	RPD	1.6	Pass RPD	1.7	1.6	RPD	3.1	Pass RPD
Vanadium (V)-Total	mg/kg	30	45	0.20	16.8	21.4	RPD	-24.1	Pass RPD	26.1	26.1	RPD	0	Pass RPD	24	23.4	RPD	2.5	Pass RPD
Zinc (Zn)-Total	mg/kg	30	45	2.0	19.7	21.3	RPD	-7.8	Pass RPD	49.2	44.2	RPD	10.7	Pass RPD	34.7	31.2	RPD	10.6	Pass RPD
Zirconium (Zr)-Total	mg/kg	30	45	1.0	3.7	3.5	DIFF	0.2	Pass Diff	3.0	3.0	DIFF	0	Pass Diff	2.3	2.0	DIFF	0.3	Pass Diff
Speciated Metals (µg/kg)																			
Methylmercury (as MeHg)	mg/kg	30	45	1.0	-	-	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*	-	-	*<DL*	*<DL*	*<DL*

Notes:

[a] Field Dup Methods are based on the concentrations:

RPD = relative percent difference is used to compare field duplicates when the measured concentration is > 5x the DL

DIFF = when concentrations < 5* DL

[b] Results refer to the RPD or absolute difference in concentration

DQO for RPDs is < Field RPD values

DQO for DIFF is < 2x the DL

Italicized numbers are below detection limits.

Table A-8. Field duplicate results for the sediment cores collected in 2023.

Month		Relative Percent Difference DQOs (%)		DUP-SC-8 (WAL-SC-2)					DUP-SC-9 (A76-SC-4)						DUP-SC-10 (MAM-SC-3)					DUP-SC-11 (NEM-SC-8)				
Station	Units			WAL-SC-2	DUP-SC-8	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	August MDLs	A76-SC-4	DUP-SC-9	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	MAM-SC-3	DUP-SC-10	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	NEM-SC-8	DUP-SC-11	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome
Date Sampled				21-Aug-2023	21-Aug-2023					13-Aug-2023	23-Aug-2023				15-Aug-2023	23-Aug-2023				16-Aug-2023	16-Aug-2023			
ALS Sample ID		Lab	Field	VA23C0344-092	VA23C0344-123					VA23C0344-044	VA23C0344-124				VA23C0344-003	VA23C0344-125				VA23C0344-058	VA23C0344-126			
Parameter					Sediment						Sediment													
Physical Tests																								
Moisture (%)	%	20	30	88.8	88.7	RPD	0.1	Pass RPD	0.25	88.9	87.9	RPD	1.1	Pass RPD	90.7	89.6	RPD	1.2	Pass RPD	87.1	87.4	RPD	-0.3	Pass RPD
pH (Laboratory)	pH units	5.0	7.5	6.2	6.2	RPD	-0.3	Pass RPD	0.10	5.9	5.4	RPD	9.6	Fail	6.1	6.1	RPD	0.7	Pass RPD	6.3	6.1	RPD	3.4	Pass RPD
Total Metals																								
Aluminum (Al)-Total	mg/kg	40	60	20200	25800	RPD	-24.3	Pass RPD	50	18100	26800	RPD	-38.8	Pass RPD	22000	21800	RPD	0.9	Pass RPD	11400	12700	RPD	-10.8	Pass RPD
Antimony (Sb)-Total	mg/kg	30	45	0.38	0.45	DIFF	-0.07	Pass Diff	0.10	0.39	0.45	DIFF	-0.06	Pass Diff	1.5	3.2	RPD	-72.3	Fail	0.28	0.42	DIFF	-0.14	Pass Diff
Arsenic (As)-Total	mg/kg	30	45	32.1	21.6	RPD	39.1	Pass RPD	0.10	356	253	RPD	33.8	Pass RPD	163	204	RPD	-22.3	Pass RPD	33.3	36	RPD	-7.8	Pass RPD
Barium (Ba)-Total	mg/kg	40	60	112	152	RPD	-30.3	Pass RPD	0.50	164	193	RPD	-16.2	Pass RPD	157	164	RPD	-4.4	Pass RPD	81.2	99.3	RPD	-20.1	Pass RPD
Beryllium (Be)-Total	mg/kg	30	45	1.6	1.6	RPD	-3.2	Pass RPD	0.10	1.1	1.6	RPD	-36.5	Pass RPD	1.5	1.3	RPD	16.1	Pass RPD	0.63	0.74	RPD	-16.1	Pass RPD
Bismuth (Bi)-Total	mg/kg	30	45	1.9	2.1	RPD	-11.2	Pass RPD	0.20	0.59	0.76	DIFF	-0.17	Pass Diff	0.52	0.44	DIFF	0.08	Pass Diff	0.21	0.25	DIFF	-0.04	Pass Diff
Boron (B)-Total	mg/kg	30	45	9.7	11.8	DIFF	-2.1	Pass Diff	5.0	5.8	9.0	DIFF	-3.2	Pass Diff	21.4	27.9	DIFF	-6.5	Pass Diff	10.6	11.6	DIFF	-1	Pass Diff
Cadmium (Cd)-Total	mg/kg	30	45	0.37	0.53	RPD	-37.2	Pass RPD	0.020	0.32	0.25	RPD	25.4	Pass RPD	0.33	0.26	RPD	24.9	Pass RPD	0.17	0.29	RPD	-50	Fail
Calcium (Ca)-Total	mg/kg	30	45	4680	4820	RPD	-2.9	Pass RPD	50	3060	3530	RPD	-14.3	Pass RPD	4220	16300	RPD	-117.7	Fail	3560	3620	RPD	-1.7	Pass RPD
Chromium (Cr)-Total	mg/kg	30	45	54.7	59.4	RPD	-8.2	Pass RPD	0.50	98.2	129	RPD	-27.1	Pass RPD	196	232	RPD	-16.8	Pass RPD	130	132	RPD	-1.5	Pass RPD
Cobalt (Co)-Total	mg/kg	30	45	9.4	9.7	RPD	-3.3	Pass RPD	0.10	22.4	22.4	RPD	0	Pass RPD	14.3	15.7	RPD	-9.3	Pass RPD	7.9	8.6	RPD	-8.6	Pass RPD
Copper (Cu)-Total	mg/kg	30	45	118	137	RPD	-14.9	Pass RPD	0.50	62	85	RPD	-31.3	Pass RPD	73.1	59.2	RPD	21	Pass RPD	31.5	42.3	RPD	-29.3	Pass RPD
Iron (Fe)-Total	mg/kg	30	45	33000	29400	RPD	11.5	Pass RPD	50	100000	90900	RPD	9.5	Pass RPD	50800	50000	RPD	1.6	Pass RPD	21300	24800	RPD	-15.2	Pass RPD
Lead (Pb)-Total	mg/kg	40	60	29.4	32	RPD	-8.5	Pass RPD	0.50	18.7	22.6	RPD	-18.9	Pass RPD	18.9	16.2	RPD	15.4	Pass RPD	7.8	9.6	RPD	-20	Pass RPD
Lithium (Li)-Total	mg/kg	30	45	34.9	36.9	RPD	-5.6	Pass RPD	2.0	14.3	19.7	RPD	-31.8	Pass RPD	19.6	18.6	RPD	5.2	Pass RPD	11.6	12.5	RPD	-7.5	Pass RPD
Magnesium (Mg)-Total	mg/kg	30	45	8060	9160	RPD	-12.8	Pass RPD	20	7660	10300	RPD	-29.4	Pass RPD	10800	12000	RPD	-10.5	Pass RPD	7780	8110	RPD	-4.2	Pass RPD
Manganese (Mn)-Total	mg/kg	30	45	365	397	RPD	-8.4	Pass RPD	1.0	2850	1220	RPD	80.1	Fail	519	1090	RPD	-71	Fail	358	445	RPD	-21.7	Pass RPD
Mercury (Hg)-Total	mg/kg	40	60	0.055	0.041	RPD	30.4	Pass RPD	0.0050	0.045	0.047	RPD	-3.5	Pass RPD	0.082	0.088	RPD	-7.3	Pass RPD	0.022	0.026	DIFF	-0.0044	Pass Diff
Molybdenum (Mo)-Total	mg/kg	40	60	7.2	6.4	RPD	12.6	Pass RPD	0.10	5.4	6.1	RPD	-11.1	Pass RPD	6.1	7.1	RPD	-15.8	Pass RPD	2.3	2.8	RPD	-20.7	Pass RPD
Nickel (Ni)-Total	mg/kg	30	45	51.9	53.4	RPD	-2.8	Pass RPD	0.50	109	110	RPD	-0.9	Pass RPD	124	120	RPD	3.3	Pass RPD	79.3	92.1	RPD	-14.9	Pass RPD
Phosphorus (P)-Total	mg/kg	30	45	647	770	RPD	-17.4	Pass RPD	50	977	1600	RPD	-48.4	Fail	822	1090	RPD	-28	Pass RPD	486	568	RPD	-15.6	Pass RPD
Potassium (K)-Total	mg/kg	40	60	3010	4100	RPD	-30.7	Pass RPD	100	2670	4170	RPD	-43.9	Pass RPD	3090	3550	RPD	-13.9	Pass RPD	1280	1330	RPD	-3.8	Pass RPD
Selenium (Se)-Total	mg/kg	30	45	0.62	0.76	DIFF	-0.14	Pass Diff	0.20	0.89	0.97	DIFF	-0.08	Pass Diff	0.82	0.94	DIFF	-0.12	Pass Diff	0.42	0.56	DIFF	-0.14	Pass Diff
Silver (Ag)-Total	mg/kg	40	60	0.52	0.64	RPD	-20.7	Pass RPD	0.10	0.28	0.32	DIFF	-0.04	Pass Diff	0.46	0.40	DIFF	0.06	Pass Diff	0.14	0.17	DIFF	-0.03	Pass Diff
Sodium (Na)-Total	mg/kg	40	60	165	198	DIFF	-33	Pass Diff	50	154	192	DIFF	-38	Pass Diff	192	287	DIFF	-95	Pass Diff	85	92	DIFF	-7	Pass Diff
Strontium (Sr)-Total	mg/kg	40	60	26	37.6	RPD	-36.5	Pass RPD	0.50	24.2	33.3	RPD	-31.7	Pass RPD	36.9	71.1	RPD	-63.3	Fail	28.6	33.2	RPD	-14.9	Pass RPD
Sulfur (S)-Total	mg/kg	30	45	1700	1700	DIFF	0	Pass Diff	1000	1900	2200	DIFF	-300	Pass Diff	2700	3100	DIFF	-400	Pass Diff	1600	2400	DIFF	-800	Pass Diff
Thallium (Tl)-Total	mg/kg	30	45	0.28	0.32	RPD	-12.3	Pass RPD	0.050	0.31	0.35	RPD	-13.1	Pass RPD	0.25	0.21	DIFF	0.031	Pass Diff	0.078	0.097	DIFF	-0.019	Pass Diff
Tin (Sn)-Total	mg/kg	40	60	*<2.0*	3.4	*<DL*	*<DL*	*<DL*	2.0	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*
Titanium (Ti)-Total	mg/kg	40	60	534	901	RPD	-51.1	Pass RPD	1.0	338	555	RPD	-48.6	Pass RPD	507	649	RPD	-24.6	Pass RPD	259	234	RPD	10.1	Pass RPD
Tungsten (W)-Total	mg/kg	30	45	0.95	1.5	DIFF	-0.5	Pass Diff	0.50	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*	1.2	1.5	DIFF	-0.27	Pass Diff	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*
Uranium (U)-Total	mg/kg	30	45	13.9	17.7	RPD	-24.1	Pass RPD	0.050	10.4	13.4	RPD	-25.2	Pass RPD	14.2	11.6	RPD	20.2	Pass RPD	3.7	4.6	RPD	-21.8	Pass RPD
Vanadium (V)-Total	mg/kg	30	45	29.1	37	RPD	-23.9	Pass RPD	0.20	31.7	43.7	RPD	-31.8	Pass RPD	43.3	41.4	RPD	4.5	Pass RPD	23.5	25.5	RPD	-8.2	Pass RPD
Zinc (Zn)-Total	mg/kg	30	45	116	116	RPD	0	Pass RPD	2.0	97.3	120	RPD	-20.9	Pass RPD	126	108	RPD	15.4	Pass RPD	51.4	62.9	RPD	-20.1	Pass RPD
Zirconium (Zr)-Total	mg/kg	30	45	4.8	3.2	DIFF	1.6	Pass Diff	1.0	2.1	2.0	DIFF	0.1	Pass Diff	3.9	1.2	DIFF	2.7	Fail	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*
Speciated Metals (µg/kg)																								
Methylmercury (as MeHg)	mg/kg	30	45	-	-	*<DL*	*<DL*	*<DL*	1.0	-	-	*<DL*	*<DL*	*<DL*	1.8	1.3	DIFF	0.52	Pass Diff	-	-	*<DL*	*<DL*	*<DL*

Notes:

[a] Field Dup Methods are based on the concentrations:

RPD = relative percent difference is used to compare field duplicates when the measured concentration is > 5x the DL

DIFF = when concentrations < 5* DL

[b] Results refer to the RPD or absolute difference in concentration

DQO for RPDs is < Field RPD values

DQO for DIFF is < 2x the DL

Italicized numbers are below detection limits.

Table A-8. Field duplicate results for the sediment cores collected in 2023.

Month		Relative Percent Difference DQOs (%)		DUP-SC-12 (A20-SC-7)						DUP-SC-13 (DS1-SC-4)						DUP-SC-15 (INUG-SC-1)					DUP-SC-16 (PDL-SC-2)				
Station	Units			A20-SC-7	DUP-SC-12	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	August MDLs	DS1-SC-4	DUP-SC-13	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	INUG-SC-1	DUP-SC-15	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	PDL-SC-2	DUP-SC-16	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome
Date Sampled				16-Aug-2023	16-Aug-2023					17-Aug-2023	17-Aug-2023				22-Aug-2023	22-Aug-2023				22-Aug-2023	22-Aug-2023			
ALS Sample ID		Lab	Field	VA23C0344-037	VA23C0344-127					VA23C0344-024	VA23C0344-128				VA23C0344-111	VA23C0344-129				VA23C0344-102	VA23C0344-130			
Parameter																								
Physical Tests																								
Moisture (%)	%	20	30	87	87	RPD	0.8	Pass RPD	0.25	69.1	76.6	RPD	-10.3	Pass RPD	84.5	85.5	RPD	-1.2	Pass RPD	82	79.8	RPD	2.7	Pass RPD
pH (Laboratory)	pH units	5.0	7.5	5.3	5.2	RPD	2.7	Pass RPD	0.10	5.3	5.7	RPD	-7.5	Fail	5.1	5.2	RPD	-2.3	Pass RPD	5.1	5.0	RPD	3.2	Pass RPD
Total Metals																								
Aluminum (Al)-Total	mg/kg	40	60	20900	17300	RPD	18.8	Pass RPD	50	19100	18900	RPD	1.1	Pass RPD	22800	25200	RPD	-10	Pass RPD	20200	24500	RPD	-19.2	Pass RPD
Antimony (Sb)-Total	mg/kg	30	45	0.20	0.22	DIFF	-0.02	Pass Diff	0.10	0.29	0.29	DIFF	0	Pass Diff	0.16	0.18	DIFF	-0.02	Pass Diff	0.29	0.28	DIFF	0.01	Pass Diff
Arsenic (As)-Total	mg/kg	30	45	127	163	RPD	-24.8	Pass RPD	0.10	27.1	177	RPD	-146.9	Fail	55	23.2	RPD	81.3	Fail	135	106	RPD	24.1	Pass RPD
Barium (Ba)-Total	mg/kg	40	60	172	200	RPD	-15.1	Pass RPD	0.50	163	212	RPD	-26.1	Pass RPD	133	152	RPD	-13.3	Pass RPD	107	113	RPD	-5.5	Pass RPD
Beryllium (Be)-Total	mg/kg	30	45	2.0	1.7	RPD	21.1	Pass RPD	0.10	1.1	1.2	RPD	-9.8	Pass RPD	1.3	1.3	RPD	-4.6	Pass RPD	0.95	1.1	RPD	-10.9	Pass RPD
Bismuth (Bi)-Total	mg/kg	30	45	0.93	0.74	DIFF	0.19	Pass Diff	0.20	0.76	0.76	DIFF	0	Pass Diff	1.2	1.2	RPD	-4.2	Pass RPD	0.92	0.99	DIFF	-0.07	Pass Diff
Boron (B)-Total	mg/kg	30	45	7.6	8.2	DIFF	-0.6	Pass Diff	5.0	16.3	20.4	DIFF	-4.1	Pass Diff	8.8	8.8	DIFF	0	Pass Diff	7.8	8.1	DIFF	-0.3	Pass Diff
Cadmium (Cd)-Total	mg/kg	30	45	0.16	0.28	RPD	-55	Fail	0.020	0.35	0.34	RPD	3.5	Pass RPD	0.24	0.28	RPD	-15.1	Pass RPD	0.28	0.22	RPD	22.7	Pass RPD
Calcium (Ca)-Total	mg/kg	30	45	2500	2620	RPD	-4.7	Pass RPD	50	2380	2370	RPD	0.4	Pass RPD	1810	1910	RPD	-5.4	Pass RPD	1910	2090	RPD	-9	Pass RPD
Chromium (Cr)-Total	mg/kg	30	45	54.4	42.1	RPD	25.5	Pass RPD	0.50	84.4	75.2	RPD	11.5	Pass RPD	103	107	RPD	-3.8	Pass RPD	127	139	RPD	-9	Pass RPD
Cobalt (Co)-Total	mg/kg	30	45	15.3	28.1	RPD	-59	Fail	0.10	17.6	16.6	RPD	5.8	Pass RPD	15.4	19.4	RPD	-23	Pass RPD	20.5	19	RPD	7.6	Pass RPD
Copper (Cu)-Total	mg/kg	30	45	41.1	32.3	RPD	24	Pass RPD	0.50	18.4	18.1	RPD	1.6	Pass RPD	45.3	45.6	RPD	-0.7	Pass RPD	50.6	52.4	RPD	-3.5	Pass RPD
Iron (Fe)-Total	mg/kg	30	45	131000	167000	RPD	-24.2	Pass RPD	50	40400	66600	RPD	-49	Fail	79000	63500	RPD	21.8	Pass RPD	66500	56500	RPD	16.3	Pass RPD
Lead (Pb)-Total	mg/kg	40	60	17.8	16.2	RPD	9.4	Pass RPD	0.50	18.9	18.9	RPD	0	Pass RPD	13.3	14.3	RPD	-7.2	Pass RPD	15.6	15.6	RPD	0	Pass RPD
Lithium (Li)-Total	mg/kg	30	45	16.4	13.8	RPD	17.2	Pass RPD	2.0	22.4	23.3	RPD	-3.9	Pass RPD	25.8	26.8	RPD	-3.8	Pass RPD	24.9	28.7	RPD	-14.2	Pass RPD
Magnesium (Mg)-Total	mg/kg	30	45	7010	5690	RPD	20.8	Pass RPD	20	12100	11500	RPD	5.1	Pass RPD	9580	10600	RPD	-10.1	Pass RPD	10500	12200	RPD	-15	Pass RPD
Manganese (Mn)-Total	mg/kg	30	45	1720	4900	RPD	-96.1	Fail	1.0	1580	7240	RPD	-128.3	Fail	1410	2100	RPD	-39.3	Pass RPD	1260	691	RPD	58.3	Fail
Mercury (Hg)-Total	mg/kg	40	60	0.046	0.040	RPD	14.7	Pass RPD	0.0050	0.065	0.070	RPD	-7.3	Pass RPD	0.029	0.031	RPD	-8.6	Pass RPD	0.023	0.018	DIFF	0.0044	Pass Diff
Molybdenum (Mo)-Total	mg/kg	40	60	8.3	8.3	RPD	-0.7	Pass RPD	0.10	2.3	10.7	RPD	-128.2	Fail	9.4	7.9	RPD	18.4	Pass RPD	4.7	4.2	RPD	11.1	Pass RPD
Nickel (Ni)-Total	mg/kg	30	45	35.3	42.5	RPD	-18.5	Pass RPD	0.50	60.4	53.8	RPD	11.6	Pass RPD	82.3	91	RPD	-10	Pass RPD	104	103	RPD	1	Pass RPD
Phosphorus (P)-Total	mg/kg	30	45	1490	1380	RPD	7.7	Pass RPD	50	703	1550	RPD	-75.2	Fail	734	649	RPD	12.3	Pass RPD	650	740	RPD	-12.9	Pass RPD
Potassium (K)-Total	mg/kg	40	60	3000	2560	RPD	15.8	Pass RPD	100	2580	2580	RPD	0	Pass RPD	3510	3800	RPD	-7.9	Pass RPD	2720	2950	RPD	-8.1	Pass RPD
Selenium (Se)-Total	mg/kg	30	45	0.75	0.76	DIFF	-0.01	Pass Diff	0.20	0.34	0.44	DIFF	-0.1	Pass Diff	0.71	0.59	DIFF	0.12	Pass Diff	0.58	0.60	DIFF	-0.02	Pass Diff
Silver (Ag)-Total	mg/kg	40	60	0.20	0.16	DIFF	0.04	Pass Diff	0.10	0.15	0.15	DIFF	0	Pass Diff	0.15	0.16	DIFF	-0.01	Pass Diff	0.20	0.20	DIFF	0	Pass Diff
Sodium (Na)-Total	mg/kg	40	60	193	193	DIFF	0	Pass Diff	50	125	130	DIFF	-5	Pass Diff	170	163	DIFF	7	Pass Diff	100	106	DIFF	-6	Pass Diff
Strontium (Sr)-Total	mg/kg	40	60	26.2	25.6	RPD	2.3	Pass RPD	0.50	29.9	31.7	RPD	-5.8	Pass RPD	24.4	26.4	RPD	-7.9	Pass RPD	21.4	24.2	RPD	-12.3	Pass RPD
Sulfur (S)-Total	mg/kg	30	45	1900	1700	DIFF	200	Pass Diff	1000	*<1000*	*<1000*	*<DL*	*<DL*	*<DL*	*<1000*	*<1000*	*<DL*	*<DL*	*<DL*	*<1000*	*<1000*	*<DL*	*<DL*	*<DL*
Thallium (Tl)-Total	mg/kg	30	45	0.25	0.32	RPD	-22.1	Pass RPD	0.050	0.23	0.22	DIFF	0.011	Pass Diff	0.23	0.26	DIFF	-0.024	Pass Diff	0.20	0.20	DIFF	0.002	Pass Diff
Tin (Sn)-Total	mg/kg	40	60	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*	2.0	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*	*<2.0*	*<2.0*	*<DL*	*<DL*	*<DL*
Titanium (Ti)-Total	mg/kg	40	60	439	405	RPD	8.1	Pass RPD	1.0	606	465	RPD	26.3	Pass RPD	639	550	RPD	15	Pass RPD	512	542	RPD	-5.7	Pass RPD
Tungsten (W)-Total	mg/kg	30	45	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*	0.50	*<0.50*	0.58	*<DL*	*<DL*	*<DL*	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*	*<0.50*	*<0.50*	*<DL*	*<DL*	*<DL*
Uranium (U)-Total	mg/kg	30	45	13.6	10.6	RPD	24.8	Pass RPD	0.050	4.7	4.9	RPD	-5.2	Pass RPD	14.9	15.1	RPD	-1.3	Pass RPD	8.5	8.7	RPD	-2.8	Pass RPD
Vanadium (V)-Total	mg/kg	30	45	29.6	24.5	RPD	18.9	Pass RPD	0.20	41.5	39.4	RPD	5.2	Pass RPD	35.8	35.2	RPD	1.7	Pass RPD	35.2	37.6	RPD	-6.6	Pass RPD
Zinc (Zn)-Total	mg/kg	30	45	97.6	84	RPD	15	Pass RPD	2.0	97.4	91.1	RPD	6.7	Pass RPD	85.9	89.3	RPD	-3.9	Pass RPD	85.3	84.2	RPD	1.3	Pass RPD
Zirconium (Zr)-Total	mg/kg	30	45	2.6	1.3	DIFF	1.3	Pass Diff	1.0	11	6.1	RPD	57.3	Fail	2.3	2.8	DIFF	-0.5	Pass Diff	1.3	2.4	DIFF	-1.1	Pass Diff
Speciated Metals (µg/kg)																								
Methylmercury (as MeHg)	mg/kg	30	45	0.88	0.32	DIFF	0.557	Pass Diff	1.0	-	-	*<DL*	*<DL*	*<DL*	0.20	0.15	DIFF	0.049	Pass Diff	-	-	*<DL*	*<DL*	*<DL*

Notes:

[a] Field Dup Methods are based on the concentrations:

RPD = relative percent difference is used to compare field duplicates when the measured concentration is > 5x the DL

DIFF = when concentrations < 5* DL

[b] Results refer to the RPD or absolute difference in concentration

DQO for RPDs is < Field RPD values

DQO for DIFF is < 2x the DL

Italicized numbers are below detection limits.

Table A-9. Field duplicate results for the sediment grabs collected in 2023.

Month		Relative Percent Difference DQOs (%)			DUP-1 (TPE-4)					DUP-2 (WAL-1)					DUP-3 (INUG-2)				
Station	Units			August DLs	TPE-4	Grab-DUP-1	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	Grab-DUP-2	WAL-1	Field Dup	Result [b]	Outcome	INUG-2	Grab-DUP-3	Field Dup	Result [b]	Outcome
Date Sampled					11-Aug-2023	11-Aug-2023				21-Aug-2023	21-Aug-2023				22-Aug-2023	22-Aug-2023			
ALS Sample ID		Lab	Field		VA23C0329-016	VA23C0329-097				VA23C0329-085	VA23C0329-007				VA23C0329-032	VA23C0329-086			
Parameter					Sediment	Sediment				Sediment	Sediment				Sediment	Sediment			
Physical Tests																			
Moisture (%)	%	20	30	0.25	80.8	84	RPD	-3.9	Pass RPD	87.3	86.7	RPD	0.7	Pass RPD	82.7	82.9	RPD	-0.2	Pass RPD
Particle Size																			
Gravel (>2mm)	%	-	40	1.0	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*
Sand (2.0mm - 0.063mm)	%	-	40	1.0	8.0	1.0	DIFF	7.0	Fail	3.7	4.1	DIFF	-0.4	Pass Diff	4.9	2.4	DIFF	2.5	Fail
Silt (0.063mm - 0.004mm)	%	-	40	1.0	67.4	71	RPD	-5.2	Pass RPD	81.8	84.3	RPD	-3	Pass RPD	72.3	83.5	RPD	-14.4	Pass RPD
Clay (<0.004mm)	%	-	40	1.0	24.6	28	RPD	-13	Pass RPD	14.5	11.6	RPD	22.2	Pass RPD	22.8	14.1	RPD	47.2	Fail
Organic / Inorganic Carbon																			
Carbon, total organic [TOC]	%	20	30	0.050	3.1	3.5	RPD	-12	Pass RPD	6.7	6.8	RPD	-1.5	Pass RPD	3.7	3.7	RPD	-0.8	Pass RPD

Notes:

[a] Field Dup Methods are based on the concentrations:

RPD = relative percent difference is used to compare field duplicates when the measured concentration is > 5x the DL

DIFF = when concentrations < 5* DL

[b] Results refer to the RPD or absolute difference in concentration

DQO for RPDs is < Field RPD values

DQO for DIFF is < 2x the DL

Italicized numbers are below detection limits.

Table A-9. Field duplicate results for the sediment grabs collected in 2023.

Month		Relative Percent Difference DQOs (%)		DUP-5 (LK8-4)						DUP-6 (A76-1)					DUP-7 (MAM-1)					DUP-8 (NEM-4)				
Station	Units			August DLs	LK8-4	Grab-DUP-5	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	A76-1	Grab-DUP-6	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	MAM-1	Grab-DUP-7	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	NEM-4	Grab-DUP-8	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome
Date Sampled					20-Aug-2023	20-Aug-2023				13-Aug-2023	23-Aug-2023				15-Aug-2023	15-Aug-2023				16-Aug-2023	16-Aug-2023			
ALS Sample ID		Lab	Field		VA23C0329-082	VA23C0329-087				VA23C0329-061	VA23C0329-088				VA23C0329-049	VA23C0329-089				VA23C0329-040	VA23C0329-090			
Parameter					Sediment	Sediment				Sediment	Sediment				Sediment	Sediment				Sediment	Sediment			
Physical Tests																								
Moisture (%)	%	20	30	0.25	81.1	76.2	RPD	6.2	Pass RPD	89.4	86.5	RPD	3.3	Pass RPD	88.3	87.9	RPD	0.5	Pass RPD	86.4	87.3	RPD	-1	Pass RPD
Particle Size																								
Gravel (>2mm)	%	-	40	1.0	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*
Sand (2.0mm - 0.063mm)	%	-	40	1.0	4.6	9.0	DIFF	-4.4	Fail	1.0	*<1.0*	*<DL*	*<DL*	*<DL*	1.5	*<1.0*	*<DL*	*<DL*	*<DL*	24.9	23.2	RPD	7.1	Pass RPD
Silt (0.063mm - 0.004mm)	%	-	40	1.0	77.2	82.2	RPD	-6.3	Pass RPD	79.2	80.7	RPD	-1.9	Pass RPD	85.7	85.3	RPD	0.5	Pass RPD	66	70.3	RPD	-6.3	Pass RPD
Clay (<0.004mm)	%	-	40	1.0	18.2	8.8	RPD	69.6	Fail	19.8	18.9	RPD	4.7	Pass RPD	12.8	14	RPD	-9	Pass RPD	9.1	6.5	RPD	33.3	Pass RPD
Organic / Inorganic Carbon																								
Carbon, total organic [TOC]	%	20	30	0.050	4.7	2.6	RPD	59.3	Fail	8.5	8.0	RPD	6.2	Pass RPD	10.6	10.1	RPD	4.8	Pass RPD	7.6	7.8	RPD	-2.9	Pass RPD

Notes:

[a] Field Dup Methods are based on the concentrations:

RPD = relative percent difference is used to compare field duplicates when the measured concentration is > 5x the DL

DIFF = when concentrations < 5* DL

[b] Results refer to the RPD or absolute difference in concentration

DQO for RPDs is < Field RPD values

DQO for DIFF is < 2x the DL

Italicized numbers are below detection limits.

Table A-9. Field duplicate results for the sediment grabs collected in 2023.

Month	Units	Relative Percent Difference DQOs (%)		DUP-9 (A20-3)						DUP-10 (DS1-5)				
Station				August MDLs	A20-3	Grab-DUP-9	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome	DS1-5	Grab-DUP-10	Field Dup Method [a]	Result [b] (RPD or Diff)	Outcome
Date Sampled					16-Aug-2023	16-Aug-2023				17-Aug-2023	17-Aug-2023			
ALS Sample ID		Lab	Field		VA23C0329-057	VA23C0329-091				VA23C0329-071	VA23C0329-092			
Parameter					Sediment	Sediment								
Physical Tests														
Moisture (%)	%	20	30	0.25	87.1	87.9	RPD	-0.9	Pass RPD	59.3	56.4	RPD	5	Pass RPD
Particle Size														
Gravel (>2mm)	%	-	40	1.0	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*	*<1.0*	*<1.0*	*<DL*	*<DL*	*<DL*
Sand (2.0mm - 0.063mm)	%	-	40	1.0	1.1	*<1.0*	*<DL*	*<DL*	*<DL*	1.2	*<1.0*	*<DL*	*<DL*	*<DL*
Silt (0.063mm - 0.004mm)	%	-	40	1.0	74.3	75.7	RPD	-1.9	Pass RPD	80.8	80.9	RPD	-0.1	Pass RPD
Clay (<0.004mm)	%	-	40	1.0	24.6	24.2	RPD	1.6	Pass RPD	18	18.2	RPD	-1.1	Pass RPD
Organic / Inorganic Carbon														
Carbon, total organic [TOC]	%	20	30	0.050	5.2	5.5	RPD	-5.2	Pass RPD	1.2	1.3	RPD	-9.9	Pass RPD

Notes:

[a] Field Dup Methods are based on the concentrations:

RPD = relative percent difference is used to compare field duplicates when the measured concentration is > 5x the DL

DIFF = when concentrations < 5* DL

[b] Results refer to the RPD or absolute difference in concentration

DQO for RPDs is < Field RPD values

DQO for DIFF is < 2x the DL

Italicized numbers are below detection limits.

Table A-10. QA/QC results for sediment grab sample hydrocarbon and PAH analyses, 2023.

Analyte	Detection Limits	Lab DQO Values	Field DQO Values[1]	COMP-DUP-1			COMP-DUP-2		
				WAL-COMP	Dup[2]	RPD (%)	MAM-COMP	Dup	RPD (%)
Date Sampled				21-Aug-2023	21-Aug-2023		15-Aug-2023	15-Aug-2023	
ALS Sample ID				VA23C0329-012	VA23C0329-093		VA23C0329-054	VA23C0329-094	
Physical Parameters									
Moisture (%)	*0.25*	20	30	89.4	89.3	0	90	90	0.0
Aggregate Organics (mg/kg)									
Mineral Oil and Grease	*500*	<1000	1500	*<500*	*<500*	-	*<500*	*<500*	-
Hydrocarbons (mg/kg)									
EPH10-19	*200*	<400	600	*<580*	*<560*	-	*<520*	*<550*	-
EPH19-32	*200*	<400	600	*<580*	*<560*	-	*<520*	*<550*	-
LEPH	*200*	<400	600	*<580*	*<560*	-	*<520*	*<550*	-
HEPH	*200*	<400	600	*<580*	*<560*	-	*<520*	*<550*	-
Hydrocarbons Surrogates (%)									
2-Bromobenzotrifluoride	*5.8*	60-140	17.4	125	117	6.6	112	110	1.8
Polycyclic Aromatic Hydrocarbons (mg/kg)									
acenaphthene	*0.005*	<0.01	0.015	*<0.0291*	*<0.0280*	-	*<0.0262*	*<0.0274*	-
acenaphthylene	*0.005*	<0.01	0.015	*<0.0291*	*<0.0280*	-	*<0.0262*	*<0.0274*	-
acridine	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
anthracene	*0.004*	<0.008	0.012	*<0.0291*	*<0.0280*	-	*<0.0262*	*<0.0274*	-
benz(a)anthracene	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
benzo(a)pyrene	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
benzo(b+j)fluoranthene	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
benzo(b+j+k)fluoranthene	*0.015*	<0.03	0.045	*<0.041*	*<0.040*	-	*<0.037*	*<0.038*	-
benzo(g,h,i)perylene	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
benzo(k)fluoranthene	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
chrysene	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
dibenz(a,h)anthracene	*0.005*	<0.01	0.015	*<0.0700*	*<0.0280*	-	*<0.0262*	*<0.0274*	-
fluoranthene	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
fluorene	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
indeno(1,2,3-c,d)pyrene	*0.01*	<0.02	0.03	*<0.045*	*<0.028*	-	*<0.026*	*<0.027*	-
methylnaphthalene, 1-	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
methylnaphthalene, 2-	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
naphthalene	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
phenanthrene	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
pyrene	*0.01*	<0.02	0.03	*<0.029*	*<0.028*	-	*<0.026*	*<0.027*	-
quinoline	*0.01*	<0.02	0.03	*<0.029*	0.04	-	*<0.026*	*<0.027*	-
PAH Surrogates (%)									
acridine-d9	*0.1*	35	52.5	124	123	0.8	117	123	-5.0
chrysene-d12	*0.1*	35	52.5	117	114	2.6	116	127	-9.1
naphthalene-d8	*0.1*	40	60	130	126	3.1	117	123	-5.0
phenanthrene-d10	*0.1*	35	52.5	129	128	0.8	123	130	-5.5

Notes:

[1] The DQO for field duplicates is an RPD 1.5x the laboratory DQO or 1.5x twice the DL when lab DQOs are "<" values.

[2] Field Dup grab samples are homogenized duplicates - the original and duplicate samples were split from the same homogenized bowl of sediment.

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are only calculated when both samples are above detection.

Bold RPDs	**RPD values exceeded but < 10 x MDL.**
Shaded RPDs	RPD values exceeded and > 10 x MDL.

Italicized numbers are below detection limits.

Table A-11. Field QA/QC data for phytoplankton for all CREMP study areas, 2023.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		
WAL - 131	6-Jul-23	0	2.5	181	31	13	35	262	33	0.79
DUP - 1	1-Jul-23	0.62	2.1	201	22	6.6	8.4	240	30	0.80
RPD (%)		**NA**	18	-10	34	**63**	**122**	8.5	9.5	-1.1
TPE - 162	3-Jul-23	0	0.073	80	39	2.8	21	142	21	0.63
DUP - 2	1-Jul-23	0	0.14	106	10	3.8	20	139	21	0.64
RPD (%)			**-60**	-28	**116**	-30	5.5	1.8	0	-1.0
NEM - 80	30-Jun-23	0	0.72	98	304	17	1.5	422	24	0.86
DUP - 3	1-Jul-23	0	4.1	113	359	19	3.6	499	19	0.87
RPD (%)			**-140**	-14	-17	-10	**-82**	-17	23	-0.94
A76 - 71	1-Jul-23	0	0.29	214	32	25	8.1	279	24	0.59
DUP - 4	1-Jul-23	0	0.79	155	30	35	9.6	230	24	0.84
RPD (%)			**-92**	32	8.1	-35	-17	19	0	-36
SP - 165	13-Aug-23	1.3	7.6	127	17	31	16	199	35	0.87
DUP - 1	13-Aug-23	1.3	12	64	25	17	20	138	33	0.83
RPD (%)		0	-44	**66**	-40	**59**	-20	36	5.9	4.1
BAP - 88	17-Aug-23	0.40	3.6	42	13	17	2.2	78	23	0.89
DUP - 2	17-Aug-23	0	1.7	20	9.3	2.1	0.84	34	23	0.71
RPD (%)		**NA**	**71**	**72**	37	**156**	**90**	**80**	0	23
MAM - 82	15-Aug-23	0.20	20	44	77	17	15	173	25	0.65
DUP - 3	15-Aug-23	0.037	22	30	24	24	11	112	25	0.86
RPD (%)		**136**	-9.2	36	**106**	-36	30	43	0	-28
A20 - 75	18-Aug-23	0.44	21	211	100	12	66	411	29	0.81
DUP - 4	1-Aug-23	0.52	16	218	99	15	68	416	30	0.80
RPD (%)		-17	25	-3.1	1.6	-22	-2.8	-1.3	-3.4	1.9
PDL - 119	6-Sep-23	5.9	4.4	63	24	3.5	13	114	28	0.89
DUP - 1	6-Sep-23	7.3	2.2	65	15	0.15	12	101	28	0.83
RPD (%)		-21	**66**	-3.2	46	**184**	10	12	0	6.3
BAP - 89	8-Sep-23	0	3.5	23	8.2	13	1.3	49	20	0.78
DUP - 2	8-Sep-23	0	2.9	29	15	16	0	62	21	0.81
RPD (%)			20	-22	**-57**	-21	**NA**	-24	-4.9	-3.7
NEM - 84	8-Sep-23	3.3	11	53	15	1.0	16	100	23	0.86
DUP - 3	1-Sep-23	2.9	8.0	22	16	5.0	1.1	55	20	0.83
RPD (%)		11	36	**82**	-1.6	**-131**	**174**	**59**	14	3.8

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-11. Field QA/QC data for phytoplankton for all CREMP study areas, 2023.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
WAL - 131	6-Jul-23	0	87,008	2,152,016	297,040	97,992	1,400	2,635,456
DUP - 1	1-Jul-23	7,184	107,960	1,736,944	201,464	32,336	1,800	2,087,688
RPD (%)		**NA**	-21	21	38	**101**	-25	23
TPE - 162	3-Jul-23	0	200	1,047,680	187,400	8,384	3,400	1,247,064
DUP - 2	1-Jul-23	0	28,736	1,205,528	207,368	9,184	3,600	1,454,416
RPD (%)			**-197**	-14	-10	-9.1	-5.7	-15
NEM - 80	30-Jun-23	0	14,368	1,362,976	1,452,544	36,936	400	2,867,224
DUP - 3	1-Jul-23	0	79,024	1,720,576	1,477,448	39,336	400	3,316,784
RPD (%)			**-138**	-23	-1.7	-6.3	0	-15
A76 - 71	1-Jul-23	0	28,736	5,333,744	306,840	126,744	1,400	5,797,464
DUP - 4	1-Jul-23	0	57,472	1,704,224	302,424	215,552	1,800	2,281,472
RPD (%)			**-67**	**103**	1.4	**-52**	-25	**87**
SP - 165	13-Aug-23	7,184	977,624	1,660,104	314,112	157,864	2,400	3,119,288
DUP - 1	13-Aug-23	7,184	374,768	1,149,640	301,344	71,056	3,200	1,907,192
RPD (%)		0	**89**	36	4.1	**76**	-29	48
BAP - 88	17-Aug-23	7,184	337,648	705,432	160,496	116,144	400	1,327,304
DUP - 2	17-Aug-23	0	64,856	474,144	74,672	7,984	200	621,856
RPD (%)		**NA**	**136**	39	**73**	**174**	**67**	**72**
MAM - 82	15-Aug-23	1,200	934,720	912,568	2,932,472	62,672	9,584	4,853,216
DUP - 3	15-Aug-23	200	843,328	733,168	355,616	43,336	2,800	1,978,448
RPD (%)		**143**	10	22	**157**	36	**110**	**84**
A20 - 75	18-Aug-23	2,400	554,168	1,861,856	2,301,296	46,904	13,600	4,780,224
DUP - 4	1-Aug-23	3,200	453,392	1,862,456	2,399,672	28,552	14,400	4,761,672
RPD (%)		-29	20	-0.03222	-4.2	49	-5.7	0.39
PDL - 119	6-Sep-23	36,968	195,568	661,728	265,824	15,168	1,400	1,176,656
DUP - 1	6-Sep-23	59,520	187,384	841,728	285,376	200	1,400	1,375,608
RPD (%)		-47	4.3	-24	-7.1	**195**	0	-16
BAP - 89	8-Sep-23	0	165,232	567,536	59,888	66,256	200	859,112
DUP - 2	8-Sep-23	0	122,128	632,592	125,192	87,608	0	967,520
RPD (%)			30	-11	**-71**	-28	**NA**	-12
NEM - 84	8-Sep-23	16,000	222,704	806,808	403,904	600	1,000	1,451,016
DUP - 3	1-Sep-23	13,200	165,232	639,376	417,872	22,552	200	1,258,432
RPD (%)		19	30	23	-3.4	**-190**	**133**	14

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-12. Laboratory QA/QC data for phytoplankton for all CREMP study areas, 2023.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
A76 - 72	1-Jul-23	0	0.68	154	32	27	18	232	22	0	93,392	1,667,120	325,392	162,064	3,200	2,251,168
A76 - 72R	1-Jul-23	0	0.70	142	32	23	14	212	23	0	43,104	1,543,592	434,536	145,896	2,600	2,169,728
RPD (%)			-2.0	8.4	1.4	13	23	9.0	-4.4		**74**	7.7	-29	11	21	3.7
INUG - 151	29-Jun-23	0	3.1	172	49	18	47	290	30	0	43,904	2,223,672	363,248	70,056	3,000	2,703,880
INUG - 151R	29-Jun-23	0	3.3	176	62	21	19	282	29	0	100,776	2,168,000	402,768	105,176	2,800	2,779,520
RPD (%)			-5.9	-2.1	-23	-18	**84**	2.7	3.4		**-79**	2.5	-10	-40	6.9	-2.8
MAM - 80	3-Jul-23	0	2.7	79	403	65	0.79	550	26	0	244,256	1,488,288	1,018,344	151,528	200	2,902,616
MAM - 80R	3-Jul-23	0	2.2	88	435	73	1.1	599	26	0	265,808	1,430,216	981,824	188,248	200	2,866,296
RPD (%)			20	-11	-7.8	-11	-34	-8.6	0		-8.5	4.0	3.7	-22	0	1.3
WAL - 131	6-Jul-23	0	2.5	181	31	13	35	262	33	0	87,008	2,152,016	297,040	97,992	1,400	2,635,456
WAL - 131R	6-Jul-23	0	1.3	185	25	9.2	6.1	227	30	0	58,072	2,180,552	311,424	41,120	1,200	2,592,368
RPD (%)			**66**	-2.5	19	33	**140**	14	9.5		40	-1.3	-4.7	**82**	15	1.6
BBD - 88	18-Aug-23	0	5.4	100	12	19	1.1	137	31	0	266,808	1,609,416	86,224	223,304	200	2,185,952
BBD - 88R	18-Aug-23	0	6.3	79	7.5	14	7.4	114	30	0	224,104	1,580,880	85,424	159,048	800	2,050,256
RPD (%)			-15	23	45	29	**-148**	18	3.3		17	1.8	0.93	34	**-120**	6.4
LK8 - 22	19-Aug-23	0.86	3.8	77	13	0.60	8.9	104	28	4,200	252,040	920,352	220,520	7,184	1,800	1,406,096
LK8 - 22R	19-Aug-23	1.3	2.3	97	12	0.74	6.1	119	29	7,200	301,928	1,200,928	219,720	400	1,200	1,731,376
RPD (%)		-44	49	-23	8.4	-20	37	-13	-3.5	**-53**	-18	-26	0.36	**179**	40	-21
PDL - 117	22-Aug-23	6.6	7.4	130	4.6	4.7	13	166	30	32,384	296,344	1,402,280	75,040	22,552	8,984	1,837,584
PDL - 117R	22-Aug-23	9.0	7.4	146	5.3	5.3	11	184	32	51,352	217,520	1,575,496	81,424	16,168	1,400	1,943,360
RPD (%)		-30	-0.56	-12	-14	-11	14	-10	-6.5	-45	31	-12	-8.2	33	**146**	-5.6
WAL - 133	21-Aug-23	0.064	16	101	17	22	24	180	39	400	806,008	1,100,152	265,624	52,104	10,984	2,235,272
WAL - 133R	21-Aug-23	0.15	16	92	23	25	23	180	36	800	769,488	921,552	336,464	48,120	16,968	2,093,392
RPD (%)		**-78**	-0.35	9.4	-30	-13	2.1	0.13	8.0	**-67**	4.6	18	-24	8.0	-43	6.6
A20 - 78	7-Sep-23	0	65	483	114	29	38	729	38	0	1,165,408	2,076,776	2,819,544	86,824	1,600	6,150,152
A20 - 78R	7-Sep-23	0.11	63	484	108	34	14	703	38	600	1,128,888	2,156,800	2,890,184	102,792	1,200	6,280,464
RPD (%)		**NA**	3.4	-0.21	5.3	-15	**92**	3.7	0	**NA**	3.2	-3.8	-2.5	-17	29	-2.1
BBD - 89	8-Sep-23	0	3.8	22	25	14	7.9	72	22	0	64,856	704,232	176,264	66,656	1,200	1,013,208
BBD - 89R	8-Sep-23	0	1.8	30	25	16	5.4	78	22	0	71,840	654,144	132,760	87,608	800	947,152
RPD (%)			**70**	-34	-0.41	-15	37	-8.7	0		-10	7.4	28	-27	40	6.7
MAM - 84	10-Sep-23	0	9.3	113	48	16	2.8	190	23	0	330,464	997,192	2,391,488	15,584	600	3,735,328
MAM - 84R	10-Sep-23	0.085	4.0	121	41	18	3.9	188	24	600	222,704	1,128,904	2,066,608	36,136	800	3,455,752
RPD (%)		**NA**	**79**	-6.7	16	-8.1	-34	1.1	-4.3	**NA**	39	-12	15	**-79**	-29	7.8
TPE - 166	7-Sep-23	0.88	4.1	75	35	15	5.6	135	25	9,384	503,480	474,944	1,550,560	34,936	1,200	2,574,504
TPE - 166R	7-Sep-23	2.0	4.1	70	38	15	9.6	138	25	25,352	546,184	517,848	1,477,320	41,920	2,000	2,610,624
RPD (%)		-79	-0.05248	7.1	-7.7	0.090	-53	-2.1	0	-92	-8.1	-8.6	4.8	-18	-50	-1.4

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-13. Percent recovery of benthic invertebrate samples for all CREMP study areas, 2023.

Area-Replicate	Number of Organisms Recovered	Number of Organisms in Re-sort	Percent Recovery
BAP-3	36	40	90.0%
BBD-3	173	177	97.7%
BES-1	141	146	96.6%
INUG-1	160	160	100.0%
NEM-1	193	195	99.0%
PDL-4	64	65	98.5%
PDL-5	64	65	98.5%
TPE-4	85	86	98.8%
		Average % Recovery	97.4%

Notes:

1. All samples were sorted in their entirety.
2. Pupae were not counted toward total number of taxa unless they were the sole representative of their taxa group.
3. Immatures were not counted toward total number of taxa unless they were the sole representative of their taxa group.
4. The exceptions to this rule are immature Tubificidae with and without hairs. Immature oligochaetes are counted as taxa as the probability of the immature being a unique taxa is high.
5. Indeterminates are unique taxa that could not be identified further for various reasons (e.g., small, damaged).

APPENDIX B
WATER CHEMISTRY DATA AND SUPPLEMENTAL PLOTS

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Water Chemistry – Meadowbank Study Area Lakes

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Table B1-1. Water quality results from the 2023 CREMP, Meadowbank study area lakes.

Lake & Area		Meadowbank Screening Values[2]			Inuggugayualik Lake (INUG)							
Month					March	March	July	July	August	August	September	September
Area-Replicate ID					INUG-148	INUG-149	INUG-150	INUG-151	INUG-152	INUG-153	INUG-154	INUG-155
Date	Aquatic Life Guideline[1]	Triggers		Thresholds	11-Mar-2023	11-Mar-2023	29-Jun-2023	29-Jun-2023	22-Aug-2023	22-Aug-2023	09-Sep-2023	09-Sep-2023
Time		Meadowbank	Wally Lake		12:10	12:35	16:15	17:00	10:00	10:46	13:50	14:30
ALS Sample ID					VA23A5681-001	VA23A5681-002	VA23B6138-002	VA23B6138-001	VA23C0684-001 VA23C0547-001	VA23C0547-002	VA23C1680-001	VA23C1680-002
Field Measurements (Surface 3m)												
Dissolved Oxygen (mg/L)					17	16	14	13	9.6	9.7	12	12
Specific Conductivity (µS/cm)					20	19	15	15	17	17	16	16
pH	6.5 - 9.0	6.4-8.15	6.54 - 8.34	6.5 - 9.0	**6.1**	**6.1**	7.2	7.0	**6.3**	**6.4**	**6.1**	**6.3**
Temperature (°C)					0.77	0.76	5.8	6.2	14	14	7.6	7.4
Physical Tests (mg/L)												
Conductivity (µS/cm)		27	37		20	19	16	17	18	18	18	18
Alkalinity - Total (as $CaCO_3$)		8.7	18		6.4	5.8	4.6	5.0	6.2	6.1	5.3	5.1
Alkalinity - Bicarbonate		8.7	18		6.4	5.8	4.6	5.0	6.2	6.1	5.3	5.1
Alkalinity - Carbonate		2.0	2.0		*<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*
Hardness (as CaCO3), dissolved		9.5	17		7.1	6.6	6.0	6.3	6.4	6.4	6.3	6.3
Hardness (as CaCO3), from total Ca/Mg					7.3	7.0	6.0	6.1	5.9	6.0	6.6	6.7
pH (Laboratory)	6.47-7.95	6.47-7.95	6.92 - 8.17	6.5 - 9.0	6.9	6.9	6.8	6.8	6.9	6.9	6.9	7.0
Total Dissolved Solids (TDS)		19	25		**22**	**24**	15	19	11	9.0	16	17
Total Suspended Solids (TSS)		3.0	3.0	5.0	*<1.0*	*<1.0*	1.2	*<1.0*	1.4	*<1.0*	1.4	*<1.0*
Turbidity (NTU)					*<0.10*	*<0.10*	0.33	0.37	0.21	0.23	0.45	0.53
Anions and Nutrients (mg/L)												
Total Kjeldahl Nitrogen		0.17	0.16		0.13	0.13	0.091	0.096	0.11	0.12	0.12	0.13
Ammonia (as N)[3]	***equation***	0.065	0.067	0.13	0.019	0.016	0.0056	0.0053	0.0075	*<0.0050*	0.0089	0.018
Bromide					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Chloride	120	60	60	120	0.91	0.87	0.72	0.72	0.78	0.78	0.79	0.77
Fluoride	0.12	0.088	0.080	0.12	0.073	0.069	0.065	0.065	0.068	0.068	0.072	0.066
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*
Nitrite (as N)	0.06	0.031	0.031	0.060	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Ortho Phosphate (as P)		0.0020	0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P) - Total	0.01	0.0051	0.0067	0.010	0.0032	0.0033	0.0037	0.0039	0.0031	0.0029	0.0035	0.0035
Phosphorus (P) - Total Diss.					*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	0.0023	0.0025	0.0021
Reactive Silica (as SiO_2)		1.0	1.1		*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Sulphate (SO_4)		65	65	128	1.1	1.0	0.93	0.94	0.81	0.82	0.90	0.88
Cyanides (mg/L)												
Free Cyanide	0.005				*<0.0010*	-	*<0.0020*	-	-	*<0.0020*	*<0.0020*	-
Total Cyanide					*<0.0010*	-	*<0.0020*	-	-	*<0.0020*	*<0.0020*	-
Organic / Inorganic Carbon (mg/L)												
Dissolved Organic Carbon		2.5	3.2		2.4	**2.7**	2.4	2.4	2.2	**2.6**	2.1	**2.6**
Total Organic Carbon		2.6	4.1		2.1	2.2	1.9	2.0	2.3	2.4	2.1	2.2
Total Metals (mg/L)												
Aluminum[3]	***equation***	0.053	0.053	0.10	0.0055	0.0050	0.012	0.0099	0.0067	0.0068	0.016	0.018
Antimony		0.0046	0.0046	0.0090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.005	0.0026	0.0026	0.0050	0.00013	0.00011	0.00011	0.00012	0.00012	0.00012	0.00012	0.00013
Barium		0.50	0.50	1.0	0.0020	0.0019	0.0021	0.0020	0.0018	0.0018	0.0021	0.0020
Beryllium		0.00012	0.00012	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth					*<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*
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*
Calcium		2.4	4.9		1.5	1.4	1.2	1.2	1.2	1.2	1.3	1.3
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium[4]	0.001	0.0025	0.0026	0.0050	*<0.00010*	*<0.00010*	0.00013	0.00012	*<0.00010*	*<0.00010*	0.00017	0.00014
Cobalt	0.00077			0.00077	*<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*	0.00056	*<0.00050*
Iron	0.3	0.15	0.16	0.30	*<0.010*	*<0.010*	0.026	0.023	0.018	0.017	0.037	0.036
Lead[3]	***equation***	0.00053	0.00053	0.0010	*<0.000050*	*<0.000050*	0.00006	*<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*
Magnesium		0.93	1.4		0.90	0.85	0.73	0.75	0.74	0.75	0.82	0.82
Manganese[3]	***equation***	0.32	0.33	***See note 3***	0.00041	0.00047	0.0061	0.0058	0.0032	0.0029	0.0029	0.0025
Mercury	0.000026	0.00002	0.00002	0.00003	*<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*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Nickel[3]	***equation***	0.013	0.013	0.025	*<0.00050*	*<0.00050*	*<0.00050*	0.00053	*<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*
Potassium		0.58	0.59		0.46	0.44	0.38	0.38	0.39	0.40	0.41	0.41
Rubidium					0.00062	0.00062	0.00052	0.00050	0.00057	0.00061	0.00066	0.00068
Selenium	0.001	0.00053	0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.20	0.65		0.20	0.19	**0.22**	**0.23**	0.20	0.20	**0.23**	**0.27**
Silver	0.0001	0.00013	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1.2	0.72		0.70	0.66	0.58	0.59	0.59	0.58	0.64	0.63
Strontium		1.25	1.26	2.5	0.0080	0.0074	0.0066	0.0066	0.0071	0.0070	0.0073	0.0074
Sulfur					*<0.50*	*<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*
Thallium	0.0008	0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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*	**0.00068**	0.00058
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.015	0.0075	0.0075	0.015	0.00005	0.00005	0.00007	0.00007	0.00005	0.00005	0.00006	0.00007
Vanadium		0.060	0.060	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc				0.0040	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved Metals (mg/L)												
Aluminum[3]	***equation***	0.026	0.026	0.050	0.0044	0.0037	0.0067	0.0054	0.0037	0.0035	0.0063	0.0063
Antimony		0.0046	0.0046	0.0090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic		0.0026	0.0026	0.0050	0.00011	0.00010	0.00010	*<0.00010*	*<0.00010*	0.00011	0.00012	0.00011
Barium		0.50	0.50	1.0	0.0019	0.0019	0.0020	0.0020	0.0018	0.0018	0.0019	0.0018
Beryllium		0.00012	0.00012	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth					*<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*
Cadmium		0.00002	0.00002	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		2.4	4.9		1.4	1.3	1.2	1.3	1.2	1.3	1.3	1.3
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium		0.00026	0.00026	0.0050	*<0.00010*	*<0.00010*	0.00011	0.00010	*<0.00010*	*<0.00010*	0.00012	0.00012
Cobalt				0.00077	*<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	0.00038	0.00039	0.00042	0.00041	0.00043	0.00042
Iron		0.16	0.16	0.30	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.011	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*
Lithium		0.0020	0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		0.93	1.4		0.86	0.82	0.73	0.76	0.80	0.79	0.77	0.77
Manganese[3]	***equation***	0.32	0.33	***See note 3***	0.00027	0.00026	0.0044	0.0043	0.00051	0.00064	0.00060	0.00058
Mercury		0.00002	0.00002	0.00003	*<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*	0.00008	0.00007	0.00010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Nickel		0.013	0.013	0.025	*<0.00050*	*<0.00050*	*<0.00050*	0.00051	*<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*
Potassium		0.58	0.59		0.46	0.45	0.39	0.39	0.44	0.44	0.41	0.41
Rubidium					0.00062	0.00065	0.00050	0.00052	0.00066	0.00060	0.00066	0.00060
Selenium		0.00053	0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.18	0.67		**0.18**	0.16	**0.20**	**0.19**	0.17	0.17	**0.19**	**0.21**
Silver		0.00013	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1.2	0.72		0.69	0.66	0.57	0.59	0.68	0.62	0.63	0.65
Strontium		1.3	1.3	2.5	0.0078	0.0074	0.0068	0.0072	0.0070	0.0068	0.0072	0.0073
Sulfur					*<0.50*	*<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*
Thallium		0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium		0.0075	0.0075	0.015	0.00005	0.00005	0.00006	0.00006	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*
Zinc[3]	***equation***	0.0018	0.0024	***See note 3***	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium					*<0.00020*	*<0.00020*	*<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)					0.021	-	-	*<0.020*	0.025	-	*<0.020*	-
Arsenobetaine (AsB)					*<0.050*	-	-	*<0.050*	*<0.050*	-	*<0.050*	-
Dimethylarsinic Acid (DMA)					*<0.020*	-	-	*<0.020*	*<0.020*	-	*<0.020*	-
Monomethylarsonic Acid (MMA)					*<0.020*	-	-	*<0.020*	*<0.020*	-	*<0.020*	-
Plant Pigments (µg/L)												
Chlorophyll a					0.25	0.30	0.42	0.37	0.64	0.42	0.30	0.29

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 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: 2022 Plan Update (Azimuth, 2022b) 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 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.

"-" not analyzed/not sampled.

Table B1-1. Water quality results from the 2023 CREMP, Meadowbank study area lakes.

Lake & Area		Meadowbank Screening Values[2]			Pipe Dream Lake (PDL)							
Month					March	March	July	July	August	August	September	September
Area-Replicate ID					PDL-113	PDL-114	PDL-115	PDL-116	PDL-117	PDL-118	PDL-119	PDL-120
Date	Aquatic Life Guideline[1]	Triggers		Thresholds	09-Mar-2023	09-Mar-2023	10-Jul-2023	10-Jul-2023	22-Aug-2023	22-Aug-2023	06-Sep-2023	06-Sep-2023
Time					10:33	11:08	14:00	15:55	10:30	11:22	14:00	15:55
ALS Sample ID		Meadowbank	Wally Lake		VA23A5826-001	VA23A5826-002	VA23B6138-017	VA23B6138-018	VA23C0684-003 VA23C0547-003	VA23C0547-004	VA23C1680-017	VA23C1680-018
Field Measurements (Surface 3m)												
Dissolved Oxygen (mg/L)					19	16	13	13	10	10	11	11
Specific Conductivity (µS/cm)					32	26	24	24	24	24	24	24
pH	6.5 - 9.0	6.4-8.15	6.54 - 8.34	6.5 - 9.0	7.4	7.0	6.6	6.8	7.2	7.1	**6.3**	6.5
Temperature (°C)					0.16	0.28	7.9	7.7	14	14	8.8	8.2
Physical Tests (mg/L)												
Conductivity (µS/cm)		27	37		**31**	27	25	25	25	25	25	25
Alkalinity - Total (as $CaCO_3$)		8.7	18		**10**	**9.1**	7.9	7.8	8.7	8.7	8.0	8.0
Alkalinity - Bicarbonate		8.7	18		**10**	**9.1**	7.9	7.8	8.7	8.7	8.0	8.0
Alkalinity - Carbonate		2.0	2.0		*<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*
Hardness (as CaCO3), dissolved		9.5	17		**12**	**10**	**10**	**10.0**	**10**	**10**	**10**	**10**
Hardness (as CaCO3), from total Ca/Mg					13	11	10	10	9.9	9.7	11	11
pH (Laboratory)	6.47-7.95	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.1	7.1	7.0	7.0	7.1	7.0	7.2	7.2
Total Dissolved Solids (TDS)		19	25		**21**	15	17	14	13	14	16	17
Total Suspended Solids (TSS)		3.0	3.0	5.0	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Turbidity (NTU)					*<0.10*	*<0.10*	0.21	0.31	0.13	0.12	0.14	0.20
Anions and Nutrients (mg/L)												
Total Kjeldahl Nitrogen		0.17	0.16		0.11	0.11	**0.18**	0.055	0.077	0.082	0.13	0.10
Ammonia (as N)[3]	***equation***	0.065	0.067	0.13	0.0065	0.0089	0.014	*<0.0050*	*<0.0050*	*<0.0050*	0.014	0.010
Bromide					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Chloride	120	60	60	120	1.0	0.84	0.70	0.72	0.77	0.85	0.81	0.76
Fluoride	0.12	0.088	0.080	0.12	0.057	0.050	0.037	0.037	0.044	0.043	0.044	0.039
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*
Nitrite (as N)	0.06	0.031	0.031	0.060	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Ortho Phosphate (as P)		0.0020	0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P) - Total	0.01	0.0051	0.0067	0.010	0.0026	0.0032	~~0.036~~	*<0.0020*	0.0020	*<0.0020*	0.0023	0.0025
Phosphorus (P) - Total Diss.					*<0.0020*	*<0.0020*	0.0078	0.0025	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Reactive Silica (as SiO_2)		1.0	1.1		*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Sulphate (SO_4)		65	65	128	2.5	2.2	1.6	1.7	1.7	1.7	1.8	1.8
Cyanides (mg/L)												
Free Cyanide	0.005				*<0.0010*	-	-	*<0.0020*	-	*<0.0010*	*<0.0010*	-
Total Cyanide					*<0.0010*	-	-	*<0.0020*	-	*<0.0010*	*<0.0010*	-
Organic / Inorganic Carbon (mg/L)												
Dissolved Organic Carbon		2.5	3.2		**2.8**	1.8	2.0	1.8	2.1	1.9	1.7	1.8
Total Organic Carbon		2.6	4.1		2.1	1.8	2.1	1.4	1.9	1.8	1.7	1.7
Total Metals (mg/L)												
Aluminum[3]	***equation***	0.053	0.053	0.10	*<0.0030*	*<0.0030*	0.0036	0.0039	0.0061	0.0055	0.0046	0.0089
Antimony		0.0046	0.0046	0.0090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.005	0.0026	0.0026	0.0050	0.00024	0.00020	0.00017	0.00020	0.00020	0.00021	0.00020	0.00022
Barium		0.50	0.50	1.0	0.0026	0.0022	0.0020	0.0019	0.0021	0.0020	0.0021	0.0021
Beryllium		0.00012	0.00012	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth					*<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*
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*
Calcium		2.4	4.9		**3.2**	**2.7**	**2.6**	**2.6**	**2.5**	**2.5**	**2.7**	**2.7**
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium[4]	0.001	0.0025	0.0026	0.0050	*<0.00010*	*<0.00010*	0.00011	*<0.00010*	*<0.00010*	*<0.00010*	0.00011	0.00013
Cobalt	0.00077			0.00077	*<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*	0.00051
Iron	0.3	0.15	0.16	0.30	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.012	0.018
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*
Lithium		0.0020	0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		0.93	1.4		**1.1**	**0.97**	0.88	0.89	0.90	0.87	**0.95**	**0.96**
Manganese[3]	***equation***	0.32	0.33	***See note 3***	0.00044	0.00044	0.0014	0.0014	0.0012	0.0012	0.0014	0.0017
Mercury	0.000026	0.00002	0.00002	0.00003	*<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	0.00008	0.00006	0.00005	*<0.000050*	0.00005	0.00006	0.00006	0.00005
Nickel[3]	***equation***	0.013	0.013	0.025	0.00066	0.00060	0.00070	0.00064	0.00061	0.00060	0.00063	0.00064
Phosphorus		0.0051	0.0067	0.0040	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.58	0.59		0.49	0.43	0.37	0.38	0.38	0.37	0.39	0.39
Rubidium					0.00063	0.00048	0.00047	0.00052	0.00050	0.00047	0.00048	0.00047
Selenium	0.001	0.00053	0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.20	0.65		0.20	0.20	0.18	0.19	0.20	0.19	**0.21**	**0.23**
Silver	0.0001	0.00013	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1.2	0.72		0.69	0.60	0.54	0.56	0.53	0.52	0.54	0.55
Strontium		1.25	1.26	2.5	0.013	0.011	0.011	0.010	0.011	0.011	0.011	0.011
Sulfur					0.73	0.60	0.64	0.74	*<0.50*	*<0.50*	0.80	0.76
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium	0.0008	0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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*	0.00033
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.015	0.0075	0.0075	0.015	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*
Zinc				0.0040	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved Metals (mg/L)												
Aluminum[3]	***equation***	0.026	0.026	0.050	*<0.0010*	*<0.0010*	0.0021	0.0032	0.0019	0.0062	0.0020	0.0020
Antimony		0.0046	0.0046	0.0090	*<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	0.00020	0.00018	0.00016	0.00018	0.00019	0.00016	0.00018
Barium		0.50	0.50	1.0	0.0023	0.0021	0.0021	0.0020	0.0020	0.0020	0.0020	0.0020
Beryllium		0.00012	0.00012	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth					*<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*
Cadmium		0.00002	0.00002	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		2.4	4.9		**3.2**	**2.6**	**2.6**	**2.5**	**2.6**	**2.5**	**2.6**	**2.6**
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium		0.00026	0.00026	0.0050	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt				0.00077	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper		0.0012	0.0015	0.0020	0.00052	0.00042	0.00066	0.00045	0.00044	0.00048	0.00043	0.00049
Iron		0.16	0.16	0.30	*<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*
Lithium		0.0020	0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		0.93	1.4		**1.0**	0.89	0.92	**0.94**	0.92	0.92	0.89	0.89
Manganese[3]	***equation***	0.32	0.33	***See note 3***	0.00022	0.00015	0.00090	0.00089	0.00021	0.00023	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*
Molybdenum		0.037	0.037	0.073	0.00008	0.00006	0.00013	0.00010	0.00007	0.00006	0.00005	0.00005
Nickel		0.013	0.013	0.025	0.00065	0.00053	0.00069	0.00069	0.00064	0.00063	0.00055	0.00057
Phosphorus					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.58	0.59		0.50	0.41	0.44	0.40	0.41	0.41	0.38	0.38
Rubidium					0.00058	0.00057	0.00063	0.00054	0.00053	0.00054	0.00051	0.00054
Selenium		0.00053	0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.18	0.67		0.17	0.15	0.17	0.16	0.16	0.16	0.16	0.17
Silver		0.00013	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1.2	0.72		0.66	0.57	0.56	0.56	0.56	0.56	0.56	0.56
Strontium		1.3	1.3	2.5	0.013	0.010	0.011	0.0098	0.0099	0.010	0.011	0.011
Sulfur					0.60	*<0.50*	*<0.50*	0.65	0.63	0.60	*<0.50*	0.62
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium		0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium		0.0075	0.0075	0.015	0.00005	0.00003	0.00003	0.00002	0.00002	0.00002	0.00003	0.00002
Vanadium		0.060	0.060	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]	***equation***	0.0018	0.0024	***See note 3***	*<0.0010*	*<0.0010*	0.0012	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Speciated Metals (µg/L)												
Arsenate (As V)					-	0.058	*<0.020*	-	*<0.020*	-	*<0.020*	-
Arsenite (As III)					-	0.042	0.069	-	0.071	-	0.063	-
Arsenobetaine (AsB)					-	*<0.050*	*<0.050*	-	*<0.050*	-	*<0.050*	-
Dimethylarsinic Acid (DMA)					-	*<0.020*	*<0.020*	-	*<0.020*	-	*<0.020*	-
Monomethylarsonic Acid (MMA)					-	*<0.020*	*<0.020*	-	*<0.020*	-	*<0.020*	-
Plant Pigments (µg/L)												
Chlorophyll a					0.48	0.64	0.42	0.39	0.43	0.13	0.50	0.26

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 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: 2022 Plan Update (Azimuth, 2022b) 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 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.

"-" not analyzed/not sampled.

Table B1-1. Water quality results from the 2023 CREMP, Meadowbank study area lakes.

Lake & Area		Meadowbank Screening Values[2]			Third Portage Lake - East Basin (TPE)							
Month					March	March	July	July	August	August	September	September
Area-Replicate ID					TPE-160	TPE-161	TPE-162	TPE-163	TPE-164	TPE-165	TPE-166	TPE-167
Date	Aquatic Life Guideline[1]	Triggers		Thresholds	12-Mar-2023	12-Mar-2023	03-Jul-2023	03-Jul-2023	13-Aug-2023	24-Aug-2023	07-Sep-2023	07-Sep-2023
Time					10:25	09:50	16:00	15:30	00:00	00:00	16:00	15:30
ALS Sample ID		Meadowbank	Wally Lake		VA23A5681-007	VA23A5681-008	VA23B6138-007	VA23B6138-008	VA23B9333-003 VA23C0547-007	VA23C0550-003	VA23C1680-007	VA23C1680-008
Field Measurements (Surface 3m)												
Dissolved Oxygen (mg/L)					17	18	12	12	9.3	10	11	11
Specific Conductivity (µS/cm)					37	36	27	26	30	28	30	30
pH	6.5 - 9.0	6.4-8.15	6.54 - 8.34	6.5 - 9.0	**8.7**	**8.8**	7.0	6.9	6.6	6.7	**6.3**	**6.3**
Temperature (°C)					0.52	0.32	9.3	9.7	17	13	7.6	7.6
Physical Tests (mg/L)												
Conductivity (µS/cm)		27	37		**38**	**37**	**30**	**28**	**29**	**30**	**30**	**30**
Alkalinity - Total (as $CaCO_3$)		8.7	18		**9.1**	**9.0**	7.7	6.9	7.7	8.0	7.3	7.3
Alkalinity - Bicarbonate		8.7	18		**9.1**	**9.0**	7.7	6.9	7.7	8.0	7.3	7.3
Alkalinity - Carbonate		2.0	2.0		*<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*
Hardness (as CaCO3), dissolved		9.5	17		**14**	**13**	**11**	**10**	**10**	**11**	**11**	**11**
Hardness (as CaCO3), from total Ca/Mg					13	13	10	9.9	10	11	11	11
pH (Laboratory)	6.47-7.95	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.1	7.1	7.2	7.0	7.0	7.1	7.1	7.1
Total Dissolved Solids (TDS)		19	25		**25**	**24**	**22**	**26**	**20**	14	**22**	**21**
Total Suspended Solids (TSS)		3.0	3.0	5.0	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Turbidity (NTU)					*<0.10*	*<0.10*	0.19	0.20	0.23	0.38	0.28	0.37
Anions and Nutrients (mg/L)												
Total Kjeldahl Nitrogen		0.17	0.16		0.10	0.11	0.071	0.076	0.11	0.088	0.11	~~1.4~~
Ammonia (as N)[3]	***equation***	0.065	0.067	0.13	0.012	0.011	*<0.0050*	*<0.0050*	0.0056	0.012	0.014	0.012
Bromide					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Chloride	120	60	60	120	1.0	0.99	0.73	0.70	0.75	0.78	0.75	0.74
Fluoride	0.12	0.088	0.080	0.12	**0.091**	0.088	0.068	0.066	0.074	0.077	0.085	0.082
Nitrate (as N)	3.0	1.5	1.5	3.0	0.0077	0.012	0.0091	0.0069	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Nitrite (as N)	0.06	0.031	0.031	0.060	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Ortho Phosphate (as P)		0.0020	0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P) - Total	0.01	0.0051	0.0067	0.010	*<0.0020*	*<0.0020*	*<0.0020*	0.0030	0.0020	*<0.0020*	0.0023	0.0021
Phosphorus (P) - Total Diss.					0.0028	0.0020	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Reactive Silica (as SiO_2)		1.0	1.1		*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Sulphate (SO_4)		65	65	128	5.7	5.6	4.0	3.9	4.3	4.3	4.3	4.3
Cyanides (mg/L)												
Free Cyanide	0.005				*<0.0020*	-	*<0.0020*	-	*<0.0010*	-	*<0.0010*	*<0.0010*
Total Cyanide					*<0.0020*	-	*<0.0020*	-	*<0.0010*	-	*<0.0010*	*<0.0010*
Organic / Inorganic Carbon (mg/L)												
Dissolved Organic Carbon		2.5	3.2		2.1	1.9	1.4	1.4	2.1	2.1	2.2	2.3
Total Organic Carbon		2.6	4.1		1.5	1.5	1.1	1.9	2.0	1.8	1.5	1.5
Total Metals (mg/L)												
Aluminum[3]	***equation***	0.053	0.053	0.10	0.0031	0.0033	0.0062	0.0062	0.0061	0.0069	0.0072	0.0096
Antimony		0.0046	0.0046	0.0090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.005	0.0026	0.0026	0.0050	0.00055	0.00039	0.00059	0.00048	0.00058	0.00067	0.00059	0.00058
Barium		0.50	0.50	1.0	0.0036	0.0036	0.0028	0.0027	0.0023	0.0027	0.0028	0.0027
Beryllium		0.00012	0.00012	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth					*<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*
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*
Calcium		2.4	4.9		**3.3**	**3.1**	**2.5**	**2.4**	**2.6**	**2.7**	**2.8**	**2.6**
Cesium					0.00001	*<0.000010*	0.00001	*<0.000010*	0.00002	0.00002	0.00002	0.00002
Chromium[4]	0.001	0.0025	0.0026	0.0050	*<0.00010*	*<0.00010*	0.00011	0.00015	*<0.00010*	0.00027	0.00010	*<0.00010*
Cobalt	0.00077			0.00077	*<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*
Iron	0.3	0.15	0.16	0.30	*<0.010*	*<0.010*	0.014	0.014	0.013	0.021	0.022	0.025
Lead[3]	***equation***	0.00053	0.00053	0.0010	0.00025	0.00008	*<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*
Magnesium		0.93	1.4		**1.3**	**1.2**	**0.95**	**0.94**	0.91	**1.1**	**1.1**	**1.1**
Manganese[3]	***equation***	0.32	0.33	***See note 3***	0.00035	0.00054	0.0022	0.0020	0.0014	0.0017	0.0017	0.0017
Mercury	0.000026	0.00002	0.00002	0.00003	*<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	0.00014	0.00012	0.00009	0.00010	0.00012	0.00014	0.00013	0.00013
Nickel[3]	***equation***	0.013	0.013	0.025	0.00062	0.00056	0.00068	0.00061	*<0.00050*	0.00051	0.00053	*<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*
Potassium		0.58	0.59		**0.68**	**0.65**	0.50	0.50	0.47	0.52	0.54	0.53
Rubidium					0.0011	0.0010	0.00076	0.00078	0.00084	0.00088	0.00092	0.00085
Selenium	0.001	0.00053	0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.20	0.65		0.15	0.14	0.17	0.17	0.13	0.15	0.15	0.16
Silver	0.0001	0.00013	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1.2	0.72		**1.4**	**1.3**	0.94	0.95	0.88	1.0	0.99	0.98
Strontium		1.25	1.26	2.5	0.015	0.014	0.011	0.011	0.012	0.013	0.013	0.012
Sulfur					2.0	1.8	1.4	1.4	1.3	1.4	1.5	1.7
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium	0.0008	0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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*	0.00032	0.00054
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.015	0.0075	0.0075	0.015	0.00003	0.00003	0.00004	0.00004	0.00005	0.00004	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*
Zinc				0.0040	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved Metals (mg/L)												
Aluminum[3]	***equation***	0.026	0.026	0.050	0.0023	0.0017	0.0032	0.0027	0.0038	0.0029	0.0032	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*
Arsenic		0.0026	0.0026	0.0050	0.00059	0.00055	0.00058	0.00046	0.00062	0.00059	0.00052	0.00050
Barium		0.50	0.50	1.0	0.0037	0.0038	0.0030	0.0029	0.0028	0.0028	0.0026	0.0027
Beryllium		0.00012	0.00012	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth					*<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*
Cadmium		0.00002	0.00002	0.00004	0.00001	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		2.4	4.9		**3.4**	**3.1**	**2.6**	**2.5**	**2.4**	**2.7**	**2.7**	**2.7**
Cesium					*<0.000010*	*<0.000010*	0.00001	*<0.000010*	0.00001	0.00002	0.00002	0.00001
Chromium		0.00026	0.00026	0.0050	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt				0.00077	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper		0.0012	0.0015	0.0020	0.00071	0.00059	0.00041	0.00042	0.00039	0.00042	0.00041	0.00052
Iron		0.16	0.16	0.30	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Lead		0.00053	0.00053	0.0010	0.00028	0.00032	*<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*
Magnesium		0.93	1.4		**1.3**	**1.2**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
Manganese[3]	***equation***	0.32	0.33	***See note 3***	0.00076	0.0025	0.0017	0.0015	0.00096	0.00098	0.00075	0.00078
Mercury		0.00002	0.00002	0.00003	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum		0.037	0.037	0.073	0.00012	0.00010	0.00010	0.00009	0.00011	0.00012	0.00012	0.00012
Nickel		0.013	0.013	0.025	0.00072	0.00069	0.00070	0.00059	*<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*
Potassium		0.58	0.59		**0.76**	**0.67**	0.54	0.53	0.56	0.55	0.53	0.53
Rubidium					0.0012	0.0010	0.00084	0.00085	0.00091	0.00090	0.00086	0.00091
Selenium		0.00053	0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.18	0.67		0.12	0.13	0.14	0.13	0.099	0.11	0.11	0.11
Silver		0.00013	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1.2	0.72		**1.4**	**1.3**	0.98	0.99	1.00	1.0	1.0	1.0
Strontium		1.3	1.3	2.5	0.015	0.014	0.012	0.012	0.011	0.011	0.012	0.012
Sulfur					1.9	1.9	1.3	1.3	1.4	1.7	1.4	1.4
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium		0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium		0.0075	0.0075	0.015	0.00004	0.00003	0.00004	0.00004	0.00004	0.00003	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*
Zinc[3]	***equation***	0.0018	0.0024	***See note 3***	0.0027	0.0015	*<0.0010*	0.0011	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Speciated Metals (µg/L)												
Arsenate (As V)					-	-	-	-	-	-	-	-
Arsenite (As III)					-	-	-	-	-	-	-	-
Arsenobetaine (AsB)					-	-	-	-	-	-	-	-
Dimethylarsinic Acid (DMA)					-	-	-	-	-	-	-	-
Monomethylarsonic Acid (MMA)					-	-	-	-	-	-	-	-
Plant Pigments (µg/L)												
Chlorophyll a					0.14	0.17	0.22	0.26	0.25	0.39	0.17	0.28

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 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: 2022 Plan Update (Azimuth, 2022b) 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 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.

"-" not analyzed/not sampled.

Table B1-1. Water quality results from the 2023 CREMP, Meadowbank study area lakes.

Lake & Area		Meadowbank Screening Values[2]			Third Portage Lake - North Basin (TPN)							
Month					March	March	July	July	August	August	September	September
Area-Replicate ID					TPN-160	TPN-161	TPN-162	TPN-163	TPN-164	TPN-165	TPN-166	TPN-167
Date	Aquatic Life Guideline[1]	Triggers		Thresholds	04-Mar-2023	04-Mar-2023	03-Jul-2023	03-Jul-2023	24-Aug-2023	24-Aug-2023	07-Sep-2023	07-Sep-2023
Time					11:30	11:55	14:45	15:25	09:00	09:30	09:30	09:00
ALS Sample ID		Meadowbank	Wally Lake		VA23A5518-003	VA23A5518-004	VA23B6138-005	VA23B6138-006	VA23C0550-001	VA23C0550-002	VA23C1680-005	VA23C1680-006
Field Measurements (Surface 3m)												
Dissolved Oxygen (mg/L)					18	19	14	14	10	10	11	11
Specific Conductivity (µS/cm)					34	33	25	25	26	26	27	28
pH	6.5 - 9.0	6.4-8.15	6.54 - 8.34	6.5 - 9.0	6.8	7.8	6.8	6.8	**6.1**	**6.3**	**6.4**	**6.3**
Temperature (°C)					0.38	0.36	4.9	4.8	12	13	8.6	8.7
Physical Tests (mg/L)												
Conductivity (µS/cm)		27	37		**32**	**31**	27	27	**28**	**28**	**28**	**28**
Alkalinity - Total (as $CaCO_3$)		8.7	18		8.3	8.0	6.1	6.0	7.1	7.0	6.3	6.3
Alkalinity - Bicarbonate		8.7	18		8.3	8.0	6.1	6.0	7.1	7.0	6.3	6.3
Alkalinity - Carbonate		2.0	2.0		*<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*
Hardness (as CaCO3), dissolved		9.5	17		**11**	**11**	**9.8**	**9.6**	**9.6**	**9.6**	**9.6**	**9.9**
Hardness (as CaCO3), from total Ca/Mg					11	11	9.2	9.4	10	10	10.0	10
pH (Laboratory)	6.47-7.95	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.1	7.0	7.0	6.9	7.0	7.0	7.1	7.1
Total Dissolved Solids (TDS)		19	25		18	15	19	19	14	13	**20**	**20**
Total Suspended Solids (TSS)		3.0	3.0	5.0	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Turbidity (NTU)					*<0.10*	*<0.10*	0.13	0.13	0.24	0.27	0.16	0.14
Anions and Nutrients (mg/L)												
Total Kjeldahl Nitrogen		0.17	0.16		0.10	0.096	0.052	0.057	0.081	0.079	0.098	0.086
Ammonia (as N)[3]	***equation***	0.065	0.067	0.13	0.018	0.014	*<0.0050*	*<0.0050*	0.014	0.0059	0.012	0.011
Bromide					*<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	0.77	0.77	0.80	0.79	0.78	0.80
Fluoride	0.12	0.088	0.080	0.12	**0.091**	**0.089**	0.069	0.069	0.071	0.069	0.073	0.065
Nitrate (as N)	3.0	1.5	1.5	3.0	0.0063	0.0054	0.011	0.011	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Nitrite (as N)	0.06	0.031	0.031	0.060	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Ortho Phosphate (as P)		0.0020	0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P) - Total	0.01	0.0051	0.0067	0.010	*<0.0020*	0.0020	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	0.0020	*<0.0020*
Phosphorus (P) - Total Diss.					*<0.0020*	0.0027	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Reactive Silica (as SiO_2)		1.0	1.1		*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Sulphate (SO_4)		65	65	128	5.7	5.5	4.2	4.3	4.1	4.1	4.2	4.2
Cyanides (mg/L)												
Free Cyanide	0.005					*<0.0010*	*<0.0020*	-	*<0.0010*	-	*<0.0010*	*<0.0010*
Total Cyanide						*<0.0010*	*<0.0020*	-	*<0.0010*	-	*<0.0010*	*<0.0010*
Organic / Inorganic Carbon (mg/L)												
Dissolved Organic Carbon		2.5	3.2		1.6	1.6	1.5	1.6	1.8	2.4	1.5	2.2
Total Organic Carbon		2.6	4.1		1.6	1.5	1.1	1.2	1.8	1.9	1.4	1.4
Total Metals (mg/L)												
Aluminum[3]	***equation***	0.053	0.053	0.10	0.0041	0.0037	0.0039	0.0044	0.0054	0.010	0.0059	0.0044
Antimony		0.0046	0.0046	0.0090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.005	0.0026	0.0026	0.0050	0.00024	0.00024	0.00019	0.00019	0.00024	0.00024	0.00021	0.00023
Barium		0.50	0.50	1.0	0.0033	0.0032	0.0025	0.0026	0.0028	0.0027	0.0029	0.0029
Beryllium		0.00012	0.00012	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth					*<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*
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*
Calcium		2.4	4.9		**2.7**	**2.6**	2.3	2.3	**2.4**	**2.4**	**2.4**	**2.4**
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium[4]	0.001	0.0025	0.0026	0.0050	*<0.00010*	0.00011	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00013
Cobalt	0.00077			0.00077	*<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*
Iron	0.3	0.15	0.16	0.30	*<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	0.00017	*<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*
Magnesium		0.93	1.4		**1.1**	**1.1**	0.85	0.89	**1.00**	**1.00**	**0.96**	**0.98**
Manganese[3]	***equation***	0.32	0.33	***See note 3***	0.00049	0.00051	0.0012	0.0013	0.0015	0.0014	0.0015	0.0015
Mercury	0.000026	0.00002	0.00002	0.00003	*<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	0.00014	0.00013	0.00010	0.00009	0.00012	0.00011	0.00010	0.00010
Nickel[3]	***equation***	0.013	0.013	0.025	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	0.00052
Phosphorus		0.0051	0.0067	0.0040	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.58	0.59		**0.60**	**0.60**	0.45	0.49	0.49	0.49	0.51	0.51
Rubidium					0.00087	0.00087	0.00074	0.00064	0.00074	0.00074	0.00077	0.00076
Selenium	0.001	0.00053	0.00053	0.0010	0.00005	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.20	0.65		0.12	0.12	0.14	0.13	0.12	0.12	0.13	0.13
Silver	0.0001	0.00013	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1.2	0.72		**1.2**	**1.2**	0.93	0.99	1.1	1.1	0.99	1.00
Strontium		1.25	1.26	2.5	0.012	0.012	0.010	0.010	0.011	0.011	0.011	0.011
Sulfur					1.9	1.6	1.4	1.1	1.5	1.6	1.5	1.6
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium	0.0008	0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.015	0.0075	0.0075	0.015	0.00005	0.00004	0.00004	0.00004	0.00004	0.00004	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*
Zinc				0.0040	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved Metals (mg/L)												
Aluminum[3]	***equation***	0.026	0.026	0.050	0.0020	0.0019	0.0028	0.0023	0.0023	0.0023	0.0024	0.0028
Antimony		0.0046	0.0046	0.0090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic		0.0026	0.0026	0.0050	0.00025	0.00021	0.00019	0.00022	0.00021	0.00022	0.00020	0.00021
Barium		0.50	0.50	1.0	0.0033	0.0032	0.0028	0.0027	0.0027	0.0028	0.0028	0.0028
Beryllium		0.00012	0.00012	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth					*<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*
Cadmium		0.00002	0.00002	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		2.4	4.9		**2.7**	**2.7**	2.3	2.3	2.3	2.3	2.3	**2.4**
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium		0.00026	0.00026	0.0050	*<0.00010*	*<0.00010*	*<0.00010*	**0.00031**	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt				0.00077	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper		0.0012	0.0015	0.0020	0.00054	0.00041	0.00040	0.00039	0.00040	0.00038	0.00038	0.00043
Iron		0.16	0.16	0.30	*<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*
Lithium		0.0020	0.0020		*<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**	**0.95**	0.91	**0.94**	0.92	0.92	**0.94**
Manganese[3]	***equation***	0.32	0.33	***See note 3***	0.00046	0.00055	0.0010	0.0010	0.0011	0.00089	0.0010	0.00084
Mercury		0.00002	0.00002	0.00003	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum		0.037	0.037	0.073	0.00011	0.00011	0.00009	0.00010	0.00009	0.00010	0.00010	0.00011
Nickel		0.013	0.013	0.025	*<0.00050*	*<0.00050*	*<0.00050*	0.00054	*<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*
Potassium		0.58	0.59		**0.62**	**0.60**	0.51	0.50	0.51	0.52	0.50	0.51
Rubidium					0.00084	0.00081	0.00079	0.00078	0.00071	0.00079	0.00074	0.00070
Selenium		0.00053	0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.18	0.67		0.086	0.085	0.094	0.098	0.076	0.086	0.085	0.079
Silver		0.00013	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1.2	0.72		**1.2**	1.1	1.0	0.99	1.0	1.0	1.0	1.1
Strontium		1.3	1.3	2.5	0.013	0.012	0.011	0.011	0.011	0.011	0.011	0.011
Sulfur					1.6	1.7	1.4	1.5	1.4	1.6	1.3	1.3
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium		0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium		0.0075	0.0075	0.015	0.00004	0.00004	0.00004	0.00004	0.00003	0.00003	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*
Zinc[3]	***equation***	0.0018	0.0024	***See note 3***	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Speciated Metals (µg/L)												
Arsenate (As V)					-	-		-	-	-		
Arsenite (As III)					-	-	-	-	-	-	-	-
Arsenobetaine (AsB)					-	-	-	-	-	-	-	-
Dimethylarsinic Acid (DMA)					-	-	-	-	-	-	-	-
Monomethylarsonic Acid (MMA)					-	-	-	-	-	-	-	-
Plant Pigments (µg/L)												
Chlorophyll a					0.14	0.14	0.16	0.20	0.33	0.32	0.29	0.29

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 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: 2022 Plan Update (Azimuth, 2022b) 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 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.

"-" not analyzed/not sampled.

Table B1-1. Water quality results from the 2023 CREMP, Meadowbank study area lakes.

Lake & Area		Meadowbank Screening Values[2]			Second Portage Lake (SP)							
Month					March	March	July	July	August	August	September	September
Area-Replicate ID					SP-160	SP-161	SP-163	SP-162	SP-164	SP-165	SP-166	SP-167
Date	Aquatic Life Guideline[1]	Triggers		Thresholds	12-Mar-2023	12-Mar-2023	05-Jul-2023	05-Jul-2023	13-Aug-2023	13-Aug-2023	07-Sep-2023	07-Sep-2023
Time		Meadowbank	Wally Lake		09:00	09:20	09:49	09:25	00:00	00:00	14:30	15:00
ALS Sample ID					VA23A5681-005	VA23A5681-006	VA23B6138-009	VA23B6138-010	VA23B9333-001 VA23C0547-008	VA23B9333-002 VA23C0547-009	VA23C1680-009	VA23C1680-010
Field Measurements (Surface 3m)												
Dissolved Oxygen (mg/L)					19	20	12	12	9.2	9.2	11	11
Specific Conductivity (µS/cm)					43	47	35	35	37	37	36	37
pH	6.5 - 9.0	6.4-8.15	6.54 - 8.34	6.5 - 9.0	6.7	6.6	7.1	7.2	6.7	6.5	**6.1**	7.6
Temperature (°C)					0.61	0.62	11	11	17	17	7.3	7.6
Physical Tests (mg/L)												
Conductivity (µS/cm)		27	37		**45**	**44**	**36**	**36**	**36**	**36**	**37**	**37**
Alkalinity - Total (as $CaCO_3$)		8.7	18		**12**	**12**	**11**	**11**	**11**	**11**	**10**	**10**
Alkalinity - Bicarbonate		8.7	18		**12**	**12**	**11**	**11**	**11**	**11**	**10**	**10**
Alkalinity - Carbonate		2.0	2.0		*<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*
Hardness (as CaCO3), dissolved		9.5	17		**17**	**16**	**16**	**15**	**14**	**14**	**14**	**15**
Hardness (as CaCO3), from total Ca/Mg					17	17	15	15	14	15	15	15
pH (Laboratory)	6.47-7.95	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.2	7.2	7.2	7.2	7.1	7.1	7.3	7.3
Total Dissolved Solids (TDS)		19	25		**27**	**27**	**33**	**28**	**23**	**22**	**26**	**26**
Total Suspended Solids (TSS)		3.0	3.0	5.0	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Turbidity (NTU)					*<0.10*	0.10	0.32	0.32	0.24	0.30	0.24	0.24
Anions and Nutrients (mg/L)												
Total Kjeldahl Nitrogen		0.17	0.16		0.13	0.13	0.094	0.092	0.13	0.12	0.12	0.11
Ammonia (as N)[3]	***equation***	0.065	0.067	0.13	0.022	0.021	0.0073	0.0061	0.0093	*<0.0050*	0.012	0.017
Bromide					*<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	0.83	0.82	0.87	0.88	0.84	0.86
Fluoride	0.12	0.088	0.080	0.12	**0.091**	**0.089**	0.060	0.058	0.069	0.074	0.067	0.076
Nitrate (as N)	3.0	1.5	1.5	3.0	0.013	0.0088	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Nitrite (as N)	0.06	0.031	0.031	0.060	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Ortho Phosphate (as P)		0.0020	0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P) - Total	0.01	0.0051	0.0067	0.010	0.0023	0.0023	0.0024	0.0025	0.0033	0.0023	0.0024	0.0027
Phosphorus (P) - Total Diss.					*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Reactive Silica (as SiO_2)		1.0	1.1		0.63	0.64	0.78	0.79	0.65	0.62	0.68	0.69
Sulphate (SO_4)		65	65	128	6.2	6.1	4.3	4.3	4.8	4.8	4.5	4.6
Cyanides (mg/L)												
Free Cyanide	0.005				*<0.0010*	-	*<0.0020*	-	-	*<0.0010*	*<0.0010*	-
Total Cyanide					*<0.0010*	-	*<0.0020*	-	-	*<0.0010*	*<0.0010*	-
Organic / Inorganic Carbon (mg/L)												
Dissolved Organic Carbon		2.5	3.2		1.9	2.1	2.1	1.9	**2.5**	**2.7**	2.3	**2.6**
Total Organic Carbon		2.6	4.1		1.9	1.9	1.6	1.8	2.3	2.5	1.8	1.9
Total Metals (mg/L)												
Aluminum[3]	***equation***	0.053	0.053	0.10	*<0.0030*	0.0040	0.010	0.011	0.0054	0.0052	0.0089	0.0084
Antimony		0.0046	0.0046	0.0090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.005	0.0026	0.0026	0.0050	0.00048	0.00043	0.00038	0.00035	0.00034	0.00042	0.00038	0.00035
Barium		0.50	0.50	1.0	0.0035	0.0033	0.0027	0.0025	0.0024	0.0024	0.0025	0.0026
Beryllium		0.00012	0.00012	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth					*<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*
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*
Calcium		2.4	4.9		**4.4**	**4.3**	**3.8**	**3.9**	**3.8**	**3.8**	**3.8**	**3.9**
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium[4]	0.001	0.0025	0.0026	0.0050	*<0.00010*	*<0.00010*	*<0.00010*	0.00011	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt	0.00077			0.00077	*<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	0.00064	0.00066	0.00085	0.00079	0.00072	0.00080	0.00070	0.00069
Iron	0.3	0.15	0.16	0.30	*<0.010*	*<0.010*	0.026	0.028	0.028	0.029	0.042	0.037
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*
Lithium		0.0020	0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		0.93	1.4		**1.5**	**1.5**	**1.3**	**1.2**	**1.2**	**1.2**	**1.3**	**1.3**
Manganese[3]	***equation***	0.32	0.33	***See note 3***	0.00034	0.00040	0.0022	0.0021	0.0027	0.0031	0.0027	0.0027
Mercury	0.000026	0.00002	0.00002	0.00003	*<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	0.00014	0.00011	0.00012	0.00013	0.00013	0.00014	0.00014
Nickel[3]	***equation***	0.013	0.013	0.025	0.00054	0.00053	0.00051	*<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*
Potassium		0.58	0.59		**0.68**	**0.67**	0.51	0.47	0.48	0.52	0.52	0.53
Rubidium					0.0011	0.0011	0.00081	0.00076	0.00076	0.00084	0.00092	0.00087
Selenium	0.001	0.00053	0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.20	0.65		**0.29**	**0.30**	**0.36**	**0.37**	**0.34**	**0.34**	**0.34**	**0.37**
Silver	0.0001	0.00013	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1.2	0.72		**1.2**	1.1	0.76	0.72	0.72	0.80	0.80	0.80
Strontium		1.25	1.26	2.5	0.020	0.020	0.018	0.018	0.019	0.018	0.019	0.019
Sulfur					1.9	1.9	1.5	1.5	1.6	1.7	1.7	1.6
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium	0.0008	0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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*	0.00040	*<0.00030*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.015	0.0075	0.0075	0.015	0.00004	0.00004	0.00006	0.00006	0.00006	0.00006	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*
Zinc				0.0040	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved Metals (mg/L)												
Aluminum[3]	***equation***	0.026	0.026	0.050	0.0035	0.0014	0.0048	0.0046	0.0043	0.0030	0.0032	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*
Arsenic		0.0026	0.0026	0.0050	0.00048	0.00057	0.00032	0.00033	0.00035	0.00038	0.00035	0.00030
Barium		0.50	0.50	1.0	0.0035	0.0035	0.0028	0.0027	0.0024	0.0025	0.0025	0.0024
Beryllium		0.00012	0.00012	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth					*<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*
Cadmium		0.00002	0.00002	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		2.4	4.9		**4.4**	**4.2**	**4.0**	**3.9**	**3.6**	**3.6**	**3.7**	**3.8**
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium		0.00026	0.00026	0.0050	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	**0.00034**	*<0.00010*
Cobalt				0.00077	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper		0.0012	0.0015	0.0020	0.00097	0.00078	0.00076	0.00079	0.00068	0.00064	0.00086	0.00066
Iron		0.16	0.16	0.30	*<0.010*	*<0.010*	0.010	0.010	0.011	0.010	0.025	0.012
Lead		0.00053	0.00053	0.0010	0.00014	0.00008	*<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*
Magnesium		0.93	1.4		**1.5**	**1.4**	**1.4**	**1.3**	**1.2**	**1.2**	**1.2**	**1.3**
Manganese[3]	***equation***	0.32	0.33	***See note 3***	0.00043	0.0015	0.0013	0.0012	0.00066	0.00081	0.0015	0.0017
Mercury		0.00002	0.00002	0.00003	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum		0.037	0.037	0.073	0.00014	0.00014	0.00012	0.00012	0.00012	0.00012	0.00013	0.00013
Nickel		0.013	0.013	0.025	0.00060	0.00064	0.00057	0.00053	*<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*
Potassium		0.58	0.59		**0.75**	**0.66**	0.53	0.50	0.52	0.53	0.50	0.52
Rubidium					0.0011	0.0010	0.00078	0.00078	0.00072	0.00082	0.00078	0.00080
Selenium		0.00053	0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.18	0.67		**0.27**	**0.27**	**0.34**	**0.35**	**0.30**	**0.29**	**0.29**	**0.31**
Silver		0.00013	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1.2	0.72		**3.6**	1.1	0.80	0.73	0.76	0.78	0.82	0.84
Strontium		1.3	1.3	2.5	0.020	0.020	0.019	0.019	0.019	0.018	0.018	0.019
Sulfur					1.9	2.0	1.6	1.5	1.4	1.7	1.5	1.5
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium		0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium		0.0075	0.0075	0.015	0.00006	0.00004	0.00005	0.00006	0.00005	0.00005	0.00005	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*
Zinc[3]	***equation***	0.0018	0.0024	***See note 3***	**0.0025**	0.0013	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Speciated Metals (µg/L)												
Arsenate (As V)					-	-					-	-
Arsenite (As III)					-	-	-	-	-	-	-	-
Arsenobetaine (AsB)					-	-	-	-	-	-	-	-
Dimethylarsinic Acid (DMA)					-	-	-	-	-	-	-	-
Monomethylarsonic Acid (MMA)					-	-	-	-	-	-	-	-
Plant Pigments (µg/L)												
Chlorophyll a					0.29	0.30	0.49	0.45	0.35	0.40	0.20	0.18

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 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: 2022 Plan Update (Azimuth, 2022b) 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 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.

"-" not analyzed/not sampled.

Table B1-1. Water quality results from the 2023 CREMP, Meadowbank study area lakes.

Lake & Area		Meadowbank Screening Values[2]			Wally Lake (WAL)							
Month					March	March	July	July	August	August	September	September
Area-Replicate ID					WAL-129	WAL-130	WAL-131	WAL-132	WAL-133	WAL-134	WAL-135	WAL-136
Date	Aquatic Life Guideline[1]	Triggers		Thresholds	04-Mar-2023	04-Mar-2023	06-Jul-2023	06-Jul-2023	21-Aug-2023	21-Aug-2023	09-Sep-2023	09-Sep-2023
Time		Meadowbank	Wally Lake		08:50	09:20	08:20	08:55	15:15	15:40	09:46	10:00
ALS Sample ID					VA23A5518-001	VA23A5518-002	VA23B6138-003	VA23B6138-004	VA23C0547-005	VA23C0547-006	VA23C1680-003	VA23C1680-004
Field Measurements (Surface 3m)												
Dissolved Oxygen (mg/L)					17	17	11	11	10.0	9.9	12	12
Specific Conductivity (µS/cm)					49	54	35	35	37	36	37	36
pH	6.5 - 9.0	6.4-8.15	6.54 - 8.34	6.5 - 9.0	6.7	6.6	7.2	7.2	6.9	7.1	**6.1**	**6.1**
Temperature (°C)					1.5	1.5	12	12	14	14	6.4	6.5
Physical Tests (mg/L)												
Conductivity (µS/cm)		27	37		**50**	**53**	36	36	**40**	**39**	**40**	**39**
Alkalinity - Total (as $CaCO_3$)		8.7	18		17	**19**	11	11	13	13	13	12
Alkalinity - Bicarbonate		8.7	18		17	**19**	11	11	13	13	13	12
Alkalinity - Carbonate		2.0	2.0		*<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*
Hardness (as CaCO3), dissolved		9.5	17		10	**23**	16	16	**17**	16	**17**	16
Hardness (as CaCO3), from total Ca/Mg					16	24	16	16	16	15	18	17
pH (Laboratory)	6.47-7.95	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.3	7.4	7.2	7.2	7.2	7.2	7.4	7.3
Total Dissolved Solids (TDS)		19	25		**33**	**43**	**27**	**27**	19	19	**29**	**29**
Total Suspended Solids (TSS)		3.0	3.0	5.0	*<1.0*	*<1.0*	1.3	1.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Turbidity (NTU)					*<0.10*	*<0.10*	0.25	0.27	0.21	0.22	0.25	0.39
Anions and Nutrients (mg/L)												
Total Kjeldahl Nitrogen		0.17	0.16		0.14	0.15	0.10	0.10	0.14	0.12	0.13	0.15
Ammonia (as N)[3]	***equation***	0.065	0.067	0.13	0.018	0.015	0.014	0.0066	0.0090	*<0.0050*	0.014	0.025
Bromide					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Chloride	120	60	60	120	0.71	0.84	0.51	0.51	0.55	0.54	0.54	0.54
Fluoride	0.12	0.088	0.080	0.12	0.066	0.074	0.049	0.049	0.054	0.058	0.056	0.055
Nitrate (as N)	3.0	1.5	1.5	3.0	0.0064	0.0094	*<0.0050*	0.0078	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Nitrite (as N)	0.06	0.031	0.031	0.060	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Ortho Phosphate (as P)		0.0020	0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P) - Total	0.01	0.0051	0.0067	0.010	0.0033	**0.0079**	0.0028	0.0024	0.0028	0.0028	0.0026	0.0029
Phosphorus (P) - Total Diss.					0.0021	0.0022	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Reactive Silica (as SiO_2)		1.0	1.1		**1.8**	**2.0**	1.1	1.0	**1.3**	**1.3**	**1.4**	**1.4**
Sulphate (SO_4)		65	65	128	5.7	6.6	4.0	3.9	3.9	3.8	4.1	4.4
Cyanides (mg/L)												
Free Cyanide	0.005				*<0.0010*		*<0.0020*	-	*<0.0010*	-	*<0.0020*	-
Total Cyanide					*<0.0010*		*<0.0020*	-	*<0.0010*	-	*<0.0020*	-
Organic / Inorganic Carbon (mg/L)												
Dissolved Organic Carbon		2.5	3.2		2.5	2.8	2.4	2.8	2.5	2.7	2.4	2.4
Total Organic Carbon		2.6	4.1		2.5	2.9	2.2	2.3	2.8	2.6	2.3	2.4
Total Metals (mg/L)												
Aluminum[3]	***equation***	0.053	0.053	0.10	0.0032	0.0033	0.0085	0.0077	0.0047	0.0050	0.0090	0.0093
Antimony		0.0046	0.0046	0.0090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.005	0.0026	0.0026	0.0050	0.00023	0.00033	0.00031	0.00029	0.00044	0.00040	0.00042	0.00037
Barium		0.50	0.50	1.0	0.0021	0.0032	0.0021	0.0022	0.0021	0.0020	0.0021	0.0021
Beryllium		0.00012	0.00012	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth					*<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*
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*
Calcium		2.4	4.9		4.6	**6.4**	4.3	4.2	4.3	4.0	4.7	4.5
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium[4]	0.001	0.0025	0.0026	0.0050	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00012	*<0.00010*
Cobalt	0.00077			0.00077	*<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	0.00085	0.0013	0.0010	0.0011	0.0010	0.0010	0.0011	0.0011
Iron	0.3	0.15	0.16	0.30	*<0.010*	*<0.010*	0.020	0.020	0.022	0.024	0.036	0.036
Lead[3]	***equation***	0.00053	0.00053	0.0010	0.00051	0.00051	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	0.00010	*<0.000050*
Lithium		0.0020	0.0020		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		0.93	1.4		1.2	**2.0**	1.3	1.3	1.3	1.3	**1.4**	**1.4**
Manganese[3]	***equation***	0.32	0.33	***See note 3***	0.00068	0.0017	0.0018	0.0017	0.0027	0.0028	0.0026	0.0028
Mercury	0.000026	0.00002	0.00002	0.00003	*<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	0.00015	0.00019	0.00013	0.00013	0.00017	0.00016	0.00019	0.00017
Nickel[3]	***equation***	0.013	0.013	0.025	*<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*
Potassium		0.58	0.59		0.40	**0.65**	0.42	0.41	0.45	0.44	0.45	0.46
Rubidium					0.00052	0.00082	0.00061	0.00069	0.00070	0.00067	0.00071	0.00076
Selenium	0.001	0.00053	0.00053	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.20	0.65		0.64	**0.94**	0.52	0.49	**0.70**	**0.67**	**0.71**	**0.71**
Silver	0.0001	0.00013	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1.2	0.72		0.50	**0.86**	0.57	0.57	0.58	0.57	0.61	0.62
Strontium		1.25	1.26	2.5	0.022	0.032	0.022	0.022	0.024	0.022	0.023	0.022
Sulfur					1.3	2.0	1.4	1.4	1.2	1.2	1.5	1.6
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium	0.0008	0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.015	0.0075	0.0075	0.015	0.00003	0.00006	0.00006	0.00006	0.00006	0.00005	0.00006	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*
Zinc				0.0040	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved Metals (mg/L)												
Aluminum[3]	***equation***	0.026	0.026	0.050	0.0010	0.0016	0.0036	0.0063	0.0031	0.0027	0.0033	0.0032
Antimony		0.0046	0.0046	0.0090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic		0.0026	0.0026	0.0050	0.00014	0.00033	0.00028	0.00031	0.00043	0.00037	0.00037	0.00032
Barium		0.50	0.50	1.0	0.0016	0.0032	0.0021	0.0021	0.0021	0.0020	0.0019	0.0019
Beryllium		0.00012	0.00012	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth					*<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*
Cadmium		0.00002	0.00002	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		2.4	4.9		2.8	**6.3**	4.4	4.3	4.5	4.3	4.6	4.3
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium		0.00026	0.00026	0.0050	*<0.00010*	*<0.00010*	0.00019	0.00012	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt				0.00077	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper		0.0012	0.0015	0.0020	0.00065	0.0012	0.0010	0.0011	0.0010	0.0010	0.0010	0.00099
Iron		0.16	0.16	0.30	*<0.010*	*<0.010*	*<0.010*	0.017	*<0.010*	*<0.010*	0.013	0.012
Lead		0.00053	0.00053	0.0010	*<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*
Magnesium		0.93	1.4		0.80	**1.8**	1.3	1.3	**1.4**	1.3	1.4	1.3
Manganese[3]	***equation***	0.32	0.33	***See note 3***	0.00023	0.00065	0.00072	0.00070	0.00050	0.00045	0.00047	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*
Molybdenum		0.037	0.037	0.073	0.00008	0.00020	0.00015	0.00014	0.00017	0.00017	0.00018	0.00016
Nickel		0.013	0.013	0.025	*<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*
Potassium		0.58	0.59		0.26	**0.63**	0.43	0.43	0.50	0.48	0.46	0.45
Rubidium					0.00035	0.00082	0.00060	0.00058	0.00073	0.00072	0.00062	0.00071
Selenium		0.00053	0.00053	0.0010	*<0.000050*	0.00006	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.18	0.67		0.37	**0.85**	0.48	0.47	0.65	0.63	0.67	0.67
Silver		0.00013	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1.2	0.72		0.35	**0.79**	0.57	0.60	0.63	0.61	0.64	0.65
Strontium		1.3	1.3	2.5	0.014	0.032	0.022	0.022	0.023	0.022	0.024	0.022
Sulfur					0.95	2.0	1.4	1.3	1.4	1.3	1.3	1.4
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium		0.00041	0.00041	0.00080	*<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*
Tin		0.00020	0.00020		*<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*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium		0.0075	0.0075	0.015	0.00003	0.00005	0.00006	0.00006	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*
Zinc[3]	***equation***	0.0018	0.0024	***See note 3***	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Speciated Metals (µg/L)												
Arsenate (As V)					-	-	-	-	-	-		
Arsenite (As III)					-	-	-	-	-	-	-	-
Arsenobetaine (AsB)					-	-	-	-	-	-	-	-
Dimethylarsinic Acid (DMA)					-	-	-	-	-	-	-	-
Monomethylarsonic Acid (MMA)					-	-	-	-	-	-	-	-
Plant Pigments (µg/L)												
Chlorophyll a					0.20	0.27	0.50	0.46	0.88	0.60	0.32	0.31

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 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: 2022 Plan Update (Azimuth, 2022b) 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 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.

"-" not analyzed/not sampled.

Table B1-2. Water quality results screened against FEIS predicted concentrations for Third Portage Lake, 2023.

Lake and Area		Simulated Maximum Whole Lake Concentration (mg/L) Third Portage Lake[2]				Third Portage Lake East Basin (TPE)							
Area-Replicate ID	CCME (2012)	Upper Mixing Estimate (169 Mm^3)		Mid-range Mixing Estimate (92 Mm^3)		TPE-160	TPE-161	TPE-163	TPE-162	TPE-164	TPE-165	TPE-166	TPE-167
Depth (m)	Guideline[1]	Without Dike Leaching	With Dike Leaching	Without Dike Leaching	With Dike Leaching	3	3	3	3	3	3	3	3
Date						12-Mar-2023	12-Mar-2023	03-Jul-2023	03-Jul-2023	13-Aug-2023	24-Aug-2023	07-Sep-2023	07-Sep-2023
Physical Tests (mg/L)													
Hardness		5.7	6.0	6.0	6.4	***14***	***13***	***10***	***11***	***10***	***11***	***11***	***11***
Anions and Nutrients (mg/L)													
Alkalinity - Total		4.1	4.1	4.2	4.2	***9.1***	***9.0***	***6.9***	***7.7***	***7.7***	***8.0***	***7.3***	***7.3***
Ammonia (as N)[3]	***equation***	0.033	0.033	0.050	0.050	0.012	0.011	*<0.0050*	*<0.0050*	0.0056	0.012	0.014	0.012
Chloride	120	0.80	0.80	1.0	1.1	1.0	0.99	0.70	0.73	0.75	0.78	0.75	0.74
Fluoride	0.12	0.070	0.080	0.070	0.090	***0.091***	**0.088**	0.066	0.068	**0.074**	**0.077**	**0.085**	**0.082**
Nitrate (as N)	3.0	0.035	0.036	0.057	0.059	0.0077	0.012	0.0069	0.0091	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Ortho Phosphate (as P)		0.0022	0.0022	0.0024	0.0024	*<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*	*<0.0020*	0.0030	*<0.0020*	0.0020	*<0.0020*	0.0023	0.0021
Sulphate (SO_4)		1.7	1.7	2.0	2.0	***5.7***	***5.6***	***3.9***	***4.0***	***4.3***	***4.3***	***4.3***	***4.3***
Cyanides (mg/L)													
Total Cyanide		0	0	0	0	*<0.0020*	-	-	*<0.0020*	*<0.0010*	-	*<0.0010*	*<0.0010*
Total Metals (mg/L)													
Aluminum[3]	***equation***	0.0070	0.0090	0.0070	0.010	0.0031	0.0033	0.0062	0.0062	0.0061	0.0069	**0.0072**	**0.0096**
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*
Arsenic	0.0050	0.00062	0.00062	0.00072	0.00072	0.00055	0.00039	0.00048	0.00059	0.00058	0.00067	0.00059	0.00058
Barium		0.020	0.022	0.020	0.023	0.0036	0.0036	0.0027	0.0028	0.0023	0.0027	0.0028	0.0027
Beryllium		0.0010	0.0010	0.0010	0.0010	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
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*
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*
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*
Calcium		1.3	1.4	1.5	1.5	***3.3***	***3.1***	***2.4***	***2.5***	***2.6***	***2.7***	***2.8***	***2.6***
Chromium[4]	0.001	0.0010	0.0010	0.0010	0.0010	*<0.00010*	*<0.00010*	0.00015	0.00011	*<0.00010*	0.00027	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*
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*
Iron	0.3	0.030	0.030	0.030	0.030	*<0.010*	*<0.010*	0.014	0.014	0.013	0.021	0.022	0.025
Lead[3]	***equation***	0.00060	0.00060	0.00060	0.00070	0.00025	0.00008	*<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*
Magnesium		0.60	0.60	0.60	0.70	***1.3***	***1.2***	***0.94***	***0.95***	***0.91***	***1.1***	***1.1***	***1.1***
Manganese[3]		0.0090	0.052	0.015	0.072	0.00035	0.00054	0.0020	0.0022	0.0014	0.0017	0.0017	0.0017
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*
Molybdenum	0.073	0.0010	0.0010	0.0010	0.0010	0.00014	0.00012	0.00010	0.00009	0.00012	0.00014	0.00013	0.00013
Nickel[3]	***equation***	0.0016	0.0016	0.0020	0.0021	0.00062	0.00056	0.00061	0.00068	*<0.00050*	0.00051	0.00053	*<0.00050*
Potassium		2.0	2.1	2.0	2.1	0.68	0.65	0.50	0.50	0.47	0.52	0.54	0.53
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*
Silicon		0.010	0.080	0.020	0.12	***0.15***	***0.14***	***0.17***	***0.17***	***0.13***	***0.15***	***0.15***	***0.16***
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*
Sodium		2.0	2.0	2.0	2.1	1.4	1.3	0.95	0.94	0.88	1.0	0.99	0.98
Strontium		0.0020	0.0050	0.0040	0.0070	***0.015***	***0.014***	***0.011***	***0.011***	***0.012***	***0.013***	***0.013***	***0.012***
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*
Uranium	0.015	0.00020	0.00020	0.00020	0.00030	0.00003	0.00003	0.00004	0.00004	0.00005	0.00004	0.00005	0.00005
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*
Zinc [3]	***equation***	0.011	0.011	0.015	0.015	*<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 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:

Upper-range Mixing Estimate (169 Mm^3):

- Shaded cells = concentrations exceed the prediction "Without Dike Leaching."
- Bordered cells = concentrations exceed the prediction "With Dike Leaching."

Mid-range Mixing Estimate (92 Mm^3):

- **Bold** = concentrations exceed the prediction "Without Dike Leaching."
- ***Bold italicized*** = concentrations exceed the prediction "With Dike Leaching."

Italicized numbers are below detection limits.

"-" not analyzed/not sampled.

Table B1-2. Water quality results screened against FEIS predicted concentrations for Third Portage Lake, 2023.

Lake and Area		Simulated Maximum Whole Lake Concentration (mg/L) Third Portage Lake[2]				Third Portage Lake North Basin (TPN)							
Area-Replicate ID	CCME (2012)	Upper Mixing Estimate (169 Mm^3)		Mid-range Mixing Estimate (92 Mm^3)		TPN-160	TPN-161	TPN-162	TPN-163	TPN-164	TPN-165	TPN-166	TPN-167
Depth (m)	Guideline[1]	Without Dike Leaching	With Dike Leaching	Without Dike Leaching	With Dike Leaching	3	3	3	3	3	3	3	3
Date						04-Mar-2023	04-Mar-2023	03-Jul-2023	03-Jul-2023	24-Aug-2023	24-Aug-2023	07-Sep-2023	07-Sep-2023
Physical Tests (mg/L)													
Hardness		5.7	6.0	6.0	6.4	***11***	***11***	***9.8***	***9.6***	***9.6***	***9.6***	***9.6***	***9.9***
Anions and Nutrients (mg/L)													
Alkalinity - Total		4.1	4.1	4.2	4.2	***8.3***	***8.0***	***6.1***	***6.0***	***7.1***	***7.0***	***6.3***	***6.3***
Ammonia (as N)[3]	***equation***	0.033	0.033	0.050	0.050	0.018	0.014	*<0.0050*	*<0.0050*	0.014	0.0059	0.012	0.011
Chloride	120	0.80	0.80	1.0	1.1	**1.0**	**1.0**	0.77	0.77	0.80	0.79	0.78	0.80
Fluoride	0.12	0.070	0.080	0.070	0.090	***0.091***	**0.089**	0.069	0.069	**0.071**	0.069	**0.073**	0.065
Nitrate (as N)	3.0	0.035	0.036	0.057	0.059	0.0063	0.0054	0.011	0.011	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Ortho Phosphate (as P)		0.0022	0.0022	0.0024	0.0024	*<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*	0.0020	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	0.0020	*<0.0020*
Sulphate (SO_4)		1.7	1.7	2.0	2.0	***5.7***	***5.5***	***4.2***	***4.3***	***4.1***	***4.1***	***4.2***	***4.2***
Cyanides (mg/L)													
Total Cyanide		0	0	0	0	0	*<0.0010*	*<0.0020*	-	*<0.0010*	-	*<0.0010*	*<0.0010*
Total Metals (mg/L)													
Aluminum[3]	***equation***	0.0070	0.0090	0.0070	0.010	0.0041	0.0037	0.0039	0.0044	0.0054	***0.010***	0.0059	0.0044
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*
Arsenic	0.0050	0.00062	0.00062	0.00072	0.00072	0.00024	0.00024	0.00019	0.00019	0.00024	0.00024	0.00021	0.00023
Barium		0.020	0.022	0.020	0.023	0.0033	0.0032	0.0025	0.0026	0.0028	0.0027	0.0029	0.0029
Beryllium		0.0010	0.0010	0.0010	0.0010	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
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*
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*
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*
Calcium		1.3	1.4	1.5	1.5	***2.7***	***2.6***	***2.3***	***2.3***	***2.4***	***2.4***	***2.4***	***2.4***
Chromium[4]	0.001	0.0010	0.0010	0.0010	0.0010	*<0.00010*	0.00011	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00013
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*
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*
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*
Lead[3]	***equation***	0.00060	0.00060	0.00060	0.00070	0.00017	*<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*
Magnesium		0.60	0.60	0.60	0.70	***1.1***	***1.1***	***0.85***	***0.89***	***1.00***	***1.00***	***0.96***	***0.98***
Manganese[3]		0.0090	0.052	0.015	0.072	0.00049	0.00051	0.0012	0.0013	0.0015	0.0014	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*
Molybdenum	0.073	0.0010	0.0010	0.0010	0.0010	0.00014	0.00013	0.00010	0.00009	0.00012	0.00011	0.00010	0.00010
Nickel[3]	***equation***	0.0016	0.0016	0.0020	0.0021	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	0.00052
Potassium		2.0	2.1	2.0	2.1	0.60	0.60	0.45	0.49	0.49	0.49	0.51	0.51
Selenium	0.001	0.0010	0.0010	0.0010	0.0010	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	**0.12**	**0.12**	***0.14***	***0.13***	**0.12**	**0.12**	***0.13***	***0.13***
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*
Sodium		2.0	2.0	2.0	2.1	1.2	1.2	0.93	0.99	1.1	1.1	0.99	1.00
Strontium		0.0020	0.0050	0.0040	0.0070	***0.012***	***0.012***	***0.010***	***0.010***	***0.011***	***0.011***	***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*
Uranium	0.015	0.00020	0.00020	0.00020	0.00030	0.00005	0.00004	0.00004	0.00004	0.00004	0.00004	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*
Zinc [3]	***equation***	0.011	0.011	0.015	0.015	*<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 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:

Upper-range Mixing Estimate (169 Mm^3):

- Shaded cells = concentrations exceed the prediction "Without Dike Leaching."
- Bordered cells = concentrations exceed the prediction "With Dike Leaching."

Mid-range Mixing Estimate (92 Mm^3):

- **Bold** = concentrations exceed the prediction "Without Dike Leaching."
- ***Bold italicized*** = concentrations exceed the prediction "With Dike Leaching."

Italicized numbers are below detection limits.

"-" not analyzed/not sampled.

Table B1-3. Water quality results screened against FEIS predicted concentrations for Second Portage Lake, 2023.

Lake and Area		Simulated Maximum Whole Lake Concentration (mg/L) Second Portage Lake[2]				Second Portage Lake (SP)							
Area-Replicate ID	CCME (2012)	Upper Mixing Estimate (169 Mm^3)		Mid-range Mixing Estimate (92 Mm^3)		SP-160	SP-161	SP-163	SP-162	SP-164	SP-165	SP-166	SP-167
Depth (m)	Guideline[1]	Without Dike Leaching	With Dike Leaching	Without Dike Leaching	With Dike Leaching	3	3	3	3	3	3	3	3
Date						12-Mar-2023	12-Mar-2023	05-Jul-2023	05-Jul-2023	13-Aug-2023	13-Aug-2023	07-Sep-2023	07-Sep-2023
Physical Tests (mg/L)													
Hardness		8.9	8.9	8.9	8.9	***17***	***16***	***16***	***15***	***14***	***14***	***14***	***15***
Anions and Nutrients (mg/L)													
Alkalinity - Total		7.0	7.0	7.0	7.0	***12***	***12***	***11***	***11***	***11***	***11***	***10***	***10***
Ammonia (as N)[3]	***equation***	0.025	0.025	0.031	0.031	0.022	0.021	0.0073	0.0061	0.0093	*<0.0050*	0.012	0.017
Chloride	120	0.70	0.70	0.80	0.80	***1.1***	***1.0***	***0.83***	***0.82***	***0.87***	***0.88***	***0.84***	***0.86***
Fluoride	0.12	0.070	0.071	0.070	0.071	***0.091***	***0.089***	0.060	0.058	0.069	***0.074***	0.067	***0.076***
Nitrate (as N)	3.0	0.017	0.017	0.025	0.025	0.013	0.0088	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Ortho Phosphate (as P)		0.0030	0.0030	0.0030	0.0030	*<0.0010*	*<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	0.0023	0.0023	0.0024	0.0025	***0.0033***	0.0023	0.0024	0.0027
Sulphate (SO_4)		2.8	2.8	2.8	2.8	***6.2***	***6.1***	***4.3***	***4.3***	***4.8***	***4.8***	***4.5***	***4.6***
Cyanides (mg/L)													
Total Cyanide		0	0	0	0	*<0.0010*	-	*<0.0020*	-	-	*<0.0010*	*<0.0010*	-
Total Metals (mg/L)													
Aluminum[3]	***equation***	0.0070	0.0070	0.0070	0.0070	*<0.0030*	0.0040	***0.010***	***0.011***	0.0054	0.0052	***0.0089***	***0.0084***
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*
Arsenic	0.0050	0.00050	0.00050	0.00060	0.00060	0.00048	0.00043	0.00038	0.00035	0.00034	0.00042	0.00038	0.00035
Barium		0.020	0.020	0.020	0.020	0.0035	0.0033	0.0027	0.0025	0.0024	0.0024	0.0025	0.0026
Beryllium		0.0010	0.0010	0.0010	0.0010	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
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*
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*
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*
Calcium		2.3	2.3	2.3	2.3	***4.4***	***4.3***	***3.8***	***3.9***	***3.8***	***3.8***	***3.8***	***3.9***
Chromium[4]	0.0010	0.0010	0.0010	0.0010	0.0010	*<0.00010*	*<0.00010*	*<0.00010*	0.00011	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
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*
Copper[3]	***equation***	0.0011	0.0011	0.0011	0.0011	0.00064	0.00066	0.00085	0.00079	0.00072	0.00080	0.00070	0.00069
Iron	0.30	0.030	0.030	0.030	0.030	*<0.010*	*<0.010*	0.026	0.028	0.028	0.029	***0.042***	***0.037***
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*
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*
Magnesium		0.80	0.80	0.80	0.80	***1.5***	***1.5***	***1.3***	***1.2***	***1.2***	***1.2***	***1.3***	***1.3***
Manganese[3]		0.0044	0.0067	0.0066	0.0089	0.00034	0.00040	0.0022	0.0021	0.0027	0.0031	0.0027	0.0027
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*
Molybdenum	0.073	0.0010	0.0010	0.0010	0.0010	0.00016	0.00014	0.00011	0.00012	0.00013	0.00013	0.00014	0.00014
Nickel[3]	***equation***	0.0010	0.0010	0.0010	0.0010	0.00054	0.00053	0.00051	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Potassium		2.0	2.0	2.0	2.0	0.68	0.67	0.51	0.47	0.48	0.52	0.52	0.53
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*
Silicon		0.010	0.010	0.010	0.010	***0.29***	***0.30***	***0.36***	***0.37***	***0.34***	***0.34***	***0.34***	***0.37***
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*
Sodium		2.0	2.0	2.0	2.0	1.2	1.1	0.76	0.72	0.72	0.80	0.80	0.80
Strontium		0.80	0.80	0.80	0.80	0.020	0.020	0.018	0.018	0.019	0.018	0.019	0.019
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*
Uranium	0.015	0.00020	0.00020	0.00020	0.00020	0.00004	0.00004	0.00006	0.00006	0.00006	0.00006	0.00005	0.00005
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*
Zinc[3]	***equation***	0.0070	0.0070	0.0090	0.0090	*<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 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:

Upper-range Mixing Estimate (169 Mm^3):

- Shaded cells = concentrations exceed the prediction "Without Dike Leaching."
- Bordered cells = concentrations exceed the prediction "With Dike Leaching."

Mid-range Mixing Estimate (92 Mm^3):

- **Bold** = concentrations exceed the prediction "Without Dike Leaching."
- ***Bold italicized*** = concentrations exceed the prediction "With Dike Leaching."

Italicized numbers are below detection limits.

Table B1-4. Water quality results screened against FEIS predicted concentrations for Wally Lake, 2023.

Lake and Area		Simulated Maximum Whole Lake Concentration (mg/L) Wally Lake[2]		Wally Lake (WAL)							
Area-Replicate ID	**CCME (2012) Guideline[1]**	Without Dike Leaching	With Dike Leaching	WAL-129	WAL-130	WAL-131	WAL-132	WAL-133	WAL-134	WAL-135	WAL-136
Depth (m)				3	3	3	3	3	3	3	3
Date				04-Mar-2023	04-Mar-2023	06-Jul-2023	06-Jul-2023	21-Aug-2023	21-Aug-2023	09-Sep-2023	09-Sep-2023
Physical Tests (mg/L)											
Hardness		17	17	10	***23***	16	16	17	16	17	16
Anions and Nutrients (mg/L)											
Alkalinity - Total		13	13	***17***	***19***	11	11	13	13	13	12
Ammonia (as N)[3]	***equation***	0.089	0.089	0.018	0.015	0.014	0.0066	0.009	*<0.0050*	0.014	0.025
Chloride	120	0.70	0.70	***0.71***	***0.84***	0.51	0.51	0.55	0.54	0.54	0.54
Fluoride	0.12	0.050	0.050	***0.066***	***0.074***	0.049	0.049	***0.054***	***0.058***	***0.056***	***0.055***
Nitrate (as N)	3.0	0.10	0.10	0.0064	0.0094	*<0.0050*	0.0078	*<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*
Phosphorus (P) - Total	0.0040	0.0039	0.0040	0.0033	***0.0079***	0.0028	0.0024	0.0028	0.0028	0.0026	0.0029
Sulphate (SO_4)		5.3	5.3	***5.7***	***6.6***	4.0	3.9	3.9	3.8	4.1	4.4
Cyanides (mg/L)											
Total Cyanide		0	0	*<0.0010*	0	*<0.0020*	-	*<0.0010*	-	*<0.0020*	-
Total Metals (mg/L)											
Aluminum[3]	***equation***	0.012	0.013	0.0032	0.0033	0.0085	0.0077	0.0047	0.0050	0.0090	0.0093
Antimony		0.00090	0.00090	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.0050	0.0050	0.0060	0.00023	0.00033	0.00031	0.00029	0.00044	0.00040	0.00042	0.00037
Barium		0.020	0.020	0.0021	0.0032	0.0021	0.0022	0.0021	0.0020	0.0021	0.0021
Beryllium		0.0010	0.0010	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth		0.10	0.10	*<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*
Cadmium[3]	***equation***	0.00018	0.00019	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		4.7	4.7	4.6	***6.4***	4.3	4.2	4.3	4.0	4.7	4.5
Chromium[4]	0.001	0.0010	0.0010	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00012	*<0.00010*
Cobalt		0.00030	0.00030	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.0020	0.0020	0.00085	0.0013	0.0010	0.0011	0.0010	0.0010	0.0011	0.0011
Iron	0.3	0.030	0.030	*<0.010*	*<0.010*	0.020	0.020	0.022	0.024	***0.036***	***0.036***
Lead[3]	***equation***	0.00070	0.00070	***0.0011***	0.00051	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	0.00010	*<0.000050*
Lithium		0.0050	0.0050	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		1.3	1.3	1.2	***2.0***	1.3	1.3	***1.3***	1.3	***1.4***	***1.4***
Manganese[3]		0.0020	0.0020	0.00068	0.0017	0.0018	0.0017	***0.0027***	***0.0028***	***0.0026***	***0.0028***
Mercury	0.000026	0.00010	0.00010	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.0020	0.0020	0.00015	0.00019	0.00013	0.00013	0.00017	0.00016	0.00019	0.00017
Nickel[3]	***equation***	0.0010	0.0010	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Potassium		2.0	2.0	0.40	0.65	0.42	0.41	0.45	0.44	0.45	0.46
Selenium	0.001	0.0010	0.0010	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.040	0.040	***0.64***	***0.94***	***0.52***	***0.49***	***0.70***	***0.67***	***0.71***	***0.71***
Silver	0.0001	0.00002	0.00002	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		2.0	2.0	0.50	0.86	0.57	0.57	0.58	0.57	0.61	0.62
Thallium	0.0008	0.00020	0.00020	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Uranium	0.015	0.00070	0.00070	0.00003	0.00006	0.00006	0.00006	0.00006	0.00005	0.00006	0.00006
Vanadium		0.030	0.030	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]	***equation***	0.013	0.013	*<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 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** = concentrations exceed the prediction "Without Dike Leaching."
- ***Bold italicized*** = concentrations exceed the prediction "With Dike Leaching."

Italicized numbers are below detection limits.

"-" not analyzed/not sampled.

FIGURES

Figure B1-1. Laboratory-measured conductivity (µS/cm).

Note: Conductivity data from 2014 should be interpreted with caution. See Azimuth (2015) for more details.

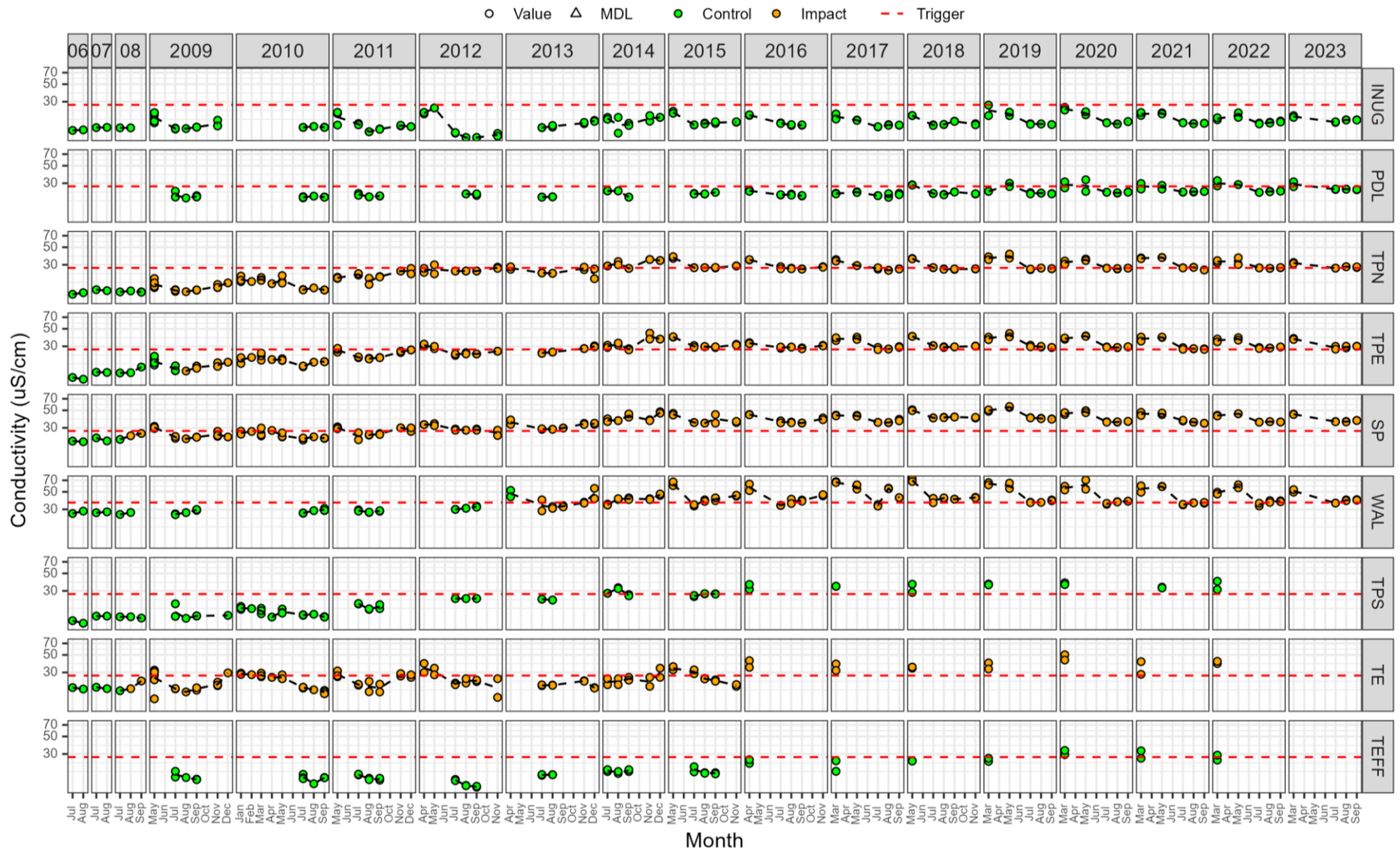


Figure B1-2. Laboratory-measured hardness (mg/L).

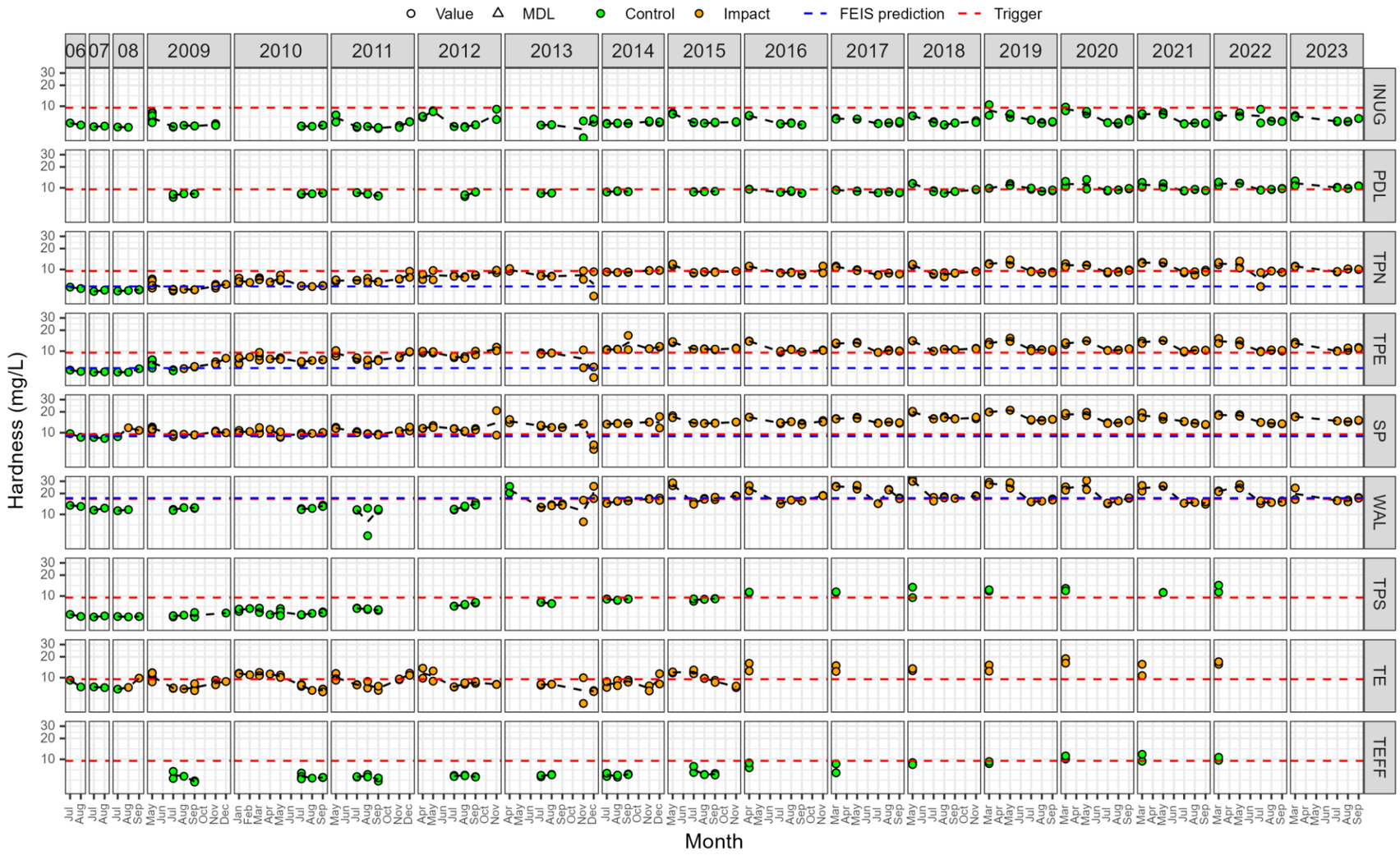


Figure B1-3. Field-measured pH.

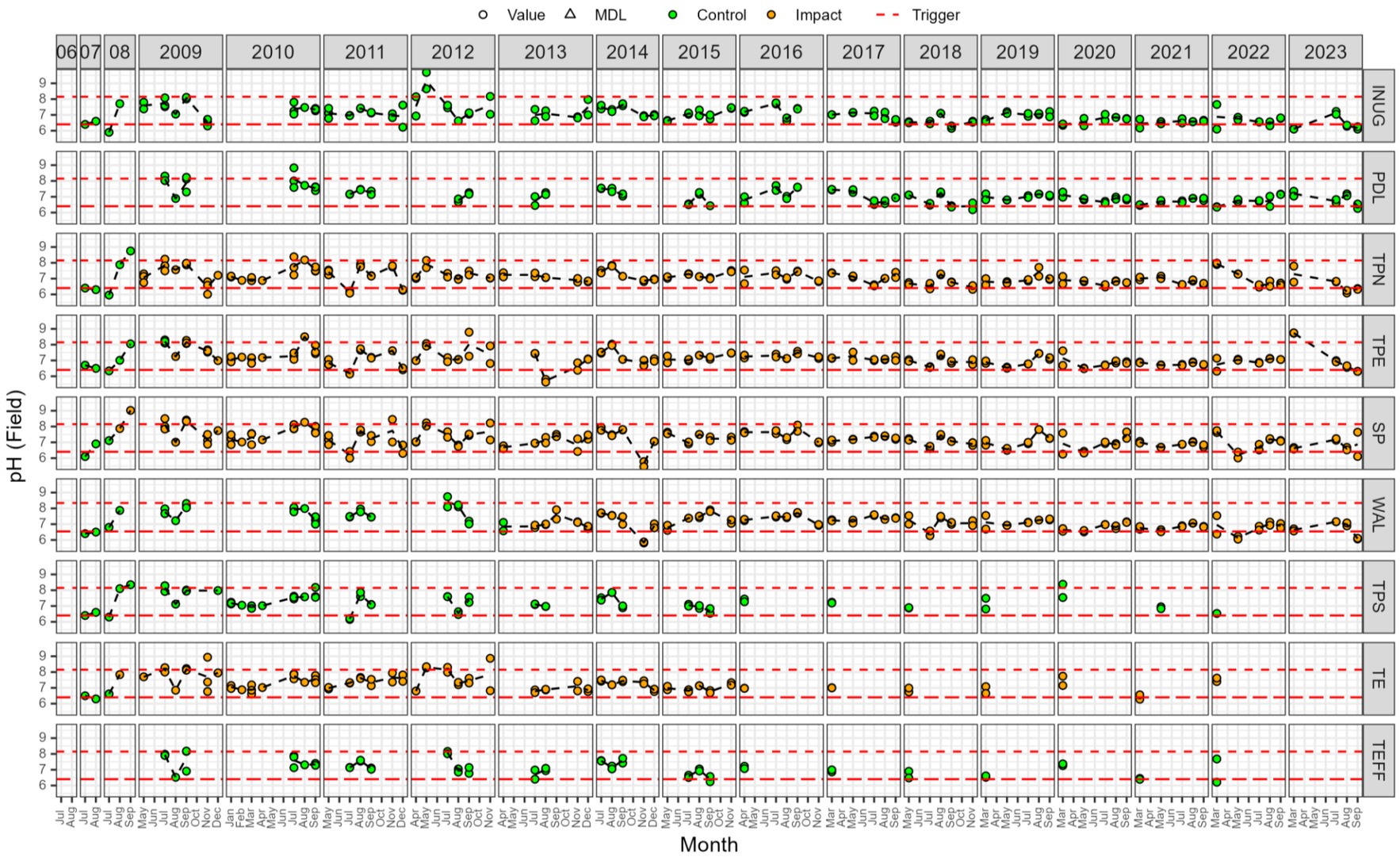


Figure B1-4. Laboratory-measured pH.

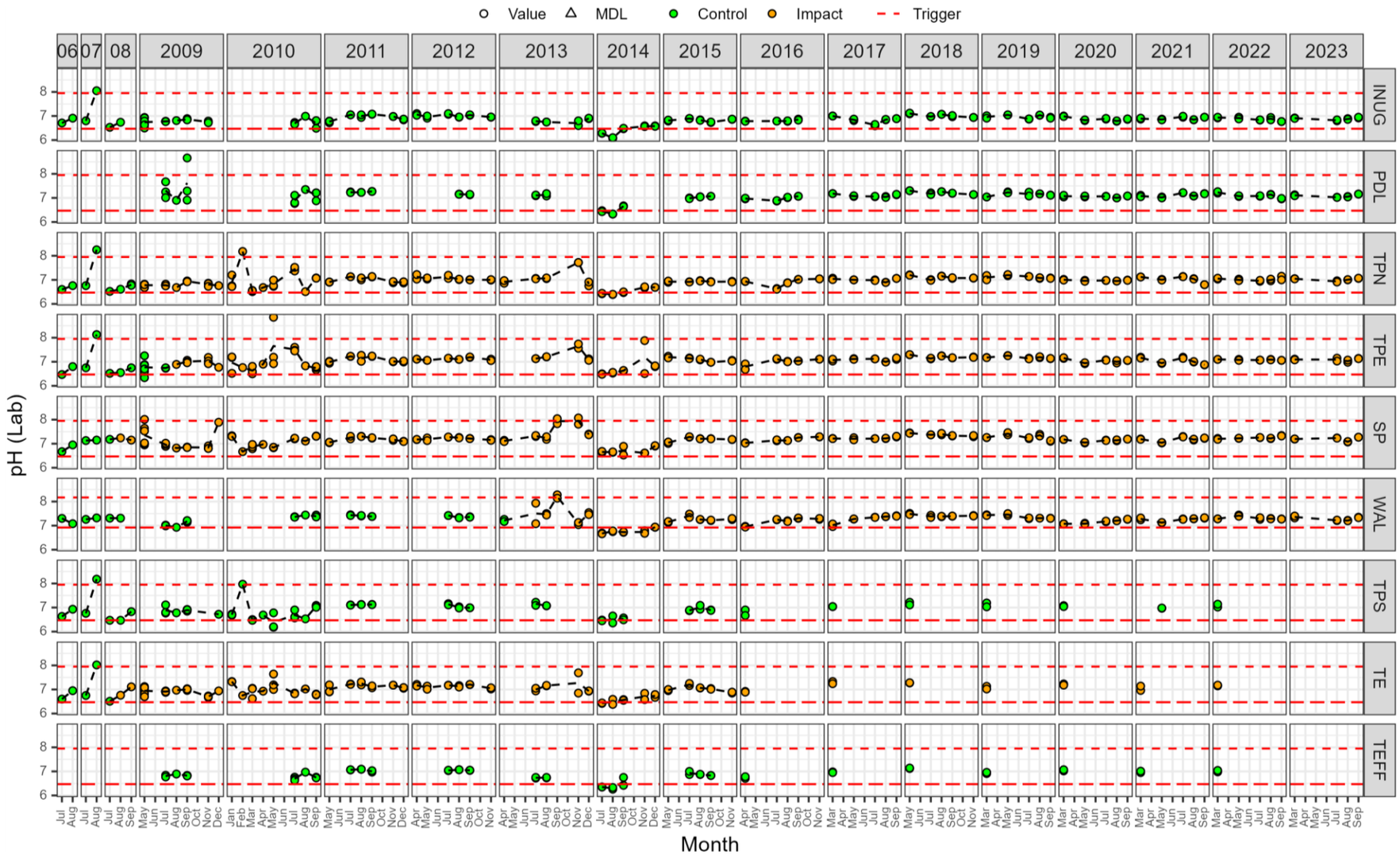


Figure B1-5. Total dissolved solids (TDS; mg/L).

Note: TDS data from 2014 were removed due to data quality concerns. See Azimuth (2015) for more details.

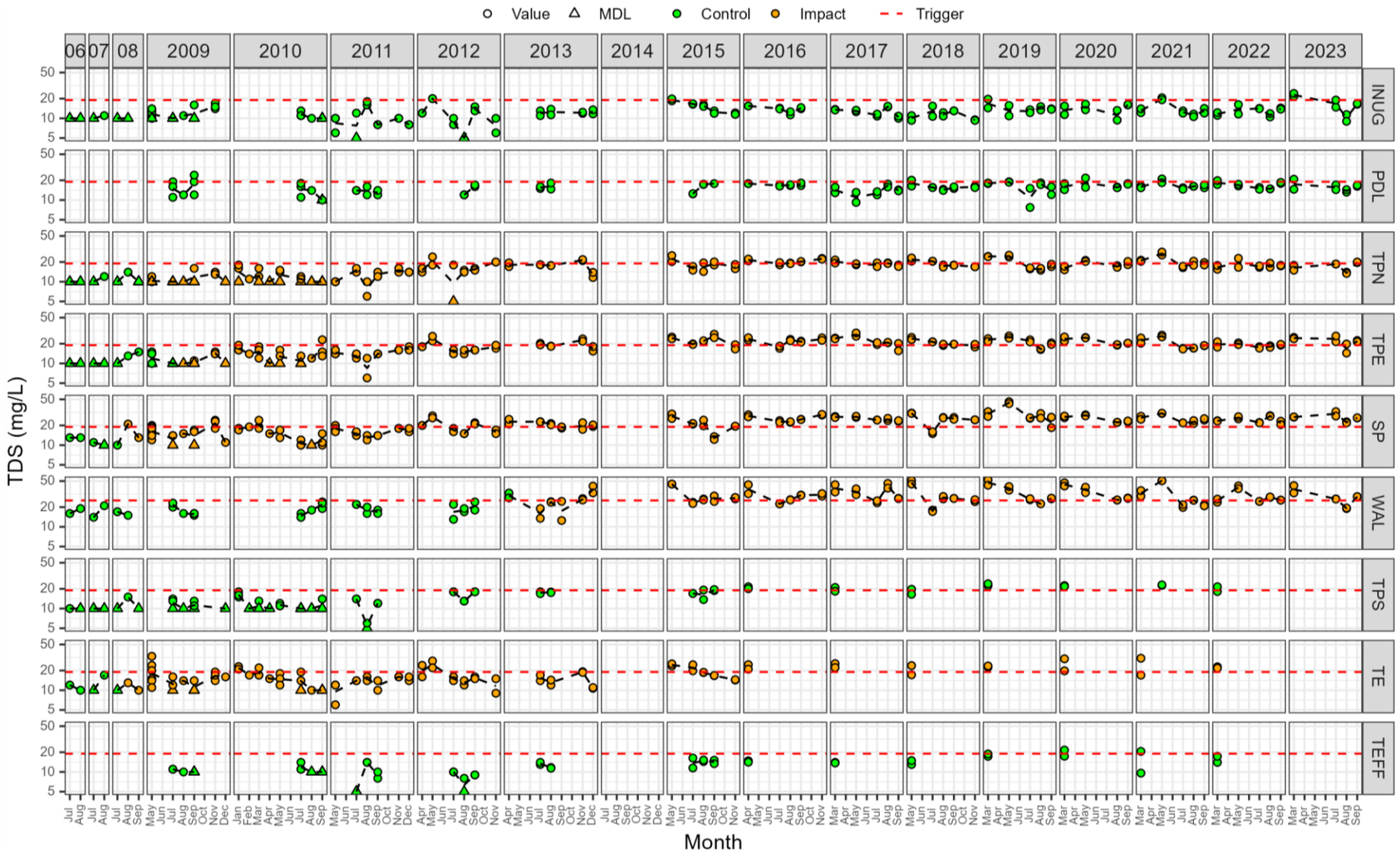


Figure B1-6. Total suspended solids (TSS; mg/L).

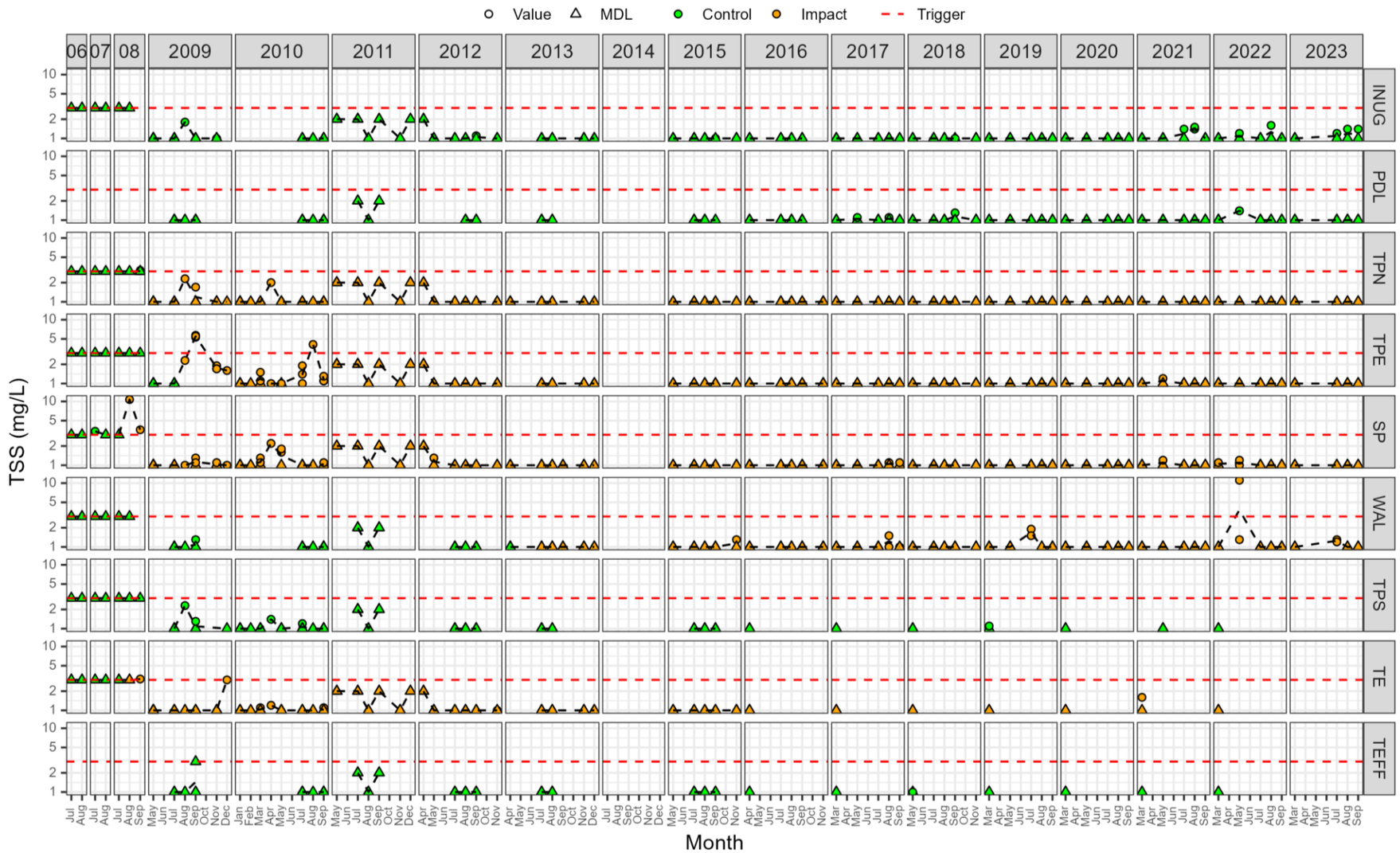


Figure B1-7. Carbonate alkalinity (mg/L).

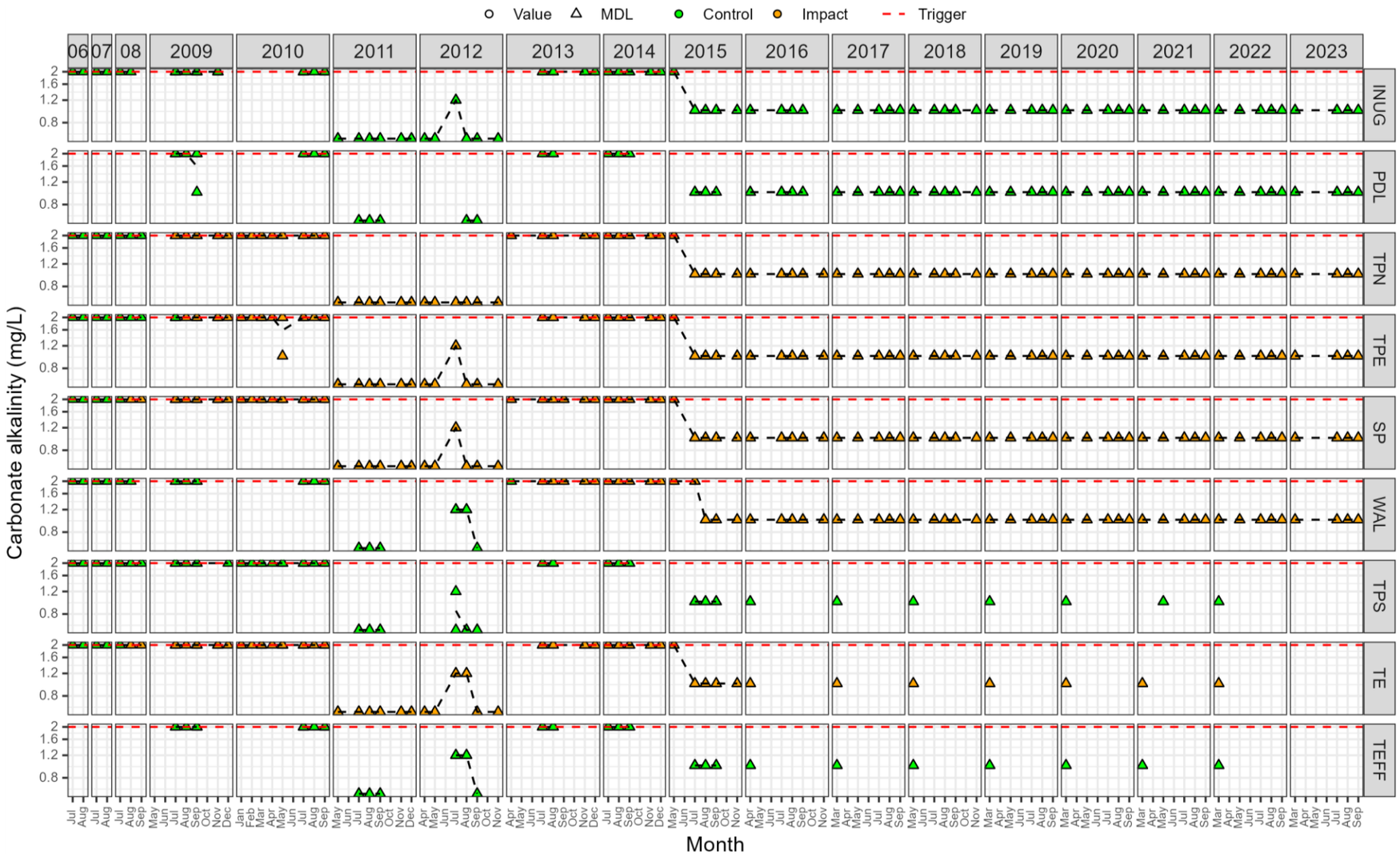


Figure B1-8. Bicarbonate alkalinity (mg/L).

Note: Bicarbonate alkalinity data from 2014 were removed due to data quality concerns. See Azimuth (2015) for more details.

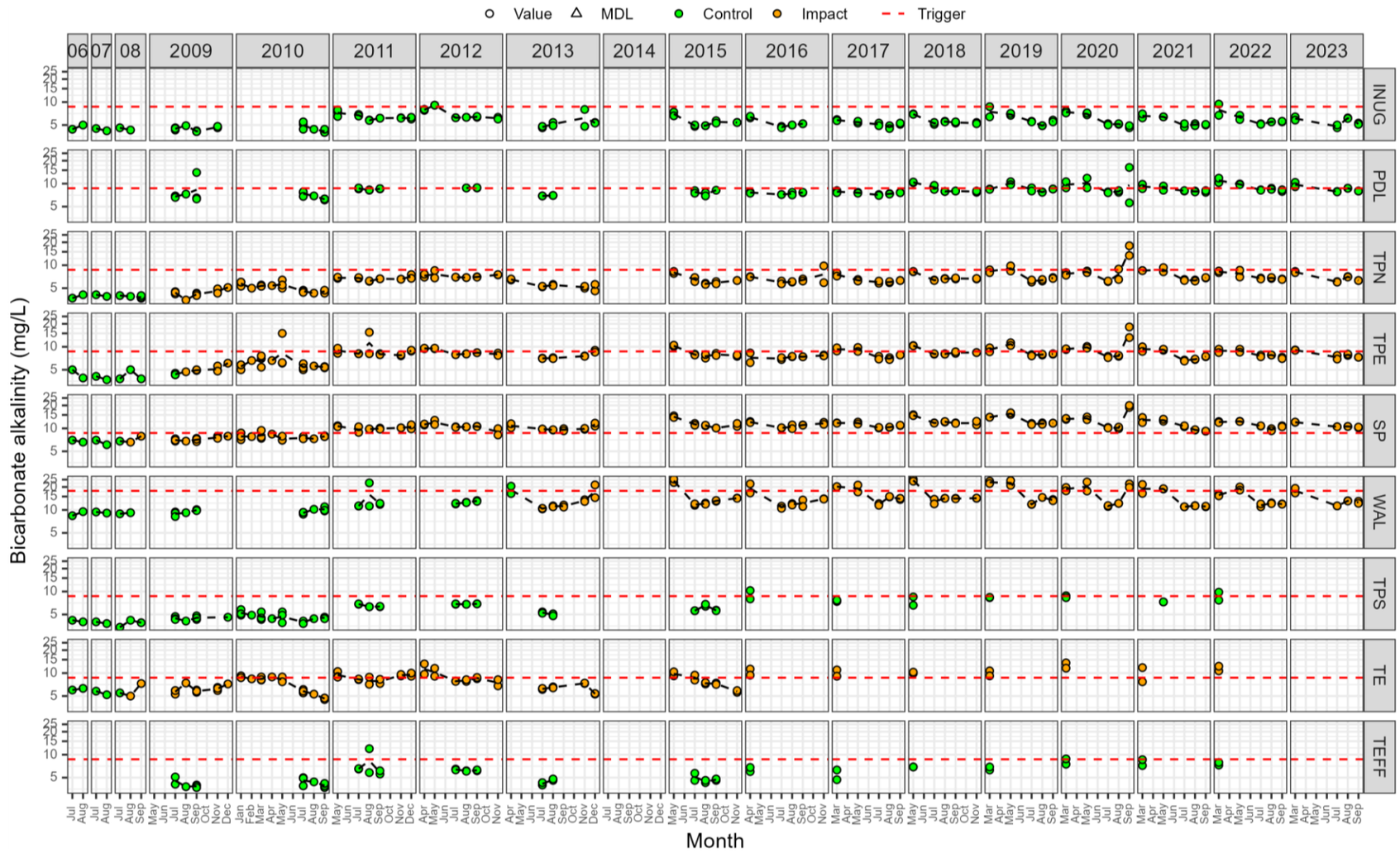


Figure B1-9. Total alkalinity (mg/L).

Note: Total alkalinity data from 2014 were removed due to data quality concerns. See Azimuth (2015) for more details.

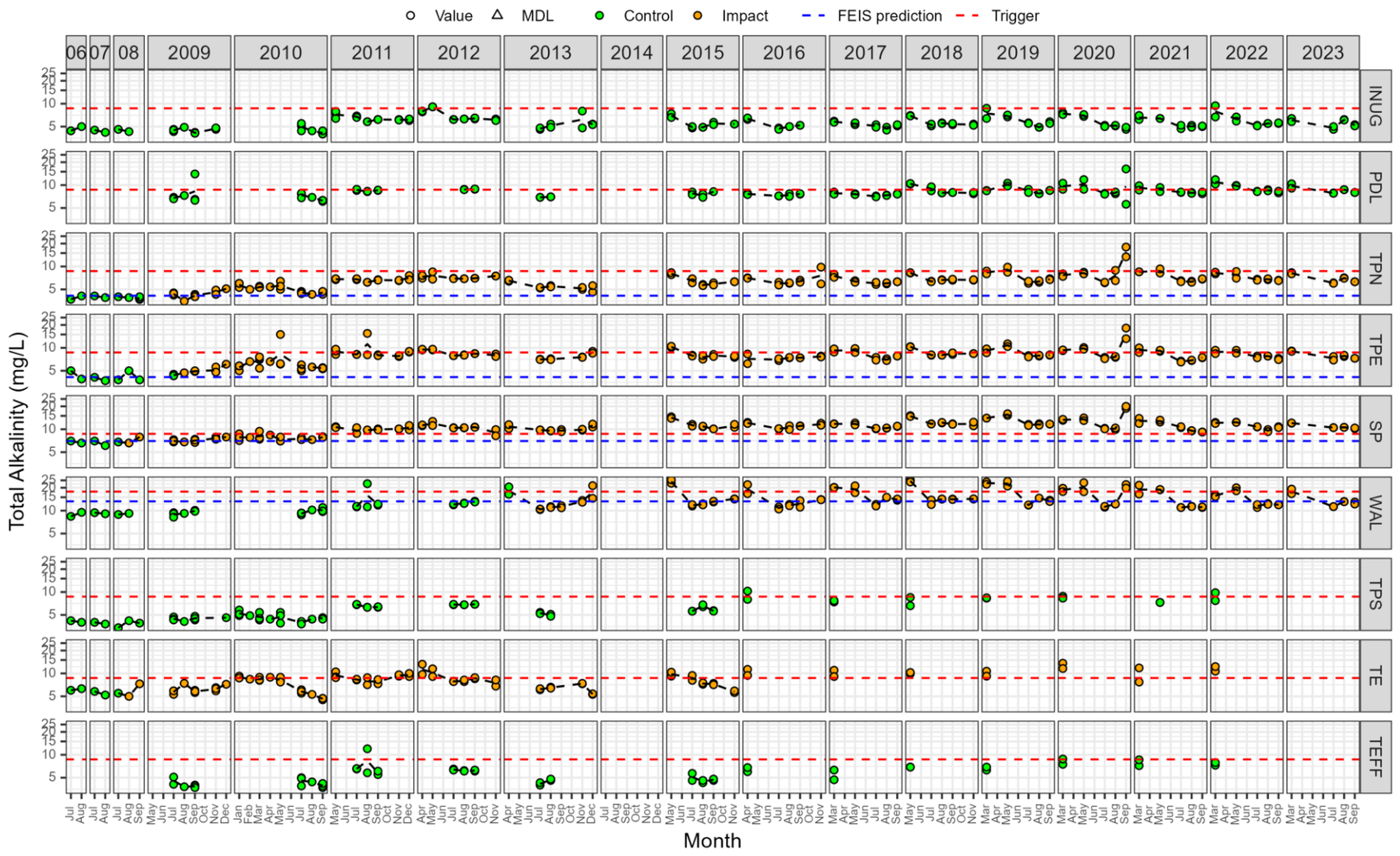


Figure B1-10. Ammonia-N (mg/L).

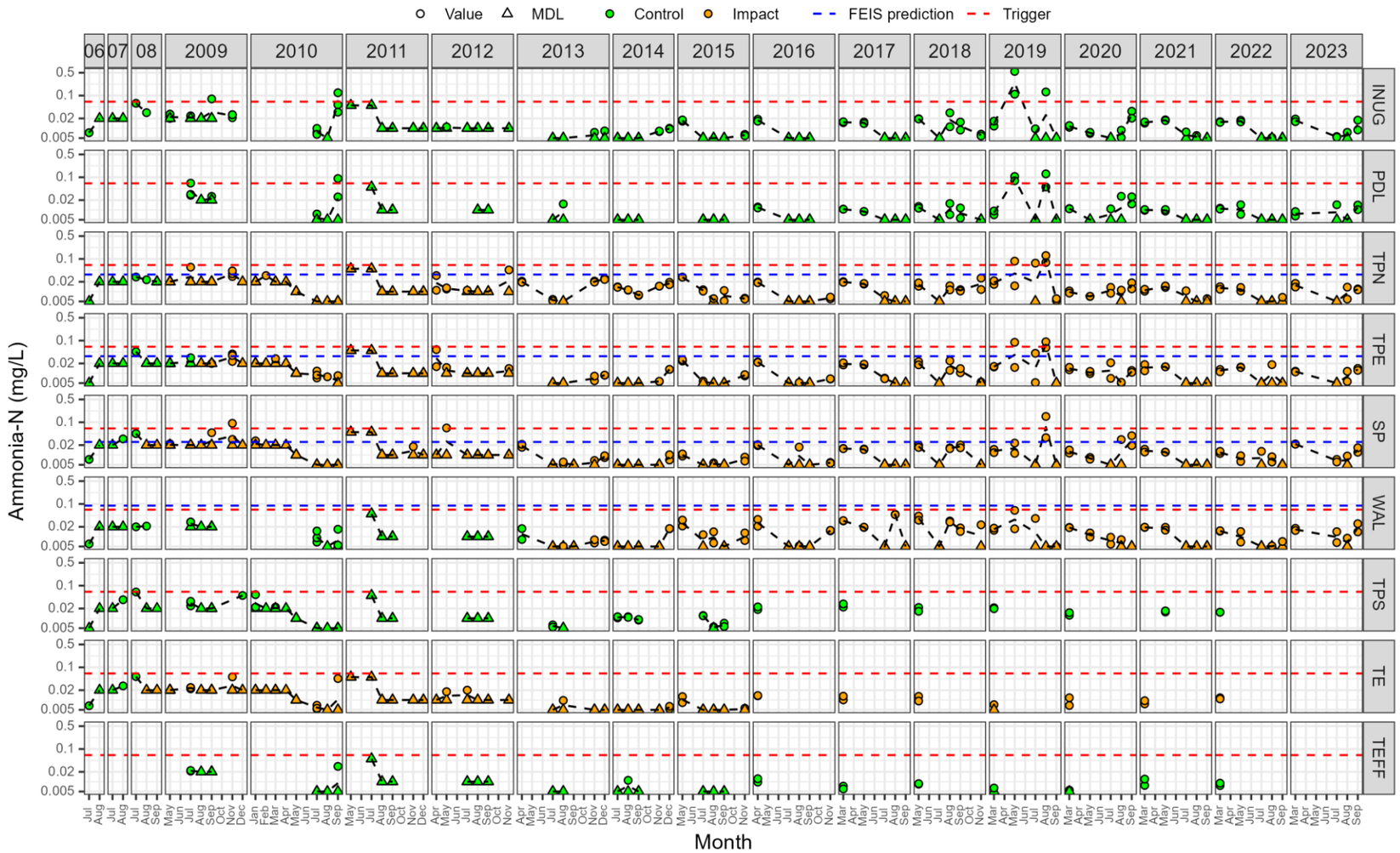


Figure B1-11. Chloride (mg/L).

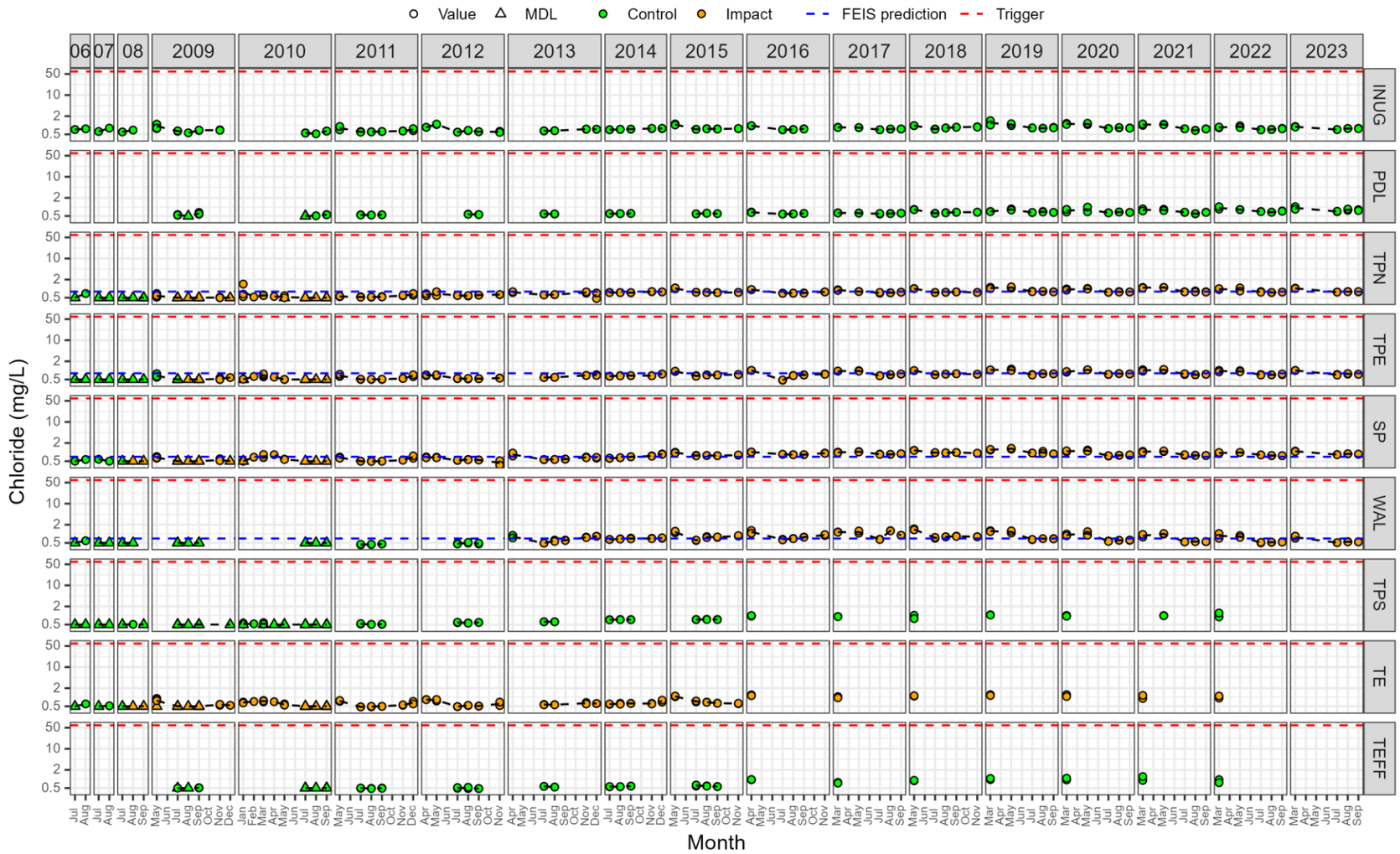


Figure B1-12. Fluoride (mg/L).

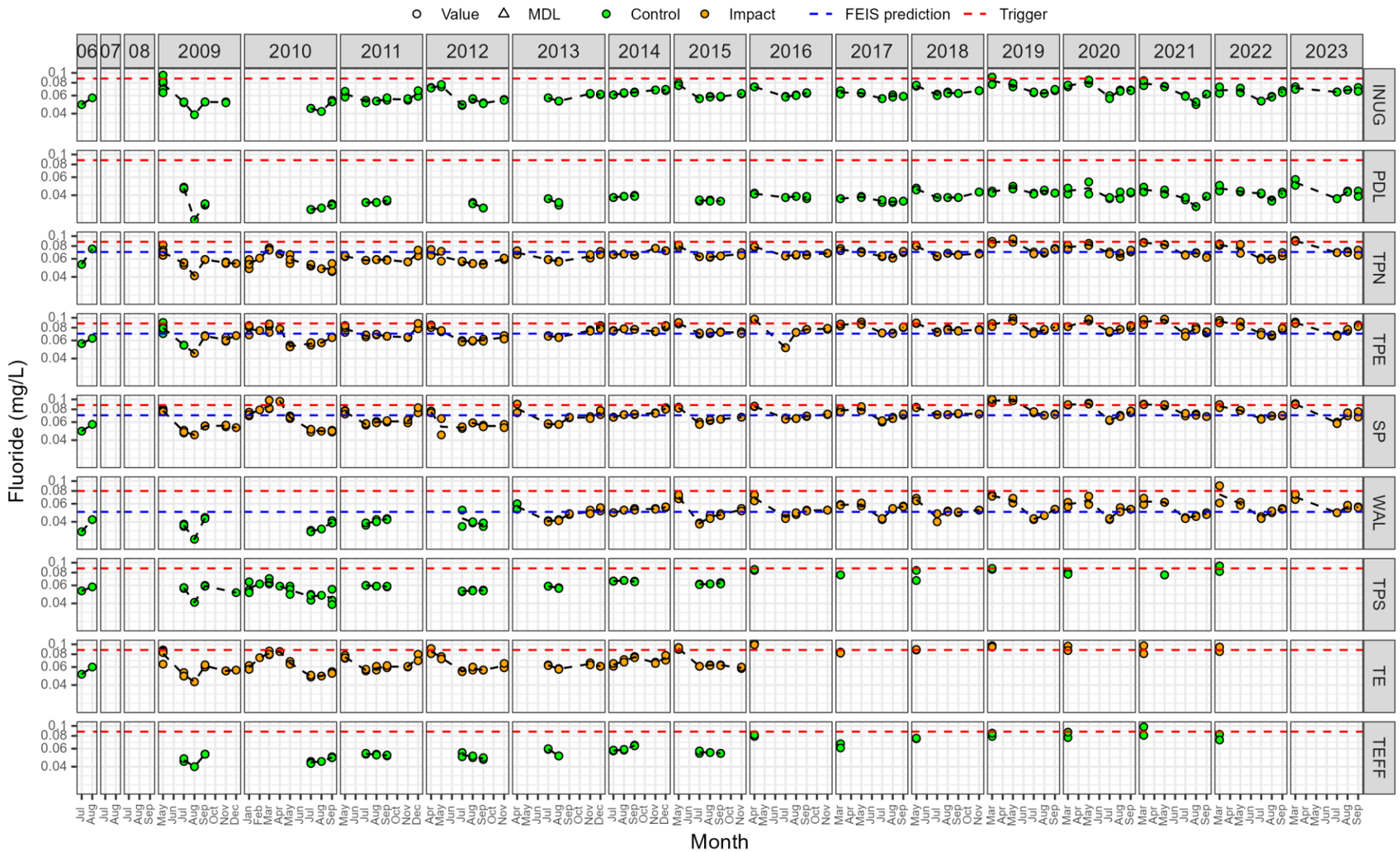


Figure B1-13. Nitrate-N (mg/L).

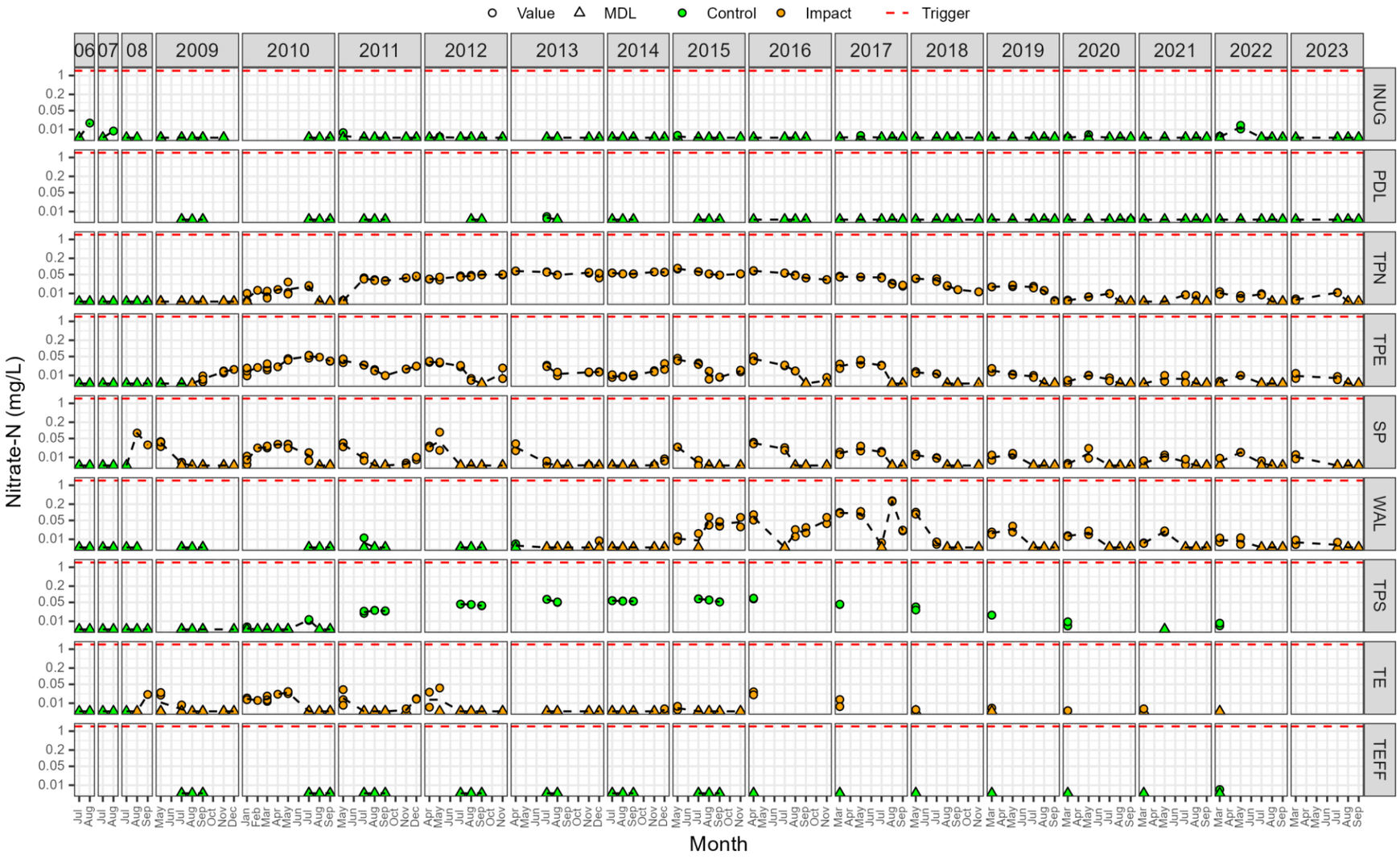


Figure B1-14. Nitrite-N (mg/L).

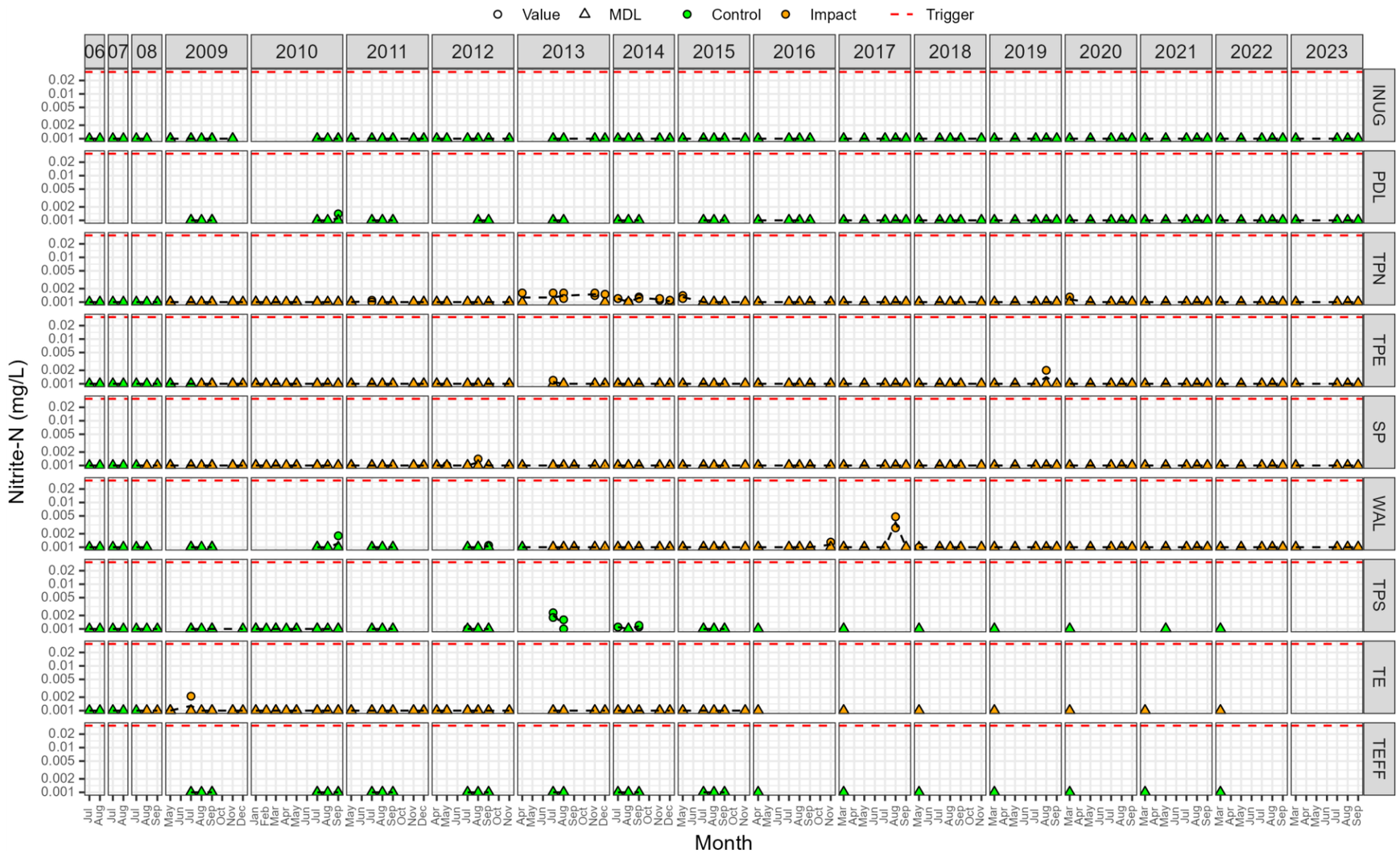


Figure B1-15. Total Kjeldahl Nitrogen (TKN; mg/L).

Note: TKN data from 2014 were removed due to data quality concerns. See Azimuth (2015) for more details.

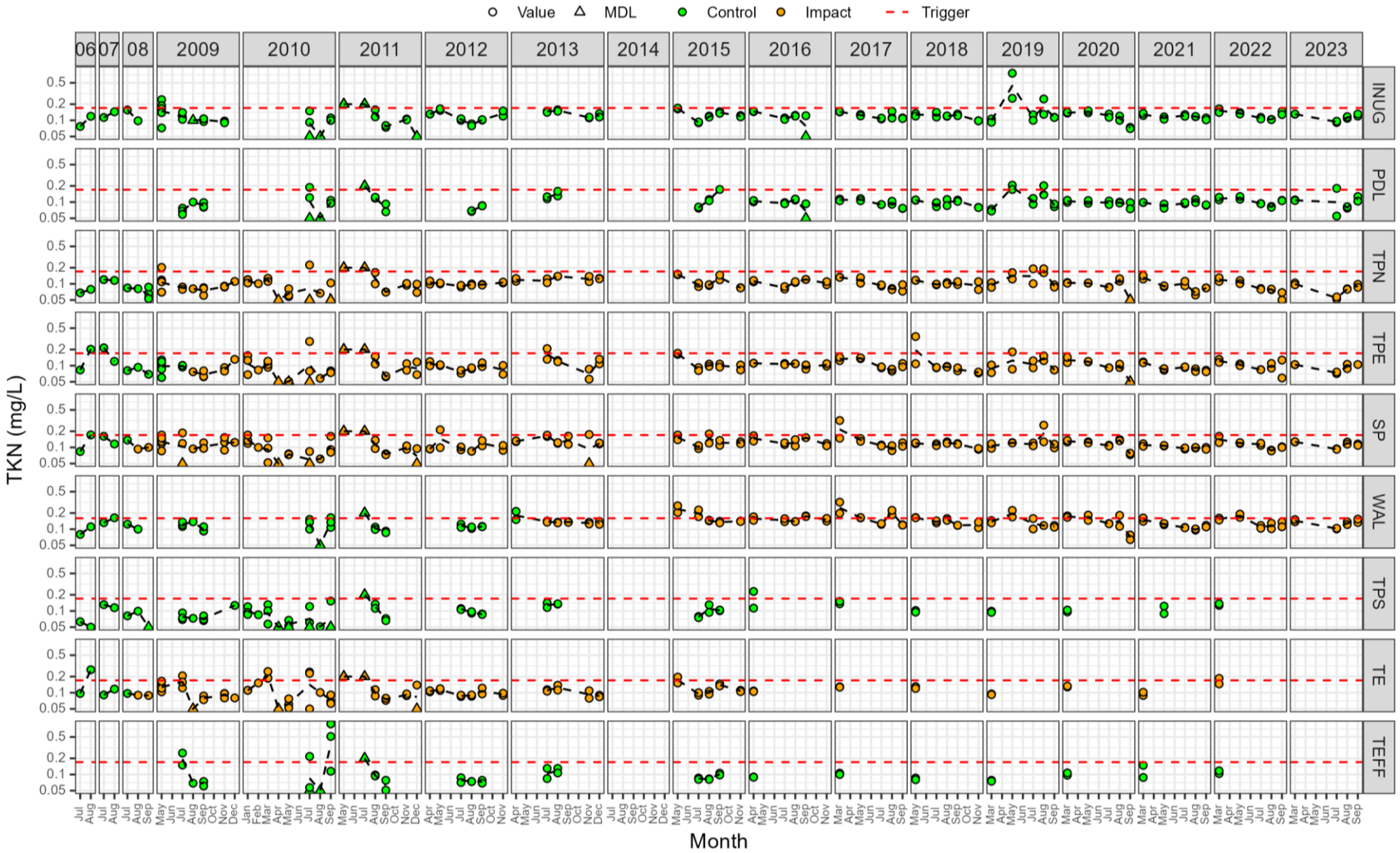


Figure B1-16. Total phosphorus (mg/L).

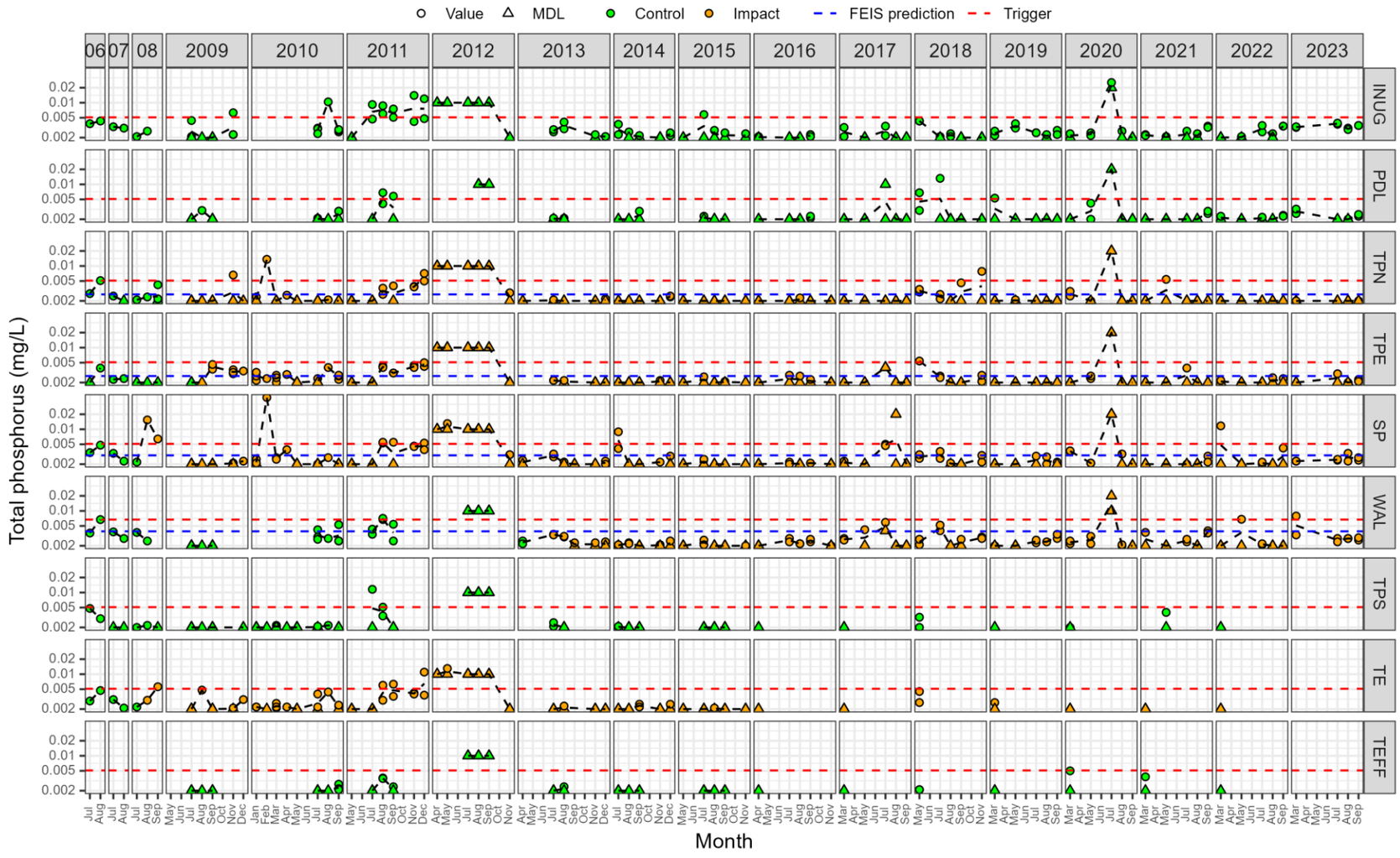


Figure B1-17. Ortho-phosphate (mg/L).

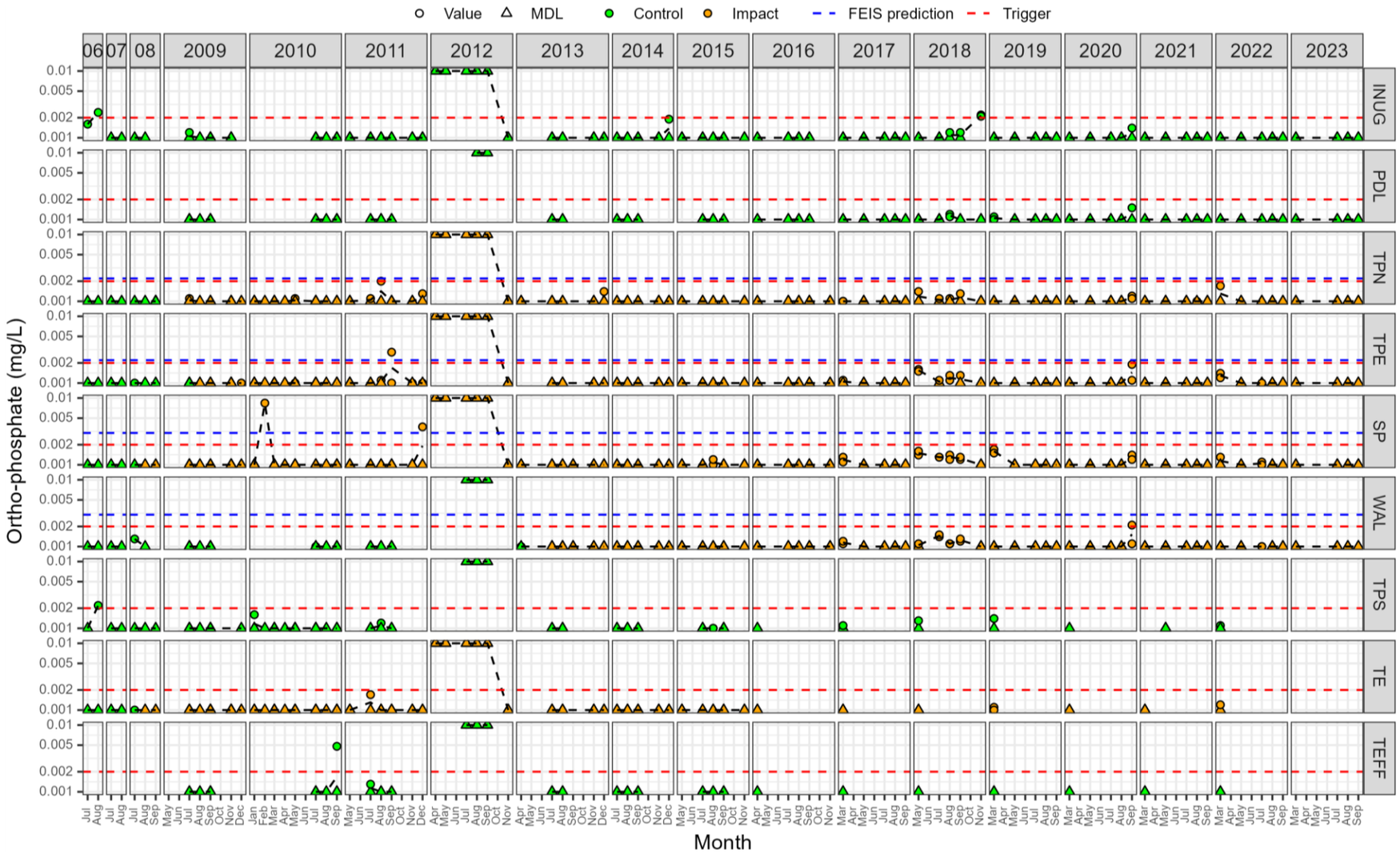


Figure B1-18. Reactive silica (mg/L).

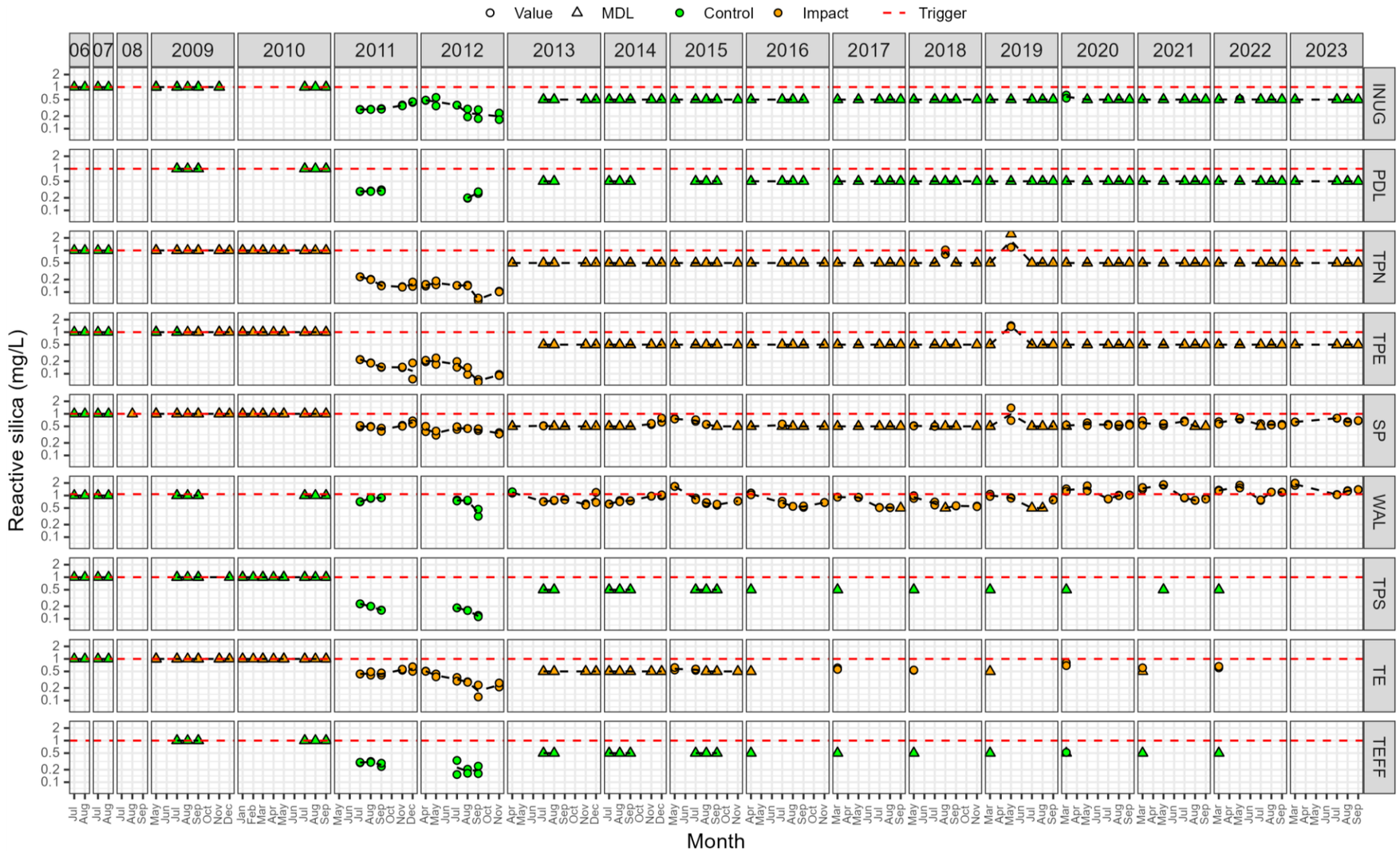


Figure B1-19. Sulphate (mg/L).

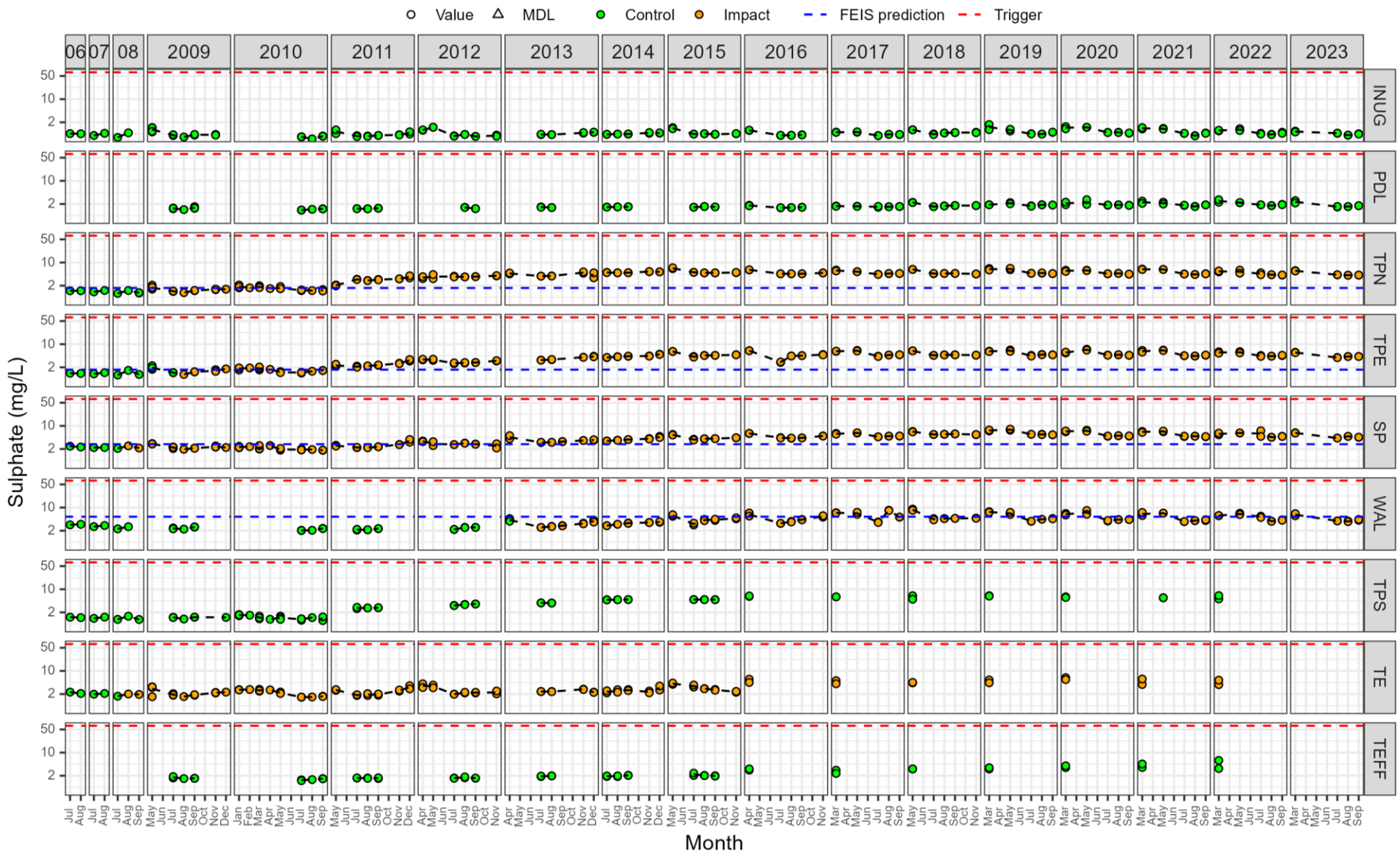


Figure B1-20. Dissolved Organic Carbon (DOC; mg/L).

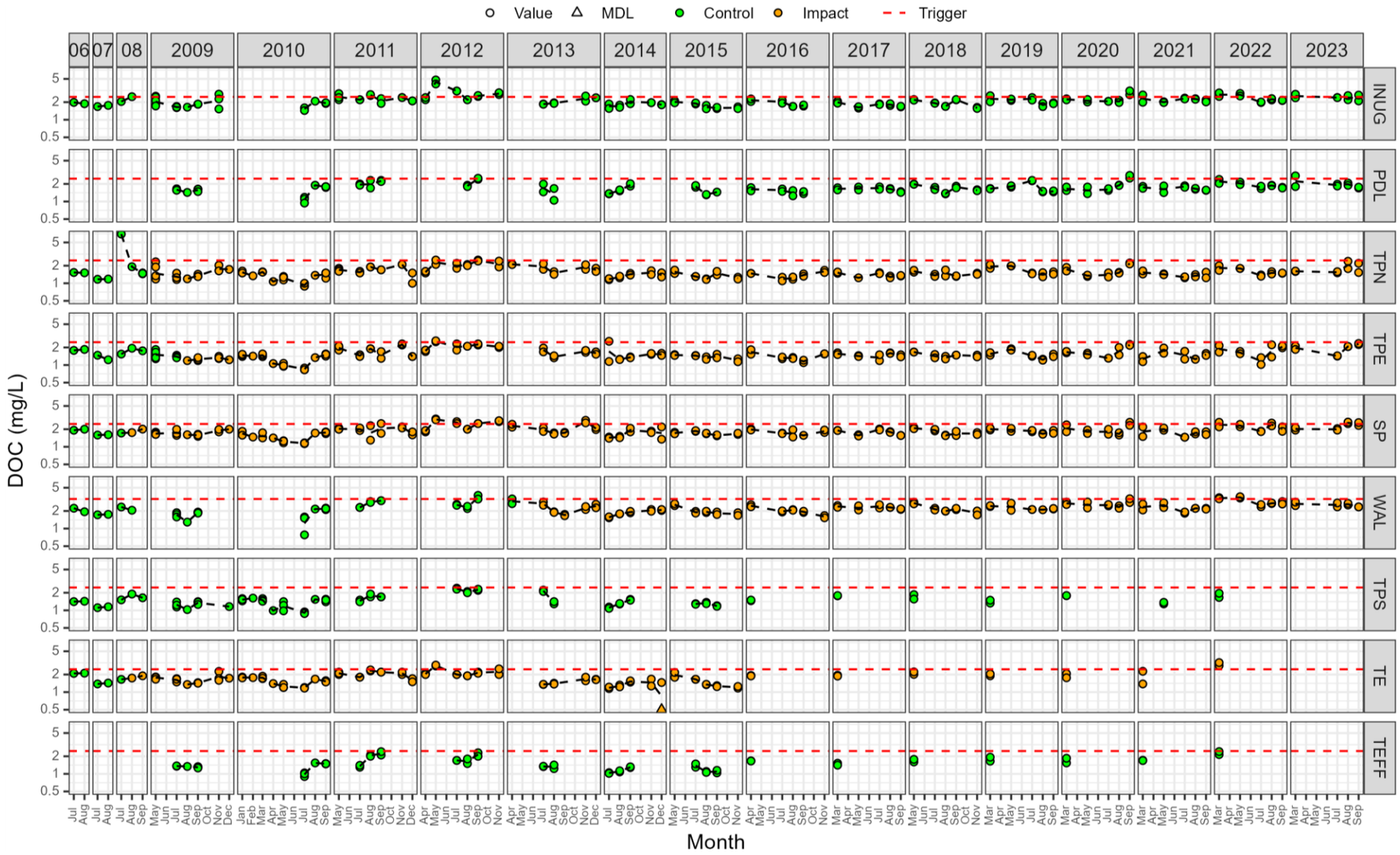


Figure B1-21. Total Organic Carbon (TOC; mg/L).

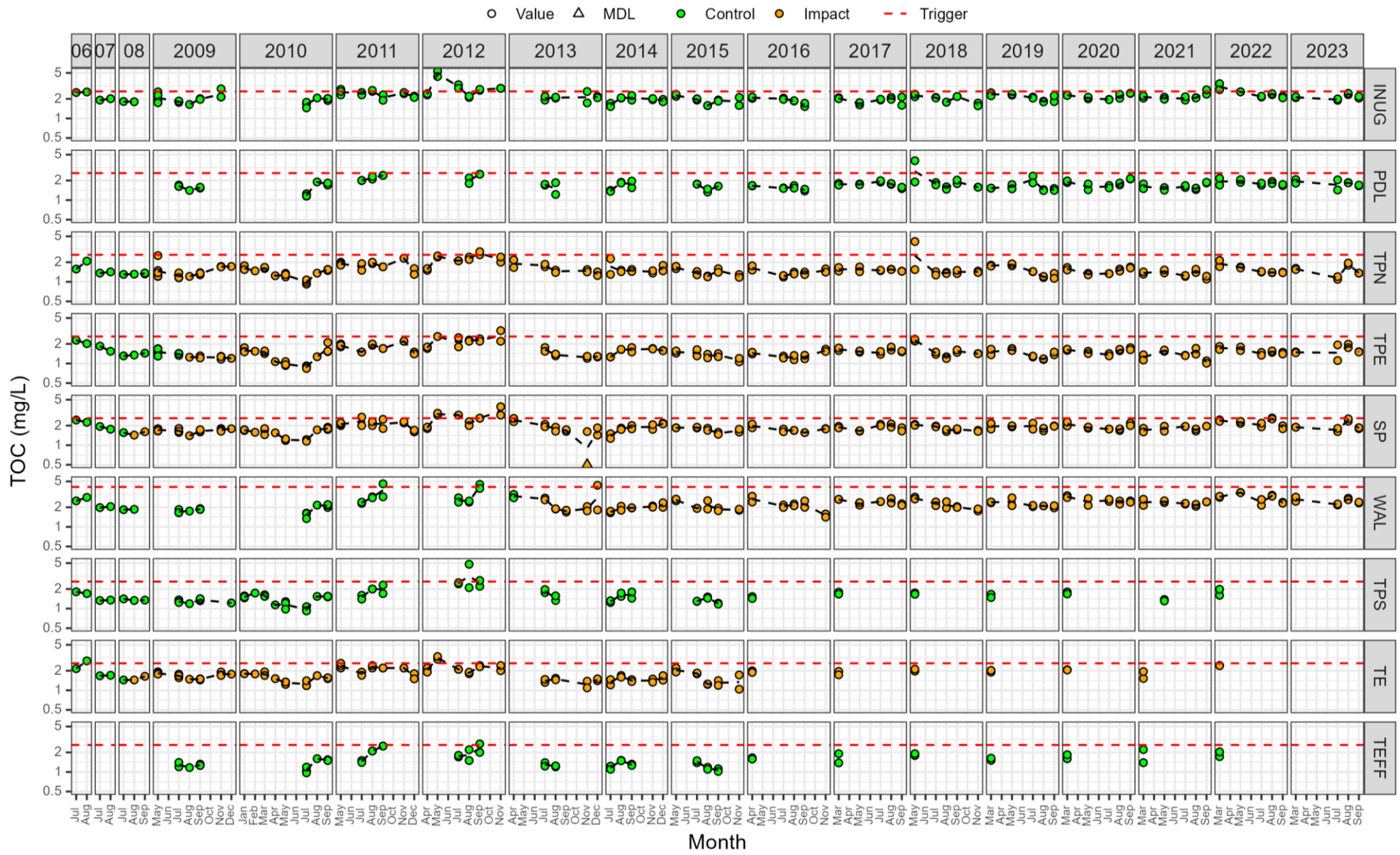


Figure B1-22. Total aluminum (mg/L).

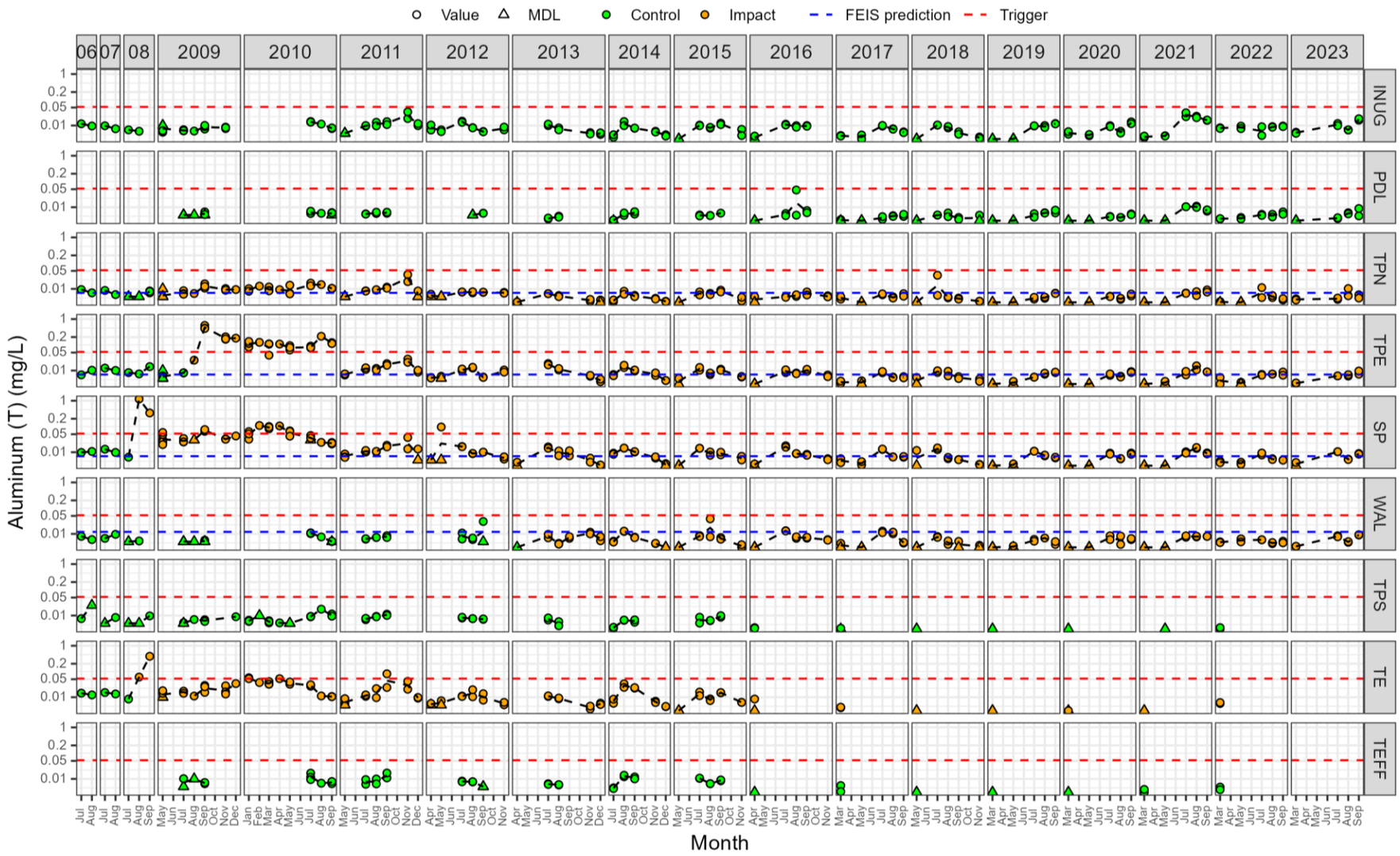


Figure B1-23. Total antimony (mg/L).

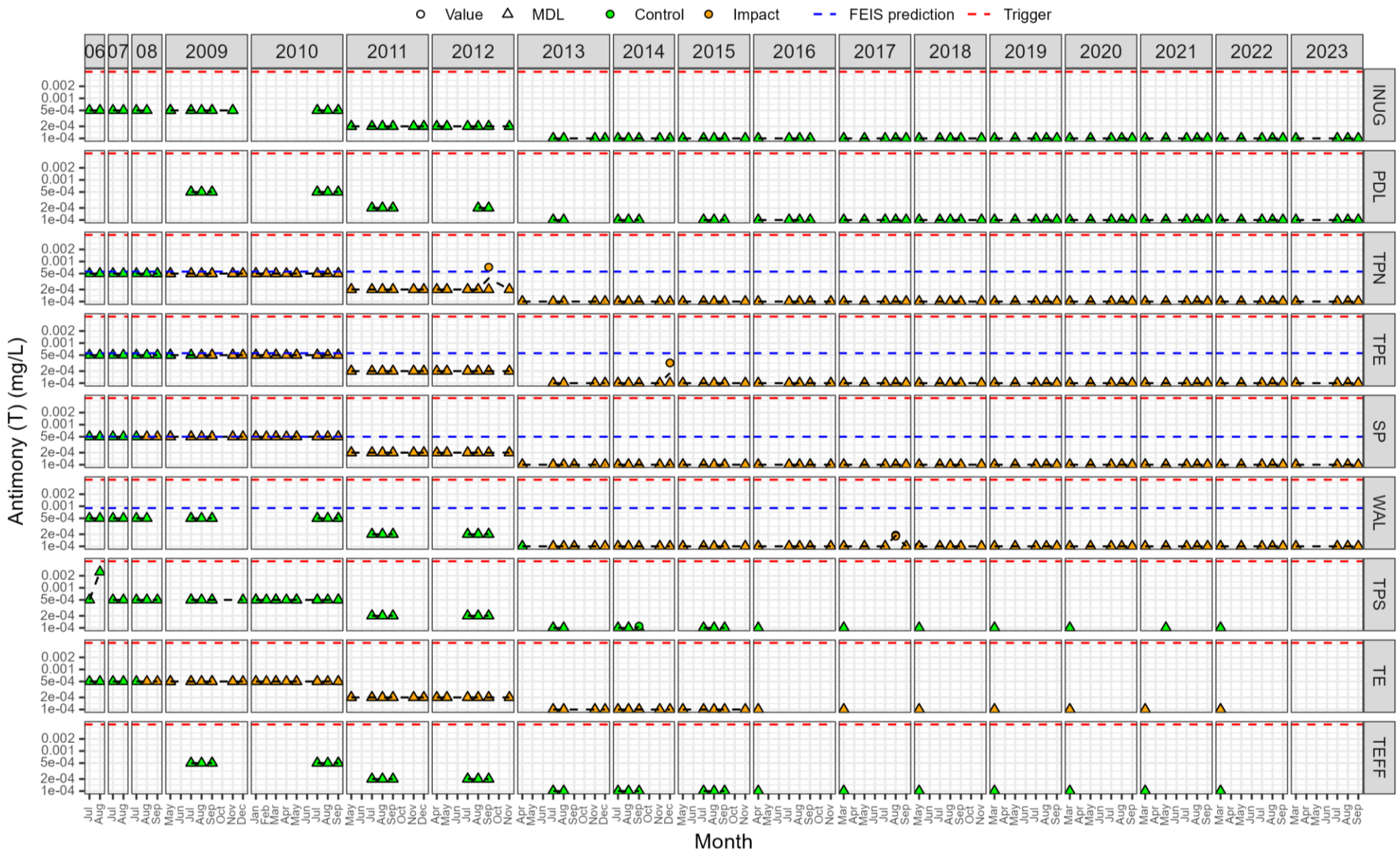


Figure B1-24. Total arsenic (mg/L).

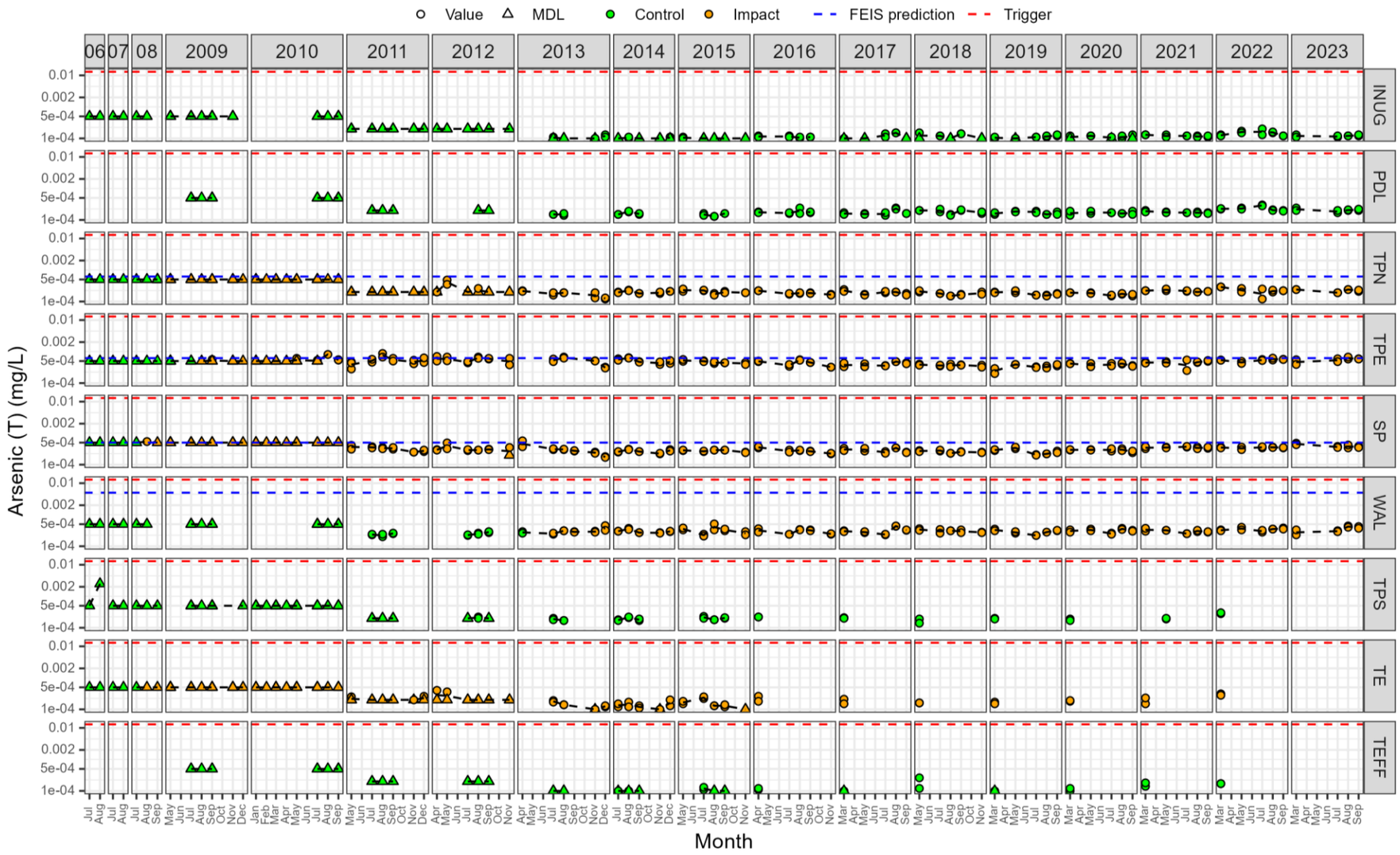


Figure B1-25. Total barium (mg/L).

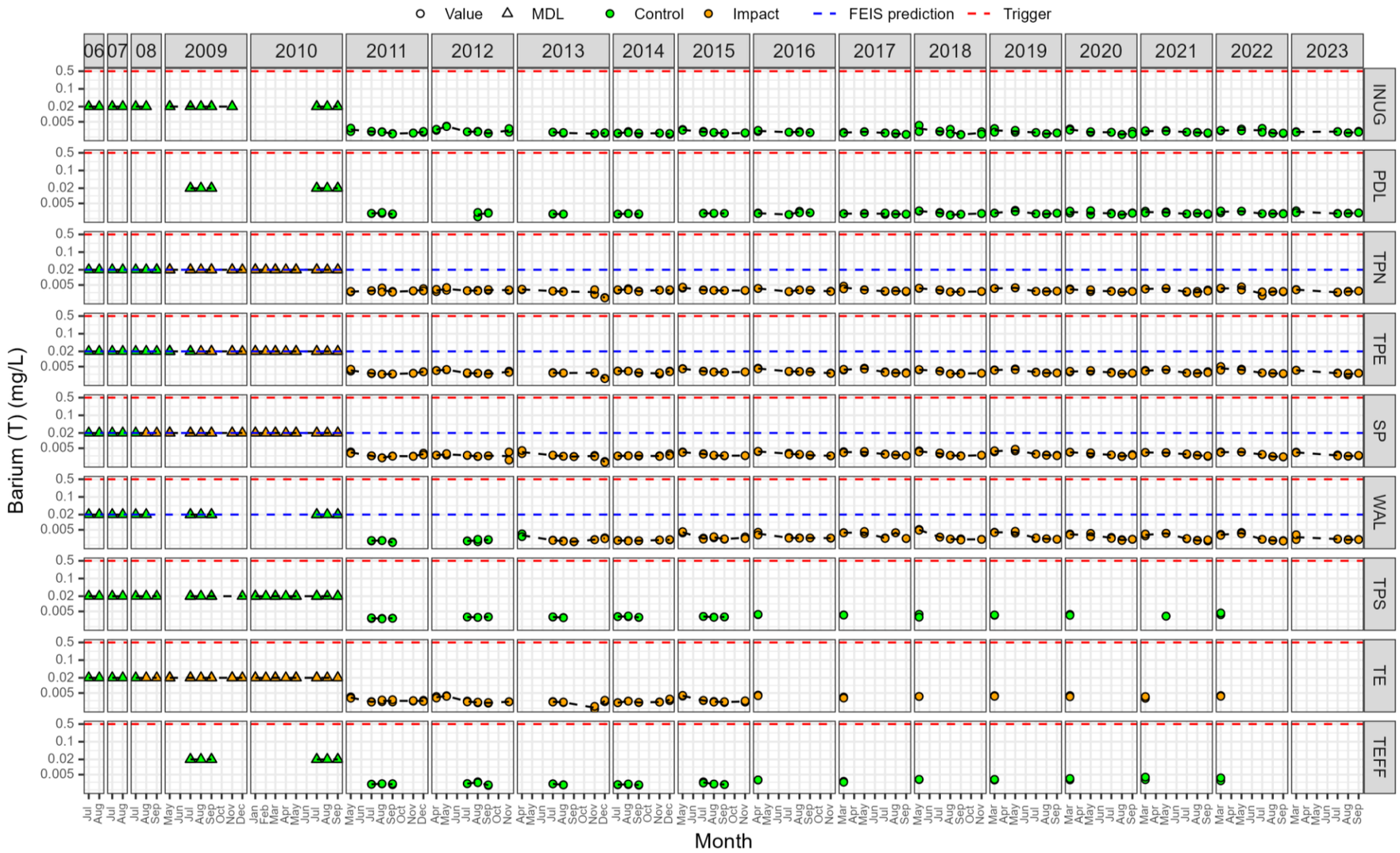


Figure B1-26. Total beryllium (mg/L).



Figure B1-27. Total boron (mg/L).

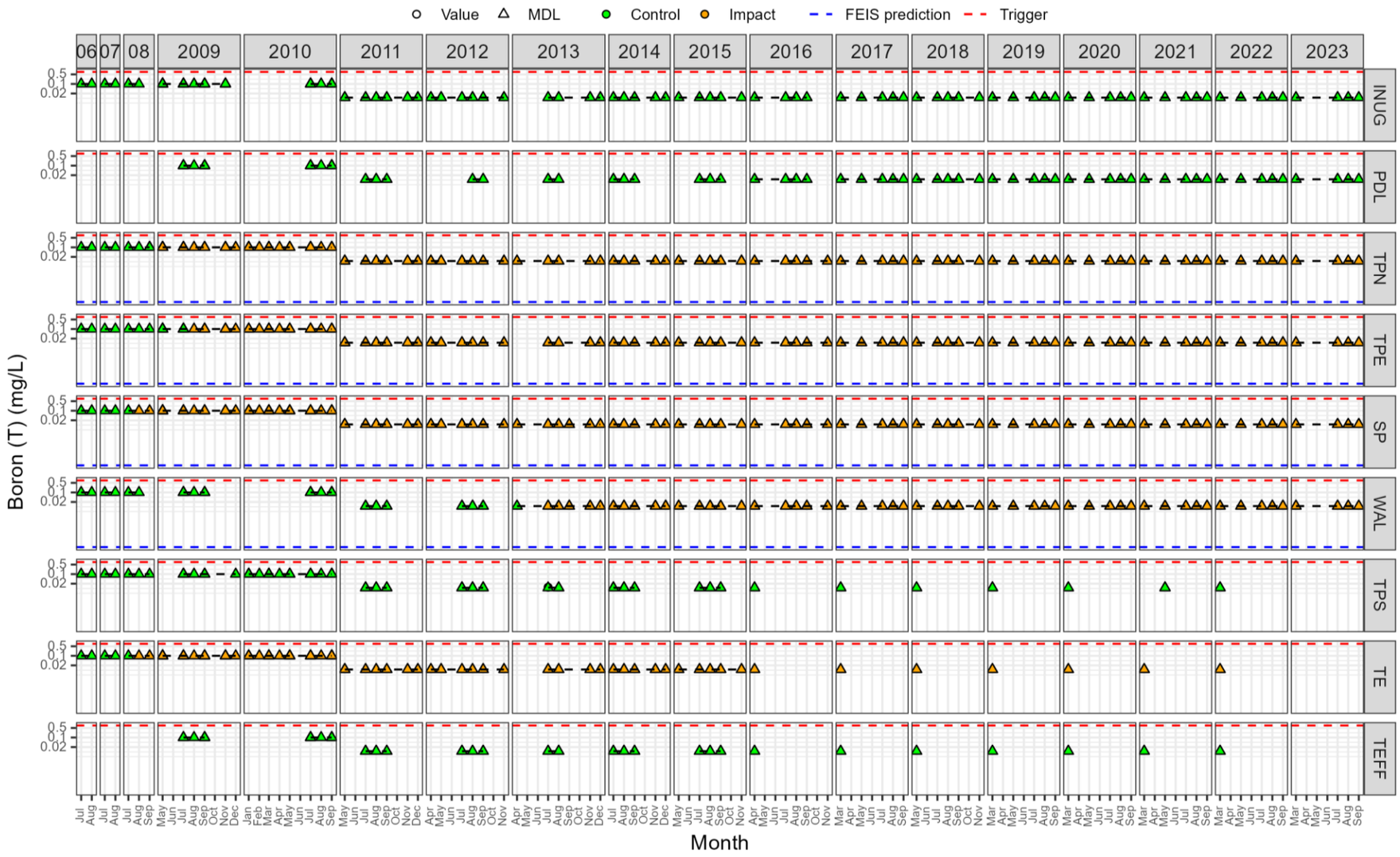


Figure B1-28. Total cadmium (mg/L).



Figure B1-29. Total calcium (mg/L).

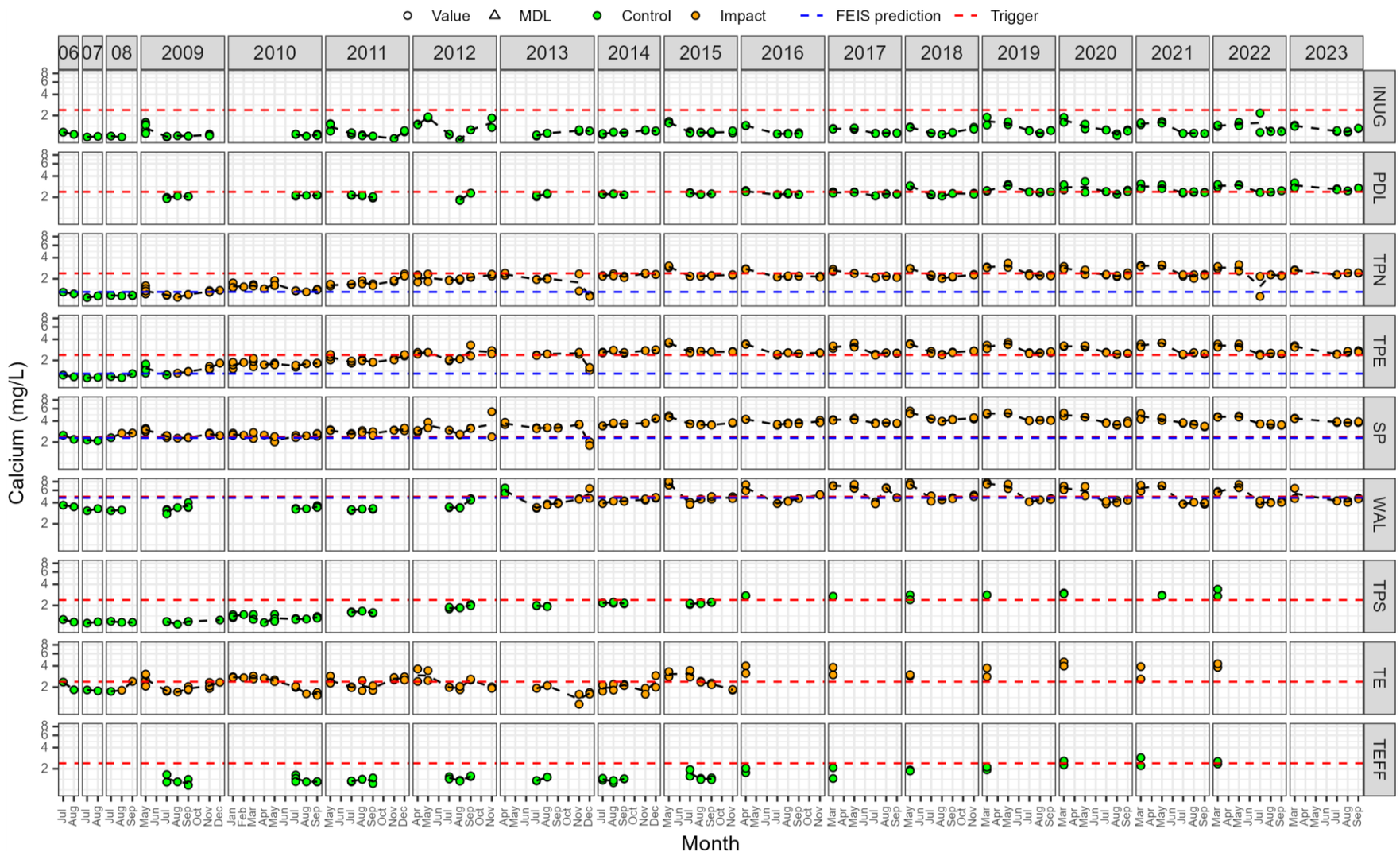


Figure B1-30. Total chromium (mg/L).

Note: The detection limit for total chromium was adjusted from 0.0001 mg/L to 0.0005 mg/L for samples collected in since May 2021.

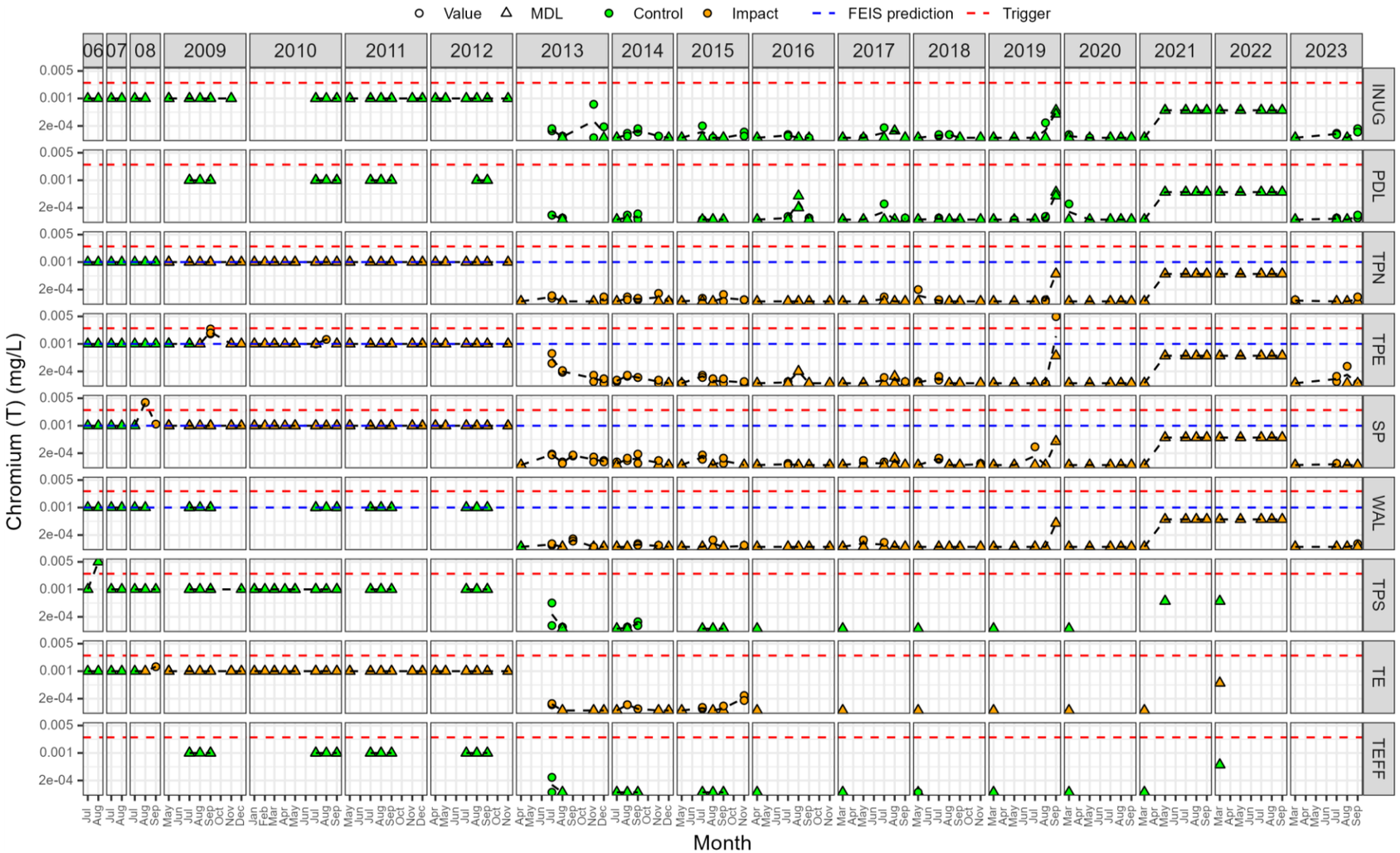


Figure B1-31. Total copper (mg/L).

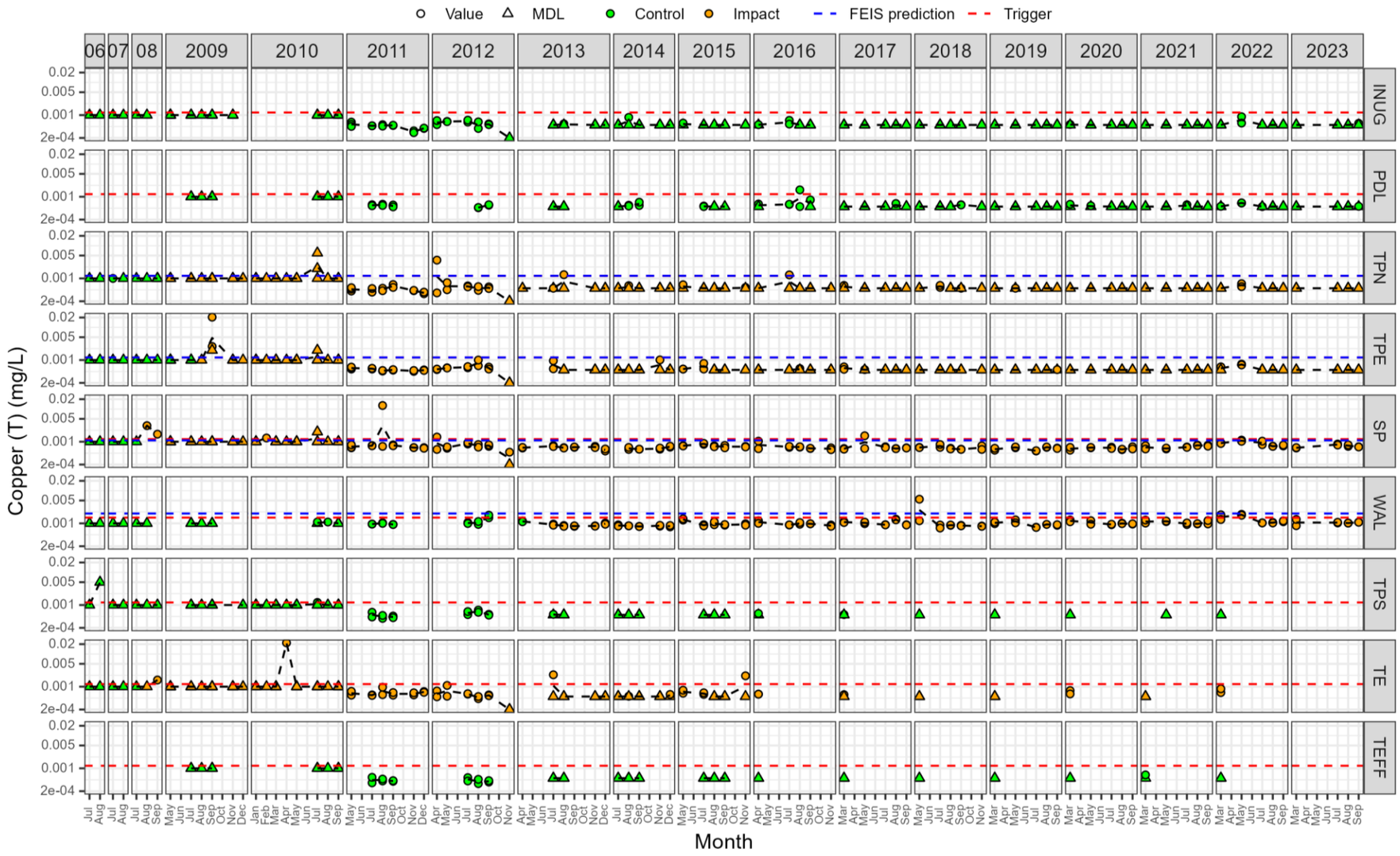


Figure B1-32. Total iron (mg/L).

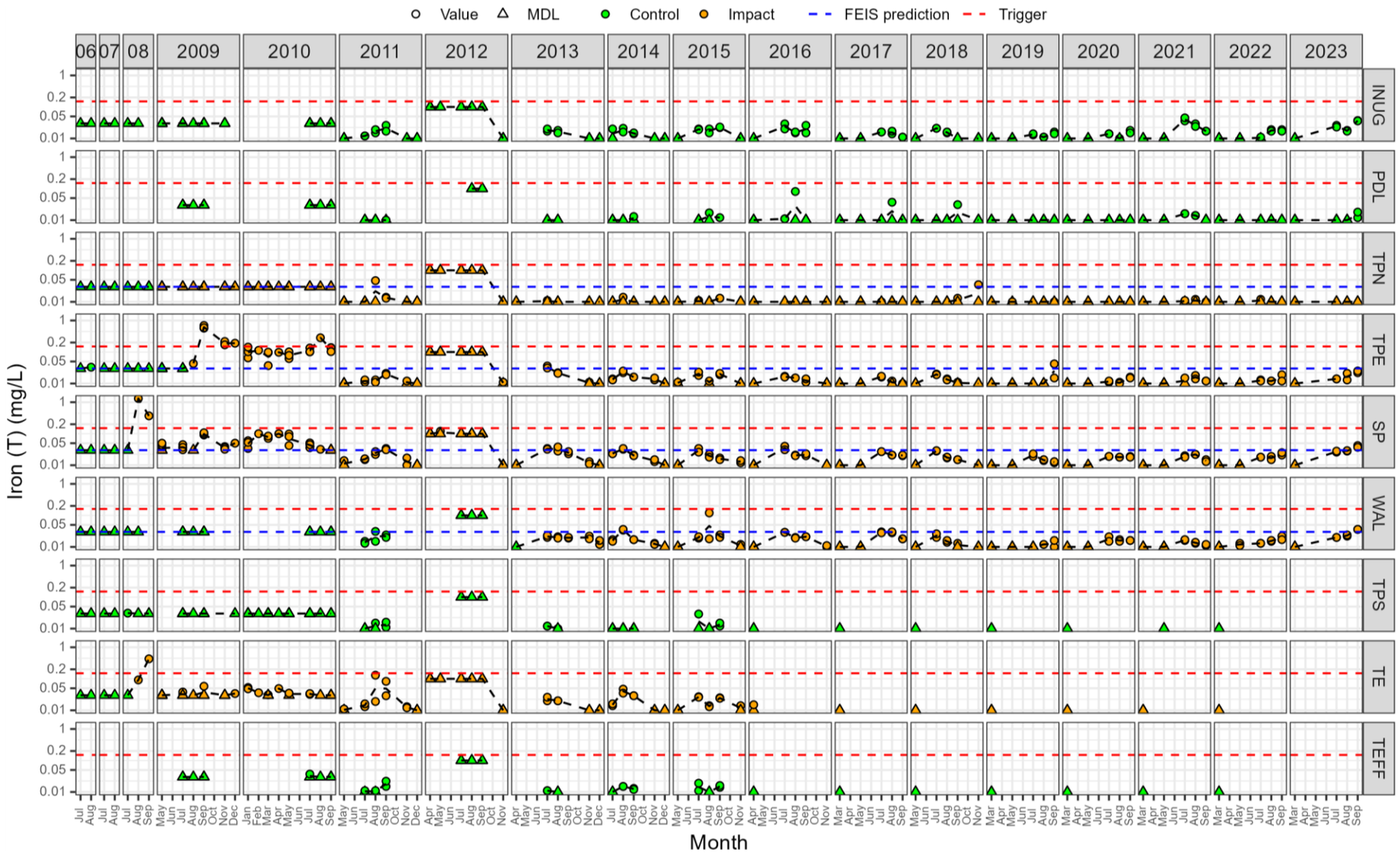


Figure B1-33. Total lead (mg/L).

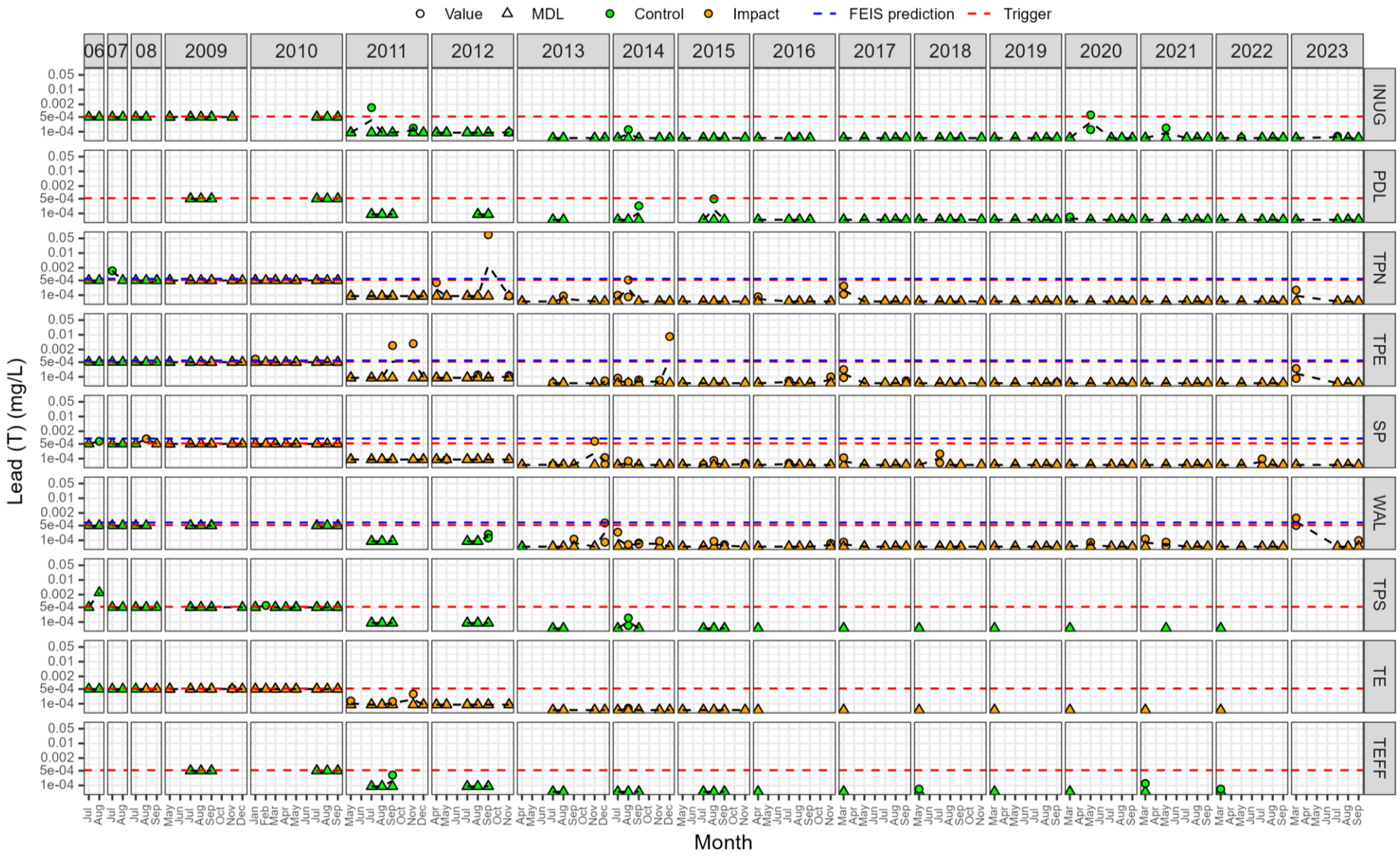


Figure B1-34. Total lithium (mg/L).

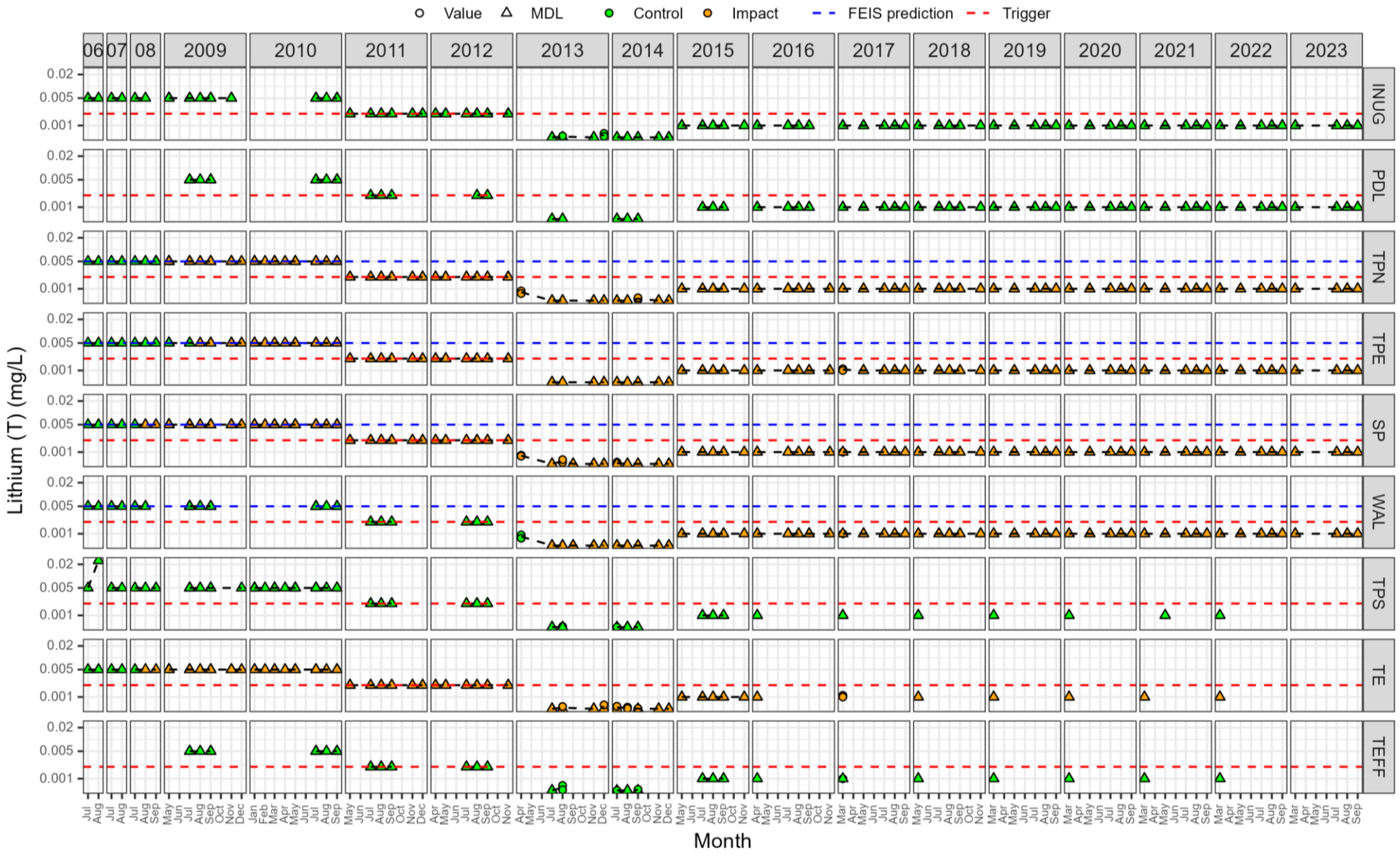


Figure B1-35. Total magnesium (mg/L).

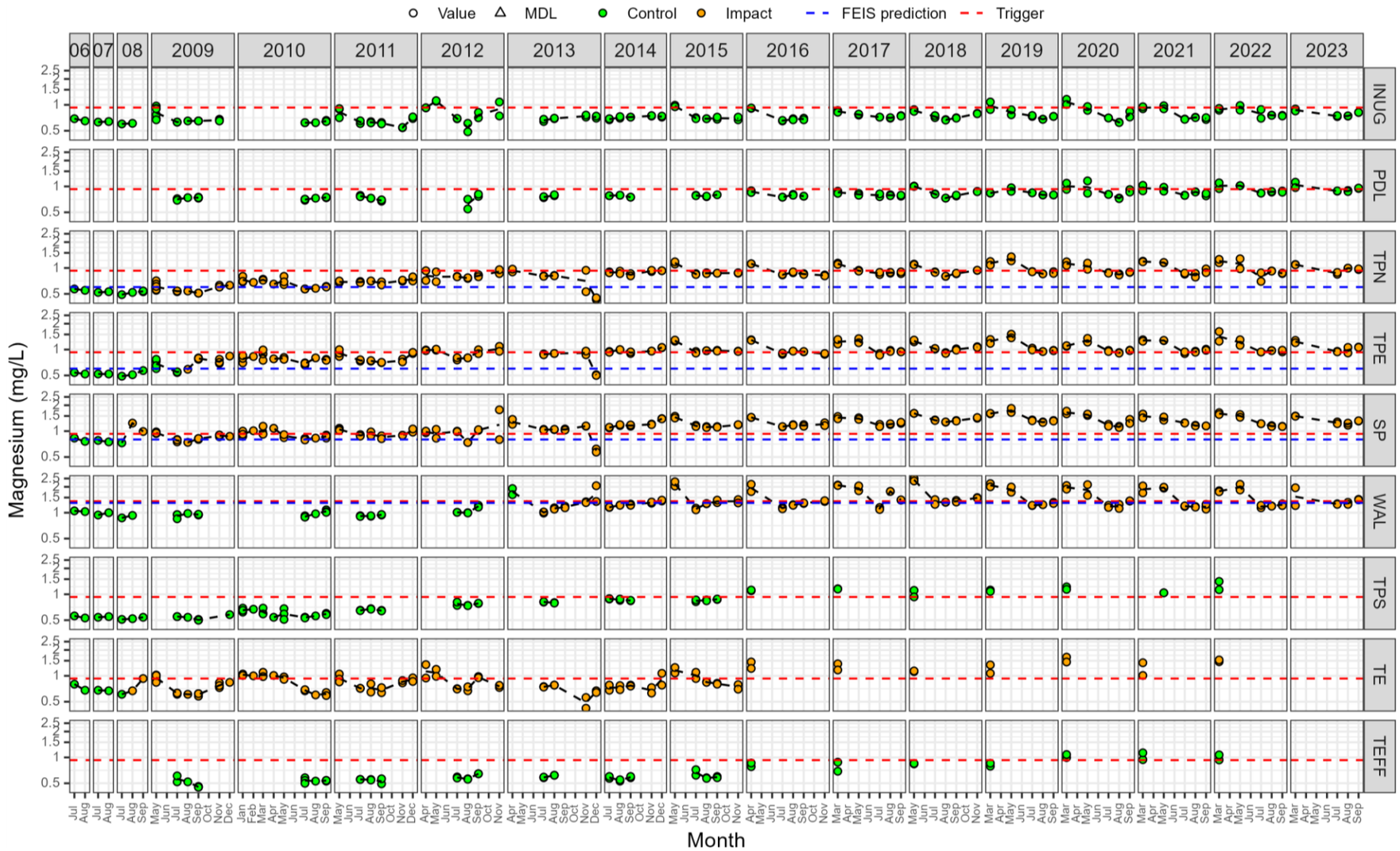


Figure B1-36. Total manganese (mg/L).

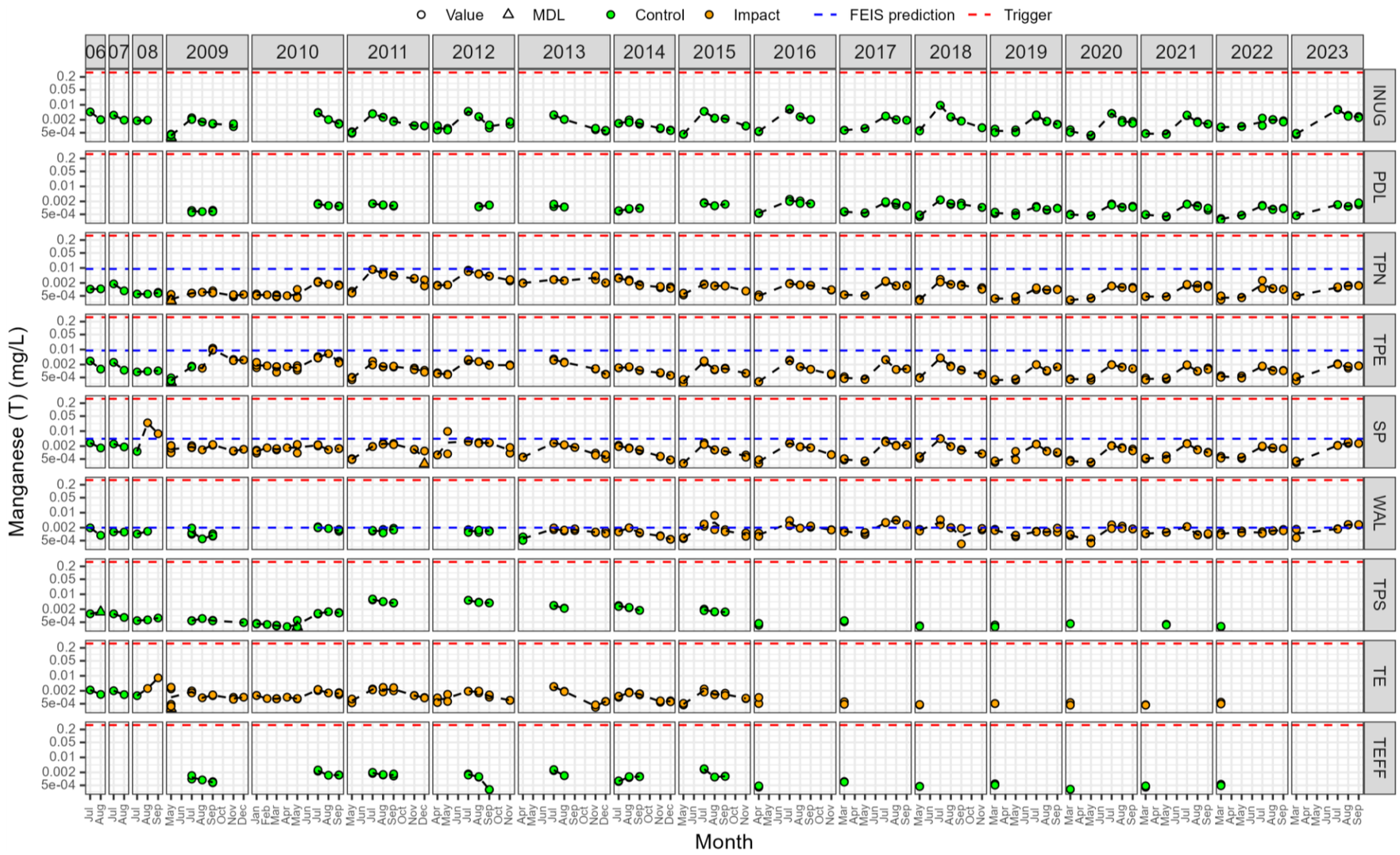


Figure B1-37. Total mercury (mg/L).

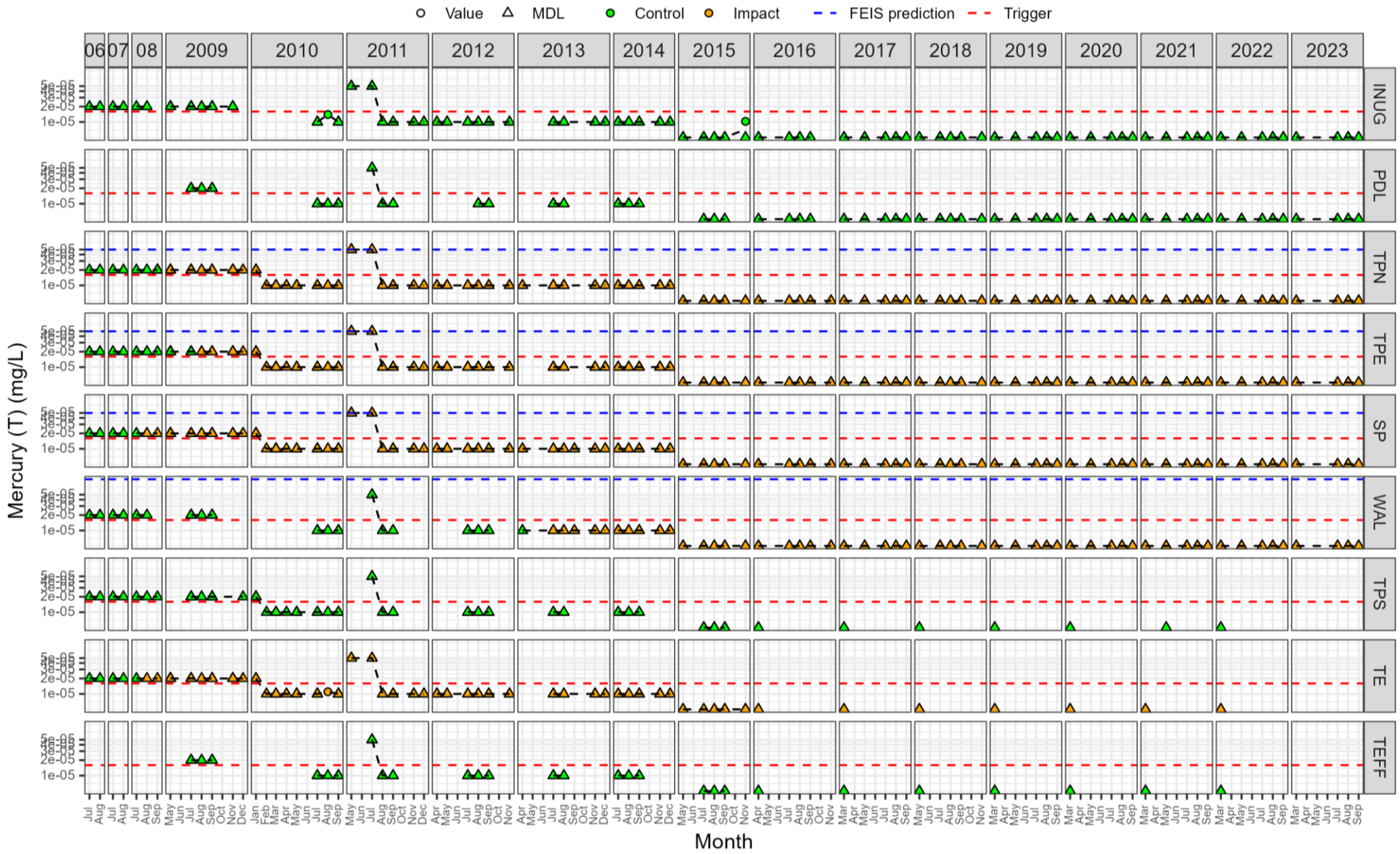


Figure B1-38. Total molybdenum (mg/L).

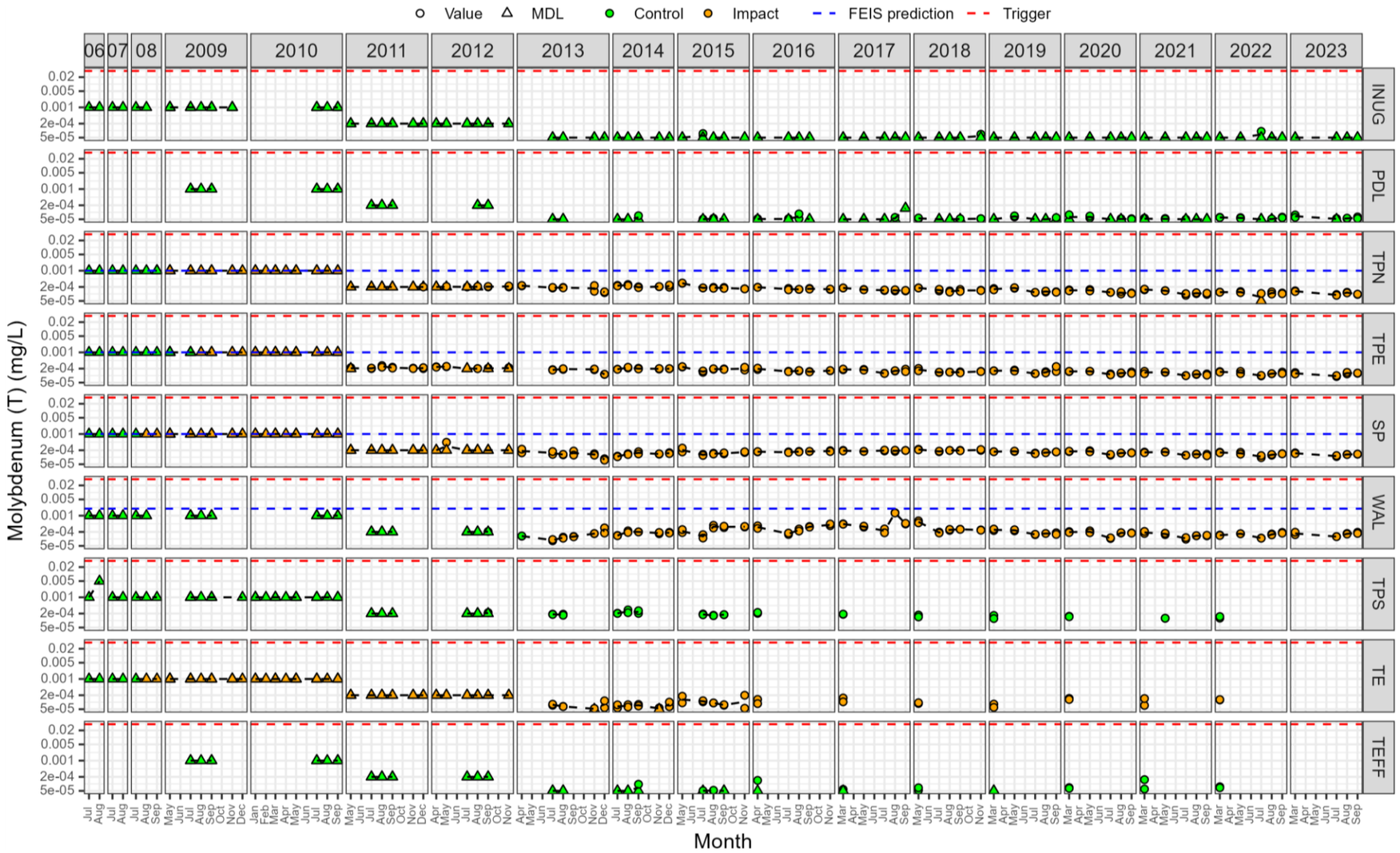


Figure B1-39. Total nickel (mg/L).

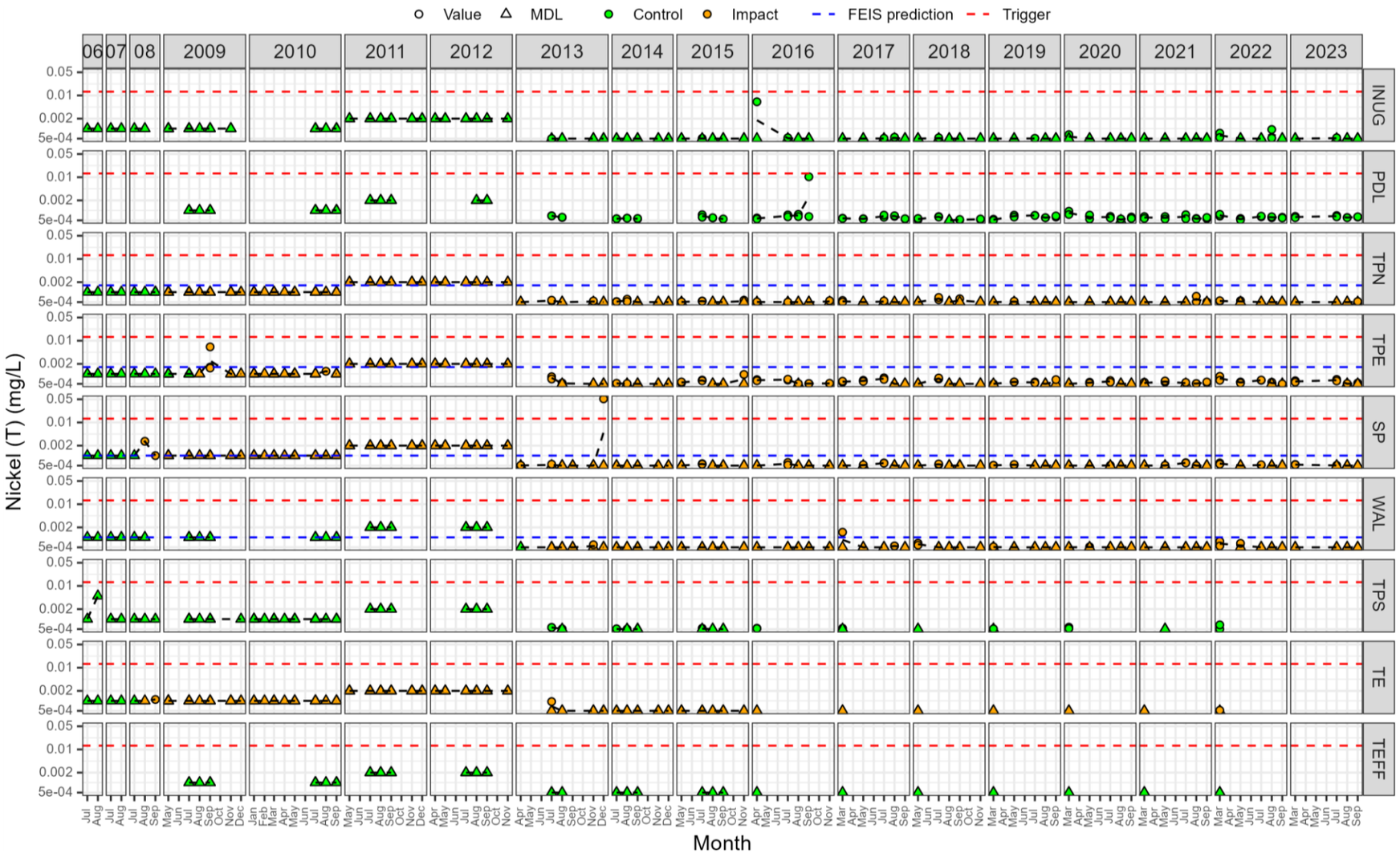


Figure B1-40. Total potassium (mg/L).

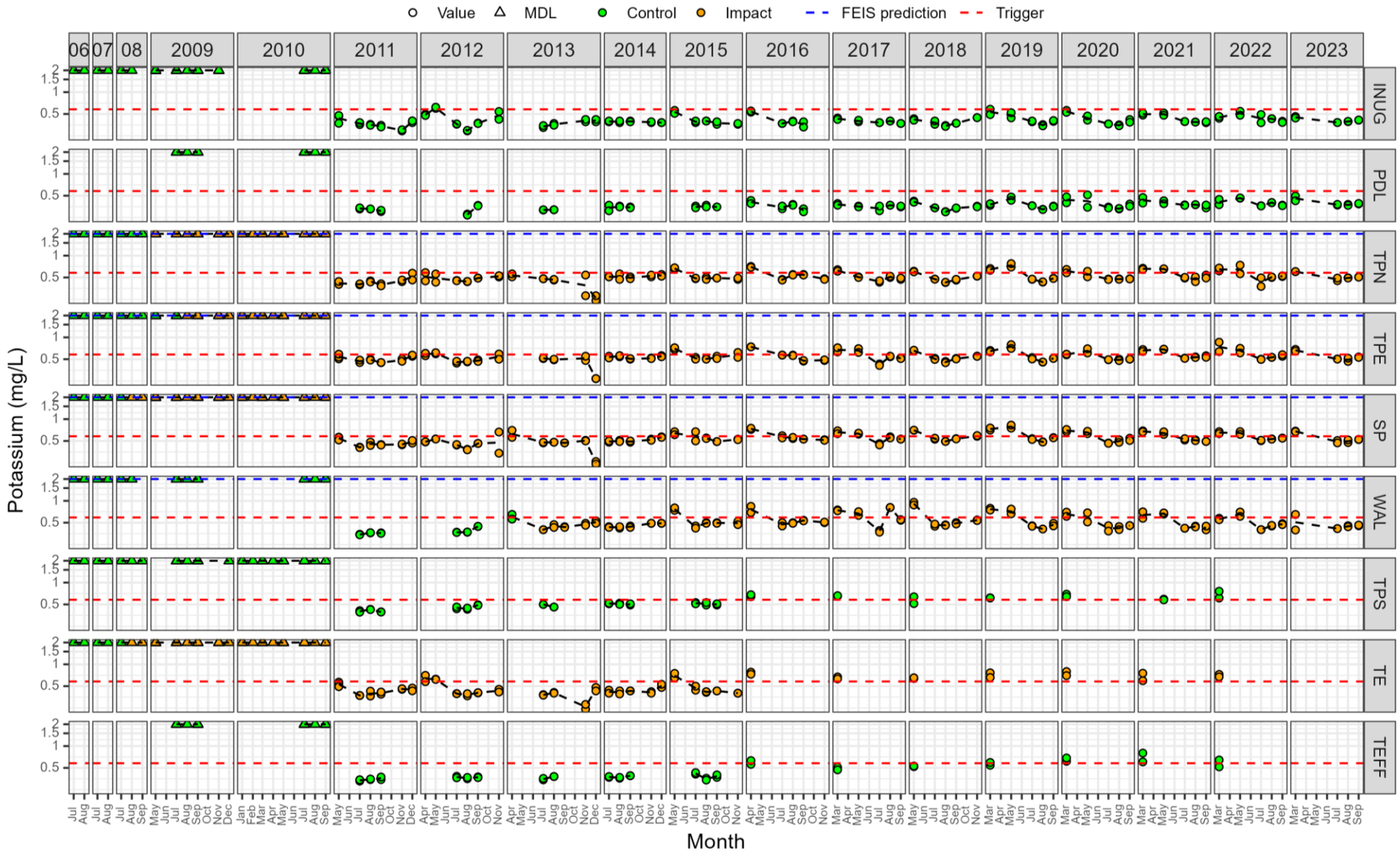


Figure B1-41. Total selenium (mg/L).



Figure B1-42. Total silicon (mg/L).

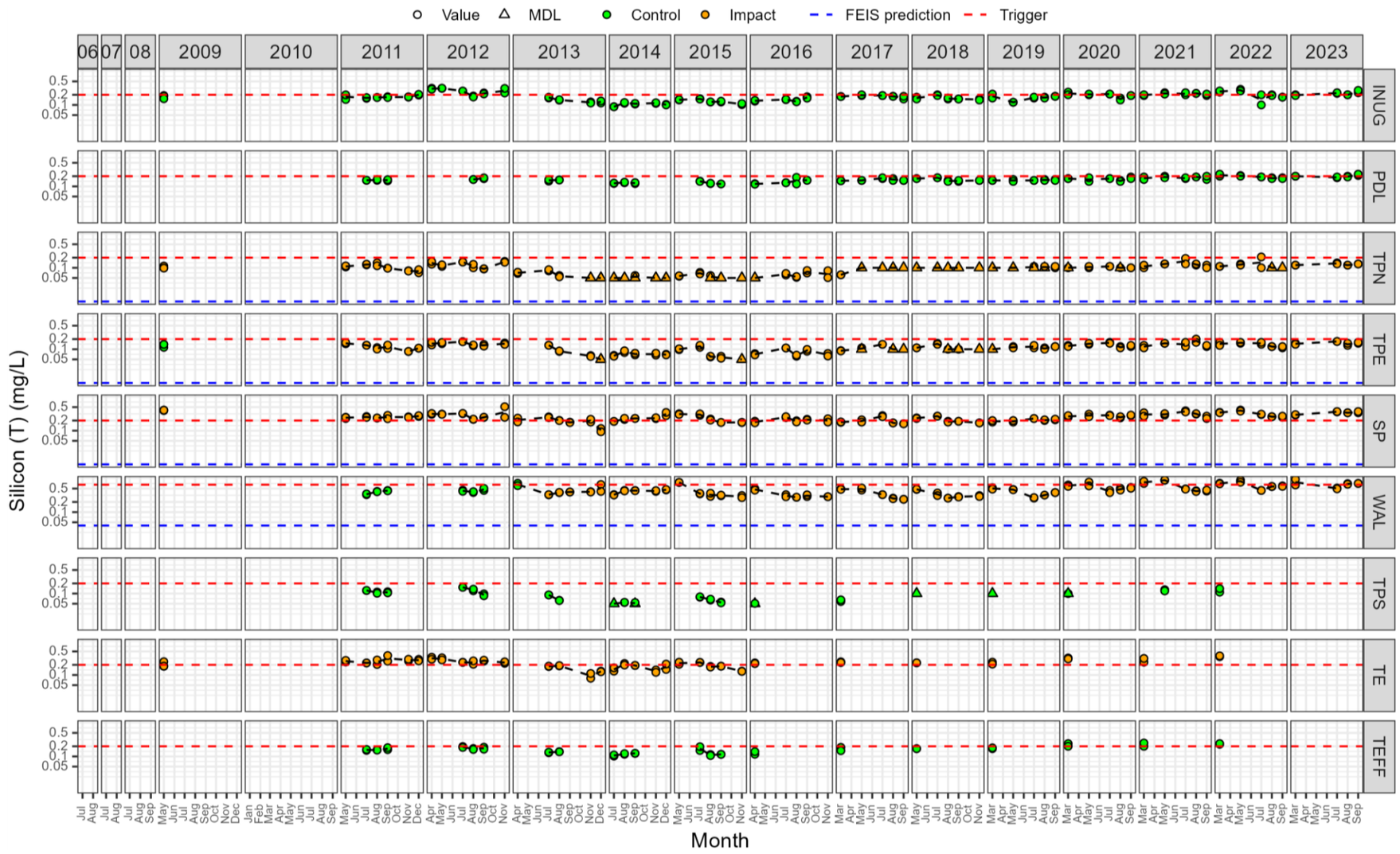


Figure B1-43. Total silver (mg/L).



Figure B1-44. Total sodium (mg/L).

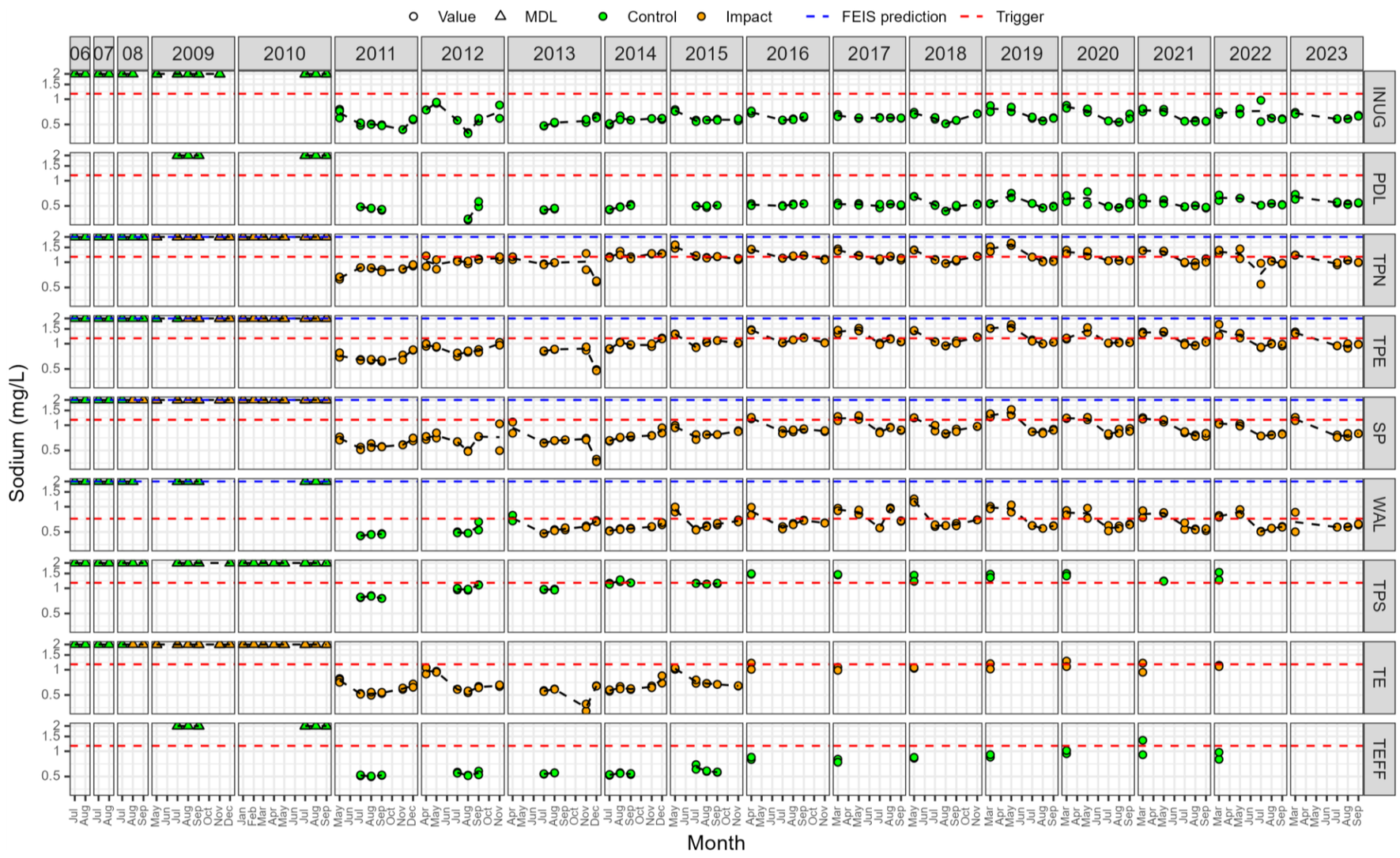


Figure B1-45. Total strontium (mg/L).

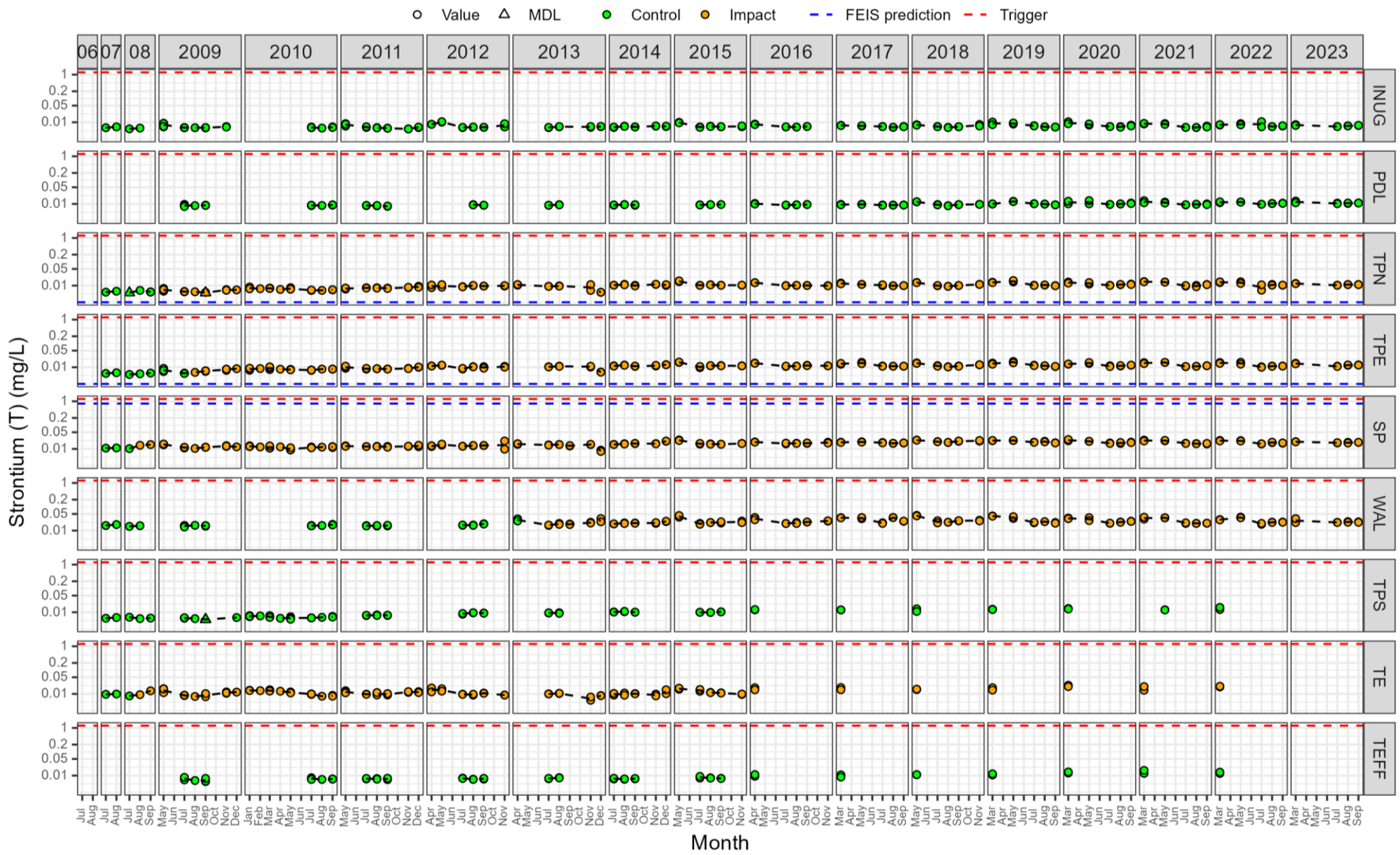


Figure B1-46. Total thallium (mg/L).

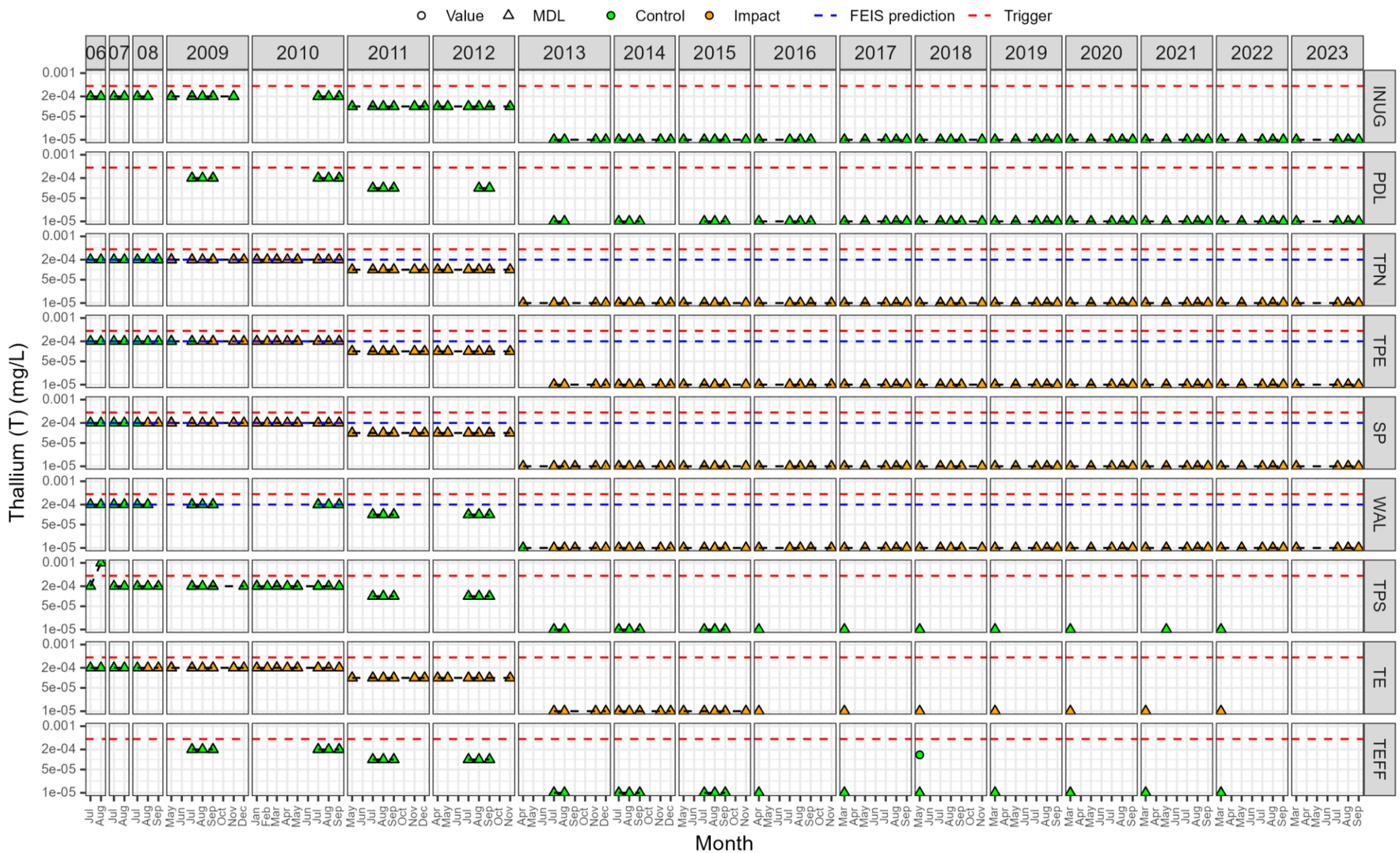


Figure B1-47. Total tin (mg/L).

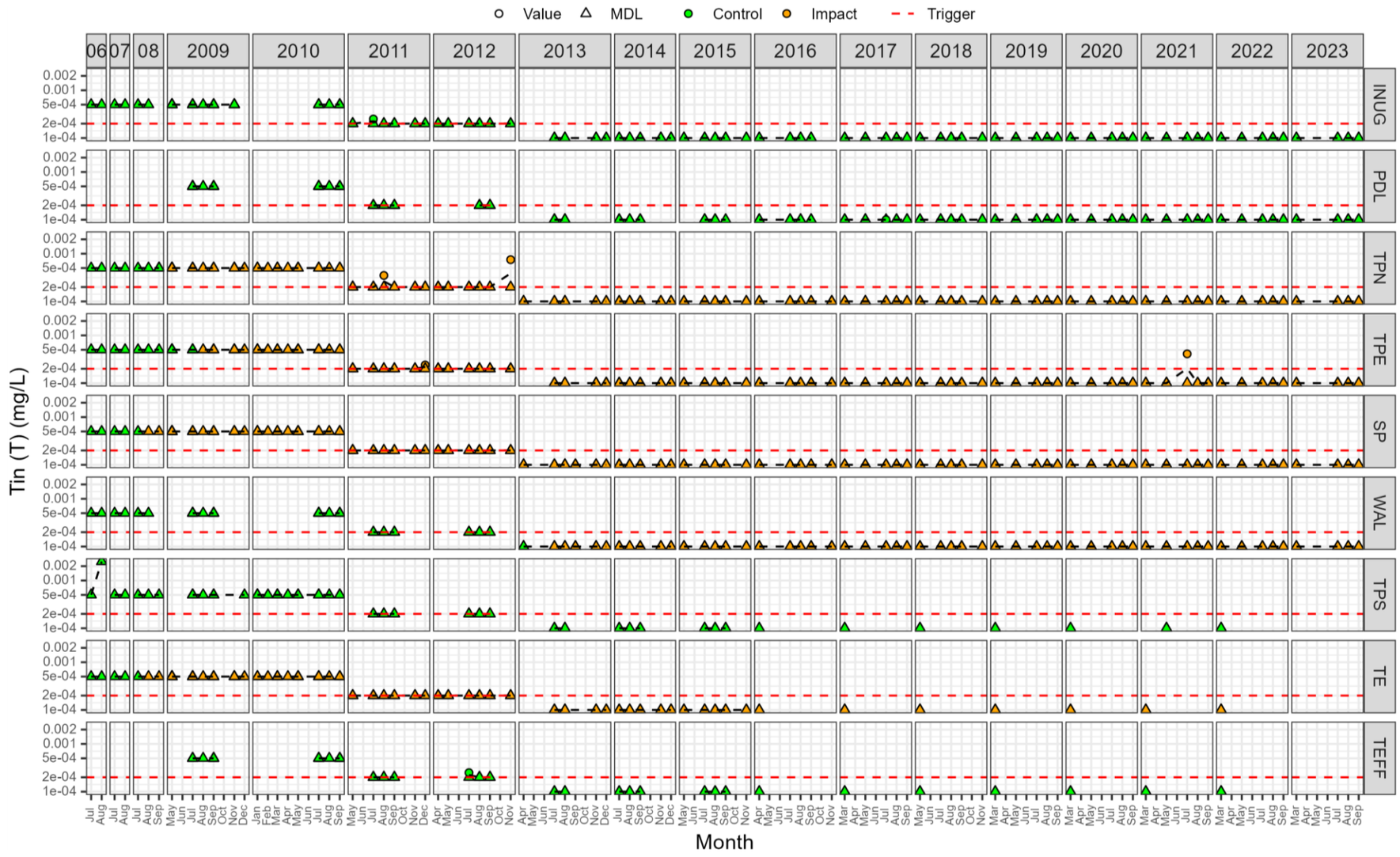


Figure B1-48. Total titanium (mg/L).

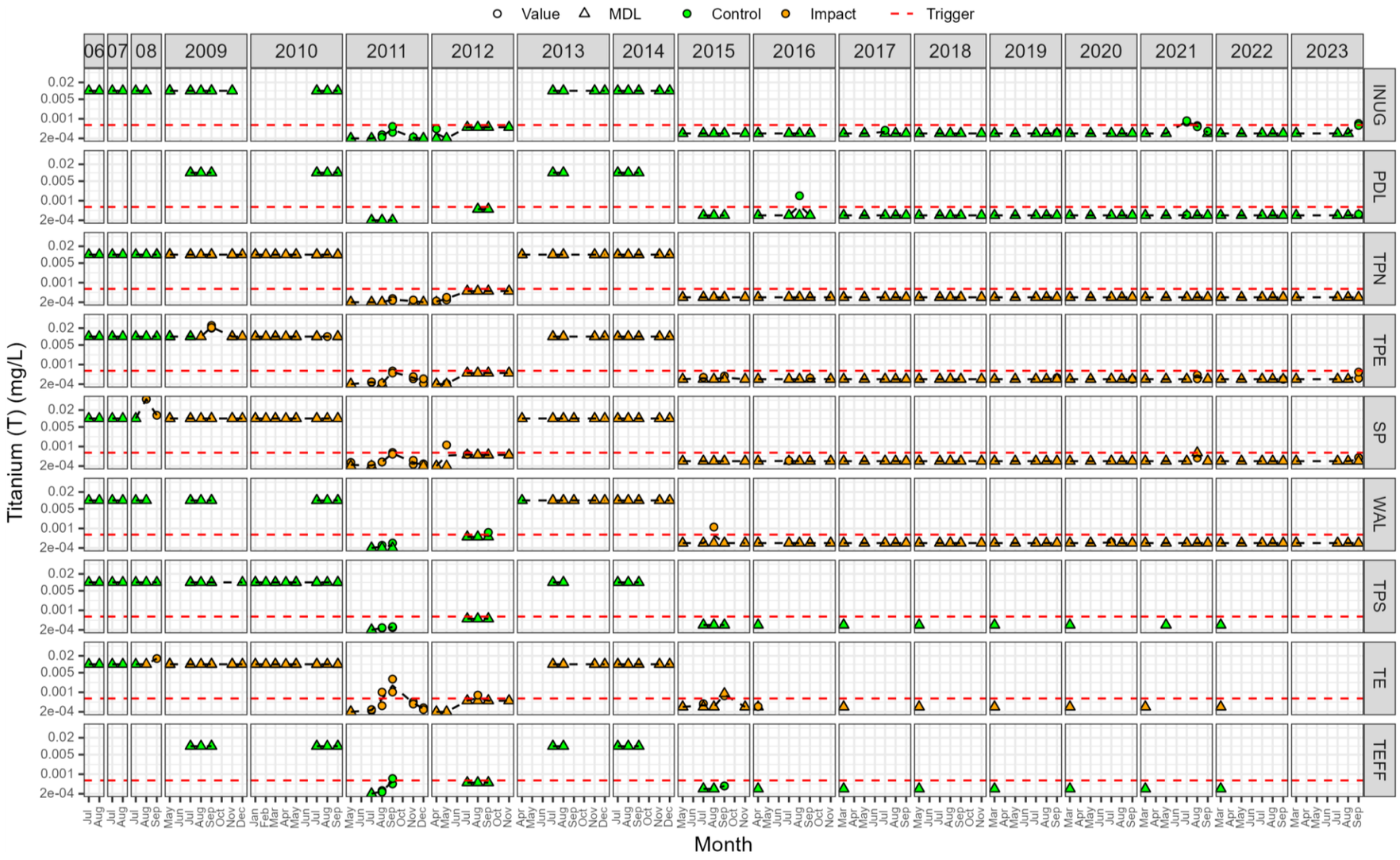


Figure B1-49. Total uranium (mg/L).

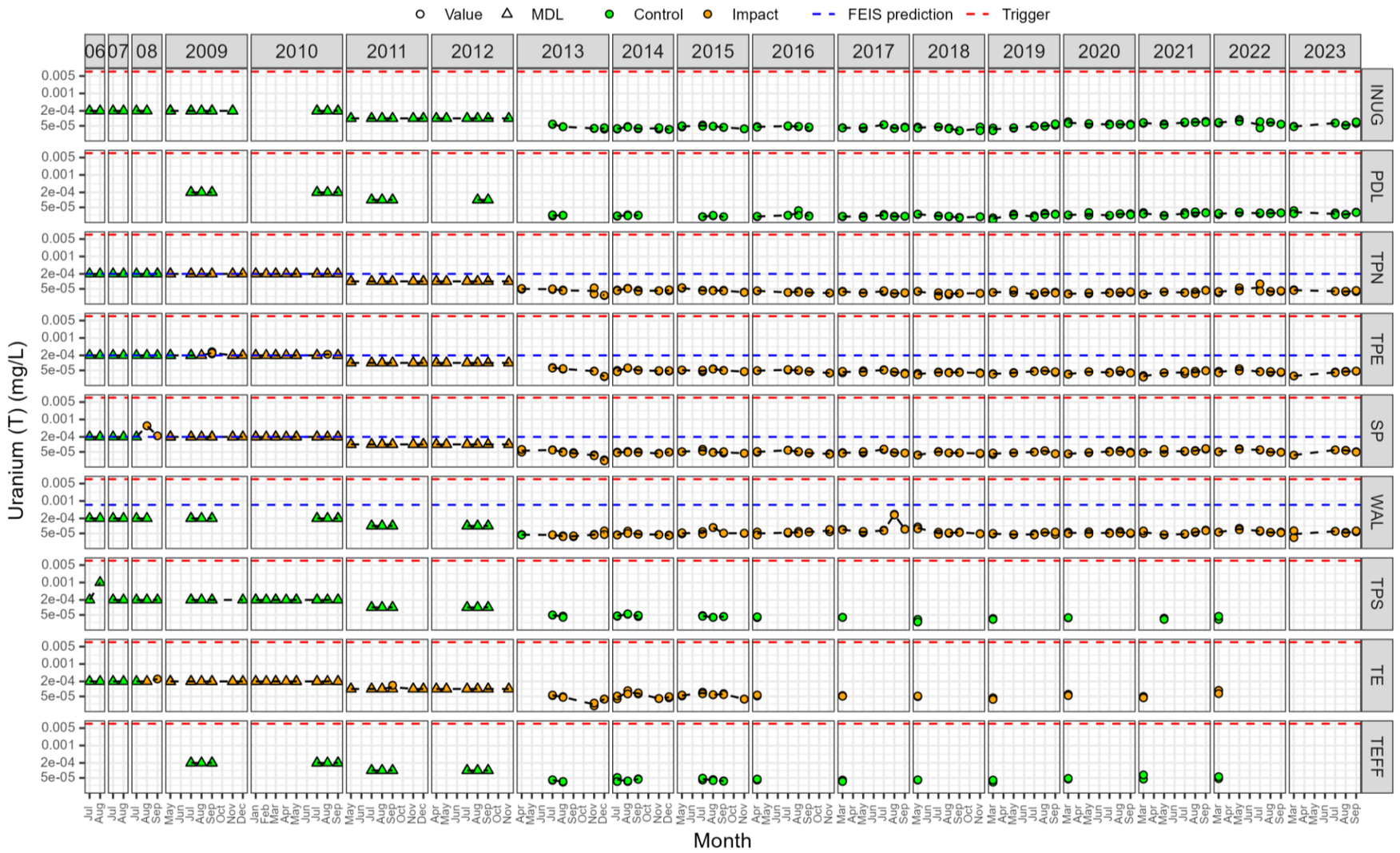


Figure B1-50. Total vanadium (mg/L).

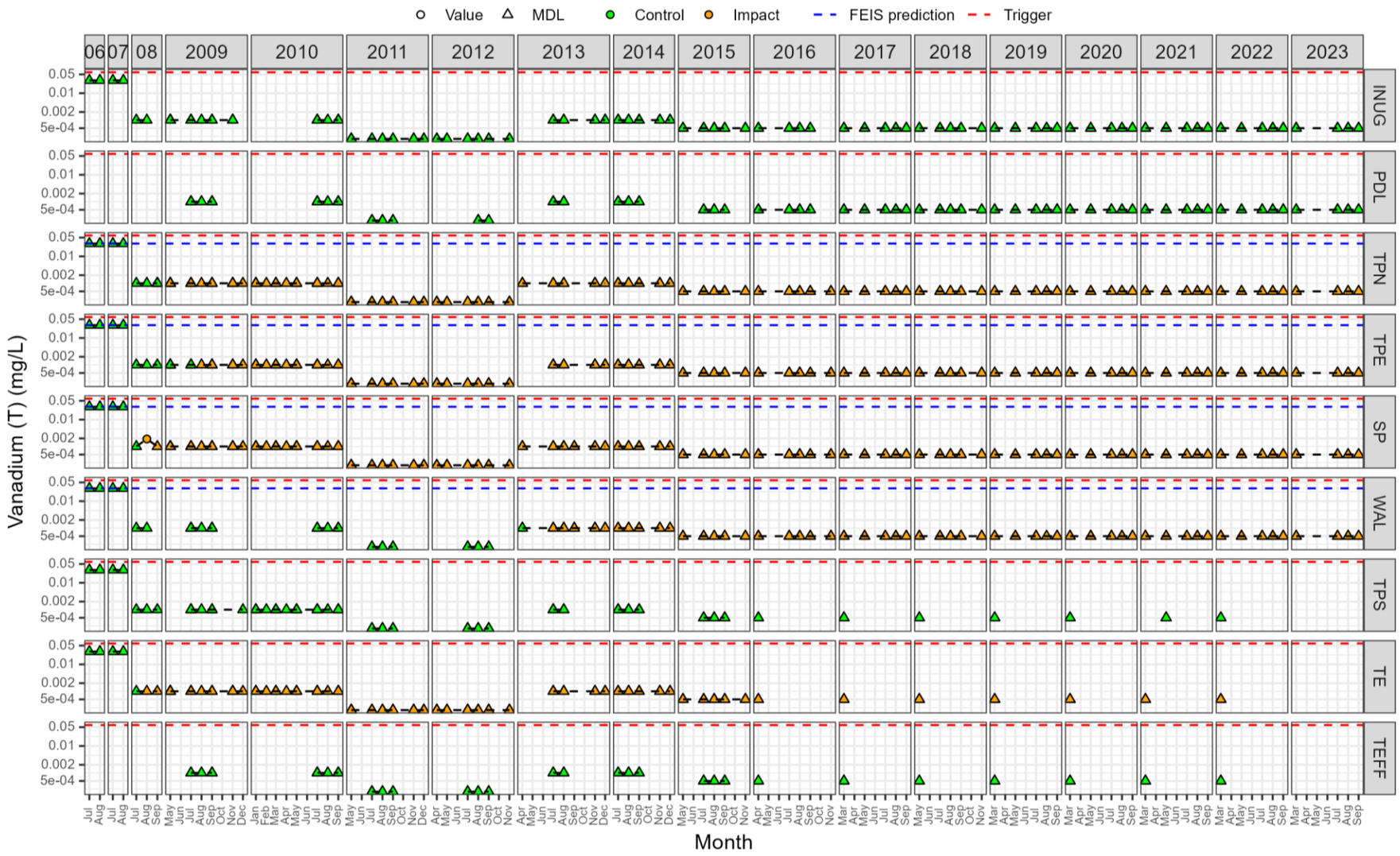


Figure B1-51. Total zinc (mg/L).

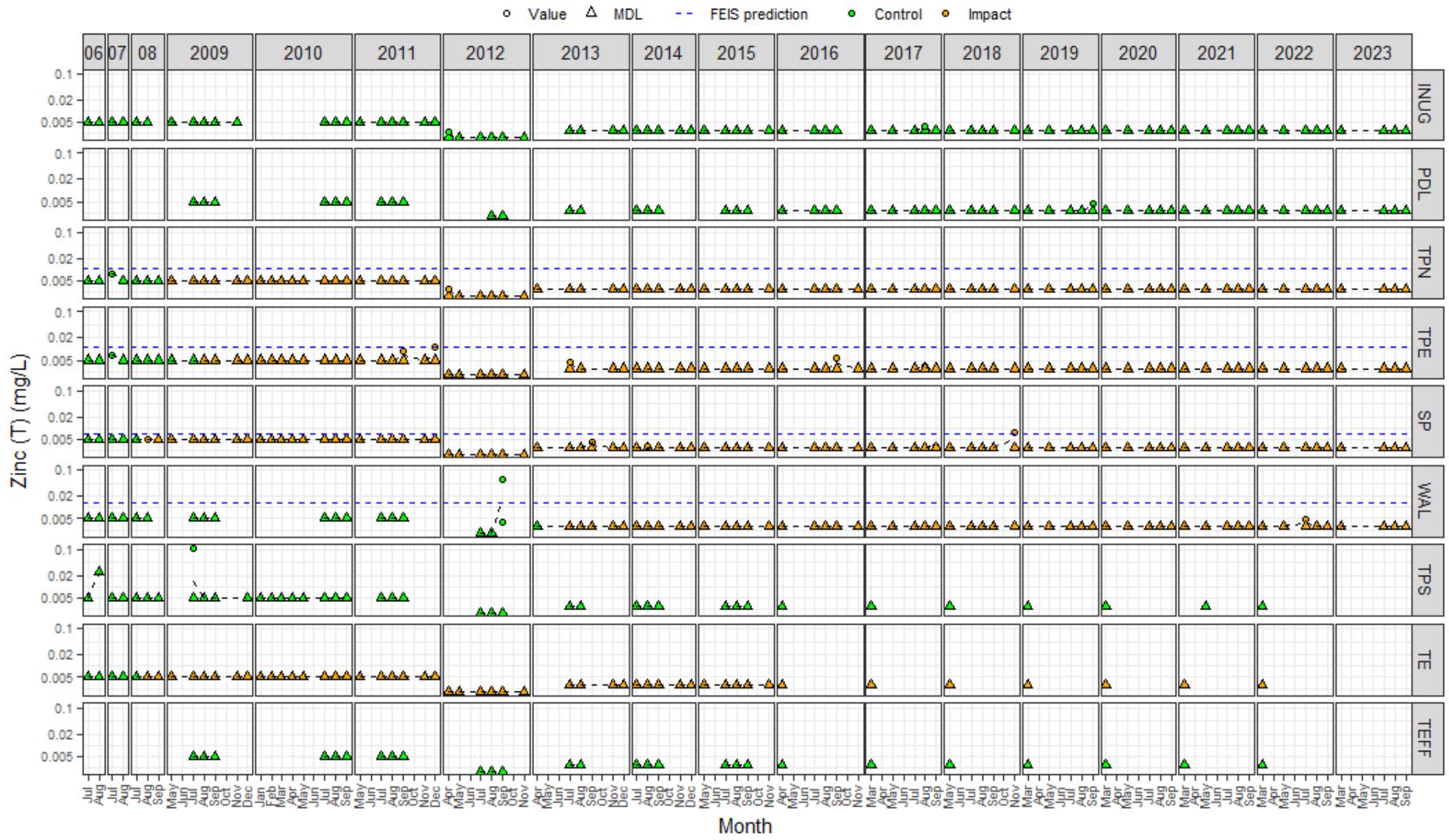


Figure B1-52. Total cyanide (mg/L).

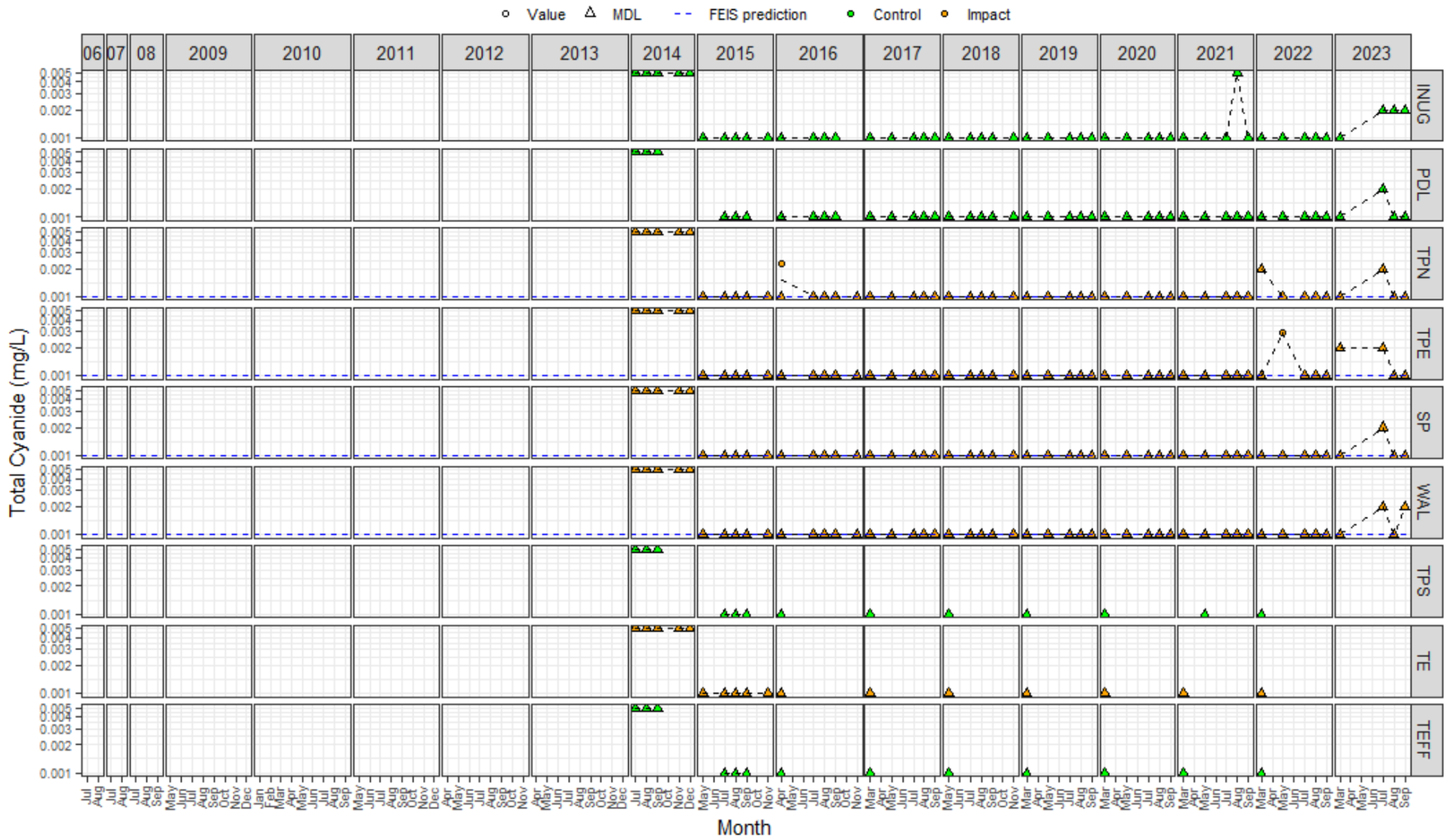


Figure B1-53. Free cyanide (mg/L).

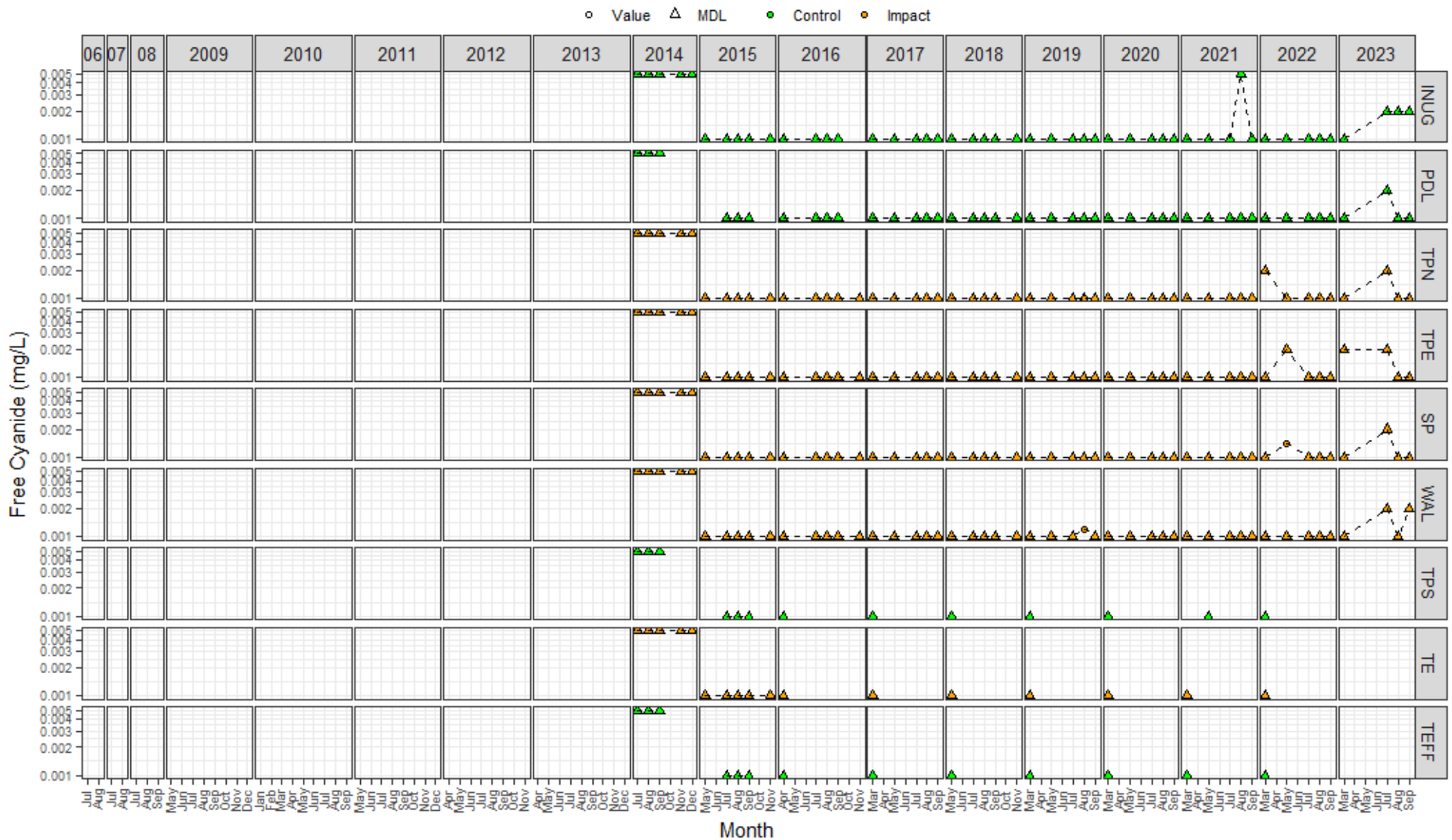


Figure B1-54. Dissolved aluminum (mg/L).

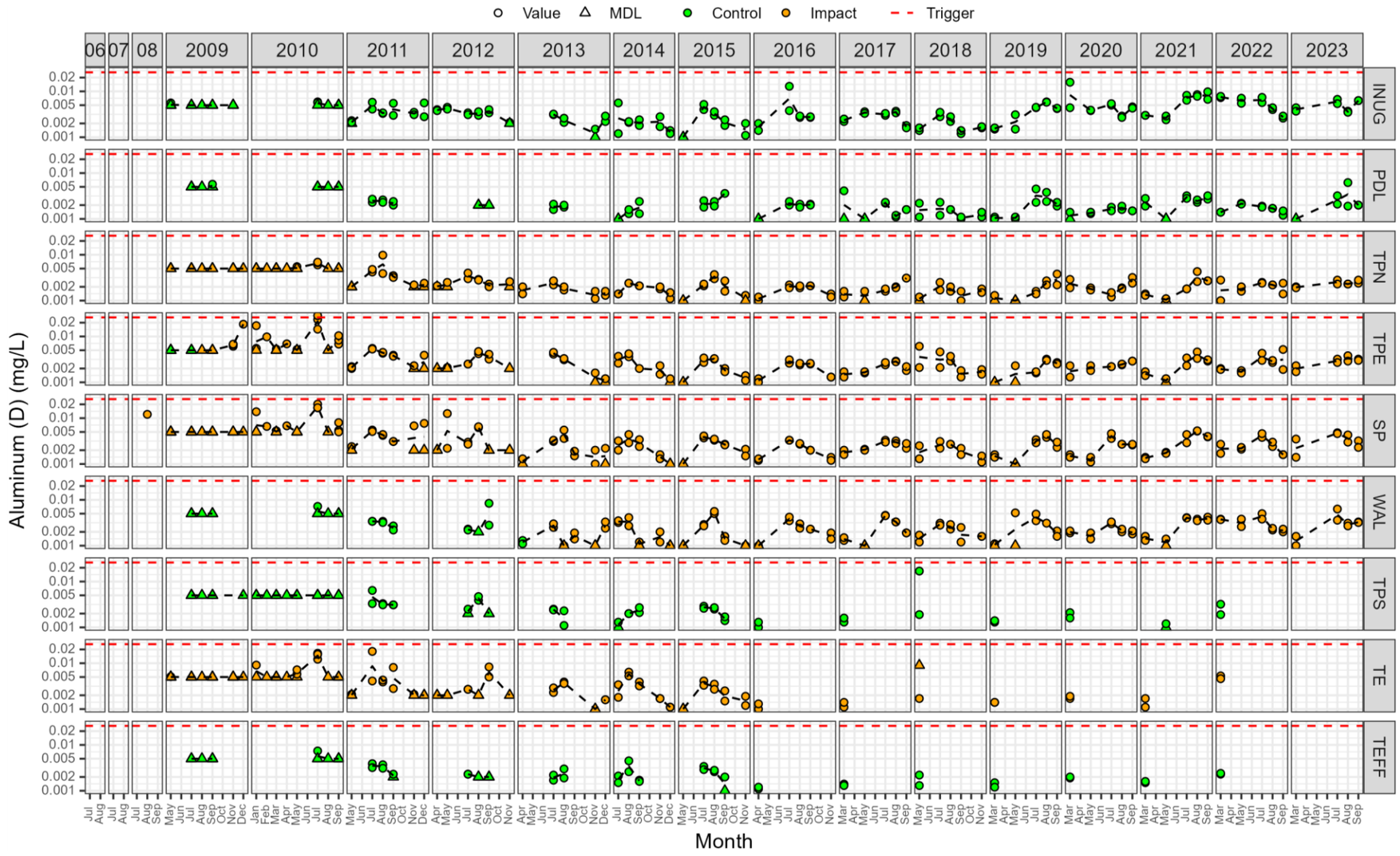


Figure B1-55. Dissolved antimony (mg/L).

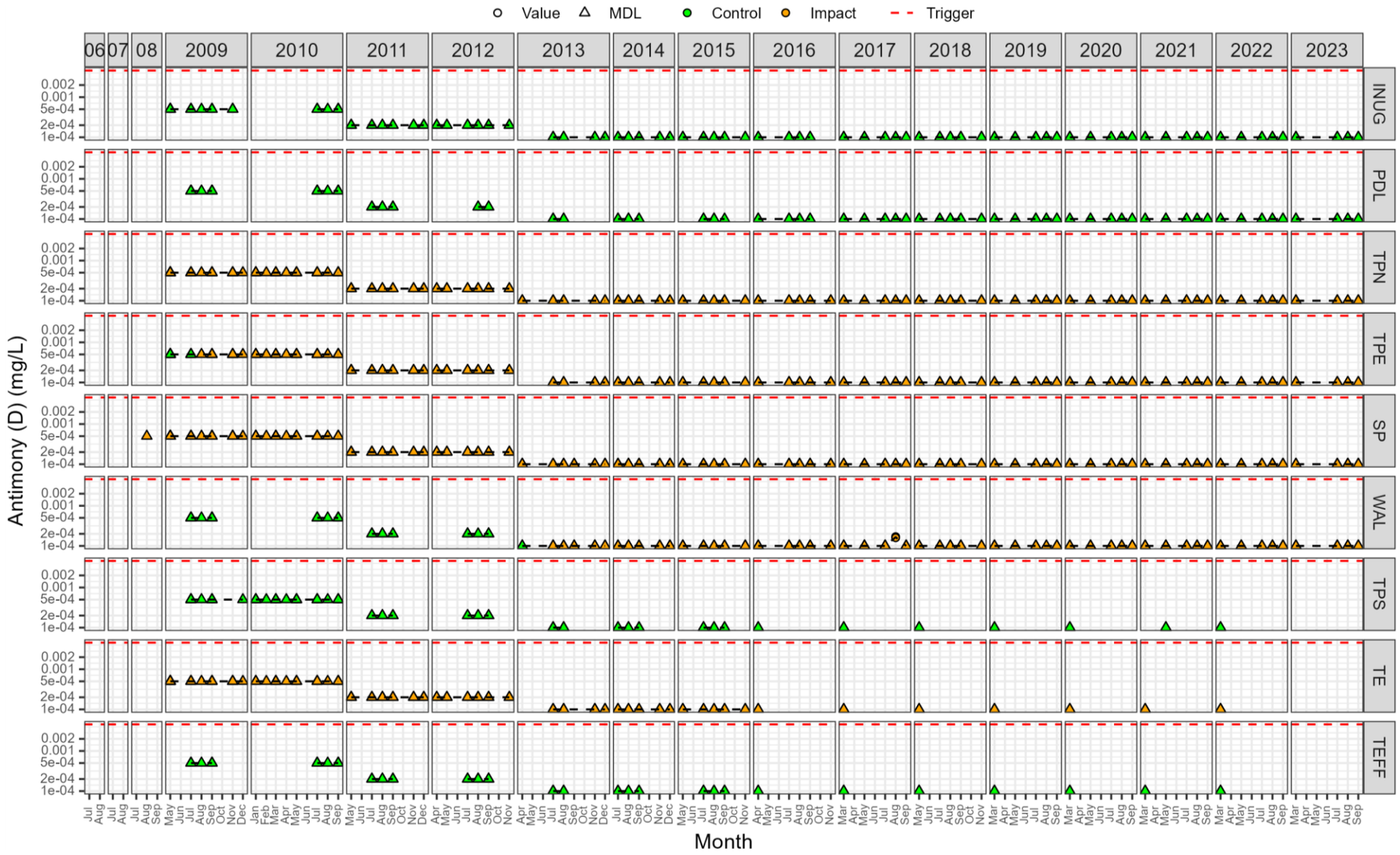


Figure B1-56. Dissolved arsenic (mg/L).

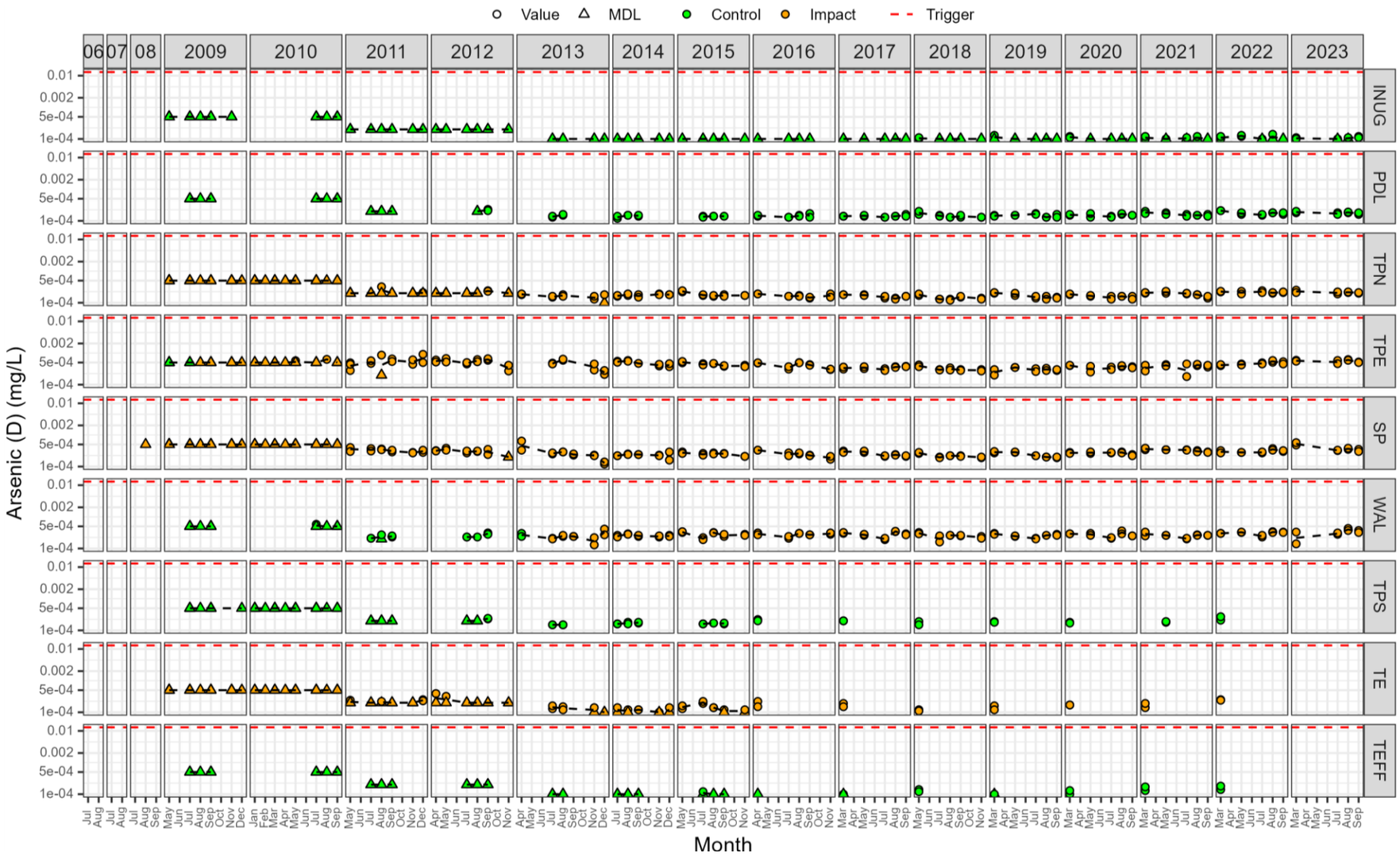


Figure B1-57. Dissolved barium (mg/L).

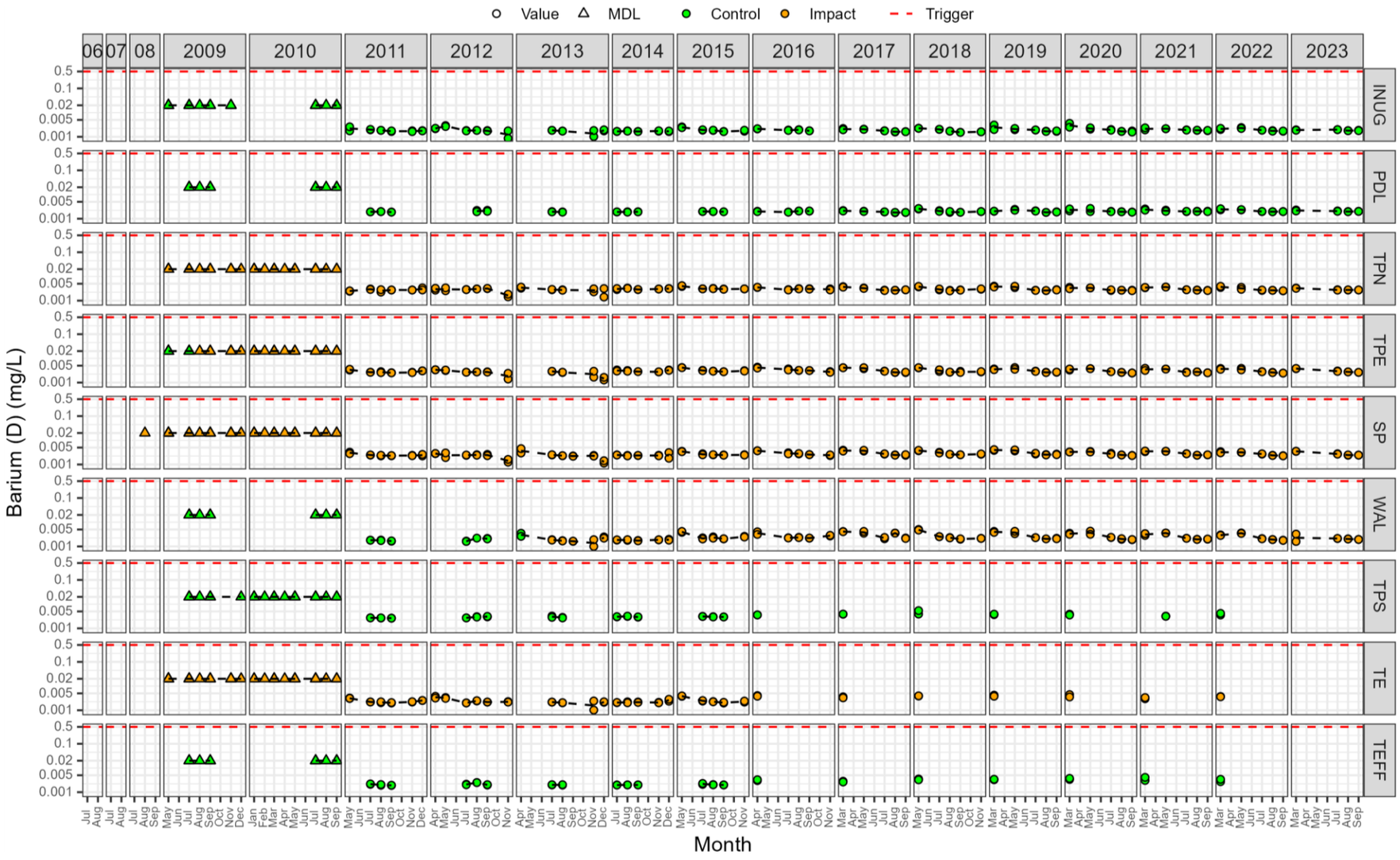


Figure B1-58. Dissolved beryllium (mg/L).

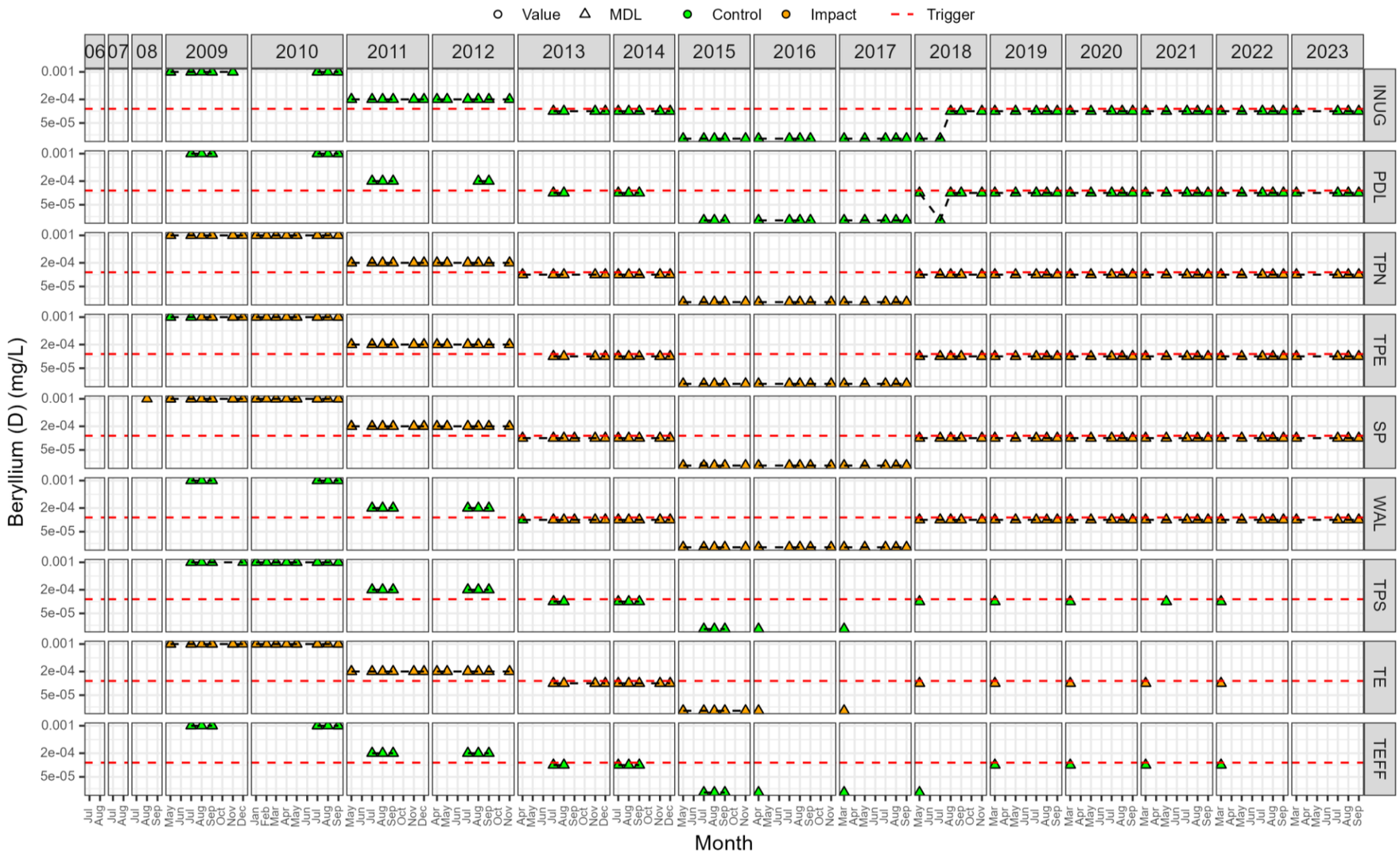


Figure B1-59. Dissolved boron (mg/L).

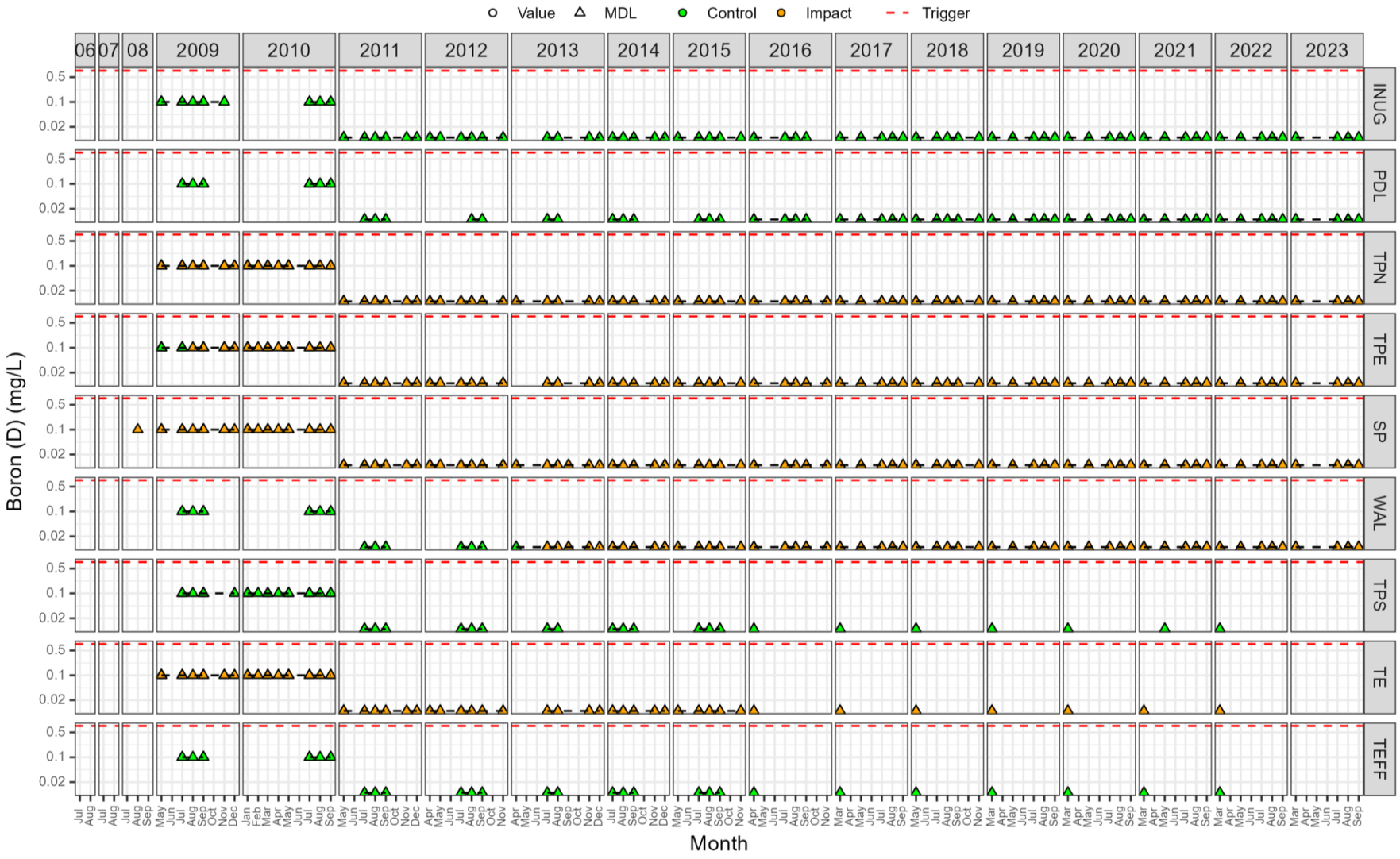


Figure B1-60. Dissolved cadmium (mg/L).

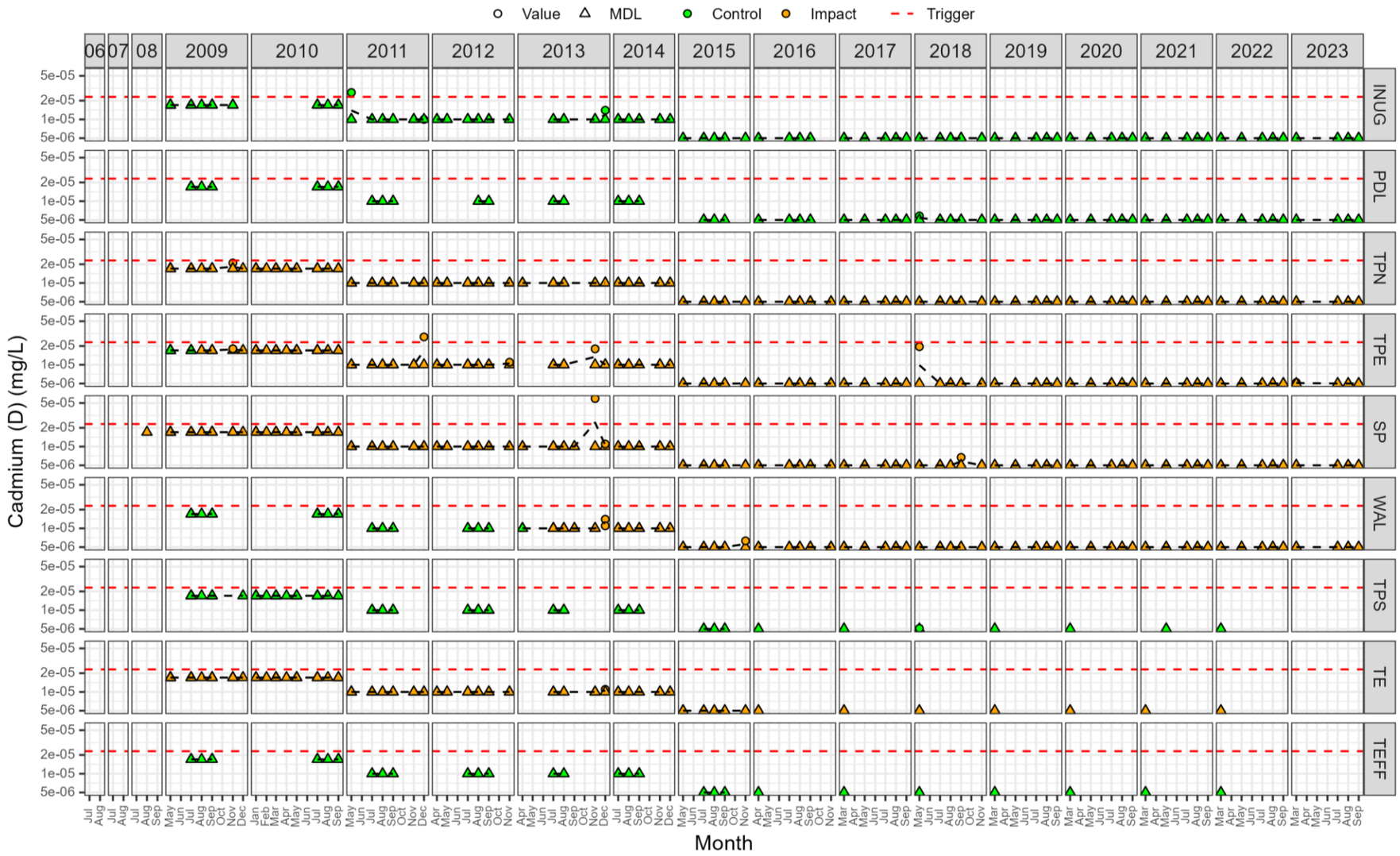


Figure B1-61. Dissolved copper (mg/L).

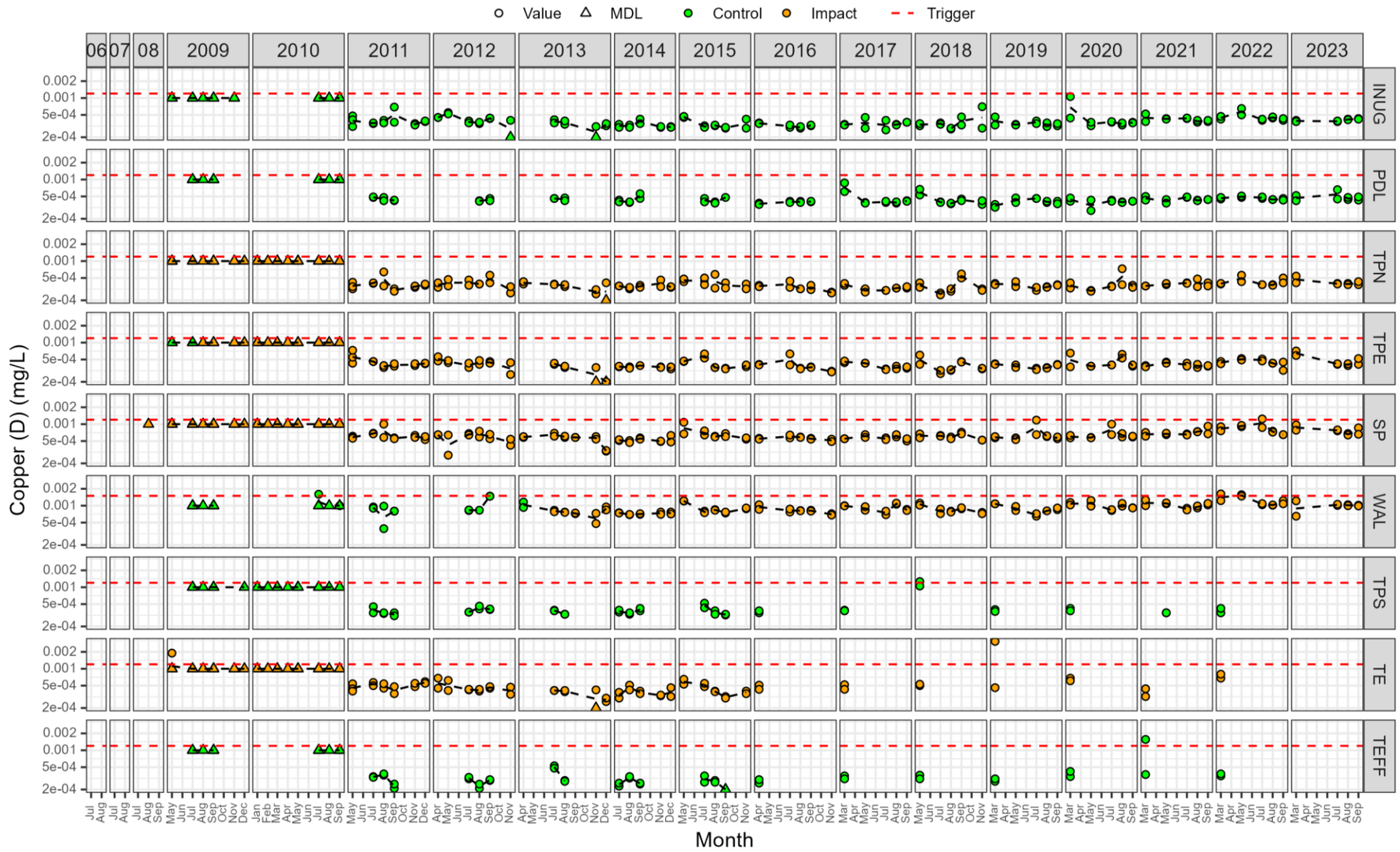


Figure B1-62. Dissolved chromium (mg/L).

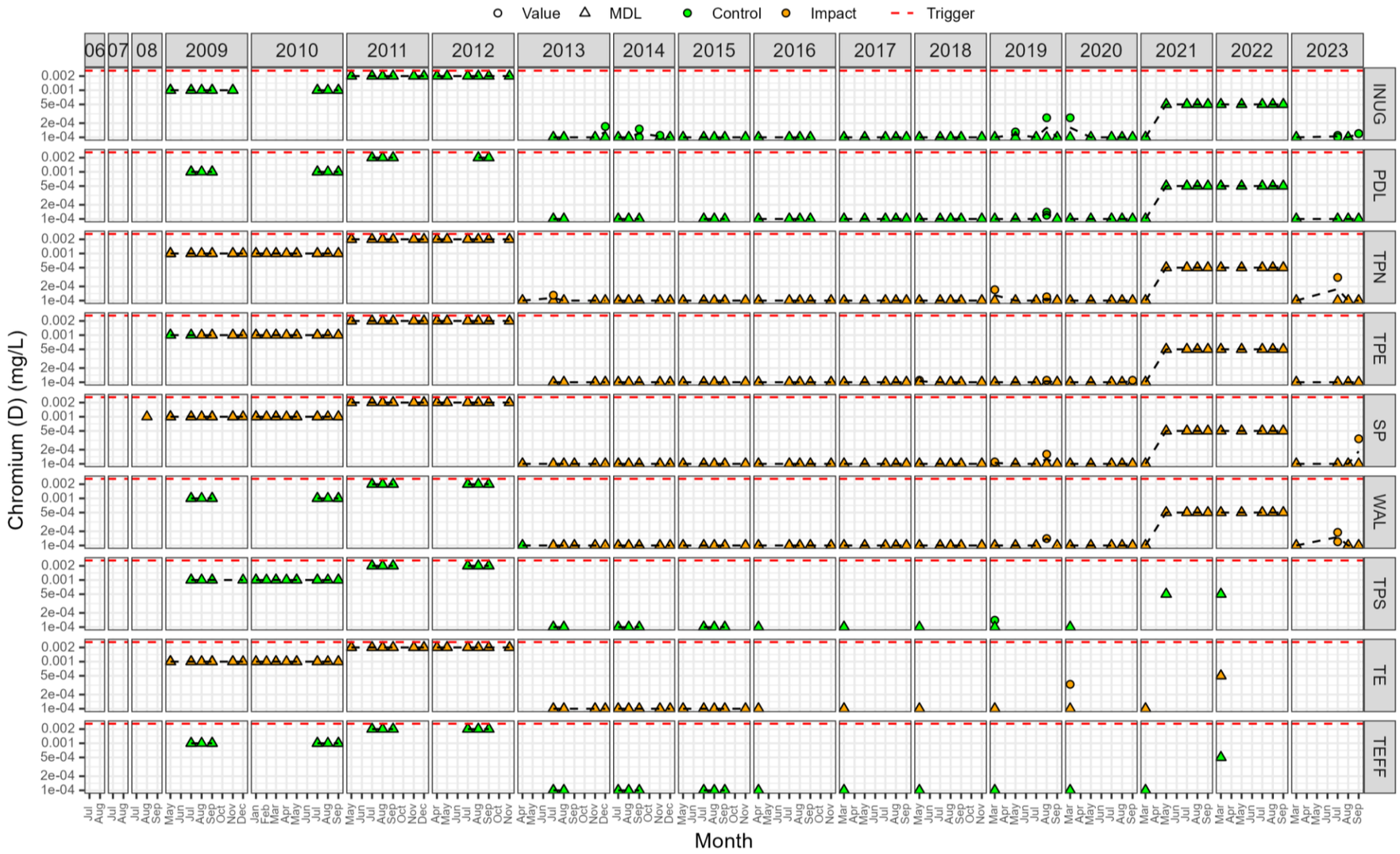


Figure B1-63. Dissolved iron (mg/L).

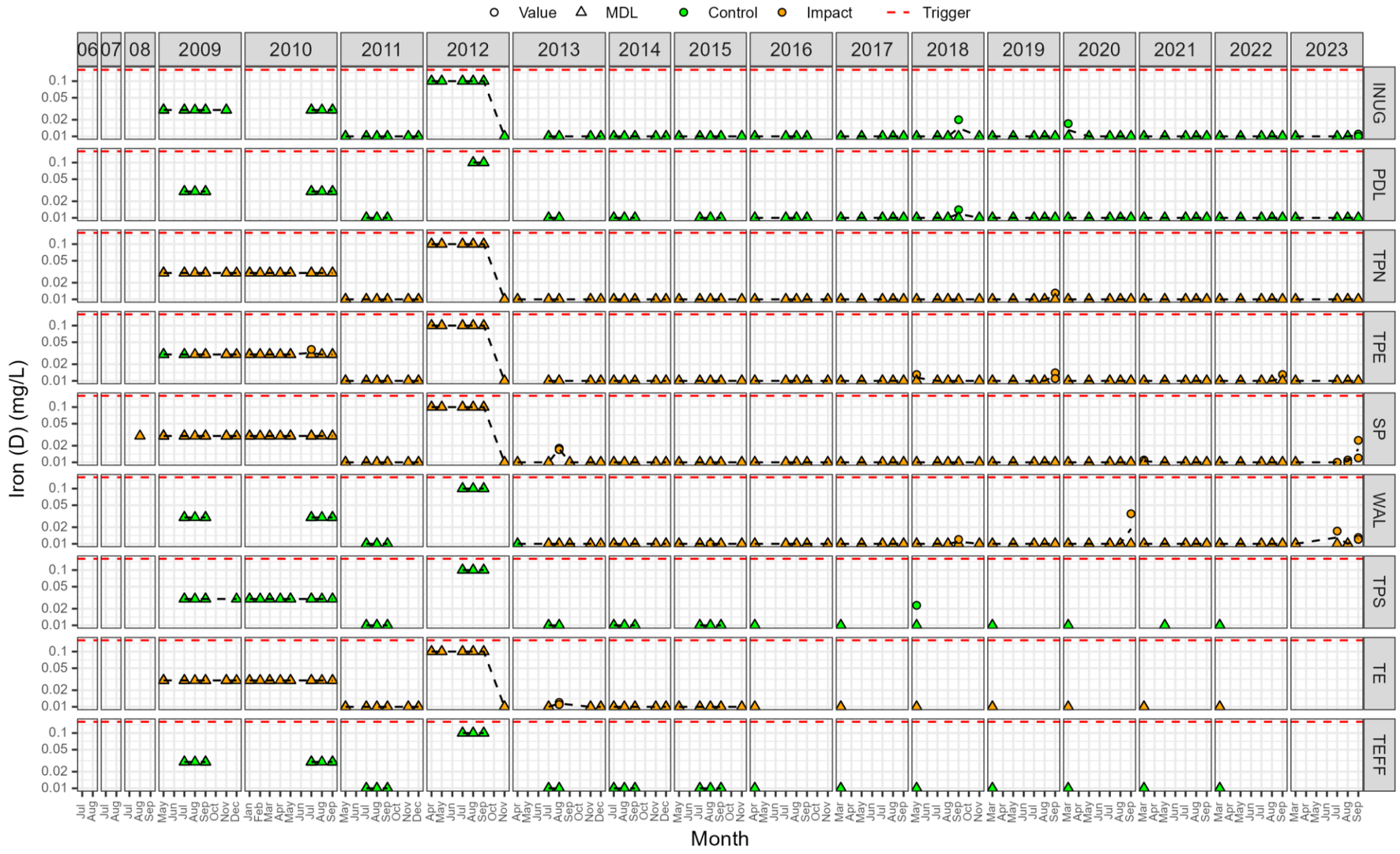


Figure B1-64. Dissolved lead (mg/L).

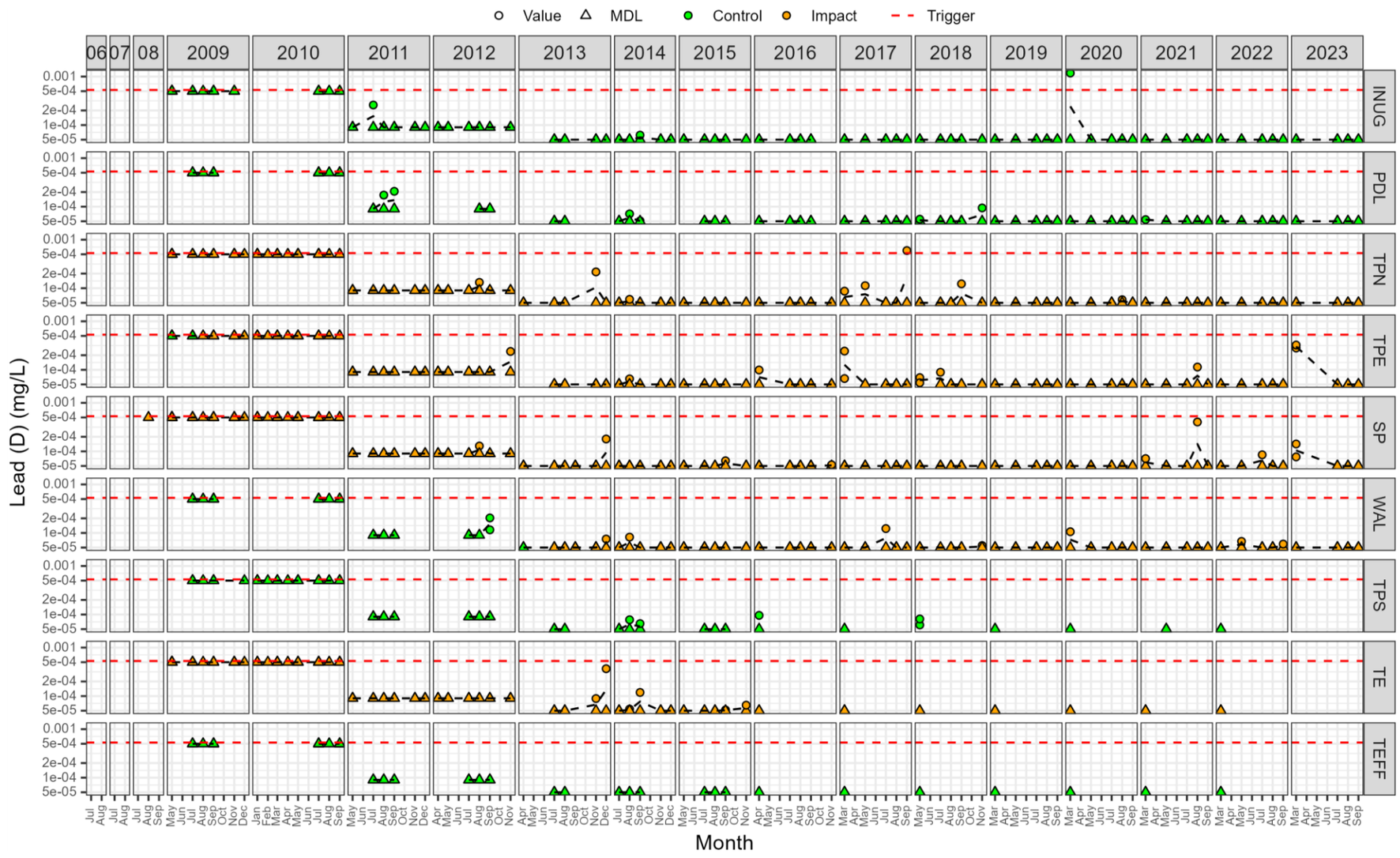


Figure B1-65. Dissolved lithium (mg/L).

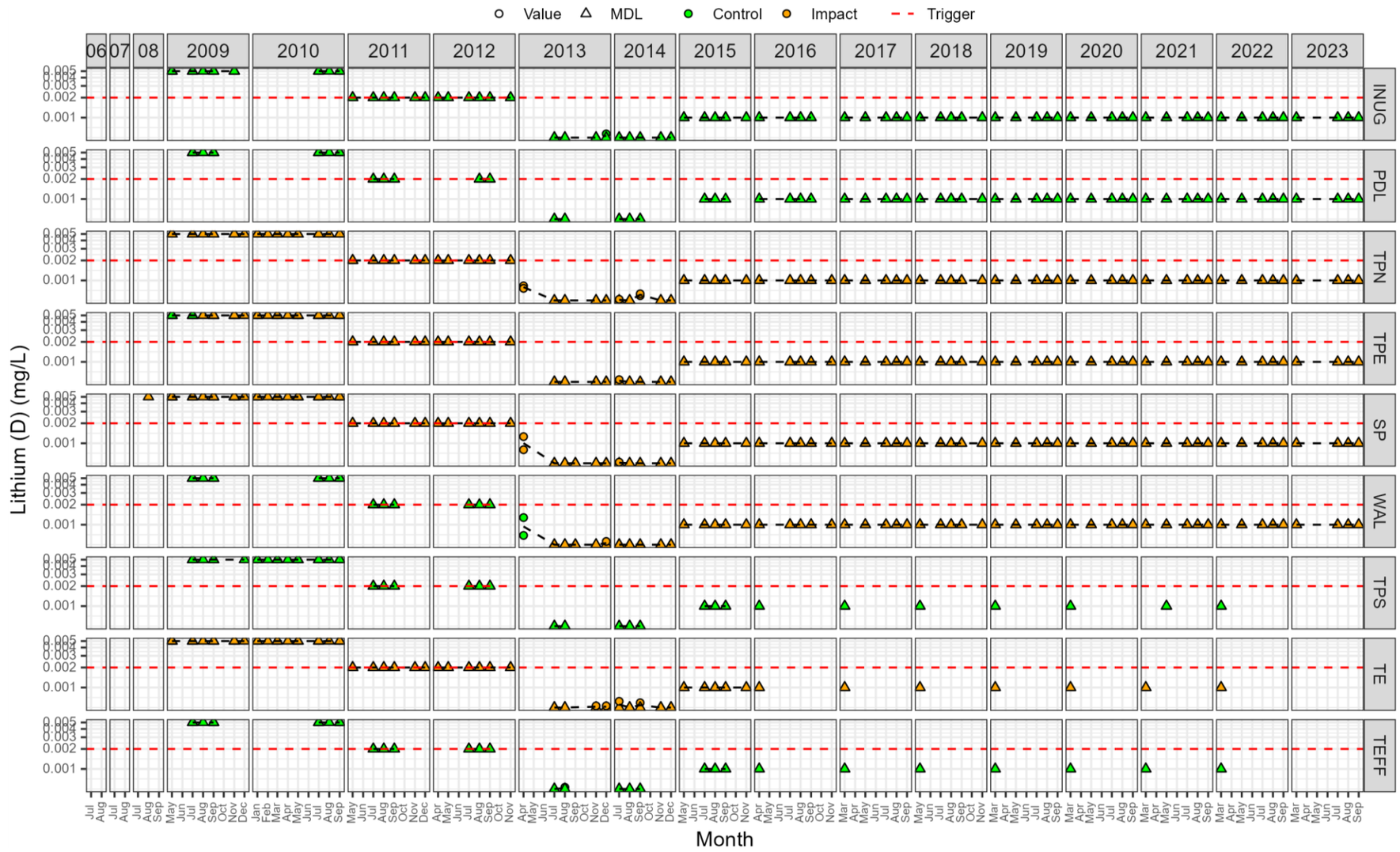


Figure B1-66. Dissolved manganese (mg/L).

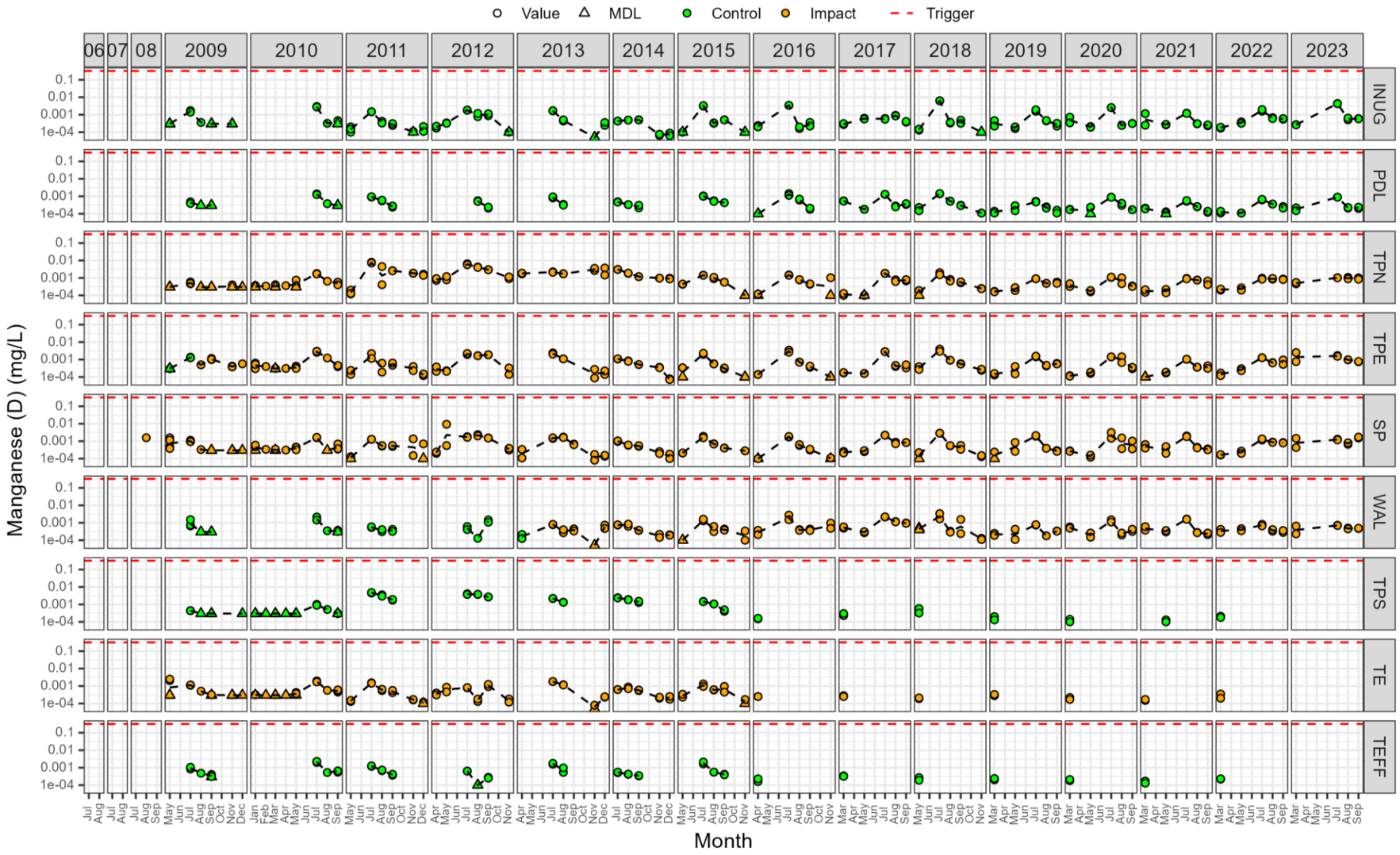


Figure B1-67. Dissolved molybdenum (mg/L).

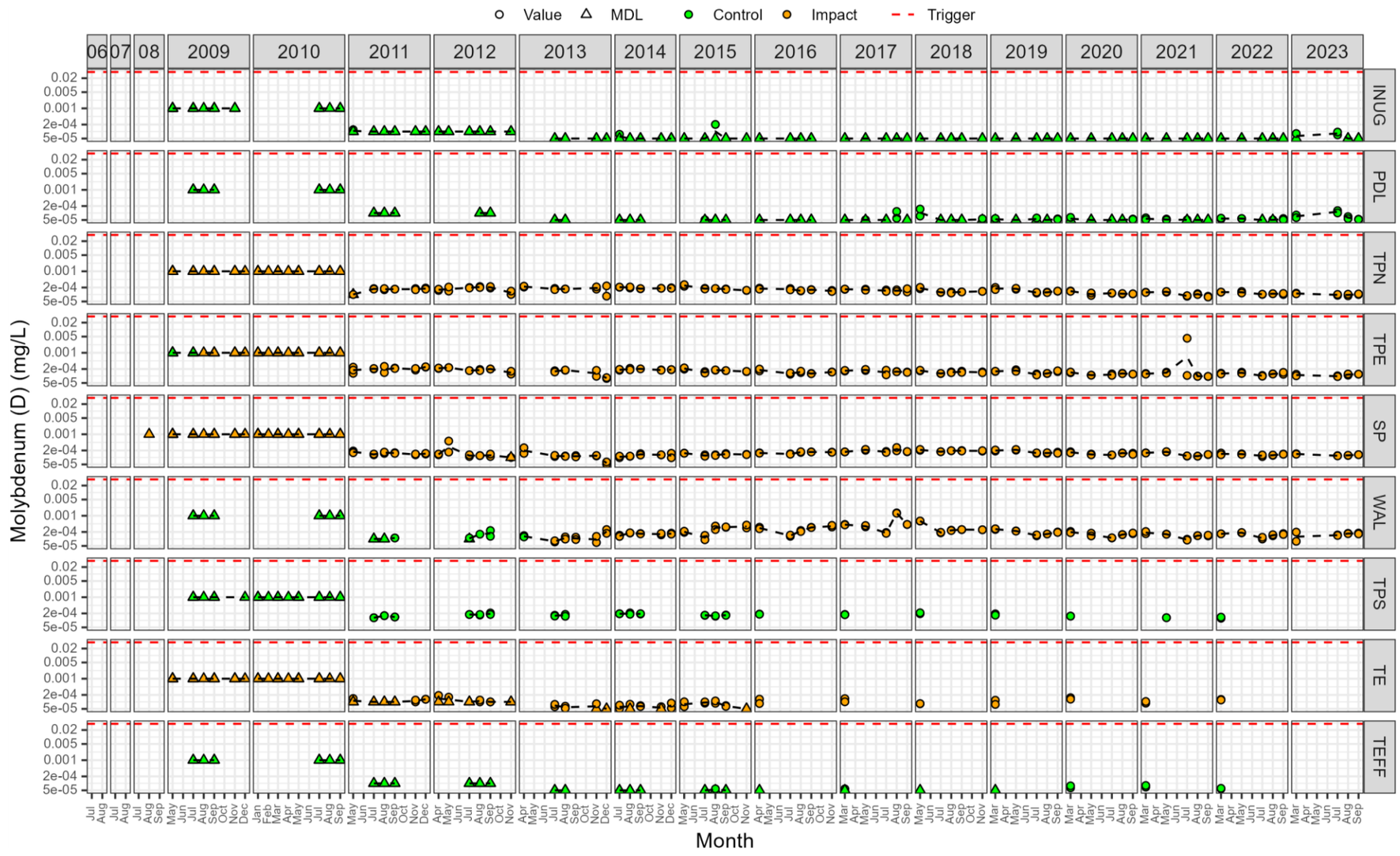


Figure B1-68. Dissolved mercury (mg/L).

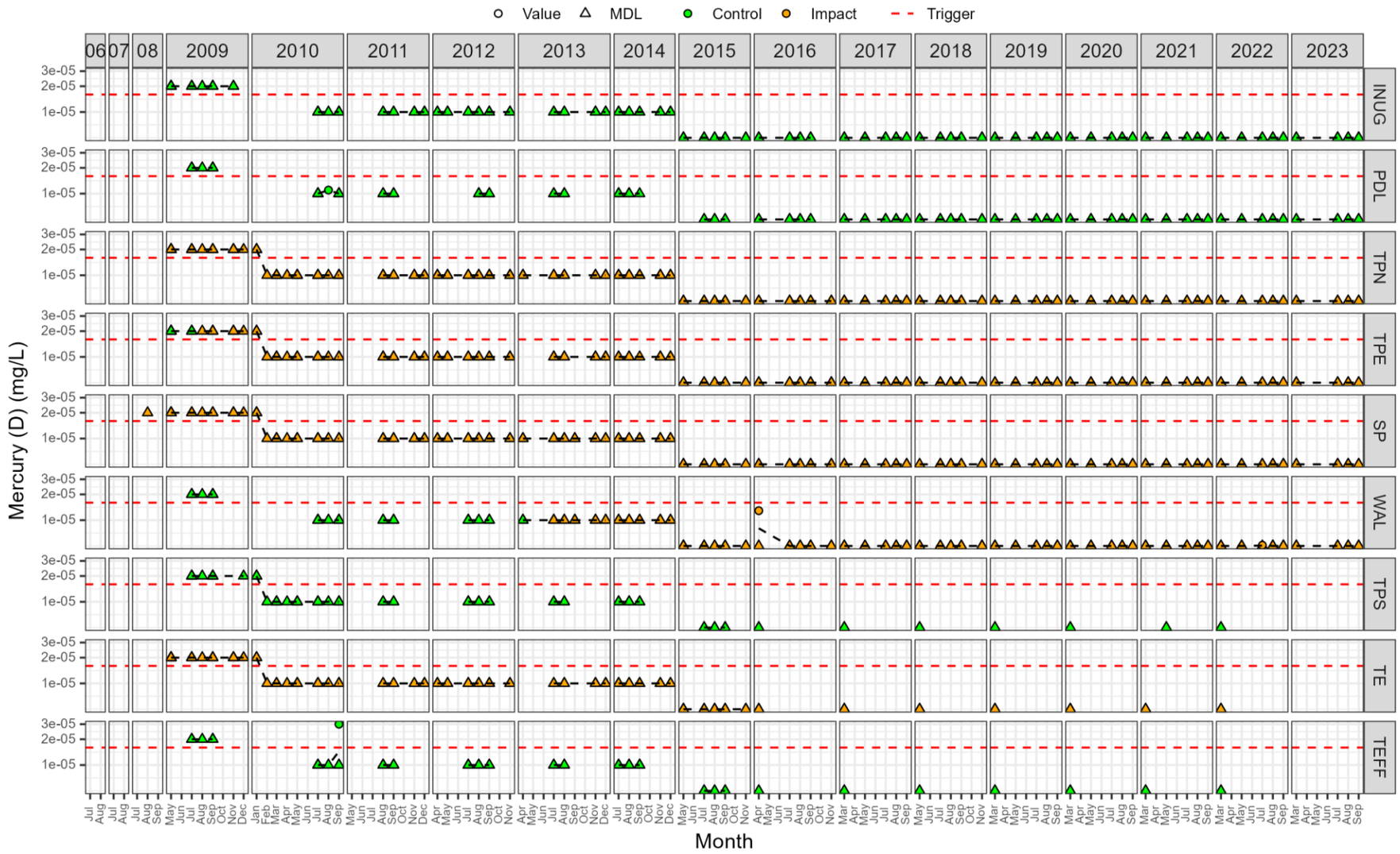


Figure B1-69. Dissolved nickel (mg/L).

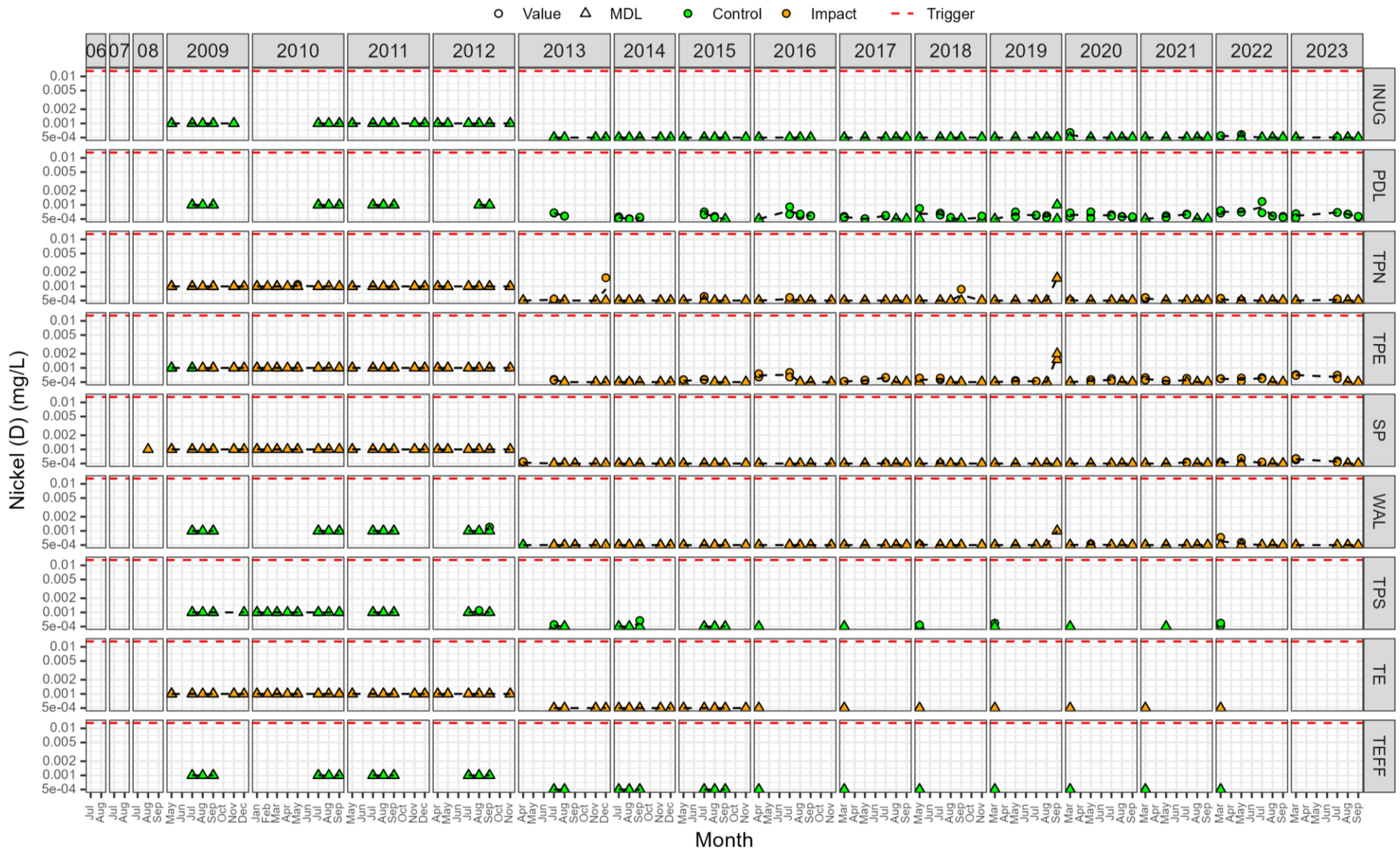


Figure B1-70. Dissolved selenium (mg/L).

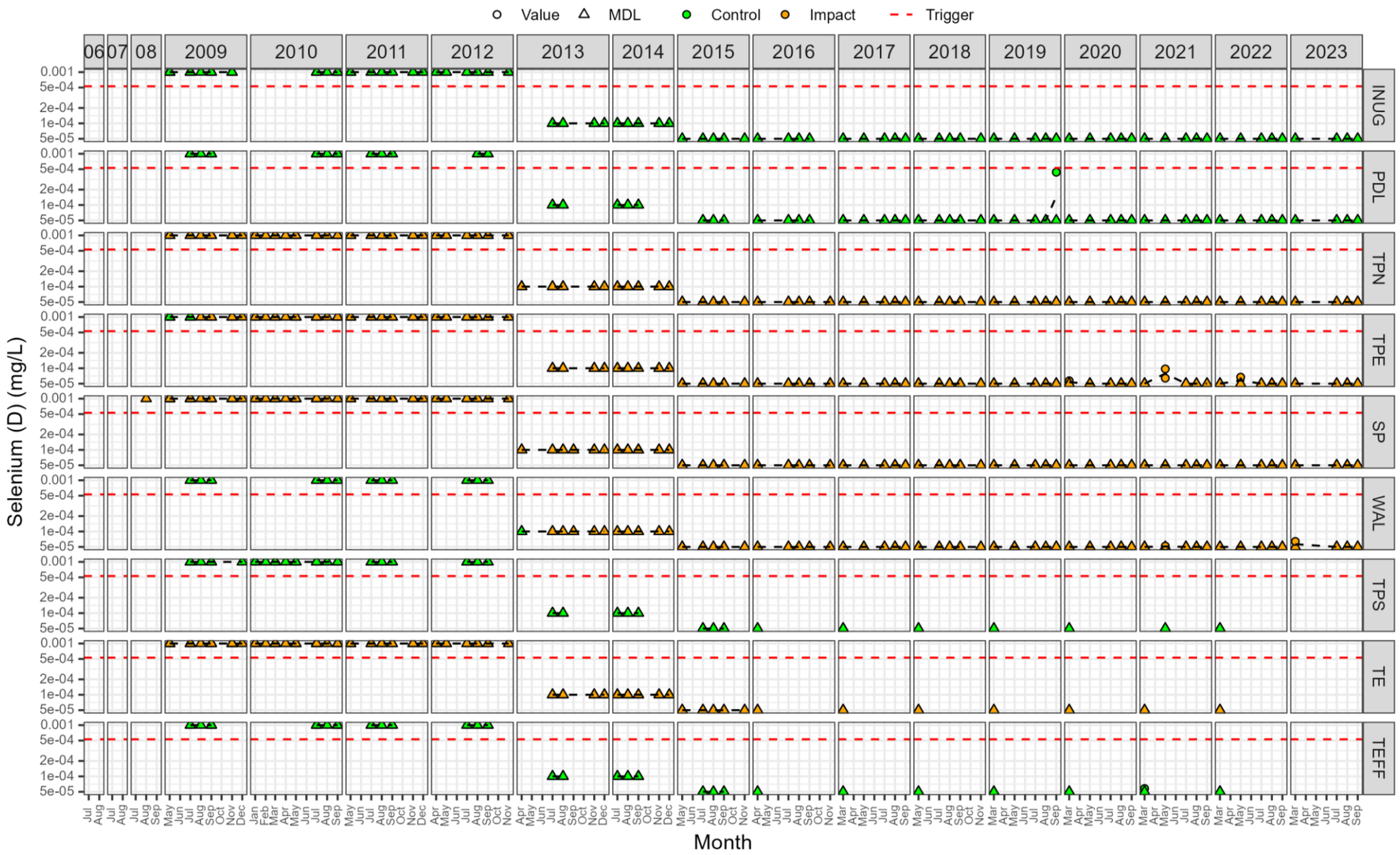


Figure B1-71. Dissolved silicon (mg/L).

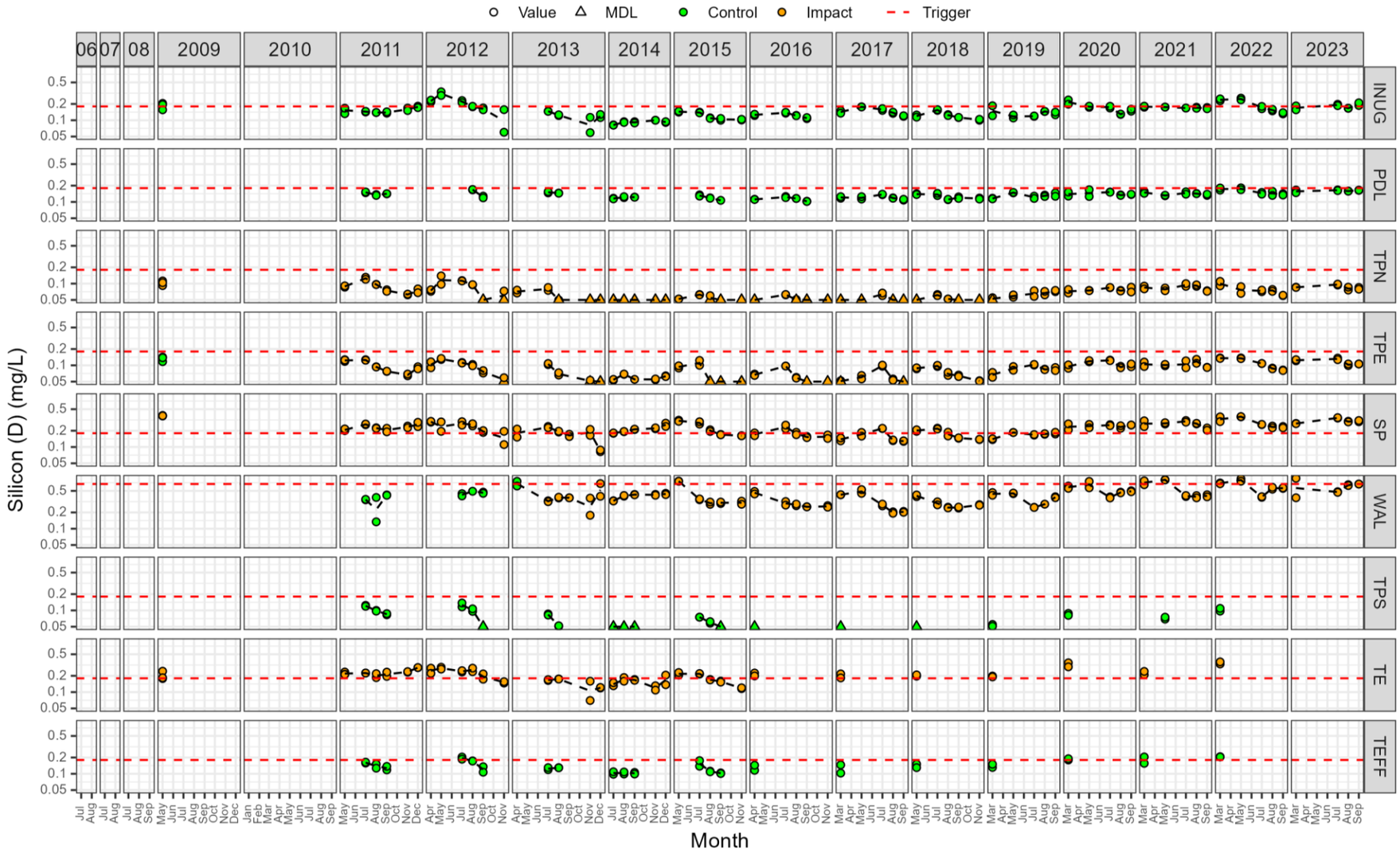


Figure B1-72. Dissolved silver (mg/L).

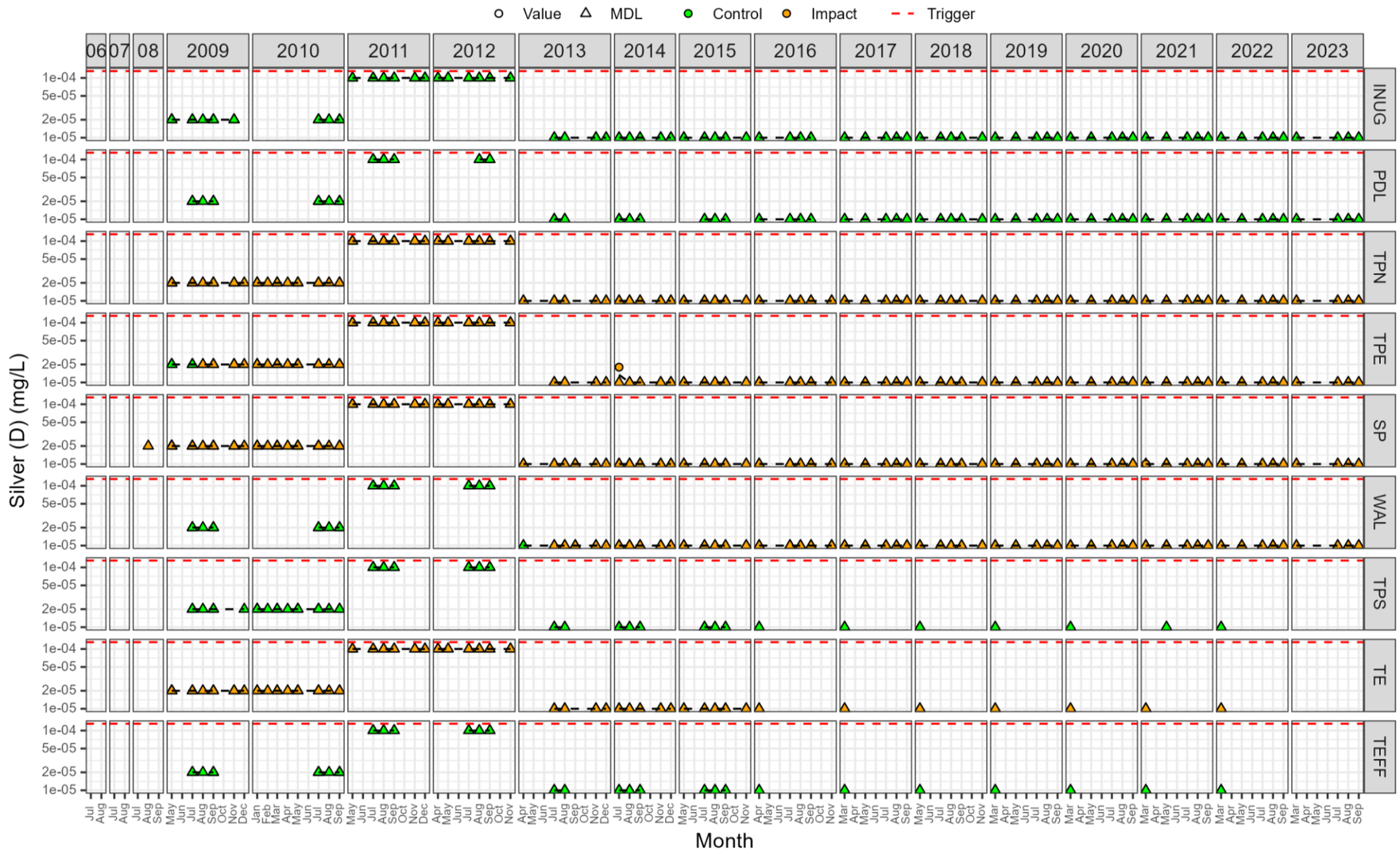


Figure B1-73. Dissolved strontium (mg/L).

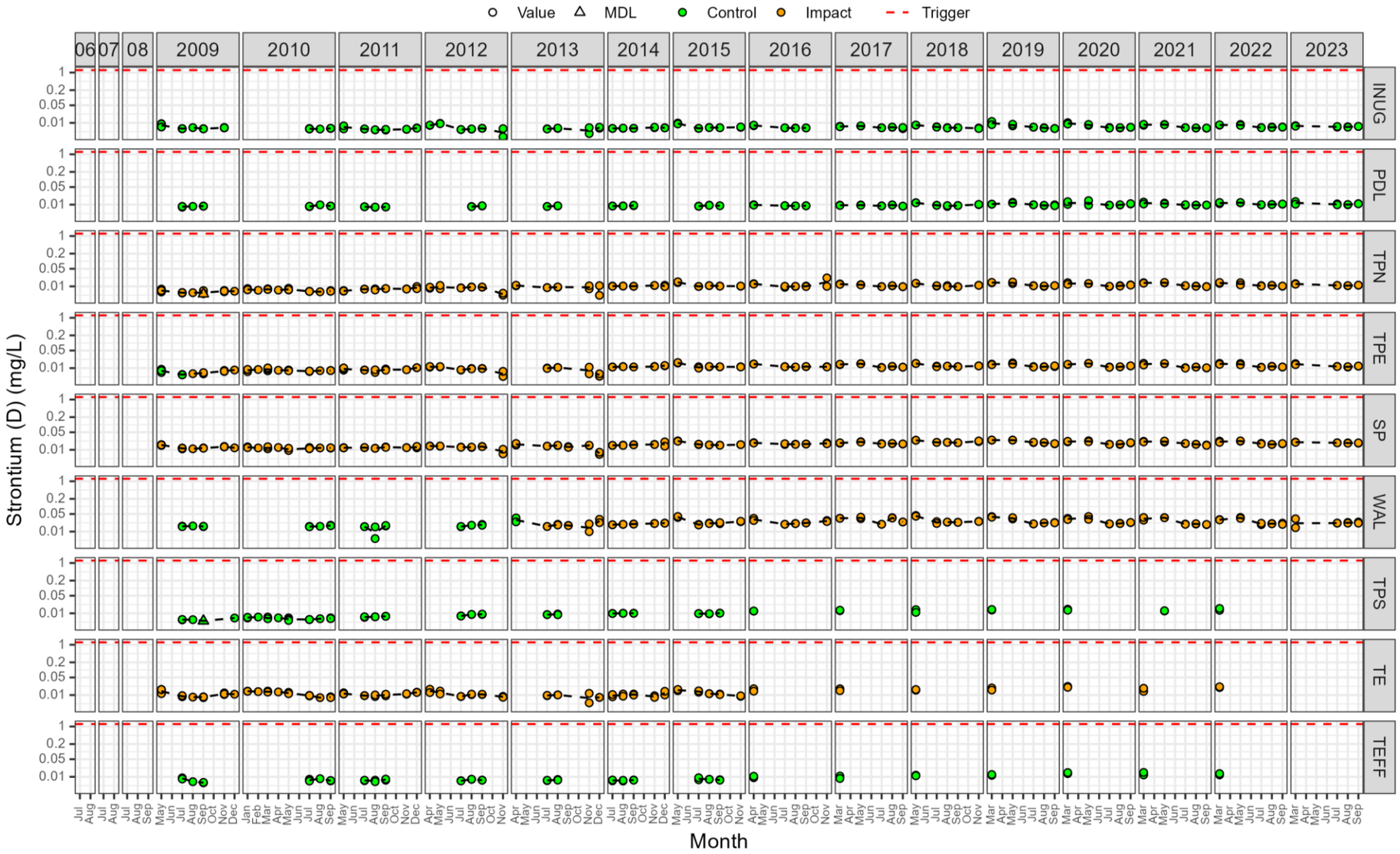


Figure B1-74. Dissolved thallium (mg/L).



Figure B1-75. Dissolved tin (mg/L).



Figure B1-76. Dissolved titanium (mg/L).

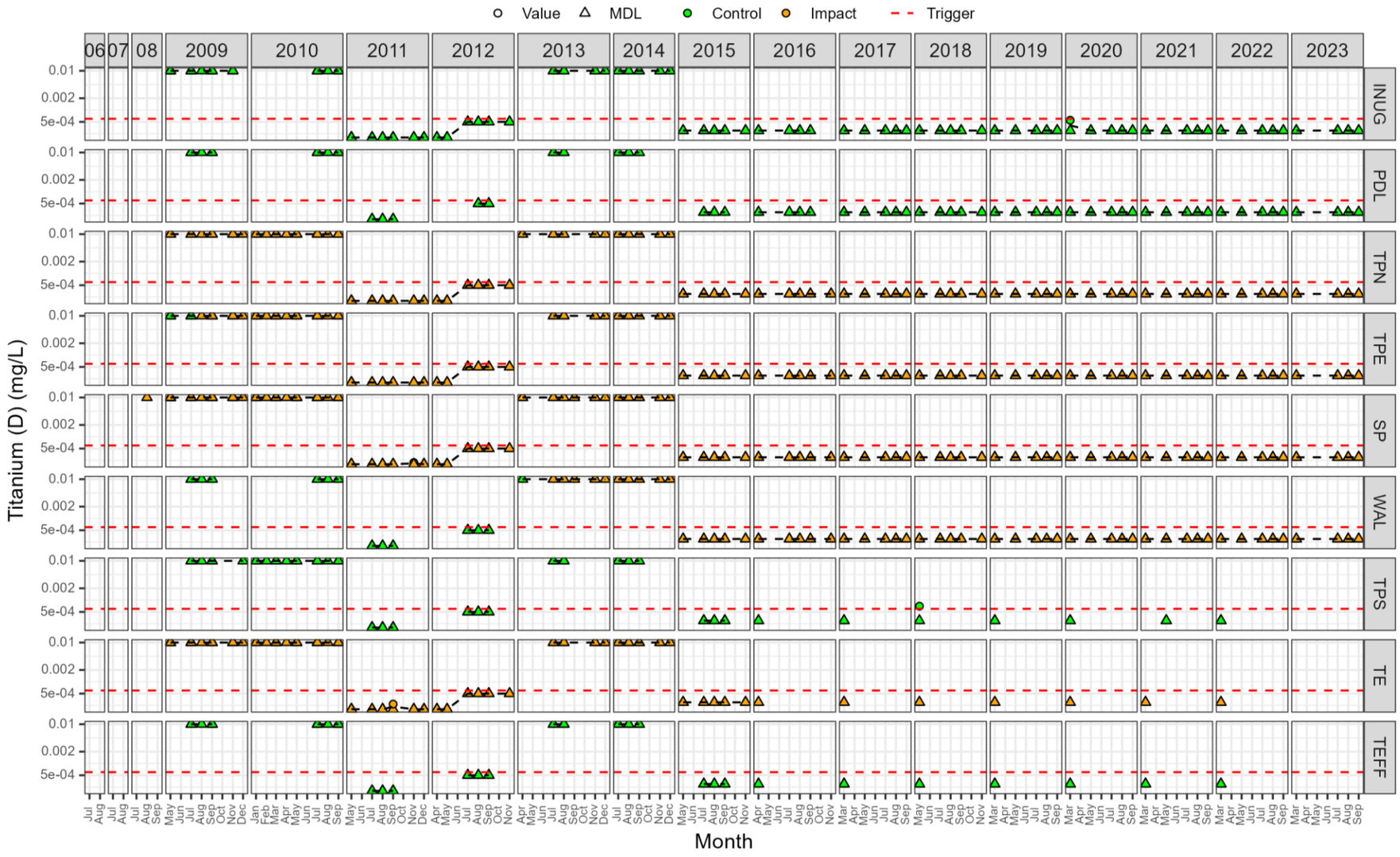


Figure B1-77. Dissolved uranium (mg/L).

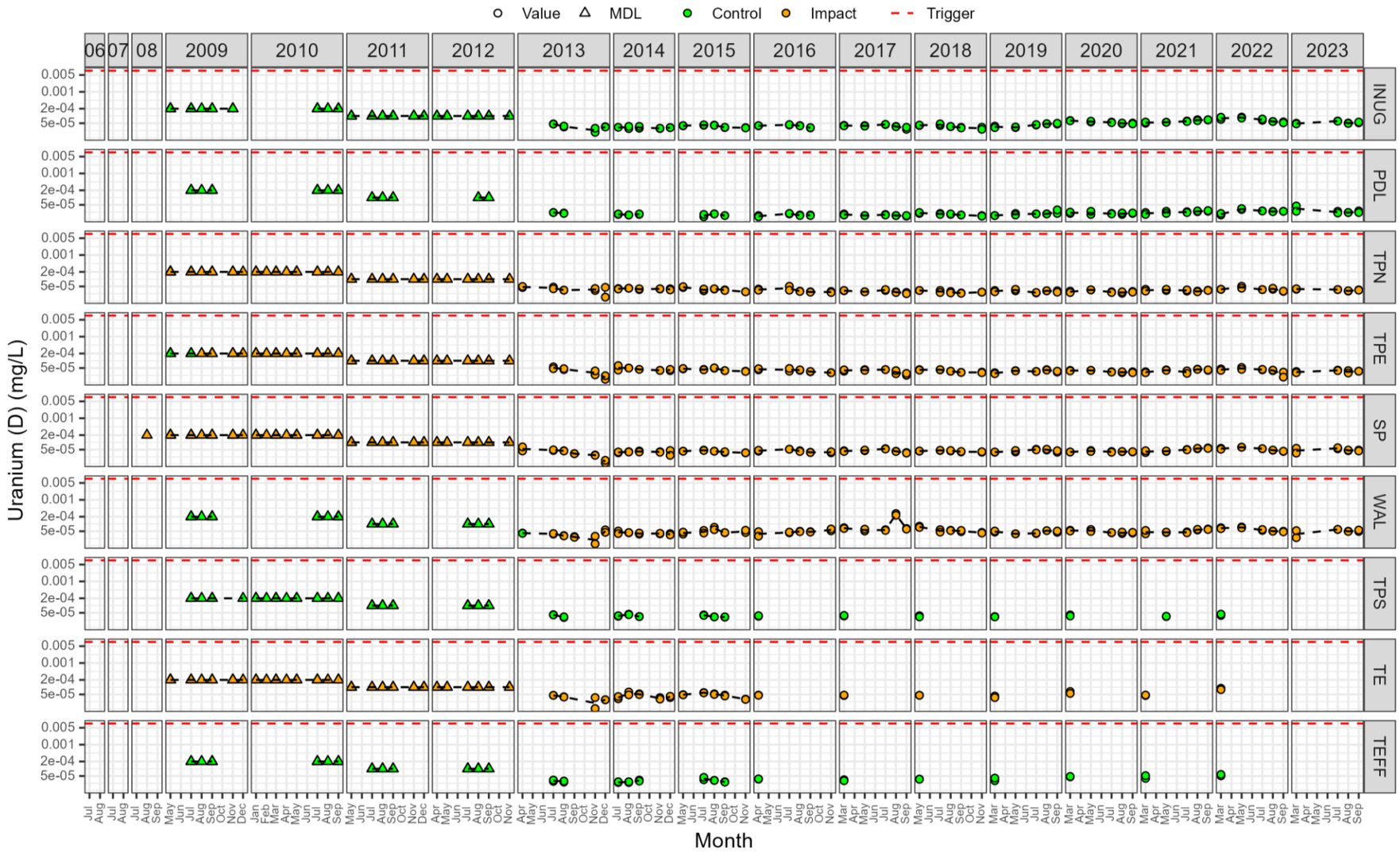


Figure B1-78. Dissolved vanadium (mg/L).

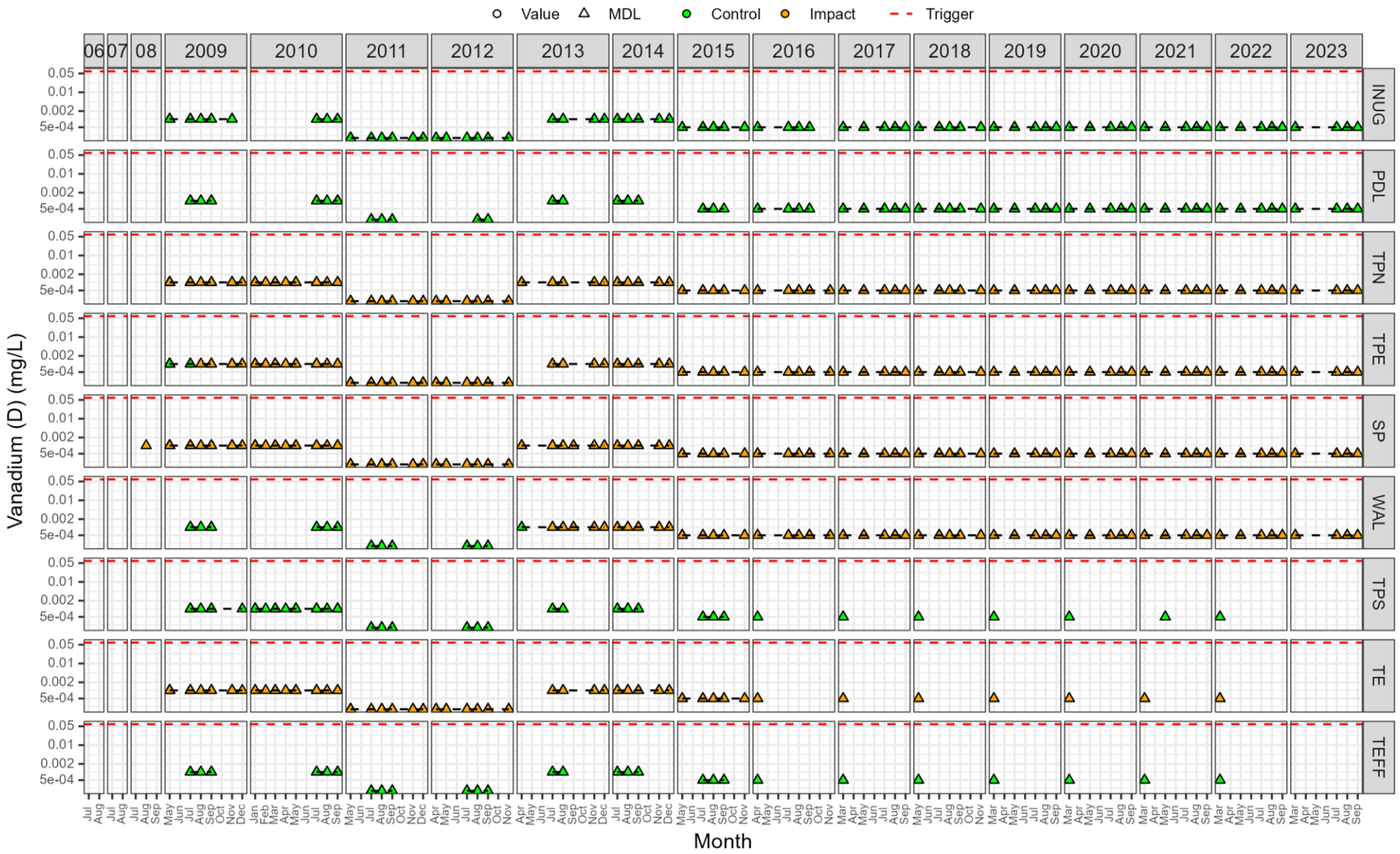


Figure B1-79. Dissolved zinc (mg/L).



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Appendix B2
Water Chemistry – Whale Tail Study Area Lakes

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Table B2-1. Water quality results from the Whale Tail study area lakes, 2023.

Lake & Area	Aquatic Life Guideline[1]	WTP Screening Values[2]		Whale Tail Lake South Basin (Impoundment)									
Month				March	March	July	July	August	August	September	September	November	November
Area-Replicate ID				WTS-77	WTS-78	WTS-79	WTS-80	WTS-81	WTS-82	WTS-83	WTS-84	WTS-85	WTS-86
Date		Triggers	Thresholds	07-Mar-2023	07-Mar-2023	02-Jul-2023	02-Jul-2023	14-Aug-2023	14-Aug-2023	07-Sep-2023	07-Sep-2023	07-Nov-2023	07-Nov-2023
Time				11:05	10:40	14:45	14:20	15:00	15:30	09:11	08:14	16:50	17:10
ALS Sample ID				VA23A5397-001	VA23A5397-002	VA23B5555-001	VA23B5555-002	VA23B9996-007 VA23C0547-011	VA23B9996-008 VA23C0547-012	VA23C1748-007	VA23C1748-008	VA23C7441-003	VA23C7441-004
Field Measurements (3 m)													
Dissolved Oxygen (mg/L)				14.7	13.0	11.7	11.3	9.6	9.6	11.3	11.3	14.1	14.4
Specific Conductivity (µS/cm)				172	167	121	121	117	117	116	116	118	119
pH	6.5 - 9.0			7.4	7.4	7.7	7.7	7.4	7.4	7.2	7.3	7.1	7.1
Temperature (°C)				0.58	0.60	10.6	12.3	16.6	16.8	7.0	7.0	0.18	0.20
Physical Tests (mg/L)													
Conductivity (µS/cm)		48.6		**163**	**161**	**122**	**121**	**116**	**116**	**117**	**118**	**121**	**122**
Alkalinity - Total (as $CaCO_3$)		9.61		**26**	**26**	**17.1**	**17.3**	**17.8**	**17.9**	**19.4**	**18.9**	**18.9**	**19.0**
Alkalinity - Bicarbonate		9.60		**26**	**26**	**17.1**	**17.3**	**17.8**	**17.9**	**19.4**	**18.9**	**18.9**	**19.0**
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*
Hardness (as CaCO3), dissolved		17.4		**60**	**60**	**44**	**43**	**41**	**41**	**42**	**39**	**46**	**45**
Hardness (as CaCO3), from total Ca/Mg				60	58	44	42	41	42	42	43	45	44
pH (Laboratory)	6.5 - 9.0	6.57-7.97	6.5-9.0	7.4	7.4	7.4	7.4	7.4	7.4	7.5	7.5	7.5	7.5
Total Dissolved Solids		38.5		**114**	**120**	**78**	**83**	**106**	**121**	**77**	**71**	**71**	**73**
Total Suspended Solids		3	5	*<1.0*	*<1.0*	1.8	1.4	1.2	1.3	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Turbidity (NTU)				0.24	0.16	0.68	0.58	0.47	0.59	0.47	0.47	0.47	0.53
Anions and Nutrients (mg/L)													
Total Kjeldahl Nitrogen		0.17		**0.44**	**0.36**	**0.23**	**0.24**	**0.29**	**0.42**	**0.24**	**0.24**	**0.24**	**0.24**
Ammonia (as N)[3]	***equation***	0.065	0.126	**0.22**	**0.14**	0.0090	0.015	0.017	0.012	0.032	0.022	0.031	0.027
Bromide				0.21	0.21	0.13	0.13	0.11	0.11	0.12	0.13	0.14	0.13
Chloride	120	60.4	120	19.4	19.1	13.0	12.9	12.4	12.3	12.7	12.7	13.2	13.3
Fluoride	0.12	0.077	0.12	**0.083**	**0.083**	0.056	0.052	0.059	0.060	0.060	0.061	0.060	0.060
Nitrate (as N)	3	1.5	3	0.79	0.68	0.57	0.54	0.31	0.30	0.28	0.28	0.34	0.34
Nitrite (as N)	0.06	0.031	0.06	0.0094	0.0084	0.0050	0.0044	0.0024	0.0028	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Ortho Phosphate (as P)		0.0022		0.0012	0.0014	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P)-Total	0.01	0.0045	0.01	**0.0066**	**0.0068**	**0.0065**	**0.011**	**0.0054**	**0.0060**	**0.0055**	**0.0060**	**0.0054**	**0.0052**
Phosphorus (P)-Total Diss.				0.0028	0.0031	0.0054	0.0060	0.0032	0.0033	0.0029	0.0029	0.0031	0.0032
Reactive Silica (as SiO_2)		1.33		1.3	1.1	0.63	0.53	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Sulphate (SO_4)		64.8	128	22	20	13.4	13.2	12.5	12.1	12.4	12.3	13.4	13.5
Cyanides (mg/L)													
Free Cyanide	0.005			-	-	-	-	-	-	-	-	-	-
Total Cyanide				-	-	-	-	-	-	-	-	-	-
Organic / Inorganic Carbon (mg/L)													
Dissolved Organic Carbon		2.43		**3.4**	**3.8**	**2.7**	**2.8**	**3.1**	**3.0**	**4.1**	**4.0**	**3.7**	**4.3**
Total Organic Carbon		2.42		**3.7**	**3.9**	**2.6**	**2.8**	**3.1**	**3.1**	**3.8**	**3.6**	**3.4**	**4.0**
Total Metals (mg/L)													
Aluminum[3]	***equation***	0.052	0.1	0.0045	0.0078	0.018	0.014	0.0056	0.0089	0.0085	0.011	0.012	0.014
Antimony		0.0046	0.009	0.0013	0.0013	0.00066	0.00065	0.00060	0.00061	0.00058	0.00058	0.00048	0.00050
Arsenic	0.005	0.013	0.025	0.00086	0.00091	0.0010	0.00091	0.00091	0.00096	0.00077	0.00080	0.00060	0.00056
Barium		0.5	1	0.026	0.025	0.019	0.018	0.018	0.018	0.017	0.017	0.017	0.017
Beryllium		0.000115	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
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***	0.000023	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		**16.4**	**15.9**	**11.9**	**11.7**	**11.5**	**11.7**	**11.3**	**11.5**	**11.7**	**11.5**
Chromium[4]	0.001	0.0025	0.005	0.00016	0.00020	0.00068	0.00024	0.00018	0.00020	0.00018	0.00017	0.00014	0.00019
Cobalt				0.00010	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.0013	0.002	0.00066	0.00069	0.00064	0.00055	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Iron	0.3	0.16	0.3	0.027	0.027	0.067	0.059	0.052	0.059	0.049	0.052	0.036	0.038
Lead[3]	***equation***	0.00053	0.001	*<0.000050*	*<0.000050*	0.00012	0.00006	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.002		**0.0026**	**0.0026**	0.0020	0.0020	0.0019	0.0020	0.0018	0.0019	0.0020	0.0020
Magnesium		1.41		**4.6**	**4.5**	**3.4**	**3.1**	**3.1**	**3.1**	**3.3**	**3.4**	**3.7**	**3.7**
Manganese[3]		0.32	***See note 3***	0.016	0.0066	0.013	0.012	0.015	0.015	0.0099	0.011	0.0047	0.0050
Mercury	0.000026	0.000016	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.00001	*<0.0000050*
Molybdenum	0.073	0.037	0.073	0.0020	0.0013	0.0012	0.0012	0.0011	0.0011	0.00096	0.00094	0.00072	0.00074
Nickel[3]	***equation***	0.013	0.025	0.0040	0.0039	0.0026	0.0023	0.0017	0.0017	0.0016	0.0015	0.0014	0.0014
Phosphorus		0.0045	0.004	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.84		**4.0**	**4.0**	**3.0**	**2.9**	**3.0**	**3.0**	**2.9**	**3.0**	**3.2**	**3.2**
Rubidium				0.0060	0.0058	0.0045	0.0043	0.0049	0.0049	0.0044	0.0045	0.0046	0.0047
Selenium	0.001	0.00053	0.001	0.00008	0.00006	*<0.000050*	*<0.000050*	0.00006	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.61		**0.66**	0.55	0.36	0.32	*<0.10*	*<0.10*	*<0.10*	0.12	0.15	0.15
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		**3.7**	**3.7**	**2.7**	**2.7**	**2.5**	**2.5**	**2.5**	**2.6**	**2.6**	**2.5**
Strontium		1.26	2.5	0.13	0.13	0.095	0.093	0.088	0.089	0.090	0.091	0.092	0.090
Sulfur				7.0	6.7	4.1	4.3	4.3	4.5	4.1	4.4	4.5	4.8
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	0.0008	*<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*	**0.00060**	**0.00051**	*<0.00030*	*<0.00030*	0.00030	0.00037	**0.00048**	**0.00049**
Tungsten				*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.015	0.0002	0.015	**0.00022**	0.00018	0.00012	0.00011	0.00007	0.00007	0.00006	0.00006	0.00007	0.00007
Vanadium		0.0006	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc	0.03	0.0075	***See note 3***	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved Metals (mg/L)													
Aluminum[3]		0.026	0.05	0.0062	0.0042	0.0025	0.0033	0.0018	0.0026	0.0027	0.0026	0.0034	0.0046
Antimony		0.005	0.009	0.0012	0.0012	0.00065	0.00062	0.00059	0.00059	0.00051	0.00046	0.00051	0.00051
Arsenic		0.013	0.025	0.00073	0.00074	0.00081	0.00084	0.00081	0.00080	0.00069	0.00066	0.00057	0.00054
Barium		0.5	1	0.023	0.022	0.019	0.018	0.017	0.017	0.017	0.016	0.018	0.017
Beryllium		0.000115	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
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		0.000023	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		**15.9**	**15.8**	**12.2**	**12.2**	**11.3**	**11.2**	**11.6**	**10.5**	**12.3**	**12.1**
Cesium				0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
Chromium		0.0026	0.005	0.00017	0.00016	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00011	0.00017	0.00013
Cobalt				*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper		0.0012	0.002	0.00059	0.00058	0.00047	0.00049	0.00041	0.00040	0.00042	0.00042	0.00052	0.00047
Iron		0.16	0.3	0.017	0.014	0.015	0.019	0.012	0.015	0.019	0.020	0.011	0.011
Lead		0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	0.00015	*<0.000050*
Lithium		0.002		**0.0026**	**0.0026**	**0.0021**	**0.0021**	0.0020	0.0020	0.0019	0.0019	0.0020	0.0020
Magnesium		1.41		**4.8**	**4.9**	**3.2**	**3.1**	**3.2**	**3.2**	**3.2**	**3.1**	**3.7**	**3.7**
Manganese[3]		0.32	***See note 3***	0.0044	0.00085	0.0015	0.0024	0.0012	0.0012	0.00086	0.00088	0.00045	0.00035
Mercury		0.000016	0.000026	*<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	0.0019	0.0012	0.0012	0.0012	0.0010	0.0010	0.00086	0.00082	0.00077	0.00077
Nickel		0.013	0.025	0.0037	0.0034	0.0023	0.0020	0.0015	0.0015	0.0015	0.0014	0.0015	0.0014
Phosphorus				*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.84		**3.8**	**3.8**	**2.9**	**2.9**	**2.9**	**2.9**	**3.0**	**2.9**	**3.2**	**3.2**
Rubidium				0.0058	0.0056	0.0044	0.0044	0.0048	0.0048	0.0048	0.0045	0.0047	0.0045
Selenium		0.00053	0.001	0.00005	0.00005	0.00005	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.57		**0.60**	0.51	0.31	0.27	*<0.050*	*<0.050*	*<0.050*	*<0.050*	0.13	0.11
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		**3.7**	**3.6**	**2.7**	**2.7**	**2.6**	**2.6**	**2.6**	**2.5**	**2.8**	**2.8**
Strontium		1.26	2.5	0.14	0.12	0.095	0.092	0.086	0.087	0.088	0.082	0.091	0.090
Sulfur				6.7	6.4	4.4	4.3	4.3	4.2	4.2	4.4	5.1	4.9
Tellurium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium		0.00041	0.0008	*<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		0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		0.0006		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	0.00020	0.00016	0.00010	0.00009	0.00007	0.00007	0.00006	0.00005	0.00006	0.00007
Vanadium		0.06	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]	***equation***	0.0023	***See note 3***	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	~~0.035~~	*<0.0010*
Zirconium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved mercury filtration location				Field	Field	Field	Field	Field	Field	Field	Field	Field	Field
Dissolved metals filtration location				Field	Field	Field	Field	Field	Field	Field	Field	Field	Field
Speciated Metals (µg/L)													
Arsenate (As V)				0.48	-	-	0.046	0.030	-	-	0.034	0.056	-
Arsenite (As III)				0.046	-	-	0.47	0.39	-	-	0.31	0.22	-
Arsenobetaine (AsB)				*<0.050*	-	-	*<0.050*	*<0.050*	-	-	*<0.050*	*<0.050*	-
Dimethylarsinic Acid (DMA)				*<0.020*	-	-	0.10	0.10	-	-	0.081	0.063	-
Monomethylarsonic Acid (MMA)				0.031	-	-	*<0.020*	*<0.020*	-	-	*<0.020*	*<0.020*	-
Plant Pigments (µg/L)													
Chlorophyll-a				0.57	0.73	2.0	2.0	2.5	2.6	2.1	2.2	1.2	1.3
Radiological Parameters (Bq/L)													
Radium-226				-	-	-	-	-	-	-	-	-	-

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, 2015b). A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015b) 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 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 values exceed the trigger.
123 Bold and shaded values exceed the threshold.
Italicized numbers are below detection limits.
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).
* Kangislulik Lake (KAN) previously referred to as Mammoth Lake (MAM). Acronym MAM still being used in tables and figures.

Table B2-1. Water quality results from the Whale Tail study area lakes, 2023.

Lake & Area	Aquatic Life Guideline[1]	WTP Screening Values[2]		Kangislulik Lake*									
Month				March	March	July	July	August	August	September	September	November	November
Area-Replicate ID				MAM-77	MAM-78	MAM-79	MAM-80	MAM-81	MAM-82	MAM-83	MAM-84	MAM-85	MAM-86
Date				07-Mar-2023	07-Mar-2023	03-Jul-2023	03-Jul-2023	15-Aug-2023	15-Aug-2023	10-Sep-2023	10-Sep-2023	07-Nov-2023	07-Nov-2023
Time				14:40	14:00	11:40	11:15	8:40	9:20	11:10	11:53	15:41	15:19
ALS Sample ID		Triggers	Thresholds	VA23A5397-003	VA23A5397-004	VA23B5555-009	VA23B5555-010	VA23B9996-005 VA23C0547-013	VA23B9996-006 VA23C0547-014	VA23C1748-017	VA23C1748-018	VA23C7441-001	VA23C7441-002
Field Measurements (3 m)													
Dissolved Oxygen (mg/L)				12.8	12.7	10.7	10.7	9.5	9.4	12.0	11.9	14.9	14.4
Specific Conductivity (µS/cm)				222	190	154	124	137	166	192	144	190	174
pH	6.5 - 9.0			7.3	7.7	7.6	7.6	7.4	7.6	7.4	7.4	7.1	7.1
Temperature (°C)				1.1	1.1	12.3	12.1	16.2	16.2	6.4	6.4	0.42	0.43
Physical Tests (mg/L)													
Conductivity (µS/cm)		48.6		**216**	**184**	**157**	**126**	**134**	**162**	**197**	**150**	**195**	**178**
Alkalinity - Total (as $CaCO_3$)		9.61		**29**	**25**	**17.8**	**16.3**	**17.7**	**19.2**	**23**	**19.4**	**24**	**23**
Alkalinity - Bicarbonate		9.60		**29**	**25**	**17.8**	**16.3**	**17.7**	**19.2**	**23**	**19.4**	**24**	**23**
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*
Hardness (as CaCO3), dissolved		17.4		**80**	**65**	**54**	**44**	**48**	**58**	**72**	**53**	**72**	**58**
Hardness (as CaCO3), from total Ca/Mg				79	66	53	44	48	56	72	55	73	64
pH (Laboratory)	6.5 - 9.0	6.57-7.97	6.5-9.0	7.5	7.4	7.5	7.4	7.5	7.5	7.5	7.5	7.6	7.5
Total Dissolved Solids		38.5		**158**	**119**	**93**	**82**	**125**	**144**	**140**	**99**	**119**	**108**
Total Suspended Solids		3	5	*<1.0*	*<1.0*	1.4	*<1.0*	*<1.0*	*<1.0*	1.3	1.1	*<1.0*	*<1.0*
Turbidity (NTU)				0.12	*<0.10*	0.41	0.36	0.24	0.26	0.35	0.32	0.26	0.26
Anions and Nutrients (mg/L)													
Total Kjeldahl Nitrogen		0.17		**0.28**	**0.24**	**0.29**	0.17	**0.26**	**0.29**	**0.37**	**0.20**	**0.24**	**0.21**
Ammonia (as N)[3]	***equation***	0.065	0.126	**0.066**	0.052	0.068	0.019	0.046	0.019	**0.095**	0.011	0.018	0.018
Bromide				0.30	0.25	0.19	0.14	0.14	0.19	0.27	0.19	0.26	0.24
Chloride	120	60.4	120	27	23	18.7	14.4	15.4	20	25	17.7	23	21
Fluoride	0.12	0.077	0.12	**0.078**	0.073	0.050	0.047	0.054	0.059	0.058	0.052	0.058	0.061
Nitrate (as N)	3	1.5	3	1.1	0.88	0.74	0.47	0.35	0.53	0.90	0.41	0.83	0.69
Nitrite (as N)	0.06	0.031	0.06	0.0049	0.0039	0.0062	0.0027	0.0034	0.0041	0.011	0.0018	0.0016	0.0015
Ortho Phosphate (as P)		0.0022		0.0012	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P)-Total	0.01	0.0045	0.01	**0.0048**	**0.0048**	0.0041	**0.0046**	0.0025	0.0027	0.0038	0.0044	0.0034	0.0034
Phosphorus (P)-Total Diss.				0.0024	*<0.0020*	0.0029	0.0025	0.0025	0.0024	0.0023	*<0.0020*	0.0025	0.0024
Reactive Silica (as SiO_2)		1.33		**1.5**	1.3	0.71	0.53	0.54	0.69	0.99	0.69	*<0.50*	0.82
Sulphate (SO_4)		64.8	128	31	26	19.0	15.1	15.5	18.5	25	17.8	26	23
Cyanides (mg/L)													
Free Cyanide	0.005			-	-	-	-	*<0.0010*	*<0.0010*	-	-	-	-
Total Cyanide				-	-	-	-	*<0.0010*	*<0.0010*	-	-	-	-
Organic / Inorganic Carbon (mg/L)													
Dissolved Organic Carbon		2.43		**2.9**	**2.5**	1.9	1.9	2.2	2.3	**3.0**	**3.6**	**3.8**	**3.2**
Total Organic Carbon		2.42		**2.9**	**2.5**	2.1	2.4	2.3	**2.6**	**3.7**	**3.2**	**3.4**	**2.6**
Total Metals (mg/L)													
Aluminum[3]	***equation***	0.052	0.1	0.0039	*<0.0030*	0.0097	0.0083	0.0060	0.0062	0.0048	0.0050	0.0033	*<0.0030*
Antimony		0.0046	0.009	0.0016	0.0014	0.00094	0.00068	0.00080	0.0011	0.0015	0.00085	0.0012	0.00097
Arsenic	0.005	0.013	0.025	0.0012	0.0010	0.0012	0.00092	0.0012	0.0018	0.0018	0.0011	0.00099	0.00084
Barium		0.5	1	0.035	0.028	0.023	0.019	0.019	0.022	0.023	0.018	0.025	0.021
Beryllium		0.000115	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
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***	0.000023	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		**23**	**18.6**	**15.1**	**12.3**	**14.2**	**16.6**	**21**	**15.7**	**21**	**18.0**
Chromium[4]	0.001	0.0025	0.005	0.00014	*<0.00010*	0.00020	0.00012	*<0.00010*	0.00020	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt				*<0.00010*	*<0.00010*	0.00013	*<0.00010*	*<0.00010*	*<0.00010*	0.00014	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.0013	0.002	0.00066	0.00061	0.00055	0.00054	0.00053	0.00057	0.00056	0.00052	*<0.00050*	*<0.00050*
Iron	0.3	0.16	0.3	*<0.010*	*<0.010*	0.037	0.031	0.017	0.028	0.027	0.016	*<0.010*	*<0.010*
Lead[3]	***equation***	0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.002		**0.0032**	**0.0027**	**0.0029**	0.0020	**0.0023**	**0.0032**	**0.0035**	**0.0025**	**0.0033**	**0.0028**
Magnesium		1.41		**5.5**	**4.7**	**3.7**	**3.1**	**3.1**	**3.6**	**4.8**	**3.7**	**5.2**	**4.5**
Manganese[3]		0.32	***See note 3***	0.0085	0.0023	0.022	0.0092	0.0051	0.0097	0.018	0.0059	0.0039	0.0038
Mercury	0.000026	0.000016	0.000026	*<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	0.00083	0.00072	0.0016	0.00076	0.0011	0.0016	0.0019	0.0011	0.0012	0.0010
Nickel[3]	***equation***	0.013	0.025	0.0026	0.0017	0.0026	0.0015	0.0010	0.0015	0.0029	0.0012	0.0015	0.0013
Phosphorus		0.0045	0.004	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.84		**5.4**	**4.5**	**3.6**	**3.0**	**3.3**	**3.8**	**4.3**	**3.5**	**4.5**	**4.0**
Rubidium				0.0064	0.0053	0.0045	0.0037	0.0046	0.0053	0.0054	0.0046	0.0053	0.0050
Selenium	0.001	0.00053	0.001	0.00010	0.00006	0.00007	*<0.000050*	0.00007	0.00009	0.00008	*<0.000050*	0.00008	*<0.000050*
Silicon		0.61		**0.74**	**0.64**	0.41	0.32	0.25	0.32	0.50	0.35	0.41	0.40
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		**4.5**	**3.8**	**3.2**	**2.7**	**2.8**	**3.1**	**3.7**	**3.0**	**3.5**	**3.1**
Strontium		1.26	2.5	0.16	0.14	0.13	0.096	0.10	0.14	0.18	0.12	0.16	0.15
Sulfur				10.0	8.5	6.4	5.0	5.7	6.5	8.4	5.9	8.9	8.4
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	0.0008	*<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*	0.00013	*<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*	0.00038	*<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	0.0002	0.015	0.00014	0.00012	**0.00022**	0.00013	0.00015	**0.00021**	**0.00033**	0.00015	0.00018	0.00015
Vanadium		0.0006	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc	0.03	0.0075	***See note 3***	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved Metals (mg/L)													
Aluminum[3]		0.026	0.05	*<0.0010*	0.0027	0.0024	0.0026	0.0032	0.0027	0.0021	0.0020	0.0011	0.0080
Antimony		0.005	0.009	0.0016	0.0013	0.00092	0.00065	0.00077	0.0010	0.0013	0.00071	0.0011	0.0010
Arsenic		0.013	0.025	0.0011	0.00090	0.00097	0.00078	0.0012	0.0016	0.0013	0.00088	0.00084	0.00078
Barium		0.5	1	0.032	0.025	0.022	0.018	0.018	0.021	0.023	0.019	0.024	0.022
Beryllium		0.000115	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
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		0.000023	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		**22**	**18.0**	**15.7**	**12.3**	**13.9**	**16.8**	**21**	**14.9**	**21**	**16.6**
Cesium				0.00002	0.00002	0.00002	0.00001	0.00002	0.00002	0.00003	0.00002	0.00002	0.00003
Chromium		0.0026	0.005	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00029
Cobalt				*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00011	*<0.00010*	*<0.00010*	*<0.00010*
Copper		0.0012	0.002	0.00061	0.00053	0.00045	0.00046	0.00049	0.00055	0.00050	0.00044	0.00048	0.00049
Iron		0.16	0.3	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.014
Lead		0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.002		**0.0032**	**0.0026**	**0.0030**	0.0020	**0.0024**	**0.0033**	**0.0035**	**0.0023**	**0.0032**	**0.0024**
Magnesium		1.41		**6.0**	**4.8**	**3.6**	**3.1**	**3.3**	**3.8**	**4.8**	**3.8**	**4.9**	**4.0**
Manganese[3]		0.32	***See note 3***	0.0031	0.00052	0.018	0.0042	0.00044	0.0014	0.014	0.0023	0.00066	0.00094
Mercury		0.000016	0.000026	*<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	0.00078	0.00069	0.0014	0.00074	0.0010	0.0016	0.0017	0.00096	0.0012	0.0011
Nickel		0.013	0.025	0.0025	0.0016	0.0024	0.0014	0.00094	0.0015	0.0027	0.0011	0.0015	0.0013
Phosphorus				*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.84		**5.5**	**4.3**	**3.6**	**3.0**	**3.3**	**3.8**	**4.3**	**3.5**	**4.3**	**3.8**
Rubidium				0.0063	0.0054	0.0046	0.0037	0.0045	0.0052	0.0054	0.0044	0.0052	0.0048
Selenium		0.00053	0.001	0.00008	0.00007	*<0.000050*	0.00007	0.00006	*<0.000050*	0.00007	*<0.000050*	0.00007	0.00011
Silicon		0.57		**0.72**	**0.60**	0.35	0.27	0.21	0.28	0.46	0.31	0.39	0.34
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		**4.6**	**3.8**	**3.2**	**2.7**	**2.9**	**3.2**	**3.7**	**2.9**	**3.7**	**3.2**
Strontium		1.26	2.5	0.17	0.14	0.13	0.094	0.10	0.13	0.17	0.11	0.16	0.14
Sulfur				9.5	7.9	6.5	4.7	5.4	6.2	8.1	6.0	9.5	7.8
Tellurium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium		0.00041	0.0008	*<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		0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		0.0006		*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	0.00034
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	0.00012	0.00010	0.00019	0.00012	0.00015	0.00022	0.00033	0.00015	0.00019	0.00016
Vanadium		0.06	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]	***equation***	0.0023	***See note 3***	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	**0.0041**
Zirconium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved mercury filtration location				Field	Field	Field	Field	Field	Field	Field	Field	Field	Field
Dissolved metals filtration location				Field	Field	Field	Field	Field	Field	Field	Field	Field	Field
Speciated Metals (µg/L)													
Arsenate (As V)				0.77	-	-	0.057	-	0.067	-	0.045	-	0.15
Arsenite (As III)				0.037	-	-	0.51	-	0.94	-	0.52	-	0.27
Arsenobetaine (AsB)				*<0.050*	-	-	*<0.050*	-	*<0.050*	-	*<0.050*	-	*<0.050*
Dimethylarsinic Acid (DMA)				*<0.020*	-	-	0.073	-	0.17	-	0.083	-	0.12
Monomethylarsonic Acid (MMA)				0.046	-	-	*<0.020*	-	*<0.020*	-	*<0.020*	-	*<0.020*
Plant Pigments (µg/L)													
Chlorophyll-a				0.75	1.1	0.79	0.78	0.97	1.0	1.3	1.4	1.2	1.1
Radiological Parameters (Bq/L)													
Radium-226				-	-	-	-	-	-	-	-	-	-

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, 2015b). A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015b) 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 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 values exceed the trigger.
123 Bold and shaded values exceed the threshold.
Italicized numbers are below detection limits.
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).
* Kangislulik Lake (KAN) previously referred to as Mammoth Lake (MAM). Acronym MAM still being used in tables and figures.

Table B2-1. Water quality results from the Whale Tail study area lakes, 2023.

Lake & Area	Aquatic Life Guideline[1]	WTP Screening Values[2]		Lake A20 (Impoundment)							
Month				March	March	July	July	August	August	September	September
Area-Replicate ID				A20-71	A20-72	A20-73	A20-74	A20-75	A20-76	A20-77	A20-78
Date				08-Mar-2023	08-Mar-2023	30-Jun-2023	30-Jun-2023	18-Aug-2023	18-Aug-2023	07-Sep-2023	07-Sep-2023
Time		Triggers	Thresholds	13:30	14:05	14:00	13:30	10:30	9:45	11:30	11:46
ALS Sample ID				VA23A5397-007	VA23A5397-008	VA23B5555-003	VA23B5555-004	VA23B9996-011 VA23C0547-021	VA23B9996-012 VA23C0547-022	VA23C1748-009	VA23C1748-010
Field Measurements (3 m)											
Dissolved Oxygen (mg/L)				12.1	15.3	11.5	11.1	9.8	9.7	12.2	11.7
Specific Conductivity (µS/cm)				111	73	64	60	71	67	66	62
pH	6.5 - 9.0			6.8	6.9	7.7	7.5	7.1	7.2	7.1	7.0
Temperature (°C)				1.3	0.69	10.2	10.0	14.1	14.8	5.4	6.7
Physical Tests (mg/L)											
Conductivity (µS/cm)		48.6		**110**	**71**	**65**	**61**	**69**	**64**	**67**	**62**
Alkalinity - Total (as $CaCO_3$)		9.61		**23**	**13.7**	**11.7**	**11.2**	**12.9**	**11.8**	**13.0**	**12.3**
Alkalinity - Bicarbonate		9.60		**23**	**13.7**	**11.7**	**11.2**	**12.9**	**11.8**	**13.0**	**12.3**
Alkalinity - Carbonate		2.0		*<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*
Hardness (as CaCO3), dissolved		17.4		**40**	**26**	**23**	**22**	**25**	**23**	**22**	**21**
Hardness (as CaCO3), from total Ca/Mg				42	26	23	21	25	24	23	21
pH (Laboratory)	6.5 - 9.0	6.57-7.97	6.5-9.0	7.4	7.2	7.3	7.2	7.3	7.3	7.3	7.3
Total Dissolved Solids		38.5		**79**	**55**	**50**	**42**	**65**	**63**	**48**	**42**
Total Suspended Solids		3	5	*<1.0*	*<1.0*	1.5	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Turbidity (NTU)				0.16	0.11	0.49	0.43	0.47	0.45	0.42	0.46
Anions and Nutrients (mg/L)											
Total Kjeldahl Nitrogen		0.17		**0.23**	**0.18**	**0.20**	**0.18**	**0.21**	**0.18**	**0.19**	**0.39**
Ammonia (as N)[3]	***equation***	0.065	0.126	0.0055	0.026	*<0.0050*	0.0078	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Bromide				0.14	0.084	0.063	0.055	0.074	0.070	0.064	0.061
Chloride	120	60.4	120	13.3	8.5	7.0	6.4	7.3	6.8	7.1	6.6
Fluoride	0.12	0.077	0.12	0.073	0.061	0.046	0.048	0.051	0.048	0.052	0.051
Nitrate (as N)	3	1.5	3	0.26	0.088	0.083	0.070	*<0.0050*	*<0.0050*	*<0.0050*	0.0072
Nitrite (as N)	0.06	0.031	0.06	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Ortho Phosphate (as P)		0.0022		0.0014	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P)-Total	0.01	0.0045	0.01	**0.0049**	**0.0049**	**0.0065**	**0.0058**	0.0036	0.0035	0.0041	**0.0071**
Phosphorus (P)-Total Diss.				0.0025	*<0.0020*	0.0048	0.0036	*<0.0020*	*<0.0020*	0.0024	0.0024
Reactive Silica (as SiO_2)		1.33		1.0	0.63	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Sulphate (SO_4)		64.8	128	10.3	6.0	5.5	4.9	5.5	5.3	5.6	5.2
Cyanides (mg/L)											
Free Cyanide	0.005			-	-	-	-	-	-	-	-
Total Cyanide				-	-	-	-	-	-	-	-
Organic / Inorganic Carbon (mg/L)											
Dissolved Organic Carbon		2.43		**3.9**	**3.1**	**2.8**	2.4	**2.7**	**2.6**	**4.0**	**4.1**
Total Organic Carbon		2.42		**4.0**	**3.2**	**2.6**	**2.5**	**3.0**	**2.9**	**4.2**	**3.7**
Total Metals (mg/L)											
Aluminum[3]	***equation***	0.052	0.1	0.0033	*<0.0030*	0.0088	0.0093	0.0050	0.0046	0.0074	0.0068
Antimony		0.0046	0.009	0.00024	0.00012	0.00018	0.00015	0.00014	0.00014	0.00013	0.00016
Arsenic	0.005	0.013	0.025	0.00041	0.00029	0.00033	0.00032	0.00037	0.00032	0.00027	0.00028
Barium		0.5	1	0.020	0.011	0.0095	0.0095	0.0092	0.0088	0.0080	0.0075
Beryllium		0.000115	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth				*<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*
Cadmium[3]	***equation***	0.000023	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		4.6		**11.3**	**7.1**	**6.1**	**5.7**	**6.8**	**6.4**	**6.3**	**5.7**
Chromium[4]	0.001	0.0025	0.005	0.00010	*<0.00010*	0.00011	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*
Copper[3]	***equation***	0.0013	0.002	0.00056	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Iron	0.3	0.16	0.3	0.022	*<0.010*	0.064	0.064	0.071	0.040	0.049	0.040
Lead[3]	***equation***	0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	0.00006
Lithium		0.002		0.0014	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		1.41		**3.3**	**2.1**	**1.8**	**1.7**	**1.9**	**1.8**	**1.9**	**1.6**
Manganese[3]		0.32	***See note 3***	0.071	0.00092	0.014	0.013	0.017	0.012	0.0088	0.0089
Mercury	0.000026	0.000016	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.037	0.073	0.00010	0.00008	0.00013	0.00011	0.00014	0.00013	0.00010	0.00010
Nickel[3]	***equation***	0.013	0.025	0.00099	0.00050	0.00060	0.00059	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus		0.0045	0.004	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.84		**2.8**	**1.8**	**1.6**	**1.5**	**1.8**	**1.7**	**1.6**	**1.5**
Rubidium				0.0040	0.0024	0.0021	0.0020	0.0026	0.0024	0.0022	0.0019
Selenium	0.001	0.00053	0.001	0.00007	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.61		0.49	0.31	0.27	0.29	0.18	0.13	0.20	0.21
Silver	0.00025	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1		**2.6**	**1.7**	**1.6**	**1.5**	**1.7**	**1.6**	**1.6**	**1.4**
Strontium		1.26	2.5	0.080	0.049	0.045	0.043	0.047	0.044	0.046	0.041
Sulfur				3.5	2.1	1.7	1.5	2.1	1.9	1.8	1.7
Tellurium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium	0.0008	0.00013	0.0008	*<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*	0.00024
Tin		0.033		*<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*
Tungsten				*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.015	0.0002	0.015	0.00005	0.00004	0.00005	0.00004	0.00004	0.00004	0.00004	0.00004
Vanadium		0.0006	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc	0.03	0.0075	***See note 3***	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved Metals (mg/L)											
Aluminum[3]		0.026	0.05	0.0023	0.0018	0.0026	0.0026	0.0014	0.0014	0.0024	0.0020
Antimony		0.005	0.009	0.00021	0.00011	0.00015	0.00012	0.00015	0.00014	*<0.00010*	*<0.00010*
Arsenic		0.013	0.025	0.00033	0.00025	0.00027	0.00027	0.00032	0.00031	0.00024	0.00027
Barium		0.5	1	0.018	0.0095	0.0092	0.0094	0.0091	0.0087	0.0081	0.0080
Beryllium		0.000115	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth				*<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*
Cadmium		0.000023	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		4.6		**10.7**	**7.1**	**6.2**	**5.9**	**6.8**	**6.2**	**5.8**	**5.6**
Cesium				*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium		0.0026	0.005	*<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*
Copper		0.0012	0.002	0.00052	0.00040	0.00035	0.00038	0.00030	0.00030	0.00029	0.00028
Iron		0.16	0.3	*<0.010*	*<0.010*	0.018	0.016	0.020	*<0.010*	0.018	0.011
Lead		0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.002		0.0013	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		1.41		**3.2**	**2.1**	**1.8**	**1.8**	**2.0**	**1.9**	**1.8**	**1.7**
Manganese[3]		0.32	***See note 3***	0.058	0.00062	0.0013	0.00099	0.0016	0.00060	0.0012	0.00046
Mercury		0.000016	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum		0.037	0.073	0.00009	0.00008	0.00012	0.00010	0.00014	0.00013	0.00011	0.00009
Nickel		0.013	0.025	0.00086	*<0.00050*	0.00052	0.00052	*<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*
Potassium		0.84		**2.5**	**1.7**	**1.5**	**1.5**	**1.8**	**1.6**	**1.6**	**1.5**
Rubidium				0.0036	0.0024	0.0022	0.0021	0.0027	0.0024	0.0023	0.0021
Selenium		0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.57		0.45	0.27	0.20	0.25	0.13	0.083	0.16	0.16
Silver		0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1		**2.6**	**1.7**	**1.6**	**1.6**	**1.8**	**1.7**	**1.5**	**1.4**
Strontium		1.26	2.5	0.075	0.048	0.044	0.042	0.046	0.043	0.042	0.039
Sulfur				3.2	1.8	1.6	1.5	2.0	1.9	2.0	1.8
Tellurium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium		0.00041	0.0008	*<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*
Tin		0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		0.0006		*<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*
Uranium		0.0075	0.015	0.00004	0.00003	0.00004	0.00003	0.00004	0.00003	0.00004	0.00003
Vanadium		0.06	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc	***equation***	0.0023	***See note 3***	0.0011	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved mercury filtration location				Field	Field	Field	Field	Field	Field	Field	Field
Dissolved metals filtration location				Field	Field	Field	Field	Field	Field	Field	Field
Speciated Metals (µg/L)											
Arsenate (As V)				-	*<0.020*	*<0.020*	-	*<0.020*	-	-	*<0.020*
Arsenite (As III)				-	0.047	0.067	-	0.083	-	-	0.051
Arsenobetaine (AsB)				-	*<0.050*	*<0.050*	-	*<0.050*	-	-	*<0.050*
Dimethylarsinic Acid (DMA)				-	*<0.020*	0.025	-	0.022	-	-	*<0.020*
Monomethylarsonic Acid (MMA)				-	*<0.020*	*<0.020*	-	*<0.020*	-	-	*<0.020*
Plant Pigments (µg/L)											
Chlorophyll-a				0.17	1.1	1.3	1.2	1.4	1.4	2.1	3.2
Radiological Parameters (Bq/L)											
Radium-226				-	-	-	-	-	-	-	-

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, 2015b). A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015b) 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 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 values exceed the trigger.
123 Bold and shaded values exceed the threshold.
Italicized numbers are below detection limits.
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).
* Kangislulik Lake (KAN) previously referred to as Mammoth Lake (MAM). Acronym MAM still being used in tables and figures.

Table B2-1. Water quality results from the Whale Tail study area lakes, 2023.

Lake & Area	Aquatic Life Guideline[1]	WTP Screening Values[2]		Lake A76							
Month				March	March	July	July	August	August	September	September
Area-Replicate ID				A76-69	A76-70	A76-71	A76-72	A76-73	A76-74	A76-75	A76-76
Date				26-Mar-2023	26-Mar-2023	01-Jul-2023	01-Jul-2023	13-Aug-2023	13-Aug-2023	09-Sep-2023	09-Sep-2023
Time		Triggers	Thresholds	10:15	10:55	14:00	13:30	10:55	10:00	11:30	11:16
ALS Sample ID				VA23A7103-003	VA23A7103-004	VA23B5555-005	VA23B5555-006	VA23B9337-001 VA23C0547-023	VA23B9337-002 VA23C0547-024	VA23C1748-015	VA23C1748-016
Field Measurements (3 m)											
Dissolved Oxygen (mg/L)				14.3	15.8	11.4	11.6	9.7	9.7	11.6	11.5
Specific Conductivity (µS/cm)				115	30	88	88	92	91	98	98
pH	6.5 - 9.0			7.3	7.4	7.6	7.7	6.8	6.6	7.1	7.1
Temperature (°C)				0.91	0.69	11.1	10.1	17.3	17.1	7.0	7.0
Physical Tests (mg/L)											
Conductivity (µS/cm)		48.6		**120**	**125**	**89**	**89**	**92**	**90**	**93**	**94**
Alkalinity - Total (as $CaCO_3$)		9.61		**16.8**	**17.5**	**12.4**	**12.6**	**13.4**	**13.5**	**14.8**	**14.2**
Alkalinity - Bicarbonate		9.60		**16.8**	**17.5**	**12.4**	**12.6**	**13.4**	**13.5**	**14.8**	**14.2**
Alkalinity - Carbonate		2.0		*<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*
Hardness (as CaCO3), dissolved		17.4		**47**	**48**	**32**	**33**	**32**	**31**	**32**	**32**
Hardness (as CaCO3), from total Ca/Mg				45	46	32	32	32	31	34	34
pH (Laboratory)	6.5 - 9.0	6.57-7.97	6.5-9.0	7.1	7.2	7.3	7.3	7.2	7.2	7.3	7.4
Total Dissolved Solids		38.5		**80**	**83**	**57**	**62**	**57**	**60**	**64**	**73**
Total Suspended Solids		3	5	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Turbidity (NTU)				*<0.10*	0.12	0.26	0.26	0.29	0.29	0.34	0.33
Anions and Nutrients (mg/L)											
Total Kjeldahl Nitrogen		0.17		**0.20**	**0.24**	0.13	0.14	**0.18**	0.15	0.15	0.15
Ammonia (as N)[3]	***equation***	0.065	0.126	0.032	0.042	*<0.0050*	*<0.0050*	0.0064	0.0071	0.0094	0.0086
Bromide				0.15	0.16	0.094	0.092	0.10	0.11	0.091	0.094
Chloride	120	60.4	120	15.2	15.9	10.6	10.6	10.8	10.7	10.7	10.7
Fluoride	0.12	0.077	0.12	0.049	0.047	0.042	0.036	0.045	0.044	0.044	0.041
Nitrate (as N)	3	1.5	3	0.12	0.10	0.064	0.066	0.011	0.0088	0.011	0.011
Nitrite (as N)	0.06	0.031	0.06	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Ortho Phosphate (as P)		0.0022		0.0018	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P)-Total	0.01	0.0045	0.01	0.0035	0.0035	0.0036	0.0037	0.0030	0.0028	0.0033	0.0035
Phosphorus (P)-Total Diss.				*<0.0020*	*<0.0020*	0.0030	0.0037	*<0.0020*	*<0.0020*	*<0.0020*	0.0020
Reactive Silica (as SiO_2)		1.33		0.97	0.97	0.65	0.65	*<0.50*	0.51	0.68	0.69
Sulphate (SO_4)		64.8	128	13.2	13.6	10.0	10.0	10.8	10.6	10.5	10.4
Cyanides (mg/L)											
Free Cyanide	0.005			-	-	-	-	-	-	-	-
Total Cyanide				-	-	-	-	-	-	-	-
Organic / Inorganic Carbon (mg/L)											
Dissolved Organic Carbon		2.43		**2.7**	**2.7**	1.8	1.7	2.2	2.1	**2.6**	**2.9**
Total Organic Carbon		2.42		**2.5**	**2.5**	1.6	1.9	2.3	2.2	**2.8**	**3.1**
Total Metals (mg/L)											
Aluminum[3]	***equation***	0.052	0.1	*<0.0030*	*<0.0030*	0.0057	0.0063	0.0032	0.0032	0.0059	0.0064
Antimony		0.0046	0.009	0.00032	0.00032	0.00024	0.00026	0.00026	0.00026	0.00026	0.00026
Arsenic	0.005	0.013	0.025	0.00032	0.00034	0.00030	0.00028	0.00034	0.00035	0.00036	0.00036
Barium		0.5	1	0.020	0.020	0.015	0.015	0.012	0.012	0.013	0.012
Beryllium		0.000115	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth				*<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*
Cadmium[3]	***equation***	0.000023	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		4.6		**12.6**	**12.7**	**8.8**	**8.9**	**8.9**	**8.8**	**9.4**	**9.3**
Chromium[4]	0.001	0.0025	0.005	*<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*
Copper[3]	***equation***	0.0013	0.002	0.00051	0.00053	0.00054	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Iron	0.3	0.16	0.3	*<0.010*	*<0.010*	0.023	0.023	0.025	0.023	0.027	0.025
Lead[3]	***equation***	0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.002		0.0012	0.0012	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		1.41		**3.4**	**3.4**	**2.4**	**2.3**	**2.3**	**2.2**	**2.6**	**2.6**
Manganese[3]		0.32	***See note 3***	0.00093	0.0012	0.0052	0.0051	0.0052	0.0049	0.0044	0.0043
Mercury	0.000026	0.000016	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.037	0.073	0.00013	0.00016	0.00012	0.00013	0.00015	0.00015	0.00016	0.00015
Nickel[3]	***equation***	0.013	0.025	0.00096	0.0010	0.00097	0.00096	0.00067	0.00073	0.00078	0.00075
Phosphorus		0.0045	0.004	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.84		**2.7**	**2.8**	**2.0**	**2.0**	**1.9**	**1.9**	**2.1**	**2.1**
Rubidium				0.0029	0.0030	0.0022	0.0021	0.0024	0.0023	0.0024	0.0023
Selenium	0.001	0.00053	0.001	*<0.000050*	0.00005	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.61		0.47	0.47	0.36	0.36	0.25	0.29	0.35	0.34
Silver	0.00025	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1		**2.1**	**2.1**	**1.6**	**1.6**	**1.6**	**1.6**	**1.8**	**1.8**
Strontium		1.26	2.5	0.072	0.076	0.057	0.057	0.057	0.058	0.061	0.061
Sulfur				4.7	5.1	3.2	3.2	3.4	3.5	3.6	3.6
Tellurium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium	0.0008	0.00013	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Thorium				0.00012	*<0.00010*	*<0.00010*	0.00021	*<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*
Titanium		0.00041		*<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*
Uranium	0.015	0.0002	0.015	0.00003	0.00003	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004
Vanadium		0.0006	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc	0.03	0.0075	***See note 3***	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved Metals (mg/L)											
Aluminum[3]		0.026	0.05	*<0.0010*	*<0.0010*	0.0018	0.0043	0.0022	0.0020	0.0019	0.0021
Antimony		0.005	0.009	0.00033	0.00032	0.00024	0.00023	0.00025	0.00025	0.00021	0.00023
Arsenic		0.013	0.025	0.00029	0.00032	0.00025	0.00027	0.00034	0.00033	0.00032	0.00031
Barium		0.5	1	0.022	0.022	0.015	0.015	0.013	0.013	0.013	0.013
Beryllium		0.000115	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth				*<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*
Cadmium		0.000023	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		4.6		**12.8**	**13.1**	**9.0**	**9.2**	**8.9**	**8.6**	**8.9**	**8.8**
Cesium				*<0.000010*	0.00001	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	0.00001
Chromium		0.0026	0.005	*<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*
Copper		0.0012	0.002	0.00058	0.00060	0.00040	0.00054	0.00039	0.00037	0.00036	0.00038
Iron		0.16	0.3	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.010	0.010
Lead		0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.002		0.0012	0.0012	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		1.41		**3.6**	**3.6**	**2.3**	**2.4**	**2.3**	**2.3**	**2.4**	**2.5**
Manganese[3]		0.32	***See note 3***	0.00056	0.0012	0.0033	0.0033	0.0015	0.0010	0.00087	0.00085
Mercury		0.000016	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum		0.037	0.073	0.00016	0.00014	0.00012	0.00011	0.00015	0.00014	0.00014	0.00015
Nickel		0.013	0.025	0.0011	0.0011	0.00089	0.0012	0.00071	0.00067	0.00071	0.00064
Phosphorus				*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.84		**2.9**	**3.0**	**2.0**	**2.0**	**2.1**	**2.0**	**2.1**	**2.1**
Rubidium				0.0031	0.0033	0.0022	0.0022	0.0024	0.0024	0.0024	0.0024
Selenium		0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.57		0.49	0.47	0.31	0.33	0.23	0.24	0.30	0.31
Silver		0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1		**2.3**	**2.4**	**1.7**	**1.7**	**1.8**	**1.8**	**1.7**	**1.8**
Strontium		1.26	2.5	0.082	0.081	0.058	0.057	0.058	0.057	0.060	0.055
Sulfur				5.0	4.7	3.1	3.1	3.5	3.6	3.3	3.4
Tellurium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium		0.00041	0.0008	*<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*
Tin		0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		0.0006		*<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*
Uranium		0.0075	0.015	0.00003	0.00003	0.00003	0.00003	0.00004	0.00003	0.00003	0.00004
Vanadium		0.06	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc	***equation***	0.0023	***See note 3***	**0.0033**	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved mercury filtration location				Field	Field	Field	Field	Field	Field	Field	Field
Dissolved metals filtration location				Field	Field	Field	Field	Field	Field	Field	Field
Speciated Metals (µg/L)											
Arsenate (As V)				0.037	-	*<0.020*	-	*<0.020*	-	*<0.020*	-
Arsenite (As III)				0.13	-	0.10	-	0.18	-	0.13	-
Arsenobetaine (AsB)				*<0.050*	-	*<0.050*	-	*<0.050*	-	*<0.050*	-
Dimethylarsinic Acid (DMA)				*<0.020*	-	0.020	-	0.022	-	0.021	-
Monomethylarsonic Acid (MMA)				*<0.020*	-	*<0.020*	-	*<0.020*	-	*<0.020*	-
Plant Pigments (µg/L)											
Chlorophyll-a				0.56	0.46	0.57	0.53	0.80	0.84	0.26	0.67
Radiological Parameters (Bq/L)											
Radium-226				-	-	-	-	-	-	-	-

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, 2015b). A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015b) 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 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 values exceed the trigger.
123 Bold and shaded values exceed the threshold.
Italicized numbers are below detection limits.
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).
* Kangislulik Lake (KAN) previously referred to as Mammoth Lake (MAM). Acronym MAM still being used in tables and figures.

Table B2-1. Water quality results from the Whale Tail study area lakes, 2023.

Lake & Area	Aquatic Life Guideline[1]	WTP Screening Values[2]		Lake DS1							
Month				March	March	July	July	August	August	September	September
Area-Replicate ID				DS1-67	DS1-68	DS1-69	DS1-70	DS1-71	DS1-72	DS1-73	DS1-74
Date				25-Mar-2023	25-Mar-2023	01-Jul-2023	01-Jul-2023	17-Aug-2023	17-Aug-2023	09-Sep-2023	09-Sep-2023
Time		Triggers	Thresholds	10:45	11:55	11:20	12:10	9:30	8:30	09:47	09:25
ALS Sample ID				VA23A7103-001	VA23A7103-002	VA23B5555-007	VA23B5555-008	VA23B9996-013 VA23C0547-025	VA23B9996-014 VA23C0547-026	VA23C1748-013	VA23C1748-014
Field Measurements (3 m)											
Dissolved Oxygen (mg/L)				16.0	15.1	10.4	10.9	9.6	9.8	11.6	11.8
Specific Conductivity (µS/cm)				37	58	30	21	28	41	29	43
pH	6.5 - 9.0			6.8	6.8	7.5	7.4	7.3	7.3	6.8	6.8
Temperature (°C)				0.55	0.62	13.3	12.7	15.4	14.2	7.0	6.3
Physical Tests (mg/L)											
Conductivity (µS/cm)		48.6		38	**61**	30	22	27	39	28	42
Alkalinity - Total (as $CaCO_3$)		9.61		9.0	**12.6**	6.8	4.9	6.0	8.0	6.7	8.6
Alkalinity - Bicarbonate		9.60		9.0	**12.6**	6.8	4.9	6.0	8.0	6.7	8.6
Alkalinity - Carbonate		2.0		*<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*
Hardness (as CaCO3), dissolved		17.4		**18.0**	**23**	10.5	7.2	9.3	13.9	9.0	13.0
Hardness (as CaCO3), from total Ca/Mg				13.6	22	10.2	7.3	9.5	13.9	9.3	14.0
pH (Laboratory)	6.5 - 9.0	6.57-7.97	6.5-9.0	7.1	6.9	7.0	6.9	7.0	7.1	7.0	7.1
Total Dissolved Solids		38.5		17.6	36	15.4	15.6	24	33	21	30
Total Suspended Solids		3	5	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	1.2	1.2
Turbidity (NTU)				0.14	0.17	0.46	0.42	0.37	0.48	0.60	0.66
Anions and Nutrients (mg/L)											
Total Kjeldahl Nitrogen		0.17		0.15	**0.19**	0.14	0.13	0.15	**0.18**	0.16	**0.18**
Ammonia (as N)[3]	***equation***	0.065	0.126	0.021	0.028	*<0.0050*	0.011	0.0053	*<0.0050*	0.020	0.0089
Bromide				*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Chloride	120	60.4	120	3.2	5.7	2.6	1.7	2.1	3.7	2.4	3.6
Fluoride	0.12	0.077	0.12	0.059	0.054	0.035	0.058	0.056	0.044	0.055	0.038
Nitrate (as N)	3	1.5	3	0.019	0.051	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	0.010
Nitrite (as N)	0.06	0.031	0.06	0.0015	0.0012	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Ortho Phosphate (as P)		0.0022		0.0017	**0.0025**	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P)-Total	0.01	0.0045	0.01	0.0040	0.0033	0.0043	0.0043	0.0028	**0.0051**	0.0041	0.0044
Phosphorus (P)-Total Diss.				0.0024	0.0028	0.0032	0.0027	0.0026	0.0030	0.0023	0.0029
Reactive Silica (as SiO_2)		1.33		0.94	**2.7**	0.78	0.53	0.67	1.1	0.96	**2.1**
Sulphate (SO_4)		64.8	128	2.6	5.0	2.4	1.7	1.9	3.0	1.9	3.8
Cyanides (mg/L)											
Free Cyanide	0.005			-	-	-	-	-	-	-	-
Total Cyanide				-	-	-	-	-	-	-	-
Organic / Inorganic Carbon (mg/L)											
Dissolved Organic Carbon		2.43		**4.3**	**3.9**	2.3	2.0	2.3	2.1	2.4	**3.5**
Total Organic Carbon		2.42		**3.4**	**4.1**	2.4	2.3	2.1	2.2	**2.7**	**3.6**
Total Metals (mg/L)											
Aluminum[3]	***equation***	0.052	0.1	0.0045	0.0071	0.017	0.020	0.0080	0.010	0.020	0.029
Antimony		0.0046	0.009	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.005	0.013	0.025	0.00017	0.00016	0.00012	0.00013	0.00018	0.00016	0.00014	0.00017
Barium		0.5	1	0.0064	0.010	0.0054	0.0048	0.0051	0.0063	0.0047	0.0059
Beryllium		0.000115	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth				*<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*
Cadmium[3]	***equation***	0.000023	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		4.6		3.5	**5.9**	2.8	1.9	2.5	3.8	2.4	3.8
Chromium[4]	0.001	0.0025	0.005	0.00018	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00043
Cobalt				*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.0013	0.002	*<0.00050*	0.00051	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	0.00063
Iron	0.3	0.16	0.3	*<0.010*	0.019	0.064	0.037	0.046	0.12	0.054	0.092
Lead[3]	***equation***	0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	0.00006	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.002		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		1.41		1.2	**1.7**	0.80	0.60	0.80	1.1	0.80	1.1
Manganese[3]		0.32	***See note 3***	0.00098	0.0026	0.0022	0.0019	0.0042	0.0055	0.0031	0.0026
Mercury	0.000026	0.000016	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.037	0.073	0.00007	0.00007	0.00013	*<0.000050*	0.00007	0.00008	*<0.000050*	0.00011
Nickel[3]	***equation***	0.013	0.025	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	0.0013
Phosphorus		0.0045	0.004	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.84		0.69	**1.2**	0.62	0.45	0.57	**0.86**	0.51	0.74
Rubidium				0.00090	0.0013	0.00078	0.00067	0.00080	0.0012	0.00071	0.00085
Selenium	0.001	0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.61		0.47	**1.3**	0.44	0.32	0.31	0.51	0.46	**1.1**
Silver	0.00025	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1		**1.2**	**1.9**	0.94	0.80	0.88	**1.1**	**1.1**	**1.5**
Strontium		1.26	2.5	0.017	0.030	0.016	0.011	0.014	0.022	0.013	0.021
Sulfur				0.86	2.0	0.59	*<0.50*	0.74	1.1	0.60	1.3
Tellurium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium	0.0008	0.00013	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Thorium				*<0.00010*	*<0.00010*	0.00011	*<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*
Titanium		0.00041		*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	0.00038	**0.00051**
Tungsten				*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.015	0.0002	0.015	0.00004	0.00005	0.00005	0.00005	0.00004	0.00003	0.00004	0.00006
Vanadium		0.0006	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc	0.03	0.0075	***See note 3***	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved Metals (mg/L)											
Aluminum[3]		0.026	0.05	0.0036	0.0057	0.0078	0.0073	0.0031	0.0038	0.0082	0.015
Antimony		0.005	0.009	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic		0.013	0.025	0.00028	0.00016	0.00011	0.00010	0.00019	0.00016	0.00012	0.00014
Barium		0.5	1	0.0081	0.011	0.0052	0.0048	0.0049	0.0060	0.0049	0.0058
Beryllium		0.000115	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth				*<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*
Cadmium		0.000023	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		4.6		**4.7**	**6.2**	2.9	1.9	2.4	3.8	2.3	3.5
Cesium				*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium		0.0026	0.005	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00014
Cobalt				*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper		0.0012	0.002	0.00052	0.00060	0.00036	0.00028	0.00030	0.00032	0.00032	0.00042
Iron		0.16	0.3	*<0.010*	0.012	0.030	0.011	0.014	0.058	0.022	0.060
Lead		0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.002		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		1.41		**1.5**	**1.8**	0.79	0.58	0.78	1.1	0.81	1.1
Manganese[3]		0.32	***See note 3***	0.0014	0.0027	0.0014	0.0010	0.00050	0.0015	0.00040	0.0017
Mercury		0.000016	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum		0.037	0.073	0.00023	0.00009	0.00005	*<0.000050*	*<0.000050*	0.00007	*<0.000050*	0.00007
Nickel		0.013	0.025	*<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*
Potassium		0.84		**0.92**	**1.2**	0.62	0.45	0.53	0.81	0.56	0.74
Rubidium				0.0012	0.0013	0.00076	0.00061	0.00077	0.0012	0.00073	0.00088
Selenium		0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.57		0.57	**1.4**	0.39	0.27	0.27	0.50	0.41	**0.95**
Silver		0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1		**1.6**	**2.1**	0.92	0.78	0.86	**1.2**	**1.1**	**1.4**
Strontium		1.26	2.5	0.022	0.034	0.016	0.011	0.014	0.021	0.012	0.019
Sulfur				1.1	1.9	0.50	*<0.50*	0.64	1.1	0.74	1.3
Tellurium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium		0.00041	0.0008	*<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*
Tin		0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		0.0006		*<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*
Uranium		0.0075	0.015	0.00006	0.00004	0.00004	0.00004	0.00003	0.00003	0.00003	0.00005
Vanadium		0.06	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]	***equation***	0.0023	***See note 3***	0.0011	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved mercury filtration location				Field	Field	Field	Field	Field	Field	Field	Field
Dissolved metals filtration location				Field	Field	Field	Field	Field	Field	Field	Field
Speciated Metals (µg/L)											
Arsenate (As V)				0.097	-	*<0.020*	-	-	*<0.020*	*<0.020*	-
Arsenite (As III)				0.052	-	0.021	-	-	0.031	0.031	-
Arsenobetaine (AsB)				*<0.050*	-	*<0.050*	-	-	*<0.050*	*<0.050*	-
Dimethylarsinic Acid (DMA)				*<0.020*	-	*<0.020*	-	-	*<0.020*	*<0.020*	-
Monomethylarsonic Acid (MMA)				*<0.020*	-	*<0.020*	-	-	*<0.020*	*<0.020*	-
Plant Pigments (µg/L)											
Chlorophyll-a				2.4	1.1	0.75	0.60	0.98	1.3	1.5	1.1
Radiological Parameters (Bq/L)											
Radium-226				-	-	-	-	-	-	-	-

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, 2015b). A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015b) 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 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 values exceed the trigger.
123 Bold and shaded values exceed the threshold.
Italicized numbers are below detection limits.
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).
* Kangislulik Lake (KAN) previously referred to as Mammoth Lake (MAM). Acronym MAM still being used in tables and figures.

Table B2-1. Water quality results from the Whale Tail study area lakes, 2023.

Lake & Area		WTP Screening Values[2]		Nemo Lake							
Month	Aquatic Life Guideline[1]			March	March	July	July	August	August	September	September
Area-Replicate ID				NEM-77	NEM-78	NEM-79	NEM-80	NEM-81	NEM-82	NEM-83	NEM-84
Date		Triggers	Thresholds	08-Mar-2023	08-Mar-2023	30-Jun-2023	30-Jun-2023	16-Aug-2023	16-Aug-2023	08-Sep-2023	08-Sep-2023
Time				10:30	11:15	16:25	15:00	8:00	8:45	11:30	10:46
ALS Sample ID				VA23A5397-005	VA23A5397-006	VA23B5555-011	VA23B5555-012	VA23B9996-009 VA23C0547-015	VA23B9996-010 VA23C0547-016	VA23C1748-011	VA23C1748-012
Field Measurements (3 m)											
Dissolved Oxygen (mg/L)				15.0	17.4	11.6	11.6	9.6	9.6	11.5	11.3
Specific Conductivity (µS/cm)				104	122	84	84	88	88	91	91
pH	6.5 - 9.0			6.9	7.0	7.5	7.5	7.2	7.2	7.3	7.4
Temperature (°C)				0.74	0.49	10.2	9.7	15.6	15.6	7.0	7.3
Physical Tests (mg/L)											
Conductivity (µS/cm)		48.6		**104**	**122**	**86**	**86**	**85**	**85**	**87**	**87**
Alkalinity - Total (as $CaCO_3$)		9.61		**13.8**	**16.0**	**12.3**	**12.2**	**11.9**	**11.8**	**13.4**	**13.1**
Alkalinity - Bicarbonate		9.60		**13.8**	**16.0**	**12.3**	**12.2**	**11.9**	**11.8**	**13.4**	**13.1**
Alkalinity - Carbonate		2.0		*<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*
Hardness (as CaCO3), dissolved		17.4		**40**	**47**	**33**	**33**	**34**	**33**	**31**	**31**
Hardness (as CaCO3), from total Ca/Mg				40	49	32	32	33	32	32	32
pH (Laboratory)	6.5 - 9.0	6.57-7.97	6.5-9.0	7.2	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Total Dissolved Solids		38.5		**73**	**91**	**61**	**63**	**99**	**96**	**67**	**65**
Total Suspended Solids		3	5	*<1.0*	*<1.0*	*<1.0*	*<1.0*	1.0	*<1.0*	*<1.0*	*<1.0*
Turbidity (NTU)				*<0.10*	*<0.10*	0.37	0.38	0.17	0.15	0.20	0.28
Anions and Nutrients (mg/L)											
Total Kjeldahl Nitrogen		0.17		0.14	0.16	0.13	0.13	0.15	0.14	0.12	0.12
Ammonia (as N)[3]	***equation***	0.065	0.126	0.019	0.023	*<0.0050*	*<0.0050*	0.0056	0.0075	*<0.0050*	*<0.0050*
Bromide				0.12	0.15	0.081	0.082	0.081	0.085	0.077	0.073
Chloride	120	60.4	120	18.6	22	13.9	13.9	13.2	13.2	13.5	13.4
Fluoride	0.12	0.077	0.12	0.040	0.043	0.034	0.030	0.031	0.028	0.028	0.026
Nitrate (as N)	3	1.5	3	0.011	0.016	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Nitrite (as N)	0.06	0.031	0.06	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Ortho Phosphate (as P)		0.0022		0.0010	0.0012	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P)-Total	0.01	0.0045	0.01	0.0036	0.0035	0.0035	0.0037	0.0021	*<0.0020*	0.0028	0.0030
Phosphorus (P)-Total Diss.				0.0031	*<0.0020*	0.0024	0.0027	*<0.0020*	0.0025	*<0.0020*	0.0023
Reactive Silica (as SiO_2)		1.33		*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Sulphate (SO_4)		64.8	128	6.2	7.4	4.5	4.5	4.5	4.4	4.9	4.8
Cyanides (mg/L)											
Free Cyanide	0.005			-	-	-	-	-	-	-	-
Total Cyanide				-	-	-	-	-	-	-	-
Organic / Inorganic Carbon (mg/L)											
Dissolved Organic Carbon		2.43		2.0	2.4	1.7	1.6	1.7	1.8	**2.8**	**2.6**
Total Organic Carbon		2.42		2.0	2.3	1.9	1.8	1.8	1.7	**2.9**	**2.6**
Total Metals (mg/L)											
Aluminum[3]	***equation***	0.052	0.1	*<0.0030*	*<0.0030*	0.012	0.012	0.0052	0.0047	0.0042	0.0044
Antimony		0.0046	0.009	0.00011	0.00012	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.005	0.013	0.025	0.00077	0.00095	0.00093	0.00091	0.0010	0.0010	0.00088	0.00089
Barium		0.5	1	0.019	0.024	0.017	0.016	0.016	0.015	0.014	0.014
Beryllium		0.000115	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth				*<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*
Cadmium[3]	***equation***	0.000023	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		4.6		**12.0**	**14.5**	**9.3**	**9.3**	**9.8**	**9.5**	**9.4**	**9.4**
Chromium[4]	0.001	0.0025	0.005	*<0.00010*	*<0.00010*	0.00029	0.00026	0.00035	0.00016	*<0.00010*	*<0.00010*
Cobalt				*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.0013	0.002	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Iron	0.3	0.16	0.3	*<0.010*	*<0.010*	0.028	0.027	0.012	0.012	0.012	0.014
Lead[3]	***equation***	0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.002		0.0015	0.0019	0.0012	0.0012	0.0012	0.0012	0.0011	0.0012
Magnesium		1.41		**2.5**	**3.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**
Manganese[3]		0.32	***See note 3***	0.0019	0.0013	0.0062	0.0063	0.0043	0.0040	0.0035	0.0035
Mercury	0.000026	0.000016	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.037	0.073	0.00009	0.00011	0.00007	0.00008	0.00009	0.00009	0.00008	0.00008
Nickel[3]	***equation***	0.013	0.025	0.0014	0.0017	0.0015	0.0016	0.0012	0.0012	0.0011	0.0010
Phosphorus		0.0045	0.004	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.84		**1.9**	**2.4**	**1.6**	**1.6**	**1.7**	**1.6**	**1.5**	**1.6**
Rubidium				0.0028	0.0034	0.0025	0.0025	0.0028	0.0027	0.0025	0.0025
Selenium	0.001	0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.61		0.18	0.22	0.18	0.18	0.16	0.15	0.18	0.18
Silver	0.00025	0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1		**1.1**	**1.4**	0.90	0.89	0.91	0.89	0.81	0.81
Strontium		1.26	2.5	0.072	0.088	0.059	0.058	0.058	0.056	0.059	0.058
Sulfur				2.0	2.4	1.4	1.4	1.8	1.7	1.7	1.6
Tellurium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium	0.0008	0.00013	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Thorium				0.00016	0.00021	*<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*
Titanium		0.00041		*<0.00030*	*<0.00030*	**0.00049**	0.00039	*<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*
Uranium	0.015	0.0002	0.015	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
Vanadium		0.0006	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc	0.03	0.0075	***See note 3***	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved Metals (mg/L)											
Aluminum[3]		0.026	0.05	*<0.0010*	*<0.0010*	0.0019	0.0020	0.0030	0.0024	0.0022	0.0019
Antimony		0.005	0.009	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic		0.013	0.025	0.00068	0.00082	0.00084	0.00084	0.00097	0.00096	0.00080	0.00079
Barium		0.5	1	0.017	0.021	0.016	0.016	0.015	0.015	0.014	0.015
Beryllium		0.000115	0.00013	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth				*<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*
Cadmium		0.000023	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		4.6		**11.8**	**14.1**	**9.6**	**9.6**	**10.2**	**9.5**	**8.9**	**8.8**
Cesium				0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00001	0.00001
Chromium		0.0026	0.005	*<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*
Copper		0.0012	0.002	0.00028	0.00034	0.00027	0.00028	0.00026	0.00026	0.00027	0.00026
Iron		0.16	0.3	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Lead		0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.002		0.0015	0.0018	0.0012	0.0012	0.0013	0.0012	0.0012	0.0012
Magnesium		1.41		**2.5**	**3.0**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**
Manganese[3]		0.32	***See note 3***	0.00026	0.00016	0.0029	0.0029	0.00040	0.00038	0.00070	0.00065
Mercury		0.000016	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum		0.037	0.073	0.00008	0.00010	0.00007	0.00007	0.00010	0.00008	0.00009	0.00008
Nickel		0.013	0.025	0.0013	0.0015	0.0014	0.0014	0.0011	0.0010	0.0010	0.00098
Phosphorus				*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.84		**1.7**	**2.1**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**
Rubidium				0.0027	0.0033	0.0026	0.0026	0.0028	0.0028	0.0027	0.0026
Selenium		0.00053	0.001	*<0.000050*	0.00005	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.57		0.15	0.16	0.12	0.13	0.11	0.12	0.13	0.14
Silver		0.00013	0.00025	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		1		**1.0**	**1.3**	0.90	0.89	0.89	0.90	0.86	0.87
Strontium		1.26	2.5	0.069	0.083	0.059	0.058	0.059	0.056	0.054	0.055
Sulfur				2.0	2.2	1.4	1.2	1.7	1.6	1.8	1.6
Tellurium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium		0.00041	0.0008	*<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*
Tin		0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		0.0006		*<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*
Uranium		0.0075	0.015	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001	0.00001	0.00001
Vanadium		0.06	0.12	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]	***equation***	0.0023	***See note 3***	**0.0033**	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium				*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Dissolved mercury filtration location				Field	Field	Field	Field	Field	Field	Field	Field
Dissolved metals filtration location				Field	Field	Field	Field	Field	Field	Field	Field
Speciated Metals (µg/L)											
Arsenate (As V)				0.34	-	-	0.061	-	0.056	-	0.087
Arsenite (As III)				0.067	-	-	0.45	-	0.51	-	0.34
Arsenobetaine (AsB)				*<0.050*	-	-	*<0.050*	-	*<0.050*	-	*<0.050*
Dimethylarsinic Acid (DMA)				0.086	-	-	0.090	-	0.14	-	0.11
Monomethylarsonic Acid (MMA)				0.037	-	-	0.022	-	*<0.020*	-	*<0.020*
Plant Pigments (µg/L)											
Chlorophyll-a				0.94	0.47	0.51	0.53	0.92	0.79	0.53	0.037
Radiological Parameters (Bq/L)											
Radium-226				-	-	-	-	-	-	-	-

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, 2015b). A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015b) 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 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 values exceed the trigger.
123 Bold and shaded values exceed the threshold.
Italicized numbers are below detection limits.
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).
* Kangislulik Lake (KAN) previously referred to as Mammoth Lake (MAM). Acronym MAM still being used in tables and figures.

Table B2-2. Water quality results screened against FEIS predicted concentrations for Whale Tail Lake – South Basin, 2023.

Lake & Area	WTS FEIS Predictions					Whale Tail Lake South Basin (Impoundment)									
Month						March	March	July	July	August	August	September	September	November	November
Area-Replicate ID						WTS-77	WTS-78	WTS-79	WTS-80	WTS-81	WTS-82	WTS-83	WTS-84	WTS-85	WTS-86
Date						07-Mar-2023	07-Mar-2023	02-Jul-2023	02-Jul-2023	14-Aug-2023	14-Aug-2023	07-Sep-2023	07-Sep-2023	07-Nov-2023	07-Nov-2023
Time	March	July	August	September	November	11:05	10:40	14:45	14:20	15:00	15:30	09:11	08:14	16:50	17:10
ALS Sample ID						VA23A5397-001	VA23A5397-002	VA23B5555-001	VA23B5555-002	VA23B9996-007 VA23C0547-011	VA23B9996-008 VA23C0547-012	VA23C1748-007	VA23C1748-008	VA23C7441-003	VA23C7441-004
Physical Tests (mg/L)															
Alkalinity - Total (as CaCO3)	8.6	8.7	9.4	9.9	10.0	**26**	**26**	**17.1**	**17.3**	**17.8**	**17.9**	**19.4**	**18.9**	**18.9**	**19.0**
Total Dissolved Solids	27	31	34	36	36	**114**	**120**	**78**	**83**	**106**	**121**	**77**	**71**	**71**	**73**
Anions and Nutrients (mg/L)															
Ammonia (as N)	0.062	0.10	0.13	0.16	0.17	**0.22**	**0.14**	0.0090	0.015	0.017	0.012	0.032	0.022	0.031	0.027
Chloride	5.7	6.8	7.4	7.8	7.9	**19.4**	**19.1**	**13.0**	**12.9**	**12.4**	**12.3**	**12.7**	**12.7**	**13.2**	**13.3**
Fluoride	0.045	0.045	0.049	0.051	0.051	**0.083**	**0.083**	**0.056**	**0.052**	**0.059**	**0.060**	**0.060**	**0.061**	**0.060**	**0.060**
Nitrate (as N)	0.93	1.4	1.5	1.6	1.6	0.79	0.68	0.57	0.54	0.31	0.30	0.28	0.28	0.34	0.34
Phosphorus (P)-Total	0.0081	0.0096	0.010	0.010	0.010	0.0066	0.0068	0.0065	**0.011**	0.0054	0.0060	0.0055	0.0060	0.0054	0.0052
Sulphate (SO_4)	3.9	4.0	4.5	4.9	5.0	**22**	**20**	**13.4**	**13.2**	**12.5**	**12.1**	**12.4**	**12.3**	**13.4**	**13.5**
Total Metals (mg/L)															
Aluminum	0.0040	0.0038	0.0039	0.0039	0.0039	**0.0045**	**0.0078**	**0.018**	**0.014**	**0.0056**	**0.0089**	**0.0085**	**0.011**	**0.012**	**0.014**
Antimony	0.00044	0.00044	0.00052	0.00058	0.00058	**0.0013**	**0.0013**	**0.00066**	**0.00065**	**0.00060**	**0.00061**	**0.00058**	**0.00058**	**0.00048**	**0.00050**
Arsenic	0.0094	0.011	0.012	0.013	0.013	0.00086	0.00091	0.0010	0.00091	0.00091	0.00096	0.00077	0.00080	0.00060	0.00056
Barium	0.0073	0.0075	0.0081	0.0084	0.0085	**0.026**	**0.025**	**0.019**	**0.018**	**0.018**	**0.018**	**0.017**	**0.017**	**0.017**	**0.017**
Beryllium	0.00002	0.00002	0.00002	0.00002	0.00002	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth	0.00005	0.00005	0.00005	0.00005	0.00005	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	0.037	0.037	0.042	0.046	0.046	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium	0.00001	0.00001	0.00001	0.00001	0.00001	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium	3.7	4.0	4.4	4.8	4.8	**16.4**	**15.9**	**11.9**	**11.7**	**11.5**	**11.7**	**11.3**	**11.5**	**11.7**	**11.5**
Chromium	0.00040	0.00040	0.00045	0.00049	0.00049	0.00016	0.00020	**0.00068**	0.00024	0.00018	0.00020	0.00018	0.00017	0.00014	0.00019
Cobalt	0.00028	0.00028	0.00032	0.00034	0.00035	0.00010	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper	0.00091	0.00089	0.00097	0.0010	0.0010	0.00066	0.00069	0.00064	0.00055	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Iron	0.052	0.053	0.055	0.058	0.059	0.027	0.027	**0.067**	**0.059**	**0.052**	**0.059**	0.049	**0.052**	0.036	0.038
Lead	0.00015	0.00015	0.00017	0.00018	0.00018	*<0.000050*	*<0.000050*	0.00012	0.00006	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium	0.0014	0.0015	0.0016	0.0017	0.0017	**0.0026**	**0.0026**	**0.0020**	**0.0020**	**0.0019**	**0.0020**	**0.0018**	**0.0019**	**0.0020**	**0.0020**
Magnesium	1.2	1.2	1.3	1.3	1.3	**4.6**	**4.5**	**3.4**	**3.1**	**3.1**	**3.1**	**3.3**	**3.4**	**3.7**	**3.7**
Manganese	0.027	0.028	0.032	0.036	0.037	0.016	0.0066	0.013	0.012	0.015	0.015	0.0099	0.011	0.0047	0.0050
Mercury	0.00001	0.00001	0.00001	0.00001	0.00001	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.00001	*<0.0000050*
Molybdenum	0.00052	0.00060	0.00066	0.00069	0.00070	**0.0020**	**0.0013**	**0.0012**	**0.0012**	**0.0011**	**0.0011**	**0.00096**	**0.00094**	**0.00072**	**0.00074**
Nickel	0.0026	0.0027	0.0032	0.0036	0.0036	**0.0040**	**0.0039**	**0.0026**	0.0023	0.0017	0.0017	0.0016	0.0015	0.0014	0.0014
Potassium	1.0	1.0	1.2	1.3	1.3	**4.0**	**4.0**	**3.0**	**2.9**	**3.0**	**3.0**	**2.9**	**3.0**	**3.2**	**3.2**
Selenium	0.00015	0.00017	0.00020	0.00022	0.00023	0.00008	0.00006	*<0.000050*	*<0.000050*	0.00006	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silver	0.00001	0.00001	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*
Sodium	2.2	2.4	2.7	2.9	2.9	**3.7**	**3.7**	**2.7**	**2.7**	**2.5**	**2.5**	**2.5**	**2.6**	**2.6**	**2.5**
Strontium	0.024	0.027	0.029	0.031	0.032	**0.13**	**0.13**	**0.095**	**0.093**	**0.088**	**0.089**	**0.090**	**0.091**	**0.092**	**0.090**
Thallium	0.00001	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*
Tin	0.00012	0.00011	0.00012	0.00012	0.00012	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.00021	0.00023	0.00025	0.00027	0.00027	**0.00022**	0.00018	0.00012	0.00011	0.00007	0.00007	0.00006	0.00006	0.00007	0.00007
Vanadium	0.00071	0.00069	0.00075	0.00079	0.00080	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc	0.0017	0.0018	0.0019	0.0021	0.0021	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*

Notes:

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

123 Bolded values exceed FEIS by < 10X.

123 Bold and shaded values exceed the FEIS by ≥ 10X.

Italicized numbers are below detection limits.

"-" not analyzed/not sampled.

Table B2-3. Water quality results screened against FEIS predicted concentrations for Kangislulik Lake, 2023.

Lake & Area	MAM/KAN FEIS Predictions					Kangislulik Lake*									
Month						March	March	July	July	August	August	September	September	November	November
Area-Replicate ID						MAM-77	MAM-78	MAM-79	MAM-80	MAM-81	MAM-82	MAM-83	MAM-84	MAM-85	MAM-86
Date						07-Mar-2023	07-Mar-2023	03-Jul-2023	03-Jul-2023	15-Aug-2023	15-Aug-2023	10-Sep-2023	10-Sep-2023	07-Nov-2023	07-Nov-2023
Time	March	July	August	September	November	14:40	14:00	11:40	11:15	8:40	9:20	11:10	11:53	15:41	15:19
ALS Sample ID						VA23A5397-003	VA23A5397-004	VA23B5555-009	VA23B5555-010	9996-005VA23C0547	9996-006VA23C0547	VA23C1748-017	VA23C1748-018	VA23C7441-001	VA23C7441-002
Physical Tests (mg/L)															
Alkalinity - Total (as $CaCO_3$)	8.8	8.4	8.5	8.5	8.5	**29**	**25**	**17.8**	**16.3**	**17.7**	**19.2**	**23**	**19.4**	**24**	**23**
Total Dissolved Solids	39	33	33	33	33	**158**	**119**	**93**	**82**	**125**	**144**	**140**	**99**	**119**	**108**
Anions and Nutrients (mg/L)															
Ammonia (as N)	0.046	0.053	0.054	0.059	0.064	**0.066**	**0.052**	**0.068**	0.019	0.046	0.019	**0.095**	0.011	0.018	0.018
Chloride	14.0	10.5	10.6	10.3	10.0	**27**	**23**	**18.7**	**14.4**	**15.4**	**20**	**25**	**17.7**	**23**	**21**
Fluoride	0.044	0.043	0.043	0.043	0.043	**0.078**	**0.073**	**0.050**	**0.047**	**0.054**	**0.059**	**0.058**	**0.052**	**0.058**	**0.061**
Nitrate (as N)	0.67	0.78	0.78	0.81	0.84	**1.1**	**0.88**	0.74	0.47	0.35	0.53	**0.90**	0.41	**0.83**	0.69
Phosphorus (P)-Total	0.0075	0.0075	0.0076	0.0076	0.0077	0.0048	0.0048	0.0041	0.0046	0.0025	0.0027	0.0038	0.0044	0.0034	0.0034
Sulphate (SO_4)	3.9	3.7	3.8	3.8	3.8	**31**	**26**	**19.0**	**15.1**	**15.5**	**18.5**	**25**	**17.8**	**26**	**23**
Total Metals (mg/L)															
Aluminum	0.0034	0.0036	0.0036	0.0037	0.0037	**0.0039**	*<0.0030*	**0.0097**	**0.0083**	**0.0060**	**0.0062**	**0.0048**	**0.0050**	0.0033	*<0.0030*
Antimony	0.00030	0.00032	0.00033	0.00034	0.00035	**0.0016**	**0.0014**	**0.00094**	**0.00068**	**0.00080**	**0.0011**	**0.0015**	**0.00085**	**0.0012**	**0.00097**
Arsenic	0.0063	0.0069	0.0069	0.0071	0.0074	0.0012	0.0010	0.0012	0.00092	0.0012	0.0018	0.0018	0.0011	0.00099	0.00084
Barium	0.0083	0.0078	0.0079	0.0079	0.0079	**0.035**	**0.028**	**0.023**	**0.019**	**0.019**	**0.022**	**0.023**	**0.018**	**0.025**	**0.021**
Beryllium	0.00002	0.00002	0.00002	0.00002	0.00002	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*	*<0.000100*
Bismuth	0.00005	0.00005	0.00005	0.00005	0.00005	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	0.037	0.034	0.034	0.034	0.035	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium	0.00001	0.00001	0.00001	0.00001	0.00001	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium	7.7	6.0	6.0	5.9	5.8	**23**	**18.6**	**15.1**	**12.3**	**14.2**	**16.6**	**21**	**15.7**	**21**	**18.0**
Chromium	0.00035	0.00034	0.00034	0.00035	0.00035	0.00014	*<0.00010*	0.00020	0.00012	*<0.00010*	0.00020	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt	0.00025	0.00025	0.00025	0.00025	0.00025	*<0.00010*	*<0.00010*	0.00013	*<0.00010*	*<0.00010*	*<0.00010*	0.00014	*<0.00010*	*<0.00010*	*<0.00010*
Copper	0.00081	0.00080	0.00080	0.00081	0.00082	0.00066	0.00061	0.00055	0.00054	0.00053	0.00057	0.00056	0.00052	*<0.00050*	*<0.00050*
Iron	0.041	0.041	0.041	0.042	0.042	*<0.010*	*<0.010*	0.037	0.031	0.017	0.028	0.027	0.016	*<0.010*	*<0.010*
Lead	0.00015	0.00014	0.00014	0.00014	0.00014	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium	0.0015	0.0014	0.0015	0.0015	0.0015	**0.0032**	**0.0027**	**0.0029**	**0.0020**	**0.0023**	**0.0032**	**0.0035**	**0.0025**	**0.0033**	**0.0028**
Magnesium	1.4	1.3	1.3	1.3	1.3	**5.5**	**4.7**	**3.7**	**3.1**	**3.1**	**3.6**	**4.8**	**3.7**	**5.2**	**4.5**
Manganese	0.023	0.022	0.022	0.023	0.023	0.0085	0.0023	0.022	0.0092	0.0051	0.0097	0.018	0.0059	0.0039	0.0038
Mercury	0.00001	0.00001	0.00001	0.00001	0.00001	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.00068	0.00059	0.00059	0.00058	0.00058	**0.00083**	**0.00072**	**0.0016**	**0.00076**	**0.0011**	**0.0016**	**0.0019**	**0.0011**	**0.0012**	**0.0010**
Nickel	0.0022	0.0022	0.0022	0.0022	0.0023	**0.0026**	0.0017	**0.0026**	0.0015	0.0010	0.0015	**0.0029**	0.0012	0.0015	0.0013
Potassium	0.93	0.92	0.93	0.95	0.96	**5.4**	**4.5**	**3.6**	**3.0**	**3.3**	**3.8**	**4.3**	**3.5**	**4.5**	**4.0**
Selenium	0.00013	0.00013	0.00013	0.00014	0.00014	0.00010	0.00006	0.00007	*<0.000050*	0.00007	0.00009	0.00008	*<0.000050*	0.00008	*<0.000050*
Silver	0.00001	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	2.4	2.2	2.2	2.2	2.2	**4.5**	**3.8**	**3.2**	**2.7**	**2.8**	**3.1**	**3.7**	**3.0**	**3.5**	**3.1**
Strontium	0.029	0.027	0.027	0.028	0.028	**0.16**	**0.14**	**0.13**	**0.096**	**0.10**	**0.14**	**0.18**	**0.12**	**0.16**	**0.15**
Thallium	0.00001	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*
Tin	0.00011	0.00011	0.00011	0.00011	0.00011	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.00024	0.00021	0.00021	0.00021	0.00021	0.00014	0.00012	**0.00022**	0.00013	0.00015	**0.00021**	**0.00033**	0.00015	0.00018	0.00015
Vanadium	0.00065	0.00065	0.00065	0.00066	0.00067	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc	0.0016	0.0016	0.0016	0.0016	0.0017	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*

Notes:

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

123 Bolded values exceed FEIS by < 10X.

123 Bold and shaded values exceed the FEIS by ≥ 10X.

Italicized numbers are below detection limits.

"-" not analyzed/not sampled.

* Previously referred to as Mammoth Lake (MAM). Acronyms MAM or KAN used interchangeably.

FIGURES

Figure B2-1. Laboratory-measured conductivity (µS/cm).

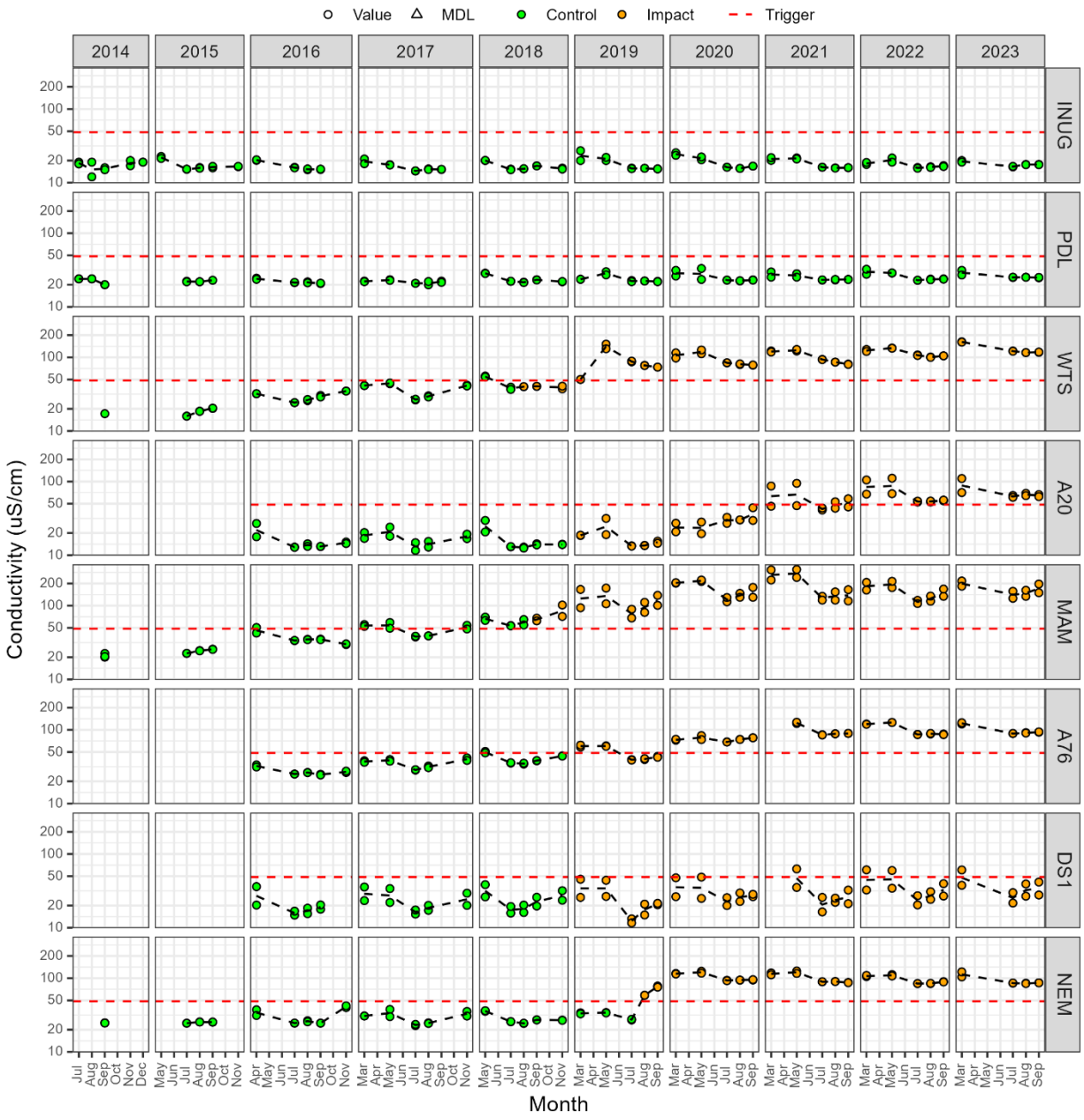


Figure B2-2. Laboratory-measured hardness (mg/L).

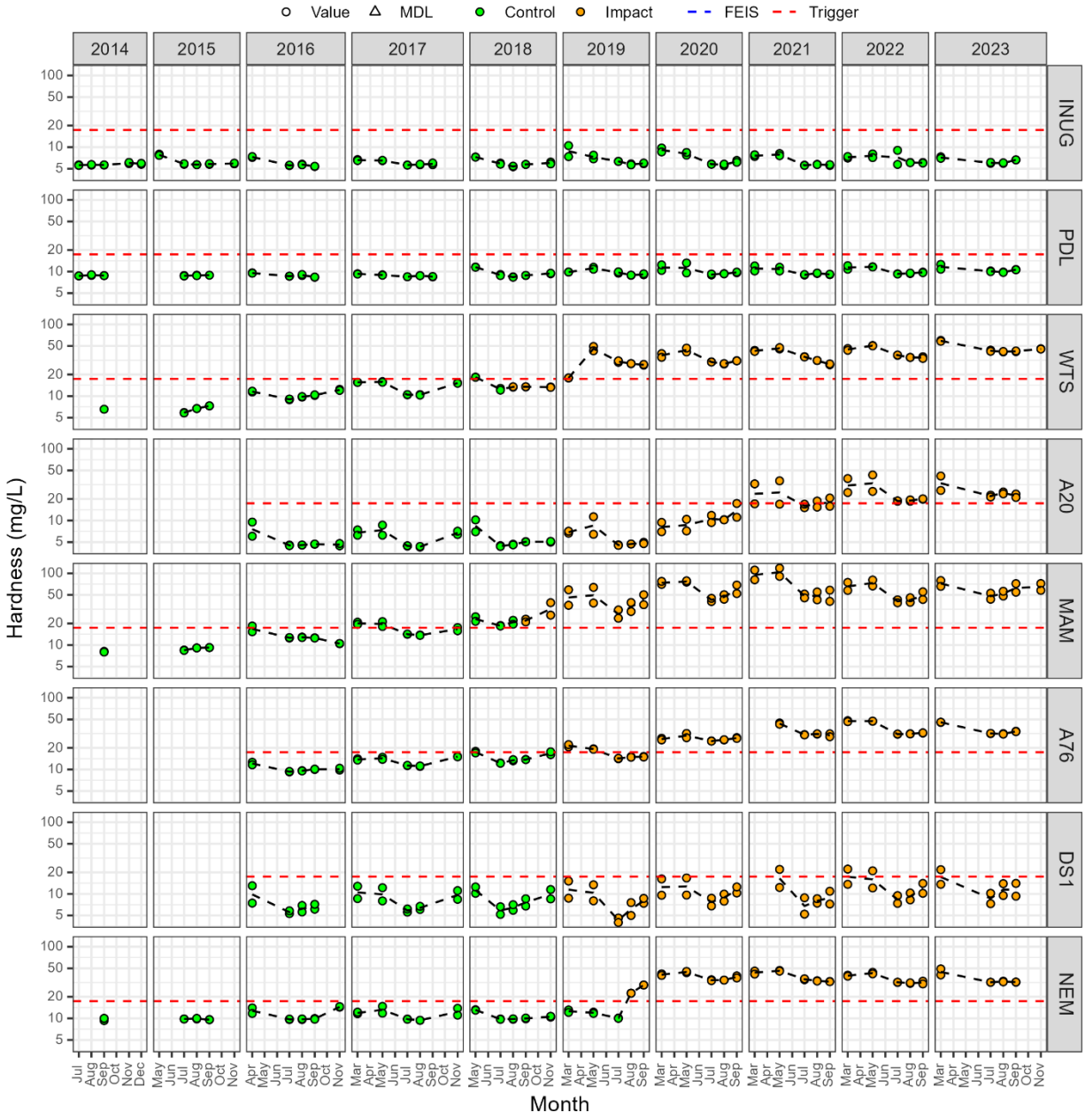


Figure B2-3. Field-measured pH.

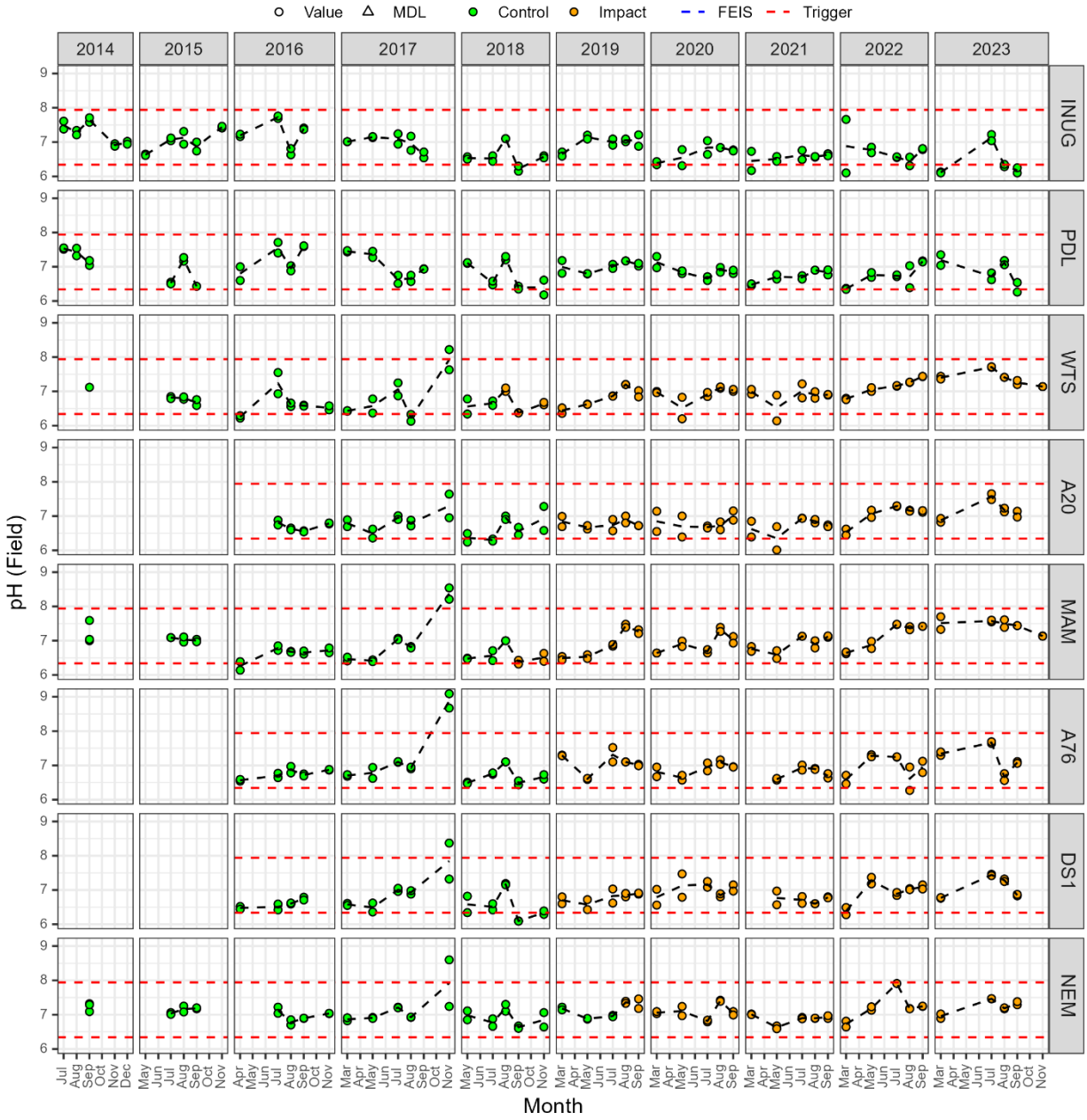


Figure B2-4. Laboratory-measured pH.

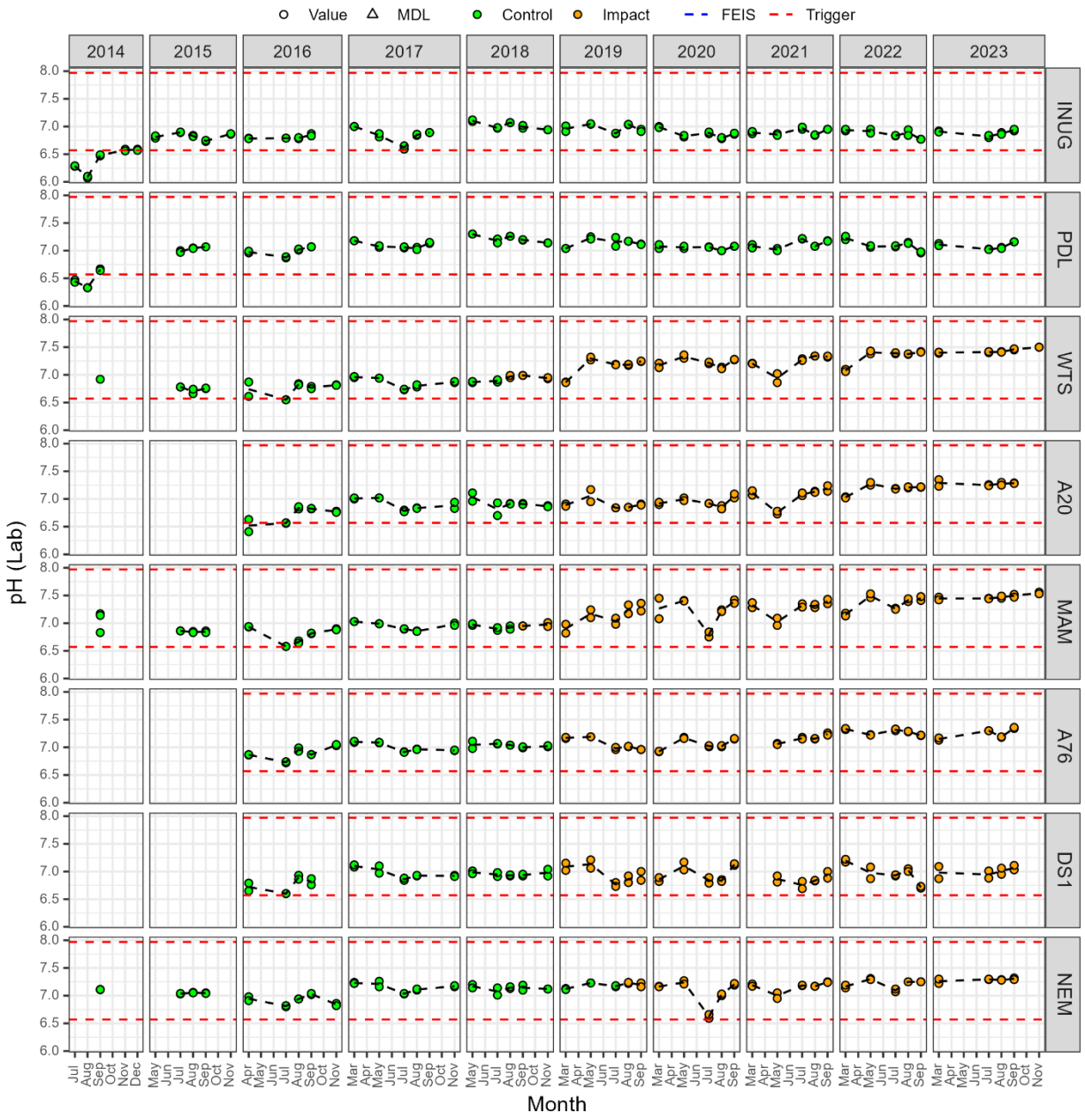


Figure B2-5. Total suspended solids (TSS; mg/L).

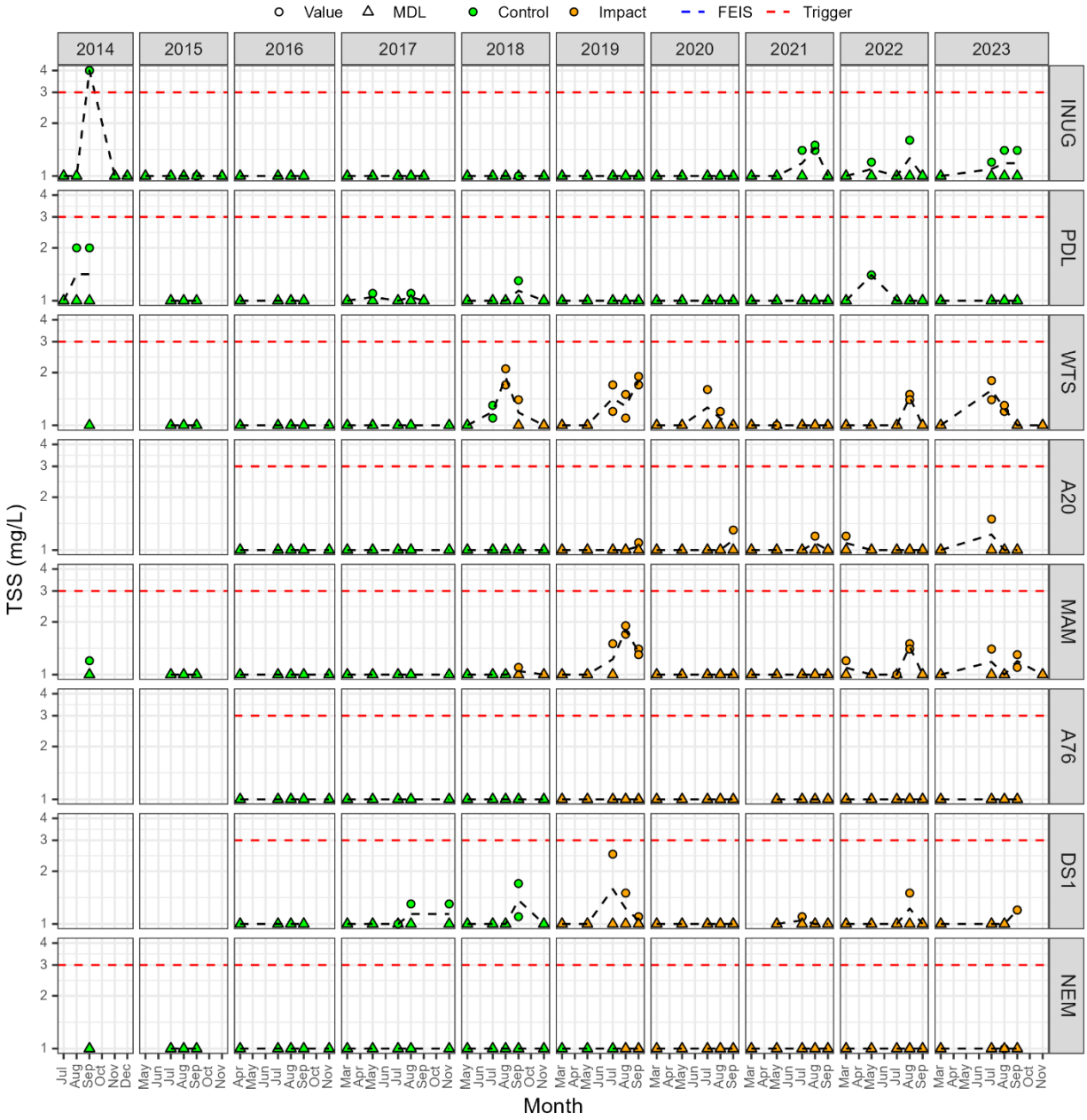


Figure B2-6. Total dissolved solids (TDS; mg/L).

Note: TDS data from 2014 were removed due to data quality concerns. See Azimuth (2015c) for more details.

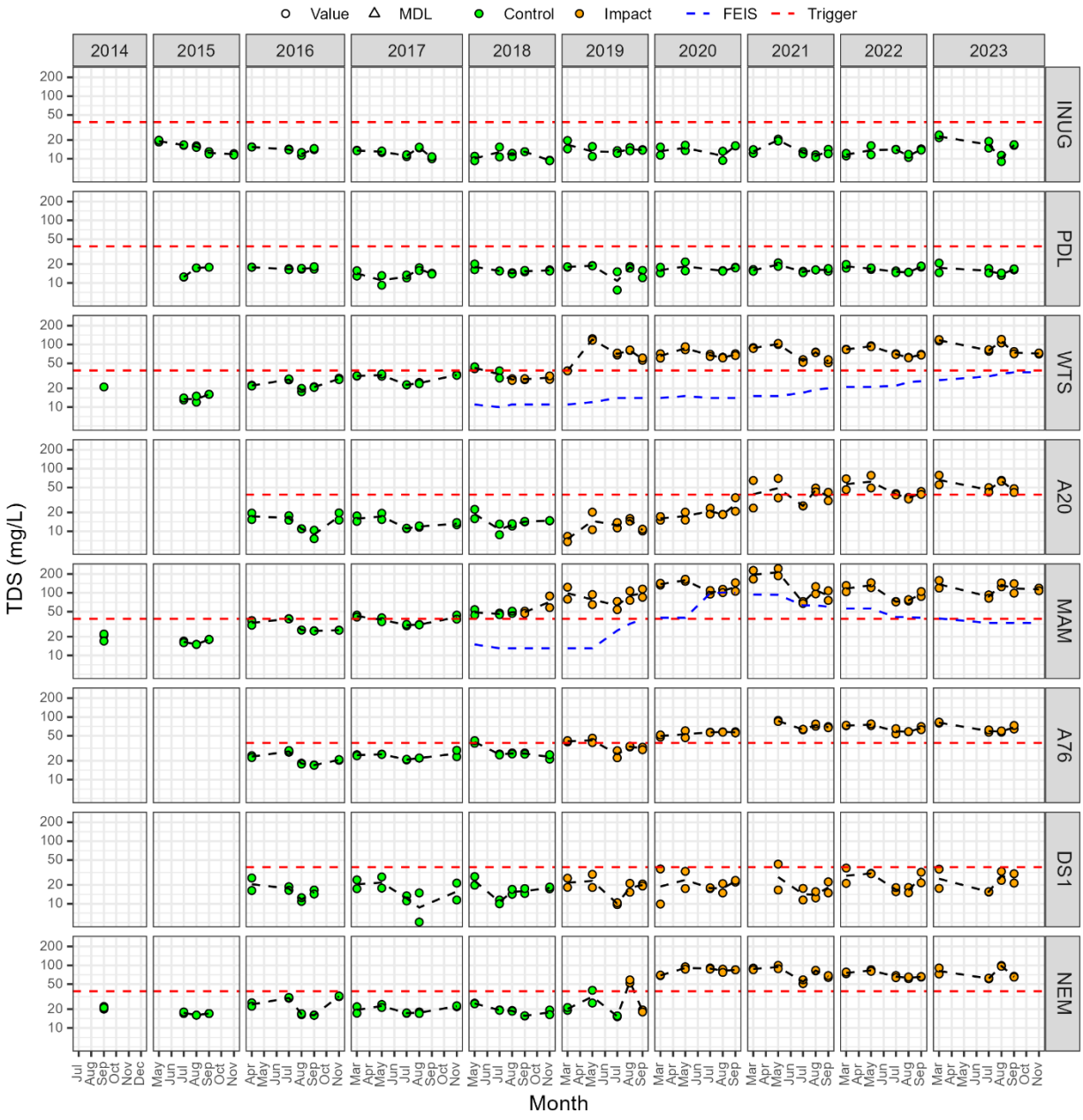


Figure B2-7. Carbonate alkalinity (mg/L).

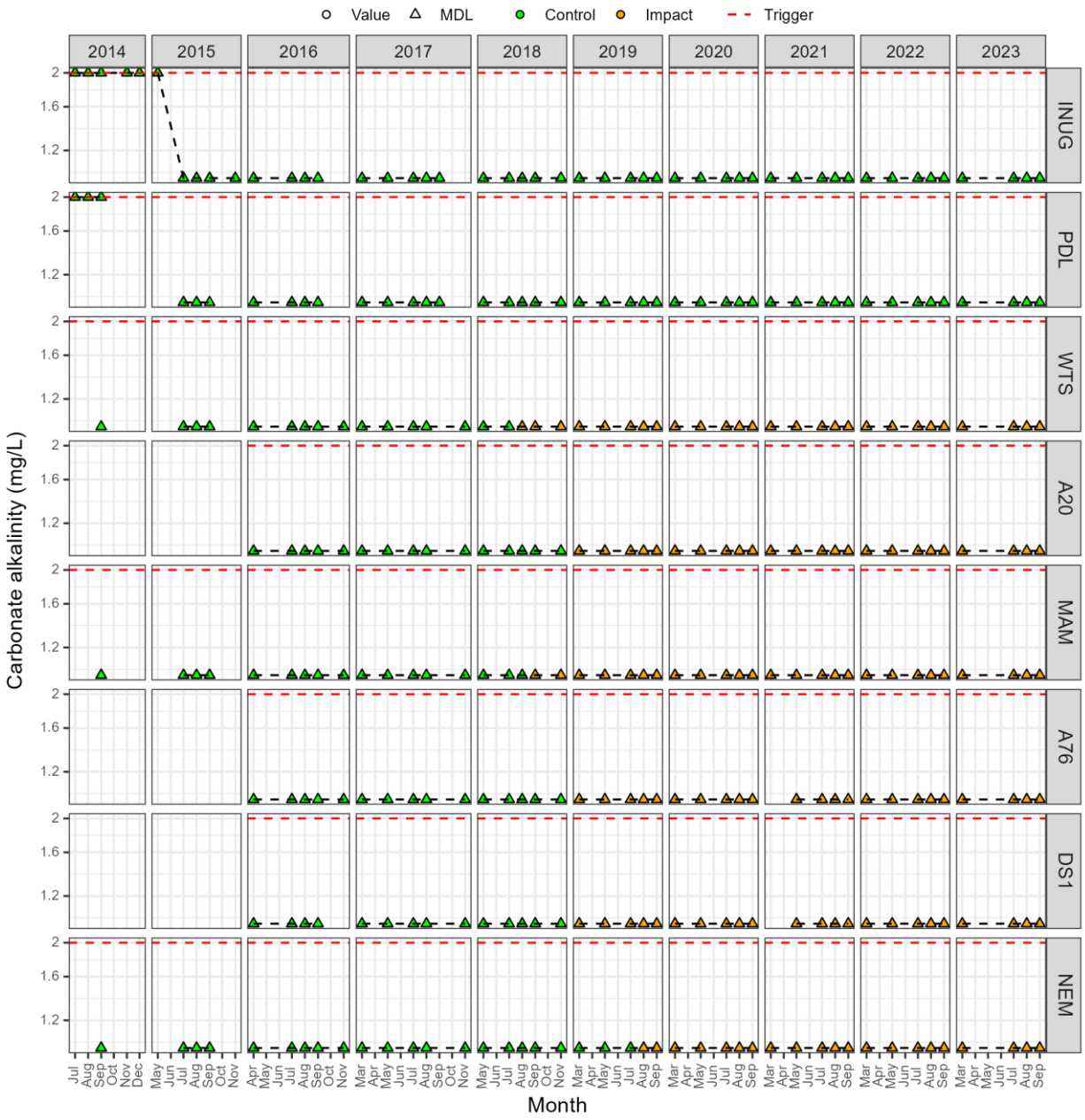


Figure B2-8. Bicarbonate alkalinity (mg/L).

Note: Bicarbonate alkalinity data from 2014 were removed due to data quality concerns. See Azimuth (2015c) for more details.

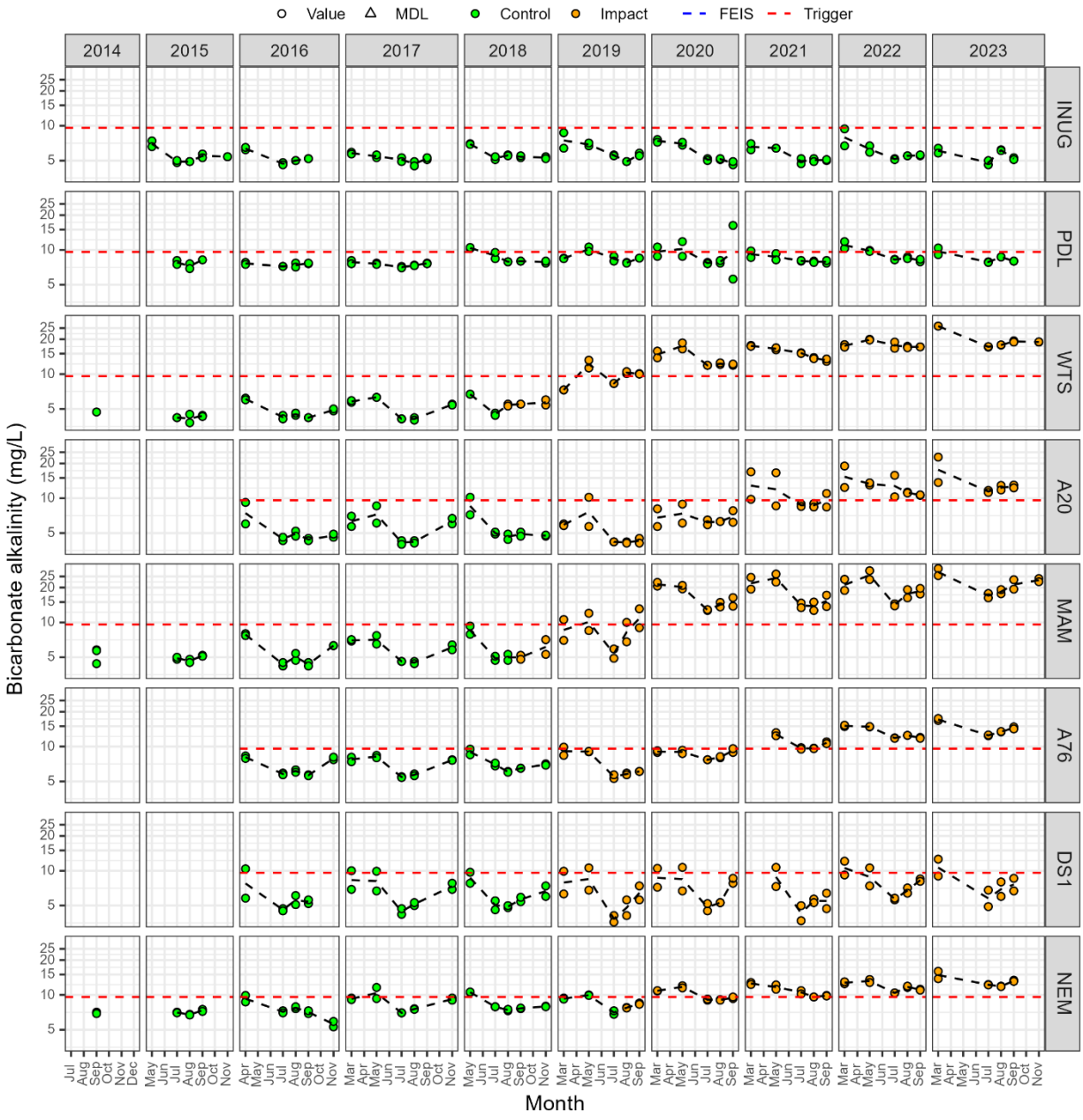


Figure B2-9. Total alkalinity (mg/L).

Note: Total alkalinity data from 2014 were removed due to data quality concerns. See Azimuth (2015c) for more details.

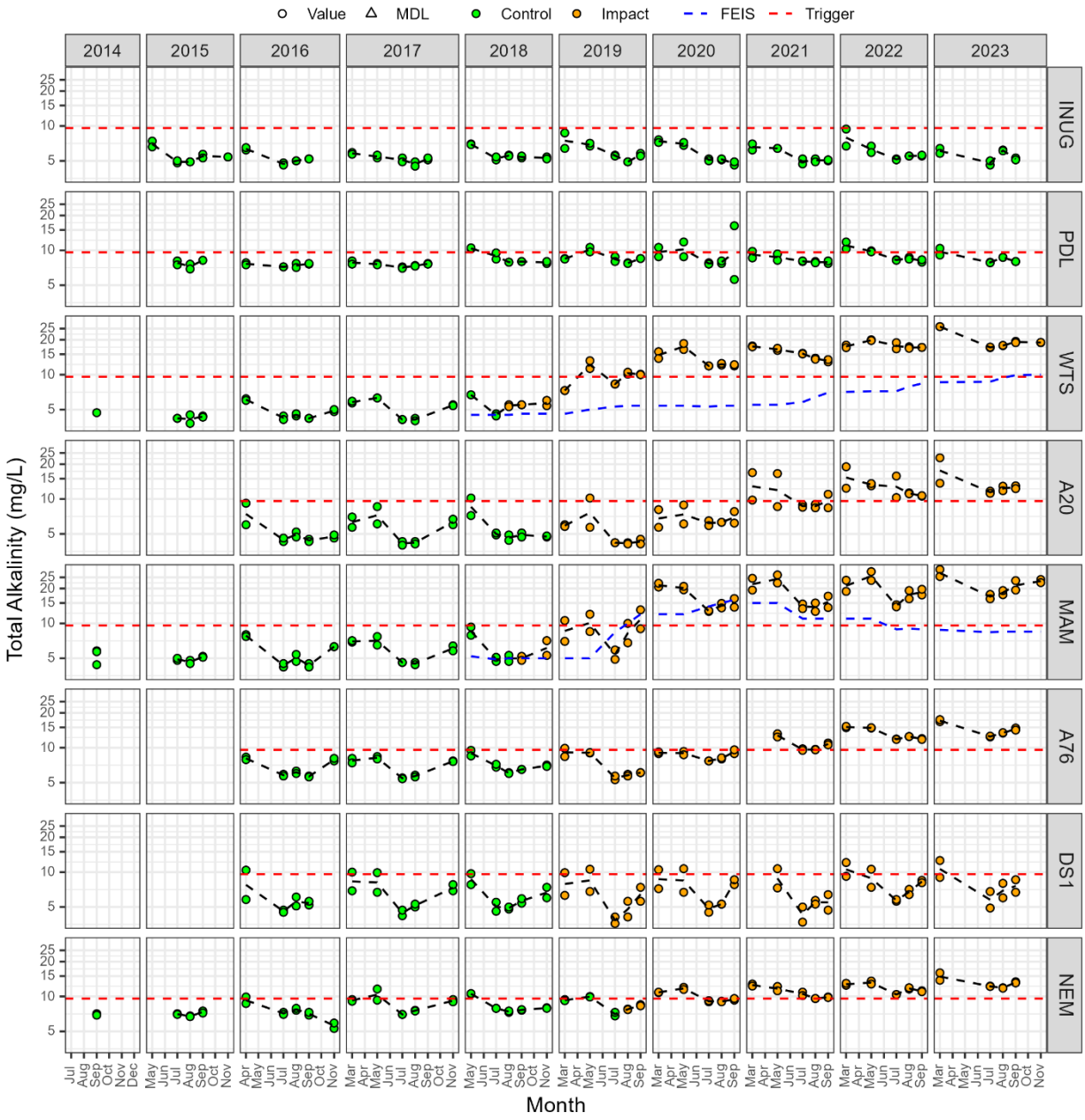


Figure B2-10. Ammonia-N (mg/L).

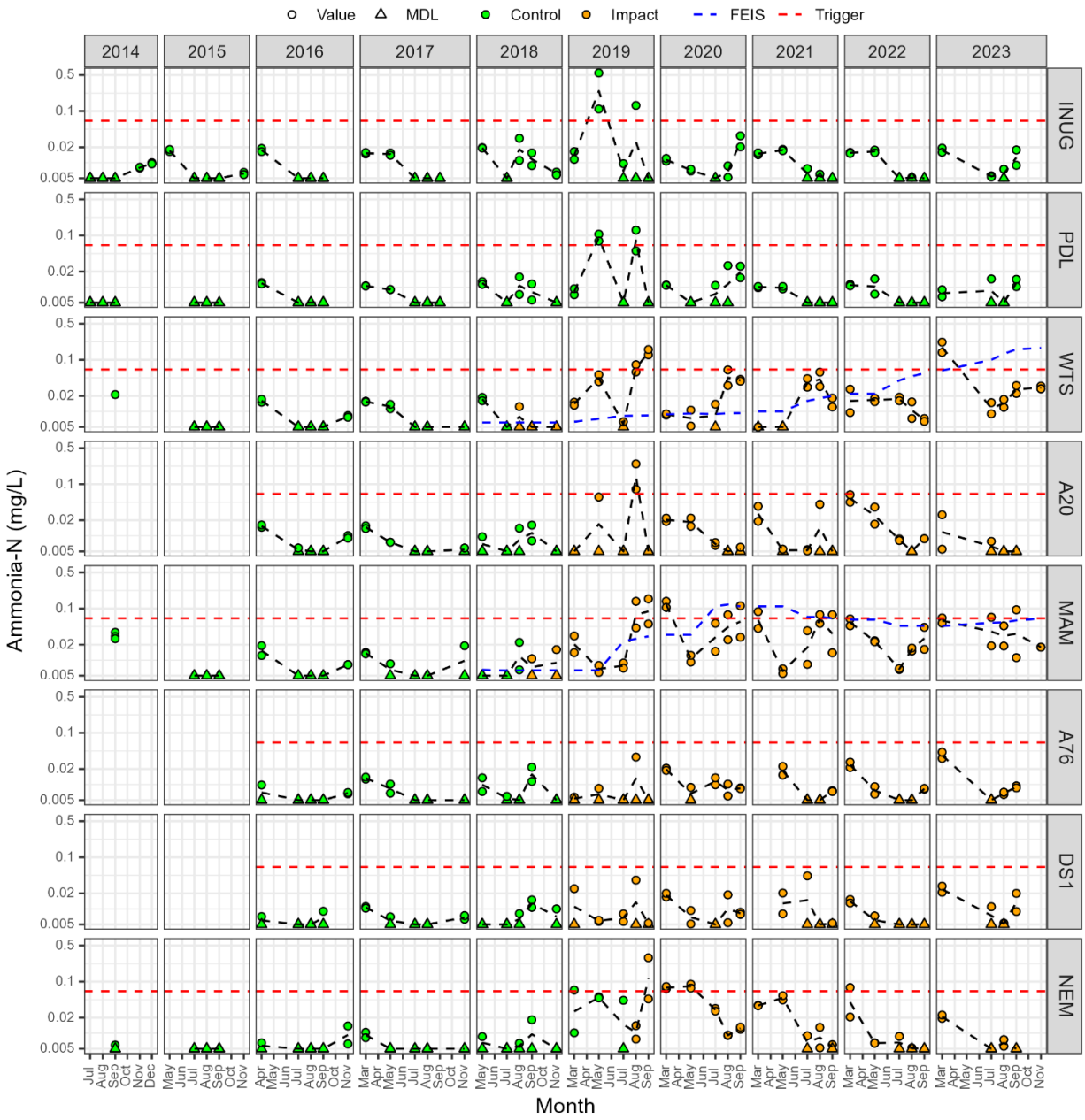


Figure B2-11. Chloride (mg/L).

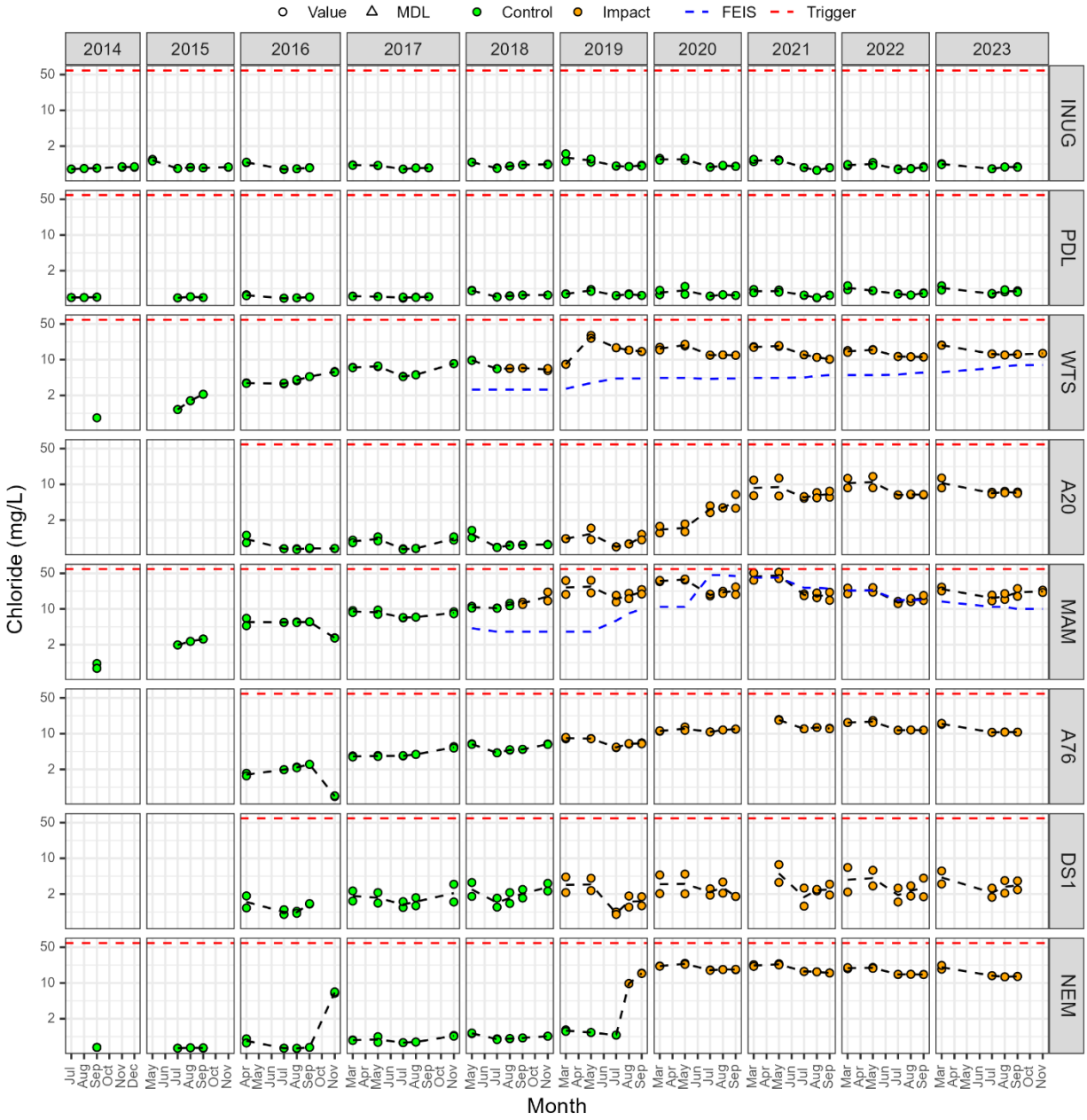


Figure B2-12. Fluoride (mg/L).

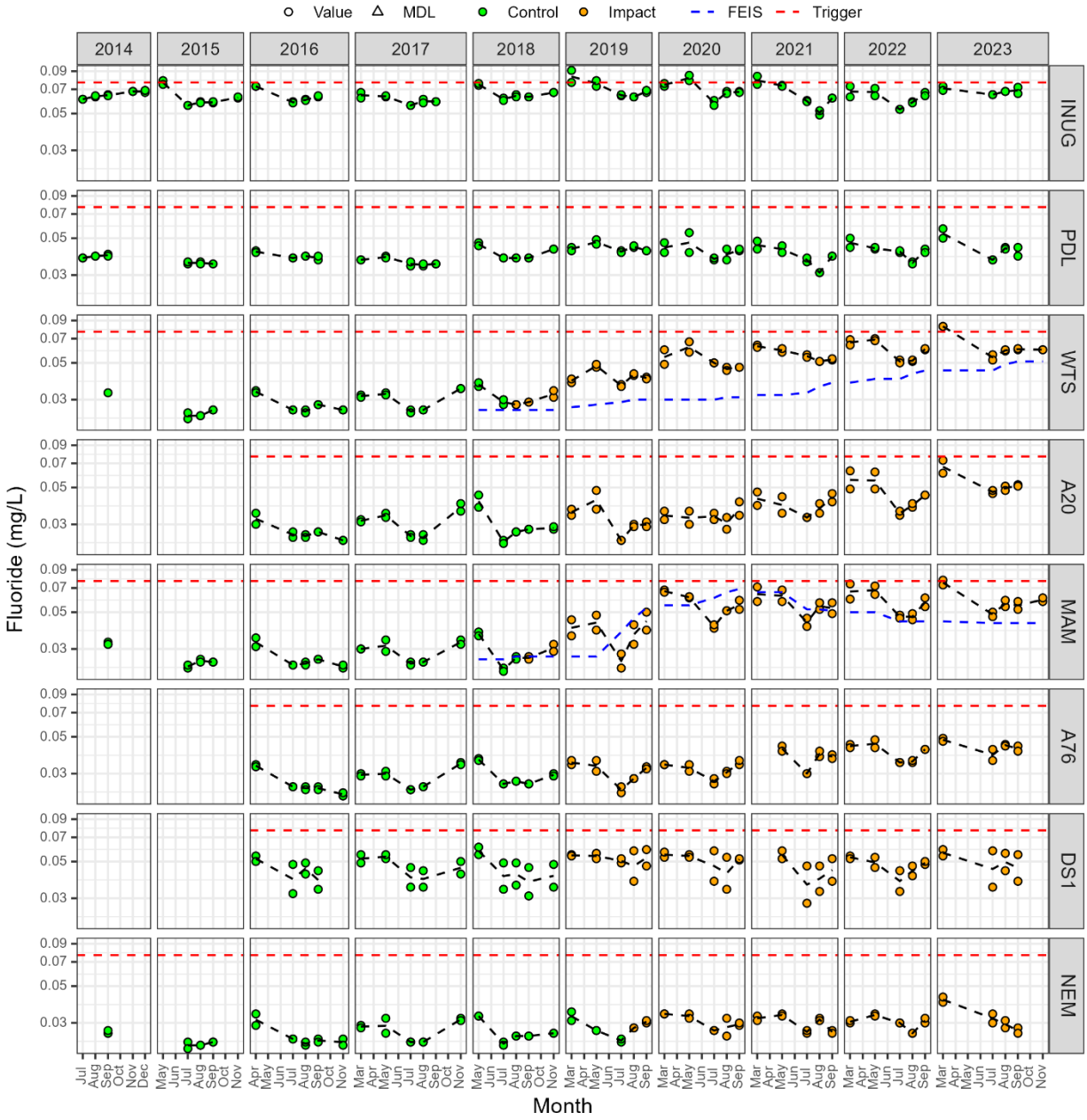


Figure B2-13. Nitrate-N (mg/L).

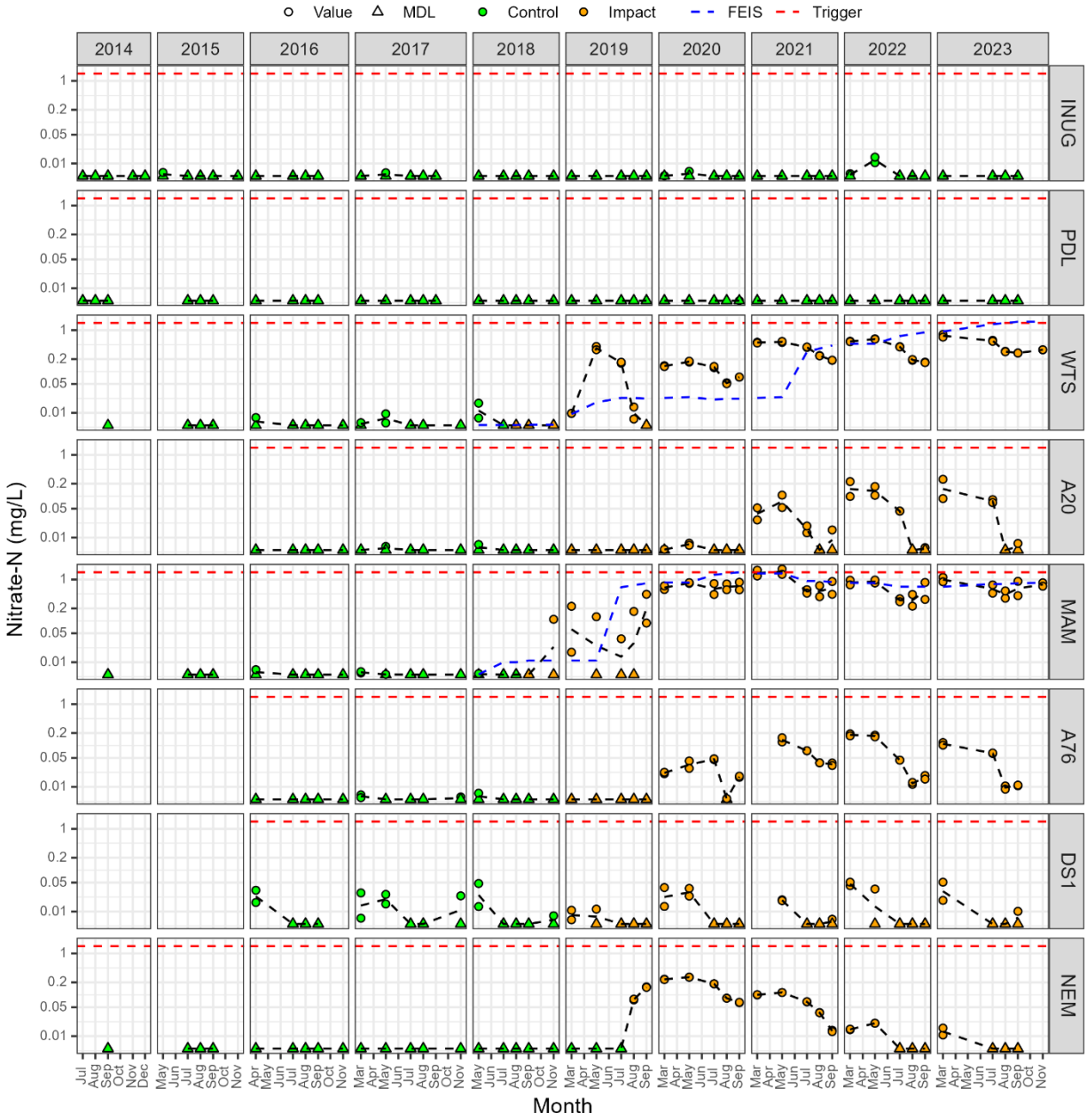


Figure B2-14. Nitrite-N (mg/L).

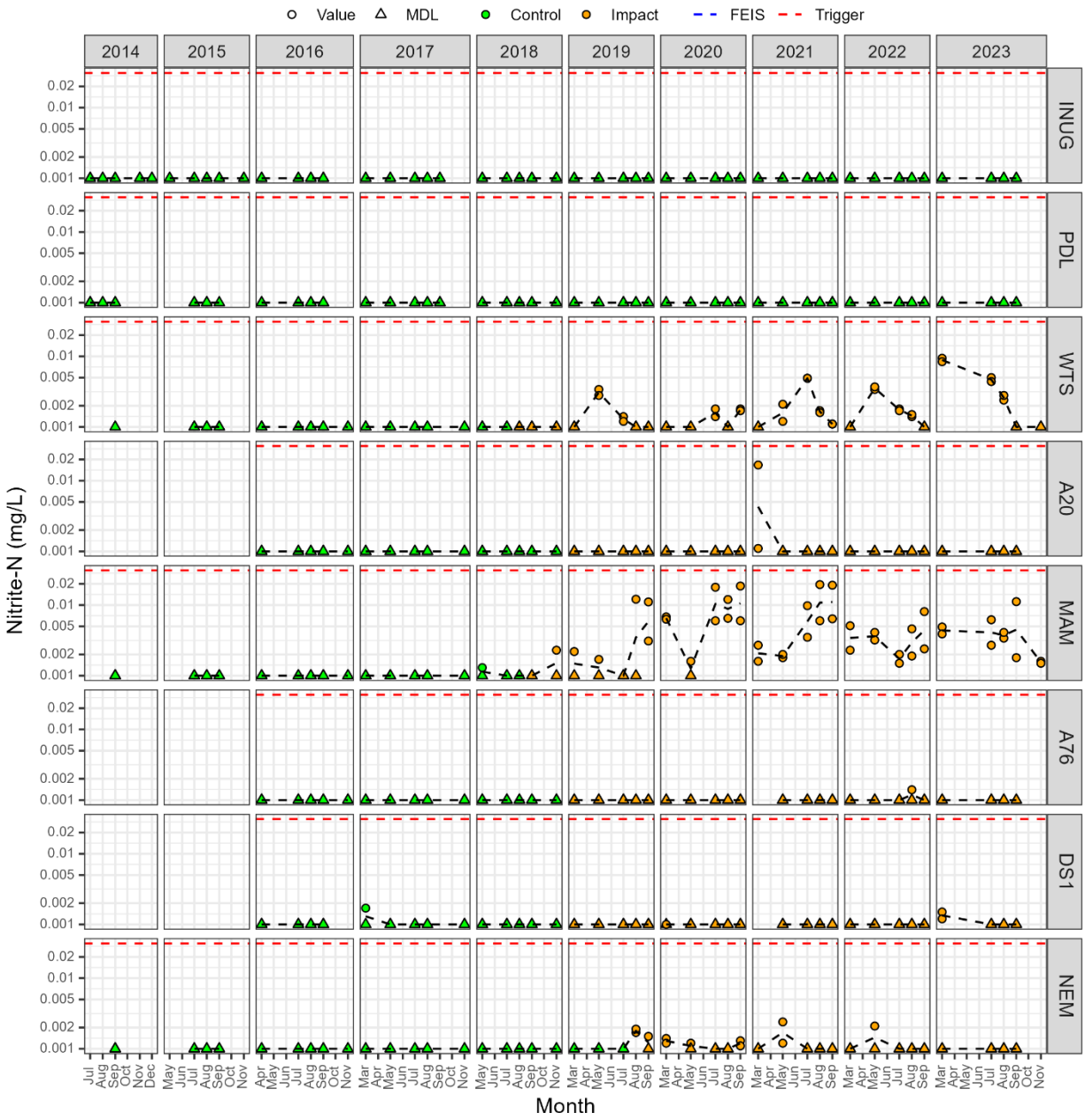


Figure B2-15. Total Kjeldahl Nitrogen (TKN; mg/L).

Note: TKN data from 2014 were removed due to data quality concerns. See Azimuth (2015c) for more details.

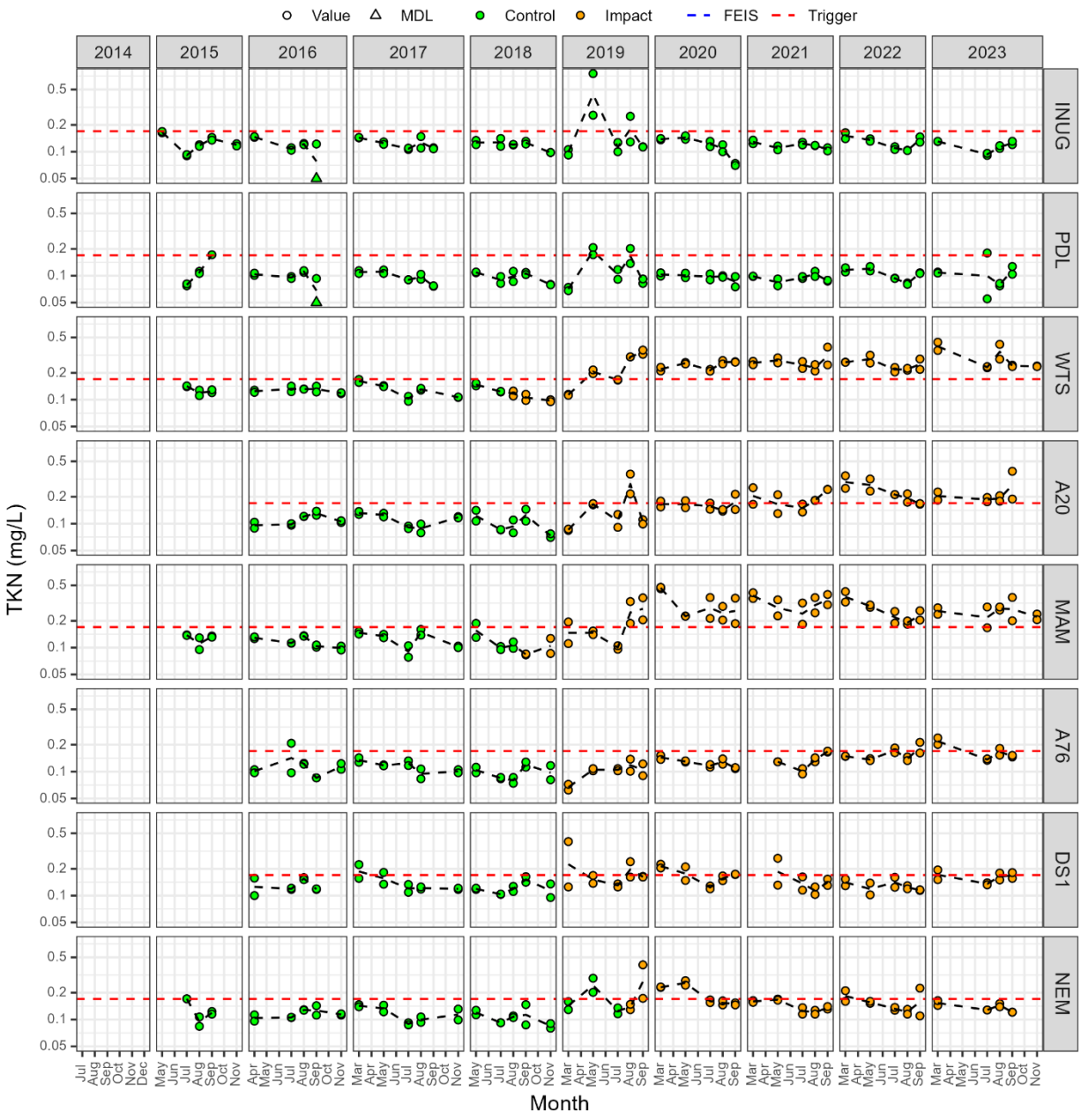


Figure B2-16. Total phosphorous (mg/L).

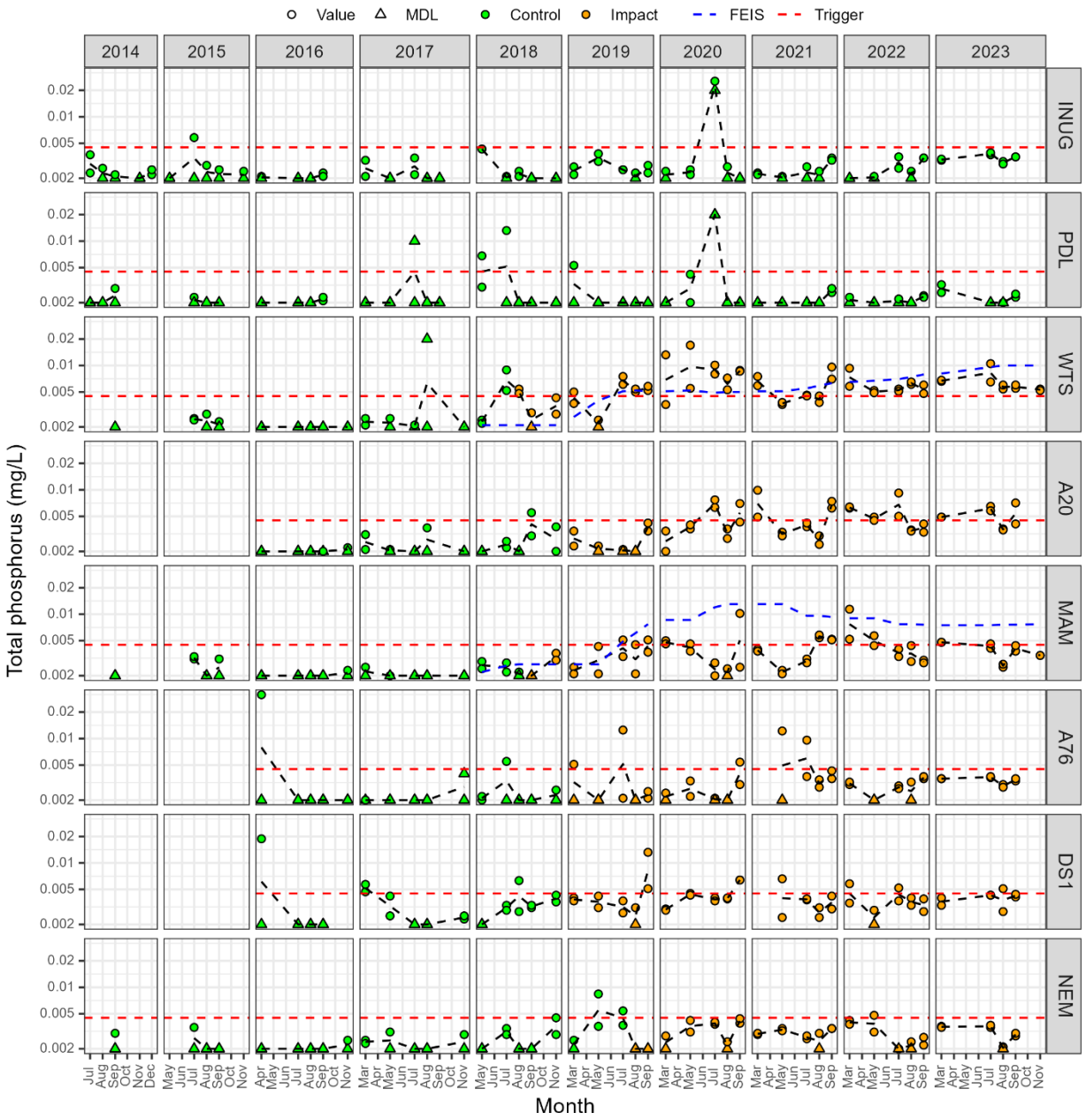


Figure B2-17. Ortho-phosphate (mg/L).

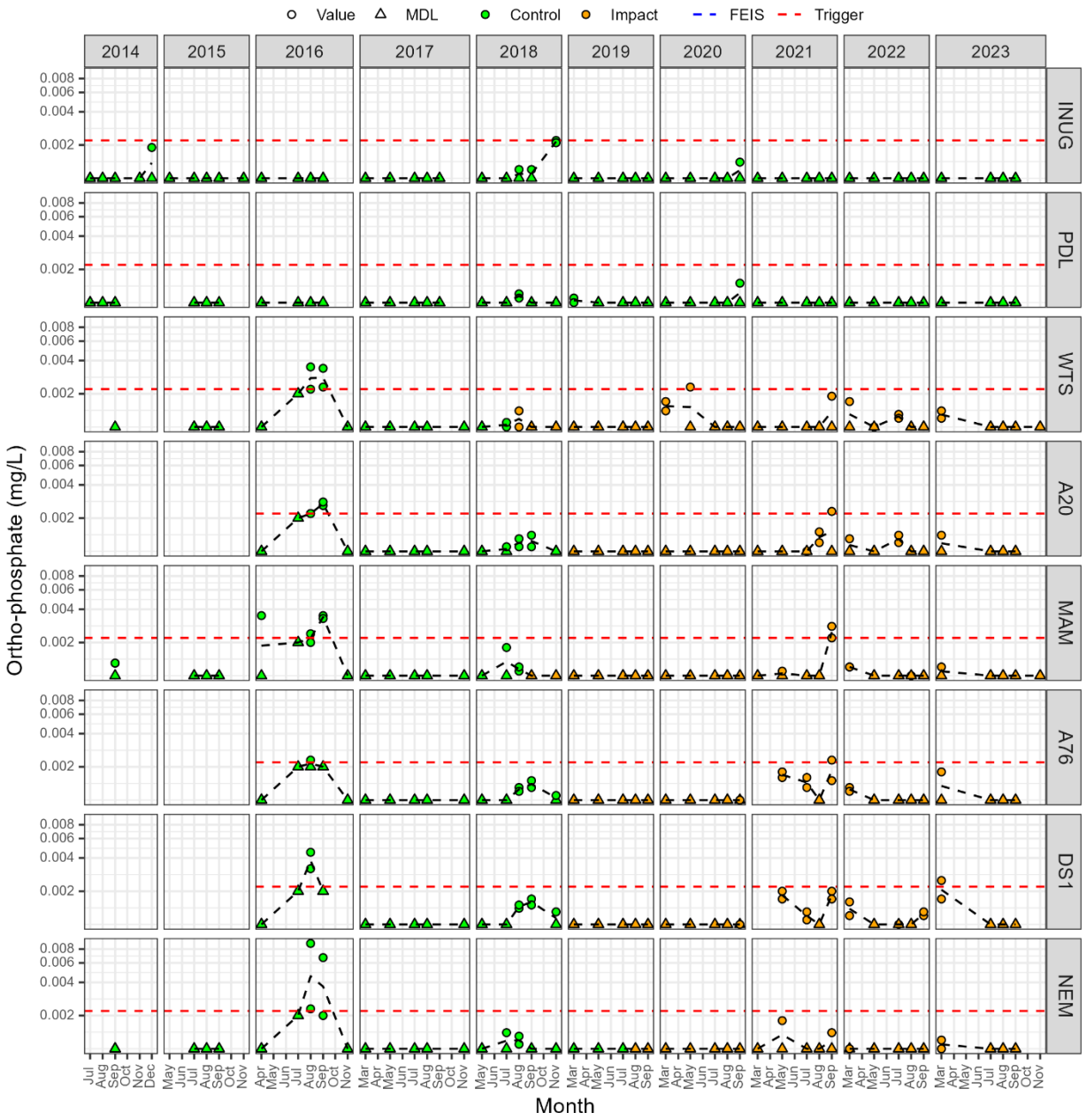


Figure B2-18. Reactive silica (mg/L).

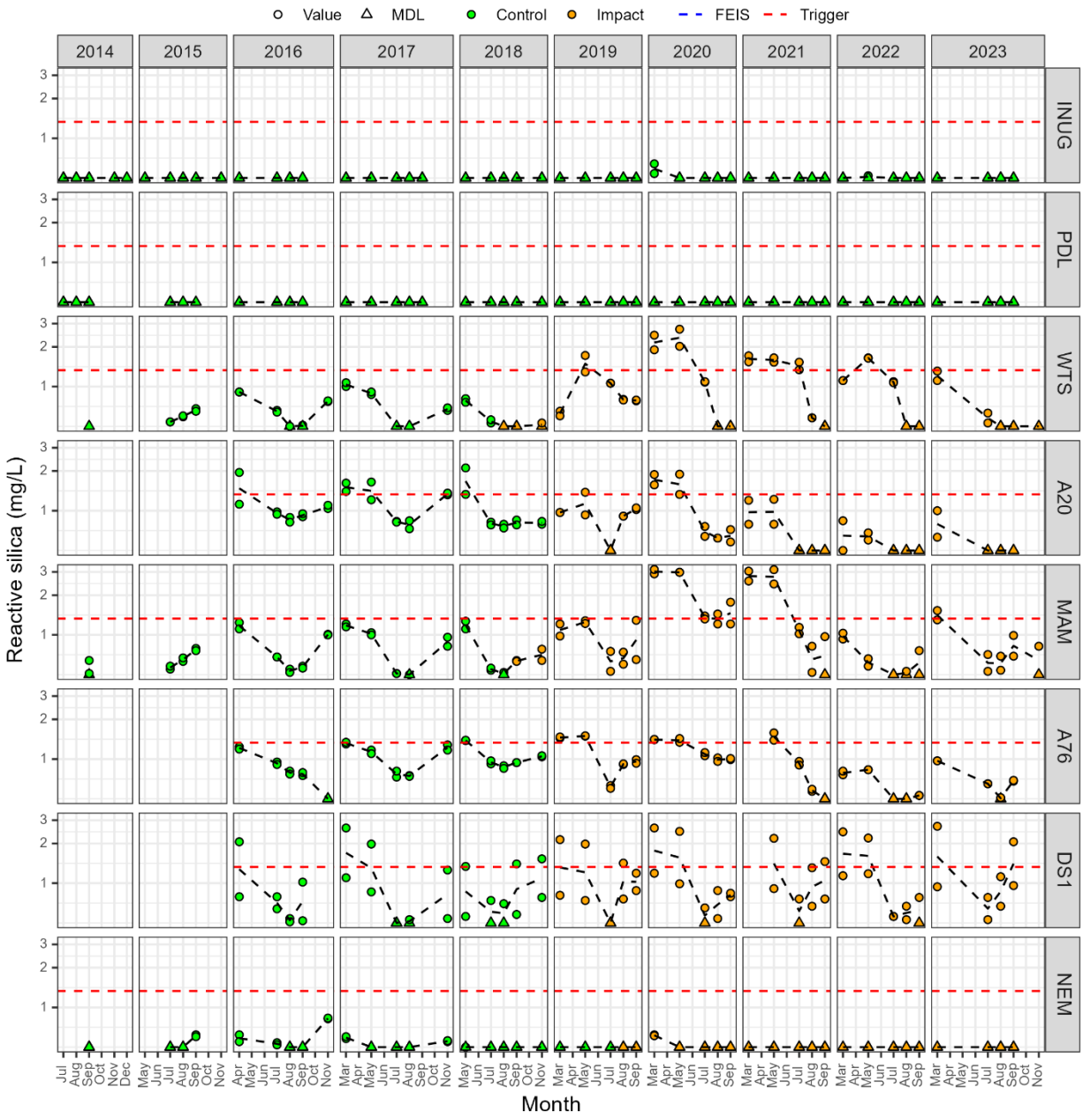


Figure B2-19. Sulphate (mg/L).

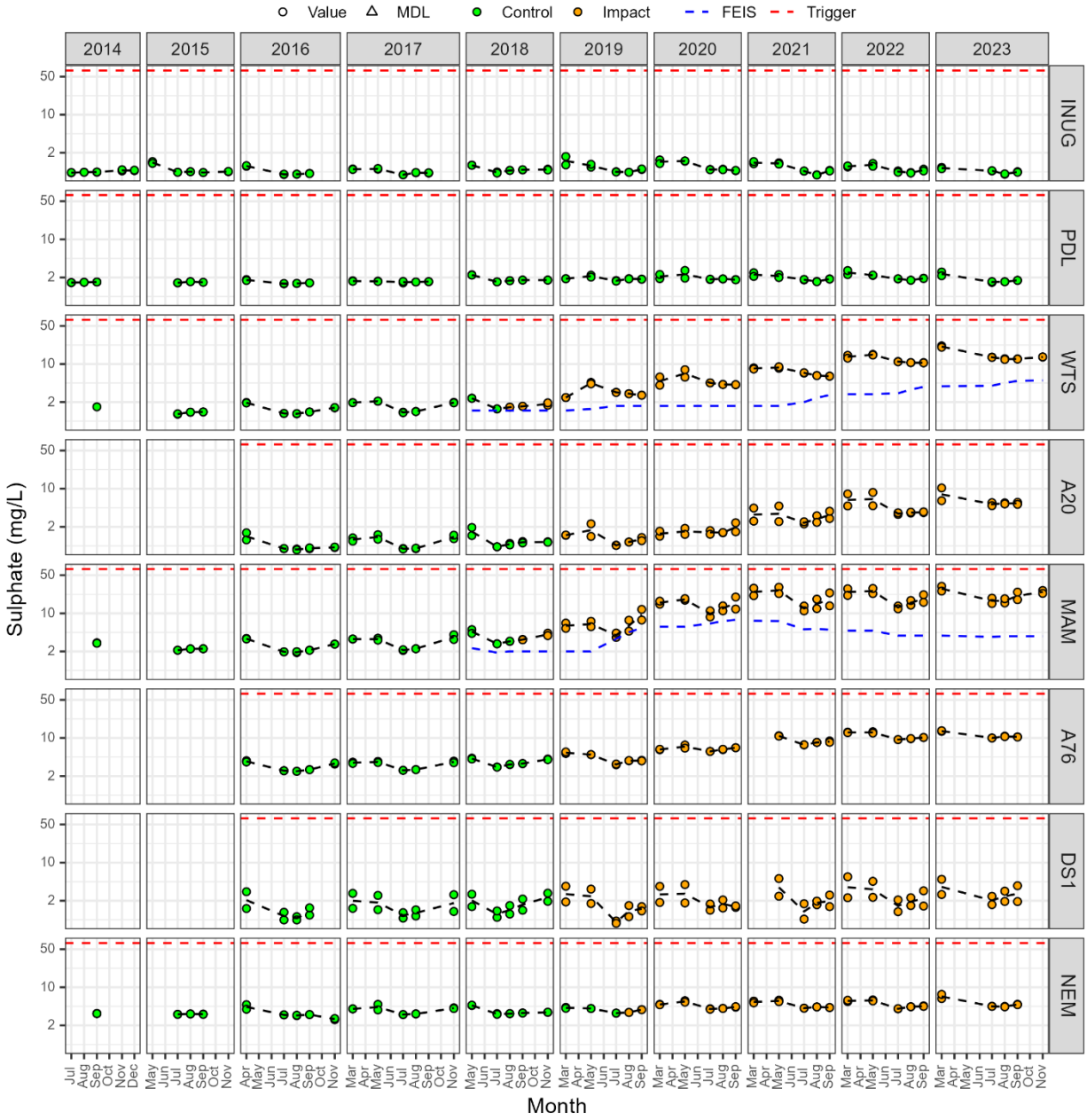


Figure B2-20. Dissolved organic carbon (DOC; mg/L).

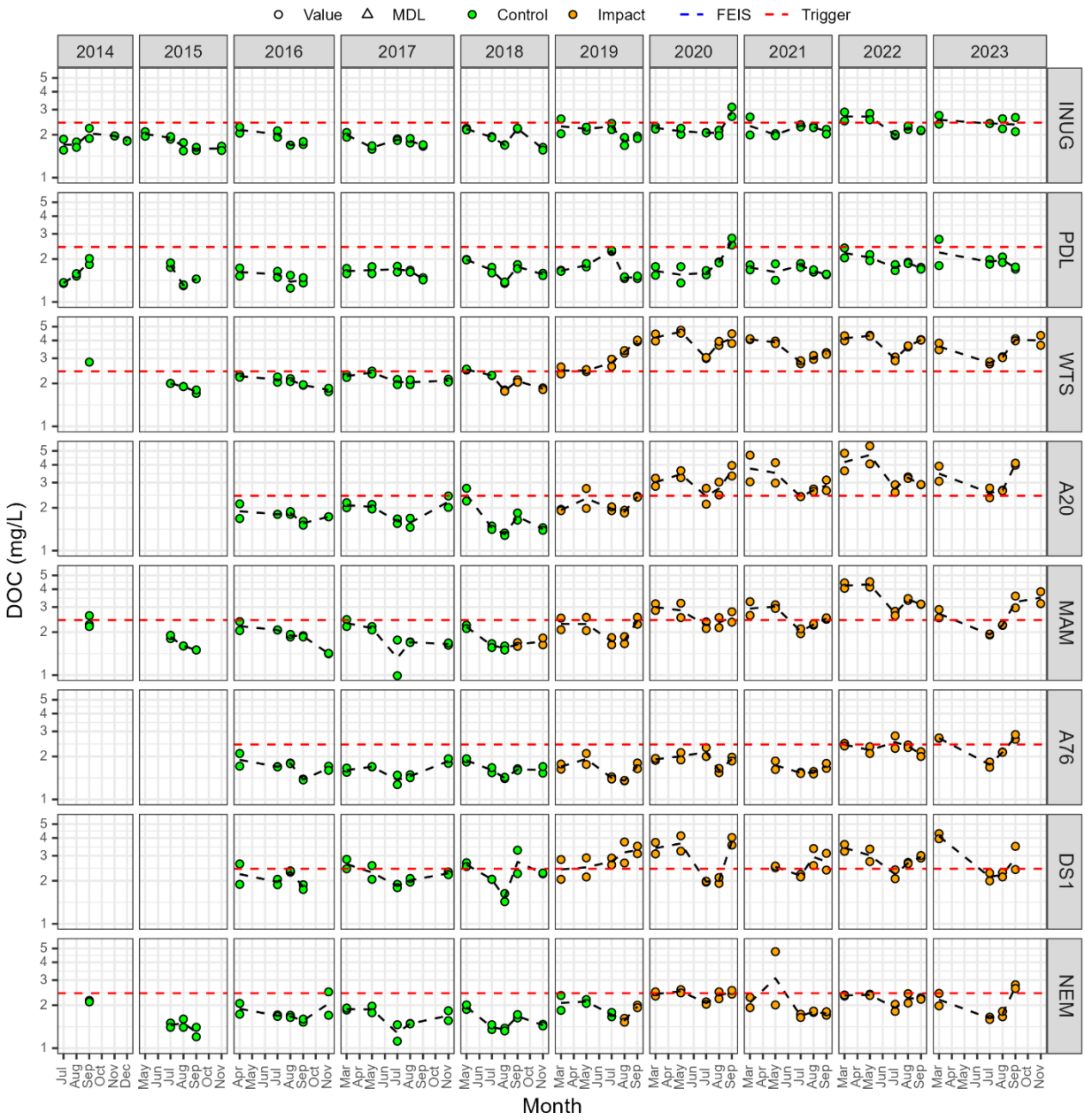


Figure B2-21. Total organic carbon (TOC; mg/L).

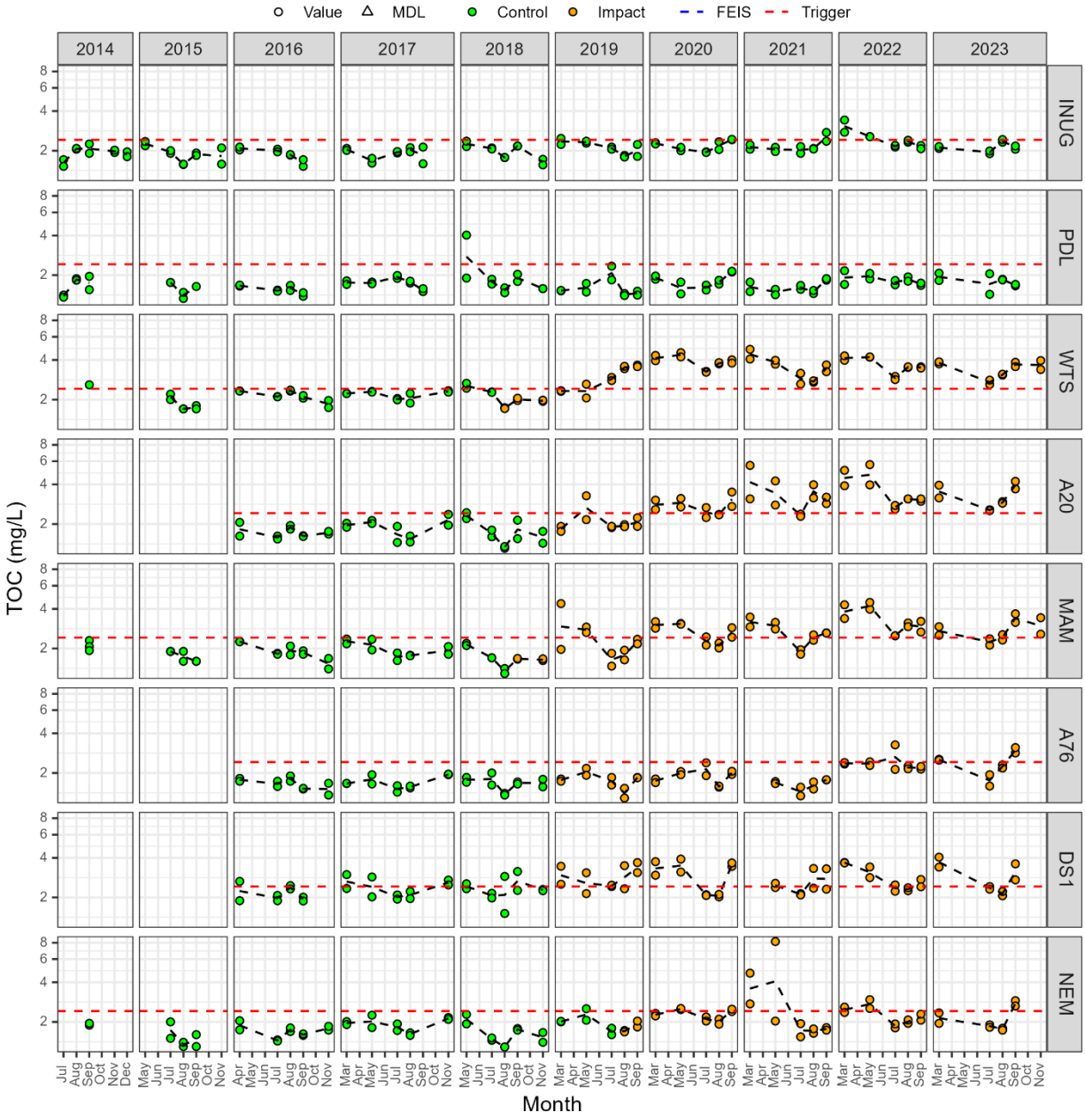


Figure B2-22. Total aluminum (mg/L).

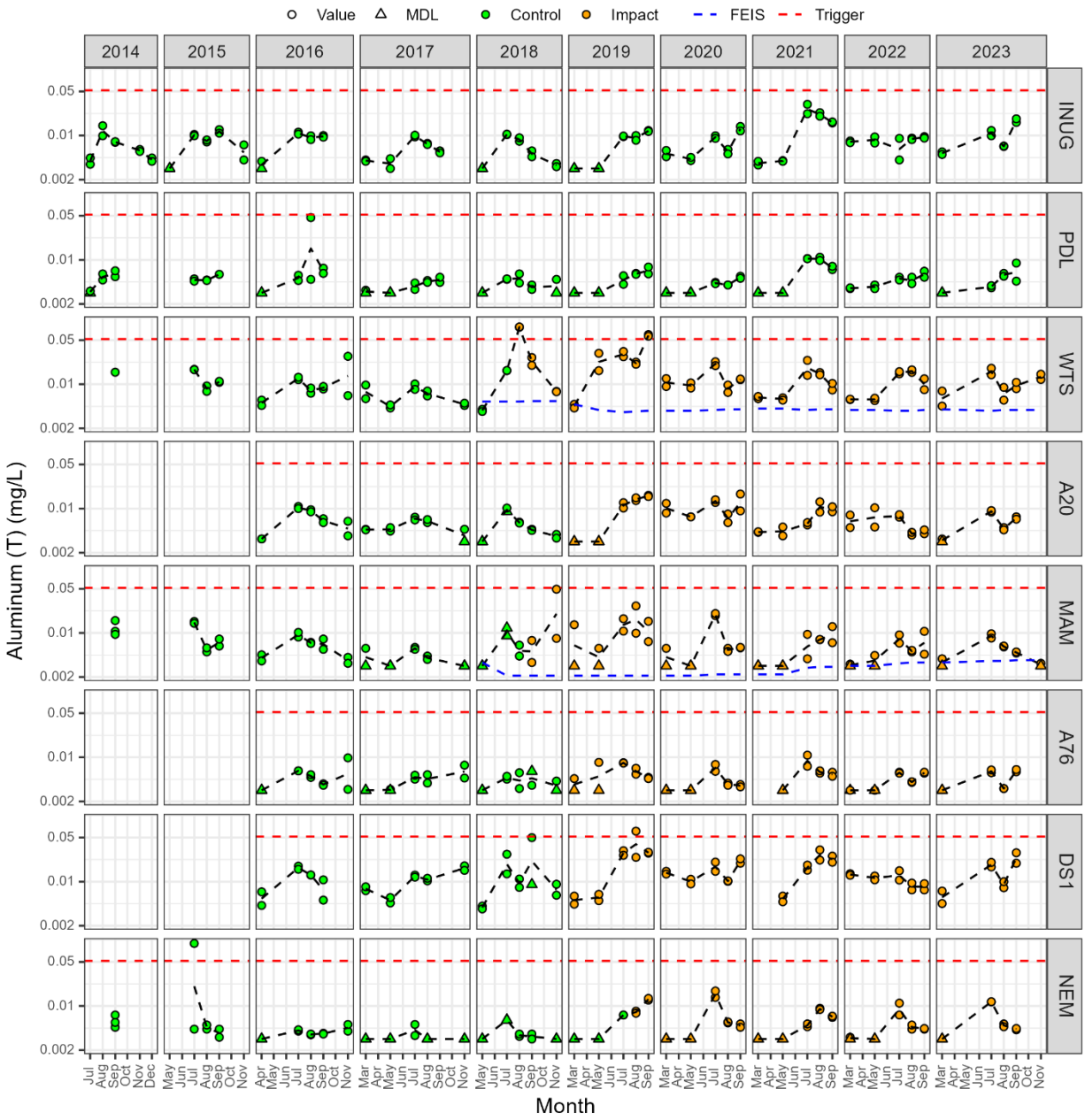


Figure B2-23. Total antimony (mg/L).

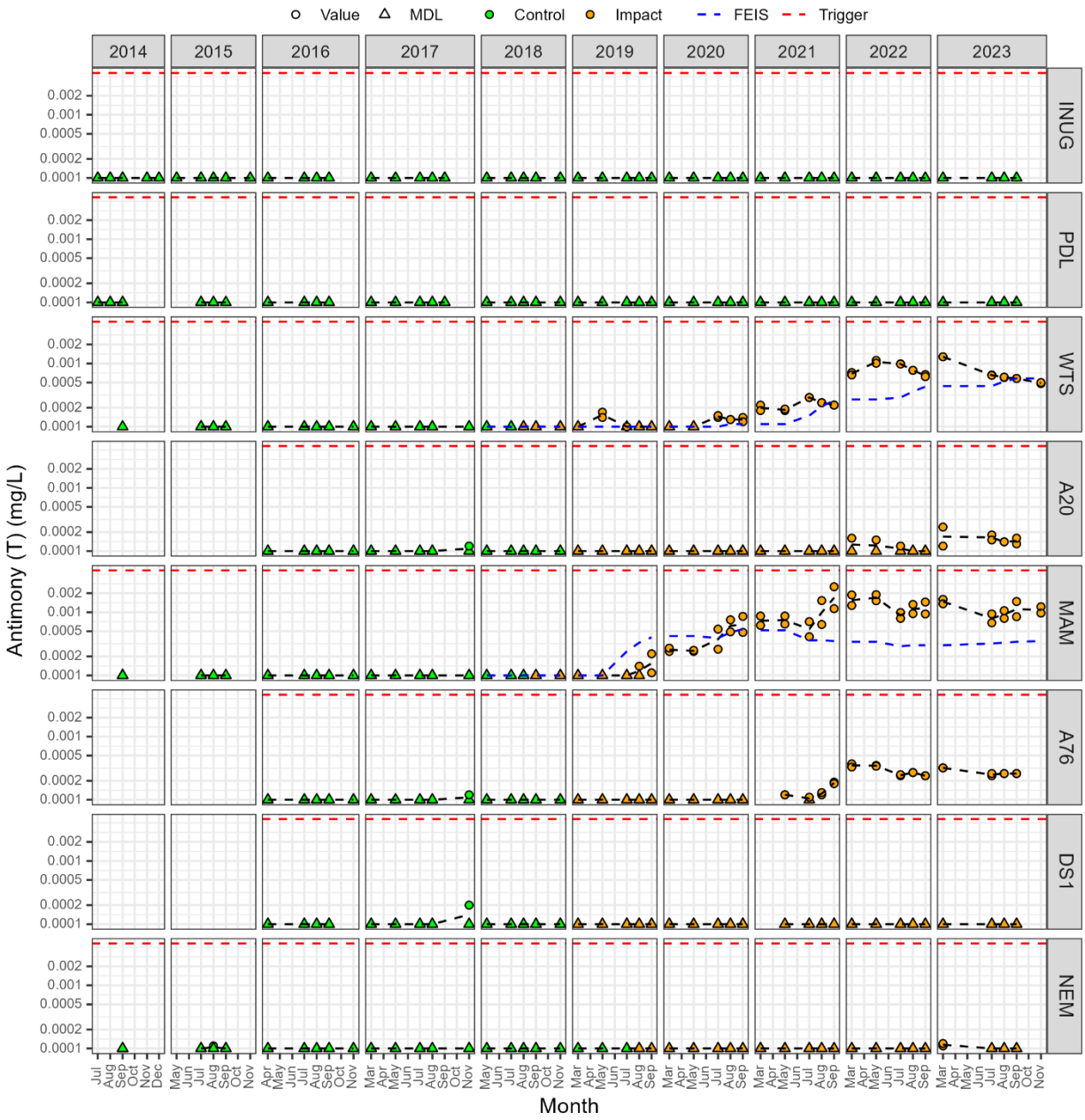


Figure B2-24. Total arsenic (mg/L).

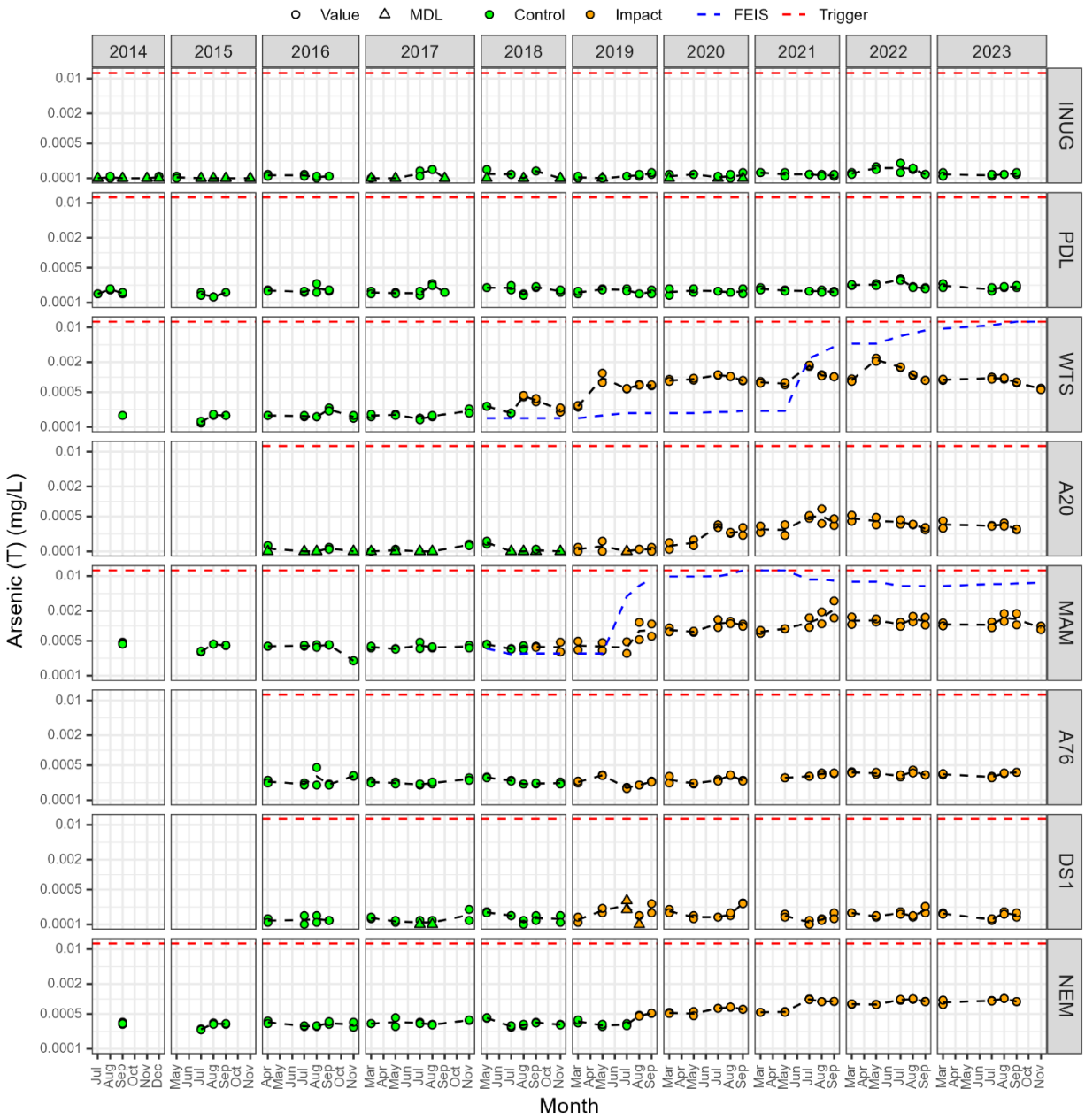


Figure B2-25. Total barium (mg/L).

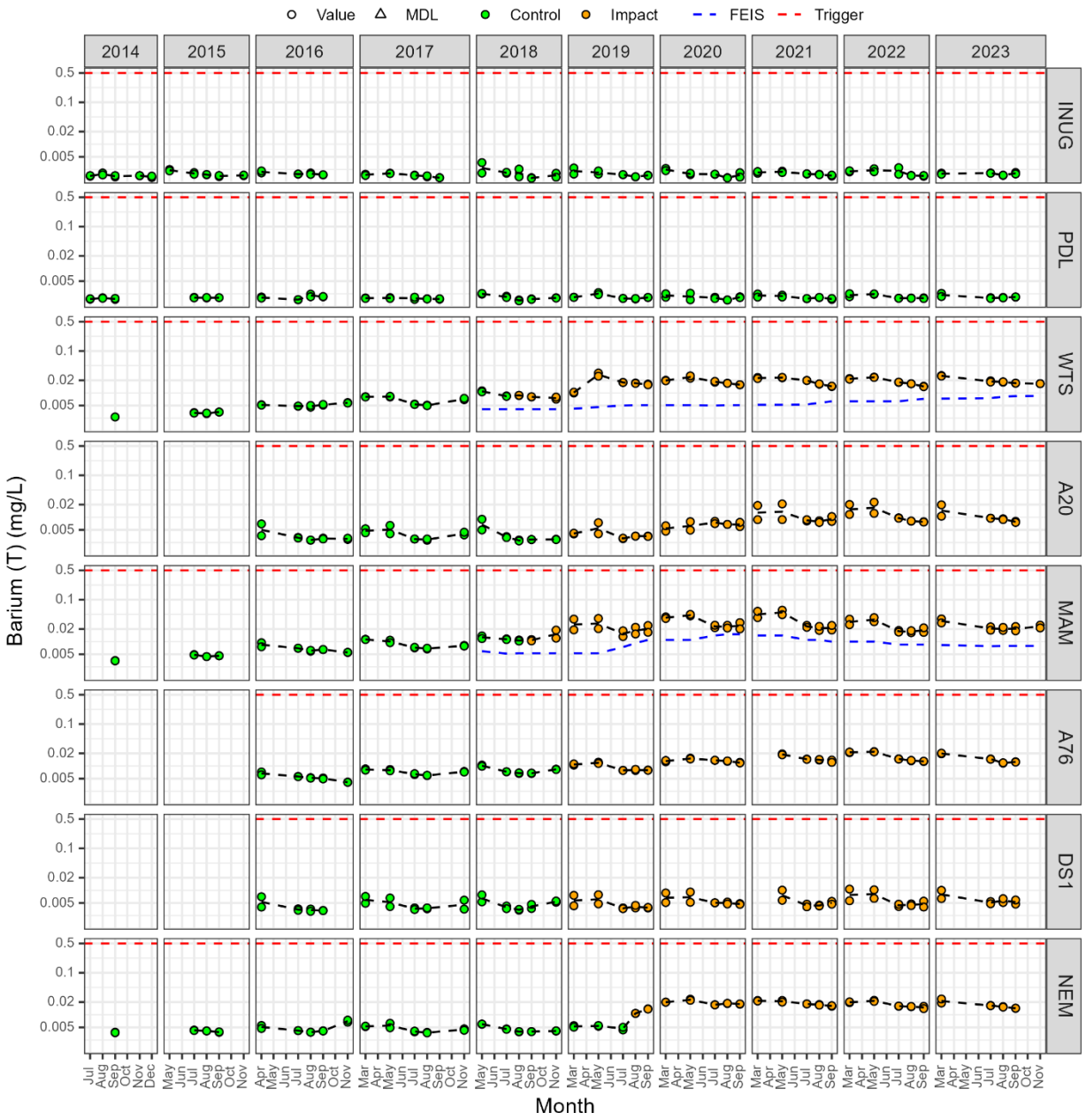


Figure B2-26. Total beryllium (mg/L).

Note: Detection limits for beryllium were revised in 2018 due to method re-validation and analysis at the lower detection limit is no longer available at ALS (Pers. Comm. Brent Mack, ALS November 28, 2022).

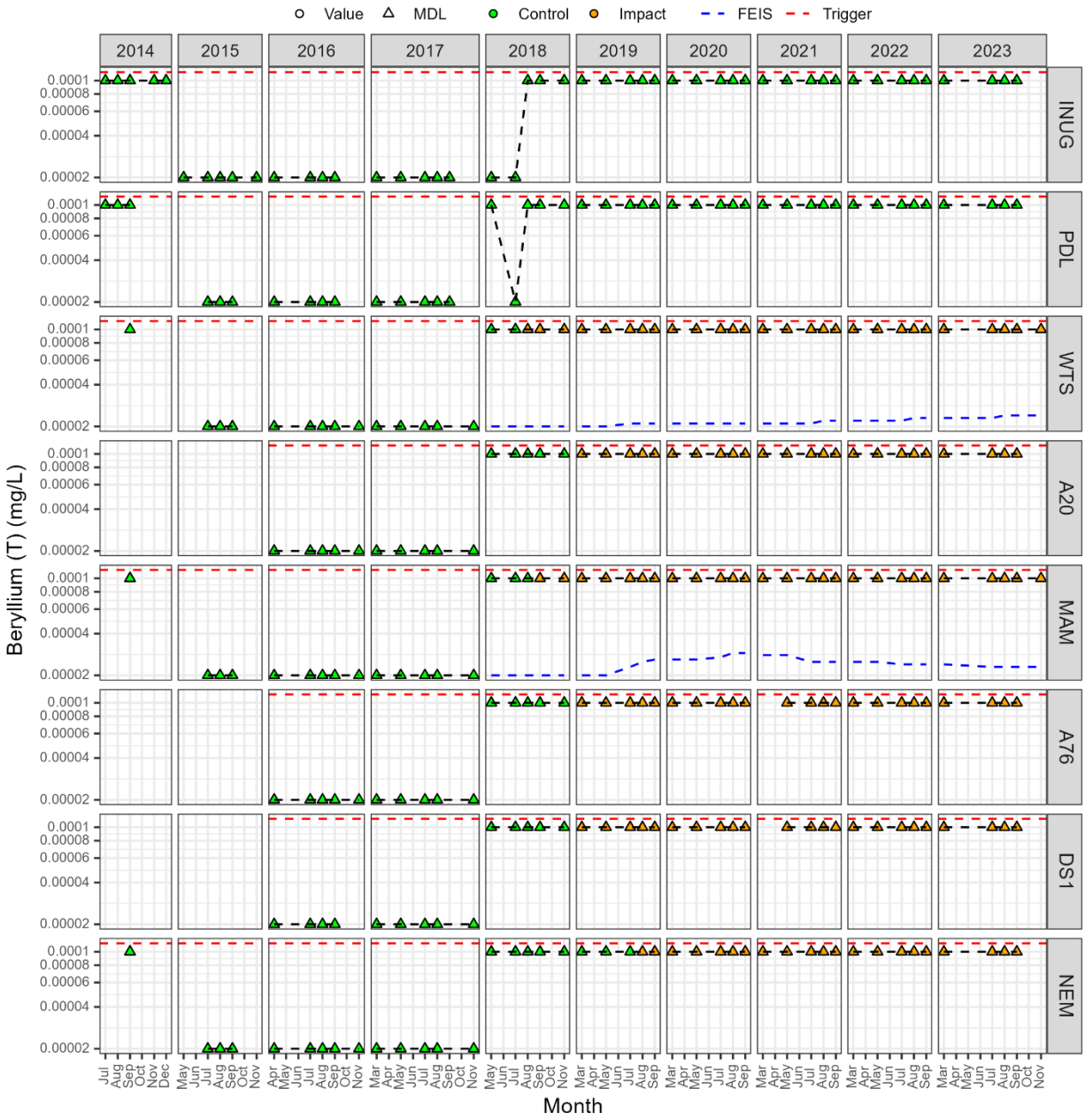


Figure B2-27. Total boron (mg/L).

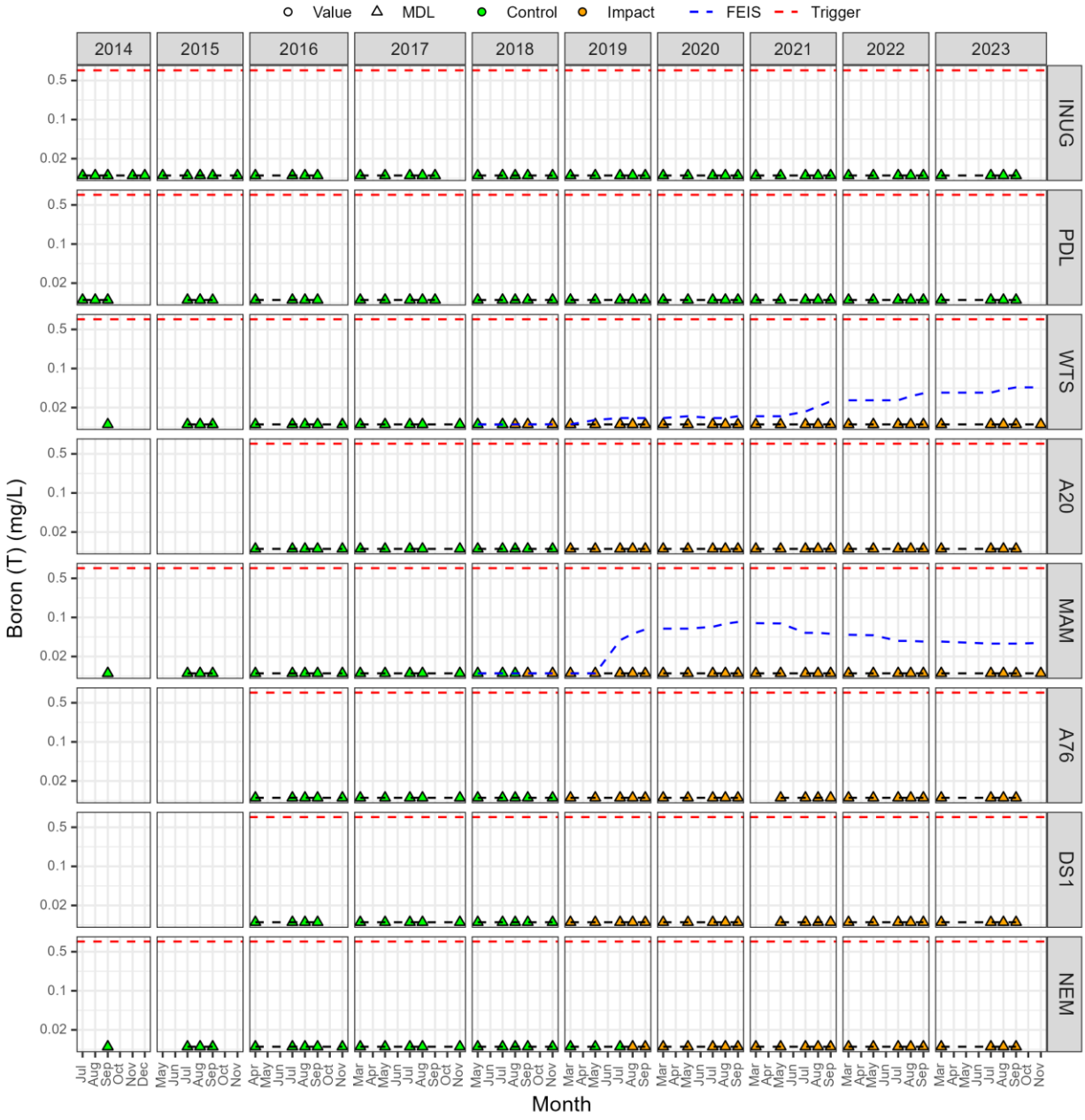


Figure B2-28. Total cadmium (mg/L).

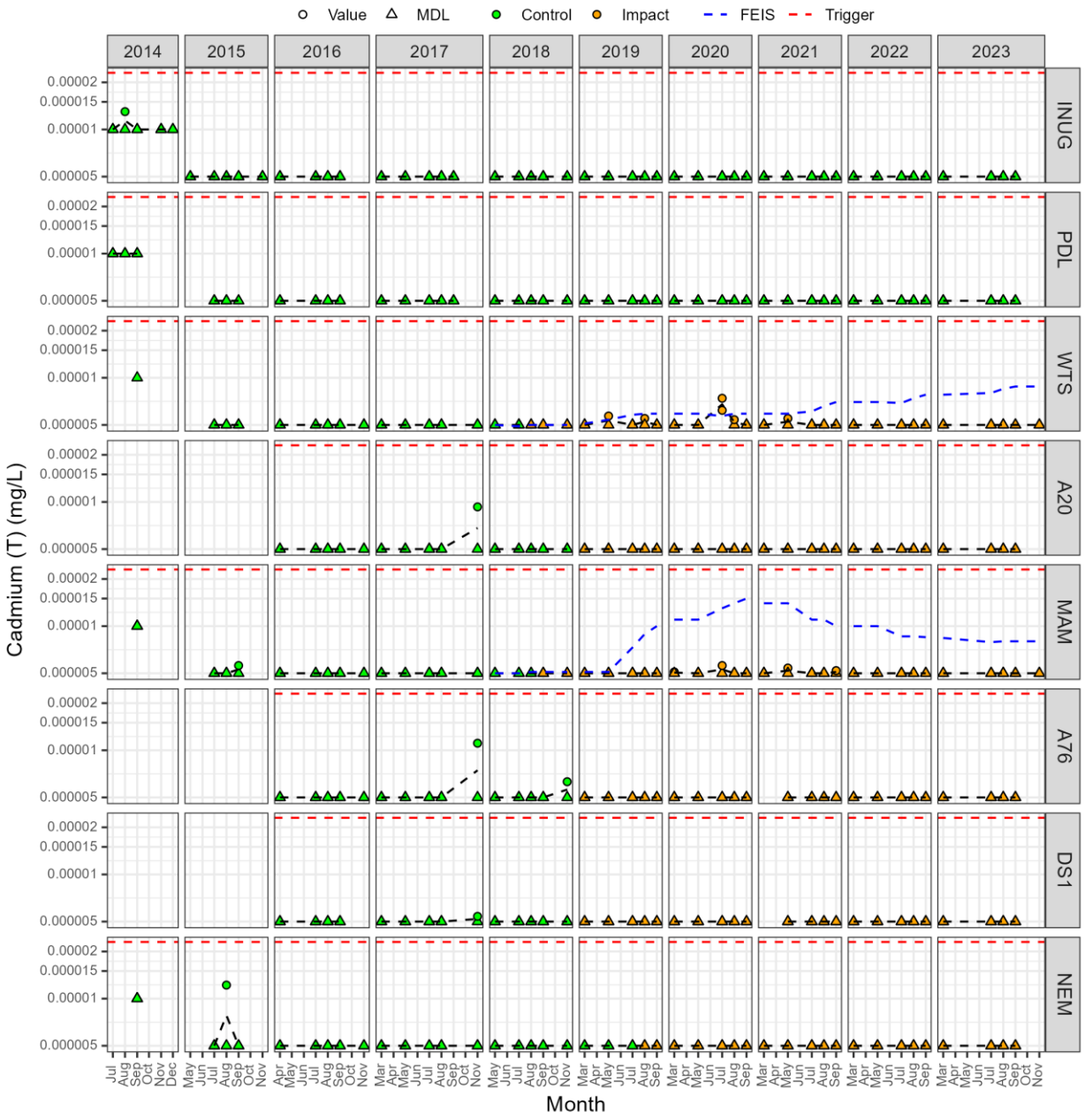


Figure B2-29. Total calcium (mg/L).

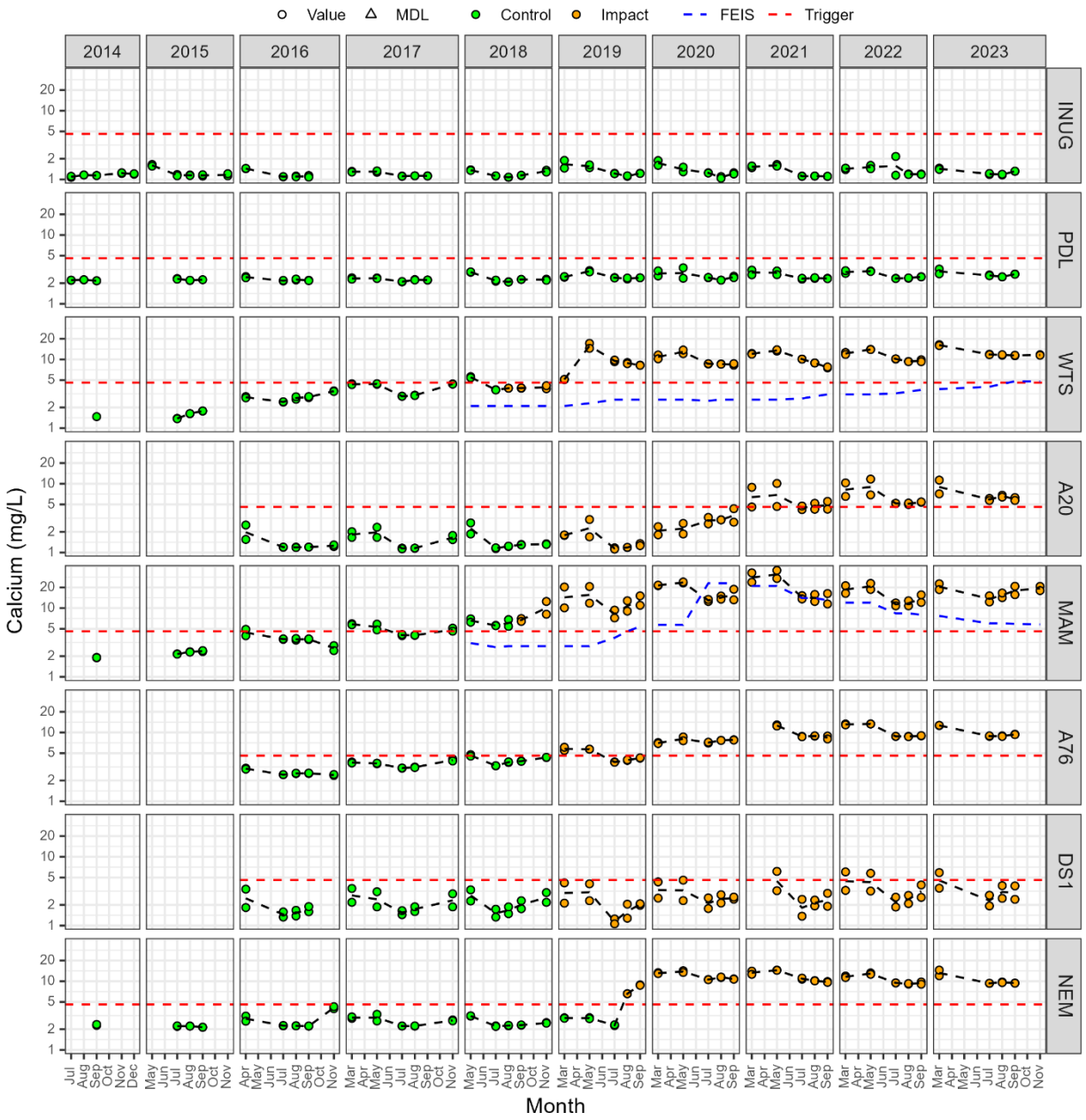


Figure B2-30. Total chromium (mg/L).

Note: The detection limit was revised in 2021 due to method re-validation (Pers. Comm. Brent Mack, ALS November 28, 2022). Low-level chromium analysis is available at a cost and will be requested for samples starting in 2023.

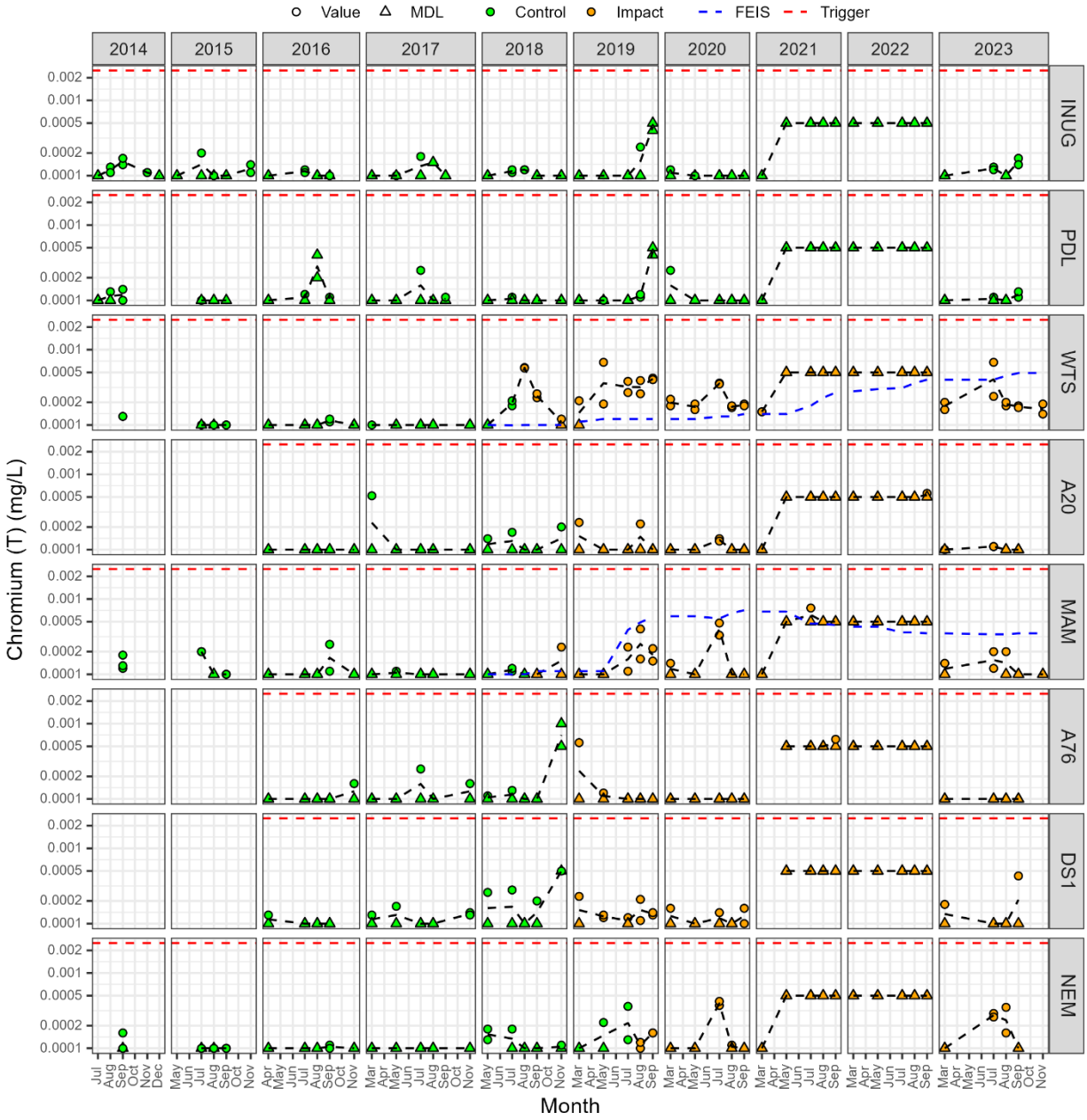


Figure B2-31. Total copper (mg/L).

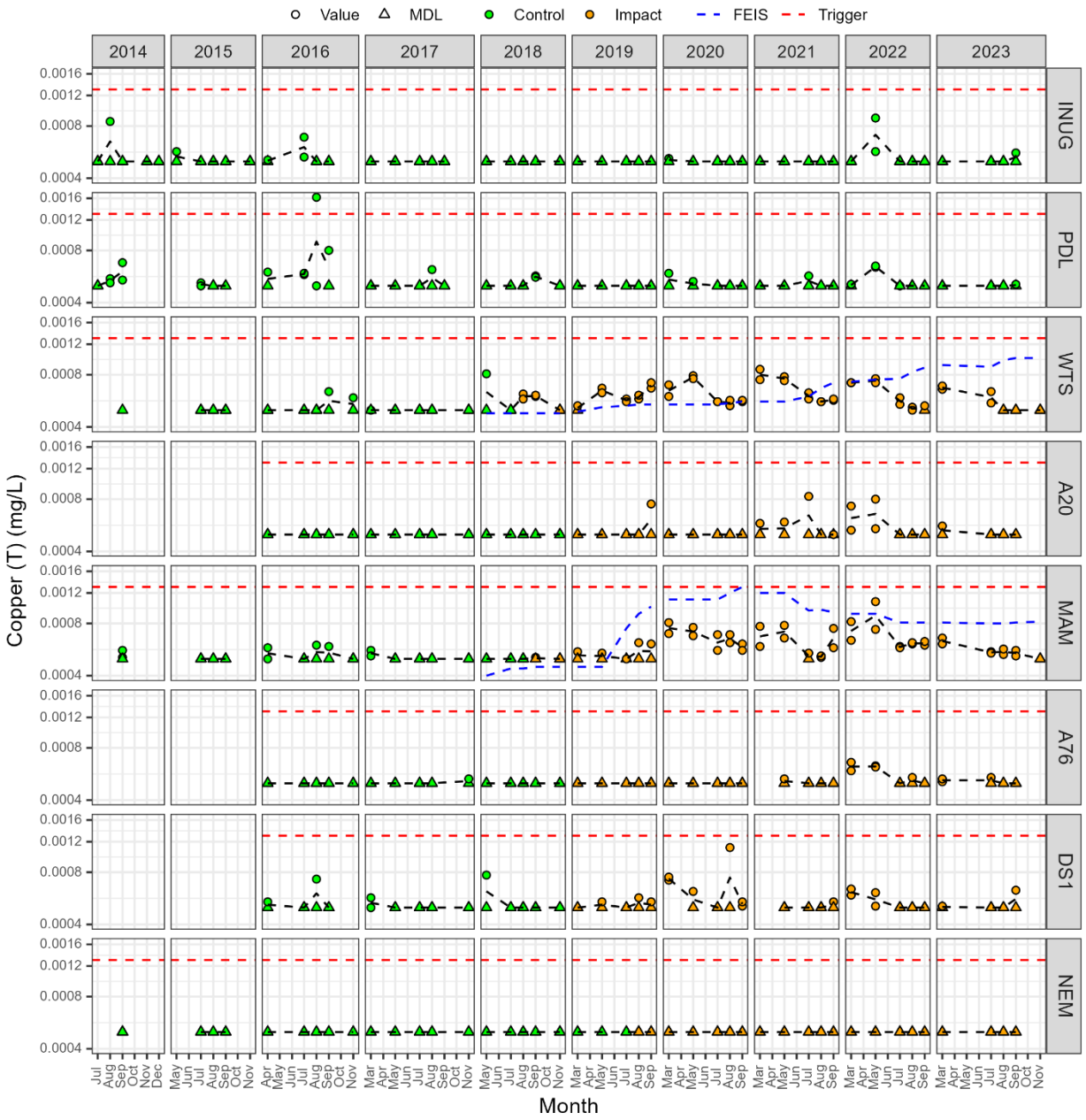


Figure B2-32. Total iron (mg/L).

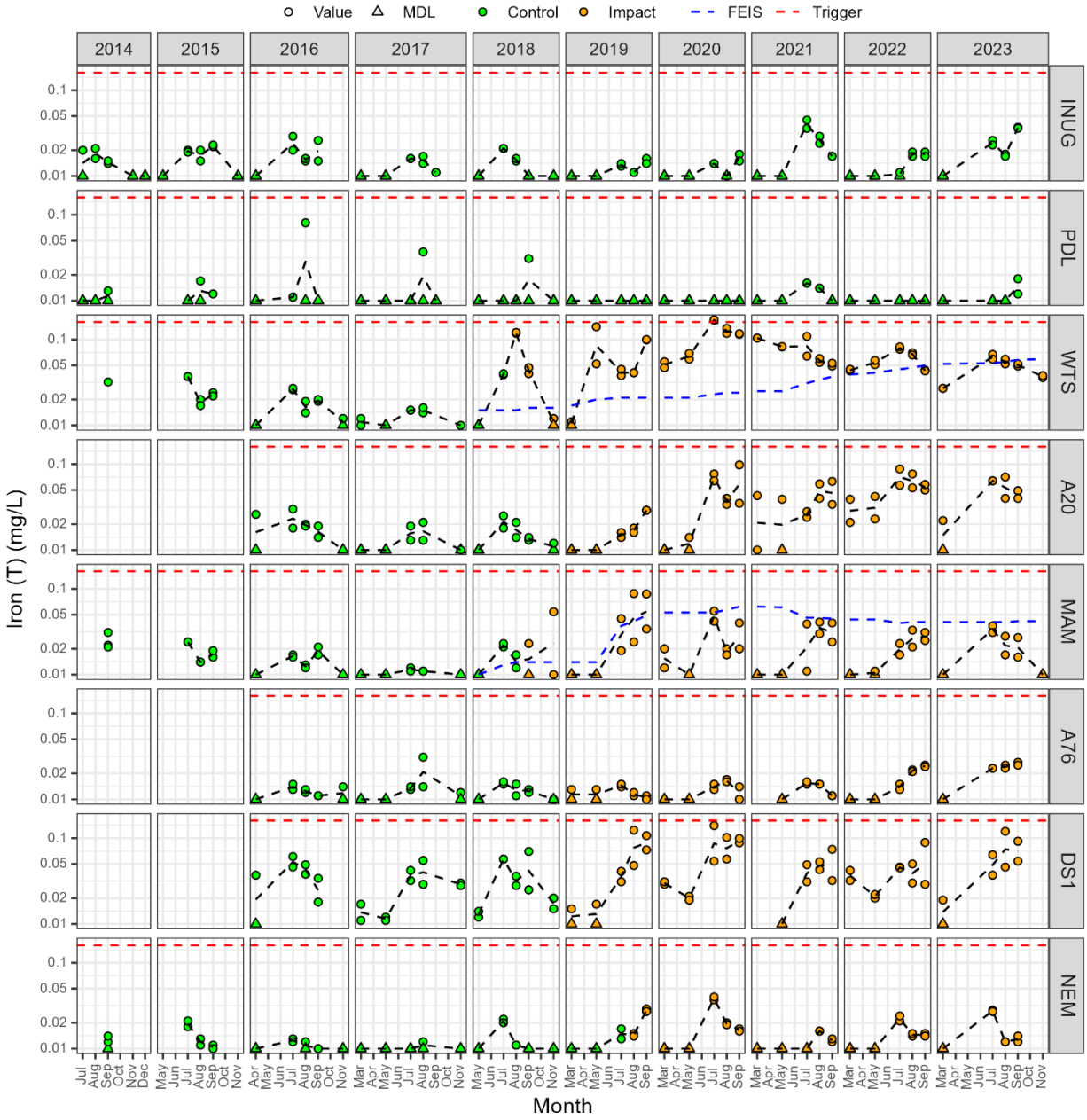


Figure B2-33. Total lead (mg/L).

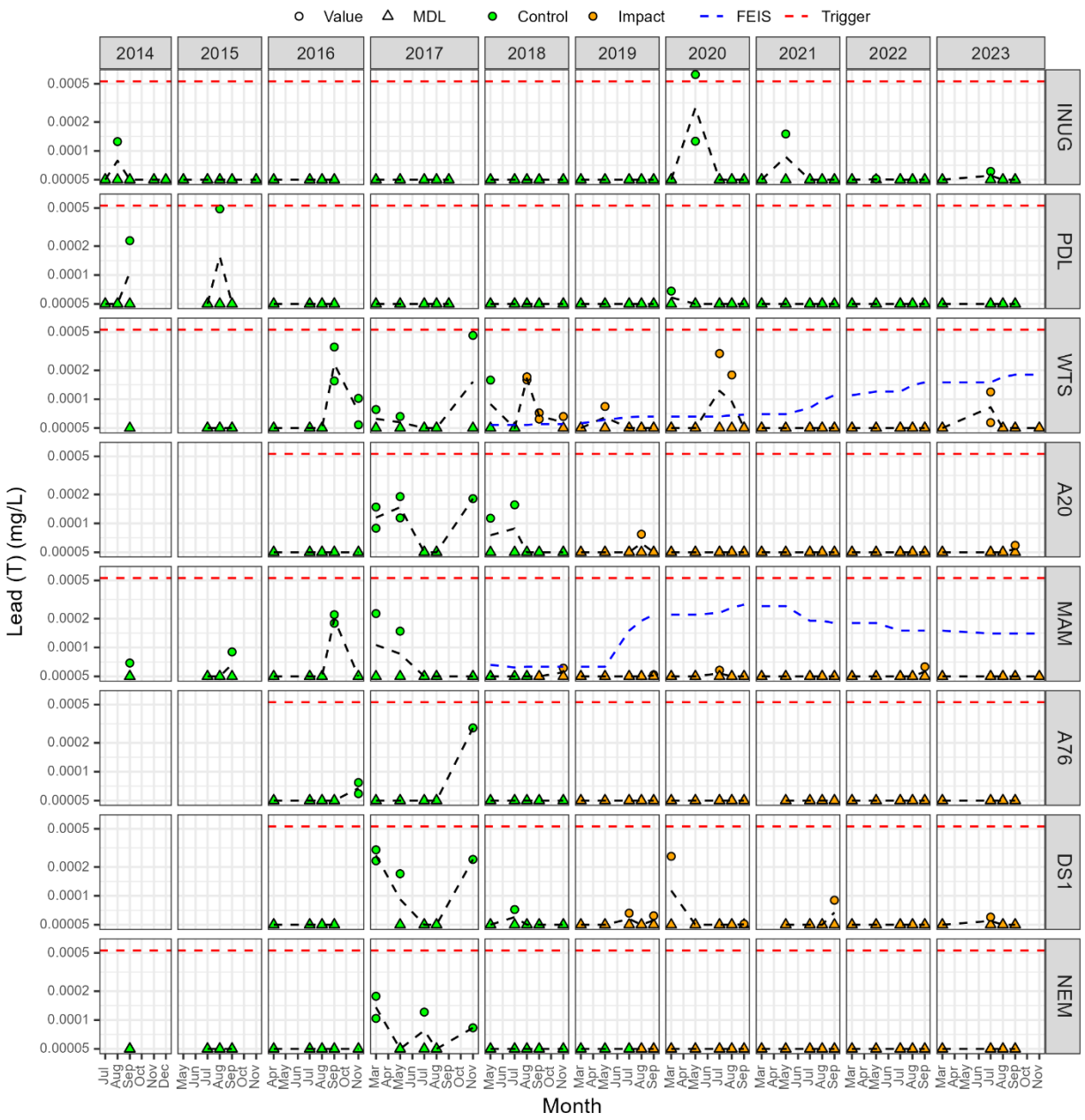


Figure B2-34. Total lithium (mg/L).

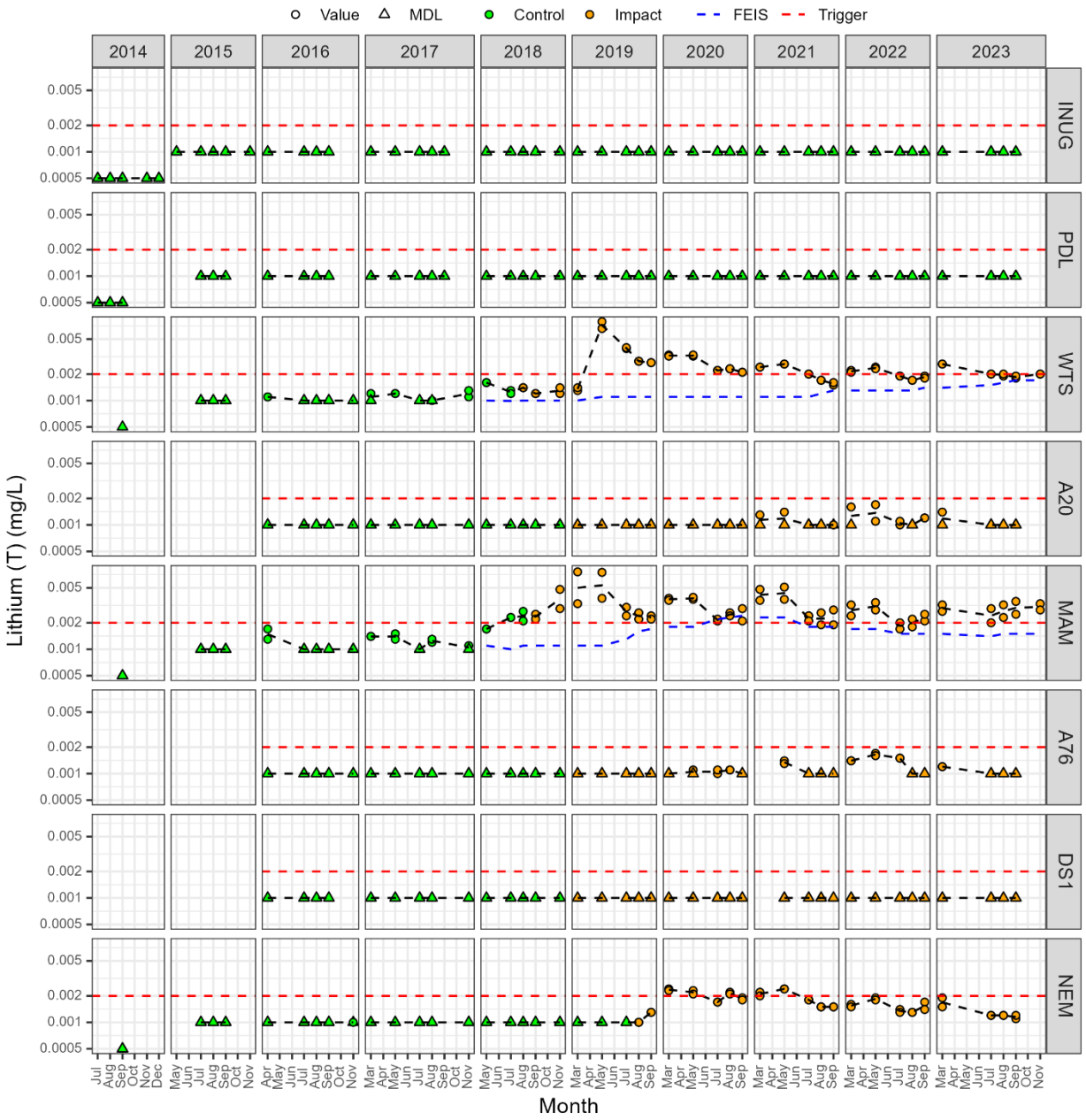


Figure B2-35. Total manganese (mg/L).

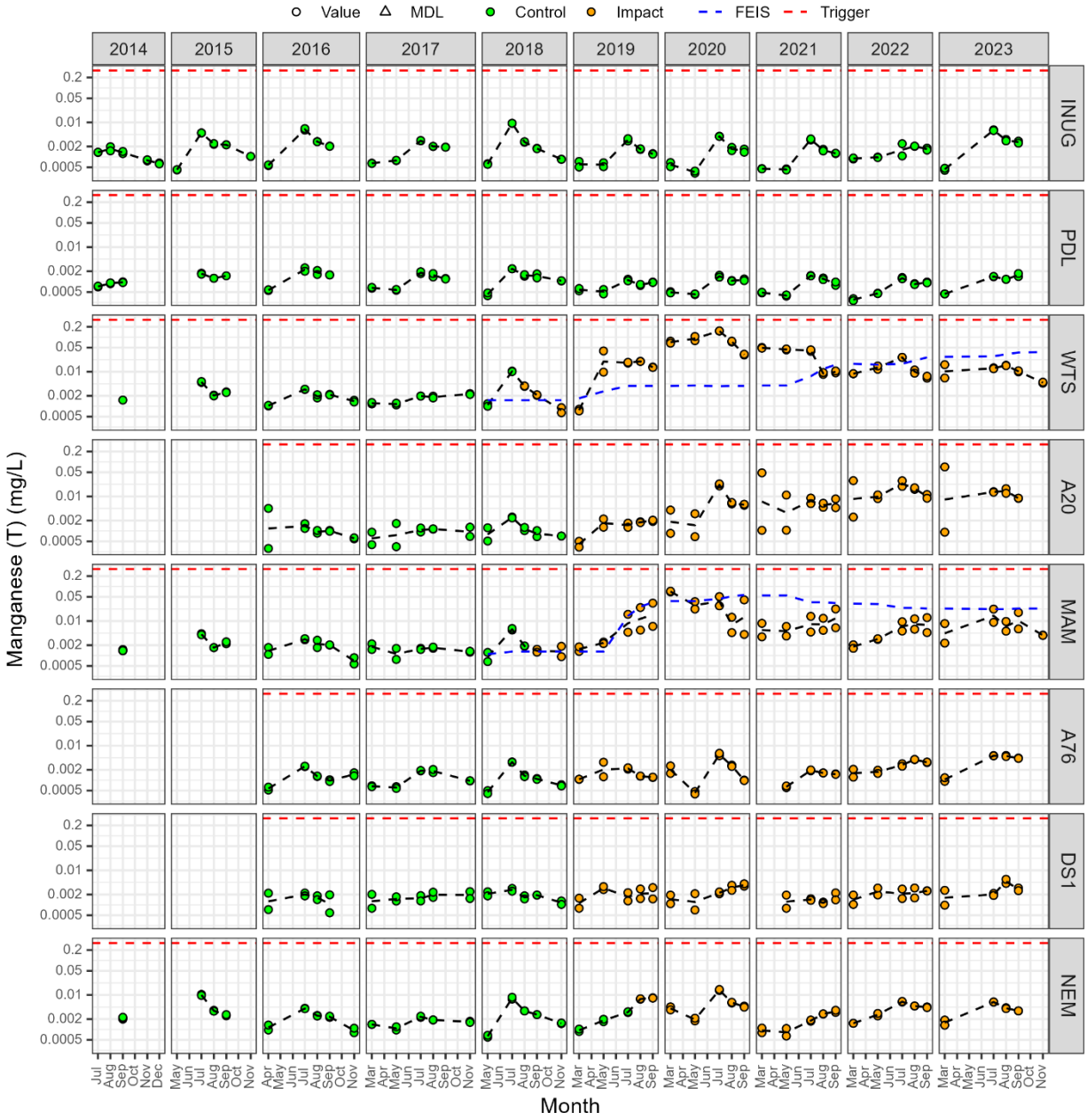


Figure B2-36. Total magnesium (mg/L).

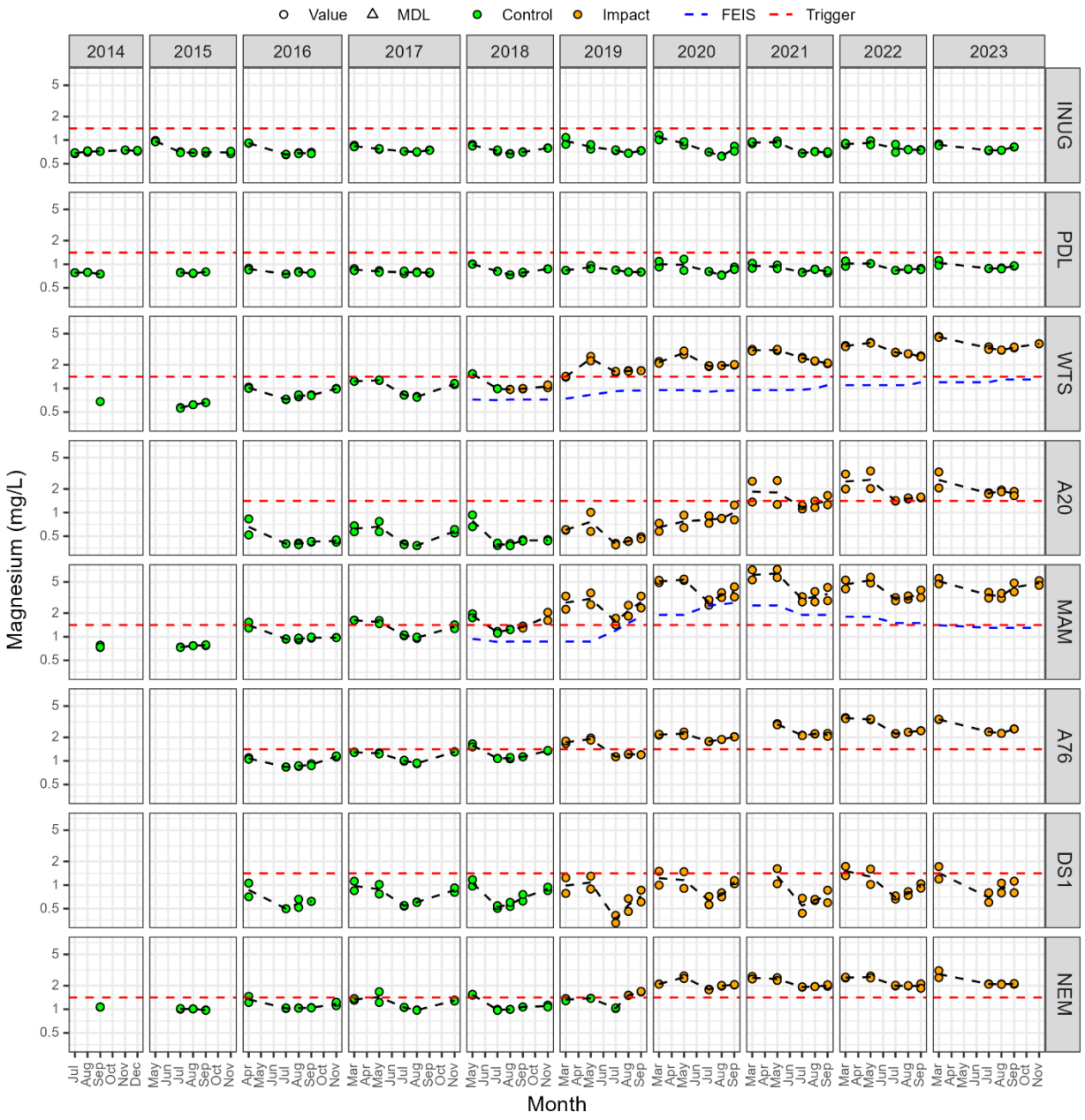


Figure B2-37. Total mercury (mg/L).

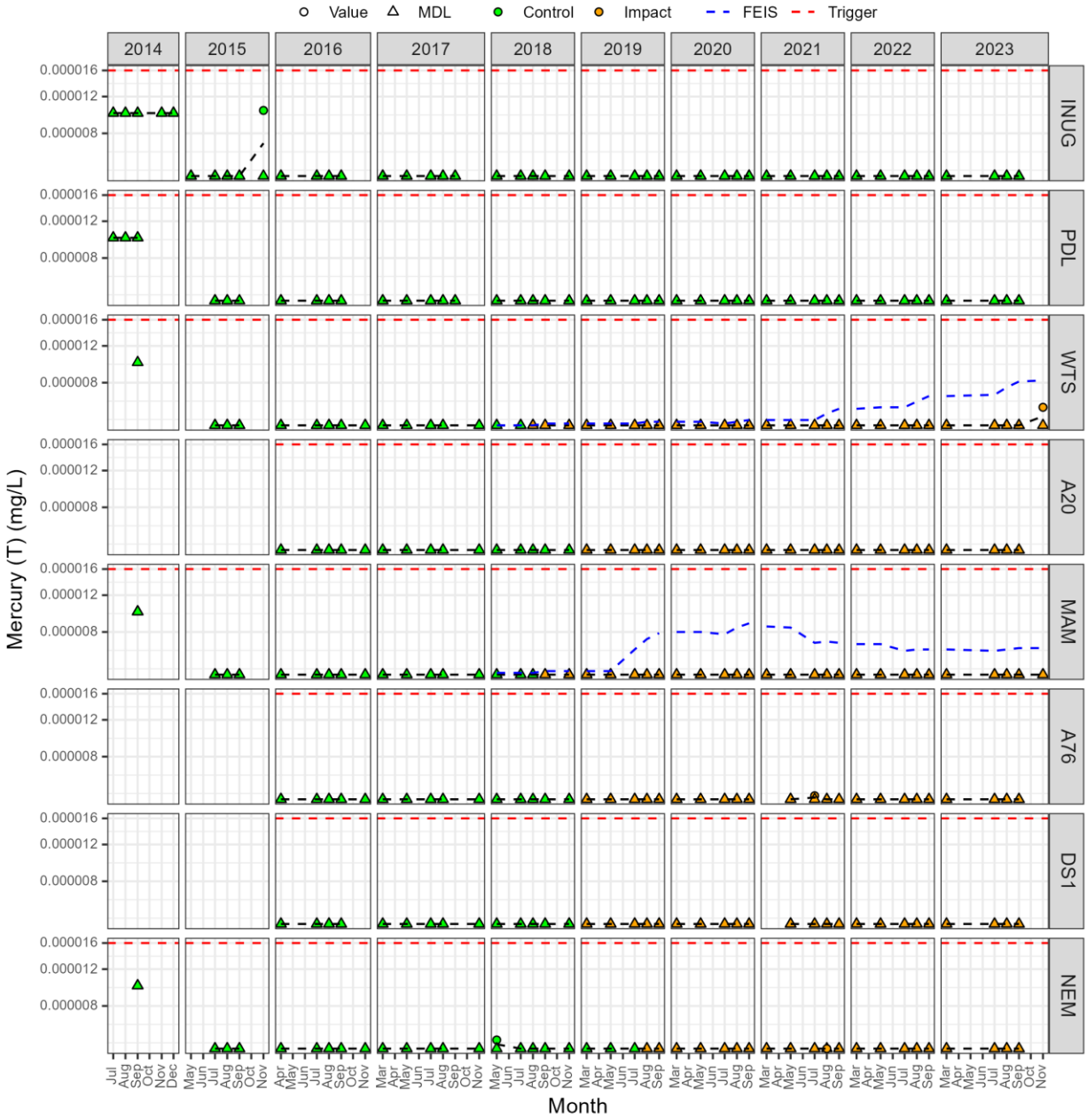


Figure B2-38. Total molybdenum (mg/L).

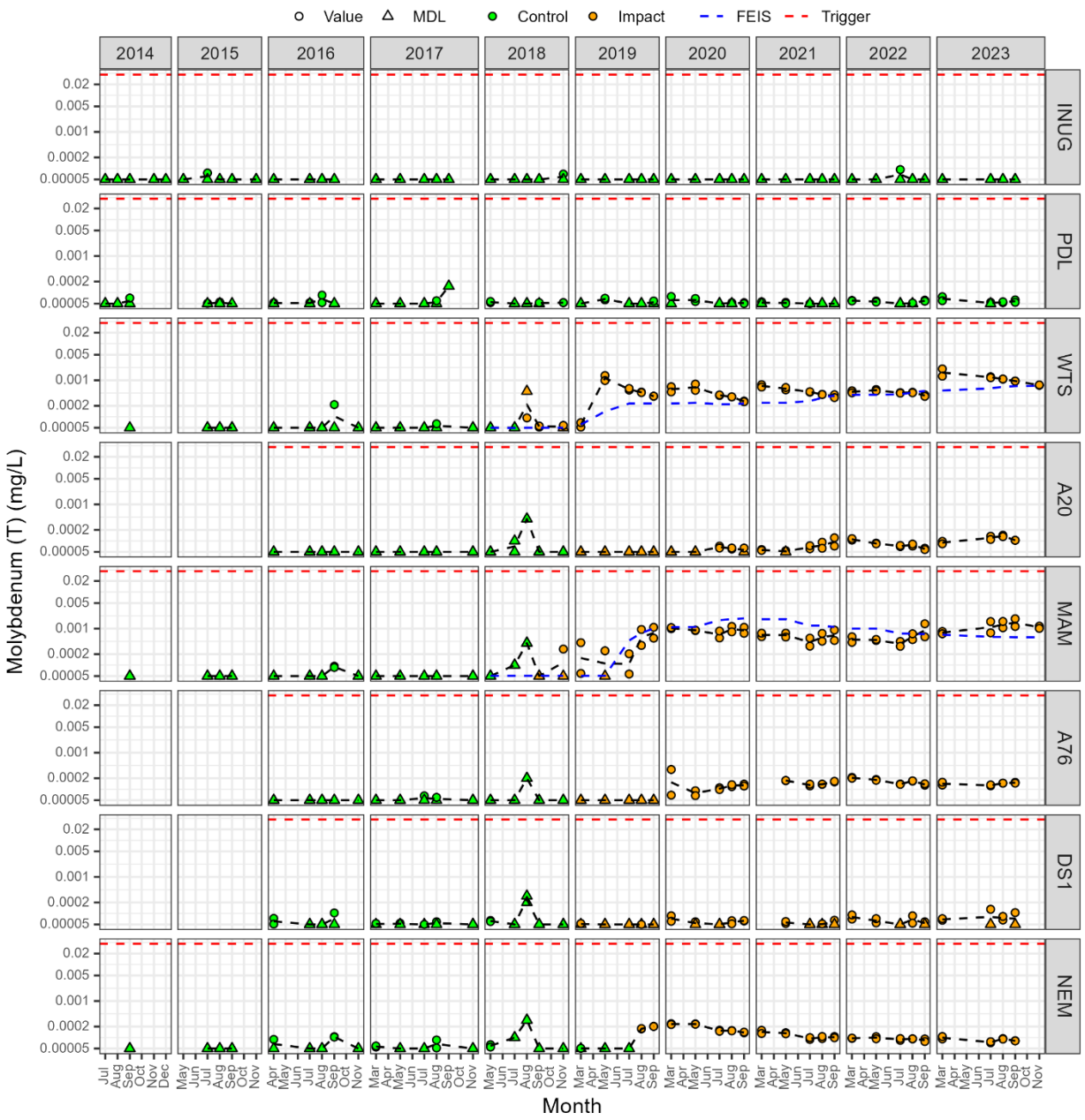


Figure B2-39. Total nickel (mg/L).

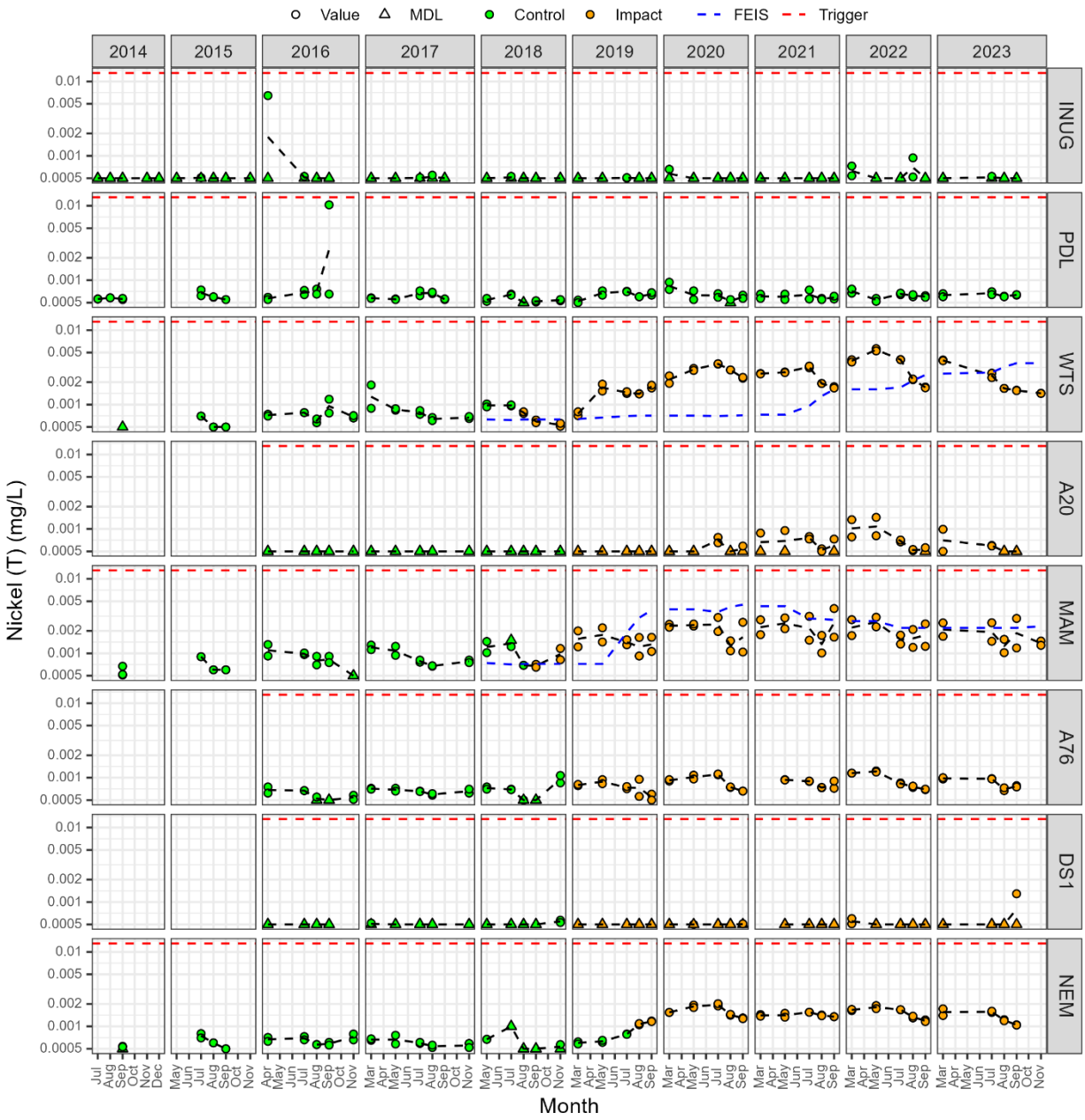


Figure B2-40. Total potassium (mg/L).

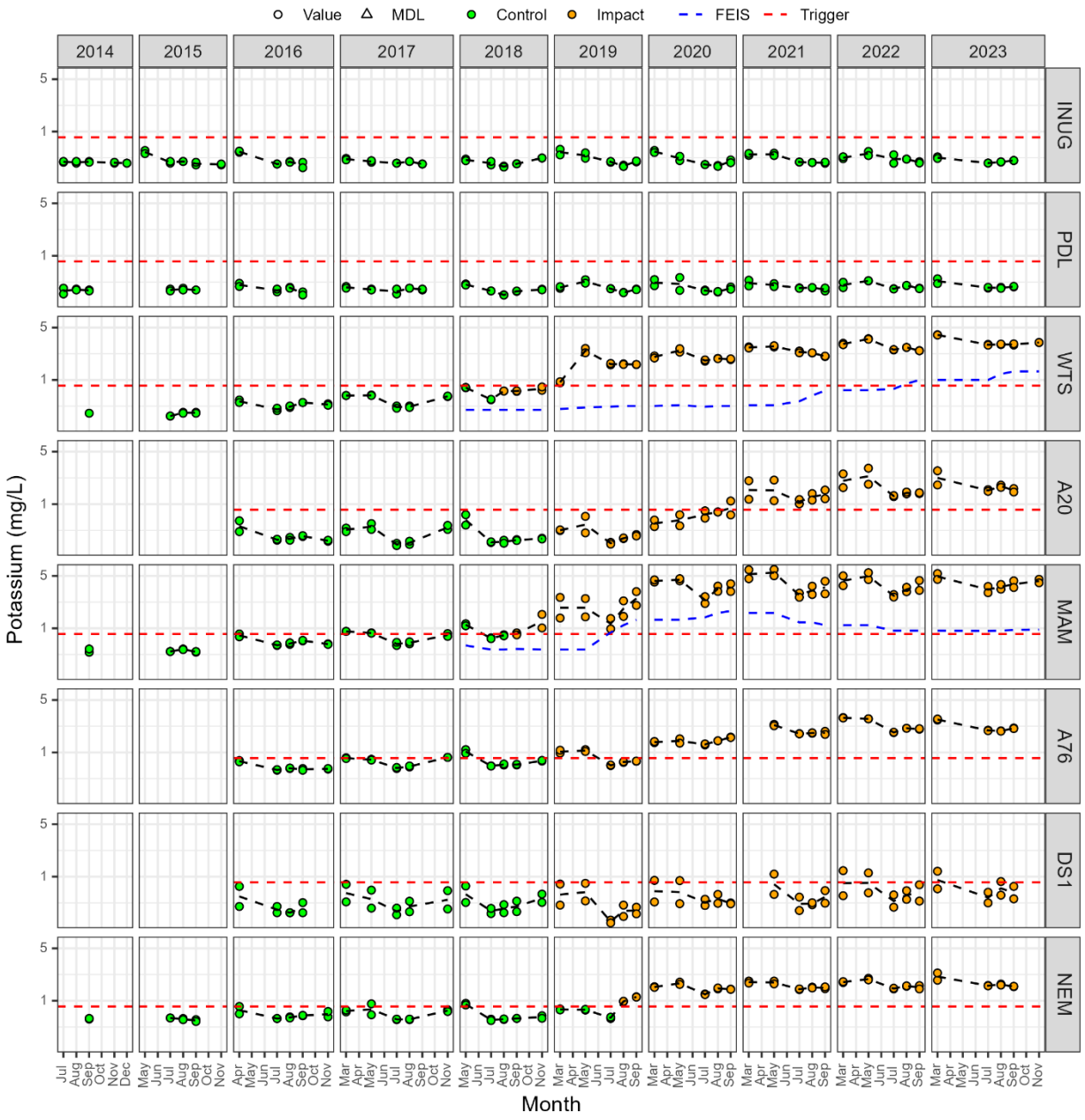


Figure B2-41. Total selenium (mg/L).

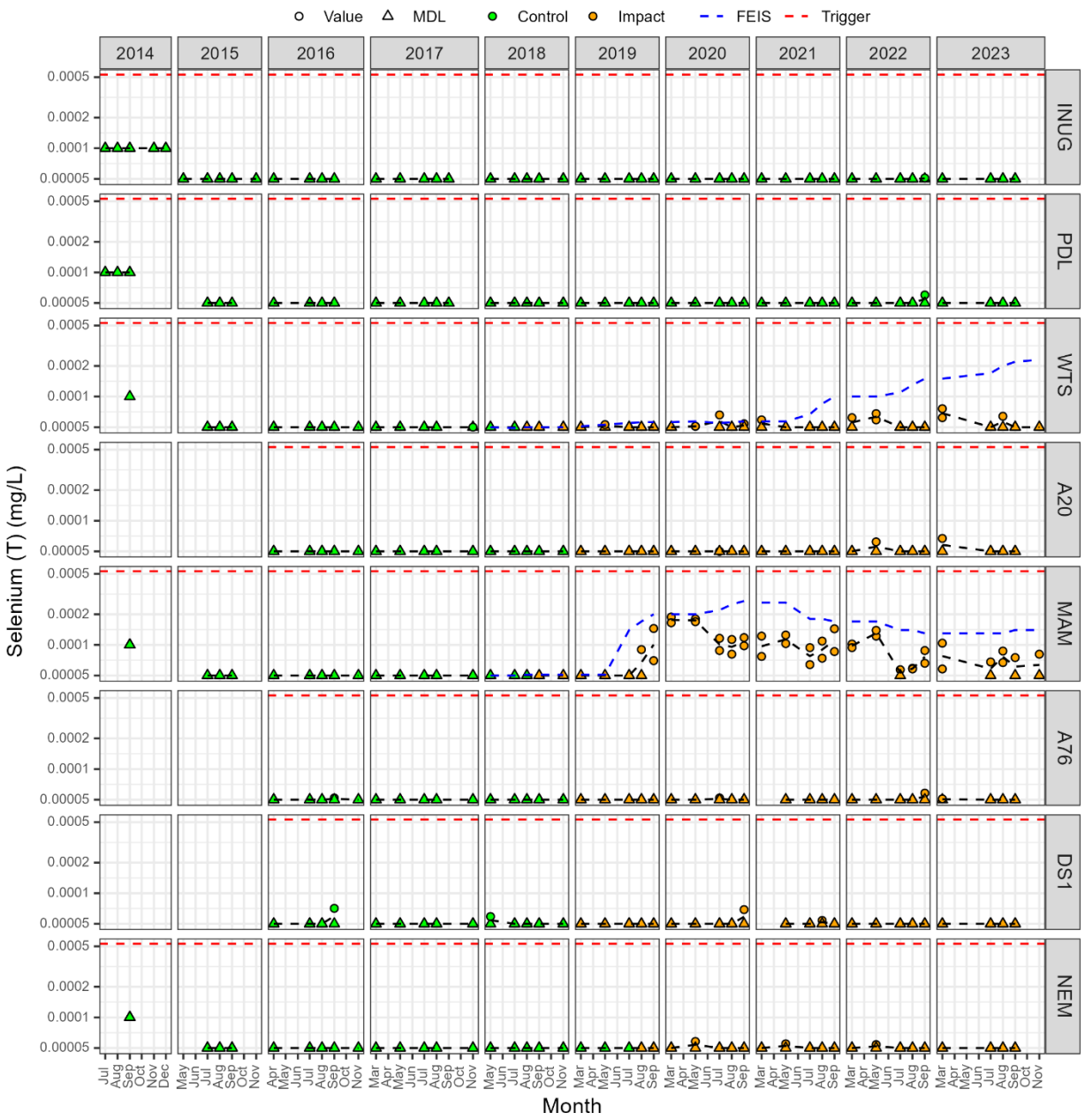


Figure B2-42. Total silicon (mg/L).

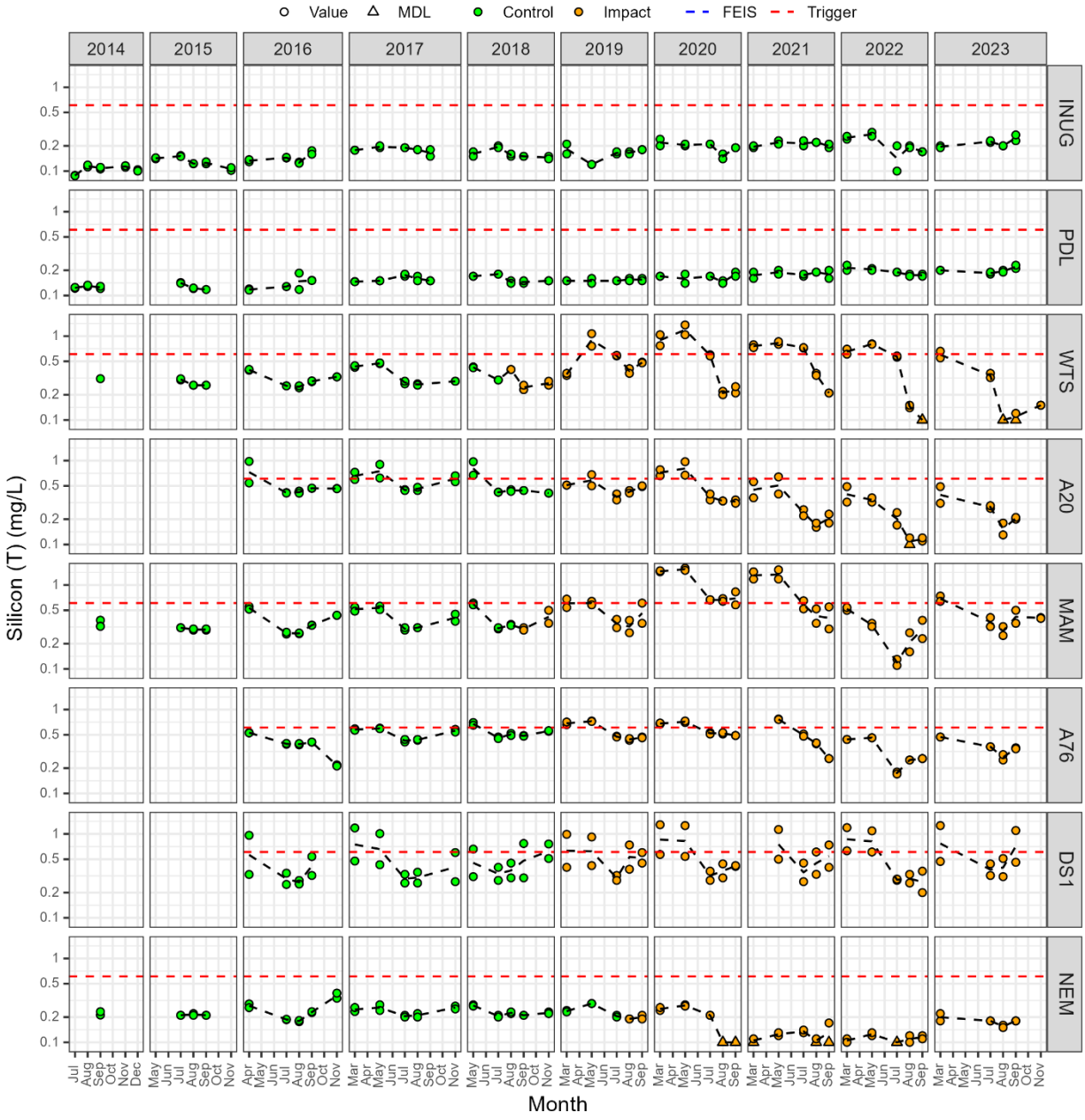


Figure B2-43. Total silver (mg/L).

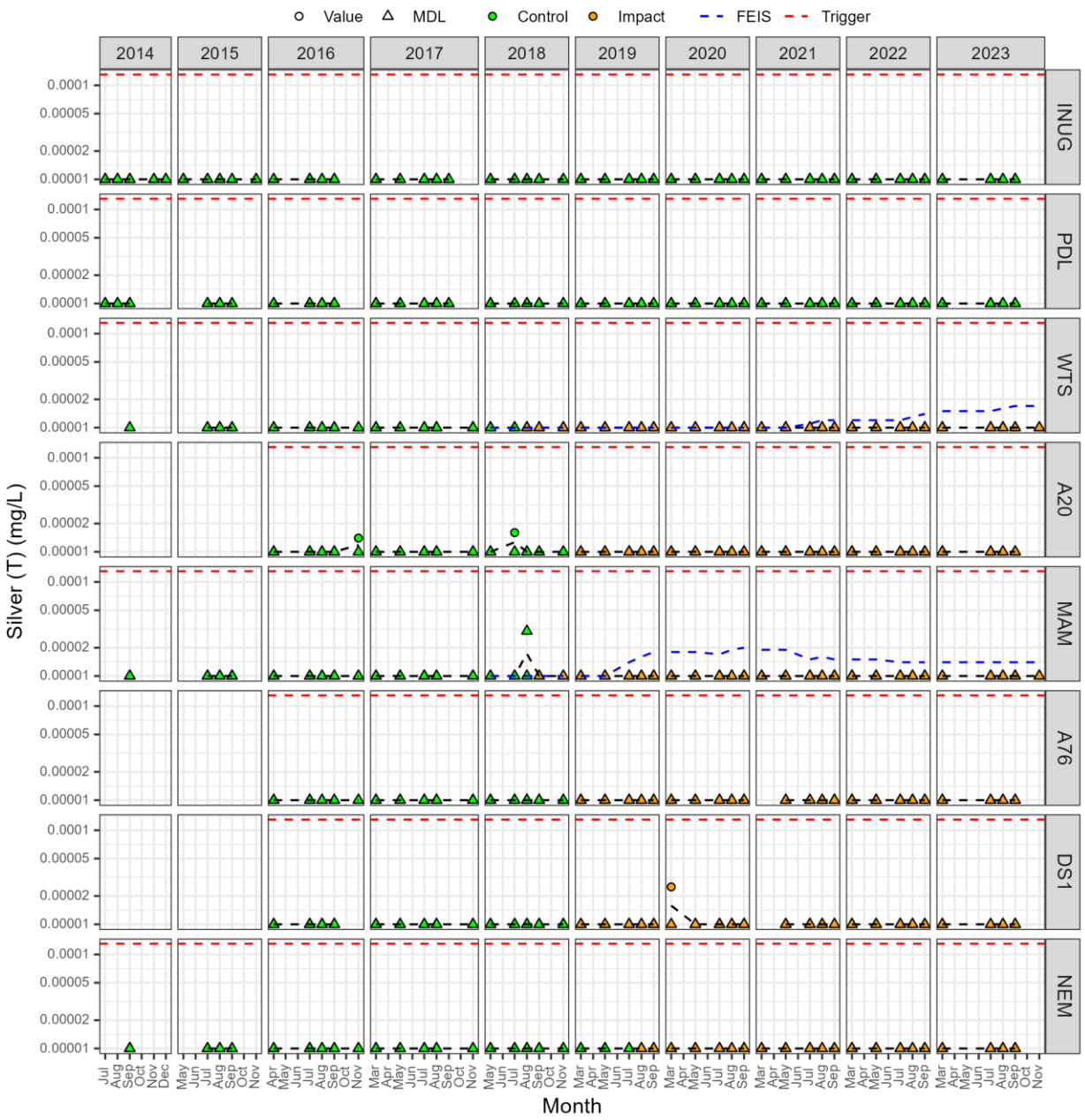


Figure B2-44. Total sodium (mg/L).

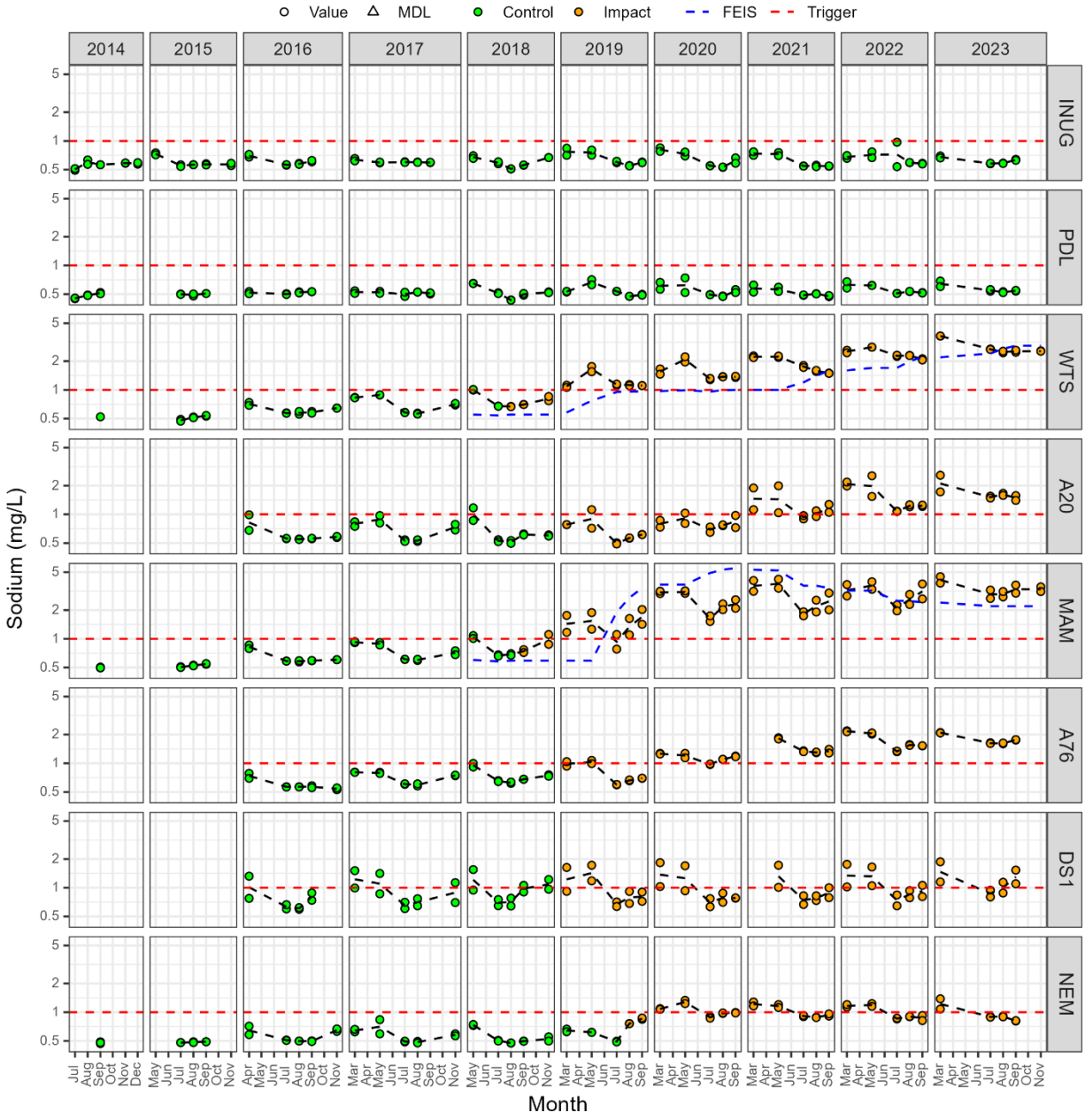


Figure B2-45. Total strontium (mg/L).

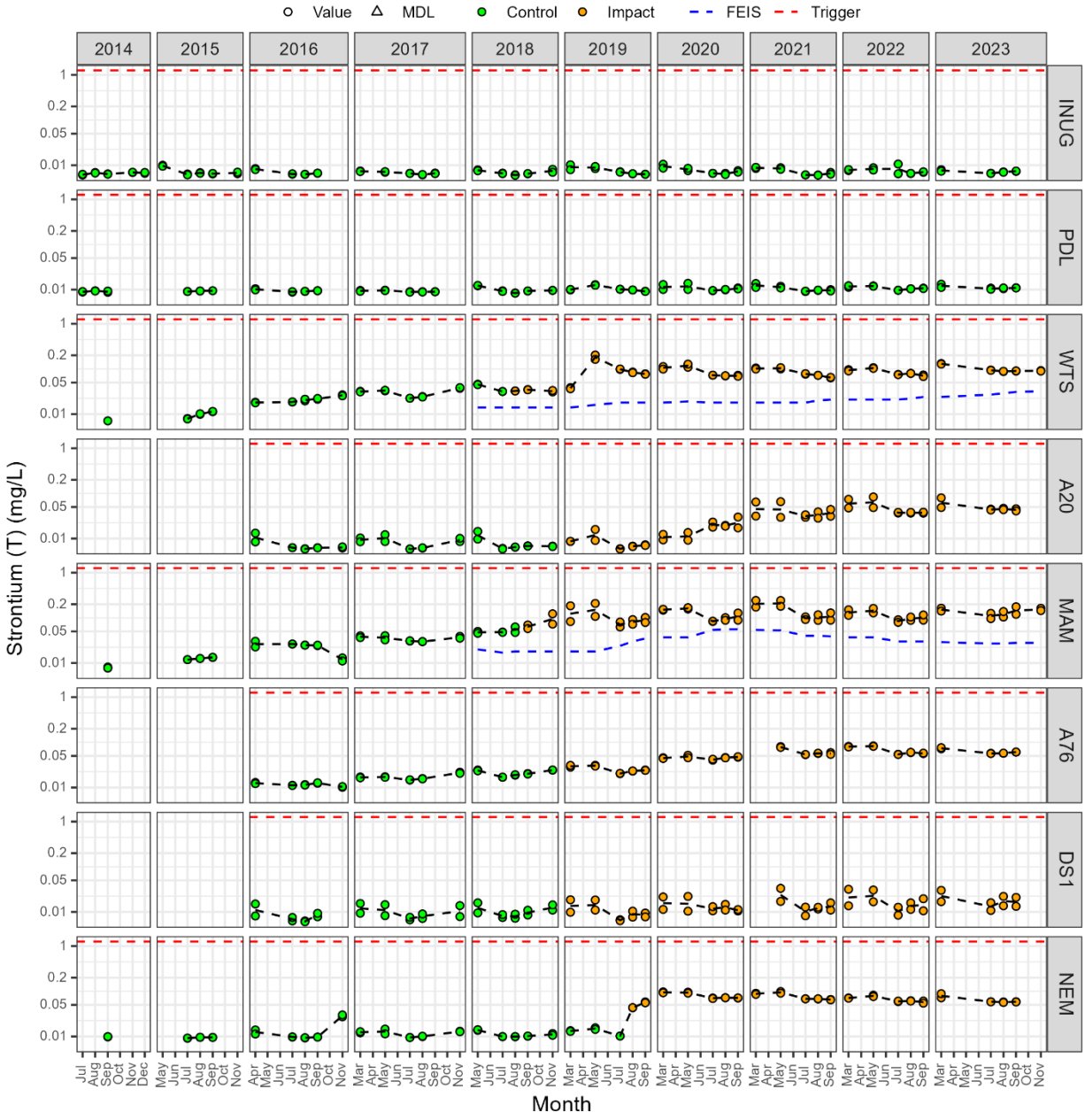


Figure B2-46. Total thallium (mg/L).

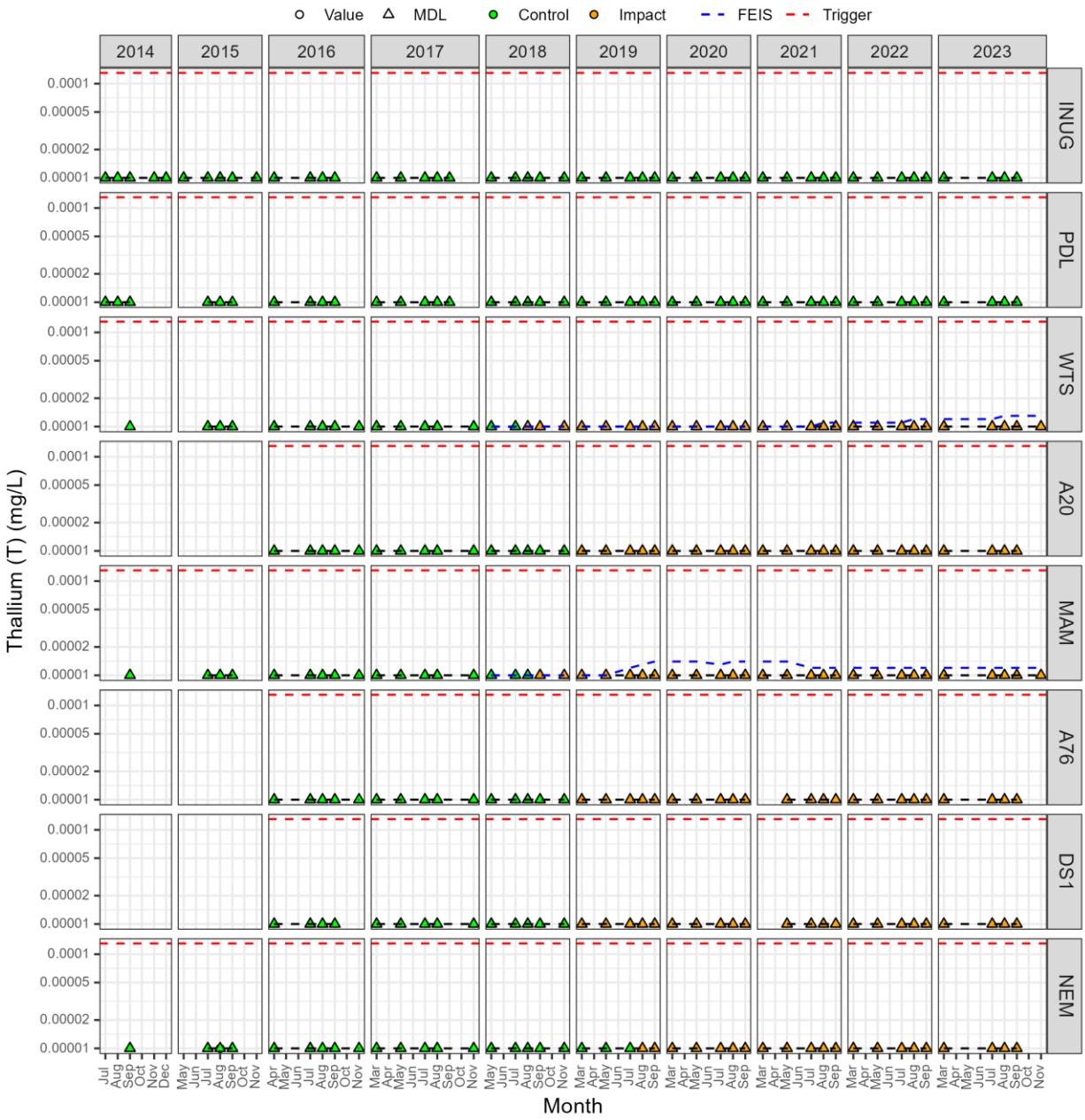


Figure B2-47. Total tin (mg/L).

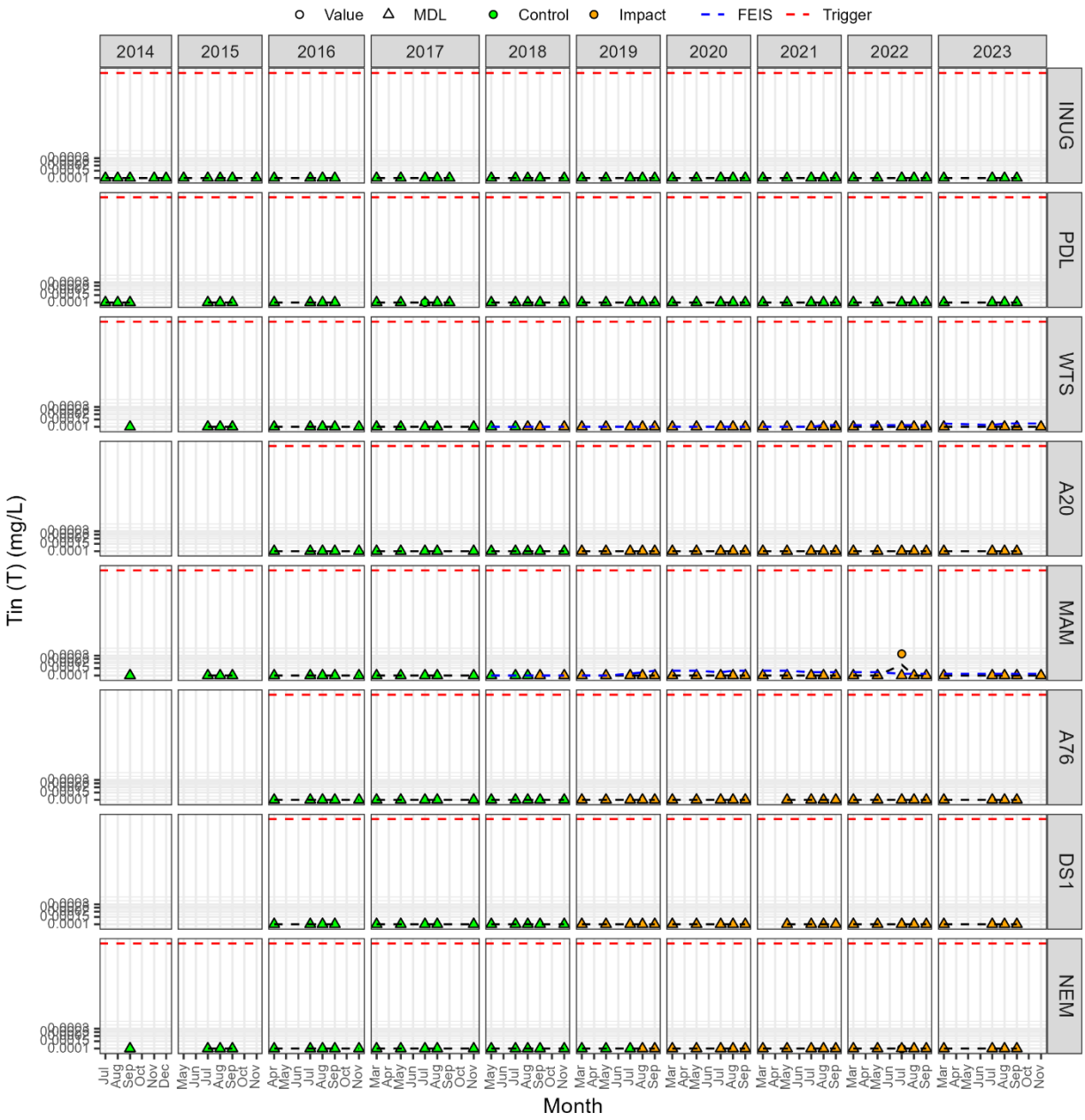


Figure B2-48. Total titanium (mg/L).

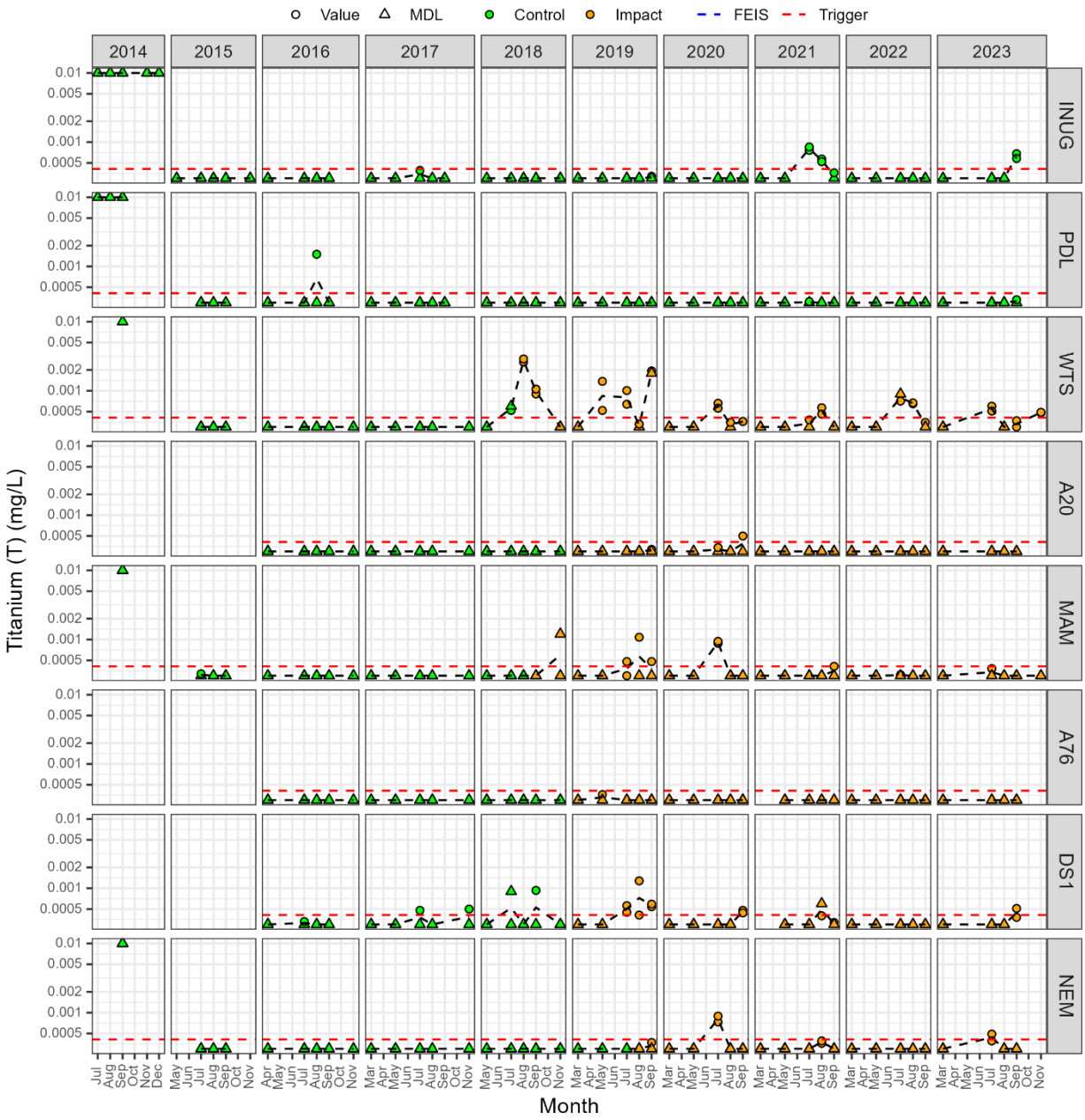


Figure B2-49. Total uranium (mg/L).

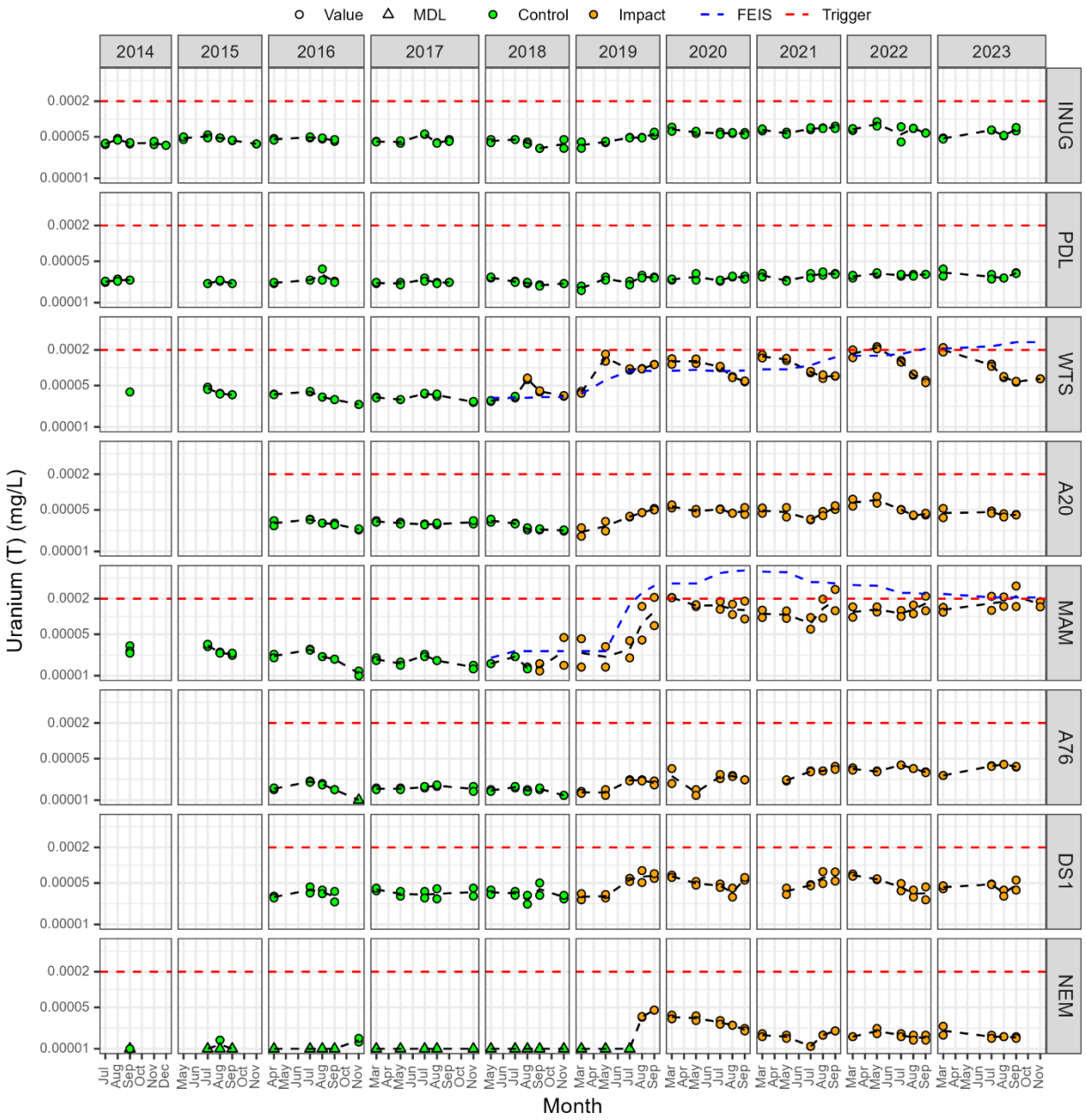


Figure B2-50. Total vanadium (mg/L).

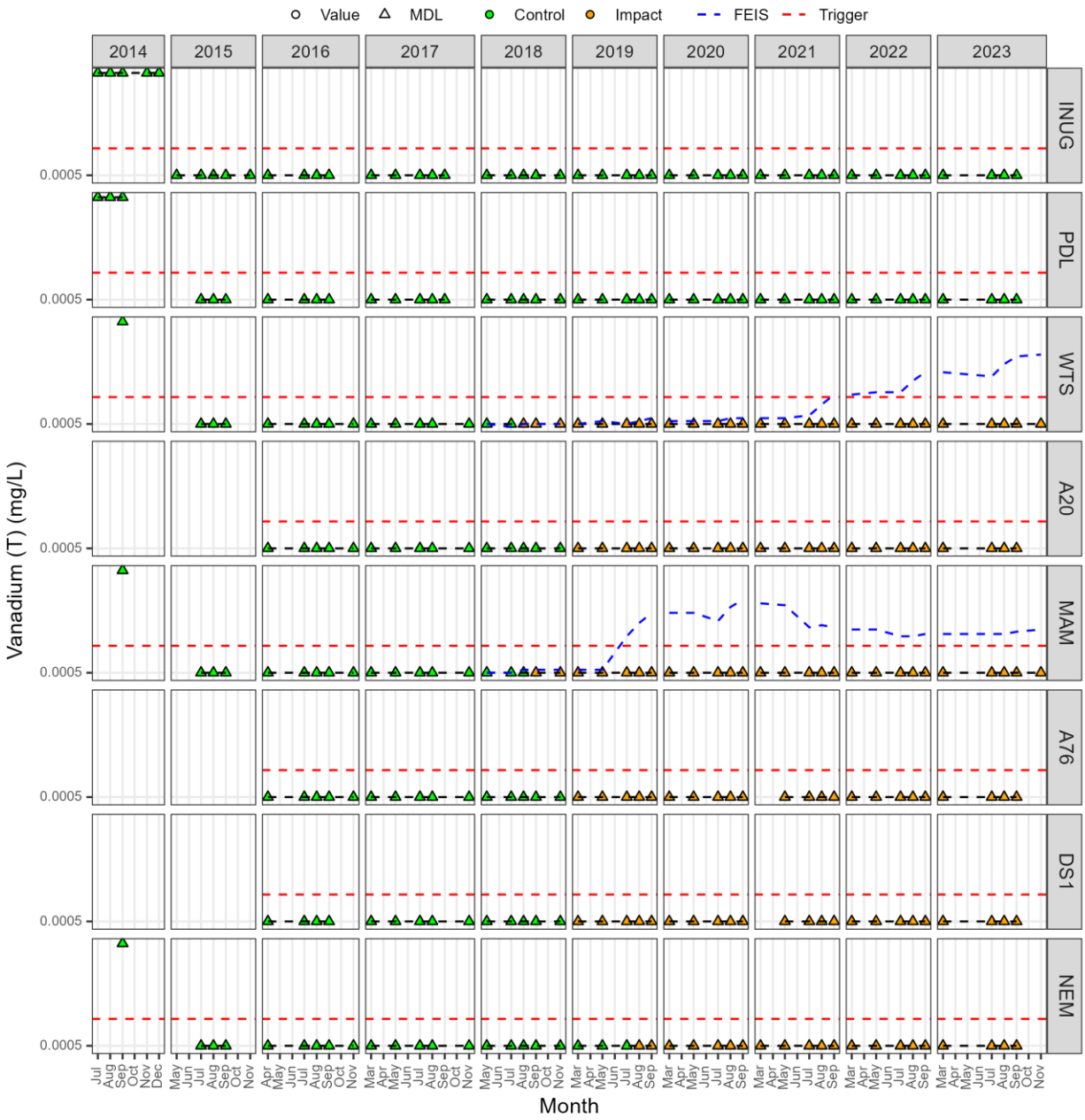


Figure B2-51. Total zinc (mg/L).

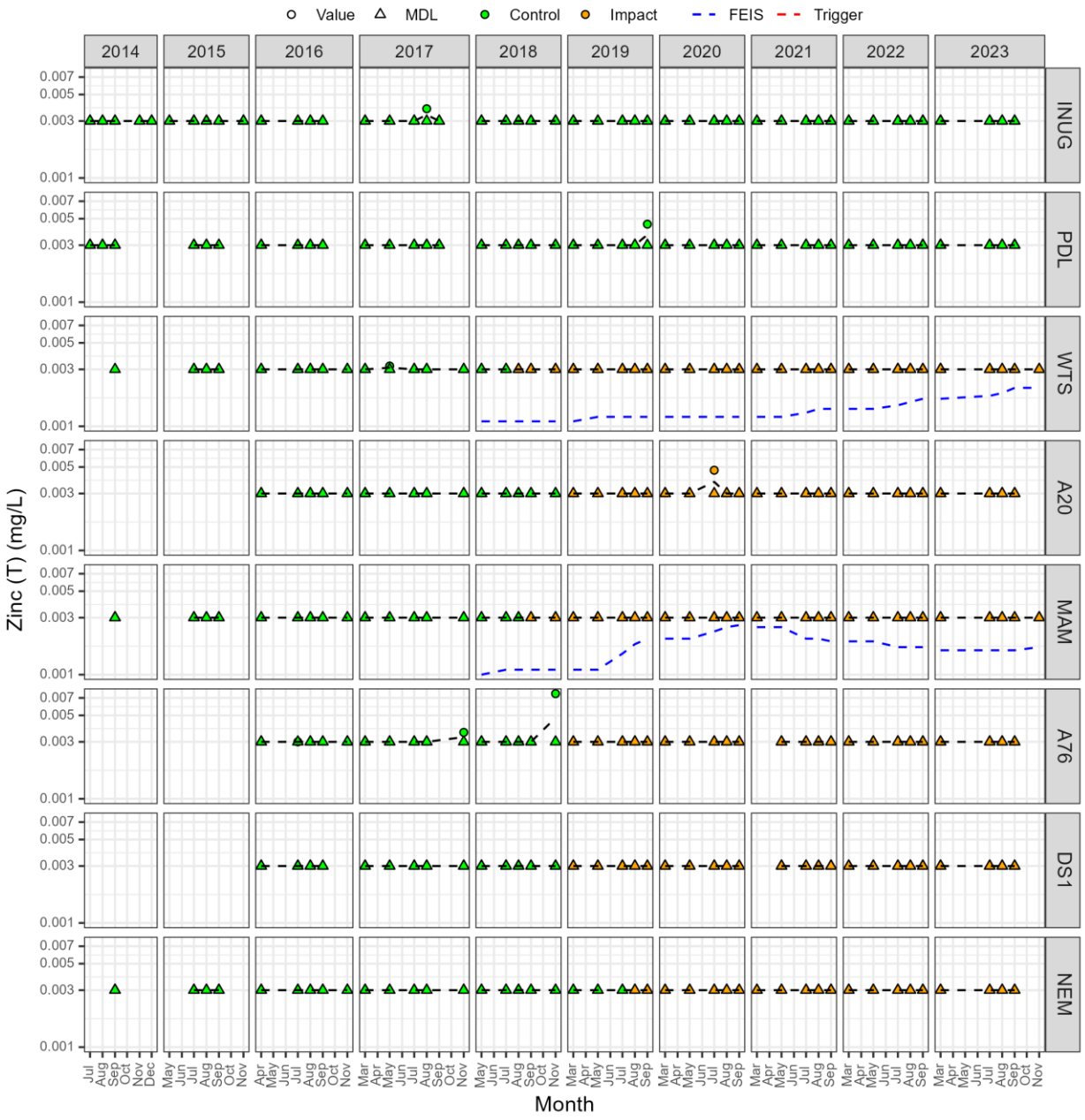


Figure B2-52. Dissolved aluminum (mg/L).

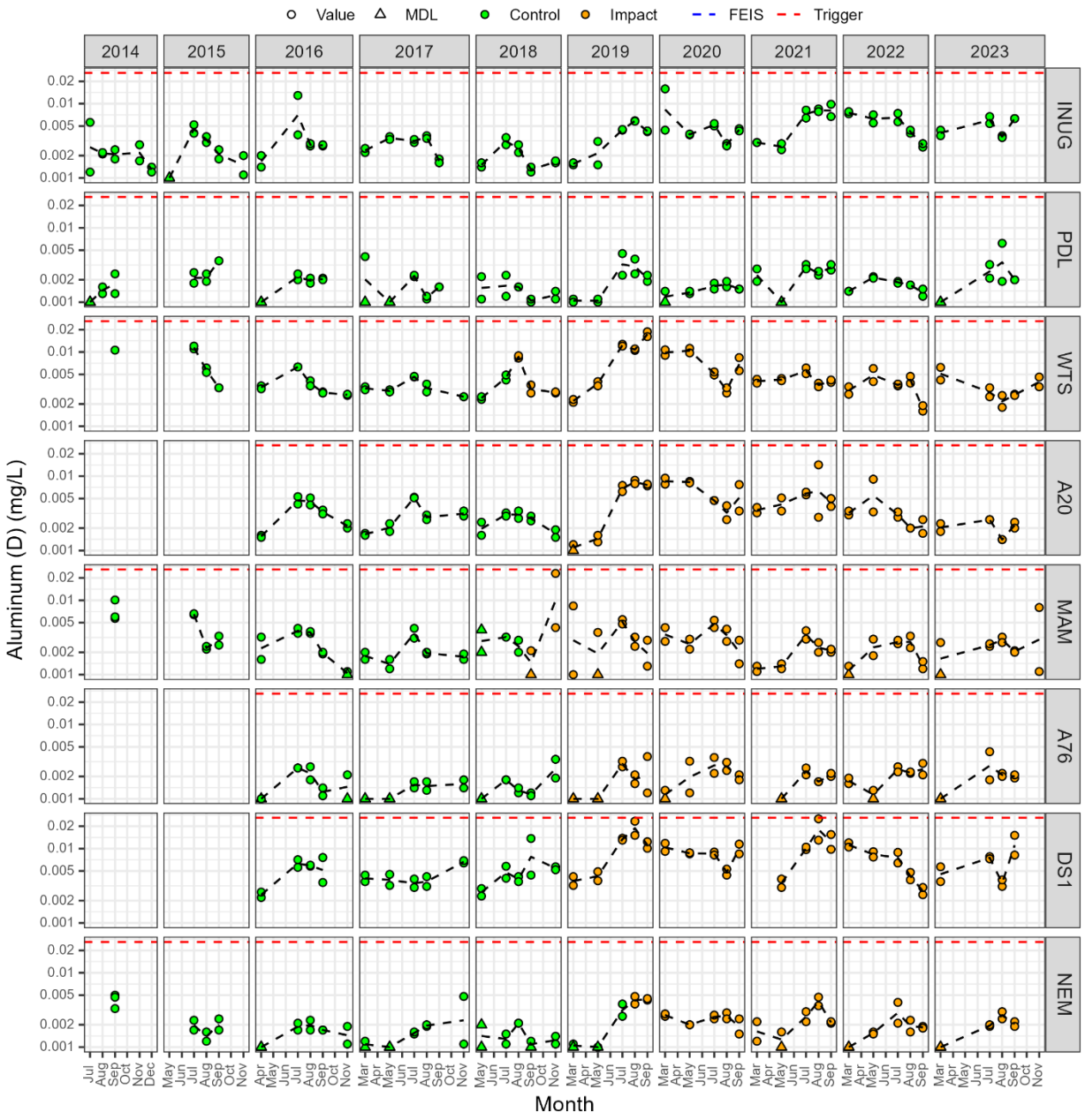


Figure B2-53. Dissolved antimony (mg/L).

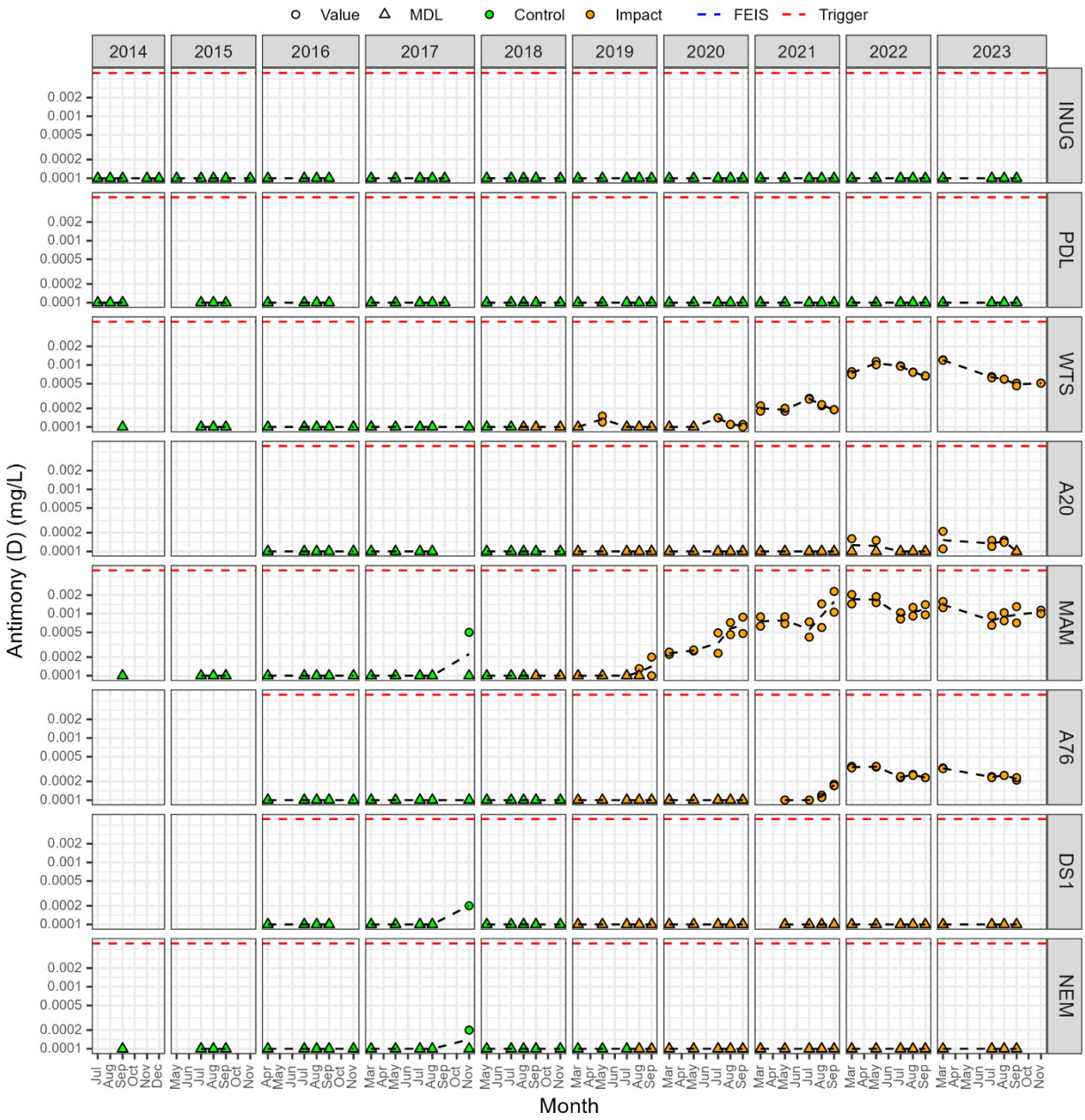


Figure B2-54. Dissolved arsenic (mg/L).

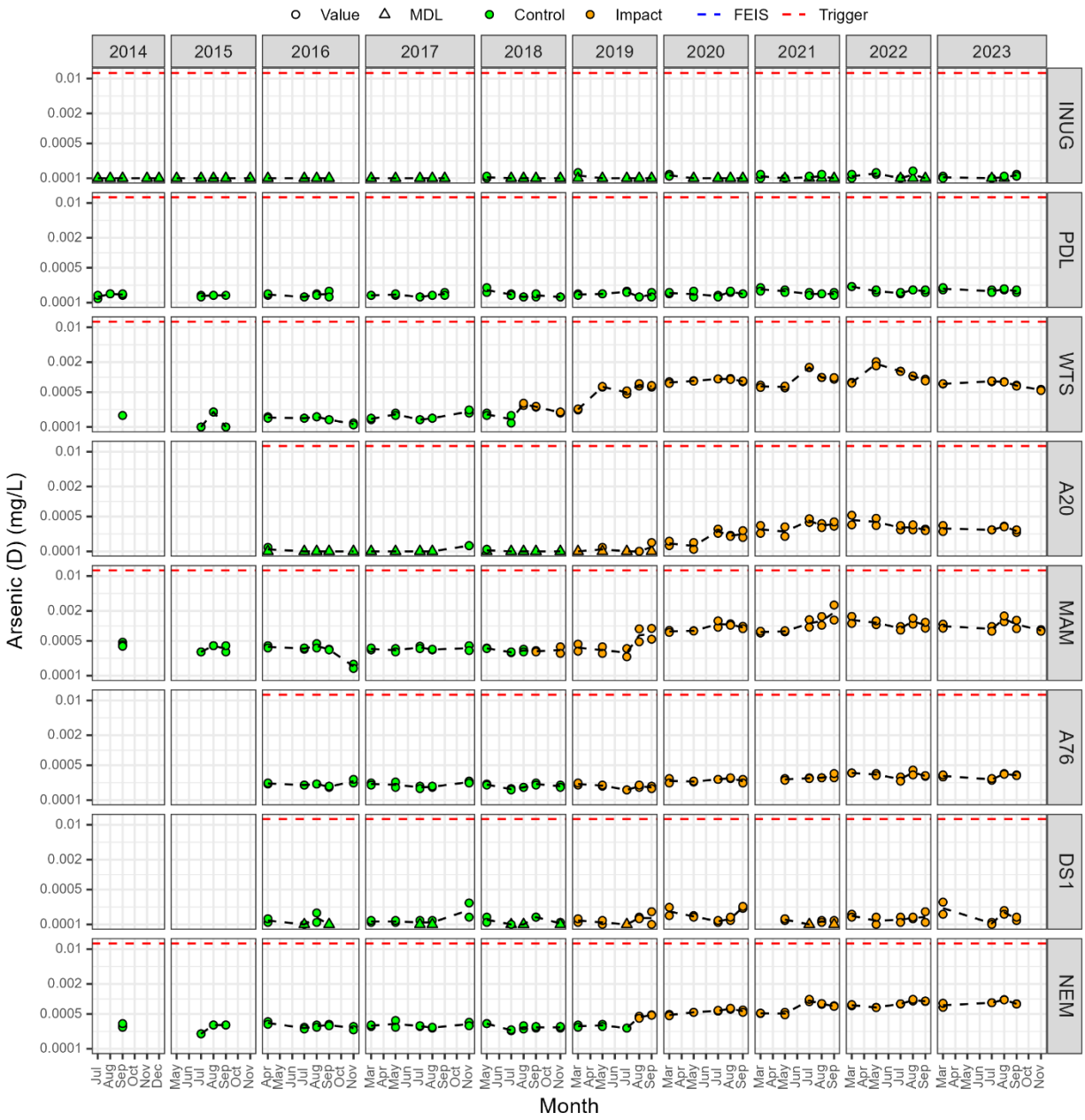


Figure B2-55. Dissolved barium (mg/L).

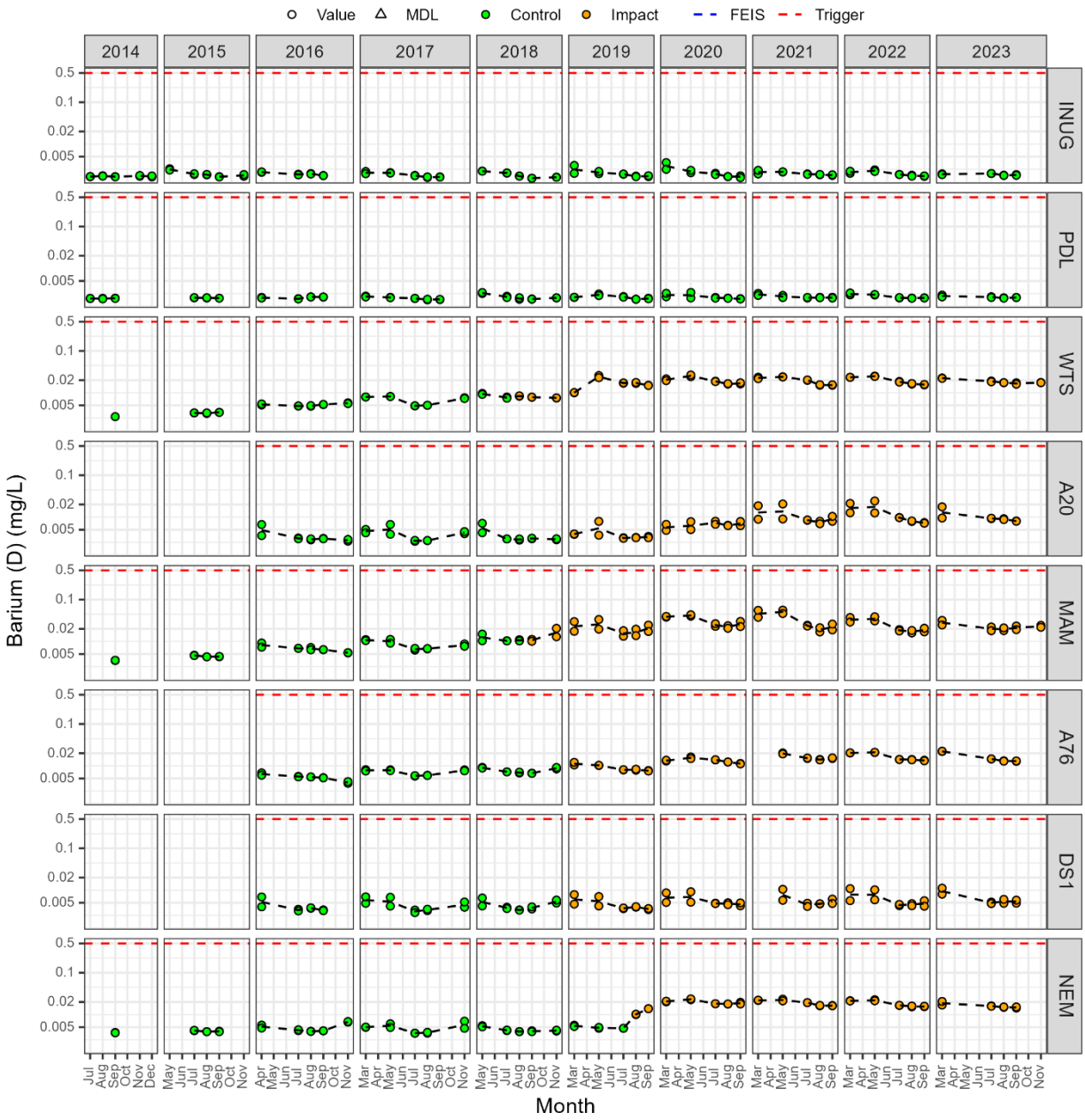


Figure B2-56. Dissolved beryllium (mg/L).

Note: Detection limits for beryllium were revised in 2018 due to method re-validation and analysis at the lower detection limit is no longer available at ALS (Pers. Comm. Brent Mack, ALS November 28, 2022).

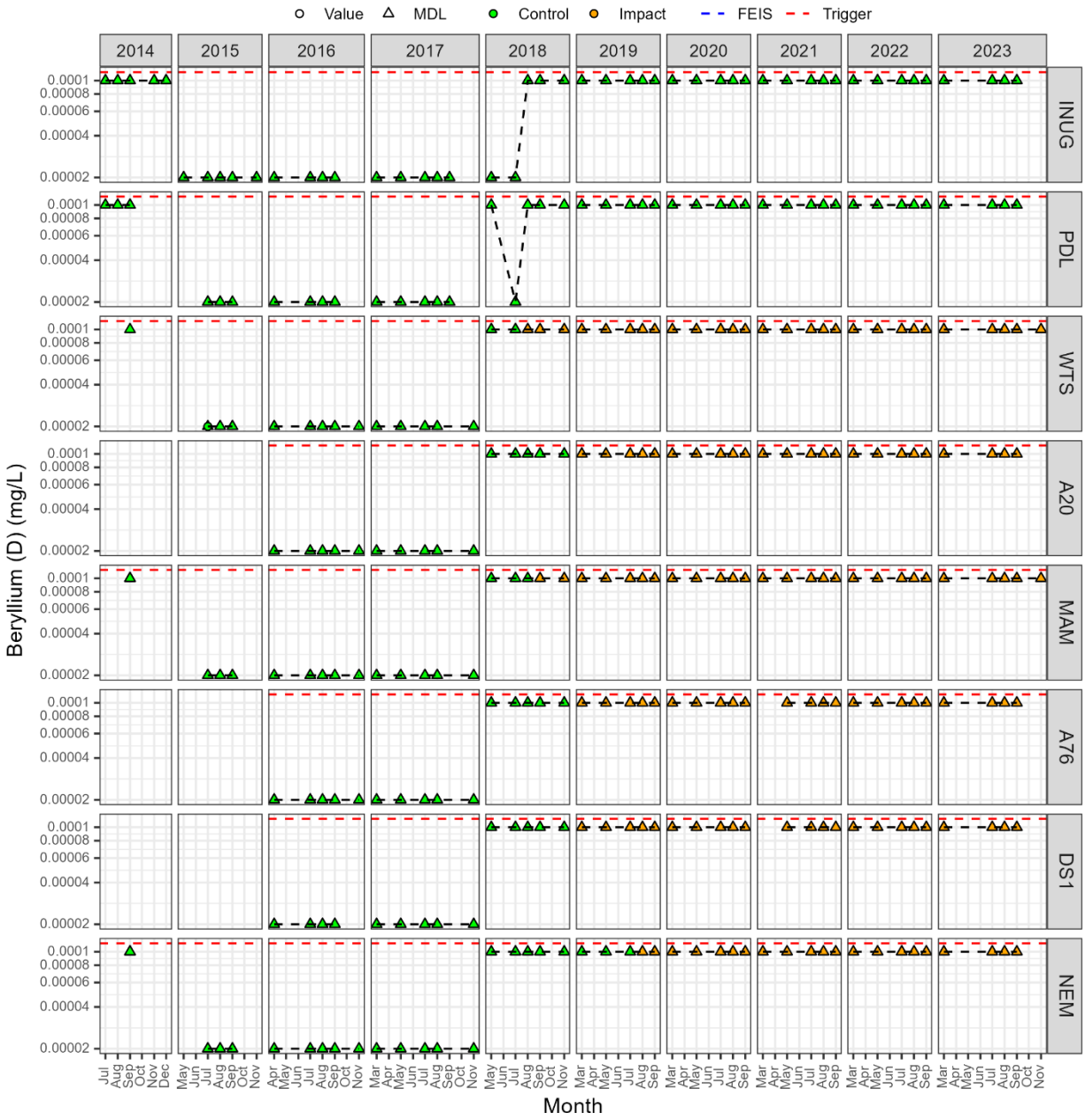


Figure B2-57. Dissolved boron (mg/L).

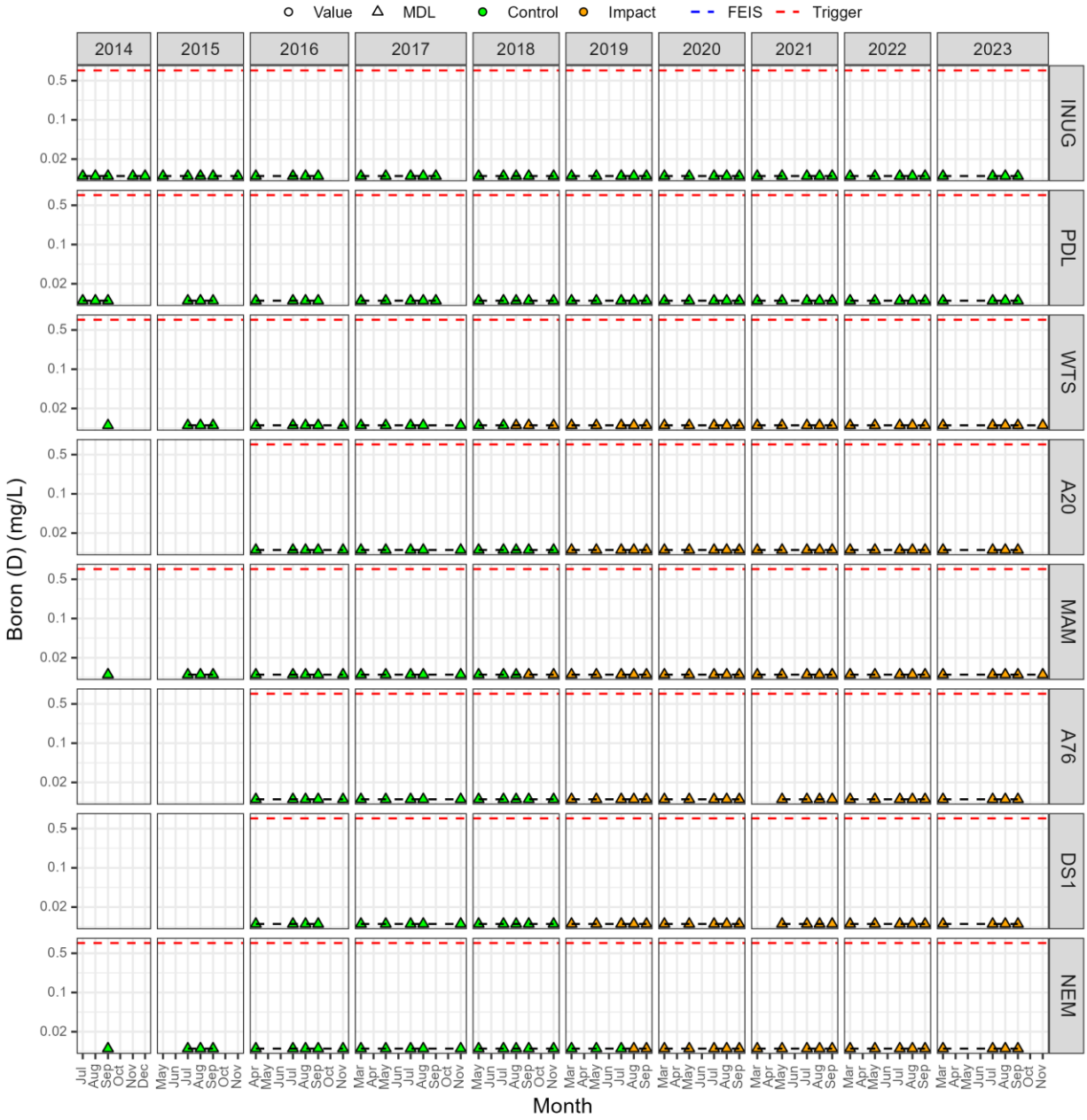


Figure B2-58. Dissolved cadmium (mg/L).

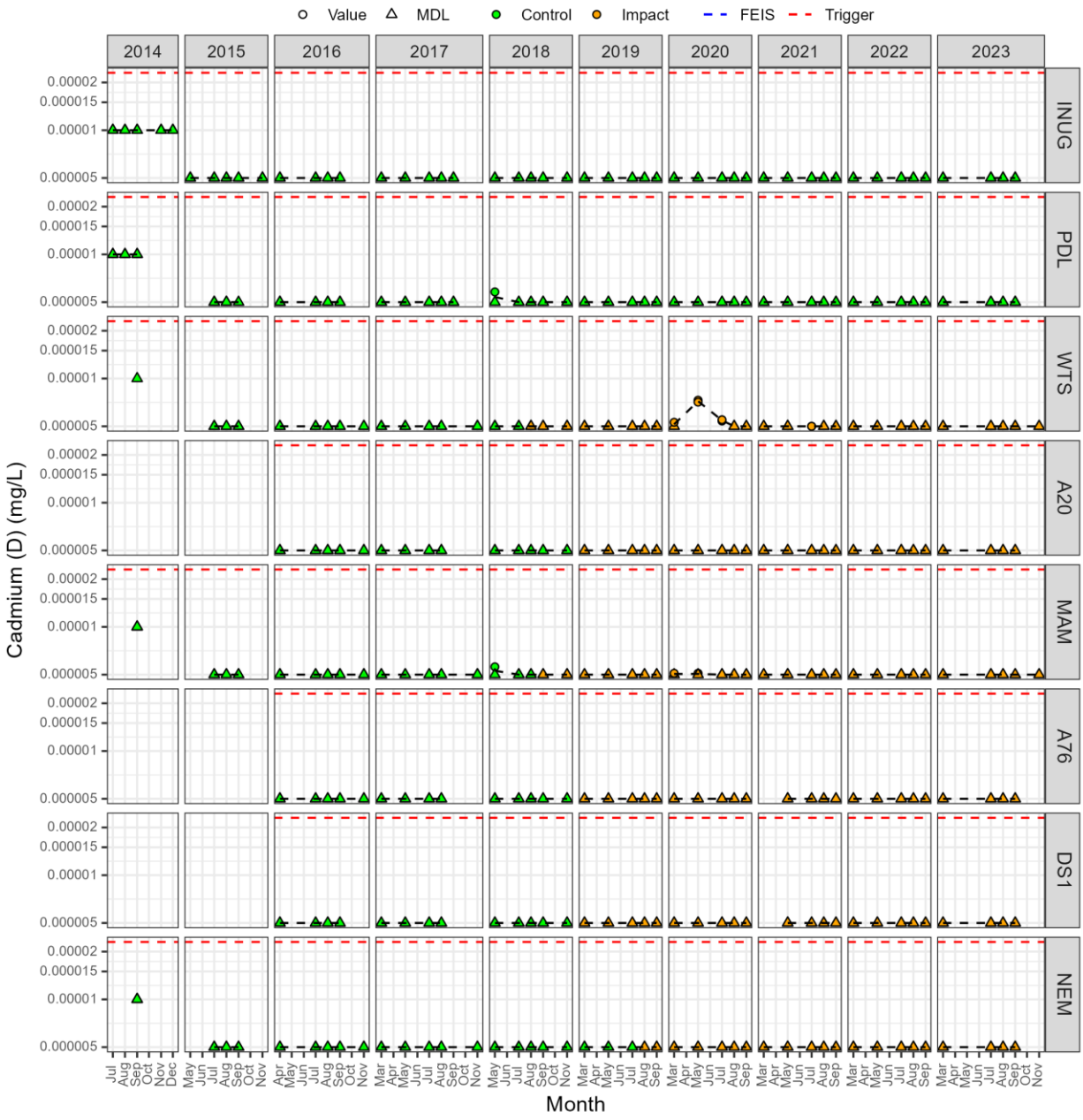


Figure B2-59. Dissolved chromium (mg/L).

Note: The detection limit was revised in 2021 due to method re-validation (Pers. Comm. Brent Mack, ALS November 28, 2022). Low-level chromium analysis is available at a cost and will be requested for samples starting in 2023.

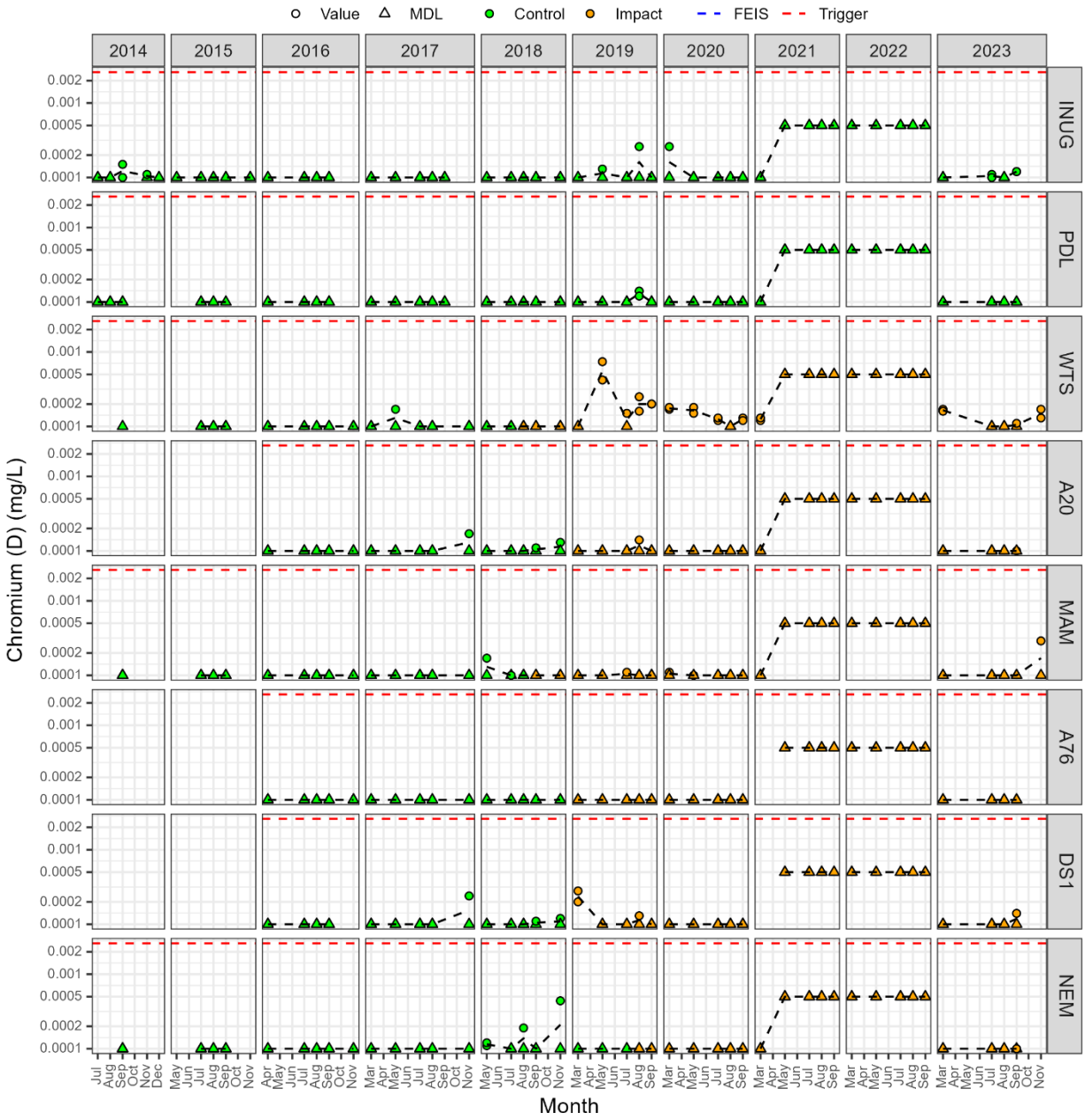


Figure B2-60. Dissolved copper (mg/L).

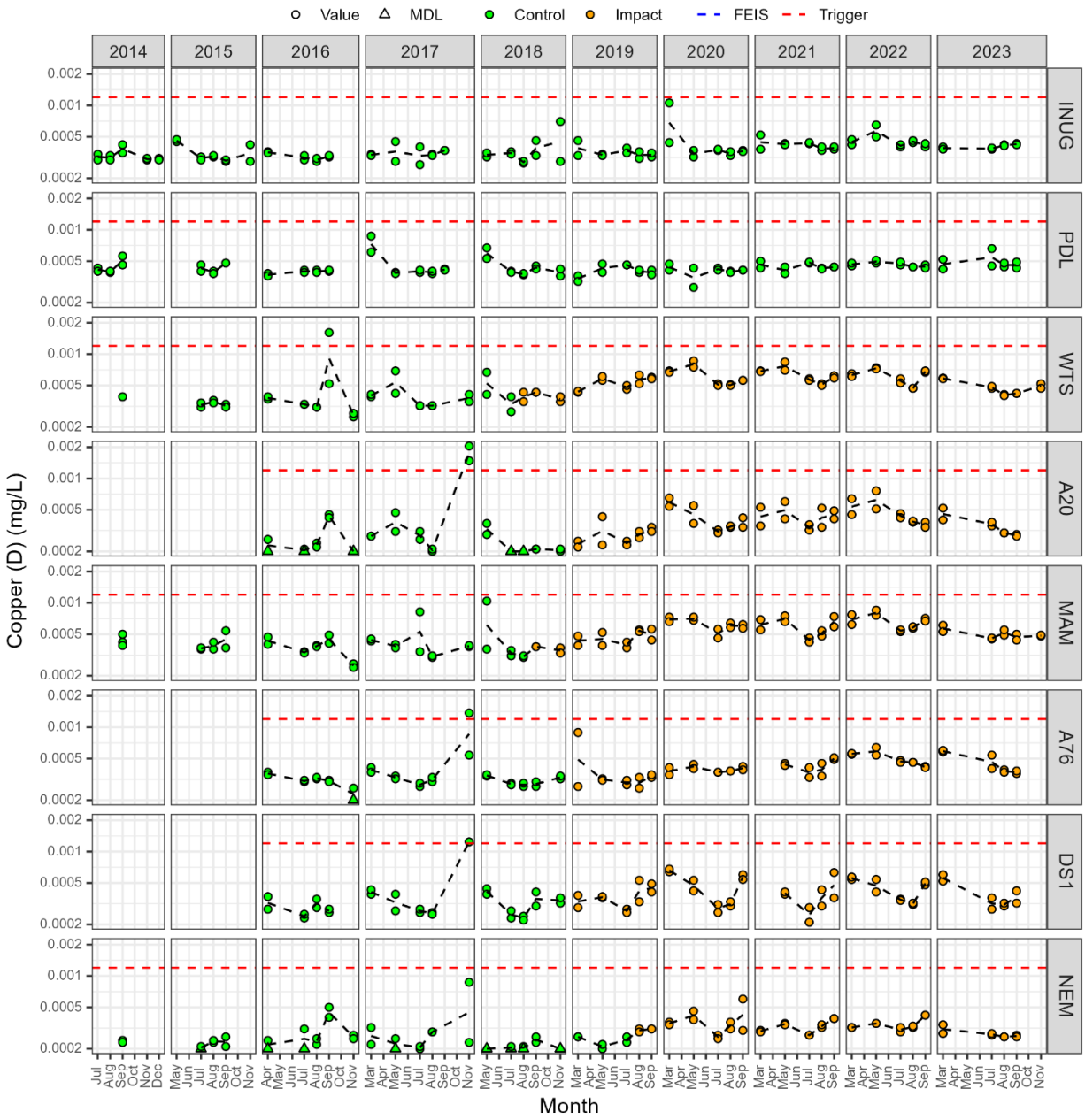


Figure B2-61. Dissolved iron (mg/L).

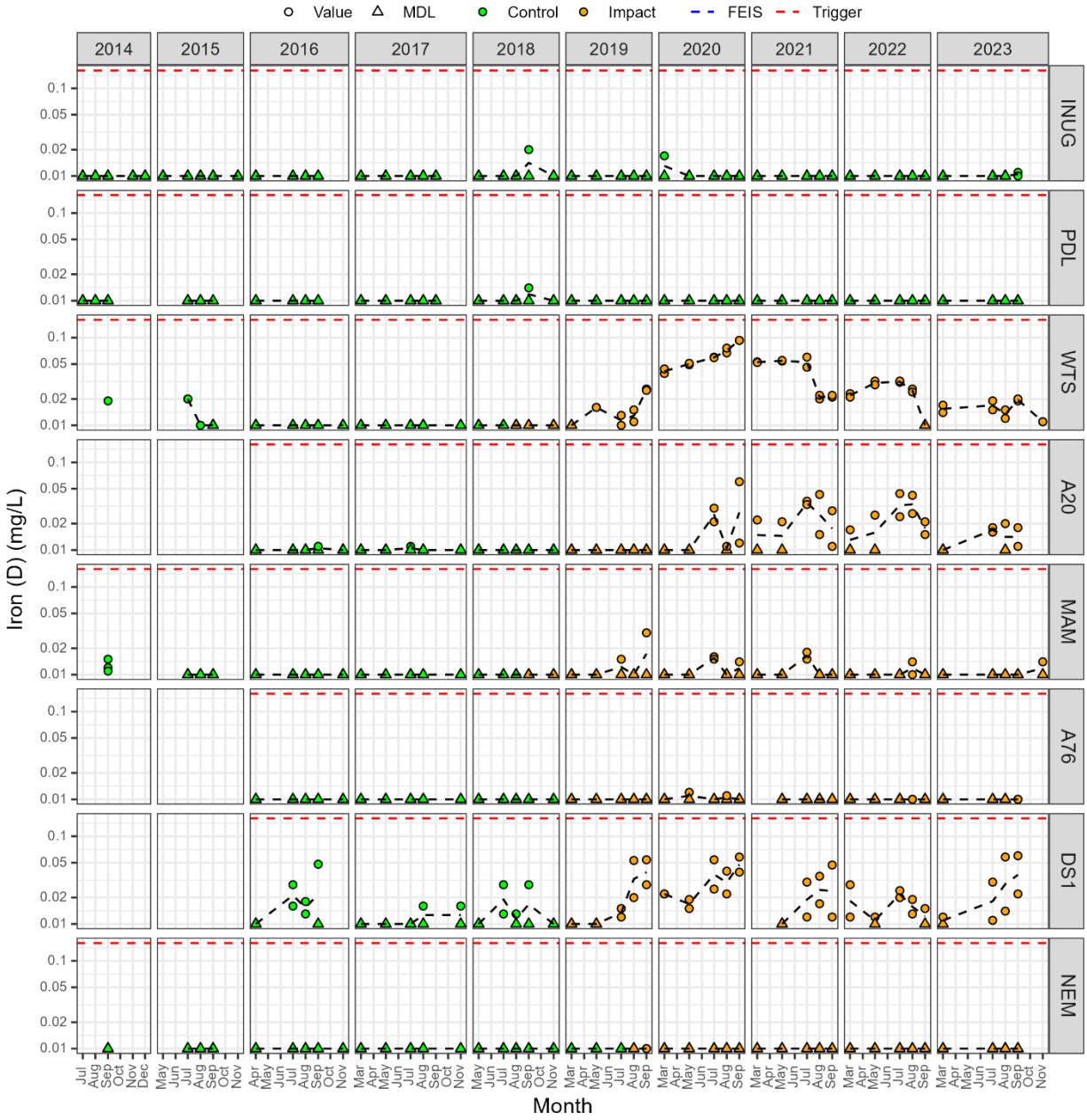


Figure B2-62. Dissolved lead (mg/L).

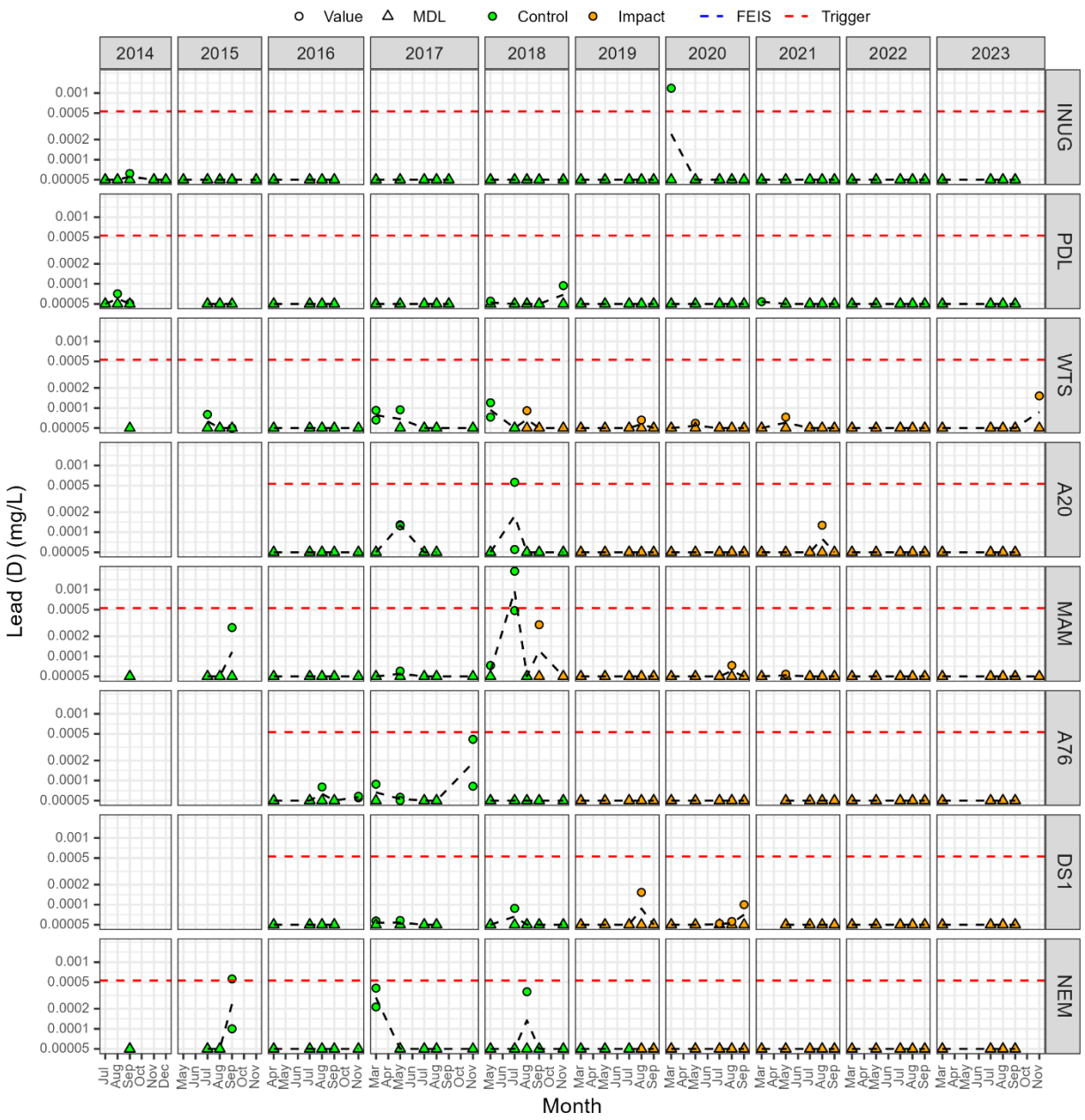


Figure B2-63. Dissolved lithium (mg/L).

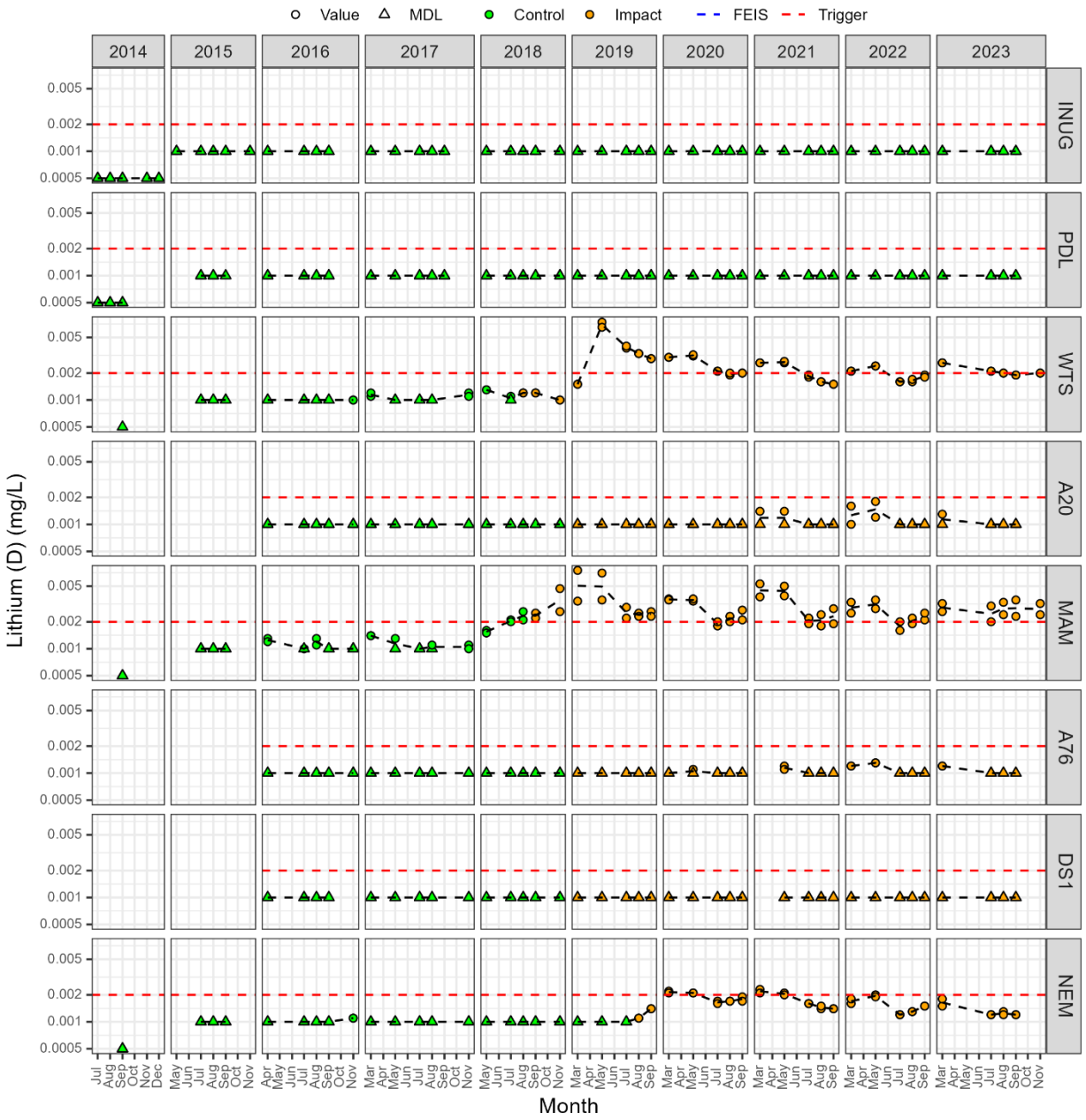


Figure B2-64. Dissolved manganese (mg/L).

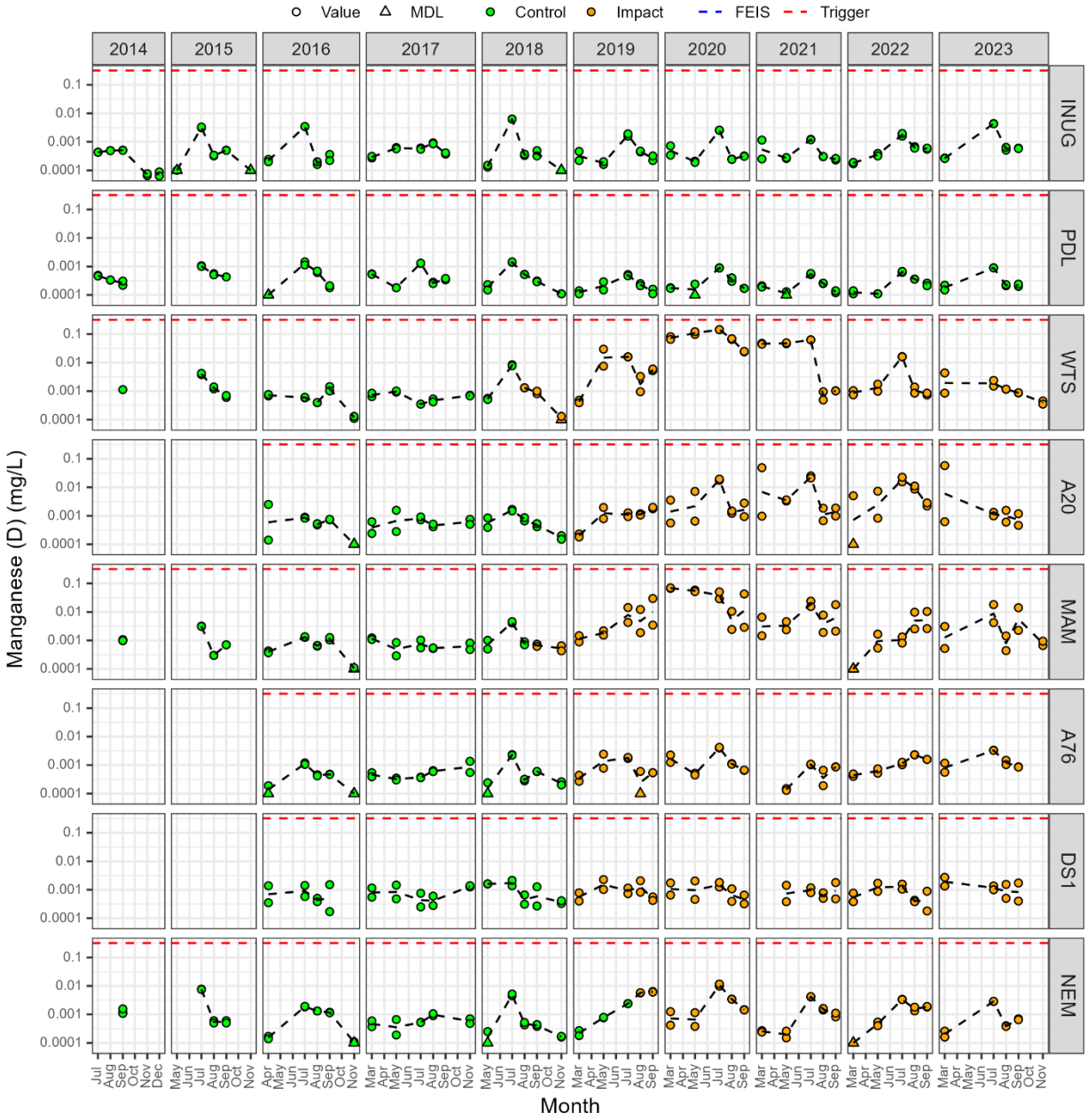


Figure B2-65. Dissolved mercury (mg/L).

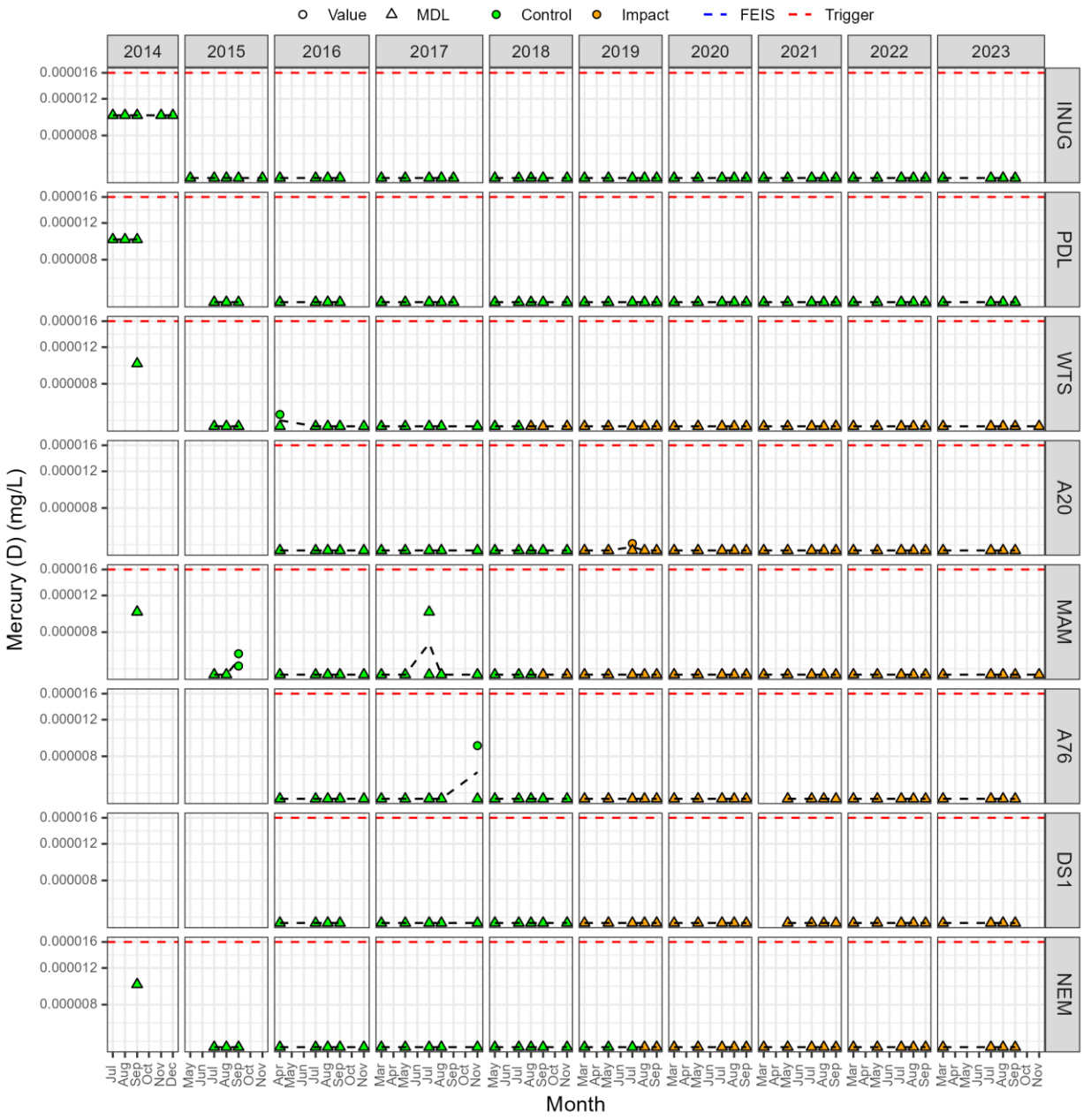


Figure B2-66. Dissolved molybdenum (mg/L).

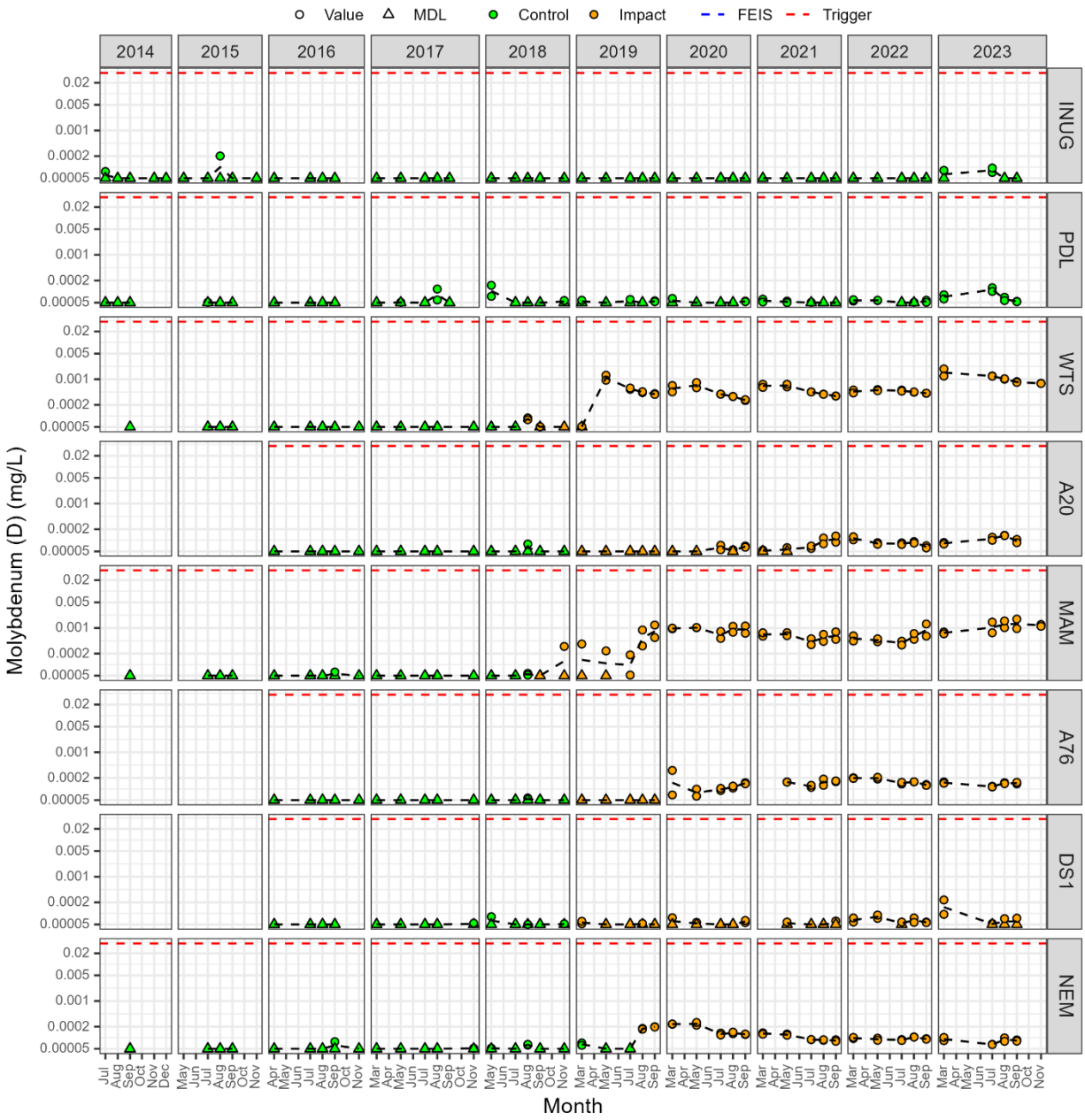


Figure B2-67. Dissolved nickel (mg/L).

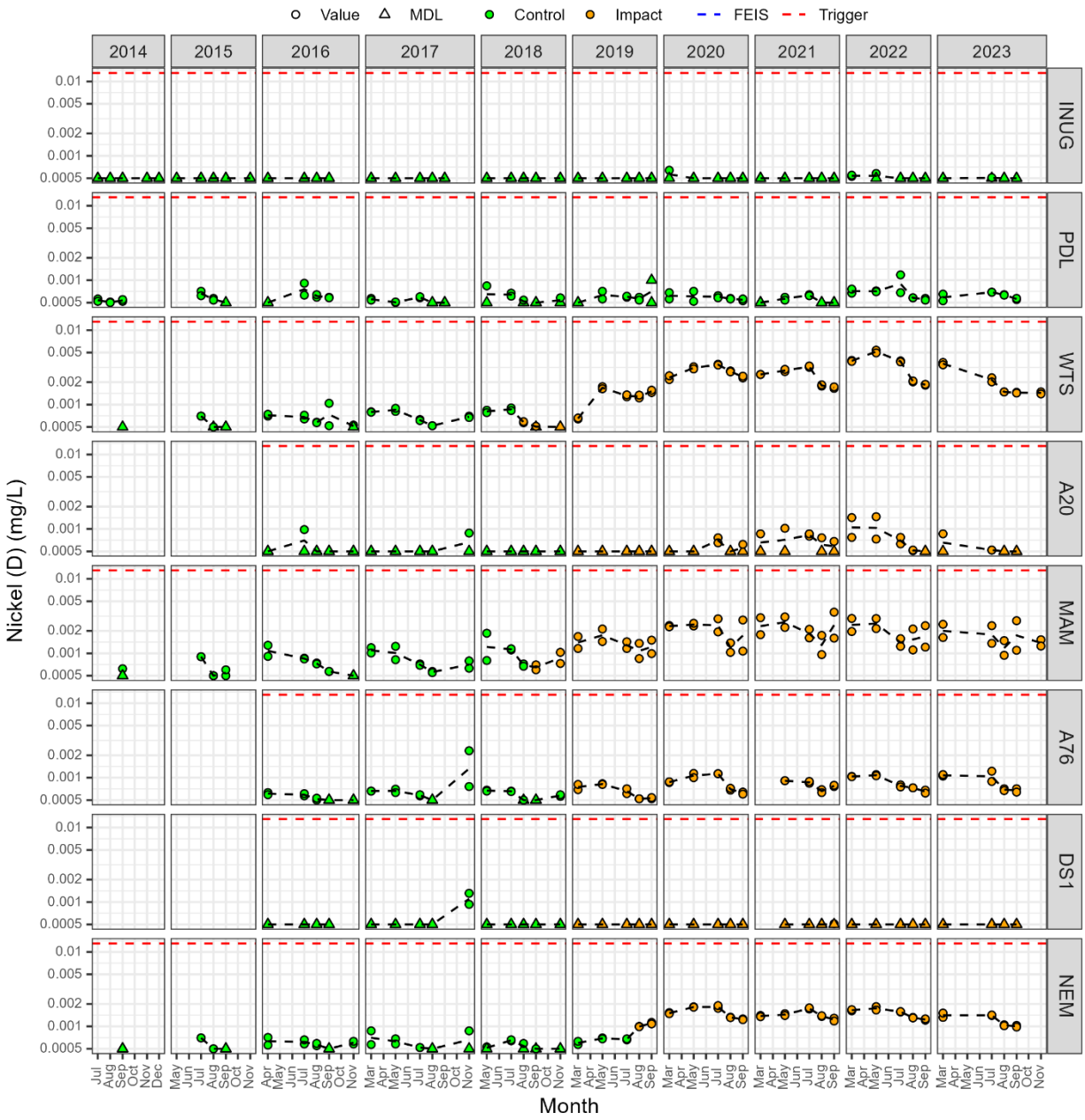


Figure B2-68. Dissolved selenium (mg/L).

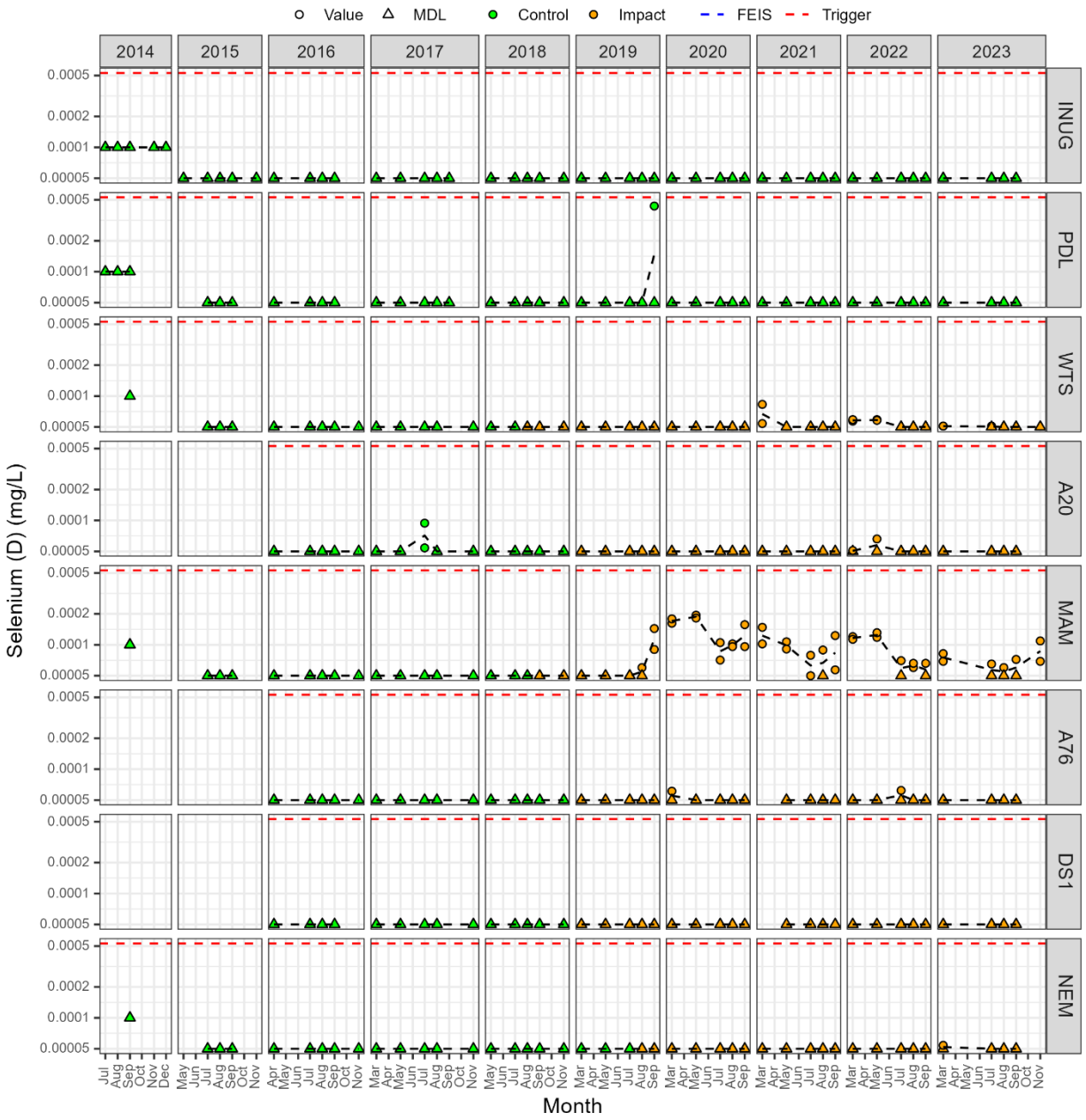


Figure B2-69. Dissolved silicon (mg/L).

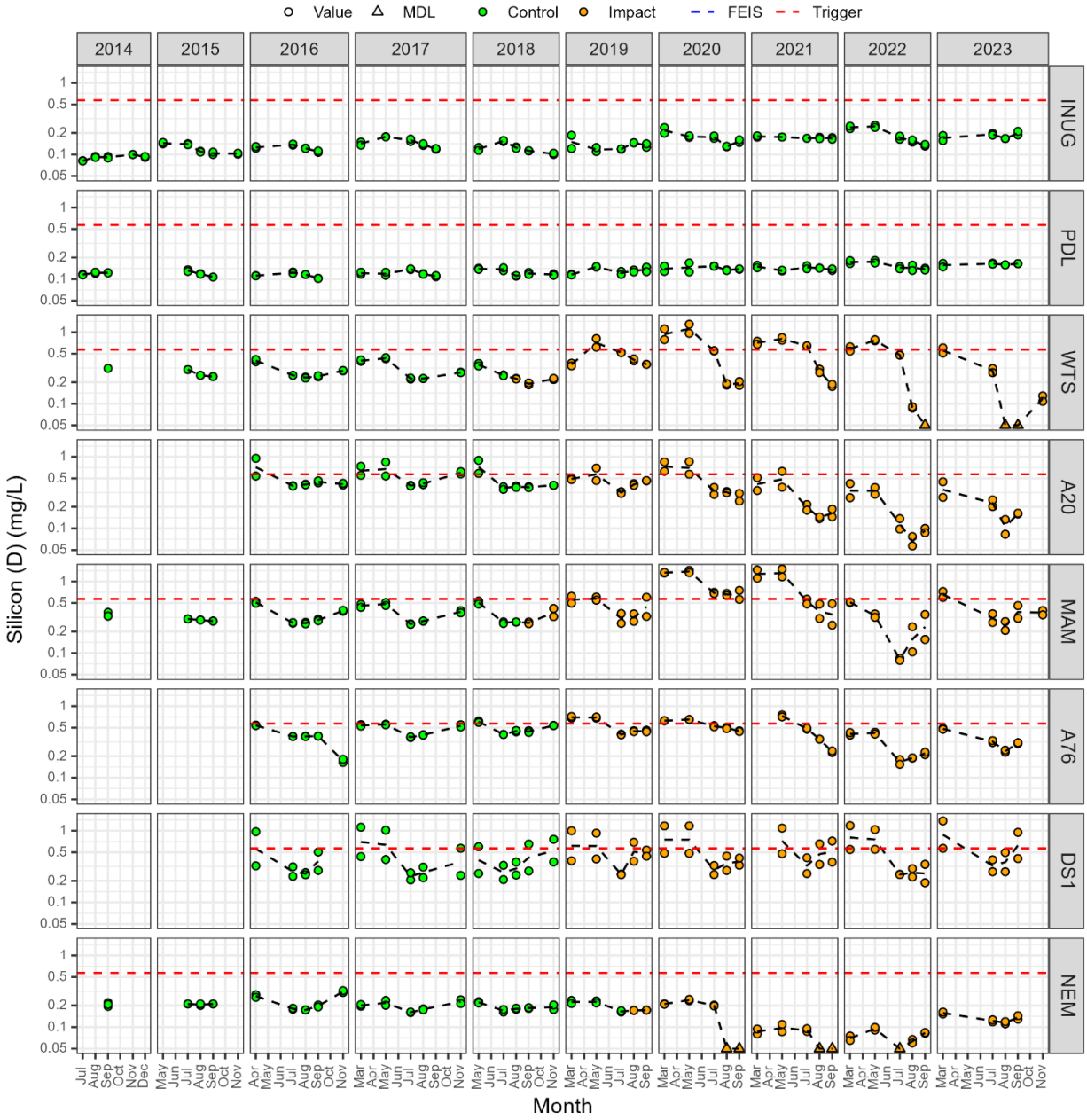


Figure B2-70. Dissolved silver (mg/L).

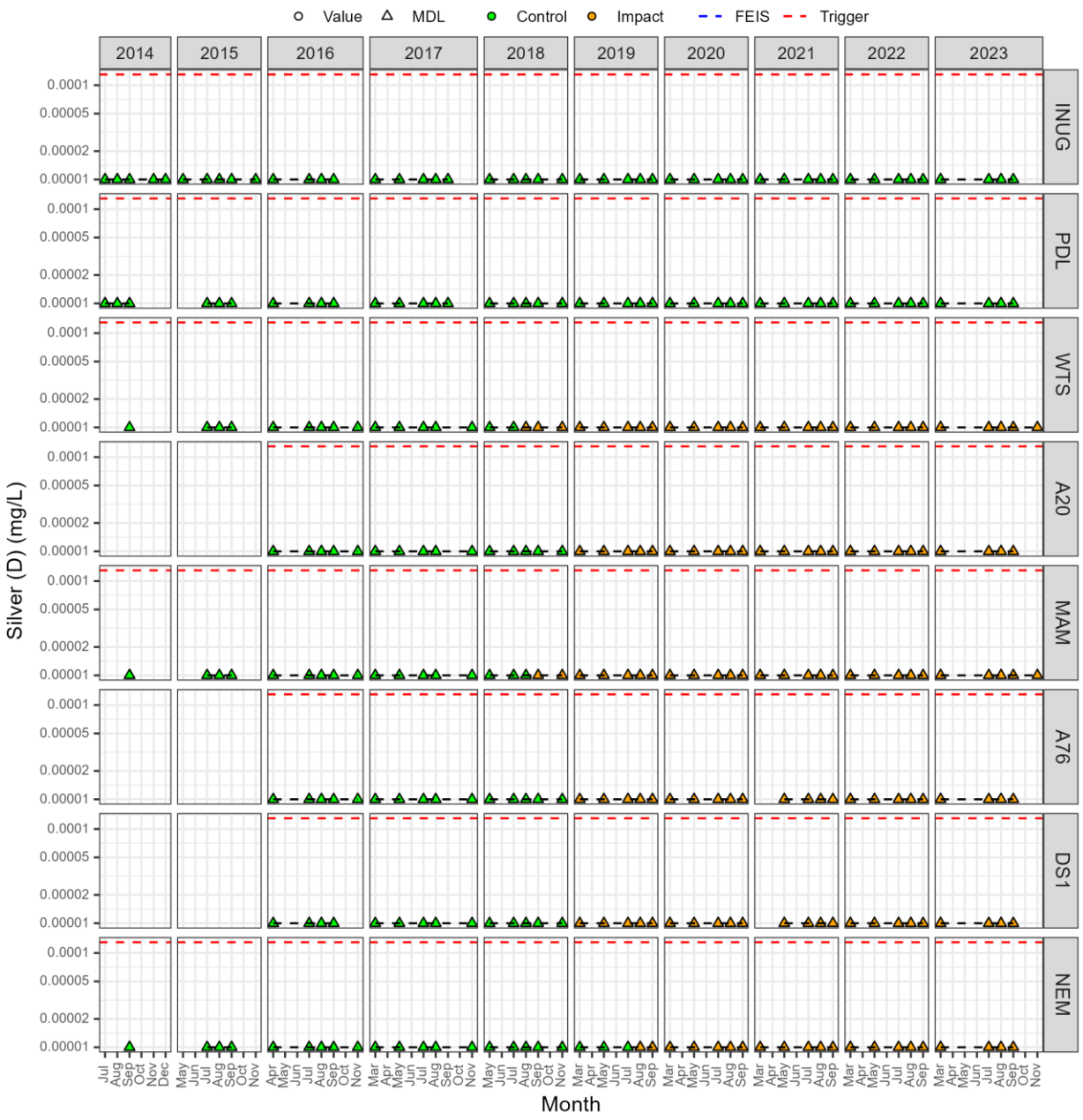


Figure B2-71. Dissolved strontium (mg/L).

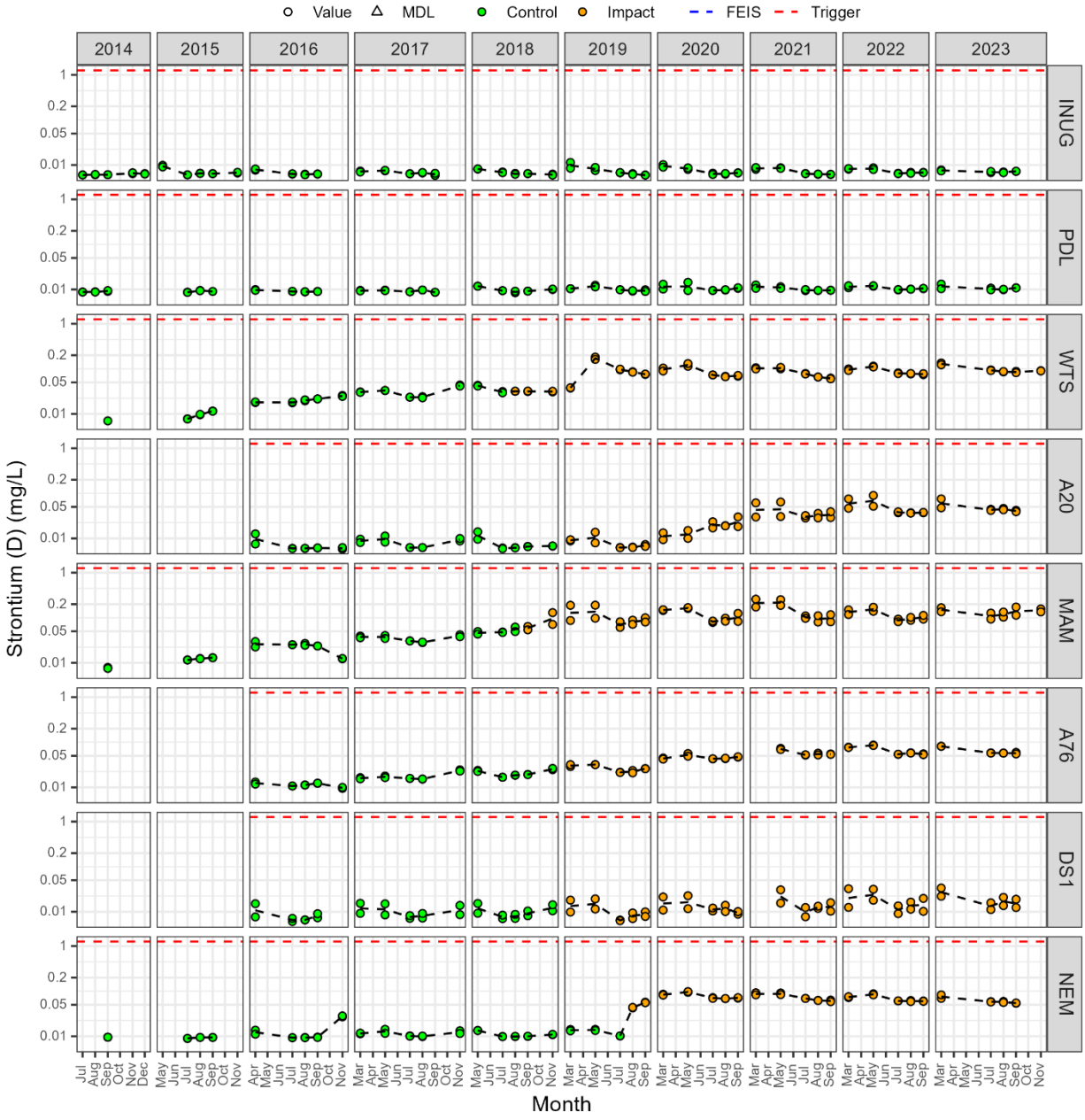


Figure B2-72. Dissolved thallium (mg/L).

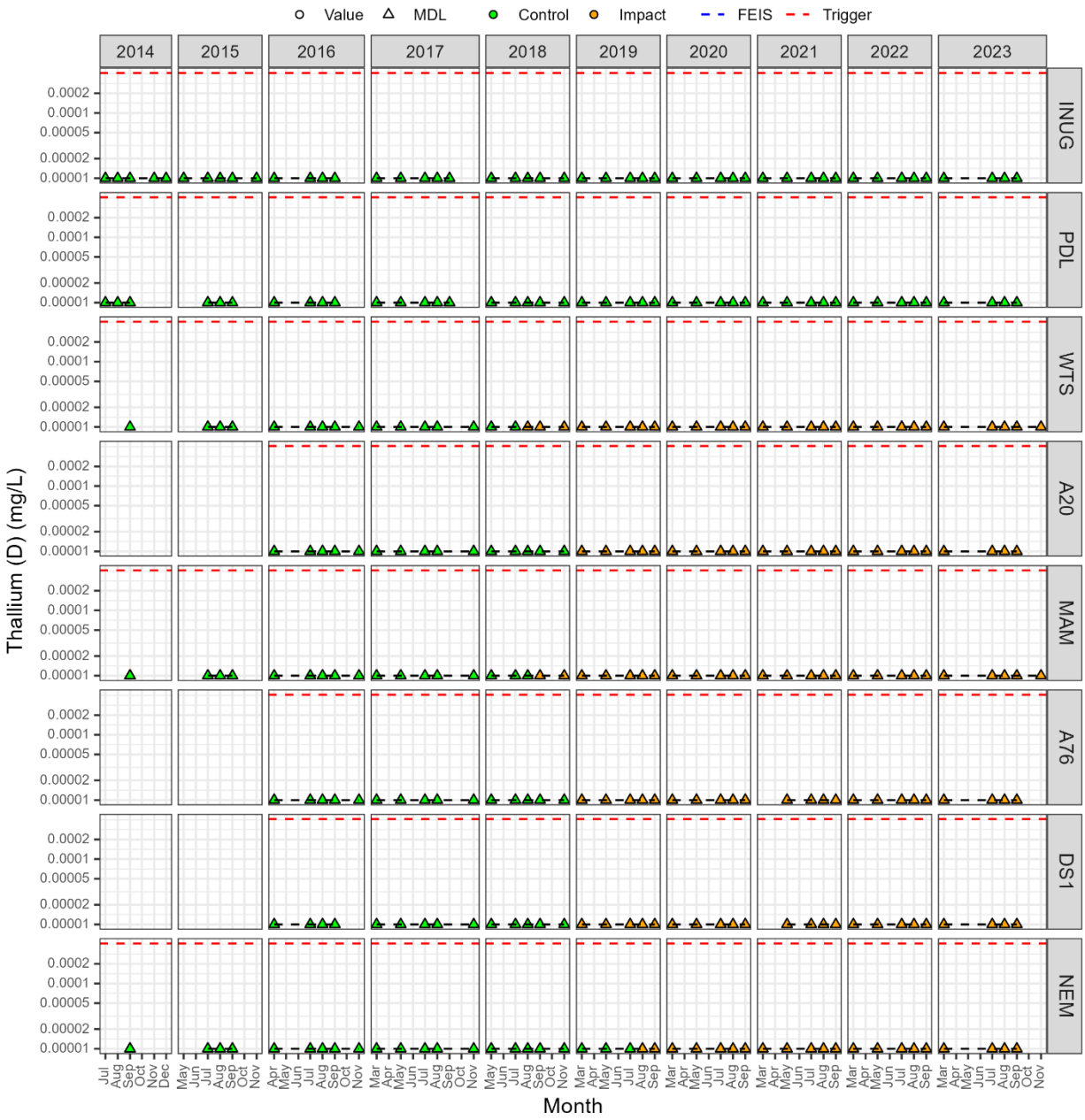


Figure B2-73. Dissolved tin (mg/L).

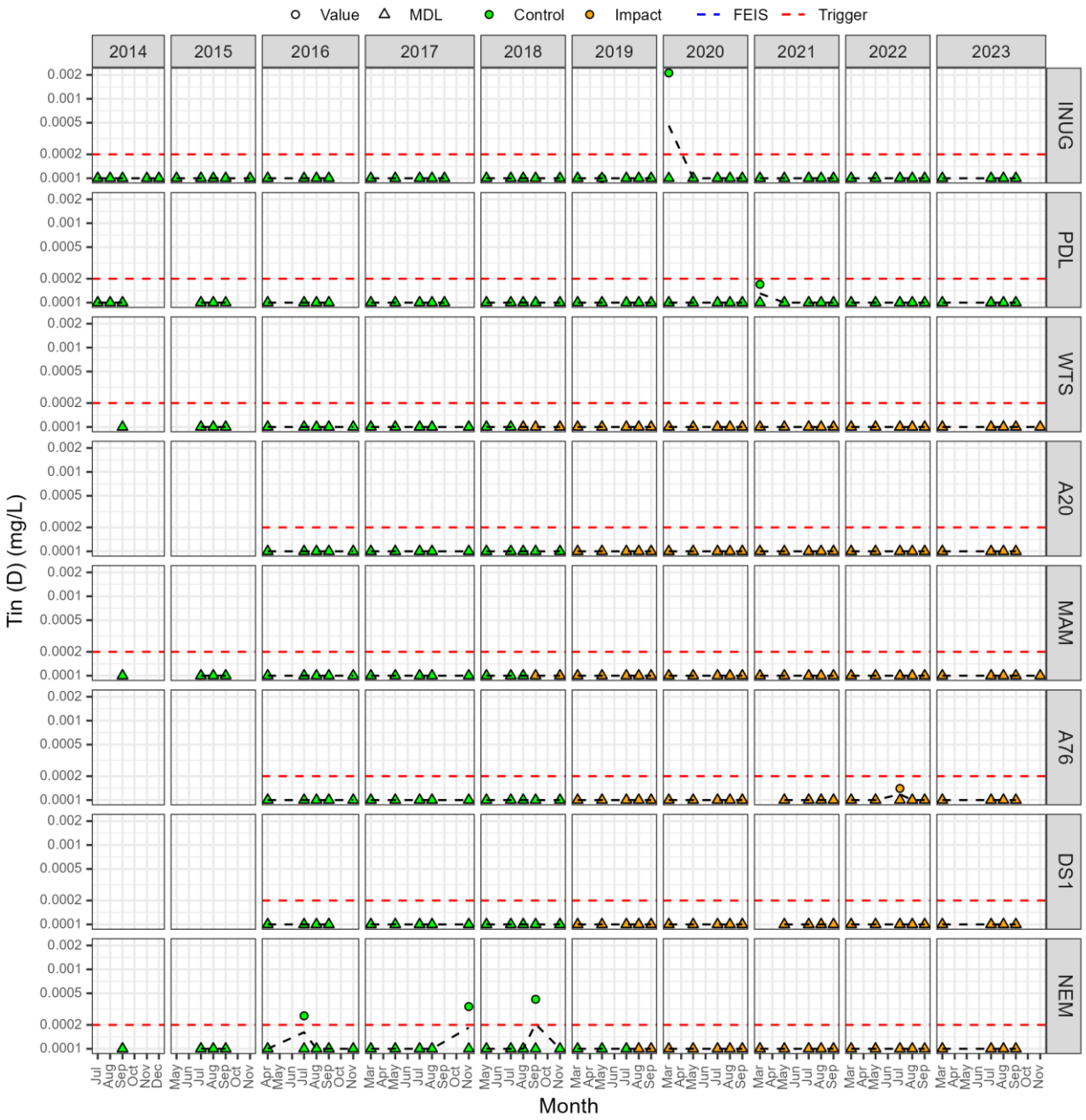


Figure B2-74. Dissolved titanium (mg/L).

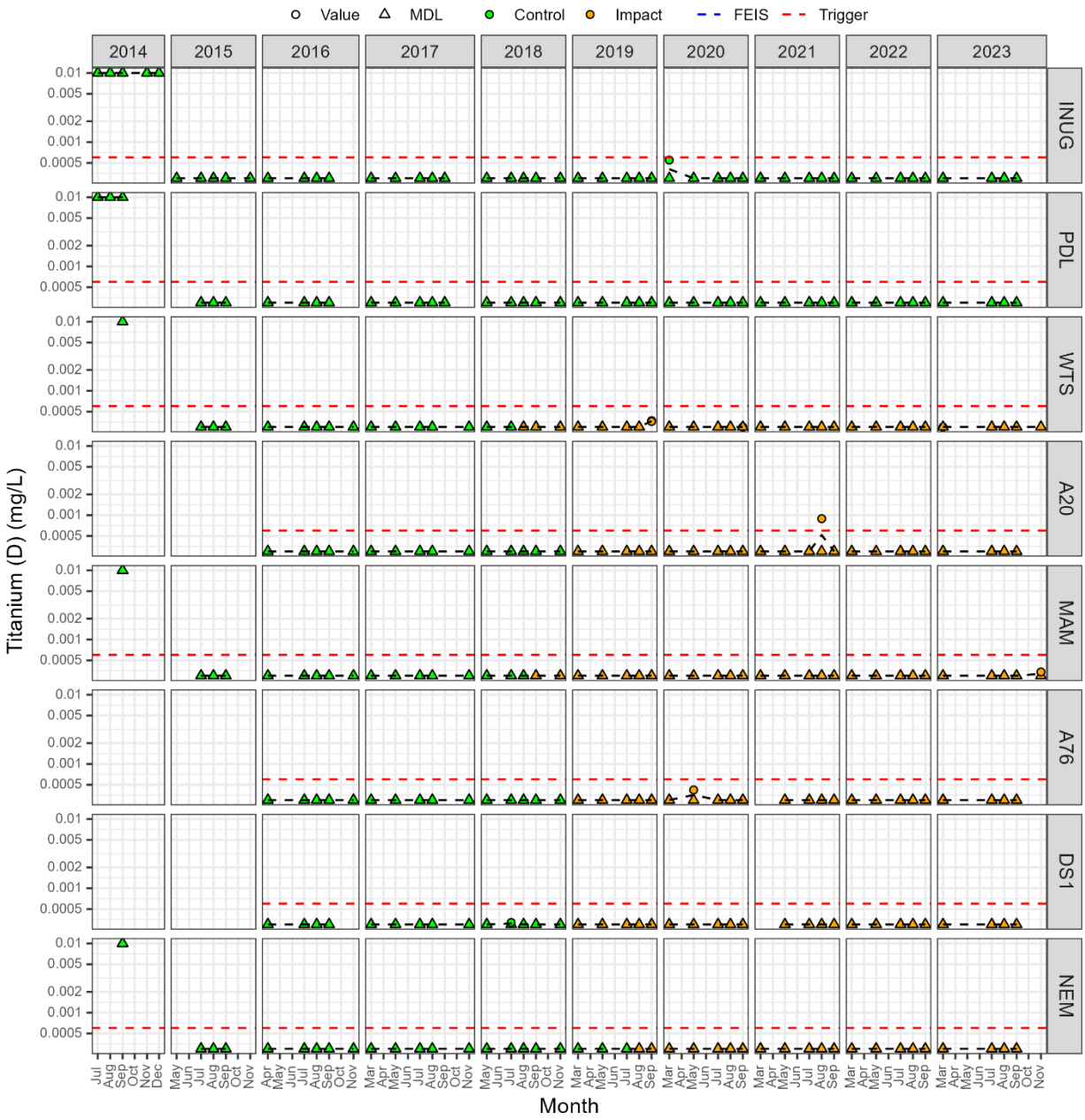


Figure B2-75. Dissolved uranium (mg/L).

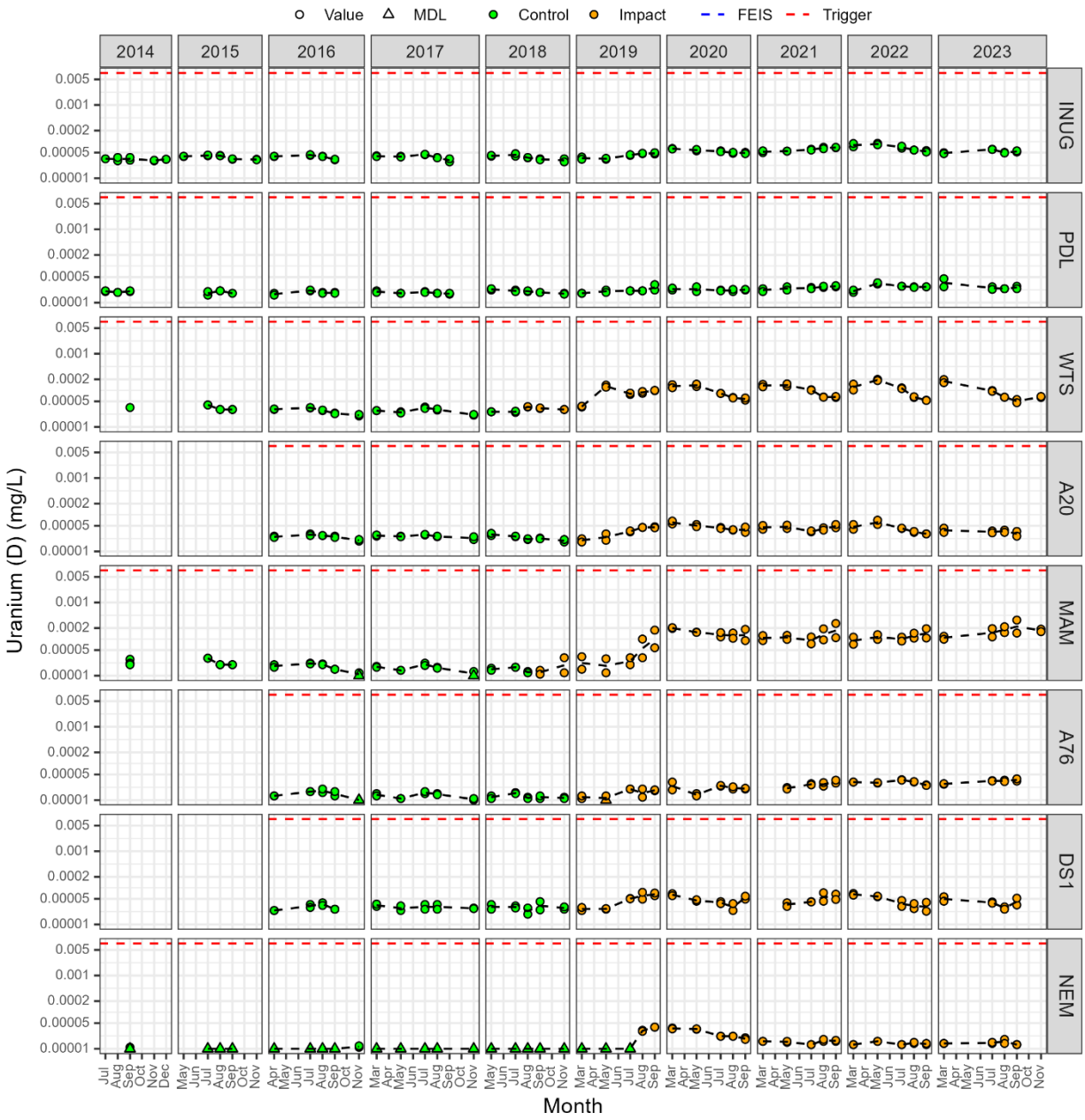


Figure B2-76. Dissolved vanadium (mg/L).

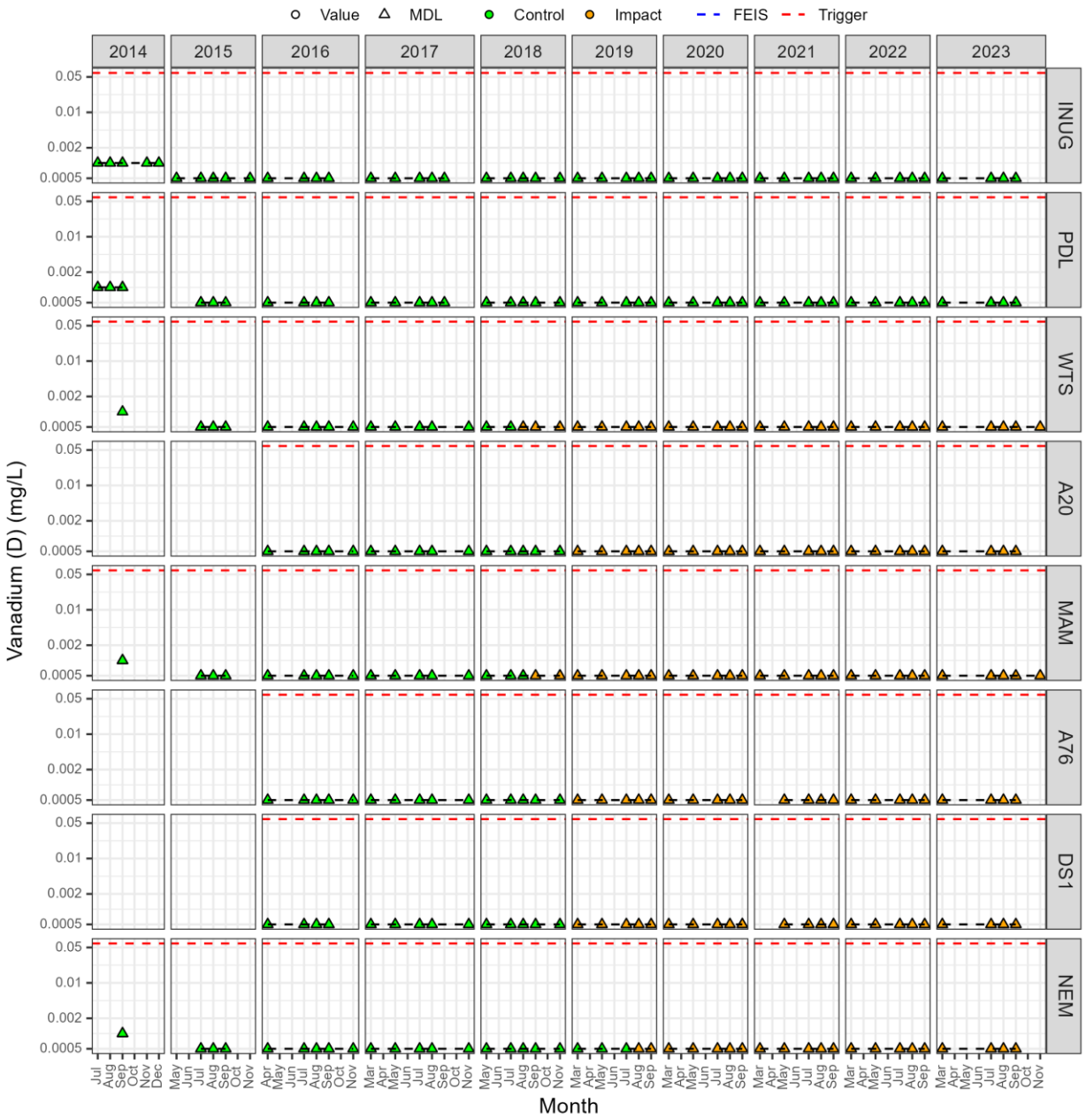
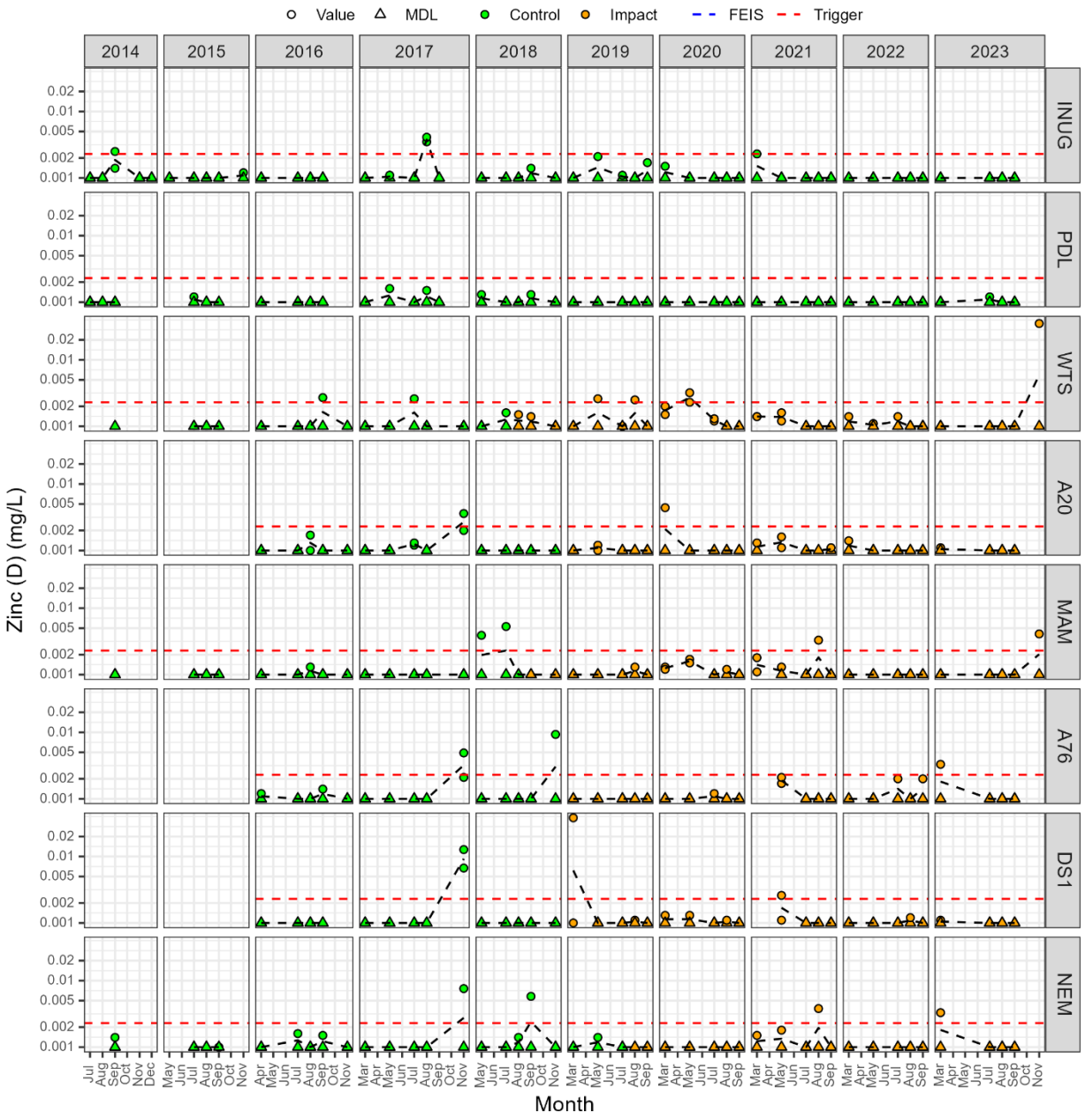


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Appendix B3
Water Chemistry – Baker Lake

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Table B3–1. Water quality results from Baker Lake, 2023.

Lake & Area				Baker Lake - Akilahaarjuk Point (BAP)						Baker Lake - Barge Dock (BBD)						Baker Lake - Proposed Jetty (BPJ)					
Month	Aquatic Life Guideline[1]	Baker Lake Screening Values[2]		July	July	August	August	September	September	July	July	August	August	September	September	July	July	August	August	September	September
Area-Replicate ID				BAP-85	BAP-86	BAP-87	BAP-88	BAP-89	BAP-90	BBD-85	BBD-86	BBD-87	BBD-88	BBD-89	BBD-90	BPJ-85	BPJ-86	BPJ-87	BPJ-88	BPJ-89	BPJ-90
Date		Triggers	Thresholds	04-Jul-2023	04-Jul-2023	17-Aug-2023	17-Aug-2023	08-Sep-2023	08-Sep-2023	04-Jul-2023	04-Jul-2023	18-Aug-2023	18-Aug-2023	08-Sep-2023	08-Sep-2023	04-Jul-2023	04-Jul-2023	18-Aug-2023	18-Aug-2023	08-Sep-2023	08-Sep-2023
Time				11:45	12:15	18:00	19:00	09:50	10:25	11:05	10:35	20:11	19:37	12:20	11:45	13:05	12:45	22:11	18:00	11:00	11:20
ALS Sample ID				VA2386138-011	VA2386138-012	WP2320725-001	WP2320725-002	VA23C1680-011	VA23C1680-012	VA2386138-016	VA2386138-015	WP2320725-003	WP2320725-004	VA23C1680-015	VA23C1680-016	VA2386138-013	VA2386138-014	WP2320725-005	WP2320725-006	VA23C1680-013	VA23C1680-014
Field Measurements (3 m)																					
Dissolved Oxygen (mg/L)				13.8	13.7	12.2	12.0	12.2	12.2	13.1	13.3	9.9	9.9	12.0	12.0	13.5	13.6	10.0	10.1	12.1	12.1
Specific Conductivity (µS/cm)				33.4	33.1	73	70	76	75	22.8	23.1	25.5	26.0	27.2	27.3	23.1	23.2	27.2	32.0	66	64
pH	6.5 - 9.0	6.50 - 8.32	6.5 - 9.0	7.1	7.1	6.4	6.3	6.1	6.1	7.0	7.3	6.7	6.6	6.7	6.7	7.0	7.0	6.5	6.5	6.1	6.6
Temperature (°C)				4.2	4.6	7.4	8.2	7.1	7.4	6.7	6.1	14.10	14.17	8.2	8.2	5.7	5.5	13.83	13.22	7.3	7.4
Physical Tests (mg/L)																					
Conductivity (µS/cm)		642		34.6	35.1	73	71	79	78	23.5	24.3	26.1	26.4	28.9	29	24.3	24.3	26.5	28	58	54
Alkalinity - Total (as $CaCO_3$)		10.6		8.9	9.2	10	9.4	9.2	9.4	8.3	8.5	8.8	9.0	9.2	9.2	8.7	8.5	9.0	8.7	9.2	9.2
Alkalinity - Bicarbonate				8.9	9.2	10	9.4	9.2	9.4	8.3	8.5	8.8	9.0	9.2	9.2	8.7	8.5	9.0	8.7	9.2	9.2
Alkalinity - Carbonate		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	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide		10.6		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Hardness (as CaCO3), dissolved		65		12.1	12	14.9	14.4	15.7	15.3	10.2	10.4	10.3	10.3	11.5	11.3	10.1	10.5	10.8	13.5	13.5	13.6
Hardness (as CaCO3), from total Ca/Mg				11.3	11.8	15.8	15.6	16	16.1	10.3	10.3	11.1	11.3	11.8	11.9	9.9	10.3	11.3	12.1	14.6	15
pH (Laboratory)	6.5 - 9.0	6.75-8.05	6.5 - 9.0	7.1	7.2	6.9	7.0	7.2	7.2	7.1	7.1	7.1	7.1	7.2	7.2	7.1	7.1	7.0	7.1	7.2	7.2
Total Dissolved Solids (TDS)		245		25.2	25.6	38.5	39.2	55	58	21	20.8	18.3	15.5	21.4	21.6	20.2	20.4	14.4	15.5	41.2	40.5
Total Suspended Solids (TSS)		3.0	5.0	<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
Turbidity (NTU)				0.47	0.50	0.12	0.21	0.12	0.19	0.31	0.29	0.22	0.20	0.30	0.22	0.32	0.29	0.18	0.20	0.25	0.17
Anions and Nutrients (mg/L)																					
Total Kjeldahl Nitrogen		0.22		0.13	0.14	0.18	0.19	0.16	**0.34**	0.13	0.11	0.18	0.17	0.17	0.16	0.13	0.13	0.18	0.18	0.20	0.17
Ammonia (as N)[3]	***equation***	0.066	0.13	0.0093	<0.0050	0.0085	0.0092	0.014	0.016	0.0077	<0.0050	<0.0050	0.0053	0.0094	0.0088	0.0053	0.0077	0.0073	0.0050	0.018	0.012
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	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	169	120	3.6	3.5	13.2	12.8	15.1	14.8	1.2	1.2	1.4	1.4	1.8	1.9	1.2	1.2	1.5	1.8	9.4	8.4
Fluoride	0.12	0.088	0.12	0.057	0.053	0.069	0.069	0.068	0.068	0.055	0.054	0.064	0.064	0.062	0.061	0.055	0.055	0.064	0.064	0.071	0.060
Nitrate (as N)	3	1.5	3.0	0.028	0.027	0.026	0.029	0.027	0.026	0.017	0.019	0.0060	0.0079	0.011	0.010	0.019	0.020	0.0073	0.0061	0.023	0.020
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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ortho Phosphate (as P)		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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P) - Total	0.01	0.0075	0.010	0.0043	0.0042	0.0022	0.0040	0.0036	0.0038	0.0039	0.0041	0.0029	0.0034	0.0041	0.0041	0.0040	0.0040	0.0024	0.0027	0.0052	**0.0078**
Phosphorus (P) - Total Diss.				0.0024	0.0024	<0.0020	<0.0020	0.0024	0.0026	0.0022	0.0024	<0.0020	<0.0020	0.0027	0.0032	0.0024	0.0020	<0.0020	<0.0020	0.0029	0.0023
Reactive Silica (as SiO_2)		1.0		<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
Sulphate (SO_4)		66	128	0.90	0.95	2.4	2.4	2.4	2.4	0.45	0.46	0.61	0.62	0.66	0.63	0.45	0.45	0.62	0.68	1.6	1.5
Organic / Inorganic Carbon (mg/L)																					
Dissolved Organic Carbon		3.9		3.5	3.5	**4.2**	**4.5**	**4.3**	**4.3**	3.7	3.7	**4.3**	**4.4**	**4.0**	3.5	3.7	3.7	**4.3**	**4.0**	3.8	**4.6**
Total Organic Carbon		4.0		3.3	3.4	**4.8**	**4.7**	3.5	3.8	3.5	3.6	**4.9**	**4.5**	3.8	3.7	3.3	3.3	**4.5**	**4.8**	3.6	3.9
Total Metals (mg/L)																					
Aluminum[4]	***equation***	0.056	0.10	0.018	0.017	0.0090	0.0090	0.0077	0.012	0.011	0.013	0.0072	0.0072	0.0088	0.0094	0.012	0.011	0.0067	0.0080	0.0099	0.0085
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	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.005	0.0026	0.0050	0.00012	0.00014	0.00014	0.00016	0.00013	0.00013	0.00014	0.00012	0.00016	0.00014	0.00011	0.00012	0.00010	0.00011	0.00013	0.00015	0.00012	0.00013
Barium		0.51	1.0	0.016	0.016	0.018	0.018	0.018	0.019	0.016	0.016	0.018	0.019	0.019	0.019	0.015	0.016	0.018	0.018	0.018	0.019
Beryllium		0.00012	0.00013	<0.000100	<0.000100	<0.000020	<0.000020	<0.000100	<0.000100	<0.000100	<0.000100	<0.000020	<0.000020	<0.000100	<0.000100	<0.000100	<0.000100	<0.000020	<0.000020	<0.000100	<0.000100
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	<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	<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	0.00004	<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	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		6.2		2.6	2.7	3.0	2.9	3.0	3.1	2.5	2.4	2.6	2.6	2.8	2.8	2.4	2.5	2.6	2.7	3.0	3.0
Cesium				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium[4]	0.001	0.0025	0.0050	0.00010	0.00011	0.00014	0.00011	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010
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[4]	***equation***	0.0012	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	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron	0.3	0.16	0.30	0.028	0.028	<0.010	<0.010	0.014	0.013	0.022	0.024	<0.010	<0.010	0.013	<0.010	0.019	0.020	<0.010	<0.010	0.013	0.012
Lead[3]	***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	<0.000050	<0.000050	<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	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0014	0.0014	<0.0010	<0.0010
Magnesium		12.44		1.2	1.2	2.1	2.0	2.1	2.1	1.0	1.0	1.2	1.2	1.2	1.2	0.96	1.0	1.2	1.3	1.8	1.8
Manganese[4]	***equation***	0.34	***equation***	0.0047	0.0049	0.0020	0.0021	0.0018	0.0019	0.0036	0.0055	0.0019	0.0020	0.0019	0.0014	0.0035	0.0037	0.0019	0.0021	0.0028	0.0019
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	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.037	0.073	0.00006	0.00006	0.00006	0.00007	0.00007	0.00007	<0.000050	0.00006	<0.000050	0.00005	0.00006	0.00006	0.00006	0.00005	0.00006	0.00006	0.00007	0.00007
Nickel[4]	***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	<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		3.9		0.47	0.49	0.66	0.66	0.73	0.73	0.41	0.42	0.41	0.41	0.43	0.44	0.38	0.40	0.40	0.43	0.62	0.65
Rubidium				0.00076	0.00082	0.00089	0.00095	0.00095	0.0010	0.00084	0.00085	0.00093	0.00086	0.00086	0.00090	0.00074	0.00074	0.00083	0.00086	0.00096	0.0010
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	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.28		0.22	0.23	0.23	0.22	0.21	0.22	0.20	0.20	0.15	0.16	0.14	0.15	0.21	0.20	0.16	0.16	0.21	0.20
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	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		89		2.0	2.1	7.2	6.9	8.5	8.0	0.70	0.70	0.71	0.71	0.97	0.99	0.64	0.67	0.77	1.3	5.5	6.3
Strontium		1.3	2.5	0.018	0.019	0.022	0.022	0.025	0.024	0.017	0.017	0.018	0.018	0.020	0.021	0.016	0.017	0.020	0.019	0.023	0.023
Sulfur				<0.50	<0.50	0.95	0.92	1.0	0.99	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.86	0.80
Tellurium				<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
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	<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	<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	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		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	<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		0.0075	0.015	0.00005	0.00004	0.00005	0.00005	0.00005	0.00005	0.00004	0.00004	0.00004	0.00004	0.00005	0.00005	0.00004	0.00005	0.00004	0.00004	0.00004	0.00005
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	<0.00050	<0.00050	<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	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zirconium				<0.00020	<0.00020	<0.00030	<0.00030	<0.00020	<0.00020	<0.00020	<0.00020	<0.00030	<0.00030	<0.00020	<0.00020	<0.00020	<0.00020	<0.00030	<0.00030	<0.00020	<0.00020
Dissolved Metals (mg/L)																					
Aluminum[4]		0.027	0.050	0.0065	0.0058	0.0044	0.0045	0.0063	0.0064	0.0061	0.0052	0.0031	0.0035	0.0062	0.0068	0.0055	0.0054	0.0033	0.0036	0.0055	0.0064
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	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.0026	0.0050	0.00011	0.00012	0.00012	0.00014	0.00012	0.00011	0.00012	0.00011	0.00014	0.00012	<0.00010	0.00010	0.00010	<0.00010	0.00011	0.00013	0.00011	0.00011
Barium		0.51	1.0	0.017	0.017	0.018	0.018	0.017	0.018	0.016	0.017	0.018	0.019	0.018	0.019	0.017	0.017	0.018	0.018	0.018	0.018
Beryllium		0.00012	0.00013	<0.000100	<0.000100	<0.000020	<0.000020	<0.000100	<0.000100	<0.000100	<0.000100	<0.000020	<0.000020	<0.000100	<0.000100	<0.000100	<0.000100	<0.000020	<0.000020	<0.000100	<0.000100
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	<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	<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	0.00004	<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	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		6.2		2.8	2.7	2.8	2.8	3.0	2.9	2.4	2.5	2.4	2.4	2.7	2.8	2.3	2.5	2.5	2.5	2.8	2.8
Cesium				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium		0.00026	0.0050	<0.00010	<0.00010	<0.00010	0.00016	<0.00010	<0.00010	<0.00050 <0.00010	<0.00050 0.00012	<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		0.0011	0.0020	0.00034	0.00035	0.00032	0.00036	0.00034	0.00032	0.00027	0.00026	0.00030	0.00028	0.00031	0.00031	0.00027	0.00027	0.00025	0.00026	0.00031	0.00032
Iron		0.16	0.30	0.011	0.011	<0.010	<0.010	<0.010	<0.010	0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
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	<0.000050	<0.000050	<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	<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		12.44		1.3	1.3	1.9	1.8	2.0	2.0	1.0	1.0	1.0	1.0	1.1	1.2	1.0	1.1	1.1	1.6	1.6	1.6
Manganese[4]		0.34	***equation***	0.0028	0.0026	0.00041	0.00034	0.00052	0.00053	0.0017	0.0035	0.00062	0.00071	0.00082	0.00092	0.0018	0.0019	0.00052	0.00080	0.00074	0.00074
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	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.073	0.00006	0.00005	0.00006	0.00007	0.00006	0.00008	<0.000050	0.00008	<0.000050	0.00005	0.00006	0.00006	<0.000050	0.00005	0.00006	0.00008	0.00006	0.00006
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	<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		3.9		0.49	0.50	0.64	0.58	0.72	0.71	0.41	0.41	0.37	0.36	0.44	0.45	0.41	0.42	0.36	0.40	0.58	0.60
Rubidium				0.00081	0.00084	0.0010	0.00094	0.00090	0.00092	0.00078	0.00084	0.00079	0.00083	0.00082	0.00084	0.00080	0.00075	0.00079	0.00090	0.00091	0.00083
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	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.25		0.18	0.17	0.20	0.17	0.17	0.16	0.16	0.16	0.13	0.12	0.11	0.12	0.17	0.16	0.11	0.14	0.15	0.15
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	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		89		2.1	2.1	6.8	6.7	8.7	8.4	0.69	0.68	0.65	0.66	1.0	1.1	0.69	0.70	0.70	1.3	5.1	5.3
Strontium		1.3	2.5	0.019	0.019	0.023	0.020	0.024	0.024	0.017	0.017	0.017	0.017	0.020	0.021	0.016	0.017	0.017	0.018	0.022	0.022
Sulfur				<0.50	<0.50	0.76	0.70	0.80	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	0.53
Tellurium				<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
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	<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	<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	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		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	<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		0.0075	0.015	0.00005	0.00004	0.00005	0.00005	0.00005	0.00005	0.00004	0.00004	0.00004	0.00004	0.00005	0.00005	0.00004	0.00005	0.00004	0.00004	0.00004	0.00005
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	<0.00050	<0.00050	<0.00050

FIGURES

Figure B3-1. Laboratory-measured conductivity (µS/cm).

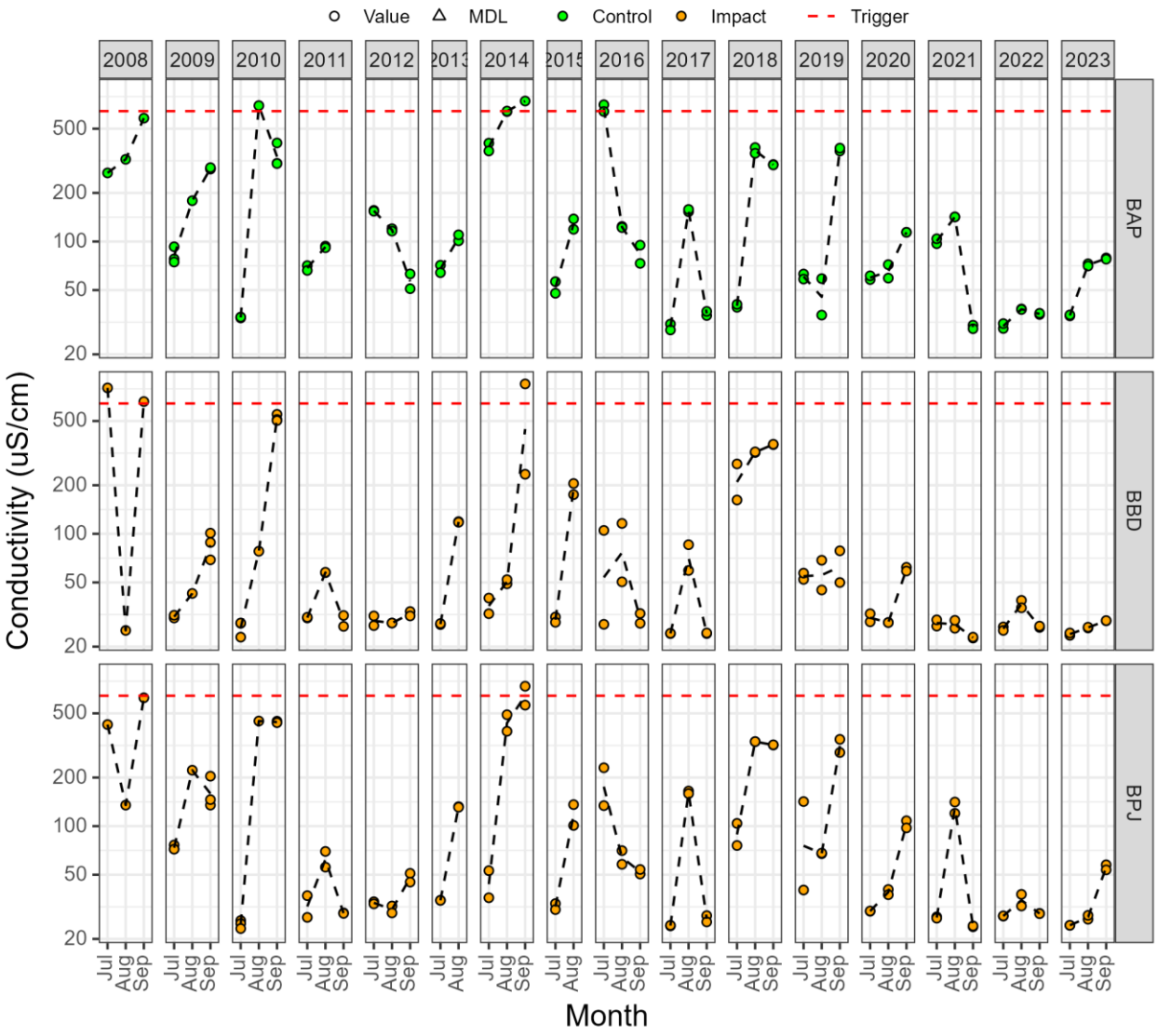


Figure B3-2. Laboratory-measured hardness (mg/L).

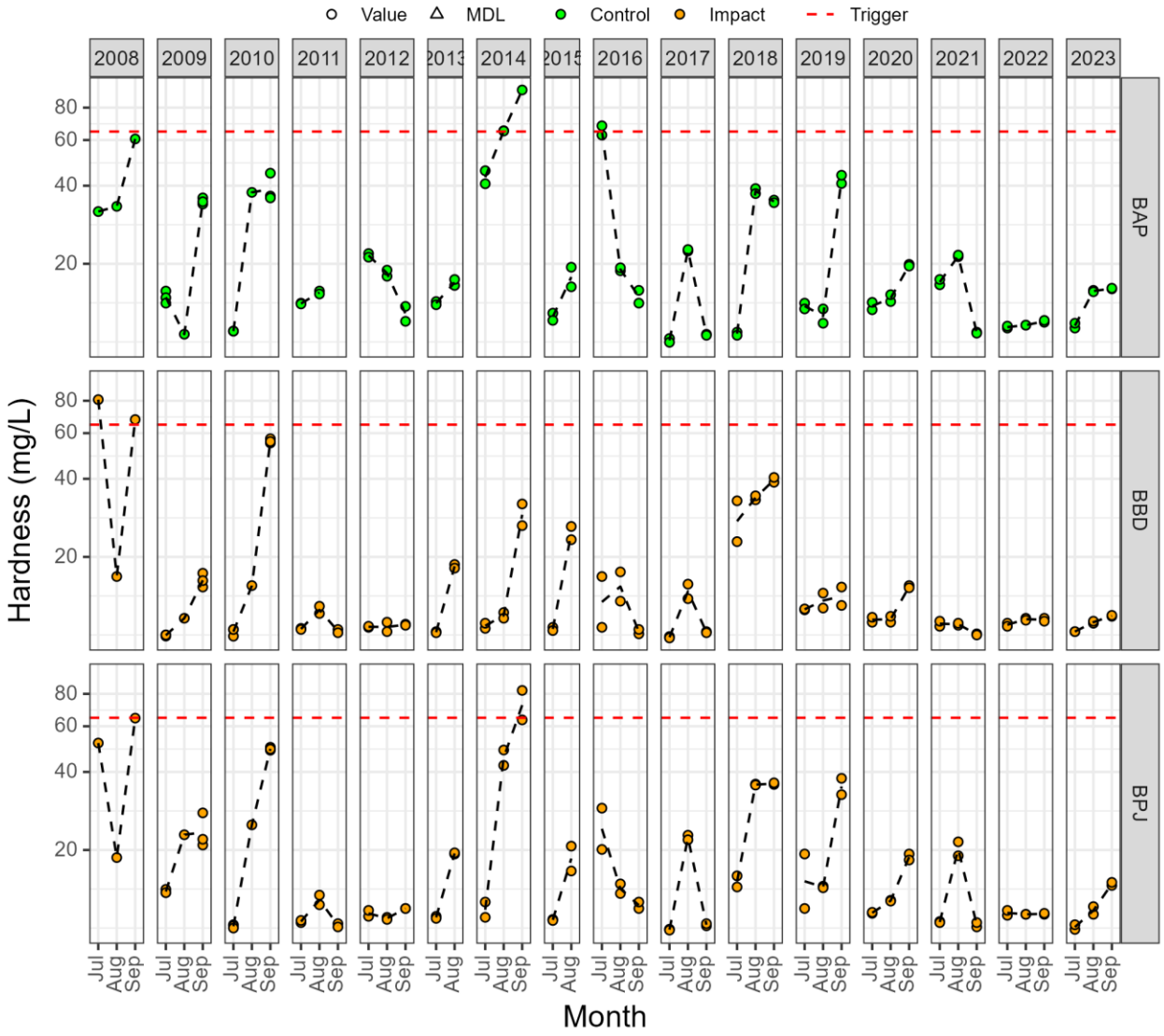


Figure B3-3. Field-measured pH.

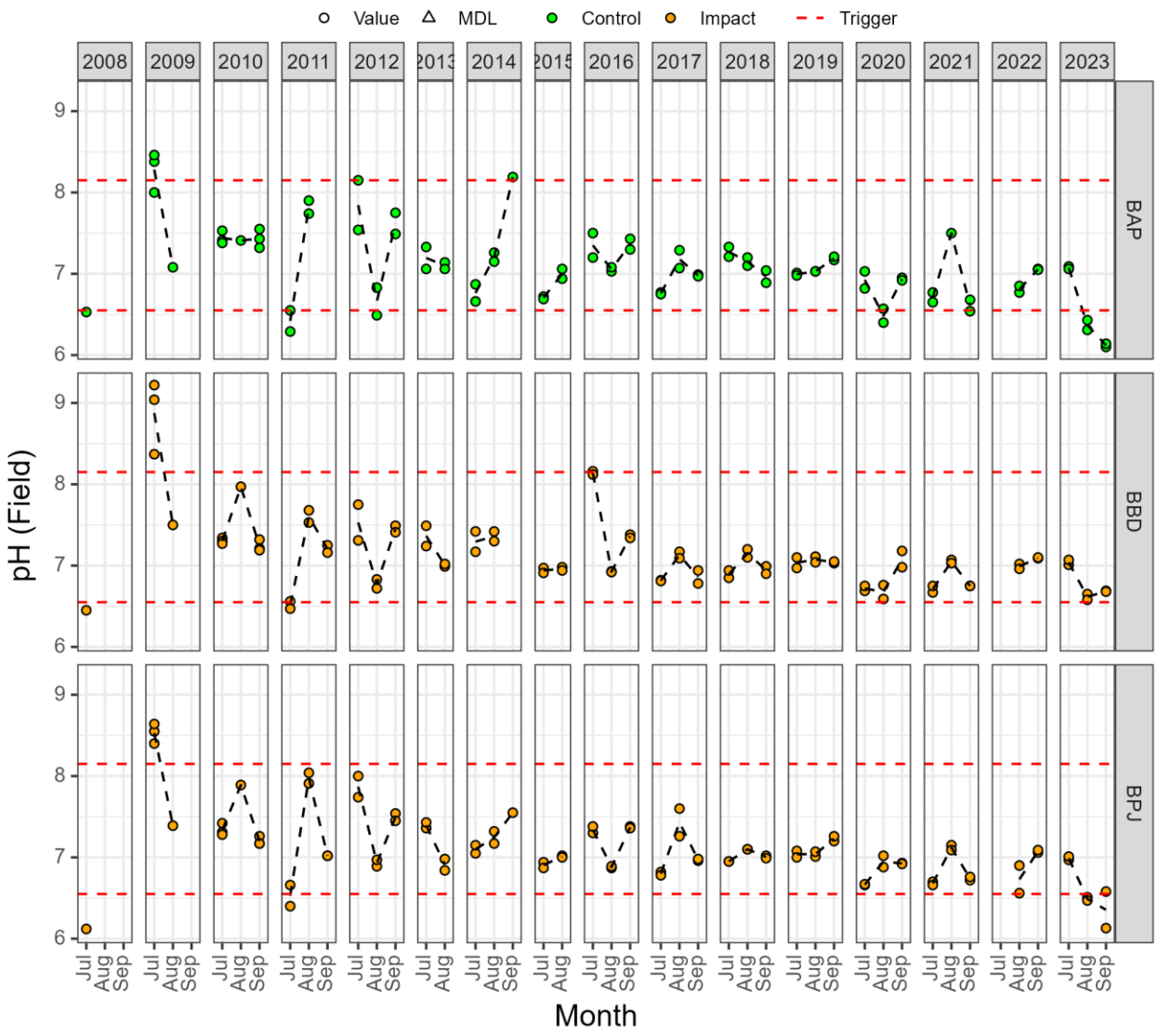


Figure B3-4. Laboratory-measured pH.

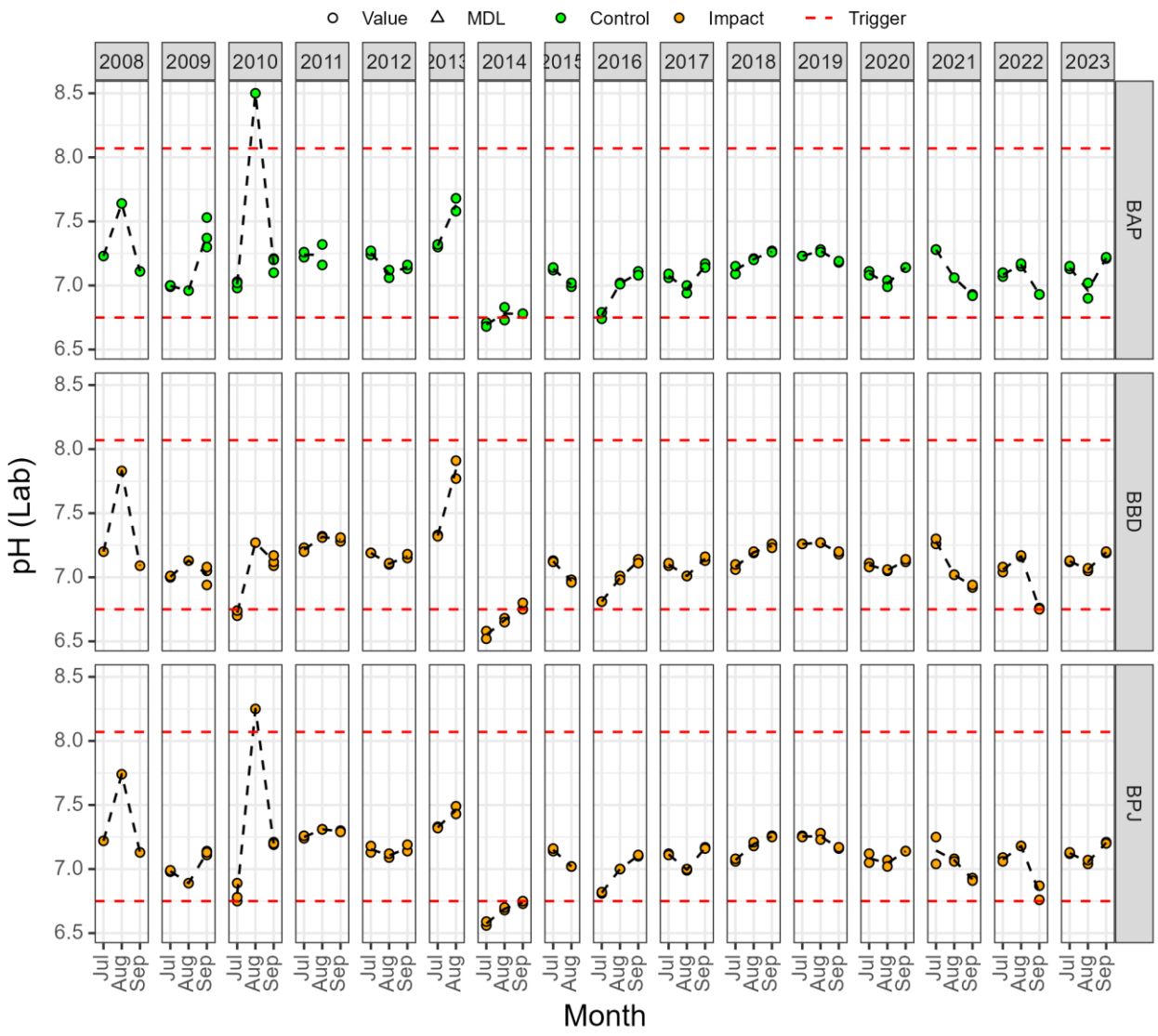


Figure B3-5. Total dissolved solids (TDS; mg/L).

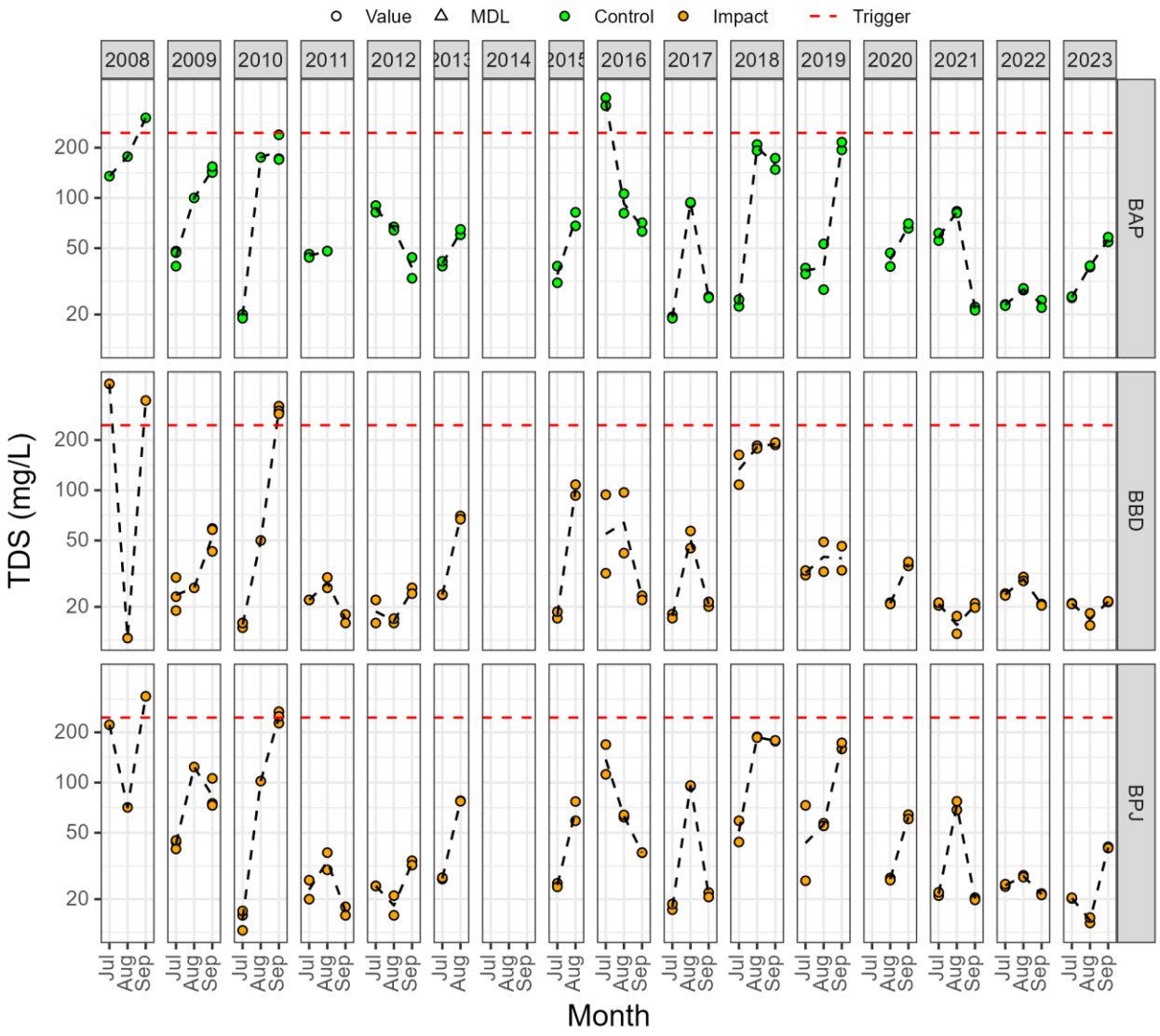


Figure B3-6. Total suspended solids (TSS; mg/L).

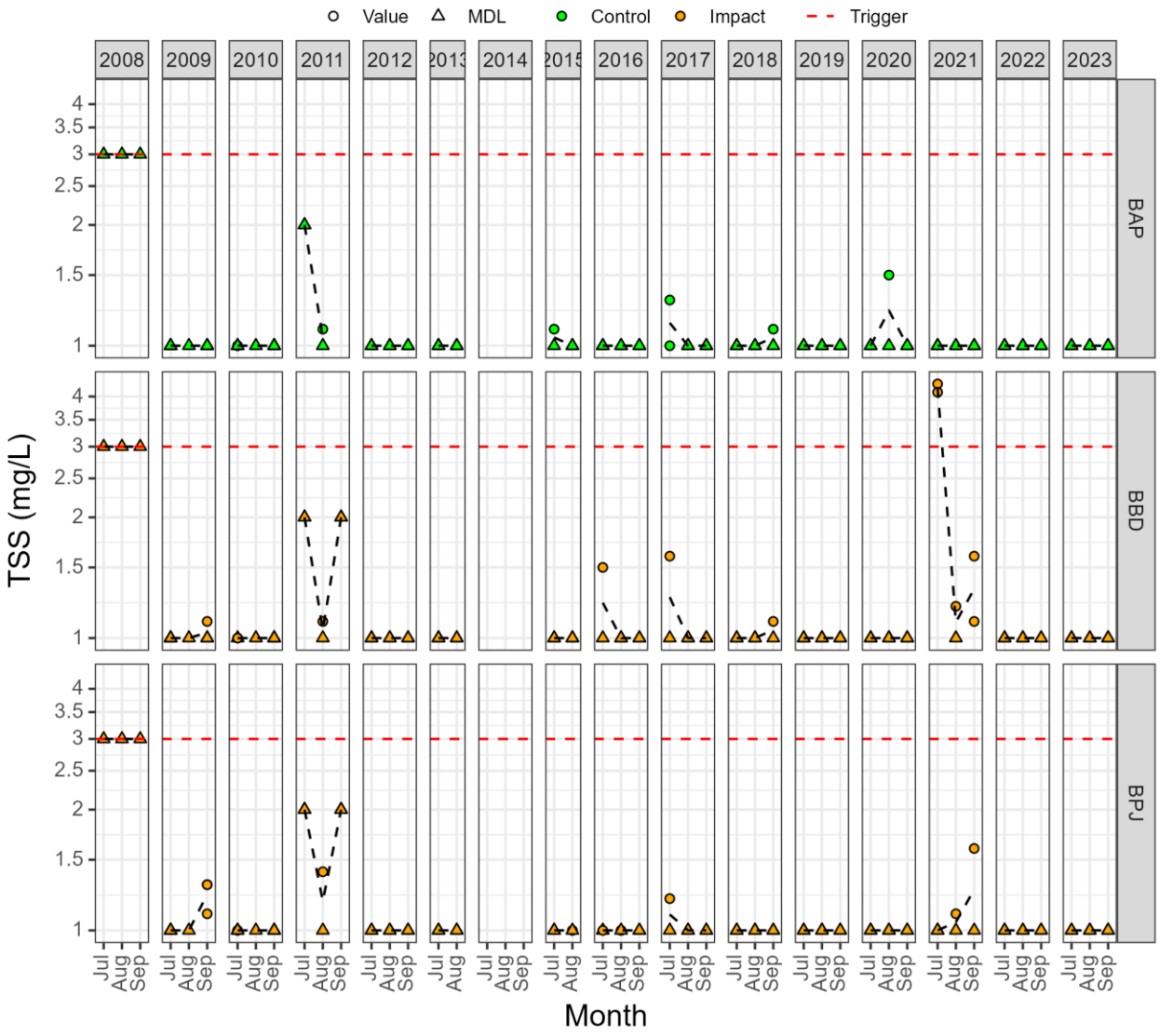


Figure B3-7. Carbonate alkalinity (mg/L).

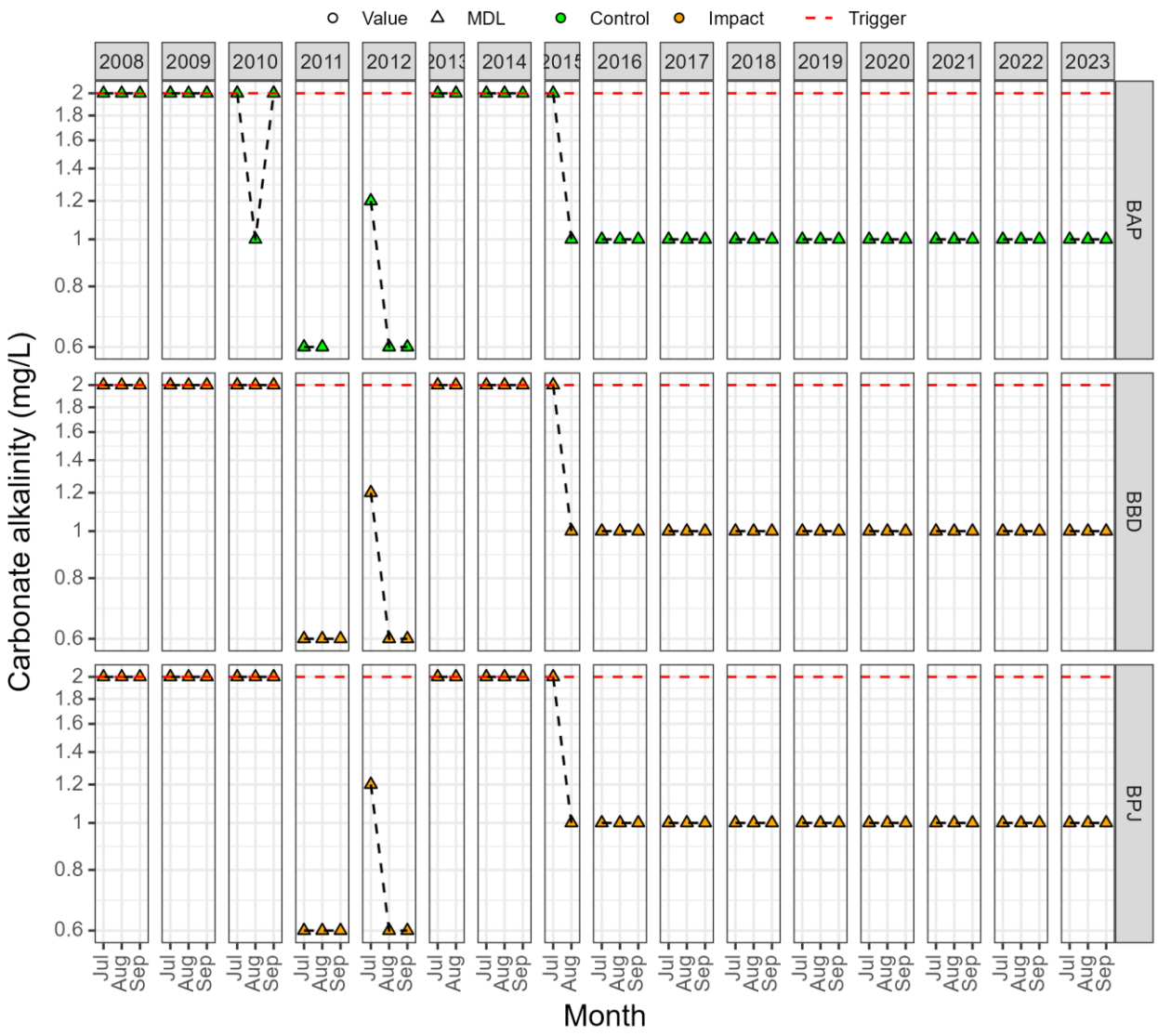


Figure B3-8. Bicarbonate alkalinity (mg/L).

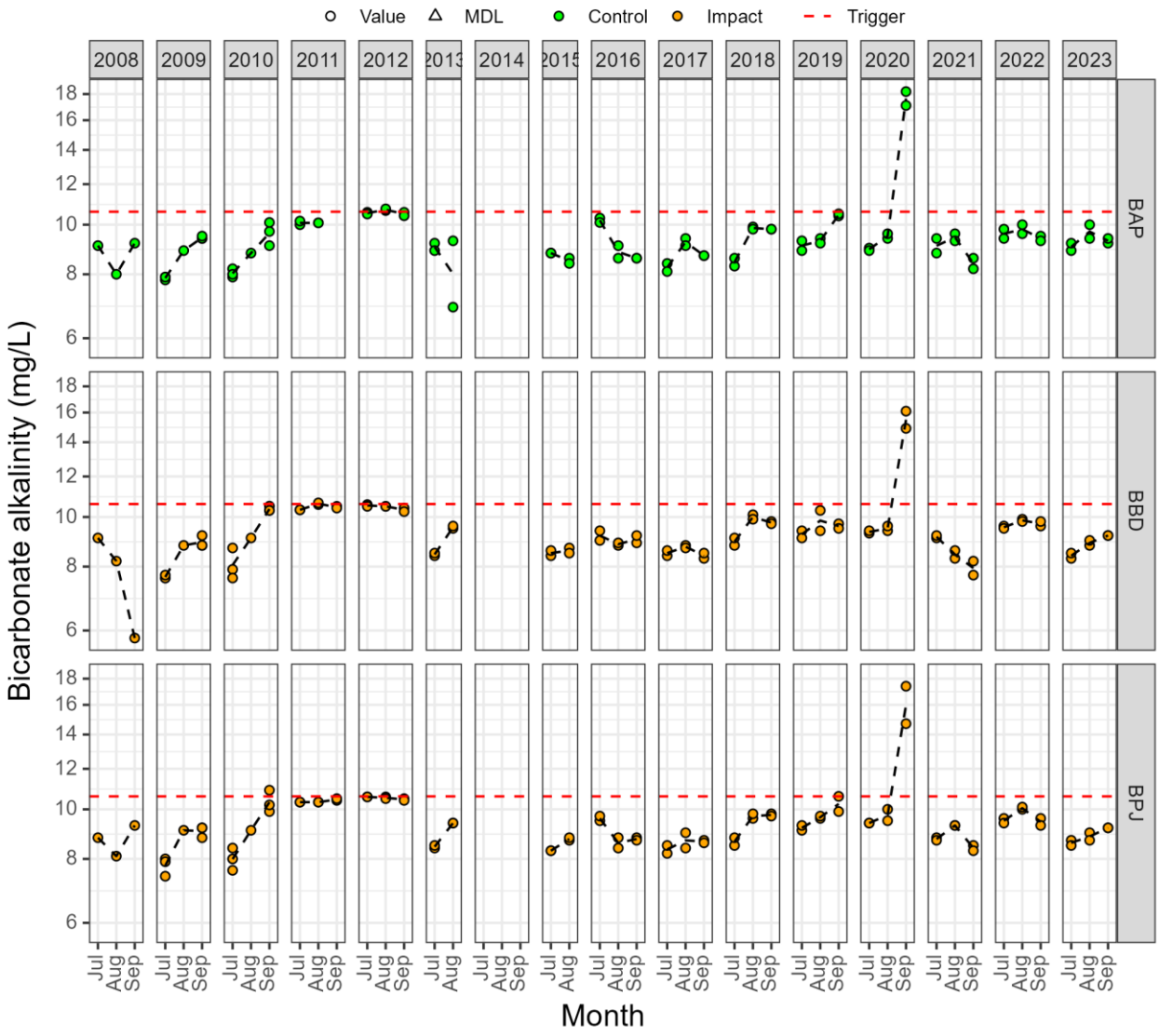


Figure B3-9. Total alkalinity (mg/L).

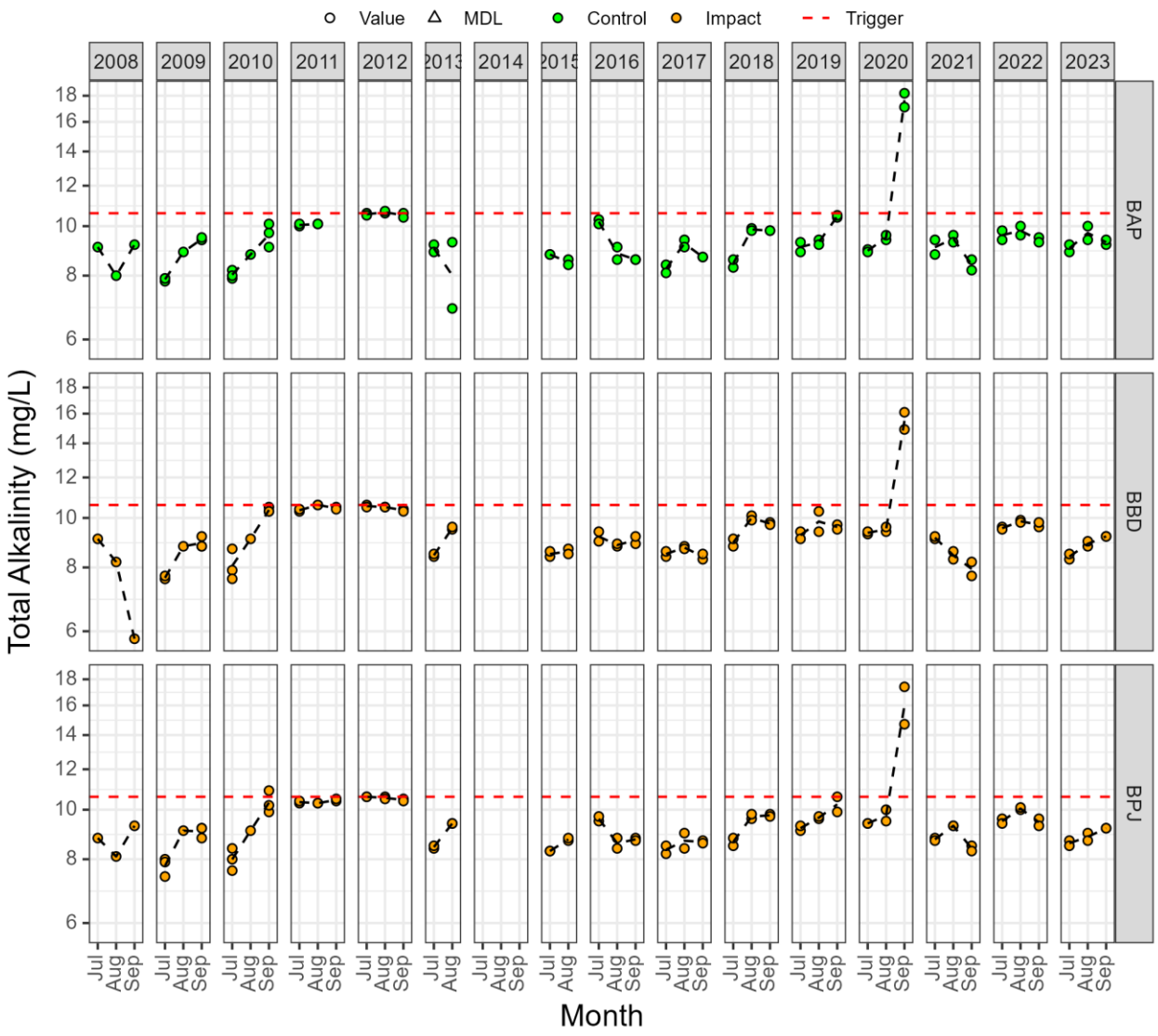


Figure B3-10. Ammonia-N (mg/L).

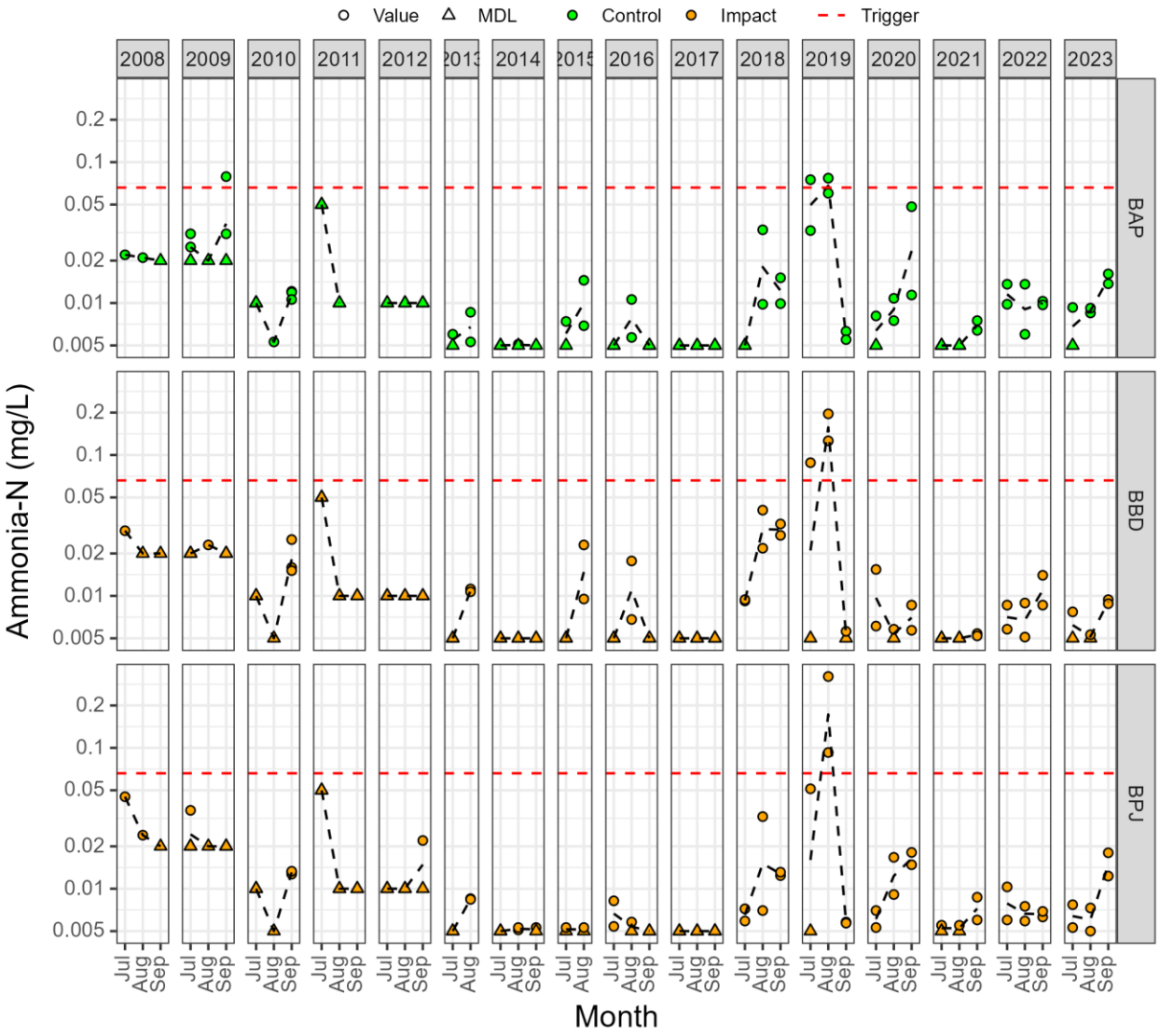


Figure B3-11. Chloride (mg/L).

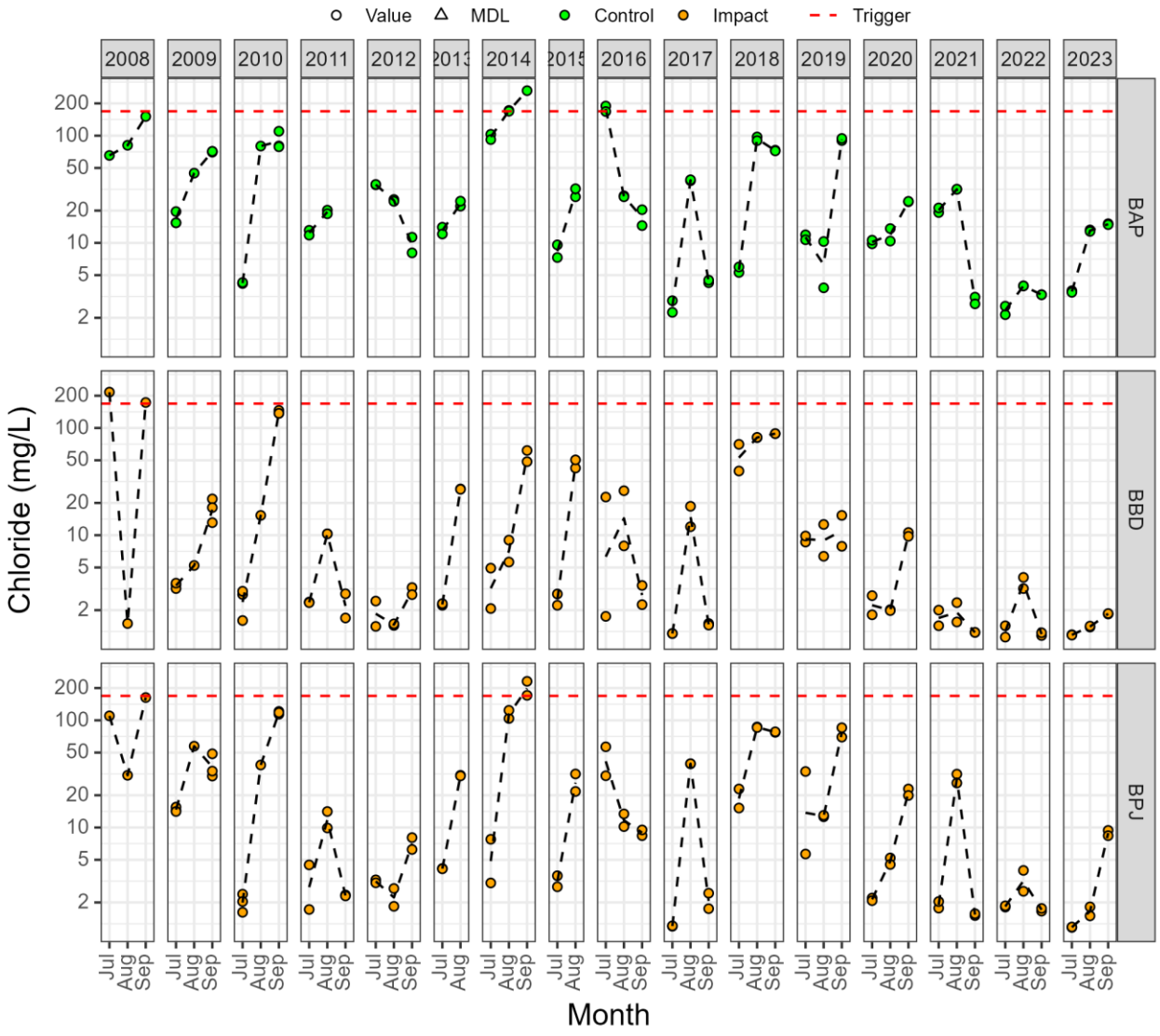


Figure B3-12. Fluoride (mg/L).

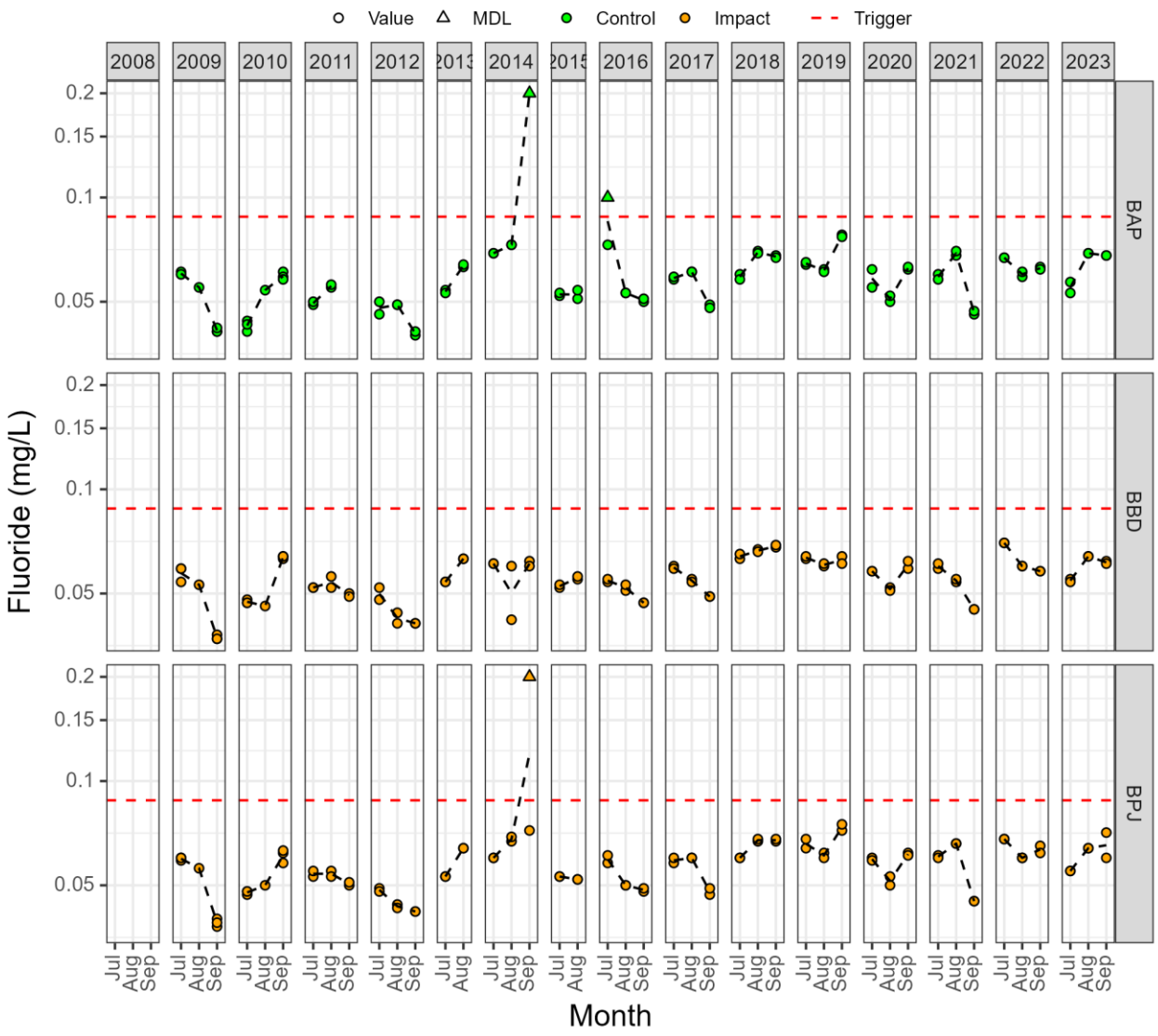


Figure B3-13. Nitrate-N (mg/L).

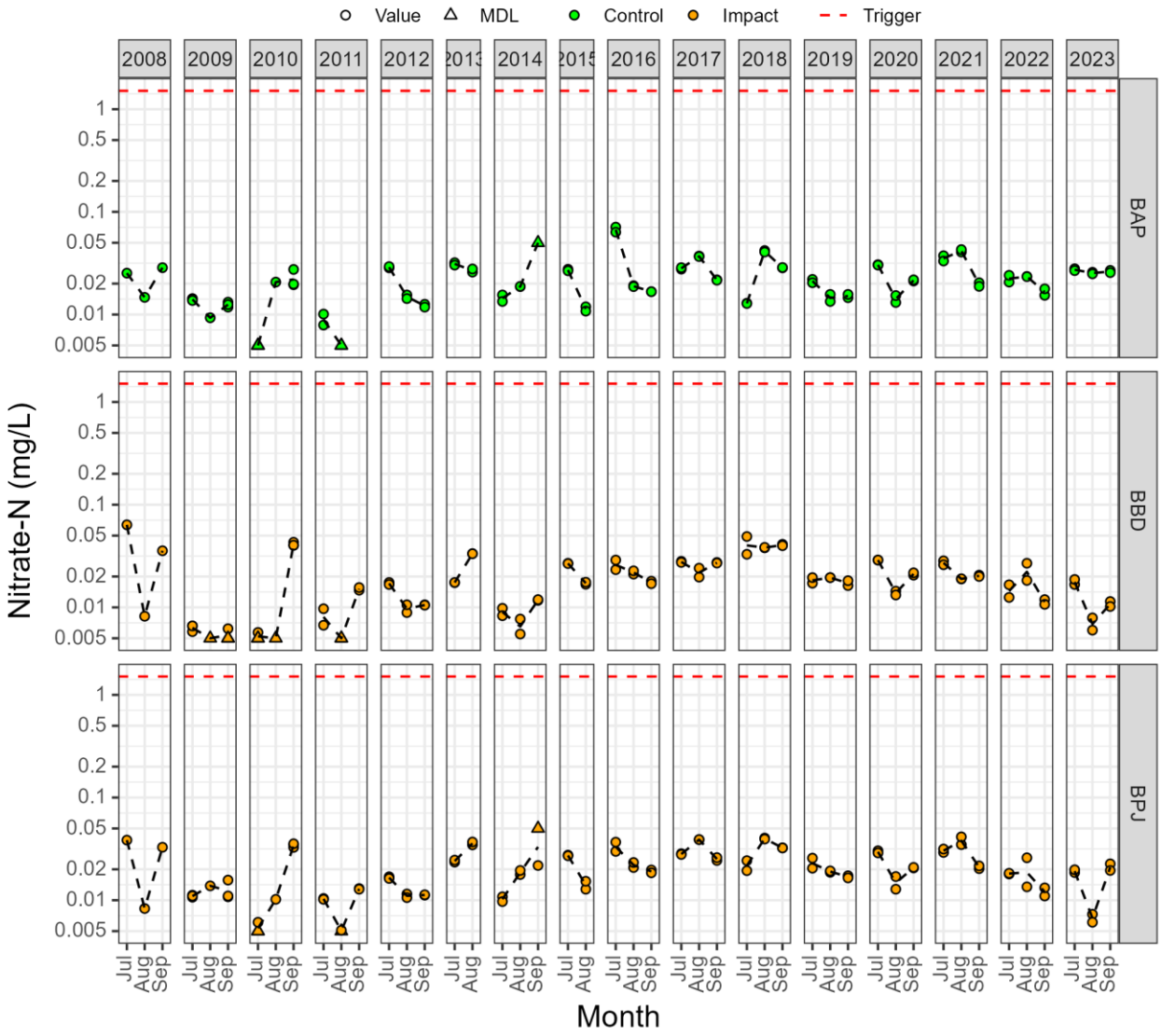


Figure B3-14. Nitrite-N (mg/L).

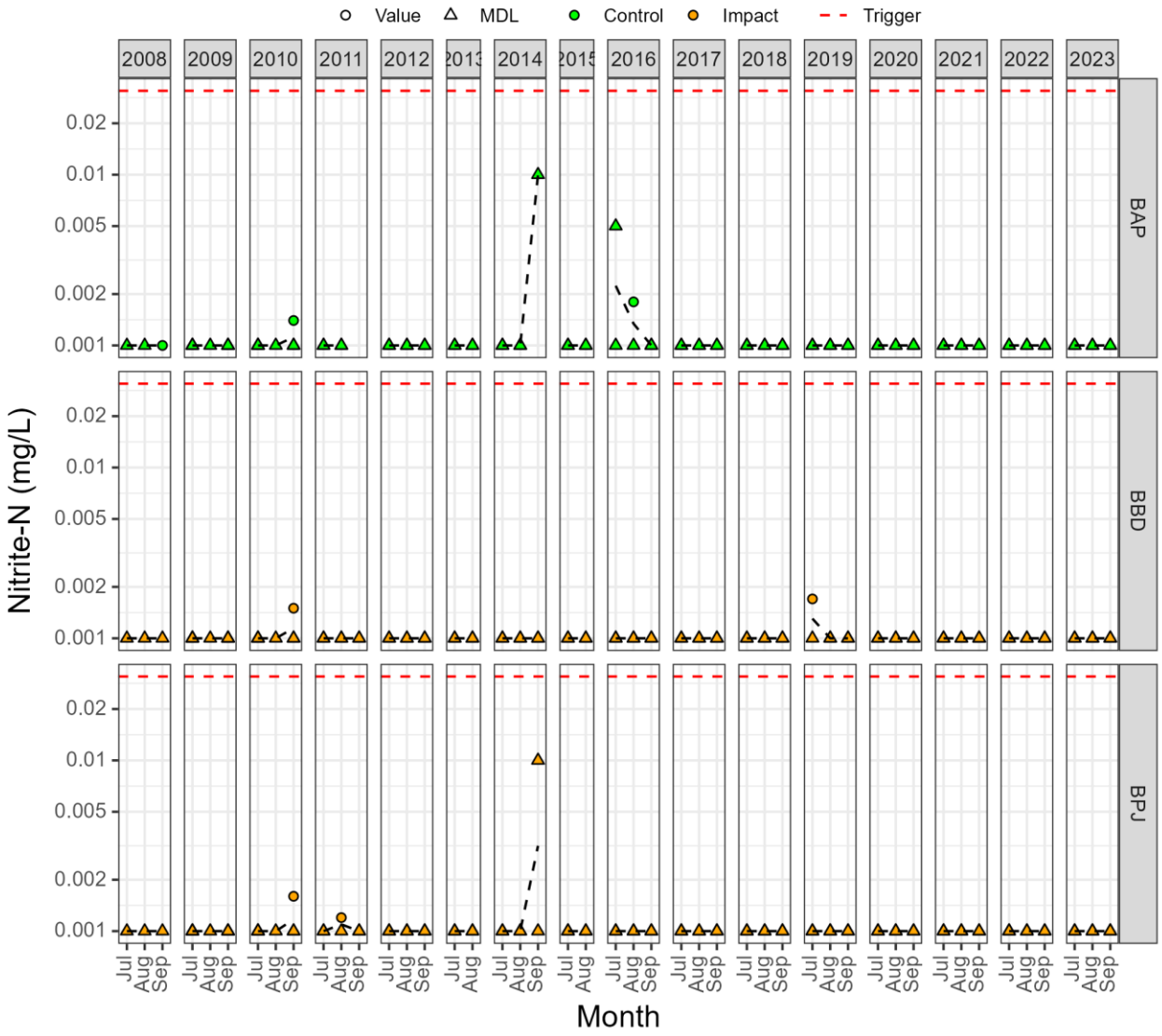


Figure B3-15. Total Kjeldahl Nitrogen (TKN; mg/L).

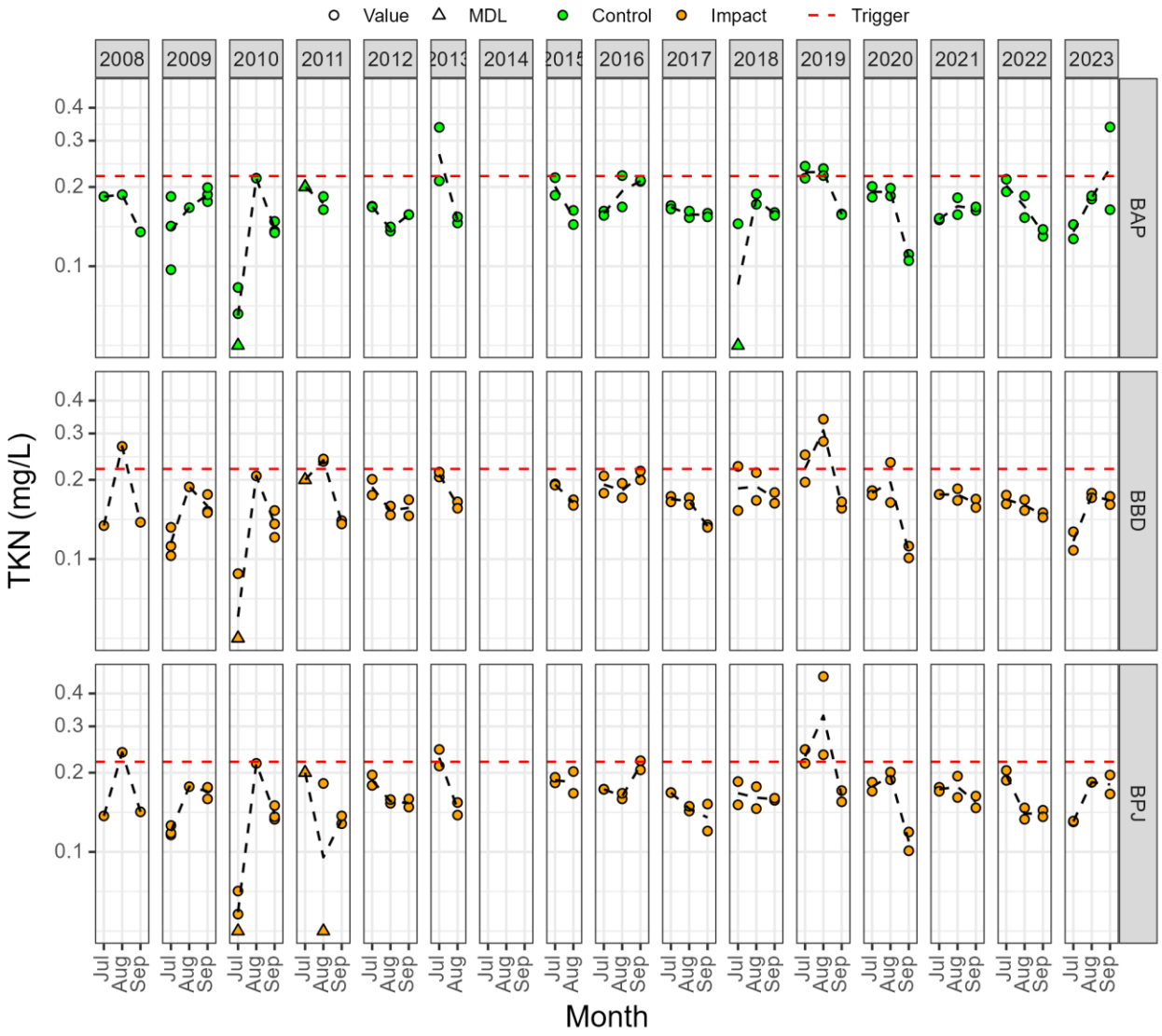


Figure B3-16. Ortho-phosphate (mg/L).

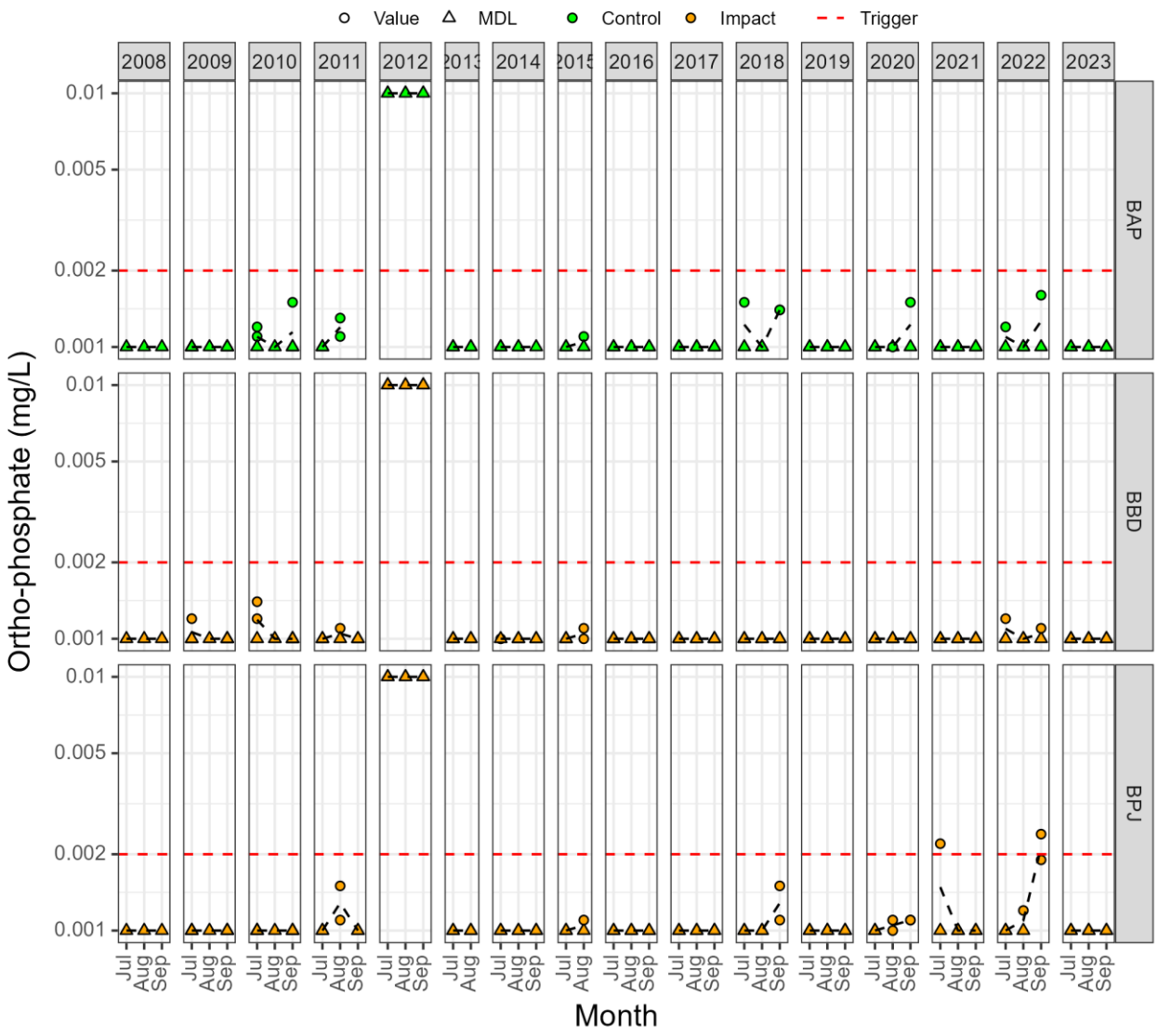


Figure B3-17. Total phosphorous (mg/L).

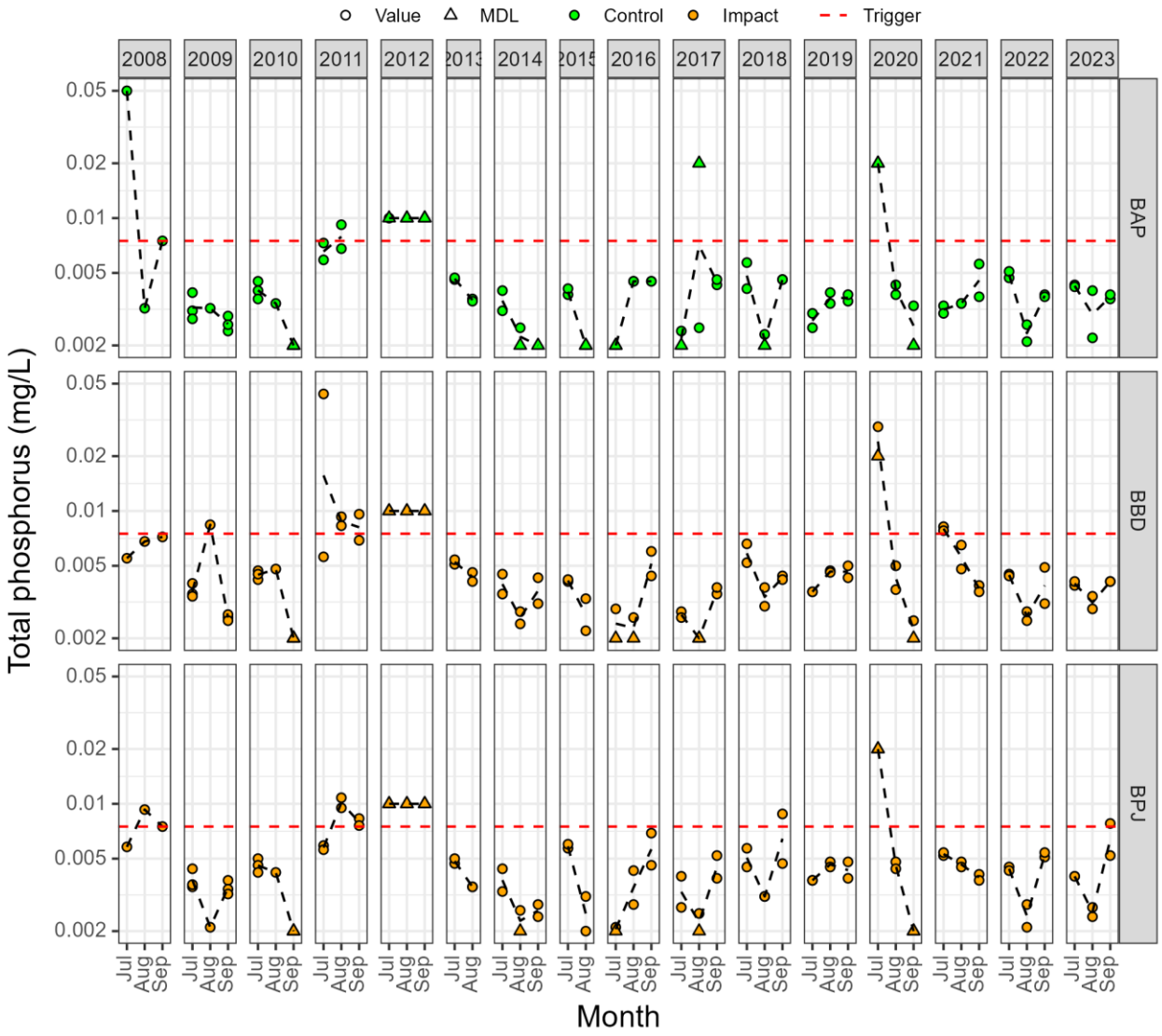


Figure B3-18. Reactive silica (mg/L).

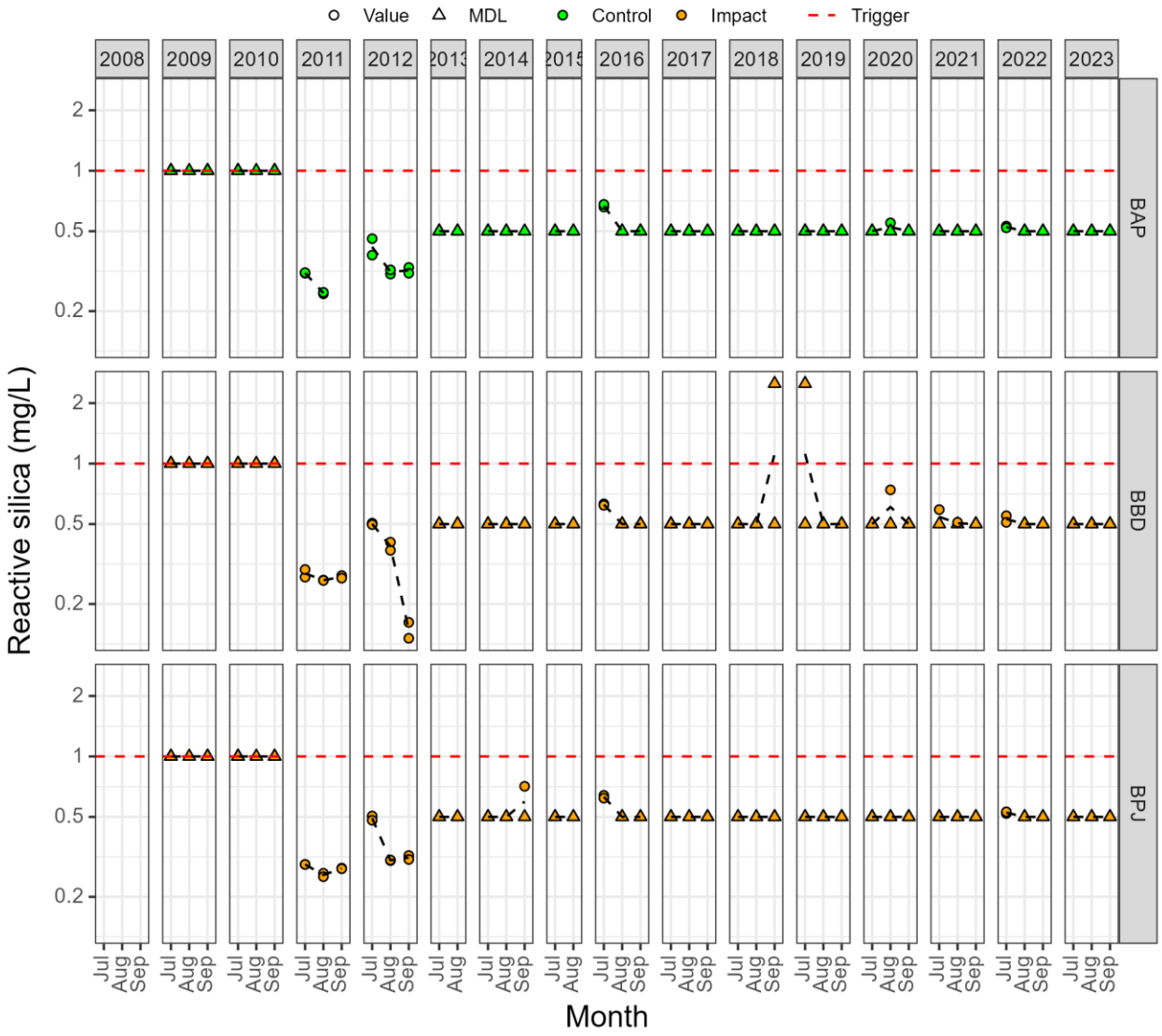


Figure B3-19. Sulphate (mg/L).

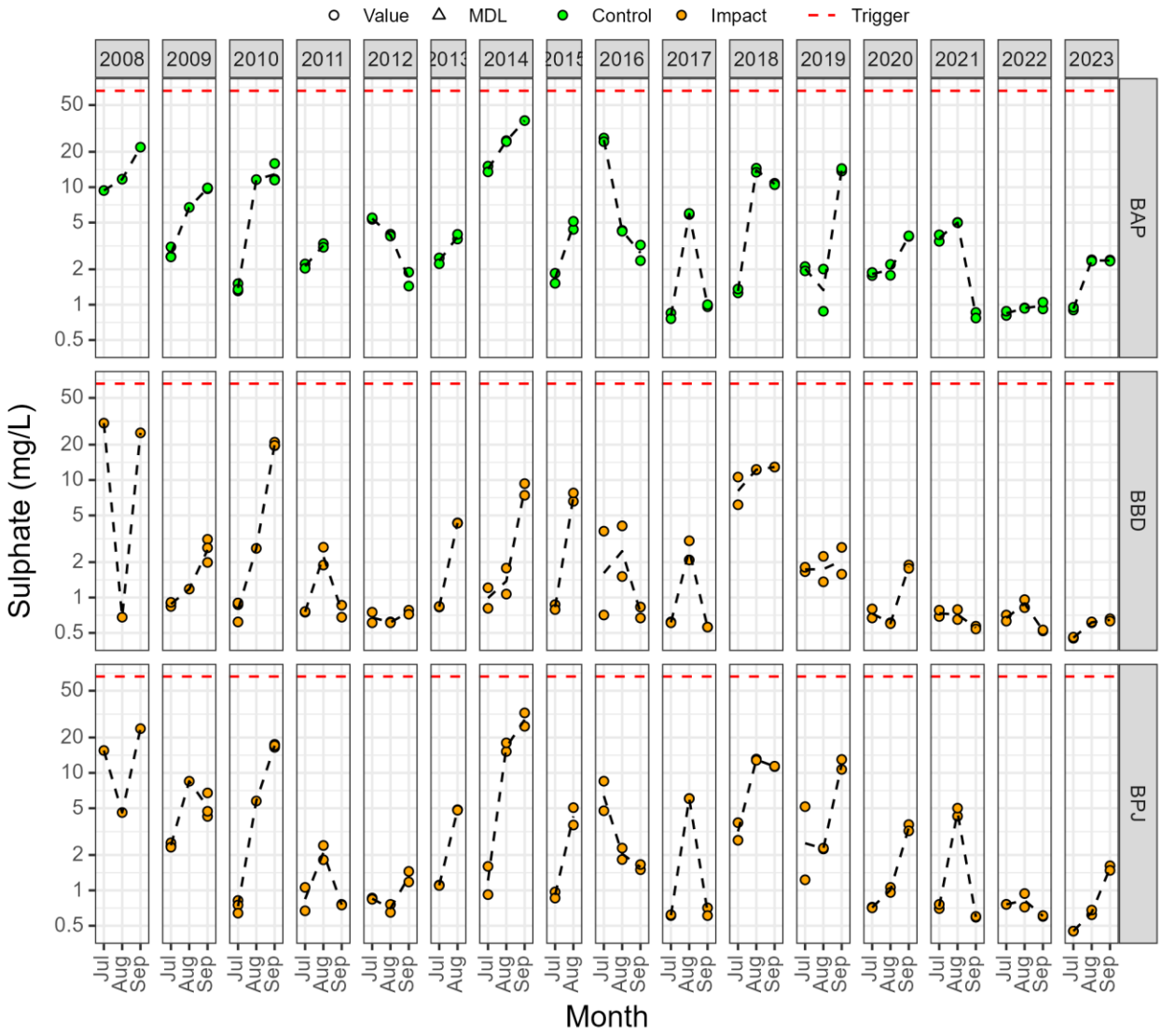


Figure B3-20. Dissolved organic carbon (DOC; mg/L).

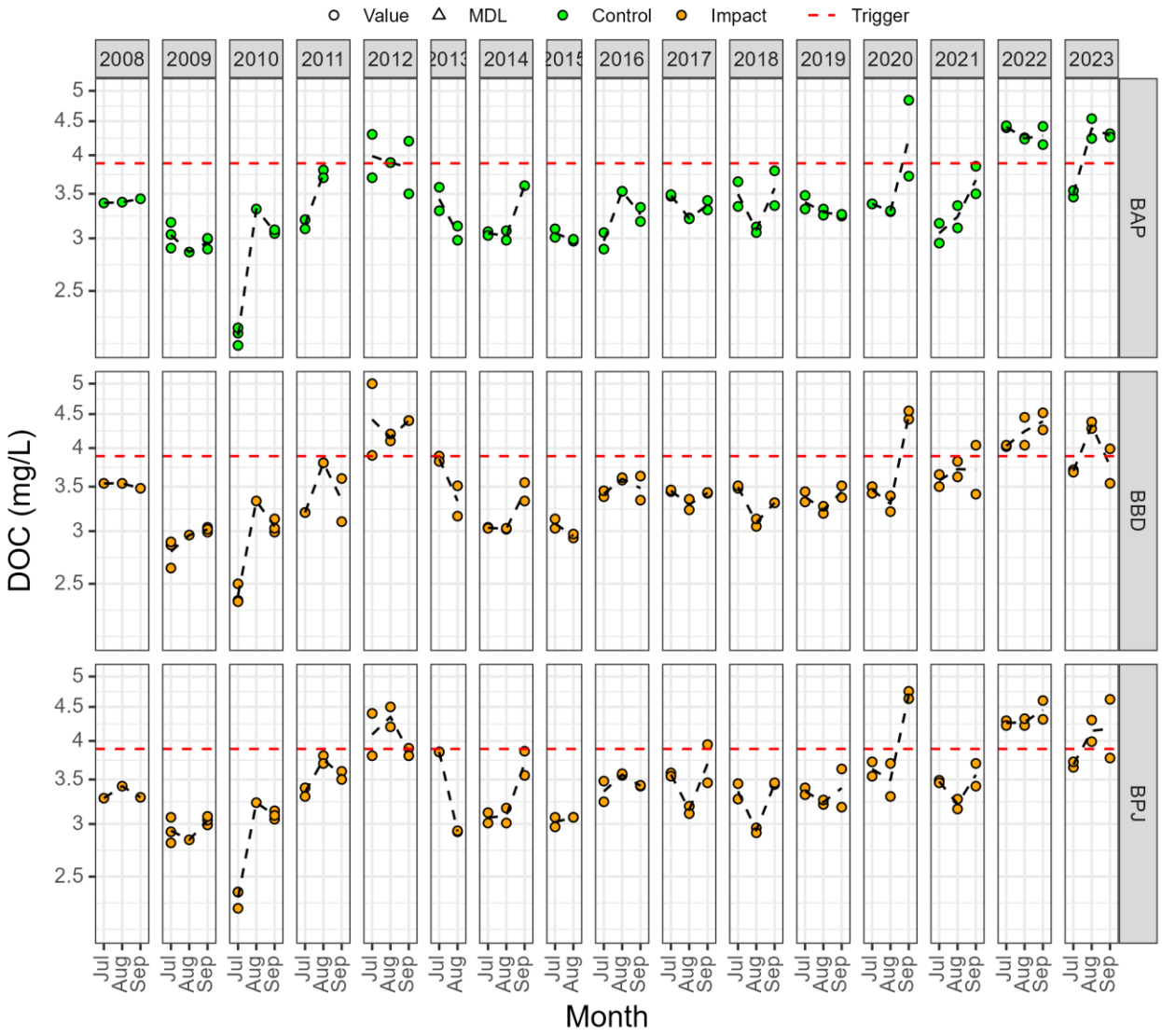


Figure B3-21. Total organic carbon (TOC; mg/L).

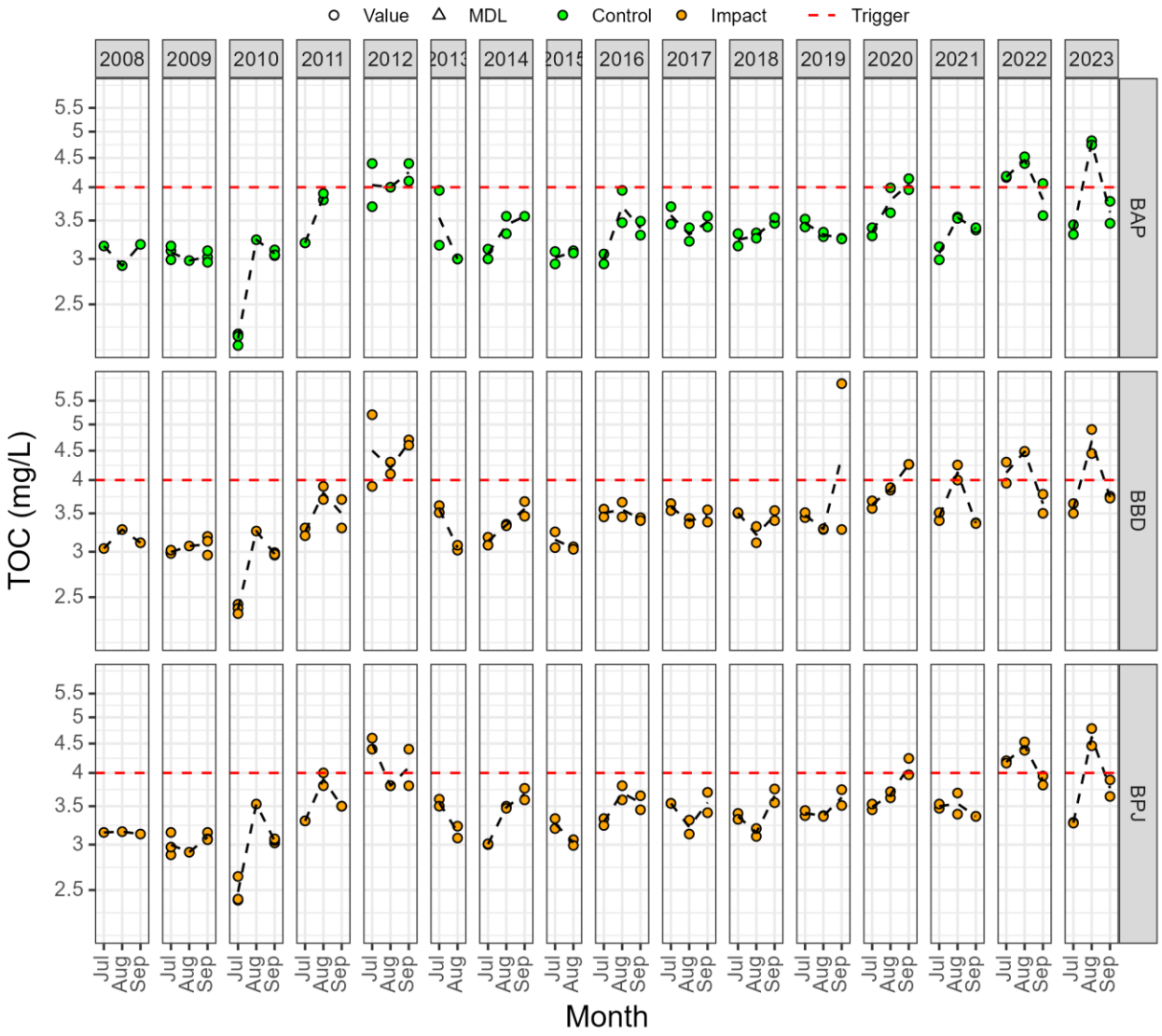


Figure B3-22. Total aluminum (mg/L).

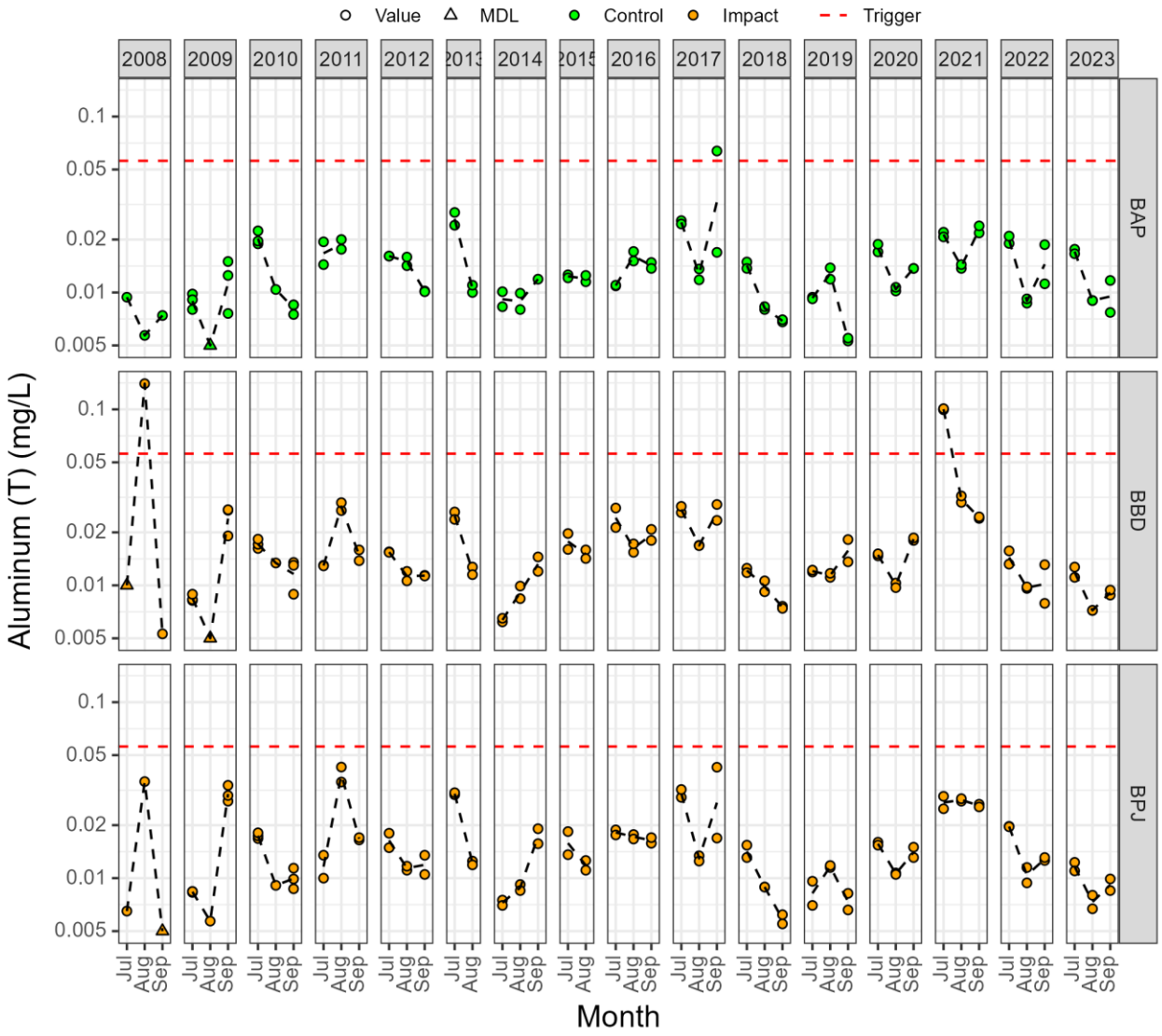


Figure B3-23. Total antimony (mg/L).

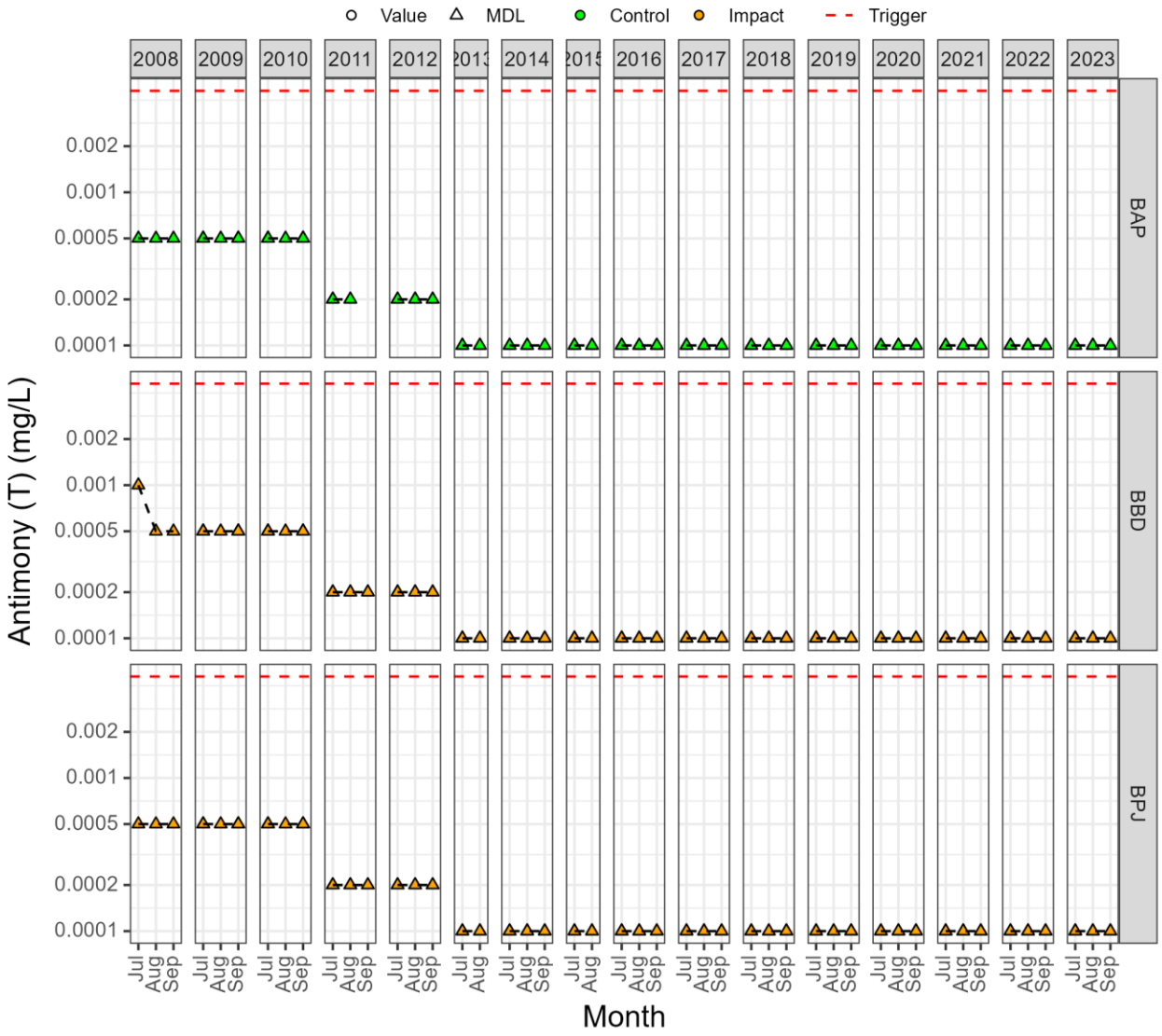


Figure B3-24. Total arsenic (mg/L).

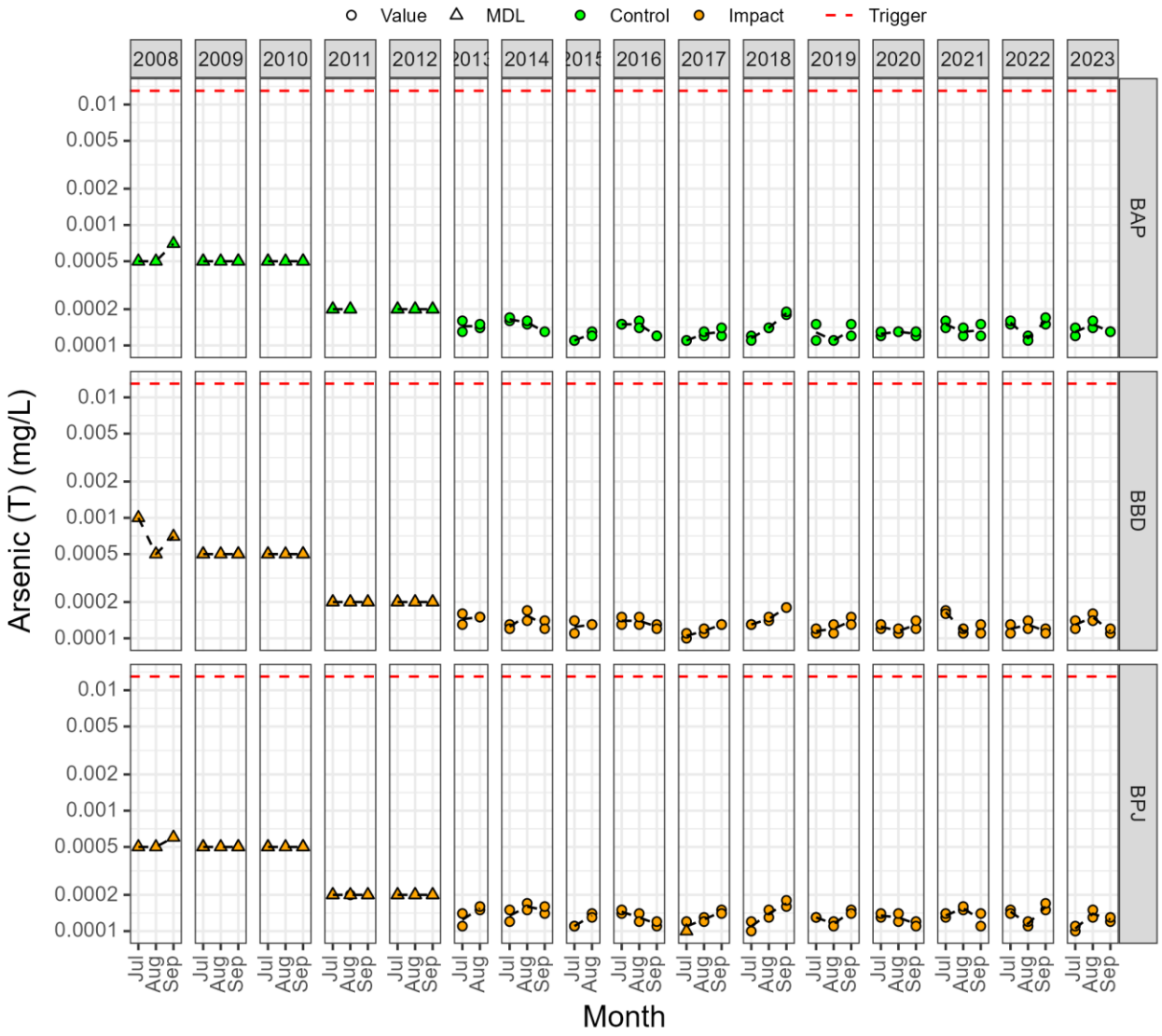


Figure B3-25. Total barium (mg/L).

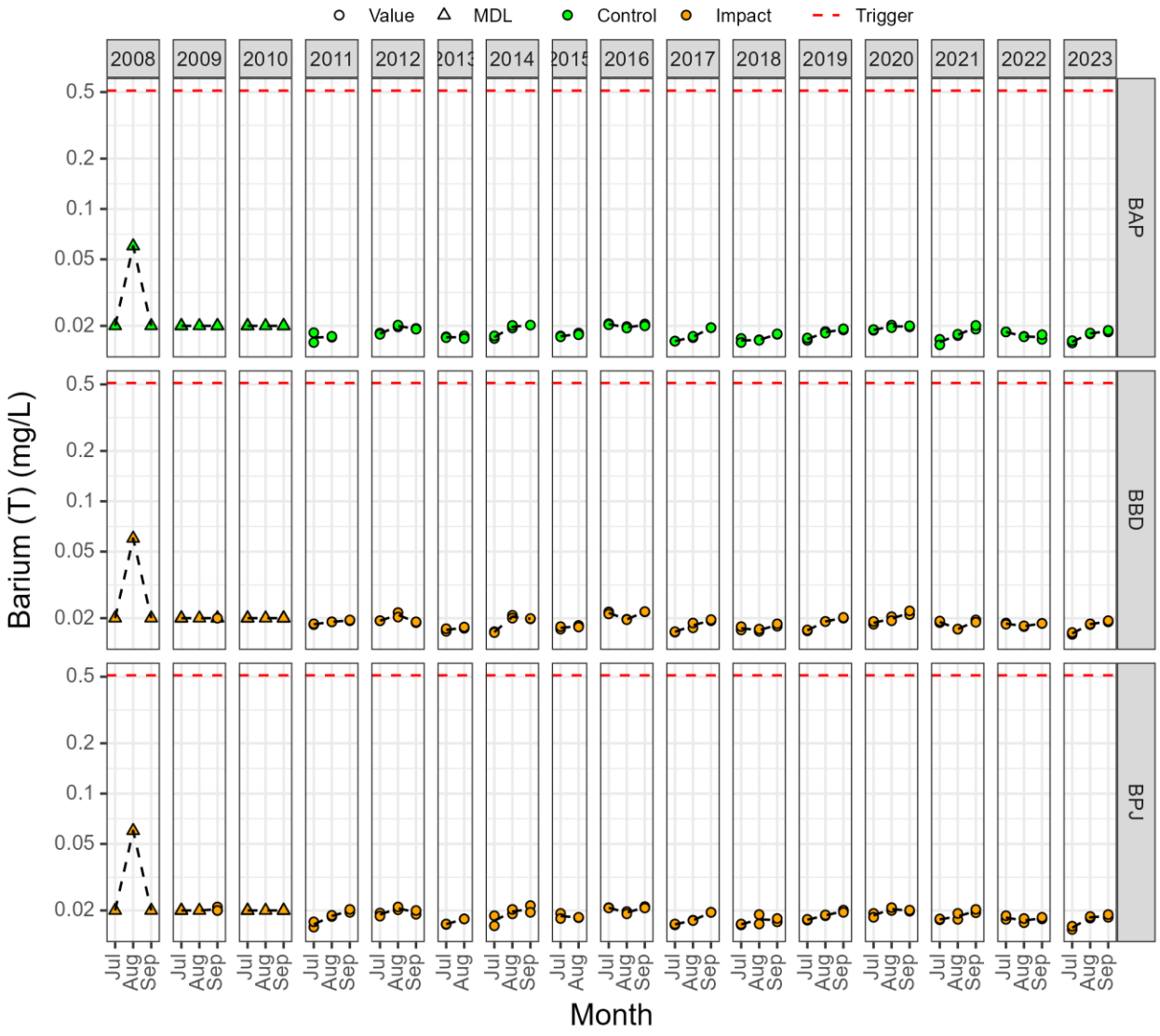


Figure B3-26. Total beryllium (mg/L).

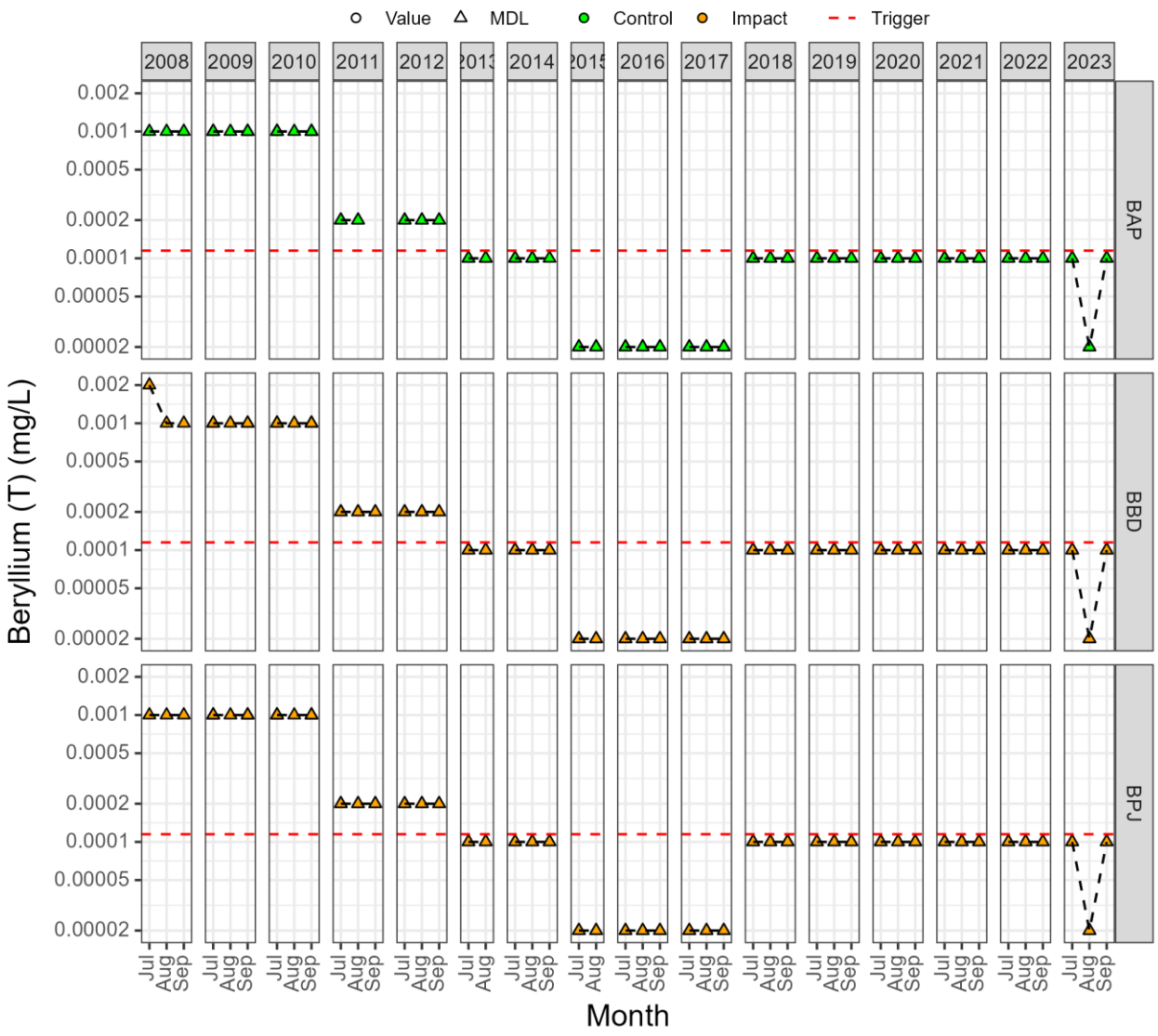


Figure B3-27. Total boron (mg/L).

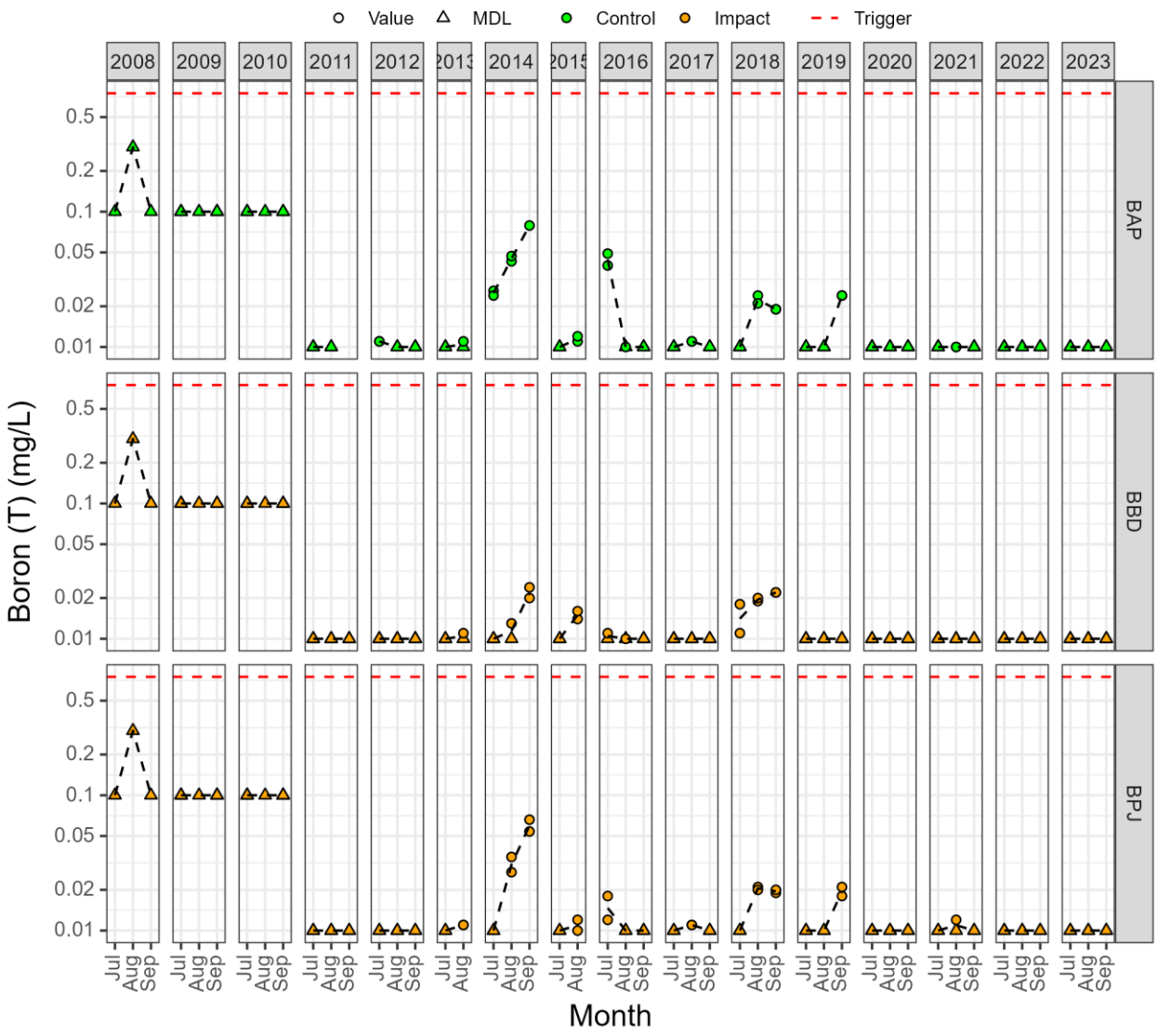


Figure B3-28. Total cadmium (mg/L).

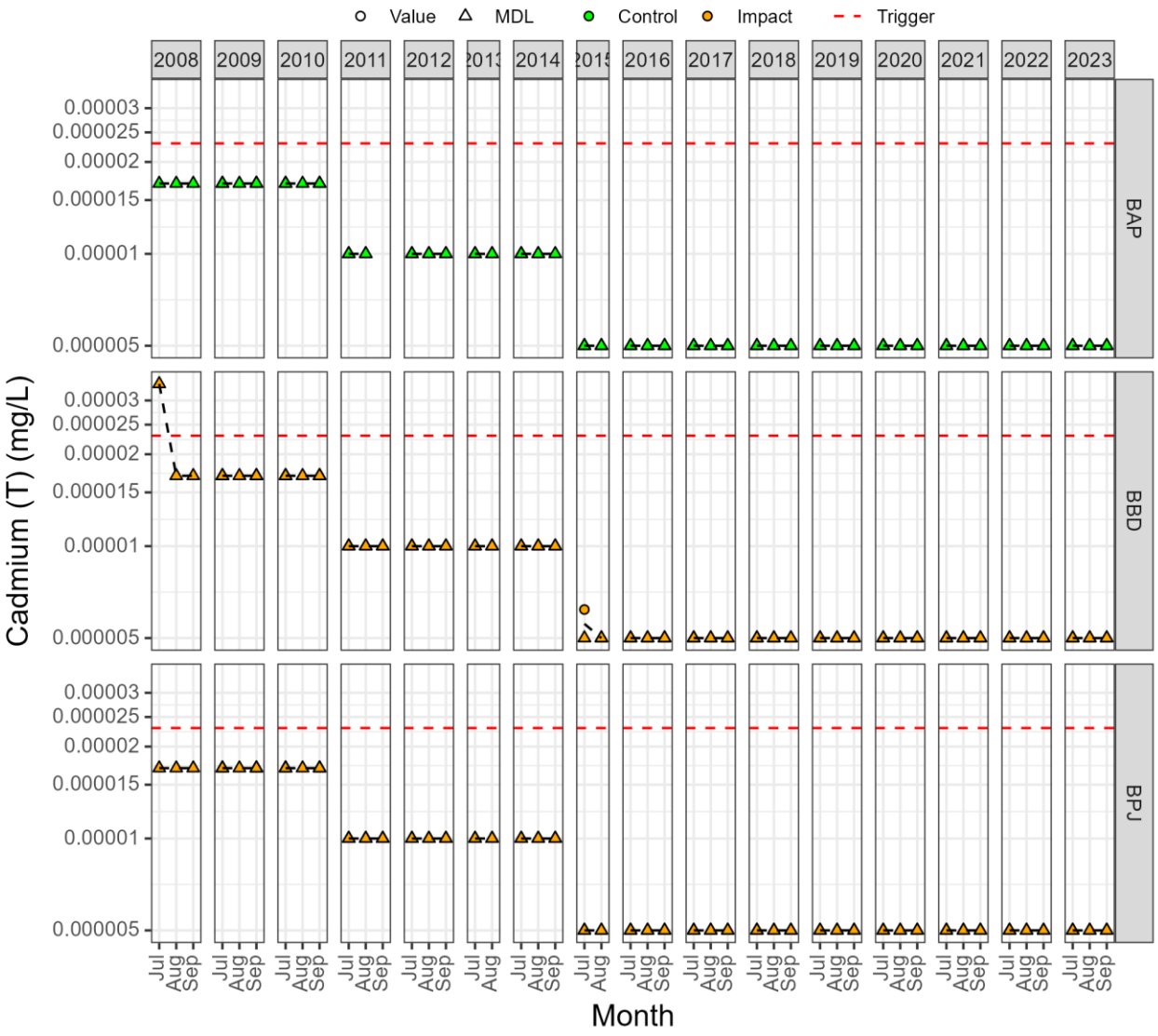


Figure B3-29. Total calcium (mg/L).

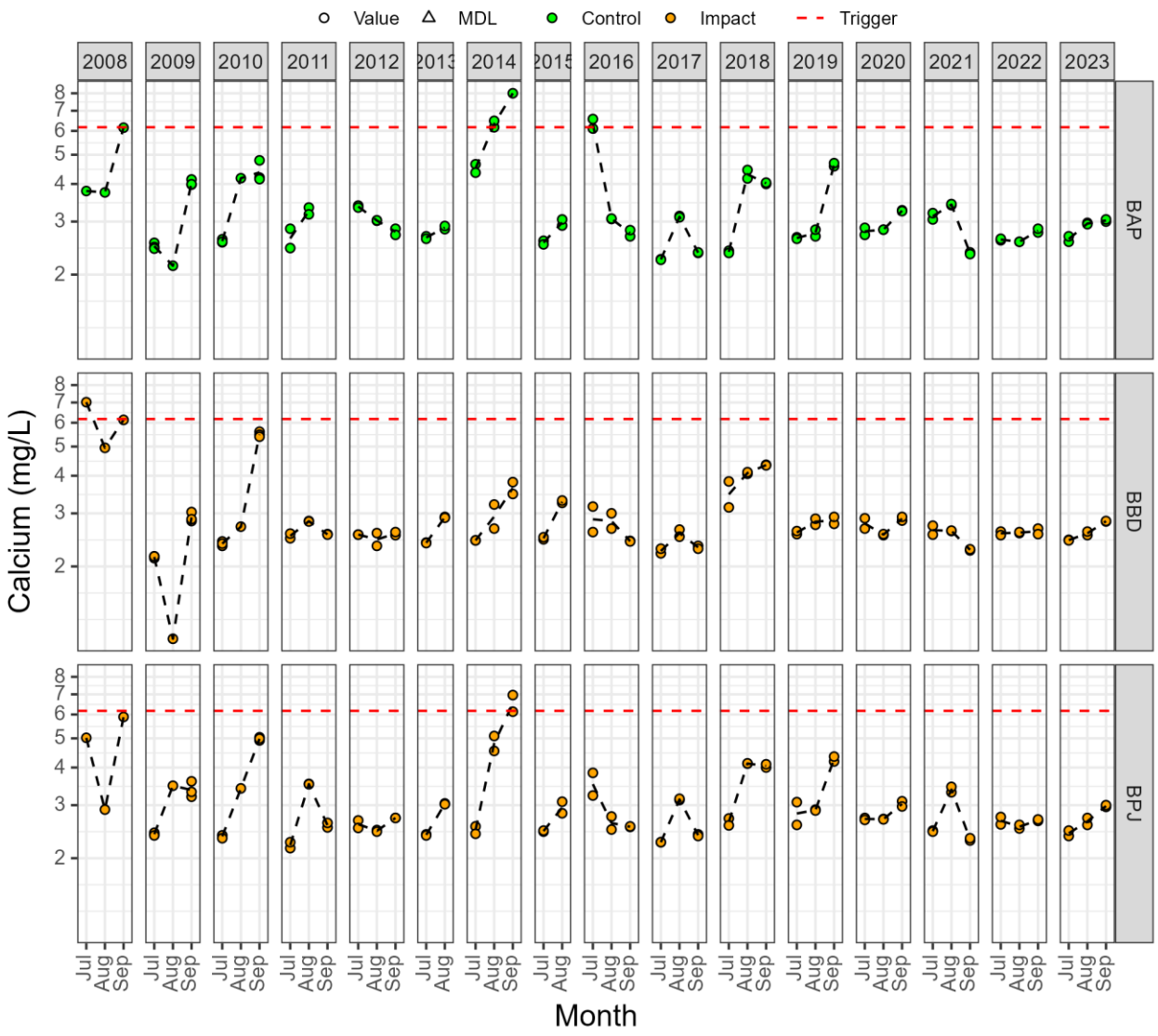


Figure B3-30. Total chromium (mg/L).

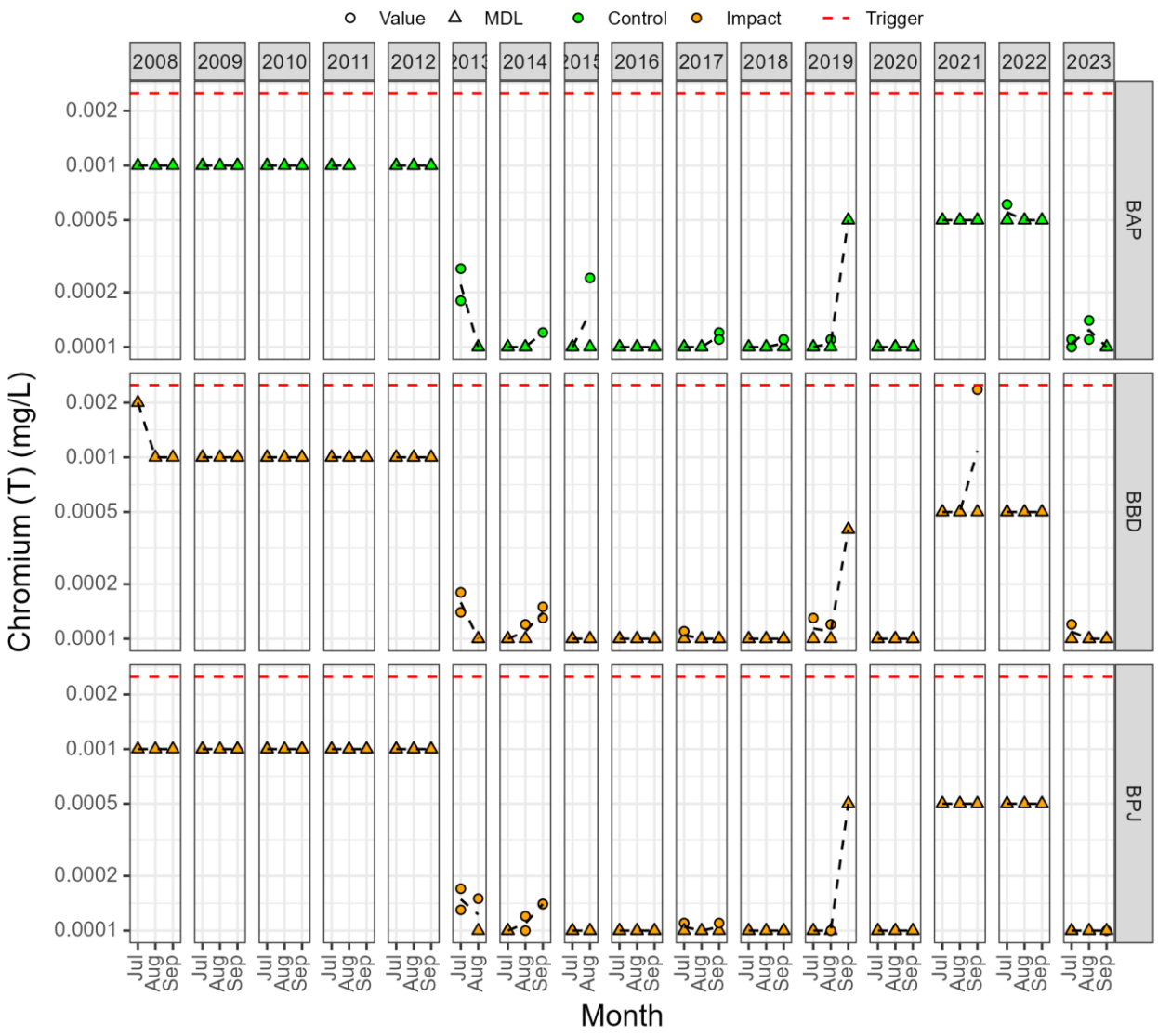


Figure B3-31. Total copper (mg/L).

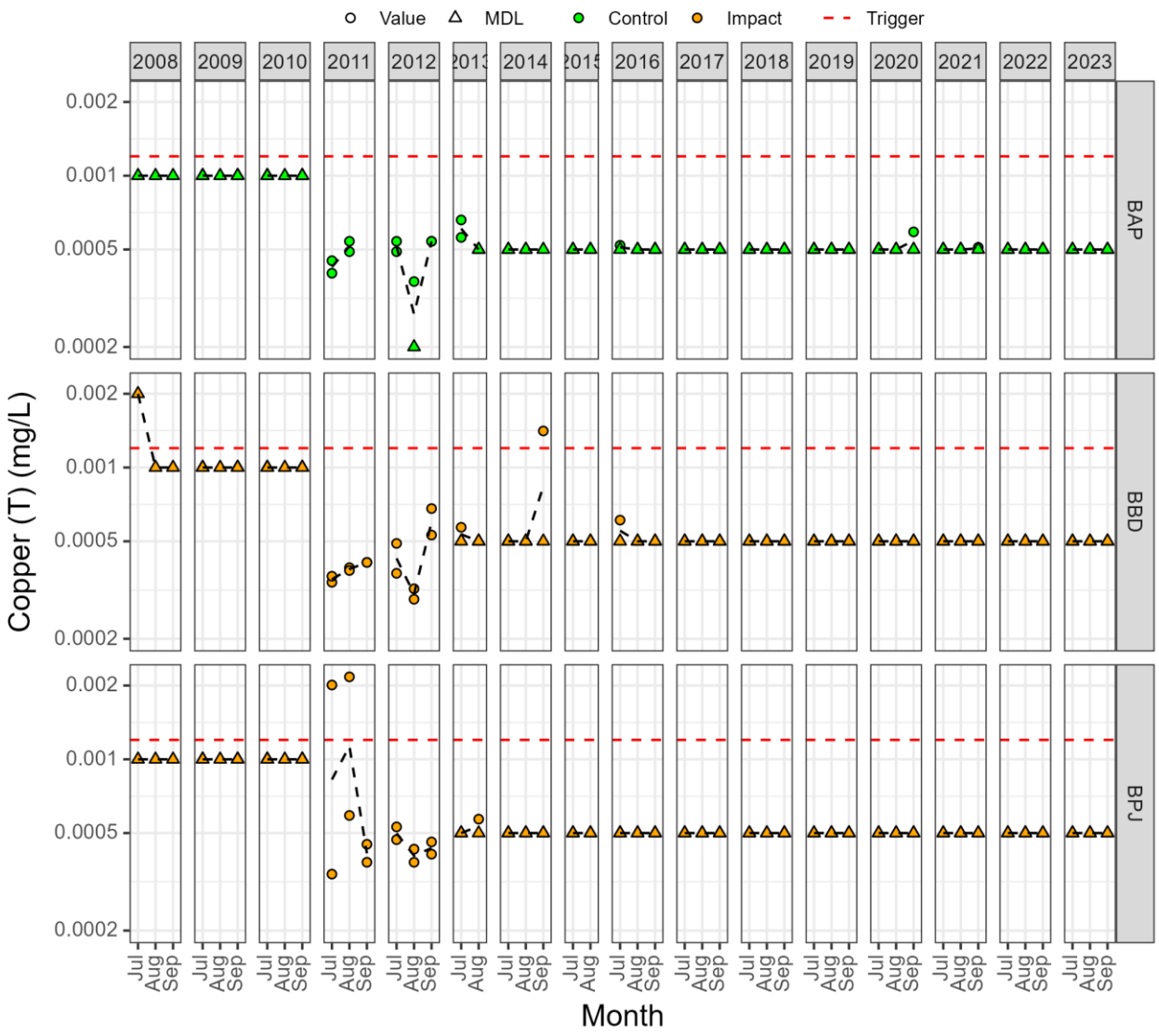


Figure B3-32. Total iron (mg/L).

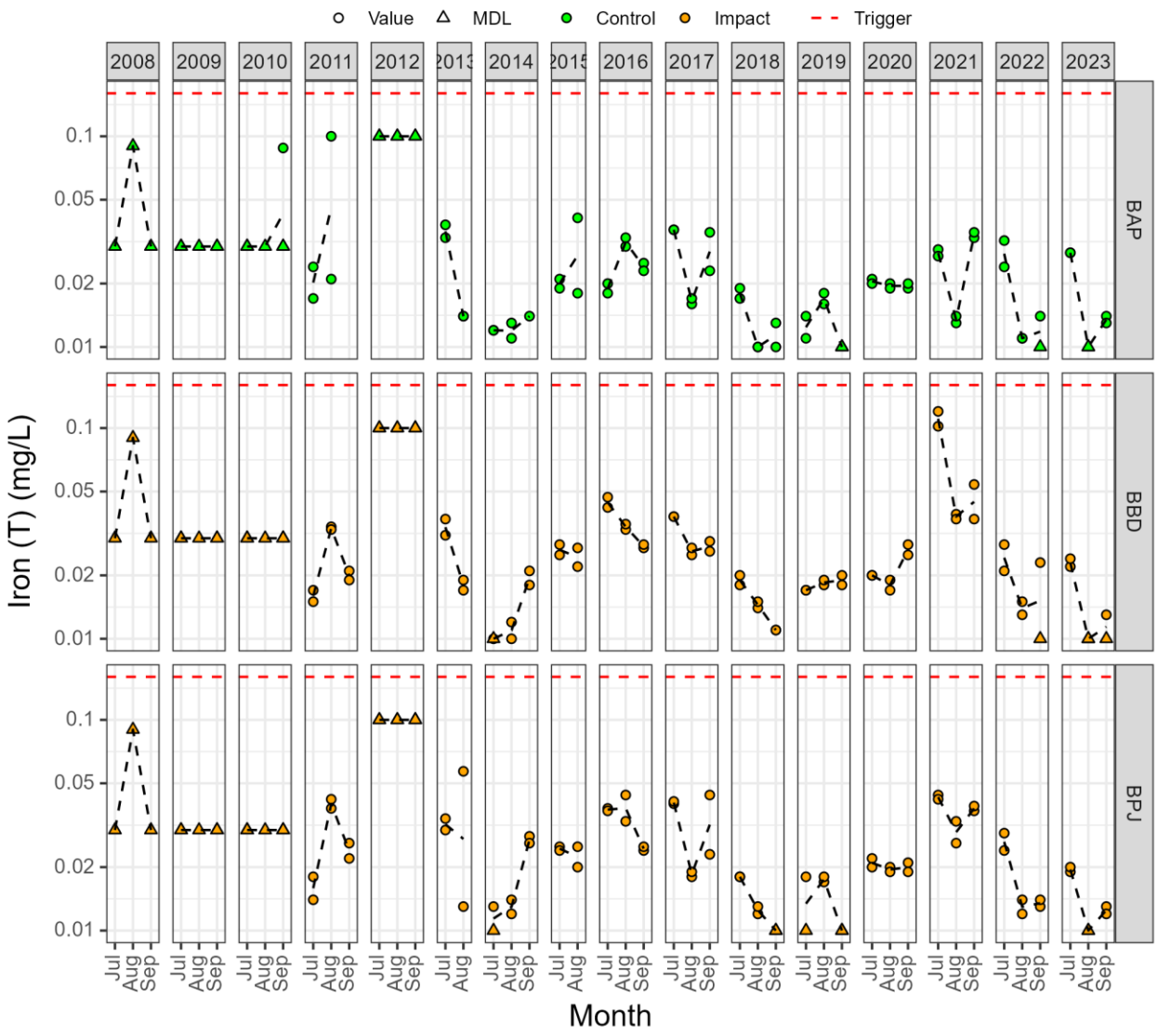


Figure B3-33. Total lead (mg/L).

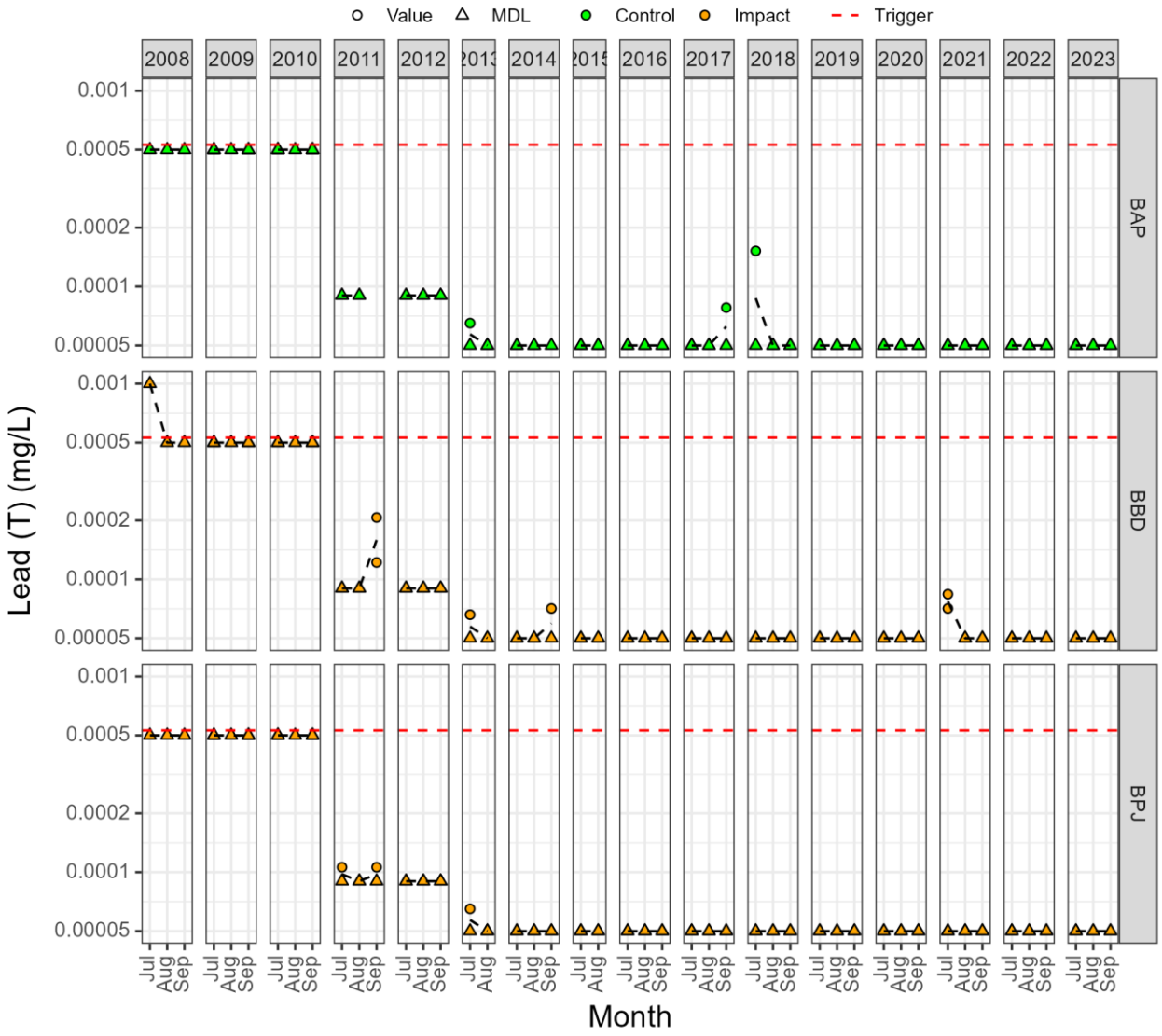


Figure B3-34. Total lithium (mg/L).

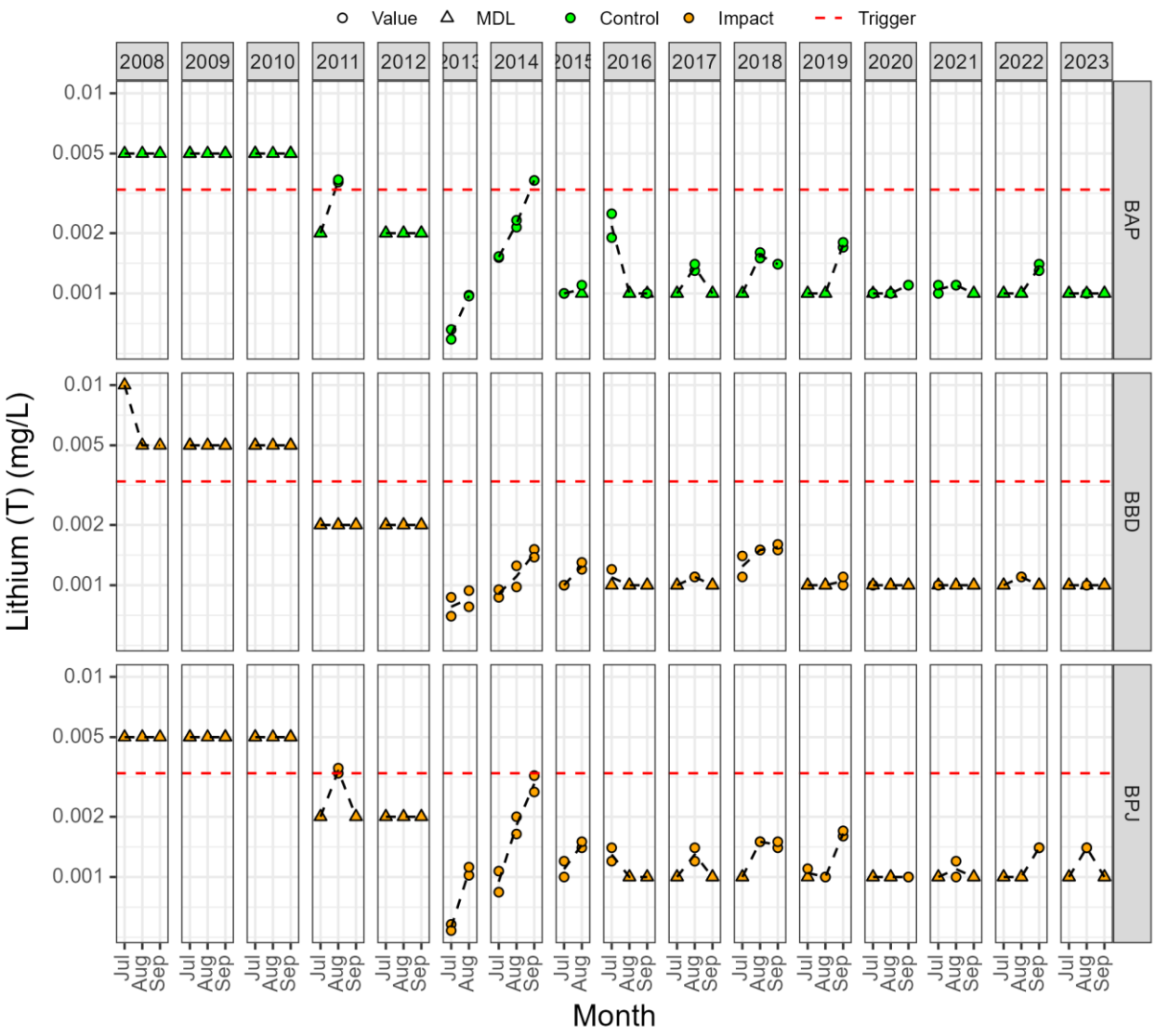


Figure B3-35. Total magnesium (mg/L).

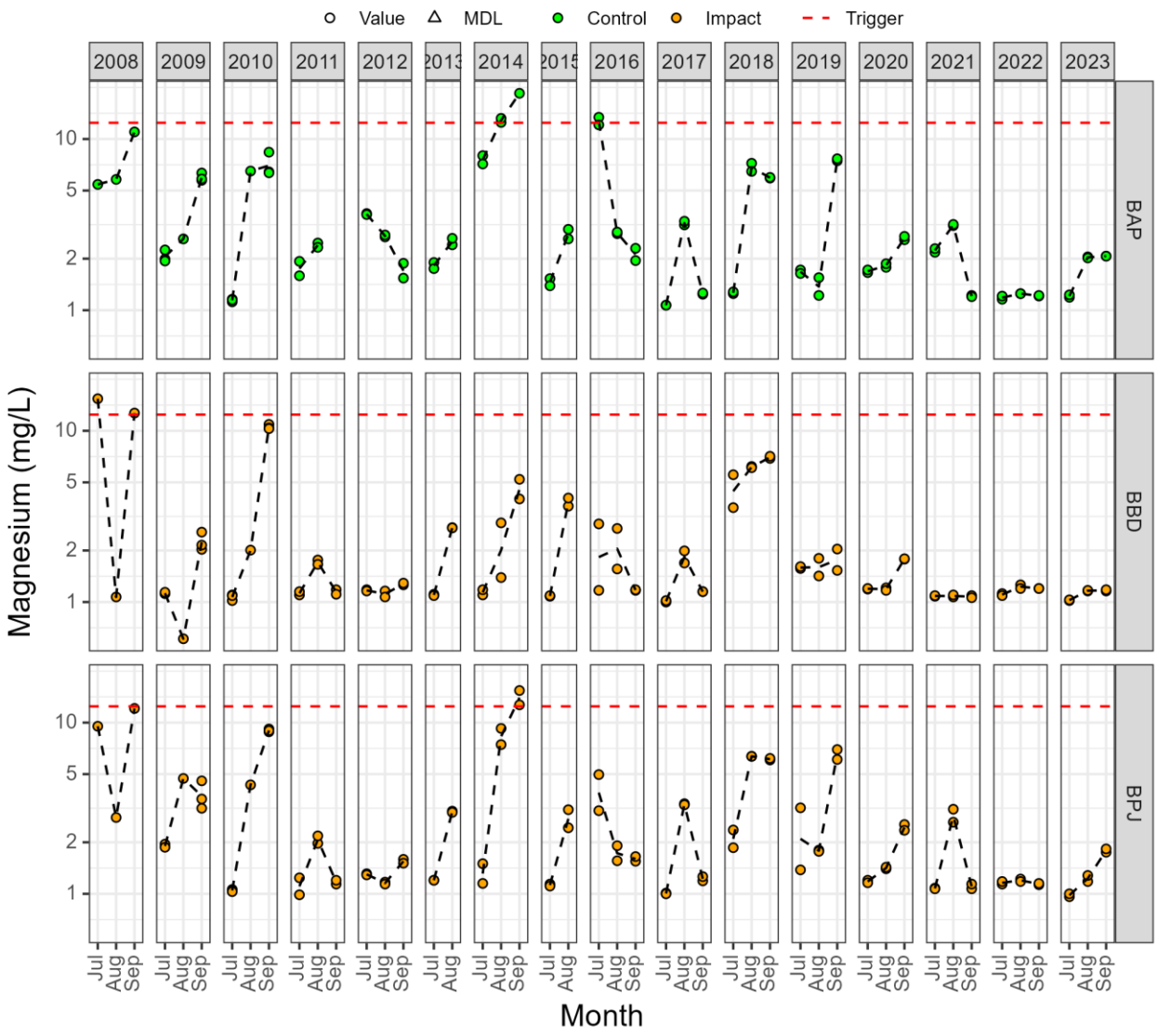


Figure B3-36. Total manganese (mg/L).

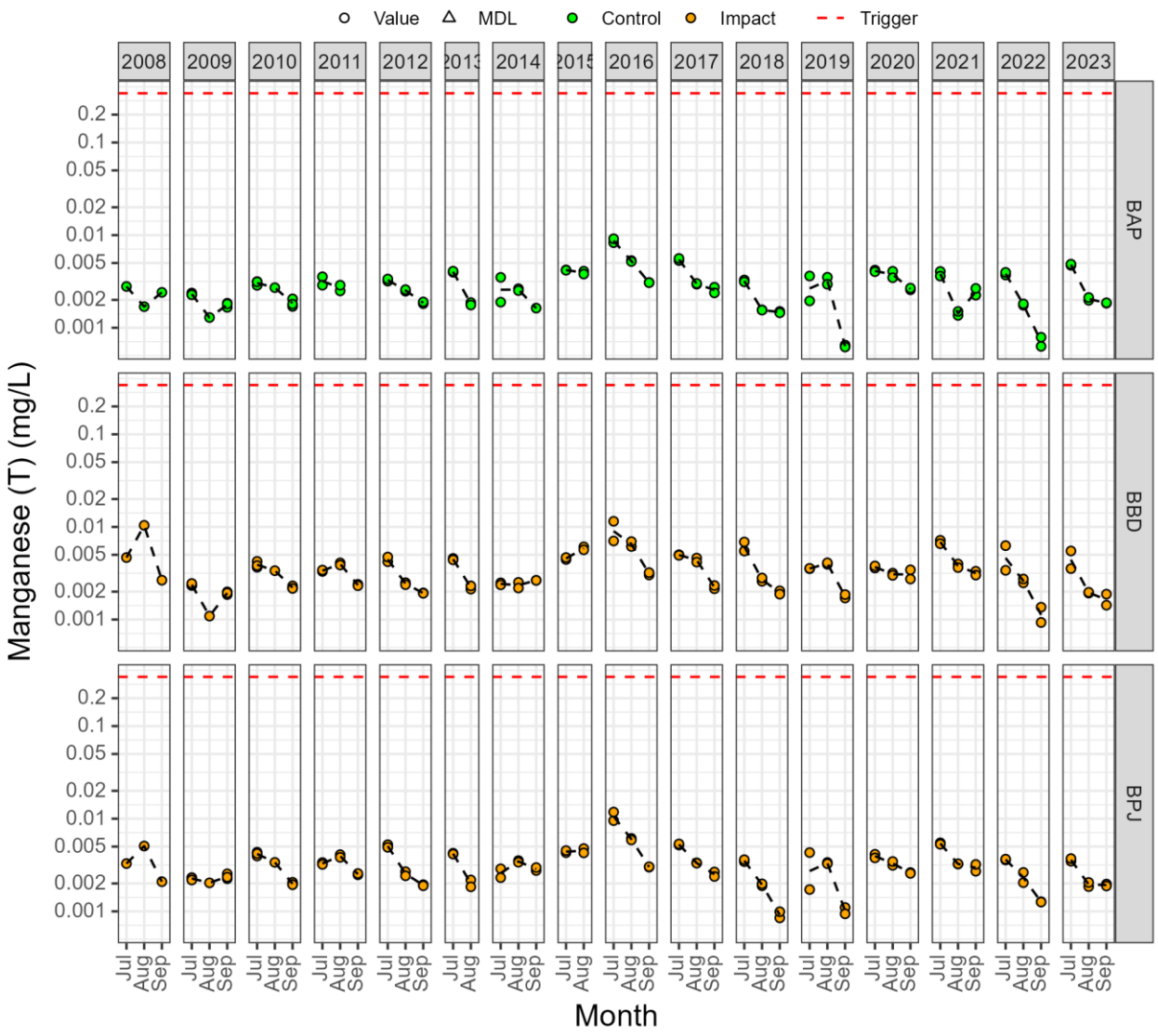


Figure B3-37. Total mercury (mg/L).

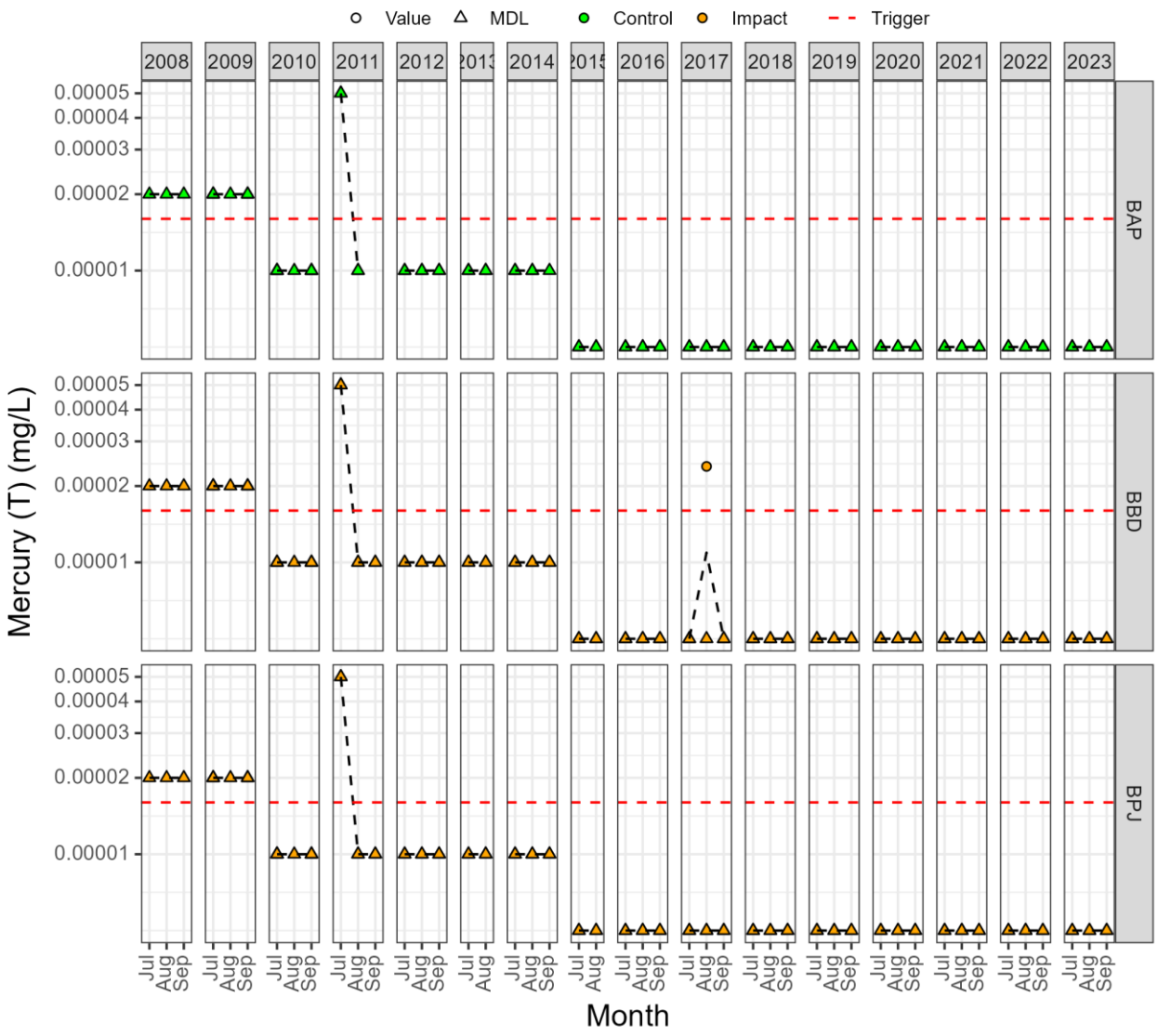


Figure B3-38. Total molybdenum (mg/L).

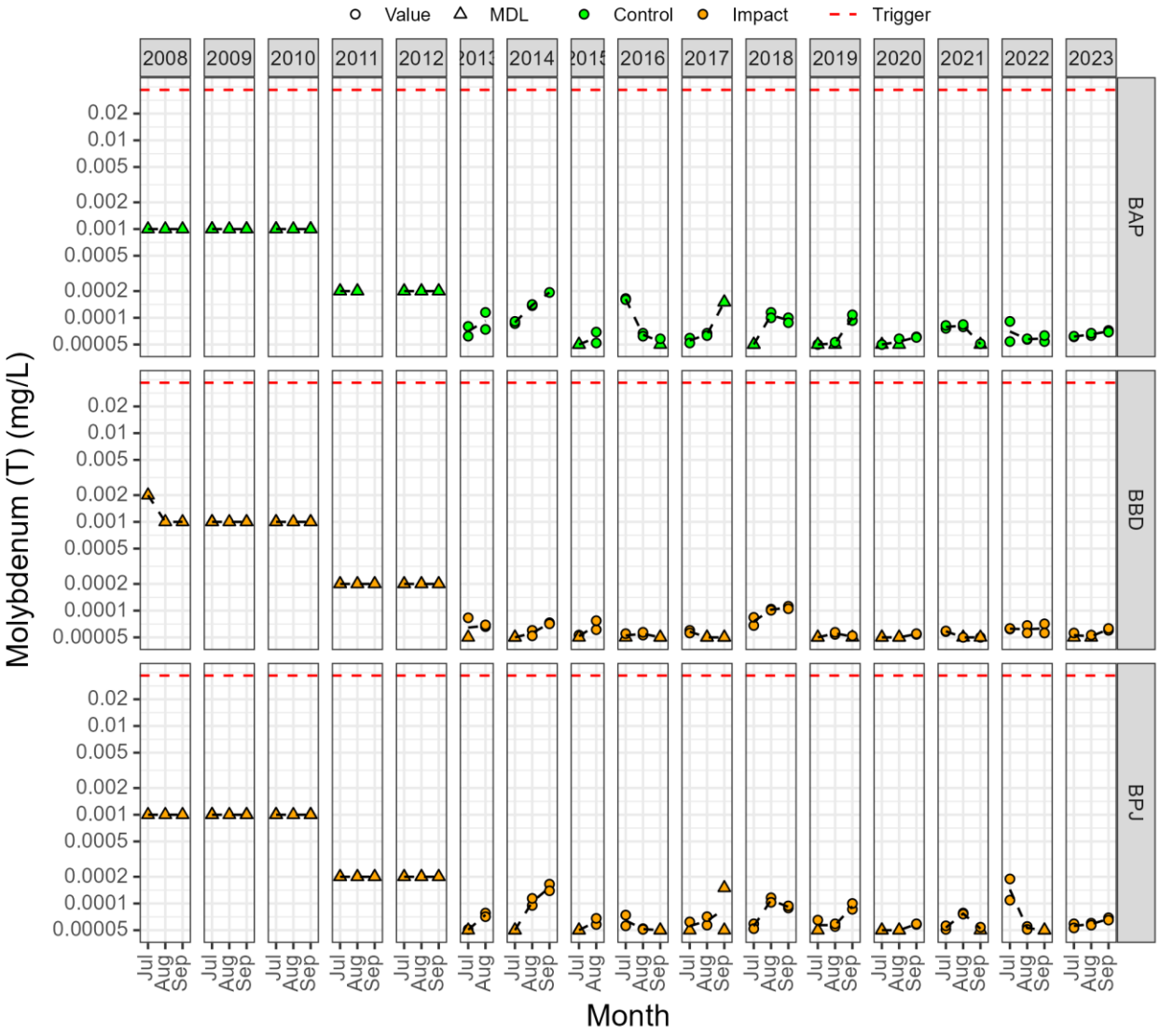


Figure B3-39. Total nickel (mg/L).

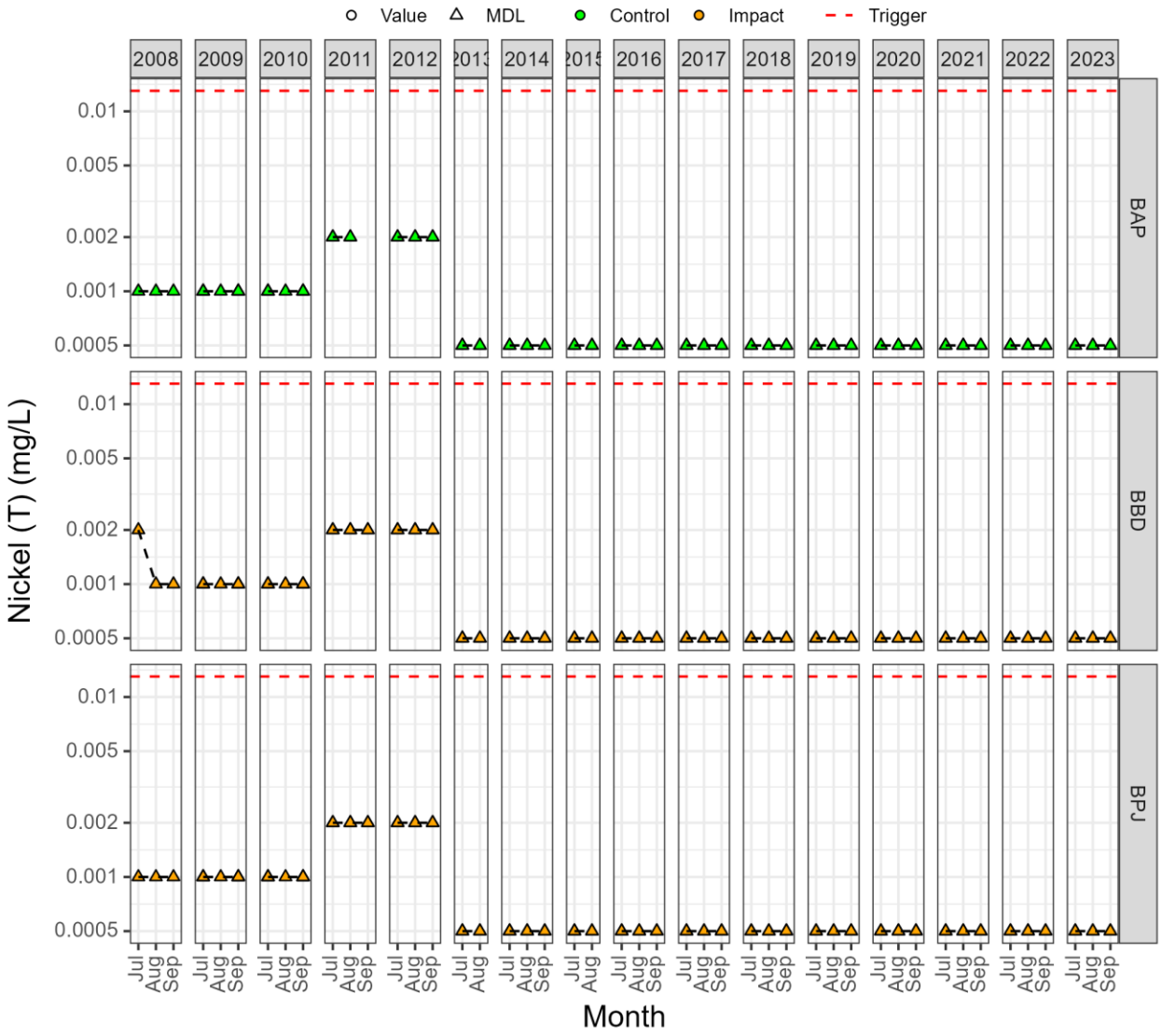


Figure B3-40. Total potassium (mg/L).

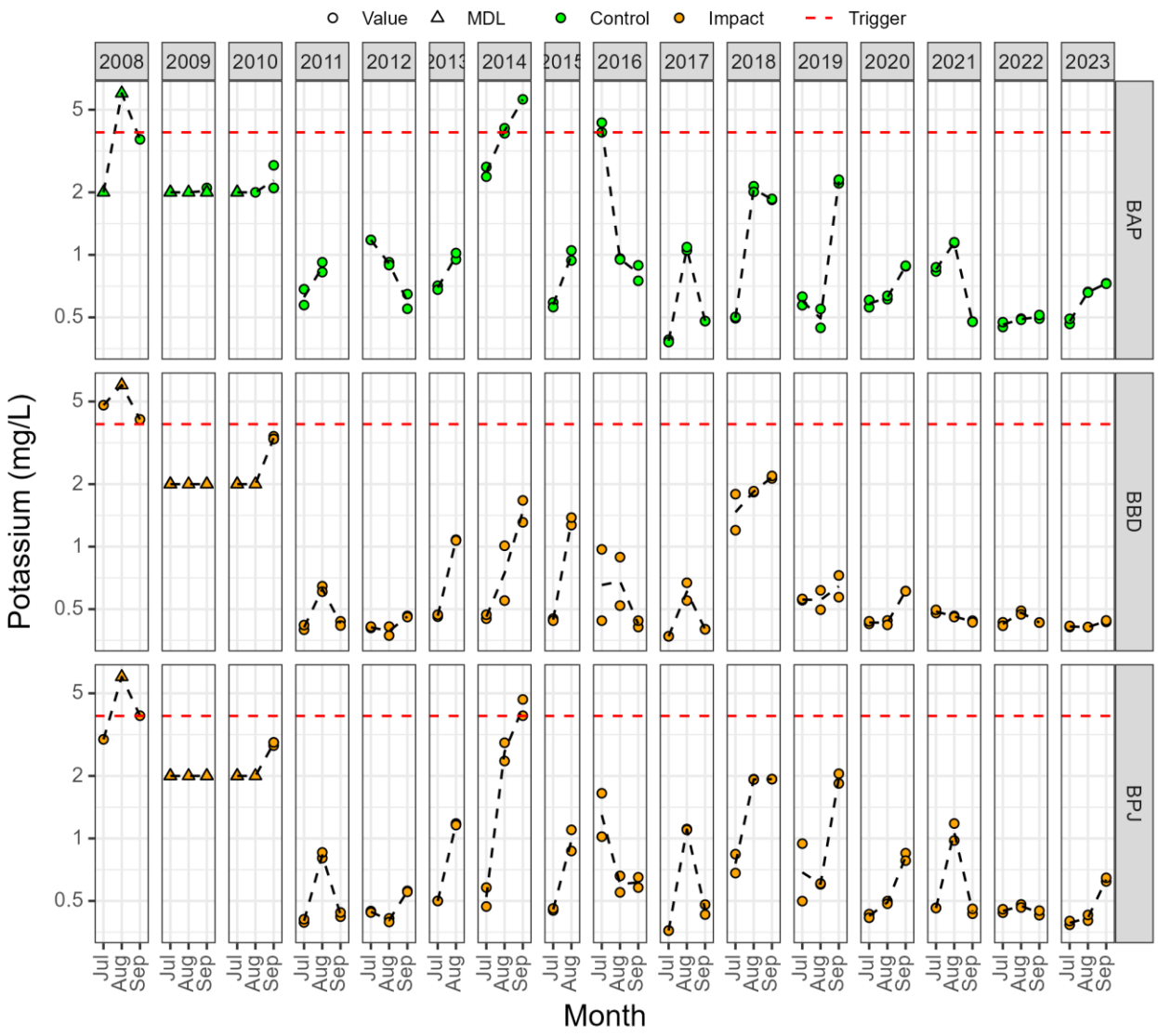


Figure B3-41. Total selenium (mg/L).

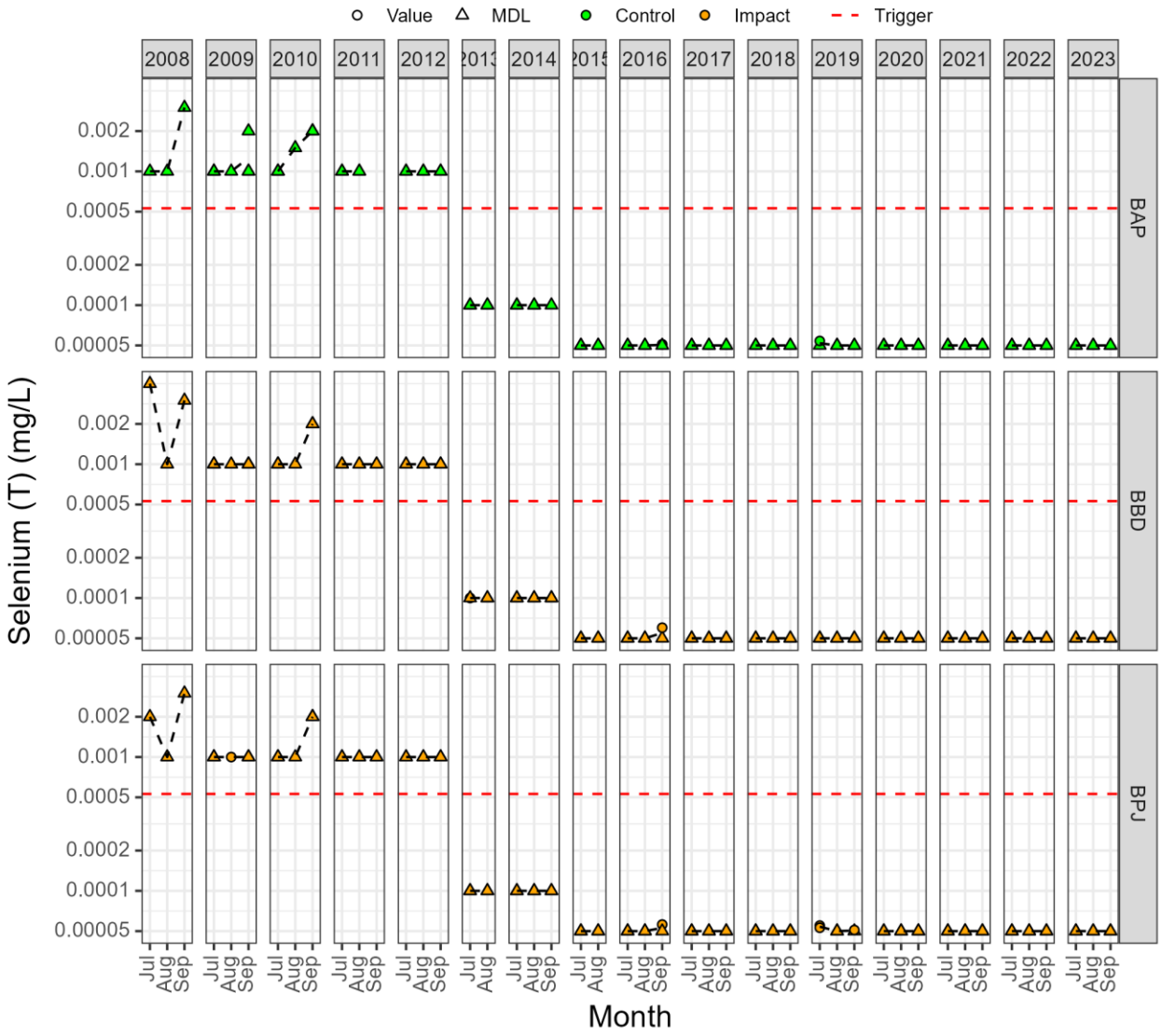


Figure B3-42. Total silicon (mg/L).

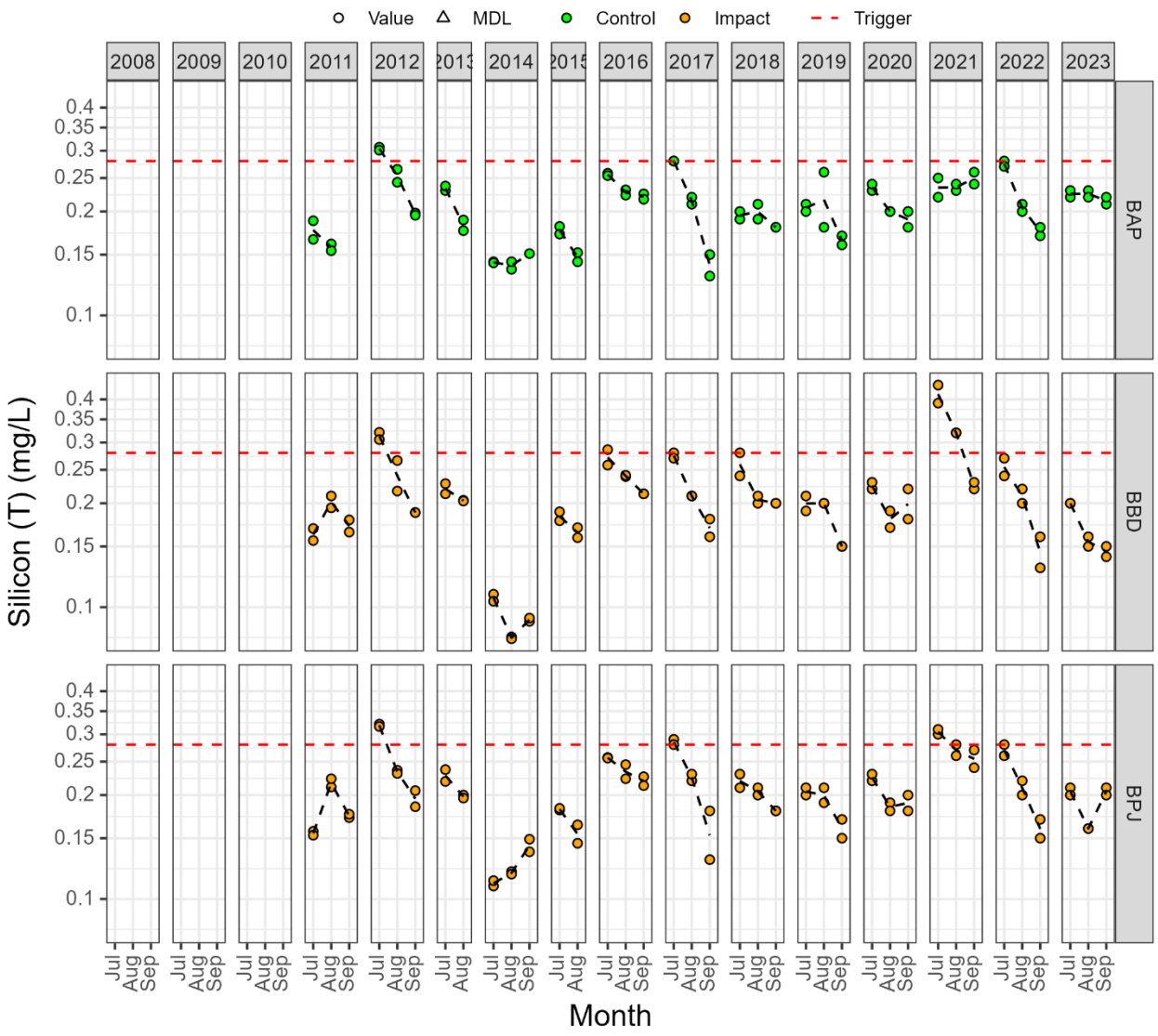


Figure B3-43. Total silver (mg/L).

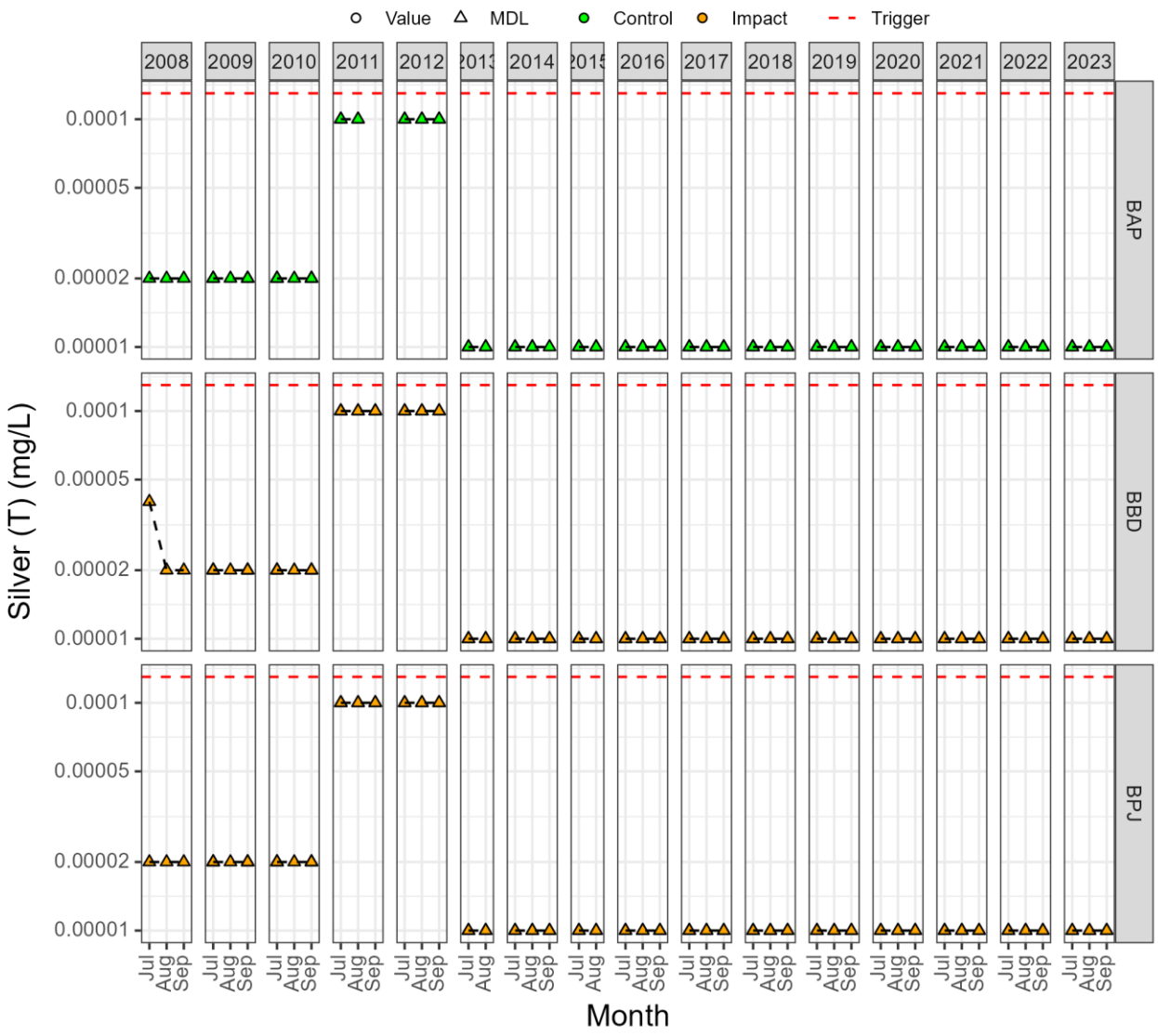


Figure B3-44. Total sodium (mg/L).

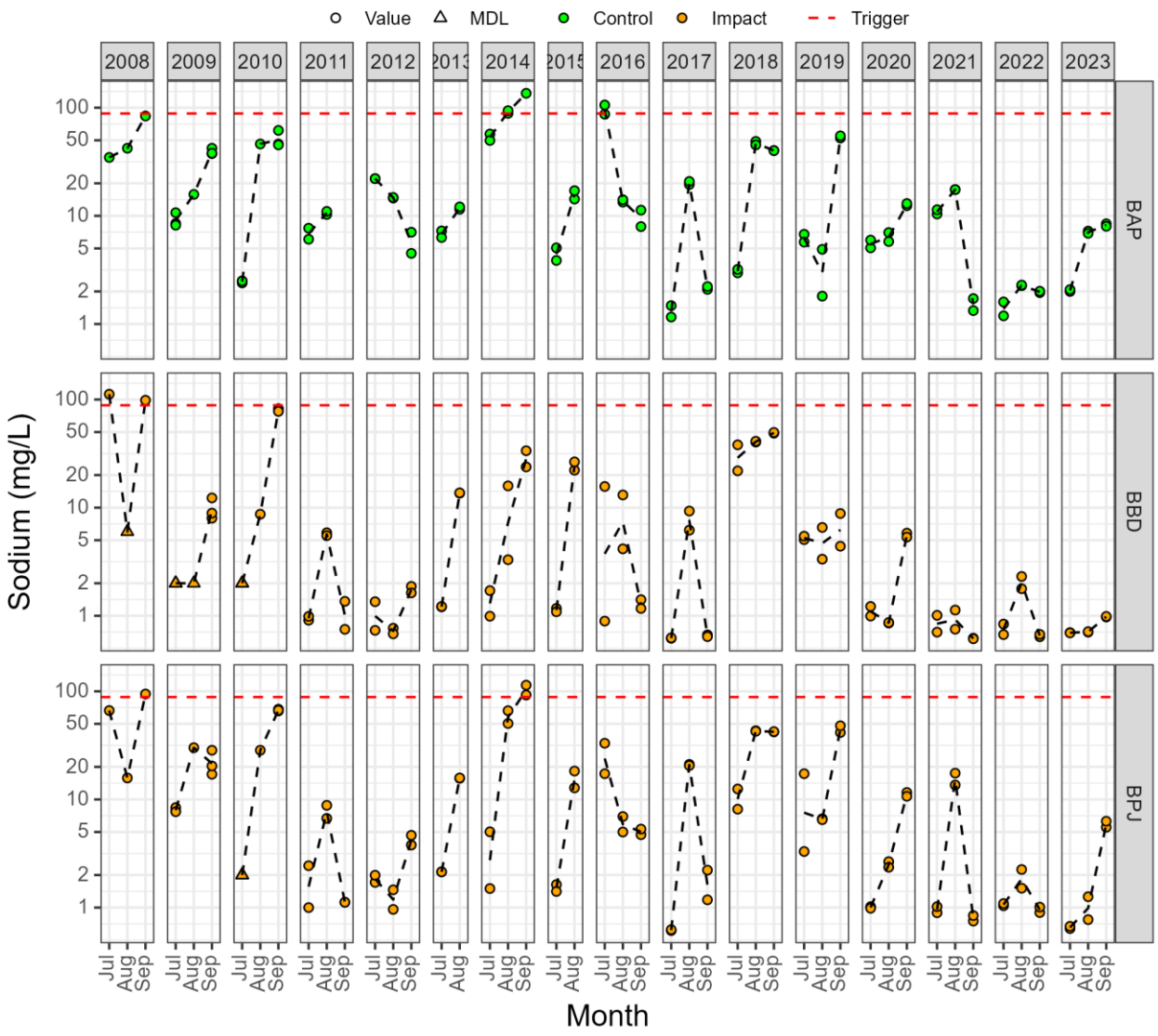


Figure B3-45. Total strontium (mg/L).

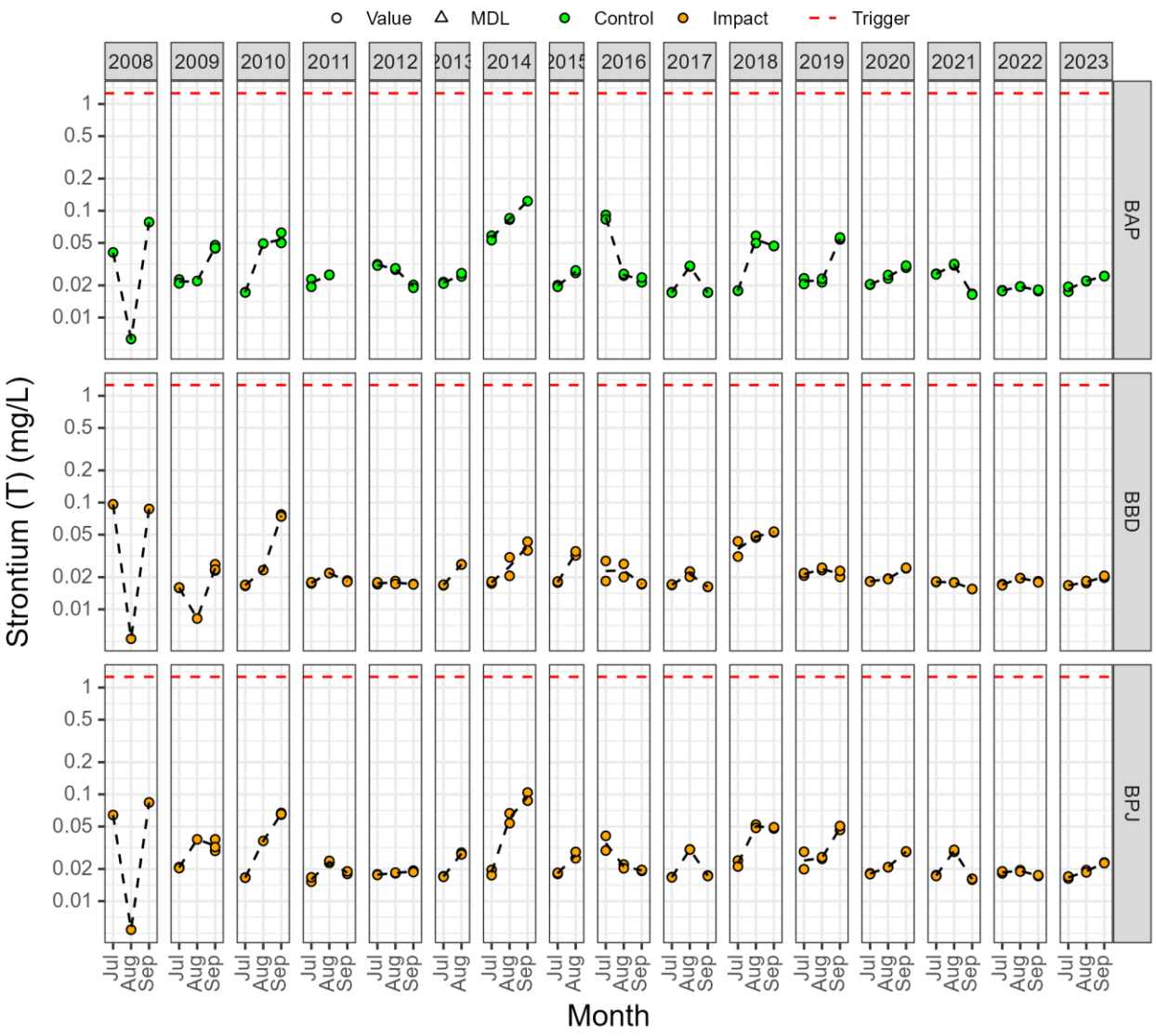


Figure B3-46. Total thallium (mg/L).

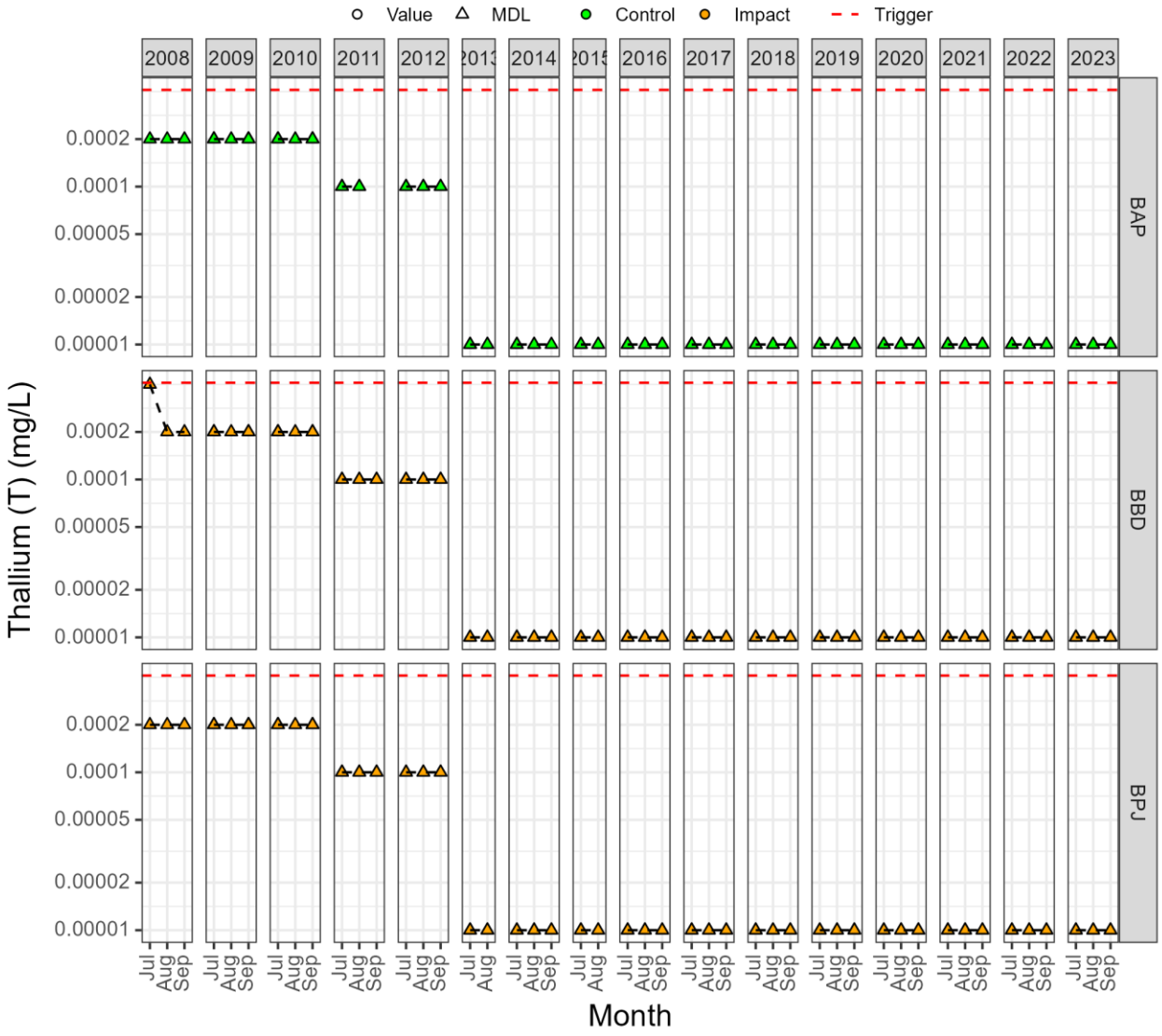


Figure B3-47. Total tin (mg/L).

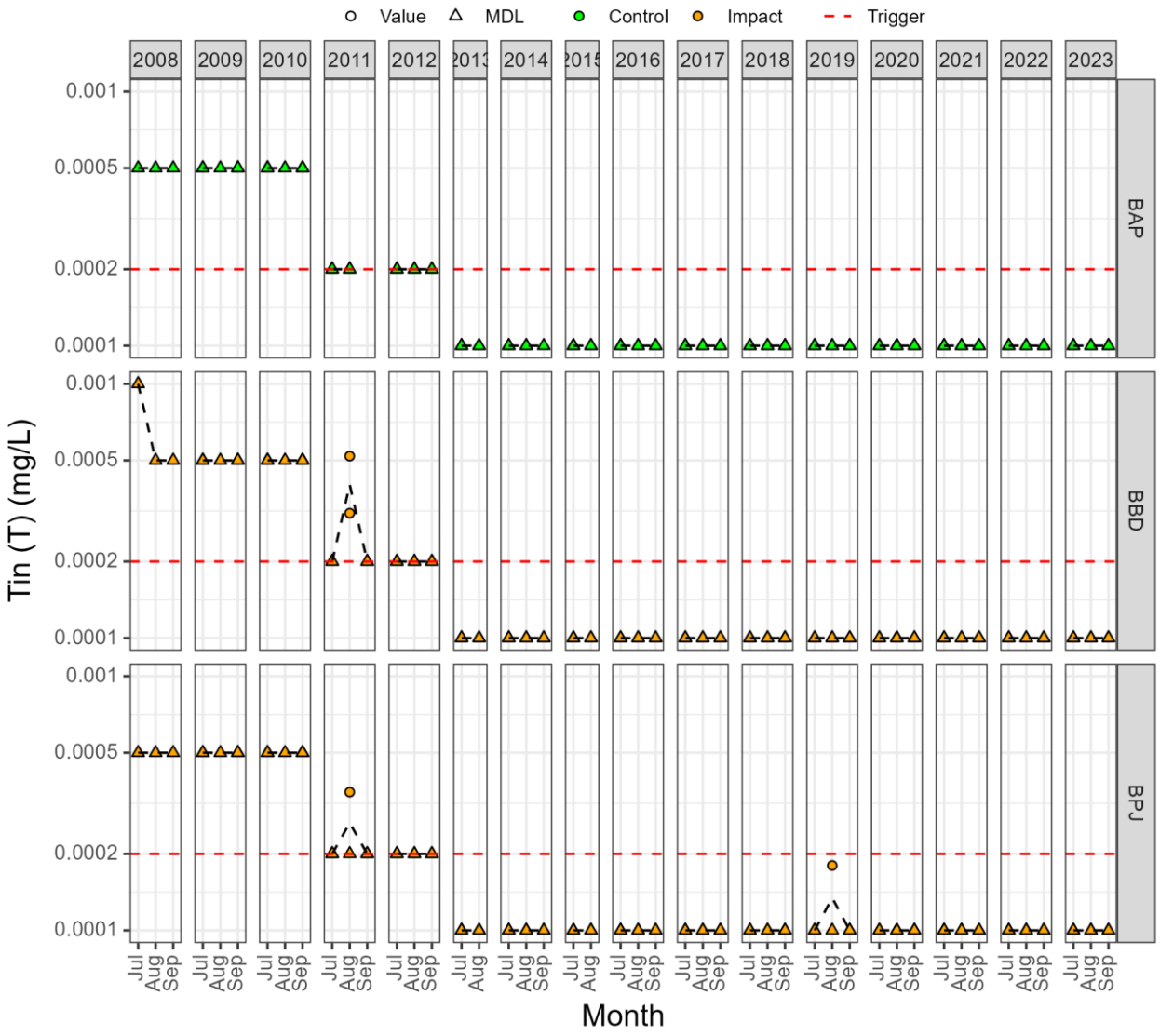


Figure B3-48. Total titanium (mg/L).

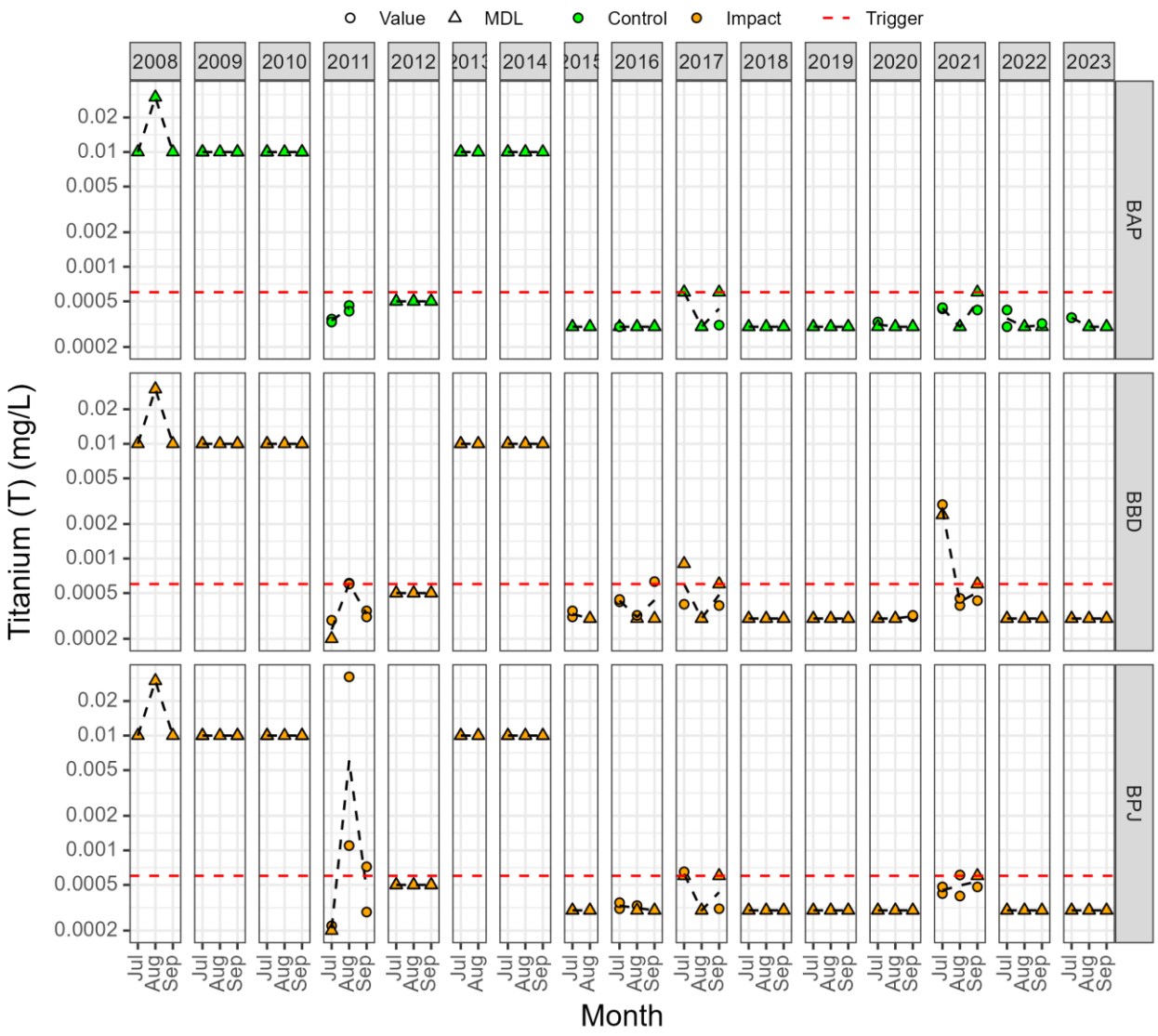


Figure B3-49. Total uranium (mg/L).

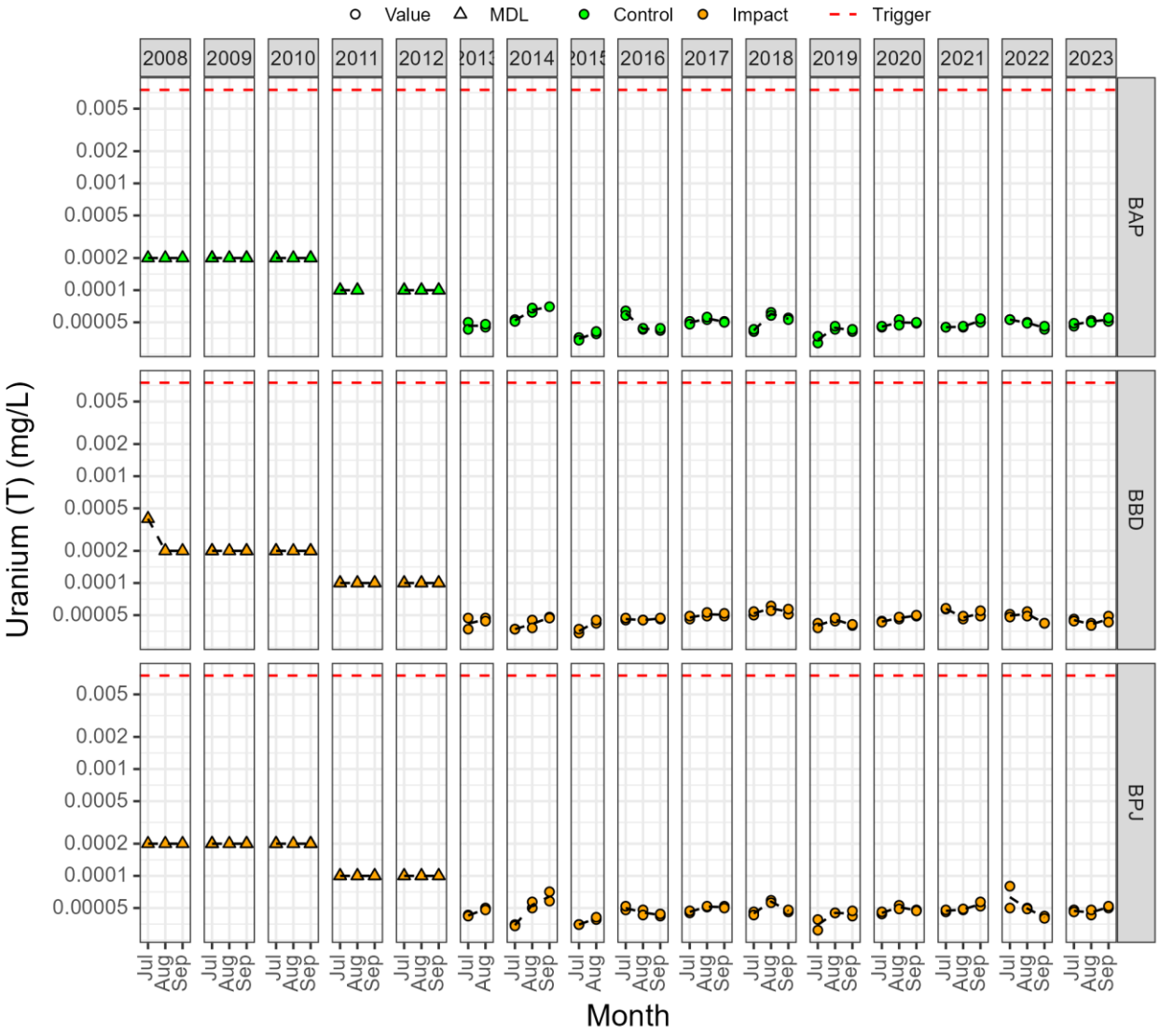


Figure B3-50. Total vanadium (mg/L).

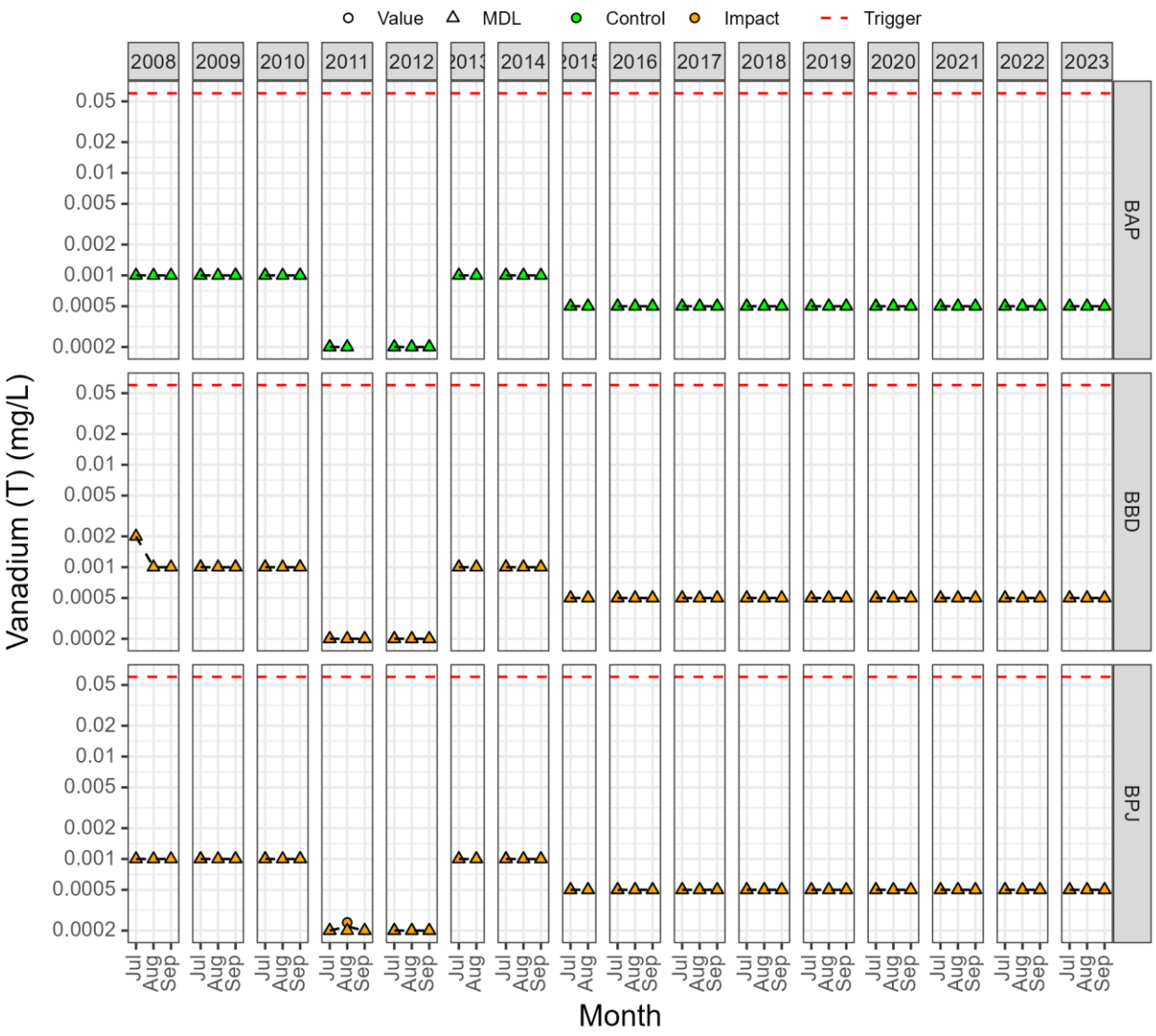


Figure B3-51. Total zinc (mg/L).

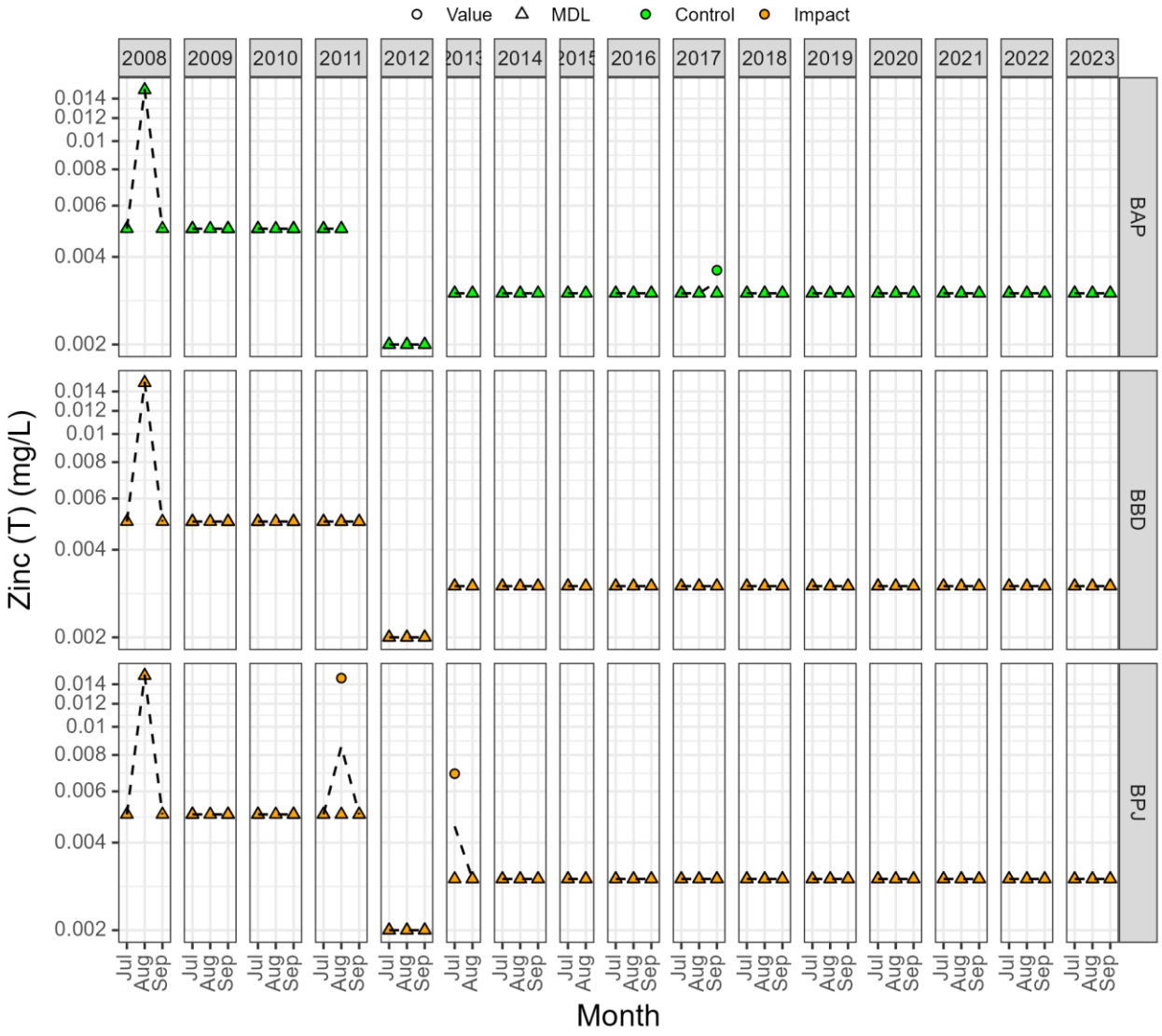


Figure B3-52. Dissolved aluminum (mg/L).

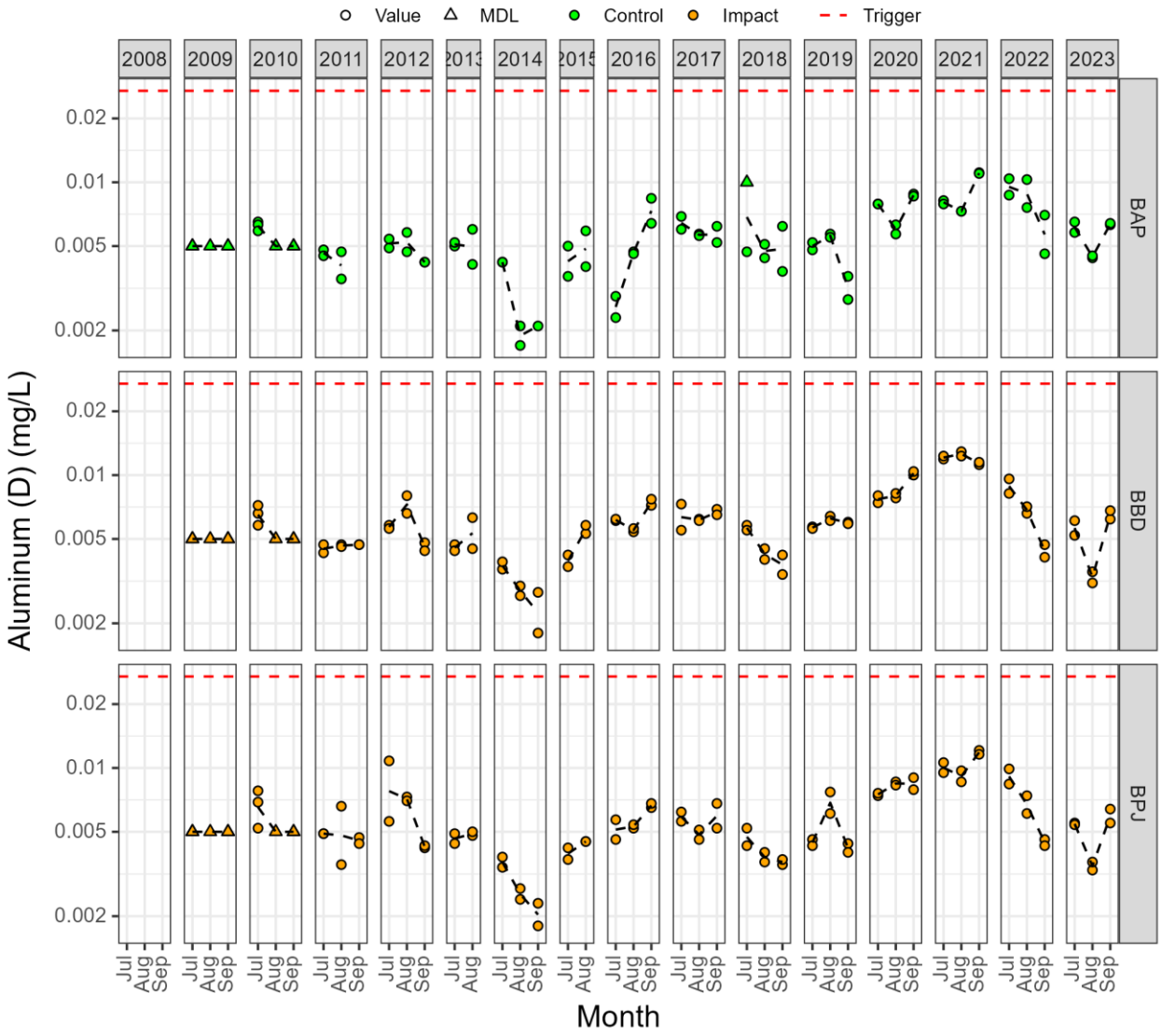


Figure B3-53. Dissolved antimony (mg/L).

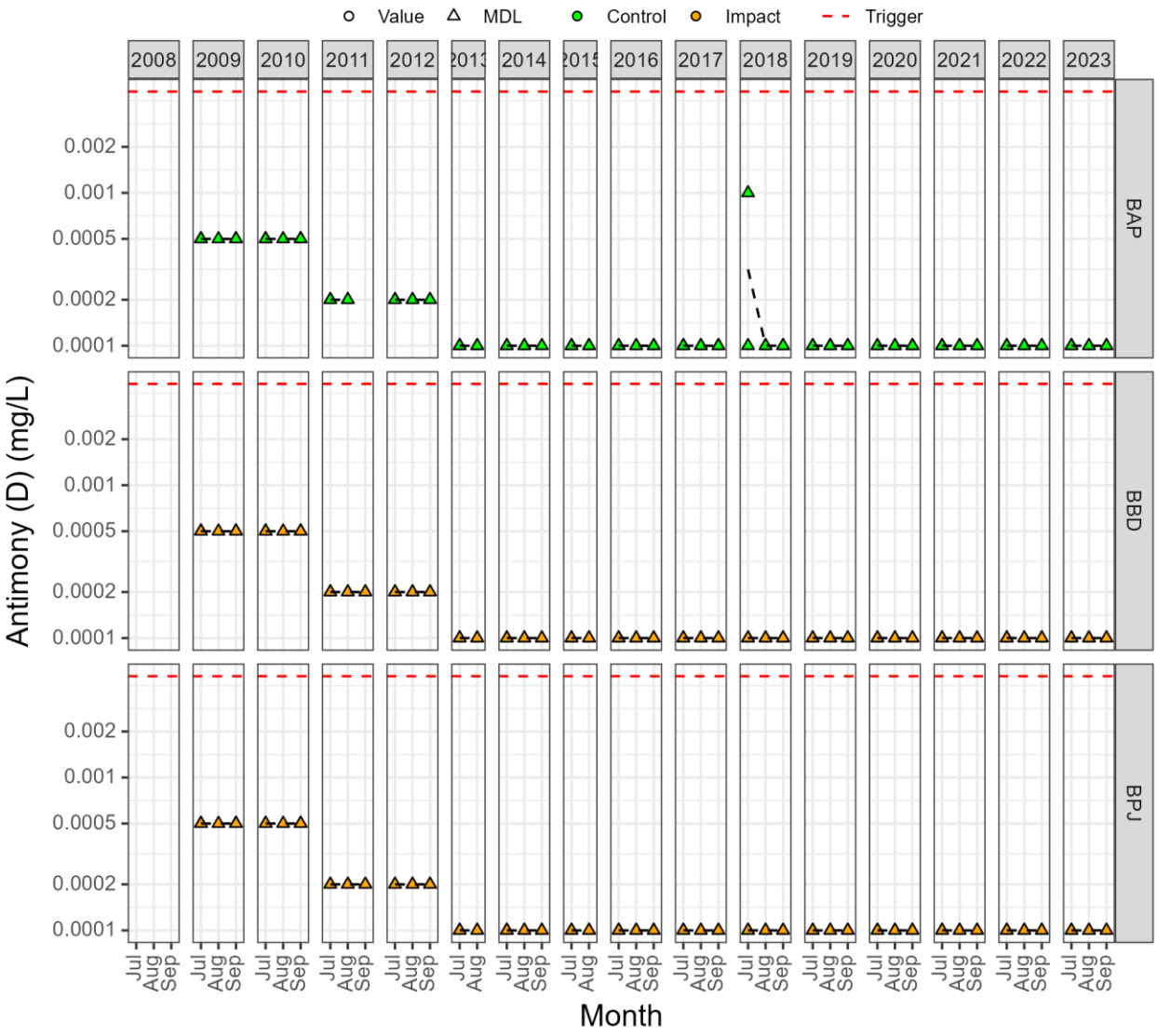


Figure B3-54. Dissolved arsenic (mg/L).

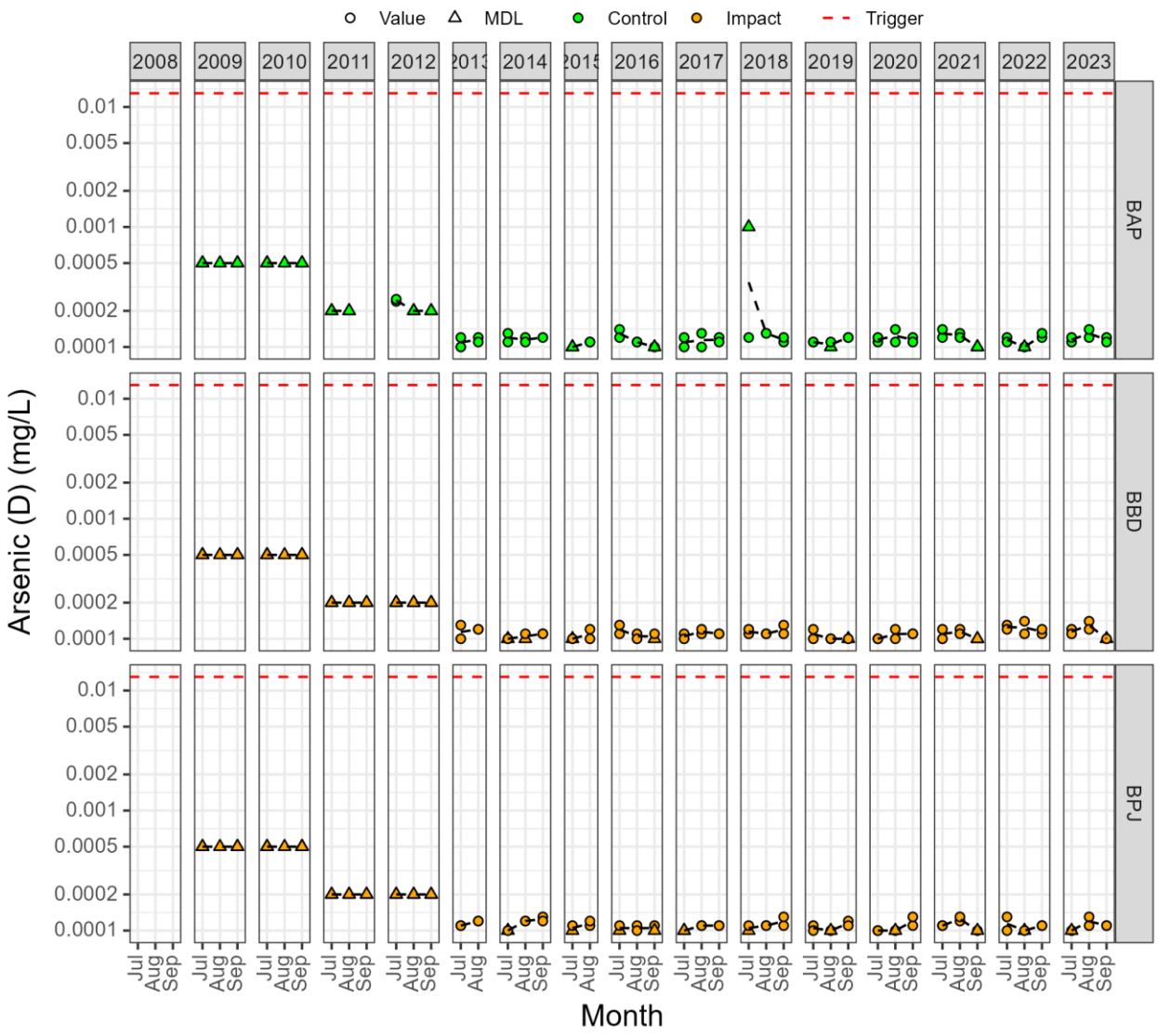


Figure B3-55. Dissolved barium (mg/L).

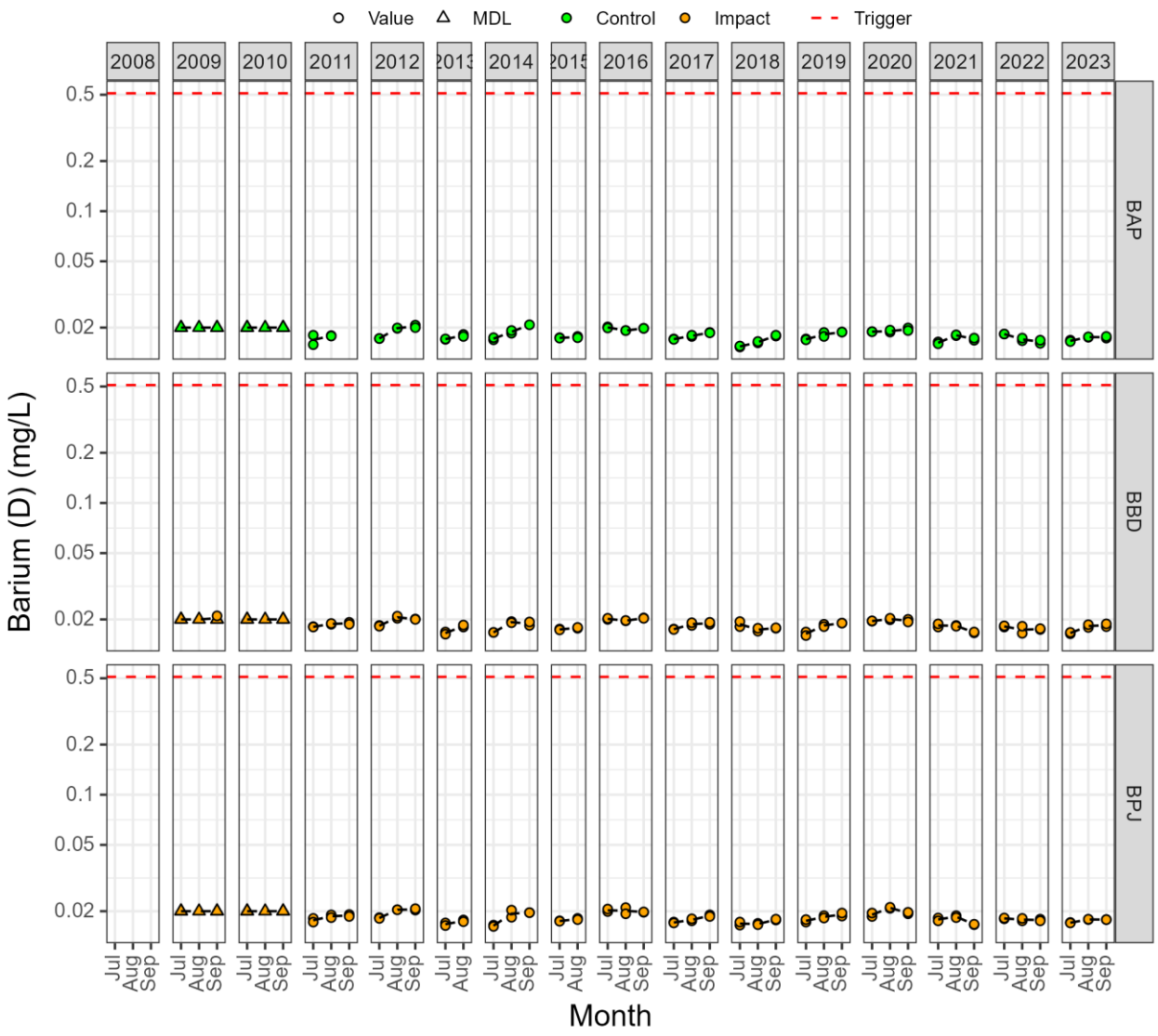


Figure B3-56. Dissolved beryllium (mg/L).

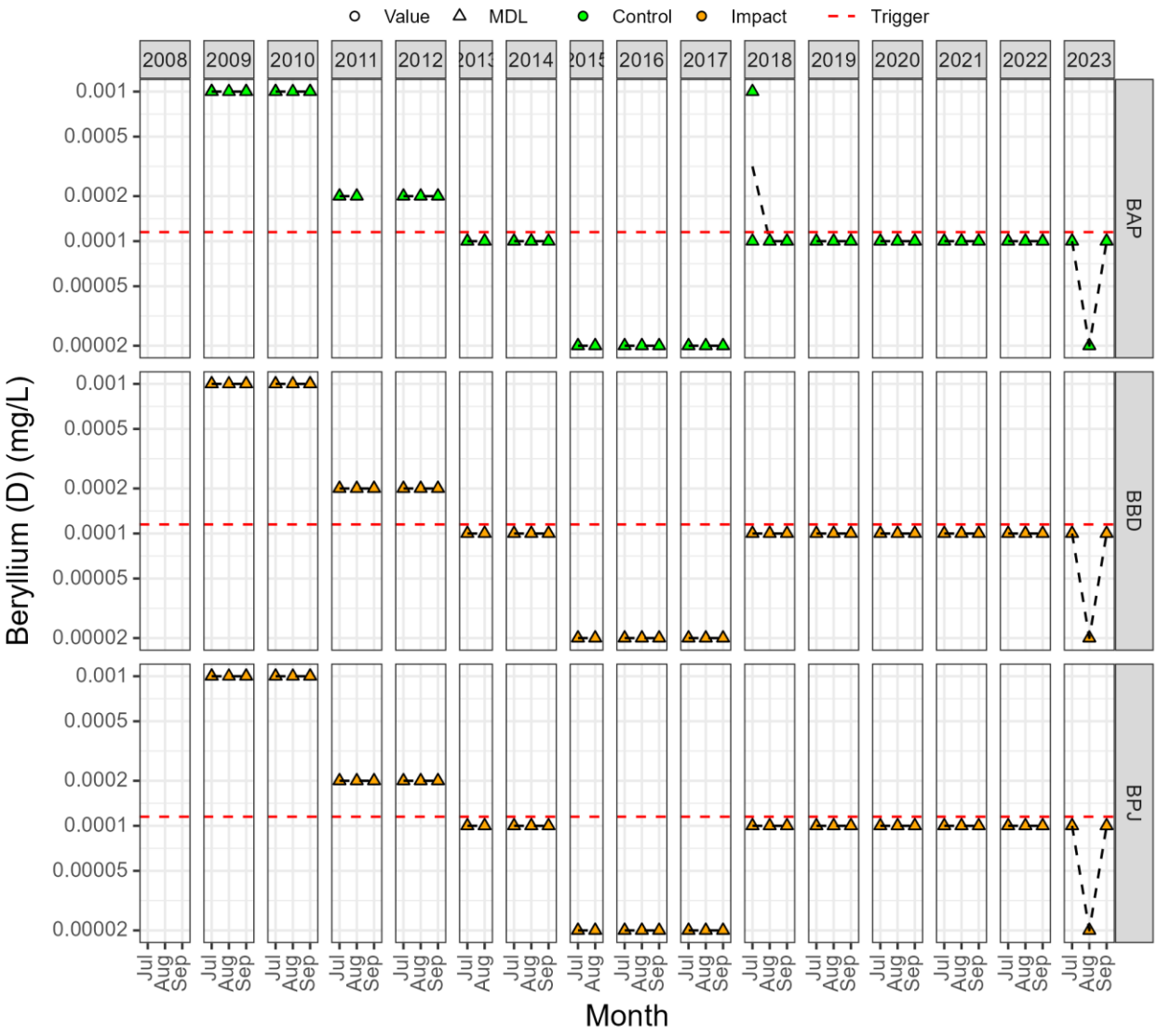


Figure B3-57. Dissolved boron (mg/L).

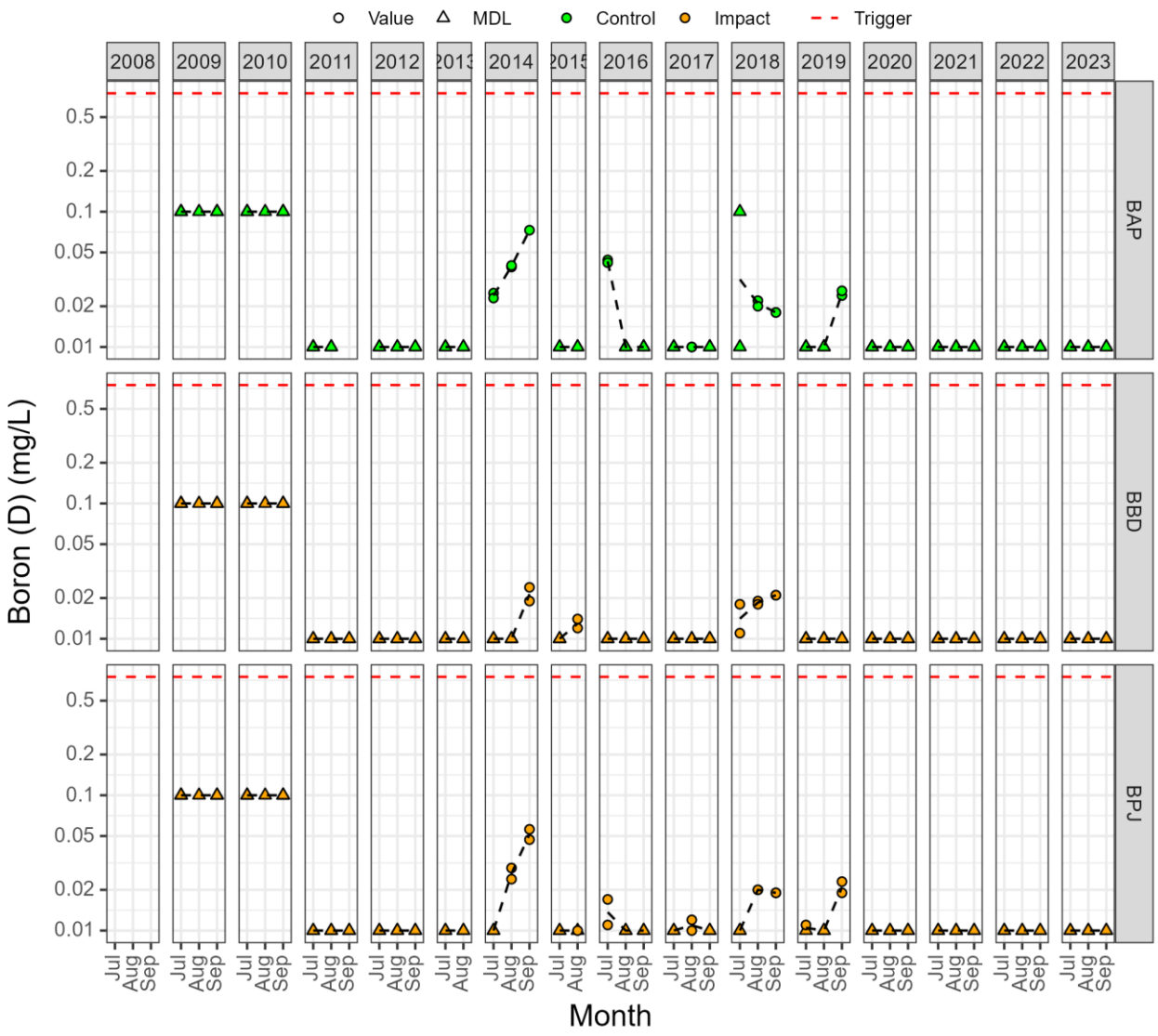


Figure B3-58. Dissolved cadmium (mg/L).

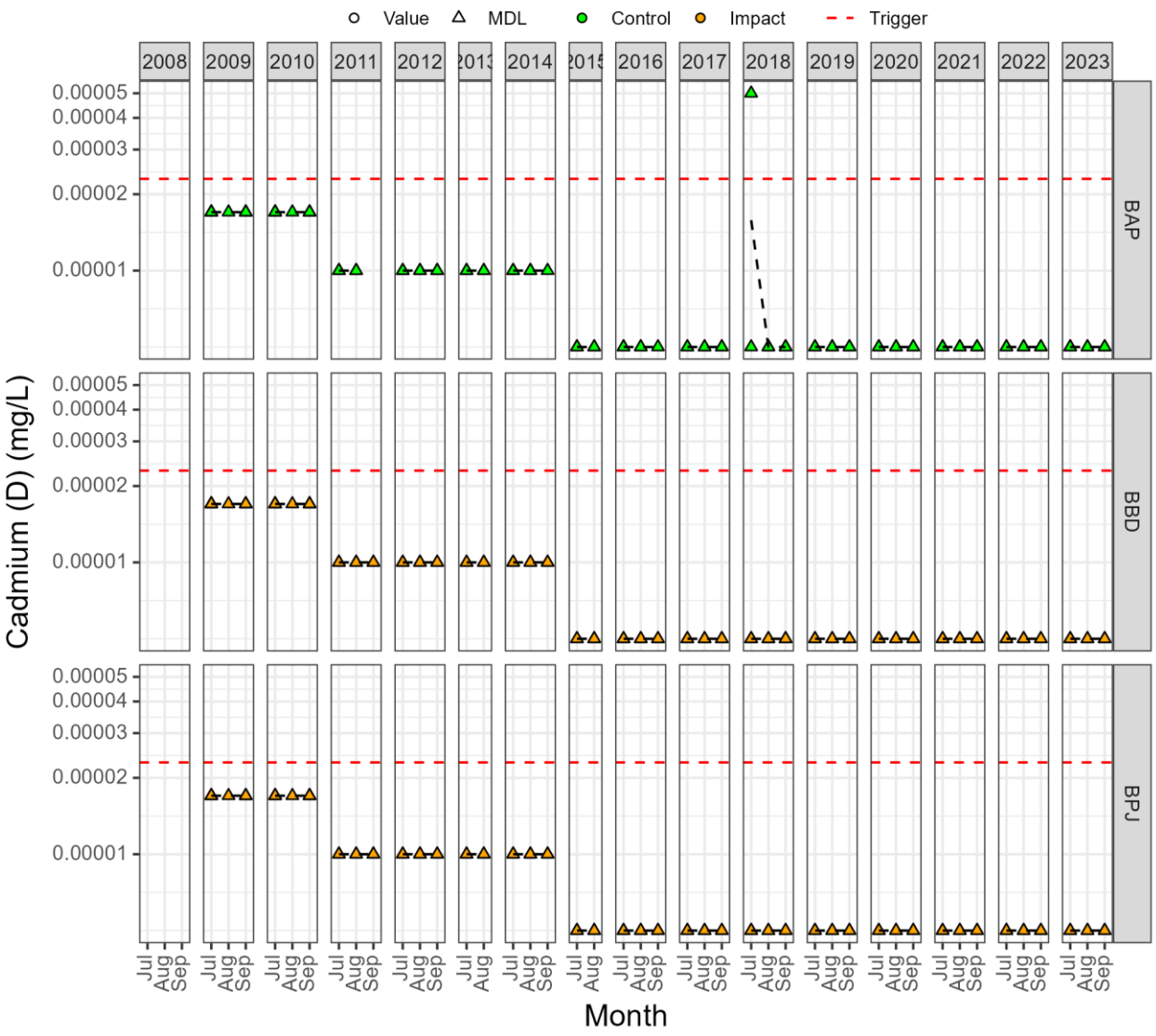


Figure B3-59. Dissolved chromium (mg/L).

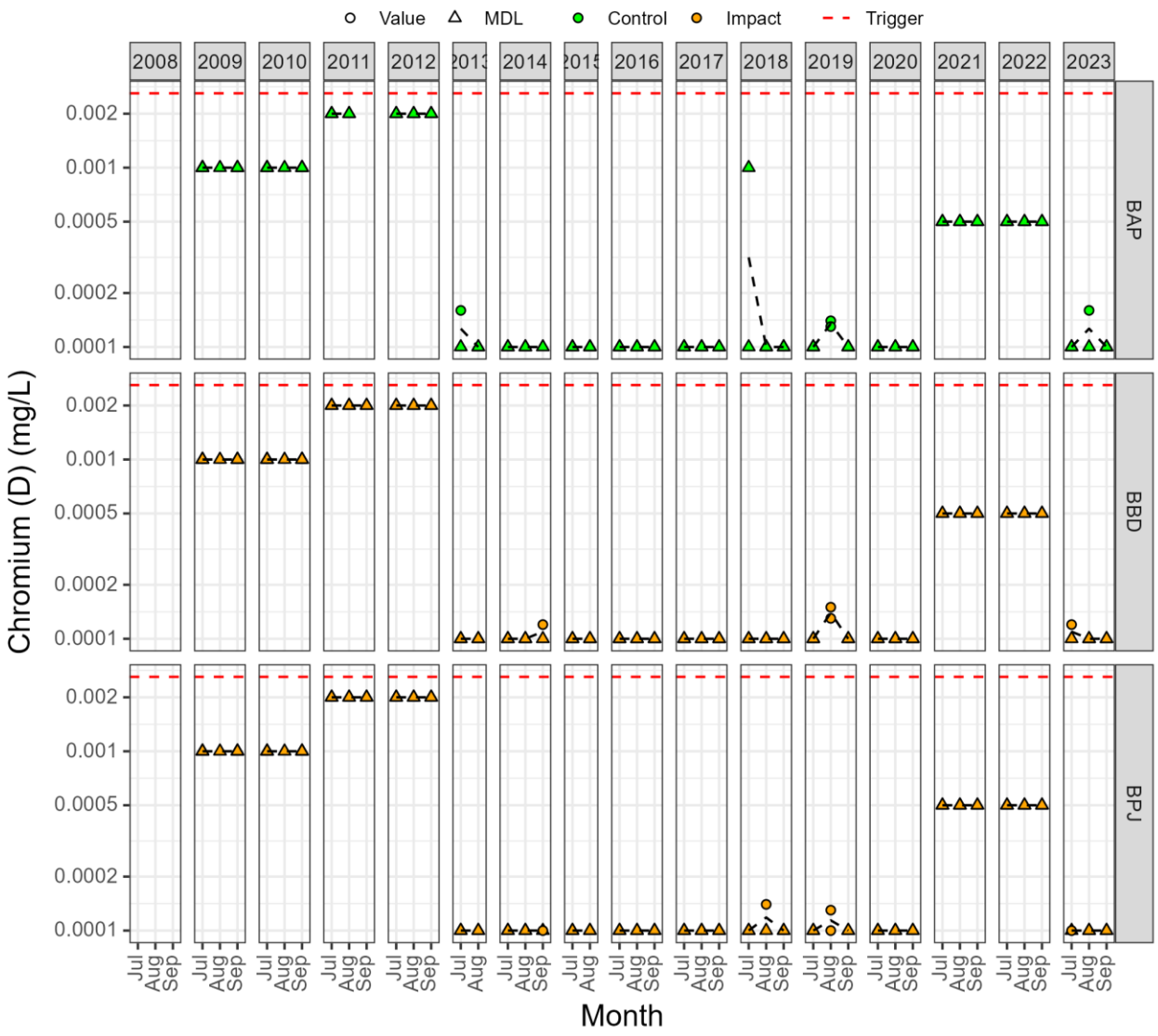


Figure B3-60. Dissolved copper (mg/L).

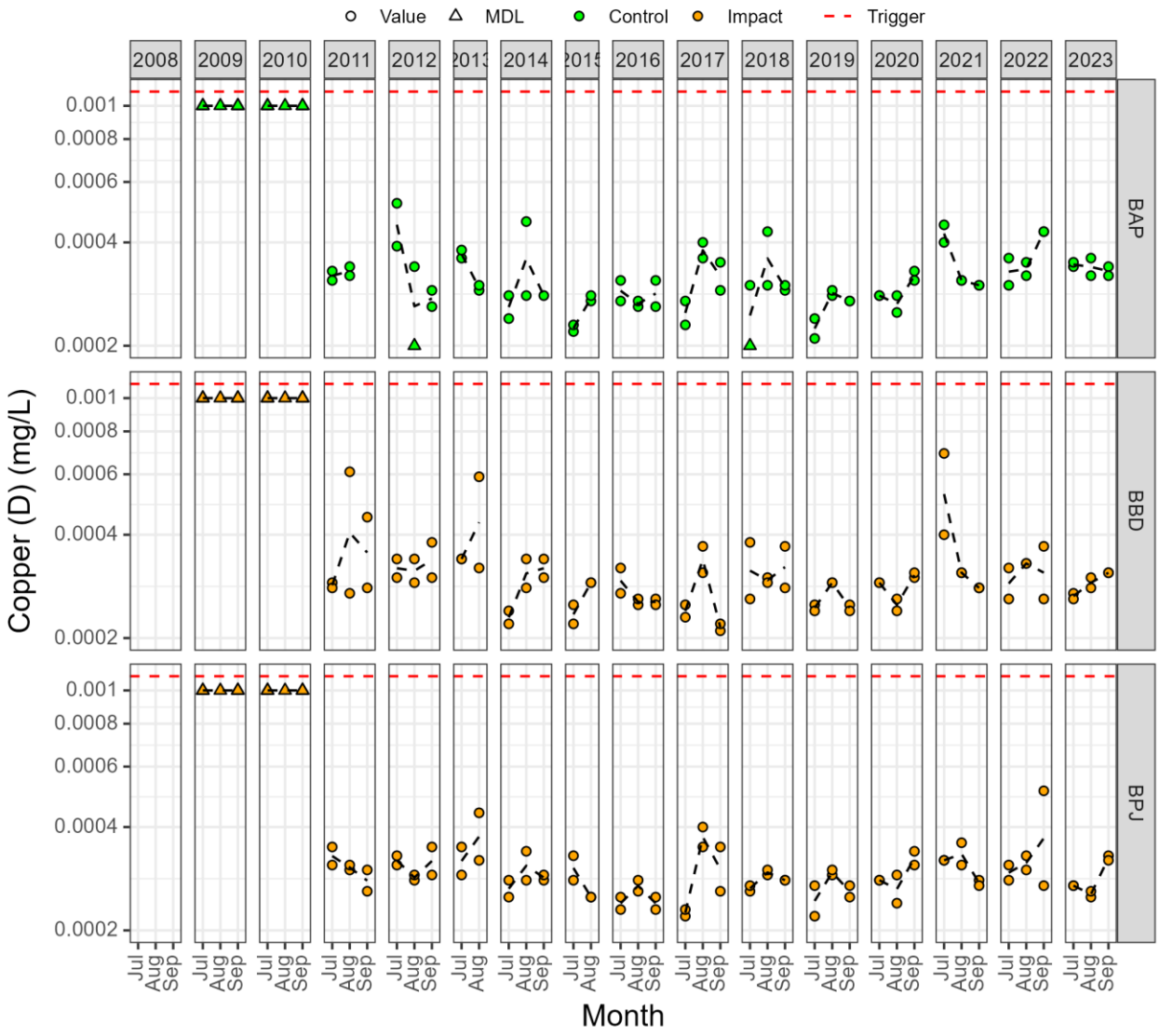


Figure B3-61. Dissolved iron (mg/L).

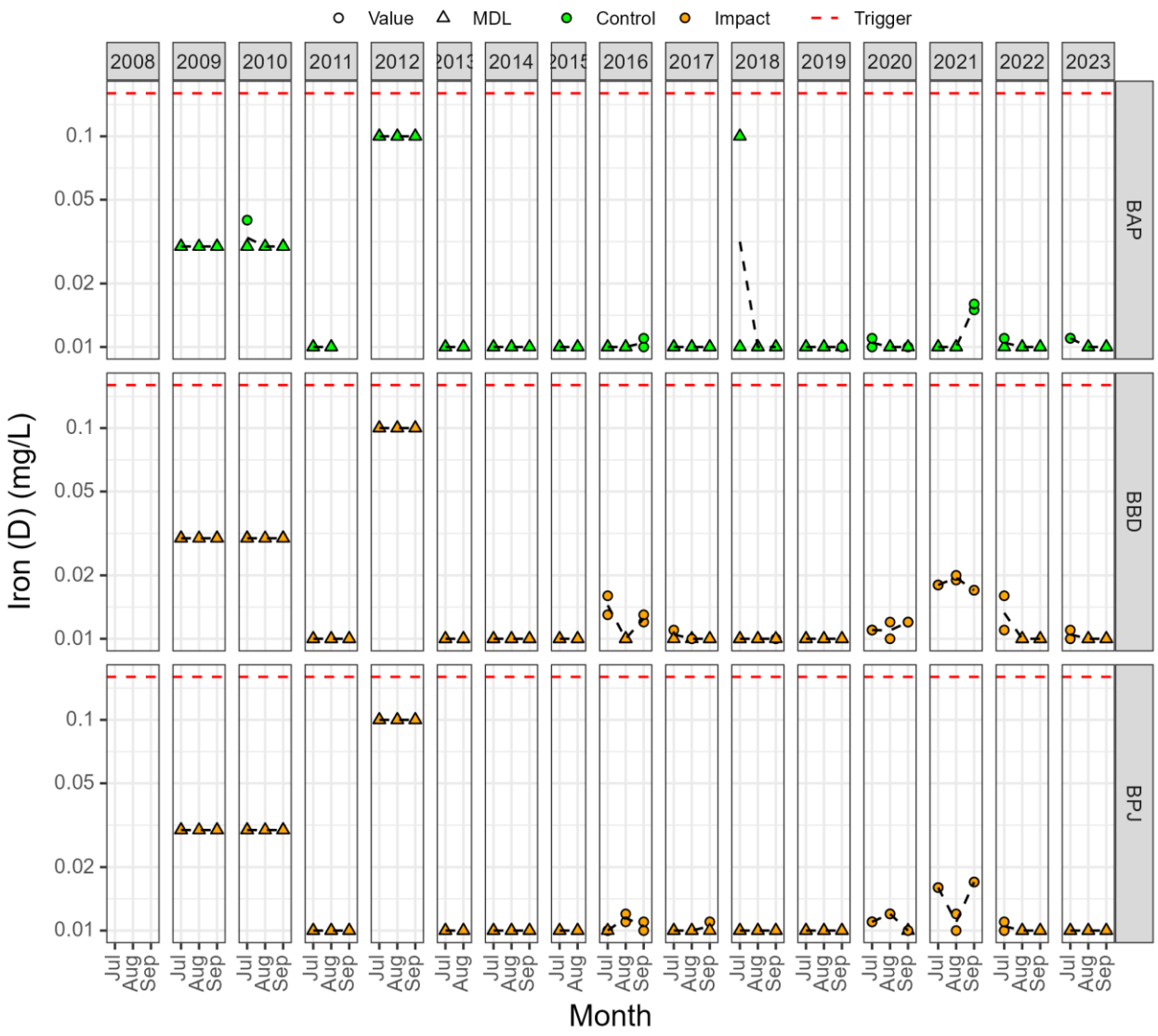


Figure B3-62. Dissolved lead (mg/L).

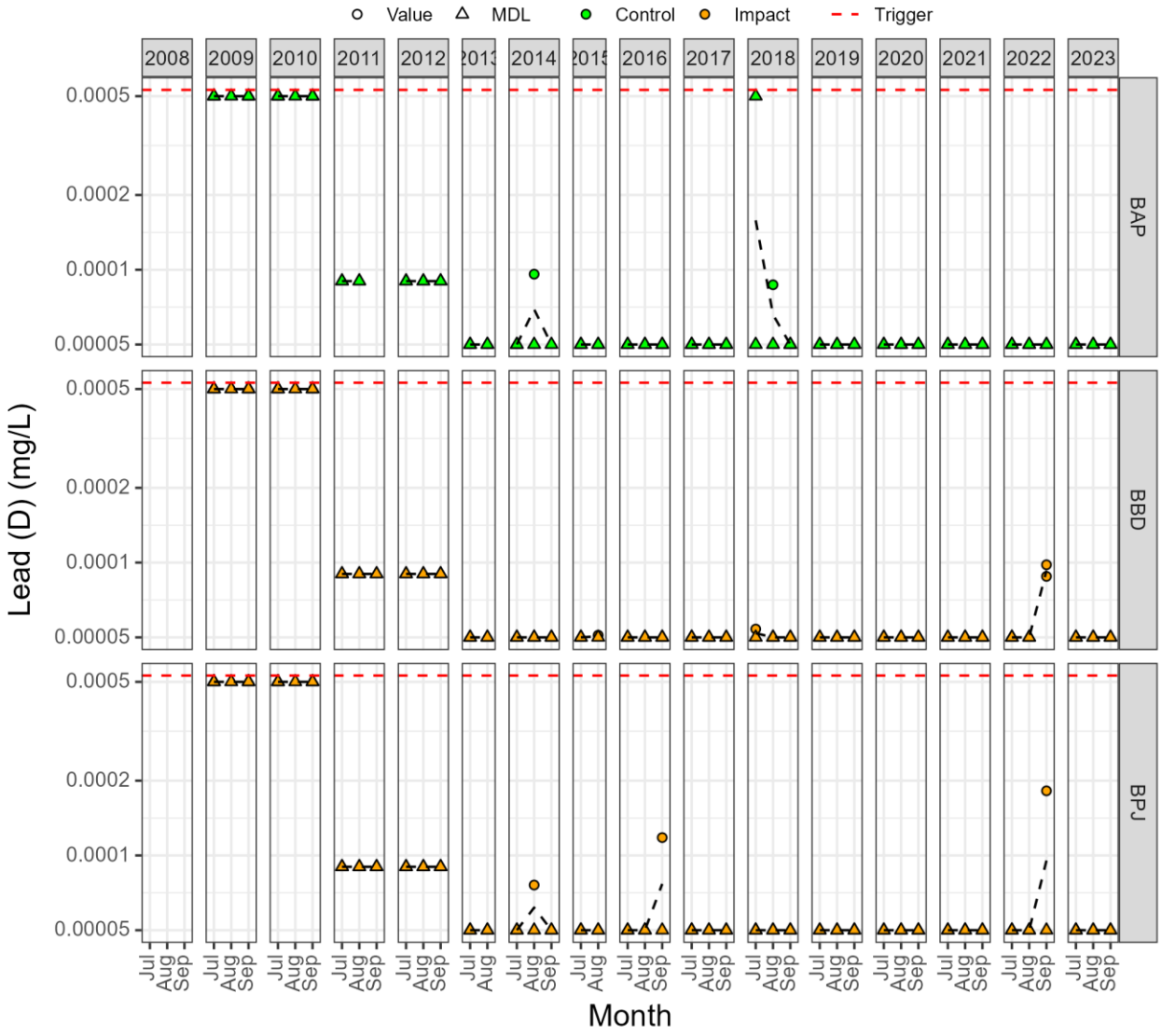


Figure B3-63. Dissolved lithium (mg/L).

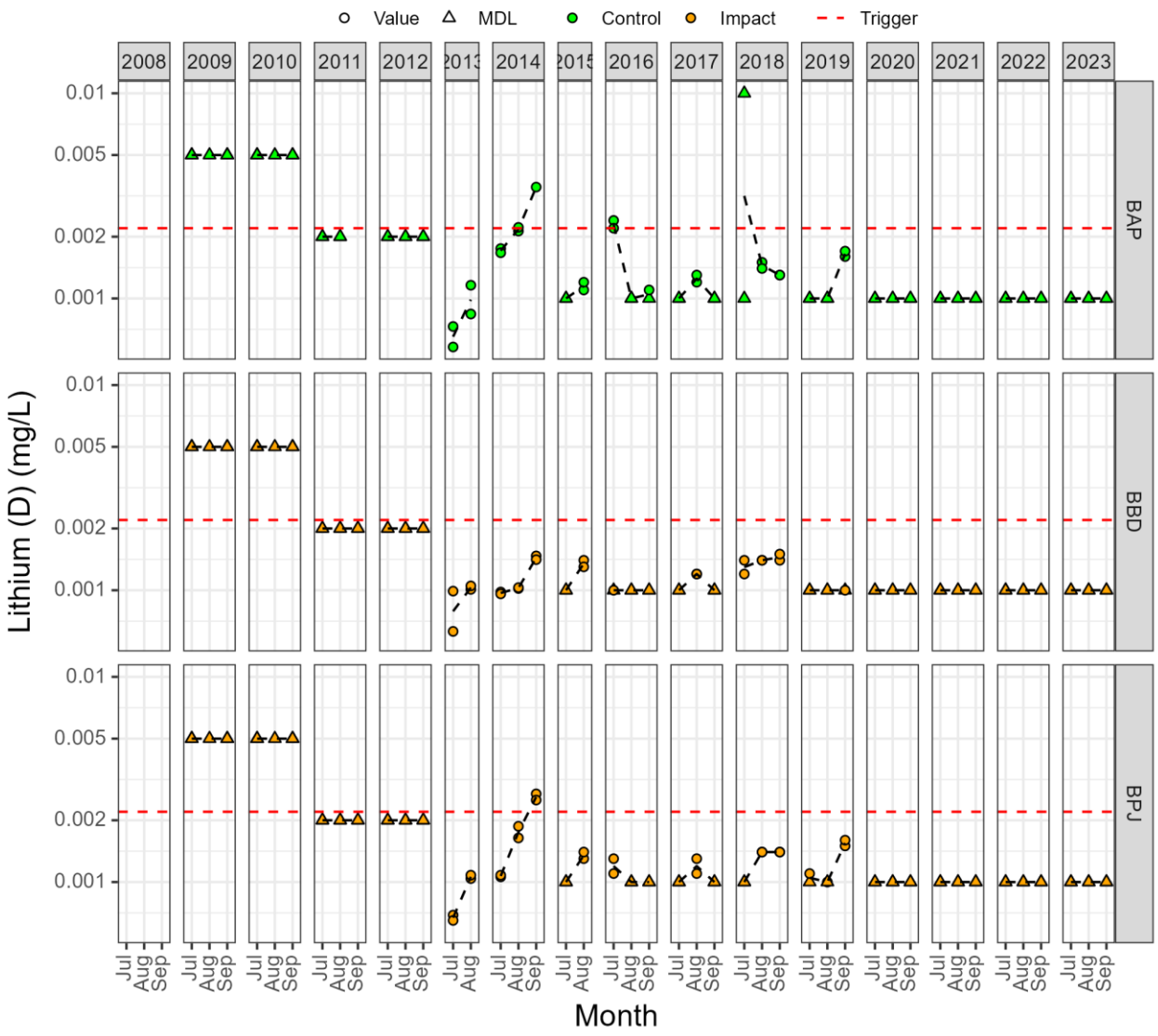


Figure B3-64. Dissolved manganese (mg/L).

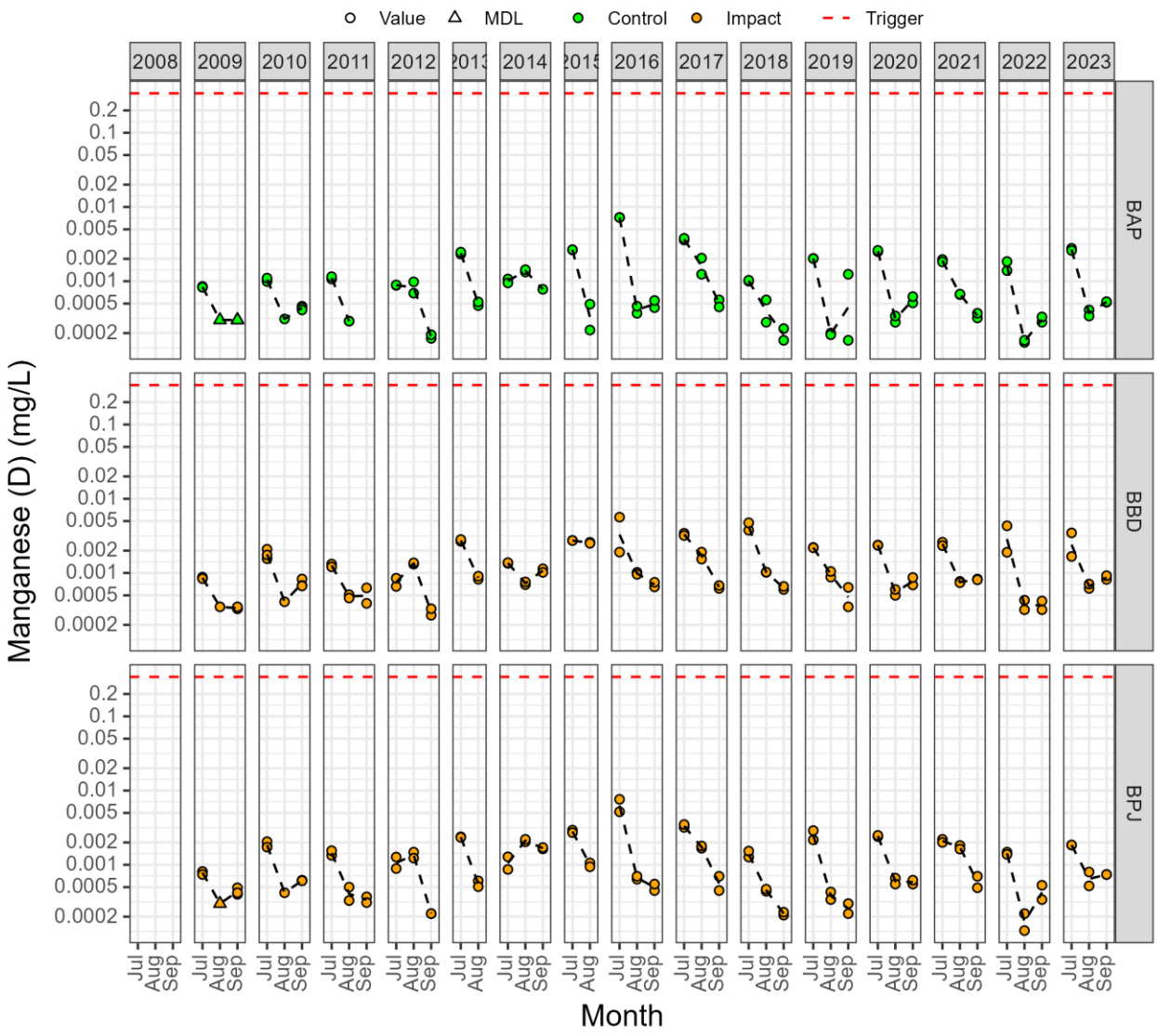


Figure B3-65. Dissolved mercury (mg/L).

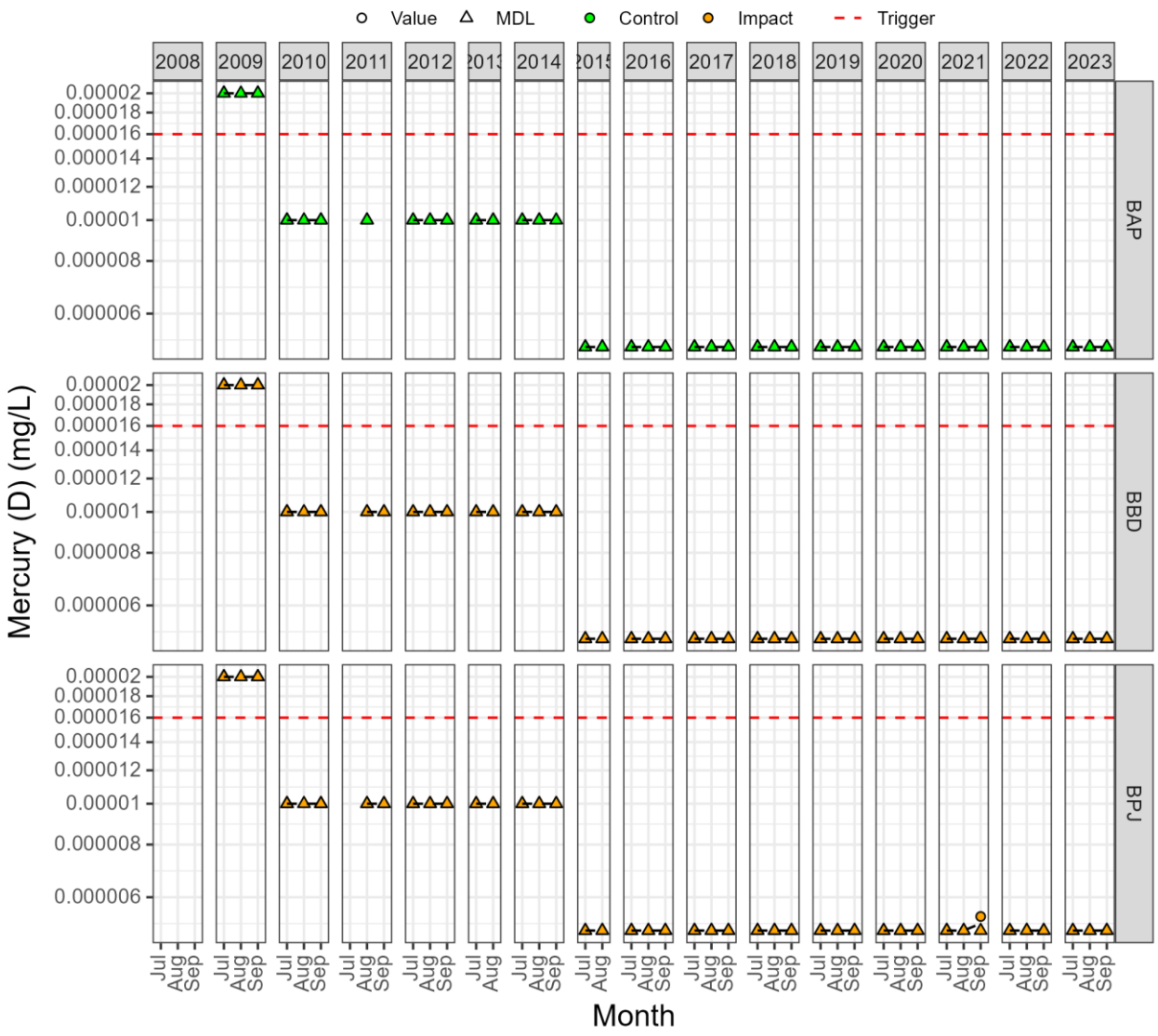


Figure B3-66. Dissolved molybdenum (mg/L).

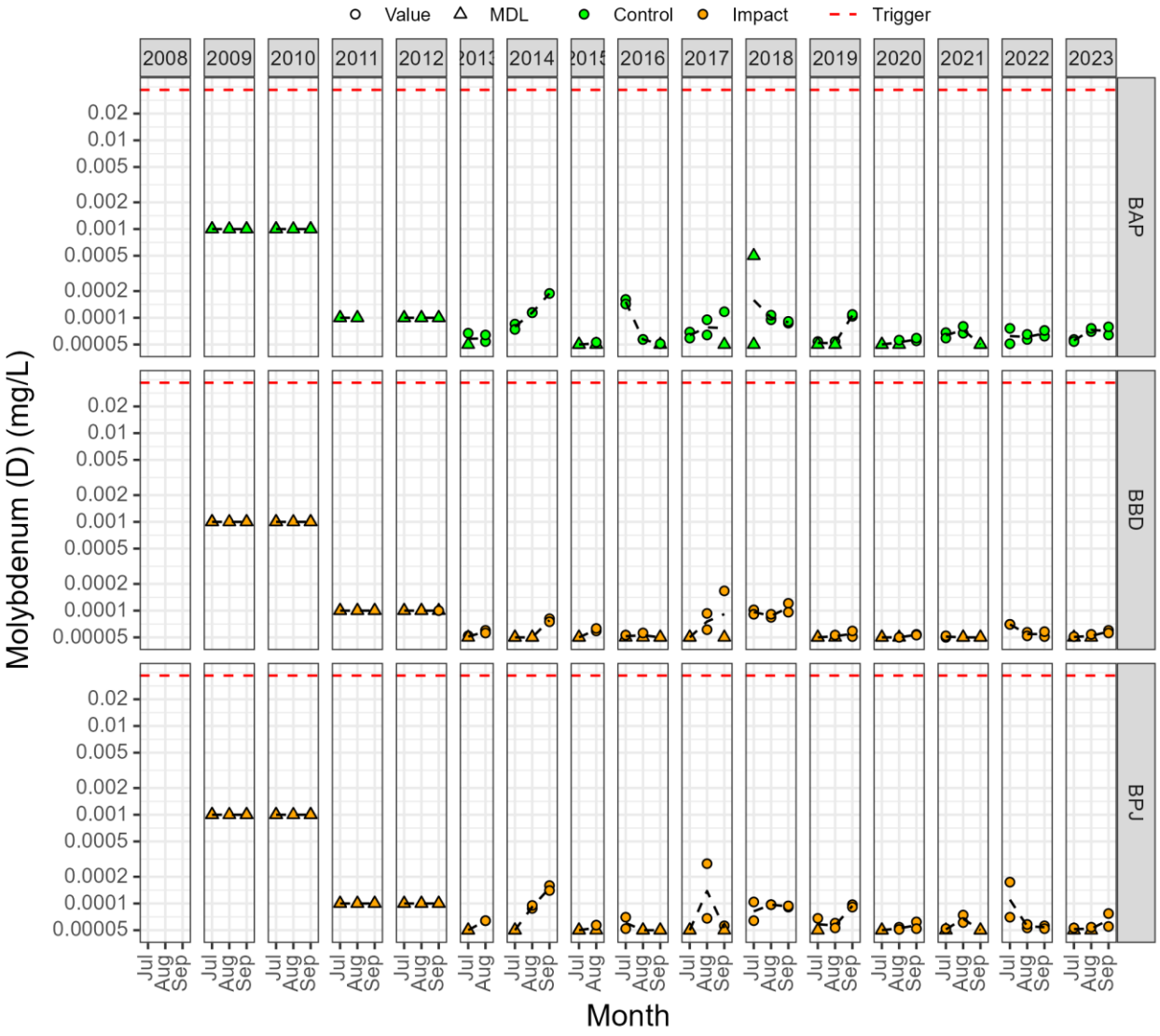


Figure B3-67. Dissolved nickel (mg/L).

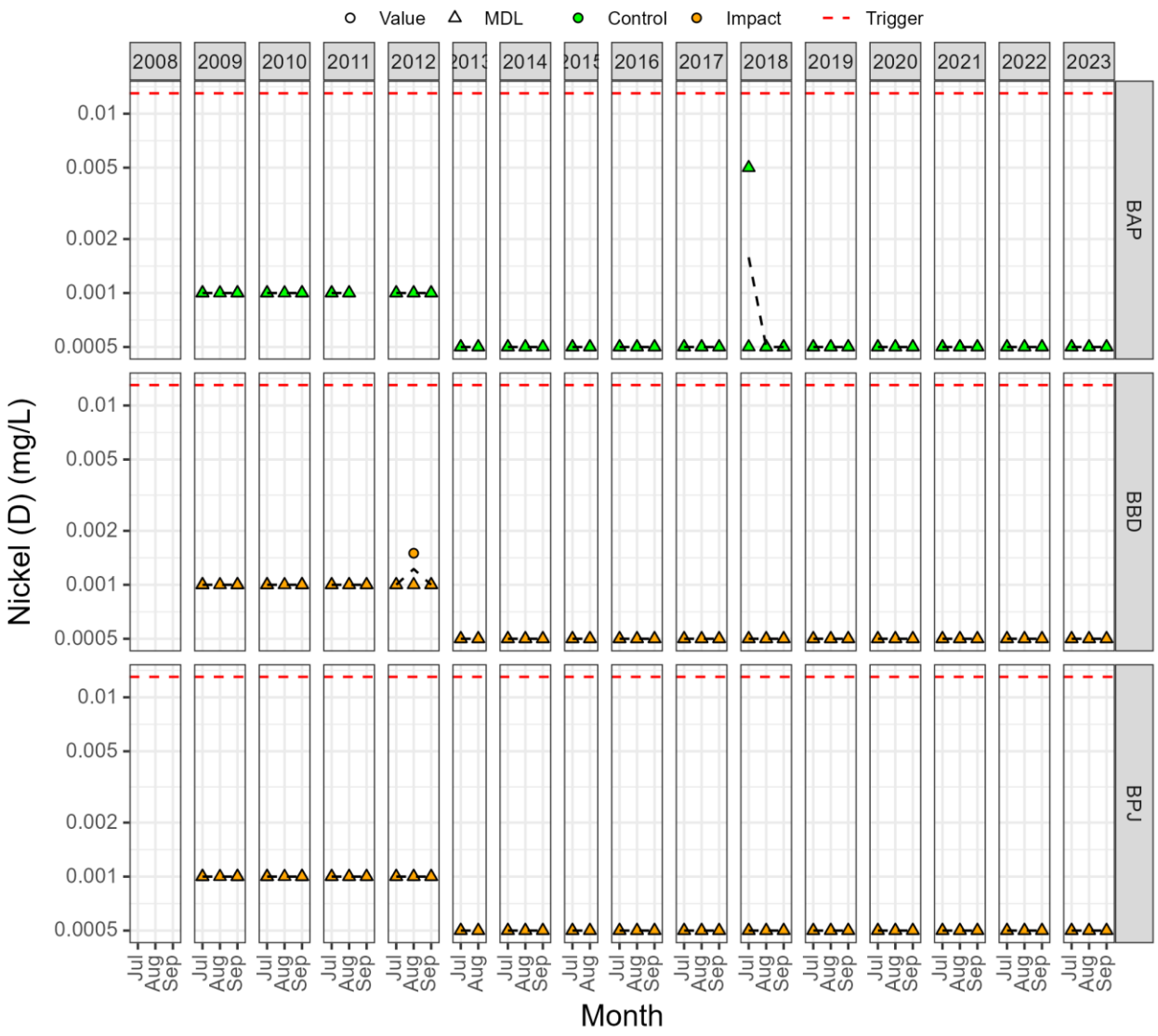


Figure B3-68. Dissolved selenium (mg/L).

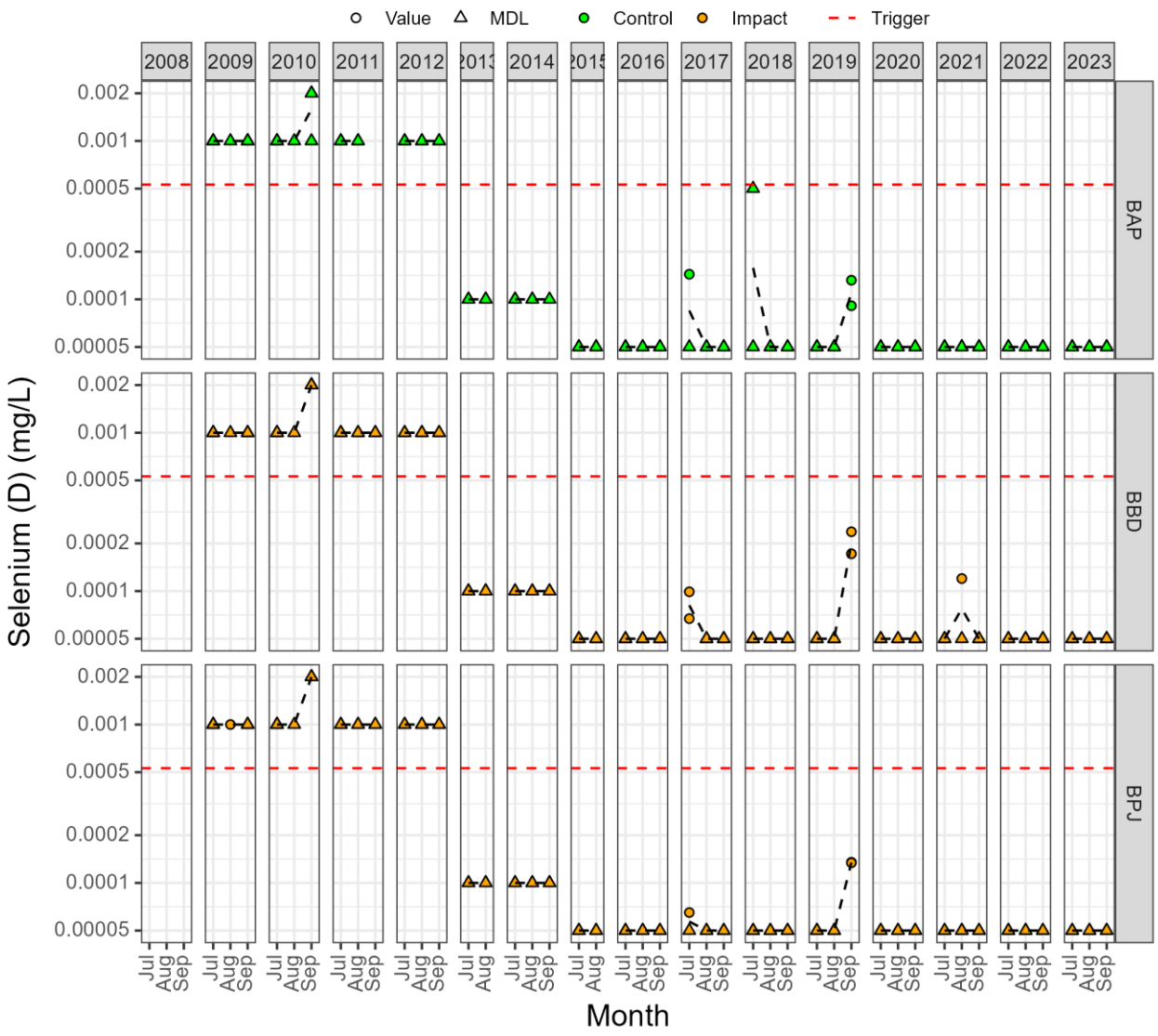


Figure B3-69. Dissolved silicon (mg/L).

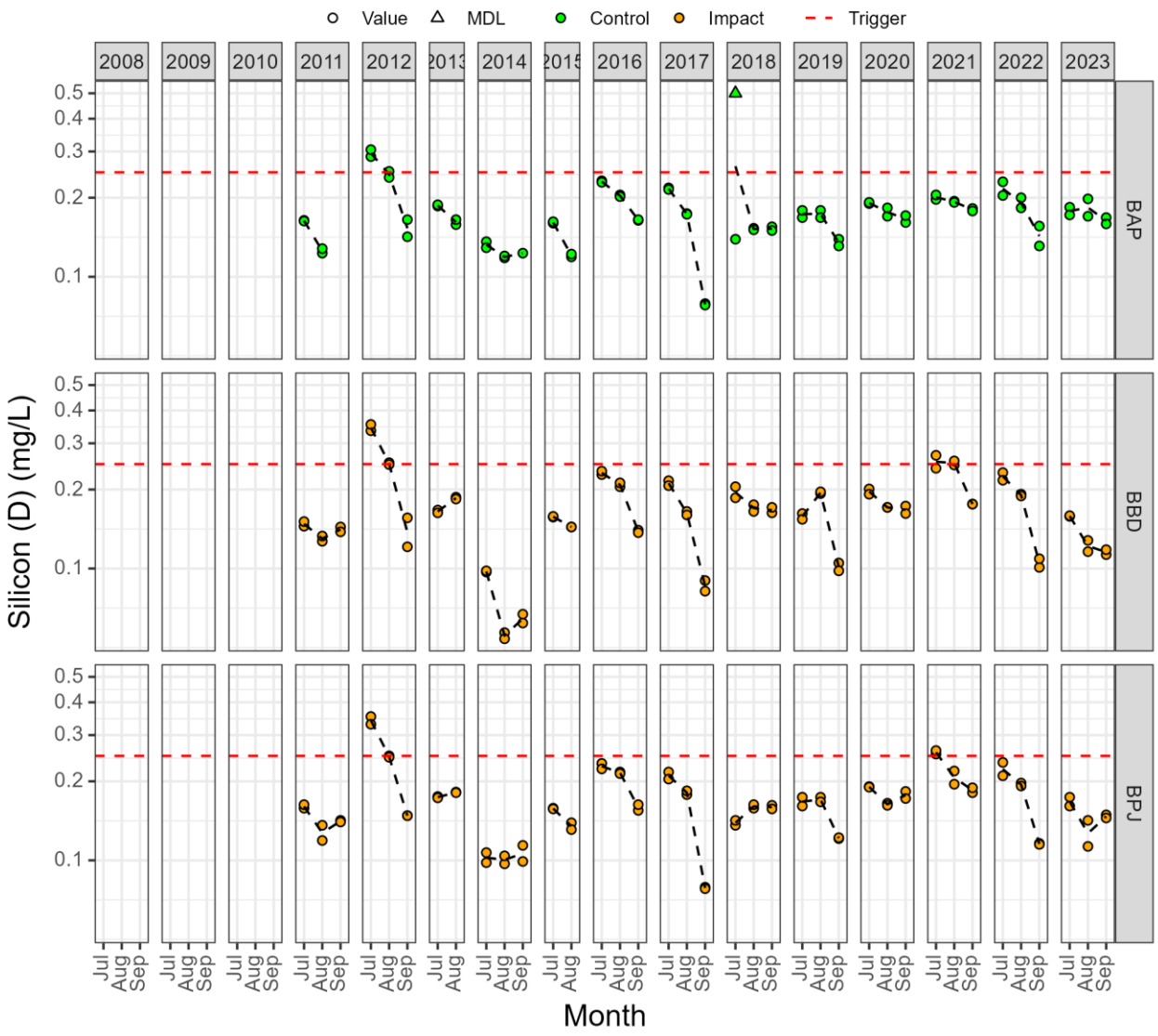


Figure B3-70. Dissolved silver (mg/L).

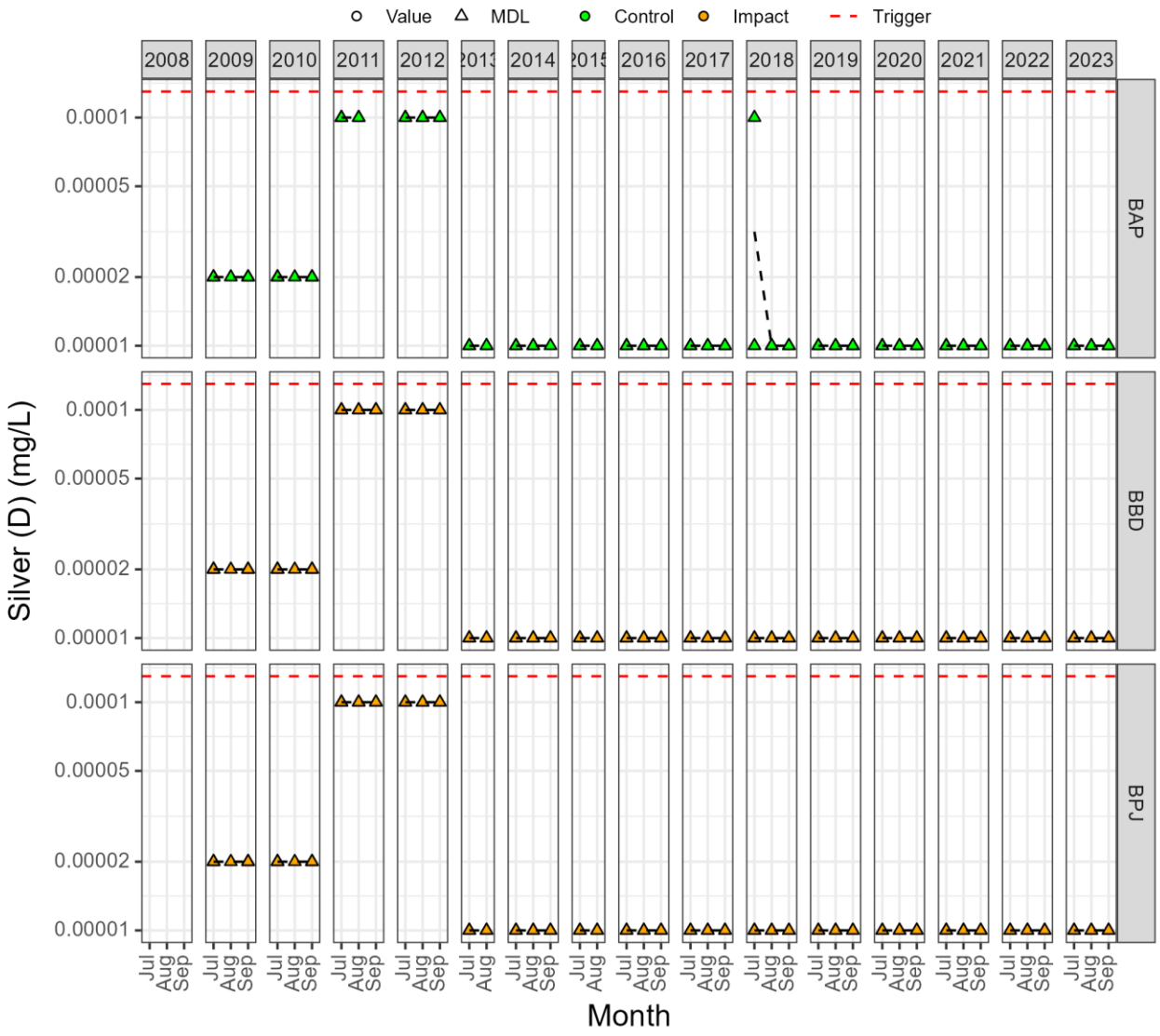


Figure B3-71. Dissolved strontium (mg/L).

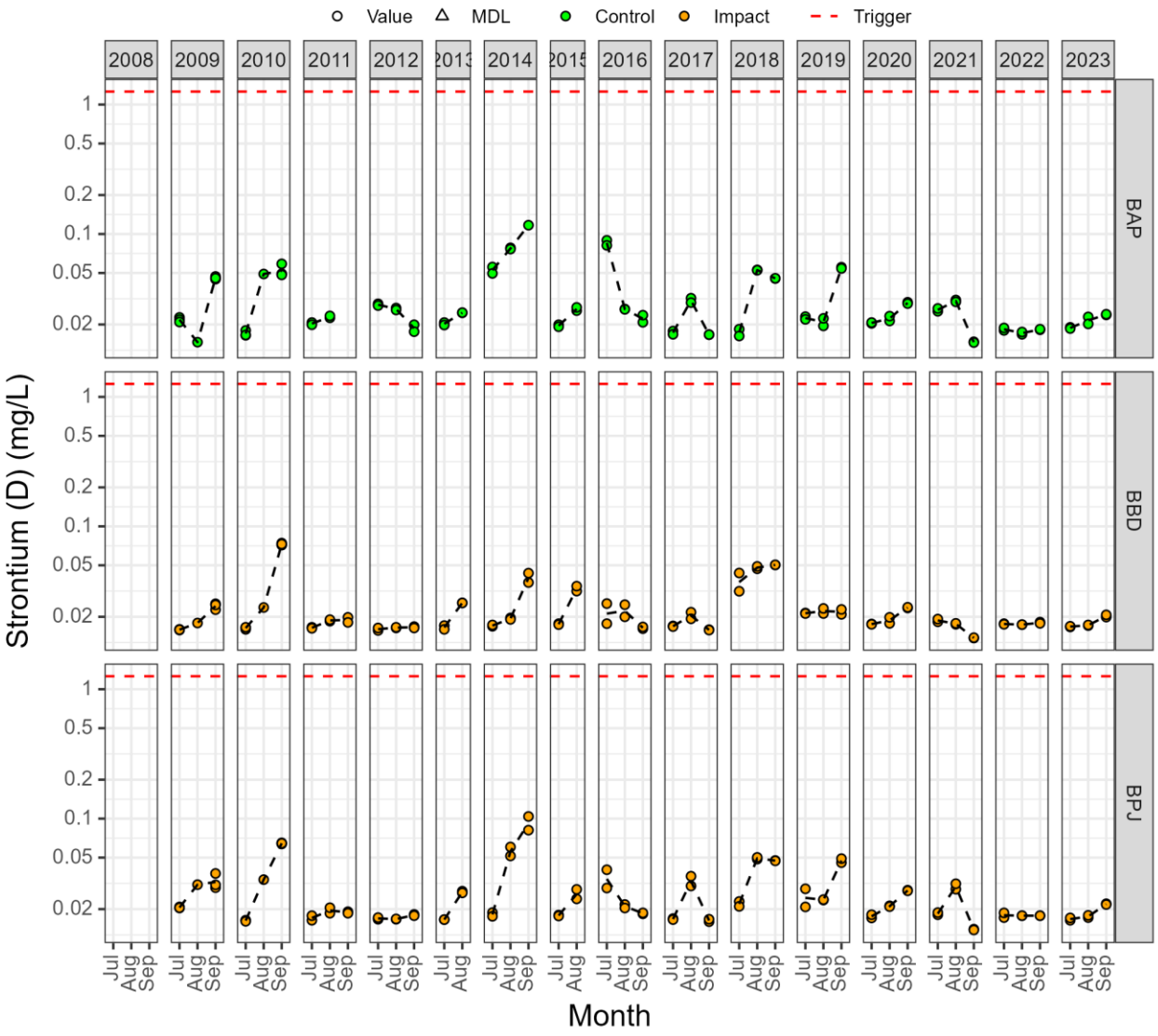


Figure B3-72. Dissolved thallium (mg/L).

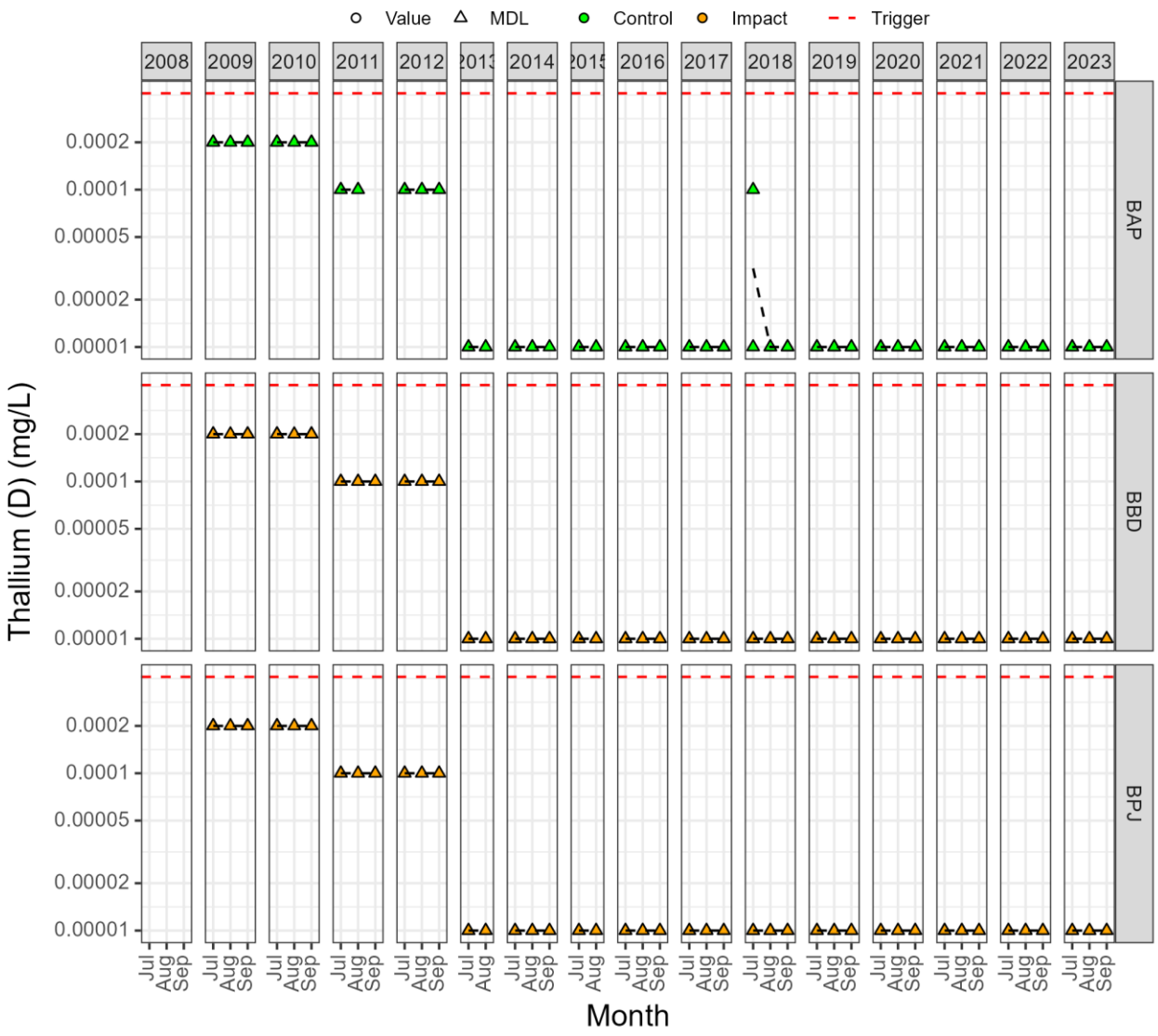


Figure B3-73. Dissolved tin (mg/L).

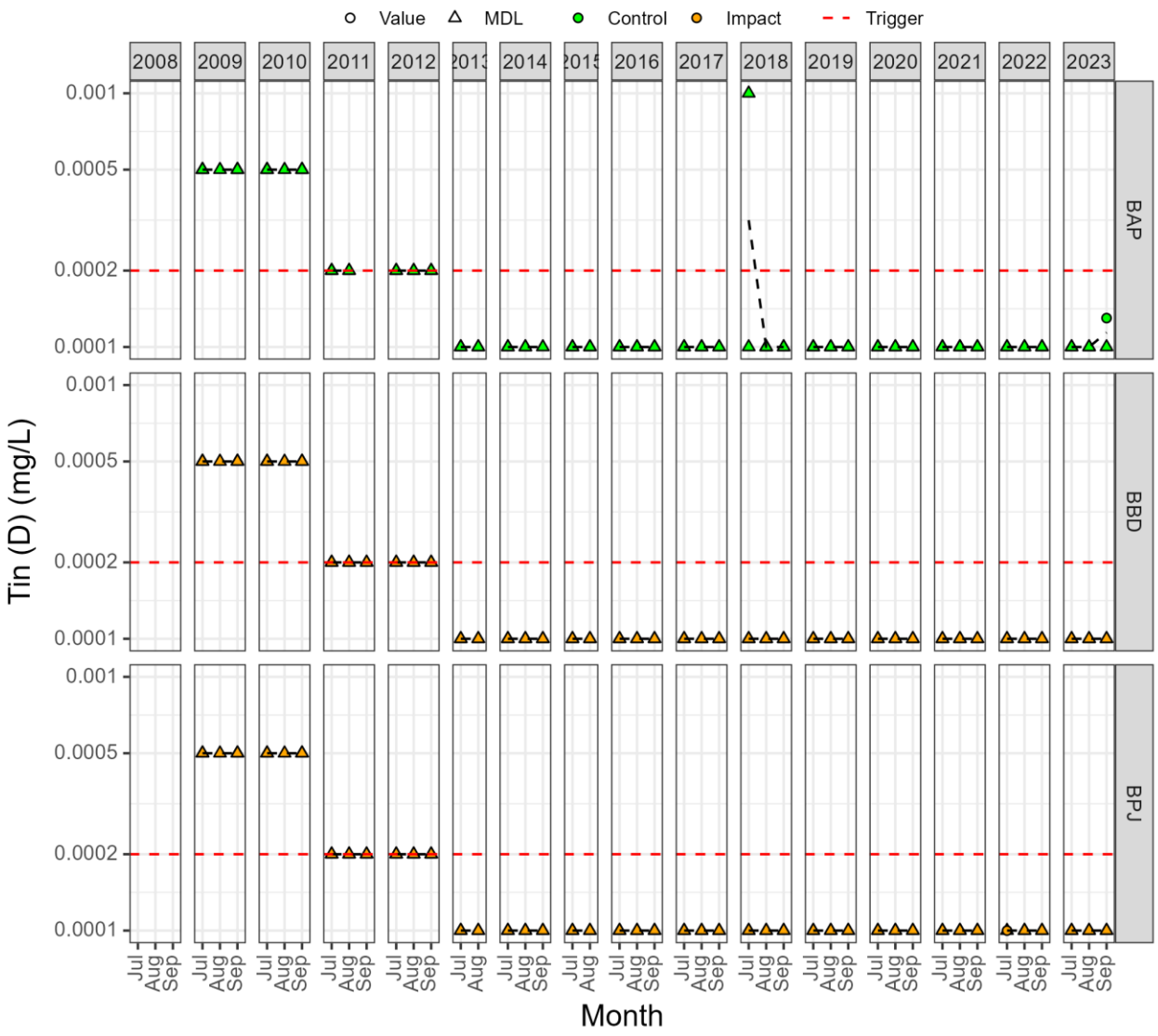


Figure B3-74. Dissolved titanium (mg/L).

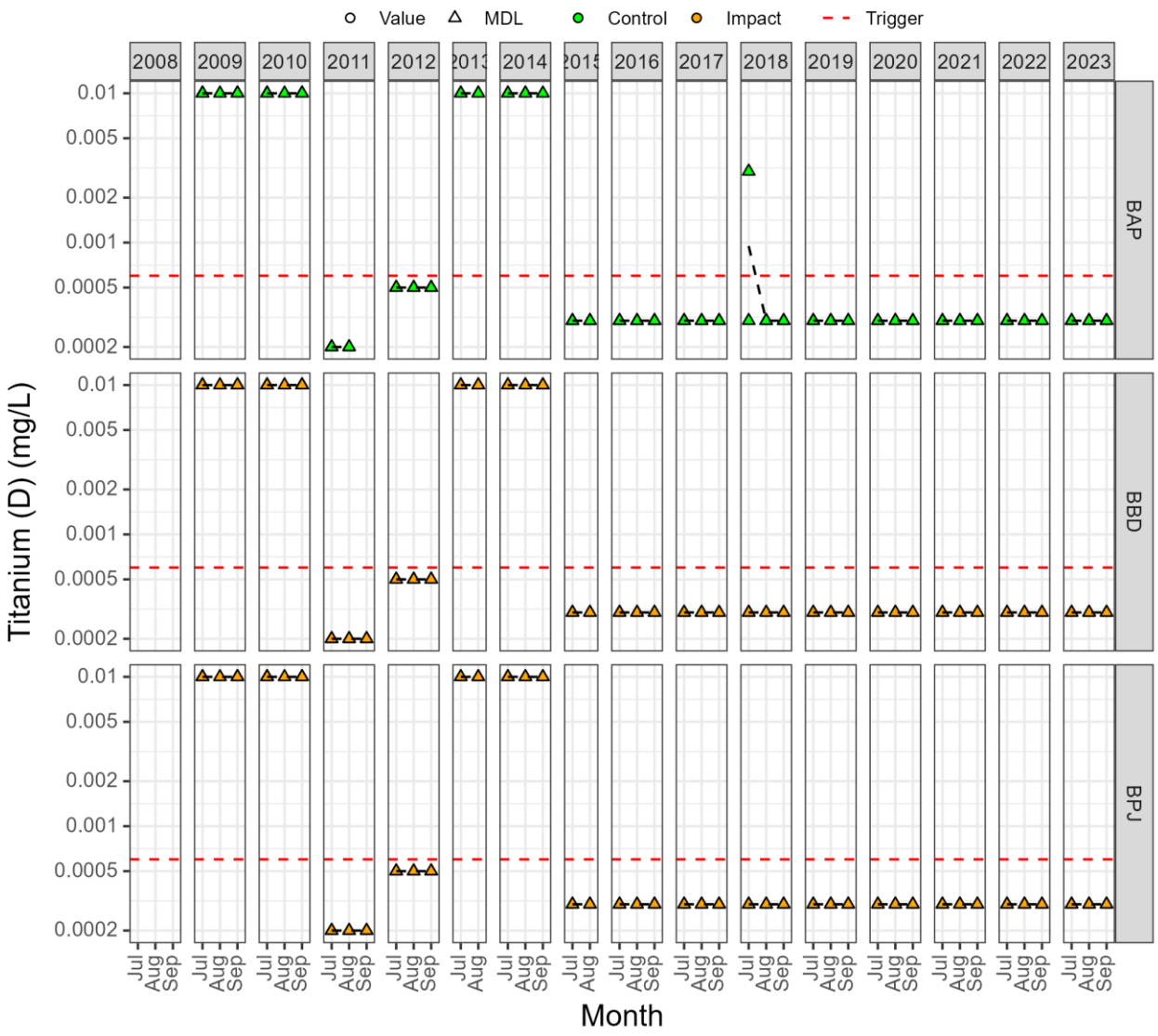


Figure B3-75. Dissolved uranium (mg/L).

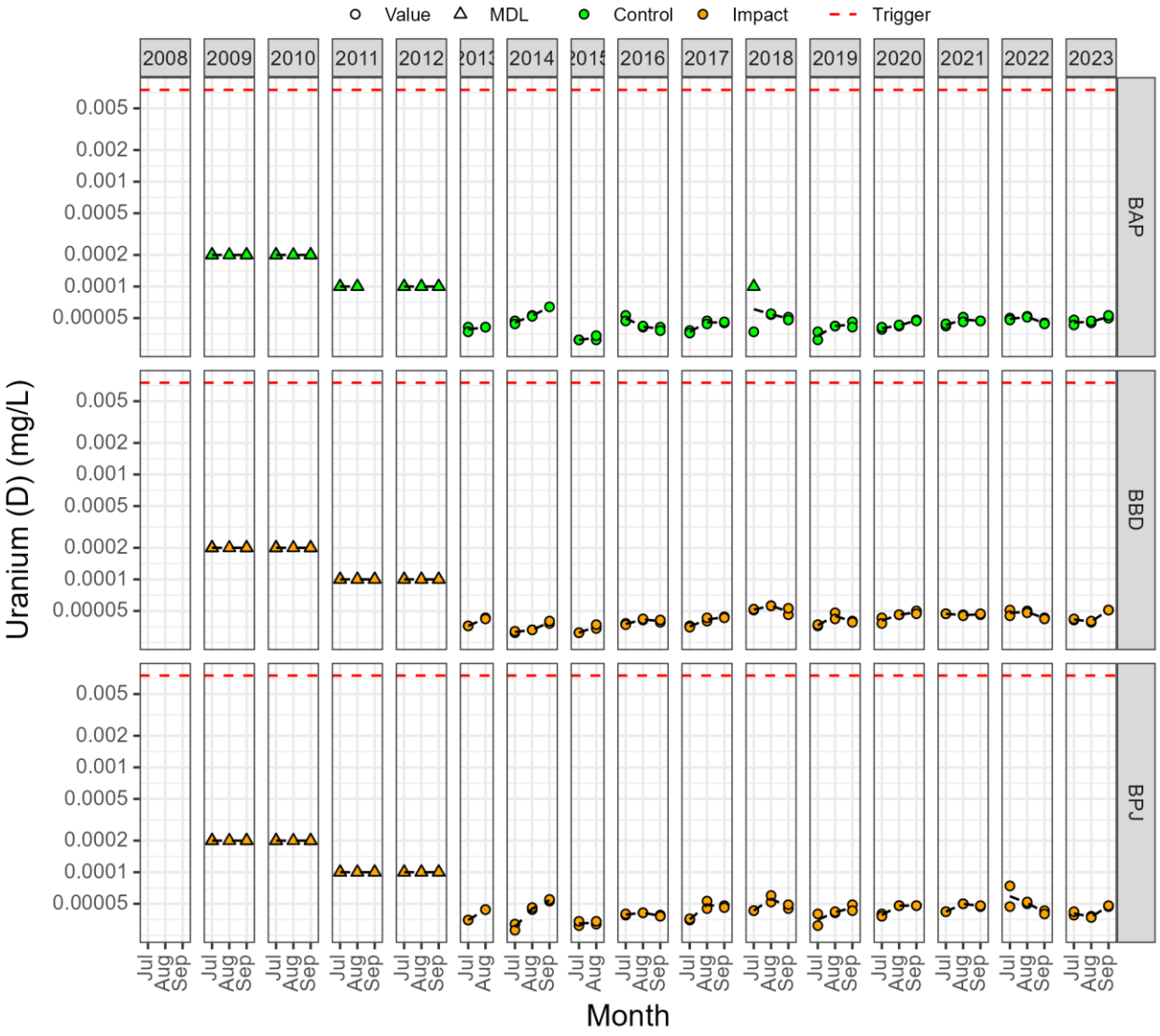


Figure B3-76. Dissolved vanadium (mg/L).

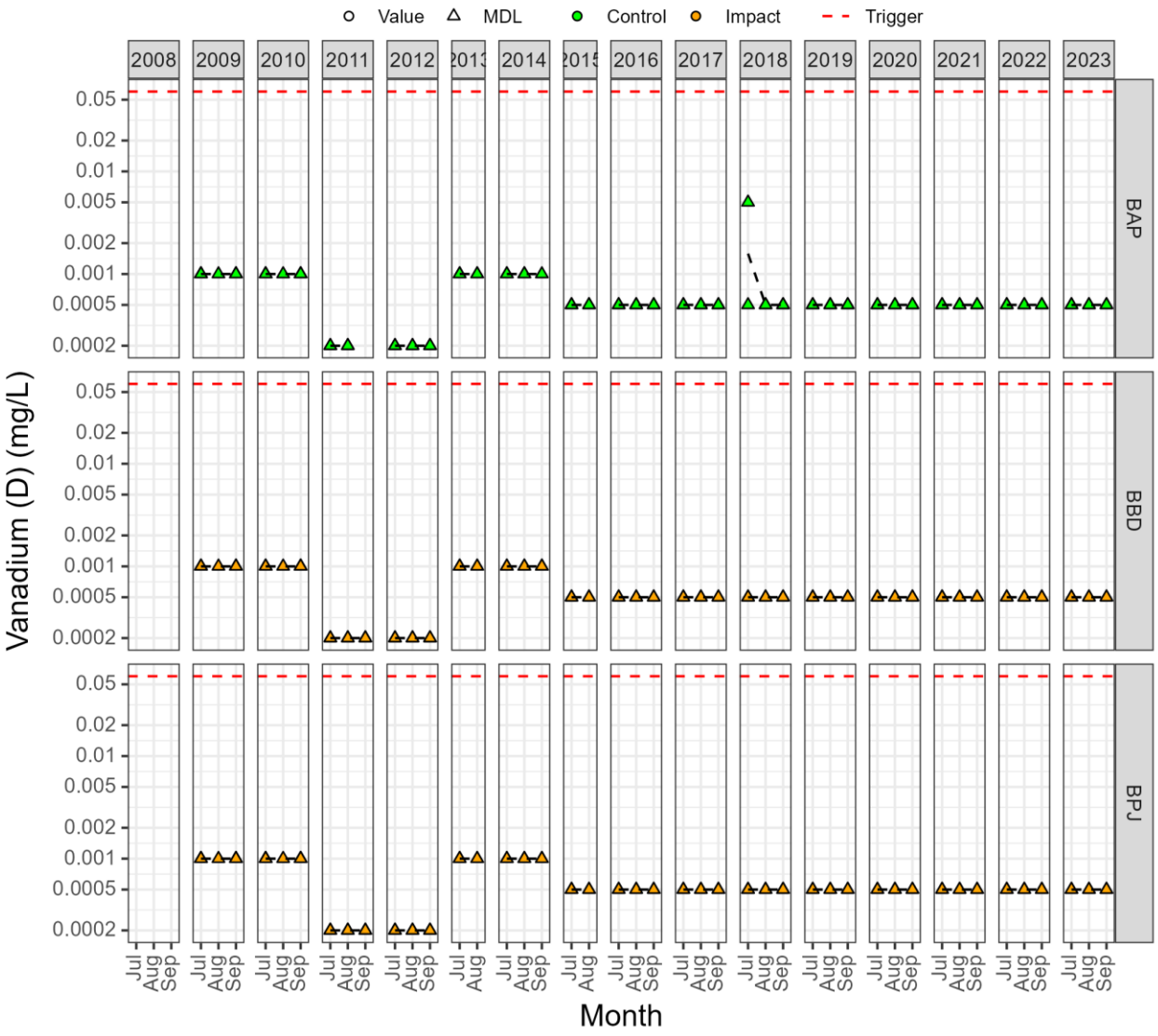
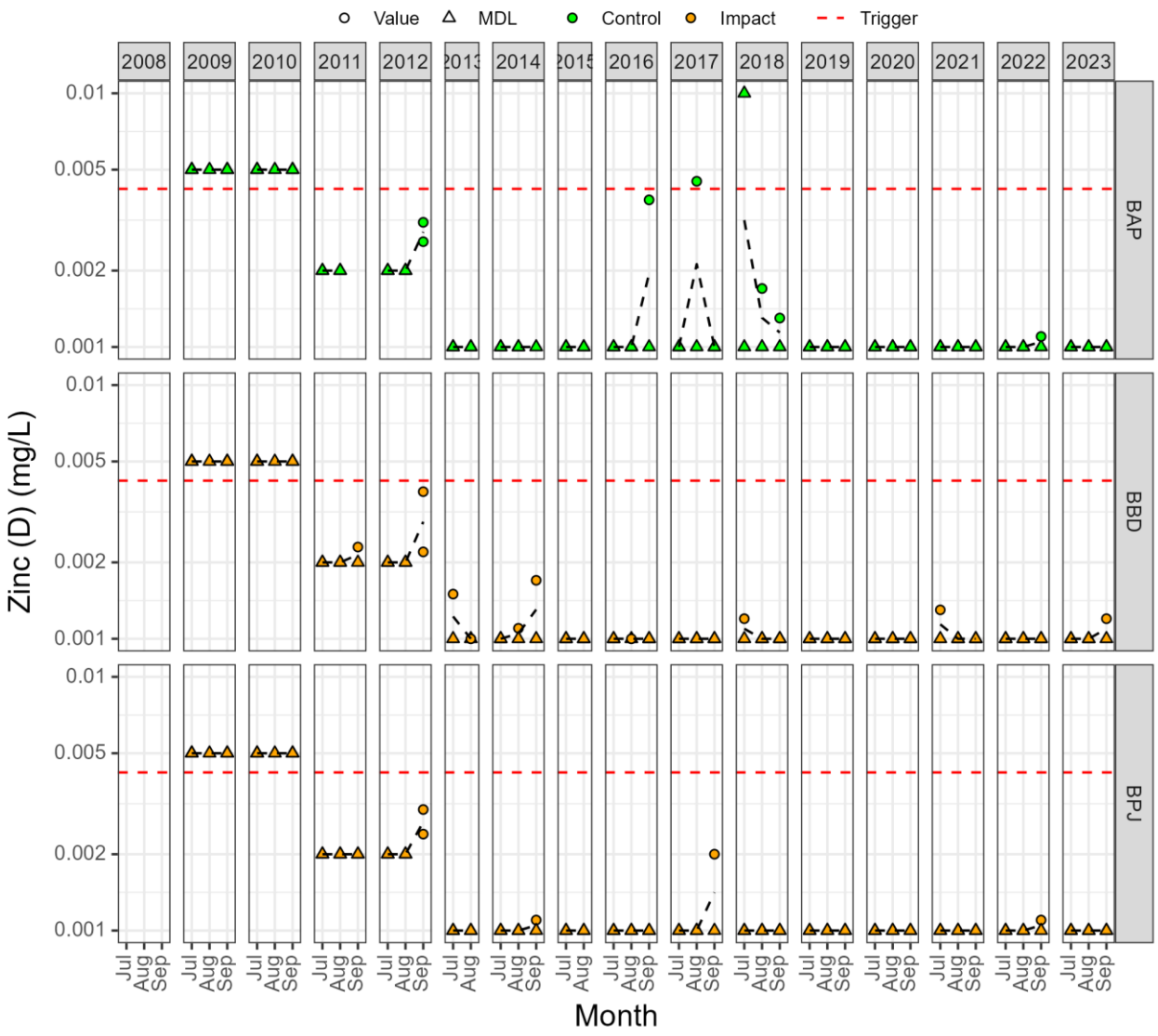


Figure B3-77. Dissolved zinc (mg/L).



APPENDIX C
SEDIMENT CHEMISTRY DATA

Appendix C1
Sediment Chemistry – Meadowbank Study Area Lakes

LIST OF TABLES

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Table C1-2. Sediment grab results, Meadowbank study lakes, 2023. 11

Table C1-3. Hydrocarbon and PAH results for composite sediment grabs at Meadowbank study area lakes, 2023. 13

SEDIMENT PROGRAM OVERVIEW

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 Plan* (Azimuth, 2015b). In addition to routine sampling, a targeted bioavailability and toxicity testing program was completed on TPE sediments to 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 study area 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[1]) was conducted to verify the 2017 results, and toxicity testing was conducted following the method used in 2015.
- **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 evaluate 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.
- **2020** – Sediment grab and core sampling was completed at the NF and reference areas only. 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. Targeted studies focusing on chromium in sediment at TPE were completed in 2019 and concluded that, while concentrations of chromium have increased relative to the baseline period and are most likely mining-related, current concentrations of chromium in sediment and porewater do not pose risks to the benthos at TPE.
- **2021** – Sediment grab sampling was completed at the NF and reference areas only. Samples were spaced throughout each basin. Grabs for chemistry and benthic invertebrates were collected at the same location. In 2021, due to a laboratory error, some of the sediment samples were discarded prior finalizing the request for analysis. As such, only one batch of sediment samples was analyzed which included the NF areas at Meadowbank (SP, TPE, and TPN [only

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

grain size]). Samples from reference areas INUG and PDL, and from NF area WAL were accidentally discarded by the laboratory prior to analysis (See **Appendix A** and **Appendix C2** in the 2021 CREMP report for details, Azimuth 2022a).

- **2022** – Sediment grab sampling was conducted at the NF and reference areas. The NF study lake sediment was analyzed for grain size and total organic carbon (TOC) with the remaining sediment archived for chemistry. Full chemistry analysis was performed for the reference lakes (INUG and PDL), however due to elevated moisture content, grain size analysis could not be performed.
- **2023** – Sediment core and grab sampling were conducted at the NF and reference areas. Sediment grab samples for habitat characteristics were analyzed for moisture, total organic carbon (TOC), and grain size; composite grab samples for chemistry were analyzed for aggregate organics, hydrocarbons, and polycyclic aromatic hydrocarbons (PAHs). Sediment core samples were analyzed for moisture, pH, and total metals.

TABLES

Table C1-1. Sediment core chemistry results, Meadowbank study lakes, 2023.

Lake & Basin	Screening Criteria					Inuggugayualik Lake (INUG)									
Area-Replicate ID	CCME[1]		MBK Triggers[2]		Thresholds[3]	INUG-SC-1	INUG-SC-2	INUG-SC-3	INUG-SC-4	INUG-SC-5	INUG-SC-6	INUG-SC-7	INUG-SC-8	INUG-SC-9	INUG-SC-10
Date						22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023
ALS Sample ID	ISQG	PEL	MBK	WAL		VA23C0344-111	VA23C0344-112	VA23C0344-113	VA23C0344-114	VA23C0344-115	VA23C0344-116	VA23C0344-117	VA23C0344-118	VA23C0344-119	VA23C0344-120
Physical Tests															
Moisture (%)						85	85	84	85	84	83	84	83	83	76
pH						5.1	5.2	5.3	5.6	5.2	5.6	5.5	5.4	5.2	6.1
Total Metals (mg/kg dw)															
Aluminum						22800	18900	24000	23700	19200	18900	25600	16200	20300	24900
Antimony						0.16	0.17	0.19	0.19	0.18	0.18	0.15	0.17	0.18	0.20
Arsenic*	5.9	17	121	45		55	95	27	12	**236**	117	14	**274**	109	31
Barium						133	118	138	142	109	114	149	101	110	126
Beryllium						1.3	1.1	1.4	1.4	1.1	1.2	1.5	0.95	1.2	1.5
Bismuth						1.2	1.1	1.3	1.3	1.0	1.1	1.3	0.89	1.1	1.3
Boron						8.8	7.1	8.0	8.3	8.2	7.3	9.0	7.2	8.5	7.8
Cadmium*	0.60	3.5	1.1	0.66		0.24	0.28	0.25	0.36	0.19	0.14	0.26	0.13	0.22	0.18
Calcium						1810	1540	1970	2240	1640	1700	2230	1700	1800	1650
Chromium*	37	90	135	61		103	90	114	114	91	91	119	77	95	117
Cobalt						15	18	13	13	13	21	11	13	14	20
Copper*	36	197	83	257		45	43	50	50	40	41	49	35	41	54
Iron						79000	114000	53400	38100	144000	124000	37400	167000	87700	65100
Lead †	35	91	25	37	35	13	13	15	15	13	13	15	11	14	15
Lithium						26	21	27	27	21	20	30	18	22	29
Magnesium						9580	8060	10400	10200	8050	7940	10700	6870	8510	9820
Manganese						1410	1900	930	653	1110	2880	515	1740	1210	2080
Mercury	0.17	0.49	0.10	0.12	0.17	0.029	0.033	0.031	0.033	0.031	0.030	0.028	0.031	0.035	0.024
Molybdenum						9.4	11	3.1	2.9	14	15	2.8	18	5.6	6.8
Nickel						82	94	85	96	73	73	86	56	82	82
Phosphorus						734	1280	1530	984	2470	1250	965	2650	2040	604
Potassium						3510	2770	3540	3440	2940	2830	3860	2520	3160	3560
Selenium						0.71	0.74	0.69	0.52	0.63	0.72	0.60	0.63	0.64	0.43
Silver						0.15	0.16	0.20	0.18	0.15	0.14	0.20	0.13	0.15	*<0.10*
Sodium						170	137	161	167	134	122	167	109	158	115
Strontium						24	20	25	26	22	22	28	21	24	23
Sulfur						*<1000*	1100	1000	1000	*<1000*	1000	*<1000*	1000	1000	*<1000*
Thallium						0.23	0.21	0.22	0.24	0.18	0.18	0.23	0.14	0.21	0.28
Tin						*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium						639	415	569	582	471	484	654	402	518	619
Tungsten						*<0.50*	*<0.50*	0.59	0.51	*<0.50*	0.53	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Uranium						15	14	16	16	14	14	17	12	14	20
Vanadium						36	30	39	38	31	32	40	26	32	38
Zinc †	123	315	114	142	123	86	87	93	102	80	79	93	68	82	95
Zirconium						2.3	1.8	2.9	3.2	1.6	1.5	3.8	1.3	1.9	3.2
Speciated Metals (µg/kg dw)															
Methylmercury (as MeHg)						0.20		0.29			0.078	0.12		0.27	

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 sediment quality guideline; PEL = probable effect level

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 C1-1. Sediment core chemistry results, Meadowbank study lakes, 2023.

Lake & Basin	Screening Criteria					Pipedream Lake (PDL)									
Area-Replicate ID	CCME[1]		MBK Triggers[2]		Thresholds[3]	PDL-SC-1	PDL-SC-2	PDL-SC-3	PDL-SC-4	PDL-SC-5	PDL-SC-6	PDL-SC-7	PDL-SC-8	PDL-SC-9	PDL-SC-10
Date						22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023
ALS Sample ID	ISQG	PEL	MBK	WAL		VA23C0344-101	VA23C0344-102	VA23C0344-103	VA23C0344-104	VA23C0344-105	VA23C0344-106	VA23C0344-107	VA23C0344-108	VA23C0344-109	VA23C0344-110
Physical Tests															
Moisture (%)						82	82	80	82	81	79	80	78	76	80
pH						5.5	5.1	5.1	5.1	5.2	5.2	5.3	5.4	5.2	5.6
Total Metals (mg/kg dw)															
Aluminum						18400	20200	17200	15800	17200	19300	19500	19800	19600	19400
Antimony						0.32	0.29	0.26	0.27	0.27	0.26	0.27	0.27	0.28	0.29
Arsenic*	5.9	17	121	45		**327**	**135**	107	**297**	117	44	36	61	50	46
Barium						108	107	75	79	79	81	90	99	87	93
Beryllium						0.92	0.95	0.79	0.78	0.83	0.90	0.91	0.96	0.92	0.90
Bismuth						0.85	0.92	0.76	0.73	0.78	0.83	0.82	0.86	0.84	0.85
Boron						7.2	7.8	6.3	5.7	6.4	6.7	7.3	7.6	7.9	7.7
Cadmium*	0.60	3.5	1.1	0.66		0.27	0.28	0.15	0.19	0.21	0.15	0.19	0.21	0.20	0.24
Calcium						2180	1910	1920	1760	1980	2070	2260	2250	2130	2330
Chromium*	37	90	135	61		115	127	111	105	112	122	118	123	123	123
Cobalt						22	21	13	17	14	16	16	21	16	15
Copper*	36	197	83	257		49	51	40	40	42	44	43	47	44	44
Iron						95100	66500	60200	80700	62100	51300	49000	52100	43900	43100
Lead †	35	91	25	37	35	16	16	14	14	14	15	15	15	15	15
Lithium						23	25	21	20	21	24	23	24	24	23
Magnesium						9610	10500	9340	8790	9460	10200	10200	10300	10100	10100
Manganese						2340	1260	784	1320	866	810	1980	3300	1410	1720
Mercury	0.17	0.49	0.10	0.12	0.17	0.028	0.023	0.020	0.022	0.022	0.018	0.020	0.019	0.020	0.020
Molybdenum						10	4.7	5.0	6.1	5.0	3.7	3.0	4.1	3.3	3.2
Nickel						100	104	73	81	80	79	83	98	87	89
Phosphorus						758	650	598	1010	687	485	509	544	524	582
Potassium						2480	2720	2270	2050	2240	2520	2560	2660	2580	2580
Selenium						0.74	0.58	0.41	0.53	0.52	0.42	0.48	0.45	0.50	0.49
Silver						0.22	0.20	0.16	0.18	0.17	0.15	0.17	0.13	0.13	0.16
Sodium						94	100	83	78	86	94	97	103	98	103
Strontium						22	21	20	18	20	22	24	24	24	25
Sulfur						*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*
Thallium						0.18	0.20	0.16	0.15	0.16	0.17	0.17	0.19	0.18	0.18
Tin						*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium						430	512	440	426	454	512	522	535	541	548
Tungsten						*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	0.60	*<0.50*	*<0.50*	*<0.50*
Uranium						8.0	8.5	6.8	6.8	7.1	7.6	7.5	8.2	7.9	7.7
Vanadium						33	35	31	29	32	34	34	35	35	35
Zinc †	123	315	114	142	123	82	85	69	69	74	77	76	79	77	77
Zirconium						1.1	1.3	1.3	1.1	1.2	1.6	*<1.0*	1.0	1.1	1.0
Speciated Metals (µg/kg dw)															
Methylmercury (as MeHg)									0.18	0.16	0.074			0.16	0.16

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

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 C1-1. Sediment core chemistry results, Meadowbank study lakes, 2023.

Lake & Basin	Screening Criteria					Third Portage Lake - East Basin (TPE)									
Area-Replicate ID	CCME[1]		MBK Triggers[2]		Thresholds[3]	TPE-SC-1	TPE-SC-2	TPE-SC-3	TPE-SC-4	TPE-SC-5	TPE-SC-6	TPE-SC-7	TPE-SC-8	TPE-SC-9	TPE-SC-10
Date						11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023
ALS Sample ID	ISQG	PEL	MBK	WAL		VA23C0344-071	VA23C0344-072	VA23C0344-073	VA23C0344-074	VA23C0344-075	VA23C0344-076	VA23C0344-077	VA23C0344-078	VA23C0344-079	VA23C0344-080
Physical Tests															
Moisture (%)						86	86	85	85	85	88	82	69	87	87
pH						5.6	6.1	5.2	5.8	5.5	5.4	5.7	5.2	5.1	5.0
Total Metals (mg/kg dw)															
Aluminum						23700	22300	25600	24700	27000	25200	28600	29600	23500	24700
Antimony						0.26	0.29	0.19	0.21	0.18	0.20	0.19	0.15	0.20	0.17
Arsenic*	5.9	17	121	45		29	51	19	22	18	25	41	17	29	18
Barium						128	104	120	119	126	115	131	146	127	113
Beryllium						1.6	1.2	1.9	1.8	1.9	1.7	2.2	2.0	1.8	1.8
Bismuth						2.1	1.5	2.5	2.2	2.5	2.1	2.5	2.5	2.1	2.3
Boron						9.1	6.9	8.2	8.3	10	8.7	9.1	11	7.5	8.4
Cadmium*	0.60	3.5	1.1	0.66		0.40	0.59	0.22	0.25	0.20	0.25	0.15	0.11	0.36	0.20
Calcium						2390	2590	1880	3100	1940	2220	1910	2010	1810	1770
Chromium*	37	90	135	61		**146**	**297**	112	127	105	**156**	108	91	130	92
Cobalt						16	23	16	17	16	17	18	15	26	16
Copper*	36	197	83	257		47	42	50	48	50	48	60	55	54	54
Iron						49000	53000	41600	39600	42800	44000	85500	45300	58300	43100
Lead †	35	91	25	37	35	21	21	20	20	21	20	20	21	20	19
Lithium						39	32	45	43	50	42	52	62	40	46
Magnesium						10800	14600	10500	10500	10200	11400	11200	11300	10400	9590
Manganese						5010	5700	1960	2740	1570	2440	2200	1430	4130	906
Mercury	0.17	0.49	0.10	0.12	0.17	0.025	0.027	0.015	0.016	0.014	0.019	0.012	0.0080	0.019	0.015
Molybdenum						4.7	4.7	3.8	3.8	3.7	3.9	8.0	4.6	4.6	3.9
Nickel						98	178	74	87	72	92	64	58	102	62
Phosphorus						419	477	384	337	376	433	475	304	442	385
Potassium						3860	2860	4080	3910	4330	3970	4640	5280	3700	4140
Selenium						0.75	0.54	0.45	0.60	0.42	0.67	0.35	*<0.20*	0.70	0.72
Silver						0.13	0.26	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	0.10	*<0.10*
Sodium						160	127	142	146	156	163	147	149	147	168
Strontium						18	17	16	17	18	18	16	18	15	16
Sulfur						1500	1900	1500	1700	1600	1900	*<1000*	*<1000*	1200	1000
Thallium						0.40	0.36	0.39	0.39	0.39	0.38	0.40	0.41	0.42	0.37
Tin						*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium						794	596	845	823	904	756	935	1230	772	909
Tungsten						0.66	0.96	0.54	0.58	*<0.50*	0.52	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Uranium						13	10	17	14	17	14	19	19	15	17
Vanadium						39	42	39	39	41	39	45	46	38	40
Zinc †	123	315	114	142	123	102	98	105	101	105	101	**119**	110	107	104
Zirconium						2.3	2.5	3.1	2.6	2.7	2.9	3.6	4.5	3.1	3.4
Speciated Metals (µg/kg dw)															
Methylmercury (as MeHg)															

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

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 C1-1. Sediment core chemistry results, Meadowbank study lakes, 2023.

Lake & Basin	Screening Criteria					Third Portage Lake - North Basin (TPN)									
Area-Replicate ID	CCME[1]		MBK Triggers[2]		Thresholds[3]	TPN-SC-1	TPN-SC-2	TPN-SC-3	TPN-SC-4	TPN-SC-5	TPN-SC-6	TPN-SC-7	TPN-SC-8	TPN-SC-9	TPN-SC-10
Date						12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023
ALS Sample ID	ISQG	PEL	MBK	WAL		VA23C0344-081	VA23C0344-082	VA23C0344-083	VA23C0344-084	VA23C0344-085	VA23C0344-086	VA23C0344-087	VA23C0344-088	VA23C0344-089	VA23C0344-090
Physical Tests															
Moisture (%)						70	39	37	42	69	73	56	66	83	85
pH						6.1	5.8	6.1	6.2	5.8	5.7	6.1	5.9	5.8	5.9
Total Metals (mg/kg dw)															
Aluminum						12300	8740	19600	16400	14500	13200	13500	14100	17600	20100
Antimony						0.13	*<0.10*	*<0.10*	0.10	0.12	0.11	0.12	0.11	0.17	0.19
Arsenic*	5.9	17	121	45		14	6.2	8.2	11	13	15	14	12	16	18
Barium						38	29	84	70	56	50	51	55	65	75
Beryllium						0.54	0.46	0.94	0.79	0.80	0.74	0.67	0.76	1.0	1.3
Bismuth						0.46	0.32	0.82	0.67	0.84	0.72	0.66	0.73	1.0	1.2
Boron						*<5.0*	*<5.0*	*<5.0*	*<5.0*	5.1	*<5.0*	5.4	6.0	7.4	8.3
Cadmium*	0.60	3.5	1.1	0.66		0.15	0.053	0.072	0.092	0.070	0.071	0.071	0.071	0.063	0.070
Calcium						1470	868	1370	1290	1260	1220	1280	1230	1630	1790
Chromium*	37	90	135	61		115	53	79	74	89	89	84	78	108	120
Cobalt						9.7	4.9	11	13	7.5	6.9	8.5	8.4	9.1	9.9
Copper*	36	197	83	257		21	12	23	22	32	29	27	29	44	55
Iron						22600	14700	28000	26400	23400	21000	23000	21700	30500	32700
Lead †	35	91	25	37	35	8.7	5.2	12	11	11	10	9.5	9.8	14	15
Lithium						17	19	46	36	23	20	22	23	25	30
Magnesium						8580	5480	9660	8460	7200	6800	6880	6710	8430	9320
Manganese						395	196	610	681	226	212	435	388	329	320
Mercury	0.17	0.49	0.10	0.12	0.17	0.010	*<0.0050*	0.0061	0.0088	0.010	0.011	0.011	0.011	0.017	0.017
Molybdenum						2.3	1.5	2.3	2.0	2.4	2.6	2.0	1.9	2.4	3.1
Nickel						55	30	63	68	43	41	42	40	51	60
Phosphorus						333	156	133	204	312	374	259	226	700	749
Potassium						1360	1200	3350	2710	2020	1790	1890	2080	2400	2780
Selenium						0.23	*<0.20*	*<0.20*	*<0.20*	*<0.20*	0.24	0.20	0.21	0.52	0.64
Silver						0.12	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	0.14	0.18
Sodium						67	*<50*	115	100	79	78	70	81	114	133
Strontium						11	8.5	14	12	12	12	12	12	14	16
Sulfur						*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*
Thallium						0.10	0.089	0.24	0.20	0.15	0.13	0.13	0.14	0.17	0.20
Tin						*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium						321	372	990	759	446	396	478	502	469	501
Tungsten						*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	0.52	0.51
Uranium						5.6	3.6	8.8	6.9	9.3	8.6	8.4	9.7	12	15
Vanadium						22	15	33	28	25	23	23	23	30	33
Zinc †	123	315	114	142	123	53	40	88	86	59	52	55	57	67	77
Zirconium						1.5	2.8	11	7.6	2.2	1.6	1.6	1.5	1.5	2.3
Speciated Metals (µg/kg dw)															
Methylmercury (as MeHg)															

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

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 C1-1. Sediment core chemistry results, Meadowbank study lakes, 2023.

Lake & Basin	Screening Criteria					Second Portage Lake (SP)									
Area-Replicate ID	CCME[1]		MBK Triggers[2]		Thresholds[3]	SP-SC-1	SP-SC-2	SP-SC-3	SP-SC-4	SP-SC-5	SP-SC-6	SP-SC-7	SP-SC-8	SP-SC-9	SP-SC-10
Date						14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023
ALS Sample ID	ISQG	PEL	MBK	WAL		VA23C0344-061	VA23C0344-062	VA23C0344-063	VA23C0344-064	VA23C0344-065	VA23C0344-066	VA23C0344-067	VA23C0344-068	VA23C0344-069	VA23C0344-070
Physical Tests															
Moisture (%)						84	85	87	84	84	87	84	84	87	86
pH						5.2	5.4	5.6	5.9	5.8	6.0	5.8	5.6	5.8	6.1
Total Metals (mg/kg dw)															
Aluminum						26400	23000	30700	23300	24300	25300	24400	25500	28600	29600
Antimony						0.23	0.20	0.21	0.22	0.29	0.24	0.22	0.28	0.21	0.24
Arsenic*	5.9	17	121	45		**176**	**140**	28	35	38	37	36	71	31	34
Barium						122	110	144	103	121	115	107	121	126	133
Beryllium						2.0	1.9	2.4	1.7	1.7	1.9	1.8	1.9	2.3	2.3
Bismuth						2.1	2.0	2.6	2.0	2.0	2.1	2.0	2.0	2.4	2.5
Boron						9.3	7.9	9.8	7.5	8.4	8.9	9.3	9.9	11	12
Cadmium*	0.60	3.5	1.1	0.66		0.24	0.14	0.11	0.16	0.27	0.22	0.22	0.22	0.22	0.23
Calcium						1880	1680	2570	2300	2460	2640	2600	2720	2580	2580
Chromium*	37	90	135	61		75	66	92	77	110	91	99	107	87	85
Cobalt						19	14	13	13	16	13	13	16	17	18
Copper*	36	197	83	257		76	67	81	60	62	65	61	65	73	78
Iron						145000	123000	57800	70000	60500	69900	59300	94800	57300	58300
Lead †	35	91	25	37	35	19	17	23	19	20	21	20	21	22	22
Lithium						34	31	46	36	35	39	39	39	46	49
Magnesium						8930	7970	11100	9010	10300	9910	9920	10700	10200	10400
Manganese						1470	1110	1100	1660	3740	2170	1540	1560	3310	2700
Mercury	0.17	0.49	0.10	0.12	0.17	0.023	0.020	0.023	0.028	0.039	0.035	0.032	0.039	0.032	0.029
Molybdenum						16	13	7.1	6.0	7.2	5.9	5.5	8.1	5.8	6.5
Nickel						66	49	60	50	77	61	60	67	61	60
Phosphorus						1440	1950	685	496	582	540	513	634	587	553
Potassium						4250	3760	4970	3780	3800	4020	3940	4090	4760	4840
Selenium						0.77	0.81	0.41	0.46	0.62	0.61	0.59	0.65	0.52	0.54
Silver						0.13	0.13	0.16	0.11	0.19	0.18	0.14	0.24	0.12	*<0.10*
Sodium						153	142	181	149	161	165	161	179	187	174
Strontium						17	17	21	18	20	20	20	21	21	21
Sulfur						1100	*<1000*	*<1000*	1000	1400	1300	1100	1400	1400	1300
Thallium						0.33	0.29	0.36	0.30	0.32	0.32	0.31	0.31	0.38	0.40
Tin						*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium						811	696	920	682	712	695	717	710	726	835
Tungsten						0.57	0.59	0.56	0.56	0.60	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Uranium						19	17	22	16	15	17	15	15	20	21
Vanadium						37	33	45	35	38	37	37	39	38	42
Zinc †	123	315	114	142	123	**127**	99	**125**	103	108	109	103	110	**118**	**121**
Zirconium						2.6	2.4	3.8	2.4	2.1	2.4	2.0	2.3	2.1	2.0
Speciated Metals (µg/kg dw)															
Methylmercury (as MeHg)															

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

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 C1-1. Sediment core chemistry results, Meadowbank study lakes, 2023.

Lake & Basin	Screening Criteria					Wally Lake (WAL)									
Area-Replicate ID	CCME[1]		MBK Triggers[2]		Thresholds[3]	WAL-SC-1	WAL-SC-2	WAL-SC-3	WAL-SC-4	WAL-SC-5	WAL-SC-6	WAL-SC-7	WAL-SC-8	WAL-SC-9	WAL-SC-10
Date						21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023
ALS Sample ID	ISQG	PEL	MBK	WAL		VA23C0344-091	VA23C0344-092	VA23C0344-093	VA23C0344-094	VA23C0344-095	VA23C0344-096	VA23C0344-097	VA23C0344-098	VA23C0344-099	VA23C0344-100
Physical Tests															
Moisture (%)						88	89	92	91	92	91	89	90	86	87
pH						6.3	6.2	6.6	6.0	6.3	6.3	6.4	6.2	6.2	6.4
Total Metals (mg/kg dw)															
Aluminum						19000	20200	14500	17400	22000	20200	22400	23900	24700	21700
Antimony						0.34	0.38	0.38	0.33	0.44	0.45	0.37	0.41	0.37	0.19
Arsenic*	5.9	17	121	45		27	32	30	30	30	31	**45**	**52**	23	26
Barium						108	112	79	90	118	110	122	131	125	106
Beryllium						1.4	1.6	1.1	1.3	1.6	1.5	1.7	1.8	1.7	1.7
Bismuth						1.7	1.9	1.3	1.5	1.9	1.8	2.1	2.2	2.2	1.9
Boron						10	9.7	12	11	14	14	11	12	7.6	6.9
Cadmium*	0.60	3.5	1.1	0.66		0.36	0.37	0.41	0.45	0.55	0.53	0.44	0.55	**0.93**	0.15
Calcium						3990	4680	5540	4240	4750	4580	4160	4560	3560	3620
Chromium*	37	90	135	61		50	55	43	47	57	53	59	**64**	**63**	55
Cobalt						8.3	9.4	8.0	8.8	9.8	9.0	9.0	10	8.9	7.9
Copper*	36	197	83	257		106	118	98	109	145	131	144	158	152	110
Iron						28900	33000	23800	24800	29800	30000	41700	44100	30200	32500
Lead †	35	91	25	37	35	26	29	24	27	32	31	33	36	33	27
Lithium						31	35	24	28	35	31	33	36	44	37
Magnesium						7350	8060	6230	7150	8470	7640	8000	8660	9440	8210
Manganese						395	365	268	268	322	333	340	415	323	288
Mercury	0.17	0.49	0.10	0.12	0.17	0.053	0.055	0.076	0.070	0.071	0.078	0.066	0.064	0.034	0.038
Molybdenum						6.3	7.2	7.1	6.7	8.2	8.2	12	12	7.0	8.9
Nickel						46	52	44	46	54	50	51	59	56	45
Phosphorus						595	647	807	665	611	629	758	802	523	581
Potassium						2980	3010	2340	2690	3370	3100	3380	3530	3710	3150
Selenium						0.55	0.62	0.59	0.75	0.92	0.78	0.90	0.97	0.81	0.62
Silver						0.42	0.52	0.48	0.59	0.71	0.66	0.58	0.64	0.47	0.37
Sodium						160	165	151	166	196	180	166	183	139	135
Strontium						25	26	26	25	28	27	26	29	24	24
Sulfur						1600	1700	3600	3000	2200	2100	1600	2200	1200	1300
Thallium						0.25	0.28	0.21	0.25	0.31	0.28	0.30	0.34	0.32	0.27
Tin						*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium						602	534	366	431	573	547	547	567	679	479
Tungsten						0.89	0.95	1.1	1.0	1.1	1.1	0.95	1.0	1.1	0.88
Uranium						12	14	11	12	15	14	16	18	16	14
Vanadium						27	29	21	24	30	28	32	34	33	29
Zinc †	123	315	114	142	123	102	116	96	107	125	112	125	133	117	107
Zirconium						2.7	4.8	4.5	5.9	4.8	3.9	3.4	3.9	5.6	5.8
Speciated Metals (µg/kg dw)															
Methylmercury (as MeHg)															

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

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 results, Meadowbank study lakes, 2023.

Lake & Basin	Inuggugayualik Lake (INUG)					Pipedream Lake (PDL)					Third Portage Lake - East Basin (TPE)				
Area-Replicate ID	**INUG-1**	**INUG-2**	**INUG-3**	**INUG-4**	**INUG-5**	**PDL-1**	**PDL-2**	**PDL-3**	**PDL-4**	**PDL-5**	**TPE-1**	**TPE-2**	**TPE-3**	**TPE-4**	**TPE-5**
Date	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023
ALS Sample ID	VA23C0329-031	VA23C0329-032	VA23C0329-033	VA23C0329-034	VA23C0329-035	VA23C0329-025	VA23C0329-026	VA23C0329-027	VA23C0329-028	VA23C0329-029	VA23C0329-013	VA23C0329-014	VA23C0329-015	VA23C0329-016	VA23C0329-017
Physical Tests															
Moisture (%)	81	83	81	82	67	75	78	75	76	72	82	82	83	81	81
Particle Size (%)															
clay (<0.004mm)	18	23	20	21	34	19	15	15	16	16	29	30	26	25	31
silt (0.063mm - 0.004mm)	81	72	78	78	57	78	74	74	75	71	68	68	72	67	64
sand (2.0mm - 0.063mm)	*<1.0*	4.9	2.2	1.5	8.5	2.7	11	11	9.8	13	2.7	2.8	2.0	8.0	4.4
gravel (>2mm)	*<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*
Organic Carbon															
TOC (% dw)	3.3	3.7	3.2	3.6	1.6	2.8	2.7	2.6	2.4	2.3	3.5	3.3	3.6	3.1	2.8

Notes:
Italicized numbers are below detection limits.

Table C1-2. Sediment grab results, Meadowbank study lakes, 2023.

Lake & Basin	Third Portage Lake - North Basin (TPN)					Second Portage Lake (SP)					Wally Lake (WAL)				
Area-Replicate ID	**TPN-1**	**TPN-2**	**TPN-3**	**TPN-4**	**TPN-5**	**SP-1**	**SP-2**	**SP-3**	**SP-4**	**SP-5**	**WAL-1**	**WAL-2**	**WAL-3**	**WAL-4**	**WAL-5**
Date	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023
ALS Sample ID	VA23C0329-019	VA23C0329-020	VA23C0329-021	VA23C0329-022	VA23C0329-023	VA23C0329-001	VA23C0329-002	VA23C0329-003	VA23C0329-004	VA23C0329-005	VA23C0329-007	VA23C0329-008	VA23C0329-009	VA23C0329-010	VA23C0329-011
Physical Tests															
Moisture (%)	26	25	67	36	82	85	83	82	84	85	87	91	89	88	81
Particle Size (%)															
clay (<0.004mm)	16	12	8.6	16	19	28	28	23	30	24	12	16	14	15	15
silt (0.063mm - 0.004mm)	26	31	41	50	61	69	70	75	68	75	84	81	83	82	79
sand (2.0mm - 0.063mm)	58	56	50	34	20	3.0	2.6	2.2	2.5	1.9	4.1	3.0	2.5	3.0	6.3
gravel (>2mm)	*<1.0*	1.3	*<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*
Organic Carbon															
TOC (% dw)	0.60	0.53	1.8	0.72	3.2	3.6	4.1	4.0	3.9	4.4	6.8	11	8.7	7.4	4.6

Notes:

Italicized numbers are below detection limits.

Table C1-3. Hydrocarbon and PAH results for composite sediment grabs at Meadowbank study area lakes, 2023.

Area-Replicate ID	CCME Sediment Quality Guidelines[1]		INUG-COMP	PDL-COMP	TPE-COMP	TPN-COMP	SP-COMP	WAL-COMP
Date			22-Aug-2023	22-Aug-2023	11-Aug-2023	12-Aug-2023	14-Aug-2023	21-Aug-2023
ALS Sample ID	ISQG	PEL	VA23C0329-036	VA23C0329-030	VA23C0329-018	VA23C0329-024	VA23C0329-006	VA23C0329-012
Physical Parameters								
Moisture (%)	-	-	81	78	85	56	86	89
Aggregate Organics (mg/kg)								
Mineral Oil and Grease	-	-	*<500*	*<500*	*<500*	*<500*	*<500*	*<500*
Hydrocarbons (mg/kg)								
EPH10-19	-	-	*<320*	*<260*	*<380*	*<200*	*<400*	*<580*
EPH19-32	-	-	*<320*	*<260*	*<380*	*<200*	*<400*	*<580*
LEPH	-	-	*<320*	*<260*	*<380*	*<200*	*<400*	*<580*
HEPH	-	-	*<320*	*<260*	*<380*	*<200*	*<400*	*<580*
Polycyclic Aromatic Hydrocarbons (mg/kg)								
Acenaphthene	0.0067	0.089	*<0.0158*	*<0.0133*	*<0.0188*	*<0.0063*	*<0.0198*	*<0.0291*
Acenaphthylene	0.0059	0.13	*<0.0158*	*<0.0133*	*<0.0188*	*<0.0063*	*<0.0198*	*<0.0291*
Acridine	-	-	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Anthracene	0.047	0.25	*<0.0158*	*<0.0133*	*<0.0188*	*<0.0063*	*<0.0198*	*<0.0291*
Benz(a)anthracene	0.032	0.39	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Benzo(a)pyrene	0.032	0.78	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Benzo(b+j)fluoranthene	-	-	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Benzo(b+j+k)fluoranthene	-	-	*<0.023*	*<0.018*	*<0.027*	*<0.015*	*<0.028*	*<0.041*
Benzo(g,h,i)perylene	-	-	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Benzo(k)fluoranthene	-	-	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Chrysene	0.057	0.86	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Dibenz(a,h)anthracene	0.0062	0.14	*<0.0158*	*<0.0133*	*<0.0188*	*<0.0063*	*<0.0198*	*<0.0700*
Fluoranthene	0.11	2.36	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Fluorene	0.021	0.144	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Indeno(1,2,3-c,d)pyrene	-	-	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.045*
Methylnaphthalene, 1-	-	-	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Methylnaphthalene, 2-	0.020	0.20	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Naphthalene	0.035	0.39	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Phenanthrene	0.042	0.52	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Pyrene	0.053	0.88	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
Quinoline	-	-	*<0.016*	*<0.013*	*<0.019*	*<0.010*	*<0.020*	*<0.029*
PAH Surrogates (%)								
Acridine-d9	-	-	113	100	110	110	108	124
Chrysene-d12	-	-	114	101	116	114	114	117
Naphthalene-d8	-	-	128	114	116	109	116	130
Phenanthrene-d10	-	-	116	104	120	118	121	129

Notes:

1. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = Interim freshwater Sediment Quality Guideline; PEL = probably effect level concentration

Bolded concentrations exceed the ISQG guideline.

Italicized numbers are below detection limits.

Appendix C2
Sediment Chemistry – Whale Tail Study Area Lakes

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Table C2-2. Sediment grab results, Whale Tail study lakes, 2023. 1

Table C2-3. Hydrocarbon and PAH results for composite sediment grabs at Whale Tail study area lakes, 2023. 4

SEDIMENT PROGRAM OVERVIEW

Below is an overview of the various sediment sampling programs at Whale Tail dating back to baseline sampling in 2015:

- **2015** – Baseline grab sampling was conducted at the NF lakes WTS, MAM, and NEM to characterize TOC, grain size, and baseline metals concentrations. A composite sample from each of the study lakes was also analyzed for hydrocarbons and PAHs. These analyses were conducted for each of the study lakes during each year of sampling to present.
- **2016** – Baseline grab sampling was expanded to include the MF lakes A20, A76, and DS1 along with the continued sampling at the NF lakes.
- **2017** – Baseline coring results in 2017 were used to established trigger concentrations in each of the Whale Tail study lakes in anticipation of future mine developments. Unlike Meadowbank in which trigger values were applied over multiple lakes in the study area, at the Whale Tail lakes sediment chemistry was too heterogeneous to apply triggers over broad spatial scales. Instead, lake specific triggers were derived.
- **2018** – NF lake WTS moved to the "Impact" category following dike construction at Whale Tail Lake which began on July 27. All other Whale Tail lakes remained in the "Control" category. Sampling conducted via grab sampling.
- **2019** – All of the NF and MF Whale Tail study lakes were characterized as "Impact". Sampling conducted via grab sampling.
- **2020** – Core sampling was conducted across the Whale Tail study lakes with results formally compared to lake specific triggers. Increases in mean concentrations of arsenic, chromium, and copper were found in some study lakes, however there was evidence that the observed concentrations may have been due to natural spatial heterogeneity. Findings were considered preliminary until further coring data is available during the 2023 coring cycle.
- **2021** – Grab sampling was conducted throughout the Whale Tail study lakes. In 2021, due to a laboratory error, some of the sediment samples were discarded prior finalizing the request for analysis. As such, results were missing for MAM, A20, and DS1.
- **2022** – Grab sampling was conducted throughout the Whale Tail study lakes. Concentrations of metals were generally similar to results from the baseline period and early operations.
- **2023** – Sediment core and grab sampling were conducted at the Whale Tail study lakes. Sediment grab samples for habitat characteristics were analyzed for moisture, total organic carbon (TOC), and grain size; composite grab samples for chemistry were analyzed for aggregate

organics, hydrocarbons, and polycyclic aromatic hydrocarbons (PAHs). Sediment core samples were analyzed for moisture, pH, and total metals.

TABLES

Table C2-1. Sediment core chemistry results, Whale Tail study lakes, 2023.

Lake & Basin	Screening Criteria				Lake A20 (Impoundment)									
Area-Replicate ID	CCME[1]		Thresholds[3] (All Lakes)	A20 Triggers	A20-SC-1	A20-SC-2	A20-SC-3	A20-SC-4	A20-SC-5	A20-SC-6	A20-SC-7	A20-SC-8	A20-SC-9	A20-SC-10
Date					16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023
ALS Sample ID	ISQG	PEL			VA23C0344-031	VA23C0344-032	VA23C0344-033	VA23C0344-034	VA23C0344-035	VA23C0344-036	VA23C0344-037	VA23C0344-038	VA23C0344-039	VA23C0344-040
Physical Tests														
Moisture (%)					87	87	86	87	89	88	87	88	88	86
pH					5.1	5.1	5.2	5.3	5.9	5.6	5.3	5.2	5.8	5.3
Total Metals (mg/kg dw)														
Aluminum					18700	19200	20800	22300	19400	25600	20900	27900	21800	27500
Antimony					0.26	0.21	0.20	0.21	0.24	0.22	0.20	0.22	0.32	0.22
Arsenic*	5.9	17	5.9	43	**109**	**84**	**57**	31	39	29	**127**	22	39	33
Barium					199	183	148	164	185	216	172	242	216	194
Beryllium					1.6	1.7	2.0	2.1	2.0	2.5	2.0	3.0	1.9	2.3
Bismuth					0.92	0.91	0.96	1.0	0.92	1.2	0.93	1.2	0.99	1.3
Boron					8.3	7.0	6.8	8.0	8.9	9.5	7.6	9.5	8.4	7.8
Cadmium*	0.60	3.5	0.60	0.37	0.26	0.23	0.17	0.18	0.15	0.27	0.16	0.21	0.21	0.12
Calcium					2710	2340	2080	2510	6060	2880	2500	2910	3000	2470
Chromium*	37	90	37	53	49	49	52	**55**	51	**64**	**54**	**70**	**64**	**70**
Cobalt					23	21	24	15	14	14	15	13	21	16
Copper*	36	197	36	42	36	38	**46**	**47**	39	**48**	41	**58**	41	**52**
Iron					140000	132000	99700	56800	84200	63900	131000	57900	80200	62200
Lead	35	91	35	25	18	18	17	18	18	22	18	24	18	23
Lithium					15	16	16	18	15	21	16	21	19	24
Magnesium					6430	6670	6760	7450	6200	8420	7010	8580	7730	9120
Manganese					4960	3600	1950	1060	1490	1210	1720	525	6100	1790
Mercury	0.17	0.49	0.17	0.11	0.062	0.052	0.043	0.047	0.060	0.052	0.046	0.056	0.060	0.045
Molybdenum					7.5	6.8	6.4	5.9	5.4	5.1	8.3	6.0	5.7	5.0
Nickel					43	39	35	39	34	43	35	44	45	43
Phosphorus					2010	1370	755	896	867	1060	1490	1340	793	772
Potassium					2980	2850	2950	3240	2860	3800	3000	3980	3410	3970
Selenium					0.88	0.83	0.87	0.78	0.73	0.69	0.75	0.91	0.81	0.57
Silver					0.24	0.21	0.12	0.14	0.27	0.30	0.20	0.30	0.19	0.12
Sodium					202	187	167	197	212	244	193	250	232	206
Strontium					28	24	22	25	30	29	26	30	32	27
Sulfur					1800	1800	1700	1800	2100	1700	1900	1600	1800	1700
Thallium					0.28	0.27	0.28	0.28	0.24	0.31	0.25	0.32	0.30	0.32
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					455	419	454	512	428	642	439	619	526	560
Tungsten					*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	0.60	*<0.50*	0.61	*<0.50*	*<0.50*
Uranium					11	12	15	16	13	16	14	19	13	16
Vanadium					28	28	30	32	29	37	30	42	32	39
Zinc*	123	315	123	103	87	87	98	101	91	**106**	98	**125**	92	**110**
Zirconium					1.5	2.3	2	2.2	1.8	2.5	2.6	3.5	1.8	2.6
Speciated Metals (µg/kg dw)														
Methylmercury (as MeHg)					-	-	-	0.51	0.86	-	0.88	-	0.28	0.70

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
2. Trigger and threshold values for Whale Tail lakes were developed for the 2019 CREMP, using baseline data collected in 2017 (Azimuth, 2020).
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 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 core chemistry results, Whale Tail study lakes, 2023.

Lake & Basin	Screening Criteria				Whale Tail Lake - South Basin (WTS)									
Area-Replicate ID	CCME[1]		Thresholds[3] (All Lakes)	WTS Triggers	WTS-SC-1	WTS-SC-2	WTS-SC-3	WTS-SC-4	WTS-SC-5	WTS-SC-6	WTS-SC-7	WTS-SC-8	WTS-SC-9	WTS-SC-10
Date					12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023
ALS Sample ID	ISQG	PEL			VA23C0344-011	VA23C0344-012	VA23C0344-013	VA23C0344-014	VA23C0344-015	VA23C0344-016	VA23C0344-017	VA23C0344-018	VA23C0344-019	VA23C0344-020
Physical Tests														
Moisture (%)					86	85	79	77	85	85	85	85	85	84
pH					5.9	6.1	6.4	6.1	5.9	5.7	6.0	5.7	5.6	5.9
Total Metals (mg/kg dw)														
Aluminum					16700	14400	16200	15100	12600	13800	16300	12400	17800	15600
Antimony					0.63	0.85	0.82	0.34	0.80	0.48	1.2	0.59	0.65	0.42
Arsenic*	5.9	17	5.9	83.1	**120**	**101**	58	15	**527**	**450**	**258**	**374**	75	**130**
Barium					129	277	110	70	194	118	205	124	164	82
Beryllium					1.3	1.1	0.96	1.0	0.99	1.1	1.1	1.1	1.2	1.2
Bismuth					0.49	0.44	0.38	0.46	0.40	0.46	0.46	0.42	0.53	0.51
Boron					7.5	6.2	5.7	5.5	6.5	6.6	6.8	7.2	6.8	5.7
Cadmium*	0.60	3.5	0.60	0.93	0.33	0.40	0.21	0.082	0.29	0.24	0.37	0.28	0.25	0.19
Calcium					4290	3850	3920	2640	4080	3080	4260	3660	3400	2860
Chromium*	37	90	37	80.6	**90**	**105**	**173**	72	**102**	71	**184**	76	**118**	74
Cobalt					24	53	21	9.2	32	21	31	18	26	20
Copper*	36	197	36	48.5	37	35	30	29	32	34	38	33	40	38
Iron					81300	125000	38900	25000	178000	159000	149000	186000	70000	98200
Lead	35	91	35	24.0	14	14	12	11	12	12	14	12	14	12
Lithium					15	12	16	15	10	11	14	10	16	13
Magnesium					7120	7140	9980	6730	6480	5730	10000	5530	8160	5930
Manganese					3020	16200	2900	588	6900	2690	6820	2800	6490	1750
Mercury	0.17	0.49	0.17	0.123	0.062	0.075	0.046	0.030	0.075	0.068	0.076	0.072	0.071	0.050
Molybdenum					4.2	6.4	5.2	2.0	10.0	7.3	9.3	7.1	5.3	4.2
Nickel					80	112	98	48	100	69	130	69	86	54
Phosphorus					774	939	780	620	1530	1540	1960	2140	914	960
Potassium					2220	1970	2090	1910	1750	1880	2240	1680	2350	1890
Selenium					0.76	0.84	0.47	0.33	0.91	0.82	0.89	1.0	0.66	0.96
Silver					0.22	0.19	0.16	0.13	0.20	0.22	0.22	0.22	0.20	0.18
Sodium					159	124	120	123	122	141	141	125	150	118
Strontium					36	46	35	29	41	33	46	37	38	29
Sulfur					1500	1600	*<1000*	1000	1600	1400	1600	1800	1700	1500
Thallium					0.22	0.25	0.19	0.13	0.20	0.17	0.24	0.15	0.22	0.17
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					424	345	580	478	337	350	498	317	413	323
Tungsten					*<0.50*	*<0.50*	0.61	*<0.50*	*<0.50*	*<0.50*	0.69	*<0.50*	*<0.50*	*<0.50*
Uranium					9.7	8.3	7.6	8.0	7.8	8.7	8.9	8.4	11	10.0
Vanadium					27	26	34	25	23	22	33	21	30	24
Zinc*	123	315	123	196	84	89	78	69	81	77	98	80	87	84
Zirconium					1	1.1	1.6	1.6	1.1	1.2	1.8	1.6	1.6	1.5
Speciated Metals (µg/kg dw)														
Methylmercury (as MeHg)				-	-	*<0.066*	0.86	-	0.30	0.36	-	2.5	-	-

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
2. Trigger and threshold values for Whale Tail lakes were developed for the 2019 CREMP, using baseline data collected in 2017 (Azimuth, 2020).
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 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 core chemistry results, Whale Tail study lakes, 2023.

Lake & Basin	Screening Criteria				Kangislulik Lake (MAM/KAN) *									
Area-Replicate ID	CCME[1]		Thresholds[3] (All Lakes)	MAM Triggers	MAM-SC-1	MAM-SC-2	MAM-SC-3	MAM-SC-4	MAM-SC-5	MAM-SC-6	MAM-SC-7	MAM-SC-8	MAM-SC-9	MAM-SC-10
Date					15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023
ALS Sample ID	ISQG	PEL			VA23C0344-001	VA23C0344-002	VA23C0344-003	VA23C0344-004	VA23C0344-005	VA23C0344-006	VA23C0344-007	VA23C0344-008	VA23C0344-009	VA23C0344-010
Physical Tests														
Moisture (%)					90	90	91	91	91	90	89	88	89	88
pH					6.3	6.2	6.1	6.0	6.2	6.2	6.1	6.4	5.8	5.4
Total Metals (mg/kg dw)														
Aluminum					20000	19500	22000	19300	20700	18500	20200	19500	29400	29500
Antimony					1.9	3.1	1.5	2.7	2.8	2.2	1.9	1.6	0.60	0.61
Arsenic*	5.9	17	5.9	140	114	**151**	**163**	**252**	**143**	118	131	97	128	129
Barium					134	134	157	145	136	136	144	117	198	206
Beryllium					1.3	1.3	1.5	1.3	1.2	1.2	1.3	1.2	2.1	2.0
Bismuth					0.42	0.42	0.52	0.47	*<1.21*	0.40	0.44	0.40	0.74	0.73
Boron					22	25	21	21	*<30.2*	22	21	19	16	17
Cadmium*	0.60	3.5	0.60	0.43	0.26	0.25	0.33	0.24	0.32	0.23	0.41	0.21	**0.63**	**0.55**
Calcium					4420	6060	4220	4350	4330	4360	4660	6140	4370	3720
Chromium*	37	90	37	194	**196**	**203**	**196**	**195**	**202**	178	**205**	178	**228**	**229**
Cobalt					14	14	14	16	15	13	16	14	38	47
Copper*	36	197	36	77	60	59	73	64	69	60	**80**	60	**101**	**109**
Iron					40700	45800	50800	59000	46100	39600	43600	35400	58100	58800
Lead	35	91	35	26	17	16	19	17	18	15	**58**	16	24	23
Lithium					19	19	20	18	20	18	19	20	27	25
Magnesium					10800	10800	10800	10400	11200	10100	10900	10000	13600	13700
Manganese					612	658	519	918	607	570	703	606	466	500
Mercury	0.17	0.49	0.17	0.13	0.086	0.082	0.082	0.076	0.094	0.080	0.083	0.083	0.071	0.067
Molybdenum					5.1	6.5	6.1	7.7	5.9	5.1	8.0	4.2	8.3	8.3
Nickel					117	117	124	123	128	112	127	114	186	202
Phosphorus					781	851	822	861	1000	907	742	702	784	891
Potassium					2970	2960	3090	2750	3440	2900	2880	2900	4070	4560
Selenium					0.89	0.90	0.82	0.89	*<1.21*	0.78	0.78	0.75	1.4	1.5
Silver					0.41	0.41	0.46	0.41	*<0.60*	0.40	1.2	0.42	0.88	0.85
Sodium					194	198	192	178	*<302*	186	188	195	224	249
Strontium					40	44	37	38	40	38	38	40	38	34
Sulfur					2800	2800	2700	2600	*<6000*	2800	2500	2300	2300	2500
Thallium					0.22	0.21	0.25	0.21	*<0.302*	0.20	0.26	0.21	0.60	0.54
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<12.1*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					486	538	507	438	856	511	475	508	800	1170
Tungsten					0.83	1.1	1.2	1.1	*<3.02*	1.1	40	0.80	0.55	1.1
Uranium					12	12	14	13	12	11	12	11	20	21
Vanadium					40	41	43	40	44	39	41	37	55	58
Zinc*	123	315	123	139	106	106	126	114	124	107	137	101	**212**	**201**
Zirconium					3.3	2.3	3.9	3.4	*<6.0*	2.6	3.2	2.7	6.5	3
Speciated Metals (µg/kg dw)														
Methylmercury (as MeHg)				-	-	-	1.8	-	2.2	1.2	-	-	0.37	0.32

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
2. Trigger and threshold values for Whale Tail lakes were developed for the 2019 CREMP, using baseline data collected in 2017 (Azimuth, 2020).
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 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.

* Previously referred to as Mammoth Lake (MAM). Acronyms MAM or KAN used interchangeably.

Table C2-1. Sediment core chemistry results, Whale Tail study lakes, 2023.

Lake & Basin	Screening Criteria				Lake A76									
Area-Replicate ID	CCME[1]		Thresholds[3] (All Lakes)	A76 Triggers	A76-SC-1	A76-SC-2	A76-SC-3	A76-SC-4	A76-SC-5	A76-SC-6	A76-SC-7	A76-SC-8	A76-SC-9	A76-SC-10
Date					13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023
ALS Sample ID	ISQG	PEL			VA23C0344-041	VA23C0344-042	VA23C0344-043	VA23C0344-044	VA23C0344-045	VA23C0344-046	VA23C0344-047	VA23C0344-048	VA23C0344-049	VA23C0344-050
Physical Tests														
Moisture (%)					92	92	88	89	87	88	88	89	90	90
pH					6.2	6.5	5.8	5.9	5.6	5.5	5.5	5.5	5.5	5.9
Total Metals (mg/kg dw)														
Aluminum					17400	16100	14600	18100	18100	16300	18900	16600	18400	20700
Antimony					0.41	0.18	0.28	0.39	0.37	0.29	0.29	0.20	0.37	0.34
Arsenic*	5.9	17	5.9	461	53	40	**637**	356	448	**659**	381	452	358	146
Barium					155	147	137	164	153	170	199	156	195	181
Beryllium					1.1	0.97	0.87	1.1	1.1	1.0	1.3	1.0	1.1	1.4
Bismuth					0.44	0.37	0.46	0.59	0.59	0.54	0.60	0.52	0.60	0.63
Boron					14	11	*<5.0*	5.8	6.8	5.7	7.0	6.4	8.3	9.3
Cadmium*	0.60	3.5	0.60	0.44	0.27	0.23	0.23	0.32	0.27	0.29	0.27	0.30	0.34	0.24
Calcium					4530	4270	2450	3060	2700	2860	2660	3400	3280	3800
Chromium*	37	90	37	103	92	77	76	98	99	89	103	86	97	**113**
Cobalt					8.0	7.9	29	22	20	25	23	26	21	10
Copper*	36	197	36	76	57	50	50	62	60	58	74	65	69	76
Iron					36800	30800	156000	100000	119000	139000	126000	150000	126000	68600
Lead	35	91	35	26	16	14	15	19	18	17	18	18	19	20
Lithium					14	13	11	14	14	12	13	11	13	14
Magnesium					7180	6950	6030	7660	7420	6600	7040	6270	7010	7400
Manganese					325	369	3600	2850	2400	3300	2640	1810	2030	465
Mercury	0.17	0.49	0.17	0.11	0.059	0.047	0.044	0.045	0.043	0.044	0.042	0.050	0.054	0.055
Molybdenum					3.4	2.6	4.9	5.4	5.3	5.3	7.4	5.5	5.8	5.3
Nickel					70	66	84	109	100	120	116	106	111	84
Phosphorus					752	661	784	977	870	1240	1250	1150	1120	834
Potassium					2640	2380	2180	2670	2760	2480	2760	2430	2820	3040
Selenium					0.70	0.53	0.94	0.89	0.90	0.84	0.94	0.98	0.96	0.84
Silver					0.48	0.43	0.25	0.28	0.25	0.27	0.36	0.34	0.40	0.49
Sodium					198	174	126	154	149	145	146	146	170	187
Strontium					29	28	20	24	22	20	22	24	25	27
Sulfur					2600	2500	1400	1900	1900	1700	1900	2300	2200	2200
Thallium					0.21	0.19	0.23	0.31	0.29	0.31	0.30	0.27	0.31	0.27
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					335	315	318	338	390	333	393	348	398	411
Tungsten					*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Uranium					9.8	9.1	8.0	10	10	9.8	11	10	11	12
Vanadium					30	26	26	32	33	29	34	29	32	36
Zinc*	123	315	123	112	83	73	79	97	94	95	**116**	112	109	**116**
Zirconium					3.1	3.1	2.6	2.1	1.5	2.5	3.7	4.1	2	2.8
Speciated Metals (µg/kg dw)														
Methylmercury (as MeHg)					-	-	-	-	-	-	-	-	-	-

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
2. Trigger and threshold values for Whale Tail lakes were developed for the 2019 CREMP, using baseline data collected in 2017 (Azimuth, 2020).
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 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 core chemistry results, Whale Tail study lakes, 2023.

Lake & Basin	Screening Criteria				Lake DS1									
Area-Replicate ID	CCME[1]		Thresholds[3] (All Lakes)	DS1 Triggers	DS1-SC-1	DS1-SC-2	DS1-SC-3	DS1-SC-4	DS1-SC-5	DS1-SC-6	DS1-SC-7	DS1-SC-8	DS1-SC-9	DS1-SC-10
Date					17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023
ALS Sample ID	ISQG	PEL			VA23C0344-021	VA23C0344-022	VA23C0344-023	VA23C0344-024	VA23C0344-025	VA23C0344-026	VA23C0344-027	VA23C0344-028	VA23C0344-029	VA23C0344-030
Physical Tests														
Moisture (%)					78	80	78	69	78	81	74	73	70	70
pH					6.0	5.8	6.2	5.3	5.8	4.9	5.0	5.3	5.5	5.2
Total Metals (mg/kg dw)														
Aluminum					17100	17300	16800	19100	15700	17400	19900	19700	21000	20900
Antimony					0.30	0.33	0.29	0.29	0.30	0.30	0.33	0.33	0.33	0.33
Arsenic*	5.9	17	5.9	198	**243**	**200**	123	27	59	53	19	19	17	18
Barium					265	330	230	163	204	190	98	108	99	91
Beryllium					1.0	1.1	1.1	1.1	0.94	0.94	1.1	1.1	1.1	1.1
Bismuth					0.67	0.71	0.70	0.76	0.66	0.67	0.72	0.74	0.71	0.74
Boron					21	23	16	16	15	18	21	22	23	23
Cadmium*	0.60	3.5	0.60	0.45	0.40	0.40	0.34	0.35	0.27	0.30	0.22	0.23	0.18	0.15
Calcium					2430	2550	2410	2380	3220	2540	3100	3380	3610	3630
Chromium*	37	90	37	80	67	65	69	**84**	66	70	**82**	**83**	**89**	**90**
Cobalt					17	20	16	18	20	20	18	19	18	18
Copper*	36	197	36	26	17	18	19	18	15	15	17	17	17	17
Iron					74600	84500	67700	40400	62400	55600	45700	46200	43800	44600
Lead	35	91	35	26	16	17	17	19	16	16	18	18	17	18
Lithium					20	20	19	22	19	19	22	22	24	24
Magnesium					10500	10400	10600	12100	10100	10700	12000	11800	12600	12600
Manganese					14900	20800	7430	1580	34200	34000	7720	16500	19500	1970
Mercury	0.17	0.49	0.17	0.12	0.075	0.081	0.076	0.065	0.065	0.075	0.067	0.068	0.050	0.060
Molybdenum					13	15	11	2.3	11	8.7	1.8	2.0	2.0	1.6
Nickel					50	53	52	60	47	51	53	53	55	52
Phosphorus					1950	1940	1660	703	1050	946	974	897	843	914
Potassium					2650	2770	2420	2580	2340	2570	2980	2970	3100	3050
Selenium					0.44	0.54	0.41	0.34	0.49	0.40	0.37	0.38	0.36	0.33
Silver					0.13	0.14	0.14	0.15	0.13	0.14	0.14	0.14	0.14	0.15
Sodium					133	130	122	125	113	119	126	128	129	128
Strontium					33	34	29	30	39	34	37	40	41	39
Sulfur					*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*
Thallium					0.18	0.21	0.19	0.23	0.19	0.20	0.20	0.20	0.19	0.20
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					462	458	406	606	445	477	604	622	710	687
Tungsten					0.82	0.76	0.61	*<0.50*	0.56	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Uranium					4.4	4.7	4.6	4.7	4.2	3.9	4.4	4.4	4.2	4.3
Vanadium					36	37	37	42	35	37	41	41	42	42
Zinc*	123	315	123	101	85	89	89	97	75	80	83	80	77	80
Zirconium					3.7	3.3	5.1	11	6.2	3.9	3.9	4.2	4.5	4.9
Speciated Metals (µg/kg dw)														
Methylmercury (as MeHg)					-	-	-	-	-	-	-	-	-	-

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
2. Trigger and threshold values for Whale Tail lakes were developed for the 2019 CREMP, using baseline data collected in 2017 (Azimuth, 2020).
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 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 core chemistry results, Whale Tail study lakes, 2023.

Lake & Basin	Screening Criteria				Nemo Lake (NEM)									
Area-Replicate ID	CCME[1]		Thresholds[3] (All Lakes)	NEM Triggers	NEM-SC-1	NEM-SC-2	NEM-SC-3	NEM-SC-4	NEM-SC-5	NEM-SC-6	NEM-SC-7	NEM-SC-8	NEM-SC-9	NEM-SC-10
Date					16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023
ALS Sample ID	ISQG	PEL			VA23C0344-051	VA23C0344-052	VA23C0344-053	VA23C0344-054	VA23C0344-055	VA23C0344-056	VA23C0344-057	VA23C0344-058	VA23C0344-059	VA23C0344-060
Physical Tests														
Moisture (%)					91	90	90	91	91	90	89	87	89	88
pH					6.1	6.1	6.2	6.4	5.9	6.4	6.4	6.3	6.2	6.1
Total Metals (mg/kg dw)														
Aluminum					11600	10100	11800	10900	11500	11100	10600	11400	11600	8640
Antimony					0.38	0.39	0.41	0.35	0.41	0.32	0.16	0.28	0.32	*<0.10*
Arsenic*	5.9	17	5.9	61	**70**	**107**	54	29	**110**	53	41	33	26	18
Barium					91	83	93	86	80	84	89	81	85	65
Beryllium					0.65	0.55	0.61	0.60	0.55	0.60	0.56	0.63	0.66	0.47
Bismuth					0.25	0.22	0.24	0.23	*<0.20*	0.22	0.20	0.21	0.28	*<0.20*
Boron					12	10	12	11	13	11	8.4	11	8.5	*<5.0*
Cadmium*	0.60	3.5	0.60	0.41	0.28	0.22	0.26	0.23	0.20	0.24	0.22	0.17	0.27	0.16
Calcium					4600	3940	4740	3940	4000	4140	3710	3560	3240	2880
Chromium*	37	90	37	130	126	128	**150**	114	**174**	**132**	115	130	114	88
Cobalt					9.3	11	10	7.5	11	9.6	8.3	7.9	7.2	8.8
Copper*	36	197	36	43	37	32	38	37	32	34	32	32	41	24
Iron					29900	37900	25400	19400	40700	25500	22700	21300	19300	14000
Lead	35	91	35	22	10.0	8.9	10	9.3	8.3	9.1	8.6	7.8	8.2	4.6
Lithium					11	9.5	12	11	11	11	11	12	12	8.1
Magnesium					7620	7240	8760	7160	9180	8010	7260	7780	7080	7140
Manganese					419	601	525	240	497	401	469	358	256	578
Mercury	0.17	0.49	0.17	0.10	0.034	0.031	0.035	0.028	0.032	0.029	0.021	0.022	0.020	0.0078
Molybdenum					3.5	3.6	3.4	2.7	3.6	2.9	2.5	2.3	2.3	1.2
Nickel					87	91	92	76	93	88	80	79	79	73
Phosphorus					690	746	735	587	779	694	610	486	421	225
Potassium					1370	1180	1380	1230	1370	1270	1140	1280	1250	610
Selenium					0.63	0.51	0.54	0.52	0.55	0.56	0.42	0.42	0.49	*<0.20*
Silver					0.17	0.14	0.16	0.17	0.15	0.15	0.14	0.14	0.16	*<0.10*
Sodium					102	89	91	81	88	83	83	85	84	53
Strontium					33	28	31	28	30	31	28	29	26	22
Sulfur					2300	2300	2500	2200	2700	2400	2100	1600	1700	1800
Thallium					0.096	0.087	0.10	0.082	0.088	0.088	0.074	0.078	0.075	*<0.050*
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					233	191	255	216	292	226	177	259	194	56
Tungsten					*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Uranium					4.2	3.7	4.0	3.9	3.5	3.7	3.5	3.7	4.3	2.1
Vanadium					24	22	26	23	26	23	21	24	23	6.8
Zinc*	123	315	123	89	60	57	63	57	55	57	52	51	52	43
Zirconium					*<1.0*	1.1	*<1.0*	1.2	*<1.0*	1.2	1.6	*<1.0*	*<1.0*	*<1.0*
Speciated Metals (µg/kg dw)														
Methylmercury (as MeHg)					-	-	-	-	-	-	-	-	-	-

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
2. Trigger and threshold values for Whale Tail lakes were developed for the 2019 CREMP, using baseline data collected in 2017 (Azimuth, 2020).
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 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 C2-2. Sediment grab results, Whale Tail study lakes, 2023.

Lake & Basin	Lake A20 (Impoundment)					Whale Tail Lake - South Basin (WTS)				
Area-Replicate ID	**A20-1**	**A20-2**	**A20-3**	**A20-4**	**A20-5**	**WTS-1**	**WTS-2**	**WTS-3**	**WTS-4**	**WTS-5**
Date	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023
ALS Sample ID	VA23C0329-055	VA23C0329-056	VA23C0329-057	VA23C0329-058	VA23C0329-059	VA23C0329-043	VA23C0329-044	VA23C0329-045	VA23C0329-046	VA23C0329-047
Physical Tests										
Moisture (%)	86	86	87	87	85	81	79	81	82	79
Particle Size (%)										
clay (<0.004mm)	20	27	25	24	27	16	13	16	18	13
silt (0.063mm - 0.004mm)	78	72	74	74	72	80	72	82	77	85
sand (2.0mm - 0.063mm)	1.3	1.4	1.1	1.6	1.3	4.6	16	1.5	4.6	2.7
gravel (>2mm)	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Organic Carbon										
TOC (% dw)	5.3	5.0	5.2	5.3	4.8	4.3	3.6	4.6	4.3	5.3

Notes:

Italicized numbers are below detection limits.

Table C2-2. Sediment grab results, Whale Tail study lakes, 2023.

Lake & Basin	Kangislulik Lake (MAM/KAN)*					Lake A76				
Area-Replicate ID	MAM-1	MAM-2	MAM-3	MAM-4	MAM-5	A76-1	A76-2	A76-3	A76-4	A76-5
Date	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023
ALS Sample ID	VA23C0329-049	VA23C0329-050	VA23C0329-051	VA23C0329-052	VA23C0329-053	VA23C0329-061	VA23C0329-062	VA23C0329-063	VA23C0329-064	VA23C0329-065
Physical Tests										
Moisture (%)	88	90	88	88	89	89	86	86	87	89
Particle Size (%)										
clay (<0.004mm)	13	14	14	14	15	20	21	22	19	21
silt (0.063mm - 0.004mm)	86	85	84	77	83	79	78	77	80	78
sand (2.0mm - 0.063mm)	1.5	1.3	1.8	8.9	2.2	1.0	1.3	1.0	1.3	1.0
gravel (>2mm)	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Organic Carbon										
TOC (% dw)	11	9.7	10	8.7	9.5	8.5	5.6	5.6	6.7	7.3

Notes:

Italicized numbers are below detection limits.

* Previously referred to as Mammoth Lake (MAM). Acronyms MAM or KAN used interchangeably.

Table C2-2. Sediment grab results, Whale Tail study lakes, 2023.

Lake & Basin	Lake DS1					Nemo Lake (NEM)				
Area-Replicate ID	**DS1-1**	**DS1-2**	**DS1-3**	**DS1-4**	**DS1-5**	**NEM-1**	**NEM-2**	**NEM-3**	**NEM-4**	**NEM-5**
Date	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023
ALS Sample ID	VA23C0329-067	VA23C0329-068	VA23C0329-069	VA23C0329-070	VA23C0329-071	VA23C0329-037	VA23C0329-038	VA23C0329-039	VA23C0329-040	VA23C0329-041
Physical Tests										
Moisture (%)	69	60	63	64	59	85	89	85	86	84
Particle Size (%)										
clay (<0.004mm)	17	17	17	17	18	8.8	8.8	6.3	9.1	7.6
silt (0.063mm - 0.004mm)	82	82	81	81	81	74	68	59	66	59
sand (2.0mm - 0.063mm)	1.0	1.0	2.4	2.2	1.2	17	23	35	25	33
gravel (>2mm)	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Organic Carbon										
TOC (% dw)	1.9	1.9	1.6	1.9	1.2	9.9	9.3	6.8	7.6	6.5

Notes:

Italicized numbers are below detection limits.

Table C2-3. Hydrocarbon and PAH results for composite sediment grabs at Whale Tail study area lakes, 2023.

Area-Replicate ID	CCME Sediment Quality Guidelines[1]		Lowest Detection Limit	A20-COMP	WTS-COMP	MAM-COMP	A76-COMP	DS1-COMP	NEM-COMP
Date				16-Aug-2023	12-Aug-2023	15-Aug-2023	13-Aug-2023	17-Aug-2023	16-Aug-2023
ALS Sample ID	ISQG	PEL		VA23C0329-060	VA23C0329-048	VA23C0329-054	VA23C0329-066	VA23C0329-072	VA23C0329-042
Physical Parameters									
Moisture (%)	-	-	0.25	87	85	90	89	68	89
Aggregate Organics (mg/kg)									
Mineral Oil and Grease	-	-	500	750	*<500*	*<500*	740	*<500*	*<500*
Hydrocarbons (mg/kg)									
EPH10-19	-	-	200	*<440*	*<370*	*<520*	*<480*	*<200*	*<500*
EPH19-32	-	-	200	*<440*	*<370*	*<520*	*<480*	*<200*	*<500*
LEPH	-	-	200	*<440*	*<370*	*<520*	*<480*	*<200*	*<500*
HEPH	-	-	200	*<440*	*<370*	*<520*	*<480*	*<200*	*<500*
Polycyclic Aromatic Hydrocarbons (mg/kg)									
Acenaphthene	0.0067	0.089	0.005	*<0.0221*	*<0.0213*	*<0.0262*	*<0.0242*	*<0.0085*	*<0.0253*
Acenaphthylene	0.0059	0.13	0.005	*<0.0221*	*<0.0213*	*<0.0262*	*<0.0242*	*<0.0085*	*<0.0253*
Acridine	-	-	0.010	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Anthracene	0.047	0.25	0.004	*<0.0221*	*<0.0213*	*<0.0262*	*<0.0242*	*<0.0085*	*<0.0253*
Benz(a)anthracene	0.032	0.39	0.01	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Benzo(a)pyrene	0.032	0.78	0.01	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Benzo(b+j)fluoranthene	-	-	0.010	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Benzo(b+j+k)fluoranthene	-	-	0.015	*<0.031*	*<0.030*	*<0.037*	*<0.034*	*<0.015*	*<0.035*
Benzo(g,h,i)perylene	-	-	0.010	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Benzo(k)fluoranthene	-	-	0.010	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Chrysene	0.057	0.86	0.01	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Dibenz(a,h)anthracene	0.0062	0.14	0.005	*<0.0221*	*<0.0213*	*<0.0262*	*<0.0242*	*<0.0085*	*<0.0253*
Fluoranthene	0.11	2.36	0.01	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Fluorene	0.021	0.144	0.01	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Indeno(1,2,3-c,d)pyrene	-	-	0.010	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Methylnaphthalene, 1-	-	-	0.010	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Methylnaphthalene, 2-	0.020	0.20	0.01	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Naphthalene	0.035	0.39	0.01	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Phenanthrene	0.042	0.52	0.01	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Pyrene	0.053	0.88	0.01	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
Quinoline	-	-	0.010	*<0.022*	*<0.021*	*<0.026*	*<0.024*	*<0.010*	*<0.025*
B(a)P total potency equivalents [B(a)P TPE]	-	-	0.020	0.027	0.026	0.032	0.029	*<0.020*	0.030
IACR (CCME)	-	-	0.15	0.26	0.25	0.31	0.28	*<0.150*	0.30
PAH Surrogates (%)									
Acridine-d9	-	-	0.010	122	107	117	119	111	116
Chrysene-d12	-	-	0.010	126	109	116	123	112	122
Naphthalene-d8	-	-	0.010	123	118	117	123	112	122
Phenanthrene-d10	-	-	0.010	129	112	123	129	118	127

Notes:

1. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
   ISQG = Interim freshwater Sediment Quality Guideline; PEL = probably effect level concentration

Bolded concentrations exceed the ISQG guideline.

Italicized numbers are below detection limits.

Appendix C3
Sediment Chemistry – Baker Lake

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TABLES

Table C3-1. Sediment core chemistry results, Baker Lake, 2023.

Lake & Basin	Screening Criteria				Bake Lake - Akilahaarjuk Point (BAP)									
Area-Replicate ID	CCME[1]		BL Triggers and Thresholds		BAP-SC-1	BAP-SC-2	BAP-SC-3	BAP-SC-4	BAP-SC-5	BAP-SC-6	BAP-SC-7	BAP-SC-8	BAP-SC-9	BAP-SC-10
Date					17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023
ALS Sample ID	ISQG	PEL	Triggers[2]	Thresholds[3]	WP2320790-001	WP2320790-002	WP2320790-003	WP2320790-004	WP2320790-005	WP2320790-006	WP2320790-007	WP2320790-008	WP2320790-009	WP2320790-010
Physical Tests														
Moisture (%)					30	36	27	28	28	28	33	41	32	26
pH					6.2	5.7	6.4	6.6	6.5	6.0	5.6	5.4	6.5	6.7
Total Metals (mg/kg dw)														
Aluminum					4,480	5,300	4,140	5,010	3,770	4,370	5,260	6,220	4,250	4,180
Antimony					0.14	0.14	0.14	0.15	0.13	0.14	0.15	0.16	0.13	0.15
Arsenic*	5.9	17	7.6		2.9	4.4	5.0	6.1	3.9	4.5	3.5	3.9	4.7	3.0
Barium					325	335	343	386	314	330	368	356	284	322
Beryllium					0.29	0.34	0.28	0.32	0.25	0.29	0.37	0.40	0.29	0.27
Bismuth					*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Boron					6.4	7.4	6.2	6.7	5.6	6.6	8.4	9.2	6.1	5.9
Cadmium	0.6	3.5	0.32	0.6	0.027	0.036	*<0.020*	0.029	*<0.020*	*<0.020*	0.030	0.042	0.027	0.026
Calcium					1,950	2,010	1,920	2,290	1,980	1,830	2,040	2,230	1,810	1,950
Chromium	37.3	90	26.8	37.3	14	15	13	15	12	13	15	17	13	14
Cobalt					3.6	4.2	3.5	4.0	3.3	3.4	4.0	4.5	3.9	3.6
Copper	35.7	197	20.3	35.7	5.7	5.3	4.4	4.6	4.2	4.2	6.4	6.7	3.7	3.5
Iron					12,100	13,800	12,700	15,500	12,800	12,700	13,500	14,200	12,400	12,800
Lead	35	91.3	19.5	35.0	3.6	4.3	3.6	4.4	3.6	3.7	4.4	5.3	3.8	3.9
Lithium					6.9	7.7	6.0	7.2	5.9	6.4	7.9	9.1	6.4	6.3
Magnesium					2,800	3,070	2,460	2,890	2,330	2,590	3,000	3,360	2,540	2,490
Manganese					124	173	210	260	154	158	123	128	717	434
Mercury	0.17	0.486	0.088	0.17	*<0.0050*	0.0052	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	0.0061	*<0.0050*	*<0.0050*
Molybdenum					0.33	0.39	0.42	0.44	0.32	0.40	0.40	0.48	0.83	0.50
Nickel					8.6	9.3	7.6	8.6	7.2	7.8	9.4	11	8.1	7.6
Phosphorus					679	726	714	811	748	666	720	745	614	634
Potassium					1,020	1,260	950	1,100	850	1,030	1,290	1,550	960	910
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					71	89	63	78	61	76	78	98	66	60
Strontium					40	42	40	44	37	42	46	48	40	39
Thallium					*<0.050*	0.057	*<0.050*	*<0.050*	*<0.050*	*<0.050*	0.057	0.067	*<0.050*	*<0.050*
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					277	313	278	327	239	271	291	348	236	278
Uranium					1.0	1.3	0.98	1.2	1.1	1.0	1.3	1.6	0.94	1.00
Vanadium					17	18	16	20	16	17	18	21	16	18
Zinc	123	315	73.1	123	20	23	17	21	16	18	22	27	18	17
Zirconium					3.7	4.1	3.7	3.4	3.4	4.0	4.6	4.7	2.6	3.0

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
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 core chemistry results, Baker Lake, 2023.

Lake & Basin	Screening Criteria				Baker Lake - East Shore									
Area-Replicate ID	CCME[1]		BL Triggers and Thresholds		BES-SC-1	BES-SC-2	BES-SC-3	BES-SC-4	BES-SC-5	BES-SC-6	BES-SC-7	BES-SC-8	BES-SC-9	BES-SC-10
Date					18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023
ALS Sample ID	ISQG	PEL	Triggers[2]	Thresholds[3]	WP2320790-011	WP2320790-012	WP2320790-013	WP2320790-014	WP2320790-015	WP2320790-016	WP2320790-017	WP2320790-018	WP2320790-019	WP2320790-020
Physical Tests														
Moisture (%)					40	28	48	51	42	35	34	40	37	35
pH					6.6	6.9	6.4	6.5	6.6	6.6	6.7	6.7	6.8	6.8
Total Metals (mg/kg dw)														
Aluminum					6,850	4,880	8,100	8,330	6,910	5,690	6,600	7,240	6,530	5,940
Antimony					0.14	0.12	0.16	0.16	0.14	0.14	0.13	0.15	0.13	0.12
Arsenic*	5.9	17	7.6		4.2	2.9	5.0	5.2	4.1	3.5	3.8	4.2	3.8	3.4
Barium					172	167	127	152	174	147	155	173	149	170
Beryllium					0.41	0.27	0.43	0.44	0.40	0.30	0.38	0.40	0.35	0.32
Bismuth					*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Boron					8.1	5.5	8.8	8.6	8.0	7.3	7.6	7.8	7.6	6.8
Cadmium	0.6	3.5	0.32	0.6	0.041	0.029	0.055	0.054	0.039	0.035	0.043	0.048	0.045	0.038
Calcium					2,400	2,070	2,580	2,490	2,340	2,250	2,220	2,350	2,320	2,120
Chromium	37.3	90	26.8	37.3	19	16	22	22	20	17	19	21	18	18
Cobalt					5.3	4.0	6.3	6.5	5.4	4.7	5.1	5.8	5.1	4.8
Copper	35.7	197	20.3	35.7	5.9	3.8	7.4	7.4	5.8	4.9	6.0	6.2	5.5	5.3
Iron					14,600	12,100	16,600	17,300	14,600	13,000	13,700	15,300	14,000	12,900
Lead	35	91.3	19.5	35.0	5.5	3.8	6.6	6.9	5.6	4.8	5.0	5.7	4.9	5.0
Lithium					11	7.5	12	12	11	8.6	9.7	11	9.6	8.7
Magnesium					4,130	3,200	4,590	4,710	4,000	3,540	3,870	4,480	3,820	3,590
Manganese					430	594	642	562	409	351	404	446	383	375
Mercury	0.17	0.486	0.088	0.17	0.0077	*<0.0050*	0.0093	0.0097	0.0078	0.0056	0.0073	0.0078	0.0070	0.0056
Molybdenum					0.54	0.44	0.73	0.75	0.55	0.53	0.58	1.2	0.46	0.48
Nickel					12	9.6	13	14	12	10	12	13	11	11
Phosphorus					708	702	789	800	718	693	673	720	722	718
Potassium					1,430	990	1,630	1,670	1,400	1,170	1,370	1,450	1,360	1,200
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					100	90	126	134	98	80	91	106	95	80
Strontium					42	31	44	47	40	36	40	42	38	37
Thallium					0.062	*<0.050*	0.076	0.079	0.062	0.056	0.062	0.065	0.058	0.054
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					344	281	400	374	356	324	359	333	341	310
Uranium					1.3	0.93	1.6	1.7	1.3	1.2	1.2	1.4	1.2	1.1
Vanadium					21	17	24	24	21	19	20	22	20	18
Zinc	123	315	73.1	123	29	21	33	35	29	25	27	32	27	26
Zirconium					2.5	2.2	2.2	2.3	2.1	2.4	2.3	2.5	2.3	2.4

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
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 core chemistry results, Baker Lake, 2023.

Lake & Basin	Screening Criteria				Baker Lake - Proposed Jetty									
Area-Replicate ID	CCME[1]		BL Triggers and Thresholds		BPJ-SC-1	BPJ-SC-2	BPJ-SC-3	BPJ-SC-4	BPJ-SC-5	BPJ-SC-6	BPJ-SC-7	BPJ-SC-8	BPJ-SC-9	BPJ-SC-10
Date					19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023
ALS Sample ID	ISQG	PEL	Triggers[2]	Thresholds[3]	WP2320790-021	WP2320790-022	WP2320790-023	WP2320790-024	WP2320790-025	WP2320790-026	WP2320790-027	WP2320790-028	WP2320790-029	WP2320790-030
Physical Tests														
Moisture (%)					47	47	51	55	39	38	39	25	60	53
pH					6.4	6.6	6.6	6.5	6.5	6.5	6.4	6.7	6.5	6.2
Total Metals (mg/kg dw)														
Aluminum					9,100	9,280	10,100	10,200	9,140	9,010	5,690	4,640	10,500	9,620
Antimony					0.15	0.15	0.15	0.14	0.14	0.12	*<0.10*	*<0.10*	0.14	0.14
Arsenic*	5.9	17	7.6		**15**	**7.8**	**9.6**	7.1	**84**	6.5	**17**	3.3	**10**	**11**
Barium					144	120	164	119	172	81	108	55	157	165
Beryllium					0.46	0.42	0.45	0.46	0.43	0.38	0.26	0.20	0.46	0.45
Bismuth					*<0.20*	0.20	0.22	0.22	0.20	*<0.20*	*<0.20*	*<0.20*	0.23	0.20
Boron					8.4	8.5	9.1	9.0	7.6	7.2	5.0	*<5.0*	9.3	8.8
Cadmium	0.6	3.5	0.32	0.6	0.11	0.088	0.089	0.11	0.063	0.054	0.046	0.030	0.092	0.087
Calcium					2,500	2,610	2,760	2,840	2,720	2,550	1,830	1,400	2,830	2,720
Chromium	37.3	90	26.8	37.3	22	24	24	24	21	20	14	12	26	23
Cobalt					8.3	7.9	8.9	8.1	8.3	6.4	5.2	3.7	8.6	8.3
Copper	35.7	197	20.3	35.7	12	12	11	12	9.4	8.8	5.2	4.3	11	11
Iron					21,600	19,000	21,900	19,300	37,600	16,600	17,100	10,900	20,800	20,900
Lead	35	91.3	19.5	35.0	8.6	9.2	9.9	9.6	8.6	8.0	5.4	3.8	9.7	8.7
Lithium					12	13	13	13	11	11	7.7	6.3	14	13
Magnesium					5,220	5,160	5,540	5,640	4,890	4,720	3,330	2,800	5,560	5,150
Manganese					1,390	1,070	4,730	1,520	2,260	1,900	3,210	516	3,080	3,880
Mercury	0.17	0.486	0.088	0.17	0.0086	0.0090	0.012	0.013	0.0067	0.0067	0.0060	*<0.0050*	0.013	0.012
Molybdenum					1.6	1.3	2.2	0.96	5.3	1.0	2.2	0.52	1.6	2.1
Nickel					15	15	16	16	13	13	8.6	7.2	16	15
Phosphorus					1,180	892	1000	944	2,260	947	767	454	939	985
Potassium					1,640	1,630	1,760	1,780	1,530	1,510	970	780	1,840	1,660
Selenium					*<0.20*	*<0.20*	*<0.20*	*<0.20*	0.21	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Silver					*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	0.13	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Sodium					133	134	140	159	149	123	78	55	151	128
Strontium					45	44	47	48	47	43	38	30	48	45
Thallium					0.078	0.076	0.085	0.084	0.063	0.057	*<0.050*	*<0.050*	0.083	0.075
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					391	425	443	426	350	413	290	272	461	418
Uranium					1.9	1.8	2.0	1.9	1.7	1.6	1.0	0.82	2.0	1.8
Vanadium					26	25	26	26	25	23	18	15	26	25
Zinc	123	315	73.1	123	64	50	49	49	39	37	26	21	50	47
Zirconium					3.5	3.4	3.0	3.0	3.2	4.6	2.6	2.2	3.0	2.7

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
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 core chemistry results, Baker Lake, 2023.

Lake & Basin	Screening Criteria				Baker Lake - Barge Dock									
Area-Replicate ID	CCME[1]		BL Triggers and Thresholds		BBD-SC-1	BBD-SC-2	BBD-SC-3	BBD-SC-4	BBD-SC-5	BBD-SC-6	BBD-SC-7	BBD-SC-8	BBD-SC-9	BBD-SC-10
Date					16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023
ALS Sample ID	ISQG	PEL	Triggers[2]	Thresholds[3]	WP2320790-031	WP2320790-032	WP2320790-033	WP2320790-034	WP2320790-035	WP2320790-036	WP2320790-037	WP2320790-038	WP2320790-039	WP2320790-040
Physical Tests														
Moisture (%)					38	37	21	23	36	21	25	20	20	20
pH					5.8	6.0	6.7	6.7	6.1	6.6	6.2	6.6	6.6	6.3
Total Metals (mg/kg dw)														
Aluminum					6,670	6,420	3,160	3,880	6,360	3,490	4,850	3,320	3,650	3,970
Antimony					0.10	*<0.10*	*<0.10*	*<0.10*	0.11	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Arsenic*	5.9	17	7.6		8.8	8.9	2.3	2.2	7.8	2.6	4.9	2.7	2.8	4.4
Barium					99	99	29	34	111	31	63	26	33	43
Beryllium					0.29	0.29	0.14	0.16	0.28	0.14	0.24	0.15	0.16	0.17
Bismuth					*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Boron					5.8	5.7	*<5.0*	*<5.0*	5.9	*<5.0*	*<5.0*	*<5.0*	*<5.0*	*<5.0*
Cadmium	0.6	3.5	0.32	0.6	0.044	0.049	*<0.020*	*<0.020*	0.045	*<0.020*	0.027	*<0.020*	*<0.020*	*<0.020*
Calcium					2,380	2,400	810	1,070	2,280	950	1,570	875	905	1,030
Chromium	37.3	90	26.8	37.3	16	15	5.9	7.2	14	6.3	9.7	7.0	8.9	7.4
Cobalt					5.1	5.1	2.6	2.9	5.6	2.8	3.7	2.6	2.8	3.1
Copper	35.7	197	20.3	35.7	7.4	7.6	1.9	2.7	7.5	3.0	5.1	2.5	2.3	2.6
Iron					14,700	15,000	7,060	8,270	14,600	8,010	10,300	6,890	7,840	8,910
Lead	35	91.3	19.5	35.0	6.2	6.2	2.0	2.5	5.6	2.4	4.2	2.1	2.2	2.7
Lithium					9.0	8.8	5.0	6.2	9.4	5.7	7.1	5.7	5.9	6.3
Magnesium					3,780	3,590	2,330	2,670	3,620	2,400	2,930	2,330	2,580	2,670
Manganese					295	326	126	170	389	175	218	162	142	218
Mercury	0.17	0.486	0.088	0.17	0.0056	0.0069	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Molybdenum					0.64	0.65	0.21	0.25	0.79	0.32	0.47	0.19	0.25	0.37
Nickel					9.9	9.3	4.7	5.2	9.3	4.8	6.7	4.7	5.2	5.4
Phosphorus					901	1000	264	314	877	307	541	258	294	379
Potassium					1,100	1,050	440	520	1,090	450	770	450	500	590
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					99	93	*<50*	*<50*	84	*<50*	55	*<50*	*<50*	*<50*
Strontium					35	31	19	21	32	20	28	21	20	23
Thallium					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					337	322	156	196	342	162	232	147	163	155
Uranium					1.3	1.3	0.36	0.50	1.2	0.49	0.86	0.38	0.40	0.53
Vanadium					18	17	8.6	12	18	9.6	13	8.3	9.0	9.8
Zinc	123	315	73.1	123	29	29	14	17	27	17	22	16	16	17
Zirconium					3.6	2.8	2.1	2.1	3.3	2.0	2.7	2.0	2.5	2.5

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
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. Sediment particle size and total organic carbon content, Baker Lake, 2023.

Lake & Basin	Baker Lake - Akilahaarjuk Point (BAP)					Baker Lake - East Shore (BES)				
Area-Replicate ID	**BAP-1**	**BAP-2**	**BAP-3**	**BAP-4**	**BAP-5**	**BES-1**	**BES-2**	**BES-3**	**BES-4**	**BES-5**
Date	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023
ALS Sample ID	WP2320803-007	WP2320803-008	WP2320803-009	WP2320803-010	WP2320803-011	WP2320803-001	WP2320803-002	WP2320803-003	WP2320803-004	WP2320803-005
Physical Tests										
Moisture (%)	28	29	27	38	29	39	40	33	35	41
pH	6.0	6.1	5.8	5.4	6.4	6.7	6.4	6.5	6.6	6.5
Particle Size (%)										
clay (<0.004mm)	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
silt (0.063mm - 0.004mm)	76	69	75	56	73	67	52	57	66	56
sand (2.0mm - 0.063mm)	22	28	22	39	24	29	42	38	30	39
gravel (>2mm)	2.0	3.1	2.7	5.1	3.4	4.2	6.6	5.2	3.8	5.7
Organic Carbon										
TOC (% dw)	0.43	0.44	0.37	0.76	0.37	0.46	0.56	0.56	0.47	0.48

Notes:

Italicized numbers are below detection limits.

Table C3-2. Sediment particle size and total organic carbon content, Baker Lake, 2023.

Lake & Basin	Baker Lake - Barge Dock (BBD)					Baker Lake - Proposed Jetty (BPJ)				
Area-Replicate ID	**BBD-1**	**BBD-2**	**BBD-3**	**BBD-4**	**BBD-5**	**BPJ-1**	**BPJ-2**	**BPJ-3**	**BPJ-4**	**BPJ-5**
Date	16-Aug-2023	16-Aug-2023	16-Aug-2023	17-Aug-2023	17-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023
ALS Sample ID	WP2320803-013	WP2320803-014	WP2320803-015	WP2320803-016	WP2320803-017	WP2320803-019	WP2320803-020	WP2320803-021	WP2320803-022	WP2320803-023
Physical Tests										
Moisture (%)	22	18	25	18	32	45	55	38	48	43
pH	6.0	6.5	6.4	6.3	6.0	6.5	6.2	6.7	6.2	6.7
Particle Size (%)										
clay (<0.004mm)	*<1.0*	*<1.0*	*<1.0*	1.0	*<1.0*	*<1.0*	*<1.0*	1.7	*<1.0*	*<1.0*
silt (0.063mm - 0.004mm)	69	96	76	96	53	36	23	37	27	25
sand (2.0mm - 0.063mm)	27	4.1	22	3.2	43	54	65	50	61	62
gravel (>2mm)	3.4	*<1.0*	1.9	*<1.0*	4.2	11	12	12	12	13
Organic Carbon										
TOC (% dw)	0.35	0.11	0.23	0.097	0.48	0.70	0.75	0.42	0.66	0.72

Notes:

Italicized numbers are below detection limits.

Table C3-3. Hydrocarbon and PAH results from composite sediment grabs at Baker Lake, 2023.

Area-Replicate ID	CCME Sediment Quality Guidelines[1]		BAP-Comp	BES-Comp	BBD-Comp	BPJ-Comp
Date			17-Aug-2023	16-Aug-2023	17-Aug-2023	19-Aug-2023
ALS Sample ID	ISQG	PEL	WP2320803-012	WP2320803-006	WP2320803-018	WP2320803-024
Physical Parameters						
Moisture (%)	-	-	38	40	16	47
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	0.089	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0052*
acenaphthylene	0.0059	0.13	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0052*
acridine	-	-	*<0.010*	*<0.010*	*<0.010*	*<0.010*
anthracene	0.047	0.25	*<0.0044*	*<0.0049*	*<0.0040*	*<0.0052*
benz(a)anthracene	0.032	0.39	*<0.010*	*<0.010*	*<0.010*	*<0.010*
benzo(a)pyrene	0.032	0.78	*<0.010*	*<0.010*	*<0.010*	*<0.010*
benzo(b+j)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	0.86	*<0.010*	*<0.010*	*<0.010*	*<0.010*
dibenz(a,h)anthracene	0.0062	0.14	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0052*
fluoranthene	0.11	2.36	*<0.010*	*<0.010*	*<0.010*	*<0.010*
fluorene	0.021	0.144	*<0.010*	*<0.010*	*<0.010*	*<0.010*
indeno(1,2,3-c,d)pyrene	-	-	*<0.010*	*<0.010*	*<0.010*	*<0.010*
methylnaphthalene, 1-	-	-	*<0.010*	*<0.010*	*<0.010*	*<0.010*
methylnaphthalene, 2-	0.020	0.20	*<0.010*	*<0.010*	*<0.010*	*<0.010*
naphthalene	0.035	0.39	*<0.010*	*<0.010*	*<0.010*	*<0.010*
phenanthrene	0.042	0.52	*<0.010*	*<0.010*	*<0.010*	*<0.010*
pyrene	0.053	0.88	*<0.010*	*<0.010*	*<0.010*	*<0.010*
quinoline	-	-	*<0.010*	*<0.010*	*<0.010*	*<0.010*
B(a)P total potency equivalents [B(a)P TPE]	-	-	*<0.020*	*<0.020*	*<0.020*	*<0.020*
IACR (CCME)	-	-	*<0.150*	*<0.150*	*<0.150*	*<0.150*
PAH Surrogates (%)						
acridine-d9	-	-	98	104	90	102
chrysene-d12	-	-	100	109	97	102
naphthalene-d8	-	-	100	106	94	117
phenanthrene-d10	-	-	101	109	96	109

Notes:

1. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
   ISQG = Interim freshwater Sediment Quality Guideline; PEL = probably effect level concentration

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

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Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2023.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)								Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Euglenophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	TOTAL		
Inuggugayualik Lake											
INUG - 150	29-Jun-23	0	3.5	0	162	37	8.8	34	245	28	0.71
INUG - 151	29-Jun-23	0	3.1	0	172	49	18	47	290	30	0.74
INUG - 152	22-Aug-23	3.5	9.4	0	40	6.4	5.5	8.5	74	32	0.84
INUG - 153	22-Aug-23	1.7	4.6	0	64	6.7	10	3.1	90	33	0.80
INUG - 154	7-Sep-23	11	5.1	0	98	2.1	8.4	3.3	128	33	0.86
INUG - 155	7-Sep-23	14	4.7	0	105	8.7	16	1.6	150	31	0.87
Percent Density or Biomass		***3.1***	***3.1***	***<0.1***	***66***	***11***	***6.8***	***10***			
Pipedream Lake											
PDL - 115	10-Jul-23	0.38	0.43	0	135	31	8.7	8.1	184	24	0.63
PDL - 116	10-Jul-23	0.54	2.2	0	120	49	4.3	6.1	182	26	0.48
PDL - 117	22-Aug-23	6.6	7.4	0	130	4.6	4.7	13	166	30	0.87
PDL - 118	22-Aug-23	10	3.7	0	140	6.5	19	11	190	31	0.87
PDL - 119	6-Sep-23	5.9	4.4	0	63	24	3.5	13	114	28	0.89
PDL - 120	6-Sep-23	5.9	9.6	0	57	4.2	4.9	6.7	88	28	0.87
Percent Density or Biomass		***3.2***	***3.0***	***<0.1***	***70***	***13***	***4.9***	***6.3***			
Third Portage Lake - East Basin											
TPE - 162	3-Jul-23	0	0.073	0	80	39	2.8	21	142	21	0.63
TPE - 163	3-Jul-23	0	0.034	0	113	23	4.7	14	155	23	0.54
TPE - 164	13-Aug-23	0.070	9.1	0	60	31	11	2.9	115	31	0.73
TPE - 165	24-Aug-23	0.099	3.3	0	104	29	18	7.3	161	27	0.70
TPE - 166	7-Sep-23	0.88	4.1	0	75	35	15	5.6	135	25	0.63
TPE - 167	7-Sep-23	0.35	5.0	0	61	25	12	9.3	113	31	0.69
Percent Density or Biomass		***0.17***	***2.6***	***<0.1***	***60***	***22***	***7.8***	***7.3***			
Third Portage Lake - North Basin											
TPN - 162	3-Jul-23	0	0.39	0	129	6.1	5.9	17	158	23	0.71
TPN - 163	3-Jul-23	0	1.1	0	116	11	12	28	168	23	0.74
TPN - 164	24-Aug-23	0	6.0	0	128	30	7.8	13	185	26	0.66
TPN - 165	24-Aug-23	0	5.3	0	108	20	5.5	7.6	147	30	0.74
TPN - 166	7-Sep-23	0	2.4	0	113	21	6.3	1.3	144	21	0.75
TPN - 167	7-Sep-23	0	1.2	0	74	26	4.4	3.2	109	20	0.66
Percent Density or Biomass		***<0.1***	***1.8***	***<0.1***	***73***	***13***	***4.6***	***7.7***			

Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2023.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)								Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Euglenophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	TOTAL		
Second Portage Lake											
SP - 162	5-Jul-23	0	0.44	0	109	21	37	25	192	25	0.76
SP - 163	5-Jul-23	0	2.1	0	108	23	12	8.4	154	26	0.81
SP - 164	13-Aug-23	3.9	9.2	0	76	9.7	23	13	135	34	0.87
SP - 165	13-Aug-23	1.3	7.6	0	127	17	31	16	199	35	0.87
SP - 166	7-Sep-23	0.089	1.2	0	54	9.9	19	3.3	87	21	0.84
SP - 167	7-Sep-23	0	0.88	0	73	17	11	3.8	105	22	0.79
Percent Density or Biomass		***0.60***	***2.5***	***<0.1***	***63***	***11***	***15***	***8.0***			
Wally Lake											
WAL - 131	6-Jul-23	0	2.5	0	181	31	13	35	262	33	0.79
WAL - 132	6-Jul-23	0	0.47	0	173	30	14	36	254	28	0.81
WAL - 133	21-Aug-23	0.064	16	0	101	17	22	24	180	39	0.89
WAL - 134	21-Aug-23	0.56	13	0	134	15	32	10	205	32	0.85
WAL - 135	9-Sep-23	0.50	17	0	118	14	21	2.1	173	32	0.85
WAL - 136	9-Sep-23	0.034	15	0	115	17	17	7.9	173	27	0.84
Percent Density or Biomass		***<0.1***	***5.2***	***<0.1***	***66***	***9.9***	***9.6***	***9.2***			
All Locations Relative Density or Biomass (%)		***1.2***	***3.2***	***<0.1***	***66***	***13***	***8.2***	***8.2***			

Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2023.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Inuggugayualik Lake								
INUG - 150	29-Jun-23	0	29,736	2,267,976	300,808	32,536	4,600	2,635,656
INUG - 151	29-Jun-23	0	43,904	2,223,672	363,248	70,056	3,000	2,703,880
INUG - 152	22-Aug-23	235,688	144,880	697,648	94,808	9,784	1,600	1,184,408
INUG - 153	22-Aug-23	13,984	123,328	906,584	76,040	72,240	7,384	1,199,560
INUG - 154	7-Sep-23	244,336	174,216	1,211,512	29,936	44,304	400	1,704,704
INUG - 155	7-Sep-23	382,416	195,168	1,103,352	88,608	100,976	200	1,870,720
Percent Density or Biomass		***7.8***	***6.3***	***74***	***8.4***	***2.9***	***0.15***	
Pipedream Lake								
PDL - 115	10-Jul-23	2,000	43,504	1,912,360	300,144	38,320	2,000	2,298,328
PDL - 116	10-Jul-23	2,800	36,920	1,623,600	304,744	16,168	1,400	1,985,632
PDL - 117	22-Aug-23	32,384	296,344	1,402,280	75,040	22,552	8,984	1,837,584
PDL - 118	22-Aug-23	71,920	165,832	1,315,272	127,128	83,624	1,800	1,765,576
PDL - 119	6-Sep-23	36,968	195,568	661,728	265,824	15,168	1,400	1,176,656
PDL - 120	6-Sep-23	26,000	245,056	712,016	97,992	22,552	800	1,104,416
Percent Density or Biomass		***1.7***	***9.7***	***75***	***12***	***2.0***	***0.16***	
Third Portage Lake - East Basin								
TPE - 162	3-Jul-23	0	200	1,047,680	187,400	8,384	3,400	1,247,064
TPE - 163	3-Jul-23	0	7,184	1,376,944	202,568	9,384	9,384	1,605,464
TPE - 164	13-Aug-23	400	1,063,832	656,544	1,366,960	26,552	600	3,114,888
TPE - 165	24-Aug-23	600	373,768	784,456	1,326,056	15,984	1,600	2,502,464
TPE - 166	7-Sep-23	9,384	503,480	474,944	1,550,560	34,936	1,200	2,574,504
TPE - 167	7-Sep-23	1,600	302,728	619,224	1,093,784	13,784	1,200	2,032,320
Percent Density or Biomass		***<0.1***	***17***	***38***	***44***	***0.83***	***0.13***	
Third Portage Lake - North Basin								
TPN - 162	3-Jul-23	0	14,368	1,152,040	103,792	30,536	2,600	1,303,336
TPN - 163	3-Jul-23	0	50,288	1,112,136	123,544	26,952	3,600	1,316,520
TPN - 164	24-Aug-23	0	165,432	908,784	1,389,312	10,984	2,600	2,477,112
TPN - 165	24-Aug-23	0	223,304	857,896	929,736	9,584	1,600	2,022,120
TPN - 166	7-Sep-23	0	93,792	1,008,360	872,864	23,352	400	1,998,768
TPN - 167	7-Sep-23	0	65,056	778,272	1,024,328	22,152	600	1,890,408
Percent Density or Biomass		***<0.1***	***5.6***	***53***	***40***	***1.1***	***0.10***	

Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2023.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Second Portage Lake								
SP - 162	5-Jul-23	0	14,568	1,125,904	146,696	136,528	17,568	1,441,264
SP - 163	5-Jul-23	0	172,416	1,190,560	97,808	53,488	1,400	1,515,672
SP - 164	13-Aug-23	86,608	726,584	855,096	69,656	127,128	2,200	1,867,272
SP - 165	13-Aug-23	7,184	977,624	1,660,104	314,112	157,864	2,400	3,119,288
SP - 166	7-Sep-23	400	35,920	840,928	289,960	50,304	600	1,218,112
SP - 167	7-Sep-23	0	29,136	732,968	200,168	12,984	600	975,856
Percent Density or Biomass		***0.93***	***19***	***63***	***11***	***5.3***	***0.24***	
Wally Lake								
WAL - 131	6-Jul-23	0	87,008	2,152,016	297,040	97,992	1,400	2,635,456
WAL - 132	6-Jul-23	0	100,576	1,777,648	311,008	112,160	1,600	2,302,992
WAL - 133	21-Aug-23	400	806,008	1,100,152	265,624	52,104	10,984	2,235,272
WAL - 134	21-Aug-23	3,400	367,384	1,123,504	92,408	78,256	1,800	1,666,752
WAL - 135	9-Sep-23	7,384	460,376	1,559,728	234,088	52,304	400	2,314,280
WAL - 136	9-Sep-23	200	395,120	1,487,888	278,792	55,288	1,400	2,218,688
Percent Density or Biomass		***<0.1***	***17***	***69***	***11***	***3.4***	***0.13***	
All Locations Relative Density or Biomass (%)		***1.7***	***13***	***61***	***22***	***2.5***	***0.15***	

Figure D1-1. Cyanophyte biomass (mg/m^3) from Meadowbank study area lakes since 2006.

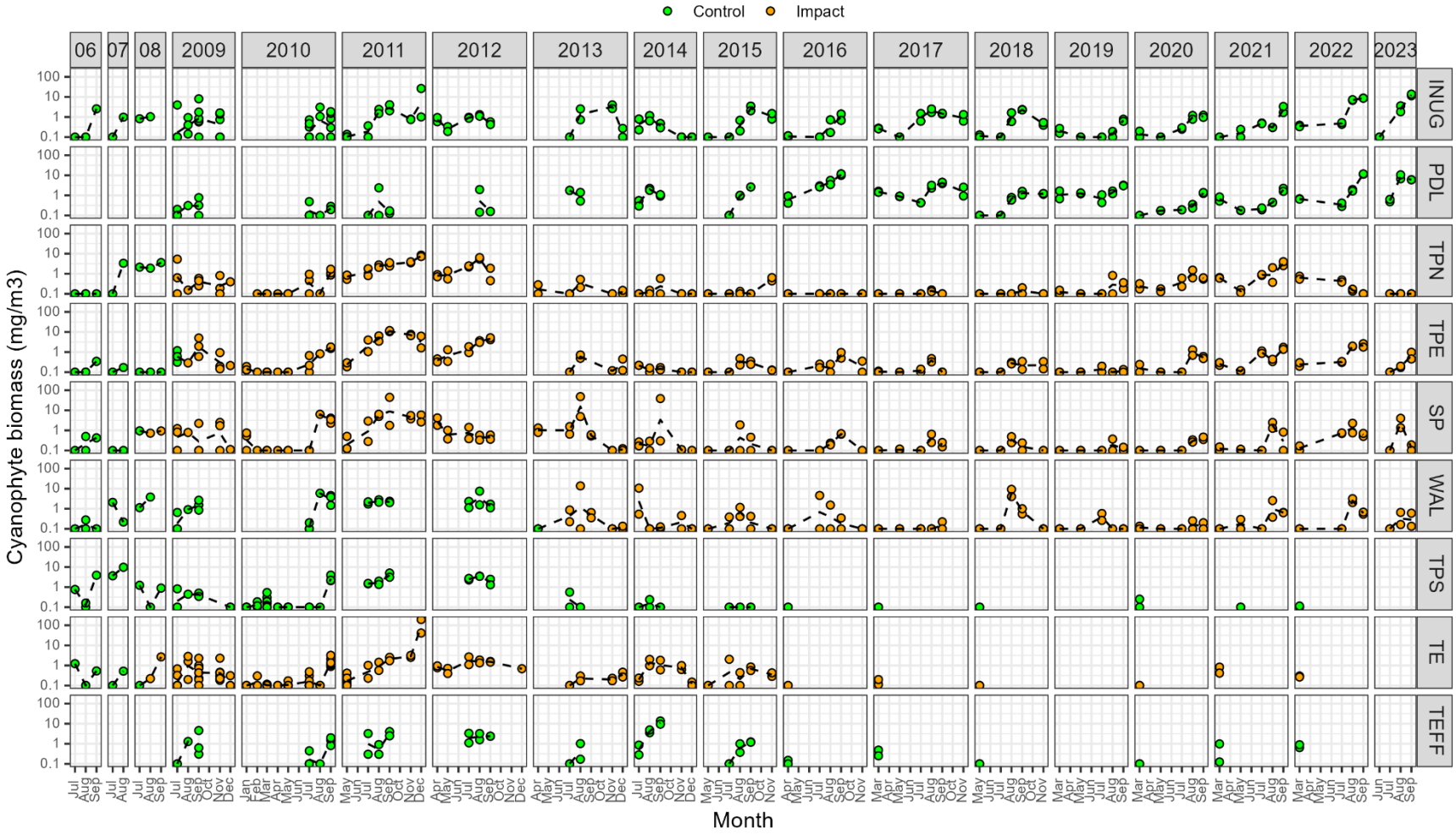


Figure D1-2. Chlorophyte biomass (mg/m^3) from Meadowbank study area lakes since 2006.

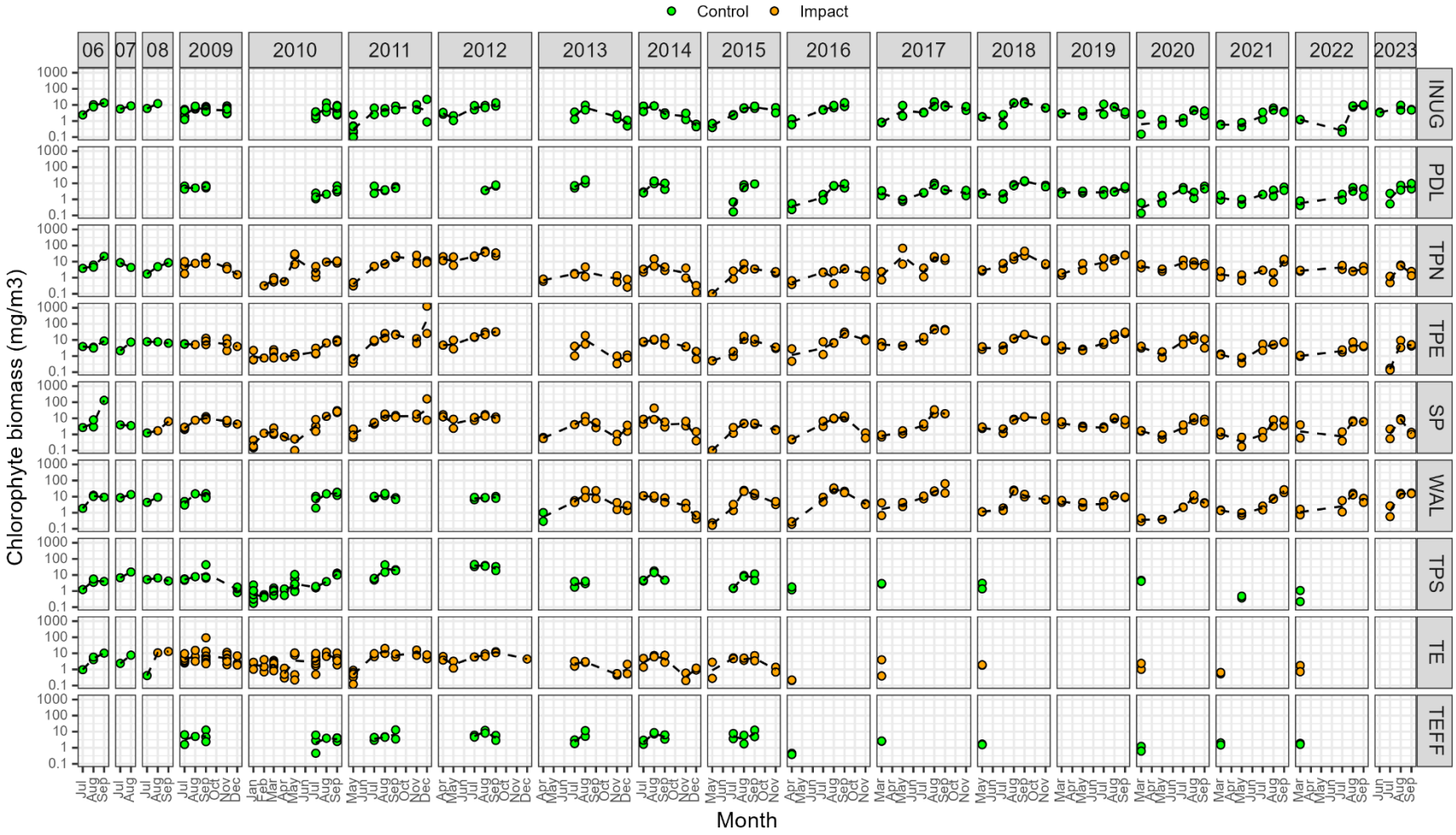


Figure D1-3. Chrysophyte biomass (mg/m^3) from Meadowbank study area lakes since 2006.

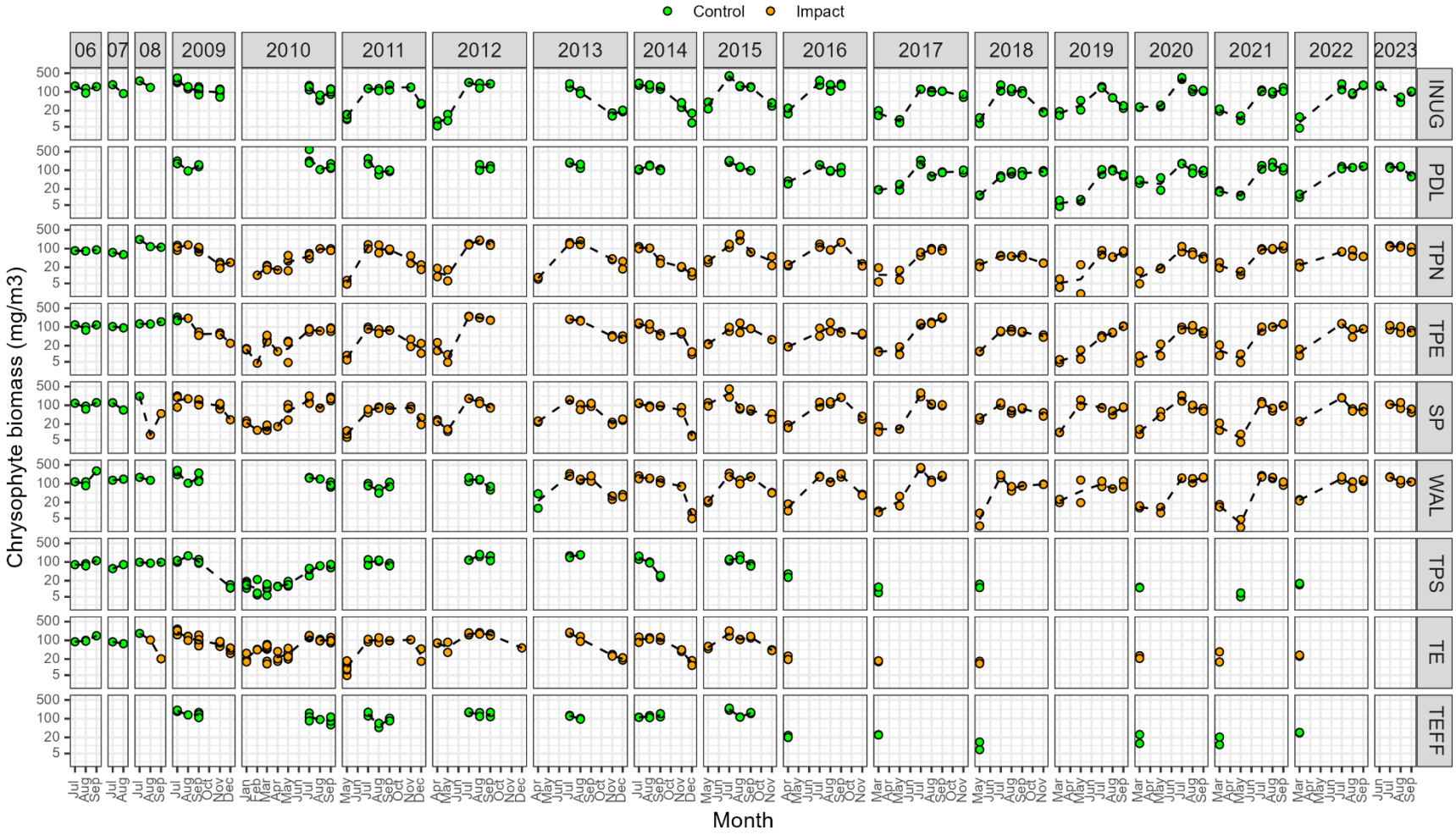


Figure D1-4. Diatom biomass (mg/m^3) from Meadowbank study area lakes since 2006.

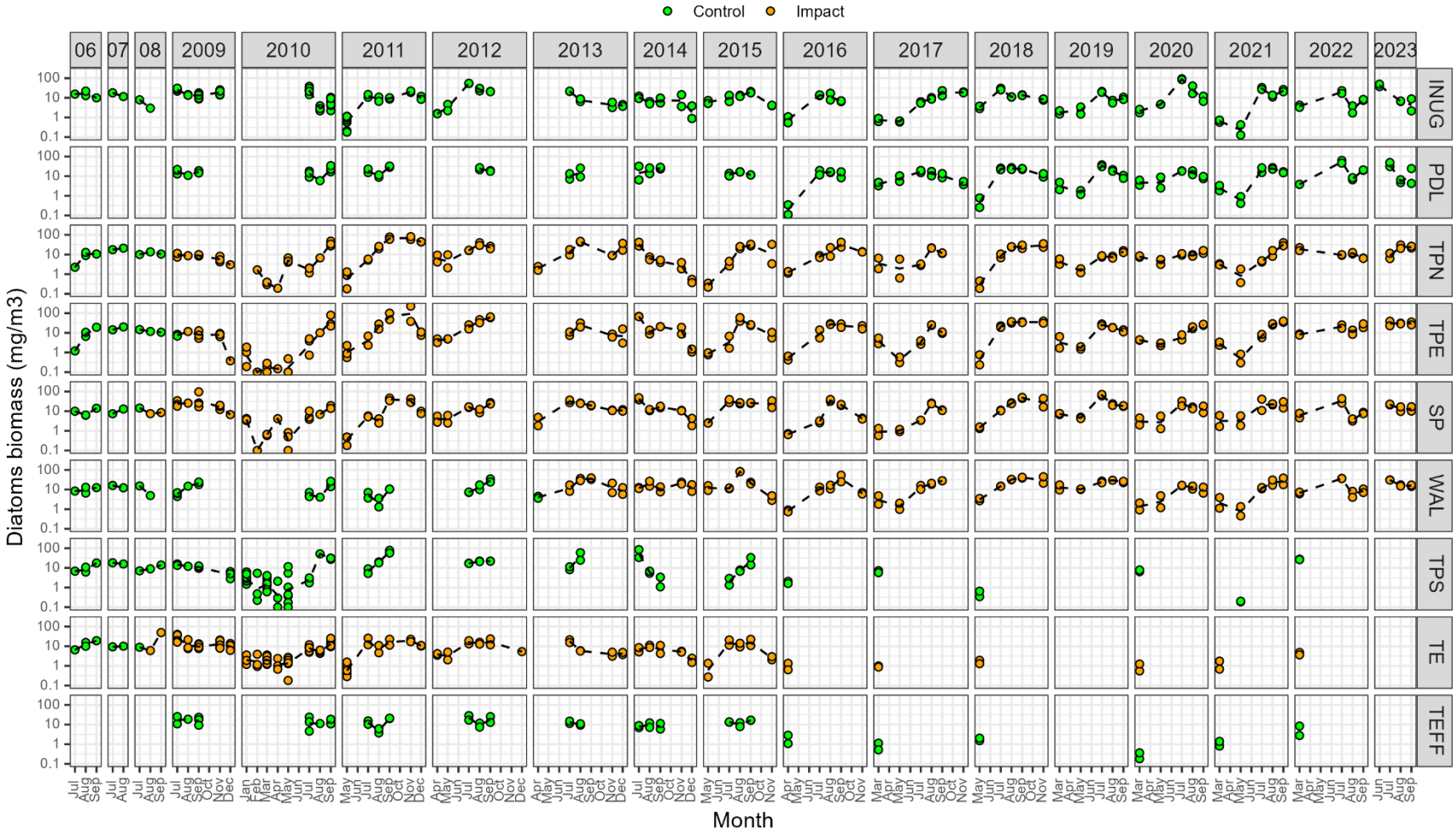


Figure D1-5. Cryptophyte biomass (mg/m^3) from Meadowbank study area lakes since 2006.

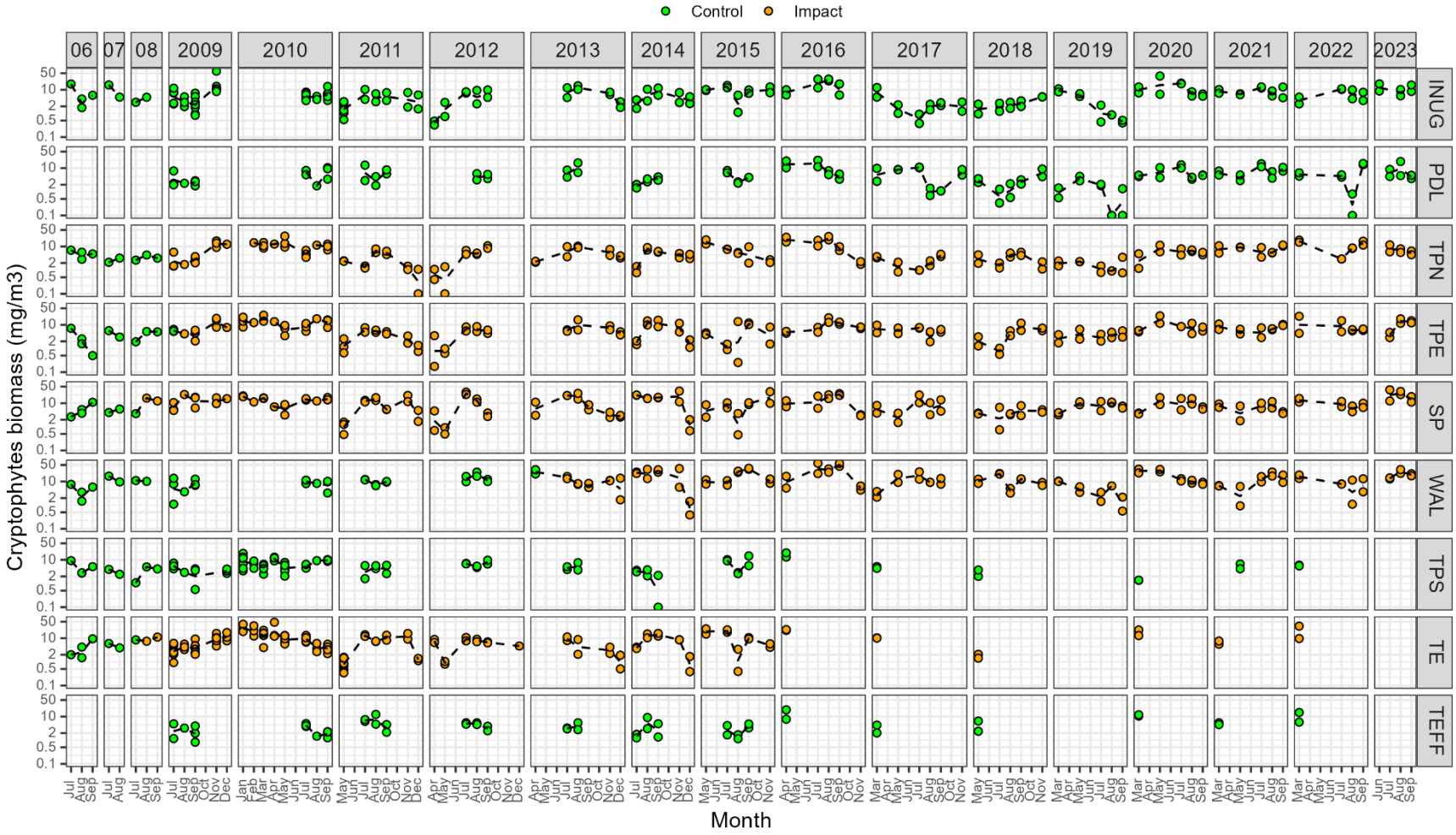


Figure D1-6. Dinoflagellate biomass (mg/m^3) from Meadowbank study area lakes since 2006.

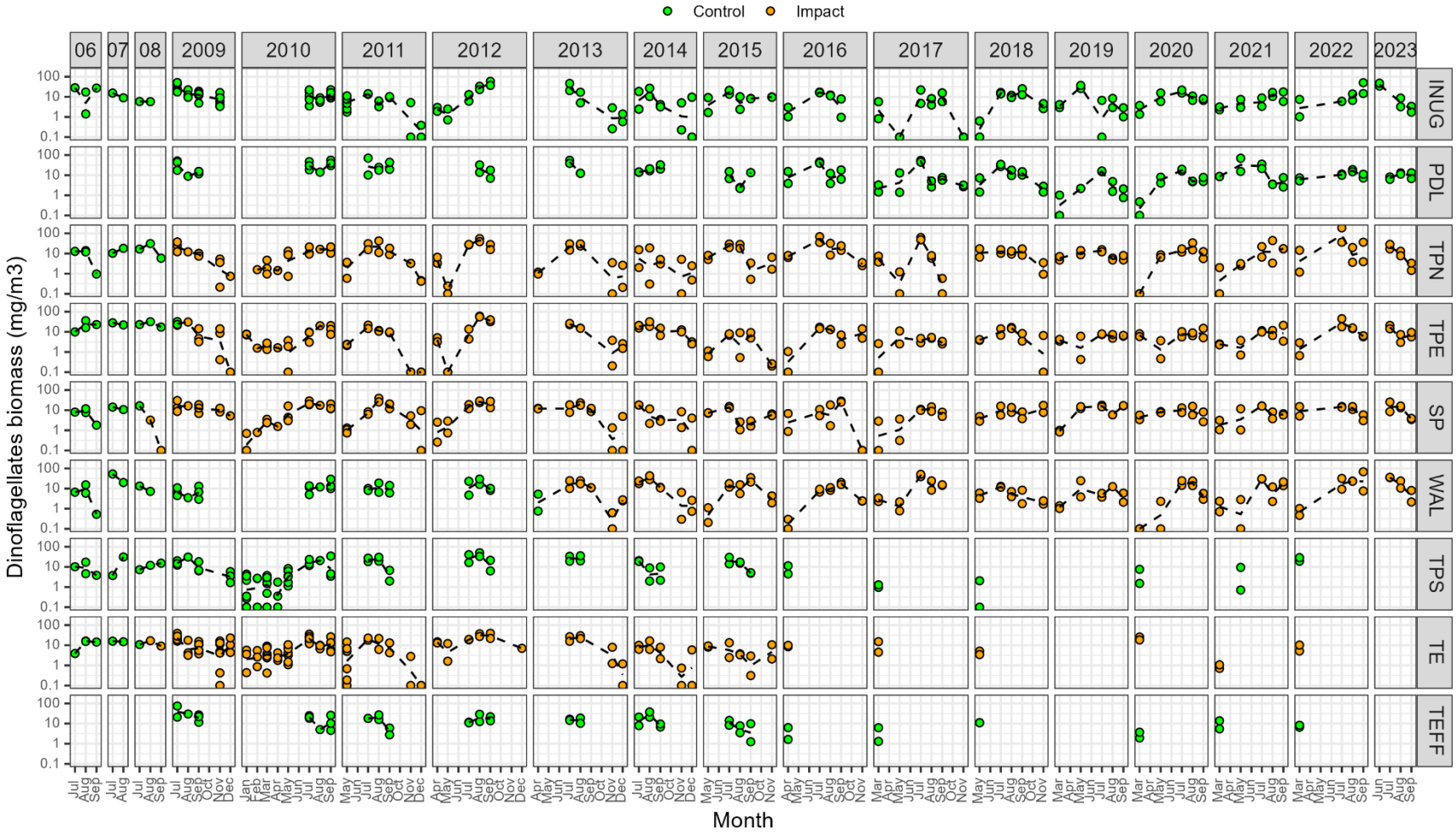


Figure D1-7. Phytoplankton density (cells/L) by major taxa group from Meadowbank study area lakes since 2006.

Note: High chlorophyll value in December 2011 at TPE omitted.

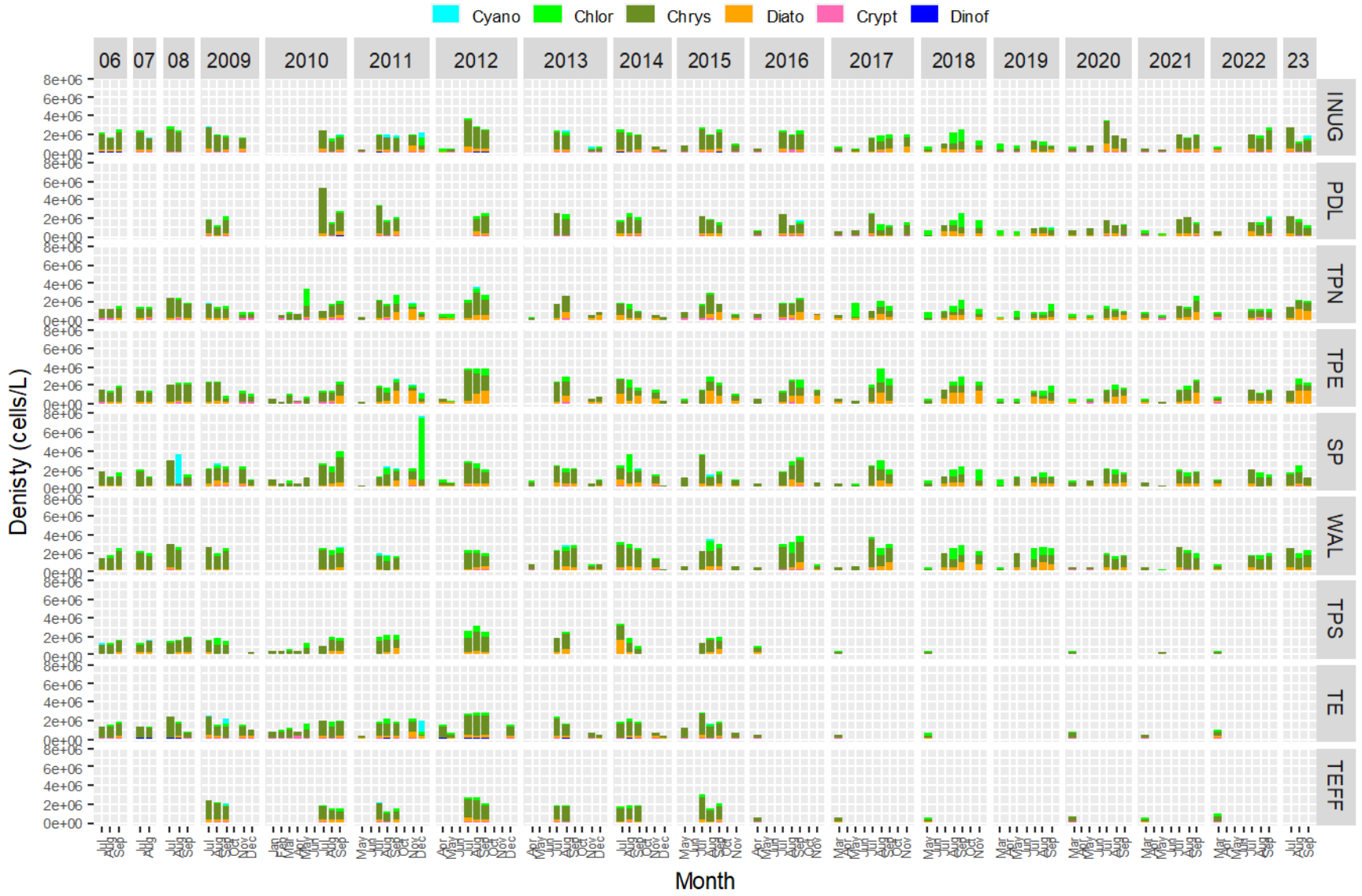


Figure D1-8. Relative phytoplankton density by major taxa group from Meadowbank study area lakes since 2006.

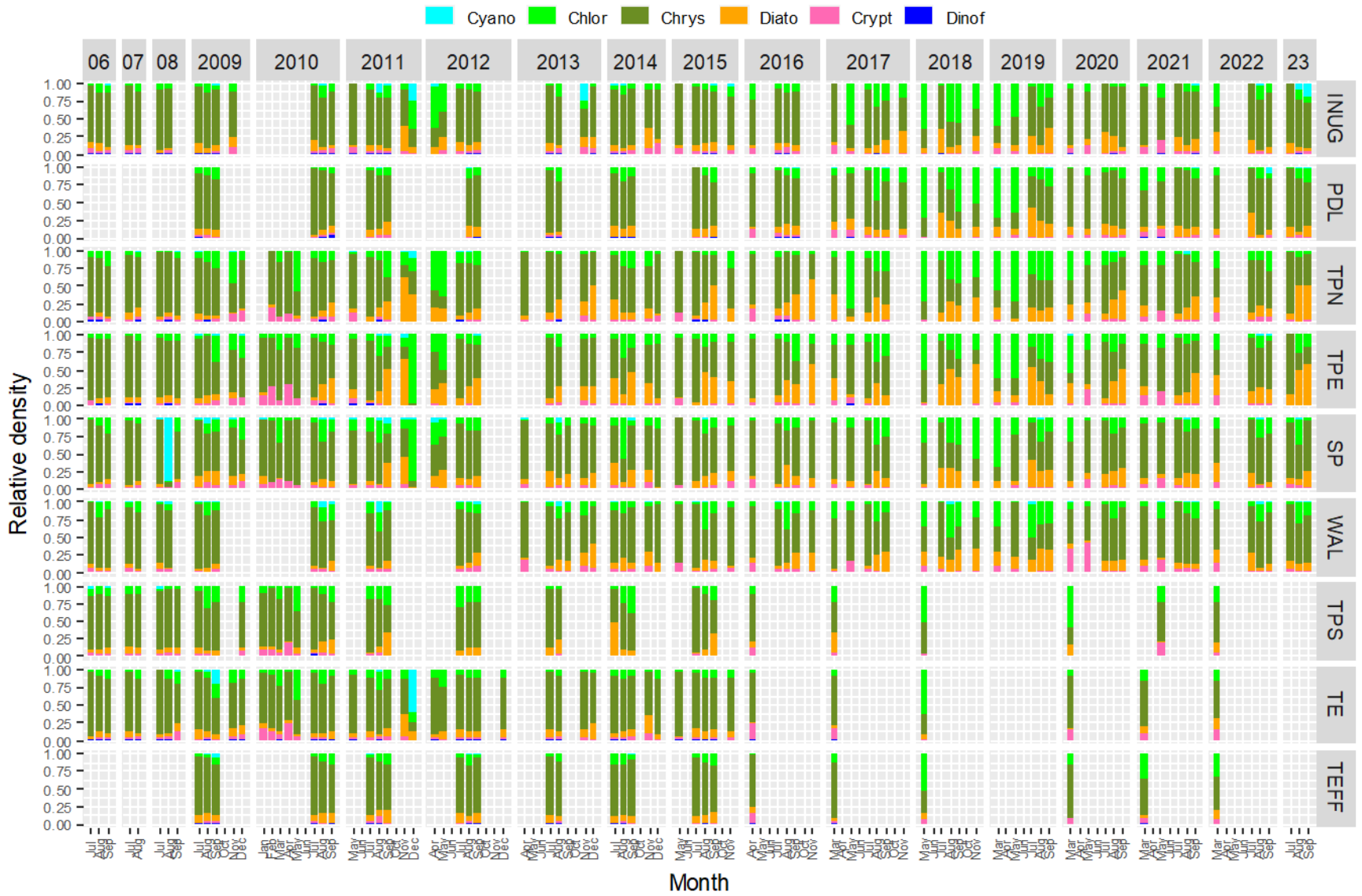


Figure D1-9. Cyanophyte density (cells/L) by major taxa group from Meadowbank study area lakes since 2006.

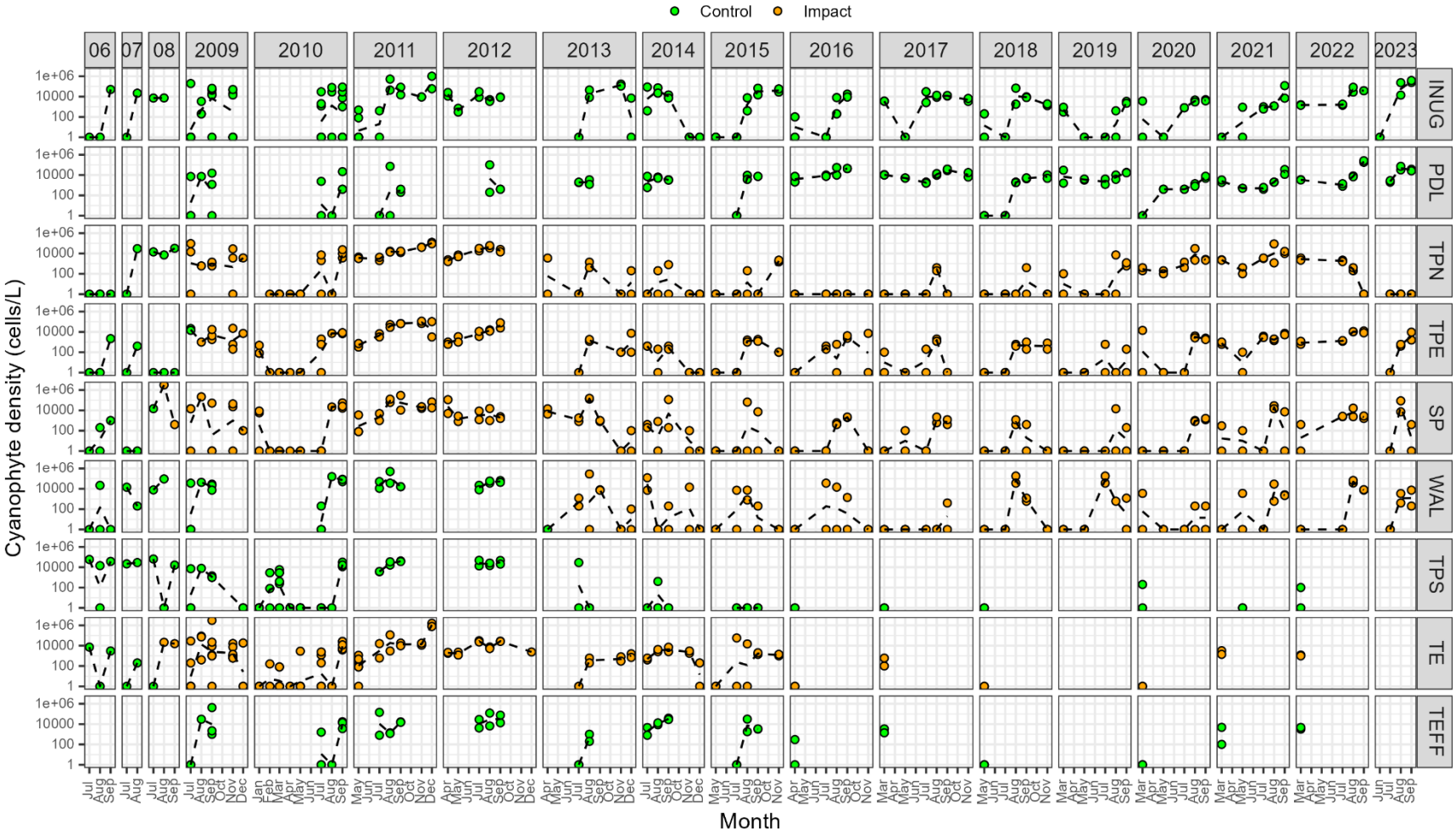


Figure D1-10. Chlorophyte density (cells/L) by major taxa group from Meadowbank study area lakes since 2006.

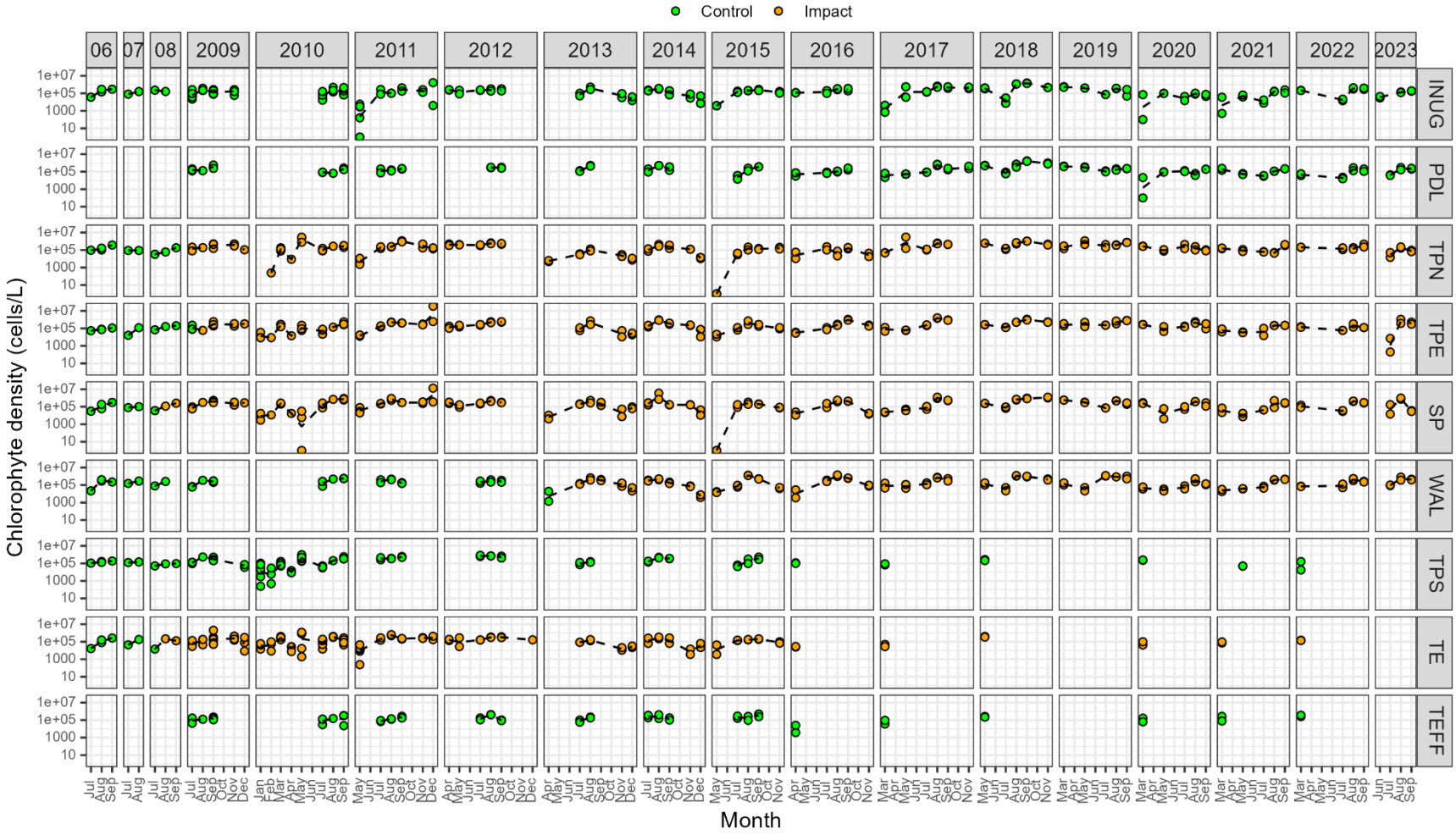


Figure D1-11. Chrysophyte density (cells/L) by major taxa group from Meadowbank study area lakes since 2006.

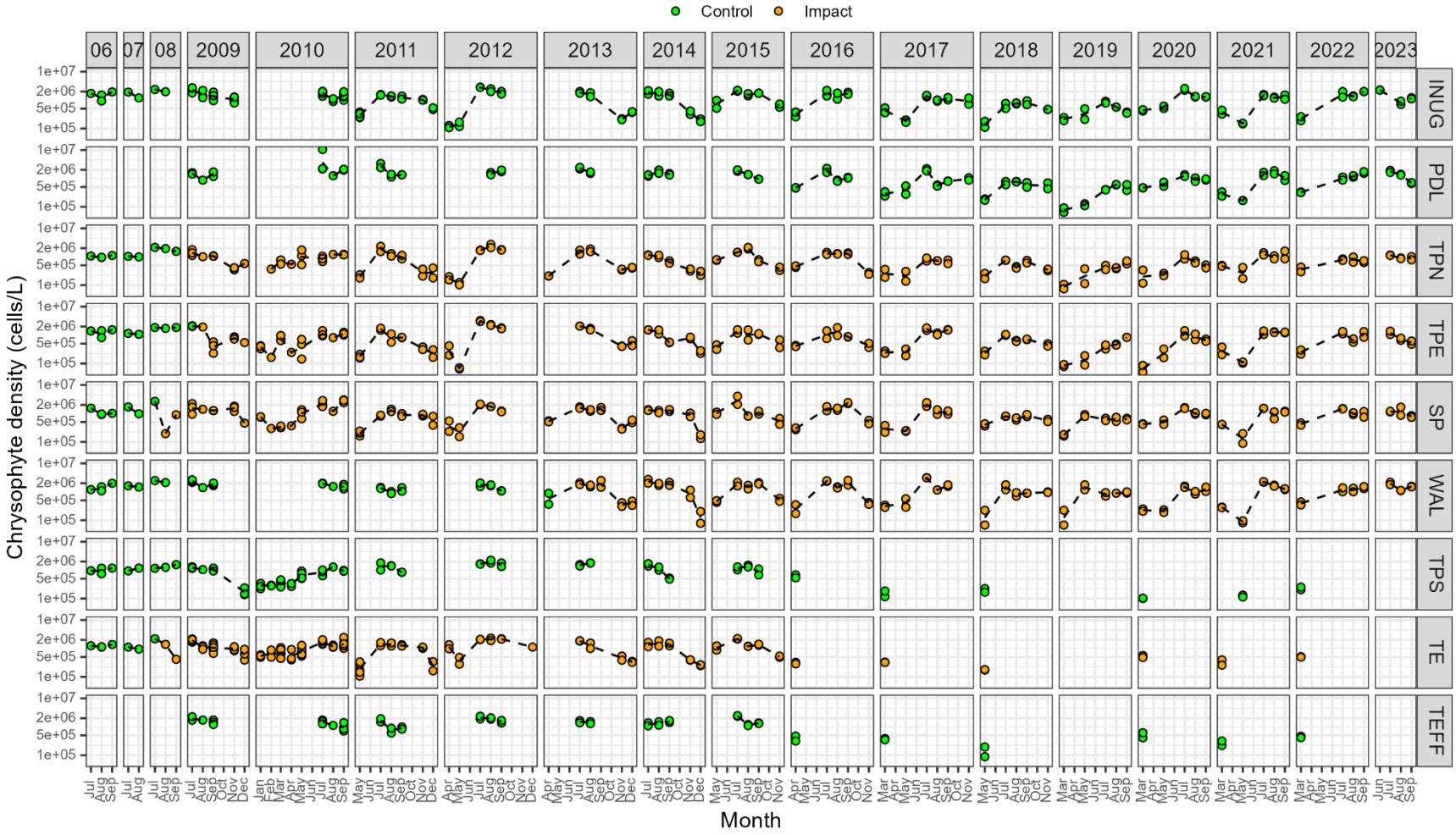


Figure D1-12. Diatoms density (cells/L) by major taxa group from Meadowbank study area lakes since 2006.

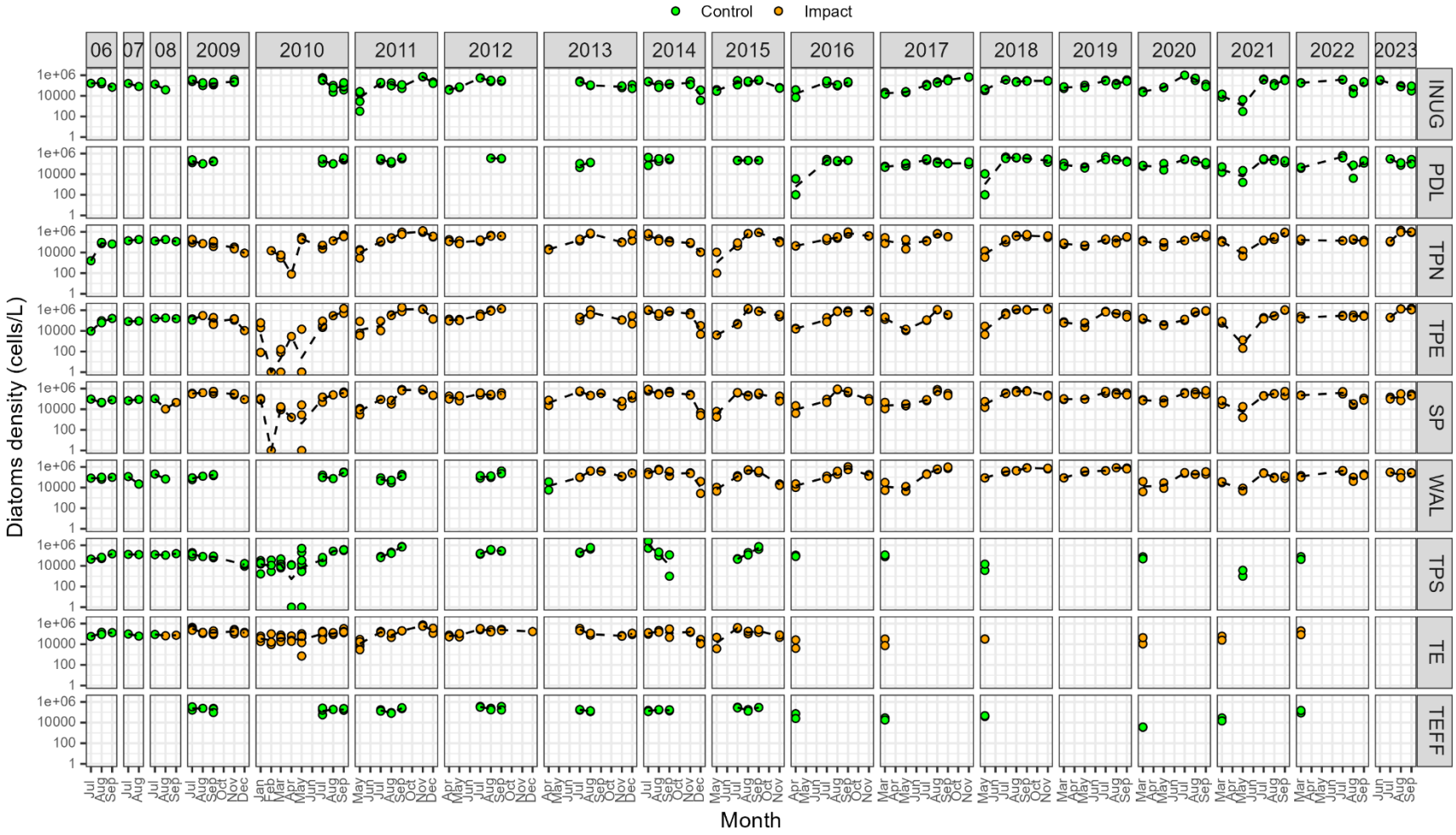


Figure D1-13. Cryptophytes density (cells/L) by major taxa group from Meadowbank study area lakes since 2006.

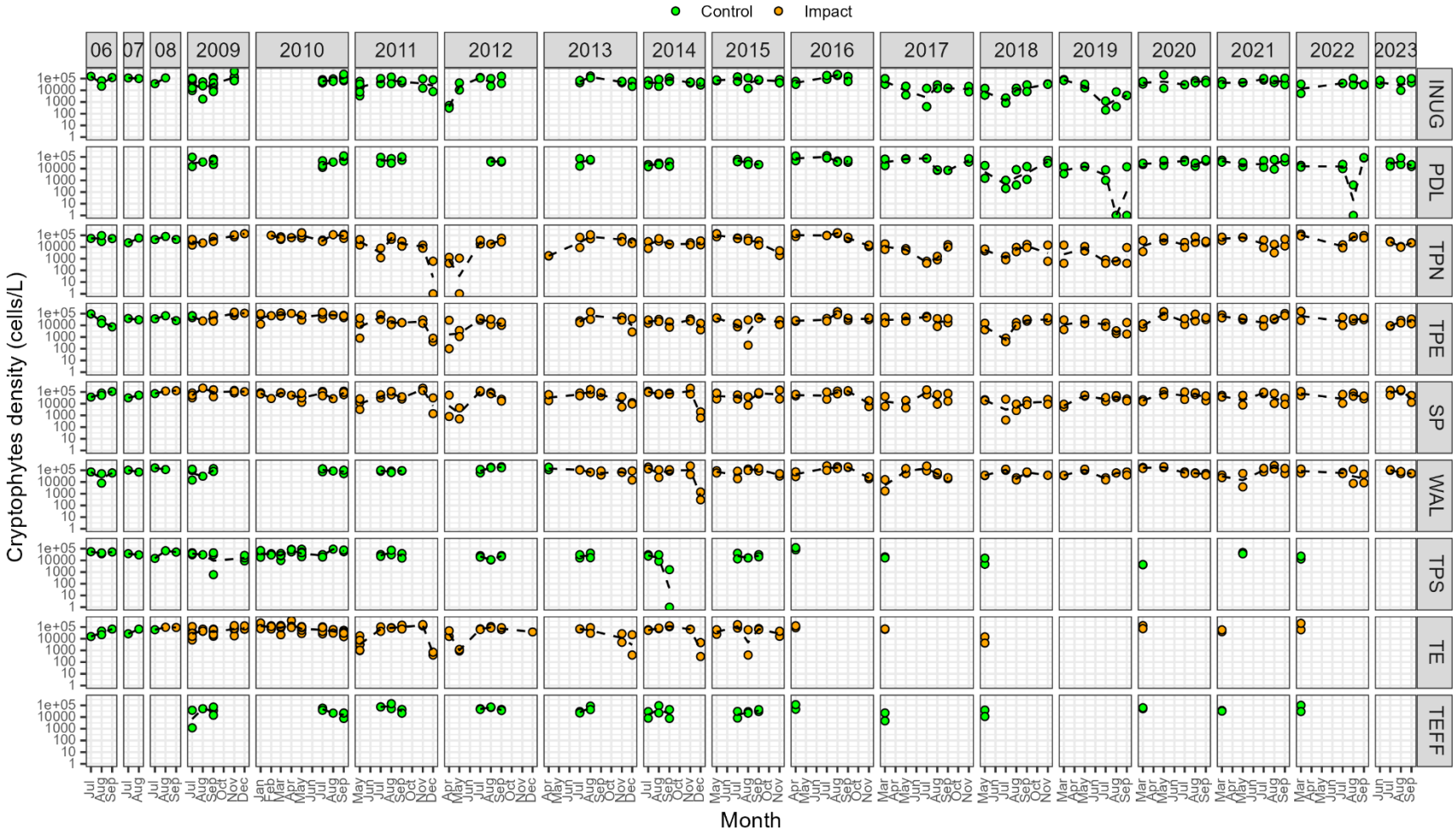


Figure D1-14. Dinoflagellates density (cells/L) by major taxa group from Meadowbank study area lakes since 2006.

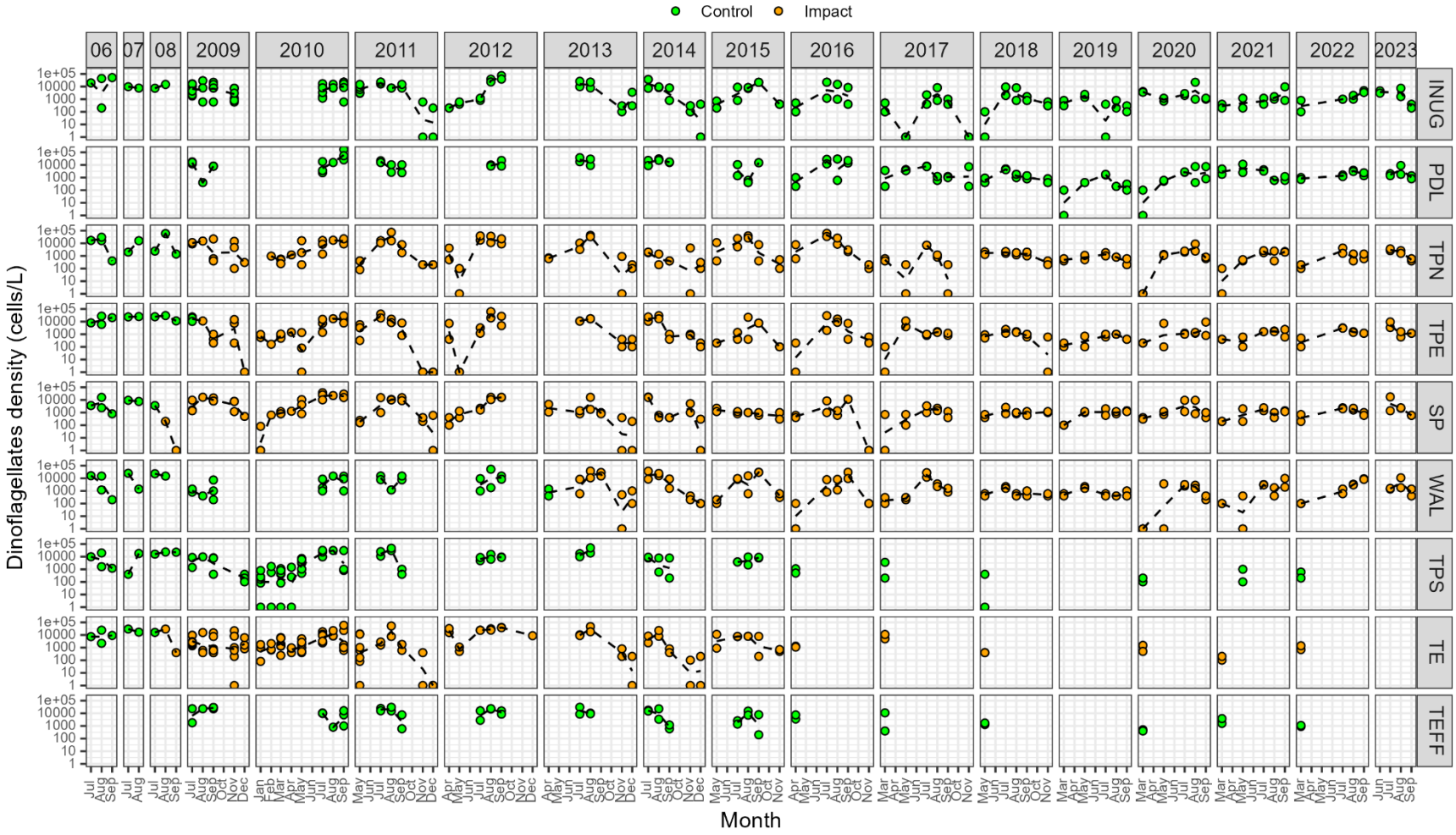
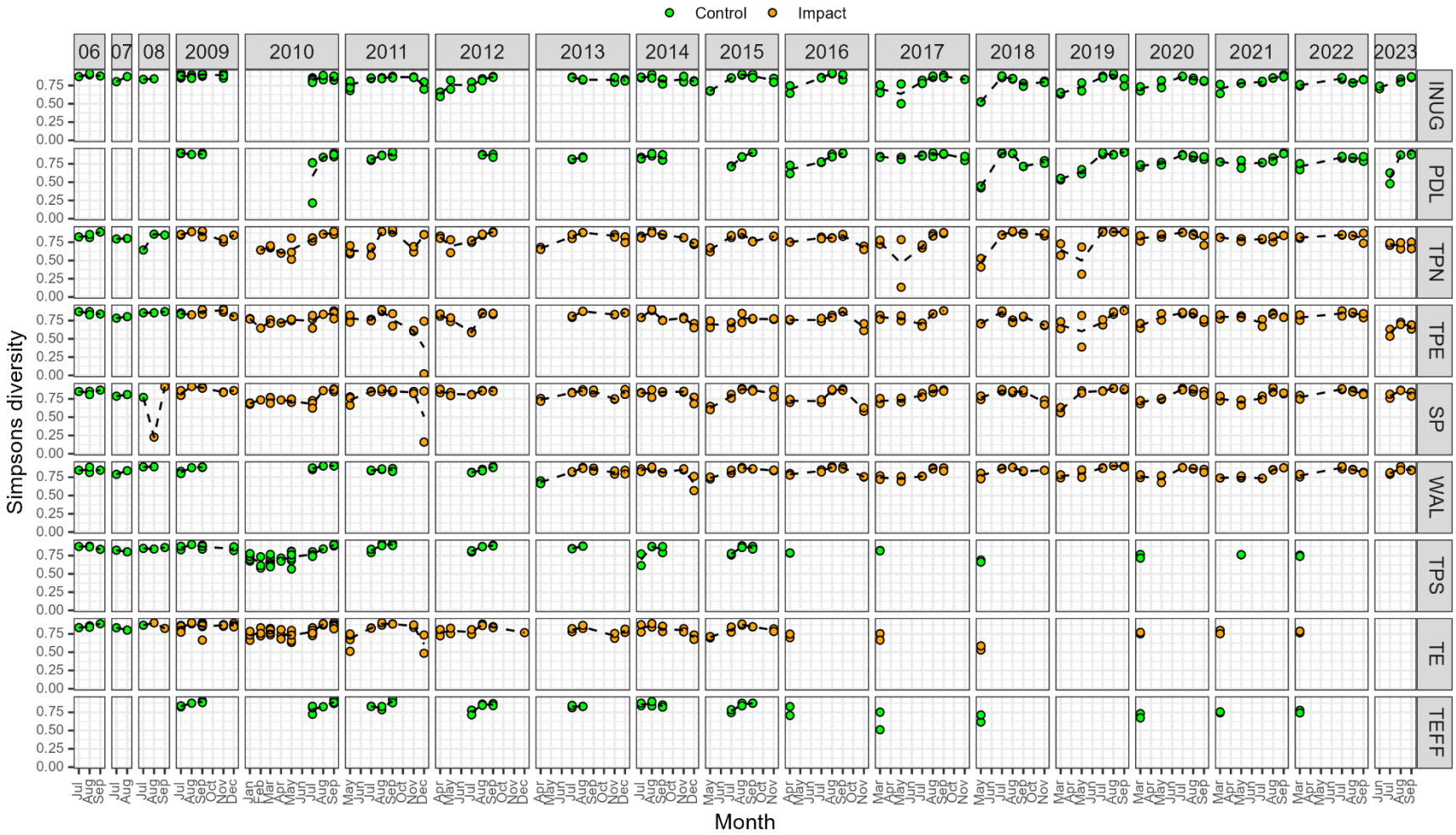


Figure D1-15. Simpsons' Diversity for the phytoplankton community from Meadowbank study area lakes since 2006.



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 study lakes, 2023.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		
Kangislulik Lake (KAN/MAM)										
MAM - 79	3-Jul-23	0	3.4	79	374	68	3.8	528	25	0.86
MAM - 80	3-Jul-23	0	2.7	79	403	65	0.79	550	26	0.84
MAM - 81	15-Aug-23	0	15	53	72	33	15	188	26	0.59
MAM - 82	15-Aug-23	0.20	20	44	77	17	15	173	25	0.65
MAM - 83	10-Sep-23	0	4.3	122	51	26	4.7	209	28	0.58
MAM - 84	10-Sep-23	0	9.3	113	48	16	2.8	190	23	0.58
Percent Density or Biomass		***<0.1***	***3.0***	***27***	***56***	***12***	***2.3***			
Nemo Lake										
NEM - 79	30-Jun-23	0	2.6	117	318	19	4.5	460	25	0.87
NEM - 80	30-Jun-23	0	0.72	98	304	17	1.5	422	24	0.86
NEM - 81	16-Aug-23	1.4	8.0	84	40	1.3	1.9	136	27	0.81
NEM - 82	16-Aug-23	2.2	8.2	81	23	1.6	1.9	118	26	0.78
NEM - 83	8-Sep-23	3.9	11	45	20	0.34	9.4	89	25	0.88
NEM - 84	8-Sep-23	3.3	11	53	15	1.0	16	100	23	0.86
Percent Density or Biomass		***0.81***	***3.1***	***36***	***54***	***3.1***	***2.7***			
Whale Tail South										
WTS - 79	2-Jul-23	0	3.2	341	97	196	5.5	643	27	0.75
WTS - 80	2-Jul-23	0	1.8	338	91	191	1.8	624	29	0.76
WTS - 81	14-Aug-23	0.21	52	227	135	63	20	496	38	0.67
WTS - 82	14-Aug-23	0.13	55	206	75	56	21	413	37	0.71
WTS - 83	7-Sep-23	0.26	16	52	114	13	5.1	201	27	0.41
WTS - 84	7-Sep-23	0.19	10	53	127	29	4.5	224	26	0.31
Percent Density or Biomass		***<0.1***	***5.3***	***47***	***25***	***21***	***2.2***			
Lake A20										
A20 - 73	30-Jun-23	0	4.2	391	23	137	11	565	29	0.82
A20 - 74	30-Jun-23	0	2.8	383	24	73	4.4	487	28	0.84
A20 - 75	18-Aug-23	0.44	21	211	100	12	66	411	29	0.81
A20 - 76	18-Aug-23	0.42	24	168	150	14	28	384	28	0.81
A20 - 77	7-Sep-23	0	66	508	117	34	9.6	734	36	0.79
A20 - 78	7-Sep-23	0	65	483	114	29	38	729	38	0.79
Percent Density or Biomass		***<0.1***	***5.5***	***65***	***16***	***9.0***	***4.7***			

Table D2-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Whale Tail study lakes, 2023.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		
Lake A76										
A76 - 71	1-Jul-23	0	0.29	214	32	25	8.1	279	24	0.59
A76 - 72	1-Jul-23	0	0.68	154	32	27	18	232	22	0.86
A76 - 73	13-Aug-23	0	23	112	59	23	12	229	29	0.80
A76 - 74	13-Aug-23	0.034	17	72	61	13	16	179	26	0.76
A76 - 75	9-Sep-23	0	3.8	34	27	2.0	0.64	67	19	0.53
A76 - 76	9-Sep-23	0	4.5	45	34	2.7	3.1	89	22	0.52
Percent Density or Biomass		***<0.1***	***4.5***	***59***	***23***	***8.6***	***5.4***			
Lake DS1										
DS1 - 69	1-Jul-23	0	2.9	220	5.6	3.1	5.5	237	28	0.73
DS1 - 70	1-Jul-23	0	2.5	189	7.9	7.9	25	232	28	0.76
DS1 - 71	17-Aug-23	0	16	49	9.2	20	38	133	33	0.88
DS1 - 72	17-Aug-23	0.031	8.3	95	6.3	41	38	189	27	0.83
DS1 - 73	9-Sep-23	0	8.3	135	10	18	15	186	34	0.86
DS1 - 74	9-Sep-23	0	0.67	122	4.9	24	11	164	29	0.81
Percent Density or Biomass		***<0.1***	***3.4***	***71***	***3.9***	***10***	***12***			
All Locations Relative Density or Biomass (%)		***0.11***	***4.5***	***51***	***28***	***12***	***4.3***			

Table D2-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Whale Tail study lakes, 2023.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Kangislulik Lake (KAN/MAM)								
MAM - 79	3-Jul-23	0	387,936	1,422,832	894,816	132,976	7,384	2,845,944
MAM - 80	3-Jul-23	0	244,256	1,488,288	1,018,344	151,528	200	2,902,616
MAM - 81	15-Aug-23	0	567,736	833,544	2,733,520	44,336	2,800	4,181,936
MAM - 82	15-Aug-23	1,200	934,720	912,568	2,932,472	62,672	9,584	4,853,216
MAM - 83	10-Sep-23	0	244,656	903,600	2,218,472	14,600	1,000	3,382,328
MAM - 84	10-Sep-23	0	330,464	997,192	2,391,488	15,584	600	3,735,328
Percent Density or Biomass		***<0.1***	***12***	***30***	***56***	***1.9***	***<0.1***	
Nemo Lake								
NEM - 79	30-Jun-23	0	50,288	1,405,280	1,446,144	24,168	1,000	2,926,880
NEM - 80	30-Jun-23	0	14,368	1,362,976	1,452,544	36,936	400	2,867,224
NEM - 81	16-Aug-23	6,400	295,344	1,243,032	677,096	7,384	400	2,229,656
NEM - 82	16-Aug-23	35,936	309,112	1,412,511	412,288	7,584	400	2,177,831
NEM - 83	8-Sep-23	18,200	323,280	734,368	353,616	200	400	1,430,064
NEM - 84	8-Sep-23	16,000	222,704	806,808	403,904	600	1,000	1,451,016
Percent Density or Biomass		***0.59***	***9.3***	***53***	***36***	***0.59***	***<0.1***	
Whale Tail South								
WTS - 79	2-Jul-23	0	165,232	4,756,008	871,352	617,016	600	6,410,208
WTS - 80	2-Jul-23	0	114,944	4,195,856	819,824	647,320	200	5,778,144
WTS - 81	14-Aug-23	600	998,976	1,783,232	3,797,264	102,632	3,600	6,686,304
WTS - 82	14-Aug-23	800	1,150,640	1,739,328	3,369,840	99,640	9,984	6,370,232
WTS - 83	7-Sep-23	1,400	941,504	783,056	5,858,992	40,120	600	7,625,672
WTS - 84	7-Sep-23	1,000	388,336	740,152	6,415,344	120,944	7,384	7,673,160
Percent Density or Biomass		***<0.1***	***9.3***	***35***	***52***	***4.0***	***<0.1***	
Lake A20								
A20 - 73	30-Jun-23	0	266,408	4,253,960	351,920	239,616	1,400	5,113,304
A20 - 74	30-Jun-23	0	280,176	3,936,464	424,712	223,968	800	4,866,120
A20 - 75	18-Aug-23	2,400	554,168	1,861,856	2,301,296	46,904	13,600	4,780,224
A20 - 76	18-Aug-23	2,400	632,592	1,530,792	2,232,840	41,320	6,000	4,445,944
A20 - 77	7-Sep-23	0	1,064,232	2,041,456	2,724,768	121,744	1,000	5,953,200
A20 - 78	7-Sep-23	0	1,165,408	2,076,776	2,819,544	86,824	1,600	6,150,152
Percent Density or Biomass		***<0.1***	***13***	***50***	***35***	***2.4***	***<0.1***	

Table D2-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Whale Tail study lakes, 2023.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Lake A76								
A76 - 71	1-Jul-23	0	28,736	5,333,744	306,840	126,744	1,400	5,797,464
A76 - 72	1-Jul-23	0	93,392	1,667,120	325,392	162,064	3,200	2,251,168
A76 - 73	13-Aug-23	0	1,278,952	1,429,616	1,683,688	112,360	1,800	4,506,416
A76 - 74	13-Aug-23	200	1,537,376	934,120	1,567,944	40,920	2,600	4,083,160
A76 - 75	9-Sep-23	0	272,992	466,960	1,531,992	1,200	200	2,273,344
A76 - 76	9-Sep-23	0	165,832	581,904	1,683,656	1,600	400	2,433,392
Percent Density or Biomass		***<0.1***	***16***	***49***	***33***	***2.1***	***<0.1***	
Lake DS1								
DS1 - 69	1-Jul-23	0	45,904	3,114,672	98,408	22,752	800	3,282,536
DS1 - 70	1-Jul-23	0	9,784	2,541,752	199,768	66,656	5,000	2,822,960
DS1 - 71	17-Aug-23	0	603,656	727,984	236,688	25,768	7,600	1,601,696
DS1 - 72	17-Aug-23	200	387,936	1,573,696	97,592	105,008	9,600	2,174,032
DS1 - 73	9-Sep-23	0	166,032	1,253,016	166,048	36,136	2,200	1,623,432
DS1 - 74	9-Sep-23	0	35,920	1,258,400	56,888	46,320	2,000	1,399,528
Percent Density or Biomass		***<0.1***	***9.7***	***81***	***6.6***	***2.3***	***0.21***	
All Locations Relative Density or Biomass (%)		***<0.1***	***12***	***45***	***40***	***2.6***	***<0.1***	

Figure D2-1. Cyanophyte biomass (mg/m^3) from Whale Tail study area lakes since 2015.

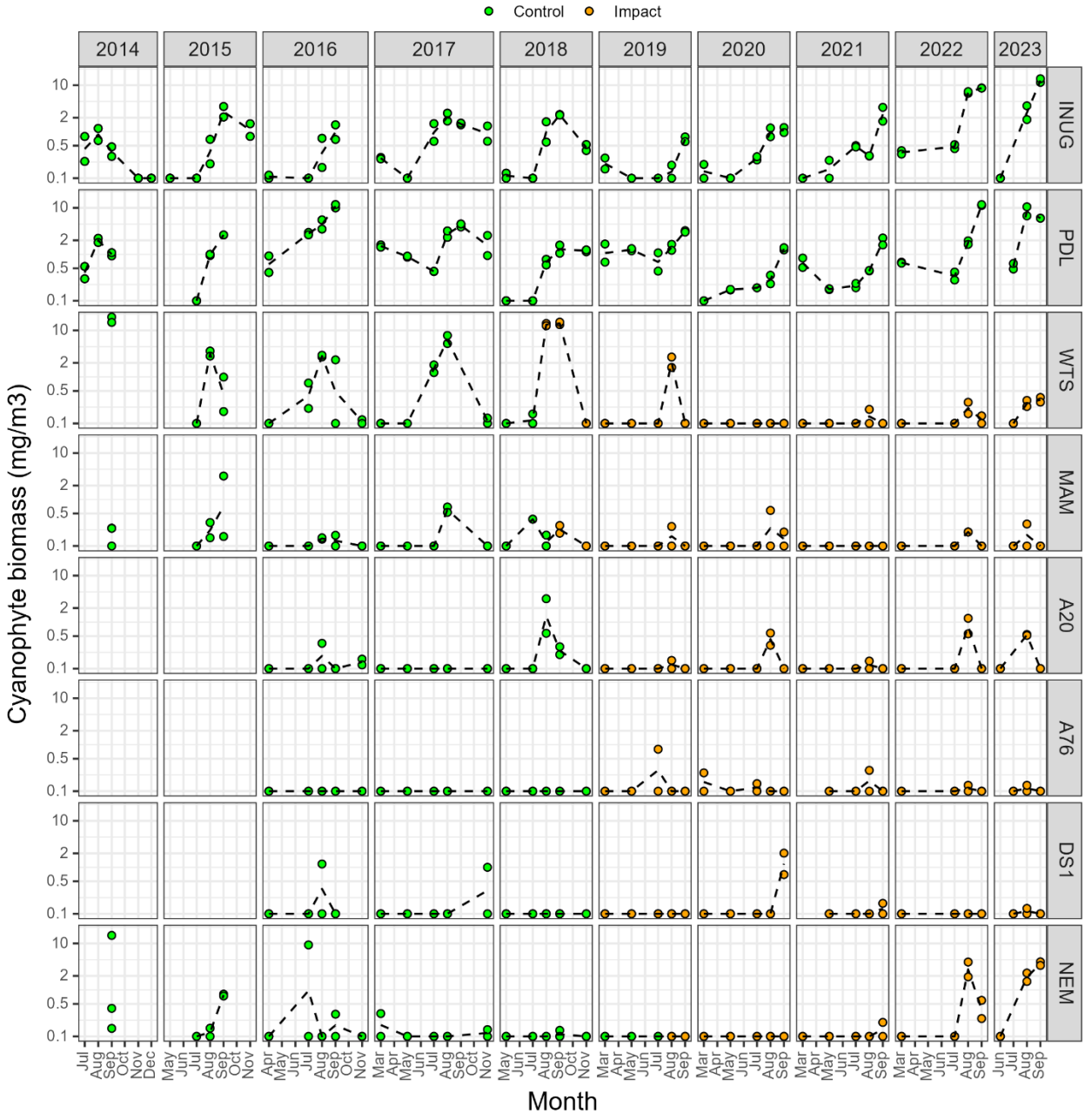


Figure D2-2. Chlorophyte biomass (mg/m^3) from Whale Tail study area lakes since 2015.

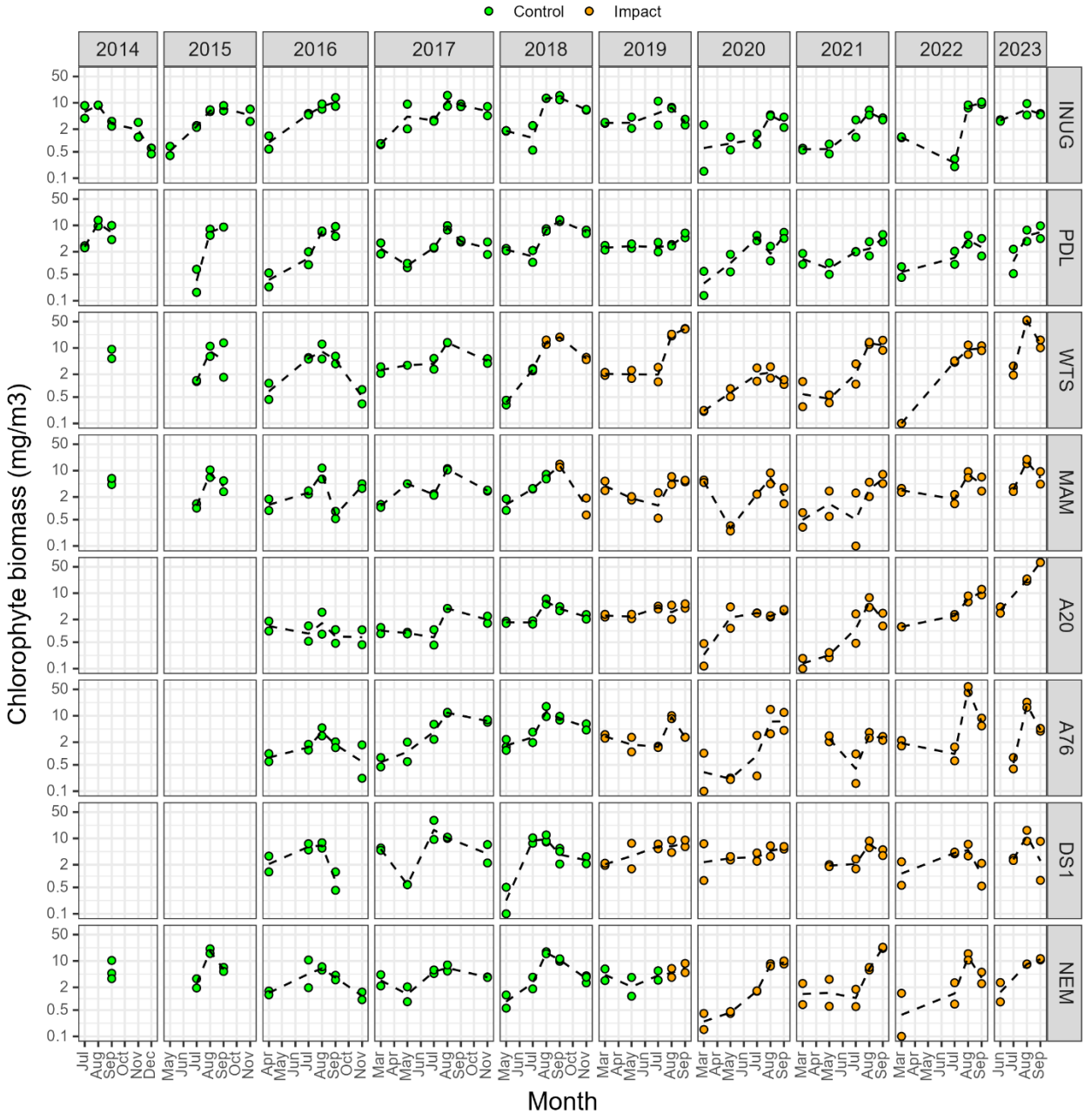


Figure D2-3. Chrysophyte biomass (mg/m^3) from Whale Tail study area lakes since 2015.

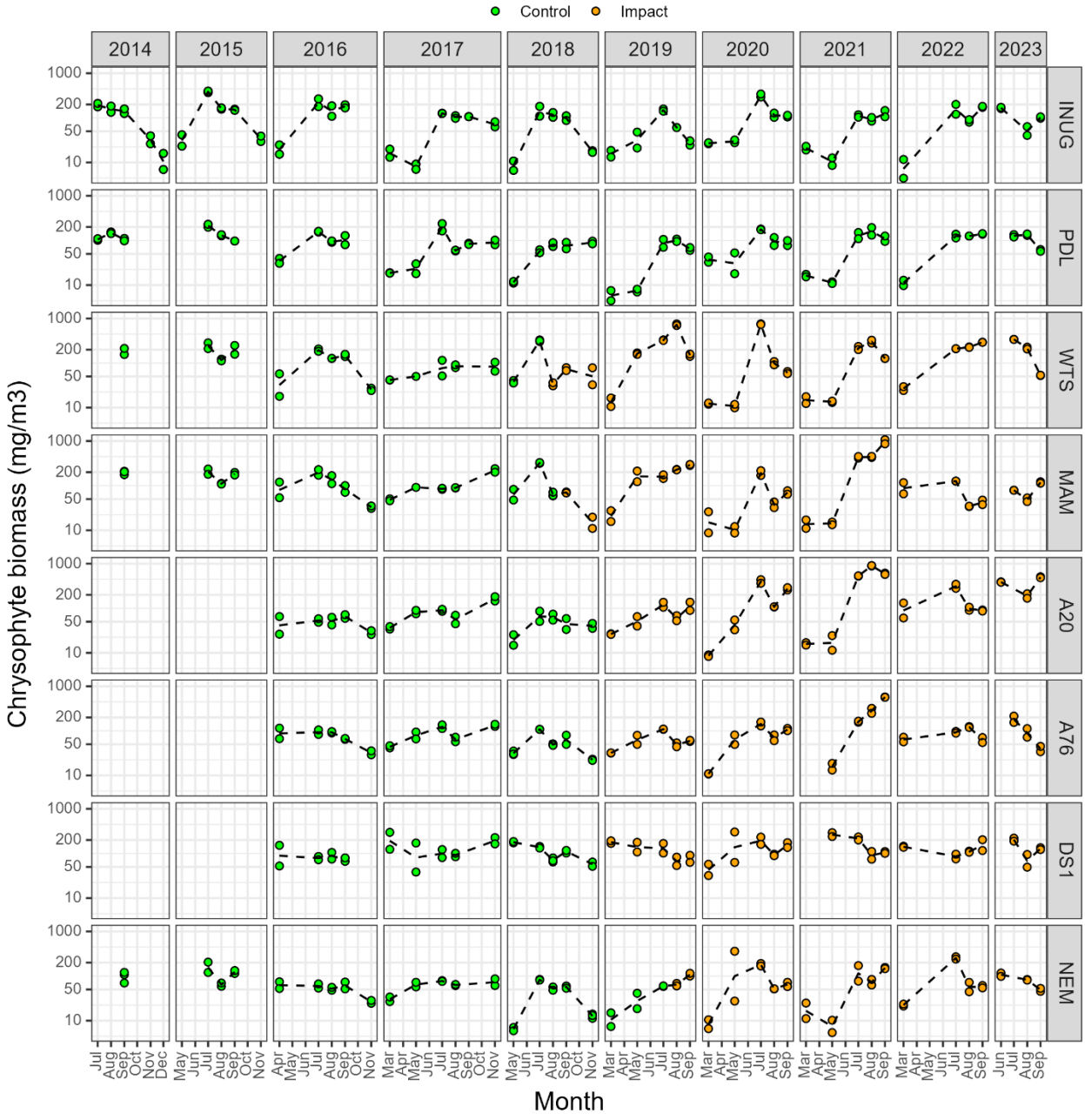


Figure D2-4. Diatoms biomass (mg/m^3) from Whale Tail study area lakes since 2015.

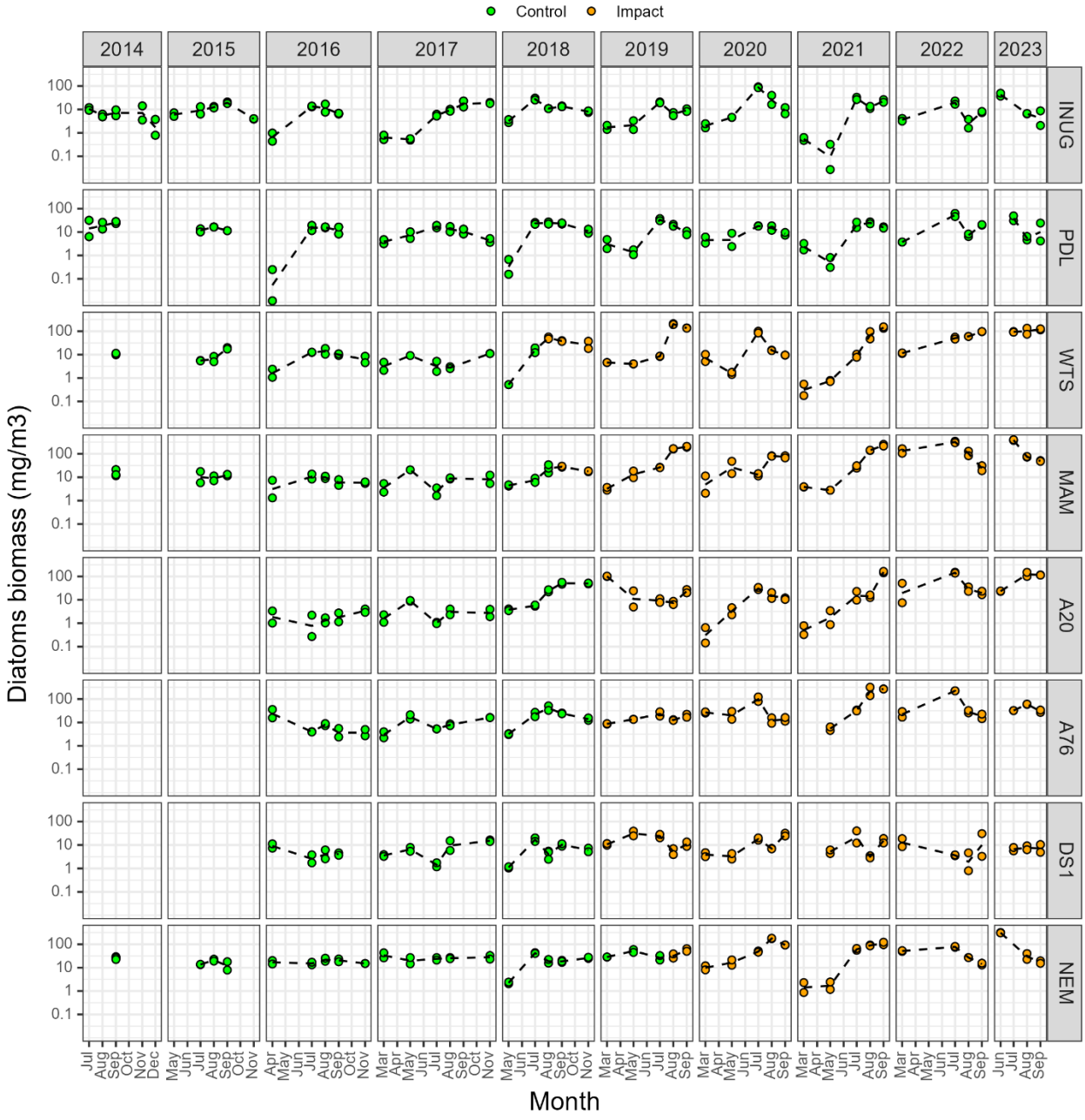


Figure D2-5. Cryptophytes biomass (mg/m^3) from Whale Tail study area lakes since 2015.

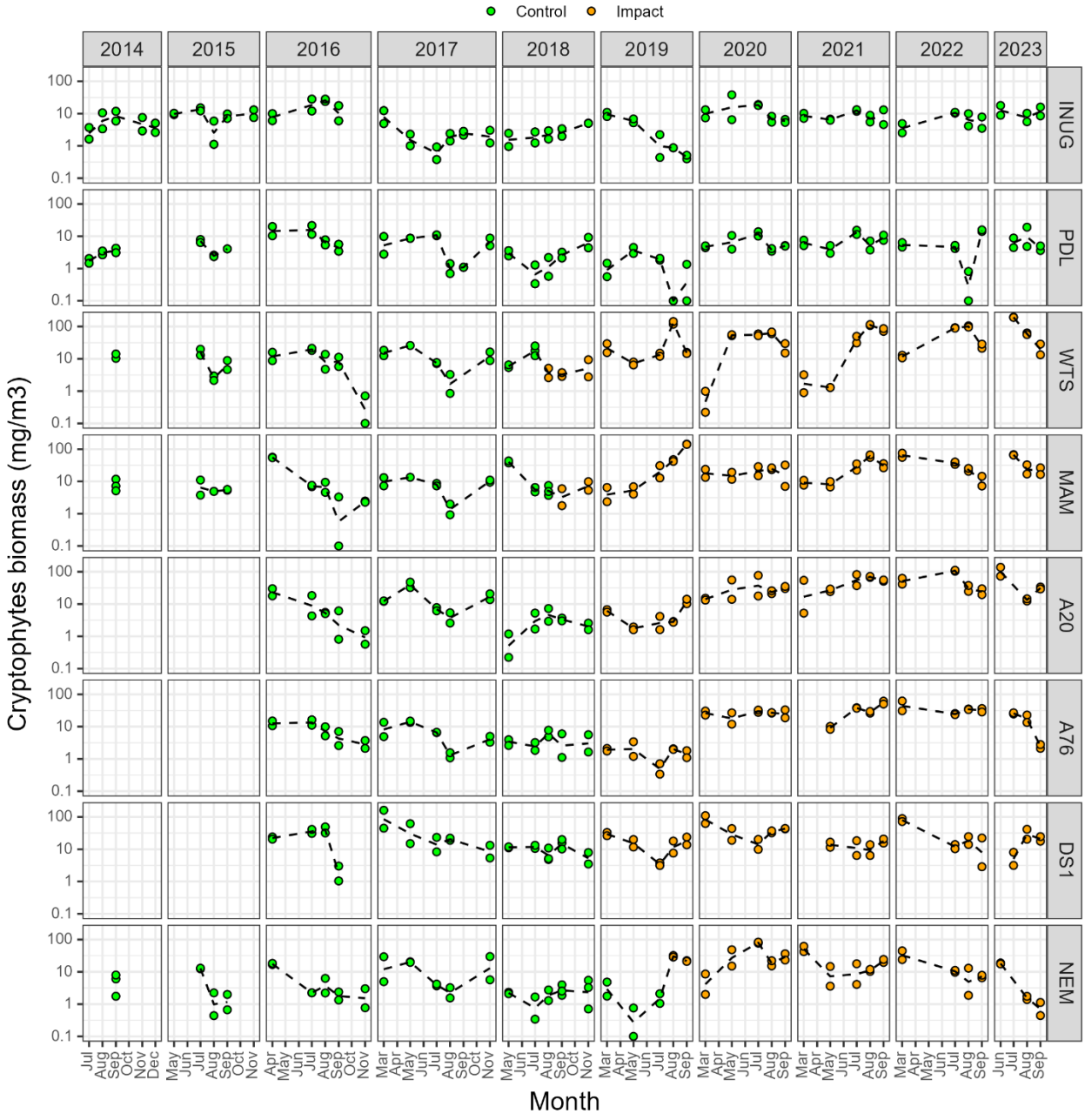


Figure D2-6. Dinoflagellates biomass (mg/m^3) from Whale Tail study area lakes since 2015.

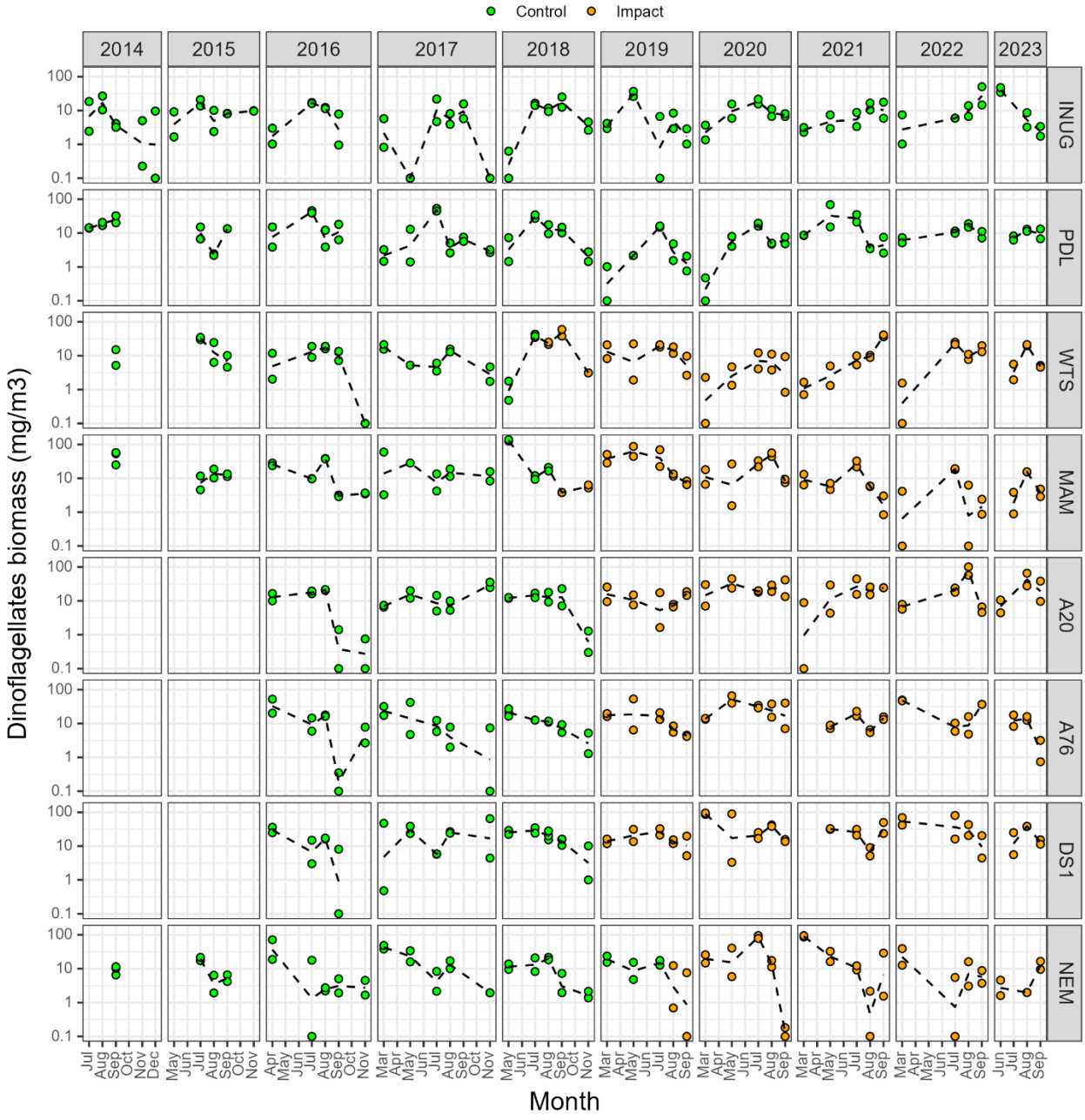


Figure D2-7. Phytoplankton density (cells/L) by major taxa group from Whale Tail study area lakes since 2015.

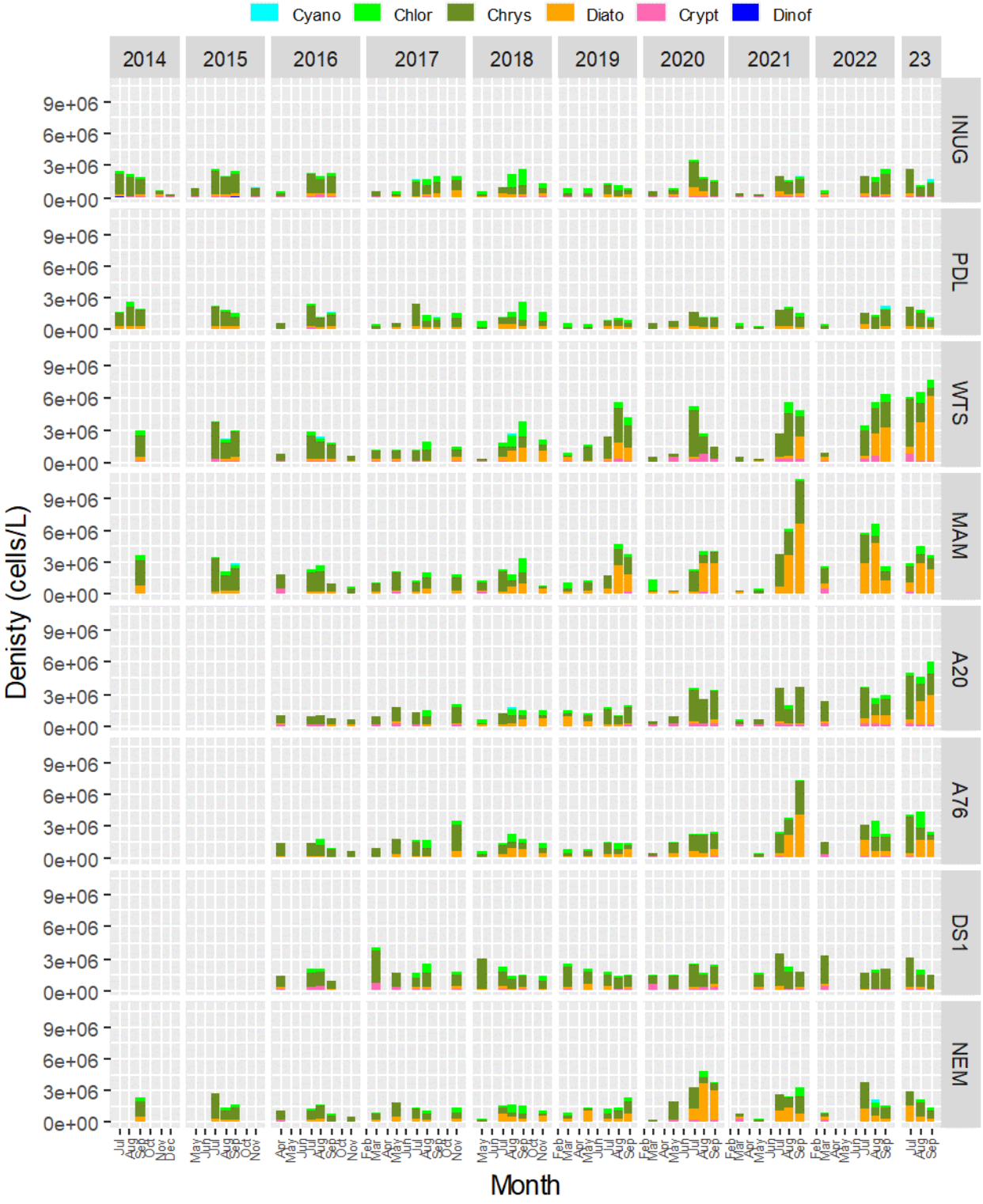


Figure D2-8. Relative phytoplankton density from Whale Tail study area lakes since 2015.

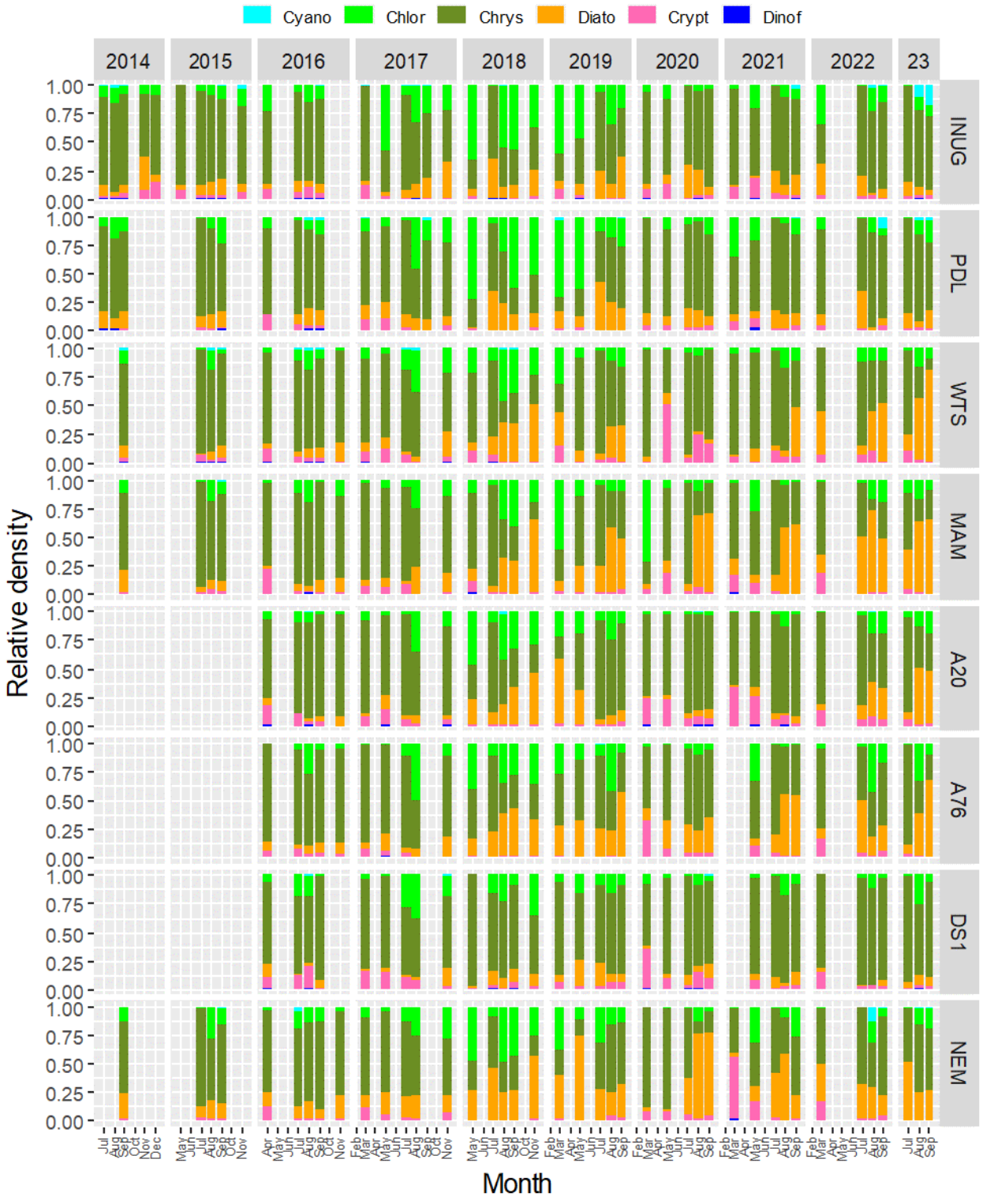


Figure D2-9. Cyanophyte density (cells/L) from Whale Tail study area lakes since 2015.

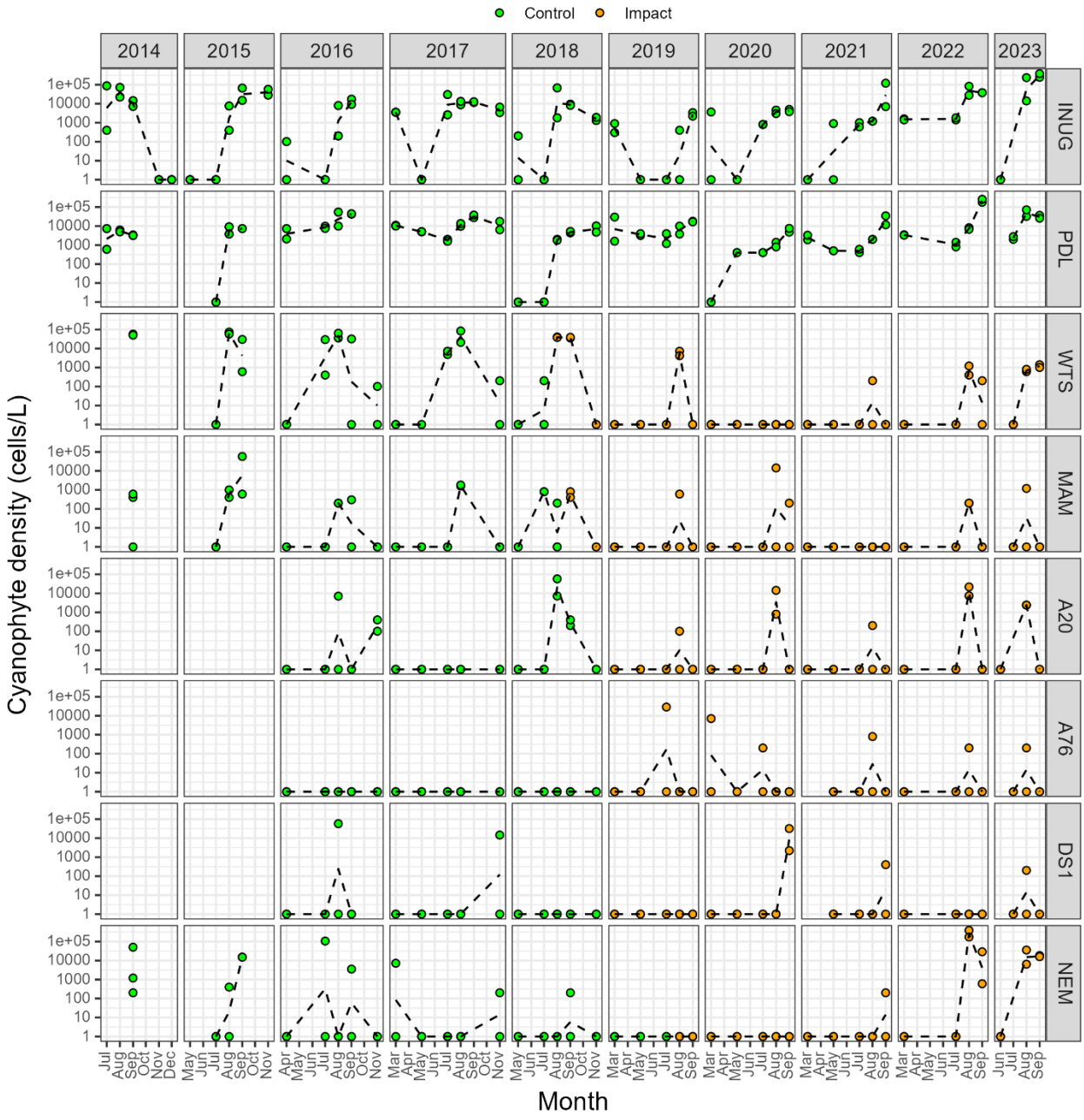


Figure D2-10. Chlorophyte density (cells/L) from Whale Tail study area lakes since 2015.

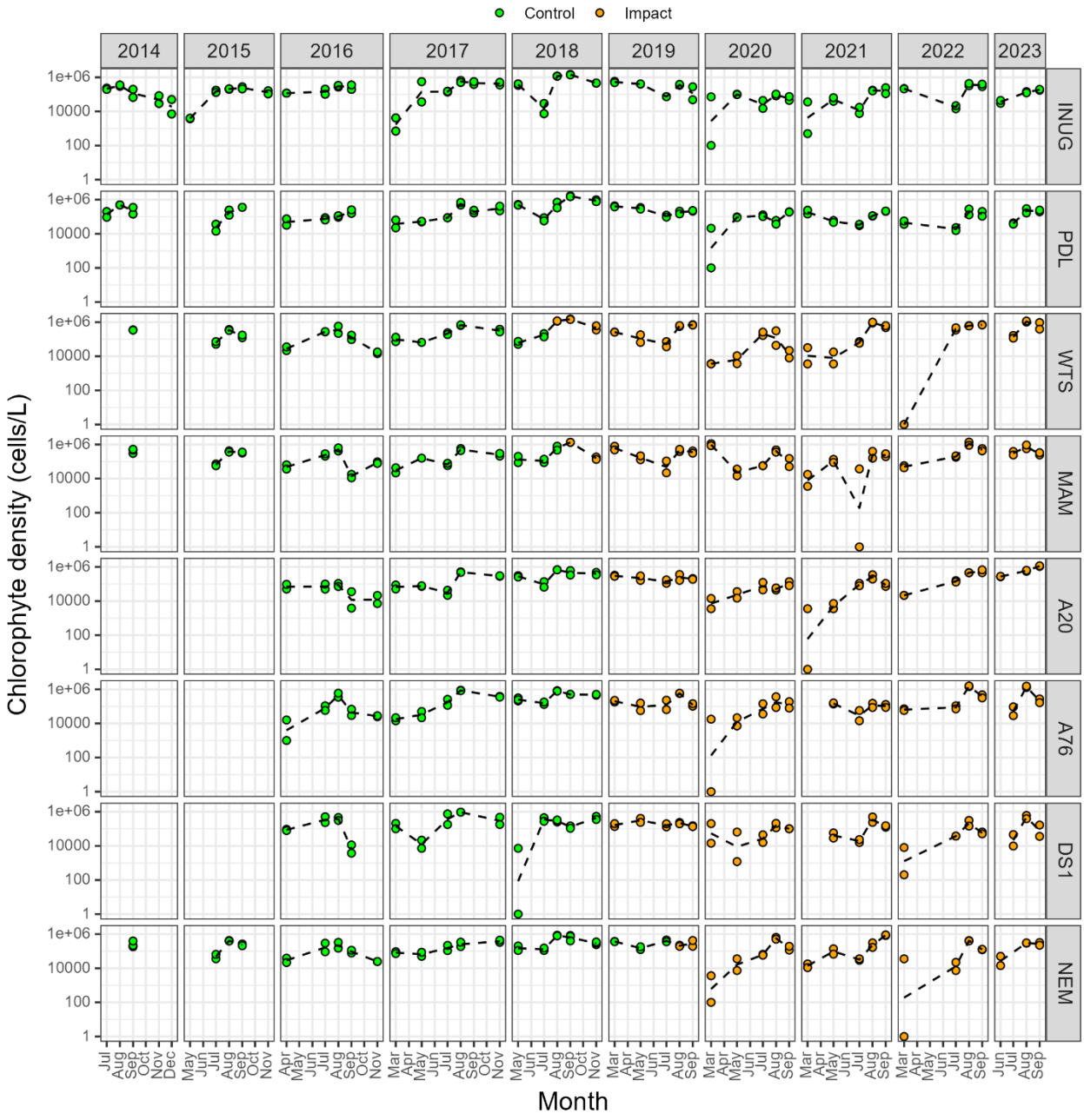


Figure D2-11. Chrysophyte density (cells/L) from Whale Tail study area lakes since 2015.

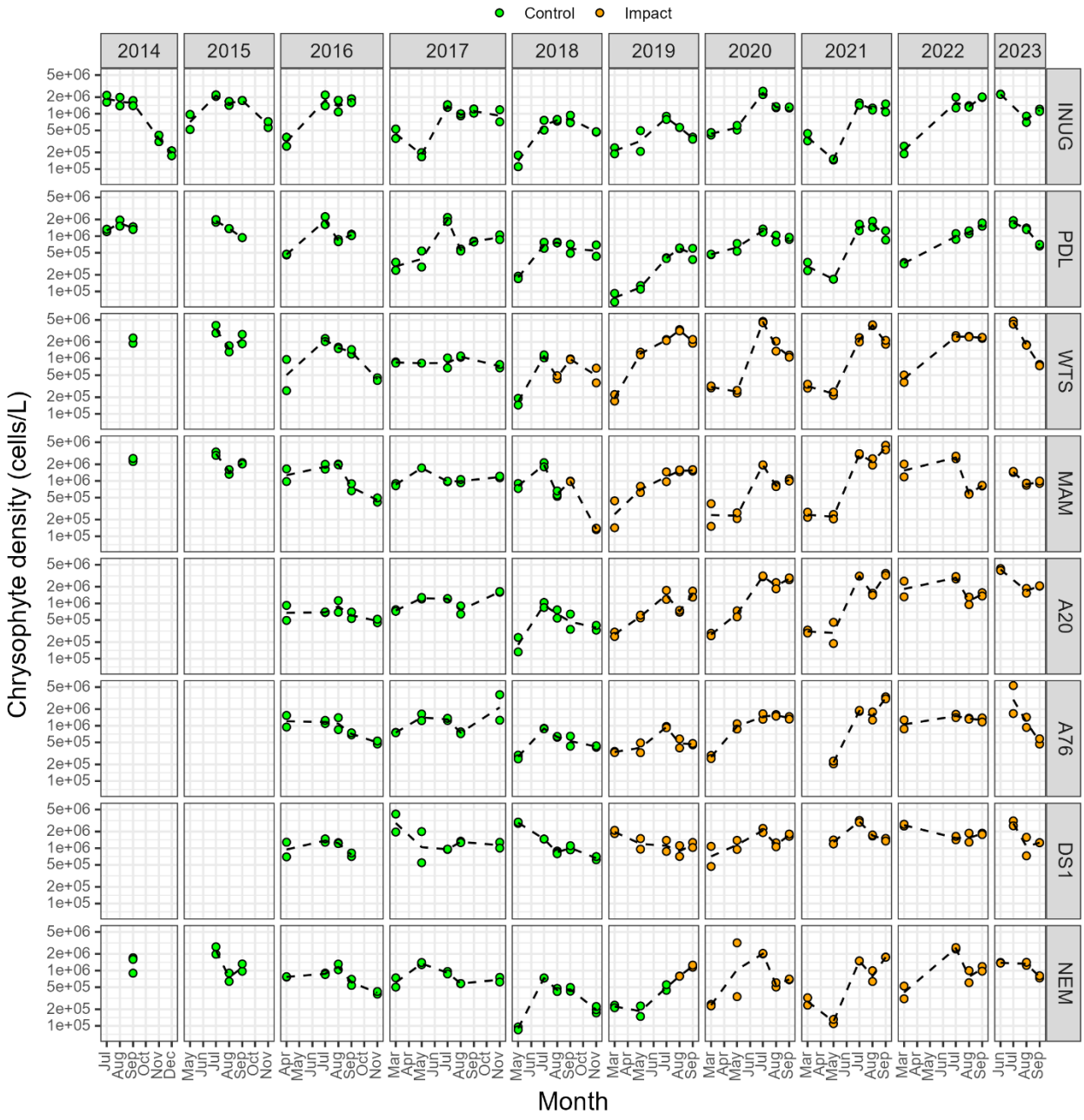


Figure D2-12. Diatoms density (cells/L) from Whale Tail study area lakes since 2015.

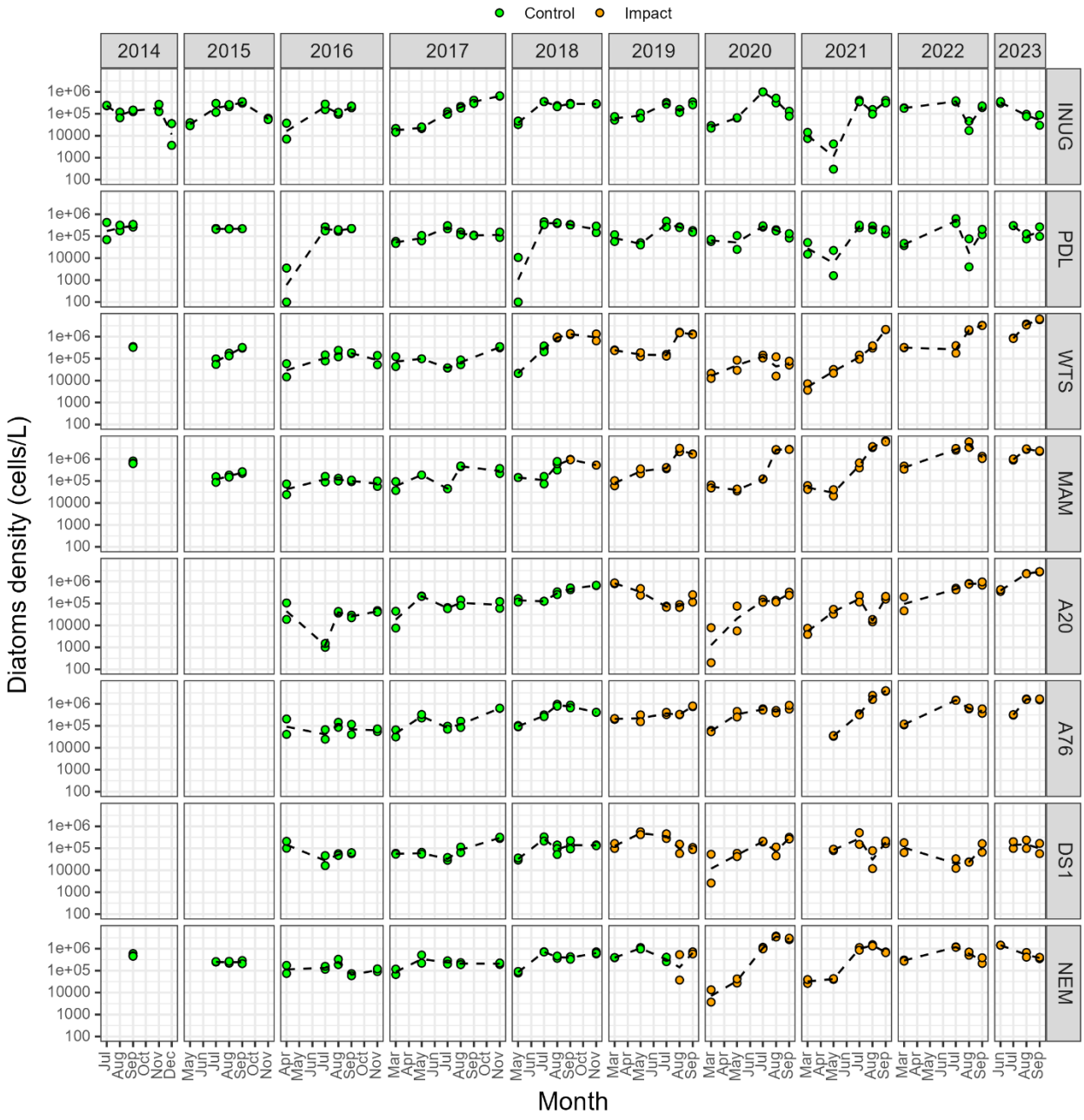


Figure D2-13. Cryptophytes density (cells/L) from Whale Tail study area lakes since 2015.

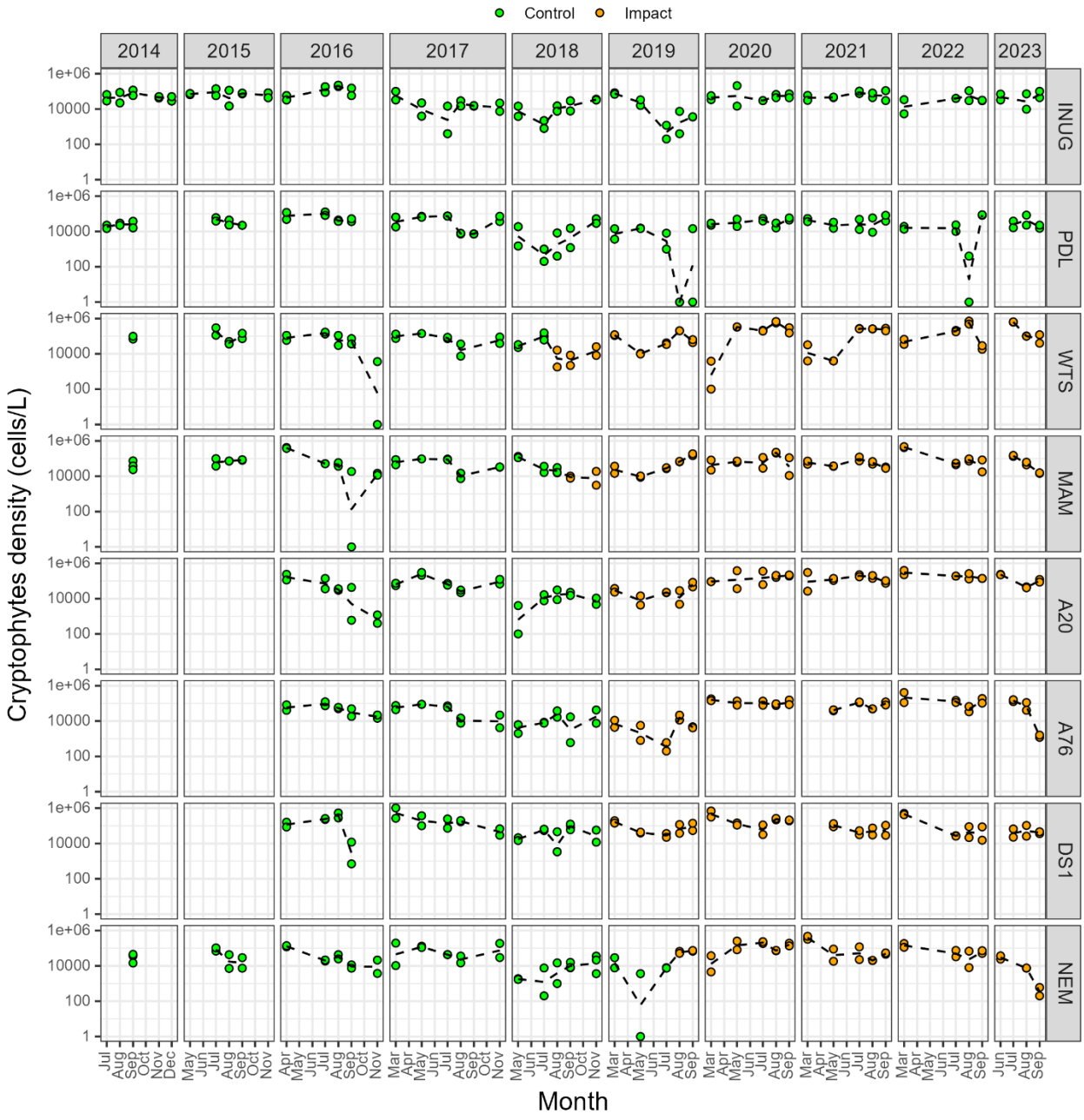


Figure D2-14. Dinoflagellates density (cells/L) from Whale Tail study area lakes since 2015.

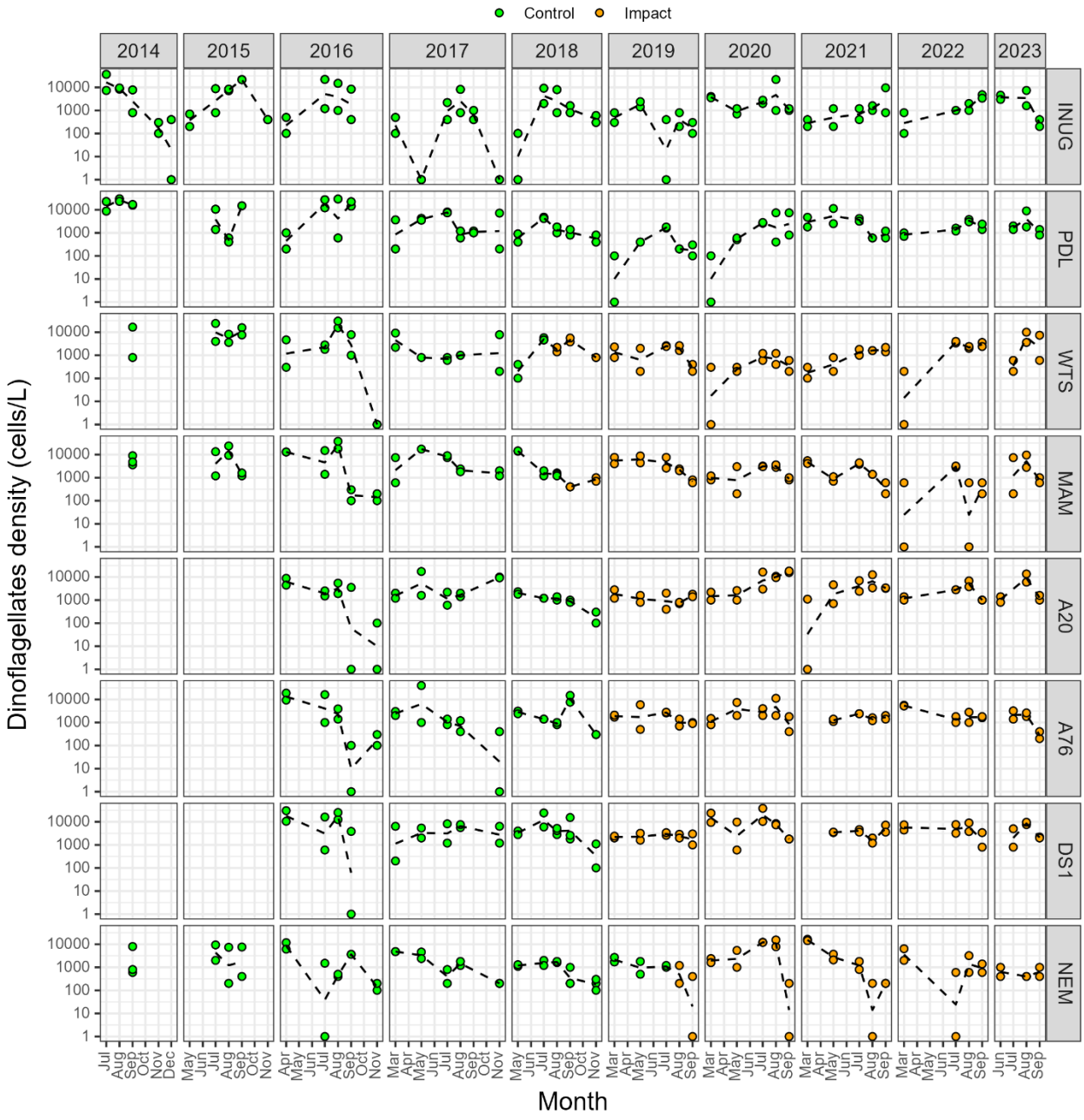
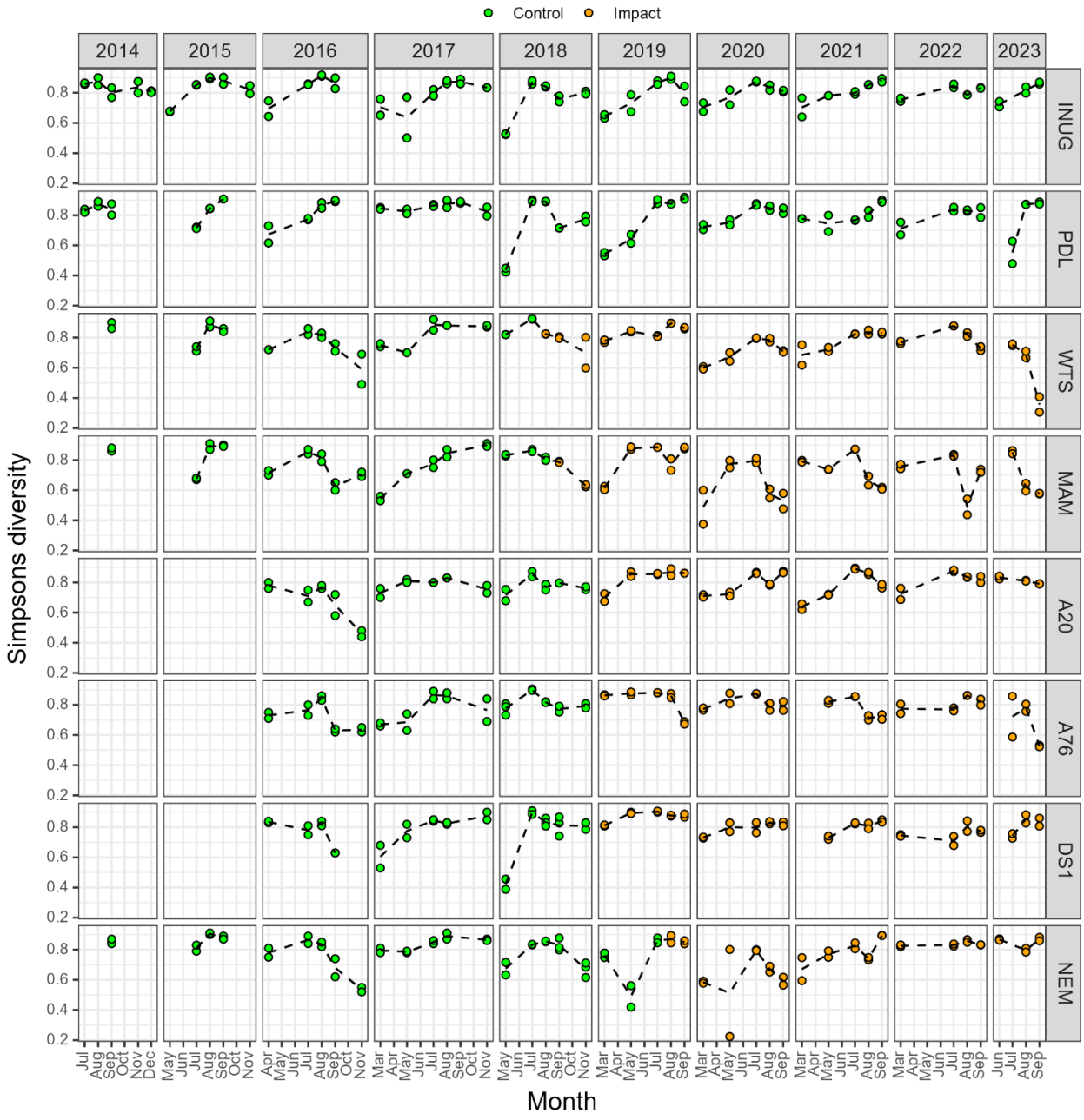


Figure D2-15. Simpsons' Diversity for the phytoplankton community from Whale Tail study area lakes since 2015.



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, 2023.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	TOTAL		
Baker Akilahaarjuk Point										
BAP - 85	4-Jul-23	0	2	59	20	33	22	136	23	0.77
BAP - 86	4-Jul-23	0	0	60	13	36	22	131	24	0.81
BAP - 87	17-Aug-23	1	4	40	7	19	8	79	27	0.85
BAP - 88	17-Aug-23	0	4	42	13	17	2	78	23	0.89
BAP - 89	8-Sep-23	0	3	23	8	13	1	49	20	0.78
BAP - 90	8-Sep-23	0	6	19	7	25	1	59	24	0.85
Percent Density or Biomass		***0.26***	***3.6***	***46***	***13***	***27***	***10***			
Baker Barge Dock										
BBD - 85	4-Jul-23	1	1	149	15	33	24	223	32	0.82
BBD - 86	4-Jul-23	0	2	149	15	35	25	227	29	0.83
BBD - 87	18-Aug-23	0	11	74	8	17	6	116	31	0.80
BBD - 88	18-Aug-23	0	5	100	12	19	1	137	31	0.84
BBD - 89	8-Sep-23	0	4	22	25	14	8	72	22	0.75
BBD - 90	8-Sep-23	0	3	48	23	45	6	126	24	0.77
Percent Density or Biomass		***<0.1***	***2.9***	***60***	***11***	***18***	***7.8***			
Baker Proposed Jetty										
BPJ - 85	4-Jul-23	0	1	99	3	32	18	153	22	0.80
BPJ - 86	4-Jul-23	0	0	80	7	44	21	153	23	0.77
BPJ - 87	18-Aug-23	0	7	59	19	17	8	110	30	0.73
BPJ - 88	18-Aug-23	0	1	131	6	11	6	156	27	0.73
BPJ - 89	8-Sep-23	0	3	44	14	31	7	99	24	0.79
BPJ - 90	8-Sep-23	0	6	28	13	8	4	58	25	0.79
Percent Density or Biomass		***<0.1***	***2.5***	***60***	***8.7***	***20***	***8.8***			
All Locations Relative Density or Biomass (%)		***<0.1***	***2.9***	***57***	***11***	***21***	***8.8***			

Table D3-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Baker Lake, 2023.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Baker Akilahaarjuk Point								
BAP - 85	4-Jul-23	0	7,384	1,064,432	45,720	146,096	3,400	1,267,032
BAP - 86	4-Jul-23	0	200	1,002,176	50,304	167,048	2,600	1,222,328
BAP - 87	17-Aug-23	7,184	244,256	826,760	78,904	144,480	8,184	1,309,768
BAP - 88	17-Aug-23	7,184	337,648	705,432	160,496	116,144	400	1,327,304
BAP - 89	8-Sep-23	0	165,232	567,536	59,888	66,256	200	859,112
BAP - 90	8-Sep-23	0	173,416	438,824	104,592	132,312	200	849,344
Percent Density or Biomass		***0.21***	***14***	***67***	***7.3***	***11***	***0.22***	
Baker Barge Dock								
BBD - 85	4-Jul-23	7,184	35,920	1,971,616	207,952	157,664	3,800	2,384,136
BBD - 86	4-Jul-23	0	21,552	1,800,000	178,016	178,816	3,200	2,181,584
BBD - 87	18-Aug-23	0	411,488	1,638,552	63,472	188,184	7,784	2,309,480
BBD - 88	18-Aug-23	0	266,808	1,609,416	86,224	223,304	200	2,185,952
BBD - 89	8-Sep-23	0	64,856	704,232	176,264	66,656	1,200	1,013,208
BBD - 90	8-Sep-23	0	79,224	1,128,088	52,936	275,192	1,200	1,536,640
Percent Density or Biomass		***<0.1***	***7.6***	***76***	***6.6***	***9.4***	***0.15***	
Baker Proposed Jetty								
BPJ - 85	4-Jul-23	0	7,184	1,209,712	40,136	78,056	9,184	1,344,272
BPJ - 86	4-Jul-23	0	7,184	1,511,840	150,680	245,272	2,800	1,917,776
BPJ - 87	18-Aug-23	0	251,840	1,703,408	152,680	102,976	8,384	2,219,288
BPJ - 88	18-Aug-23	200	330,464	2,291,896	28,952	73,240	1,600	2,726,352
BPJ - 89	8-Sep-23	0	129,312	891,216	88,624	181,800	7,984	1,298,936
BPJ - 90	8-Sep-23	0	151,064	747,336	66,872	43,904	400	1,009,576
Percent Density or Biomass		***<0.1***	***8.3***	***79***	***5.0***	***6.9***	***0.29***	
All Locations Relative Density or Biomass (%)		***<0.1***	***9.3***	***75***	***6.2***	***8.9***	***0.22***	

Figure D3-1. Cyanophyte biomass (mg/m^3) from Baker Lake since 2008.

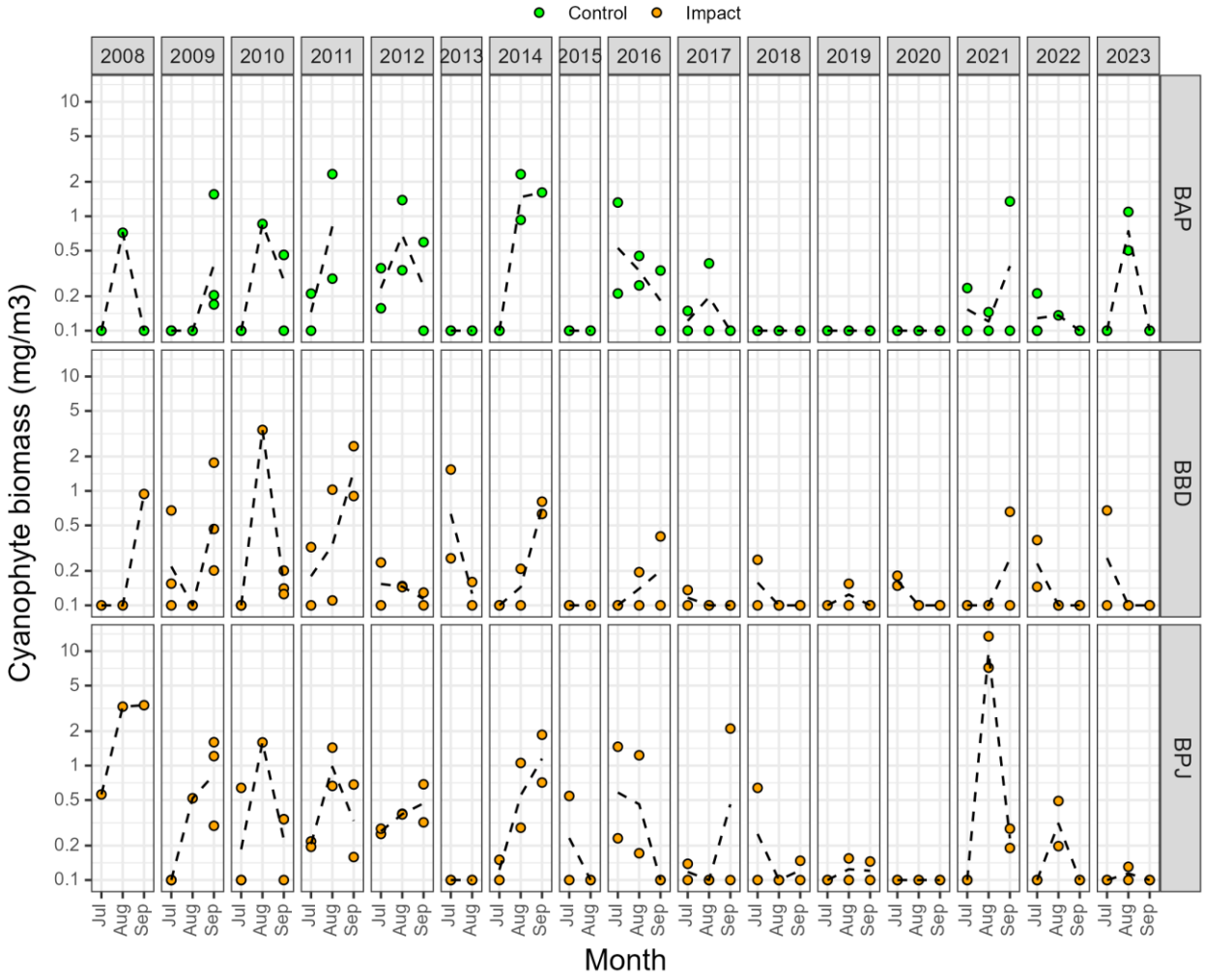


Figure D3-2. Chlorophyte biomass (mg/m^3) from Baker Lake since 2008.

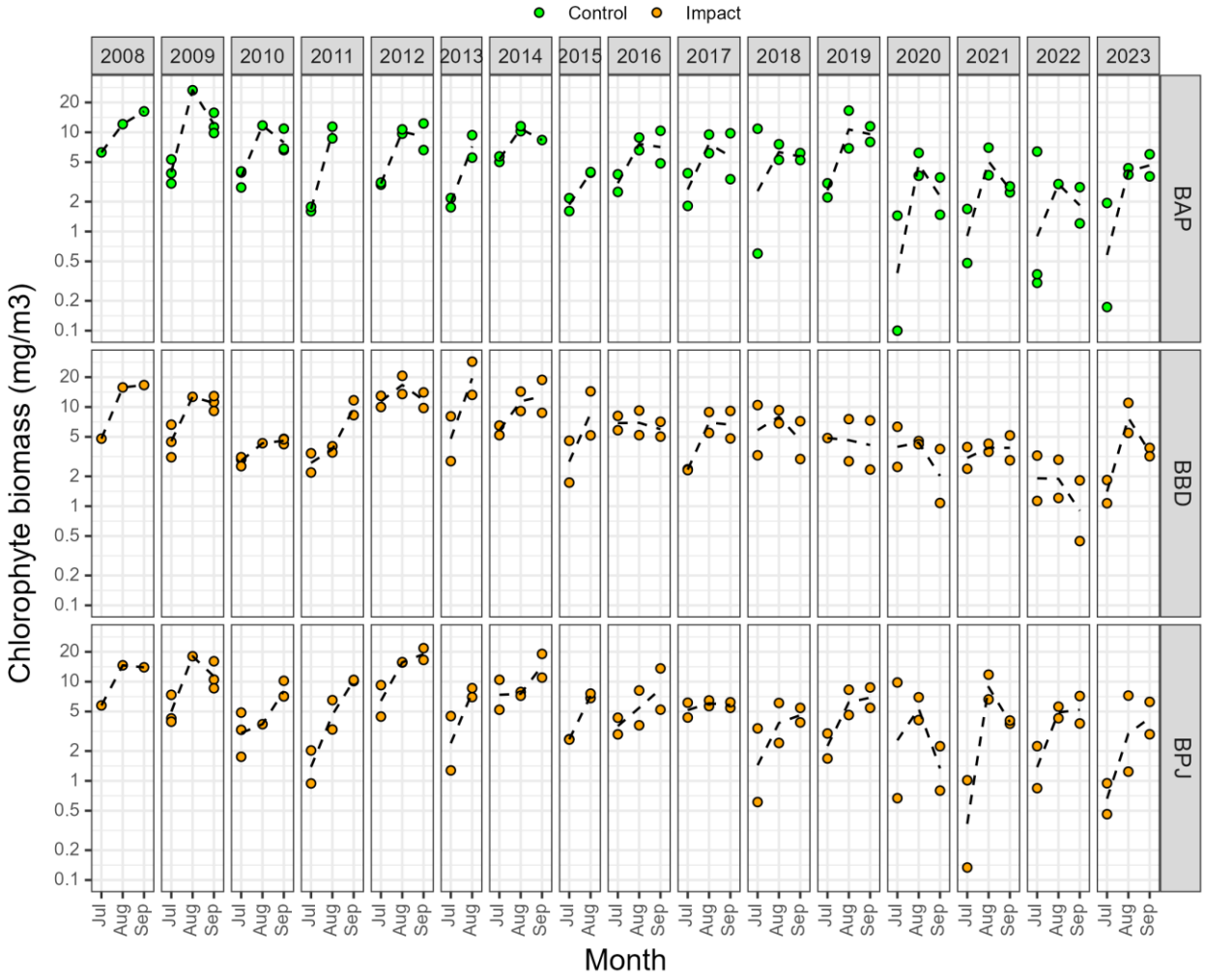


Figure D3-3. Chrysophyte biomass (mg/m^3) from Baker Lake since 2008.

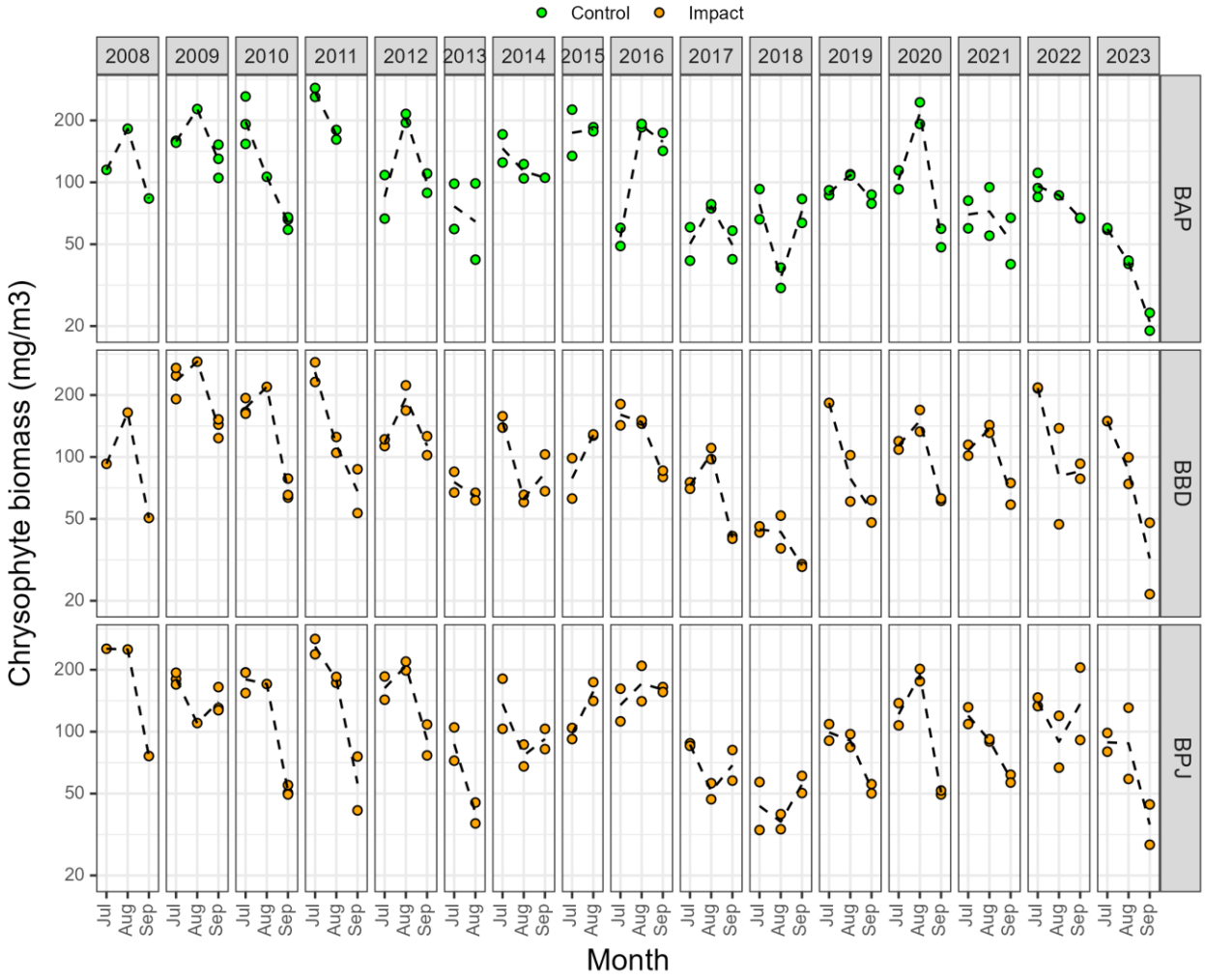


Figure D3-4. Diatoms biomass (mg/m^3) from Baker Lake since 2008.

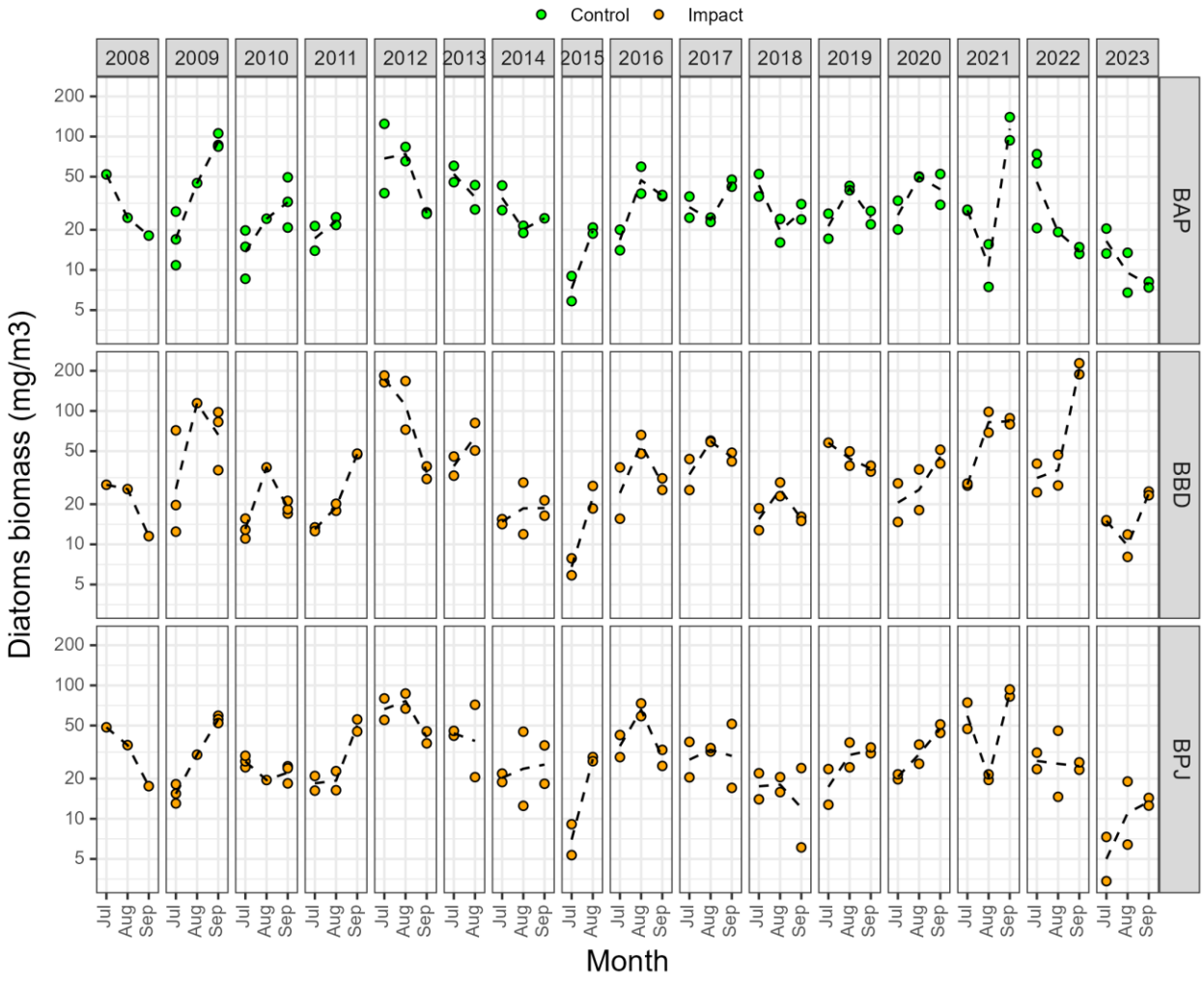


Figure D3-5. Cryptophytes biomass (mg/m^3) from Baker Lake since 2008.

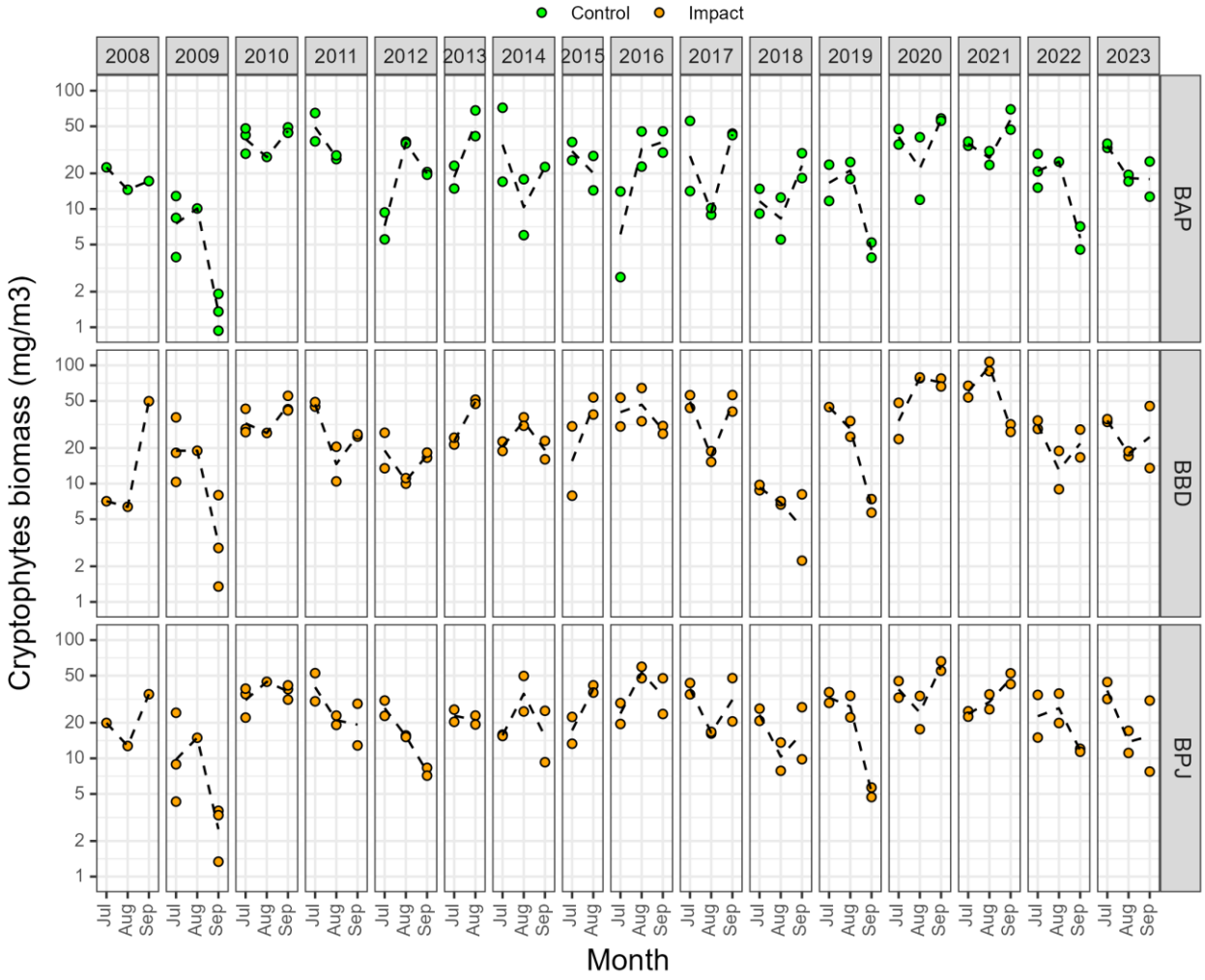


Figure D3-6. Dinoflagellates biomass (mg/m^3) from Baker Lake since 2008.

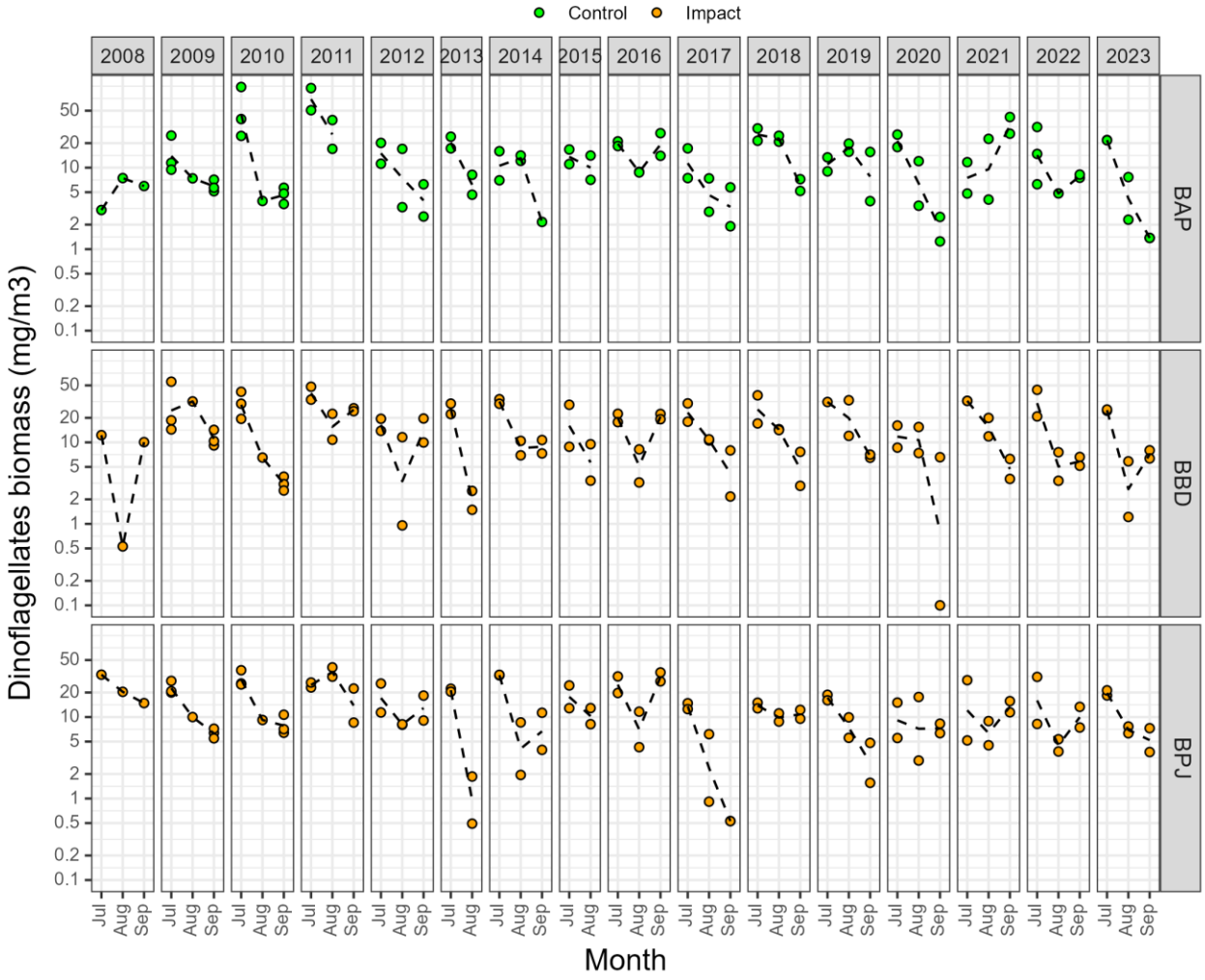


Figure D3-7. Phytoplankton density (cells/L) by major taxa group from Baker Lake since 2008.

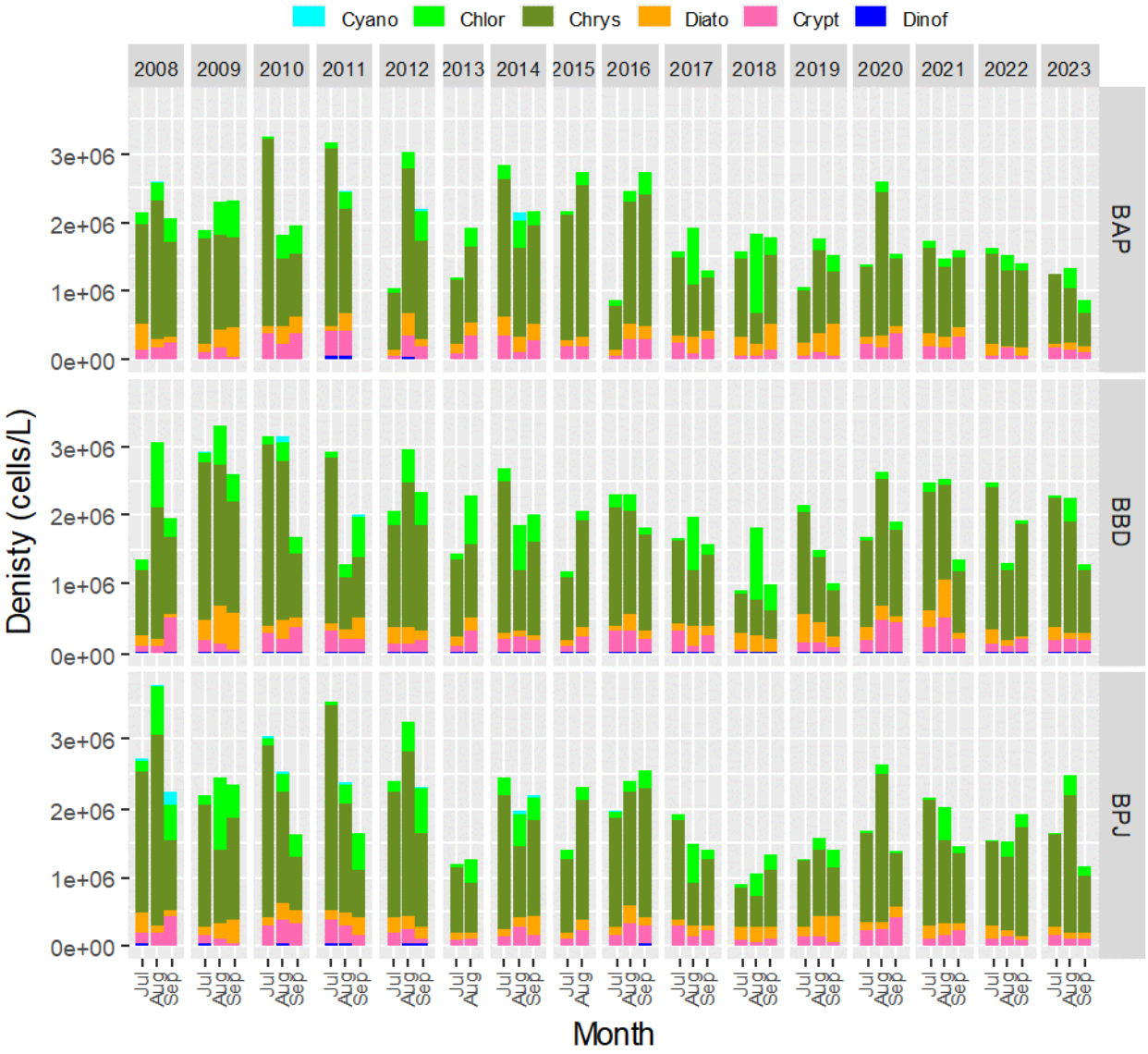


Figure D3-8. Relative phytoplankton density from Baker Lake since 2008.

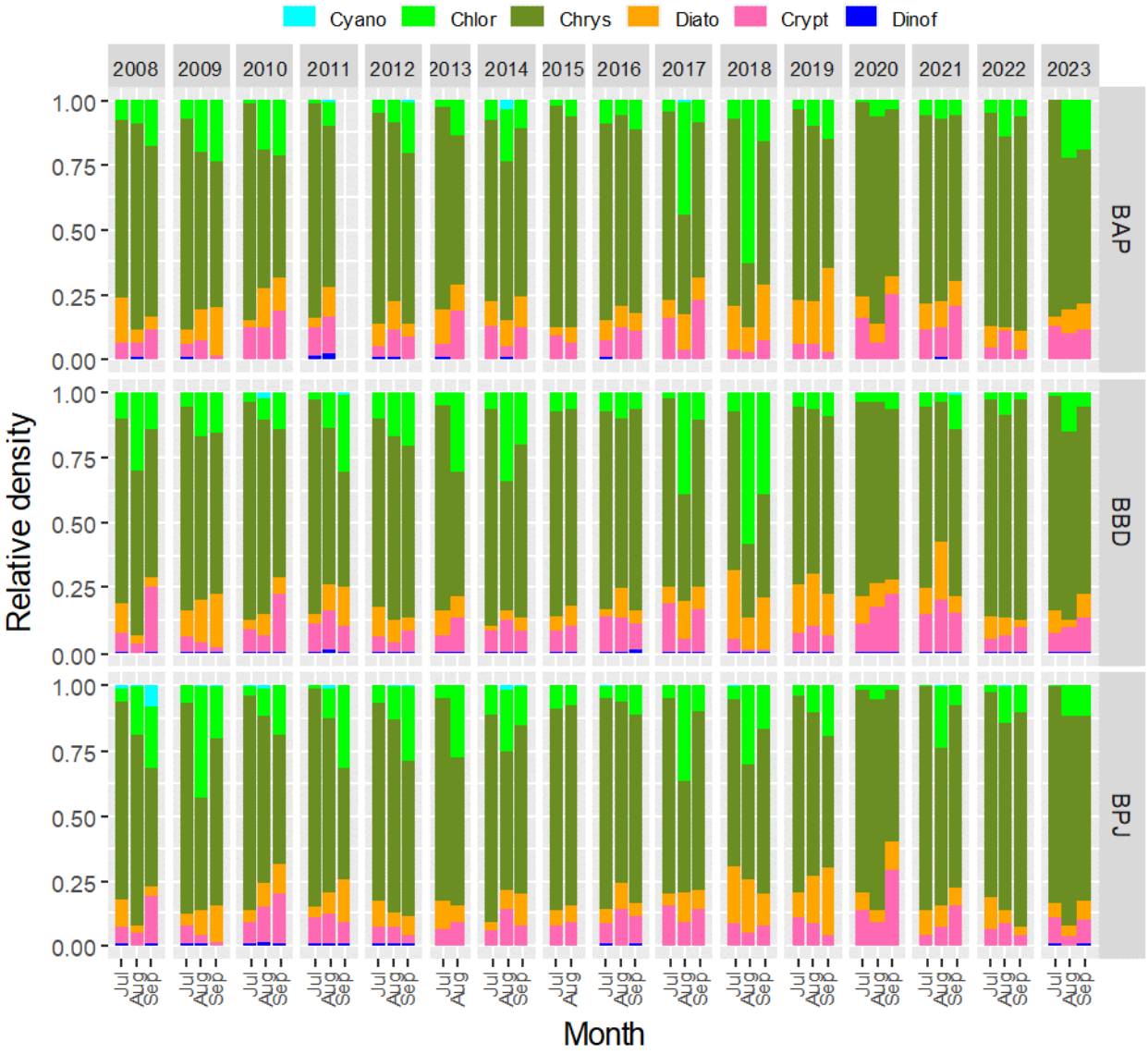


Figure D3-9. Cyanophyte density (cells/L) from Baker Lake since 2008.

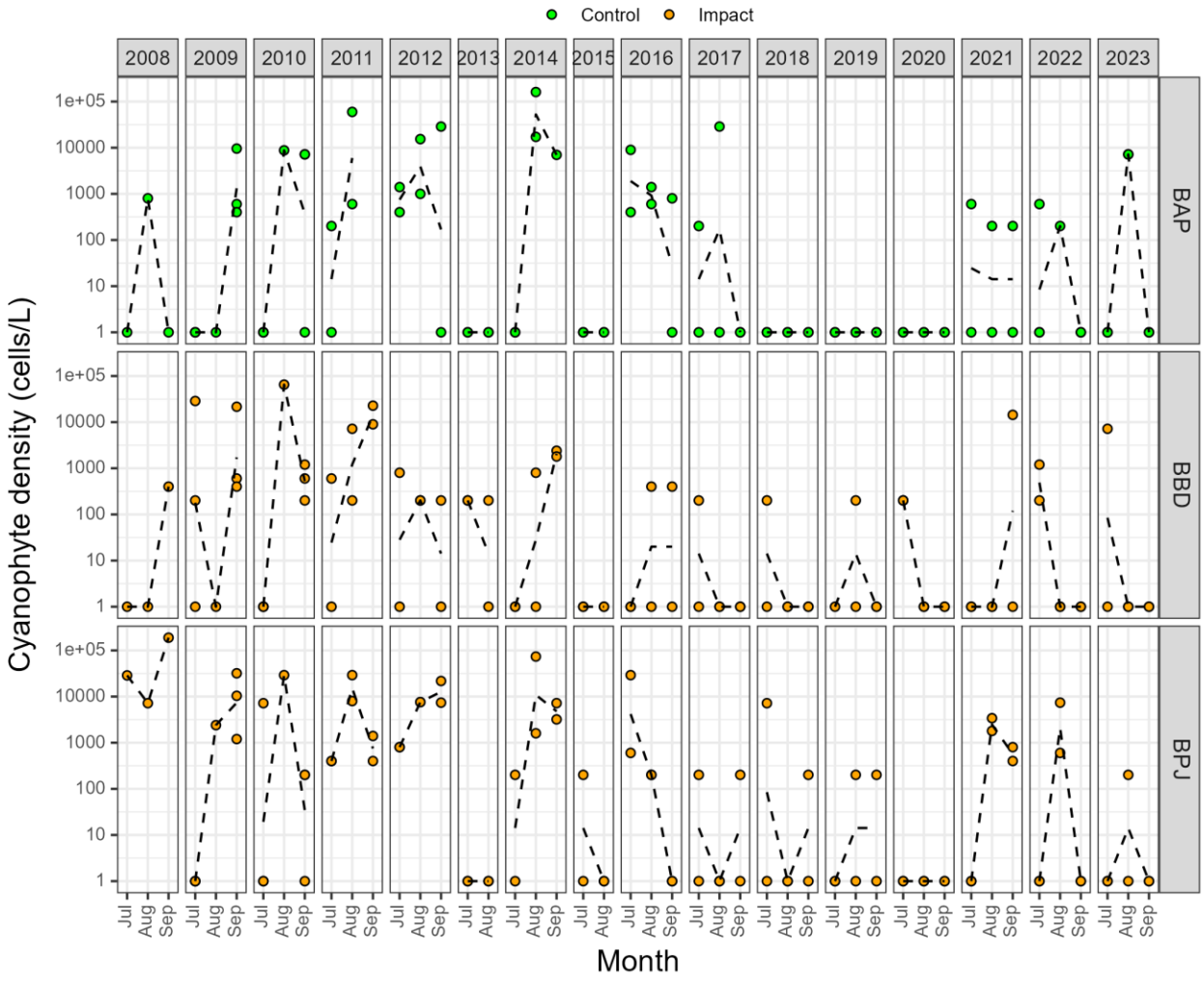


Figure D3-10. Chlorophyte density (cells/L) from Baker Lake since 2008.

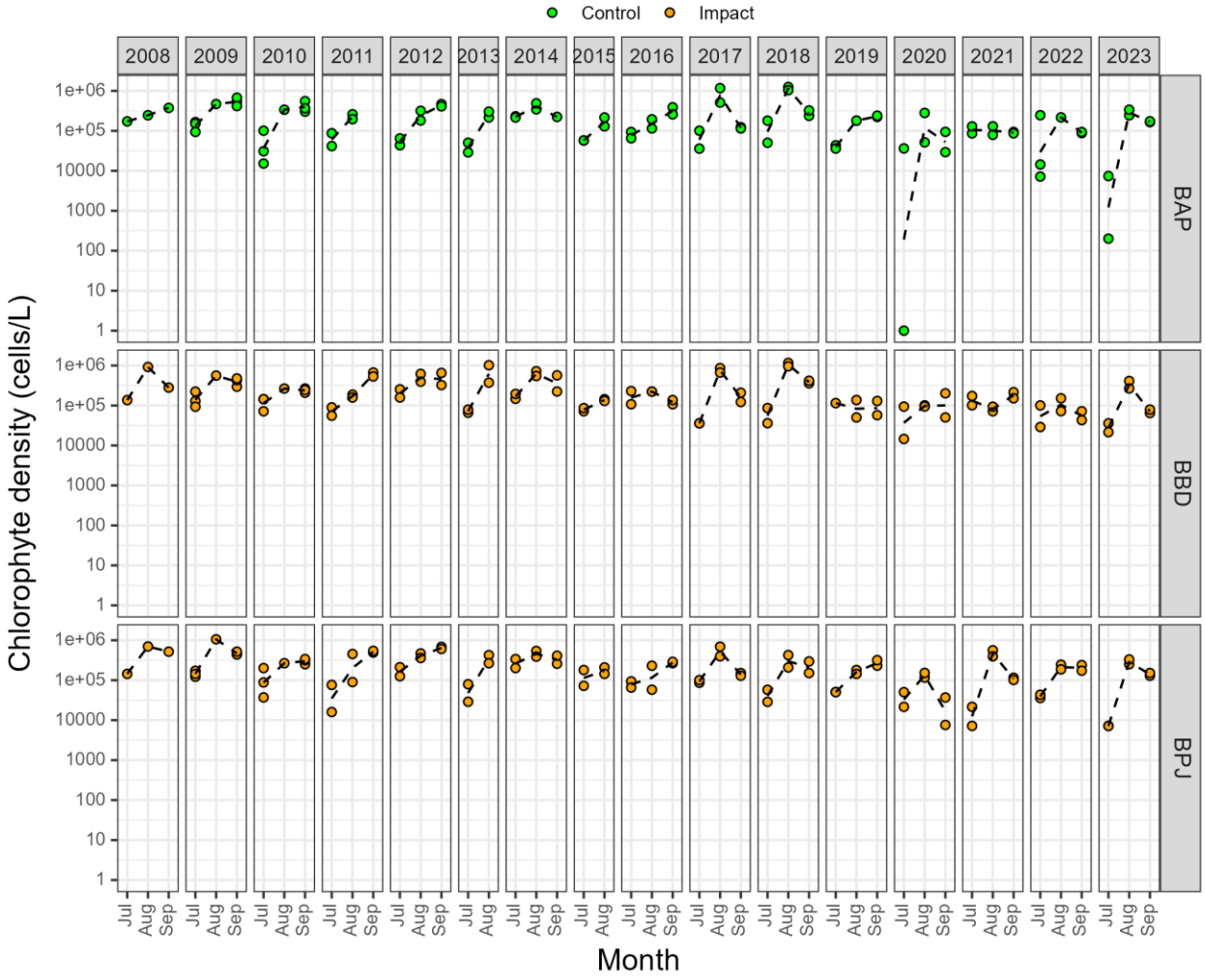


Figure D3-11. Chrysophyte density (cells/L) from Baker Lake since 2008.

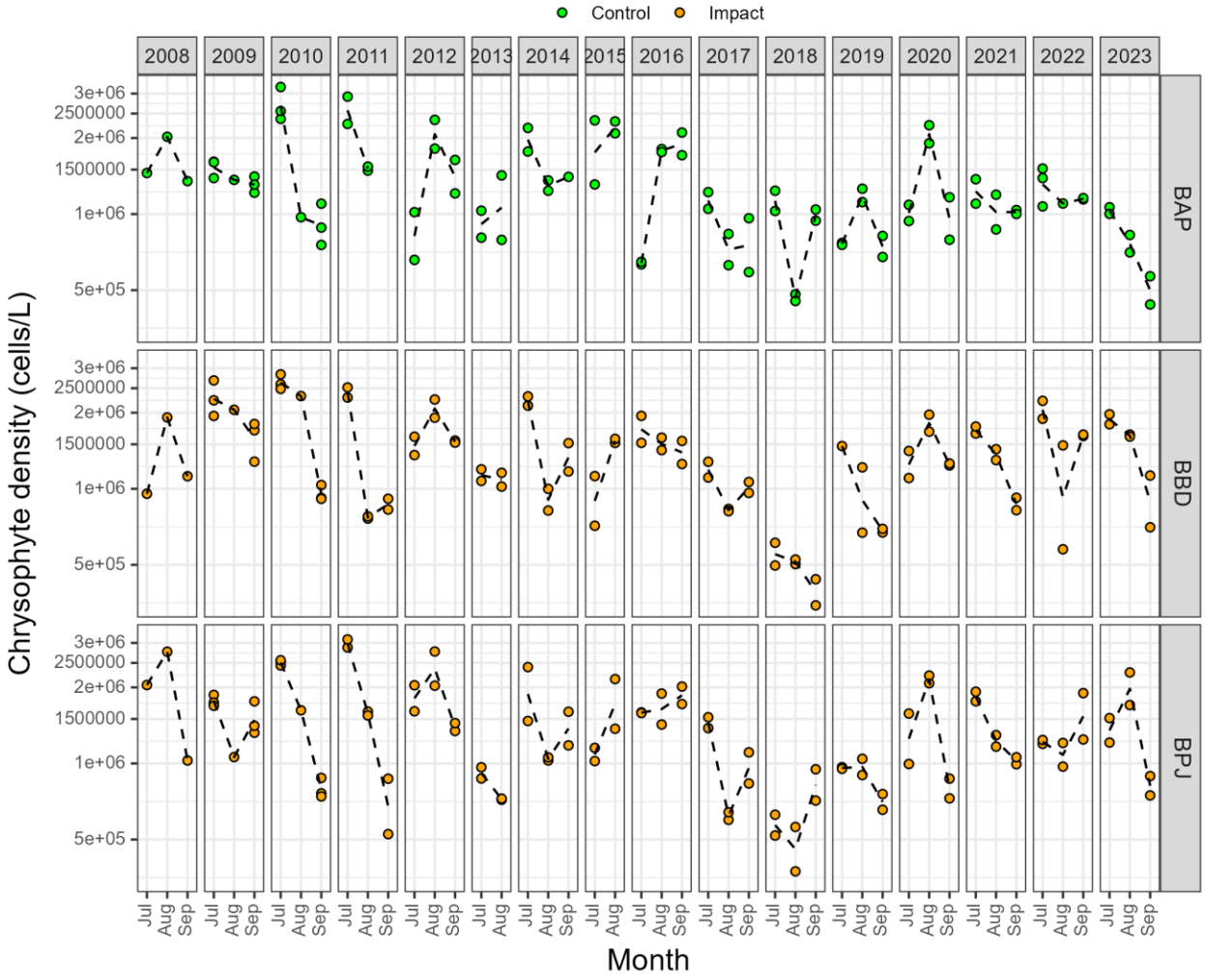


Figure D3-12. Diatoms density (cells/L) from Baker Lake since 2008.

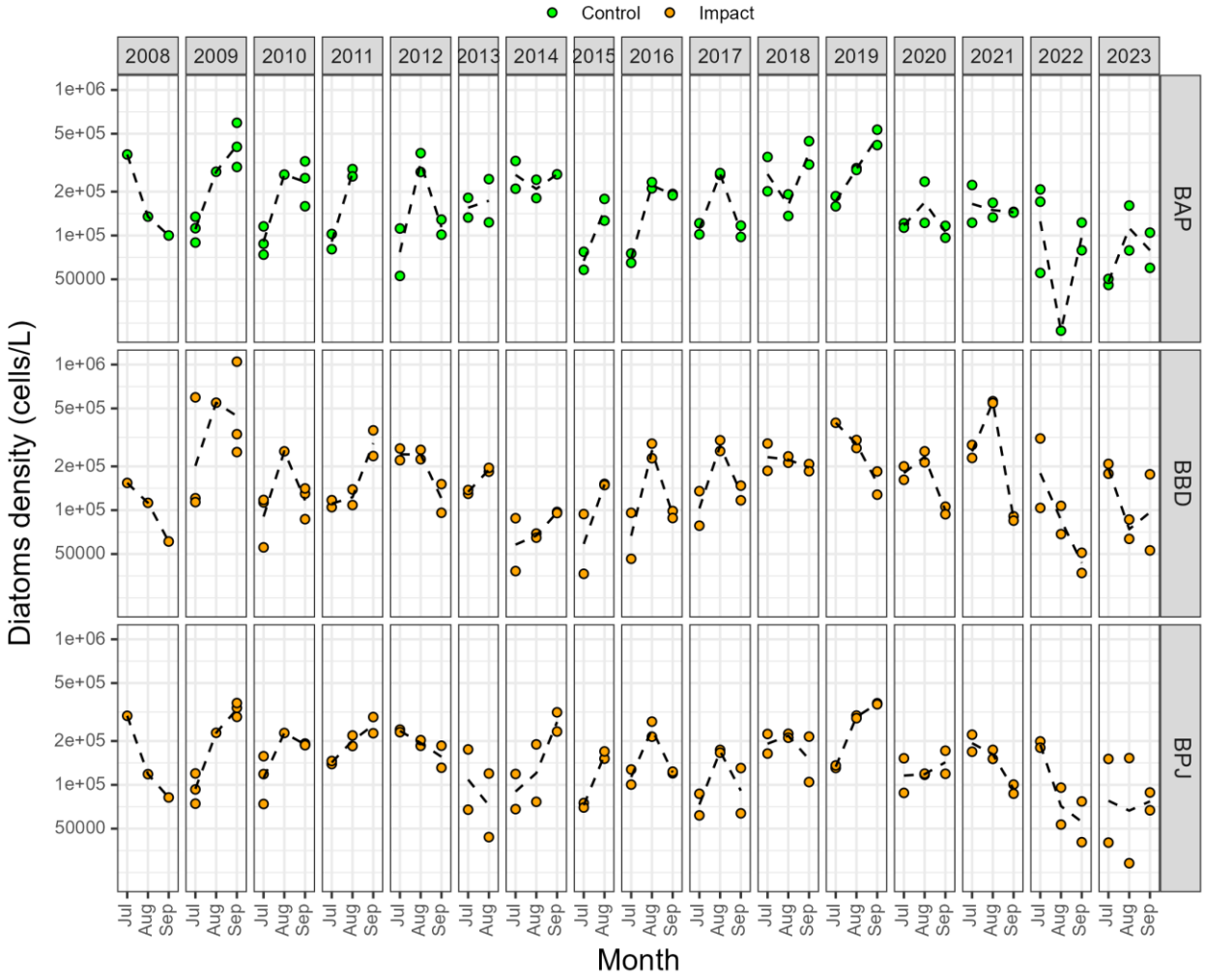


Figure D3-13. Cryptophytes density (cells/L) from Baker Lake since 2008.

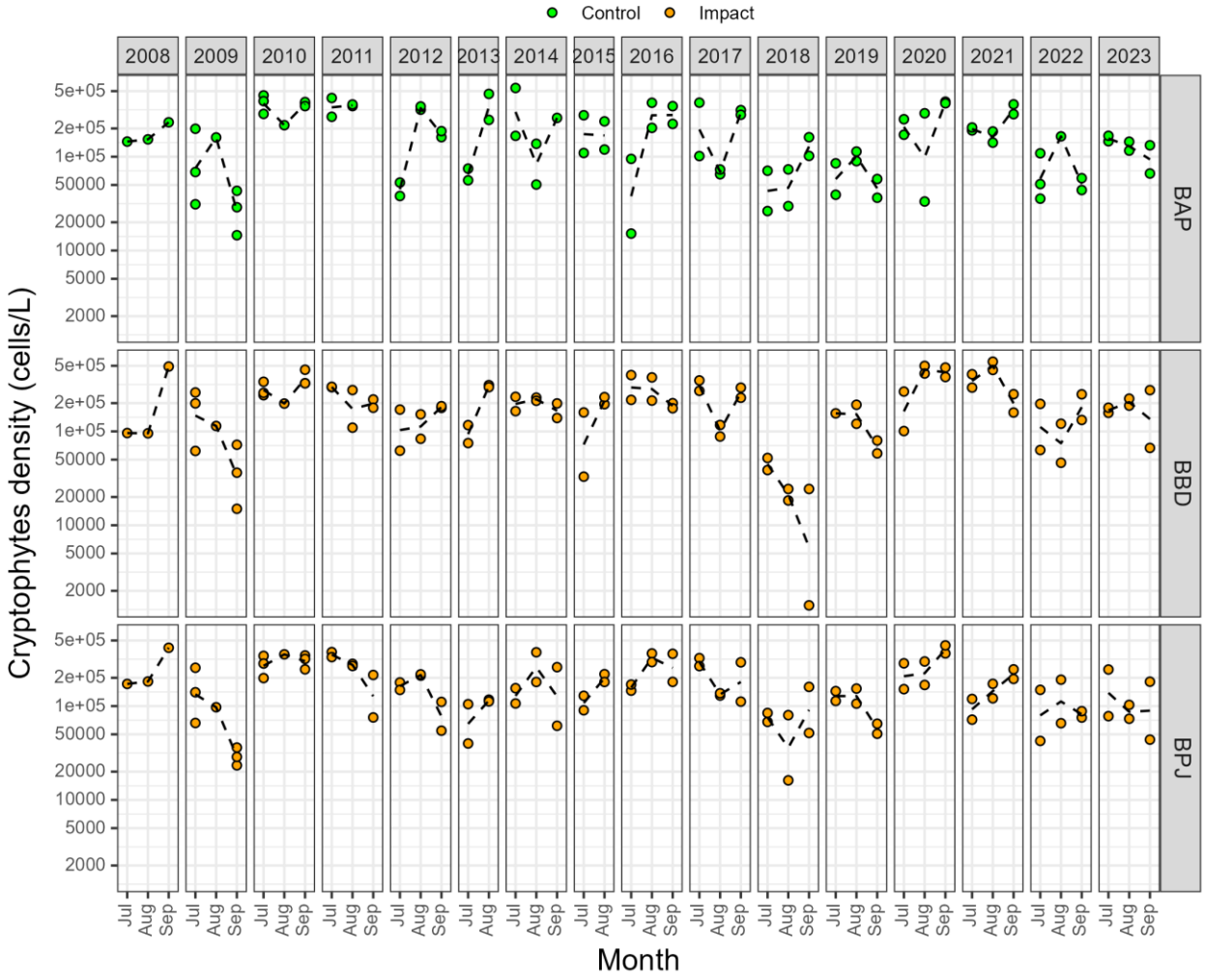


Figure D3-14. Dinoflagellate density (cells/L) from Baker Lake since 2008.

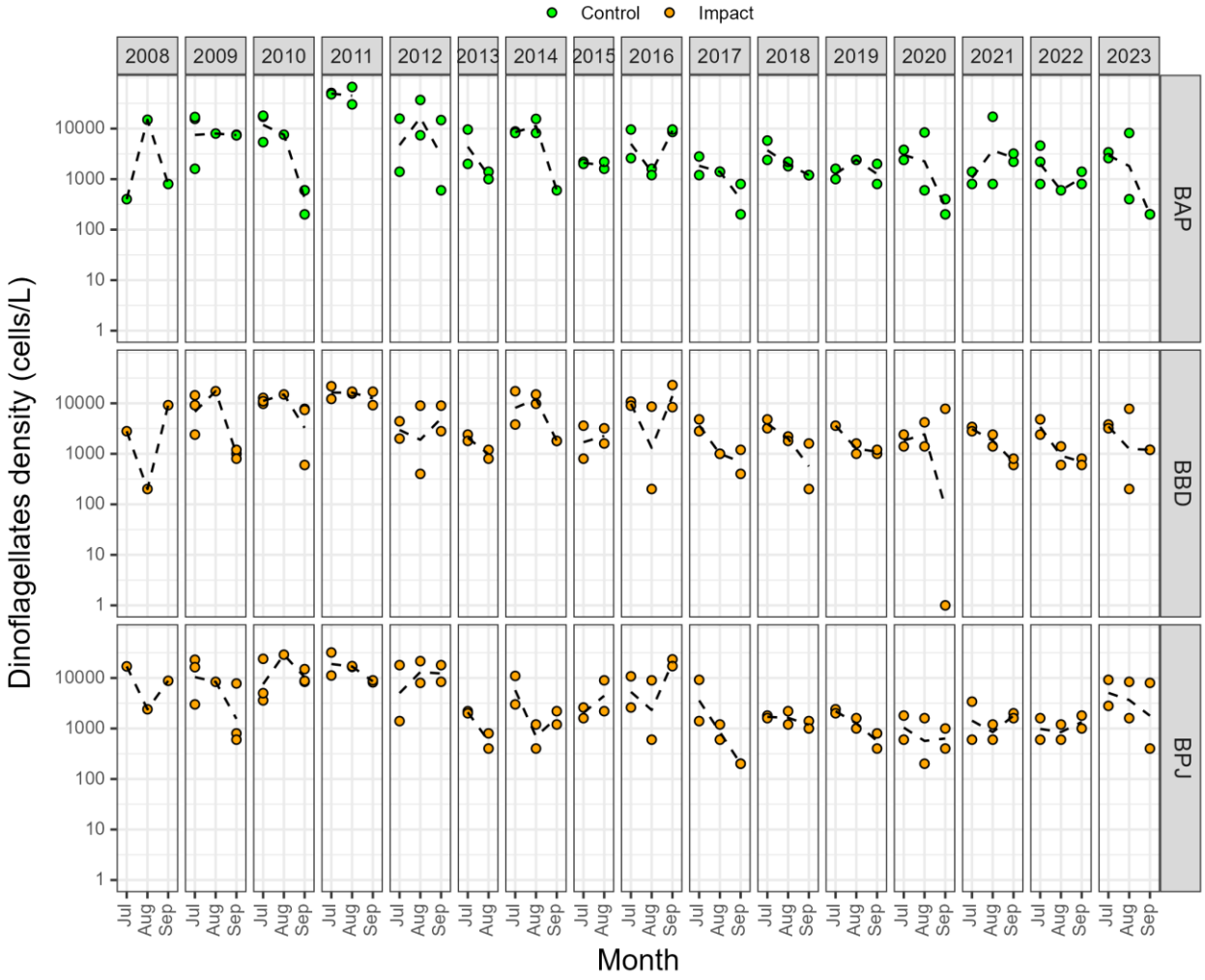
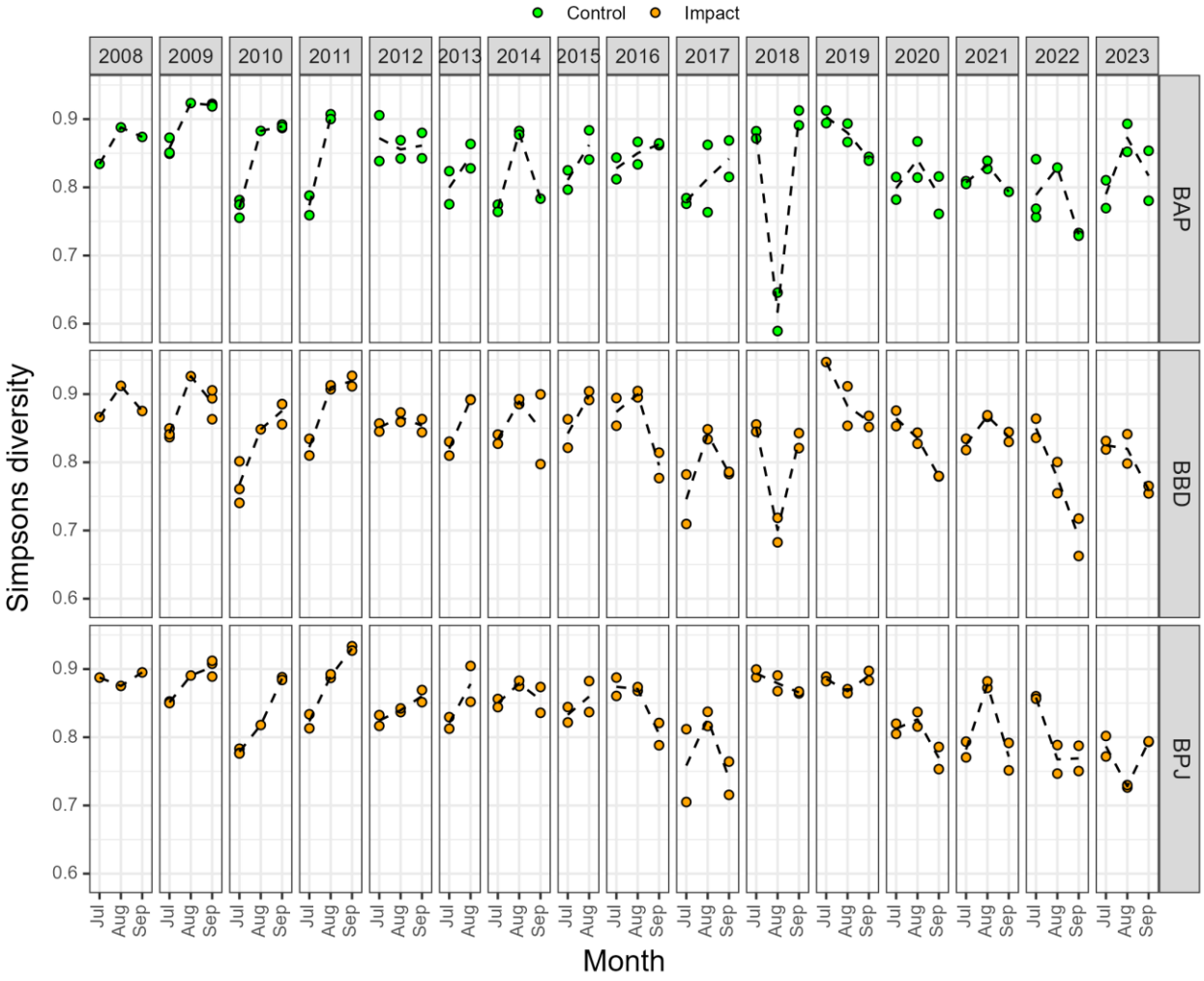


Figure D3-15. Simpsons' Diversity for the phytoplankton community from Baker Lake since 2008.



APPENDIX E
BENTHOS TAXONOMY DATA AND SUPPLEMENTAL PLOTS

Appendix E1
Benthos Data – Meadowbank Study Area Lakes

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Table E1-1. Benthic invertebrate abundance (#/m2) and richness (# taxa) by major taxa group, Meadowbank study area lakes, 2023.

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	22-Aug-23	7.8	43	2,978	370	22	3,413	1	10	3	1	15	0.53	0.41
INUG-2	22-Aug-23	8	43	1,109	457	22	1,630	2	5	3	1	11	0.72	0.10
INUG-3	22-Aug-23	8.0	22	1,217	196	22	1,457	1	10	3	1	15	0.67	0.20
INUG-4	22-Aug-23	8.4	0	1,087	109	0	1,196	0	7	1	0	8	0.58	0.18
INUG-5	22-Aug-23	7.5	0	804	478	0	1,283	0	8	3	0	11	0.87	0.33
Area Mean			***22***	***1,439***	***322***	***13***	***1,796***	***0.8***	***8.0***	***2.6***	***0.6***	***12.0***	***0.67***	***0.24***
Pipedream Lake														
PDL-1	22-Aug-23	8.6	22	522	196	0	739	1	3	2	0	6	0.66	0.07
PDL-2	22-Aug-23	9.0	174	1,022	196	43	1,435	2	4	2	2	10	0.73	0.47
PDL-3	22-Aug-23	8.5	22	696	304	43	1,065	1	3	2	2	8	0.73	0.13
PDL-4	22-Aug-23	8.9	22	587	174	174	957	1	3	2	2	8	0.77	0.11
PDL-5	22-Aug-23	8.8	22	870	217	43	1,152	1	6	2	2	11	0.82	0.13
Area Mean			***52***	***739***	***217***	***60.9***	***1,070***	***1.2***	***3.8***	***2.0***	***1.6***	***8.6***	***0.74***	***0.18***
Second Portage Lake														
SP-1	14-Aug-23	9.3	43	1,065	413	43	1,565	1	11	2	1	15	0.90	0.41
SP-2	14-Aug-23	8.3	0	1,152	370	43	1,565	0	8	2	2	12	0.85	0.52
SP-3	14-Aug-23	7.0	65	1,565	326	0	1,957	2	9	2	0	13	0.88	0.27
SP-4	14-Aug-23	7.7	43	696	304	0	1,043	1	6	2	0	9	0.83	0.42
SP-5	14-Aug-23	9.3	22	413	304	0	739	1	5	2	0	8	0.86	0.38
Area Mean			***35***	***978***	***343***	***17***	***1,374***	***1.0***	***7.8***	***2.0***	***0.6***	***11.4***	***0.87***	***0.40***
Third Portage Lake - East Basin														
TPE-1	11-Aug-23	7.5	87	1,130	348	0	1,565	3	10	2	0	15	0.89	0.52
TPE-2	11-Aug-23	8.2	22	913	435	0	1,370	1	8	2	0	11	0.88	0.54
TPE-3	11-Aug-23	7.6	304	2,848	478	0	3,630	3	9	2	0	14	0.86	0.62
TPE-4	11-Aug-23	6.5	43	630	565	0	1,239	2	7	2	0	11	0.83	0.56
TPE-5	11-Aug-23	6.6	43	1,109	609	22	1,783	1	7	2	1	11	0.88	0.53
Area Mean			***100***	***1,326***	***487***	***4***	***1,917***	***2.0***	***8.2***	***2.0***	***0.2***	***12.4***	***0.87***	***0.55***
Third Portage Lake - North Basin														
TPN-1	12-Aug-23	9.5	22	652	130	0	804	1	7	2	0	10	0.89	0.30
TPN-2	12-Aug-23	8.6	22	457	43	22	543	1	7	2	1	11	0.85	0.58
TPN-3	12-Aug-23	7.5	196	348	304	0	848	2	4	2	0	8	0.84	0.31
TPN-4	12-Aug-23	7.7	22	500	174	0	696	1	7	1	0	9	0.82	0.54
TPN-5	12-Aug-23	9.1	22	217	87	0	326	1	3	2	0	6	0.82	0.42
Area Mean			***57***	***435***	***148***	***4***	***643***	***1.2***	***5.6***	***1.8***	***0.2***	***8.8***	***0.85***	***0.43***
Wally Lake														
WAL-1	21-Aug-23	7.9	22	457	239	22	739	1	6	2	1	10	0.77	0.66
WAL-2	21-Aug-23	9.5	22	5,196	130	43	5,391	1	9	2	2	14	0.58	0.63
WAL-3	21-Aug-23	8.8	22	4,326	370	22	4,739	1	6	1	1	9	0.49	0.66
WAL-4	21-Aug-23	7.5	0	3,130	391	43	3,565	0	7	2	2	11	0.55	0.60
WAL-5	21-Aug-23	7.1	22	2,109	391	22	2,543	1	5	2	1	9	0.58	0.62
Area Mean			***17***	***3,043***	***304***	***30***	***3,396***	***0.8***	***6.6***	***1.8***	***1.4***	***10.6***	***0.60***	***0.63***

Notes:

1. "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, Pionidae, Harpacticoida, O. Notostraca, and Gammaracanthidae).

Table E1-2. Raw benthic invertebrate data from the Meadowbank study area lakes 2023.

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	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23
Sample Depth (m)	7.8	8.0	8.0	8.4	7.5	8.6	9.0	8.5	8.9	8.8
ROUNDWORMS										
P. Nemata	1	10	-	1	4	-	2	1	12	4
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	-	-	-	-	-	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
immatures with hair chaetae	-	-	-	-	-	-	5	1	-	-
immatures without hair chaetae	-	-	-	-	-	1	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	1	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-					
F. Lumbriculidae										
Lumbriculus	2	1	1	-	-	-	3	-	1	1
inderterminate	-	-	-	-	-	-	-	-	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	-	-	-	-	-	-	-		
F. Acalyptonotidae										
Acalyptonotus	-	-	-	-	-	-	-	1	-	1
F. Hygrobatidae										
Hygrobates	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae										
Lebertia	-	1	1	-	-	-	1	-	5	-
F. Oxidae										
Oxus	1	-	-	-	-	-	1	1	3	1
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	2	1	-	1	3	7	16	9	9	8
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature	-	-	-	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	-	-	-	-	-	-	-	-	-	-
F. Hydroptilidae										
Agraylea	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	-	-	-	-	-	-	1
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	-	-	-	-	-	-	-	-	-	-
S.F. Chironominae										
Cladotanytarsus	-	-	-	-	-	-	-	-	-	-
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	1	-	1	2	-	-	-	-	-	-
Cryptochironomus	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-
Micropsectra	107	37	38	35	15	-	1	-	-	-
Microtendipes	10	5	5	7	7	-	-	-	-	-
Parachironomus	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	3	5	2	2	5	-	-	-	-	-
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	-	-	-
Stictochironomus	3	-	3	2	5	18	31	22	19	18
Tanytarsus	-	-	1	-	2	-	-	-	-	-
S.F. Diamesinae										
Potthastia	-	-	-	-	-	-	-	-	-	-
Protanypus	2	2	-	-	-	-	-	-	-	1
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Eukiefferiella	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	1	-	1	-	-	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-
Psectrocladius	6	-	3	1	1	-	1	-	-	3
Zalutschia	-	-	-	-	-	-	-	-	-	-
Orthocladiinae Genus "Greenland"	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	2	2	1	1	1	1	-	2	2	6
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	-	-	-	-
Procladius	2	-	-	-	1	5	14	8	6	11
Thienemannimyia complex	-	-	1	-	-	-	-	-	-	-
F. Empididae										
Chelifera/Metachela	-	-	-	-	-	-	-	-	-	-
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata lewisi	-	-	-	-	-	-	-	-	-	-
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium/Cyclocalyx	10	12	3	5	10	8	3	11	6	6
Pisidium (Cyclocalyx/Neopisidium)	3	1	4	-	5	1	6	3	2	4
Sphaerium nitidum	4	8	2	-	7	-	-	-	-	-

Table E1-2. Raw benthic invertebrate data from the Meadowbank study area lakes 2023.

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	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23	22-Aug-23
Sample Depth (m)	7.8	8.0	8.0	8.4	7.5	8.6	9.0	8.5	8.9	8.8
TOTAL NUMBER OF ORGANISMS	160	86	67	57	66	41	84	59	65	65
TOTAL NUMBER OF TAXA [a]	17	13	15	10	13	7	12	10	10	13
R (Richness) - totals [2,3]										
Total	15	11	15	8	11	6	10	8	8	11
Oligochaete	1	2	1	0	0	1	2	1	1	1
Insect	10	5	10	7	8	3	4	3	3	6
Mollusc	3	3	3	1	3	2	2	2	2	2
Other[4]	1	1	1	0	0	0	2	2	2	2
Abundance (raw) - totals [5,6]										
Total	157	75	67	55	59	34	66	49	44	53
Oligochaete	2	2	1	0	0	1	8	1	1	1
Insect	137	51	56	50	37	24	47	32	27	40
Mollusc	17	21	9	5	22	9	9	14	8	10
Other[4]	1	1	1	0	0	0	2	2	8	2
N (Abundance) - #/m²										
Total	3,413	1,630	1,457	1,196	1,283	739	1,435	1,065	957	1,152
Oligochaete	43	43	22	0	0	22	174	22	22	22
Insect	2,978	1,109	1,217	1,087	804	522	1,022	696	587	870
Mollusc	370	457	196	109	478	196	196	304	174	217
Other[4]	22	22	22	0	0	0	43	43	174	43

[a] Bold entries excluded from taxa count

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 area lakes 2023.

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	14-Aug-23	14-Aug-23	14-Aug-23	14-Aug-23	14-Aug-23	11-Aug-23	11-Aug-23	11-Aug-23	11-Aug-23	11-Aug-23
Sample Depth (m)	9.3	8.3	7.0	7.7	9.3	7.5	8.2	7.6	6.5	6.6
ROUNDWORMS										
P. Nemata	3	8	3	5	8	1	2	1	4	-
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	-	-	-	-	-	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	1	-	-
S.F. Tubificinae										
immatures with hair chaetae	2	-	2	2	-	1	1	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	-	-	-	-	1	-	11	1	2
Rhyacodrilus montana	-	-	-			-	-	-	-	-
F. Lumbriculidae										
Lumbriculus	-	-	1	-	1	2	-	2	1	-
inderterminate	-	-	-	-	-	-	-	-	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature						-	-	**2**	-	-
F. Acalyptonotidae										
Acalyptonotus	-	-	-	-	-	-	-	-	-	-
F. Hygrobatidae										
Hygrobates	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae										
Lebertia	-	1	-	-	-	-	-	-	-	1
F. Oxidae										
Oxus	2	1	-	-	-	-	-	-	-	-
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	5	5	5	1	-	66	34	208	25	32
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature						-	-	-	-	-
F. Apataniidae										
Apatania	-	-	-	-	-	-	-	-	-	-
F. Hydroptilidae										
Agraylea						-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**2**	**1**	**3**
S.F. Chironominae										
Cladotanytarsus	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	-	-	-	-	-	-	-	-	-	-
Cryptochironomus	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-
Micropsectra	8	7	23	14	-	4	2	4	8	4
Microtendipes	6	-	7	-	1	-	-	-	-	-
Parachironomus	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	2	5	7	1	5	17	7	43	6	13
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	1	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	-	-	-
Stictochironomus	6	3	8	1	2	10	8	15	1	10
Tanytarsus	4	3	3	-	-	-	-	-	-	-
S.F. Diamesinae										
Potthastia	-	-	-	-	-	1	-	-	-	-
Protanypus	-	-	1	-	-	-	-	-	1	-
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Eukiefferiella	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	2	-	-	-	-	1	2	4	1	2
Mesocricotopus	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-
Psectrocladius	3	18	9	7	3	8	13	37	9	14
Zalutschia	-	-	-	-	-	-	-	-	-	-
Orthocladiinae Genus "Greenland"	-	-	-	-	-	-	-	1	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	1	1	5	1	-	3	3	2	-	2
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	-	-	-	-
Procladius	13	15	9	8	7	1	3	10	2	3
Thienemannimyia complex	1	1	-	-	-	5	2	13	-	-
F. Empididae										
Chelifera/Metachela	-	-	-	-	-	-	-	-	-	-
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata lewisi	-	-	-	-	-	-	-	-	-	-
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium/Cyclocalyx	13	13	10	10	9	8	7	12	19	15
Pisidium (Cyclocalyx/Neopisidium)	6	4	5	4	5	8	13	10	7	13
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-

Table E1-2. Raw benthic invertebrate data from the Meadowbank study area lakes 2023.

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	14-Aug-23	14-Aug-23	14-Aug-23	14-Aug-23	14-Aug-23	11-Aug-23	11-Aug-23	11-Aug-23	11-Aug-23	11-Aug-23
Sample Depth (m)	9.3	8.3	7.0	7.7	9.3	7.5	8.2	7.6	6.5	6.6
TOTAL NUMBER OF ORGANISMS	80	85	98	54	42	139	99	378	86	114
TOTAL NUMBER OF TAXA [a]	17	14	15	11	9	17	13	17	13	12
R (Richness) - totals [2,3]										
Total	15	12	13	9	8	15	11	14	11	11
Oligochaete	1	0	2	1	1	3	1	3	2	1
Insect	11	8	9	6	5	10	8	9	7	7
Mollusc	2	2	2	2	2	2	2	2	2	2
Other[4]	1	2	0	0	0	0	0	0	0	1
Abundance (raw) - totals [5,6]										
Total	72	72	90	48	34	72	63	167	57	82
Oligochaete	2	0	3	2	1	4	1	14	2	2
Insect	49	53	72	32	19	52	42	131	29	51
Mollusc	19	17	15	14	14	16	20	22	26	28
Other[4]	2	2	0	0	0	0	0	0	0	1
N (Abundance) - #/m²										
Total	1,565	1,565	1,957	1,043	739	1,565	1,370	3,630	1,239	1,783
Oligochaete	43	0	65	43	22	87	22	304	43	43
Insect	1,065	1,152	1,565	696	413	1,130	913	2,848	630	1,109
Mollusc	413	370	326	304	304	348	435	478	565	609
Other[4]	43	43	0	0	0	0	0	0	0	22

[a] Bold entries excluded from taxa count

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 area lakes 2023.

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	12-Aug-23	12-Aug-23	12-Aug-23	12-Aug-23	12-Aug-23	21-Aug-23	21-Aug-23	21-Aug-23	21-Aug-23	21-Aug-23
Sample Depth (m)	9.5	8.6	7.5	7.7	9.1	7.9	9.5	8.8	7.5	7.1
ROUNDWORMS										
P. Nemata	4	2	4	2	3	-	1	2	-	2
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	-	-	-	-	-	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
immatures with hair chaetae	1	-	-	-	-	-	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	-	7	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae										
Lumbriculus	-	1	2	1	1	1	1	1	-	1
inderterminate	-	-	-	-	-	-	-	-	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	-	-	-	-	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	-	1	-	-	-	-	-	-	-	-
F. Hygrobatidae										
Hygrobates	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae										
Lebertia	-	-	-	-	-	-	1	1	1	1
F. Oxidae										
Oxus	-	-	-	-	-	1	1	-	1	-
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	10	9	12	4	2	6	11	5	6	6
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature	-	-	-	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	-	-	-	-	-	-	-	-	-	-
F. Hydroptilidae										
Agraylea	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	**2**	-	-	-	-	-	-	-	-	-
S.F. Chironominae										
Cladotanytarsus	-	-	-	-	-	-	9	2	-	-
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	-	-	-	-	-	14	155	153	107	73
Cryptochironomus	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-
Micropsectra	-	1	-	1	-	1	36	15	17	11
Microtendipes	-	-	-	-	-	-	-	-	-	-
Parachironomus	-	-	-	-	-	-	-	-	1	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	4	1	-	3	-	-	13	-	4	1
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	2	-	-	-	-	-	3	-	-	-
Stempellinella	-	-	-	-	-	-	-	-	-	-
Stictochironomus	7	7	10	7	5	2	-	16	9	10
Tanytarsus	-	1	-	-	-	1	18	6	-	-
S.F. Diamesinae										
Potthastia	-	-	-	-	-	-	-	-	-	-
Protanypus	-	-	-	1	-	1	-	-	1	-
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Eukiefferiella	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	1	-	-	-	-	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-
Psectrocladius	2	1	2	1	-	-	-	-	-	-
Zalutschia	-	-	-	-	-	-	-	-	-	-
Orthocladiinae Genus "Greenland"	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	-	-	-	1	1	-	1	-	-	-
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	1	-	-	-
Procladius	8	7	2	9	4	2	3	7	5	2
Thienemannimyia complex	4	3	2	-	-	-	-	-	-	-
F. Empididae										
Chelifera/Metachela	-	-	-	-	-	-	-	-	-	-
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata lewisi	-	-	-	-	-	-	-	-	-	-
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium/Cyclocalyx	4	1	9	-	3	9	5	17	15	15
Pisidium (Cyclocalyx/Neopisidium)	2	1	5	8	1	2	1	-	3	3
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-

Table E1-2. Raw benthic invertebrate data from the Meadowbank study area lakes 2023.

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	12-Aug-23	12-Aug-23	12-Aug-23	12-Aug-23	12-Aug-23	21-Aug-23	21-Aug-23	21-Aug-23	21-Aug-23	21-Aug-23
Sample Depth (m)	9.5	8.6	7.5	7.7	9.1	7.9	9.5	8.8	7.5	7.1
TOTAL NUMBER OF ORGANISMS	51	36	55	38	20	40	260	225	170	125
TOTAL NUMBER OF TAXA [a]	12	13	10	11	8	11	16	11	12	11
R (Richness) - totals [2,3]										
Total	10	11	8	9	6	10	14	9	11	9
Oligochaete	1	1	2	1	1	1	1	1	0	1
Insect	7	7	4	7	3	6	9	6	7	5
Mollusc	2	2	2	1	2	2	2	1	2	2
Other[4]	0	1	0	0	0	1	2	1	2	1
Abundance (raw) - totals [5,6]										
Total	37	25	39	32	15	34	248	218	164	117
Oligochaete	1	1	9	1	1	1	1	1	0	1
Insect	30	21	16	23	10	21	239	199	144	97
Mollusc	6	2	14	8	4	11	6	17	18	18
Other[4]	0	1	0	0	0	1	2	1	2	1
N (Abundance) - #/m²										
Total	804	543	848	696	326	739	5,391	4,739	3,565	2,543
Oligochaete	22	22	196	22	22	22	22	22	0	22
Insect	652	457	348	500	217	457	5,196	4,326	3,130	2,109
Mollusc	130	43	304	174	87	239	130	370	391	391
Other[4]	0	22	0	0	0	22	43	22	43	22

[a] Bold entries excluded from taxa count

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 lakes since 2006.

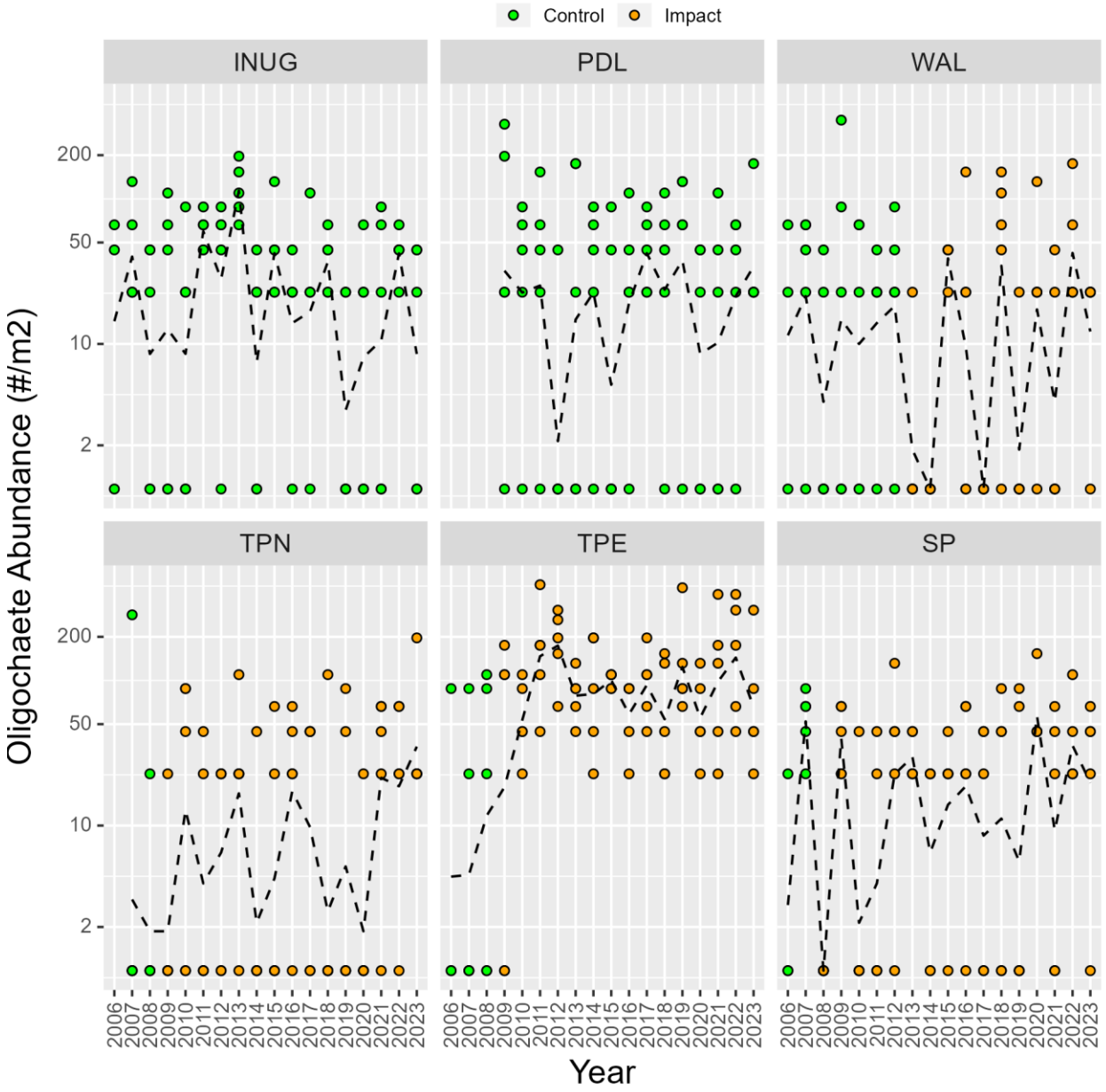


Figure E1-2. Insect abundance (#/m^2) from Meadowbank lakes since 2006.

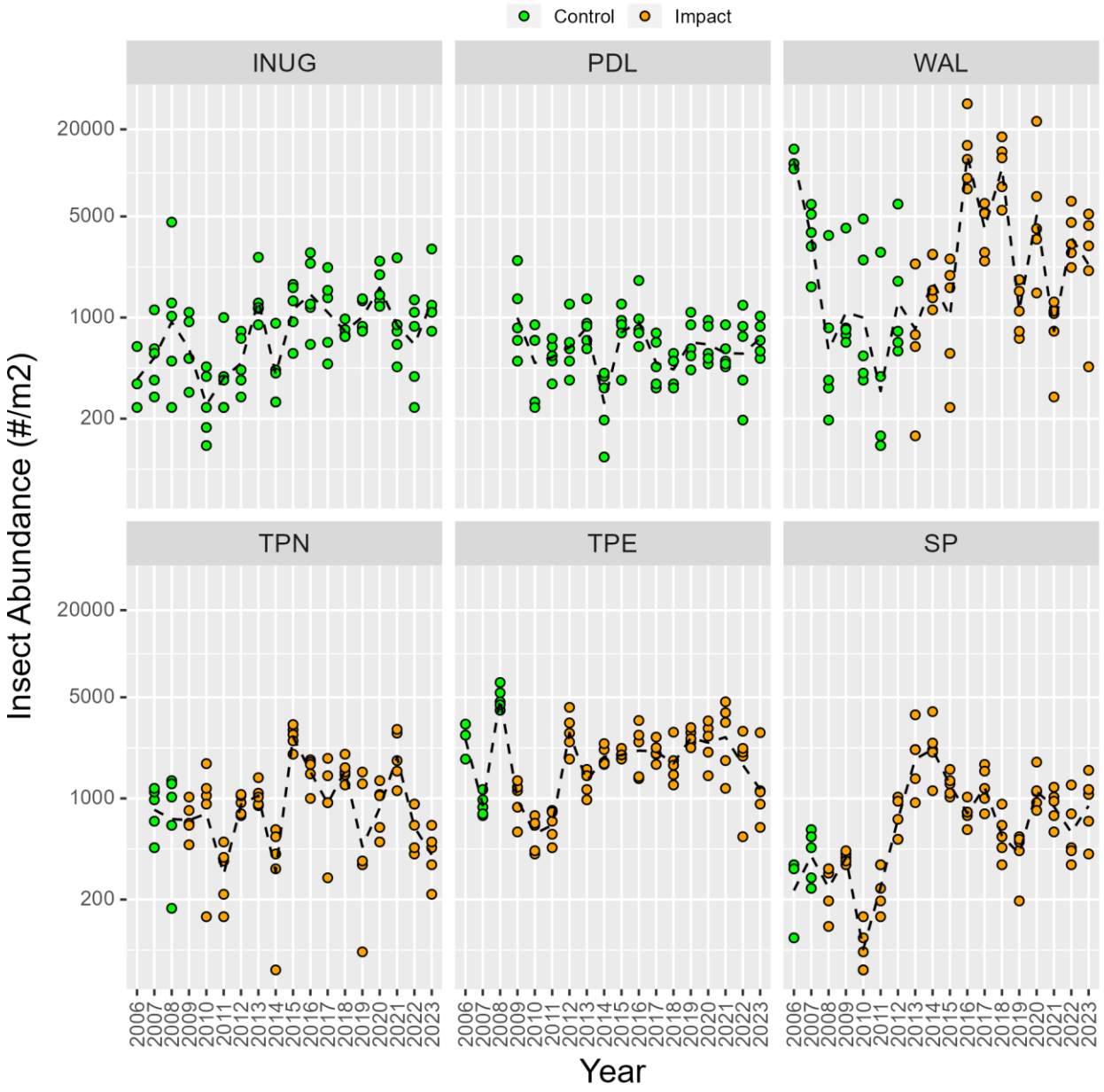


Figure E1-3. Mollusc abundance (#/m^2) from Meadowbank lakes since 2006.

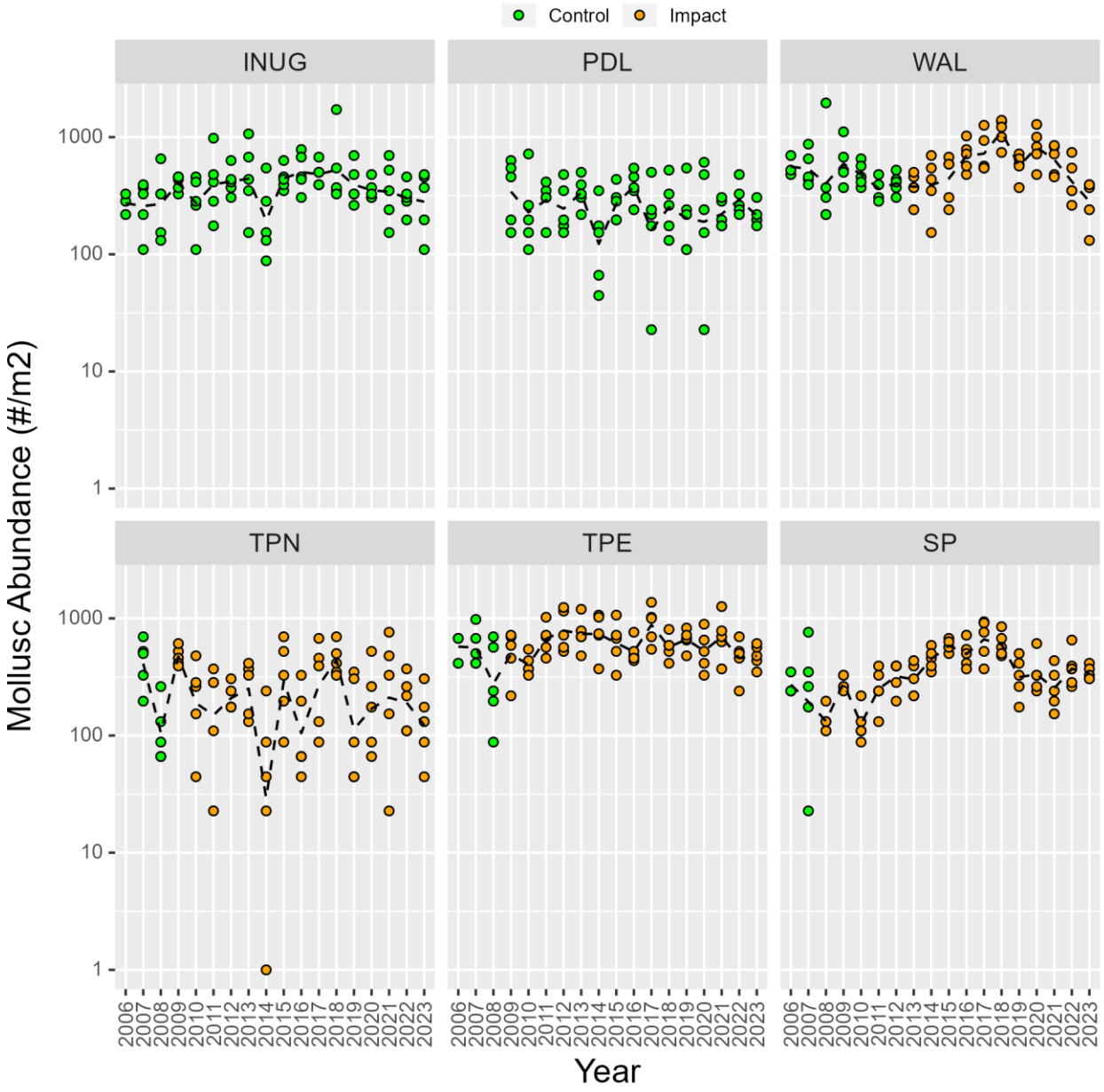


Figure E1-4. Other taxa abundance (#/m^2) from Meadowbank lakes since 2006.

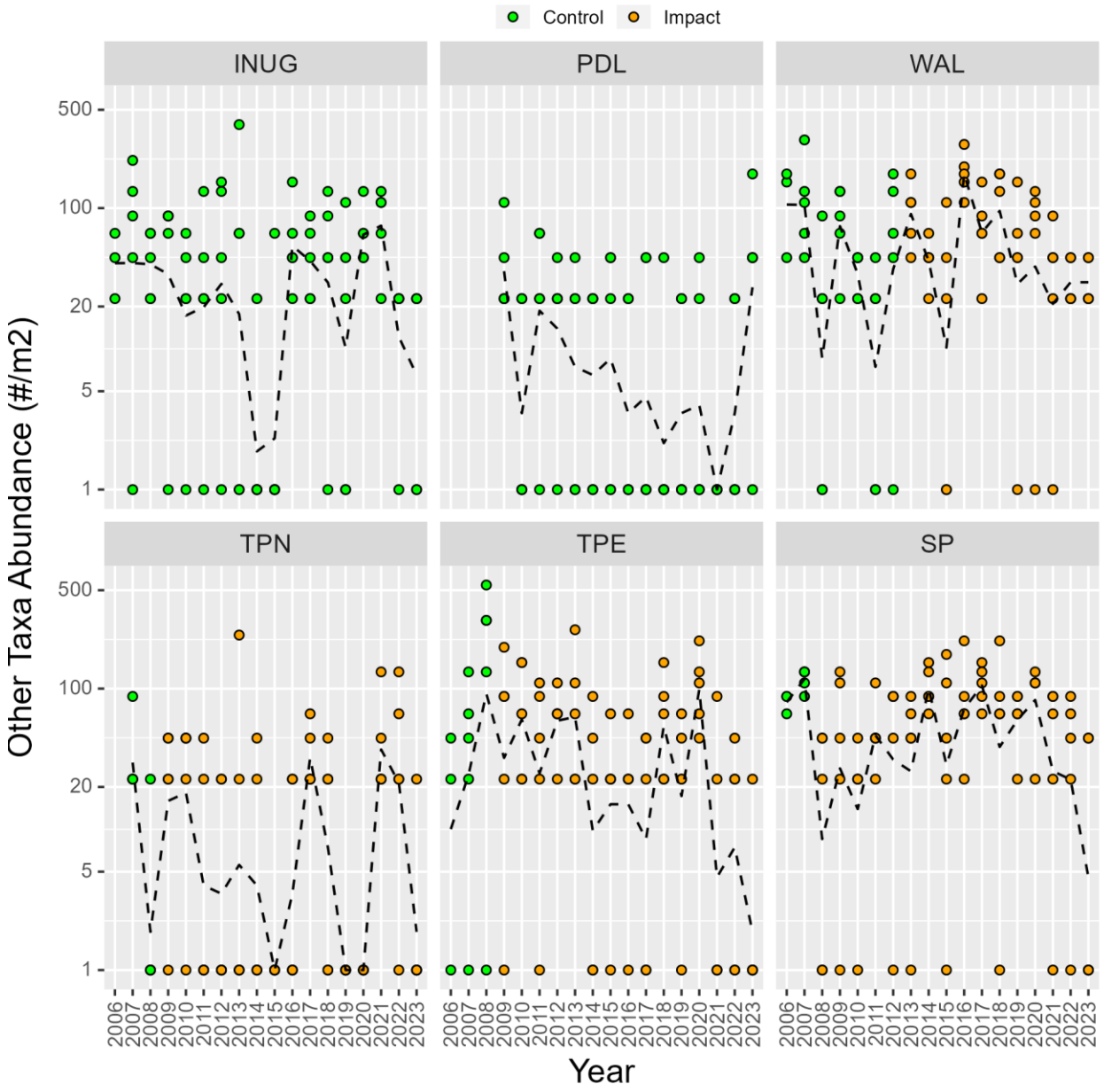


Figure E1-5. Oligochaete richness (# of taxa) from Meadowbank lakes since 2006.

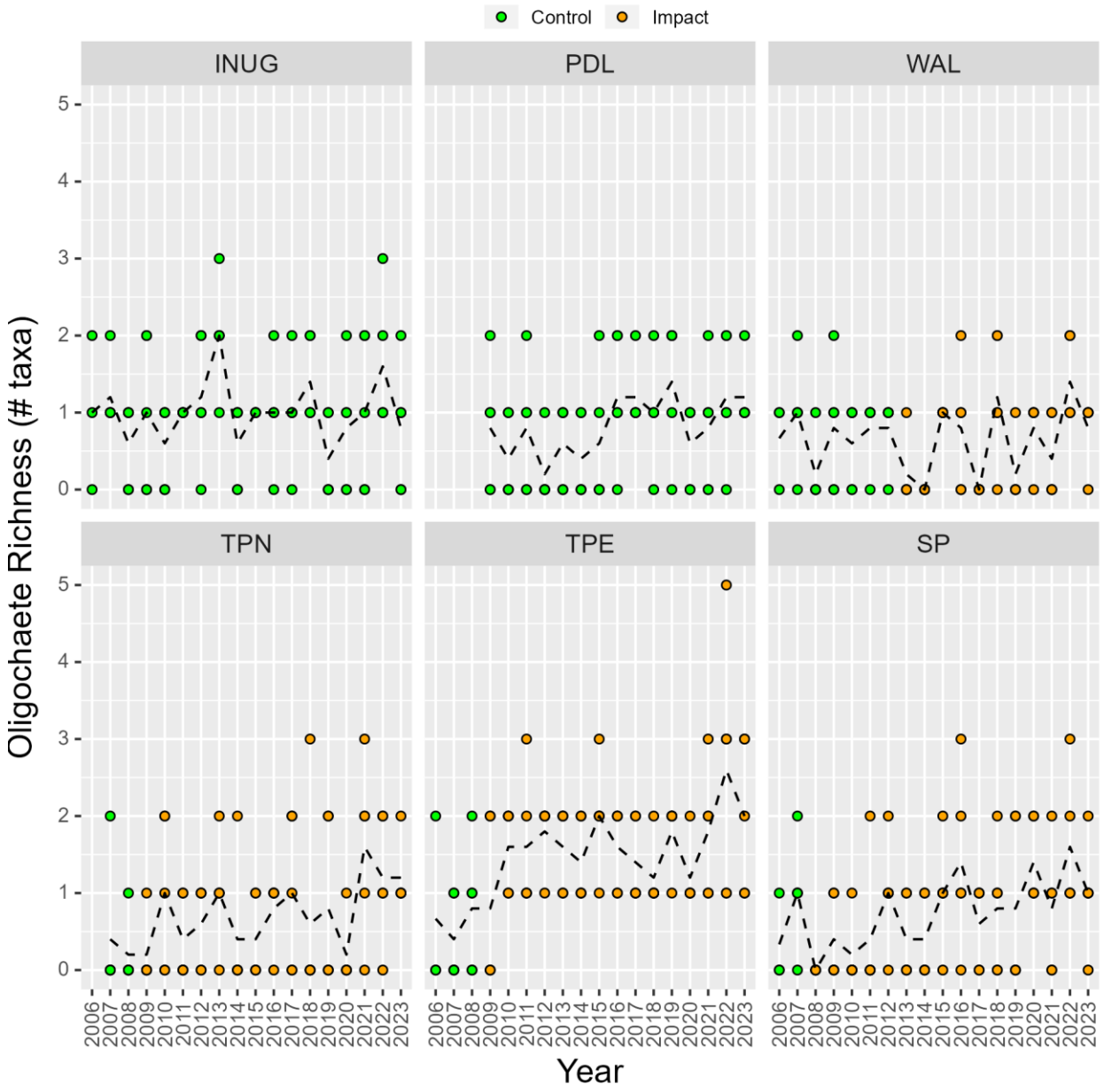


Figure E1-6. Insect richness (# of taxa) from Meadowbank lakes since 2006.

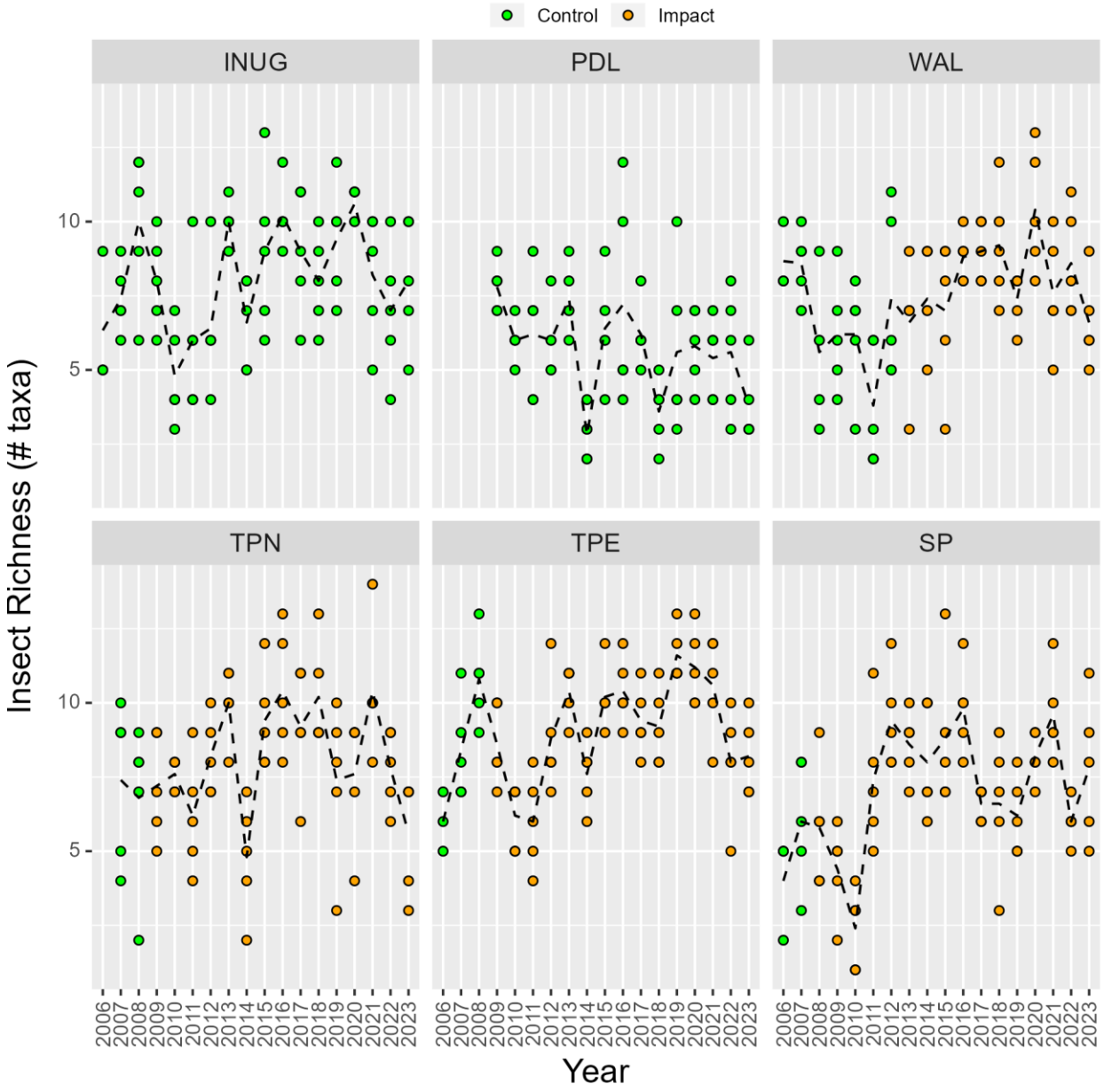


Figure E1-7. Mollusc richness (# of taxa) from Meadowbank lakes since 2006.

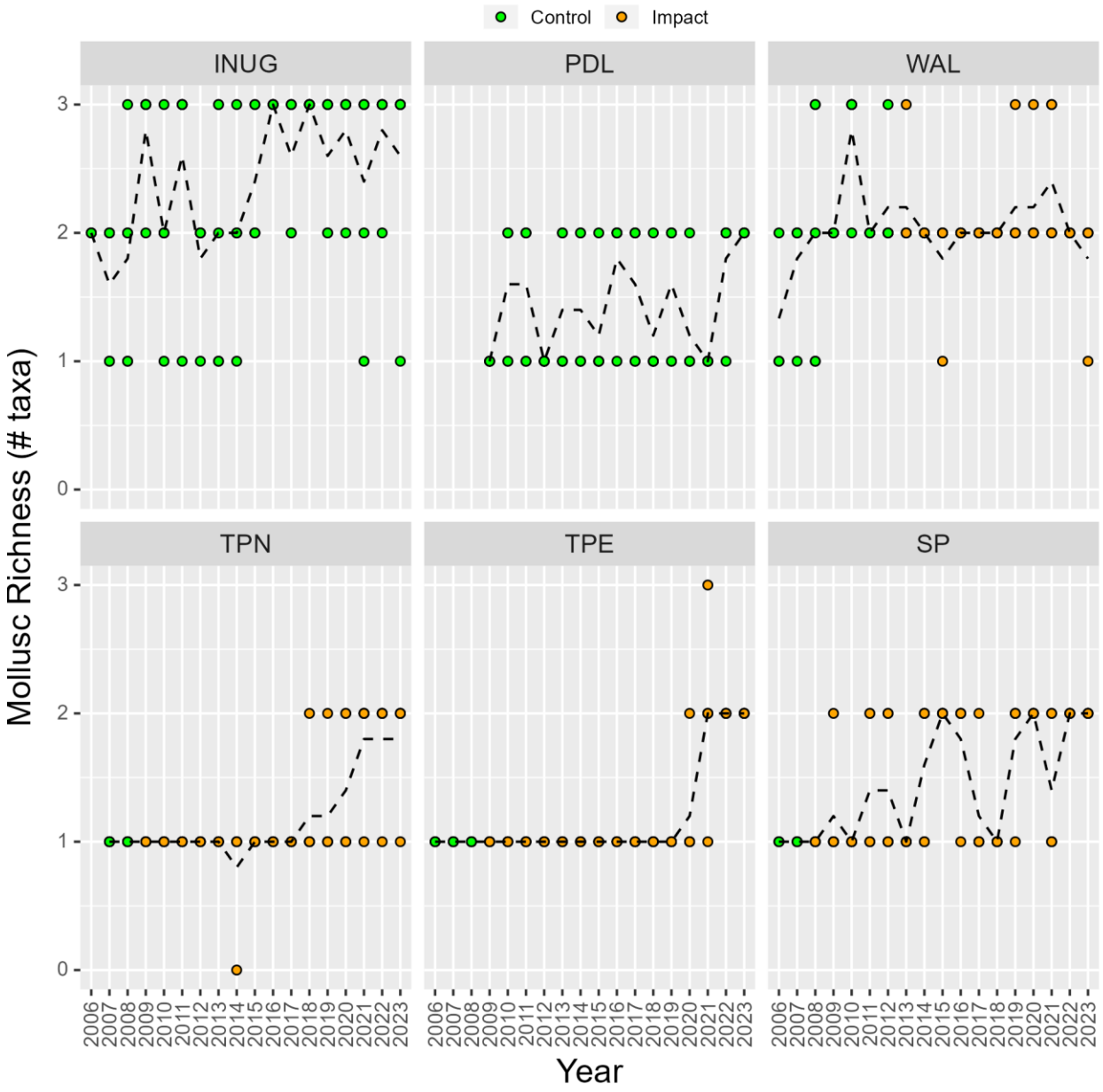


Figure E1-8. Other taxa richness (# of taxa) from Meadowbank lakes since 2006.

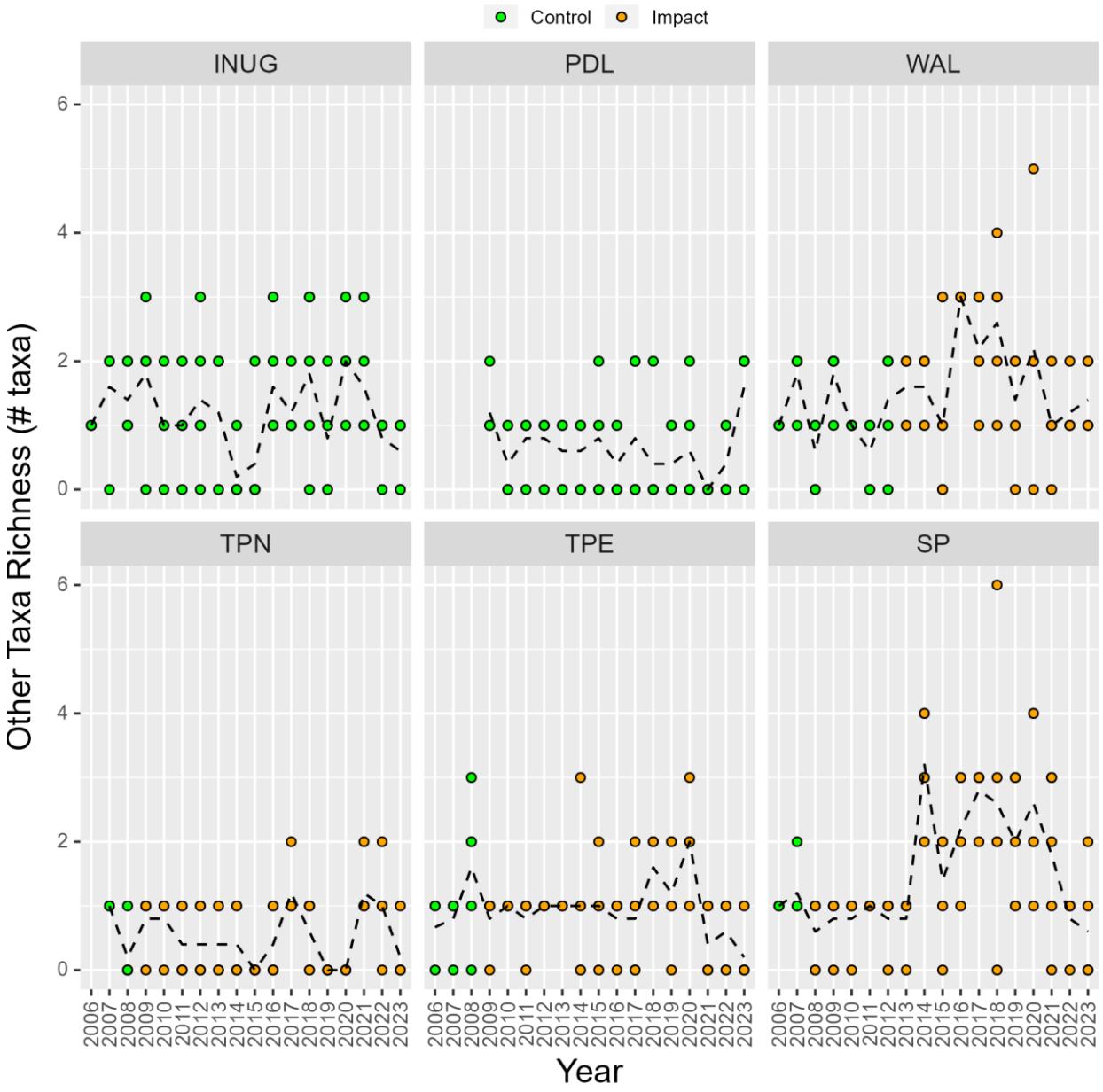


Figure E1-9. Simpsons' Diversity for the benthic invertebrate community at the Meadowbank lakes since 2006.

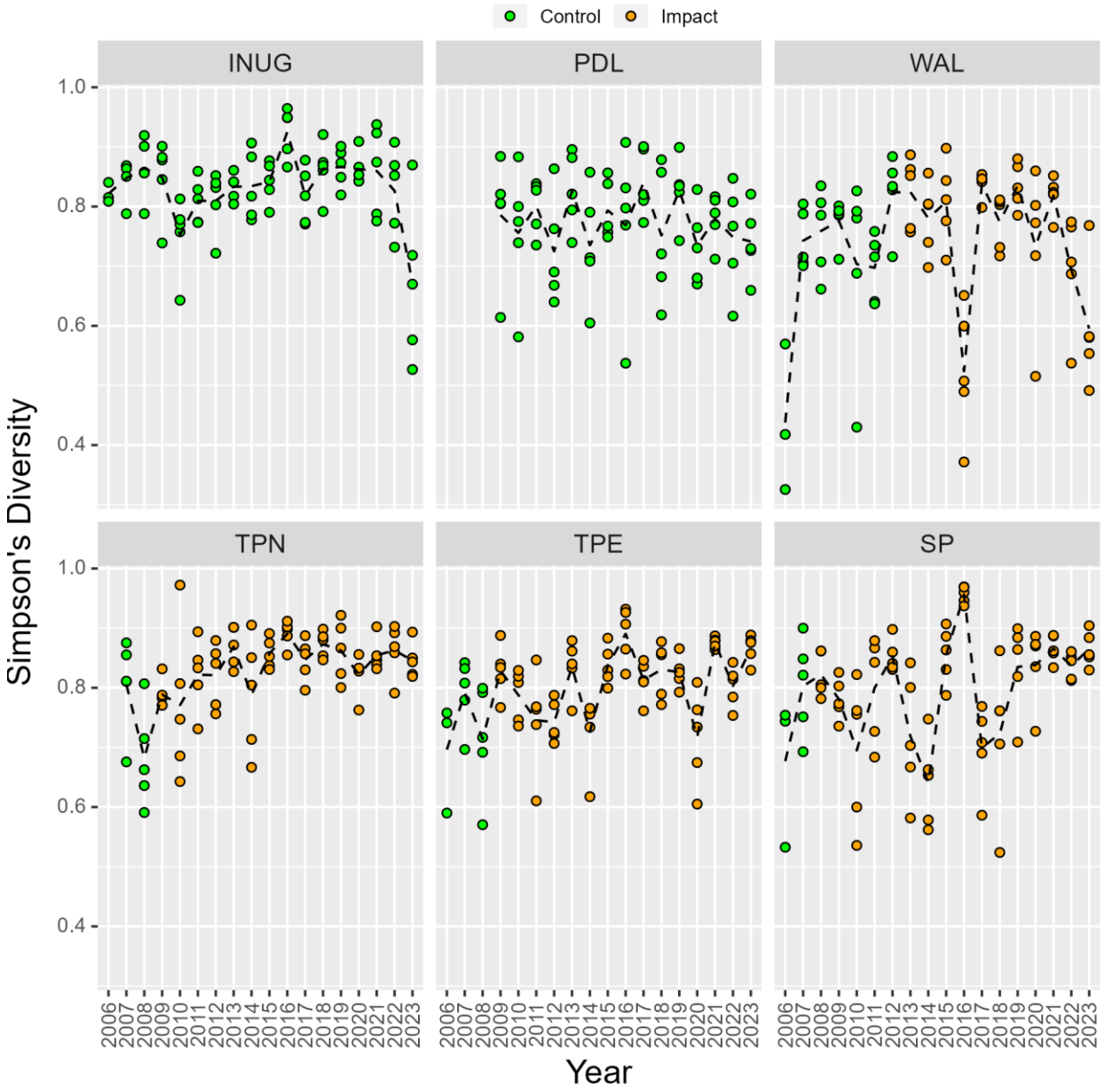
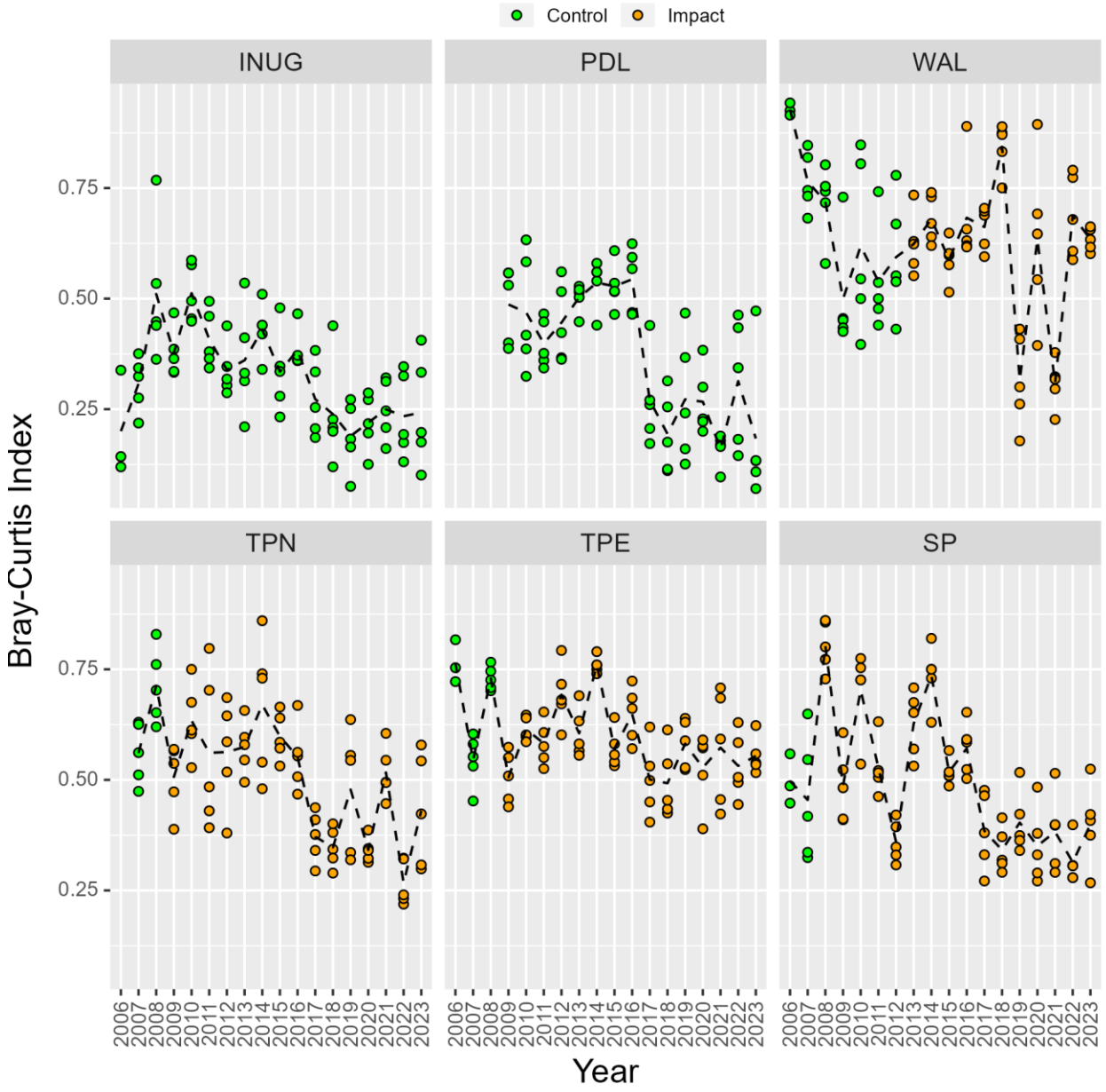


Figure E1-10. Bray-Curtis Index for the benthic invertebrate community at the Meadowbank lakes since 2006.



Appendix E2
Benthos Data – Whale Tail Study Area Lakes

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Figure E2-10. Bray-Curtis Index for the benthic invertebrate community at the Whale Tail study lakes since 2015. 17

Table E2-1. Benthic invertebrate abundance (#/m^2) and richness (# taxa) by major taxa group, Whale Tail study area lakes, 2023.

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 Lake - South Basin (WTS)														
WTS-1	12-Aug-23	9.0	22	2,543	3,870	283	6,717	1	10	3	3	17	0.71	0.59
WTS-2	12-Aug-23	8.9	43	3,478	2,283	239	6,043	1	7	3	4	15	0.86	0.60
WTS-3	12-Aug-23	8.7	22	1,696	1,717	87	3,522	1	8	3	2	14	0.85	0.47
WTS-4	12-Aug-23	8.7	87	2,283	2,783	87	5,239	2	11	3	2	18	0.83	0.52
WTS-5	12-Aug-23	9.3	65	1,891	2,283	130	4,370	2	9	3	3	17	0.78	0.52
	Area Mean		***47.8***	***2,378***	***2,587***	***165***	***5,178***	***1.4***	***9.0***	***3.0***	***2.8***	***16.2***	***0.81***	***0.54***
Kangislulik Lake (KAN/MAM)*														
MAM-1	15-Aug-23	7.9	43	7,826	2,304	65	10,239	1	12	3	2	18	0.73	0.66
MAM-2	15-Aug-23	7.5	0	6,261	1,935	196	8,391	0	12	3	4	19	0.79	0.63
MAM-3	15-Aug-23	7.6	130	7,804	2,674	65	10,674	2	10	3	2	17	0.70	0.68
MAM-4	15-Aug-23	7.9	174	6,587	1,783	196	8,739	2	11	3	3	19	0.77	0.65
MAM-5	15-Aug-23	8.9	217	8,174	0	217	8,609	2	12	0	4	18	0.74	0.69
	Area Mean		***113***	***7,330***	***1,739***	***148***	***9,330***	***1.4***	***11.4***	***2.4***	***3.0***	***18.2***	***0.74***	***0.66***
Lake A20														
A20-1	16-Aug-23	8.6	0	3,043	1,196	130	4,370	0	10	2	1	13	0.81	0.46
A20-2	16-Aug-23	8.0	43	2,891	1,109	130	4,174	1	10	2	3	16	0.71	0.51
A20-3	16-Aug-23	7.7	22	4,717	1,065	87	5,891	1	11	2	3	17	0.62	0.63
A20-4	16-Aug-23	8.4	87	2,087	674	43	2,891	2	10	2	2	16	0.80	0.30
A20-5	16-Aug-23	8.2	43	3,391	1,152	0	4,587	1	11	2	0	14	0.64	0.46
	Area Mean		***39***	***3,226***	***1,039***	***78***	***4,383***	***1.0***	***10.4***	***2.0***	***1.8***	***15.2***	***0.72***	***0.47***
Lake A76														
A76-1	13-Aug-23	9.0	87	6,870	848	43	7,848	3	9	3	1	16	0.61	0.69
A76-2	13-Aug-23	8.0	0	2,565	978	174	3,717	0	10	3	3	16	0.86	0.54
A76-3	13-Aug-23	8.2	65	543	22	0	630	1	5	1	0	7	0.61	0.69
A76-4	13-Aug-23	8.0	109	2,761	1,413	217	4,500	2	9	3	4	18	0.87	0.58
A76-5	13-Aug-23	8.0	22	2,848	1,022	109	4,000	1	9	3	3	16	0.85	0.56
	Area Mean		***57***	***3,117***	***857***	***109***	***4,139***	***1.4***	***8.4***	***2.6***	***2.2***	***14.6***	***0.76***	***0.61***
Lake DS1														
DS1-1	17-Aug-23	6.8	22	1,826	957	65	2,870	1	10	3	2	16	0.85	0.60
DS1-2	17-Aug-23	7.9	109	1,522	717	43	2,391	1	11	3	2	17	0.82	0.65
DS1-3	17-Aug-23	9.5	0	304	326	65	696	0	7	3	3	13	0.83	0.19
DS1-4	17-Aug-23	9.5	22	652	761	87	1,522	1	6	4	2	13	0.83	0.61
DS1-5	17-Aug-23	8.4	43	1,413	1,239	65	2,761	1	8	4	1	14	0.86	0.57
	Area Mean		***39.1***	***1,143***	***800***	***65***	***2,048***	***0.8***	***8.4***	***3.4***	***2.0***	***14.6***	***0.84***	***0.52***
Nemo Lake (NEM)														
NEM-1	16-Aug-23	9.0	65	2,283	1,326	87	3,761	1	9	2	2	14	0.87	0.54
NEM-2	16-Aug-23	9.2	87	4,174	1,717	152	6,130	1	9	3	2	15	0.87	0.57
NEM-3	16-Aug-23	9.0	65	4,870	1,391	22	6,348	1	10	3	1	15	0.87	0.63
NEM-4	16-Aug-23	7.4	22	3,283	1,304	65	4,674	1	10	2	1	14	0.89	0.48
NEM-5	16-Aug-23	8.0	*65*	*3,609*	*1,283*	*22*	*4,978*	*1*	*9*	*2*	*1*	*13*	*0.86*	*0.59*
	Area Mean		***61***	***3,643***	***1,404***	***70***	***5,178***	***1.0***	***9.4***	***2.4***	***1.4***	***14.2***	***0.87***	***0.56***

Notes:

1. "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, Pionidae, Harpacticoida, O. Notostraca, and Gammaracanthidae).

* Kangislulik Lake (KAN) was previously referred to as Mammoth Lake (MAM).

Table E2-2. Raw benthic invertebrate data from the Whale Tail study area lakes, 2023.

Program	Whale Tail									
Location	Lake A20					Lake A76				
Station	A20					A76				
Control/Impact?	Impact					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	16-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	13-Aug-23	13-Aug-23	13-Aug-23	13-Aug-23	13-Aug-23
Sample Depth (m)	8.6	8.0	7.7	8.4	8.2	9.0	8.0	8.2	8.0	8.0
ROUNDWORMS										
P. Nemata	9	1	-	2	-	4	6	1	4	3
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	-	-	2	-	-	-	1
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
immatures with hair chaetae	-	-	-	-	-	1	-	3	2	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	-	-	1	-	1	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae										
Lumbriculus	-	2	1	3	2	2	-	-	3	1
indeterminate	-	-	-	-	-	-	-	-	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	-	-	-	-	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	6	-	2	-	-	-	4	-	6	3
F. Hygrobatidae										
Hygrobates	-	1	-	-	-	-	-	-	1	-
F. Lebertiidae										
Lebertia	-	3	1	1	-	-	3	-	2	-
F. Oxidae										
Oxus	-	2	1	1	-	-	1	-	1	1
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	80	47	32	22	63	46	43	-	48	54
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature	1	-	-	1	-	-	-	1	-	-
F. Apataniidae										
Apatania	-	-	-	-	-	-	-	-	-	-
F. Hydroptilidae										
Agraylea	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	2	-	1	1	-	1	-	-	1	1
S.F. Chironominae										
Cladotanytarsus	-	-	-	-	-	-	-	-	-	-
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	8	13	19	6	1	218	44	18	46	54
Cryptochironomus	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	2	-	-	-	-
Micropsectra	69	95	163	52	117	34	23	-	27	23
Microtendipes	2	1	-	-	6	-	1	-	1	-
Parachironomus	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	15	8	8	13	4	9	-	-	1	3
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	-	-	-
Stictochironomus	32	5	1	15	11	2	-	2	-	4
Tanytarsus	-	-	-	-	-	4	6	-	21	11
S.F. Diamesinae										
Potthastia	-	-	-	-	-	-	-	-	-	-
Protanypus	-	-	1	-	-	-	-	-	-	-
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	6	2	2	4	11	-	2	4
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Eukiefferiella	-	1	-	-	-	-	-	-	-	-
Heterotrissocladius	-	1	-	-	-	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-
Psectrocladius	-	2	2	1	3	-	2	-	-	1
Zalutschia	-	-	-	1	-	-	-	-	-	-
Orthocladiinae *Genus "Greenland"*	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	1	1	7	2	3	13	5	3	5	6
S.F. Tanypodinae										
Ablabesmyia	1	-	1	-	-	-	1	-	-	-
Procladius	3	6	4	2	6	29	24	1	22	24
Thienemannimyia complex	6	-	4	-	2	-	1	-	1	-
F. Empididae										
Chelifera/Metachela	-	-	-	-	1	-	-	-	-	-
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata lewisi	-	-	-	-	-	-	-	-	-	-
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium/Cyclocalyx	31	30	32	21	47	24	15	-	25	29
Pisidium (Cyclocalyx/Neopisidium)	24	21	17	10	6	10	27	-	37	14
Sphaerium nitidum	-	-	-	-	-	5	3	1	3	4

Table E2-2. Raw benthic invertebrate data from the Whale Tail study area lakes, 2023.

Program	Whale Tail										
Location	Lake A20					Lake A76					
Station	A20					A76					
Control/Impact?	Impact					Impact					
Replicate	1	2	3	4	5	1	2	3	4	5	
Date	16-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	13-Aug-23	13-Aug-23	13-Aug-23	13-Aug-23	13-Aug-23	
Sample Depth (m)	8.6	8.0	7.7	8.4	8.2	9.0	8.0	8.2	8.0	8.0	
TOTAL NUMBER OF ORGANISMS	290	240	303	157	274	411	220	30	259	241	#
TOTAL NUMBER OF TAXA [a]	15	18	18	18	15	18	18	8	20	18	
[a] Bold entries excluded from taxa count											
R (Richness) - totals [2,3]											
Total	13	16	17	16	14	16	16	7	18	16	
Oligochaete	0	1	1	2	1	3	0	1	2	1	
Insect	10	10	11	10	11	9	10	5	9	9	
Mollusc	2	2	2	2	2	3	3	1	3	3	
Other [4]	1	3	3	2	0	1	3	0	4	3	
Abundance (raw) - totals [5,6]											
Total	201	192	271	133	211	361	171	29	207	184	
Oligochaete	0	2	1	4	2	4	0	3	5	1	
Insect	140	133	217	96	156	316	118	25	127	131	
Mollusc	55	51	49	31	53	39	45	1	65	47	
Other [4]	6	6	4	2	0	2	8	0	10	5	
N (Abundance) - #/m²											
Total	4,370	4,174	5,891	2,891	4,587	7,848	3,717	630	4,500	4,000	
Oligochaete	0	43	22	87	43	87	0	65	109	22	
Insect	3,043	2,891	4,717	2,087	3,391	6,870	2,565	543	2,761	2,848	
Mollusc	1,196	1,109	1,065	674	1,152	848	978	22	1,413	1,022	
Other [4]	130	130	87	43	0	43	174	0	217	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 E2-2. Raw benthic invertebrate data from the Whale Tail study area lakes, 2023.

Program	Whale Tail									
Location	Lake DS1					Kangislulik Lake				
Station	DS1					KAN/MAM				
Control/Impact?	Impact					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	17-Aug-23	17-Aug-23	17-Aug-23	17-Aug-23	17-Aug-23	15-Aug-23	15-Aug-23	15-Aug-23	15-Aug-23	15-Aug-23
Sample Depth (m)	6.8	7.9	9.5	9.5	8.4	7.9	7.5	7.6	7.9	8.9
ROUNDWORMS										
P. Nemata	6	8	1	3	3	2	1	5	3	1
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	1	1	-	-	2	-	4	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	5	-	1	-	-	-	-	-	-
S.F. Tubificinae										
immatures with hair chaetae	-	-	-	-	-	-	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	-	-	-	2	-	-	2	1	8
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae										
Lumbriculus	1	-	-	-	-	2	-	4	7	2
indeterminate	-	-	-	-	-	-	-	-	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	-	-	-	-	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	-	-	-	-	-	1	1	1	-	4
F. Hygrobatidae										
Hygrobates	-	-	1	-	-	-	-	-	-	-
F. Lebertiidae										
Lebertia	2	1	-	-	-	2	3	2	3	2
F. Oxidae										
Oxus	1	-	1	3	3	-	3	-	2	3
F. Pionidae										
indeterminate	-	1	-	-	-	-	-	-	-	1
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	8	10	3	5	31	65	41	58	53	87
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature	2	1	-	-	3	-	-	-	-	-
F. Apataniidae										
Apatania	-	-	-	-	1	-	-	-	-	-
F. Hydroptilidae										
Agraylea	-	1	-	-	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	-	-	-	2	-	-	-	-	-	1
S.F. Chironominae										
Cladotanytarsus	-	-	-	-	-	21	-	-	10	18
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	-	-	-	-	-	226	151	254	178	184
Cryptochironomus	-	-	-	-	-	1	-	-	-	-
Dicrotendipes	-	1	-	-	-	3	3	-	-	-
Micropsectra	10	2	-	1	15	42	66	37	30	47
Microtendipes	1	-	-	-	-	6	8	5	6	9
Parachironomus	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	38	41	2	3	27	6	14	13	3	63
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	-	-	-
Stictochironomus	4	4	-	-	3	17	13	19	13	9
Tanytarsus	5	3	-	1	-	12	9	16	30	18
S.F. Diamesinae										
Potthastia	-	1	-	-	-	-	-	-	-	-
Protanypus	-	-	1	1	-	-	-	-	-	-
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	1	-	-	-	1	1	-	4
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Eukiefferiella	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	1	-	2	11	2	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-
Psectrocladius	-	-	1	-	-	-	-	-	3	-
Zalutschia	-	-	-	-	-	-	-	-	-	-
Orthocladiinae *Genus "Greenland"*	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	-	-	-	-	-	9	11	4	14	9
S.F. Tanypodinae										
Ablabesmyia	3	1	-	-	-	-	-	-	-	3
Procladius	19	10	6	11	11	7	5	6	8	4
Thienemannimyia complex	-	5	1	-	3	10	6	4	8	7
F. Empididae										
Chelifera/Metachela	1	-	-	-	-	-	1	-	-	-
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata lewisi	-	12	1	3	3	-	-	-	-	-
Valvata	16	-	-	-	6	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium/Cyclocalyx	21	17	12	23	23	83	62	76	37	-
Pisidium (Cyclocalyx/Neopisidium)	7	4	2	8	25	10	13	29	15	-
Sphaerium nitidum	-	-	-	1	-	13	14	18	30	-

Table E2-2. Raw benthic invertebrate data from the Whale Tail study area lakes, 2023.

Program	Whale Tail									
Location	Lake DS1					Kangislulik Lake				
Station	DS1					KAN/MAM				
Control/Impact?	Impact					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	17-Aug-23	17-Aug-23	17-Aug-23	17-Aug-23	17-Aug-23	15-Aug-23	15-Aug-23	15-Aug-23	15-Aug-23	15-Aug-23
Sample Depth (m)	6.8	7.9	9.5	9.5	8.4	7.9	7.5	7.6	7.9	8.9
TOTAL NUMBER OF ORGANISMS	146	128	36	78	161 #	538	428	554	458	484
TOTAL NUMBER OF TAXA [a]	18	19	15	16	14	20	21	19	21	21
[a] Bold entries excluded from taxa count										
R (Richness) - totals [2,3]										
Total	16	17	13	13	14	18	19	17	19	18
Oligochaete	1	1	0	1	1	1	0	2	2	2
Insect	10	11	7	6	8	12	12	10	11	12
Mollusc	3	3	3	4	4	3	3	3	3	0
Other [4]	2	2	3	2	1	2	4	2	3	4
Abundance (raw) - totals [5,6]										
Total	132	110	32	70	127	471	386	491	402	396
Oligochaete	1	5	0	1	2	2	0	6	8	10
Insect	84	70	14	30	65	360	288	359	303	376
Mollusc	44	33	15	35	57	106	89	123	82	0
Other [4]	3	2	3	4	3	3	9	3	9	10
N (Abundance) - #/m²										
Total	2,870	2,391	696	1,522	2,761	10,239	8,391	10,674	8,739	8,609
Oligochaete	22	109	0	22	43	43	0	130	174	217
Insect	1,826	1,522	304	652	1,413	7,826	6,261	7,804	6,587	8,174
Mollusc	957	717	326	761	1,239	2,304	1,935	2,674	1,783	0
Other [4]	65	43	65	87	65	65	196	65	196	217

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. Leberтiidae, 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 study area lakes, 2023.

Program	Whale Tail									
Location	Nemo Lake					Whale Tail Lake - South Basin				
Station	NEM					WTS				
Control/Impact?	Impact					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	16-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	12-Aug-23	12-Aug-23	12-Aug-23	12-Aug-23	12-Aug-23
Sample Depth (m)	9.0	9.2	9.0	7.4	8.0	9.0	8.9	8.7	8.7	9.3
ROUNDWORMS										
P. Nemata	2	-	-	-	2	-	3	1	-	-
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	1	-	-	-	-	2	-	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
immatures with hair chaetae	-	-	-	-	-	-	-	1	3	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	-	-	-	-	1	2	-	1	2
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae										
Lumbriculus	3	4	3	1	3	-	-	-	-	1
indeterminate	-	-	-	-	-	-	-	-	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	-	-	-	-	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	3	6	1	3	1	3	2	-	3	1
F. Hygrobatidae										
Hygrobates	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae										
Lebertia	1	-	-	-	-	2	1	1	-	1
F. Oxidae										
Oxus	-	-	-	-	-	8	6	3	1	4
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	20	26	47	47	29	125	71	42	101	72
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature	-	-	-	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	-	-	-	-	-	-	-	-	-	-
F. Hydroptilidae										
Agraylea	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	-	2	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	-	1	-	-	1	-	2	-	1	-
S.F. Chironominae										
Cladotanytarsus	2	-	8	1	-	-	-	-	7	-
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	30	32	32	26	33	3	17	7	8	2
Cryptochironomus	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	2	-
Micropsectra	12	33	22	34	18	53	59	28	27	31
Microtendipes	-	2	2	-	-	6	19	3	8	1
Parachironomus	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	4	26	59	16	9	1	-	-	1	-
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	1	-	-	-	-
Stictochironomus	20	42	35	15	37	9	1	7	12	5
Tanytarsus	15	33	37	28	38	17	47	21	17	28
S.F. Diamesinae										
Potthastia	-	-	-	-	-	-	-	-	-	-
Protanypus	-	-	-	-	-	-	-	-	-	1
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	-	-	-	6	3	3	3	8
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Eukiefferiella	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	-	-	-	-	-	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-
Psectrocladius	7	5	7	12	12	-	-	-	-	-
Zalutschia	-	-	-	-	-	-	-	-	-	-
Orthocladiinae *Genus "Greenland"*	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	-	-	-	2	-	3	-	1	3	4
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	-	-	-	-
Procladius	14	16	16	11	9	18	12	8	16	7
Thienemannimyia complex	1	2	6	6	7	-	-	-	-	-
F. Empididae										
Chelifera/Metachela	-	-	-	-	-	-	-	-	-	-
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata lewisi	-	-	-	-	-	-	-	-	-	-
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium/Cyclocalyx	39	68	57	38	52	155	54	45	84	82
Pisidium (Cyclocalyx/Neopisidium)	22	10	6	22	7	13	25	26	40	15
Sphaerium nitidum	-	1	1	-	-	10	26	8	4	8

Table E2-2. Raw benthic invertebrate data from the Whale Tail study area lakes, 2023.

Program	Whale Tail									
Location	Nemo Lake					Whale Tail Lake - South Basin				
Station	NEM					WTS				
Control/Impact?	Impact					Impact				
Replicate	1	2	3	4	5	1	2	3	4	5
Date	16-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	12-Aug-23	12-Aug-23	12-Aug-23	12-Aug-23	12-Aug-23
Sample Depth (m)	9.0	9.2	9.0	7.4	8.0	9.0	8.9	8.7	8.7	9.3
TOTAL NUMBER OF ORGANISMS	195	308	339	262	260	434	352	205	342	273
TOTAL NUMBER OF TAXA [a]	16	17	16	15	15	18	17	16	19	18
R (Richness) - totals [2,3]										
Total	14	15	15	14	13	17	15	14	18	17
Oligochaete	1	1	1	1	1	1	1	1	2	2
Insect	9	9	10	10	9	10	7	8	11	9
Mollusc	2	3	3	2	2	3	3	3	3	3
Other [4]	2	2	1	1	1	3	4	2	2	3
Abundance (raw) - totals [5,6]										
Total	173	282	292	215	229	309	278	162	241	201
Oligochaete	3	4	3	1	3	1	2	1	4	3
Insect	105	192	224	151	166	117	160	78	105	87
Mollusc	61	79	64	60	59	178	105	79	128	105
Other [4]	4	7	1	3	1	13	11	4	4	6
N (Abundance) - #/m²										
Total	3,761	6,130	6,348	4,674	4,978	6,717	6,043	3,522	5,239	4,370
Oligochaete	65	87	65	22	65	22	43	22	87	65
Insect	2,283	4,174	4,870	3,283	3,609	2,543	3,478	1,696	2,283	1,891
Mollusc	1,326	1,717	1,391	1,304	1,283	3,870	2,283	1,717	2,783	2,283
Other [4]	87	152	22	65	22	283	239	87	87	130

[a] Bold entries excluded from taxa count

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. Leberтiidae, 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 study lakes since 2015.

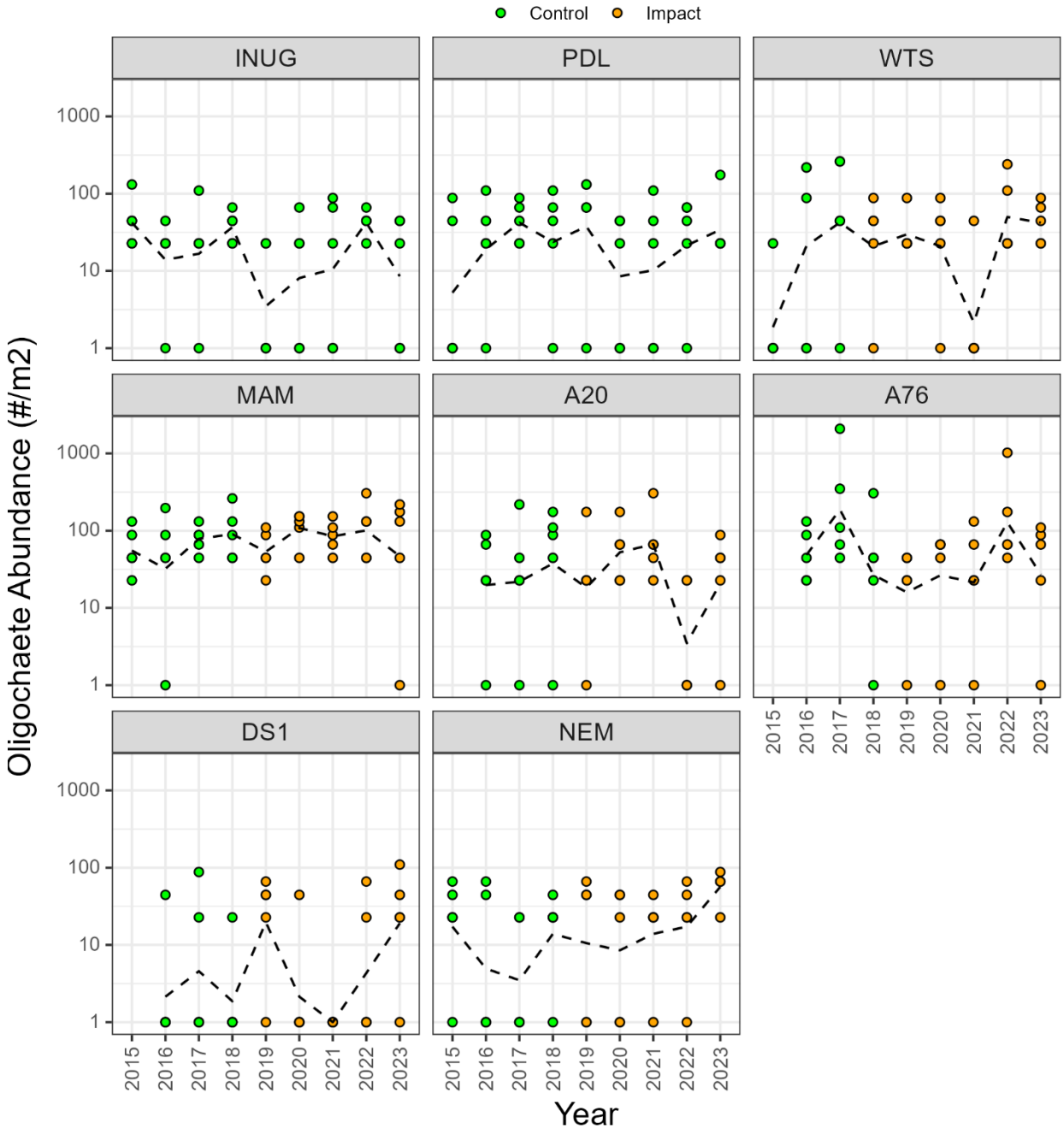


Figure E2-2. Insect abundance (#/m^2) from the Whale Tail study lakes since 2015.

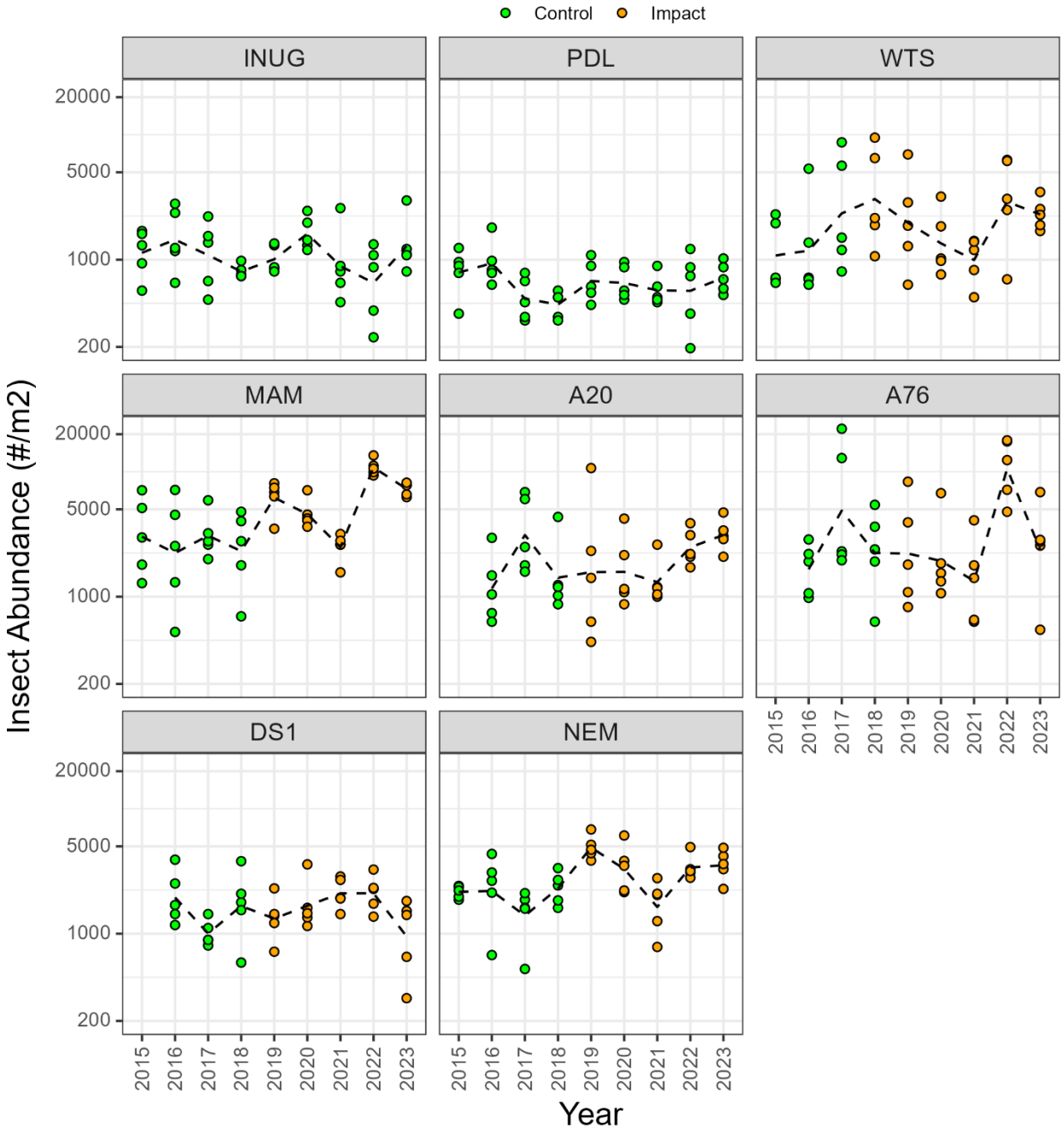


Figure E2-3. Mollusc abundance (#/m^2) from the Whale Tail study lakes since 2015.

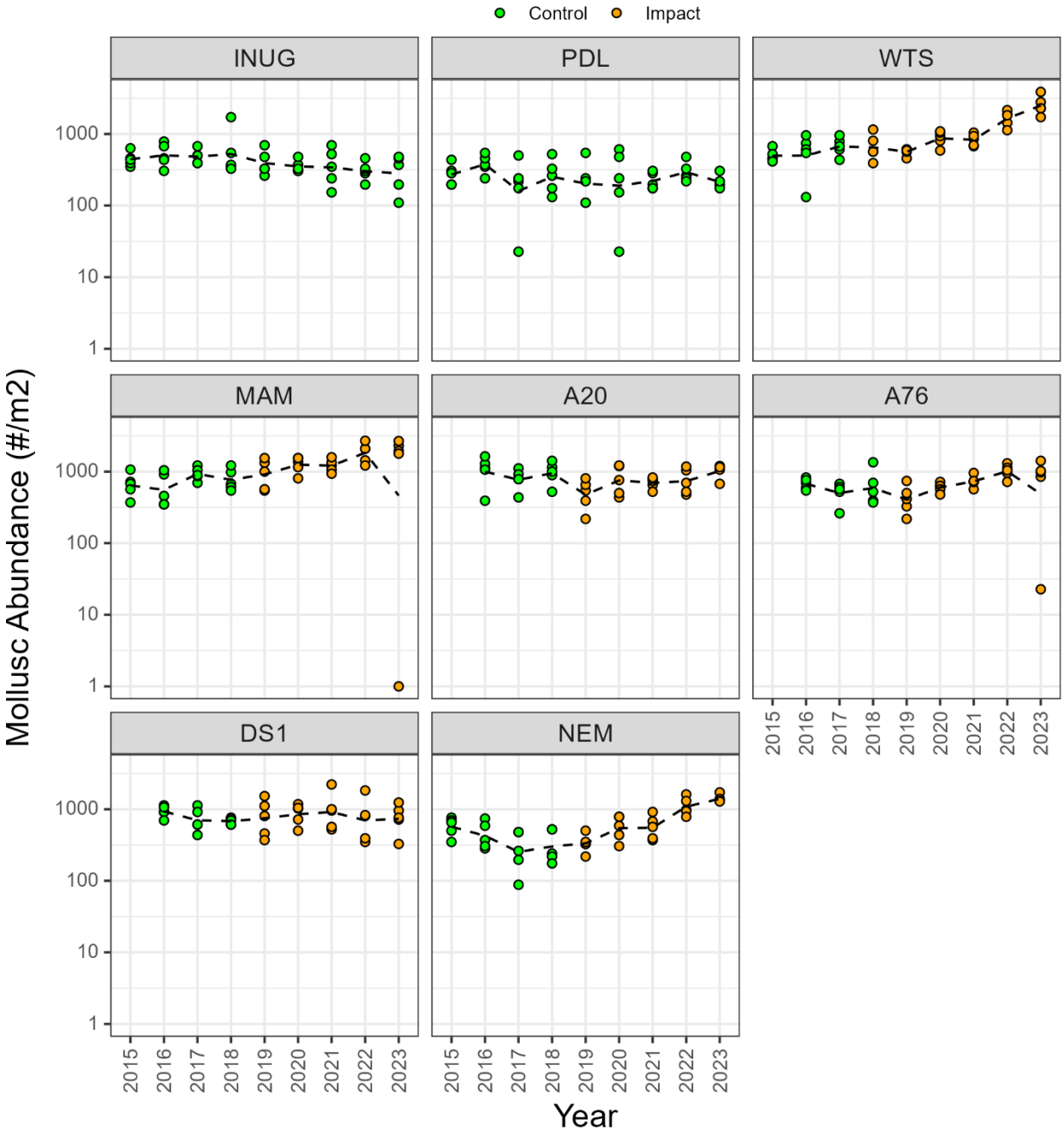


Figure E2-4. Other taxa abundance (#/m^2) from the Whale Tail study lakes since 2015.

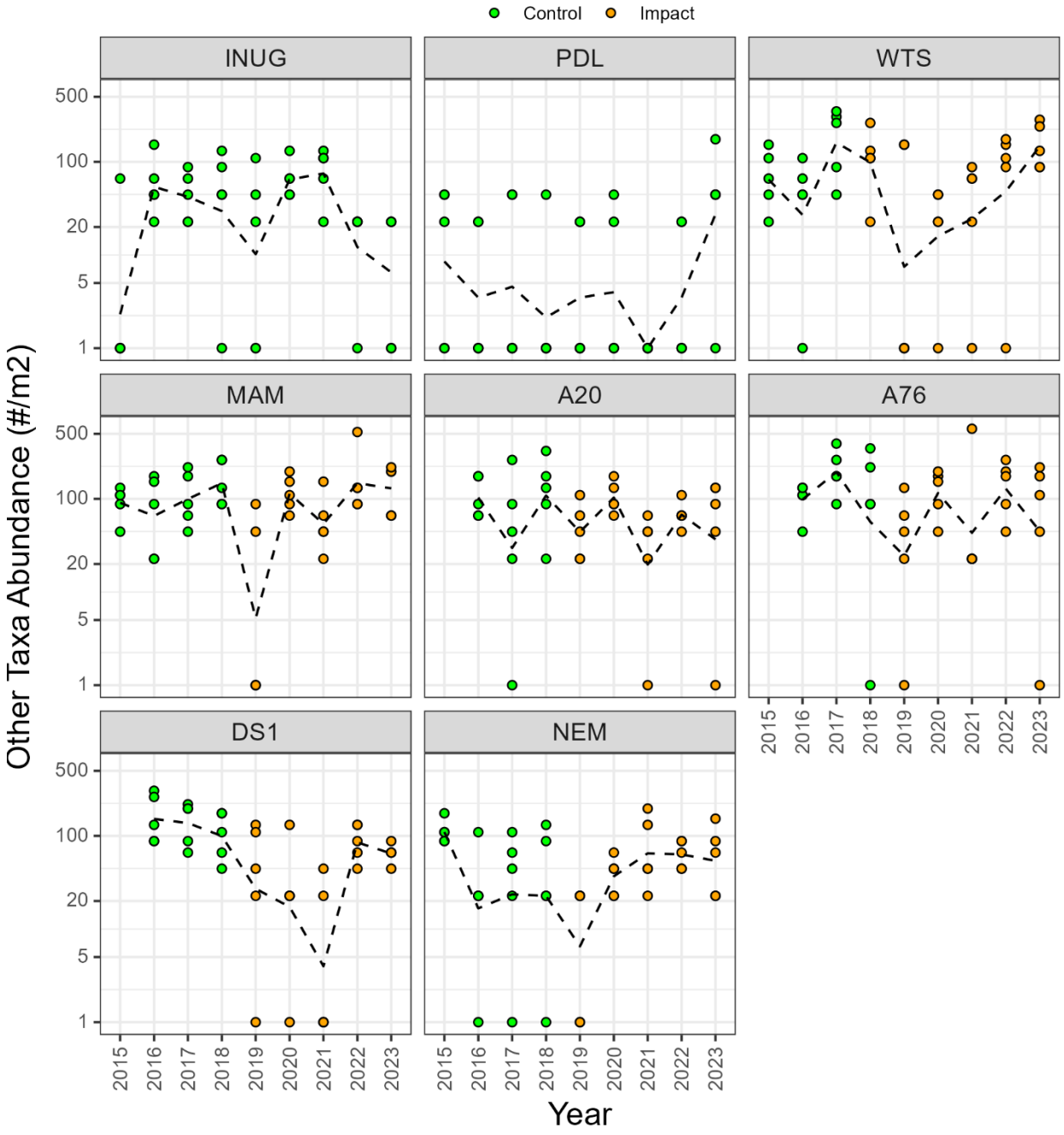


Figure E2-5. Oligochaete richness (# of taxa) from the Whale Tail study lakes since 2015.

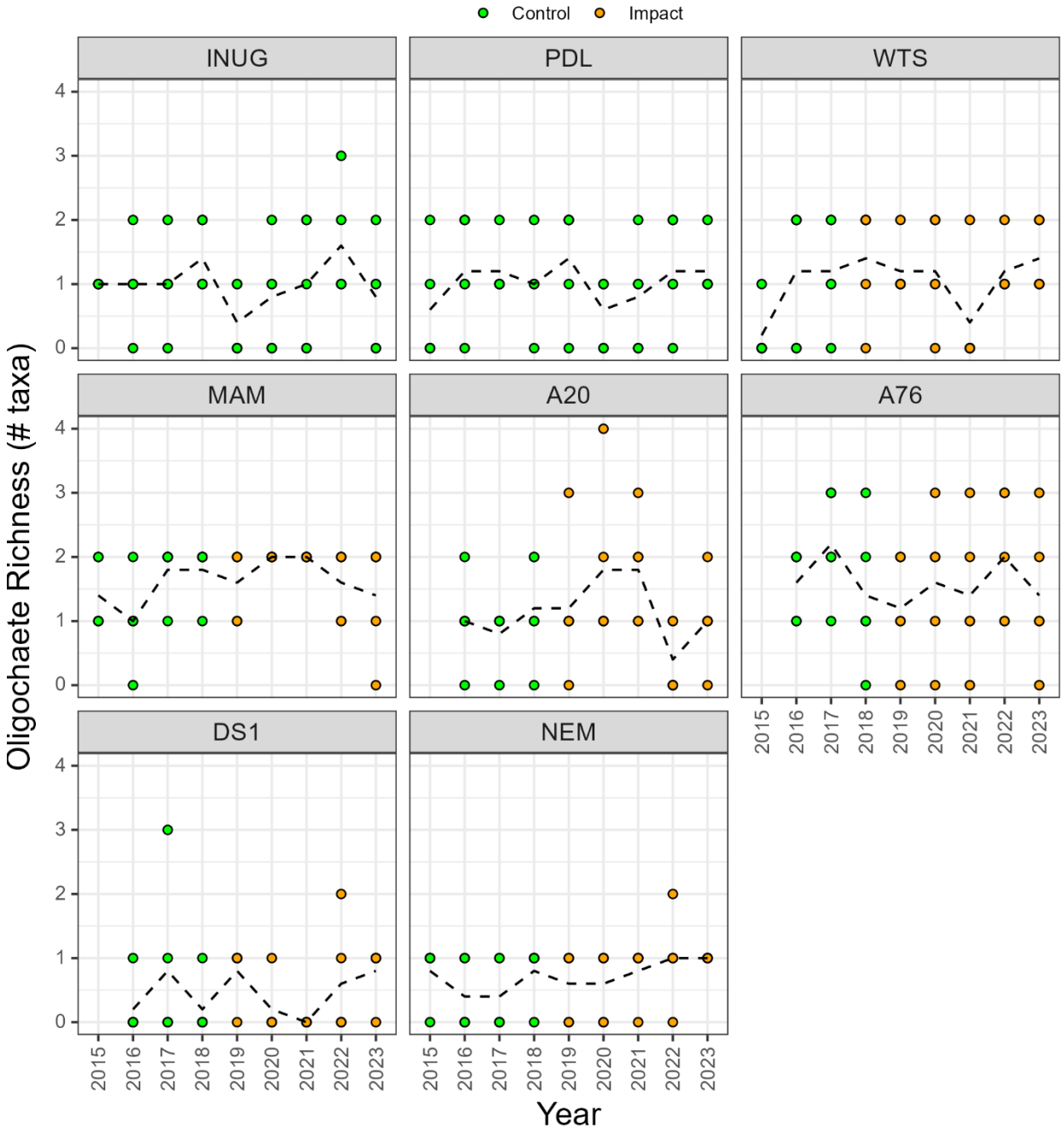


Figure E2-6. Insect richness (# of taxa) from the Whale Tail study lakes since 2015.

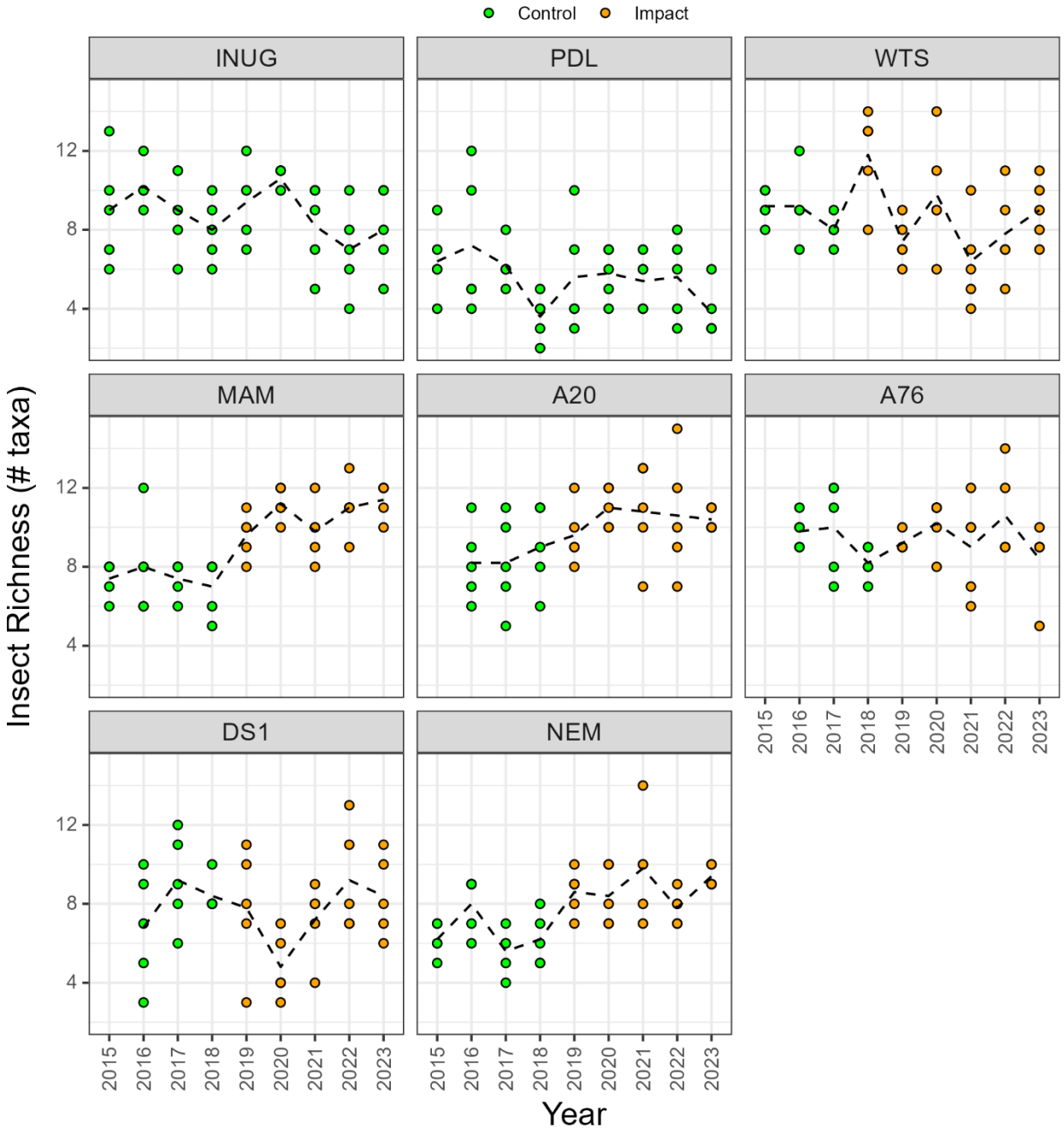


Figure E2-7. Mollusc richness (# of taxa) from the Whale Tail study lakes since 2015.

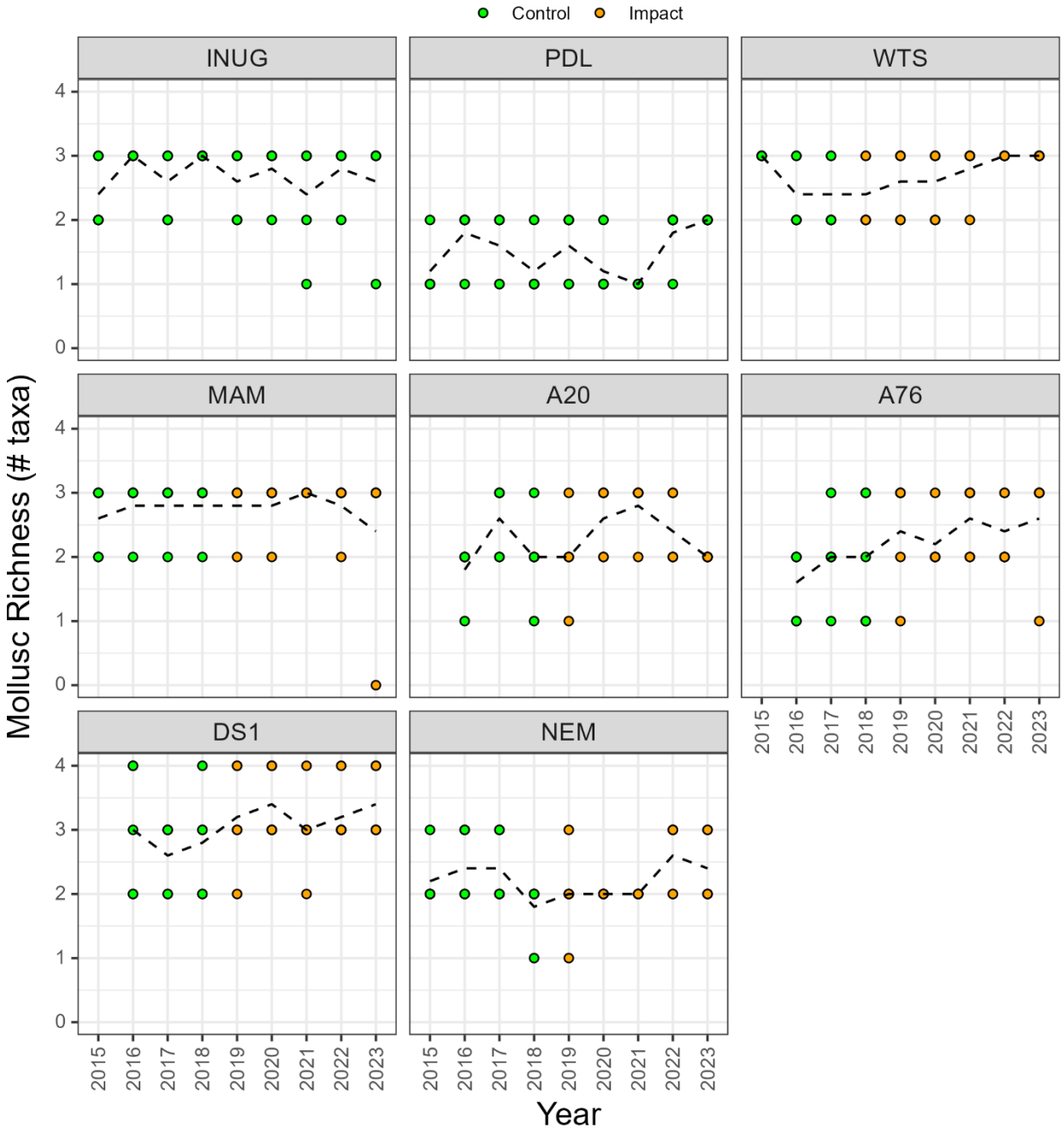


Figure E2-8. Other taxa richness (# of taxa) from the Whale Tail study lakes since 2015.

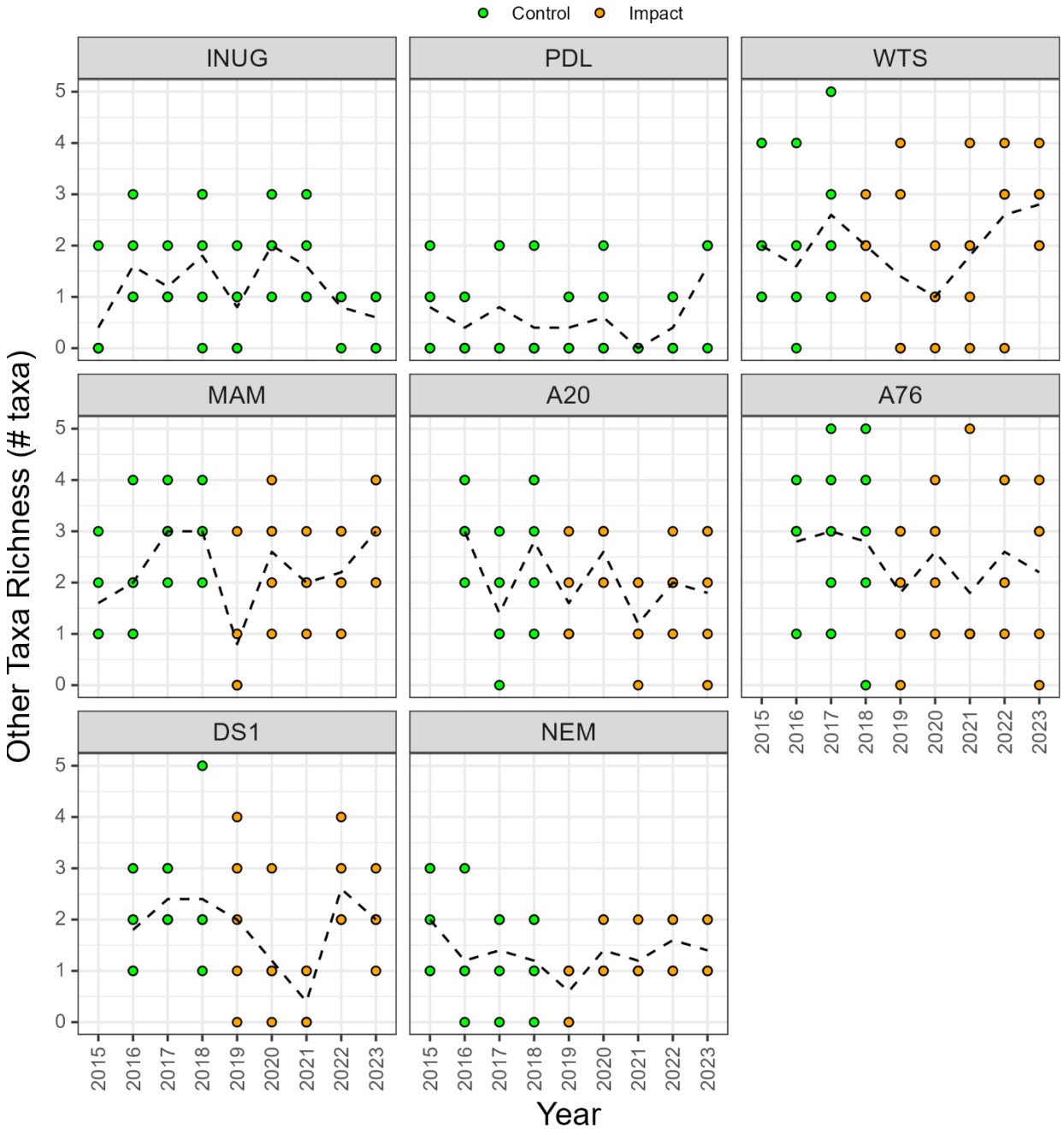


Figure E2-9. Simpson's Diversity for the benthic invertebrate community at the Whale Tail study lakes since 2015.

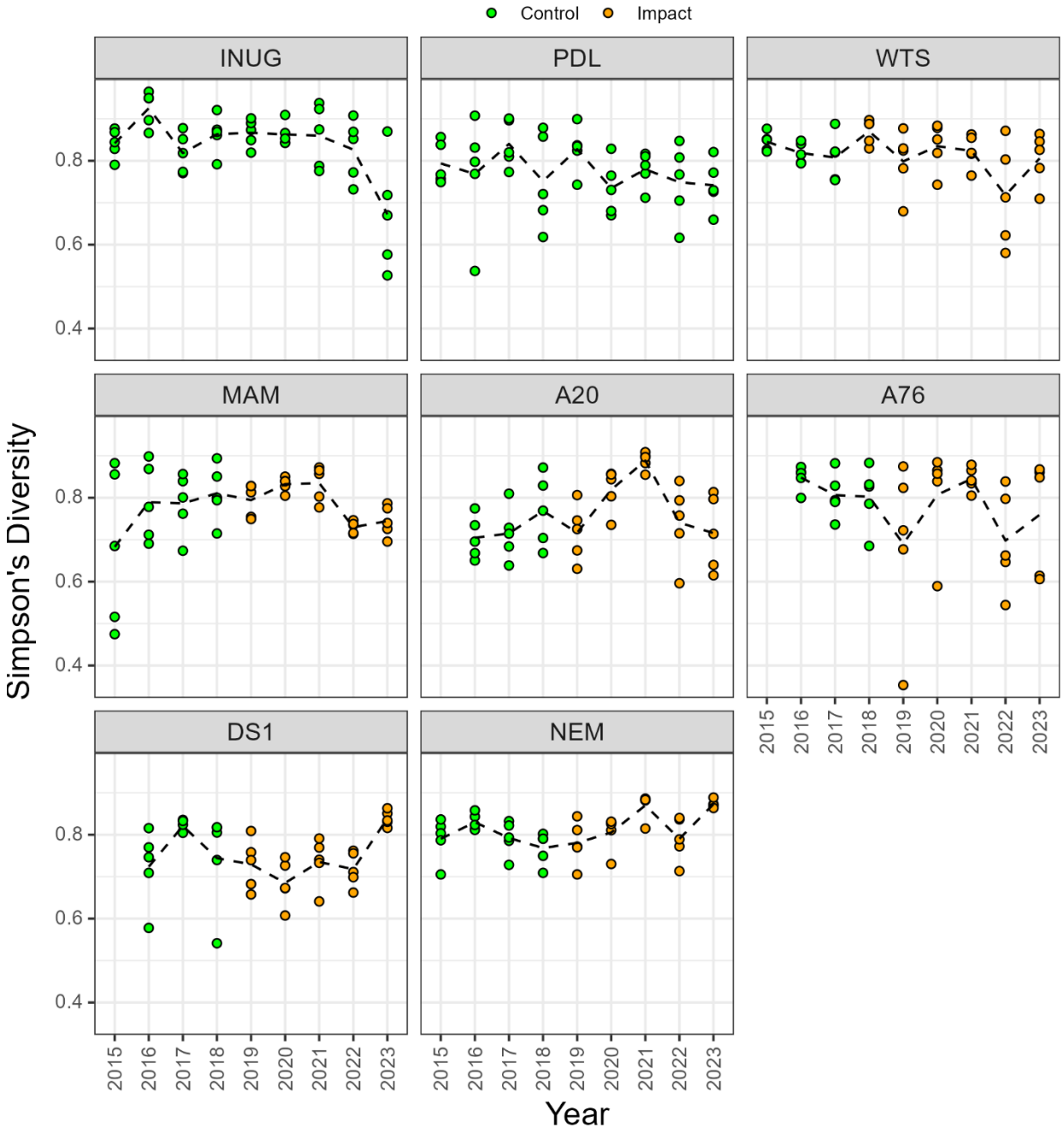
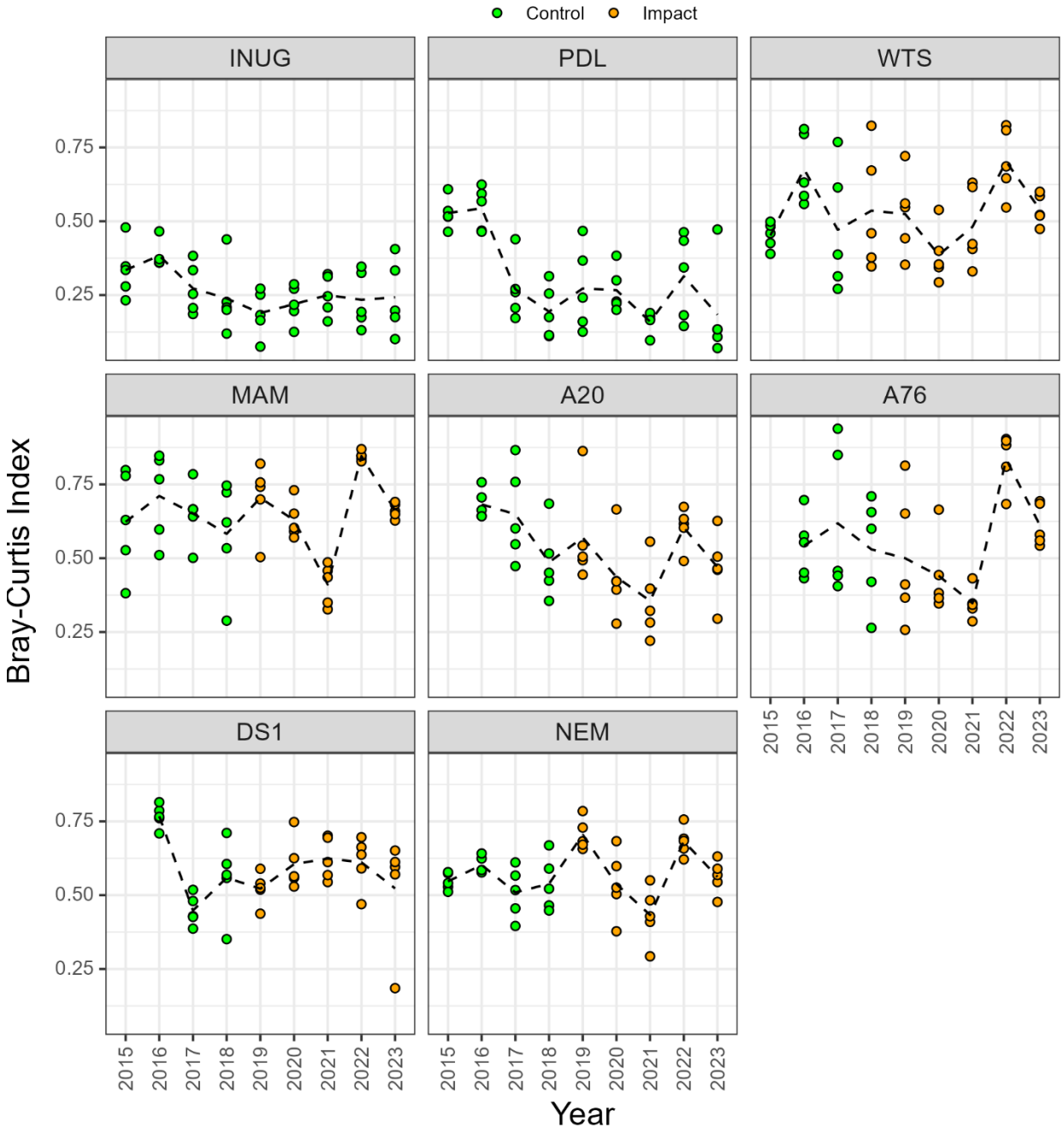


Figure E2-10. Bray-Curtis Index for the benthic invertebrate community at the Whale Tail study lakes since 2015.



Appendix E3
Benthos Data – Baker Lake

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Table E3-1. Benthic invertebrate abundance (#/m^2) and richness (# taxa) by major taxa group, Baker Lake, 2023.

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	17-Aug-23	6.9	152	1,043	435	391	2,022	2	11	2	4	19	0.92	0.24
BAP-2	17-Aug-23	7.5	174	1,413	435	217	2,239	2	13	2	3	20	0.91	0.29
BAP-3	17-Aug-23	7.9	22	413	217	43	696	1	8	2	1	12	0.91	0.35
BAP-4	17-Aug-23	9.1	1,543	739	630	43	2,957	4	9	1	2	16	0.87	0.44
BAP-5	17-Aug-23	8.9	22	717	196	239	1,174	1	9	1	3	14	0.91	0.20
	Area Mean		***383***	***865***	***383***	***187***	***1,817***	***2.0***	***10.0***	***1.6***	***2.6***	***16.2***	***0.91***	***0.30***
Baker Barge Dock														
BBD-1	16-Aug-23	8.4	196	6,848	1,674	22	8,739	3	14	2	1	20	0.63	0.74
BBD-2	16-Aug-23	7.9	22	652	0	87	761	1	11	0	3	15	0.94	0.45
BBD-3	16-Aug-23	8.5	22	2,543	630	22	3,217	1	8	2	1	12	0.68	0.63
BBD-4	16-Aug-23	8.2	65	1,370	22	65	1,522	2	11	1	1	15	0.88	0.37
BBD-5	16-Aug-23	8.4	65	3,457	1,370	174	5,065	1	10	2	3	16	0.78	0.61
	Area Mean		***74***	***2,974***	***739***	***74***	***3,861***	***1.6***	***10.8***	***1.4***	***1.8***	***15.6***	***0.78***	***0.56***
Baker East Shore														
BES-1	18-Aug-23	7.4	152	1,565	152	65	1,935	3	11	1	1	16	0.86	0.22
BES-2	18-Aug-23	9.4	22	1,478	370	130	2,000	1	11	2	1	15	0.81	0.24
BES-3	18-Aug-23	8.5	43	1,130	304	196	1,674	2	10	2	2	16	0.87	0.18
BES-4	18-Aug-23	8.5	174	1,239	348	87	1,848	2	8	2	2	14	0.88	0.22
BES-5	18-Aug-23	8.7	22	1,457	196	217	1,891	1	9	2	3	15	0.83	0.25
	Area Mean		***83***	***1,374***	***274***	***139***	***1,870***	***1.8***	***9.8***	***1.8***	***1.8***	***15.2***	***0.85***	***0.22***
Baker Proposed Jetty														
BPJ-1	19-Aug-23	8.2	87	1,978	391	87	2,543	2	14	2	2	20	0.91	0.34
BPJ-2	19-Aug-23	8.2	22	2,239	130	196	2,587	1	13	2	3	19	0.83	0.35
BPJ-3	19-Aug-23	7.4	0	326	22	22	370	0	8	1	1	10	0.94	0.50
BPJ-4	19-Aug-23	8.8	65	500	43	0	609	2	8	1	0	11	0.90	0.48
BPJ-5	19-Aug-23	7.9	22	1,891	391	22	2,326	1	11	2	1	15	0.81	0.47
	Area Mean		***39***	***1,387***	***196***	***65***	***1,687***	***1.2***	***10.8***	***1.6***	***1.4***	***15.0***	***0.88***	***0.43***

Notes:

1. "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, Pionidae, Harpacticoida, O. Notostraca, and Gammaracanthidae).

Table E3-2. Raw benthic invertebrate data from the Baker Lake, 2023.

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	17-Aug-23	17-Aug-23	17-Aug-23	17-Aug-23	17-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	17-Aug-23	17-Aug-23
Sample Depth (m)	6.9	7.5	7.9	9.1	8.9	8.4	7.9	8.5	8.2	8.4
ROUNDWORMS										
P. Nemata	7	18	8	6	8	2	5	8	8	8
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	-	-	-	2	-	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	1	-	1	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
immatures with hair chaetae	2	-	1	16	1	1	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	-	-	19	-	1	-	-	-	-
Rhyacodrilus montana	5	6	-	10	-	7	-	1	2	3
F. Lumbriculidae										
Lumbriculus	-	-	-	-	-	-	-	-	-	-
indeterminate	-	2	-	26	-	-	-	-	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	1	1	-	-	1	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	4	3	-	1	2	-	-	-	-	-
F. Hygrobatidae										
Hygrobates	2	-	-	-	-	-	-	-	-	-
F. Lebertiidae										
Lebertia	9	6	-	1	4	1	1	1	3	6
F. Oxidae										
Oxus	3	1	2	-	5	-	-	-	-	1
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	1
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	1	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	-	2	-	6	4	80	5	21	14	75
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature	-	-	-	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	-	1	-	-	-	1	-	-	-	-
F. Hydroptilidae										
Agraylea	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	11	9	3	2	7	14	3	5	7	12
S.F. Chironominae										
Cladotanytarsus	-	-	-	-	-	-	-	-	-	-
Constempellina	1	1	1	-	-	2	2	-	4	7
Corynocera ambigua	-	-	-	-	-	-	-	-	-	-
Cryptochironomus	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-
Micropsectra	1	-	-	-	2	10	1	3	5	11
Microtendipes	-	-	-	-	-	-	-	-	-	-
Parachironomus	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	1	-	1	-	-	-
Paratanytarsus	4	20	3	-	1	-	1	-	2	1
Polypedilum	1	-	-	-	-	4	5	3	1	1
Sergentia	-	-	-	-	-	1	-	-	-	-
Stempellinella	-	-	-	-	-	-	1	-	1	-
Stictochironomus	4	7	5	16	-	238	-	80	21	98
Tanytarsus	4	8	1	1	7	13	-	-	7	10
S.F. Diamesinae										
Potthastia	-	2	-	-	-	1	-	-	-	-
Protanypus	1	-	-	-	-	2	4	-	1	-
Pseudodiamesa	-	-	-	1	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	1	-	1	-	10	-	12	-	8
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Eukiefferiella	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	9	6	1	1	7	2	3	4	3	2
Mesocricotopus	-	-	1	-	1	-	-	1	-	-
Paracladius	*1*	1	-	-	2	-	-	-	-	-
Psectrocladius	-	-	-	-	-	-	-	-	-	-
Zalutschia	-	-	-	-	-	-	-	-	-	-
Orthocladiinae *Genus "Greenland"*	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	1	-
S.F. Prodiamesinae										
Monodiamesa	3	3	3	1	4	9	3	6	4	7
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	-	-	-	-
Procladius	8	1	1	7	1	6	5	3	6	2
Thienemannimyia complex	-	4	-	1	-	-	1	-	-	-
F. Empididae										
Chelifera/Metachela	-	1	-	3	-	2	-	-	-	-
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata lewisi	-	-	-	-	-	-	-	-	-	-
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium/Cyclocalyx	17	15	3	29	9	53	-	18	-	36
Pisidium (Cyclocalyx/Neopisidium)	3	5	7	-	-	24	-	11	1	27
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-

Table E3-2. Raw benthic invertebrate data from the Baker Lake, 2023.

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	17-Aug-23	17-Aug-23	17-Aug-23	17-Aug-23	17-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	17-Aug-23	17-Aug-23
Sample Depth (m)	6.9	7.5	7.9	9.1	8.9	8.4	7.9	8.5	8.2	8.4
TOTAL NUMBER OF ORGANISMS	101	124	40	148	67	484	45	177	92	316
TOTAL NUMBER OF TAXA [a]	20	22	13	18	16	22	17	14	18	18
R (Richness) - totals [2,3]										
Total	19	20	12	16	14	20	15	12	15	16
Oligochaete	2	2	1	4	1	3	1	1	2	1
Insect	11	13	8	9	9	14	11	8	11	10
Mollusc	2	2	2	1	1	2	0	2	1	2
Other[4]	4	3	1	2	3	1	3	1	1	3
Abundance (raw) - totals [5,6]										
Total	93	103	32	136	54	402	35	148	70	233
Oligochaete	7	8	1	71	1	9	1	1	3	3
Insect	48	65	19	34	33	315	30	117	63	159
Mollusc	20	20	10	29	9	77	0	29	1	63
Other[4]	18	10	2	2	11	1	4	1	3	8
Abundance - totals (#/m²) [5]										
Total	2,022	2,239	696	2,957	1,174	8,739	761	3,217	1,522	5,065
Oligochaete	152	174	22	1,543	22	196	22	22	65	65
Insect	1,043	1,413	413	739	717	6,848	652	2,543	1,370	3,457
Mollusc	435	435	217	630	196	1,674	0	630	22	1,370
Other[4]	391	217	43	43	239	22	87	22	65	174

[a] Bold entries excluded from taxa count

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, 2023.

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	16-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	19-Aug-23	19-Aug-23	19-Aug-23	19-Aug-23	19-Aug-23
Sample Depth (m)	7.4	9.4	8.5	8.5	8.7	8.2	8.2	7.4	8.8	7.9
ROUNDWORMS										
P. Nemata	13	10	7	5	12	5	19	1	6	4
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	-	-	-	-	-	-	-	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	3	1	1	3	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
immatures with hair chaetae	1	-	-	-	-	-	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	1	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	-	-	-	-	-	-	-	1	-
Rhyacodrilus montana	3	-	1	5	1	3	1	-	2	1
F. Lumbriculidae										
Lumbriculus	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	1	2	-	1	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	-	-	-	1	4	-	1	-	-	-
F. Hygrobatidae										
Hygrobates	-	-	-	-	-	1	1	-	-	-
F. Lebertiidae										
Lebertia	3	6	7	3	5	3	7	-	-	1
F. Oxidae										
Oxus	-	-	2	-	1	-	-	1	-	-
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	38	9	16	9	13	16	2	3	-	2
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
immature	-	-	-	-	-	-	-	-	-	-
F. Apataniidae										
Apatania	-	-	-	-	-	-	-	-	-	-
F. Hydroptilidae										
Agraylea	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	28	37	23	22	32	17	45	3	5	7
S.F. Chironominae										
Cladotanytarsus	-	-	-	-	-	-	-	-	-	-
Constempellina	10	5	2	3	3	1	3	-	-	2
Corynocera ambigua	-	-	-	-	-	-	-	-	-	-
Cryptochironomus	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-
Micropsectra	1	1	1	1	2	8	3	1	-	3
Microtendipes	-	-	-	-	-	-	-	-	-	-
Parachironomus	3	6	-	-	-	-	-	-	-	-
Paracladopelma	-	1	1	-	-	1	2	-	1	-
Paratanytarsus	3	-	-	-	1	2	1	1	-	2
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	1	-	-	-	-
Stictochironomus	3	-	-	-	-	14	8	2	1	42
Tanytarsus	7	5	9	14	9	18	16	3	3	14
S.F. Diamesinae										
Potthastia	-	-	-	-	-	-	-	-	-	-
Protanypus	-	-	-	-	-	1	1	-	-	-
Pseudodiamesa	1	1	1	-	1	1	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	2	-	-	1	-	3	2	-	-	2
Cricotopus/Orthocladius	-	2	1	-	-	-	-	-	-	1
Eukiefferiella	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	10	4	2	2	7	1	6	-	7	1
Mesocricotopus	-	1	-	-	-	-	-	1	1	-
Paracladius	-	-	4	8	8	-	3	1	1	1
Psectrocladius	-	-	-	-	-	-	-	-	-	-
Zalutschia	-	-	-	-	-	-	-	-	-	-
Orthocladiinae *Genus "Greenland"*	-	-	-	-	-	-	1	-	-	-
indeterminate	-	-	-	1	1	-	2	-	-	-
S.F. Prodiamesinae										
Monodiamesa	2	2	3	4	1	7	4	2	3	7
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	-	-	-	-
Procladius	2	3	5	1	2	15	6	1	1	5
Thienemannimyia complex	-	-	-	-	-	-	-	-	-	-
F. Empididae										
Chelifera/Metachela	-	-	-	-	-	1	-	-	-	-
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata lewisi	-	-	-	-	-	-	-	-	-	-
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Pisidium/Cyclocalyx	7	7	10	6	7	9	2	1	-	12
Pisidium (Cyclocalyx/Neopisidium)	-	10	4	10	2	9	4	-	2	6
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-

Table E3-2. Raw benthic invertebrate data from the Baker Lake, 2023.

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	16-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	16-Aug-23	19-Aug-23	19-Aug-23	19-Aug-23	19-Aug-23	19-Aug-23
Sample Depth (m)	7.4	9.4	8.5	8.5	8.7	8.2	8.2	7.4	8.8	7.9
TOTAL NUMBER OF ORGANISMS	140	112	102	99	113 #	138	140	21	34	113
TOTAL NUMBER OF TAXA [a]	18	17	19	17	18	22	22	12	12	17
[a] Bold entries excluded from taxa count										
R (Richness) - totals [2,3]										
Total	14	16	17	11	13	20	19	10	11	15
Oligochaete	1	1	2	0	0	2	1	0	2	1
Insect	9	11	10	8	9	14	13	8	8	11
Mollusc	1	1	1	1	1	2	2	1	1	2
Other[4]	3	3	4	2	3	2	3	1	0	1
Abundance (raw) - totals [5,6]										
Total	86	102	86	53	68	117	119	17	28	107
Oligochaete	2	4	2	0	0	4	1	0	3	1
Insect	59	74	52	36	29	91	103	15	23	87
Mollusc	9	13	12	4	19	18	6	1	2	18
Other[4]	16	11	20	13	20	4	9	1	0	1
Abundance - totals (#/m^2) [5]										
Total	1,870	2,217	1,870	1,152	1,478	2,543	2,587	370	609	2,326
Oligochaete	43	87	43	0	0	87	22	0	65	22
Insect	1,283	1,609	1,130	783	630	1,978	2,239	326	500	1,891
Mollusc	196	283	261	87	413	391	130	22	43	391
Other[4]	348	239	435	283	435	87	196	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.

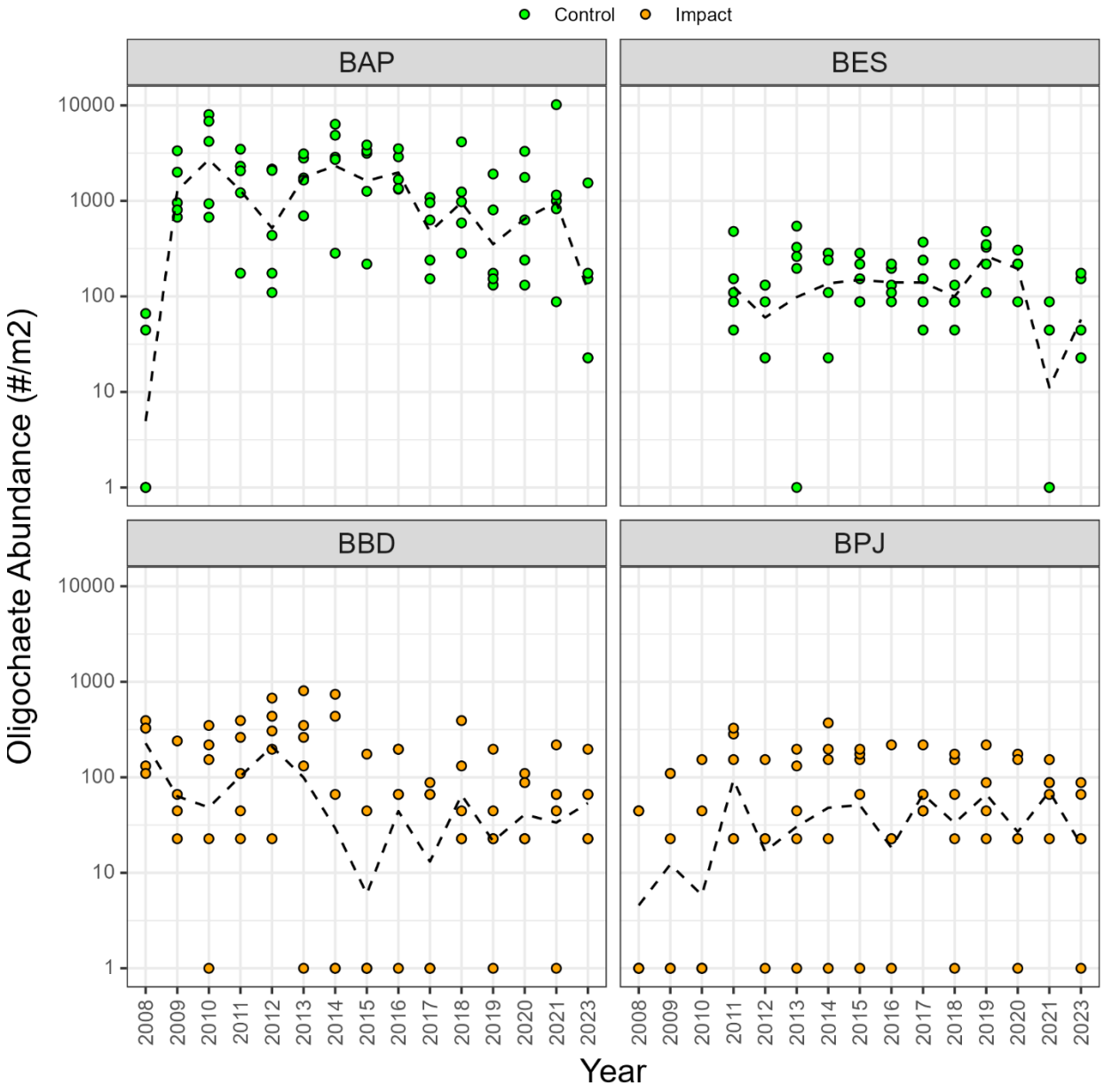


Figure E3-2. Insect abundance (#/m^2) from Baker Lake since 2008.

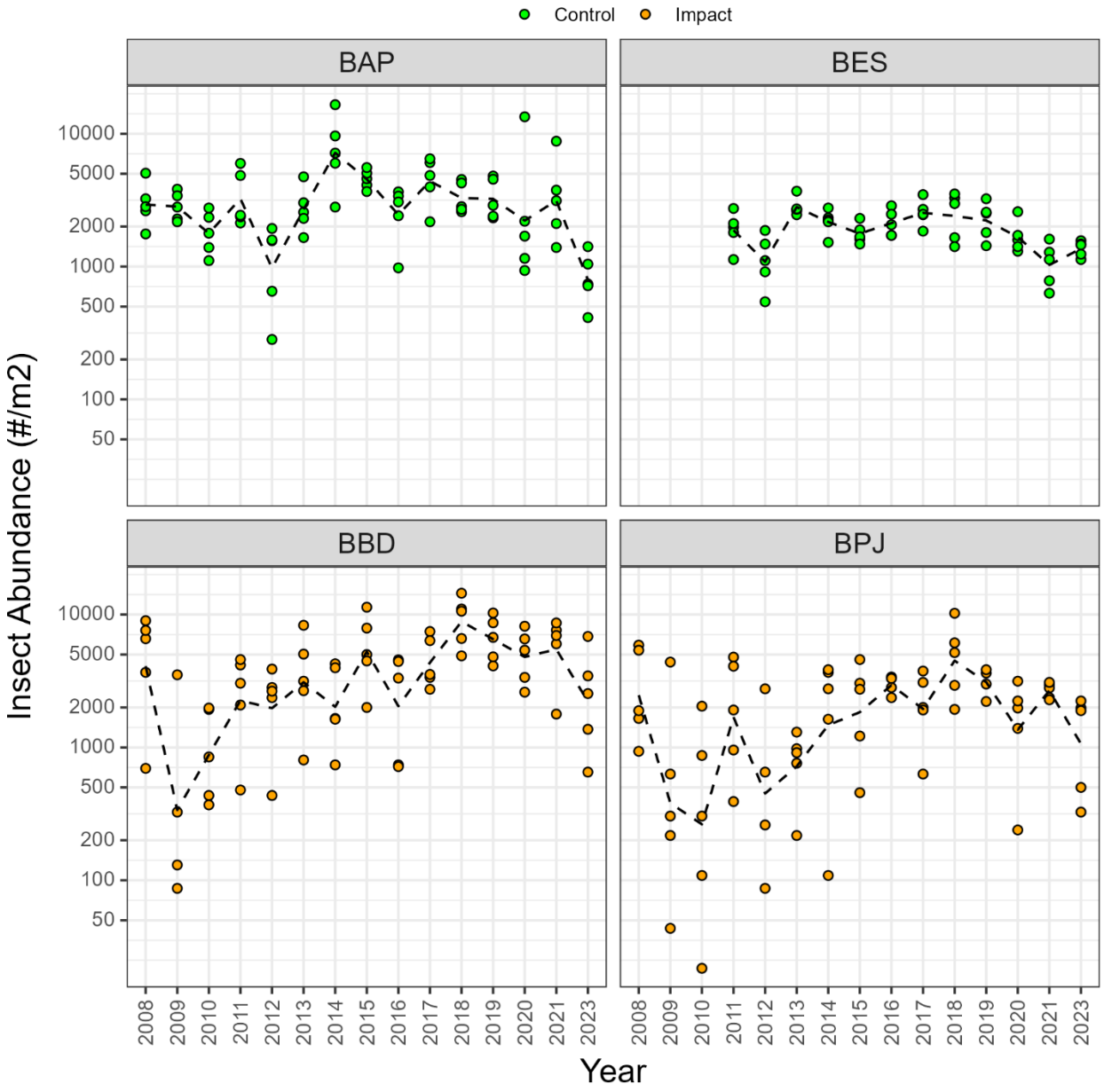


Figure E3-3. Mollusc abundance (#/m^2) from Baker Lake since 2008.

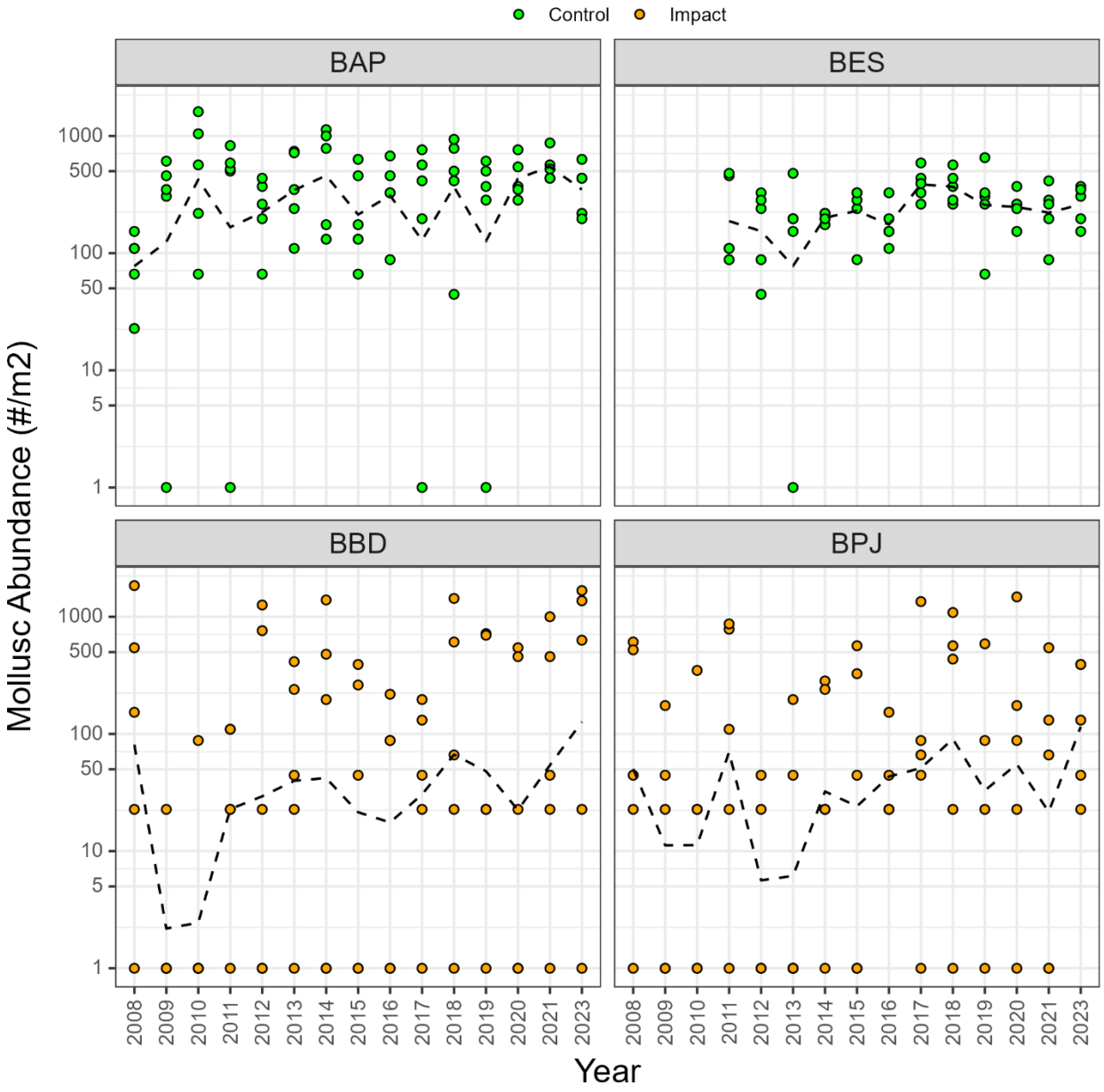


Figure E3-4. Other taxa abundance (#/m^2) from Baker Lake since 2008.

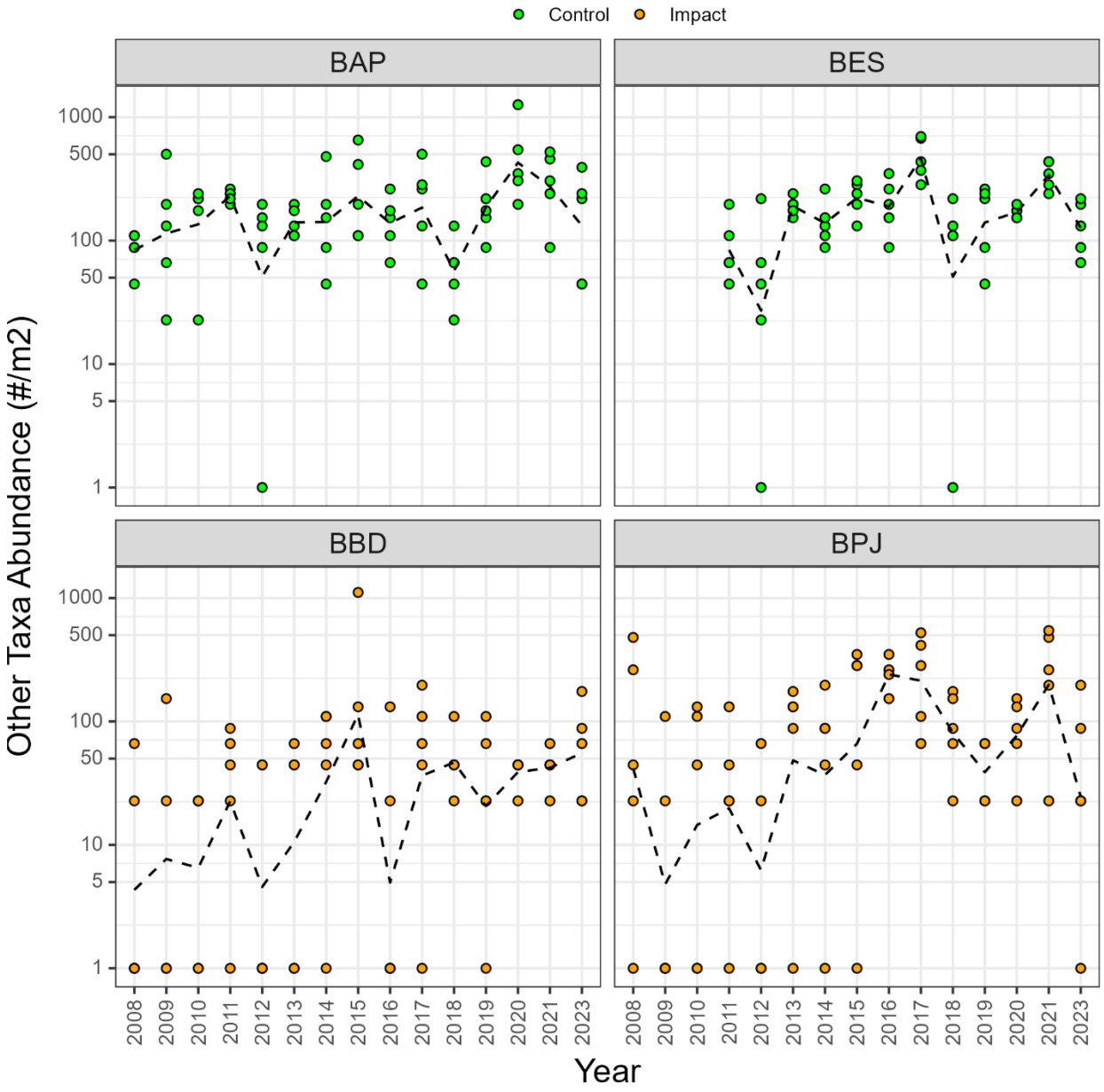


Figure E3-5. Oligochaete richness (# of taxa) from Baker Lake since 2008.

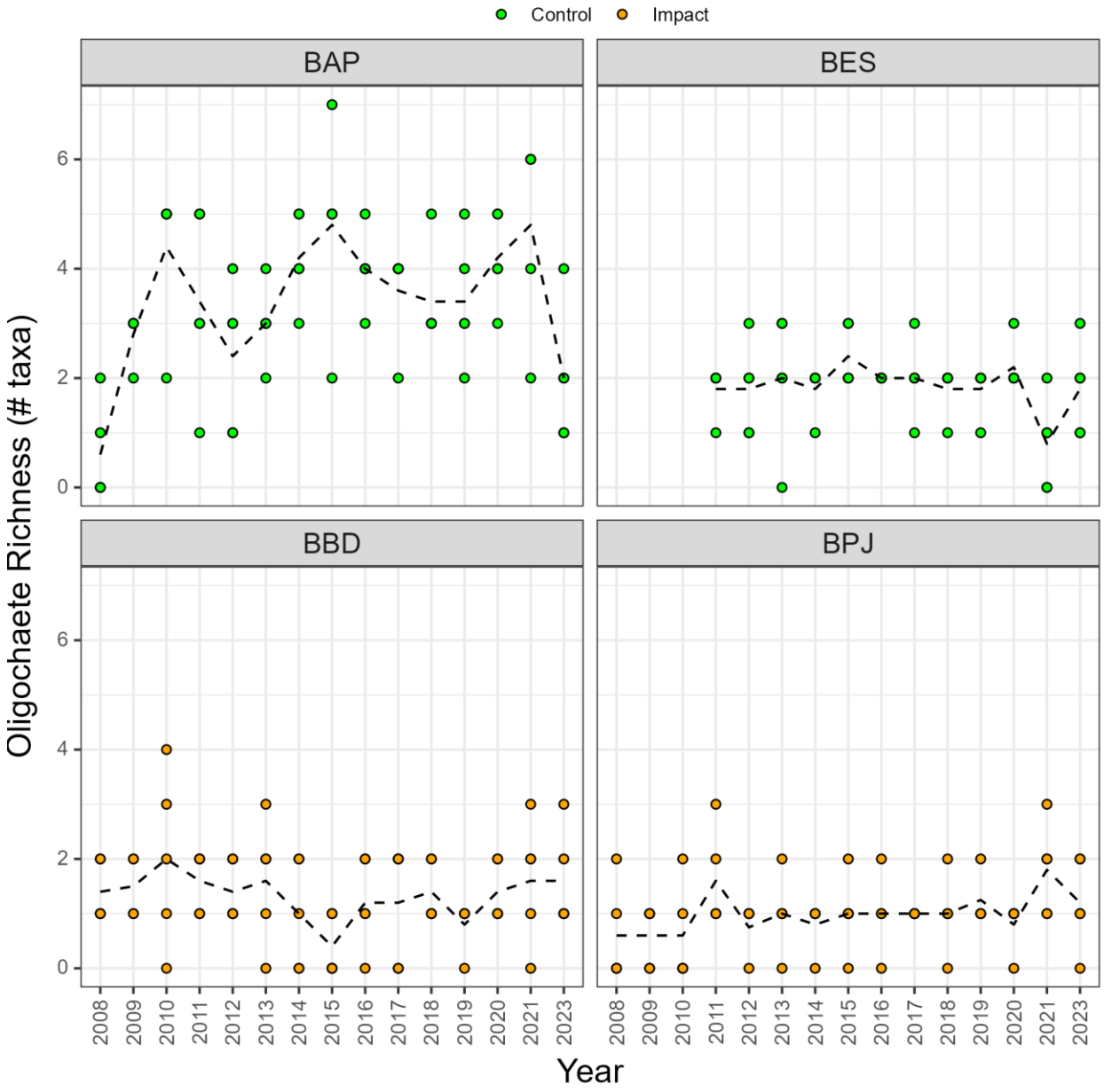


Figure E3-6. Insect richness (# of taxa) from Baker Lake since 2008.

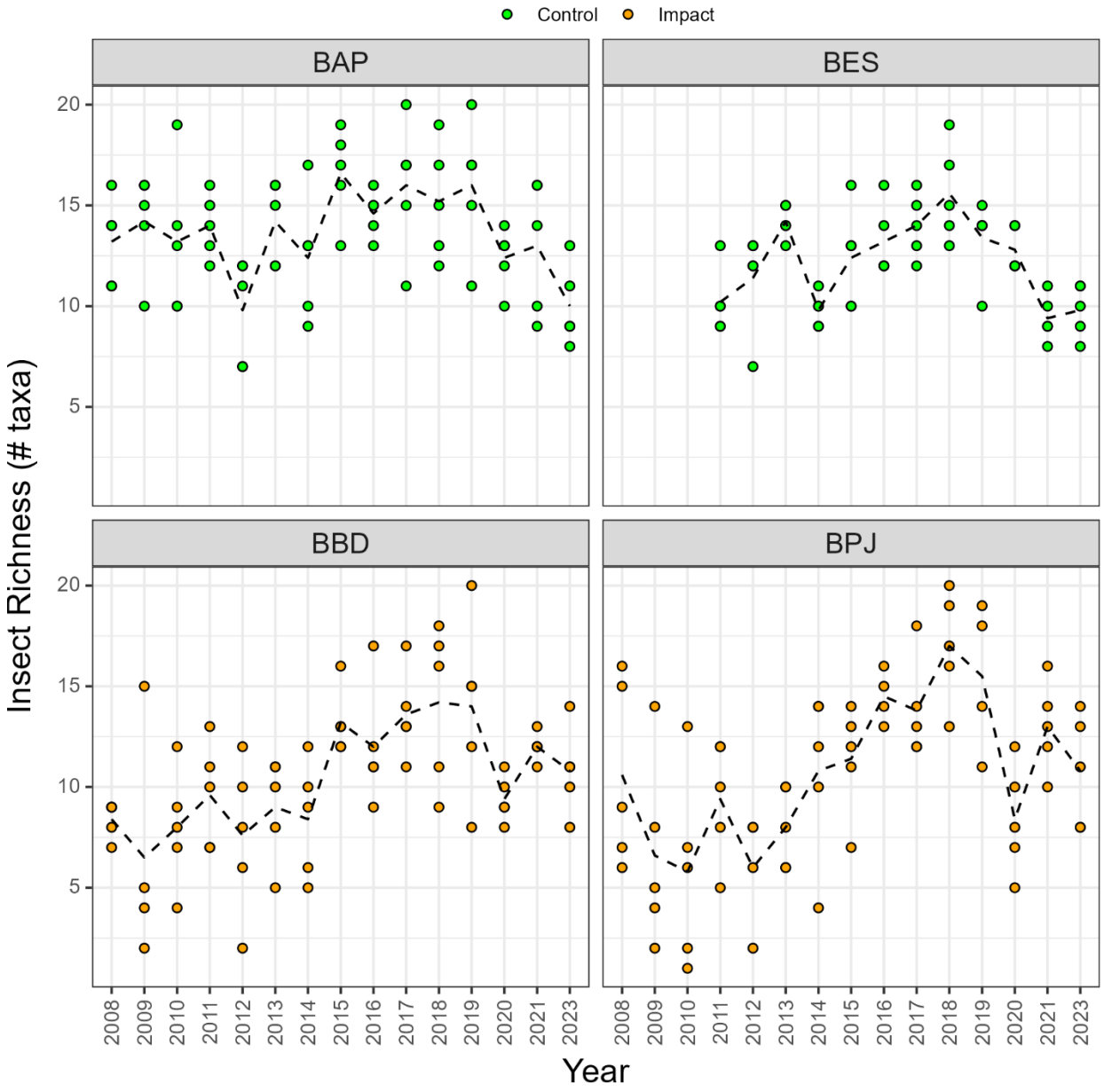


Figure E3-7. Mollusc richness (# of taxa) from Baker Lake since 2008.

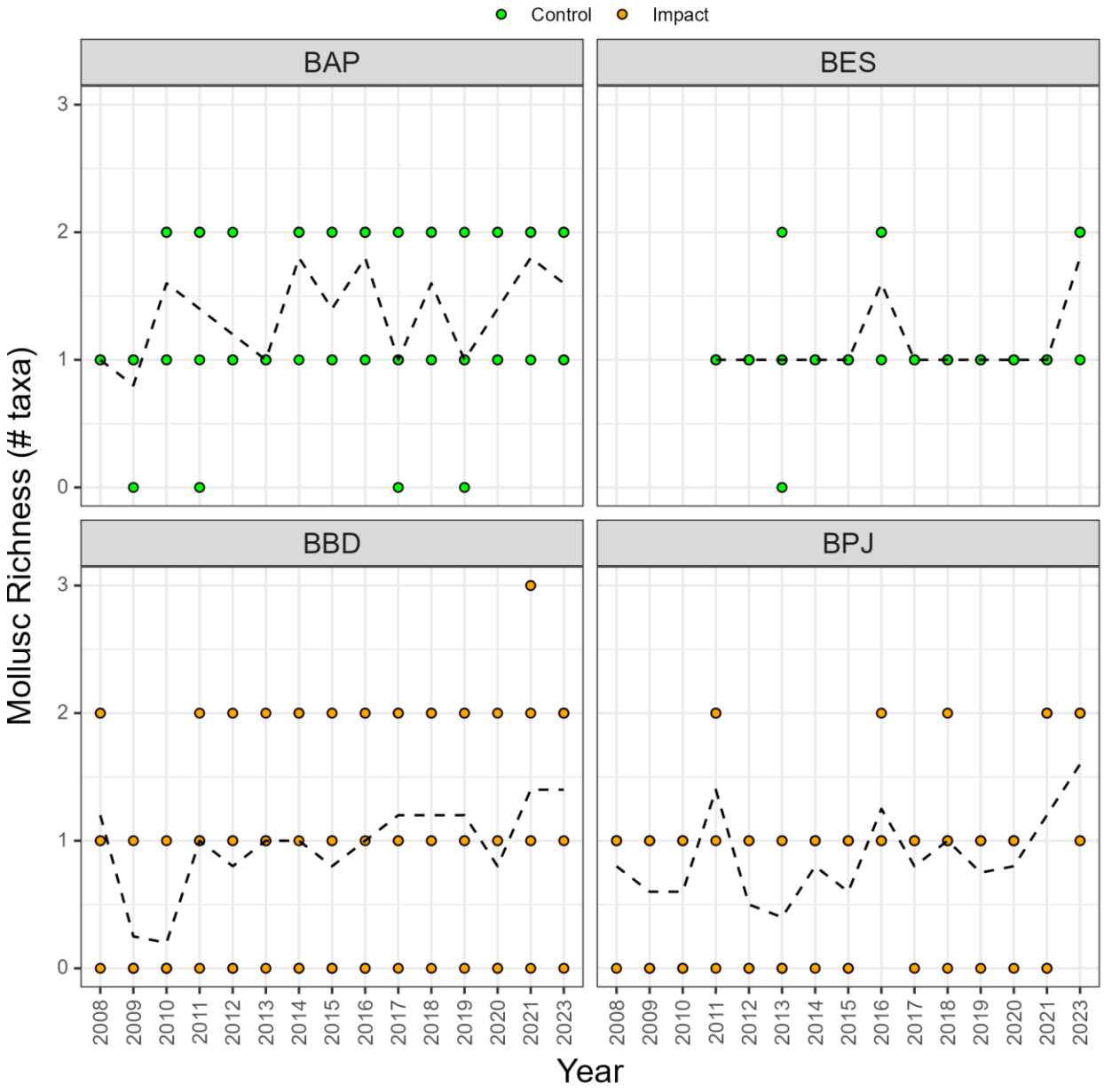


Figure E3-8. Other taxa richness (# of taxa) from Baker Lake since 2008.

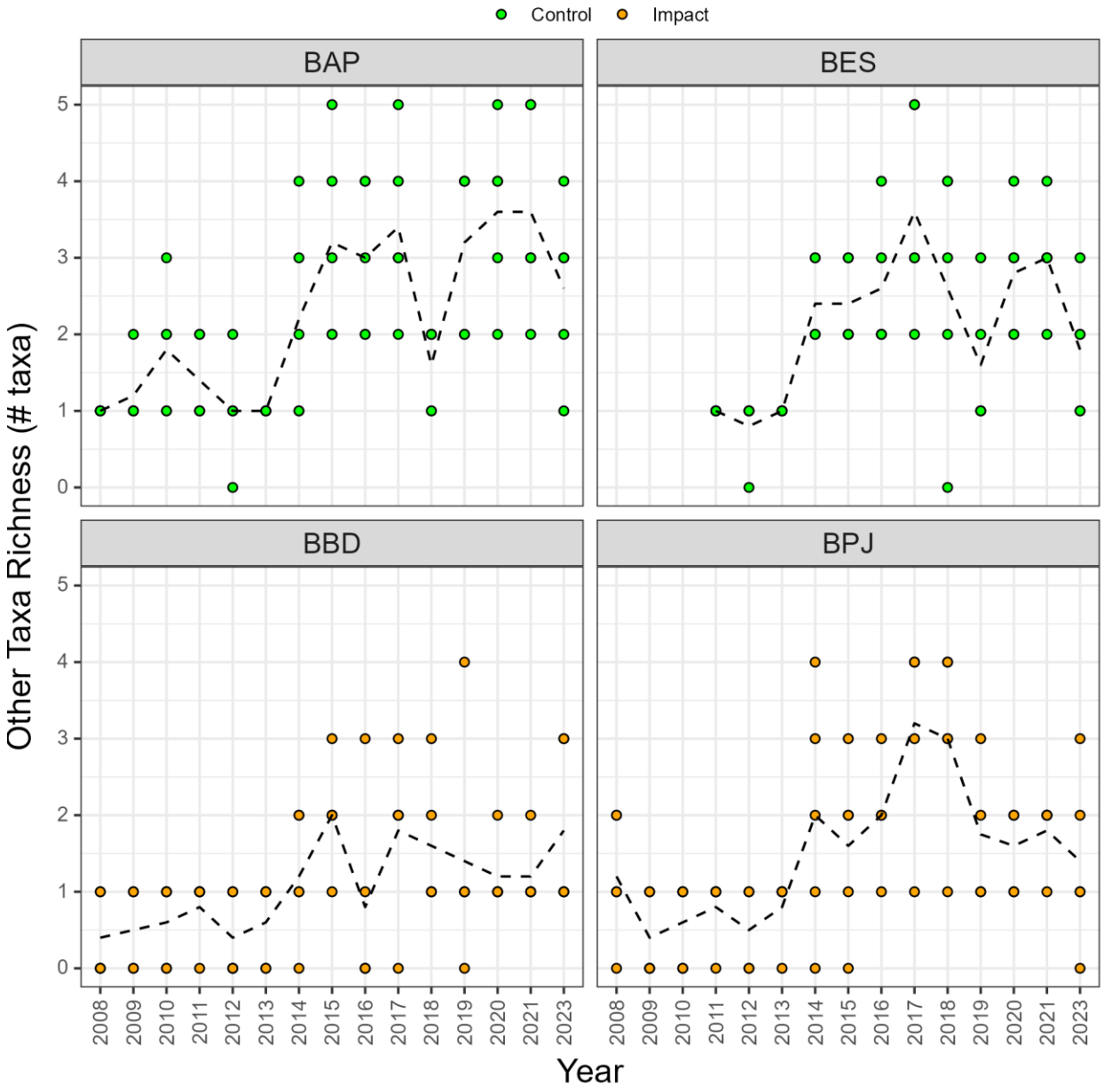


Figure E3-9. Simpsons' Diversity for the benthic invertebrate community at Baker Lake since 2008.

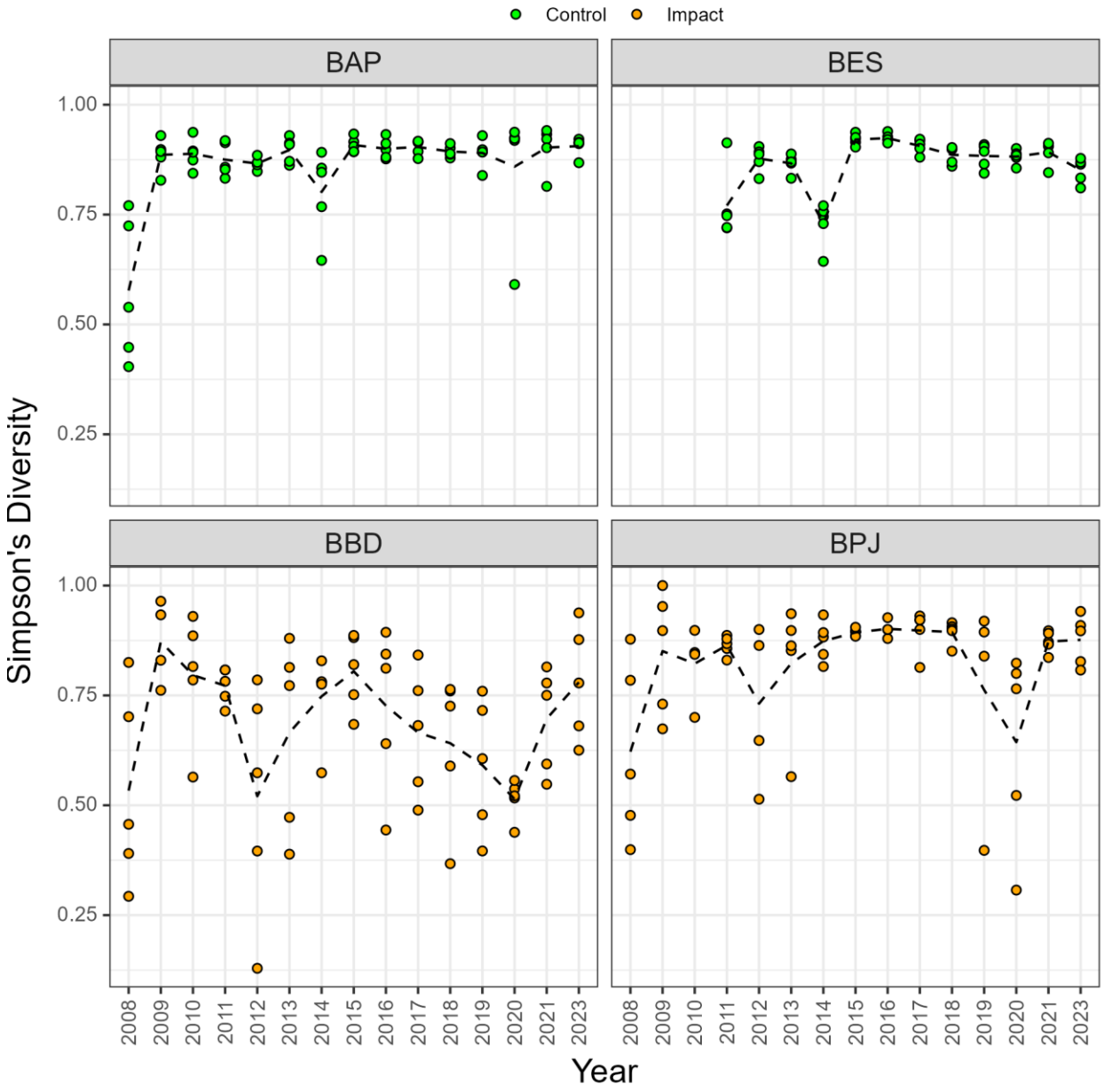
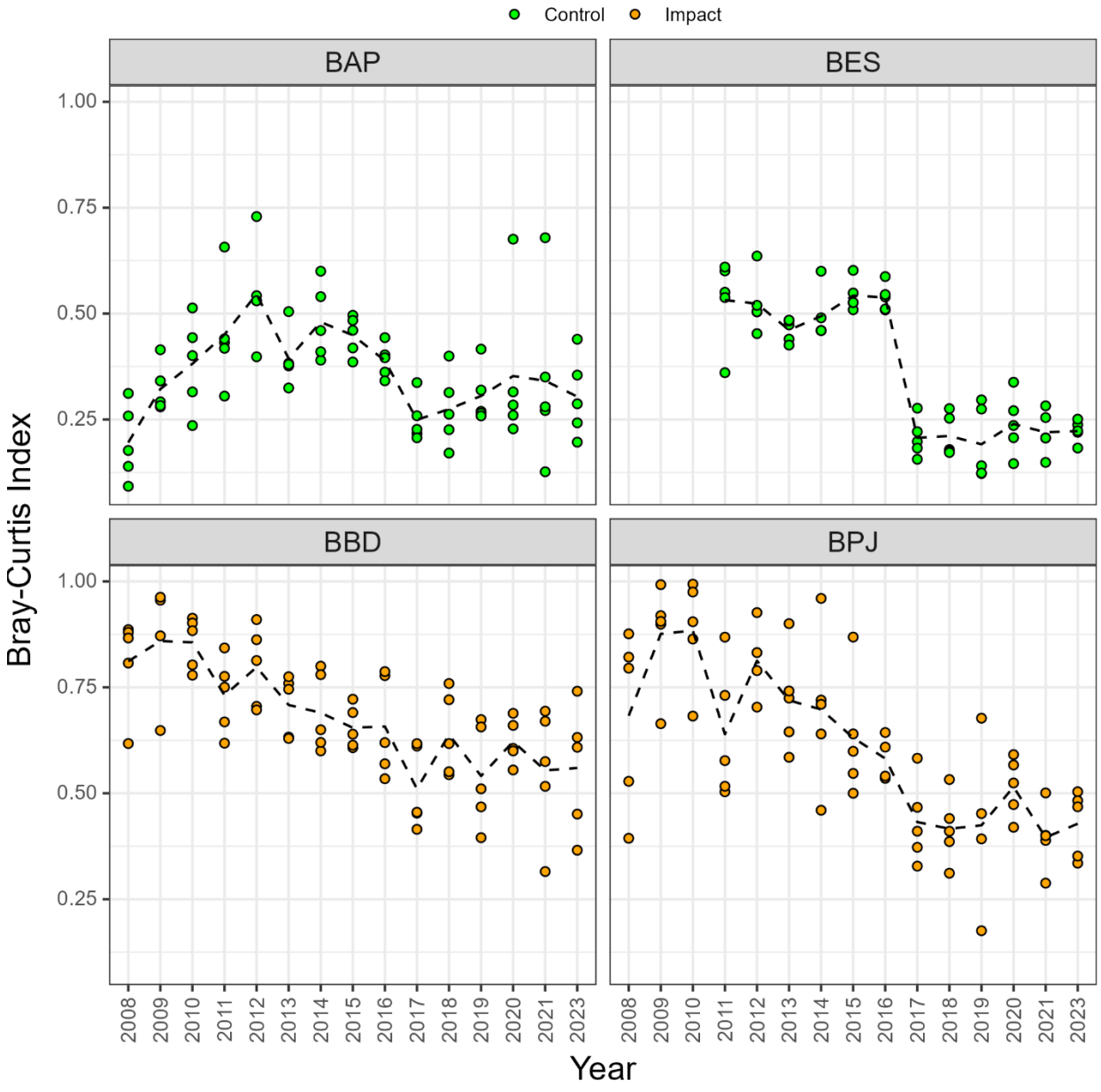


Figure E3-10. Bray-Curtis Index for the benthic invertebrate community at Baker Lake since 2008.



APPENDIX F
2019 WATER QUALITY EFFECTS ASSESSMENT

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F.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).

F.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** in the 2020 CREMP report 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.

F.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.

F.1.3 Approach

As described in **Section F.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.

F.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.

F.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.

F.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.

F.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.

F.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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