Keeyask Generation Project

Aquatic Effects Monitoring Plan

Benthic Invertebrate Monitoring Report

AEMP-2024-10

KEEYASK

Manitoba Environment and Climate Change Client File 5550.00
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2023 - 2024

KEEYASK GENERATION PROJECT

AQUATIC EFFECTS MONITORING PLAN

REPORT #AEMP-2024-10

BENTHIC INVERTEBRATE MONITORING
SPLIT LAKE TO STEPHENS LAKE, 2021 TO 2023

Prepared for

Manitoba Hydro

By

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SUMMARY

Background

The Keeyask Hydropower Limited Partnership (KHLP) was required to prepare a plan to monitor the effects of construction and operation of the Keeyask Generating Station (GS) on the environment. Monitoring results provide information to assess the accuracy of predictions, information to determine the actual effects of construction and operation of the GS on the environment, and whether more needs to be done to reduce harmful effects.

Construction of the Keeyask GS began in mid-July 2014 and instream work was completed in 2020. The reservoir was impounded with water levels being raised to full supply level between August 31 and September 5, 2020. Commissioning of the powerhouse turbines was initiated after impoundment. They were brought into service one at a time with the final of seven turbines completed on March 9, 2022.

Aquatic habitat provides the environment in which aquatic plants and animals live. Benthic invertebrates are tiny animals without backbones, such as insect larvae and clams that live in or on the bottom of lakes and rivers. Benthic invertebrates are often used to assess habitat and water quality in lakes and rivers and are a food source for many fish species.

Impoundment of the Keeyask reservoir in fall 2020 changed many types of aquatic habitat in areas upstream of the GS and changed flow patterns in areas downstream of the GS. Monitoring benthic invertebrates in these areas was used to measure the biological effects of the Keeyask GS on the aquatic environment.

This report presents the benthic invertebrate results from sampling upstream and downstream of the Keeyask reservoir in 2023, the third open-water season after flooding. This report also provides a summary of the changes seen during the first three years after the reservoir was created.

Why is the study being done?

Monitoring areas upstream and downstream of the Keeyask GS is being done to answer three questions:

What is the response of the benthic invertebrate community to GS operation and to changes in types of aquatic habitat, substrates, and water quality in the Keeyask reservoir? And what is the response of the benthic invertebrate community to changes in flow patterns, water depths, and ice scour downstream of the GS in Stephens Lake?

Both questions are important because benthic invertebrates are a major food source for many fish species and are a key part of the aquatic food web that links their food (organic matter, algae, plants, and other organisms) to higher trophic level vertebrates, like fish. Bugs are also recognized in the *Fisheries Act*, which includes in the definition of fish habitat the food sources on which fish depend. It is important that newly created habitats in the reservoir are suitable for benthic invertebrates so that there are food sources for fish.

How accurate were the predictions in the EIS Aquatic Effects Supporting Volume?

This question is important because it will help us to understand how the benthic invertebrate community changes as the habitat conditions upstream and downstream of the Keeyask GS develop over time. It was predicted that changes to the habitats from flooding, sediment deposition, water level fluctuations, and/or flow patterns would have a large initial effect on the benthic invertebrate community that would result in an overall change in the types of bugs present to a community that is adapted to the post-impoundment habitat.

What was done?

In 2023, benthic invertebrate sampling was conducted in Split Lake, the Keeyask reservoir, and in Stephens Lake (see map below). Split Lake was sampled to record the invertebrate community in an area not directly affected by the Keeyask GS and to show how the invertebrate community in a lake upstream can vary from year to year. Sites in the Keeyask reservoir (from Clark Lake to the Keeyask GS) were sampled to show how the invertebrate community may be affected by the Project from effects like flooding, fluctuating water levels, and changes in water quality. These sites were also sampled to record whether newly flooded areas are colonized by invertebrates. Finally, sites in Stephens Lake (downstream, and within 3 km and 11 km of the Keeyask GS) were sampled to show how the benthic invertebrate community may be affected by changes in flow. O'Neil Bay in Stephens Lake was also sampled to record the invertebrate community in an area that the Keeyask reservoir backbay sites may resemble in about 25 years.

A total of 153 benthic invertebrate samples were collected in 2023. These included 15 samples from one site in Split Lake, 90 samples from six sites in the Keeyask reservoir, and 48 samples from four sites in Stephens Lake. Sampling was conducted in Split Lake on August 17 (these data are collected as part of the Coordinated Aquatic Monitoring Program [CAMP]) and the Keeyask reservoir and Stephens Lake were sampled between September 17 and 24.

Three habitat types were sampled at most sites: i) intermittently-exposed (IE; very close to shore measuring less than 1 m deep), ii) predominantly-wetted (PW; a little farther from shore measuring 1 to 3 m deep), and iii) offshore (areas farthest from shore measuring 3 to 10 m deep).

Collecting substrate (right) at a benthic invertebrate sampling site with a petite Ponar dredge (left) in the Keeyask reservoir, fall 2023.

Benthic invertebrate samples were collected using a Ponar dredge (pictured above). The dredge was lowered to the bottom to rest on the substrate. The jaws were then closed, collecting a sample of the bottom. This sample was rinsed to get rid of the sediment and all the invertebrates that were left were preserved and brought back to the lab for identification. In the shallowest areas (the IE sites), kicknetting (pictured below) was used to collect invertebrates in Split Lake where a small net is kicked along the bottom. However, this was difficult in the areas that contain lots of flooded terrestrial vegetation (like willows), so a petite Ponar dredge was also used to collect samples from the IE sites in the Keeyask reservoir and Stephens Lake.

Using a kicknet to sample IE sites close to shore in Split Lake.

What was found?

The number and types of bugs found in the main part of the Keeyask reservoir did not change much from before the GS was built. Along the shoreline at most sites the kinds of bugs found were similar to pre-Project, but at some sites groups like non-biting midges and aquatic worms, which are tolerant of poor conditions, became relatively more abundant following impoundment. This change may be because these sites also had detritus and loose or broken-down plant matter.

Monitoring in the three backbays showed different kinds of changes after flooding depending on the amount of flooding and whether areas that used to be land were sampled. Overall, newly flooded land was rapidly colonized by groups that are tolerant to environmental change like non-biting midges and aquatic worms but sensitive groups like mayflies were not present. Comparisons of similar habitats in the backbays pre- and post-impoundment found that the tolerant groups were relatively more common than the sensitive groups.

Monitoring in habitats downstream of the Keeyask GS in Stephens Lake indicated there was no reduction in the total number of kinds of bugs so there have not been negative effects due to control of flows at the GS.

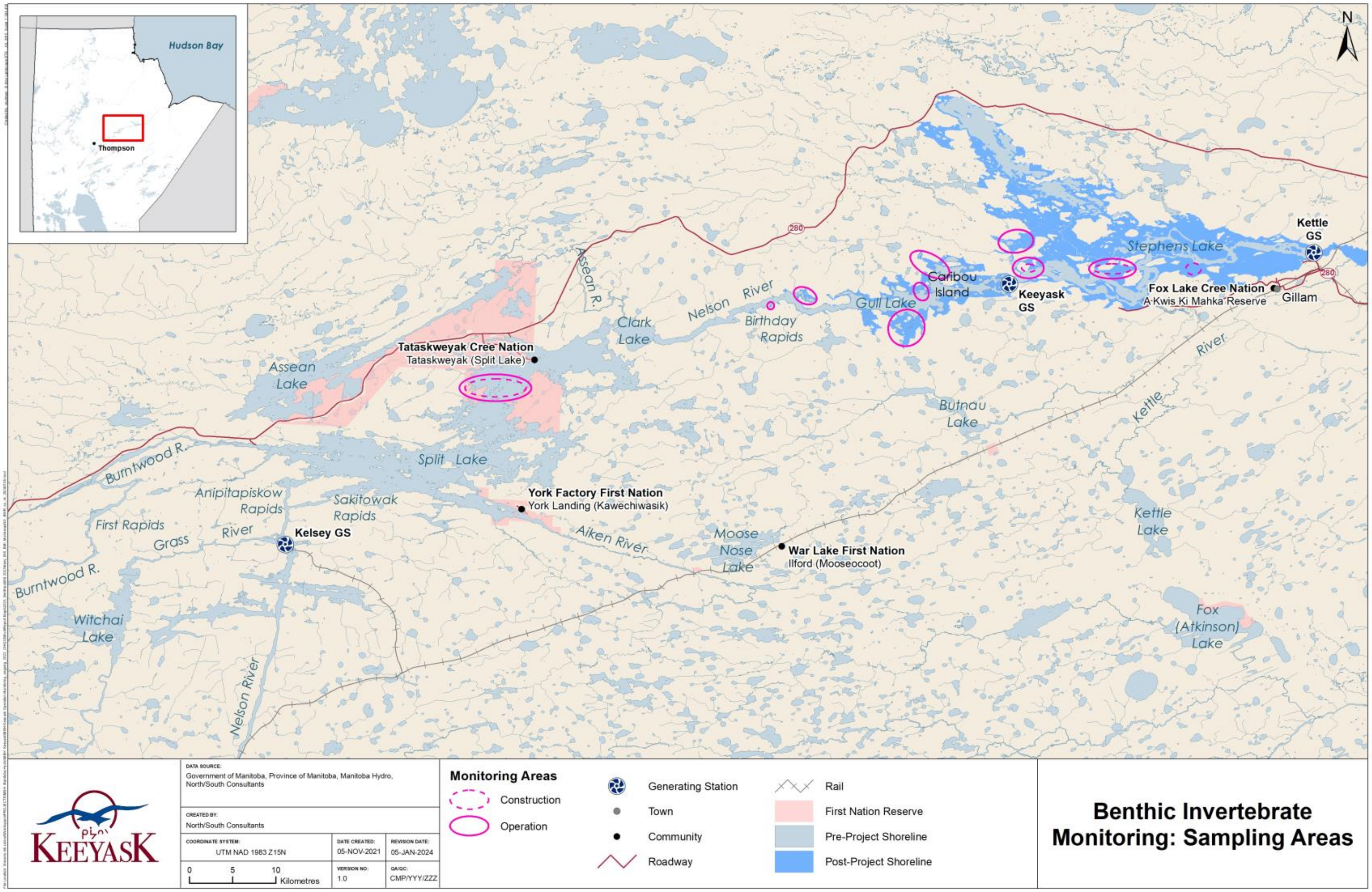
The biggest change seen at the reference sites in Split Lake and Stephens Lake was that zebra mussels were now abundant.

What does it mean?

Sampling in 2023 represents the third year of studying the changes in the benthic invertebrate community in the Keeyask reservoir. The post-impoundment environment has changed the aquatic invertebrate community in some habitats at some sites, with tolerant groups like non-biting midges and aquatic worms becoming relatively more abundant. These groups have also colonized new habitats created from flooding terrestrial areas.

What will be done next?

Going forward, changes are expected to occur more slowly, so monitoring will be conducted every three years (next in 2026). Surveys will be repeated using the same methods in the Keeyask reservoir and downstream of the GS.



Map showing the areas where benthic invertebrate sampling was done.

ACKNOWLEDGEMENTS

We would like to thank Manitoba Hydro for the opportunity and resources to conduct this study.

Stewart Anderson of Fox Lake Cree Nation (FLCN) is thanked for his local expertise and assistance in conducting the field work. We would also like to thank Ray Mayham of FLCN and Gordon Cook of Tataskweyak Cree Nation for arranging logistic support and personnel needed to conduct the fieldwork.

The collection of biological samples described in this report was authorized by Natural Resources and Northern Development, Fish and Wildlife Branch, under terms of the Scientific Collection Permit #57172605 (SCP 19-2023) and Aquatic Invasive Species (AIS) Permit No. 20-2023.

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1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt (MW) hydroelectric generating station at Gull Rapids on the lower Nelson River in northern Manitoba. The Project is approximately 725 kilometres (km) northeast of Winnipeg, 35 km upstream of the existing Kettle Generating Station, where Gull Lake flows into Stephens Lake, 60 km east of the community of Split Lake, 180 km east-northeast of Thompson and 30 km west of Gillam (Map 1). Construction of the Project began in July 2014.

The *Keeyask Generation Project: Response to EIS Guidelines*, completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project. Technical supporting information for the aquatic environment, including a description of the environmental setting, effects and mitigation, and a summary of proposed monitoring and follow-up programs, is provided in the *Keeyask Generation Project Environmental Impact Statement: Aquatic Environment Supporting Volume* (AE SV) (KHLP 2012). As part of the licensing process for the Project, an *Aquatic Effects Monitoring Plan* (AEMP) was developed detailing the monitoring activities of various components of the aquatic environment (KHLP 2014). This includes monitoring of the benthic macroinvertebrate community for the construction and operation phases of the Project.

Benthic invertebrate baseline studies in the Keeyask study area were conducted between 1997 and 2006 in Split Lake, the Clark Lake to Gull Rapids reach of the Nelson River, and Stephens Lake (Lawrence and Fazakas 1997; Lawrence *et al.* 1999; Fazakas and Zrum 1999; Zrum and Neufeld 2001; Zrum and Bezte 2003; Zrum and Kroeker 2003; Juliano and Neufeld 2004, 2005; Sotiropoulos and Neufeld 2004; Neufeld 2007; Capar 2008). Additional baseline data were collected in fall 2013 to augment the existing dataset and improve its utility for post-Project comparisons. As part of the Manitoba and Manitoba Hydro's Coordinated Aquatic Monitoring Program (CAMP), benthic invertebrate data were collected in Split Lake since 2009 (annually); and in Stephens Lake since 2009 (every three years) (CAMP 2014, 2017). These data were reviewed and used as an additional source of information for Project monitoring. Additionally, total suspended solids (TSS), turbidity, and dissolved oxygen (DO) data collected during the Physical Effects Monitoring Plan (PEMP) and the Sediment Monitoring Plan (SMP) were considered in the interpretation of benthic invertebrate baseline monitoring results.

Construction monitoring (2014 to 2019) specifically addressed questions related to the biological effects of predicted increases in TSS on the benthic community due to in-stream work on the Nelson River and complemented the water quality program (Zrum and Gill 2015, 2016; Dawson 2017, 2018, 2019; Dawson and Neufeld 2020). Overall, the results observed in Stephens Lake throughout construction monitoring suggested that observed changes in the benthic invertebrate community metrics were more likely related to natural variation as opposed to the Project-related activities.

Operation monitoring of the benthic invertebrate community began in 2021 (Gill *et al.* 2022) and was repeated in 2022 (Gill *et al.* 2023) and 2023. The primary objective of benthic invertebrate monitoring upstream of the Keeyask GS is to monitor the biological effects of predicted habitat changes on established and newly created habitats within the Keeyask reservoir mainstem, and to monitor predicted effects of flooding, sedimentation, increased frequency of water level fluctuations, and changes in water quality in the Keeyask reservoir backbays. The biological effects of the predicted changes within the Keeyask reservoir are addressed by these key questions:

- *Has an area-wide, large increase in benthic invertebrate abundance, and a change in community composition, occurred in the long-term in response to the increased availability of aquatic habitat and changes in substrates?*
- *Are benthic invertebrate abundance and/or distribution in littoral habitat negatively affected by the increased frequency of water level fluctuations?*
- *Do low DO concentrations in areas of flooding and peat disintegration result in initially low levels of benthic abundance and changes to community composition?*
- *What is the ultimate abundance of benthos in the long-term if DO depletion continues to occur during the winter months?*
- *Are there any unexpected effects on the upstream benthic invertebrate community that may be related to GS operation?*

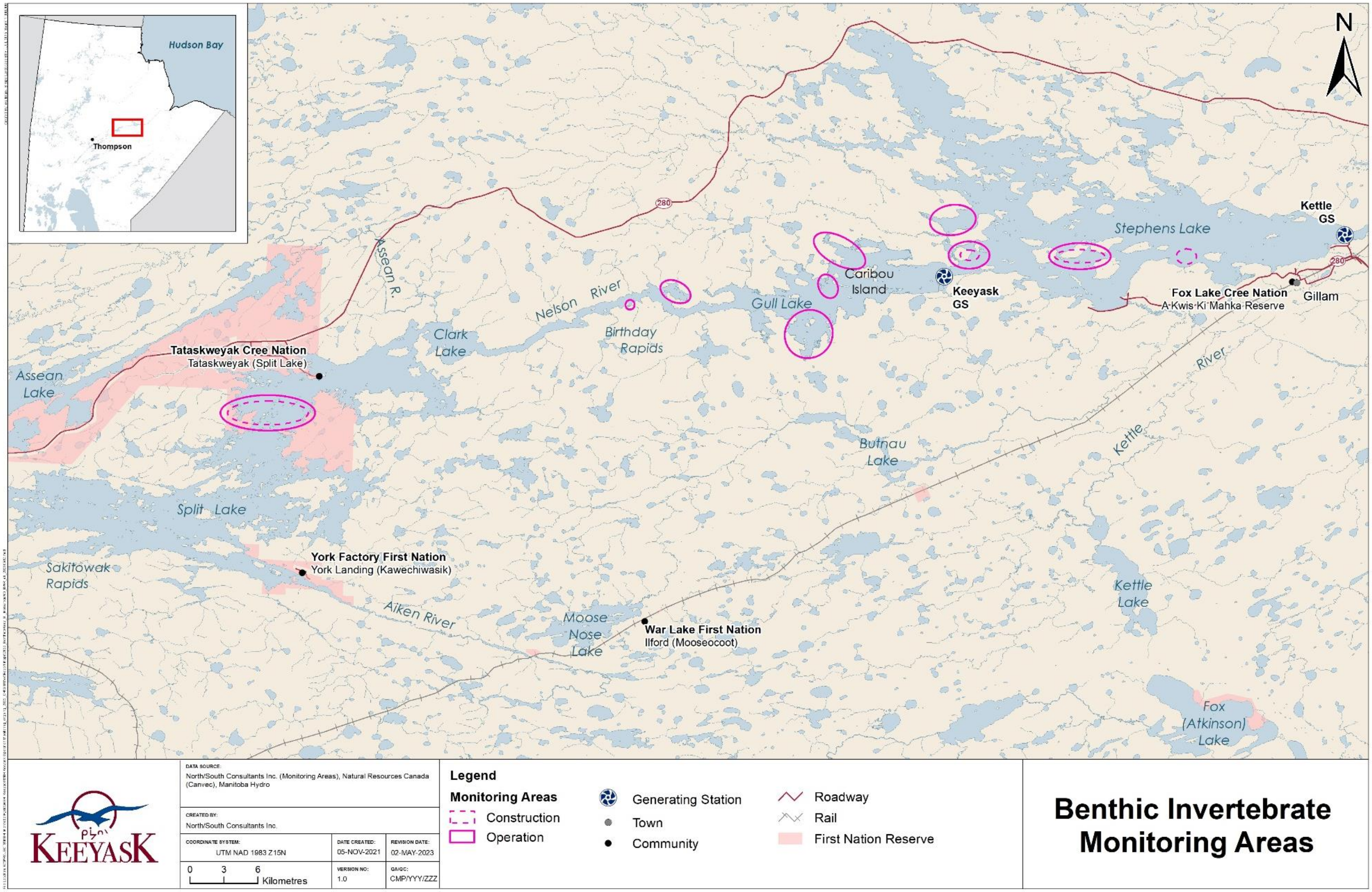
Benthic invertebrate monitoring downstream of the Keeyask GS in Stephens Lake is intended to assess the biological effects of habitat changes caused by predicted alteration of flows, water velocities, water depths, and reduced ice scour. The biological effects of the predicted changes downstream of the Keeyask GS are addressed by these key questions:

- *Have irregular flow patterns contributed to a reduction in benthic invertebrate taxa richness?*
- *Has reduced ice scour in littoral habitat contributed to a change to the abundance and/or distribution of benthos?*
- *Are there any unexpected effects on the downstream benthic invertebrate community that may be related to GS operation?*

Two reference areas were sampled to provide context to results from the Keeyask reservoir and the mainstem of Stephens Lake. Split Lake was sampled to record the invertebrate community in an area not directly affected by the Keeyask GS (upstream of the hydraulic zone of influence) show how the invertebrate community in a lake upstream can vary from year to year. Sampling was conducted at sites in O'Neil Bay in Stephens Lake to record the invertebrate community in an area that the Keeyask reservoir backbay sites may resemble in about 25 years.

This report presents the results of benthic invertebrate sampling conducted in 2023, three full years after impoundment of the Keeyask reservoir in September 2020. A detailed analysis of the post-impoundment invertebrate community and comparison to the pre-Project conditions was also completed. Monitoring of the benthic invertebrate community in Split Lake, an upstream lake with regulated inflows, provided a measure of the benthic invertebrate community in a non-reservoir, including interannual variation. Comparisons to sites in Stephens Lake not immediately downstream of the GS provided a measure of inter-annual variation in a reservoir where water levels are controlled.

It is expected that the benthic invertebrate community in the reservoir and immediately downstream of the GS in Stephens Lake is still undergoing changes in response to the large changes in habitat because of impoundment and diversion of flow from the spillway to the powerhouse. Since it is anticipated that the benthic invertebrate community will continue to evolve over time as aquatic habitat in the reservoir and Stephens Lake matures, benthic invertebrate monitoring will continue at a reduced frequency in the future.



Map 1: The Nelson River showing the site of Keeyask Generating Station and the benthic invertebrate monitoring areas.

2.0 STUDY SETTING

The study area encompasses an approximately 110 km long reach of the Nelson River from Split Lake to Stephens Lake (Map 2). This section of river offers a diversity of physical habitat conditions, including a variety of substrate types, and variable water depths (range 0 to 30 m) and velocities.

Split Lake, which is immediately downstream of the Kelsey GS at the confluence of the Burntwood and Nelson rivers, is the second largest waterbody in the Keeyask study area. Due to large inflows from the Nelson and Burntwood rivers, the lake has a detectable current in several locations. Split Lake has maximum and mean depths of 28.0 m and 3.9 m respectively, at a water surface elevation of 167.0 m above sea level (mASL) (Lawrence *et al.* 1999). The surface area of Split Lake was determined to be 26,100 ha (excluding islands), with a total shoreline length, including islands, of 940.0 km (Lawrence *et al.* 1999). The numerous islands in Split Lake represent 411.6 km of the total shoreline.

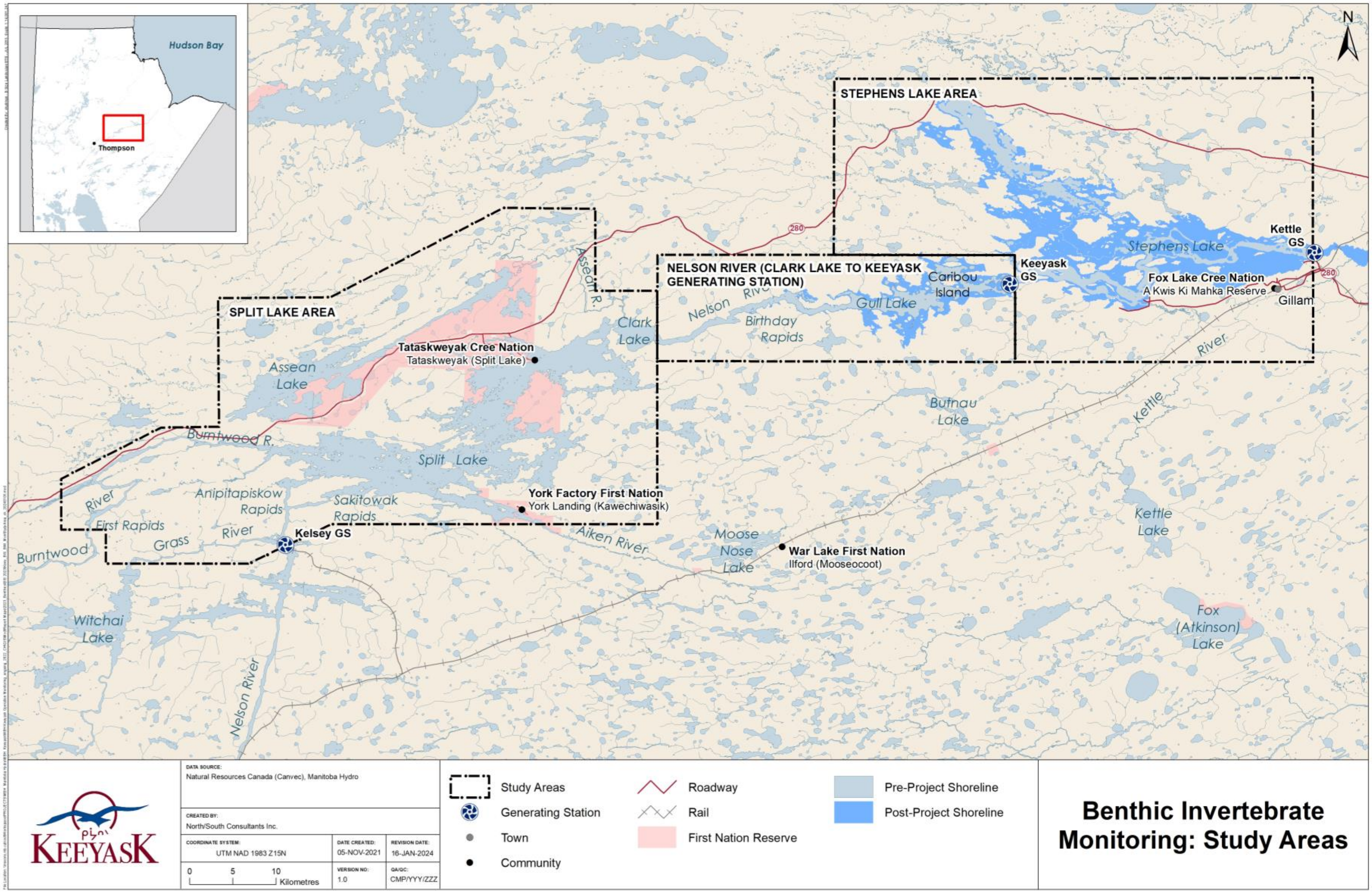
Clark Lake is located immediately downstream of Split Lake, and approximately 42 km upstream of the Keeyask GS. Current is restricted to the main section of the lake, with off-current bays outside the main channel. The Assean River is the only major tributary to Clark Lake and flows into the north side. Downstream from the outlet of Clark Lake, the Nelson River narrows and water velocity increases for a 3 km stretch, known as Long Rapids. For the next 7 km, the river widens, and water velocity decreases.

Birthday Rapids is located approximately 10 km downstream of Clark Lake and 30 km upstream of the Keeyask GS and marks the upstream end of major water level changes because of impoundment by the Keeyask GS. The drop in elevation from the upstream to downstream side of Birthday Rapids was approximately 2 m prior to impoundment but is now nearly level, albeit a fast-flowing section of river. The 14 km reach of the Nelson River between Birthday Rapids and Gull Lake was characterized as a large and somewhat uniform channel with medium to high water velocities and a few large bays. This area is now within the Keeyask reservoir, though flooding was limited to mainly shoreline areas.

Prior to impoundment, Gull Lake was a widening of the Nelson River, with moderate to low water velocity beginning approximately 20 km upstream the Keeyask GS. Water levels on Gull Lake increased by several metres following impoundment and flooding along the shoreline and small tributaries entering this reach was extensive; this area is larger than prior to impoundment.

Just below the Keeyask GS, the Nelson River enters Stephens Lake. Stephens Lake was formed in 1971 by the construction of the Kettle GS. Construction of the Keeyask GS has altered the flow distribution immediately downstream of the station.

Construction of the Kettle GS flooded Moose Nose Lake (north arm) and several other small lakes that previously drained into the Nelson River, as well as the old channels of the Nelson River that now lie within the southern portion of the lake. Major tributaries of Stephens Lake include the North and South Moswakot rivers that enter the north arm of the lake. Looking Back Creek is a second order stream that drains into the north arm of Stephens Lake. Kettle GS is located approximately 40 km downstream of the Keeyask GS.



Map 2: The Nelson River showing the site of Keeyask Generating Station (GS) and the benthic invertebrate study areas.

3.0 METHODS

3.1 FALL 2023

In 2023, benthic invertebrate and supporting sediment samples were collected in Split Lake (Map 3), the Keeyask reservoir (Map 4), and in Stephens Lake (Map 5). Samples were collected from intermittently exposed (IE; approximately 1 m deep), predominantly wetted (PW; 1 to 3 m deep), and offshore (OS; 3 to 10 m deep) habitat polygons. Habitat attributes within sampling polygons were constrained to meet three criteria: consistent water movement (*i.e.*, standing water, low water velocity); homogeneous/consistent substrate; and no aquatic macrophyte beds. The spatial extent of a sampling polygon was at least 100 m x 100 m, and large enough to adequately accommodate five replicate stations. Within each polygon, the locations of the five replicate stations were established by field crews and selected based on specific habitat attributes (*i.e.*, water depth, water velocity, substrate type, and absence of aquatic plants) and the spatial separation criteria outlined in Metal Mining Technical Guidance for Environmental Effects Monitoring (EEM; Environment Canada 2012). By EEM definition, a replicate station is a specific, fixed sampling location that can be recognized, re-sampled, and defined quantitatively (*e.g.*, UTM position and a written description). The size of each replicate station was minimally 10 m x 10 m and separated from other replicate stations by at least 20 m.

3.1.1 FIELD PROCEDURES

In 2023, the IE polygon in Split Lake was sampled using a kicknet. The IE polygon contained five replicate stations (n=5). Three one-minute travelling kick and sweeps along a transect perpendicular to the shoreline (sub-samples) were collected in each replicate station and combined into a single sample for invertebrate analysis. Within the Keeyask reservoir, sampling areas were selected to represent a range of post-impoundment habitat types, as defined by reservoir zones (Map 6). These include sites in the mainstem, the part of the reservoir through which most of the flow travels (zones 1a, 1b, and 2) and backbays, relatively shallow bays formed due to flooding of terrestrial areas (zones 4, 12, and 8). Site selection in 2021 within the IE sampling areas was often impacted by the presence of flooded habitat and terrestrial vegetation (such as willows and Labrador tea) where sampling with a kicknet was challenging. This necessitated shifting the IE sampling polygon from the 2021 target area (away from the shoreline) and changing the sampling approach for 2022 and 2023.

Benthic invertebrate samples were collected in the IE habitat (in water depths less than 1 m) using either a petite Ponar or Ekman dredge (each with an area of 0.023 m^2). The IE polygon contained five replicate stations. Three benthic grabs (sub-samples) were collected in each replicate station from a boat and combined into a single sample for invertebrate analysis. The same sampling method was used for IE polygons at sites in Stephens Lake. Three new locations were sampled in the mainstem downstream of the Keeyask GS in 2023. One sample was collected at each location with the intention to compare to pre-impoundment samples for the post-impoundment assessment summary.

All PW and OS sites (in Split Lake, Keeyask reservoir, and Stephens Lake) were sampled using either a petite Ponar or Ekman dredge. The PW and OS polygons contained five replicate stations. Three benthic grabs (sub-samples) were collected in each replicate station from a boat and combined into a single sample for invertebrate analysis.

An acceptable benthic grab sample required that the jaws be completely closed upon retrieval. If the jaws were not completely closed, the sample was discarded into a bucket (and disposed of once sampling was completed) and the procedure was repeated. All sampling equipment was rinsed before sampling at the next site.

Each invertebrate sample (whether collected using a kicknet, a petit Ponar, or an Ekman dredge) was sieved through a 500 micron (µm) mesh rinsing bucket. All material retained by the sieve bucket were transferred to labelled plastic jars and fixed with 10% formalin. Invertebrate samples were shipped to the NSC laboratory (Winnipeg, MB) for analysis.

One additional grab sample was collected in each replicate station for substrate analysis. The sediment grab was sub-sampled to provide approximately 500 millilitres (mL) of benthic material to analyze for total organic carbon (% TOC) and particle sizes (PSA; % sand, % silt, and % clay). Sediment samples were transferred into labelled plastic bags and refrigerated. Sediment samples were shipped to the ALS Laboratory Group (Winnipeg, MB) for analysis.

Water depths and descriptions of the benthic substrate were recorded with every sample. The following supporting variables were measured/recorded within each replicate station:

- UTM position (hand-held GPS receiver);
- Water temperature (hand-held thermometer, below surface);
- Water transparency (Secchi disk, down and up measures);
- Water velocity (Swoffer current velocity meter at approximately 20 centimetres [cm] below water surface or visually estimated); and
- Where applicable, a description of the riparian area, and presence of algae, aquatic vegetation, flooded terrestrial vegetation, and rafted logs or woody debris.

3.1.2 LAB PROCEDURES

At the NSC laboratory, benthic invertebrate samples were rinsed with water through a 500 µm sieve and sorted under a 3X magnifying lamp. Invertebrates were transferred to 70% ethanol prior to being identified to the appropriate taxonomic level. A Leica Mz125 microscope (maximum 100x magnification) and reference texts listed in Appendix 1 were used for taxonomic identification. Scientific names used followed the Integrated Taxonomic Information System classification (ITIS

2024). Invertebrates were identified to major group (subclass, order, or family) and Ephemeroptera were identified to genus. Invertebrate identification and enumeration were performed by benthic invertebrate taxonomists at NSC.

Samples were processed using the NSC Benthic Invertebrate Sample Processing Protocol and Quality Assurance/Quality Control (QA/QC) Procedures (Appendix 1). Sorted samples will be retained and archived for the duration of the operation monitoring phase should further analysis be required. A reference collection of benthic invertebrates will be maintained to ensure taxonomic consistency throughout the duration of the monitoring program.

3.1.3 DATA REPORTING

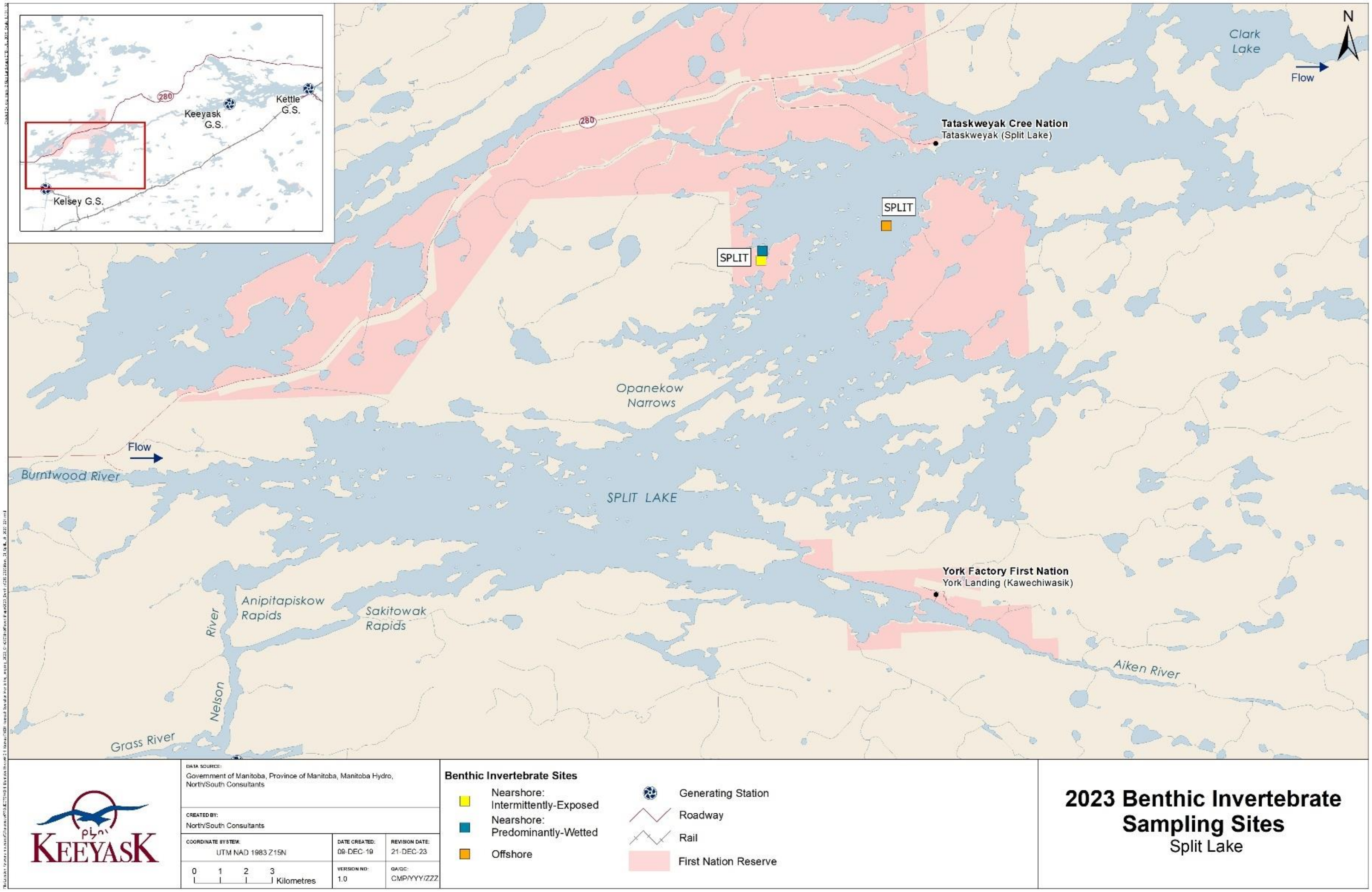
Invertebrate counts for samples collected with a kicknet were reported as abundance and expressed as the total number of invertebrates per sample. Invertebrate counts for samples collected with a benthic grab sampler were expressed as density or the total number of invertebrates per square metre and calculated as follows:

$$Density = \left(\frac{Invertebrate\ Count}{Number\ of\ Sub - Samples}\right) \div Grab\ Sampler\ Area$$

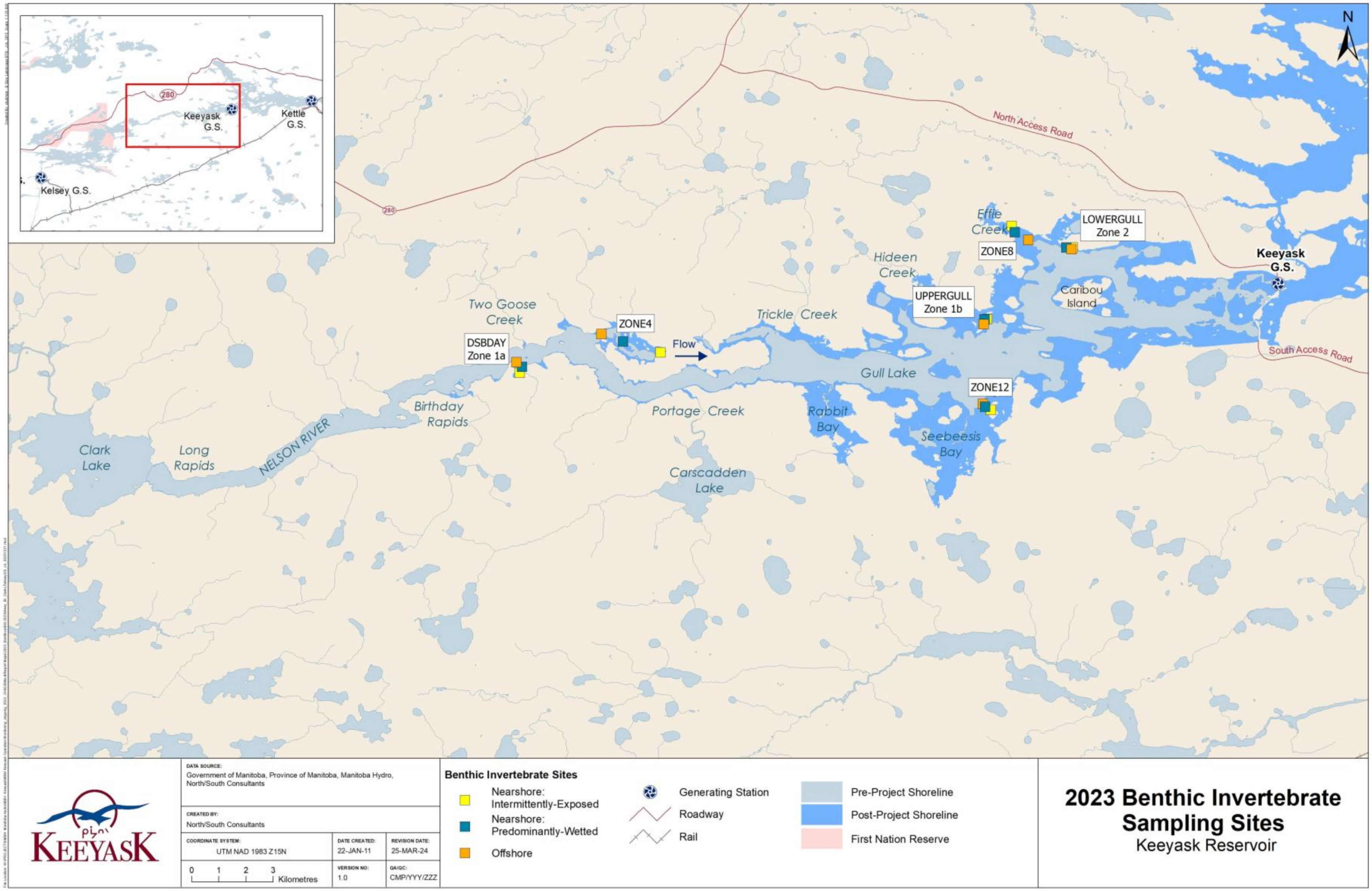
Abundance was used to characterize the invertebrate community in terms of quantity and composition, these measures included: total invertebrate abundance (or density) and relative abundances of the major groups: Oligochaeta (aquatic worms), Crustacea (*e.g.*, amphipods), Mollusca (snails and clams), Coleoptera (beetles), Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies), Chironomidae (non-biting midges), Ceratopogonidae (biting midges), and the remaining aquatic taxa that were categorized as Other Taxa (*e.g.*, mites) and EPT index (percent Ephemeroptera (E), Plecoptera (P), and Trichoptera (T)).

Taxonomic richness (total and EPT) and Simpson's indices (diversity and evenness) were used to characterize the benthic invertebrate community in terms of diversity (to the family-level). Taxonomic richness is the total number of taxa in a habitat (or sample). EPT taxa richness (number of distinct families of Ephemeroptera (E), Plecoptera (P), and Trichoptera (T)). Simpson's diversity index measures the probability that two individuals randomly selected from a sample will belong to the same taxon. Simpson's diversity index values (probabilities) range from zero (low diversity) to one (high diversity). Simpson's evenness index is a measure of the relative abundances of the different taxa comprising the richness of a habitat (or sample). Evenness values range from zero (no evenness) to one (complete evenness).

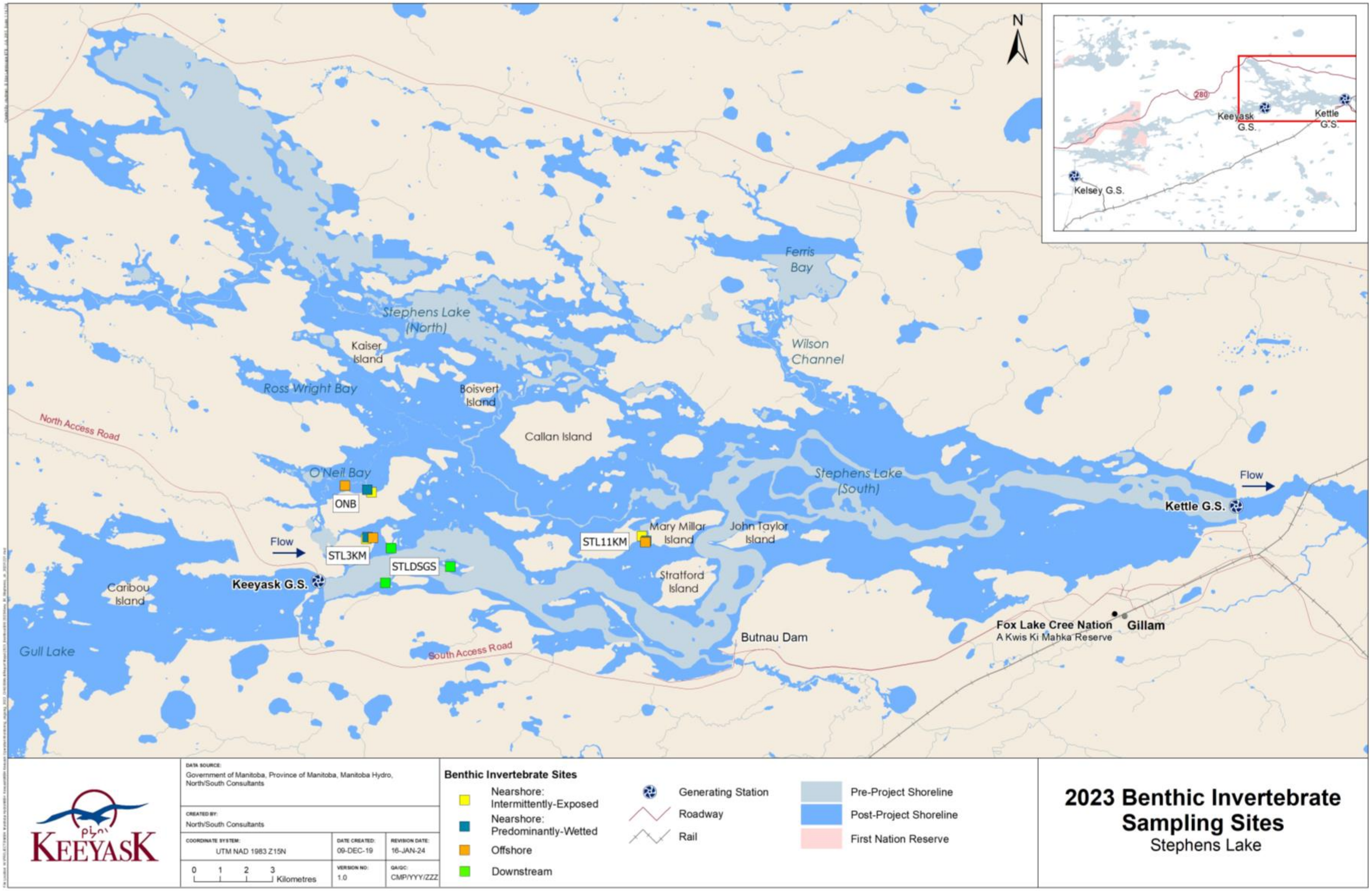
Summary statistics (mean, minimum, maximum, 1st quartile, median, 3rd quartile, variance, standard deviation, and standard error) were reported for each 2023 metric organized by site and habitat.



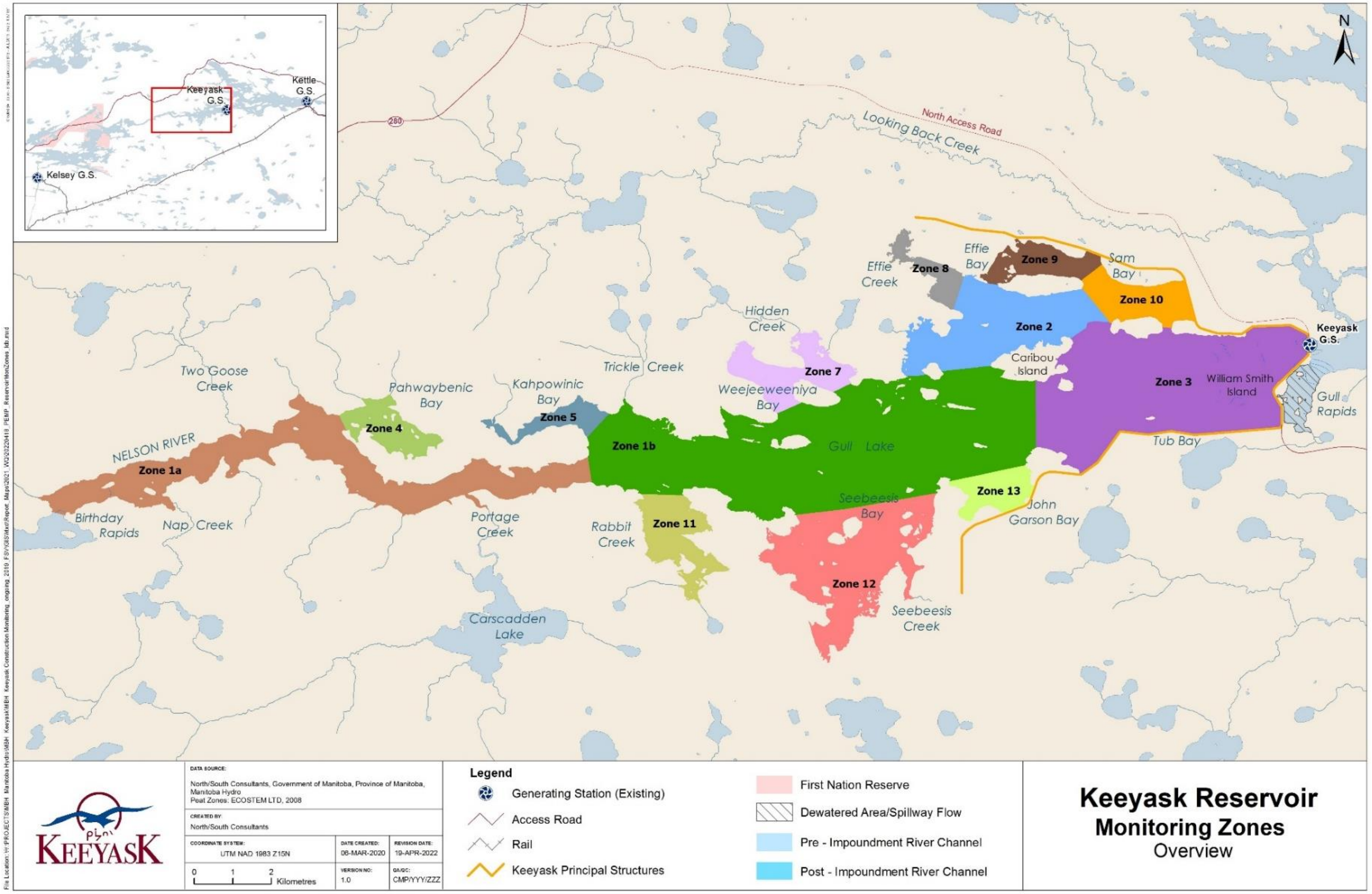
Map 3: Benthic invertebrate sampling sites in Split Lake, late summer 2023.



Map 4: Benthic invertebrate sampling sites in the Keeyask reservoir, fall 2023.



Map 5: Benthic invertebrate sampling sites in Stephens Lake, fall 2023.



Map 6: The Keeyask reservoir showing the zones used to define benthic invertebrate sampling areas. Zones includes sites in the mainstem (the part of the reservoir through which most of the flow travels; zones 1a, 1b, 2, and 3) and backbays (relatively shallow bays formed due to flooding of terrestrial areas; zones 4, 5, 7, 8, 9, 10, 11,12, and 13).

3.2 POST-IMPOUNDMENT ASSESSMENT

The AEMP is designed to compare benthic invertebrate community metrics at sites predicted to be most affected by the Project (*i.e.*, upstream of the Keeyask GS in the reservoir and downstream of the Keeyask GS in Stephens Lake) to baseline and to reference sites (*i.e.*, Split Lake and O'Neil Bay). The AEMP study design is comparable to the current CAMP design whereby sampling areas (*i.e.*, habitat polygons) were stratified by water depth and constrained by other aquatic habitat attributes to minimize the inherent variability within the invertebrate data.

3.2.1 DATA INCLUDED IN THE ASSESSMENT

Pre-impoundment sample locations were plotted with the post-impoundment sample locations in Google Earth Pro to assess which samples could be used for the assessment analysis. Pre-impoundment samples with comparable aquatic habitat attributes (*i.e.*, sediment composition and water depths) and general locations as post-impoundment were selected for the assessment. Comparisons were made between pre- and post-impoundment datasets collected using the same collection method (*i.e.*, tall Ekman/petite Ponar or kicknet sampler).

Map 7 shows the pre- and post-impoundment sites used for the assessment of areas upstream of the Keeyask GS. The Keeyask reservoir - mainstem sites included:

Habitat Type	Monitoring Period	Zone 1a	Zone 1b	Zone 2
Intermittently exposed kicknet	Pre-impoundment	2013	2013	2013
	Post-impoundment	2021	2021	2021
Intermittently exposed benthic grab	Pre-impoundment	2002	2002, 2004	2002, 2004
	Post-impoundment	2022, 2023	2022, 2023	2022, 2023
Predominantly wetted benthic grab	Pre-impoundment	2001, 2004, 2013	1999, 2001, 2002, 2013	1999, 2001, 2002, 2004, 2013
	Post-impoundment	2021, 2022, 2023	2021, 2022, 2023	2021, 2022, 2023
Offshore benthic grab	Pre-impoundment	1999, 2001, 2002	1999, 2001, 2002, 2008, 2013	1999, 2001, 2002, 2008, 2013
	Post-impoundment	2021, 2022, 2023	2021, 2022, 2023	2021, 2022, 2023

The Keeyask reservoir - backbay sites included:

Habitat Type	Monitoring Period	Zone 4	Zone 12	Zone 8
Intermittently exposed benthic grab	Pre-impoundment	2002, 2004	2002, 2004	na
	Post-impoundment	2022, 2023	2022, 2023	2022, 2023
Predominantly wetted benthic grab	Pre-impoundment	na	2001, 2002, 2013	na
	Post-impoundment	2021, 2022, 2023	2022, 2023	2022, 2023
Offshore benthic grab	Pre-impoundment	2002, 2004	na	na
	Post-impoundment	2021, 2022, 2023	2022, 2023	2022, 2023

Map 8 shows the pre- and post-impoundment sites downstream of the Keeyask GS. Samples collected during the benthic invertebrate construction monitoring period in Stephens Lake were also plotted but not included in the post-impoundment assessment analysis. O'Neil Bay in Stephens Lake was sampled to record the invertebrate community in an area that the Keeyask reservoir backbay sites may resemble in about 25 years. The Stephens Lake sites assessment included:

Monitoring Period	Downstream of Keeyask GS
Pre-impoundment	2001, 2002
Post-impoundment	2023

Habitat Type	Monitoring Period	3 km downstream of Keeyask GS	11 km downstream of Keeyask GS	O'Neil Bay
Intermittently exposed kicknet	Pre-impoundment	2013	2013	2013
	Post-impoundment	2021	2021	2021
Intermittently exposed benthic grab	Pre-impoundment	2002, 2004	2001	no data
	Post-impoundment	2022, 2023	2022, 2023	2022, 2023

Predominantly wetted benthic grab	Pre-impoundment	2013	2001, 2002, 2013	2006, 2013
	Post-impoundment	2021, 2022, 2023	2021, 2022, 2023	2021, 2022, 2023
Offshore benthic grab	Pre-impoundment	2013	2013	2006
	Post-impoundment	2021, 2022, 2023	2021, 2022, 2023	2021, 2022, 2023

Map 9 shows the pre- and post-impoundment sites in Split Lake. Samples collected during the benthic invertebrate construction monitoring period in Split Lake were also plotted but not included in the post-impoundment assessment analysis. Sites in Split Lake were assessed for the same time periods in comparable habitat types to provide a regional context for changes observed in the monitoring areas upstream and downstream of the Keeyask GS. Due to the inherent differences between sites within and outside of the Project footprint, comparisons to Split Lake were qualitative and intended to understand changes in the benthic invertebrate community metrics due to factors not related to the Project (*e.g.*, natural variation).

Habitat Type	Monitoring Period	Split Lake
Intermittently exposed kicknet	Pre-impoundment	2010 to 2013
	Post-impoundment	2021, 2022, 2023
Predominantly wetted benthic grab	Pre-impoundment	2001, 2002, 2009
	Post-impoundment	2021, 2022, 2023
Offshore benthic grab	Pre-impoundment	2001, 2002, 2009, 2010 to 2013
	Post-impoundment	2021, 2022, 2023

3.2.2 METRICS USED FOR THE ASSESSMENT

All benthic invertebrate data were prepared by calculating abundance or density for each sample. Kicknet sample counts from Split Lake IE were reported as abundance, *i.e.*, number of invertebrates per sample and standardized according to sampling effort (three minutes per sample). Counts for the IE habitat in the Keeyask reservoir and Stephens Lake, and PW and OS habitats at all sites were reported as density, *i.e.*, number of invertebrates per square metre (no. per m^2) based on the grab sampler area ($0.023m^2$).

Composition metrics (EPT index, O+C index, and EPT:C) were calculated to characterize the benthic invertebrate community in terms of relative proportions of taxa that are generally considered sensitive to habitat disturbances (EPT) and taxa generally considered tolerant to habitat disturbances (O+C). EPT index was derived by dividing the summed abundance (density) of the Ephemeroptera (E: mayflies), Plecoptera (P: stoneflies), and Trichoptera (T: caddisflies) by the total invertebrate abundance and multiplied by 100 to report the value in percent (%). O+C index was derived by dividing the summed abundances of the Oligochaeta (O: aquatic segmented worms) and Chironomidae (C: non-biting midges) by the total invertebrate abundance and multiplied by 100 to report the value in percent (%). EPT:C or the ratio of EPT to Chironomidae was derived by dividing the summed abundances of the EPT by the Chironomidae abundance.

Taxonomic richness and Simpson's indices were used to characterize the benthic invertebrate community in terms of diversity (to the family-level). Total taxonomic richness is the total number of distinct taxa at the family-level. EPT taxa richness (number of families within the groups Ephemeroptera, Plecoptera, and Trichoptera). Simpson's diversity index measures the probability that two individuals randomly selected from a sample will belong to the same taxon. Simpson's diversity index values (probabilities) range from zero (low diversity) to one (high diversity). Simpson's evenness index is a measure of the relative abundance of the different taxa making up the richness of a habitat (or sample). Evenness values range from zero (no evenness) to one (complete evenness).

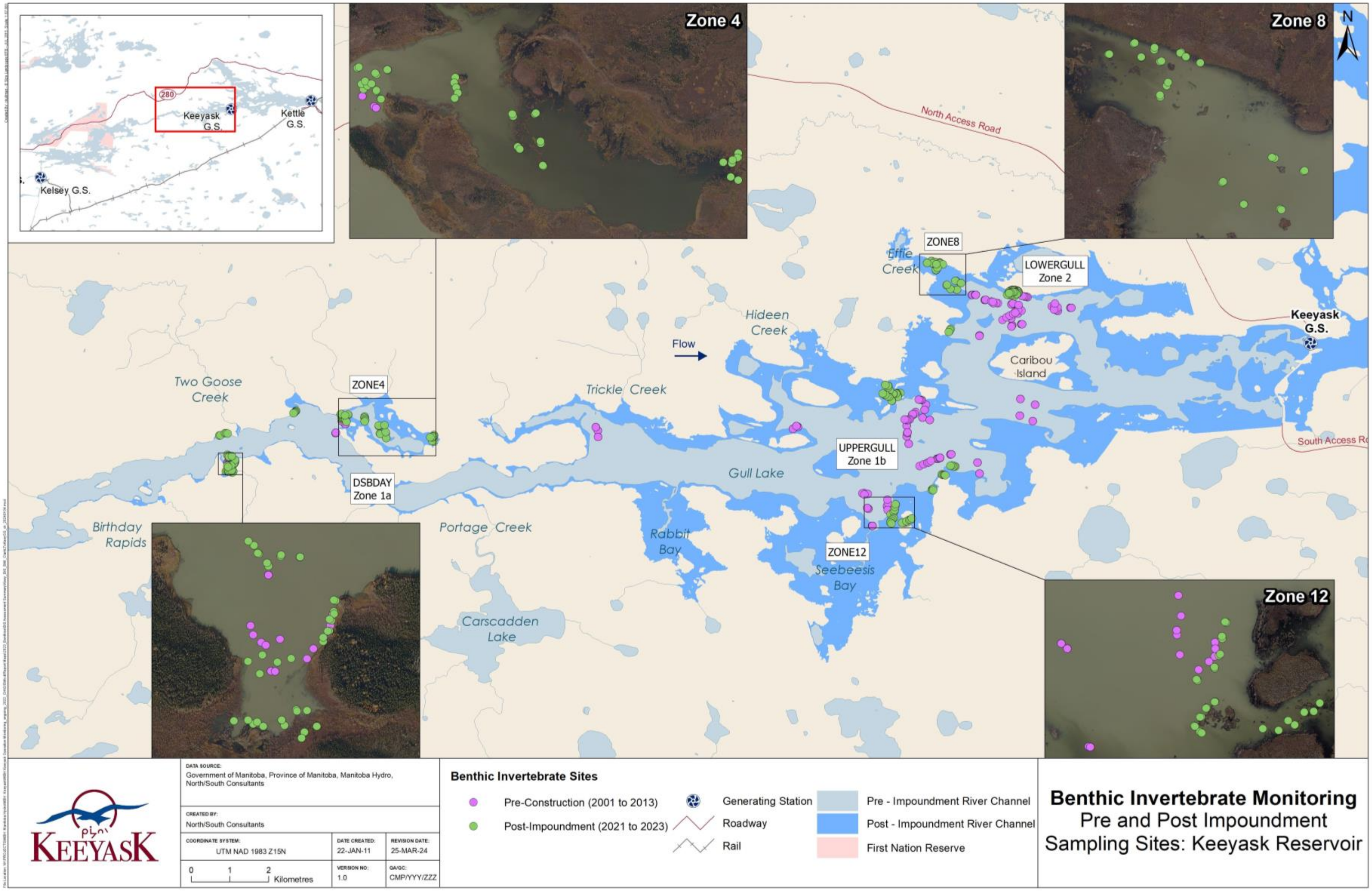
Sampling location and habitat data, organized by site and year are presented in Appendices 2 to 6 support the benthic invertebrate metric results. Substrate parameters (% sand, silt, clay, and % total organic carbon) identified as below the detection limit by the analytical laboratory were adjusted to one half of the detection limit value.

3.2.3 DATA ANALYSIS

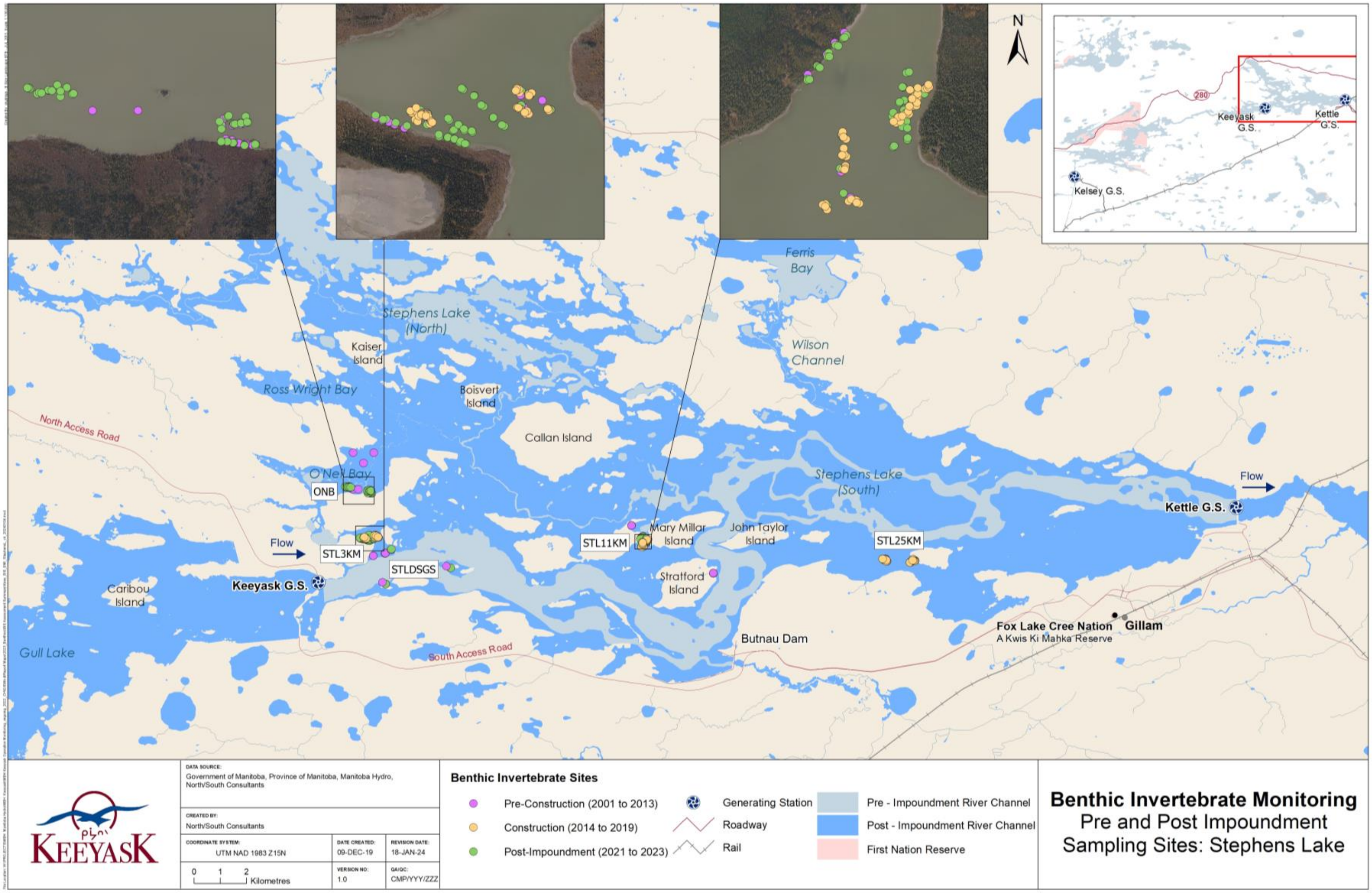
Invertebrate results, water depths, and substrate composition data were reviewed and collated. Invertebrate community metrics and sediment parameters were calculated and plotted for individual samples (years) for both monitoring periods. Comparative analyses between the two monitoring periods were performed on the pooled pre-impoundment dataset versus the individual post-impoundment monitoring years.

Total invertebrate abundance (or density), community composition (EPT index, O+C index, and EPT to Chironomidae ratio), taxonomic richness (total and EPT), and Simpson's indices (diversity and evenness) were graphed by site and year and habitat type in boxplots to show the summary statistic values (minimum, maximum, median, mean, 1st, and 3rd quartiles) and outliers (which were retained). Supporting substrate parameters (total organic carbon, and percents of sand and silt+clay) were also plotted.

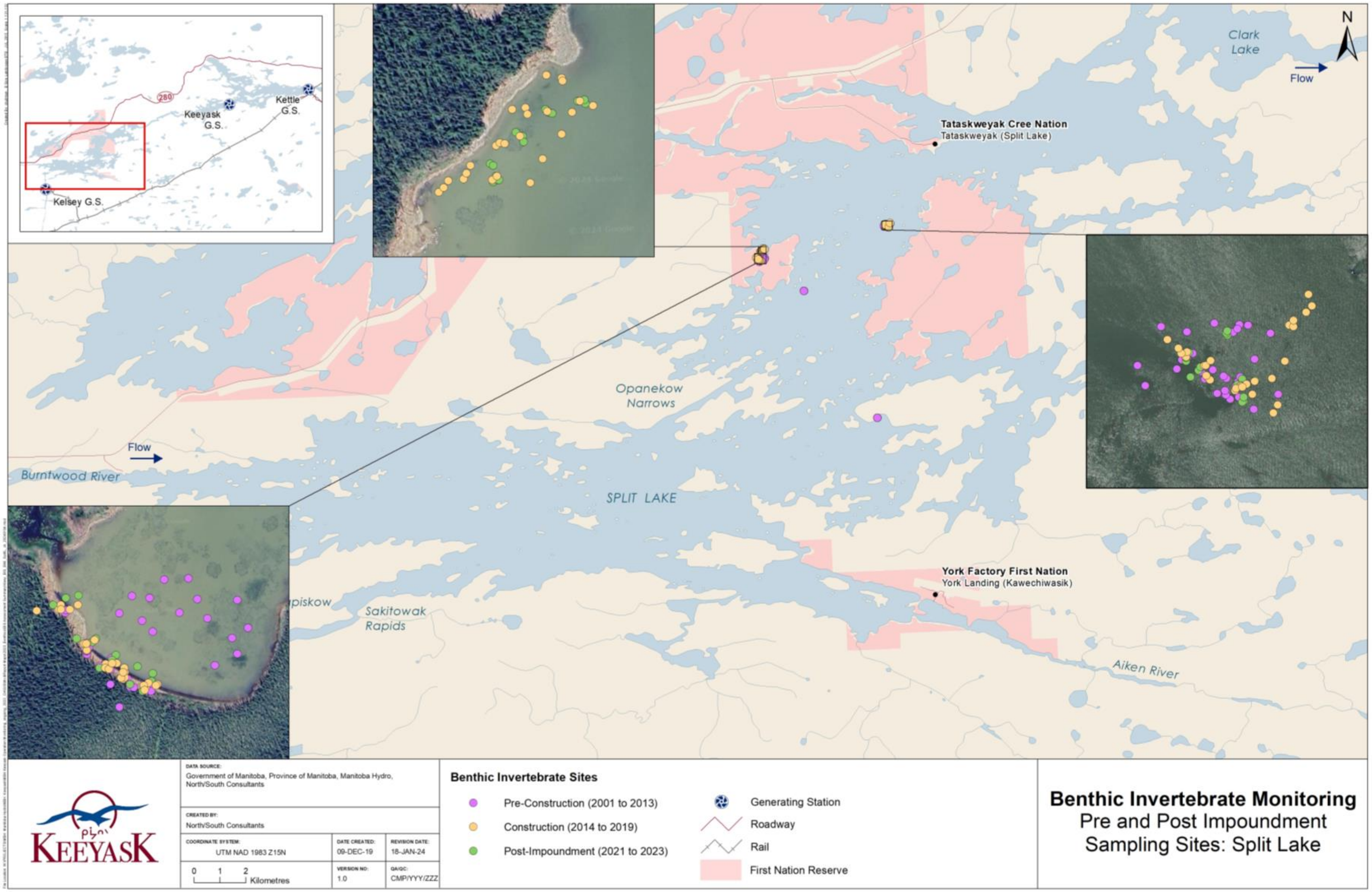
Keeyask reservoir – mainstem, Stephens Lake, Split Lake datasets were tested to detect statistically significant differences between the pre- and post-impoundment monitoring periods. Keeyask reservoir – backbay sites were tested for statistically significant differences among years within the post-impoundment monitoring period and between the pre- and post-impoundment monitoring periods where the baseline data were available. Invertebrate and substrate datasets (by site and habitat type) were first tested for normality and homogeneity of variances. Normality-distributed datasets were tested using a t-test for a two-year comparison, or an Analysis of Variance (ANOVA) with Bonferroni pairwise comparison for sites/habitat types with more than two years of data. Where normality assumptions were not met, non-parametric tests were applied with a Mann-Whitney test for a two-year comparison, or a Kruskal-Wallis test with Dunn's multiple pairwise comparison for sites/habitat types with more than two years of data. All analyses were performed using the significance level alpha = 0.05 in XLSTAT (Lumivero 2023). Statistically significant differences that were more than ± 50% of the pre-impoundment condition were determined to consider any notable differences from the post-impoundment condition in terms of the magnitude of change (*i.e.*, a halving or a doubling).



Map 7: Benthic invertebrate sites sampled during the pre- and post-impoundment monitoring periods in the Keeyask reservoir.



Map 8: Benthic invertebrate sites sampled during the pre- and post-impoundment monitoring periods in Stephens Lake.



Map 9: Benthic invertebrate sites sampled during the pre- and post-impoundment monitoring periods in Split Lake.

4.0 RESULTS

4.1 FALL 2023

Sampling was conducted at one site in Split Lake on August 17 as part of CAMP. Six sites were sampled within the Keeyask reservoir and four within Stephens Lake between September 17 and 24. A total of 153 benthic invertebrate samples were collected including 15 from Split Lake, 90 from the Keeyask reservoir, and 48 from Stephens Lake. Sediment samples were not collected from every replicate station because some samples contained too much flooded terrestrial material to analyze. A total of 147 sediment samples were collected for TOC and PSA analysis.

Site and habitat data, invertebrate analysis outputs, and sediment analysis outputs are presented in Appendix 2 (Tables A2-1 to A2-9).

4.1.1 SPLIT LAKE

Substrate within the IE sampling polygon was comprised of silt (51%), sand (26%) and clay (23%) with 8% total organic carbon (Figure 1). Mean total abundance was 1,028 invertebrates per sample and the most abundant taxon (comprising 75%) was Amphipoda (Table 1; Figure 2). Mean EPT index was 10%, mean total richness was 16 taxa, mean Simpson's diversity index was 0.42, and mean Simpson's evenness index was 0.11.

Table 1: Summary statistics for benthic invertebrates in the intermittently exposed sampling polygon in Split Lake in 2023.

Split Lake - IE	Abundance (no./sample)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	1027.87	9.59%	16.20	5.40	0.42	0.11
Minimum	456.67	4.41%	13.00	3.00	0.32	0.09
Maximum	1805.00	18.34%	19.00	7.00	0.48	0.13
1st Quartile	567.00	6.89%	15.00	5.00	0.38	0.10
Median	619.33	8.76%	16.00	6.00	0.44	0.10
3rd Quartile	1691.33	9.53%	18.00	6.00	0.48	0.12
Variance (n-1)	437422.81	0.28%	5.70	2.30	0.00	0.00
Standard deviation (n-1)	661.38	5.28%	2.39	1.52	0.07	0.02
Standard error of the mean	295.78	2.36%	1.07	0.68	0.03	0.01

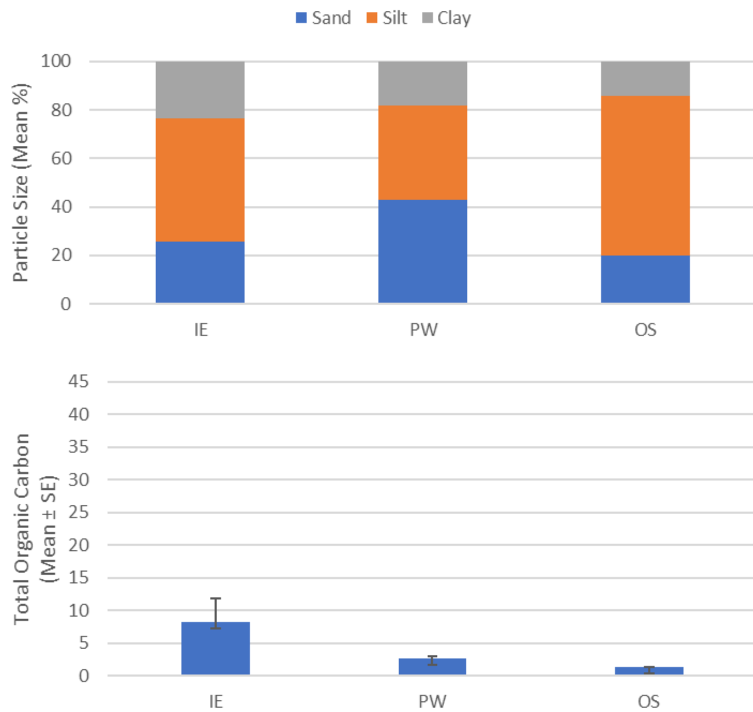


Figure 1: Supporting substrate metrics for the intermittently exposed (IE), predominantly wetted (PW), and offshore (OS) sampling polygons in Split Lake in 2023.

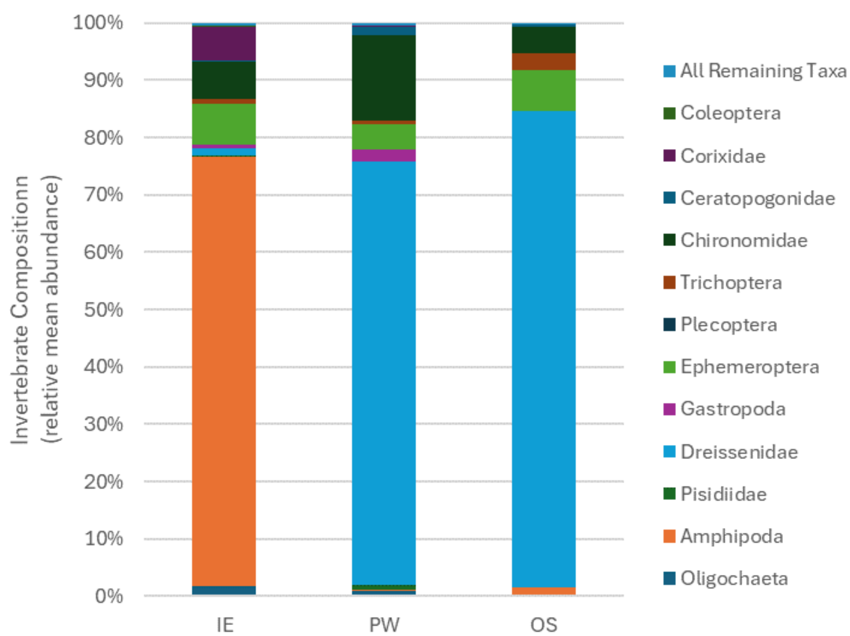


Figure 2: Composition of major invertebrate groups in intermittently exposed, predominantly wetted, and offshore habitat of Split Lake in 2023.

Sediment content in the PW polygon was sand (43%), silt (39%) and clay (18%) with 3% total organic carbon (Figure 1). Mean total density was 9,098 invertebrates per m^2 (Table 2). Dreissenidae (zebra mussels; 74%) and Chironomidae (15%) were the dominant taxa (Figure 2). Mean EPT index was 13%, mean total richness was 12 taxa, mean Simpson's diversity index was 0.43, and mean Simpson's evenness index was 0.18.

Table 2: Summary statistics for benthic invertebrates in the predominantly wetted sampling polygon in Split Lake in 2023.

Split Lake - PW	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	9097.99	13.14%	12.20	3.20	0.43	0.18
Minimum	1731.30	1.10%	8.00	2.00	0.31	0.09
Maximum	22333.80	34.17%	16.00	5.00	0.62	0.33
1st Quartile	2741.23	3.59%	8.00	2.00	0.31	0.10
Median	8036.13	4.74%	14.00	3.00	0.33	0.10
3rd Quartile	10647.51	22.11%	15.00	4.00	0.57	0.29
Variance (n-1)	68347901.59	2.07%	15.20	1.70	0.02	0.01
Standard deviation (n-1)	8267.28	14.40%	3.90	1.30	0.15	0.12
Standard error of the mean	3697.24	6.44%	1.74	0.58	0.07	0.05

Sediment composition within the OS sampling polygon was silt (66%), sand (20%) and clay (14%) with 1% total organic carbon (Figure 1). Mean total density was 765 invertebrates per m^2 (Table 3). Dreissenidae was the dominant invertebrate group, making up 83% of the total abundance (Figure 2). Mean EPT index was 26%, mean total richness was six taxa, mean Simpson's diversity index was 0.49, and mean Simpson's evenness index was 0.53.

Table 3: Summary statistics for benthic invertebrates in the offshore sampling polygon in Split Lake in 2023.

Split Lake - OS	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	764.66	25.86%	5.60	2.40	0.49	0.53
Minimum	158.70	3.85%	4.00	2.00	0.12	0.15
Maximum	2120.84	46.15%	8.00	4.00	0.78	0.79
1st Quartile	187.56	5.44%	5.00	2.00	0.16	0.23
Median	230.84	36.36%	5.00	2.00	0.68	0.73
3rd Quartile	1125.35	37.50%	6.00	2.00	0.73	0.77
Variance (n-1)	738631.71	3.90%	2.30	0.80	0.11	0.10
Standard deviation (n-1)	859.44	19.74%	1.52	0.89	0.33	0.32
Standard error of the mean	384.35	8.83%	0.68	0.40	0.15	0.14

4.1.2 KEEYASK RESERVOIR

4.1.2.1 KEEYASK RESERVOIR DOWNSTREAM OF BIRTHDAY RAPIDS ZONE 1A

Substrate within the IE sampling polygon was mainly composed of silt (83%) with 17% total organic carbon (Figure 3). Mean total density was 5,032 invertebrates per m^2 (Table 4). The most abundant taxa were Chironomidae (33%), Amphipoda (31%), and Oligochaeta (22%) (Figure 4). Mean EPT index was 6%, mean total richness was nine taxa, Simpson's diversity index was 0.51, and the Simpson's evenness index was 0.22.

Table 4: Summary statistics for benthic invertebrates in the intermittently exposed sampling polygon in the Keeyask reservoir downstream of Birthday Rapids (Zone 1a) in 2023.

Zone 1a - IE	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	5032.32	5.57%	8.80	3.20	0.51	0.22
Minimum	0.00	0.00%	0.00	0.00	0.00	0.00
Maximum	9002.77	14.61%	13.00	6.00	0.74	0.37
1st Quartile	3174.05	2.11%	9.00	3.00	0.46	0.18
Median	4789.94	4.55%	10.00	3.00	0.65	0.24
3rd Quartile	8194.83	6.57%	12.00	4.00	0.70	0.30
Variance (n-1)	13650521.81	0.32%	26.70	4.70	0.09	0.02
Standard deviation (n-1)	3694.66	5.63%	5.17	2.17	0.31	0.14
Standard error of the mean	1652.30	2.52%	2.31	0.97	0.14	0.06

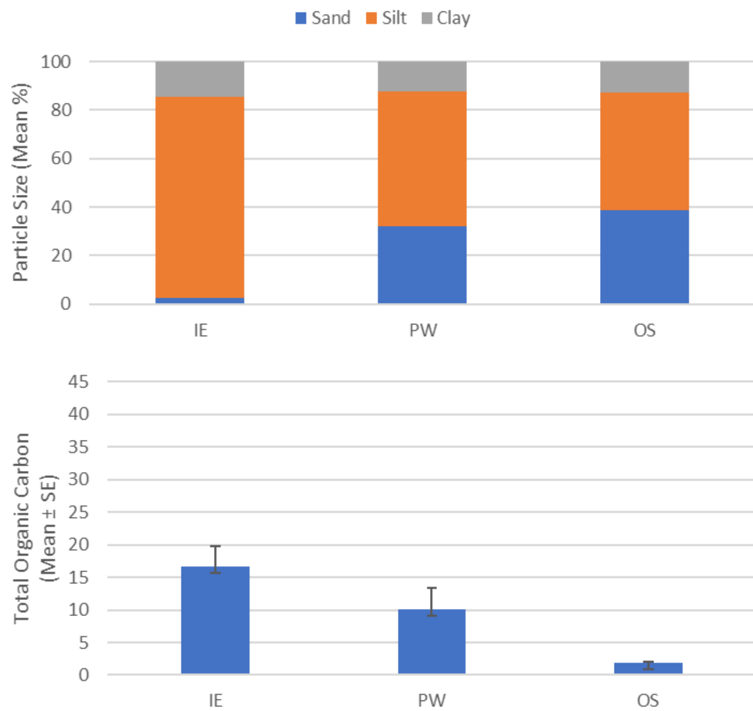


Figure 3: Supporting substrate metrics for the intermittently exposed (IE), predominantly wetted (PW), and offshore (OS) sampling polygons of the Keeyask reservoir downstream of Birthday Rapids (Zone 1a) in 2023.

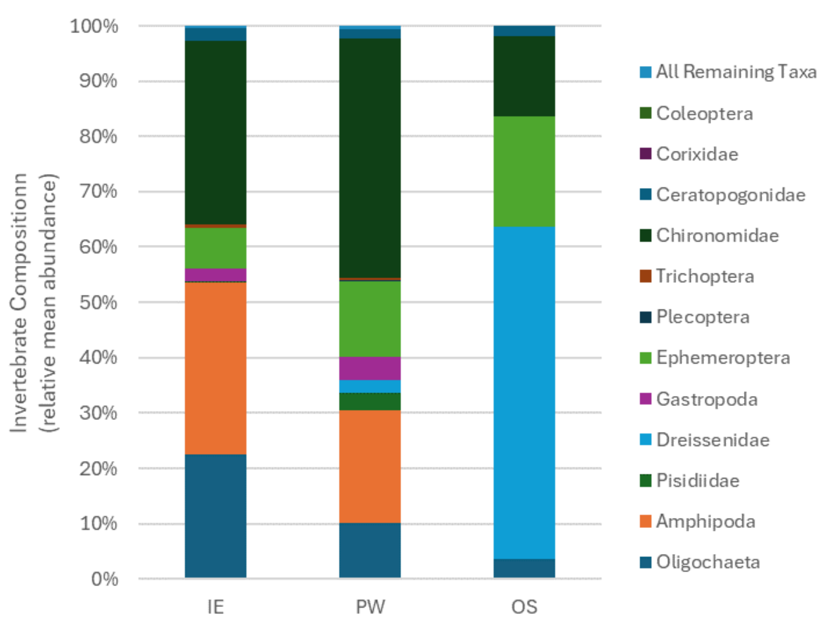


Figure 4: Composition of major invertebrate groups in intermittently exposed, predominantly wetted, and offshore habitat of the Keeyask reservoir downstream of Birthday Rapids (Zone 1a) in 2023.

Sediment content in the PW polygon was largely silt (55%) and sand (32%) with 10% total organic carbon (Figure 3). Mean total density was 3,318 invertebrates per m^2 (Table 5). Chironomidae (43%) and Amphipoda (20%) were the dominant taxa (Figure 4). Mean EPT index was 14%, mean total richness was nine taxa, mean Simpson's diversity index was 0.47, and mean Simpson's evenness index was 0.30.

Table 5: Summary statistics for benthic invertebrates in the predominantly wetted sampling polygon in the Keeyask reservoir downstream of Birthday Rapids (Zone 1a) in 2023.

Zone 1a - PW	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	3318.33	14.35%	8.80	3.20	0.47	0.30
Minimum	461.68	3.13%	2.00	1.00	0.06	0.18
Maximum	9046.05	29.63%	17.00	6.00	0.68	0.53
1st Quartile	1168.63	12.00%	7.00	2.00	0.41	0.24
Median	1226.34	12.94%	8.00	3.00	0.56	0.26
3rd Quartile	4688.94	14.04%	10.00	4.00	0.62	0.29
Variance (n-1)	12960868.55	0.92%	29.70	3.70	0.06	0.02
Standard deviation (n-1)	3600.12	9.58%	5.45	1.92	0.25	0.13
Standard error of the mean	1610.02	4.28%	2.44	0.86	0.11	0.06

Sediment composition in the OS sampling polygon was largely silt (48%) and sand (39%) with 2% total organic carbon (Figure 3). Mean total density was 159 invertebrates per m^2 (Table 6). Dreissenidae (60%) and Ephemeroptera (20%) were the dominant invertebrate groups (Figure 4). Mean EPT index was 48%, mean total richness was two taxa, mean Simpson's diversity index was 0.29, and mean Simpson's evenness index was 0.78.

Table 6: Summary statistics for benthic invertebrates in the offshore sampling polygon in the Keeyask reservoir downstream of Birthday Rapids (Zone 1a) in 2023.

Zone 1a - OS	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	158.70	47.88%	2.40	1.00	0.29	0.78
Minimum	28.86	8.33%	1.00	1.00	0.00	0.52
Maximum	288.55	100.00%	4.00	1.00	0.62	1.00
1st Quartile	28.86	10.00%	1.00	1.00	0.00	0.65
Median	173.13	21.05%	2.00	1.00	0.33	0.75
3rd Quartile	274.12	100.00%	4.00	1.00	0.52	1.00
Variance (n-1)	16027.80	22.88%	2.30	0.00	0.08	0.05
Standard deviation (n-1)	126.60	47.83%	1.52	0.00	0.29	0.21
Standard error of the mean	56.62	21.39%	0.68	0.00	0.13	0.10

4.1.2.2 FLOODED BACKBAY ZONE 4

Substrate in the IE sampling polygon was largely silt (91%) with high levels of total organic carbon (38%; Figure 5). Mean total density was 10,376 invertebrates per m^2 (Table 7). Oligochaeta (62%) and Chironomidae (29%) were the dominant invertebrate groups (Figure 6). Mean EPT index was 0%, mean total richness was six taxa, mean Simpson's diversity index was 0.53, and mean Simpson's evenness index was 0.40.

Table 7: Summary statistics for benthic invertebrates in the intermittently exposed sampling polygon in the Keeyask reservoir backbay Zone 4 in 2023.

Zone 4 - IE	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	10376.27	0.27%	6.40	0.40	0.53	0.40
Minimum	1125.35	0.00%	5.00	0.00	0.32	0.19
Maximum	19390.58	1.28%	8.00	1.00	0.77	0.63
1st Quartile	6925.21	0.00%	6.00	0.00	0.33	0.25
Median	7127.19	0.00%	6.00	0.00	0.59	0.45
3rd Quartile	17313.02	0.07%	7.00	1.00	0.63	0.49
Variance (n-1)	59355557.49	0.00%	1.30	0.30	0.04	0.03
Standard deviation (n-1)	7704.26	0.57%	1.14	0.55	0.20	0.18
Standard error of the mean	3445.45	0.25%	0.51	0.24	0.09	0.08

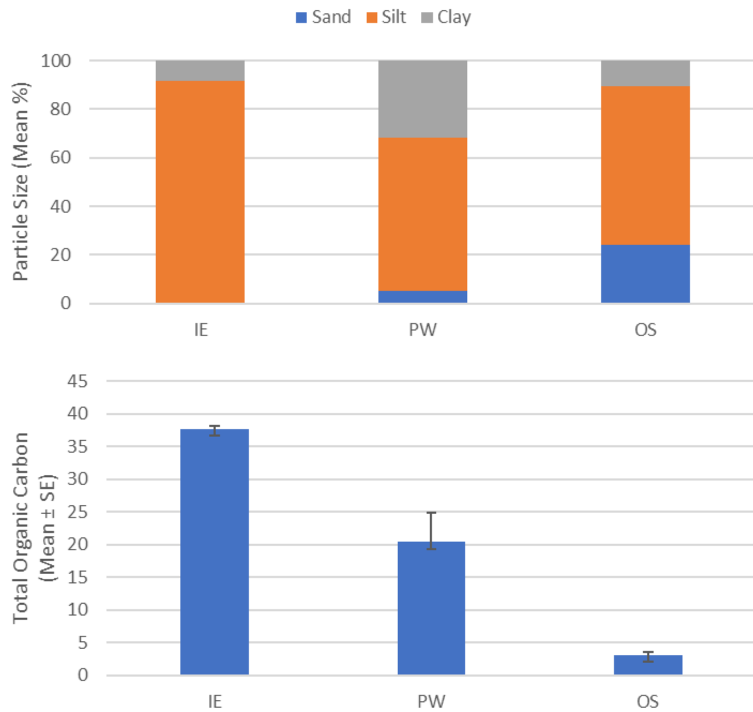


Figure 5: Supporting substrate metrics for the intermittently exposed (IE), predominantly wetted (PW), and offshore (OS) sampling polygons in the Keeyask reservoir backbay Zone 4 in 2023.

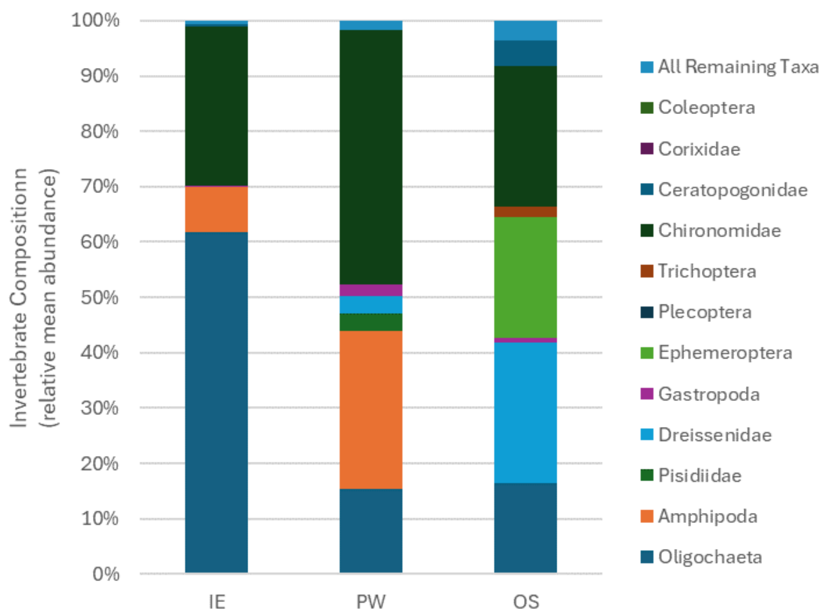


Figure 6: Composition of major invertebrate groups in intermittently exposed, predominantly wetted, and offshore habitat of the Keeyask reservoir backbay Zone 4 in 2023.

Sediment composition of the PW polygon was largely silt (63%) and clay (32%) with 20% total organic carbon (Figure 5). Mean total density was 3,243 invertebrates per m^2 (Table 8). Chironomidae (46%), Amphipoda (29%), and Oligochaeta (15%) were the most dominant taxa (Figure 6). Mean EPT index was 0%, mean total richness was seven taxa, mean Simpson's diversity index was 0.61, and mean Simpson's evenness index was 0.41.

Table 8: Summary statistics for benthic invertebrates in the predominantly wetted sampling polygon in the Keeyask reservoir backbay Zone 4 in 2023.

Zone 4 - PW	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	3243.31	0.08%	7.20	0.20	0.61	0.41
Minimum	1457.18	0.00%	5.00	0.00	0.38	0.28
Maximum	4616.81	0.40%	10.00	1.00	0.78	0.57
1st Quartile	2943.21	0.00%	5.00	0.00	0.61	0.32
Median	3592.45	0.00%	8.00	0.00	0.64	0.34
3rd Quartile	3606.88	0.00%	8.00	0.00	0.65	0.52
Variance (n-1)	1355223.19	0.00%	4.70	0.20	0.02	0.02
Standard deviation (n-1)	1164.14	0.18%	2.17	0.45	0.15	0.13
Standard error of the mean	520.62	0.08%	0.97	0.20	0.06	0.06

Sediment composition of the OS polygon was largely silt (66%) and sand (24%) with 3% total organic carbon (Figure 5). Mean total density at the site was 317 invertebrates per m^2 (Table 9). Dreissenidae (25%), Chironomidae (25%), Ephemeroptera (22%), and Oligochaeta (16%) were the dominant invertebrate groups (Figure 6). Mean EPT index was 23%, mean total richness was five taxa, mean Simpson's diversity index was 0.71, and mean Simpson's evenness index was 0.78.

Table 9: Summary statistics for benthic invertebrates in the offshore sampling polygon in the Keeyask reservoir backbay Zone 4 in 2023.

Zone 4 - OS	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	317.41	22.91%	4.60	1.40	0.71	0.78
Minimum	100.99	14.29%	3.00	1.00	0.62	0.62
Maximum	591.53	31.25%	6.00	2.00	0.75	0.90
1st Quartile	129.85	17.07%	4.00	1.00	0.70	0.68
Median	230.84	22.22%	4.00	1.00	0.72	0.84
3rd Quartile	533.82	29.73%	6.00	2.00	0.73	0.88
Variance (n-1)	52870.92	0.56%	1.80	0.30	0.00	0.02
Standard deviation (n-1)	229.94	7.50%	1.34	0.55	0.05	0.13
Standard error of the mean	102.83	3.35%	0.60	0.24	0.02	0.06

4.1.2.3 FLOODED BACKBAY ZONE 12

Substrate within the IE sampling polygon was comprised largely of silt (72%) and clay (27%) with 30% total organic carbon (Figure 7). Mean total density was 3,038 invertebrates per m^2 (Table 10). Amphipoda (49%) and Chironomidae (30%) were the dominant invertebrate groups (Figure 8). Mean EPT index was 1%, mean total richness was six taxa, mean Simpson's diversity index was 0.68, and mean Simpson's evenness index was 0.51.

Table 10: Summary statistics for benthic invertebrates in the intermittently exposed sampling polygon in the Keeyask reservoir backbay Zone 12 in 2023.

Zone 12 - IE	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	3038.43	1.38%	6.40	0.60	0.68	0.51
Minimum	2005.42	0.00%	6.00	0.00	0.57	0.39
Maximum	5338.18	5.76%	7.00	1.00	0.77	0.68
1st Quartile	2236.27	0.00%	6.00	0.00	0.64	0.41
Median	2582.53	0.48%	6.00	1.00	0.65	0.47
3rd Quartile	3029.78	0.65%	7.00	1.00	0.75	0.62
Variance (n-1)	1801836.74	0.06%	0.30	0.30	0.01	0.02
Standard deviation (n-1)	1342.33	2.47%	0.55	0.55	0.08	0.13
Standard error of the mean	600.31	1.10%	0.24	0.24	0.04	0.06

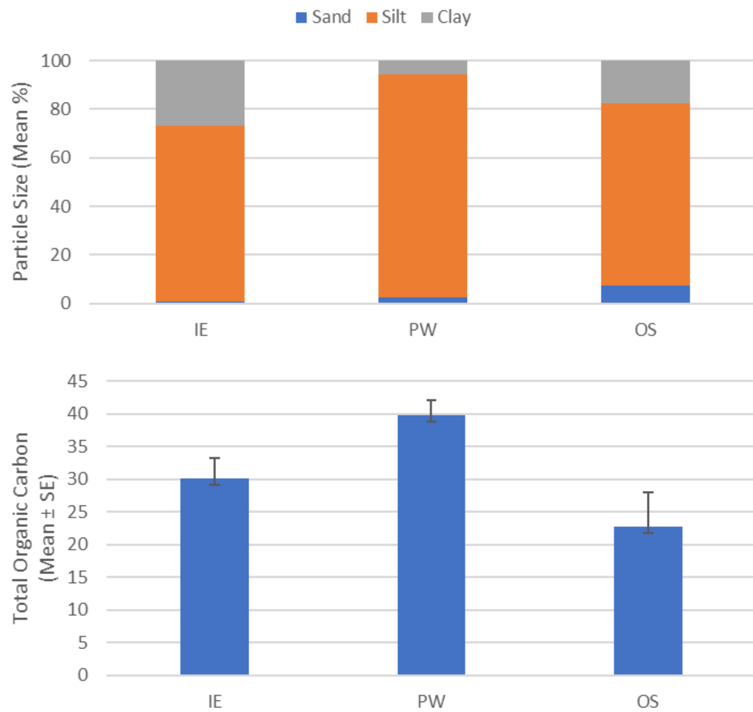


Figure 7: Supporting substrate metrics for the intermittently exposed (IE), predominantly wetted (PW), and offshore (OS) sampling polygons in the Keeyask reservoir backbay Zone 12 in 2023.

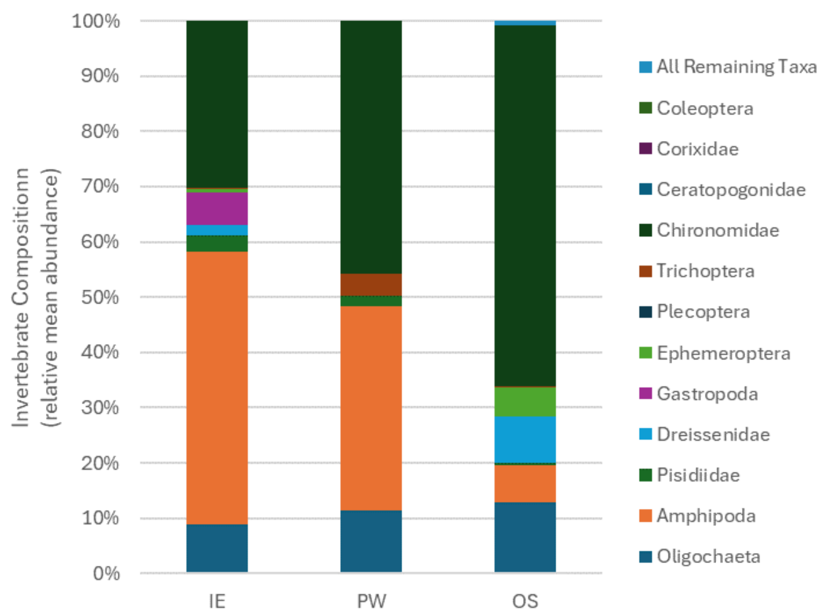


Figure 8: Composition of major invertebrate groups in intermittently exposed, predominantly wetted, and offshore habitat of the Keeyask reservoir backbay Zone 12 in 2023.

Sediment content in the PW polygon was largely silt (92%) with 40% total organic carbon (Figure 7). Mean total density was 1,223 invertebrates per m^2 (Table 11). Chironomidae (30%) and Amphipoda (37%) were the dominant invertebrate groups (Figure 8). Mean EPT index was 2%, mean total richness was four taxa, mean Simpson's diversity index was 0.56, and mean Simpson's evenness index was 0.61.

Table 11: Summary statistics for benthic invertebrates in the predominantly wetted sampling polygon in the Keeyask reservoir backbay Zone 12 in 2023.

Zone 12 - PW	Density (no./m²)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	1223.45	2.35%	4.20	0.40	0.56	0.61
Minimum	288.55	0.00%	3.00	0.00	0.46	0.31
Maximum	2308.40	10.00%	6.00	1.00	0.70	0.83
1st Quartile	822.37	0.00%	4.00	0.00	0.47	0.48
Median	1240.77	0.00%	4.00	0.00	0.49	0.66
3rd Quartile	1457.18	1.75%	4.00	1.00	0.69	0.80
Variance (n-1)	566738.78	0.19%	1.20	0.30	0.01	0.05
Standard deviation (n-1)	752.82	4.34%	1.10	0.55	0.12	0.22
Standard error of the mean	336.67	1.94%	0.49	0.24	0.05	0.10

Sediment content in the OS polygon was largely silt (75%) and clay (18%) with 23% total organic carbon (Figure 7). Mean total density was 1,997 invertebrates per m^2 (Table 12). Chironomidae (65%) was the dominant invertebrate group (Figure 8). Mean EPT index was 5%, mean total richness was seven taxa, mean Simpson's diversity index was 0.48, and mean Simpson's evenness index was 0.31.

Table 12: Summary statistics for benthic invertebrates in the offshore sampling polygon in the Keeyask reservoir backbay Zone 12 in 2023.

Zone 12 - OS	Density (no./m²)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	1996.77	5.46%	7.20	2.40	0.48	0.31
Minimum	1486.03	0.97%	6.00	1.00	0.27	0.17
Maximum	2438.25	10.95%	8.00	3.00	0.75	0.49
1st Quartile	1817.87	1.91%	6.00	2.00	0.38	0.21
Median	1976.57	4.73%	8.00	3.00	0.41	0.27
3rd Quartile	2265.12	8.73%	8.00	3.00	0.61	0.43
Variance (n-1)	140045.49	0.19%	1.20	0.80	0.04	0.02
Standard deviation (n-1)	374.23	4.30%	1.10	0.89	0.19	0.14
Standard error of the mean	167.36	1.92%	0.49	0.40	0.09	0.06

4.1.2.4 UPPER GULL LAKE ZONE 1B

Substrate within the IE sampling polygon was comprised largely of sand (52%) and silt (42%) with 10% total organic carbon (Figure 9). Mean total density was 1,812 invertebrates per m^2 (Table 13). The most abundant taxa were Amphipoda (50%) and Oligochaeta (35%; Figure 10). Mean EPT index was 1%, mean total richness was five taxa, mean Simpson's diversity index was 0.45, and mean Simpson's evenness index was 0.56.

Table 13: Summary statistics for benthic invertebrates in the intermittently exposed sampling polygon in the Keeyask reservoir in upper Gull Lake (Zone 1b) in 2023.

Zone 1b - IE	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	1812.10	0.73%	4.60	0.40	0.45	0.56
Minimum	86.57	0.00%	1.00	0.00	0.00	0.28
Maximum	5323.75	2.17%	8.00	1.00	0.66	1.00
1st Quartile	692.52	0.00%	4.00	0.00	0.48	0.48
Median	1009.93	0.00%	4.00	0.00	0.55	0.48
3rd Quartile	1947.71	1.48%	6.00	1.00	0.56	0.57
Variance (n-1)	4306128.16	0.01%	6.80	0.30	0.07	0.07
Standard deviation (n-1)	2075.12	1.03%	2.61	0.55	0.26	0.27
Standard error of the mean	928.02	0.46%	1.17	0.24	0.12	0.12

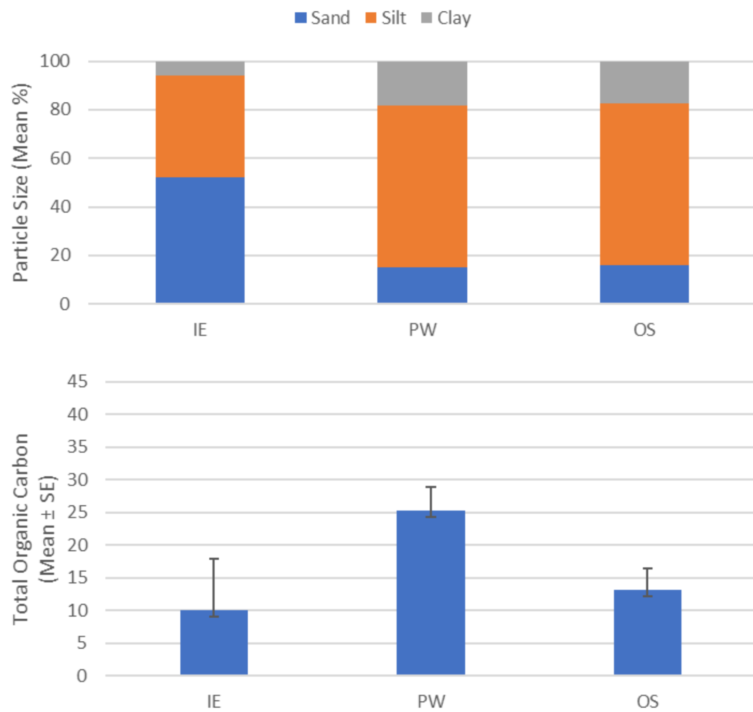


Figure 9: Supporting substrate metrics for the intermittently exposed (IE), predominantly wetted (PW), and offshore (OS) sampling polygons in the Keeyask reservoir in upper Gull Lake (Zone 1b) in 2023.

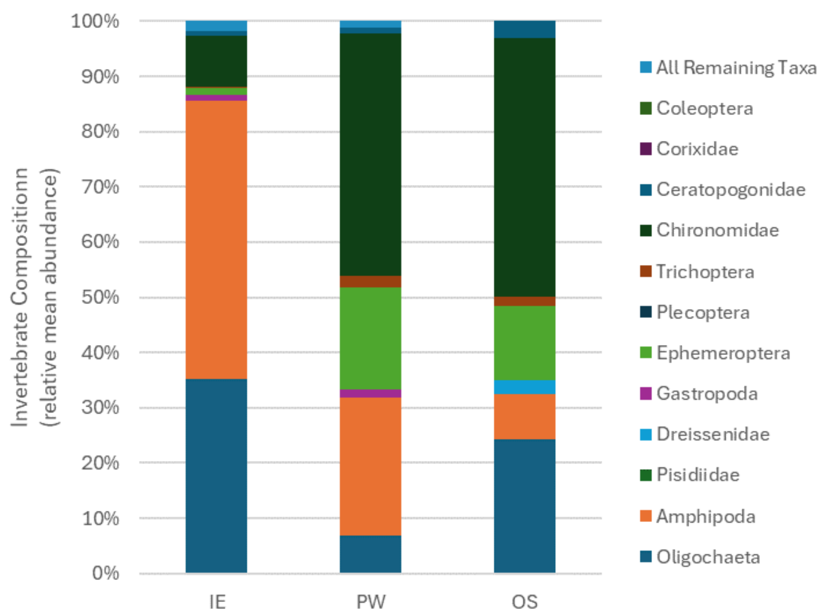


Figure 10: Composition of major invertebrate groups in intermittently exposed, predominantly wetted, and offshore habitat of the Keeyask reservoir in upper Gull Lake (Zone 1b) in 2023.

Sediment content in the PW polygon was largely silt (67%) with 25% total organic carbon (Figure 9). Mean total density was 3,212 invertebrates per m^2 (Table 14). Chironomidae (44%), Amphipoda (25%), and Ephemeroptera (18%) were the dominant taxa (Figure 10). Mean EPT index was 18%, mean total richness was ten taxa, mean Simpson's diversity index was 0.67, and mean Simpson's evenness index was 0.33.

Table 14: Summary statistics for benthic invertebrates in the predominantly wetted sampling polygon in the Keeyask reservoir in upper Gull Lake (Zone 1b) in 2023.

Zone 1b - PW	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	3211.57	17.85%	10.40	3.40	0.67	0.33
Minimum	2236.27	4.17%	7.00	2.00	0.54	0.19
Maximum	4313.83	53.51%	13.00	5.00	0.80	0.50
1st Quartile	3000.92	8.65%	8.00	3.00	0.56	0.28
Median	3116.34	9.36%	12.00	3.00	0.70	0.31
3rd Quartile	3390.47	13.55%	12.00	4.00	0.75	0.38
Variance (n-1)	562908.76	4.09%	7.30	1.30	0.01	0.01
Standard deviation (n-1)	750.27	20.21%	2.70	1.14	0.12	0.12
Standard error of the mean	335.53	9.04%	1.21	0.51	0.05	0.05

Sediment composition in the OS sampling polygon was largely silt (67%) with 13% total organic carbon (Figure 9). Mean total density was 1,140 invertebrates per m^2 (Table 15). The most abundant taxa were Chironomidae (47%) and Oligochaeta (24%; Figure 10). Mean EPT index was 17%, mean total richness was five taxa, mean Simpson's diversity index was 0.62, and mean Simpson's evenness index was 0.60.

Table 15: Summary statistics for benthic invertebrates in the offshore sampling polygon in the Keeyask reservoir upstream of Gull Lake (Zone 1b) in 2023.

Zone 1b - OS	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	1139.77	16.97%	5.20	1.80	0.62	0.60
Minimum	504.96	7.69%	2.00	1.00	0.41	0.38
Maximum	1543.74	28.57%	7.00	3.00	0.75	0.85
1st Quartile	1125.35	9.28%	5.00	1.00	0.57	0.49
Median	1125.35	14.95%	6.00	2.00	0.68	0.63
3rd Quartile	1399.47	24.36%	6.00	2.00	0.71	0.66
Variance (n-1)	158508.68	0.85%	3.70	0.70	0.02	0.03
Standard deviation (n-1)	398.13	9.20%	1.92	0.84	0.14	0.18
Standard error of the mean	178.05	4.11%	0.86	0.37	0.06	0.08

4.1.2.5 FLOODED BACKBAY ZONE 8

Substrate within the IE sampling polygon was comprised largely of silt (74%) and clay (26%) with 38% total organic carbon (Figure 11). Mean total density was 3,569 invertebrates per m^2 (Table 16). The most abundant taxa were Amphipoda (46%), Chironomidae (30%), and Oligochaeta (18%; Figure 12). Mean EPT index was <1%, the mean total richness was eight taxa, mean Simpson's diversity index was 0.65, and mean Simpson's evenness index was 0.42.

Table 16: Summary statistics for benthic invertebrates in the intermittently exposed sampling polygon in the Keeyask reservoir backbay Zone 8 in 2023.

Zone 8 - IE	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	3569.37	0.34%	7.60	0.60	0.65	0.42
Minimum	1009.93	0.00%	5.00	0.00	0.37	0.29
Maximum	9363.46	1.23%	11.00	2.00	0.76	0.58
1st Quartile	1861.15	0.00%	7.00	0.00	0.68	0.32
Median	2510.39	0.00%	7.00	0.00	0.70	0.45
3rd Quartile	3101.92	0.47%	8.00	1.00	0.72	0.47
Variance (n-1)	11095045.51	0.00%	4.80	0.80	0.02	0.01
Standard deviation (n-1)	3330.92	0.54%	2.19	0.89	0.16	0.12
Standard error of the mean	1489.63	0.24%	0.98	0.40	0.07	0.05

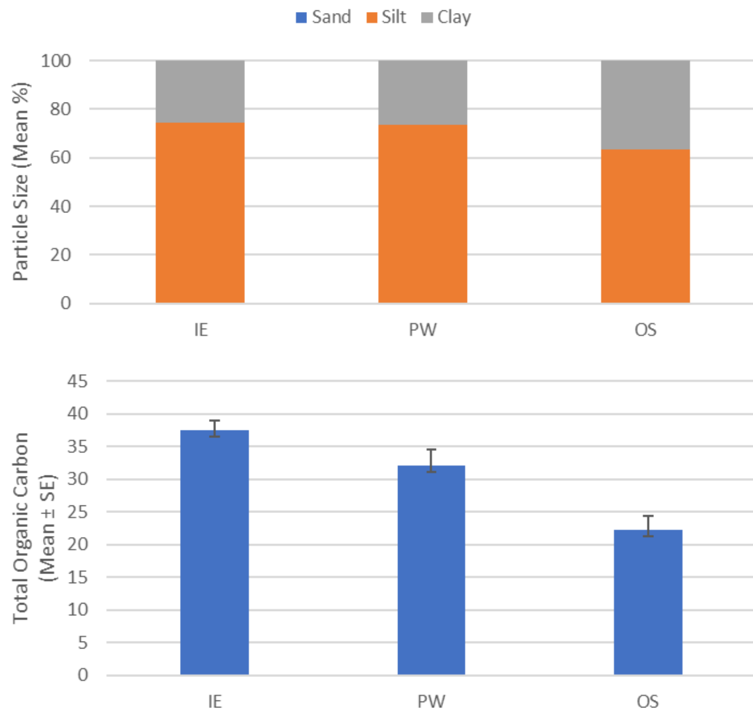


Figure 11: Supporting substrate metrics for the intermittently exposed (IE), predominantly wetted (PW), and offshore (OS) sampling polygons in the Keeyask reservoir backbay Zone 8 in 2023.

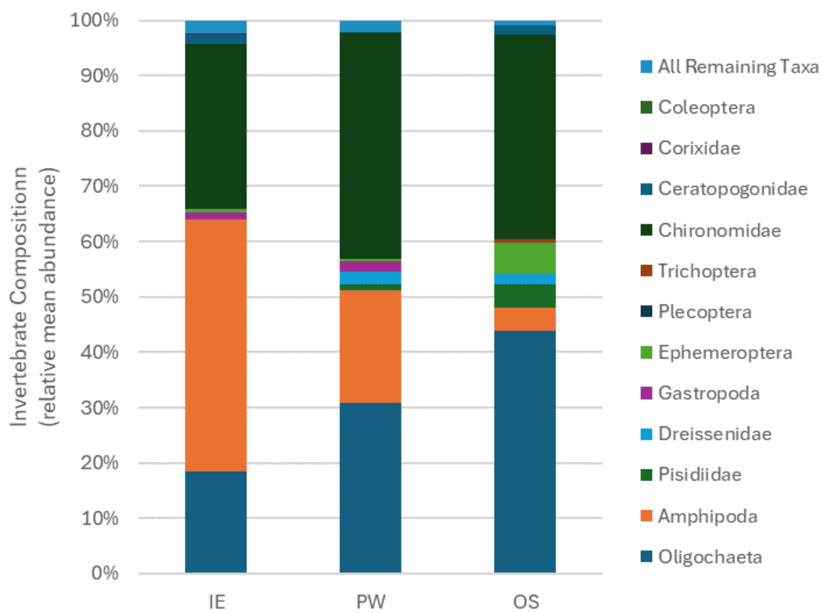


Figure 12: Composition of major invertebrate groups in intermittently exposed, predominantly wetted, and offshore habitat of the Keeyask reservoir backbay Zone 8 in 2023.

Sediment content in the PW polygon was largely silt (73%) and clay (27%) with 32% total organic carbon (Figure 11). Mean total density was 2,277 invertebrates per m^2 (Table 17). Most of the invertebrate abundance in this habitat was comprised of Chironomidae (41%), Oligochaeta (31%), and Amphipoda (20%; Figure 12). Mean EPT index was 1%, mean total richness was six taxa, mean Simpson's diversity index was 0.62, and mean Simpson's evenness index was 0.44.

Table 17: Summary statistics for benthic invertebrates in the predominantly wetted sampling polygon in the Keeyask reservoir backbay Zone 8 in 2023.

Zone 8 - PW	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	2276.66	0.54%	6.40	0.60	0.62	0.44
Minimum	1572.60	0.00%	4.00	0.00	0.43	0.38
Maximum	3491.46	1.83%	8.00	2.00	0.74	0.54
1st Quartile	1644.74	0.00%	6.00	0.00	0.62	0.41
Median	1644.74	0.00%	7.00	0.00	0.62	0.43
3rd Quartile	3029.78	0.88%	7.00	1.00	0.70	0.44
Variance (n-1)	834319.75	0.01%	2.30	0.80	0.01	0.00
Standard deviation (n-1)	913.41	0.82%	1.52	0.89	0.12	0.06
Standard error of the mean	408.49	0.37%	0.68	0.40	0.05	0.03

Sediment composition in the OS sampling polygon was largely silt (63%) and clay (37%) with 22% total organic carbon (Figure 11). Mean total density was 1,489 invertebrates per m^2 (Table 18). The most abundant taxa were Oligochaeta (44%) and Chironomidae (37%; Figure 12). Mean EPT index was 8%, mean total richness was seven taxa, mean Simpson's diversity index was 0.65, and mean Simpson's evenness index was 0.44.

Table 18: Summary statistics for benthic invertebrates in the offshore sampling polygon in the Keeyask reservoir backbay Zone 8 in 2023.

Zone 8 - OS	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	1488.92	8.48%	6.80	2.00	0.65	0.44
Minimum	490.54	0.52%	5.00	1.00	0.60	0.36
Maximum	2770.08	17.65%	8.00	3.00	0.77	0.53
1st Quartile	1053.21	2.17%	7.00	1.00	0.61	0.37
Median	1327.33	6.85%	7.00	2.00	0.62	0.44
3rd Quartile	1803.44	15.20%	7.00	3.00	0.67	0.51
Variance (n-1)	738257.03	0.59%	1.20	1.00	0.00	0.01
Standard deviation (n-1)	859.22	7.66%	1.10	1.00	0.07	0.08
Standard error of the mean	384.25	3.43%	0.49	0.45	0.03	0.04

4.1.2.6 LOWER GULL LAKE ZONE 2

Substrate within the IE sampling polygon was made largely of sand (94%) with 1% total organic carbon (Figure 13). Mean total density was 46 invertebrates per m^2 (Table 19). The dominant taxon was Amphipoda (81%; Figure 14). Mean EPT index was 0%, mean total richness was one taxon, mean Simpson's diversity index was 0.15, and mean Simpson's evenness index was 0.73.

Table 19: Summary statistics for benthic invertebrates in the intermittently exposed sampling polygon in the Keeyask reservoir in lower Gull Lake (Zone 2) in 2023.

Zone 2 - IE	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	46.17	0.00%	1.20	0.00	0.15	0.73
Minimum	0.00	0.00%	0.00	0.00	0.00	0.00
Maximum	86.57	0.00%	2.00	0.00	0.45	1.00
1st Quartile	28.86	0.00%	1.00	0.00	0.00	0.74
Median	43.28	0.00%	1.00	0.00	0.00	0.91
3rd Quartile	72.14	0.00%	2.00	0.00	0.32	1.00
Variance (n-1)	1186.47	0.00%	0.70	0.00	0.05	0.18
Standard deviation (n-1)	34.45	0.00%	0.84	0.00	0.22	0.42
Standard error of the mean	15.40	0.00%	0.37	0.00	0.10	0.19

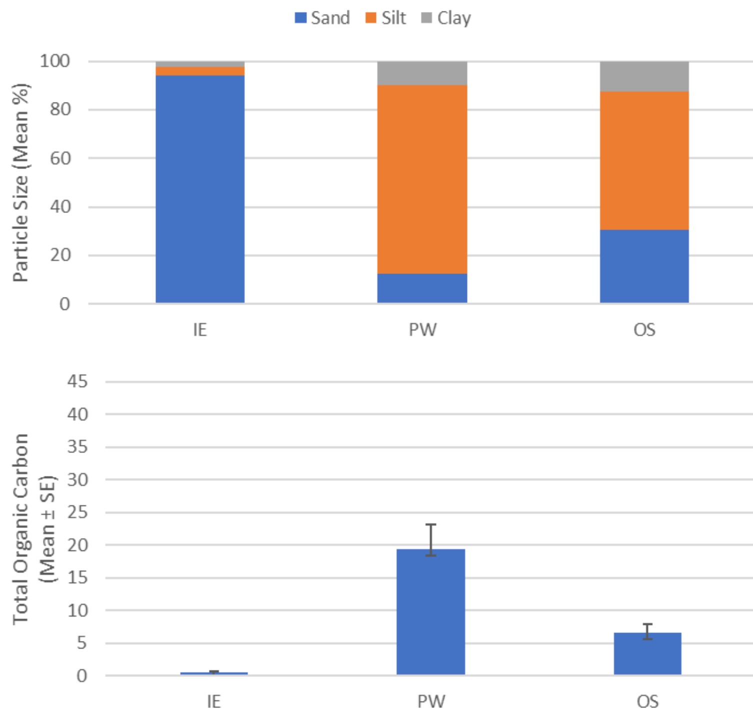


Figure 13: Supporting substrate metrics for the intermittently exposed (IE), predominantly wetted (PW), and offshore (OS) sampling polygons in the Keeyask reservoir in lower Gull Lake (Zone 2) in 2023.

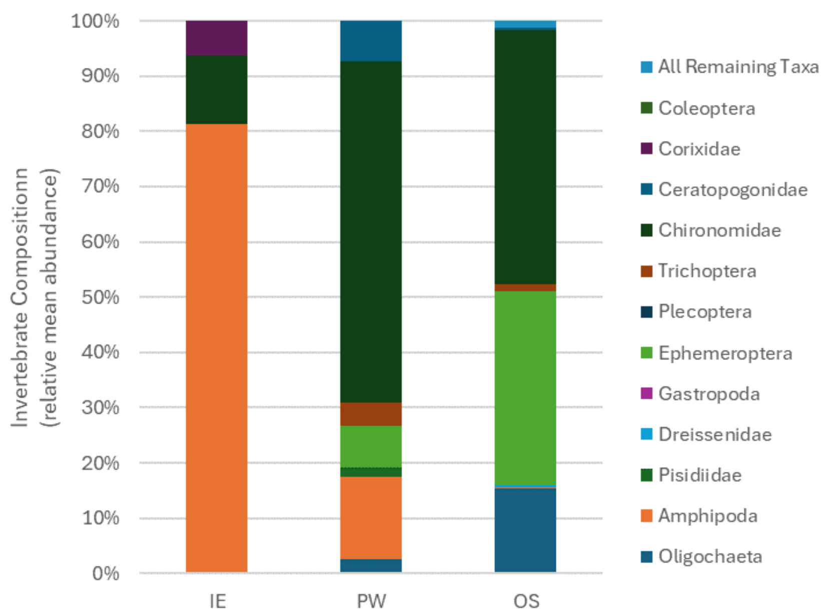


Figure 14: Composition of major invertebrate groups in intermittently exposed, predominantly wetted, and offshore habitat of the Keeyask reservoir in lower Gull Lake (Zone 2) in 2023.

Sediment content in the PW polygon was largely silt (78%) with 19% total organic carbon (Figure 13). Total density was 3,001 invertebrates per m^2 (Table 20). The most abundant taxa were Chironomidae (62%) and Amphipoda (15%; Figure 14). Mean EPT index was 11%, mean total richness was five taxa, mean Simpson's diversity index was 0.52, and mean Simpson's evenness index was 0.48.

Table 20: Summary statistics for benthic invertebrates in the predominantly wetted sampling polygon in the Keeyask reservoir in lower Gull Lake (Zone 2) in 2023.

Zone 2 - PW	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	3000.92	10.71%	5.20	1.60	0.52	0.48
Minimum	1817.87	0.00%	4.00	0.00	0.16	0.20
Maximum	4284.97	30.30%	7.00	4.00	0.70	0.72
1st Quartile	2366.11	1.01%	4.00	1.00	0.53	0.46
Median	2726.80	10.05%	5.00	1.00	0.57	0.48
3rd Quartile	3808.86	12.20%	6.00	2.00	0.65	0.53
Variance (n-1)	1044825.10	1.49%	1.70	2.30	0.05	0.03
Standard deviation (n-1)	1022.17	12.20%	1.30	1.52	0.21	0.19
Standard error of the mean	457.13	5.46%	0.58	0.68	0.10	0.08

Sediment composition in the OS sampling polygon was largely silt (57%) and sand (31%) with 7% total organic carbon (Figure 13). Mean total density was 848 invertebrates per m^2 (Table 21). Chironomidae (46%) and Ephemeroptera (35%) were most abundant (Figure 14). Mean EPT index was 41%, mean total richness was four taxa, mean Simpson's diversity index was 0.45, and mean Simpson's evenness index was 0.48.

Table 21: Summary statistics for benthic invertebrates in the offshore sampling polygon in the Keeyask reservoir in lower Gull Lake (Zone 2) in 2023.

Zone 2 - OS	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	848.34	40.97%	4.40	1.60	0.45	0.48
Minimum	360.69	3.61%	3.00	1.00	0.24	0.33
Maximum	1312.90	85.71%	7.00	2.00	0.66	0.73
1st Quartile	461.68	21.88%	4.00	1.00	0.25	0.34
Median	908.93	29.67%	4.00	2.00	0.55	0.44
3rd Quartile	1197.48	64.00%	4.00	2.00	0.58	0.55
Variance (n-1)	182175.70	11.05%	2.30	0.30	0.04	0.03
Standard deviation (n-1)	426.82	33.24%	1.52	0.55	0.20	0.17
Standard error of the mean	190.88	14.87%	0.68	0.24	0.09	0.07

4.1.3 STEPHENS LAKE

4.1.3.1 O'NEIL BAY

Substrate within the IE sampling polygon was 35% silt, 33% clay and 32% sand with 1% total organic carbon (Figure 15). Mean total density was very low at 26 invertebrates per m^2 (Table 22). Chironomidae was the dominant taxon, comprising 89% of the total abundance (Figure 16). Mean EPT index was 0%, mean total richness was one taxon, mean Simpson's diversity index was 0.06, and mean Simpson's evenness index was 0.54.

Table 22: Summary statistics for benthic invertebrates in the intermittently exposed sampling polygon in O'Neil Bay in Stephens Lake (ONB) in 2023.

STLONB - IE	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	25.97	0.00%	0.80	0.00	0.06	0.54
Minimum	0.00	0.00%	0.00	0.00	0.00	0.00
Maximum	86.57	0.00%	2.00	0.00	0.28	1.00
1st Quartile	0.00	0.00%	0.00	0.00	0.00	0.00
Median	14.43	0.00%	1.00	0.00	0.00	0.70
3rd Quartile	28.86	0.00%	1.00	0.00	0.00	1.00
Variance (n-1)	1290.55	0.00%	0.70	0.00	0.02	0.26
Standard deviation (n-1)	35.92	0.00%	0.84	0.00	0.13	0.51
Standard error of the mean	16.07	0.00%	0.37	0.00	0.06	0.23

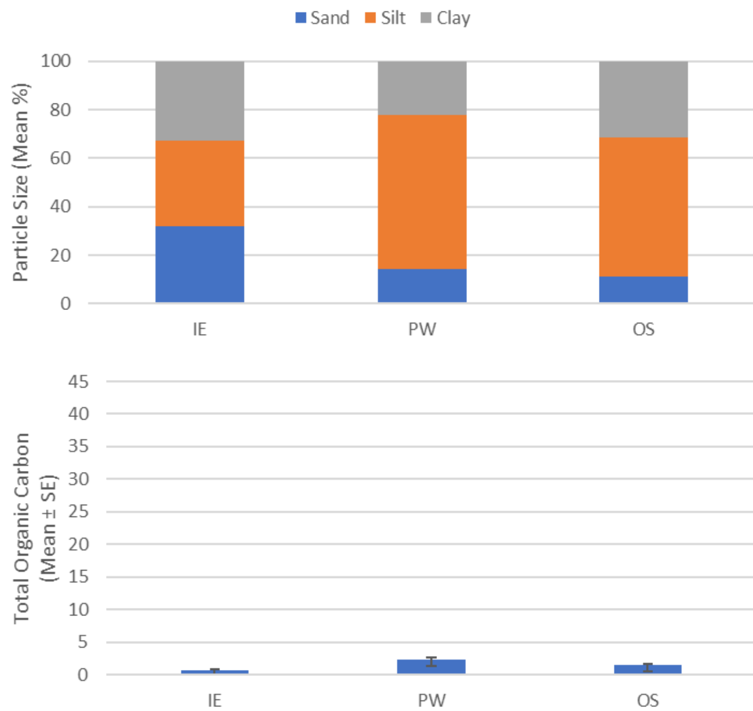


Figure 15: Supporting substrate metrics for the intermittently exposed (IE), predominantly wetted (PW), and offshore (OS) sampling polygons in O'Neil Bay in Stephens Lake (ONB) in 2023.

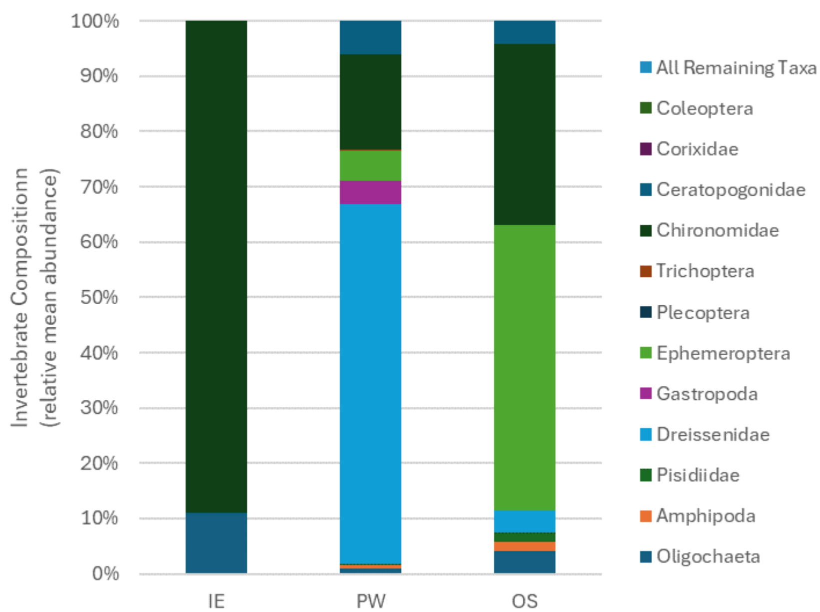


Figure 16: Composition of major invertebrate groups in intermittently exposed, predominantly wetted, and offshore habitat in O'Neil Bay in Stephens Lake (ONB) in 2023.

Sediment content in the PW polygon was largely silt (64%) with 2% total organic carbon (Figure 15). Mean total density was 2,862 invertebrates per m^2 (Table 23). Dreissenidae was the dominant taxa, comprising 65% of the total abundance (Figure 16). Mean EPT index was 18%, mean total richness was seven taxa, mean Simpson's diversity index was 0.59, and mean Simpson's evenness index was 0.45.

Table 23: Summary statistics for benthic invertebrates in the predominantly wetted sampling polygon in O'Neil Bay in Stephens Lake (ONB) in 2023.

STLONB - PW	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	2862.42	18.49%	7.20	1.40	0.59	0.45
Minimum	504.96	2.03%	6.00	1.00	0.19	0.11
Maximum	9954.99	40.00%	11.00	2.00	0.74	0.65
1st Quartile	634.81	3.64%	6.00	1.00	0.55	0.37
Median	836.80	17.24%	6.00	1.00	0.72	0.53
3rd Quartile	2380.54	29.55%	7.00	2.00	0.73	0.59
Variance (n-1)	16289925.49	2.70%	4.70	0.30	0.05	0.05
Standard deviation (n-1)	4036.08	16.42%	2.17	0.55	0.23	0.22
Standard error of the mean	1804.99	7.34%	0.97	0.24	0.10	0.10

The sediment composition in the OS sampling polygon was largely silt (57%) and clay (31%) with 2% total organic carbon (Figure 15). Mean total density was 352 invertebrates per m^2 (Table 24). Ephemeroptera (52%) and Chironomidae (33%) were the most abundant taxa (Figure 16). Mean EPT index was 52%, mean total richness was four taxa, mean Simpson's diversity index was 0.59, and mean Simpson's evenness was 0.66.

Table 24: Summary statistics for benthic invertebrates in the offshore sampling polygon in O'Neil Bay in Stephens Lake (ONB) in 2023.

STLONB - OS	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	352.03	52.03%	4.00	1.20	0.59	0.66
Minimum	115.42	34.62%	3.00	1.00	0.47	0.47
Maximum	476.11	73.91%	5.00	2.00	0.75	0.83
1st Quartile	331.83	48.48%	4.00	1.00	0.56	0.57
Median	375.12	50.00%	4.00	1.00	0.59	0.61
3rd Quartile	461.68	53.13%	4.00	1.00	0.60	0.81
Variance (n-1)	21085.92	2.00%	0.50	0.20	0.01	0.03
Standard deviation (n-1)	145.21	14.14%	0.71	0.45	0.10	0.16
Standard error of the mean	64.94	6.32%	0.32	0.20	0.05	0.07

4.1.3.2 3 KM DOWNSTREAM OF THE KEEYASK GS

Substrate within the IE sampling polygon was comprised largely of silt (48%) and clay (40%) with 1% total organic carbon (Figure 17). Mean total density was 9,173 invertebrates per m^2 (Table 25). Chironomidae (81%) and Oligochaeta (18%) were the dominant taxa (Figure 18). Mean EPT index was 0%, mean total richness was four taxa, mean Simpson's diversity index was 0.16, and mean Simpson's evenness index was 0.32.

Table 25: Summary statistics for benthic invertebrates in the intermittently exposed sampling polygon in Stephens Lake 3 km downstream of the Keeyask GS (STL3KM) in 2023.

STL3KM - IE	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	9173.01	0.00%	4.40	0.00	0.16	0.32
Minimum	2741.23	0.00%	2.00	0.00	0.03	0.22
Maximum	22088.53	0.00%	7.00	0.00	0.45	0.52
1st Quartile	4284.97	0.00%	3.00	0.00	0.04	0.26
Median	5482.46	0.00%	4.00	0.00	0.05	0.26
3rd Quartile	11267.89	0.00%	6.00	0.00	0.23	0.34
Variance (n-1)	62520006.86	0.00%	4.30	0.00	0.03	0.02
Standard deviation (n-1)	7906.96	0.00%	2.07	0.00	0.18	0.12
Standard error of the mean	3536.10	0.00%	0.93	0.00	0.08	0.05

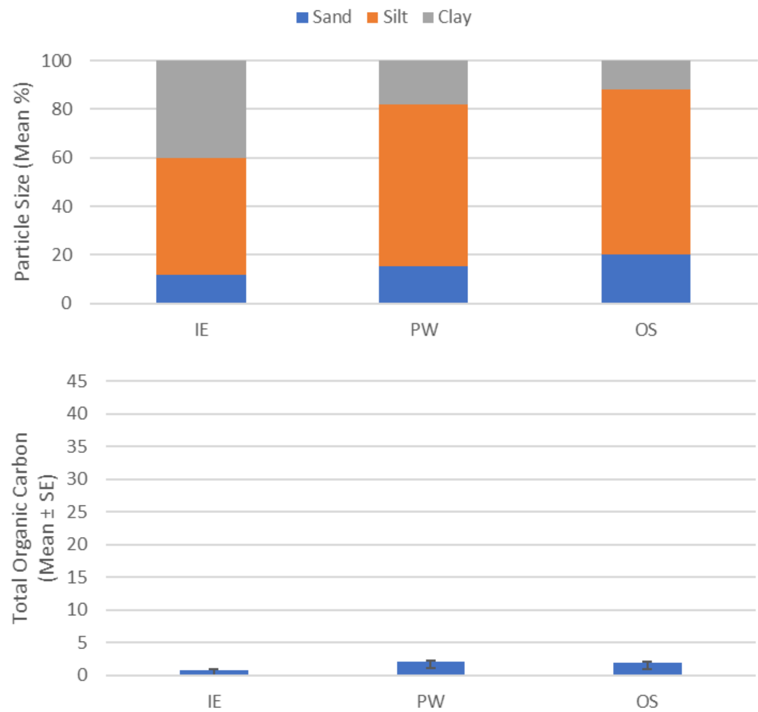


Figure 17: Supporting substrate metrics for the intermittently exposed (IE), predominantly wetted (PW), and offshore (OS) sampling polygons in Stephens Lake 3 km downstream of the Keeyask GS in 2023.

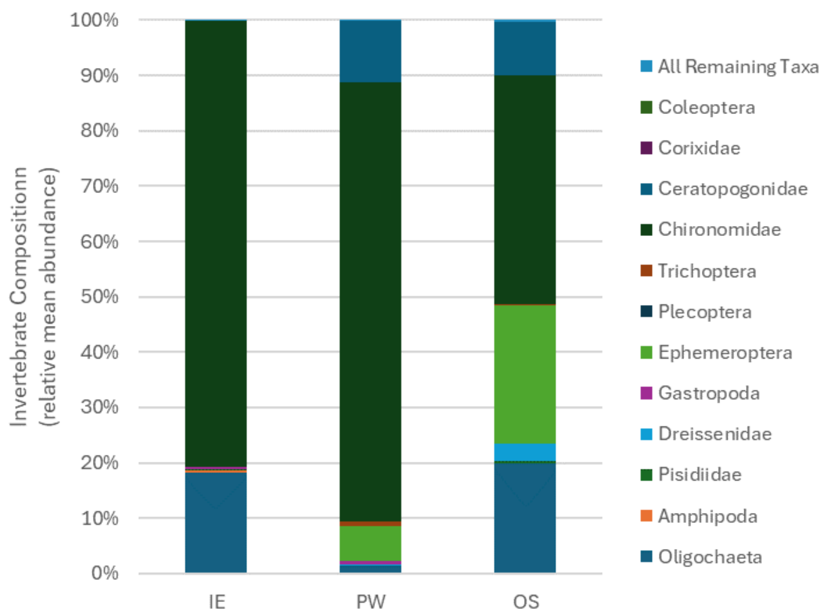


Figure 18: Composition of major invertebrate groups in intermittently exposed, predominantly wetted, and offshore habitat in Stephens Lake 3 km downstream of the Keeyask GS in 2023.

Sediment content in the PW polygon was largely silt (67%) with 2% total organic carbon (Figure 17). Mean total density was 2,643 invertebrates per m^2 (Table 26). Chironomidae were the dominant taxon, comprising 79% of the total abundance (Figure 18). Mean EPT index was 9%, mean total richness was six taxa, mean Simpson's diversity index was 0.39, and mean Simpson's evenness index was 0.30.

Table 26: Summary statistics for benthic invertebrates in the predominantly wetted sampling polygon in Stephens Lake 3 km downstream of the Keeyask GS (STL3KM) in 2023.

STL3KM - PW	Density (no./m²)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	2643.12	9.37%	6.00	2.20	0.39	0.30
Minimum	894.51	3.22%	4.00	2.00	0.22	0.18
Maximum	4486.96	17.65%	7.00	3.00	0.56	0.40
1st Quartile	2207.41	4.68%	6.00	2.00	0.29	0.23
Median	2236.27	5.16%	6.00	2.00	0.37	0.32
3rd Quartile	3390.47	16.13%	7.00	2.00	0.52	0.35
Variance (n-1)	1842822.11	0.48%	1.50	0.20	0.02	0.01
Standard deviation (n-1)	1357.51	6.92%	1.22	0.45	0.15	0.09
Standard error of the mean	607.10	3.10%	0.55	0.20	0.07	0.04

Sediment composition in the OS sampling polygon was largely silt (68%) with 2% total organic carbon (Figure 17). Mean total density was 895 invertebrates per m^2 (Table 27). Chironomidae (81%), Ephemeroptera (25%), and Oligochaeta (20%) were the most abundant taxa (Figure 18). Mean EPT index was 37%, mean total richness was four taxa, mean Simpson's diversity index was 0.65, and mean Simpson's evenness index was 0.67.

Table 27: Summary statistics for benthic invertebrates in the offshore sampling polygon in Stephens Lake 3 km downstream of the Keeyask GS (STL3KM) in 2023.

STL3KM - OS	Density (no./m²)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	894.51	36.75%	4.40	1.20	0.65	0.67
Minimum	173.13	17.79%	4.00	1.00	0.56	0.57
Maximum	2351.69	55.56%	5.00	2.00	0.72	0.89
1st Quartile	375.12	21.95%	4.00	1.00	0.57	0.59
Median	389.54	38.46%	4.00	1.00	0.70	0.66
3rd Quartile	1183.06	50.00%	5.00	1.00	0.70	0.66
Variance (n-1)	812942.41	2.78%	0.30	0.20	0.01	0.02
Standard deviation (n-1)	901.63	16.66%	0.55	0.45	0.08	0.13
Standard error of the mean	403.22	7.45%	0.24	0.20	0.03	0.06

4.1.3.3 11 KM DOWNSTREAM OF THE KEEYASK GS

Substrate within the IE sampling polygon was comprised largely of sand (93%) with 1% total organic carbon (Figure 19). Mean total density was 2,909 invertebrates per m^2 (Table 28). Chironomidae was the dominant taxon, comprising 76% of the total abundance (Figure 20). Mean EPT index was 2%, mean total richness was eight taxa, mean Simpson's diversity index was 0.43, and mean Simpson's evenness index was 0.23.

Table 28: Summary statistics for benthic invertebrates in the intermittently exposed sampling polygon in Stephens Lake 11 km downstream of the Keeyask GS (STL11KM) in 2023.

STL11KM - IE	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	2908.59	1.75%	8.20	1.00	0.43	0.23
Minimum	1399.47	0.00%	6.00	0.00	0.33	0.17
Maximum	7516.74	5.66%	11.00	2.00	0.55	0.28
1st Quartile	1529.32	0.90%	7.00	1.00	0.35	0.19
Median	1601.45	1.03%	8.00	1.00	0.39	0.22
3rd Quartile	2495.96	1.16%	9.00	1.00	0.51	0.28
Variance (n-1)	6823429.16	0.05%	3.70	0.50	0.01	0.00
Standard deviation (n-1)	2612.17	2.23%	1.92	0.71	0.10	0.05
Standard error of the mean	1168.20	1.00%	0.86	0.32	0.04	0.02

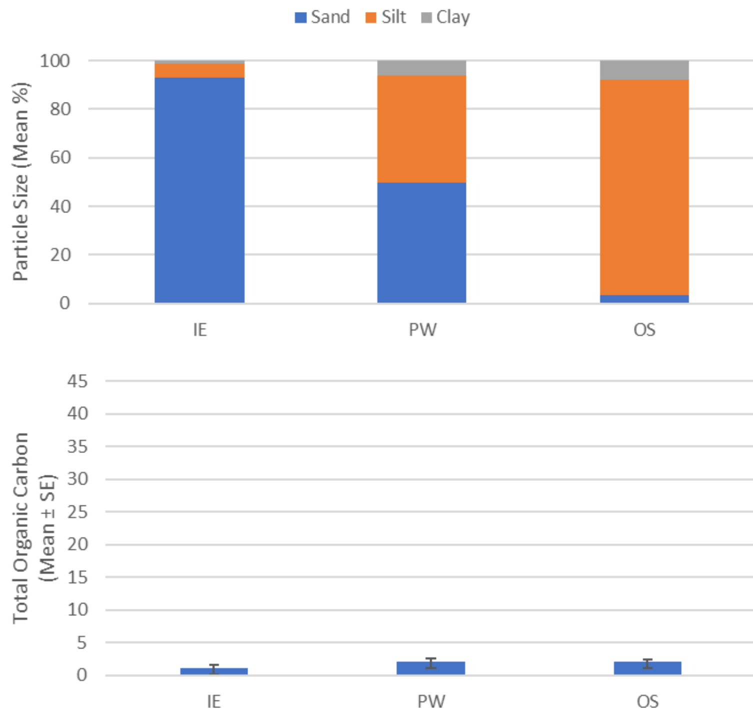


Figure 19: Supporting substrate metrics for the intermittently exposed (IE), predominantly wetted (PW), and offshore (OS) sampling polygons in Stephens Lake 11 km downstream of the Keeyask GS in 2023.

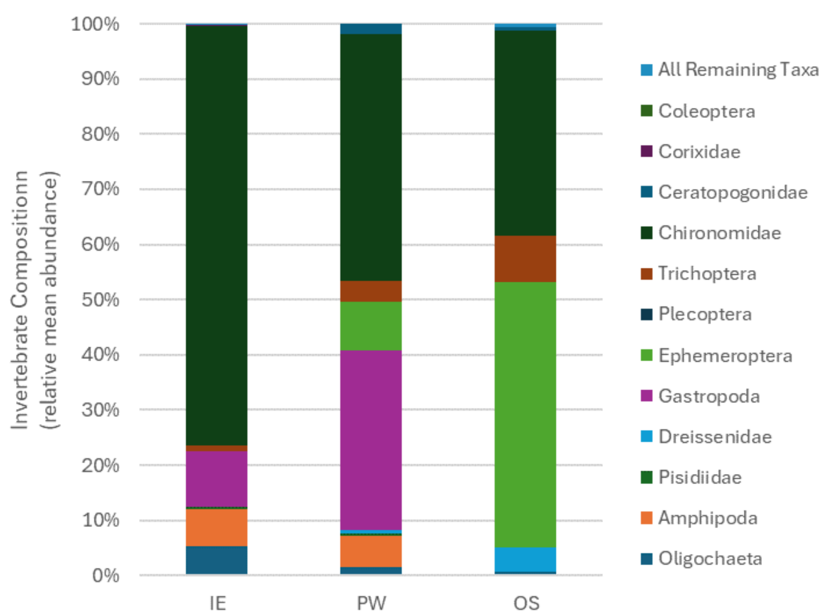


Figure 20: Composition of major invertebrate groups in intermittently exposed, predominantly wetted, and offshore habitat in Stephens Lake 11 km downstream of the Keeyask GS in 2023.

Sediment content in the PW polygon was largely sand (50%) and silt (44%) with 2% total organic carbon (Figure 19). Total density was 6,247 invertebrates per m^2 (Table 29). Chironomidae (45%) and Gastropoda (32%) were the dominant taxa (Figure 20). Mean EPT index was 14%, mean total richness was 12 taxa, mean Simpson's diversity index was 0.67, and mean Simpson's evenness index was 0.26.

Table 29: Summary statistics for benthic invertebrates in the predominantly wetted sampling polygon in Stephens Lake 11 km downstream of the Keeyask GS (STL11KM) in 2023.

STL11KM - PW	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	6247.11	13.92%	12.40	5.00	0.67	0.26
Minimum	2481.53	4.29%	9.00	4.00	0.60	0.20
Maximum	8339.10	27.91%	15.00	6.00	0.76	0.39
1st Quartile	5713.30	4.30%	12.00	4.00	0.64	0.21
Median	7314.75	8.88%	12.00	5.00	0.64	0.23
3rd Quartile	7386.89	24.22%	14.00	6.00	0.71	0.28
Variance (n-1)	5319980.06	1.28%	5.30	1.00	0.00	0.01
Standard deviation (n-1)	2306.51	11.32%	2.30	1.00	0.06	0.08
Standard error of the mean	1031.50	5.06%	1.03	0.45	0.03	0.03

Sediment composition in the OS sampling polygon was largely silt (89%) with 2% total organic carbon (Figure 19). Mean total density was 444 invertebrates per m^2 (Table 30). Ephemeroptera (48%) and Chironomidae (37%) were the most abundant taxa (Figure 20). Mean EPT index was 64%, mean total richness was four taxa, mean Simpson's diversity index was 0.54, and mean Simpson's evenness index was 0.57.

Table 30: Summary statistics for benthic invertebrates in the offshore sampling polygon in Stephens Lake 11 km downstream of the Keeyask GS (STL11KM) in 2023.

STL11KM - OS	Density (no./m^2)	EPT Index (%)	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	444.37	63.81%	4.00	2.20	0.54	0.57
Minimum	288.55	25.93%	3.00	2.00	0.46	0.46
Maximum	779.09	80.00%	5.00	3.00	0.65	0.64
1st Quartile	331.83	69.57%	3.00	2.00	0.48	0.54
Median	346.26	70.83%	4.00	2.00	0.54	0.57
3rd Quartile	476.11	72.73%	5.00	2.00	0.57	0.62
Variance (n-1)	39902.97	4.65%	1.00	0.20	0.01	0.00
Standard deviation (n-1)	199.76	21.56%	1.00	0.45	0.07	0.07
Standard error of the mean	89.33	9.64%	0.45	0.20	0.03	0.03

4.2 POST-IMPOUNDMENT ASSESSMENT

4.2.1 KEEYASK RESERVOIR MAINSTEM

Sampling was conducted at sites in the Keeyask mainstem both pre- and post-impoundment of the Keeyask reservoir to assess changes in benthic macroinvertebrate communities caused by changes in habitat characteristics (such as water depth, velocity, and sediment composition). Pre-impoundment (baseline) monitoring in the Keeyask reservoir mainstem was conducted between 2001 and 2013, with different areas sampled in different years (Map 7). A total of 220 invertebrate and 105 sediment baseline samples were collected. Post-impoundment monitoring was conducted between 2021 and 2023; a total of 133 invertebrate and 128 sediment samples were collected. Summary statistics for benthic invertebrate metrics by mainstem site and habitat type are provided in Appendix 3 (Tables A3-1 to A3-48). Comparable habitats were compared both pre- and post-impoundment. Conclusions are based on statistical comparisons of means between time periods, presented in Appendix 7 (Tables A7-1 to A7-24).

4.2.1.1 ZONE 1A

Kicknet sampling with IE habitats were conducted along transects perpendicular from the shoreline up to water depths of 0.5 to 1.1 m in 2013 (pre-impoundment) and 2021 (post-impoundment).

- Total organic carbon was significantly lower (by >50%) in post-impoundment; however, particle sizes (% sand and % silt/ clay) were comparable between both monitoring periods (Figure 21; Table A7-1).
- Total abundance and evenness were comparable between both monitoring periods (Figure 22; Table A7-2). The post-impoundment benthic invertebrate community was significantly less taxa rich (by >50% for EPT richness only), less diverse, and contained a significantly lower (by >50%) proportion of disturbance-sensitive taxa (EPT index) and a significantly higher (by >50%) proportion of disturbance-tolerant taxa (O+C index) (Table A7-2).

Benthic grab sampling was also conducted within IE habitats in 0.60–1.2 m water depths during both pre-impoundment (2002) and post-impoundment (2022 and 2023).

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between both monitoring periods (Figure 23; Table A7-3).
- There were no statistically significant differences detected between the monitoring periods for any of the benthic invertebrate community metrics (density, composition, richness, diversity, and evenness; Figure 24; Table A7-4). While not statistically different, total invertebrate density in 2022 (1,380 per m^2) was more than 50% lower than baseline

density (6,882 per m^2), and then increased in 2023 (5,032 per m^2) closer to pre-Project conditions.

PW nearshore habitats were sampled in 1.1 to 2.7 m water depths both pre-impoundment (2001, 2004, and 2013) and post-impoundment (2021 to 2023).

- Total organic carbon was comparable between the monitoring periods (Figure 25; Table A7-5). Benthic substrates contained significantly less sand (>50% lower) and more silt/clay (>50% higher) in 2022 compared to pre-impoundment. Relative proportions of sand and silt/clay in 2021 and 2023 were comparable to baseline conditions.
- Total invertebrate density, EPT index, ratio of EPT:C, and diversity were comparable between both monitoring periods (Figure 26; Table A7-6). Compared to pre-impoundment, the 2021 post-impoundment community was significantly more taxa rich and significantly less even (both by >50%). The invertebrate community in 2022 contained a significantly higher (by >50%) proportion of disturbance-tolerant taxa (O+C index).

OS habitats were sampled in 3.6 to 6.6 m water depths both pre-impoundment (1999, 2001, and 2002) and post-impoundment (2021 to 2023).

- Total organic carbon was comparable between the monitoring periods (Figure 27; Table A7-7). Significantly less sand was present post-impoundment, while significantly more silt/clay (by >50%) was only found in 2021.
- Taxa richness, relative proportions of disturbance-sensitive and tolerant taxa, diversity, and evenness were comparable between both monitoring periods (Figure 28; Table A7-8). Compared to pre-impoundment, total invertebrate density was lower but only significantly different from baseline in 2022 (by >50%); EPT:C ratio was significantly higher (by >50%) in 2021.

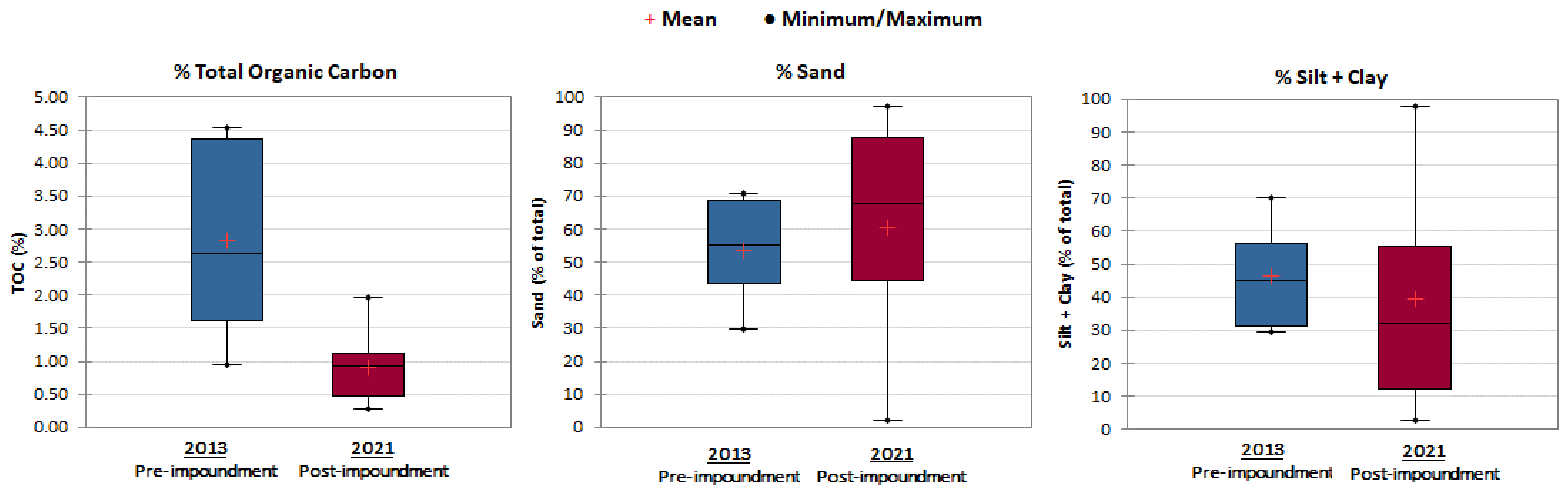


Figure 21: Sediment parameters for Keeyask reservoir Zone 1a intermittently exposed habitat (at kicknet sites) for pre-impoundment (2013) and post-impoundment (2021).

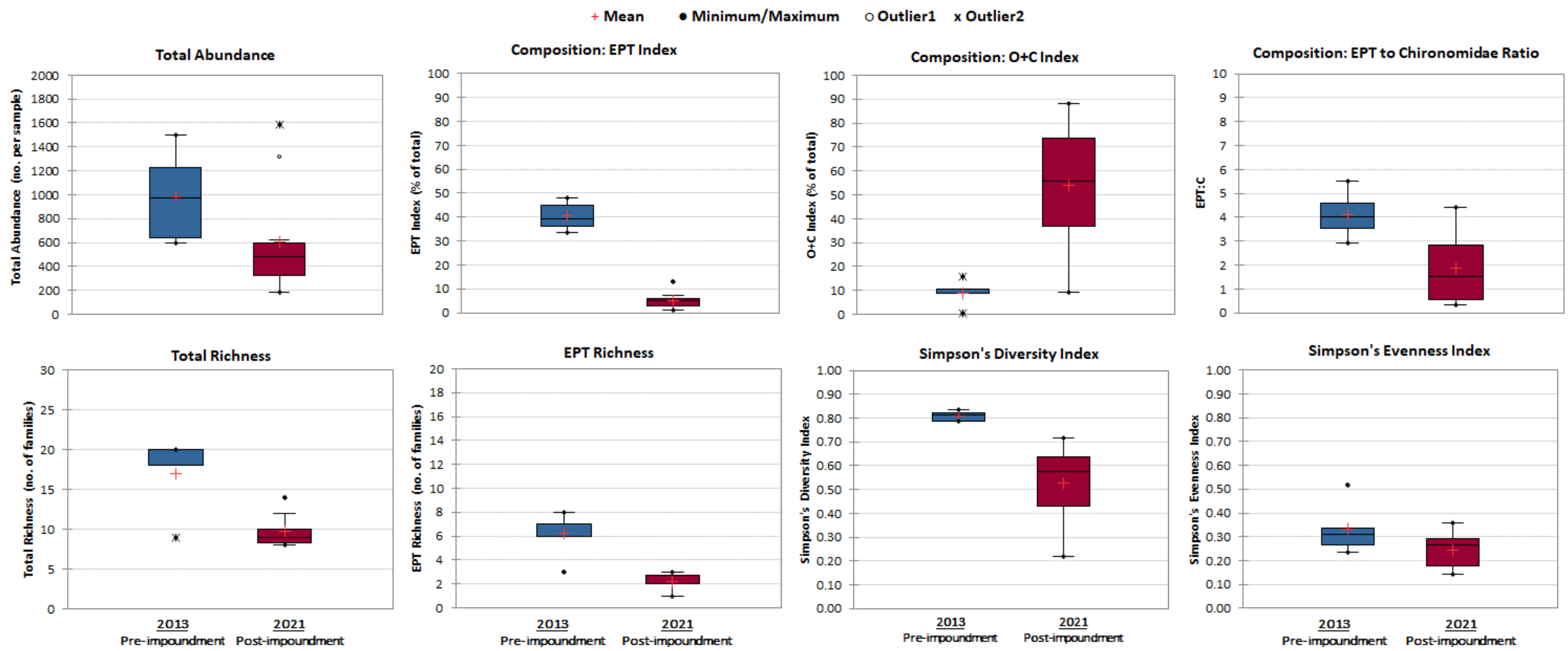


Figure 22: Benthic invertebrate metrics for the Keeyask reservoir Zone 1a intermittently exposed habitat (kicknet) for pre-impoundment (2013) and post-impoundment (2021).

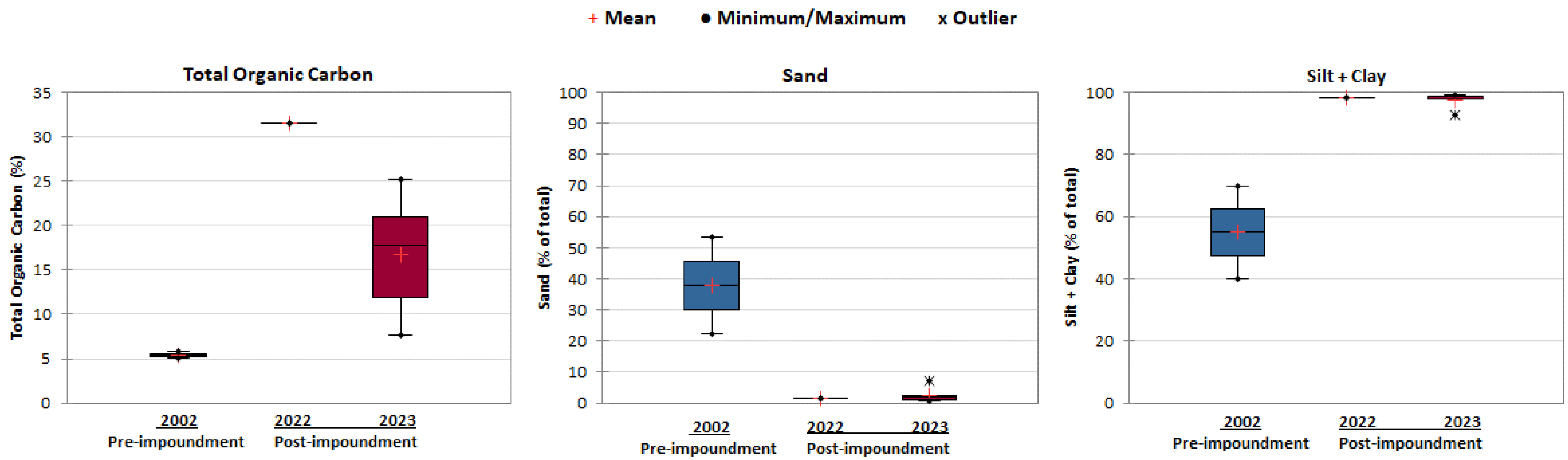


Figure 23: Sediment parameters for Keeyask reservoir Zone 1a intermittently exposed habitat (grab) for pre-impoundment (2002) and post-impoundment (2022 and 2023).

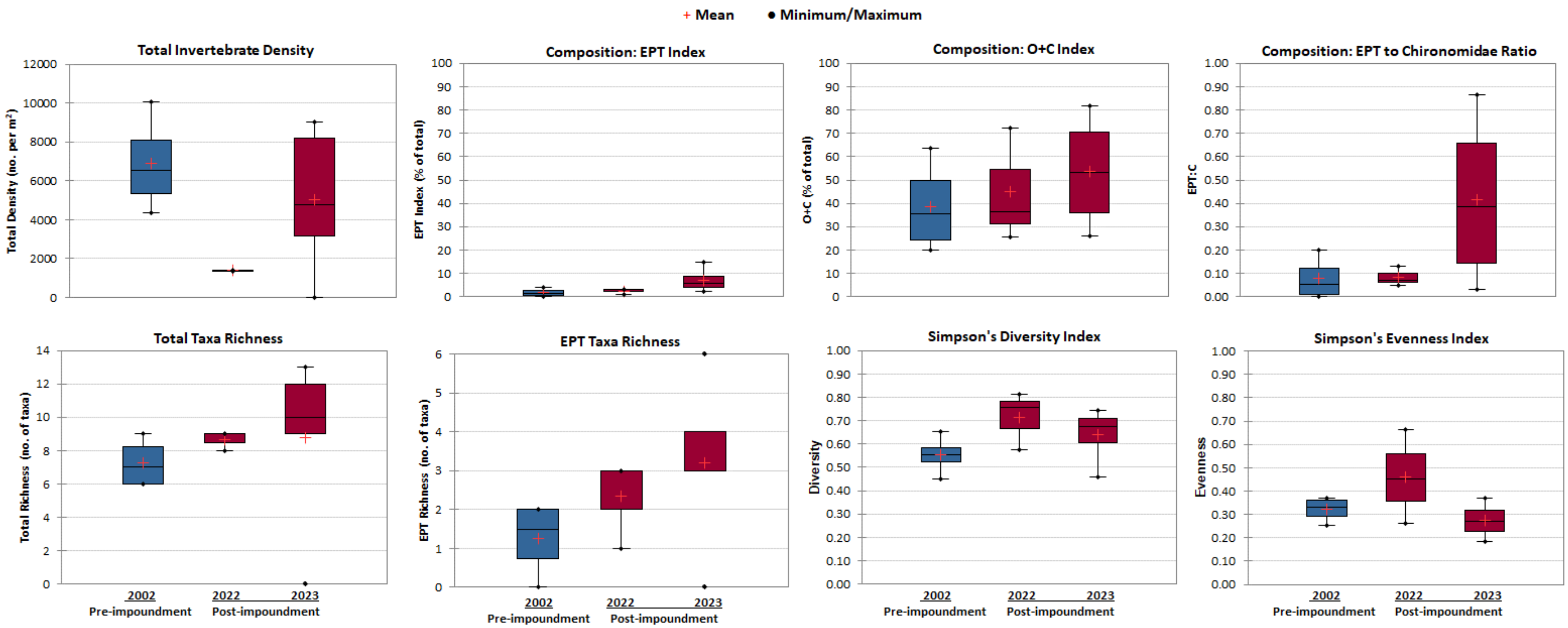


Figure 24: Benthic invertebrate metrics for Keeyask reservoir Zone 1a intermittently exposed habitat (grab) for pre-impoundment (2002) and post-impoundment (2022 and 2023).

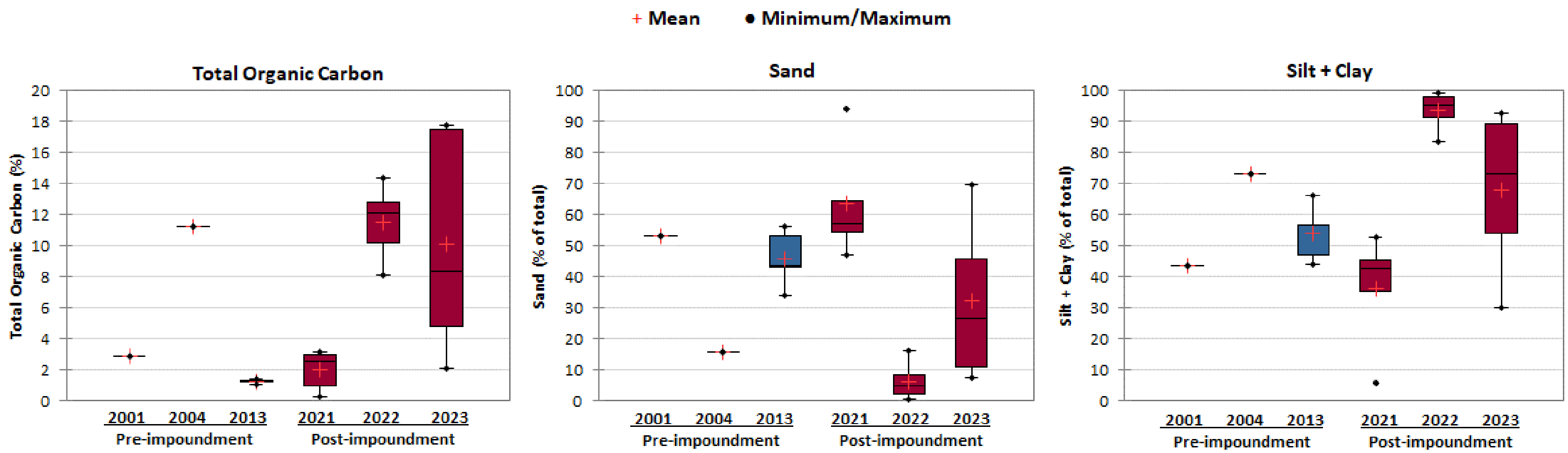


Figure 25: Sediment parameters for Keeyask reservoir Zone 1a predominantly wetted habitat for pre-impoundment (2001, 2004, and 2013) and post-impoundment (2021, 2022, and 2023).

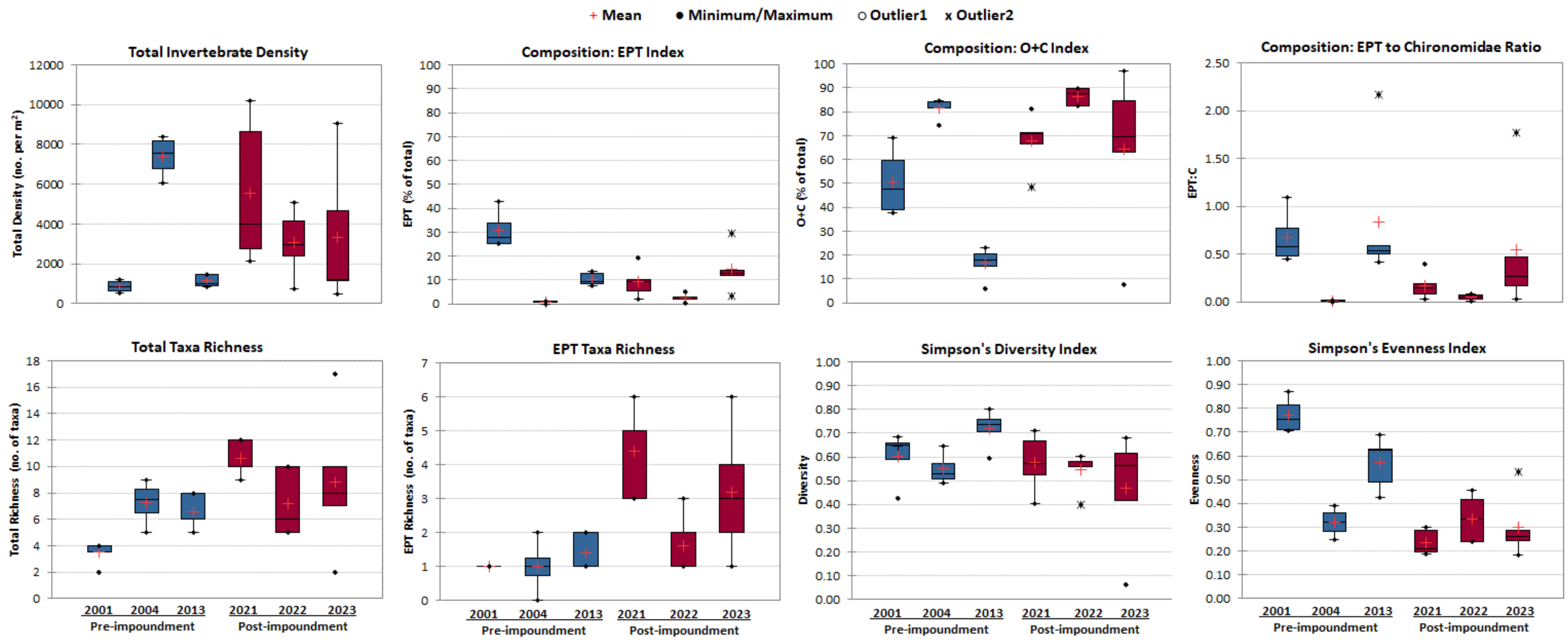


Figure 26: Benthic invertebrate metrics for Keeyask reservoir Zone 1a predominantly wetted habitat pre-impoundment (2001, 2004, and 2013) and post-impoundment (2021, 2022, and 2023).

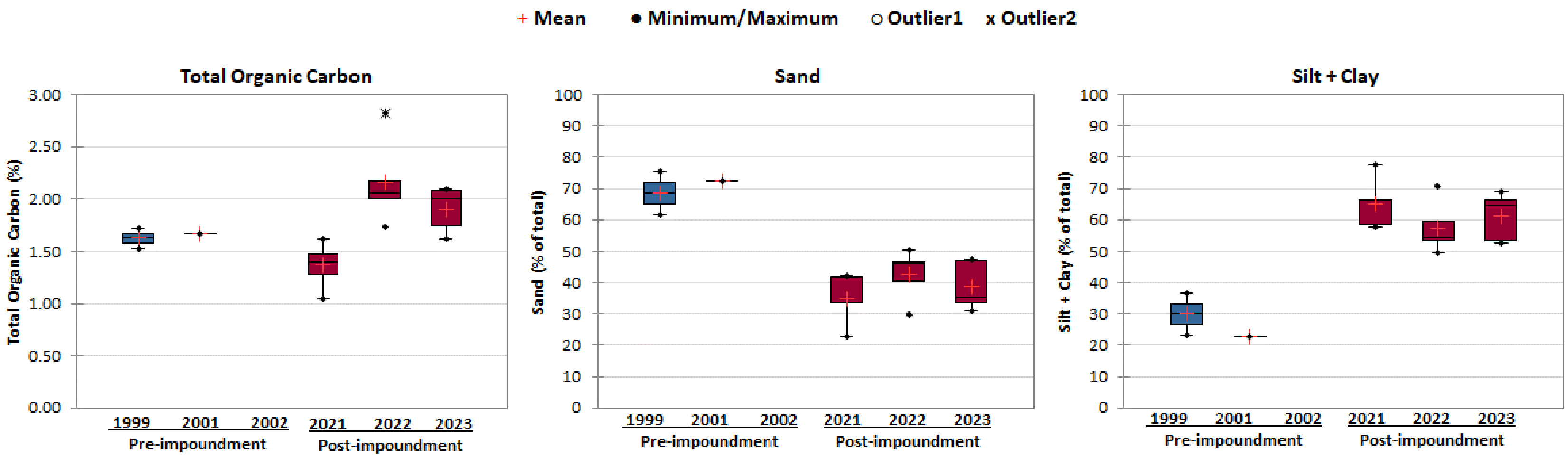


Figure 27: Sediment parameters for Keeyask reservoir Zone 1a offshore habitat for pre-impoundment (1999, 2001, and 2002) and post-impoundment (2021, 2022, and 2023).

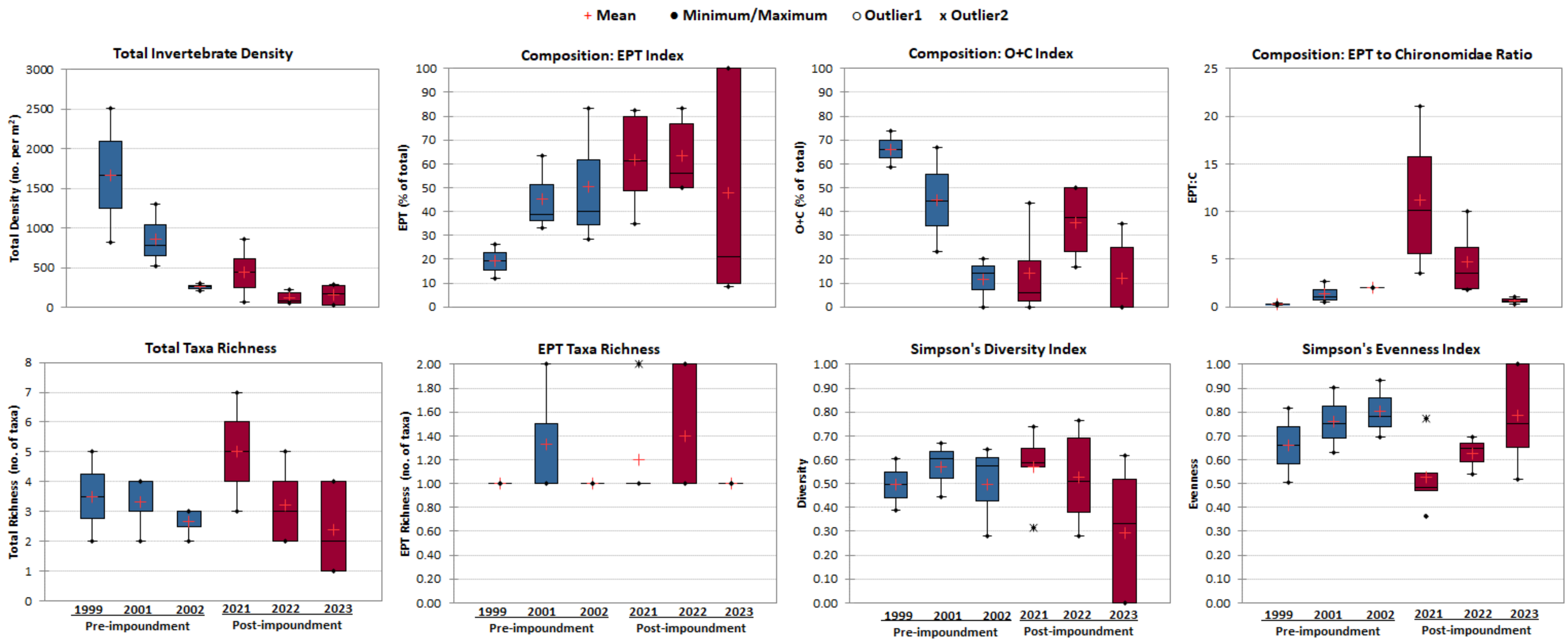


Figure 28: Benthic invertebrate metrics for Keeyask reservoir Zone 1a offshore habitat for pre-impoundment (1999, 2001, and 2002) and post-impoundment (2021 to 2023).

4.2.1.2 ZONE 1B

Kicknet sampling with IE habitats were conducted along transects perpendicular from the shoreline up to water depths of 0.3 to 0.7 m both pre-impoundment (2013) and post-impoundment (2021).

- Benthic substrates (total organic carbon and sediment composition) were comparable between both monitoring periods (Figure 29; Table A7-9).
- Total invertebrate abundance, relative proportion of disturbance-tolerant taxa (O+C index), and evenness was comparable between both monitoring periods (Figure 30; Table A7-10). However, the post-impoundment invertebrate community was significantly less diverse (by >50%), less rich (by >50% for EPT richness only) and contained a lower (by >50%) proportion of sensitive taxa (EPT index) compared to baseline conditions.

Monitoring of the IE nearshore habitat also included benthic grab sampling in 0.3 to 0.9 m water depths both pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023).

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between both monitoring periods (Figure 31; Table A7-11).
- There were no statistically significant differences detected between the pre- and post-impoundment monitoring periods for any of the benthic invertebrate community metrics (density, composition, richness, diversity, and evenness) (Figure 32; Table A7-12). While not statistically different, total invertebrate density was higher in 2022 (15,976 per m^2) compared to both baseline (8,786 per m^2) and 2023 (1,812 per m^2).

PW nearshore habitats were sampled in 1.1 to 2.8 m water depths both pre-impoundment (1999, 2001, 2002, and 2013) and post-impoundment (2021 to 2023).

- Total organic carbon was significantly higher (by >50%) in 2022 and 2023 compared to pre-impoundment; however, particle sizes (% sand and % silt/ clay) were comparable between both monitoring periods (Figure 33; Table A7-13).
- Total invertebrate density, proportions of sensitive taxa (EPT index), EPT:C, and diversity were comparable between both monitoring periods (Figure 34; Table A7-14). Proportions of disturbance-tolerant taxa (O+C index) were significantly higher in 2021 and 2022 (both by >50%) compared to pre-impoundment, and while also higher in 2023, the difference from baseline was not statistically significant. Compared to pre-impoundment, the benthic invertebrate community was more taxa rich (by >50%) and less even (by >50% in 2021 only).

OS habitats were sampled in 3.1 to 11.2 m water depths both pre-impoundment (1999, 2001, 2002, 2008, and 2013) and post-impoundment (2021 to 2023).

- Total organic carbon was significantly higher (by >50%) post-impoundment (2022 and 2023 only) (Figure 35; Table A7-15). Substrates were comprised of less sand (>50% lower) and more silt/clay (>50% higher) following reservoir flooding (Table A7-15).
- Total invertebrate density, proportions of sensitive taxa (EPT index), richness, diversity, and evenness were comparable between both monitoring periods (Figure 36; Table A7-16). The post-impoundment community contained a significantly higher (by >50%) proportion of disturbance-tolerant taxa in 2023 (O+C index). Lower EPT:C values in 2022 and 2023 (by >50% in both years), also indicated higher Chironomidae densities relative to EPT densities compared to the pre-impoundment period.

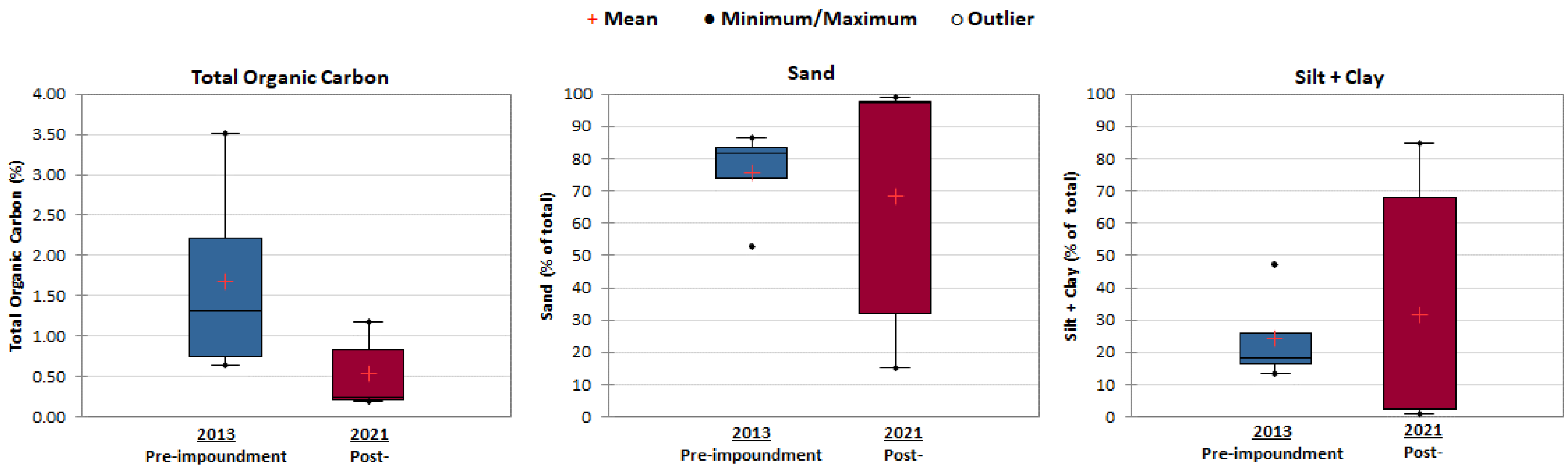


Figure 29: Sediment parameters for Keeyask reservoir Zone 1b intermittently exposed habitat (at kicknet sites) for pre-impoundment (2013) and post-impoundment (2021).

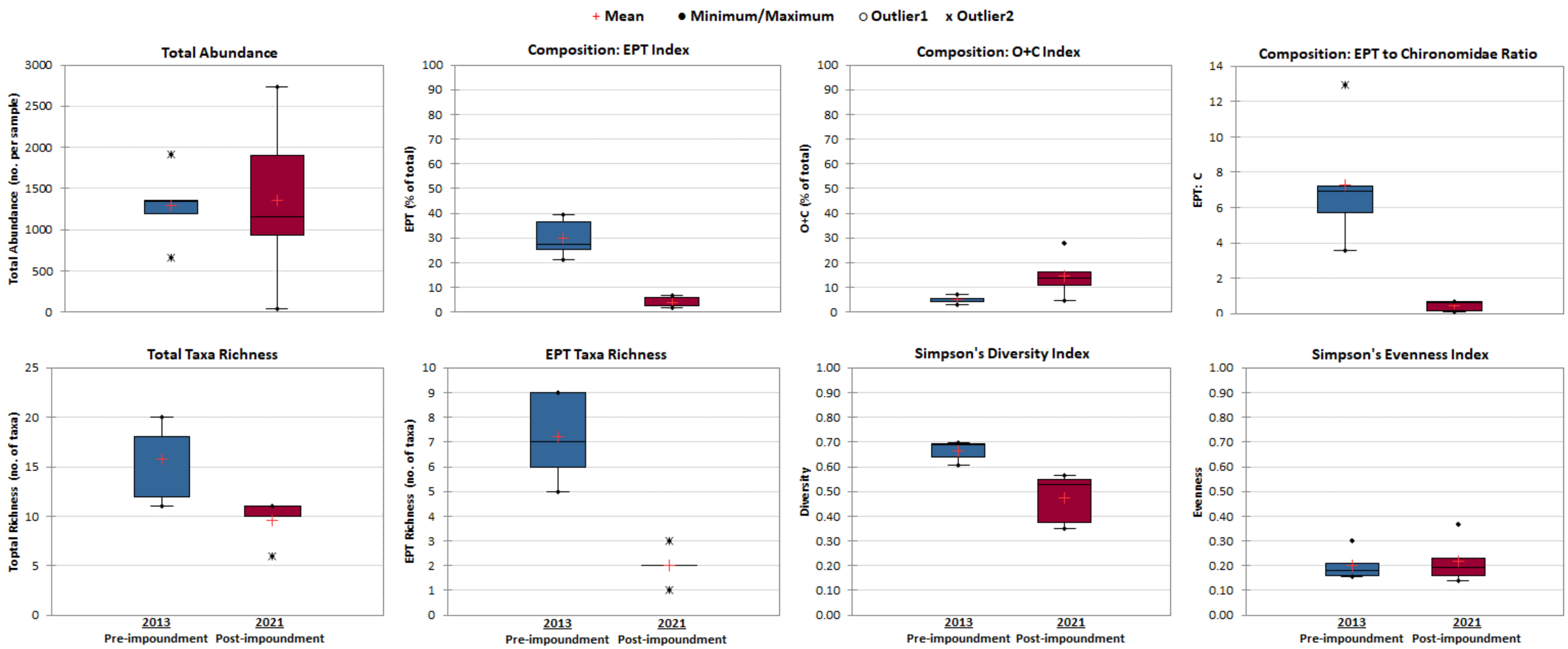


Figure 30: Benthic invertebrate metrics for the Keeyask reservoir Zone 1b intermittently exposed habitat (kicknet) for pre-impoundment (2013) and post-impoundment (2021).

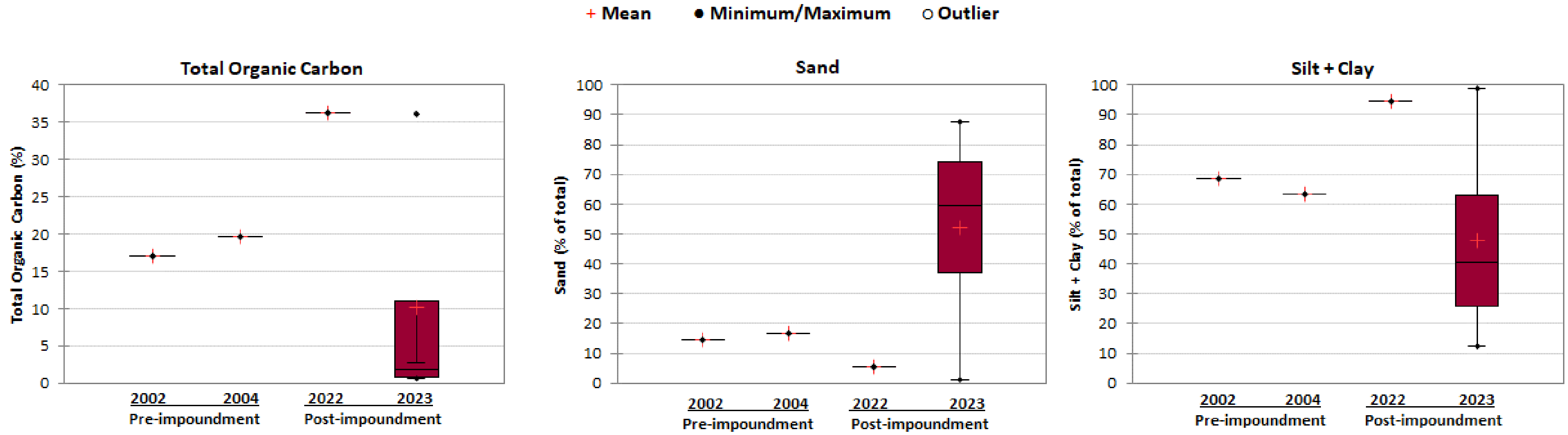


Figure 31: Sediment parameters for Keeyask reservoir Zone 1b intermittently exposed habitat (grab) for pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023).

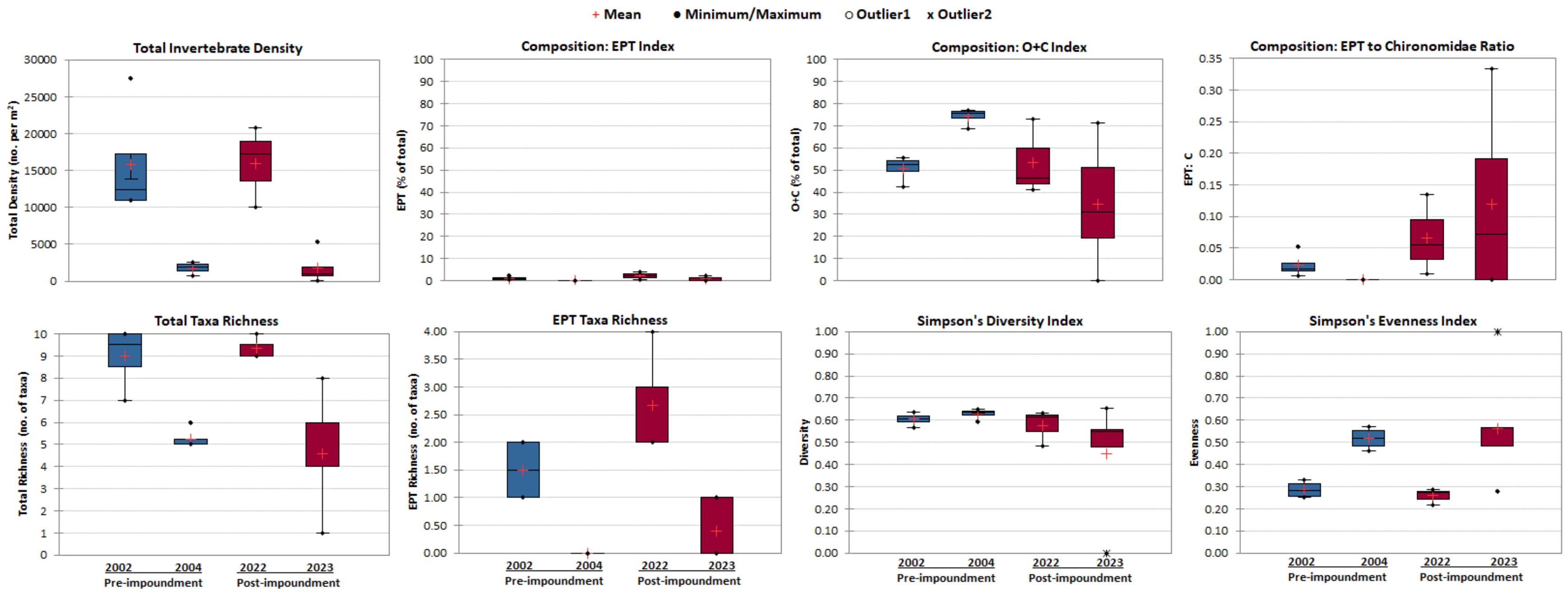


Figure 32: Benthic invertebrate metrics for Keeyask reservoir Zone 1b intermittently exposed habitat (grab) for pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023).

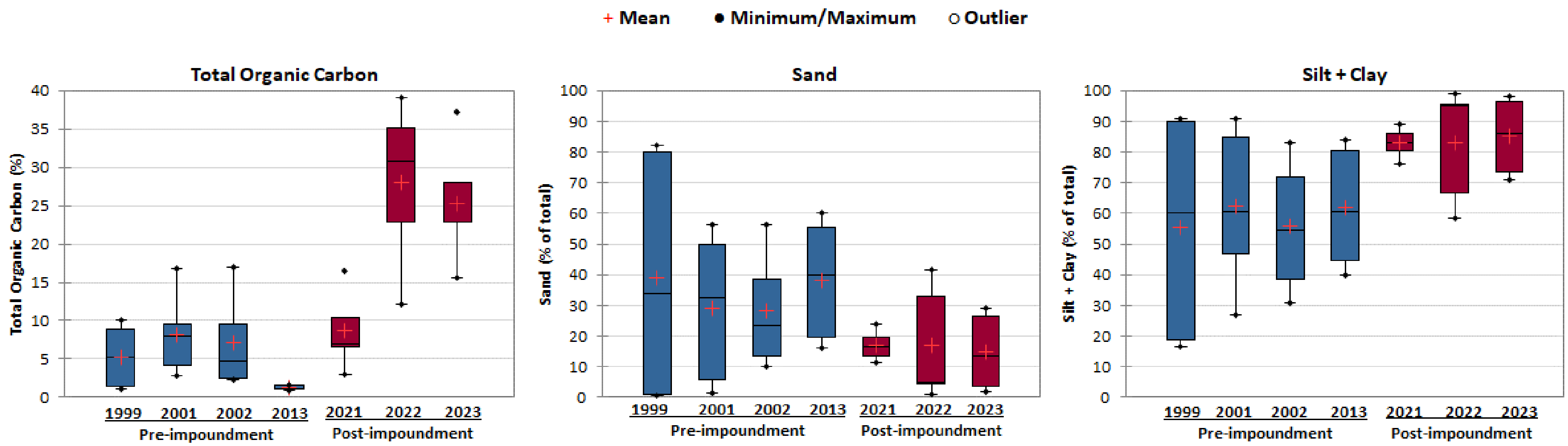


Figure 33: Sediment parameters for Keeyask reservoir Zone 1b predominantly wetted habitat for pre-impoundment (1999, 2001, 2002, and 2013) and post-impoundment (2021, 2022, and 2023).

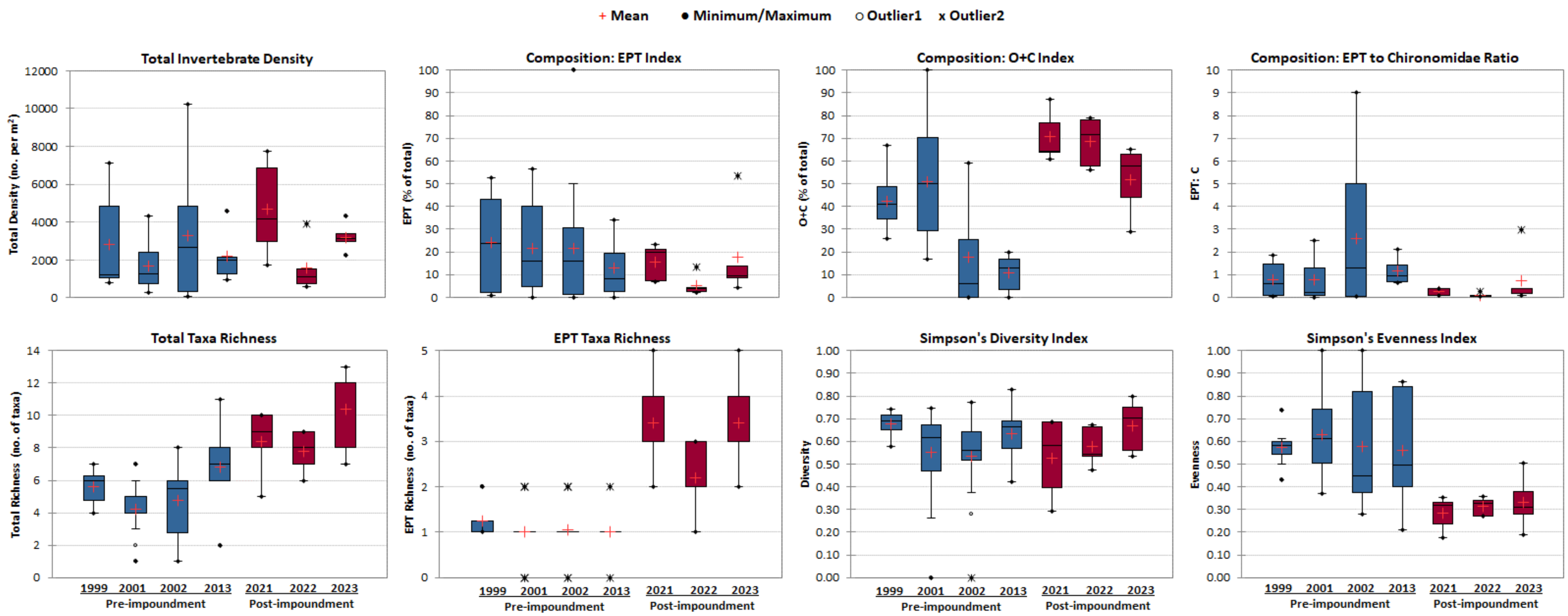


Figure 34: Benthic invertebrate metrics for Keeyask reservoir Zone 1b predominantly wetted habitat pre-impoundment (1999, 2001, 2002, and 2013) and post-impoundment (2021, 2022, and 2023).

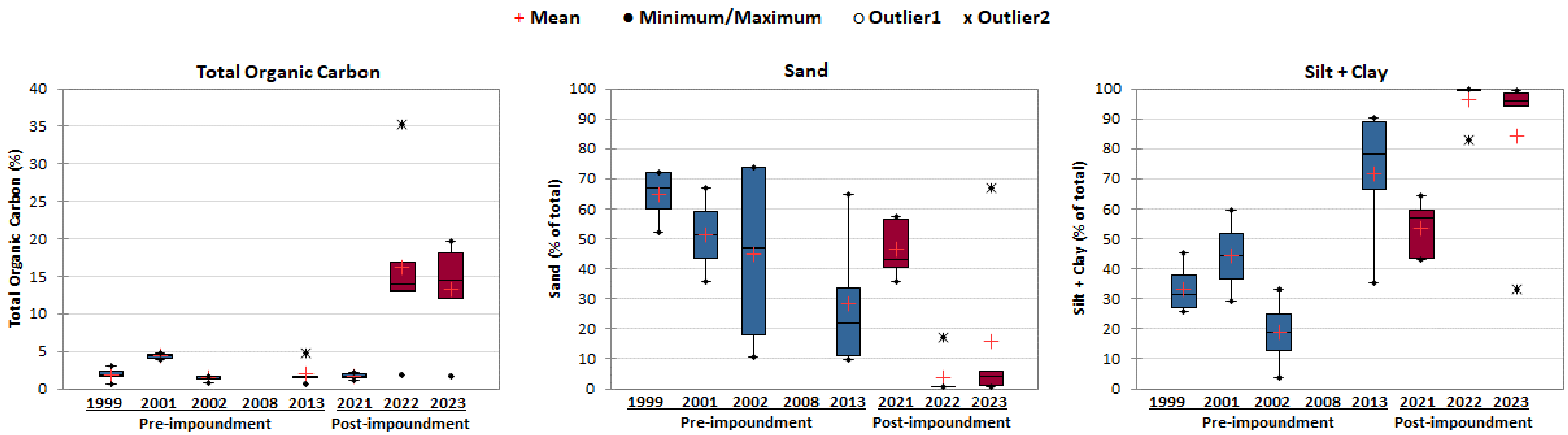


Figure 35: Sediment parameters for Keeyask reservoir Zone 1b offshore habitat for pre-impoundment (1999, 2001, 2002, 2008, and 2013) and post-impoundment (2021, 2022, and 2023).

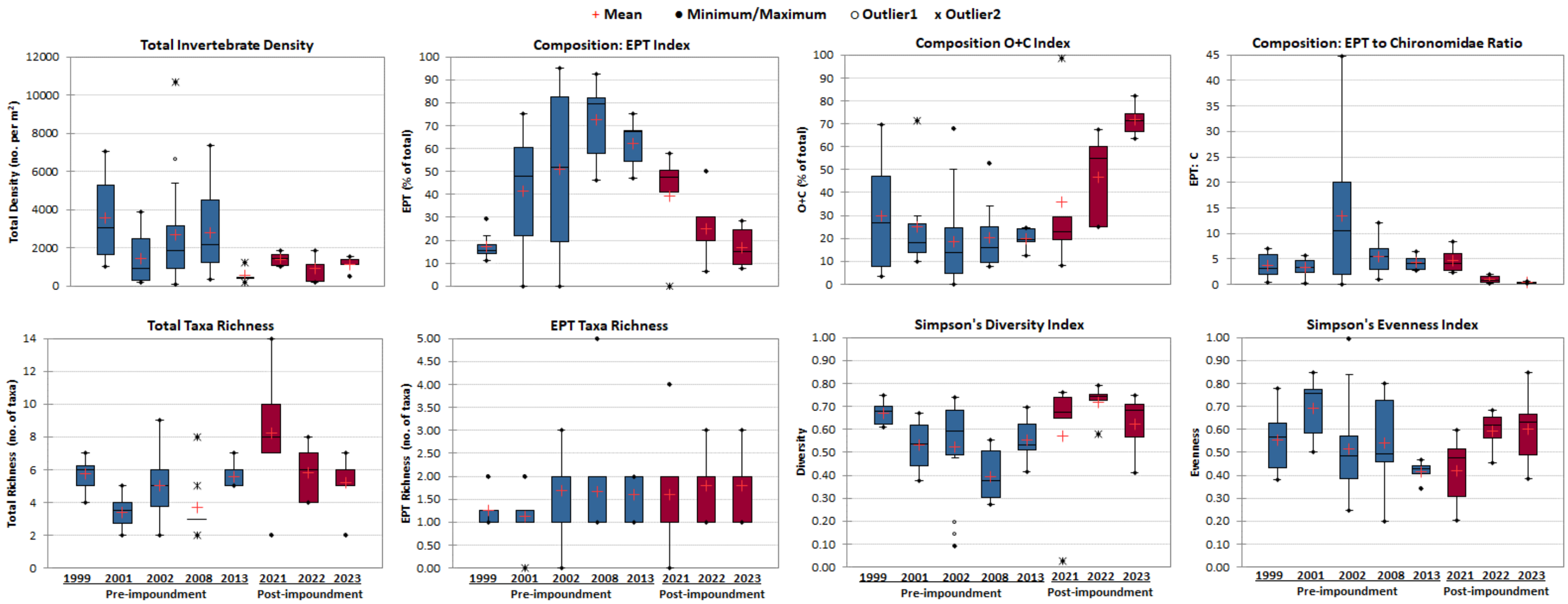


Figure 36: Benthic invertebrate metrics for Keeyask reservoir Zone 1b offshore habitat pre-impoundment (1999, 2001, 2002, 2008, and 2013) and post-impoundment (2021, 2022, and 2023).

4.2.1.3 ZONE 2

Kicknet sampling with IE habitats were conducted along transects perpendicular from the shoreline up to water depths of 0.6 to 1.1 m both pre-impoundment (2013) and post-impoundment (2021).

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between both monitoring periods (Figure 37; Table A7-17).
- Total invertebrate abundance and evenness were comparable between both monitoring periods (Figure 38; Table A7-18). However, the post-impoundment invertebrate community was less taxa rich (by >50%), less diverse (by >50%), and contained significantly lower (by >50%) proportions of sensitive taxa (EPT index) and higher (by >50%) proportions of tolerant taxa (O+C index).

Monitoring of the IE nearshore habitat also included benthic grab sampling in 0.2 to 0.8 m water depths both pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023).

- Total organic carbon and % silt/clay were comparable between both monitoring periods (Figure 39; Table A7-19). Post-impoundment sand was more than 50% higher than baseline, though only significantly different from pre-impoundment conditions in 2023.
- Proportions of sensitive taxa (EPT index) and EPT:C ratio were statistically comparable between both monitoring periods even though no EPT were collected post-impoundment (Figure 40; Table A7-20). However, the post-impoundment invertebrate community was less abundant (by >50%), less taxa rich (by >50% for total richness only), less diverse (by >50%), and less even (by >50%). Proportions of disturbance-tolerant taxa were also lower (by >50%) compared to baseline.

PW nearshore habitats were sampled in 1.2 to 2.9 m water depths both pre-impoundment (1999, 2001, 2002, 2004 and 2013) and post-impoundment (2021 to 2023).

- Substrates sampled in 2022 contained significantly more organic carbon (by >50%) than pre-impoundment, although no differences were observed in either 2021 or 2023 (Figure 41; Table A7-21). Particle sizes (% sand and % silt/clay) were comparable between both monitoring periods.
- Total invertebrate density, proportions of sensitive taxa (EPT index), proportions of disturbance-tolerant taxa (O+C index), EPT:C ratio, and diversity were comparable between both monitoring periods (Figure 42; Table A7-22). Compared to pre-impoundment, the invertebrate community in 2021 was significantly more taxa rich (by >50%) and less even (by >50%), although statistically significant differences from baseline were not observed in 2022 or 2023.

OS habitats were sampled in 3.0 to 13.2 m water depths both pre-impoundment (1999, 2001, 2002, 2008, and 2013) and post-impoundment (2021 to 2023).

- Substrates sampled in 2022 and 2023 contained significantly more organic carbon (by >50%) than pre-impoundment (Figure 43; Table A7-23). Substrates also contained significantly less sand and more silt/clay post-impoundment (both by >50%; Table A7-23).
- Total invertebrate density, proportions of disturbance-tolerant taxa (O+C index), taxa richness and diversity were comparable between both monitoring periods (Figure 44; Table A7-24). Compared to pre-impoundment, the 2021 proportions of sensitive taxa (EPT index) and EPT:C ratio values were significantly higher (both by >50%), and evenness was significantly lower (by >50%), although statistically significant differences from baseline were not observed in 2022 or 2023 (Table A7-24).

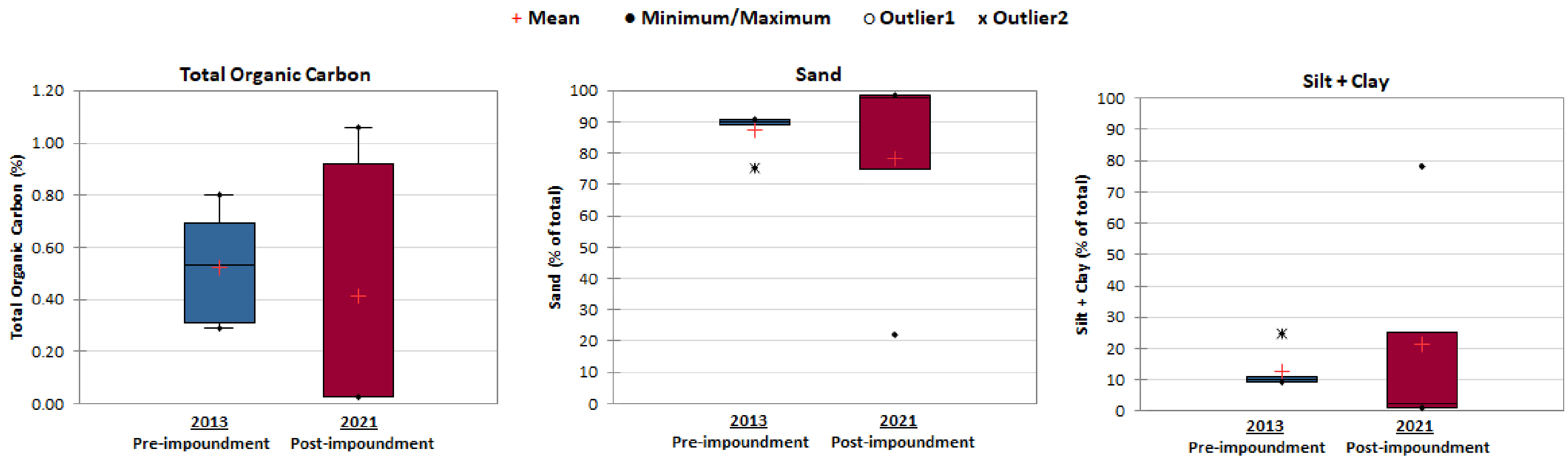


Figure 37: Sediment parameters for Keeyask reservoir Zone 2 intermittently exposed habitat (at kicknet sites) for pre-impoundment (2013) and post-impoundment (2021).

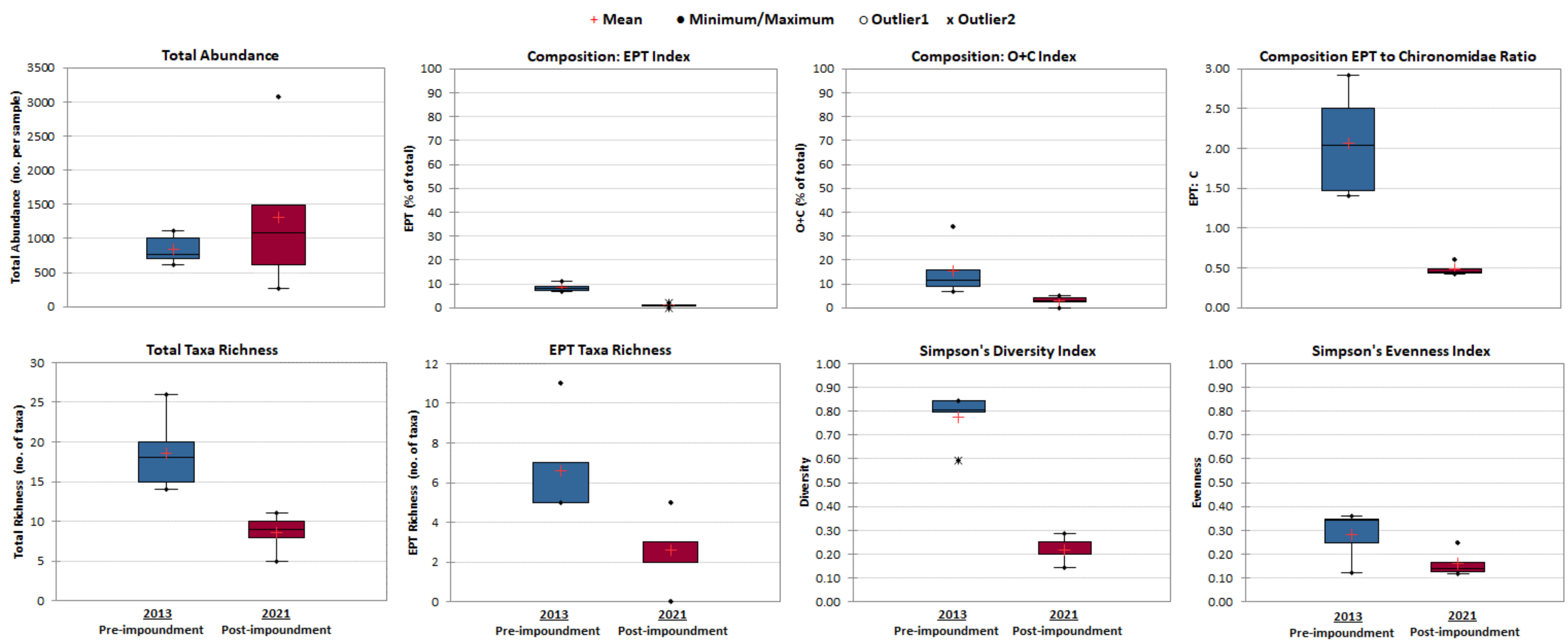


Figure 38: Benthic invertebrate metrics for the Keeyask reservoir Zone 2 intermittently exposed habitat (kicknet) for pre-impoundment (2013) and post-impoundment (2021).

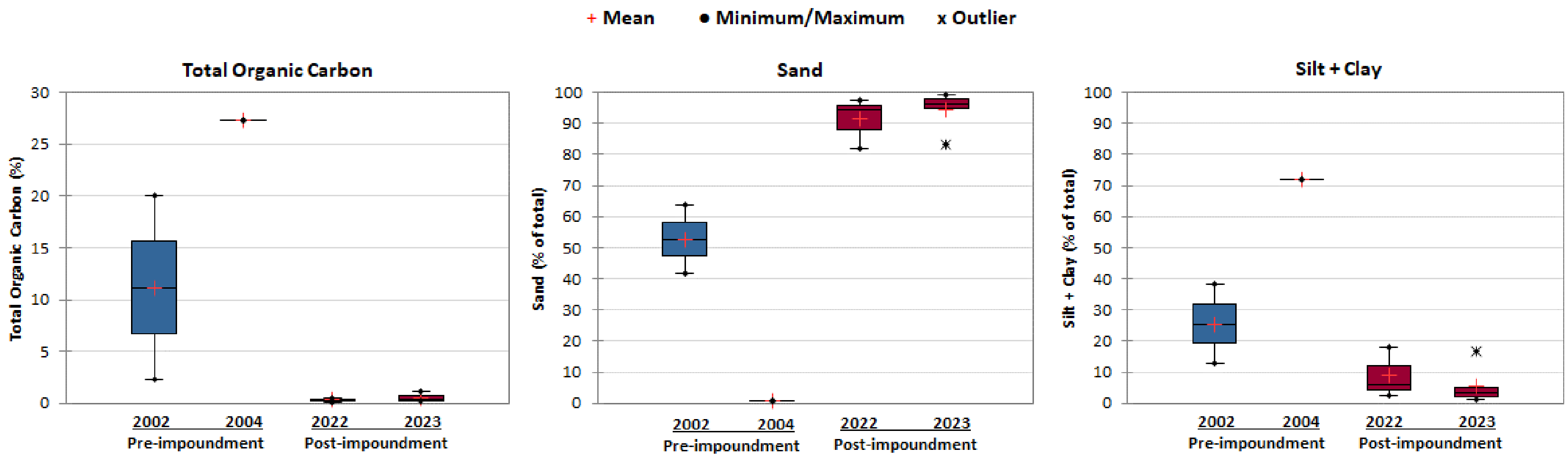


Figure 39: Sediment parameters for Keeyask reservoir Zone 2 intermittently exposed habitat (grab) for pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023).

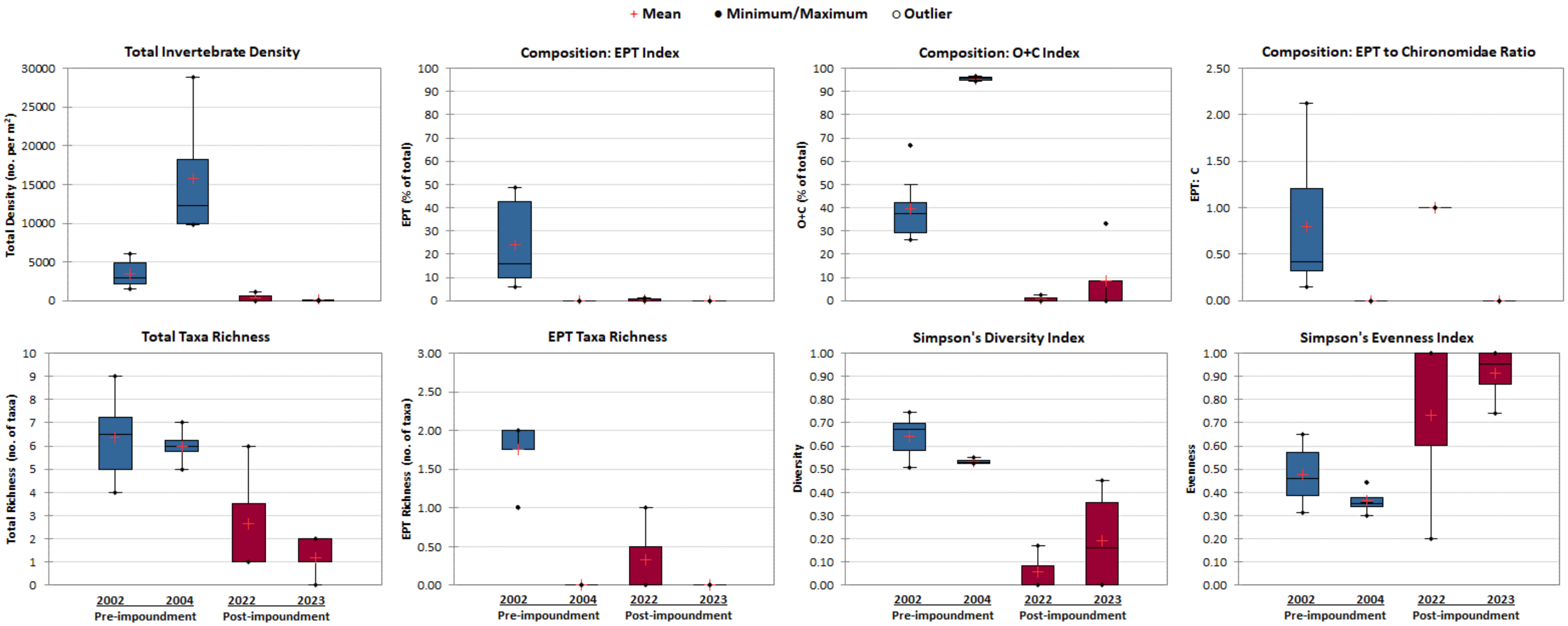


Figure 40: Benthic invertebrate metrics for Keeyask reservoir Zone 2 intermittently exposed habitat (grab) for pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023).

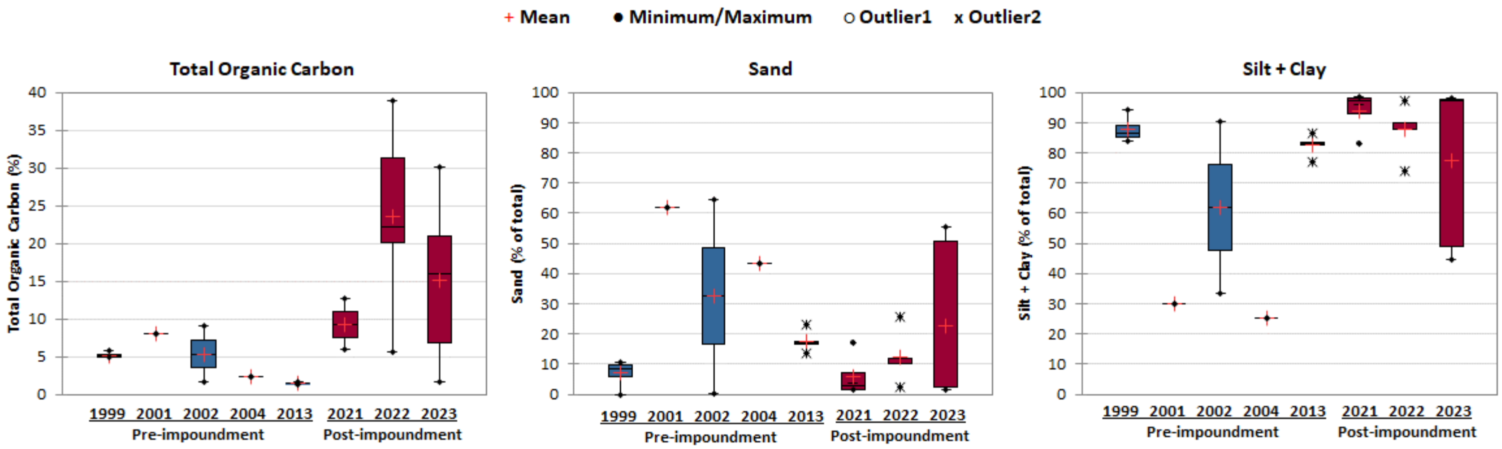


Figure 41: Sediment parameters for Keeyask reservoir Zone 2 predominantly wetted habitat for pre-impoundment (1999, 2001, 2002, 2004, and 2013) and post-impoundment (2021, 2022, and 2023).

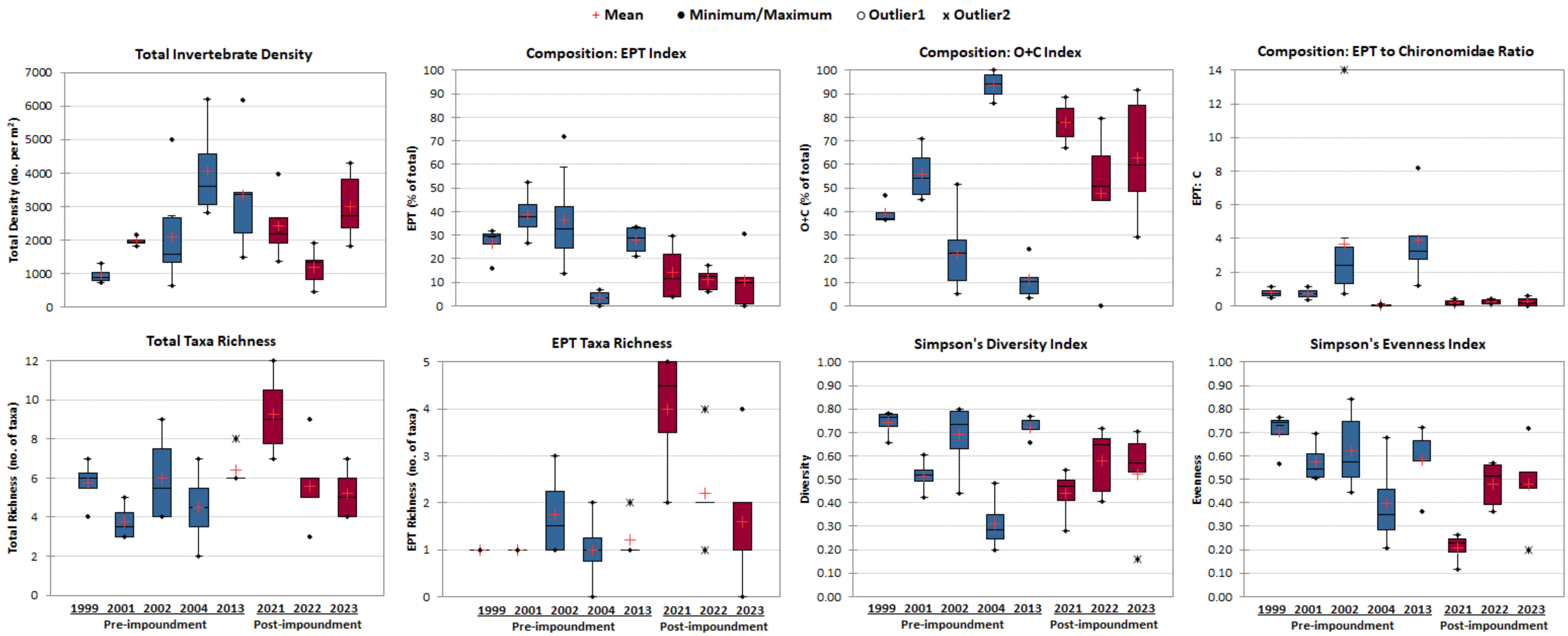


Figure 42: Benthic invertebrate metrics for Keeyask reservoir Zone 2 predominantly wetted habitat pre-impoundment (1999, 2001, 2002, 2004, and 2013) and post-impoundment (2021, 2022, and 2023).

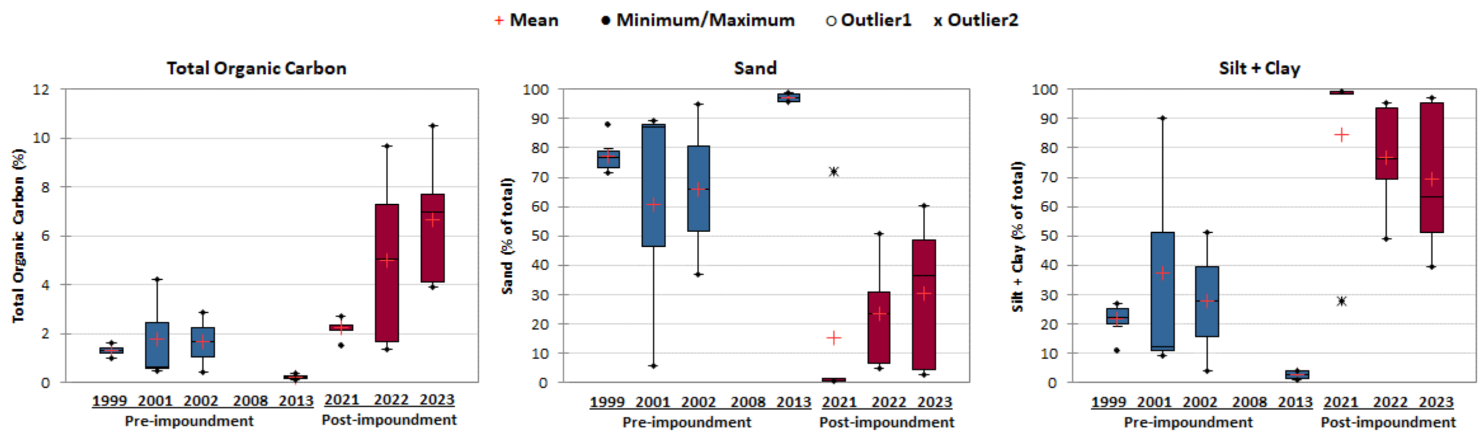


Figure 43: Sediment parameters for Keeyask reservoir Zone 2 offshore habitat for pre-impoundment (1999, 2001, 2002, 2008, and 2013) and post-impoundment (2021, 2022, and 2023).

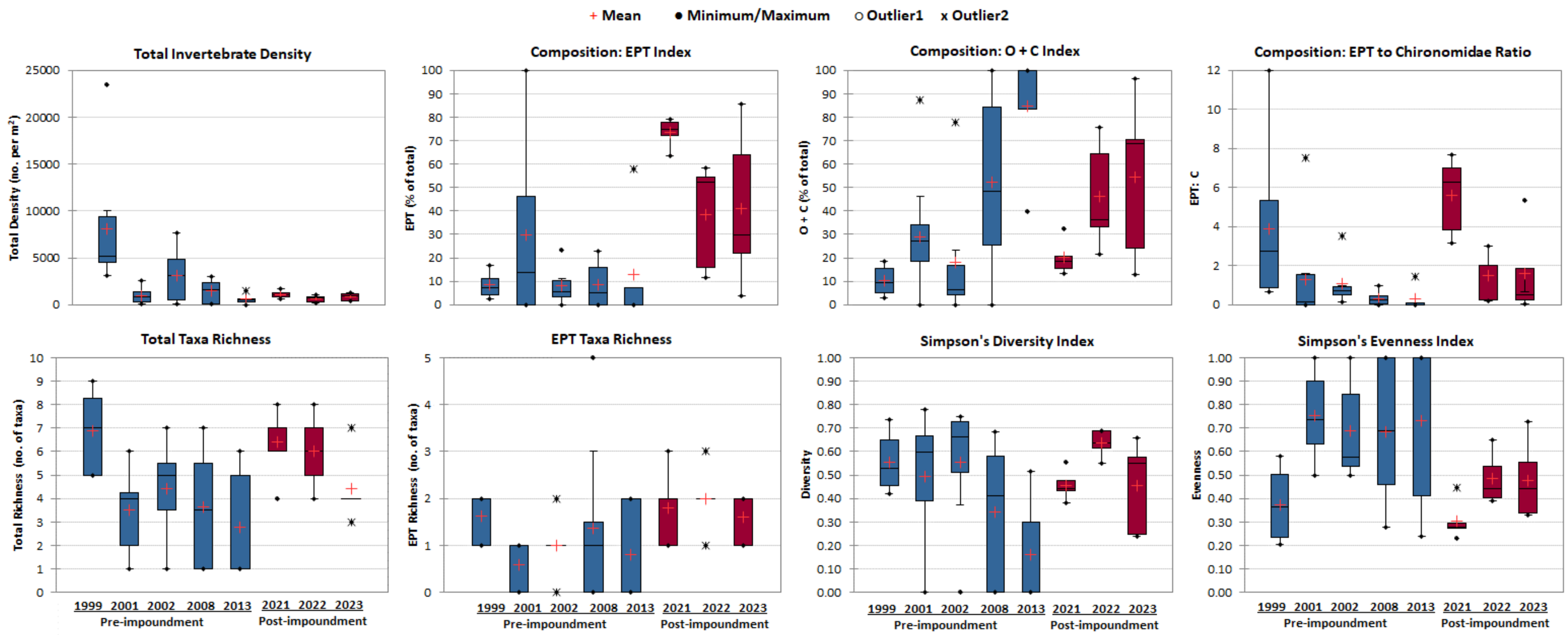


Figure 44: Benthic invertebrate metrics for Keeyask reservoir Zone 2 offshore habitat pre-impoundment (1999, 2001, 2002, 2008, and 2013) and post-impoundment (2021, 2022, and 2023).

4.2.2 FLOODED RESERVOIR BACKBAYS

Sampling was conducted at sites in flooded backbays in the Keeyask reservoir following impoundment to determine how aquatic macroinvertebrates colonize areas that were once terrestrial or shoreline habitat. A total of 94 invertebrate and 79 sediment samples were collected. Because most of these sites were terrestrial habitats prior to impoundment, little baseline data exist. However, 33 invertebrate and 12 sediment samples collected from comparable wetted habitats prior to flooding in Zone 4 (IE: 2002 and 2004) and Zone 12 (IE: 200 and 2004; and PW: 2001, 2002, and 2013) were available and therefore incorporated in the assessment. Summary statistics for benthic invertebrate metrics by flooded backbay site and habitat type are provided in Appendix 4 (Tables A4-1 to A4-38). Conclusions are based on statistical comparisons of means between time periods, presented in Appendix 7 (Tables A7-25 to A7-44).

4.2.2.1 ZONE 4

The IE habitat of Zone 4 was sampled in both 2002 and 2004. However, pre-impoundment sampling was conducted in a different location than post-impoundment sampling in 2022 and 2023 (Map 7). Benthic invertebrate grab samples taken from the pre-impoundment area were collected in mean water depths between 0.8 and 1.4 m. Post-impoundment monitoring of the IE nearshore habitat included benthic grab sampling in 0.3 to 1.0 m depths.

- There was significantly more total organic carbon (by >50%) in post-impoundment substrates compared to baseline (Figure 45; Table A7-25). Substrates contained similar proportions of sand but higher amounts of silt/clay post-impoundment. However, these samples were taken from different sampling locations and are not directly comparable. Substrates did not change significantly between 2022 and 2023 (Table A7-26).
- When compared to baseline (3,394 per m^2), total invertebrate density was more than 50% higher in 2022 (25,994 per m^2) and 2023 (10,376 per m^2; Figure 46; Table A7-27). However, composition, richness, diversity, and evenness were comparable between both monitoring periods (Table A7-27). There were no statistically significant differences between 2022 and 2023 benthic community metrics (total density, composition, richness, diversity, and evenness; Table A7-28). EPT were absent from samples in 2022, but were present, albeit in small numbers, in 2023.

No pre-impoundment data are available at the PW sites in Zone 4. Post-impoundment monitoring of the PW nearshore habitat included benthic grab sampling in 1.5 to 2.9 m water depths from 2021-2023.

- Statistically significant differences were detected for substrate parameters between 2021 and 2023 (Figure 47; Table A7-29). Total organic carbon and relative percent of silt/clay were significantly higher in 2023 compared to 2021, but within ±50% of the post-impoundment mean. Relative proportion of sand was significantly lower (by >50%) in 2023 compared to 2021 (Table A7-29).

- Total invertebrate density, relative proportions of disturbance-tolerant taxa (O+C index), total richness, diversity, and evenness were comparable within the three-year post-impoundment monitoring period (Figure 48; Table A7-30). However, compared to 2021 there was a significant decline in the 2022 and 2023 relative proportions of sensitive taxa (EPT index, by >50% in both years) and EPT richness (by >50% in 2023 only; Table A7-30).

No pre-impoundment data are available at the OS sites in Zone 4. Post-impoundment monitoring of the OS nearshore habitat included benthic grab sampling in 3.7 to 5.0 m water depths from 2021-2023.

- Substrate parameters (total organic carbon and sediment composition) were comparable between all post-impoundment years (Figure 49; Table A7-31).
- EPT richness and diversity were comparable within the three-year post-impoundment monitoring period (Figure 50; Table A7-32). However, statistically significant differences were observed among all other metrics. Compared to 2021, the 2023 benthic invertebrate community was less abundant (by >50%), less rich (by >50%), and contained lower (by >50%) proportions of sensitive taxa (EPT index) and higher (by >50%) proportions of disturbance-tolerant taxa (O+C index; Table A7-32).

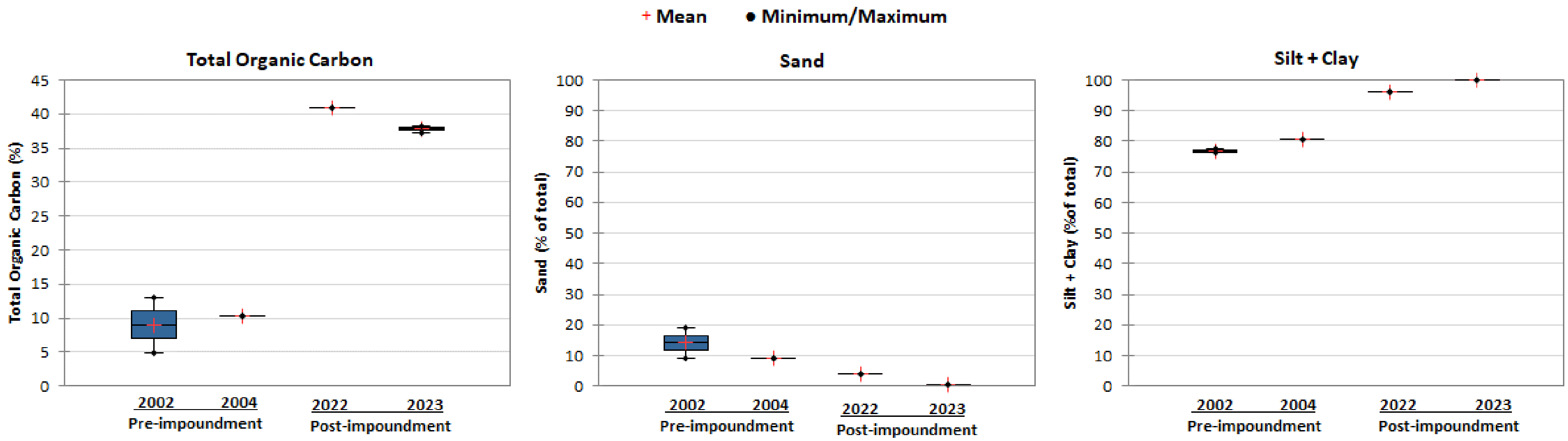


Figure 45: Sediment parameters for Keeyask reservoir Zone 4 intermittently exposed habitat (grab) for post-impoundment (2022 and 2023).

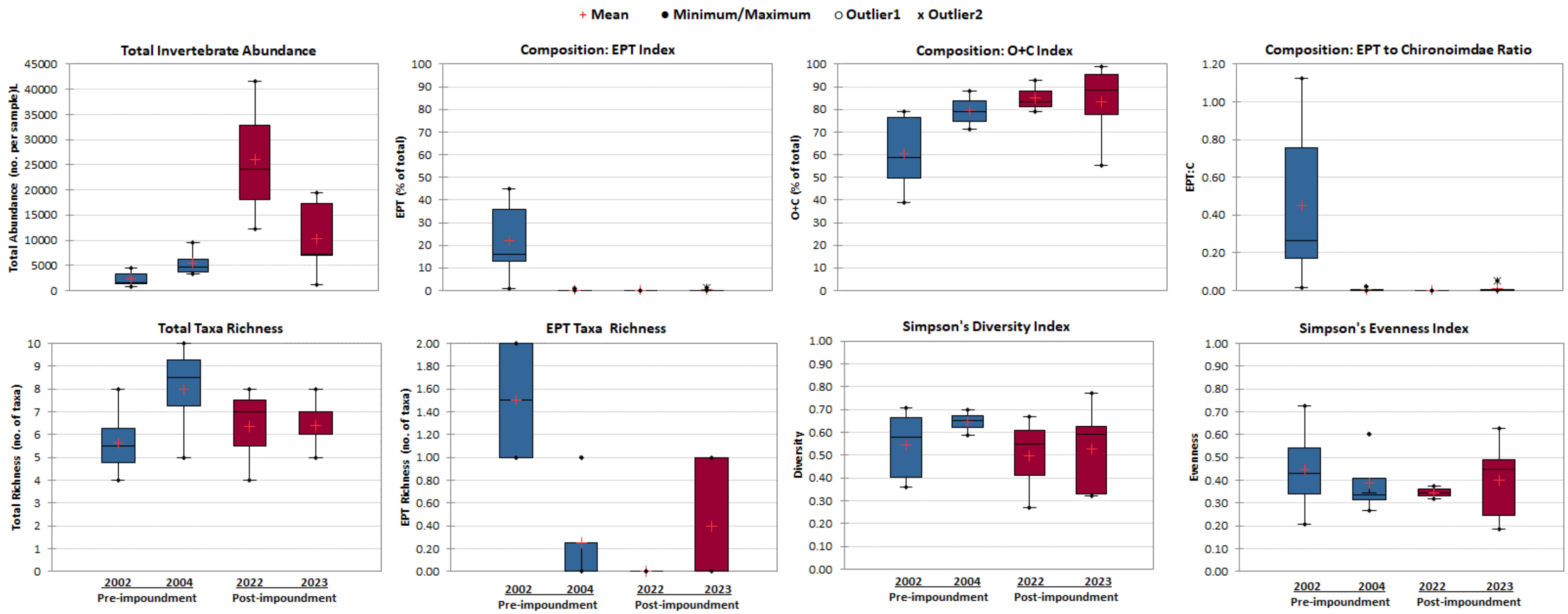


Figure 46: Benthic invertebrate metrics for Keeyask reservoir Zone 4 intermittently exposed habitat (grab) for post-impoundment (2022 and 2023).

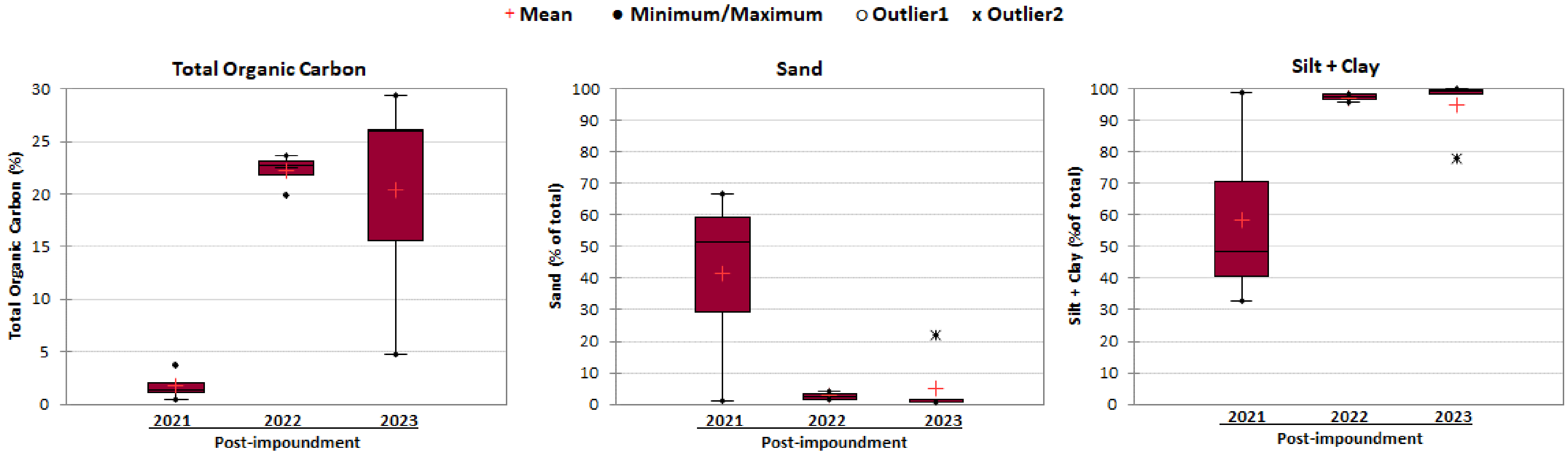


Figure 47: Sediment parameters for Keeyask reservoir Zone 4 predominantly wetted habitat for post-impoundment (2021, 2022, and 2023).

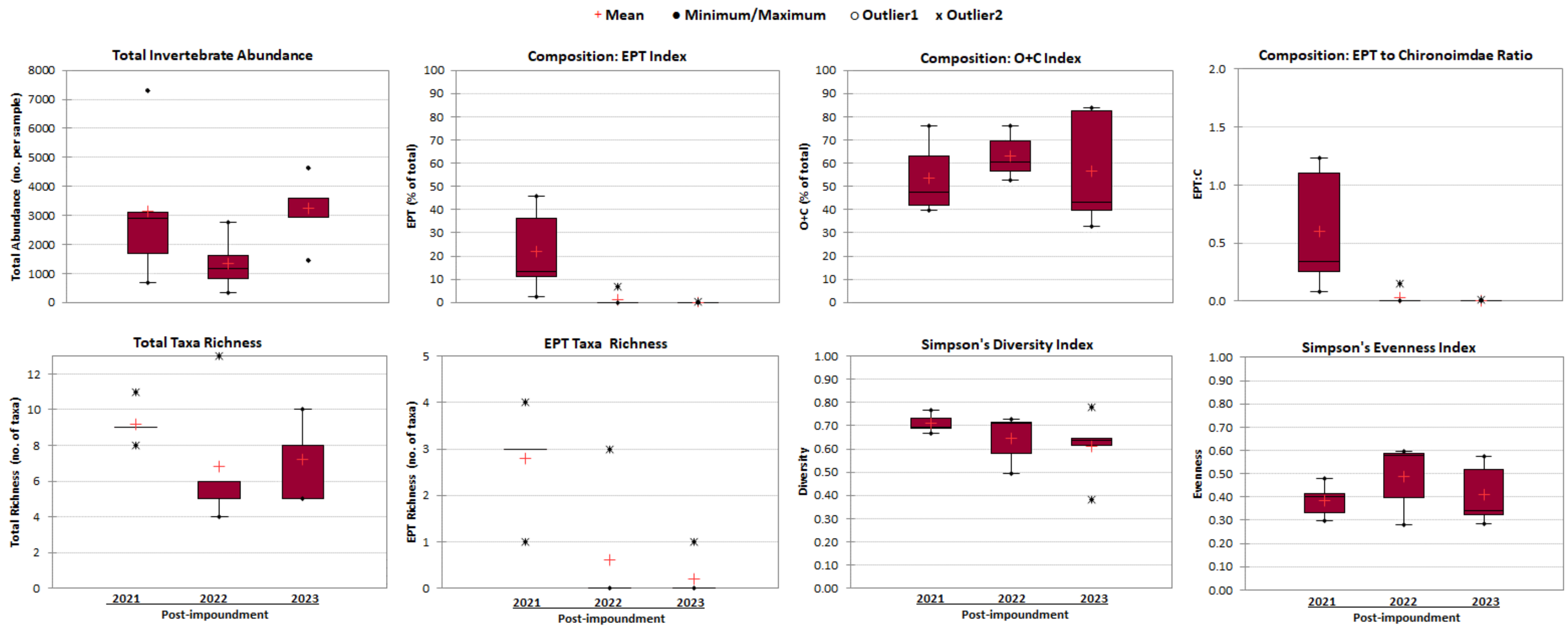


Figure 48: Benthic invertebrate metrics for Keeyask reservoir Zone 4 predominantly wetted habitat for post-impoundment (2021, 2022, and 2023).

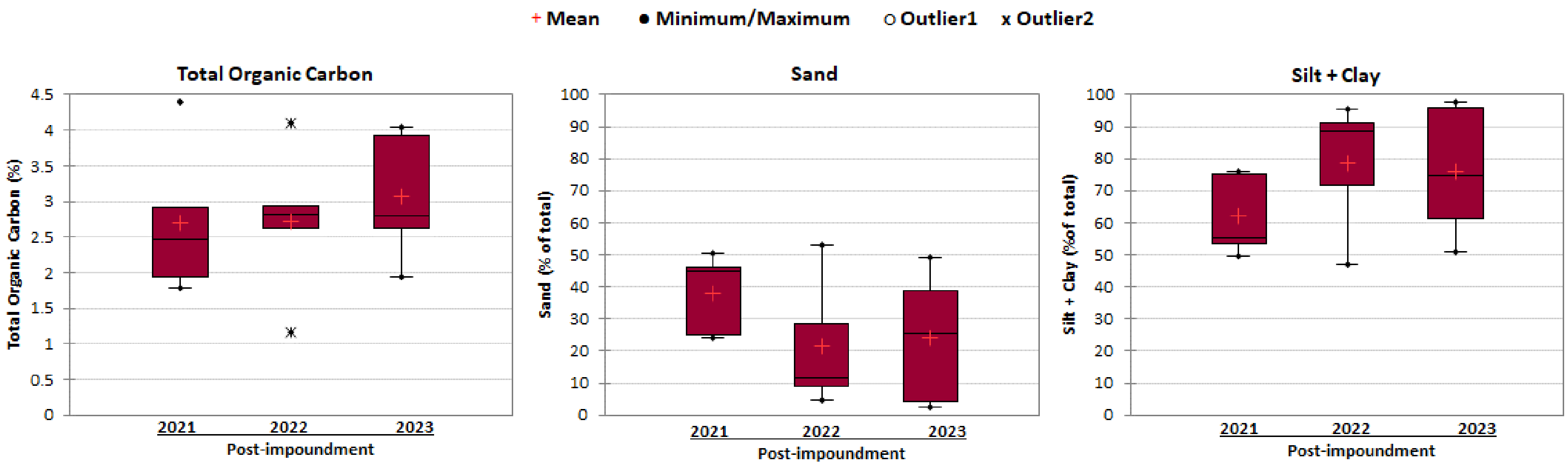


Figure 49: Sediment parameters for Keeyask reservoir Zone 4 offshore habitat for post-impoundment (2021, 2022, and 2023).

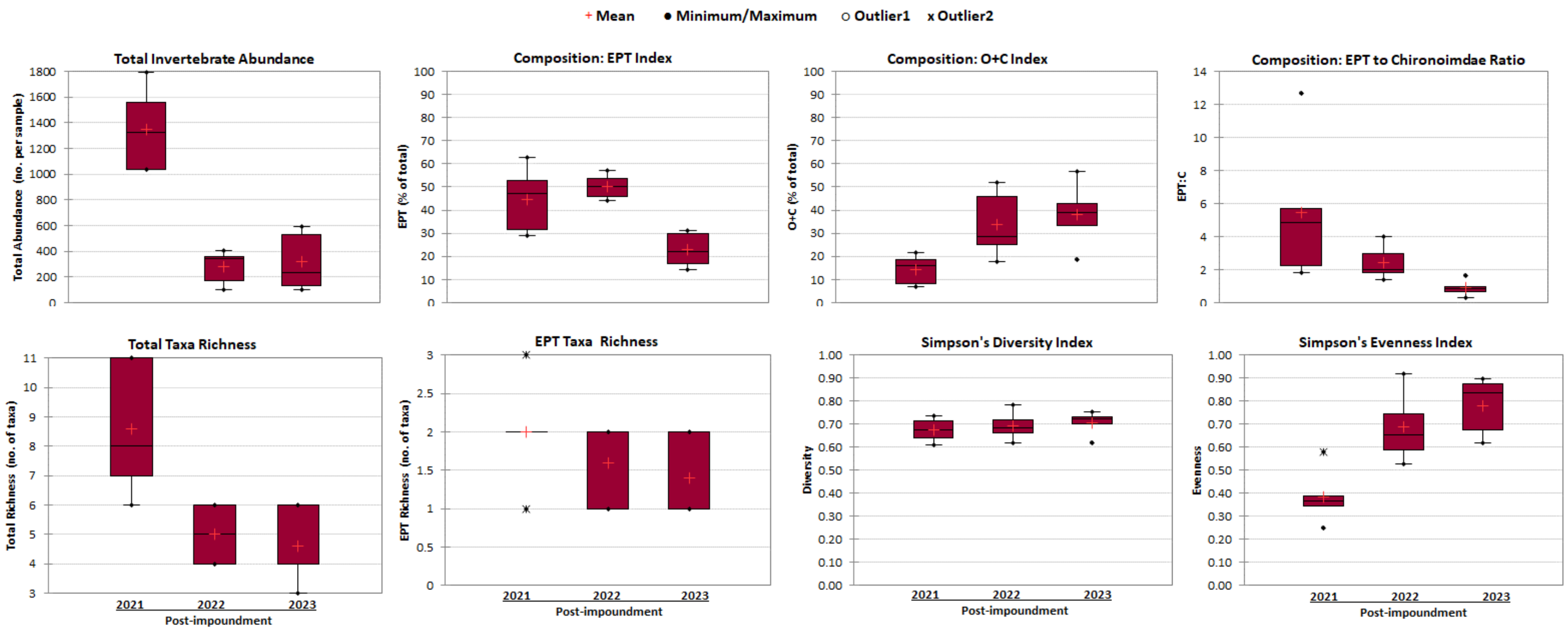


Figure 50: Benthic invertebrate metrics for Keeyask reservoir Zone 4 offshore habitat for post-impoundment (2021, 2022, and 2023).

4.2.2.2 ZONE 12

The IE habitat of Zone 12 was sampled in both pre- (2002 and 2004) and post-impoundment (2022 and 2023) using benthic grabs in water depths of 0.2 to 0.9 m.

- Statistically significant differences were not detected among benthic substrate parameters (total organic carbon and sediment composition) between both monitoring periods (Figure 51; Table A7-33). However, post-impoundment substrate composition consisted of less sand and more silt/clay compared to baseline and did not appear to change between 2022 and 2023 (Table A7-33).
- Total invertebrate density, composition, richness, diversity, and evenness were comparable to pre-impoundment and during both post-impoundment years (Figure 52; Table A7-34).

Monitoring of the PW nearshore habitat included benthic grab sampling in 1.9 to 2.6 m water depths both pre-impoundment (2001, 2002 and 2013) and post-impoundment (2022 and 2023).

- Substrate composition differed significantly between both monitoring periods (Figure 53; Table A7-35). Significantly greater amounts of organic carbon were present in substrate samples post-impoundment. Post-impoundment substrates also contained significantly less sand and more silt/clay than during pre-impoundment and did not appear to change between 2022 and 2023 (Table A7-35).
- The diversity and evenness of the benthic invertebrate community were comparable between both monitoring periods (Figure 54; Table A7-36). However, the post-impoundment invertebrate community was significantly less abundant (by >50% in 2022) and less rich (by > 50% in 2022 and 2023) compared to pre-impoundment. Relative densities of sensitive taxa (EPT index) were significantly lower (by >50%) post-impoundment and relative densities of disturbance-tolerant taxa (O+C index) was higher (by >50%) in 2023. Total invertebrate density and relative density of disturbance-tolerant taxa in 2023 were also higher than 2022; the other invertebrate metrics did not appear to change between the second- and third years following impoundment (Table A7-36).

No pre-impoundment data are available at the OS sites in Zone 12. Post-impoundment monitoring of the OS habitat included benthic grab sampling in 3.0 to 4.0 m water depths in 2022 and 2023.

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between 2022 and 2023 (Figure 55; Table A7-37).
- Relative densities of sensitive taxa (EPT index), EPT:C, taxa richness, and diversity were comparable between the second- and third years following impoundment (Figure 56; Table A7-38). Total invertebrate density in 2023 was significantly higher (by >50%) compared to 2022; relative density of disturbance-tolerant taxa (O+C index) was significantly higher in 2023 and evenness was significantly lower in 2023.

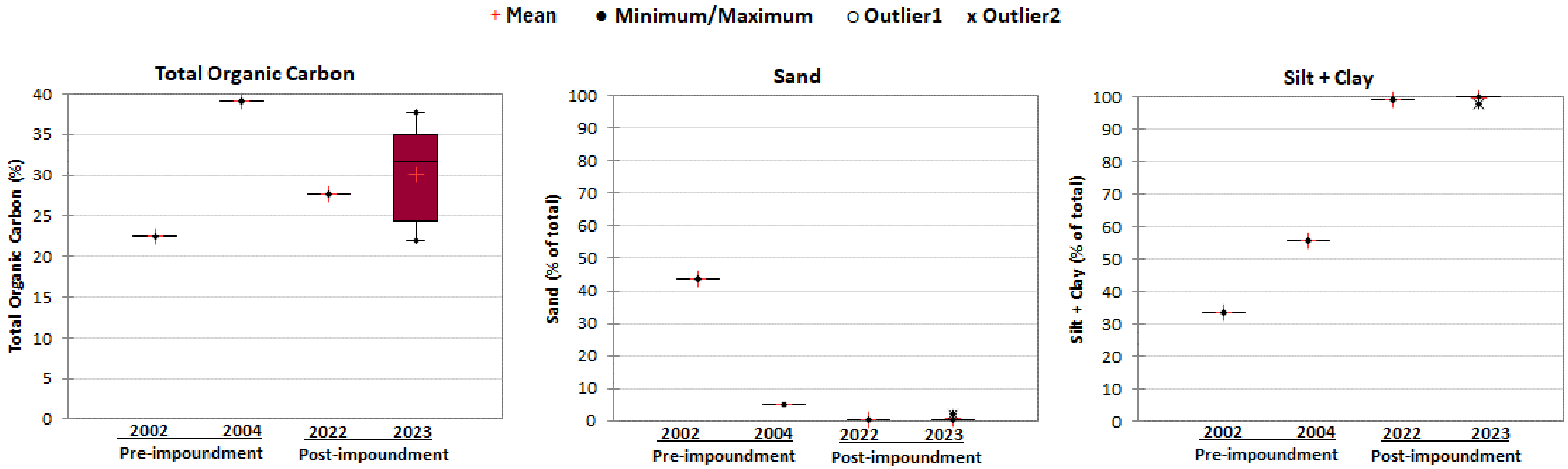


Figure 51: Sediment parameters for Keeyask reservoir Zone 12 intermittently exposed habitat (grab) for pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023).

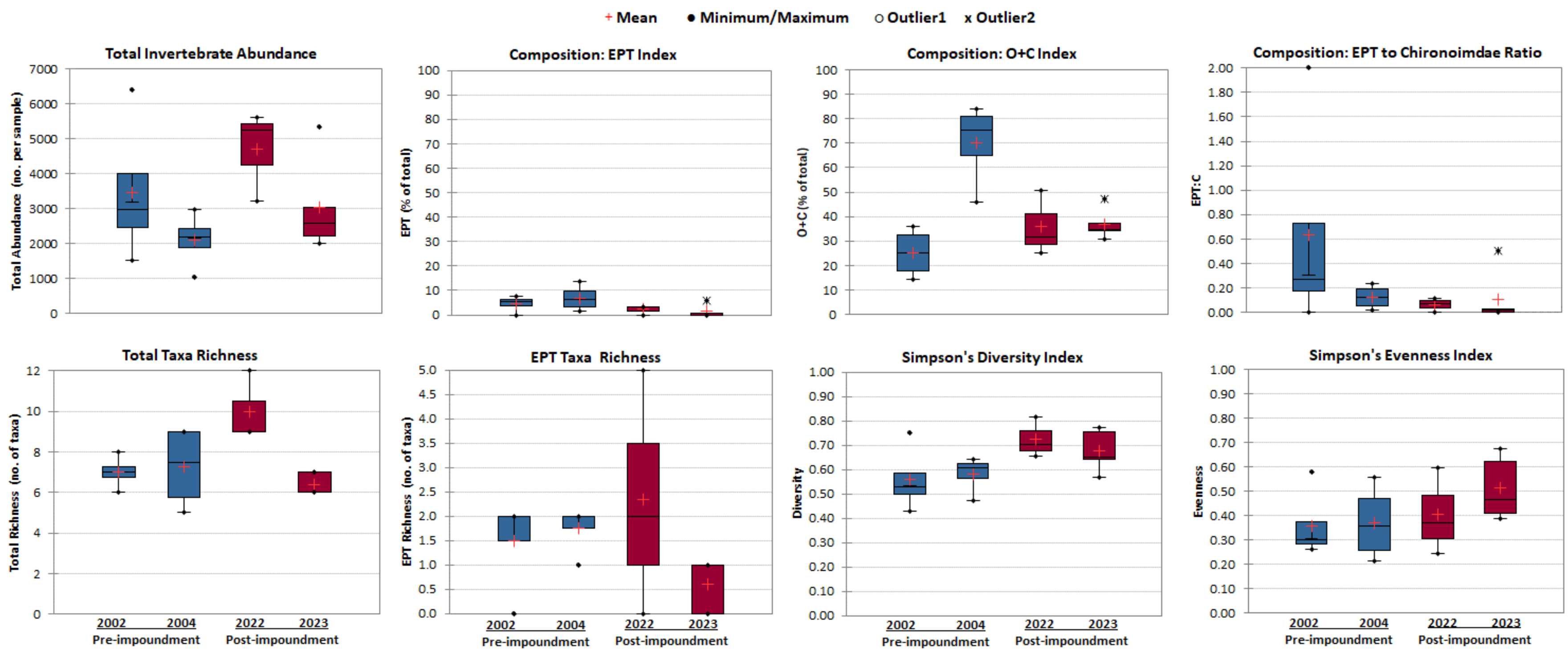


Figure 52: Benthic invertebrate metrics for Keeyask reservoir Zone 12 intermittently exposed habitat (grab) for pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023).

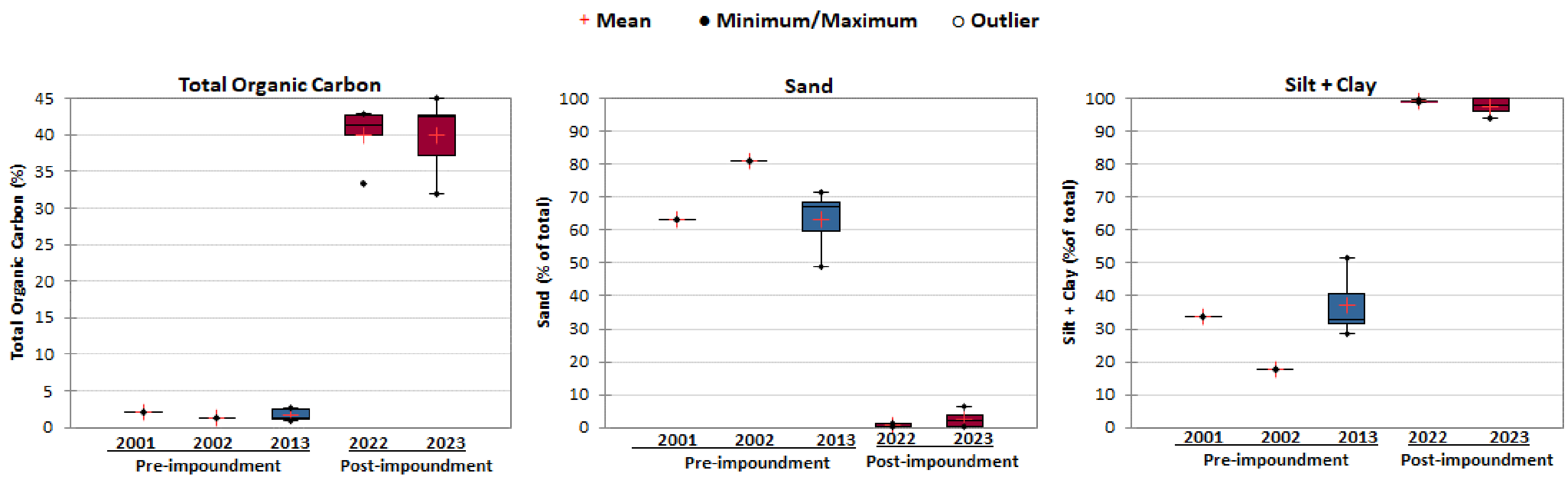


Figure 53: Sediment parameters for Keeyask reservoir Zone 12 predominantly wetted habitat for pre-impoundment (2001, 2002, and 2013) and post-impoundment (2022 and 2023).

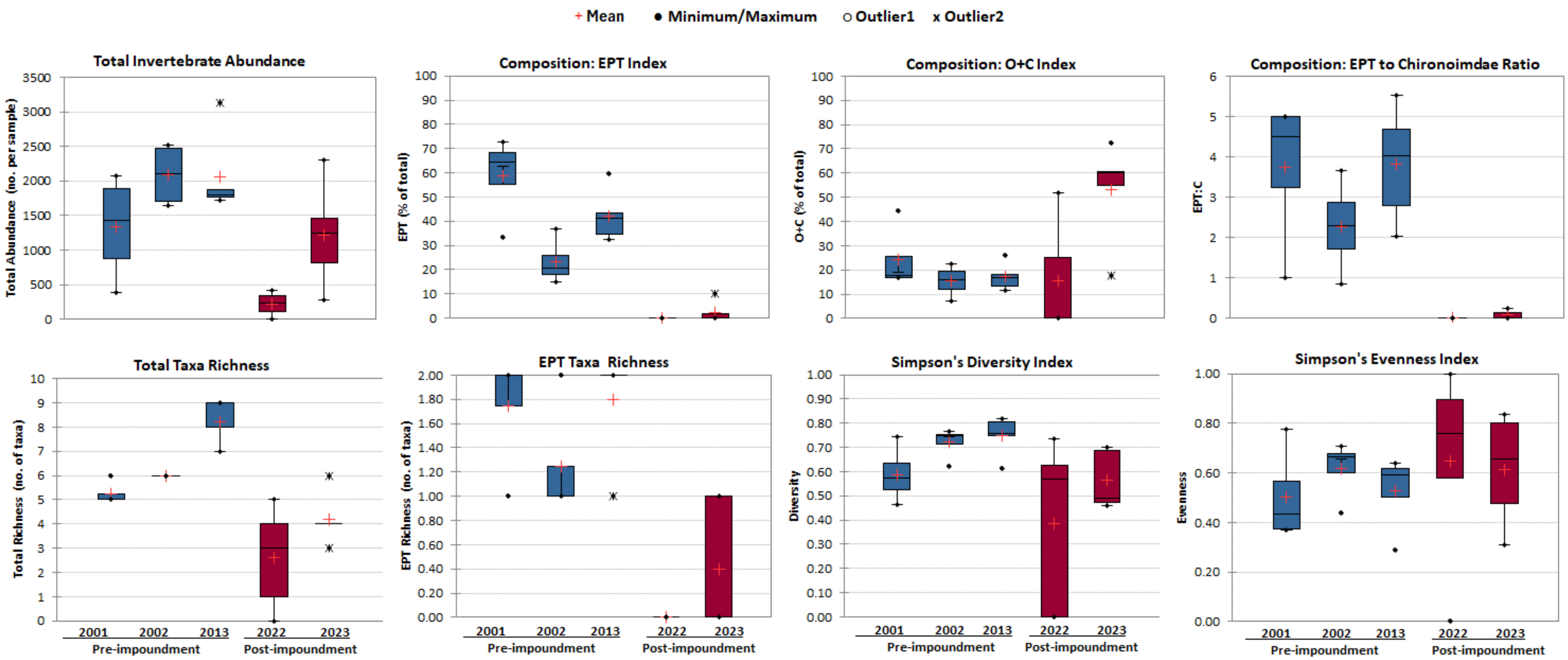


Figure 54: Benthic invertebrate metrics for Keeyask reservoir Zone 12 predominantly wetted habitat pre-impoundment (2001, 2002, and 2013) and post-impoundment (2022 and 2023).

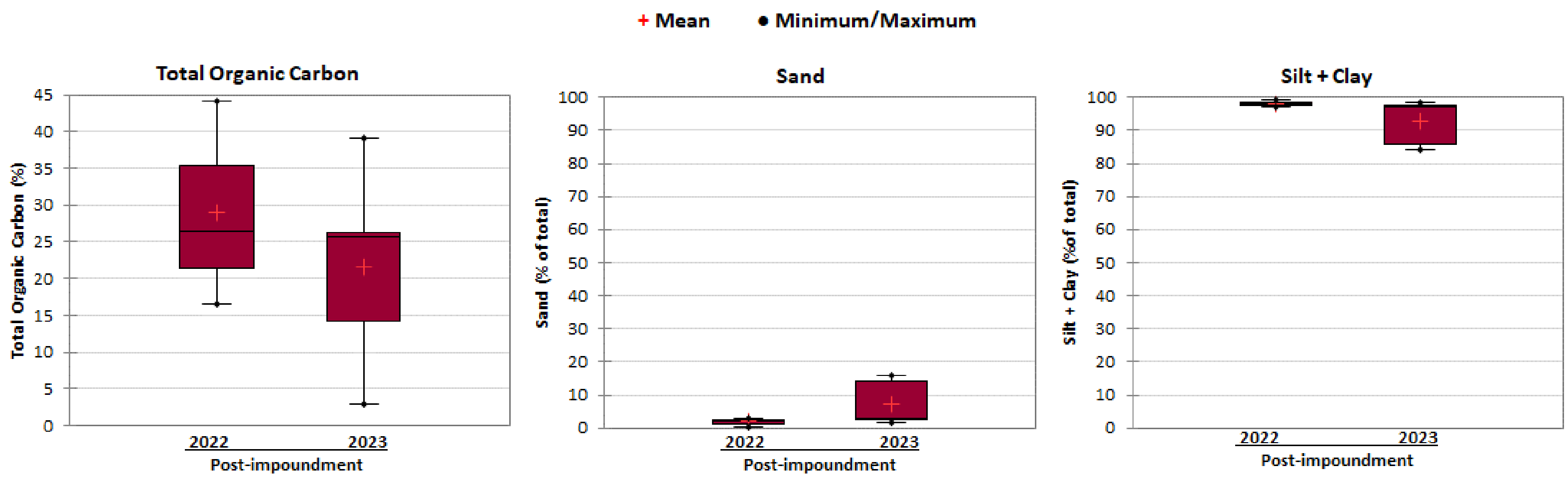


Figure 55: Sediment parameters for Keeyask reservoir Zone 12 offshore habitat for post-impoundment (2022 and 2023).

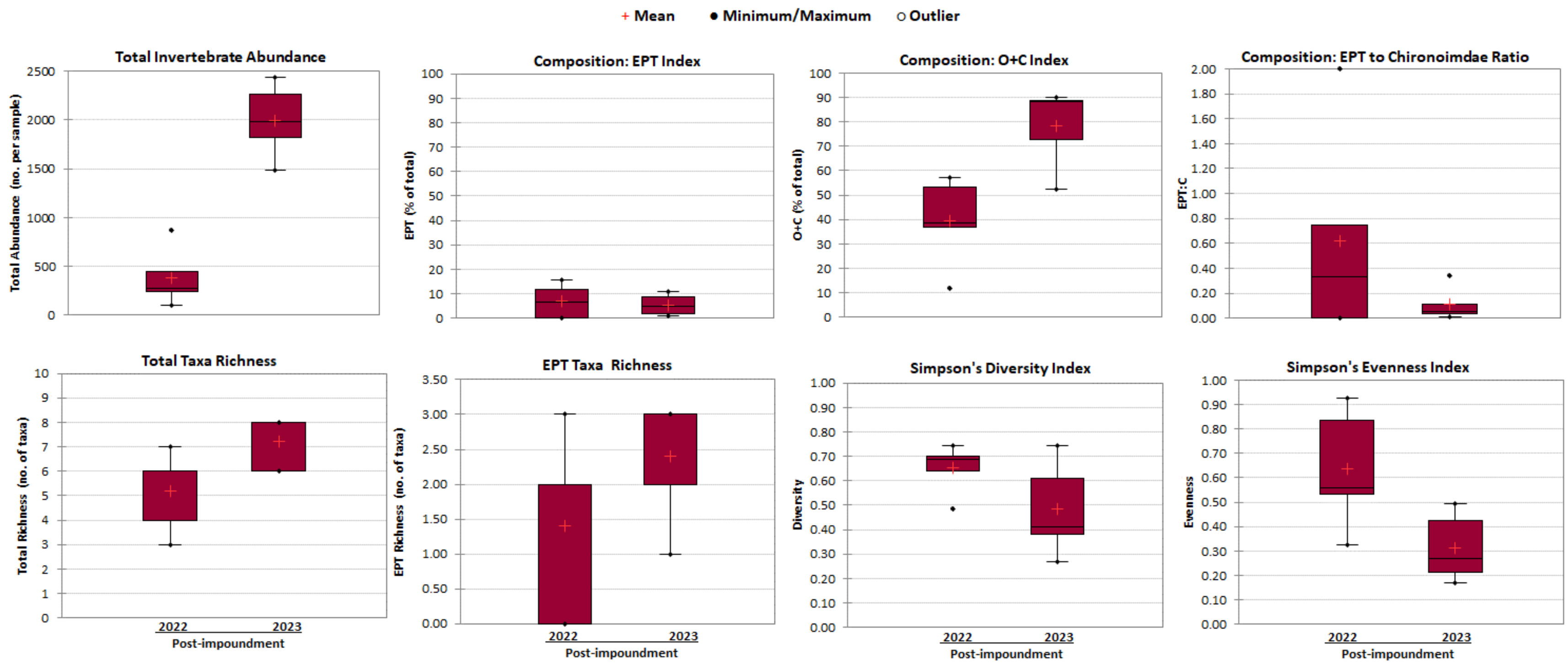


Figure 56: Benthic invertebrate metrics for Keeyask reservoir Zone 12 offshore habitat for post-impoundment (2022 and 2023).

4.2.2.3 ZONE 8

Monitoring of the IE nearshore habitat included benthic grab sampling in 0.5 to 1.0 m water depths in two years post-impoundment (2022 and 2023).

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between the two post-impoundment years; however, only one sediment sample was collected from this habitat in 2022 (Figure 57; Table A7-39).
- The benthic invertebrate community was comparable between the second- and third year following impoundment, although the relative proportion of the disturbance-tolerant taxa (O+C index) was significantly lower in 2023 (Figure 58; Table A7-40).

Monitoring of the PW nearshore habitat included benthic grab sampling in 1.9 to 2.8 m water depths in two years post-impoundment (2022 and 2023).

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between the two post-impoundment years (Figure 59; Table A7-41).
- Benthic invertebrate community metrics (total density, composition, richness, diversity, and evenness) were comparable between the two post-impoundment years (Figure 60; Table A7-42).

Monitoring of the OS habitat included benthic grab sampling in 3.2 to 5.2 m water depths in two years post-impoundment (2022 and 2023).

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between the two post-impoundment years (Figure 61; Table A7-43).
- Total invertebrate density, relative proportions of sensitive taxa (EPT index), relative proportions of disturbance-tolerant taxa (O+C index), EPT:C, EPT richness, and diversity were comparable between the second- and third year following impoundment (Figure 62; Table A7-44). Compared to 2022, total taxa richness was significantly higher, and evenness was significantly lower in 2023 but differences were within 50% of the post-impoundment range (Table A7-44).

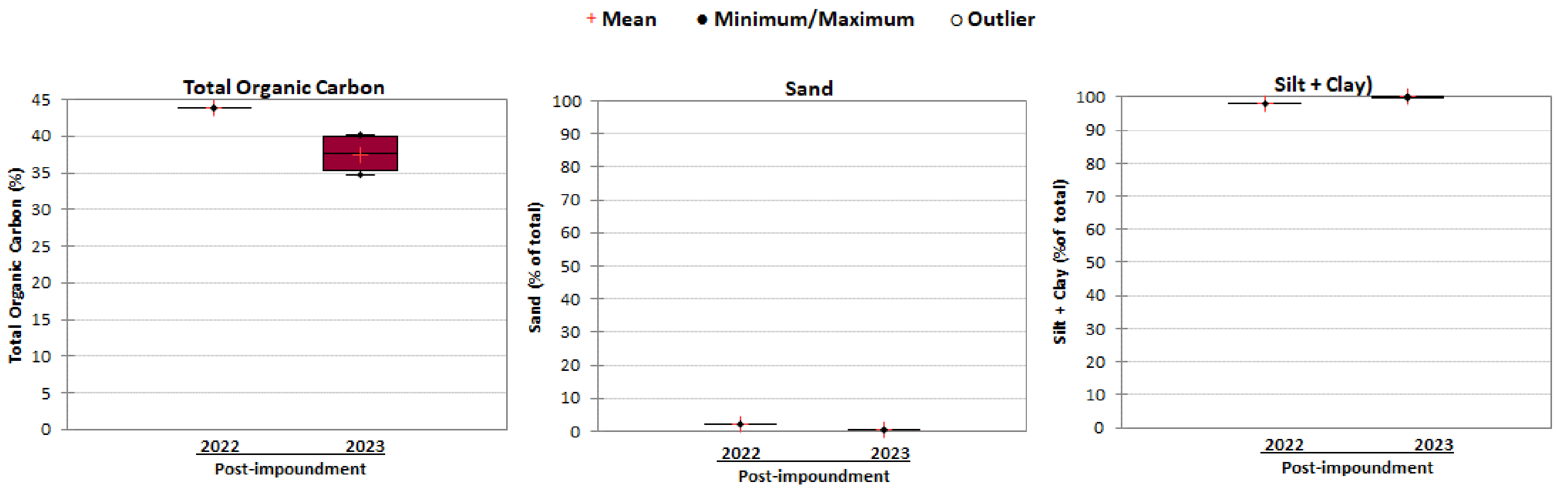


Figure 57: Sediment parameters for Keeyask reservoir Zone 8 intermittently exposed habitat (grab) for post-impoundment (2022 and 2023).

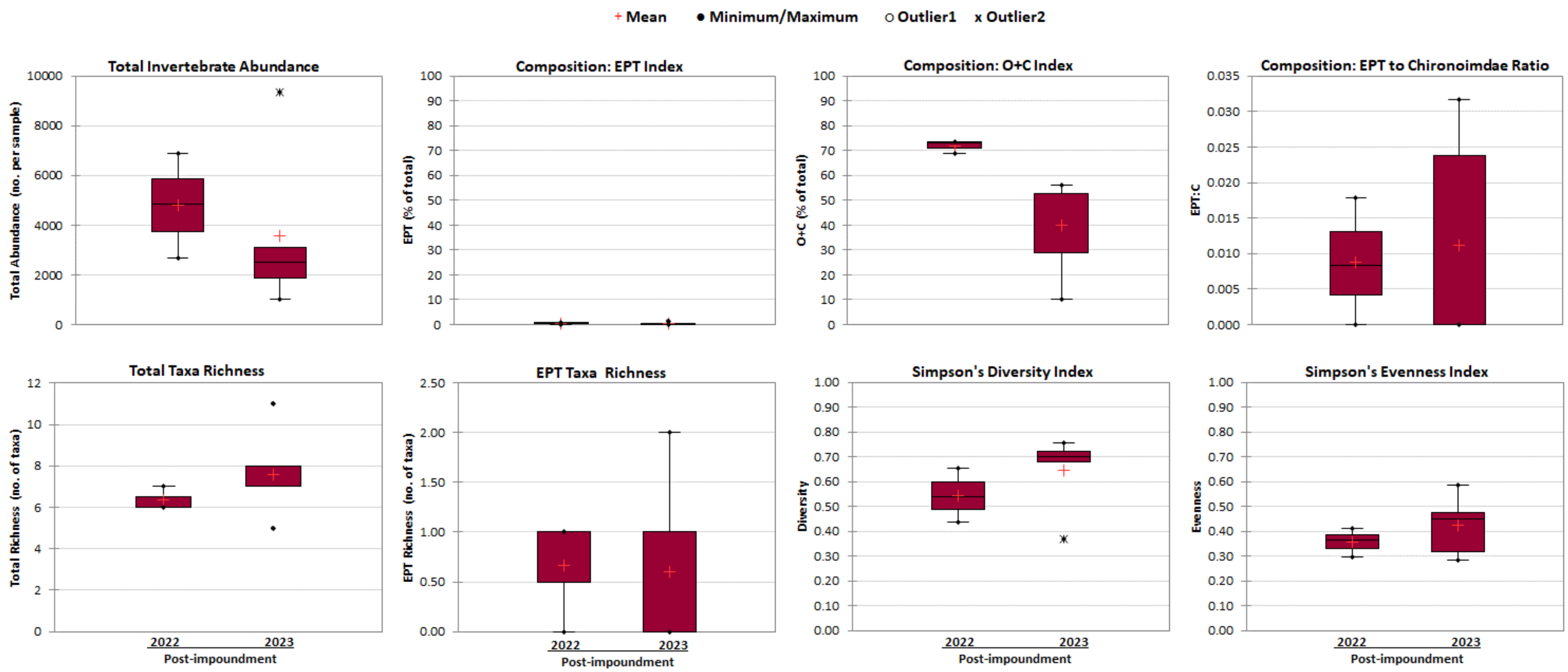


Figure 58: Benthic invertebrate metrics for Keeyask reservoir Zone 8 intermittently exposed habitat (grab) for post-impoundment (2022 and 2023).

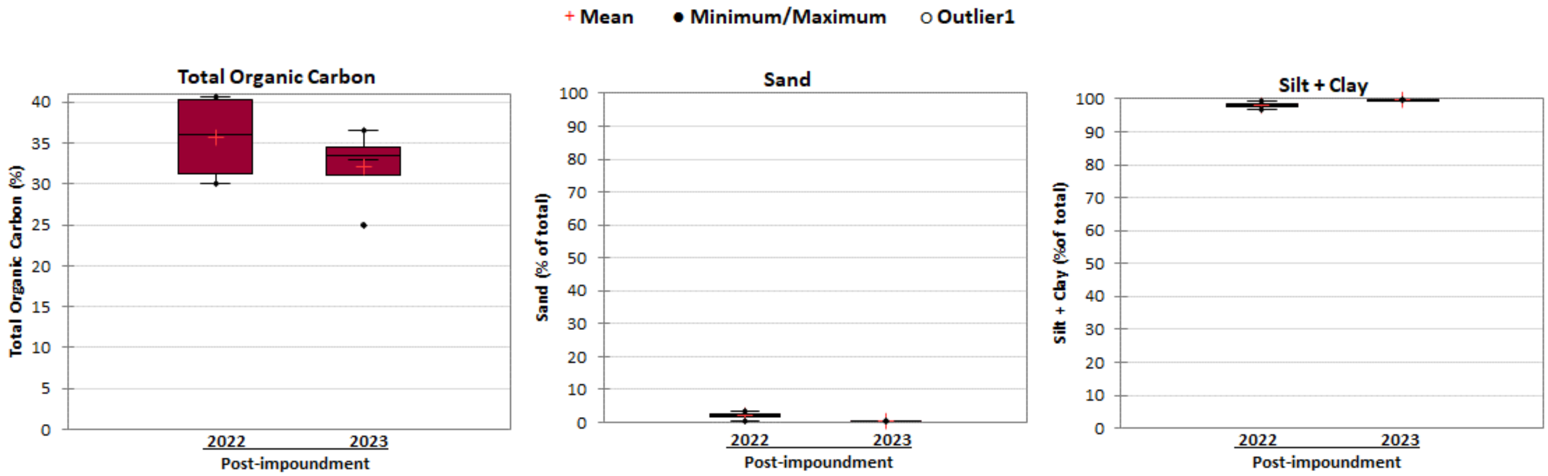


Figure 59: Sediment parameters for Keeyask reservoir Zone 8 predominantly wetted habitat for post-impoundment (2022 and 2023).

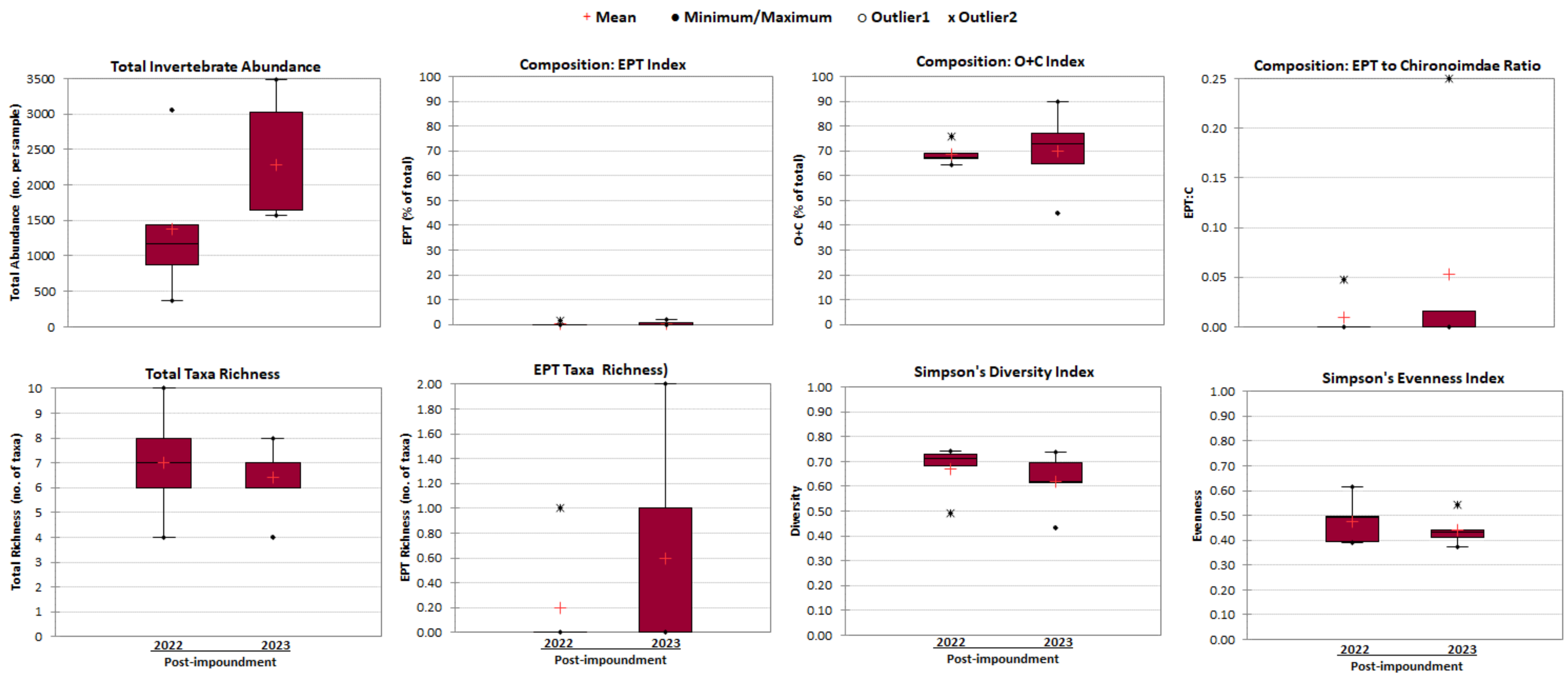


Figure 60: Benthic invertebrate metrics for Keeyask reservoir Zone 8 predominantly wetted habitat for post-impoundment (2022 and 2023).

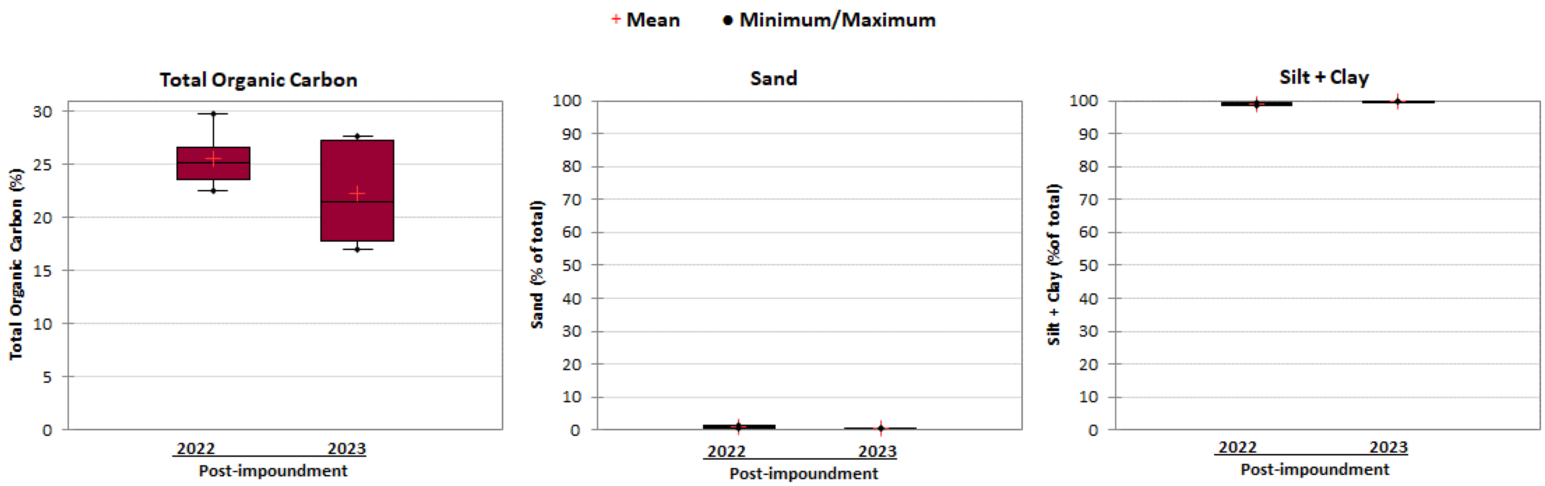


Figure 61: Sediment parameters for Keeyask reservoir Zone 8 offshore habitat for post-impoundment (2022 and 2023).

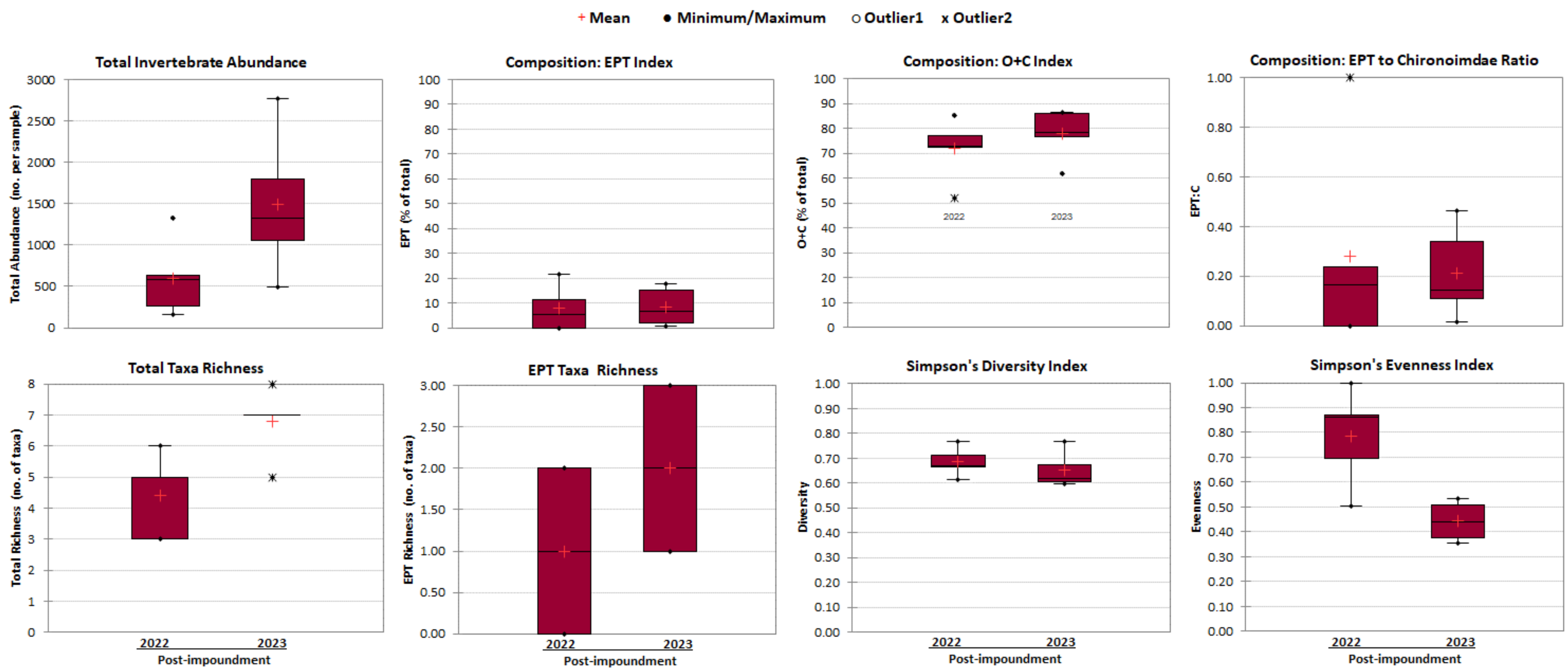


Figure 62: Benthic invertebrate metrics for Keeyask reservoir Zone 8 offshore habitat for post-impoundment (2022 and 2023).

4.2.3 STEPHENS LAKE

Sampling was conducted at sites in Stephens Lake downstream of the Keeyask GS both pre- and post-impoundment of the Keeyask reservoir to assess changes in benthic macroinvertebrate communities caused by changes in habitat characteristics due to operation of the GS (such as changes in ice development, water velocity, and substrate deposition patterns). Pre-impoundment (baseline) monitoring in the Keeyask reservoir mainstem was conducted between 2001 and 2013, with different areas sampled in different years (Map 8). A total of 84 invertebrate and 91 sediment samples were collected during the baseline monitoring period. Post-impoundment monitoring was conducted between 2021 and 2023; a total of 91 invertebrate and 91 sediment samples were collected. Summary statistics for benthic invertebrate metrics by mainstem site and habitat type are provided in Appendix 5 (Tables A5-1 to A5-36). Comparable habitats were compared both pre- and post-impoundment for the Stephens Lake 3KM and 11KM sites. Conclusions are based on statistical comparisons of means between time periods, presented in Appendix 7 (Tables A7-45 to A7-62).

4.2.3.1 MAINSTEM DOWNSTREAM OF THE KEEYASK GS

Several areas in the mainstem immediately downstream of the GS were sampled to monitor differences in benthic invertebrate communities due to changes in ice scouring patterns. The same sites were sampled both pre- and post-impoundment (Map 8). Benthic grabs were collected from sites in 1.1 to 11.7 m water depths both pre-impoundment (2001 and 2002) and post-impoundment (2023).

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between both monitoring periods (Figure 63; Table A7-45).
- The benthic invertebrate community was comparable between both monitoring periods and there were no statistically significant differences detected between the monitoring periods for any of the benthic invertebrate community metrics (density, composition, richness, diversity, and evenness) (Figure 64; Table A7-46).

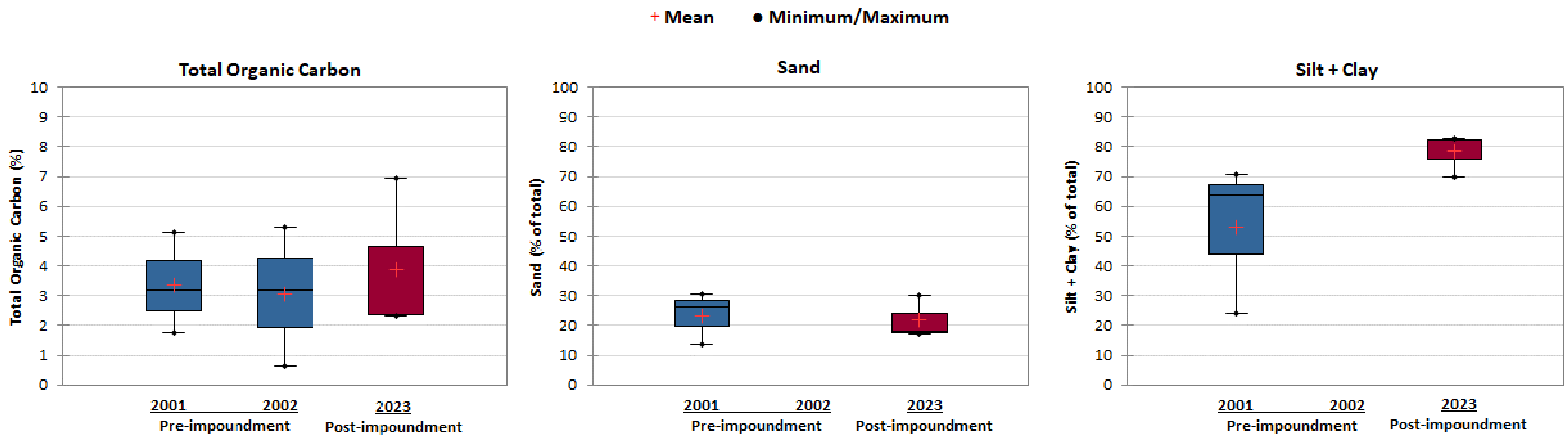


Figure 63: Sediment parameters for Stephens Lake downstream of the Keeyask GS for pre-impoundment (2001 and 2002) and post-impoundment (2023).

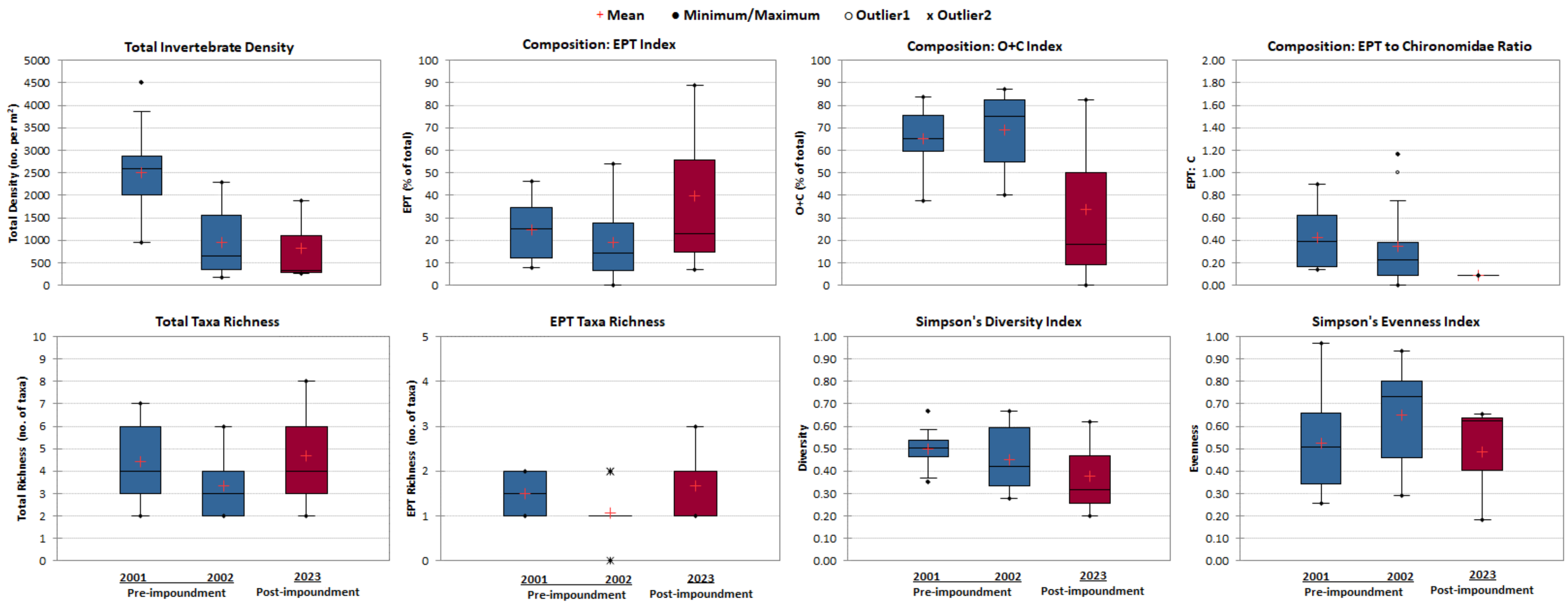


Figure 64: Benthic invertebrate metrics for Stephens Lake downstream of the Keeyask GS for pre-impoundment (2001 and 2002) and post-impoundment (2023).

4.2.3.2 3 KM DOWNSTREAM OF THE KEEYASK GS

Kicknet sampling within IE habitats was conducted along transects perpendicular from the shoreline up to water depths of 0.3 to 1.2 m in 2013 (pre-impoundment) and 2021 (post-impoundment). Commissioning of the Keeyask GS powerhouse was ongoing in 2021, so habitats did not fully reflect the operational conditions.

- Total organic carbon was comparable between monitoring periods (Figure 65; Table A7-47). Substrates contained significantly more sand (>50% higher) and less silt/clay (within ±50% of the baseline range mean) in 2021 than in 2013.
- Total invertebrate density, relative proportions of disturbance-tolerant taxa (O+C index), and total taxa richness were comparable between both monitoring periods (Figure 66; Table A7-48). However, the benthic invertebrate community in 2021 was significantly less diverse, less even (by >50%), and contained fewer of the disturbance-sensitive taxa (lower relative abundance and lower EPT richness, both by >50%) compared to 2013 (Table A7-48).

Benthic grab sampling was also conducted within IE habitats in 0.3 to 1.4 m water depths during both pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023).

- Sampling sites contained significantly less (by >50%) organic carbon in 2023 than in the pre-impoundment years (Figure 67; Table A7-49). Substrate composition also differed in 2023, containing significantly less sand and more silt/clay (by >50% for both) compared to pre-impoundment. No statistically significant differences were found in between baseline and 2022; however, 2022 substrate parameters were in line with those from 2023 (Table A7-49).
- Total invertebrate density, relative densities of sensitive taxa (EPT index), and EPT richness were comparable between both monitoring periods (Figure 68; Table A7-50). In 2023, there was a significant decrease in total richness and diversity compared to previous years (including 2022), and a dramatic shift in the invertebrate community to one with a higher proportion of disturbance-tolerant taxa (O+C index: 99% in 2023). No statistically significant differences were detected for the EPT metrics (index and taxa richness); however, values were low in during baseline and 2022, and absent from 2023 samples (Table A7-50).

PW nearshore habitats were sampled in 1.8 to 3.1 m water depths both pre-impoundment (2013) and post-impoundment (2021 to 2023).

- Total organic carbon in 2021 and 2022 was significantly higher (by >50%) than pre-impoundment (Figure 69; Table A7-51). No statistically significant differences were detected in substrate particle size (sand and silt/clay) between monitoring periods.
- Total invertebrate density, EPT:C, and taxa richness (total and EPT) were comparable between both monitoring periods (Figure 70; Table A7-52). Compared to baseline, there was a significant increase in the relative proportion of the disturbance-sensitive taxa (EPT

index) in 2022 and a significant decrease in 2023 (both by >50%). Significantly higher relative density of disturbance-tolerant taxa (O+C index) and lower diversity values in 2023 suggested there was a shift in the invertebrate community with higher proportions of disturbance-tolerant taxa compared to previous years including 2021 and 2022 (Table A7-52).

OS habitats were sampled in 3.8 to 6.3 m water depths both pre-impoundment (2013) and post-impoundment (2021 to 2023).

- Significantly more organic carbon was present in substrates in 2022 (by >50%) compared to pre-impoundment (Figure 71; Table A7-53). In 2021, sediment composition differed from baseline, containing significantly more sand (by more than 50%) and less silt/clay. No statistically significant differences were found in between baseline and 2022 and 2023; however, substrate composition was in line with those from 2021.
- Total invertebrate density, total richness, and diversity were comparable between both monitoring periods (Figure 72; Table A7-54). EPT richness was significantly lower (by >50%) in 2023 than baseline but was low in all years including pre-impoundment. There was a significant increase (by >50%) in the relative proportion of the disturbance-sensitive taxa (EPT index) in all post-impoundment years compared to 2013 (Table A7-54).

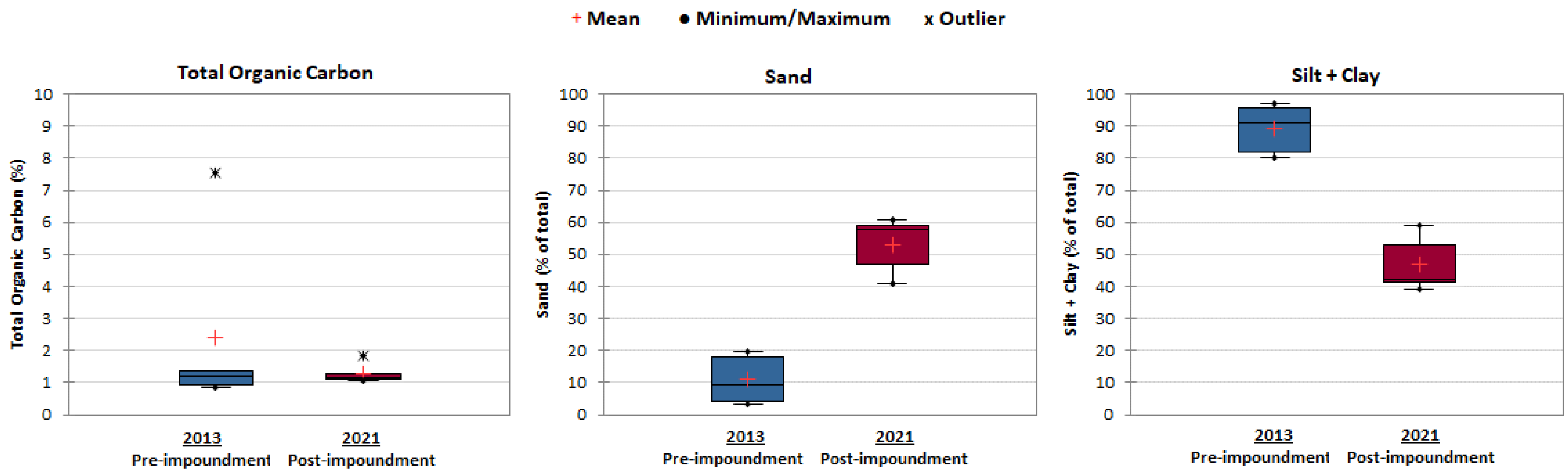


Figure 65: Sediment parameters for Stephens Lake 3 KM downstream of the Keeyask GS intermittently exposed habitat (kicknet) for pre-impoundment (2013) and post-impoundment (2021).

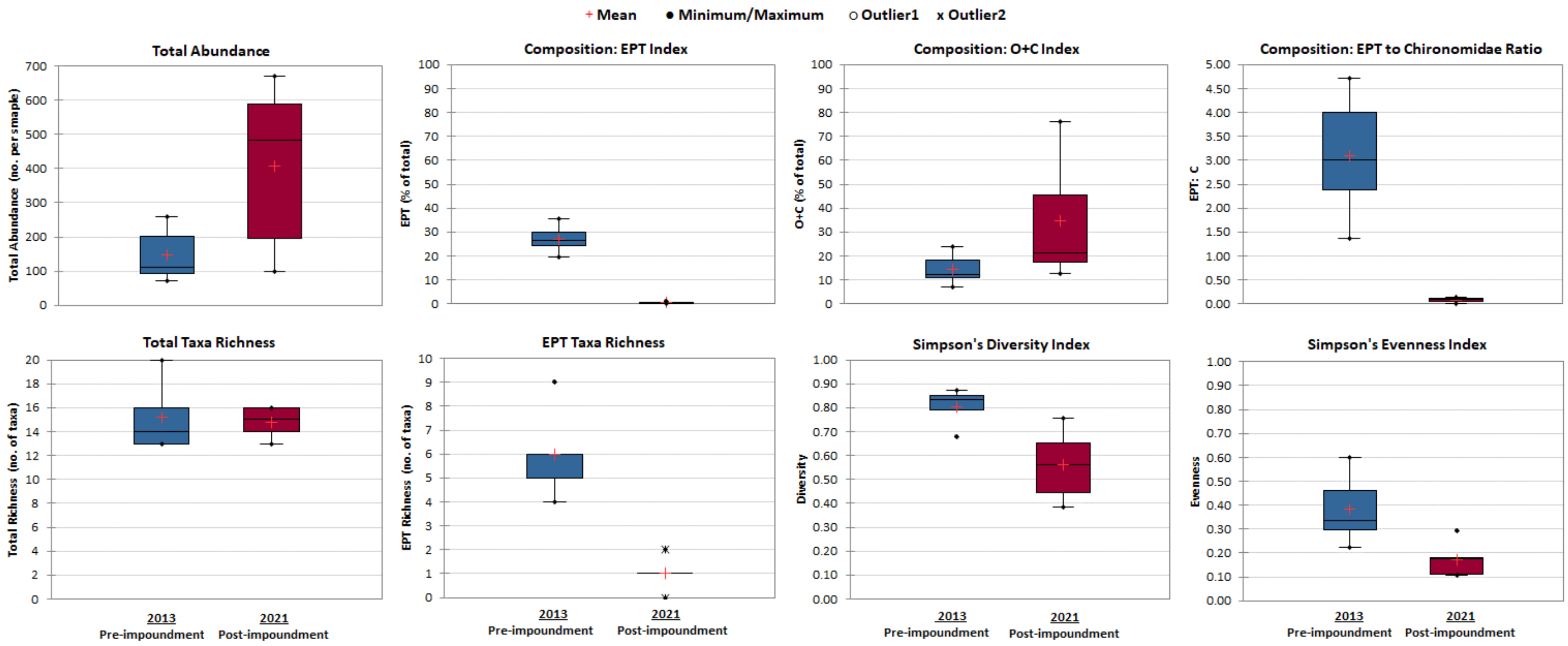


Figure 66: Benthic invertebrate metrics for Stephens Lake 3 KM downstream of the Keeyask GS intermittently exposed habitat (kicknet) for pre-impoundment (2013) and post-impoundment (2021).

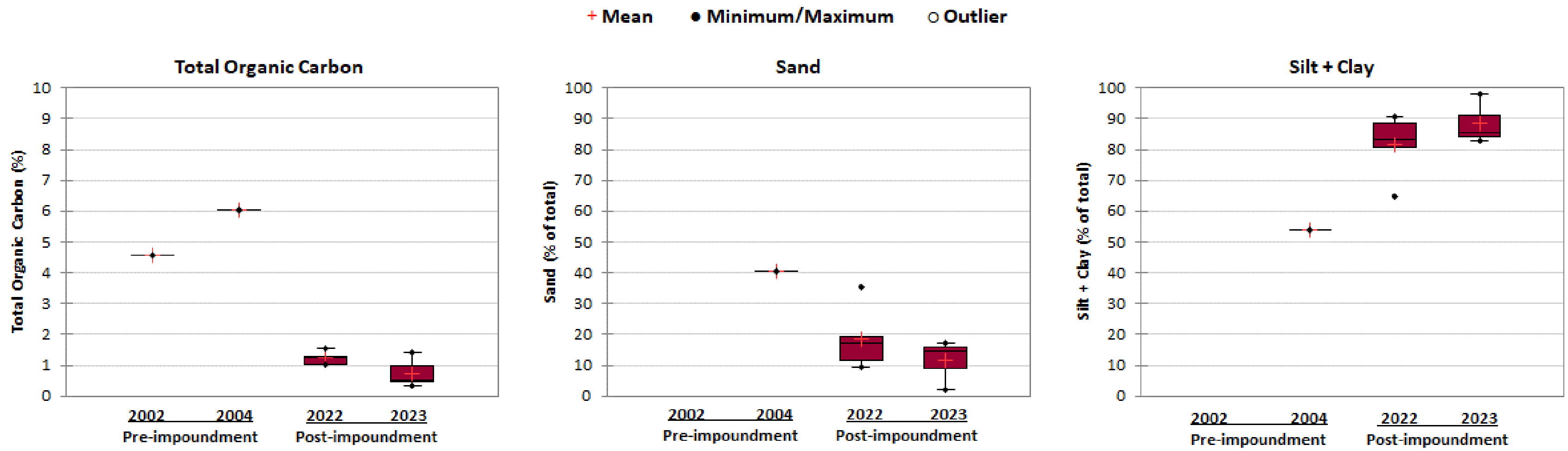


Figure 67: Sediment parameters for Stephens Lake 3 KM downstream of the Keeyask GS intermittently exposed habitat (grab) for pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023).

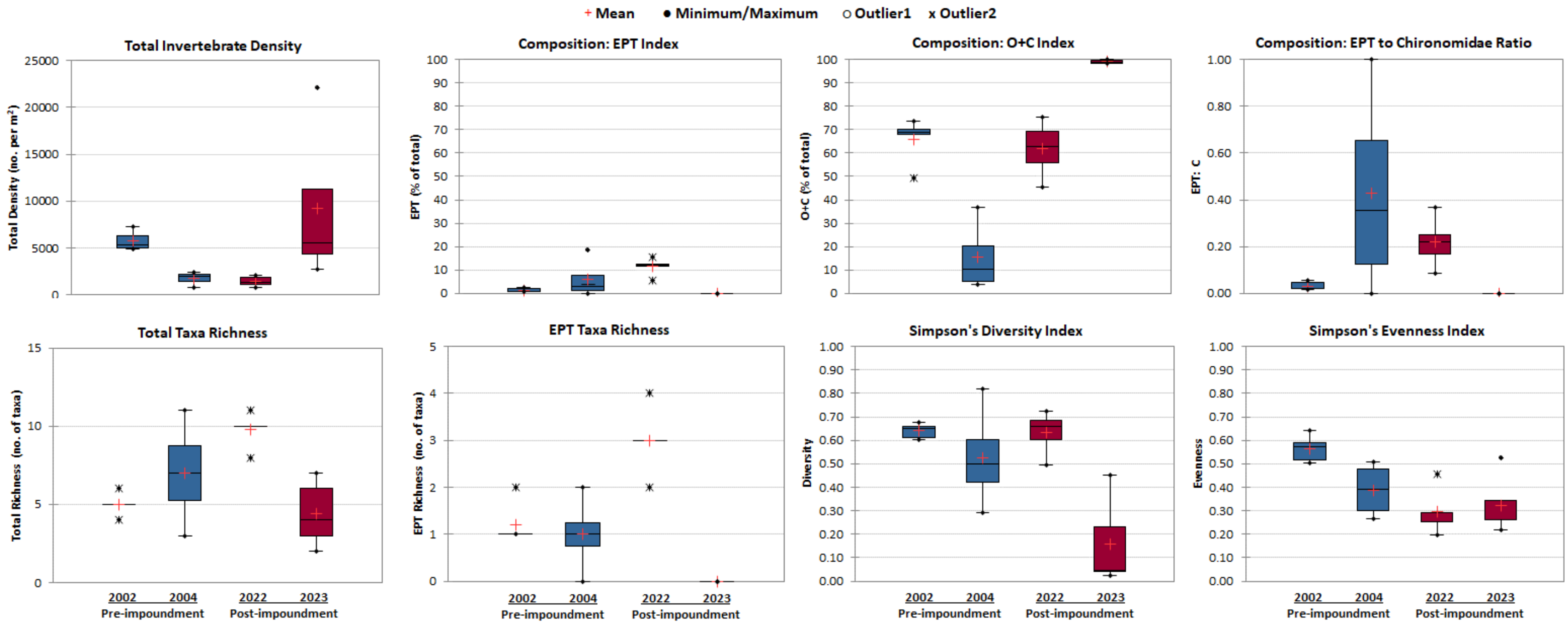


Figure 68: Benthic invertebrate metrics for Stephens Lake 3 KM downstream of the Keeyask GS intermittently exposed habitat (grab) for pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023).

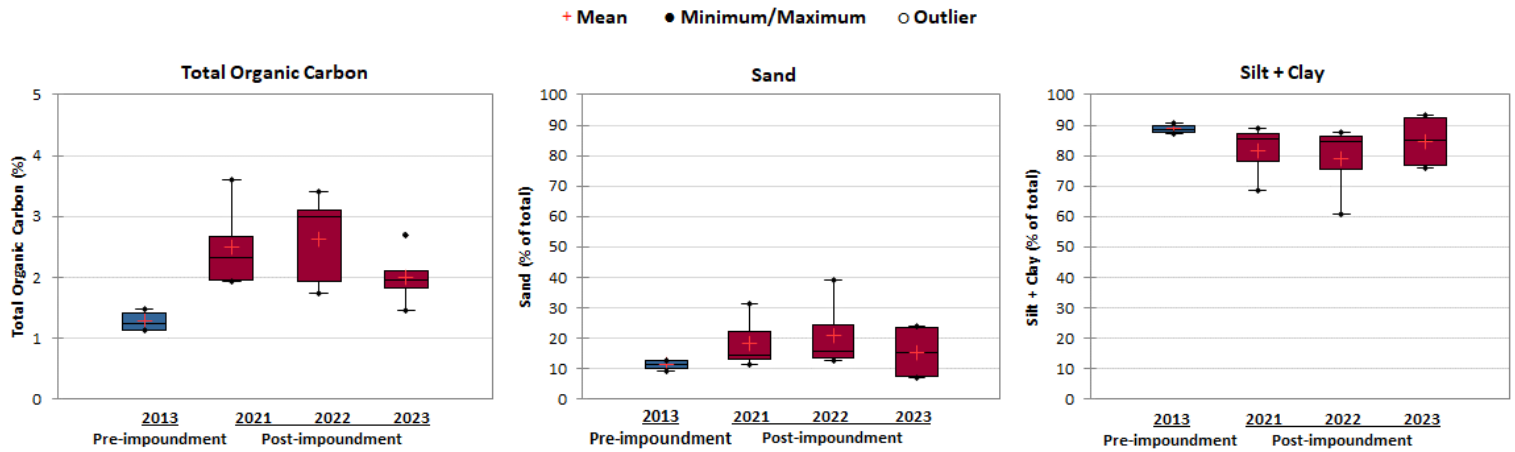


Figure 69: Sediment parameters for Stephens Lake 3 KM downstream of the Keeyask GS predominantly wetted habitat for pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023).

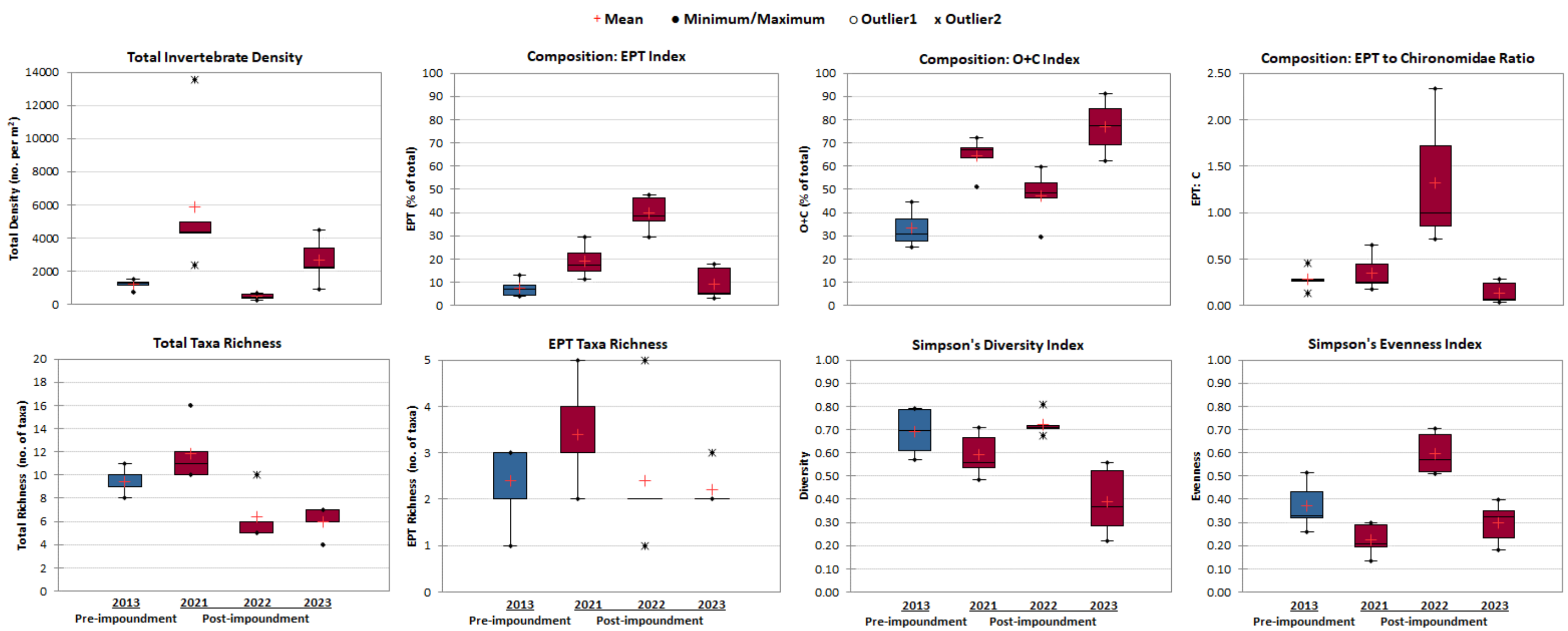


Figure 70: Benthic invertebrate metrics for Stephens Lake 3 KM downstream of the Keeyask GS predominantly wetted habitat for pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023).

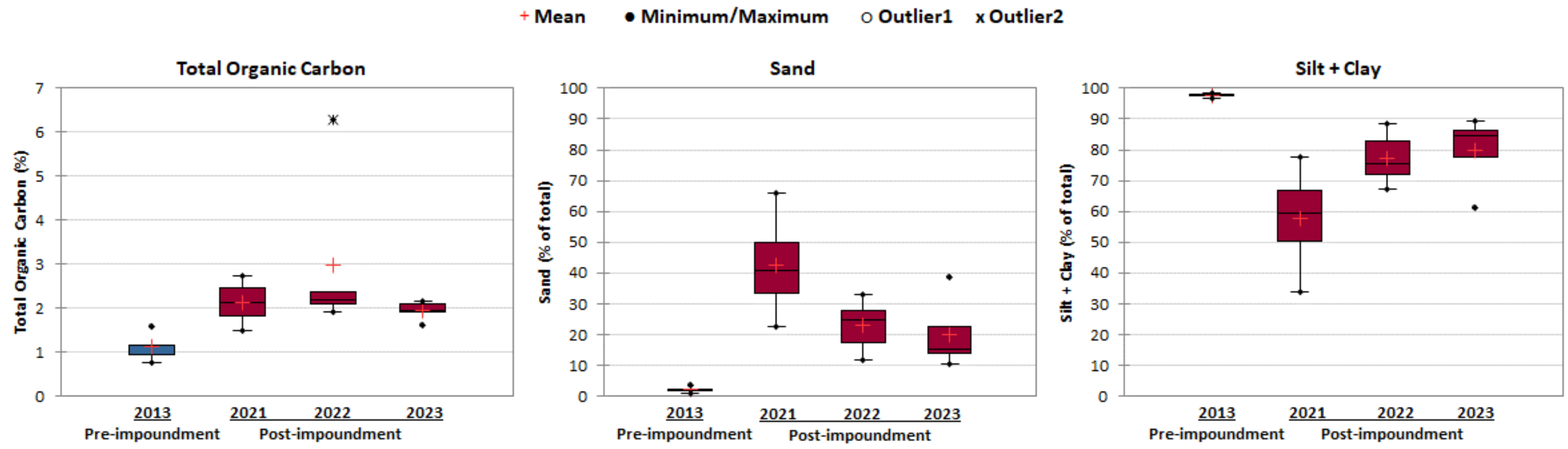


Figure 71: Sediment parameters for Stephens Lake 3 KM downstream of the Keeyask GS offshore habitat for pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023).

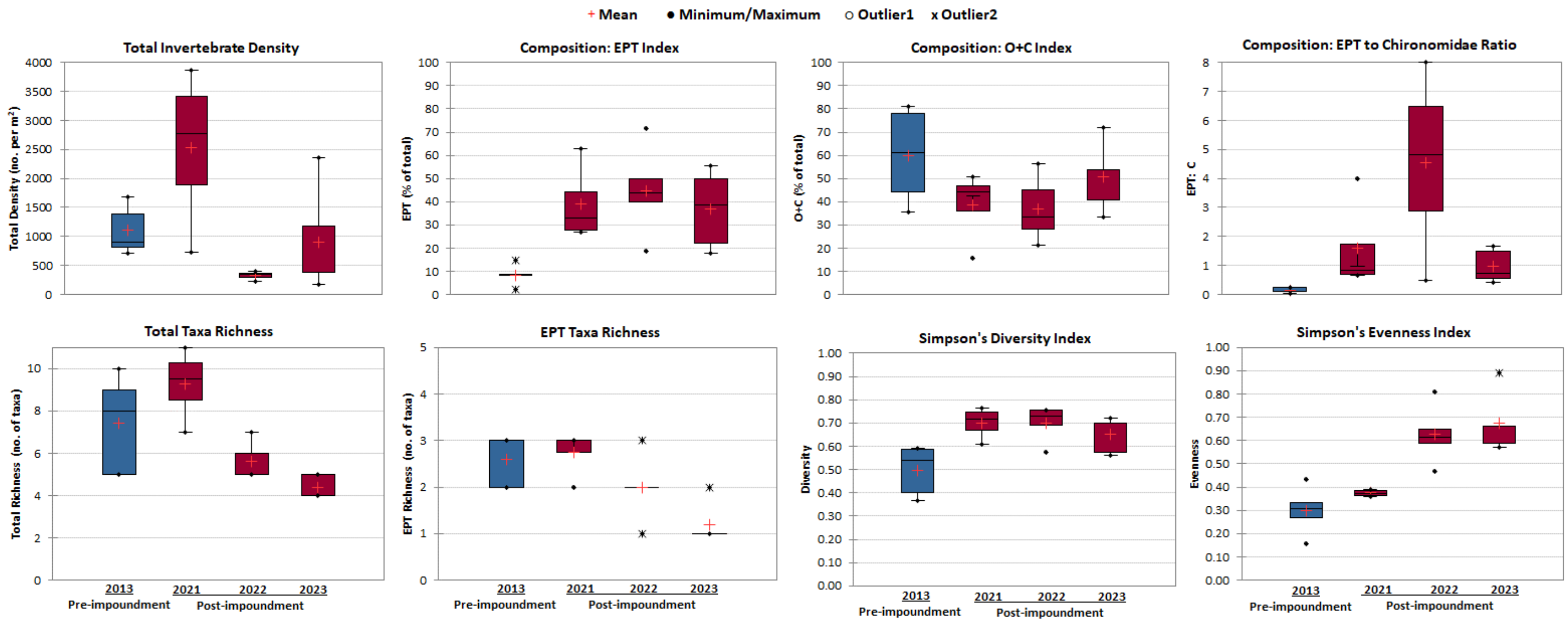


Figure 72: Benthic invertebrate metrics for Stephens Lake 3 KM downstream of the Keeyask GS offshore habitat for pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023).

4.2.3.3 11 KM DOWNSTREAM OF THE KEEYASK GS

Kicknet sampling with IE habitats was conducted along transects perpendicular from the shoreline up to water depths of 0.8 to 1.2 m in 2013 (pre-impoundment) and 2021 (post-impoundment). Commissioning of the Keeyask GS powerhouse was ongoing in 2021, so habitats did not fully reflect the operational conditions.

- Sediment samples contained significantly more (by >50%) organic carbon in 2021 compared to 2013 (Figure 73; Table A7-55). Substrates contained similar amounts of sand, but significantly less (by >50%) silt/clay in 2021.
- Total invertebrate abundance, diversity, and evenness of the benthic invertebrate community were comparable between both monitoring periods (Figure 74; Table A7-56). Compared to 2013, the benthic invertebrate community in 2021 was dominated by disturbance-tolerant species (O+C index) with significantly lower EPT metrics (index and taxa richness) differing by more than 50% for each metric (Table A7-56).

Benthic grab sampling was also conducted within IE habitats in 0.2 to 1.0 m water depths during both pre-impoundment (2001) and post-impoundment (2022 and 2023).

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between both monitoring periods (Figure 75; Table A7-57).
- The post-impoundment invertebrate community was comparable to pre-impoundment with no statistically significant differences detected between the monitoring periods for total density, composition, richness, and diversity (Figure 76; Table A7-58). Evenness in 2023 was significantly lower (by >50%) than baseline but in line with 2022 evenness (Table A7-58).

PW nearshore habitats were sampled in 1.1 to 3.4 m water depths both pre-impoundment (2001, 2002, and 2013) and post-impoundment (2021 to 2023).

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between the monitoring periods (Figure 77; Table A7-59).
- Total invertebrate density, relative densities of disturbance-sensitive taxa (EPT index), and diversity were comparable between both monitoring periods (Figure 78; Table A7-60). There was a significant increase in the relative proportion of disturbance-tolerant taxa (O+C index) in both 2021 and 2022 compared to baseline (by >50% in both years). Total richness was significantly higher (by >50%) post-impoundment compared to baseline. EPT richness in 2023 was also significantly higher (by >50%) compared to pre-impoundment (Table A7-60).

OS habitats were sampled in 3.1 to 7.3 m water depths both pre-impoundment (2013) and post-impoundment (2021 to 2023).

- Substrate samples contained significantly more (by >50%) organic carbon post-impoundment compared to 2013 (Figure 79; Table A7-61). In 2023, substrates contained significantly more sand (by >50%) and significantly less silt /clay than any other sampling year; however, the % silt/clay values were in line with all previous years including baseline (Table A7-61).
- Relative densities of disturbance-sensitive taxa (EPT index), EPT:C and taxa richness of the benthic invertebrate community were comparable between the monitoring periods (Figure 80; Table A7-62). Compared to baseline, total invertebrate density was significantly lower (by >50%) in 2022. Relative densities of disturbance-tolerant taxa (O+C index) in 2023 was higher (by >50%) than baseline, higher compared to 2021, and marginally higher than 2022. Compared to pre-impoundment, the post-impoundment invertebrate community was significantly more (by >50%) diverse and even (Table A7-62).

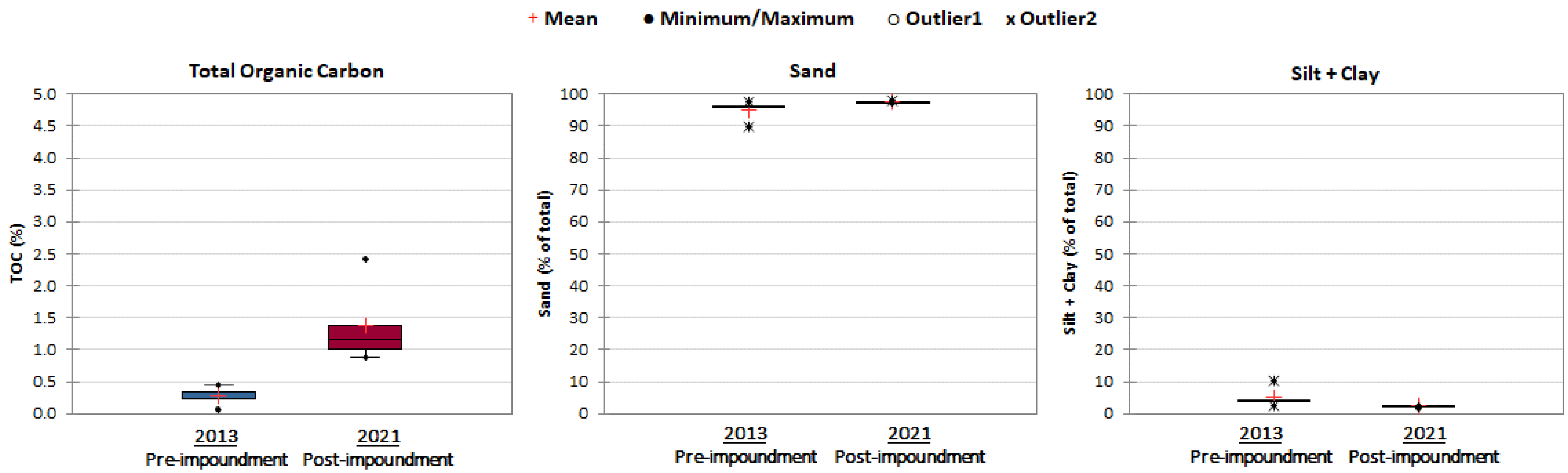


Figure 73: Sediment parameters for Stephens Lake 11 KM downstream of the Keeyask GS intermittently exposed habitat (at kicknet sites) for pre-impoundment (2013) and post-impoundment (2021).

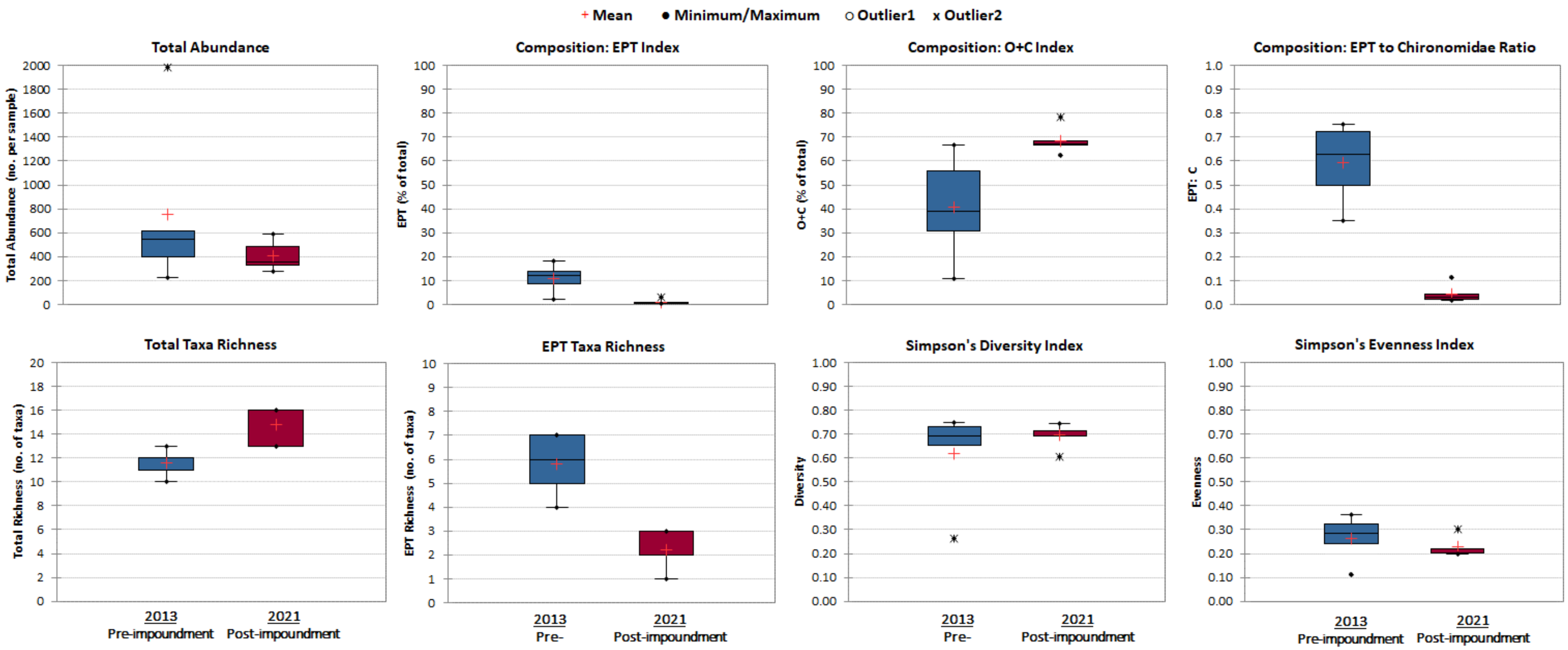


Figure 74: Benthic invertebrate metrics for the Stephens Lake 11 KM downstream of the Keeyask GS intermittently exposed habitat (kicknet) for pre-impoundment (2013) and post-impoundment (2021).

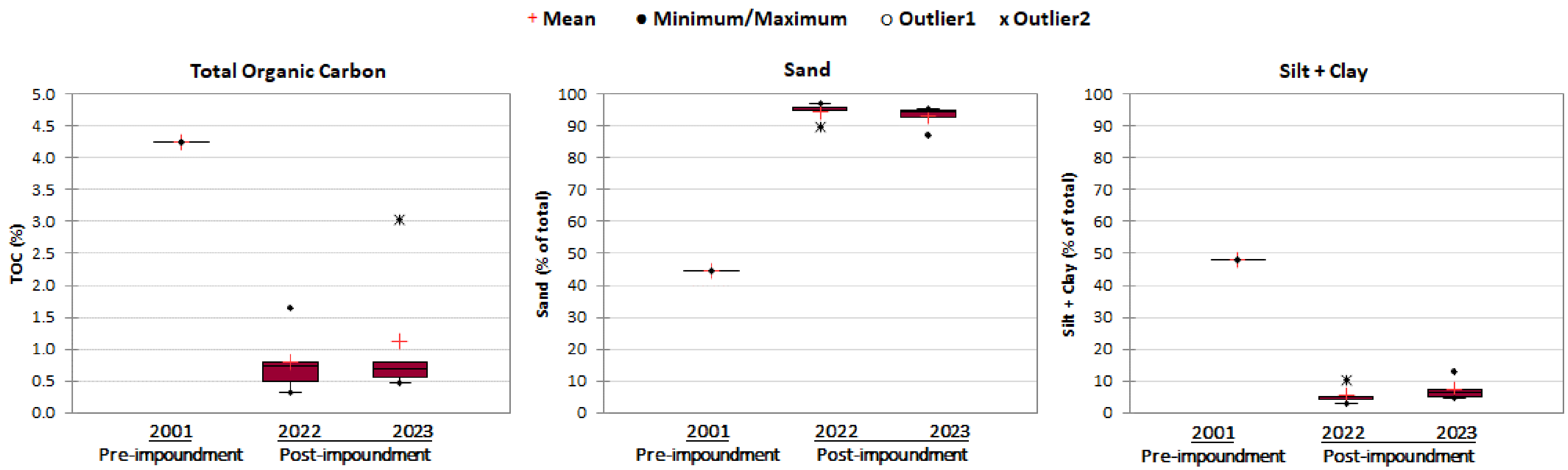


Figure 75: Sediment parameters for Stephens Lake 11 KM downstream of the Keeyask GS intermittently exposed habitat (grab) for pre-impoundment (2001) and post-impoundment (2022 and 2023).

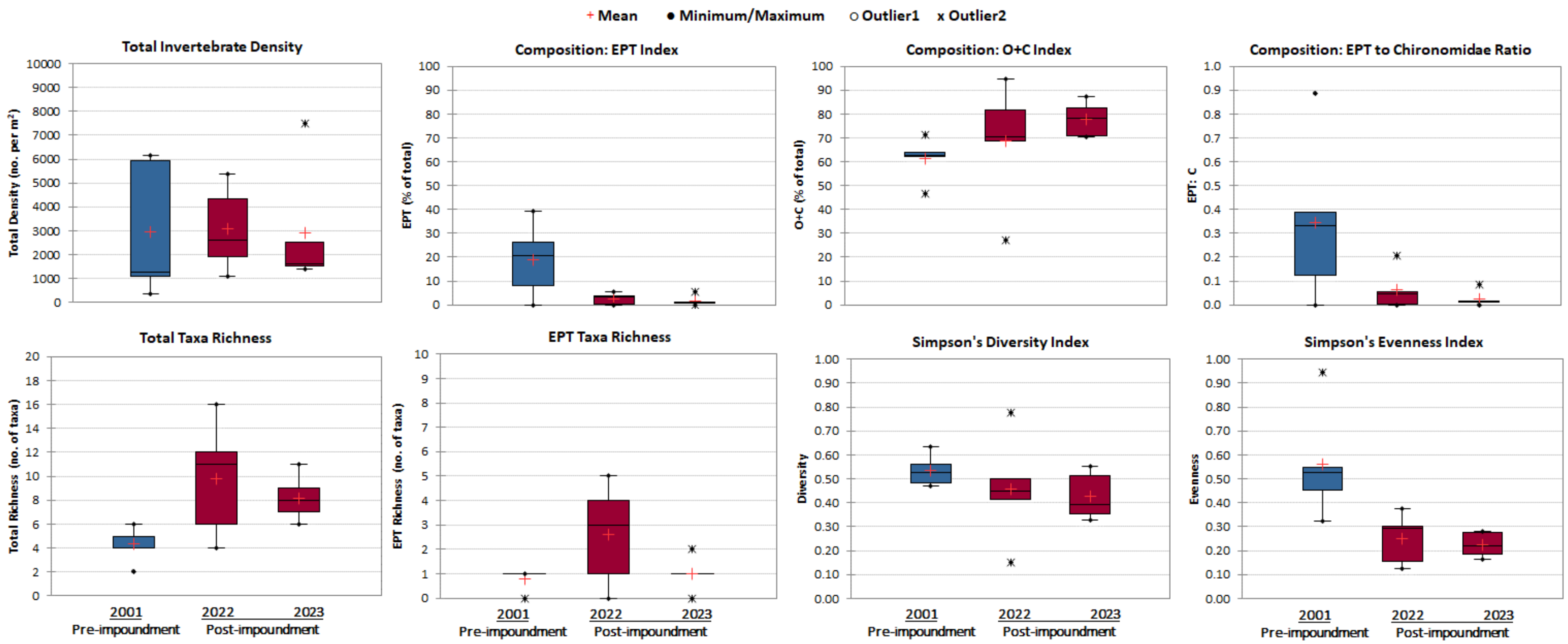


Figure 76: Benthic invertebrate metrics for Stephens Lake 11 KM downstream of the Keeyask GS intermittently exposed habitat (grab) for pre-impoundment (2001) and post-impoundment (2022 and 2023).

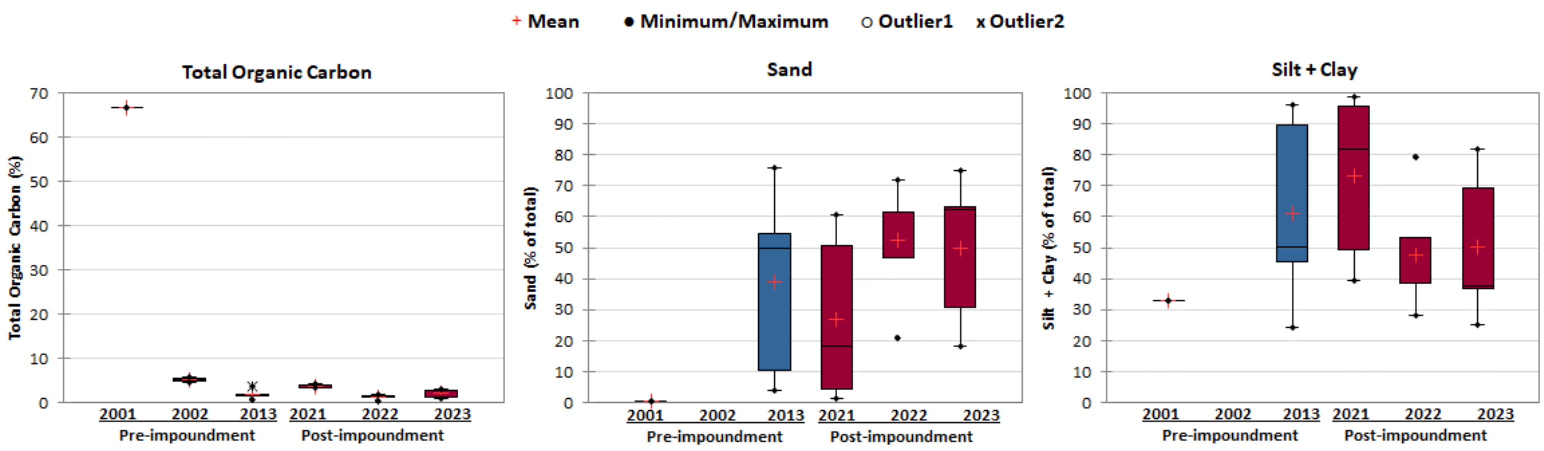


Figure 77: Sediment parameters for Stephens Lake 11 KM downstream of the Keeyask GS predominantly wetted habitat for pre-impoundment (2001, 2002, and 2013) and post-impoundment (2021, 2022, and 2023).

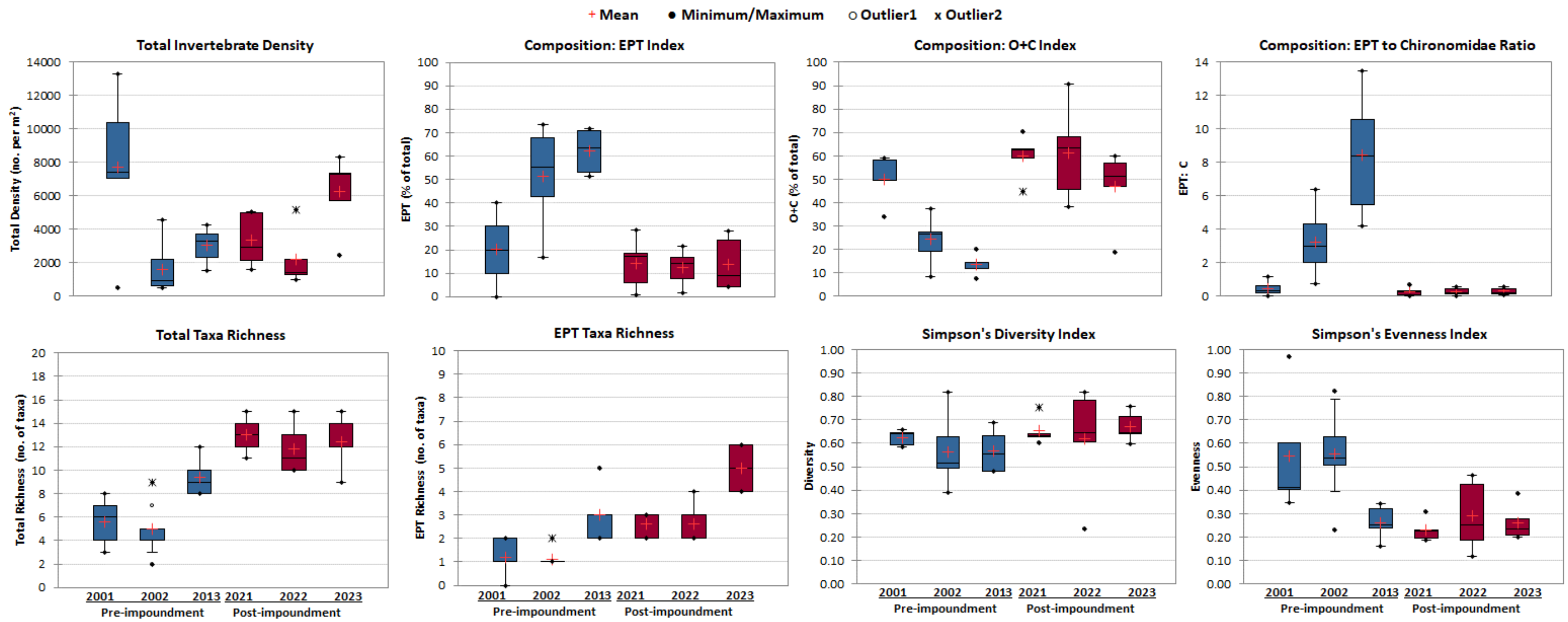


Figure 78: Benthic invertebrate metrics for Stephens Lake 11 KM downstream of the Keeyask GS predominantly wetted habitat for pre-impoundment (2001, 2002, and 2013) and post-impoundment (2021, 2022, and 2023).

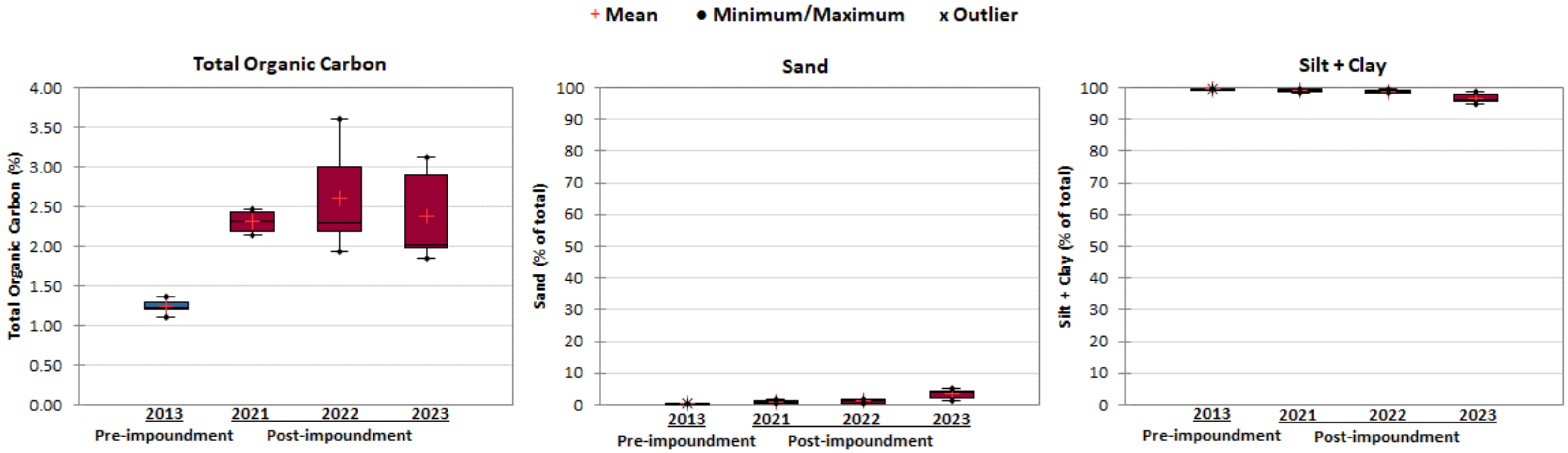


Figure 79: Sediment parameters for Stephens Lake 11 KM downstream of the Keeyask GS offshore habitat for pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023).

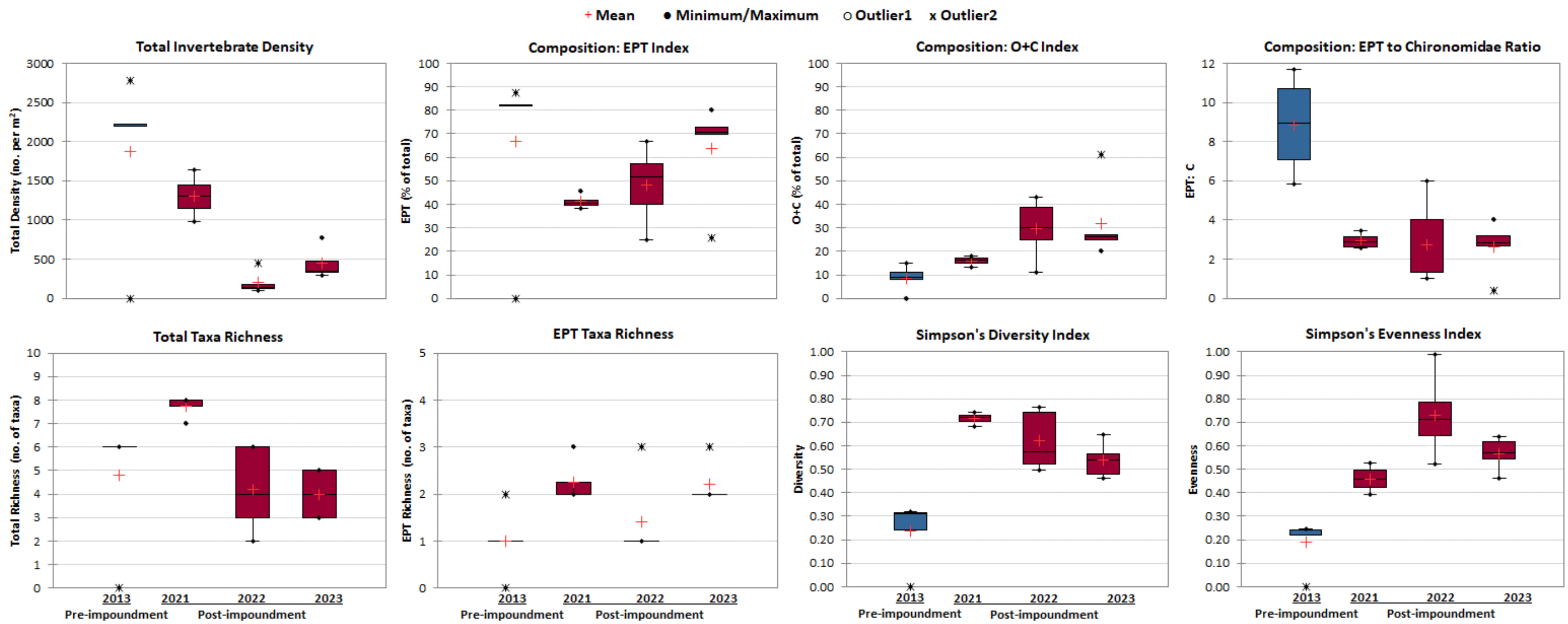


Figure 80: Benthic invertebrate metrics for Stephens Lake 11 KM downstream of the Keeyask GS offshore habitat for pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023).

4.2.4 O'NEIL BAY

Sampling was conducted at sites in O'Neil Bay in Stephens Lake to record the invertebrate community in an area that the Keeyask reservoir backbay sites may resemble in about 25 years. As this area is not directly impacted by construction and operation of the GS, no changes in the benthic invertebrate community are expected between pre- and post-impoundment. Any changes between the time periods will provide context to the results from the Keeyask reservoir and mainstem of Stephens Lake. Pre-impoundment (baseline) monitoring in O'Neil Bay was conducted between 2006 and 2013, with different areas sampled in different years (Map 8). A total of 15 invertebrate and 10 sediment samples were collected during the Project baseline period. Post-impoundment monitoring was conducted between 2021 and 2023; a total of 44 invertebrate and 43 sediment samples were collected. Summary statistics for benthic invertebrate metrics are provided in Appendix 6 (Tables A6-1 to A6-16). Comparable habitats were compared both pre- and post-impoundment. Conclusions are based on statistical comparisons of means between time periods, presented in Appendix 7 (Tables A7-63 to A7-70).

Kicknet sampling with IE habitats were conducted along transects perpendicular from the shoreline up to water depths of 0.5 to 1.2 m in 2013 (pre-impoundment) and 2021 (post-impoundment).

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between both monitoring periods (Figure 81; Table A7-63).
- Total invertebrate abundance was comparable between both monitoring periods (Figure 82; Table A7-64). Compared to pre-impoundment, the post-impoundment benthic invertebrate community was more diverse, more even, but contained significantly lower (by >50%) sensitive taxa (EPT index and EPT richness) and significantly higher (by >50%) proportion of disturbance-tolerant taxa (O+C index). Post-impoundment diversity and evenness values were significantly higher (by >50%) than baseline (Table A7-64).

Benthic grab sampling was also conducted within IE habitats in 0.3 to 0.8 m water depths during post-impoundment (2022 and 2023). No pre-impoundment grab sampling was conducted within the IE area.

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between the two years (Figure 83; Table A7-65).
- Total invertebrate density, total richness, and evenness of the benthic invertebrate community was comparable between the two years (Figure 84; Table A7-66). The benthic invertebrate community was less diverse and contained significantly more tolerant taxa in 2023 (O+C index: 100%) compared to 2022 (O+C index: 13%) as the 2022 community consisted solely of Oligochaeta (aquatic segmented worms), Dreissenidae (zebra mussels), and Corixidae (water boatmen). All metrics in both years were low and devoid of disturbance-sensitive taxa (EPT index and EPT richness; Table A7-66).

PW nearshore habitats were sampled in 1.8 to 3.6 m water depths both pre-impoundment (2006 and 2013) and post-impoundment (2021 to 2023).

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between the monitoring periods (Figure 85; Table A7-67).
- The post-impoundment invertebrate community was comparable to pre-impoundment with no statistically significant differences found for total density, composition, taxa richness, diversity, and evenness between the monitoring periods (Figure 86; Table A7-68).

OS habitats were sampled in 3.6 to 5.8 m water depths both pre-impoundment (2006) and post-impoundment (2021 to 2023).

- A pre- and post-impoundment comparison of benthic substrate was not done because sediment samples were not collected in 2006. Benthic substrate parameters appeared to be comparable among the three post-impoundment years (Figure 87; Table A7-69).
- EPT richness, diversity, and evenness of the benthic invertebrate community were comparable between both monitoring periods (Figure 88; Table A7-70). Compared to baseline, total invertebrate density was significantly lower (by >50%) in 2022 and 2023. During the post-impoundment period, relative proportions of disturbance-sensitive taxa (EPT index) were significantly higher (by >50%) and relative proportions of disturbance-tolerant taxa (O+C index) were significantly lower (by >50%) compared to the pre-impoundment period. Total richness in 2021 was significantly higher (by >50%) than baseline, and higher than 2022 and 2023 (Table A7-70).

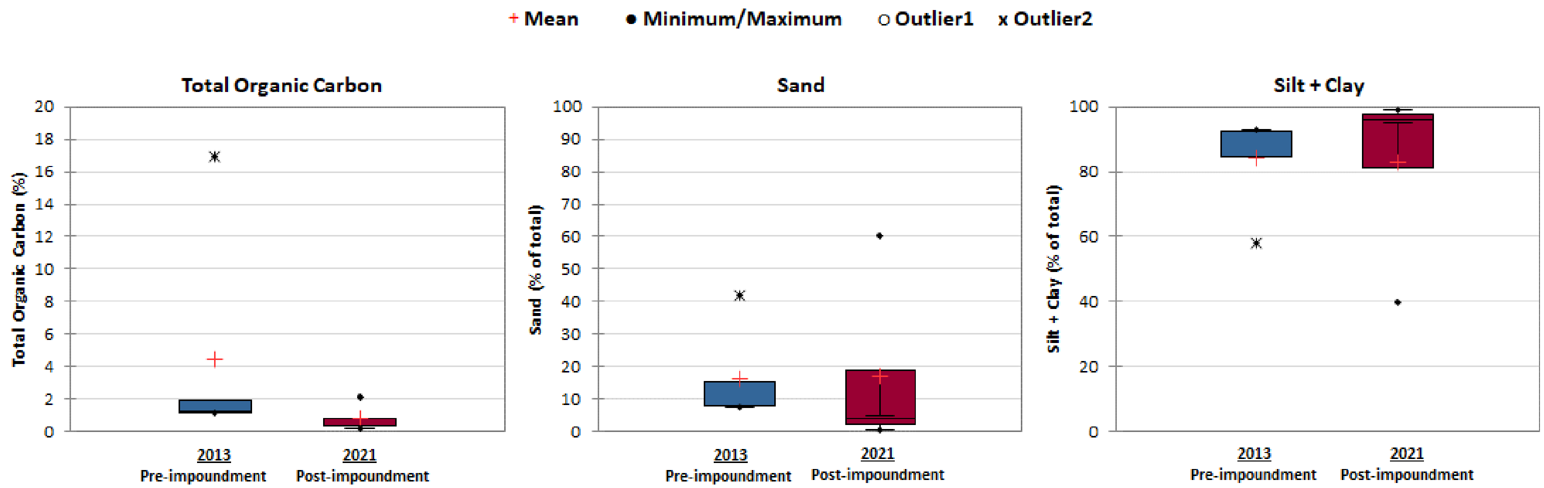


Figure 81: Sediment parameters for O'Neil Bay intermittently exposed habitat (at kicknet sites) for pre-impoundment (2013) and post-impoundment (2021).

Figure 82: Benthic invertebrate metrics for the O'Neil Bay intermittently exposed habitat (kicknet) for pre-impoundment (2013) and post-impoundment (2021).

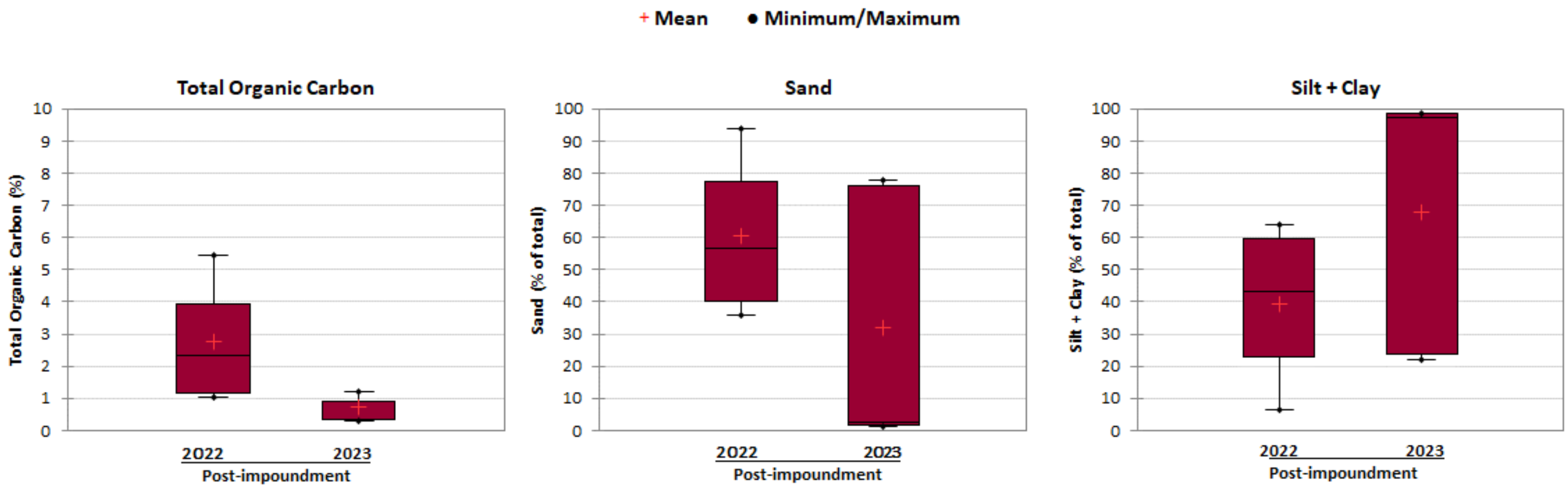


Figure 83: Sediment parameters for O'Neil Bay intermittently exposed habitat (grab) for post-impoundment (2022 and 2023).

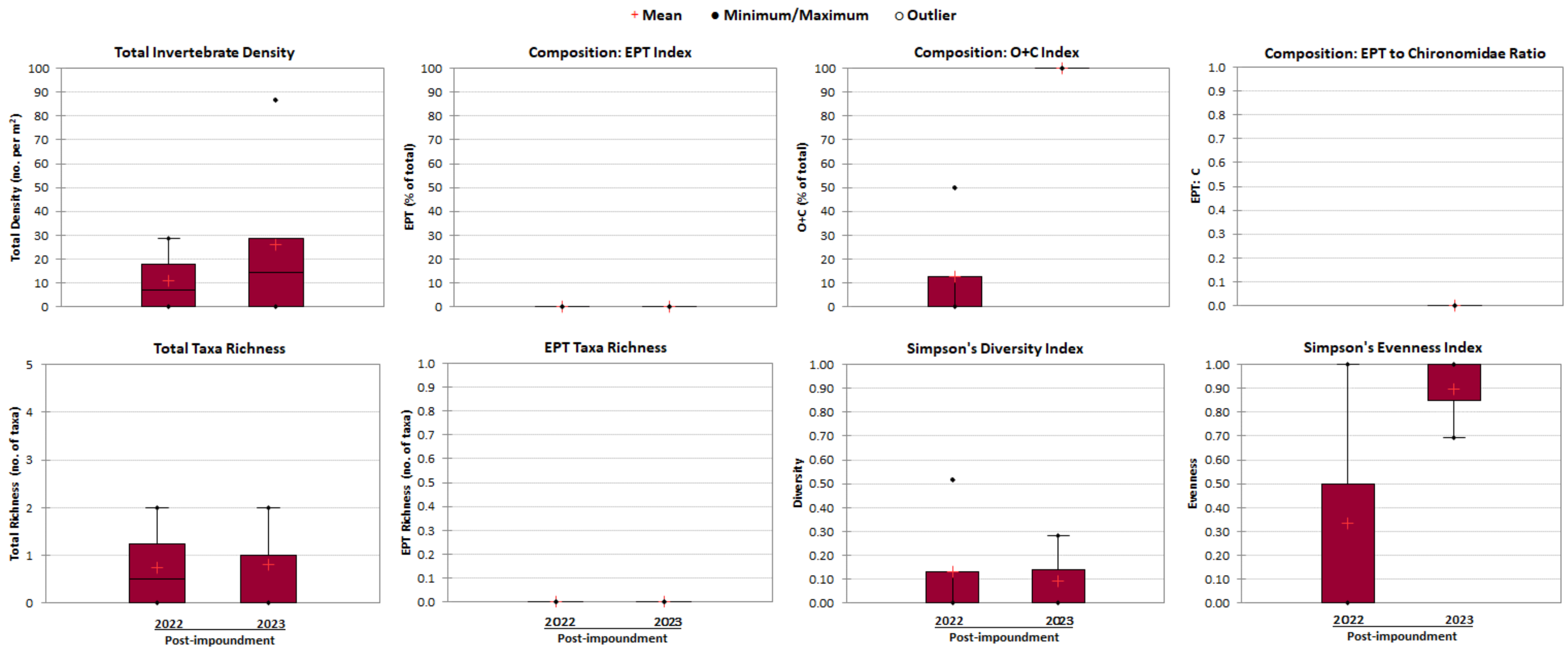


Figure 84: Benthic invertebrate metrics for O'Neil Bay intermittently exposed habitat (grab) for post-impoundment (2022 and 2023).

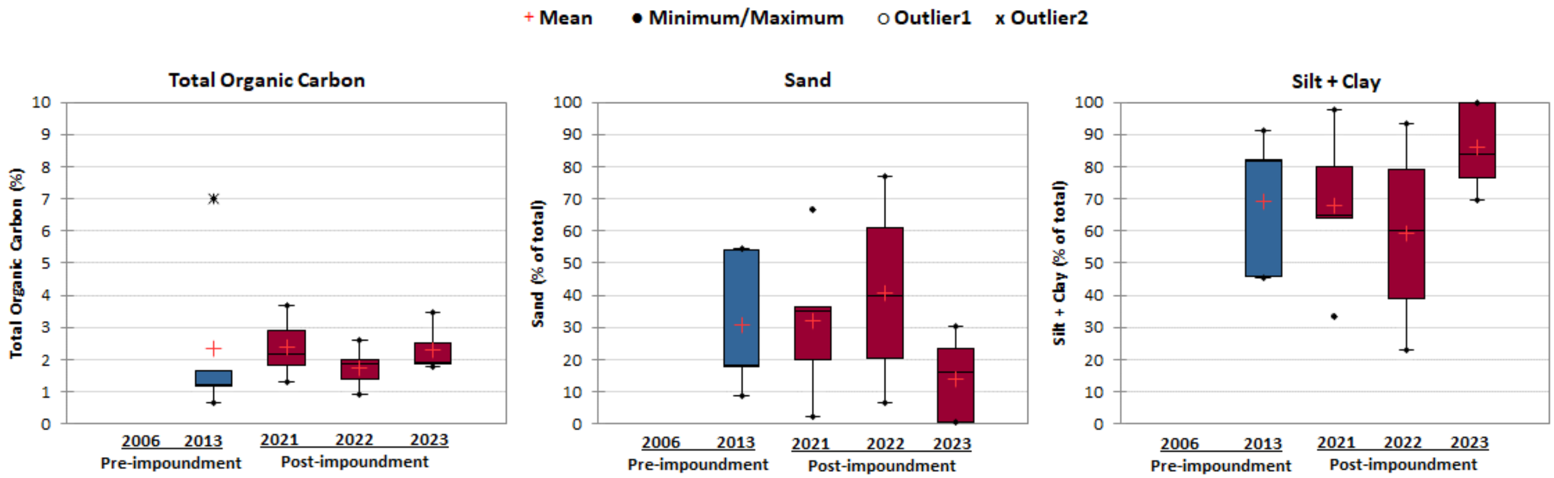


Figure 85: Sediment parameters for O'Neil Bay predominantly wetted habitat for pre-impoundment (2006 and 2013) and post-impoundment (2021, 2022, and 2023).

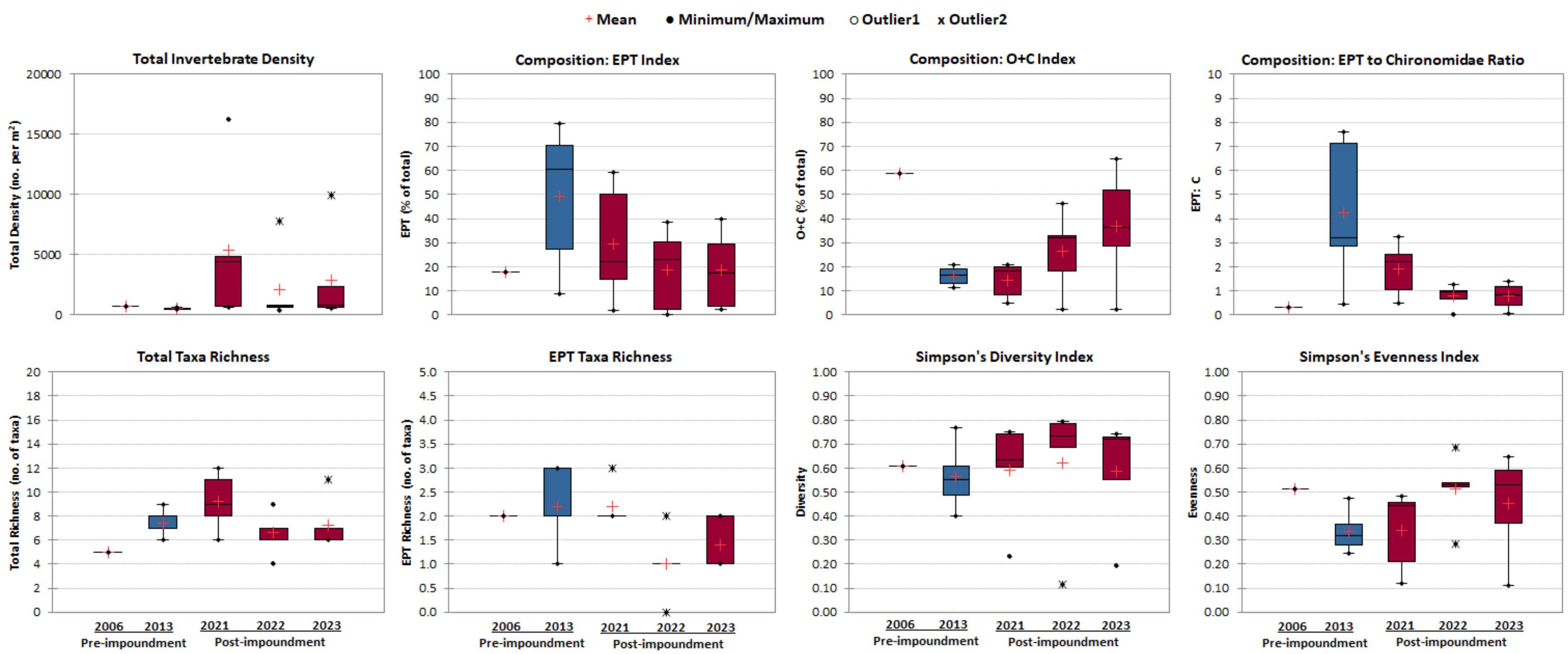


Figure 86: Benthic invertebrate metrics for O'Neil Bay predominantly wetted habitat pre-impoundment (2006 and 2013) and post-impoundment (2021, 2022, and 2023).

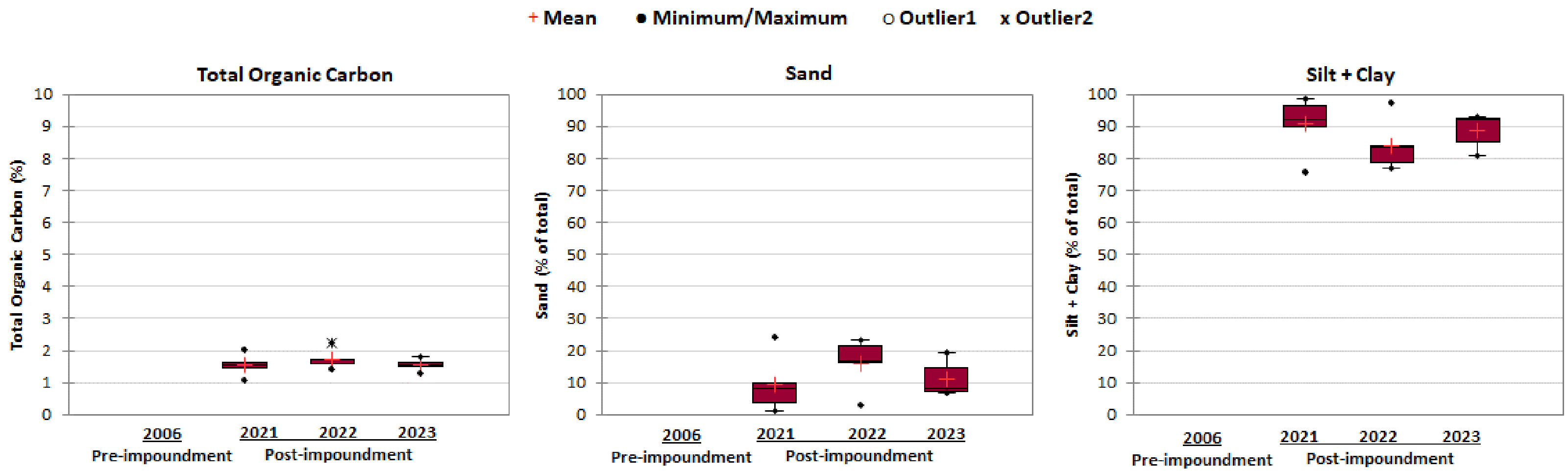


Figure 87: Sediment parameters for O'Neil Bay offshore habitat for pre-impoundment (2006) and post-impoundment (2021, 2022, and 2023).

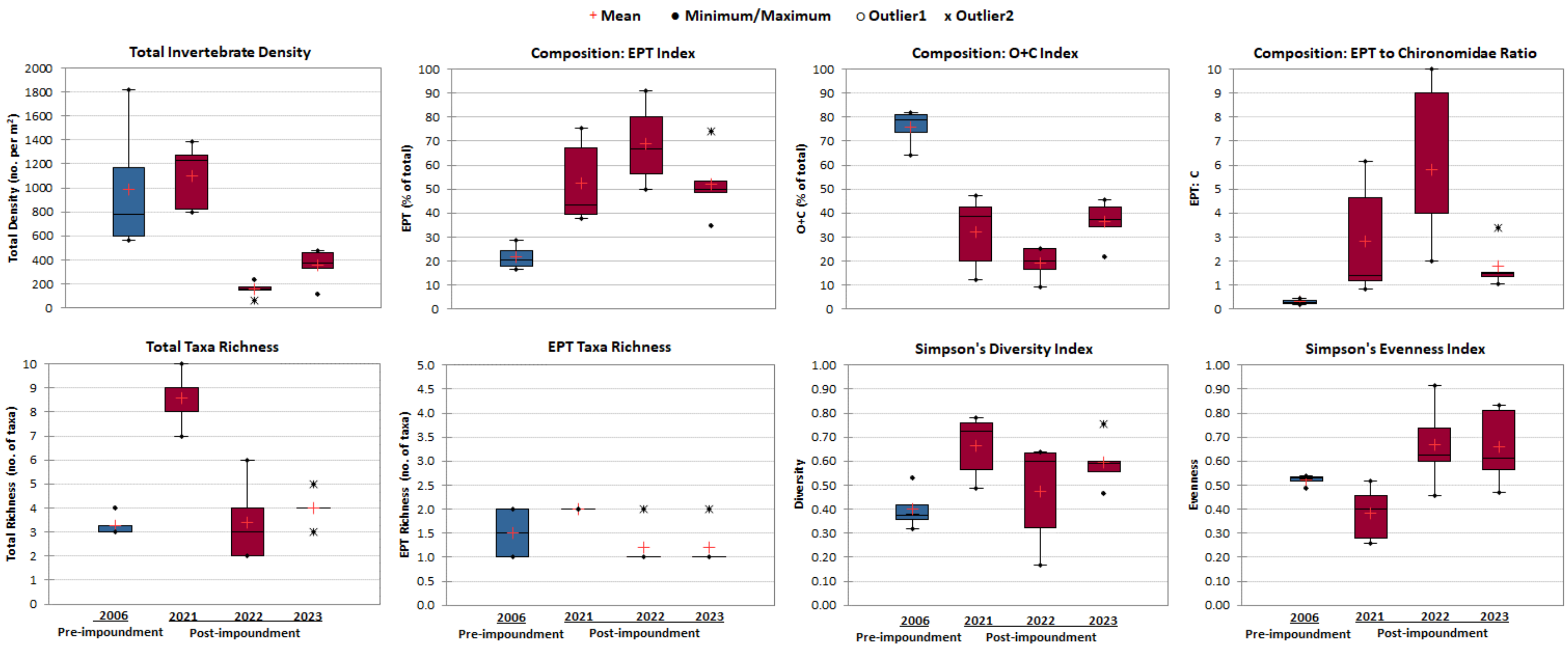


Figure 88: Benthic invertebrate metrics for O'Neil Bay offshore habitat pre-impoundment (2006) and post-impoundment (2021, 2022, and 2023).

4.2.5 SPLIT LAKE

Sampling was conducted in Split Lake to record the invertebrate community in an area not directly affected by the Keeyask GS (upstream of the hydraulic zone of influence) to show how the invertebrate community in a lake upstream can vary from year to year. Comparisons between pre- and post-impoundment periods were conducted to provide a regional context for observed changes in the benthic invertebrate community attributable to natural variation. Pre-impoundment (baseline) monitoring in Split Lake was conducted between 2006 and 2013, with different areas sampled in different years (Map 9). A total of 94 invertebrate and 51 sediment samples were collected during the Project baseline period. Post-impoundment monitoring was conducted between 2021 and 2023; a total of 45 invertebrate and 45 sediment samples were collected. Summary statistics for benthic invertebrate metrics by site and habitat type are provided in Appendix 6 (Tables A6-17 to A6-28). Comparable habitats were compared both pre- and post-impoundment. Conclusions are based on statistical comparisons of means between time periods, presented in Appendix 7 (Tables A7-71 to A7-76).

Kicknet sampling with IE habitats were conducted along transects perpendicular from the shoreline up to water depths of 0.3 to 1.1 m in 2010 to 2013 (pre-impoundment) and 2021 to 2023 (post-impoundment).

- Total organic carbon was comparable between monitoring periods (Figure 89; Table A7-71). In 2021, substrates contained significantly less sand and more silt/clay compared to pre-impoundment (by >50% for both); however, sediment composition in 2022 and 2023 were comparable to that measured during the baseline period (Table A7-71).
- Relative abundances of disturbance-sensitive invertebrate taxa (EPT index), EPT:C, and diversity were comparable between both monitoring periods (Figure 90; Table A7-72). Richness was significantly higher in 2021 but within 50% of the baseline values. In 2022, total invertebrate abundance was lower (by >50%). Taxa richness was also significantly lower in 2022 compared to baseline but only by more than 50% for EPT richness. Relative abundance of disturbance-tolerant taxa (O+C index) and evenness in 2023 were significantly lower (by >50% for both) than baseline and lower compared to 2021 and 2022 (Table A7-72).

PW nearshore habitats were sampled in 1.0 to 3.5 m water depths in both pre-impoundment (2001, 2002, and 2009) and post-impoundment (2021 to 2023).

- Total organic carbon was comparable between monitoring periods (Figure 91; Table A7-73). Substrates contained significantly more sand (by >50%) and less silt/clay in 2021 and 2023 than during baseline.
- Relative densities of disturbance-sensitive (EPT index) and tolerant taxa (O+C index) were comparable between both monitoring periods (Figure 92; Table A7-74). Post-impoundment total richness was significantly higher (by >50%) than the pre-impoundment period. Diversity was significantly higher in 2021 and 2022 but within 50% of the baseline values. In 2023, total

invertebrate density (by >50%) was significantly higher and evenness was significantly lower (by >50%) than the pre-impoundment period (Table A7-74).

OS habitats were sampled in 4.6 to 10.5 m water depths in both pre-impoundment (2001, 2002, and 2009 to 2013) and post-impoundment (2021 to 2023).

- Benthic substrate parameters (total organic carbon and sediment composition) were comparable between the monitoring periods (Figure 93; Table A7-75).
- Benthic invertebrate composition, EPT richness, diversity, and evenness were comparable between the two monitoring periods (Figure 94; Table A7-76). Total invertebrate density was significantly lower (by >50%) post-impoundment compared to baseline. Total richness was significantly lower in 2022 but within 50% of the baseline values (Table A7-76).

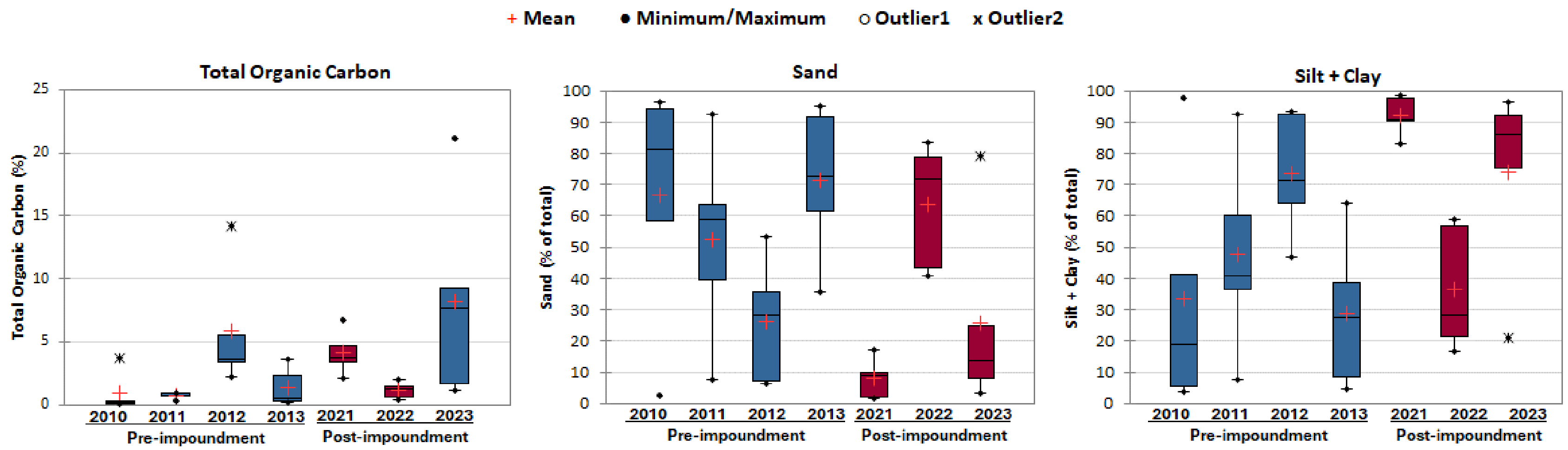


Figure 89: Sediment parameters for Split Lake intermittently exposed habitat (at kicknet sites) for pre-impoundment (2010, 2011, 2012, and 2013) and post-impoundment (2021, 2022, and 2023).

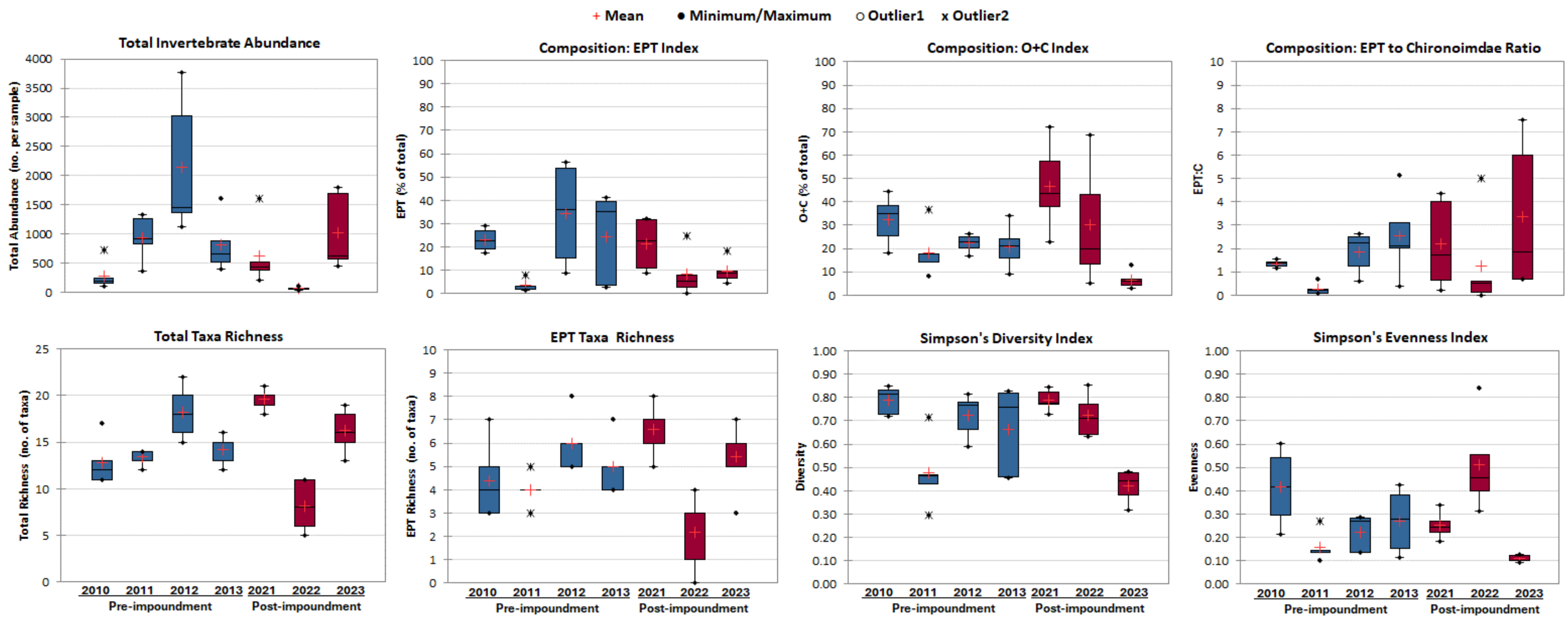


Figure 90: Benthic invertebrate metrics for the Split Lake intermittently exposed habitat (kicknet) for pre-impoundment (2010, 2011, 2012, and 2013) and post-impoundment (2021, 2022, and 2023).

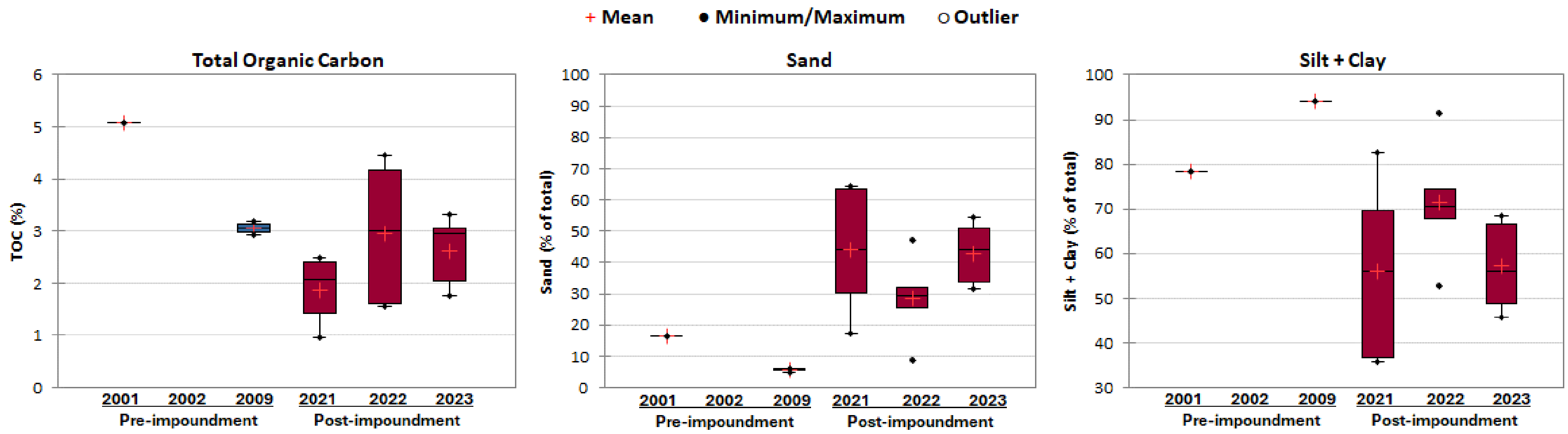


Figure 91: Sediment parameters for Split Lake predominantly wetted habitat for pre-impoundment (2001, 2002, and 2009) and post-impoundment (2021, 2022, and 2023).

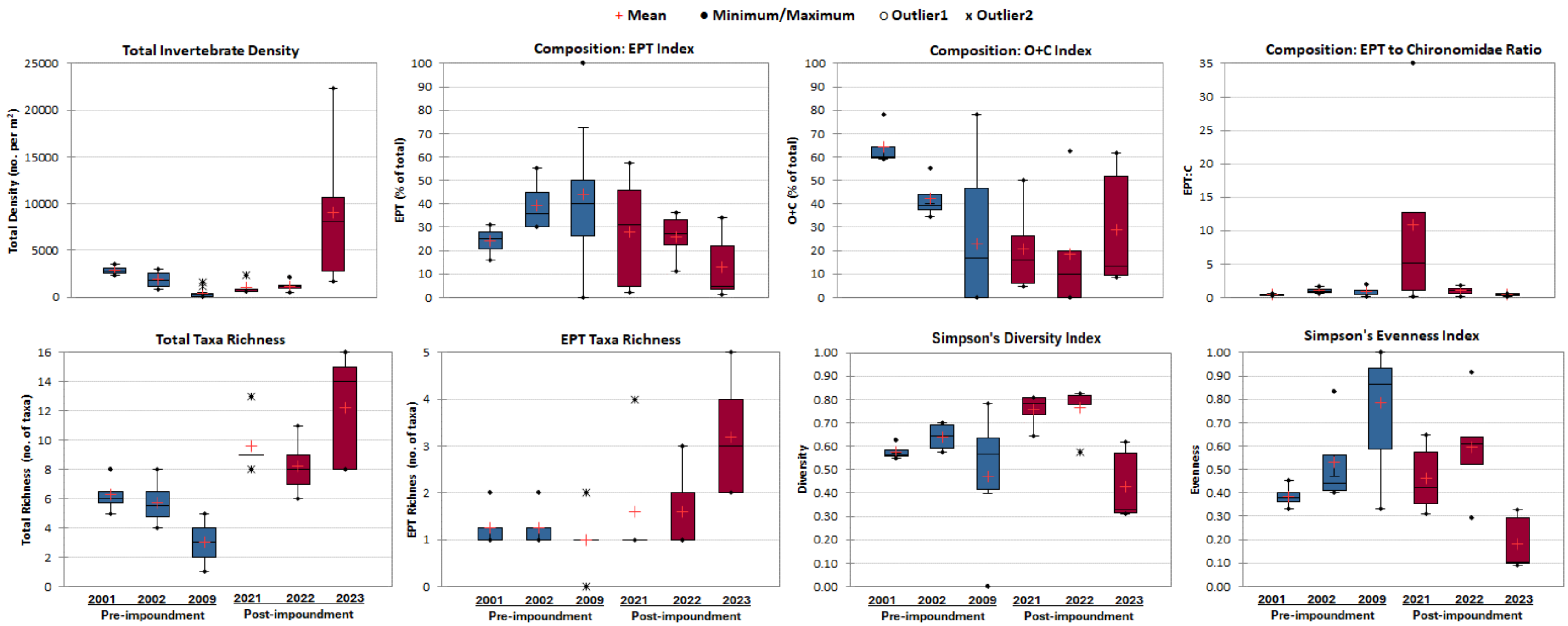


Figure 92: Benthic invertebrate metrics for Split Lake predominantly wetted habitat for pre-impoundment (2001, 2002, and 2009) and post-impoundment (2021, 2022, and 2023).

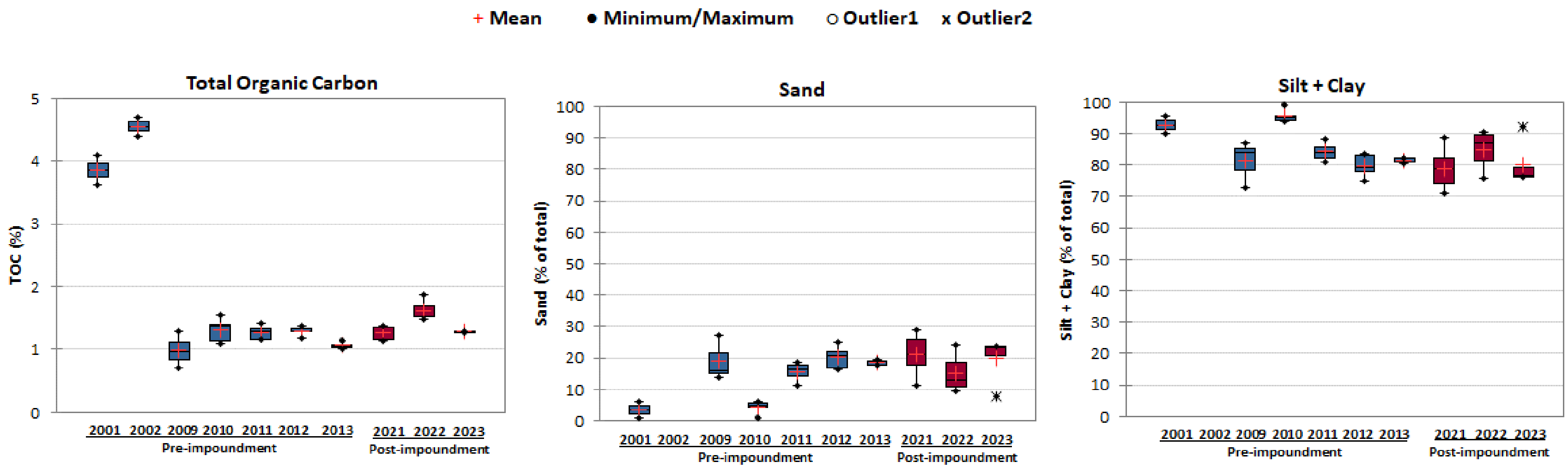


Figure 93: Sediment parameters for Split Lake offshore habitat for pre-impoundment (2001, 2002, 2009 2010, 2011, 2012, and 2013) and post-impoundment (2021, 2022, and 2023).

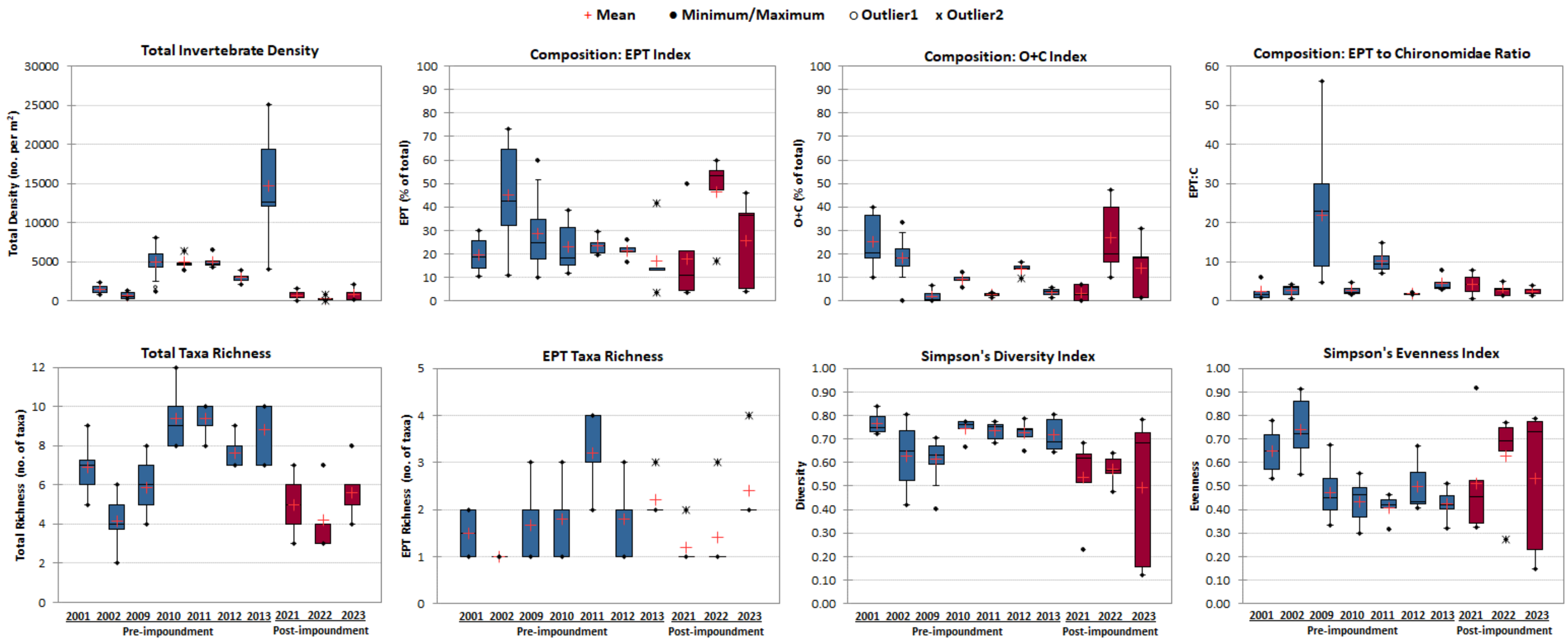


Figure 94: Benthic invertebrate metrics for Split Lake offshore habitat for pre-impoundment (2001, 2002, 2009, 2010, 2011, 2012, and 2013) and post-impoundment (2021, 2022, and 2023).

5.0 DISCUSSION

The primary objective of benthic invertebrate monitoring upstream of the Keeyask GS is to monitor effects of impoundment on the invertebrate community in existing aquatic habitats and the development of an invertebrate community in newly flooded terrestrial areas, which occur primarily in the backbays. Invertebrates would be affected by flooding of habitat, sedimentation, increased frequency of water level fluctuations, and changes in water quality. Benthic invertebrate monitoring downstream of the Keeyask GS is intended to assess effects of habitat changes caused by alteration of flows, water velocities, and depths. Two reference areas are sampled to provide context to results from the Keeyask reservoir and the mainstem of Stephens Lake. Sampling was conducted at sites in O'Neil Bay in Stephens Lake to record the invertebrate community in an area that the Keeyask reservoir backbay sites may resemble in about 25 years. Split Lake, upstream of the hydraulic zone of influence of the Keeyask GS, was sampled to show how the invertebrate community in a lake can vary from year to year.

Benthic invertebrates were sampled within IE, PW, and OS habitats at six locations in the Keeyask reservoir and at three downstream locations in Stephens Lake in the first three years post-impoundment and compared to pre-impoundment conditions. Changes in benthic substrate and invertebrate metrics are described as notable when statistically significant differences were greater than 50% (*i.e.*, a halving or a doubling) from baseline and/or within the operation monitoring period.

5.1 KEY QUESTIONS

Key questions identified in the AEMP for benthic invertebrate monitoring in the Keeyask reservoir and Stephens Lake in the first three years following impoundment are addressed below. Key questions related to longer-term effects will be addressed following benthic invertebrate monitoring at ten years post-impoundment.

Has an area-wide, large increase in benthic invertebrate abundance, and a change in community composition, occurred in the long-term in response to the increased availability of aquatic habitat and changes in substrates?

It was predicted in the EIS that creation of the reservoir would reduce medium and high-water velocity habitats and change substrates to softer silt/clay. In turn, this would increase benthic invertebrate abundance and change community composition in the Keeyask reservoir. PW (1 to 3 m deep) and OS (3 to 10 m deep) habitats of the Keeyask reservoir were sampled both pre- and post-impoundment in three zones (1a, 1b, and 2; Map 7). Sediment parameters in both the PW and OS habitats varied among the mainstem sites following reservoir impoundment. Notable increases in total organic carbon were pronounced at two sites (Zone 1b and 2), while the percent of silt and clay notably increased in the PW habitat at one site (Zone 1a) and in the OS habitat at all three sites in comparison to pre-impoundment samples. Benthic invertebrate abundance and community composition changed little at PW sites; however, the benthic invertebrate community was more diverse (with notably higher total and EPT taxa richness) in at least one of the post-impoundment years at all three sampling sites. This increase in diversity was also observed in Split Lake (the upstream reference site) indicating a potential cause other than the Project. The benthic invertebrate communities changed little between pre-impoundment and post-impoundment in the OS habitats, with the exception that the proportion of disturbance-sensitive taxa (EPT index) notably increased at one site (Zone 2) and the proportion of disturbance-tolerant taxa (O+C index) notably increased at another (Zone 1b). It is expected that silt deposition will increase over time in the Keeyask reservoir (Morrison and Hrenchuk 2024) and that benthic invertebrate communities may continue to change as the reservoir ages.

Are benthic invertebrate abundance and/or distribution in littoral habitat negatively affected by the increased frequency of water level fluctuations?

The EIS predicted that GS operations would lead to an increase in the frequency of water level fluctuations, in turn decreasing benthic invertebrate abundance and changing community composition in the littoral areas (IE) of the Keeyask reservoir. Three sites were sampled in the IE (measuring 1 m or less in depth) habitat in the Keeyask reservoir mainstem both pre- and post-reservoir impoundment (Zones 1a, 1b, and 2; Map 7). Sites were sampled using two methods (kicknet and benthic grab) and covered a variety of substrate types.

Benthic invertebrate abundance from kicknet and grab samples collected from IE habitat was comparable between pre-and post-impoundment at most sites; however, species richness and diversity notably declined in grab samples from one site (Zone 2) and kicknet samples from two sites (Zones 1b and 2) following reservoir impoundment. The invertebrate community at these sites also contained notably higher proportions of disturbance-tolerant taxa including oligochaetes (aquatic worms) and chironomids (non-biting midges). The same patterns were not observed at the upstream reference site in Split Lake, suggesting that the observed differences are likely related to the Project. Habitat monitoring found that substrates within sites near the mainstem of the Keeyask reservoir had organic substrate composed of detritus and loose or broken-down plant matter following impoundment although inorganic substrates, largely silt and clay, were also present in each area (Hrenchuk *et al.* 2024). It is likely that the presence of these substrates following impoundment impacted the benthic invertebrate community.

Do low DO concentrations in areas of flooding and peat disintegration result in initially low levels of benthic abundance and changes to community composition?

The EIS identified flooded backbays in the Keeyask reservoir as areas where effects of the Project on water quality would be greatest (notably in winter under ice cover), with most effects occurring in the initial years post-impoundment. The EIS predicted that conversion of tributary habitat to bays due to flooding and the associated changes in water quality would decrease benthic invertebrate abundance and change community composition and that low DO conditions would limit invertebrate colonization to a few disturbance-resilient groups (*e.g.*, Oligochaeta and Chironomidae). DO concentrations measuring less than 2 mg/L were considered unsuitable for aquatic macroinvertebrates, while those measuring between 2 and 6.5 mg/L were considered minimally suitable.

Sampling was conducted at newly flooded habitats in three Keeyask reservoir backbays (Zones 4, 12, and 8; Map 7). Within the backbays, three habitat types were sampled using a benthic grab sampler targeting water depths of less than 1 m (IE), 1 to 3 m (PW), and 3 to 10 m (OS). Because most of these sites were terrestrial prior to impoundment, little baseline data exist. Pre-impoundment data were available at some sites within two backbays (Zones 4 and 12); however, sampling was conducted at different sites (Map 7).

Flooded reservoir backbay Zone 4 is the farthest upstream backbay sampled and contains less flooded terrestrial habitat than the other two backbays (Map 7). Despite this, low dissolved oxygen (*i.e.*, less than 6.5 mg/L) was measured at some Zone 4 sites during both winter (ice cover) and open-water seasons; however, no anoxic conditions were observed in any sampling season or year (Hrenchuk 2022; Dowd and Hrenchuk 2023, 2024). At the same time, notable increases in total organic carbon and relative percent of silt and clay were observed within Zone 4 IE and PW habitats in the three sampling years. Organic substrate composed of detritus and loose or broken-down plant matter was predominant in both habitat types (Hrenchuk *et al.* 2024). Benthic invertebrate communities in Zone 4 IE habitat were similar between 2022 and 2023 in terms of total density, composition, richness, diversity, and evenness. However, when compared to the original IE habitat (pre-impoundment; Map 7), total invertebrate abundance was higher and relative abundance of disturbance-sensitive taxa (EPT index) was lower. Total invertebrate densities in Zone 4 PW habitat were similar among the post-impoundment years. Total invertebrate density and richness in the OS habitat was notably high in 2021 (following the first year post-impoundment) and then significantly lower in the two years that followed (2022 and 2023). Disturbance-sensitive taxa (*i.e.*, EPT: Ephemeroptera, Plecoptera, and Trichoptera) were absent from samples within IE habitats in 2022, but were present, albeit in small numbers, in 2023. Relative density of EPT in both PW and OS habitats were notably lower in 2023 than any other sampling year. At the same time, relative density of disturbance-tolerant taxa (*i.e.*, Oligochaeta and Chironomidae; O+C index) was comparable among post-impoundment years in both IE and PW habitats, and notably higher in the OS habitat in 2023 compared to 2021.

Prior to impoundment, much of Zone 12 was terrestrial habitat, with small creeks leading to inland ponds (Map 7). Flooding was extensive within this area, and much of the backbay consisted of flooded terrestrial vegetation and peatland (Hrenchuk *et al.* 2024). Over the first three years, dissolved oxygen levels at water quality sites where benthic invertebrates were sampled were above 6.5 mg/L throughout the water column in both the winter and open-water seasons (Hrenchuk 2022; Dowd and Hrenchuk 2023, 2024). However, near anoxic conditions were recorded farther in the backbay in winter 2023 (Dowd and Hrenchuk 2024). Organic substrate composed of detritus and loose or broken-down plant matter was predominant (Hrenchuk *et al.* 2024). Invertebrate sampling of IE, PW, and OS habitats was conducted within an area that was terrestrial prior to reservoir impoundment. Both IE and PW habitats were sampled within the same bay pre-impoundment, although sampling sites differed. No significant changes were observed for the benthic invertebrate community within IE habitat for the two post-impoundment monitoring years and compared to pre-impoundment conditions. Within both PW and OS habitats, the post-impoundment invertebrate community was initially less abundant with notably lower relative densities of sensitive taxa (EPT index) compared to pre-impoundment, while total invertebrate density and relative densities of disturbance-tolerant taxa (O+C index) were notably higher in 2023 compared to 2022.

Zone 8 is the farthest downstream backbay sampled, located in lower Gull Lake. Much of this area was terrestrial habitat prior to reservoir impoundment with a small central creek (named Effie Creek) leading to an inland pond (Map 7). Organic substrate composed of detritus and loose or broken-down plant matter was predominant in this area over all three years post-impoundment (Hrenchuk *et al.* 2024). DO levels near the benthic invertebrate monitoring site were low in most sampling periods during both winter and open water (Hrenchuk 2022; Dowd and Hrenchuk 2023, 2024). Anoxic conditions were observed at this site during both winter 2021 and 2023. Compared to 2022, there was a decrease in the relative proportion of the disturbance-tolerant taxa (O+C index) in 2023 in the IE habitat. Otherwise, the invertebrate communities of the second and third years post-impoundment were similar within all habitat types.

O'Neil Bay in Stephens Lake provides a reference site for the potential future condition of the Keeyask reservoir backbay sites in about 25 years (Map 8). Benthic invertebrate communities in IE habitats in the backbays were generally more abundant than in O'Neil Bay, with mean values ranging from 10,376 to 25,994 individuals per m^2 in Zone 4, 3,038 to 4, 703 per m^2 in Zone 12, 3,569 to 4,795 per m^2 in Zone 8, compared to only 11 to 26 per m^2 in O'Neil Bay. The high densities of benthic invertebrates in the IE areas of the flooded reservoir backbays likely reflect trophic upsurge, a short-term increase in general ecosystem productivity following impoundment of reservoirs due to increased nutrient levels from the flooding of terrestrial habitat and the subsequent decomposition of organic matter.

Have irregular flow patterns in Stephens Lake contributed to a reduction in benthic invertebrate taxa richness?

It was predicted in the EIS that operation of the Keeyask GS may alter flow patterns in Stephens Lake downstream of the GS but these changes were not expected to affect the benthic invertebrate community in the long-term. Sites in Stephens Lake were located three (3KM) and eleven (11KM) kilometres downstream of the Keeyask GS (Map 8). Differences in richness were observed pre-/post-impoundment at some of the sampling locations, but overall, there was not a consistent reduction in total richness. However, compared to pre-impoundment there was a notable decrease in EPT richness in one or more post-impoundment years in the 3KM and 11KM IE kicknet samples and in the 3KM OS habitat.

Has reduced ice scour in littoral habitat contributed to a change to the abundance and/or distribution of benthos?

Prior to construction of the Keeyask GS, a hanging ice dam formed downstream of Gull Rapids, extending 5 km into Stephens Lake, causing scouring and some redirection of flow. It was predicted in the EIS that operation of the Keeyask GS would prevent the formation of this ice dam, which would reduce the extent and severity of ice scour downstream of the GS. In turn, benthic invertebrate abundance would increase in these areas and the community composition would change. Benthic invertebrate samples were collected in 2023 at three locations approximately 2 to 3 km downstream of the Keeyask GS where sampling had been conducted pre-Project in 1.0 to 11.7 m water depth (Map 8). As predicted in the EIS, ice formation at the Stephens Lake inlet was smoother and thinner and hanging ice dams did not form over the winters of 2022 and 2023 (Manitoba Hydro 2022, 2023). However, the benthic invertebrate community and sediment parameters were similar between both the pre- and post-impoundment monitoring periods.

Are there any unexpected effects on the benthic invertebrate community that may be related to GS operation?

No unexpected effects on the benthic invertebrate community that may be related to operation of the Keeyask GS were observed in the first three years following reservoir impoundment; however, the invasion of zebra mussels was not anticipated when the EIS was written. Zebra mussel veliger monitoring began in 2017; zebra mussels were first found in the Keeyask area in 2019 and have since established in large numbers (*Zebra Mussel Monitoring Plan* in accordance with the Keeyask *Environment Act* Licence; Manitoba Hydro and North/South Consultants Inc. 2018 to 2023, inclusive). Although this change is not Project-related, zebra mussels have become a major part of the benthic invertebrate community throughout the study area. In 2023, zebra mussels were the most abundant taxon within both the PW and OS habitats in Split Lake (the upstream reference area), as well as in the OS habitat within one of the mainstem sites in the Keeyask reservoir. They were also the most abundant taxon within the PW habitat in O'Neil Bay (the reference area for the backbay sites). It is expected that as conditions in the Keeyask reservoir become more like those in Split Lake and O'Neil Bay, the benthic invertebrate community will also change and will likely include zebra mussels.

Benthic macroinvertebrate monitoring was conducted annually in the first three years post-impoundment to document early conditions and changes. Going forward, changes are expected to occur more slowly, thus monitoring will be conducted every three years (next in 2026). Surveys will be repeated using the same methods to document development of the benthic invertebrate community in the Keeyask reservoir.

6.0 SUMMARY AND CONCLUSIONS

- Benthic invertebrate sampling was completed during the first three years post-impoundment at sites representing the range of habitat in the reservoir as follows:
  - Permanently wetted and offshore sites in the mainstem of the Keeyask reservoir; littoral (intermittently exposed) sites along the mainstem; and predominantly wetted and intermittently exposed sites in backbays that reflect a range of flooding of terrestrial habitat.
  - Benthic invertebrates were sampled downstream of the GS at sites in Stephens Lake to determine whether there were effects related to changes in flow or ice scour.
  - Reference sites were sampled in Split Lake to indicate interannual variation in the benthic invertebrate community in the absence of Project effects and in O'Neil Bay in Stephens Lake as an example of a backbay environment 25 years after impoundment.
- Monitoring of the permanently wetted (PW) and offshore (OS) mainstem sites in the Keeyask reservoir indicated the benthic invertebrate community overall did not notably change post-impoundment in these habitat types.
- Monitoring of the Keeyask reservoir mainstem littoral (IE) habitat indicated that the community was generally comparable between pre-and post-impoundment at most sites. However, at some sites there were notably higher proportions of disturbance-tolerant taxa including oligochaetes (aquatic worms) and chironomids (non-biting midges) and lower proportions of disturbance-sensitive (EPT index) taxa. This change may be due to the presence of organic substrate composed of detritus and loose or broken-down plant matter at these sites. Sampling at these mainstem littoral sites was intended to address the effects of frequent water level changes on the benthic fauna but since the GS did not cycle during the sampling period, this potential effect could not be addressed.
- Monitoring in the three backbays showed varying effects depending on the amount of flooding and whether formally terrestrial areas were sampled. Overall, newly flooded terrestrial habitat was rapidly colonized by tolerant taxa (oligochaetes and chironomids), but sensitive taxa (EPT) were not abundant. Comparisons of similar habitats pre- and post-impoundment found that tolerant taxa were relatively more abundant and sensitive taxa relatively less abundant.
- Monitoring in habitats downstream of the Keeyask GS in Stephens Lake indicated there was no reduction in total benthic invertebrate taxa richness compared to pre-impoundment conditions.
- Monitoring in the Nelson River from the GS to the inlet of Stephens Lake within the first three years post-impoundment indicated there were no changes in benthic invertebrate abundance or composition compared to pre-impoundment conditions.

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APPENDICES

APPENDIX 1: BENTHIC INVERTEBRATE SAMPLE PROCESSING PROTOCOL AND QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) PROCEDURES

Detailed sample processing protocols are developed on a by-project-basis depending on the specific needs of each client. The following provides an overview of standard QA/QC procedures employed for each project.

Large &/or Rare Search for Samples Requiring Sub-Sampling

- Sample is washed and sieved using appropriate sized mesh;
- Entire sample is scanned for large &/or rare invertebrates in an appropriately sized tray. This scan is conducted on a per sample basis to avoid under-representing taxa that tend to occur singly or in few numbers that may be missed as a result of sub-sampling;
- Large organisms tend to occur in small numbers (*e.g.*, Belostomatidae, crayfish); these organisms are rare in relation to the overall number of organisms in the sample being processed. Based on the overall number of organisms in the sample, if an organism tends to occur rarely with respect to the rest of the organisms in the sample, this organism is removed (or more, if > 1) and retained in a separate vial for taxonomic identification; and
- Large &/or rare organisms are not included in the split correction and this is indicated clearly on the bench sheet. It is noted that there is a separate vial containing large &/or rare organisms.

Sample Processing

Sub-Sampling

- Most samples are sub-sampled (unless requested by the client) to decrease processing time. A minimum of 300 organisms processed ensures the inclusion of more rare taxa and permits comparisons of richness among sites;
- The entire sample is examined in a large tray and estimate the number of splits necessary to produce the appropriate number of aliquots needed to achieve a 300-organism target;
- If a sample contains > 300 organisms, large &/or rare invertebrates and any small fish are removed from the whole sample before sub-sampling (see above);
- When > 300 organisms are present, the sample is split into halves. In order to reduce any bias created by the mixing/splitting process, the well-cleaned and mixed sample is split using a 1.0 or 4.0 L [specific to sample volume] Folsom Plankton Splitter. Each sub-sample is subsequently sorted until at least 300 animals are counted. When the 300-organism count is

achieved part way through a sub-sample, the remainder of this fraction is sorted so that a known fraction is sorted. All splitting information is recorded on the bench sheet.

- In sparse samples (*i.e.*, containing ~300 animals or less), the entire sample is processed;
- To be counted, a specimen must have enough intact body parts to permit its identification to the targeted level, and it must have a head (this prevents a body and detached head from being counted as two animals);
- Larval exuviae (exoskeleton remains), and empty shells (snails and clams) and cases (caddisflies) are not counted in the 300-fixed count. If there are no "live" molluscs in the sample, a few empty shells are set aside for identification; these are placed into vial with the large &/or rare specimens;
- The taxa Porifera, Nemata, Copepoda, Cladocera, Rotifera, Platyhelminthes, Ostracoda, and non-aquatic (terrestrial) taxa are not included in the 300 organism count because they are not considered as part of the benthic macroinvertebrate community. Typically, they are counted and their numbers recorded on the bench sheet.

Sorting Samples

- Sorting aquatic samples involves removing aquatic macroinvertebrates from organic and inorganic materials within each sample;
- All sorting is conducted with a 3x desktop magnifier or stereomicroscope [specific to project];
- All sorted samples are checked by a 2nd laboratory technician (QA/QC technician);
- Any additional invertebrates collected during the QA/QC process are combined with the original sample, but counted separately;
- Sorting efficiency must be ≥ 95%. The QA/QC technician checks on a tray-by-tray basis so that the sample is handled as few times as possible; the QA/QC technician will sort any remaining invertebrates from the tray and record the number of missed invertebrates per tray;
- The QA/QC technician will also check the bench sheet data to ensure it matches the sample data; and
- Sorted invertebrate samples are stored in 70% ethanol prior to delivery to the taxonomist.

Verification of Taxonomic Identification

- NSC taxonomists regularly communicate with external taxonomic specialists to ensure accuracy and consistency.

Sample Identifications

- Samples are identified to the appropriate taxonomic level [specific to client] by an in-house or external taxonomist. Ten percent (10%) of the in-house identifications are randomly selected and sent to an external taxonomy specialist for QA/QC. The accuracy of the sample subset is assessed for identification and enumeration; all unknown invertebrates are sent to an external specialist; incorrect identifications and/or enumeration discrepancies are noted on the laboratory datasheet;

- The target overall accuracy level for in-house invertebrate identifications and enumeration is 95% at the Family level and 90% at the Genus level. Corrected identifications and enumeration values received from the external taxonomist are used in place of in-house data discrepancies. If the average error rate of audited samples is outside the target, the entire project must be re-identified by someone other than the original taxonomist.

Data Processing

- Data from field books and laboratory bench sheets are entered into an MS Excel® data template;
- Data templates specify the Project Name, Study Area, Site Location/Description, GPS coordinates (Global Positioning System), Site Label, Sampling Date, Time of Day, Gear Type, Sieve Mesh Size in Field/Laboratory, Presence or Absence of Vegetation/Algae, Water Temperature, Water Depth, Velocity, Substrate Type, Number of Splits, Taxonomic List, Life Stage, and Enumeration List;
- A 2nd and 3rd technician sequentially verify all entered data and formulae to original field book and laboratory bench sheets (*i.e.*, verification is done twice) and a final verification is conducted by the project biologist and/or report author.

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APPENDIX 2: KEEYASK 2023 BENTHIC INVERTEBRATE MONITORING DATA

Table A2-1: Site and habitat data measured at benthic invertebrate monitoring sites in Split Lake, 2023.

Site ID	Habitat Type	Date	UTM coordinates (Zone 15U)		Water Temp (°C)	Water Depth (m)	Water Velocity (m/s)	Secchi Depth (m)	Algae Type	Dominant Substrate
			Easting	Northing						
SPLIT-IE	Intermittently Exposed	17-Aug	673615	6232643	-	0.6	0.00	-	Filamentous	organic matter/clay
SPLIT-PW	Predominantly Wetted	17-Aug	673665	6233005	20	1.3	0.00	0.6	Balls	clay/organic matter
SPLIT-OS	Offshore	17-Aug	678441	6233979	22	6.2	0.15	1.1	None	clay/shell pieces

Table A2-2: Benthic invertebrate analysis output, Split Lake, 2023.

		Split Lake														
	Sample ID	SPLIT-IE-R1	SPLIT-IE-R2	SPLIT-IE-R3	SPLIT-IE-R4	SPLIT-IE-R5	SPLIT-PW-R1	SPLIT-PW-R2	SPLIT-PW-R3	SPLIT-PW-R4	SPLIT-PW-R5	SPLIT-OS-R1	SPLIT-OS-R2	SPLIT-OS-R3	SPLIT-OS-R4	SPLIT-OS-R5
	Water Depth (mean,m)	0.6	0.6	0.5	0.3	0.4	1.3	1.0	1.3	1.2	1.6	6.2	8.5	5.4	5.9	8.6
Taxa	Sub-sampling correction factor	0.25	0.0625	0.25	0.0625	0.0625	0	0	0	0	0	0	0	0	0	0
Oligochaeta	Clitellata (aquatic oligochaete worms)	8	5	7	11	53	0	390	0	29	0	0	0	0	0	0
Crustacea	Gammaridae	10	11	11	21	11	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	376	485	403	1189	1334	0	43	14	72	0	14	0	0	0	14
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	14	14	0
Mollusca	Dreissenidae (zebra mussels)	7	11	9	27	11	0	18366	8671	6608	0	1948	72	29	72	1053
	Pisidiidae (fingernail clams)	3	11	0	0	5	101	58	43	58	58	0	0	0	0	0
	Gastropoda (snails) - unidentified	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0
	Hydrobiidae	0	5	0	0	0	58	101	231	87	72	0	0	0	0	0
	Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae	1	0	0	0	5	0	14	0	0	0	0	0	0	0	0
	Planorbidae	0	0	0	5	0	0	87	29	29	0	0	0	0	0	0
	Valvatidae	0	0	1	0	5	29	72	87	43	0	0	0	0	0	0
Odonata	Aeshnidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coenagrionidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coleoptera	Dytiscidae (larvae + adult)	0	0	1	5	5	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemeroptera	Baetidae (larvae)	12	27	76	27	59	0	0	0	0	0	0	0	0	0	0
	Baetiscidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae (larvae)	23	5	11	11	5	0	0	14	0	0	0	0	0	0	0
	Ephemerellidae (larvae)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae (larvae)	1	6	5	37	23	548	188	433	216	577	43	43	72	58	29
	Heptageniidae (larvae)	0	0	0	0	0	0	0	0	0	0	29	0	0	0	0
	Leptophlebiidae (larvae)	1	5	3	0	21	0	0	0	0	0	0	0	0	0	0
Plecoptera	Chloroperlidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Dipseudopsidae (larvae)	0	0	0	0	0	0	0	14	29	0	0	0	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	16	5	0	11	58	43	29	14	14	29	14	14	29	14
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	1	0	0	0	0	14	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	1	0	3	0	5	0	14	0	0	0	0	0	0	0	0
Ceratopogonidae	Ceratopogonidae (larvae)	4	0	1	0	5	216	245	72	58	87	14	0	0	0	0
Chaoboridae	Chaoboridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	Chironomidae (larvae + pupae)	5	32	17	107	181	1688	2611	938	721	895	29	29	58	43	14
All Other Taxa	Hirudinida (leeches)	0	0	1	5	0	0	14	0	0	0	0	0	0	0	0
	Cambaridae (crayfish)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Hydrachnidae (water mites)	3	0	1	5	0	0	0	0	0	0	0	0	0	0	0
	Hydrozoa (hydra)	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	11	0	43	72	43	43	14	0	0	0	14	0
	Corixidae (water boatmen)	0	0	9	229	53	0	0	14	0	14	0	0	0	0	0
	Empididae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A2-3: Benthic sediment analysis output, Split Lake, 2023.

Split Lake											
Habitat Type	Sample ID	Water Depth (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	SPLIT-IE-R1	0.1	0.407	3.39	9.66	9.25	79.2	13.1	7.8	Loamy sand
	SPLIT-IE-R2	0.3	1.39	11.6	22.5	21.1	24.7	61.9	13.4	Silt loam
	SPLIT-IE-R3	0.2	2.40	20.0	10.1	7.70	13.8	67.0	19.2	Silt loam
	SPLIT-IE-R4	0.2	3.88	32.3	5.54	1.66	8.2	62.2	29.7	Silty clay loam
	SPLIT-IE-R5	0.1	3.50	29.2	4.67	1.17	3.3	49.8	46.8	Silty clay
Predominantly Wetted	SPLIT-PW-R1	1.3	1.81	15.1	4.76	2.95	33.5	47.6	19.0	Loam
	SPLIT-PW-R2	1.0	1.72	14.4	4.78	3.06	51.1	33.7	15.2	Loam
	SPLIT-PW-R3	1.3	1.79	15.0	5.11	3.32	31.7	45.5	22.8	Loam
	SPLIT-PW-R4	1.2	1.54	12.8	3.60	2.06	54.3	29.9	15.9	Sandy loam
	SPLIT-PW-R5	1.6	1.88	15.6	3.64	1.76	44.0	36.7	19.3	Loam
Offshore	SPLIT-OS-R1	6.1	1.80	15.0	3.07	1.27	23.8	65.5	10.8	Silt loam
	SPLIT-OS-R2	8.5	1.84	15.3	3.14	1.30	23.4	64.4	12.1	Silt loam
	SPLIT-OS-R3	5.4	2.20	18.3	3.47	1.27	7.7	69.0	23.3	Silt loam
	SPLIT-OS-R4	5.9	1.90	15.8	3.19	1.29	20.8	66.2	13.0	Silt loam
	SPLIT-OS-R5	8.6	2.11	17.6	3.38	1.27	23.6	64.5	11.9	Silt loam

Table A2-4: Site and habitat data measured at benthic invertebrate monitoring sites in the Keeyask reservoir, 2023.

Site ID	Habitat Type	Date	UTM coordinates (Zone 15U)		Water Temp (°C)	Water Depth (m)	Water Velocity (m/s)	Secchi Depth (m)	Algae Type	Dominant Substrate
			Easting	Northing						
ZONE1A-IE	Intermittently Exposed	17-Sep	336024	6243919	15	1.2	0.08	1.0	None	organic matter/silt
ZONE1A-PW	Predominantly Wetted	17-Sep	336113	6244145	15	1.3	0.02	>2	None	organic matter/silt
ZONE1A-OS	Offshore	18-Sep	335911	6244316	15	5.1	0.04	1.9	None	clay/silt/organic matter
ZONE4-IE	Intermittently Exposed	18-Sep	341207	6244675	15	0.9	0.00	>1	Balls	organic matter/silt
ZONE4-PW	Predominantly Wetted	18-Sep	339824	6245074	15	2.1	0.02	1.5	None	organic matter/silt
ZONE4-OS	Offshore	18-Sep	339033	6245355	15	4.4	0.09	1.3	None	clay/silt/organic matter
ZONE12-IE	Intermittently Exposed	19-Sep	353351	6242556	16	0.5	0.00	>0.5	None	organic matter/silt
ZONE12-PW	Predominantly Wetted	19-Sep	353137	6242676	15	2.4	0.02	0.9	None	organic matter/silt
ZONE12-OS	Offshore	19-Sep	353056	6242775	15	3.6	0.06	0.9	None	organic matter/silt
ZONE1B-IE	Intermittently Exposed	20-Sep	353221	6245902	16	0.3	0.00	>0.5	Attached	organic matter/silt
ZONE1B-PW	Predominantly Wetted	20-Sep	353123	6245889	16	2.6	0.00	1.4	None	organic matter/silt
ZONE1B-OS	Offshore	19-Sep	353086	6245713	16	3.8	0.03	1.3	None	organic matter/silt
ZONE8-IE	Intermittently Exposed	21-Sep	354116	6249330	15	0.7	0.01	>0.5	Balls	organic matter/silt
ZONE8-PW	Predominantly Wetted	20-Sep	354230	6249097	16	2.1	0.03	1.4	None	organic matter/silt
ZONE8-OS	Offshore	20-Sep	354731	6248817	16	3.9	0.02	1.2	None	organic matter/silt
ZONE2-IE	Intermittently Exposed	22-Sep	356358	6248539	15	0.3	0.00	>0.5	None	gravel/sand/silt/organic matter
ZONE2-PW	Predominantly Wetted	21-Sep	356122	6248539	16	1.9	0.01	1.0	None	organic matter/silt
ZONE2-OS	Offshore	21-Sep	356316	6248475	15	5.9	0.01	1.0	None	silt/organic matter/clay

Table A2-5: Benthic invertebrate analysis output, Keeyask reservoir, 2023.

	Sample ID	Zone 1A														
		DSBDAY-IE-R1	DSBDAY-IE-R2	DSBDAY-IE-R3	DSBDAY-IE-R4	DSBDAY-IE-R5	DSBDAY-PW-R1	DSBDAY-PW-R2	DSBDAY-PW-R3	DSBDAY-PW-R4	DSBDAY-PW-R5	DSBDAY-OS-R1	DSBDAY-OS-R2	DSBDAY-OS-R3	DSBDAY-OS-R4	DSBDAY-OS-R5
	Water Depth (mean,m)	1.2	0.9	0.9	0.8	0.8	1.3	1.7	2.7	2.3	1.2	5.1	5.4	4.6	5.4	4.7
Taxa	Sub-sampling correction factor	0.125	0.03125	0.03125	0.125	0.125	0.03125	0	0.125	0	0.5	0	0	0	0	0
Oligochaeta	Clitellata (aquatic oligochaete worms)	462	1847	2770	577	0	29	0	115	0	1529	0	0	0	0	29
Crustacea	Gammaridae	0	58	476	87	0	0	0	0	0	29	0	0	0	0	0
	Hyalellidae	433	3679	1385	1717	0	2770	14	14	0	548	0	0	0	0	0
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca	Dreissenidae (zebra mussels)	0	0	0	0	0	0	0	0	0	404	0	0	144	216	115
	Pisidiidae (fingernail clams)	29	14	0	14	0	462	0	0	0	58	0	0	0	0	0
	Gastropoda (snails) - unidentified	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrobiidae	0	0	0	0	0	29	43	14	0	29	0	0	0	0	0
	Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0
	Planorbidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Valvatidae	43	0	476	14	0	462	29	0	0	87	0	0	0	0	0
Odonata	Aeshnidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coenagrionidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coleoptera	Dytiscidae (larvae + adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemeroptera	Baetidae (larvae)	0	0	462	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae (larvae)	29	1140	0	43	0	462	216	14	0	491	0	0	0	0	0
	Ephemerellidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae (larvae)	58	43	43	14	0	101	43	115	14	87	29	29	29	58	14
	Heptageniidae (larvae)	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0
	Leptophlebiidae (larvae)	0	0	14	0	0	0	72	29	0	577	0	0	0	0	0
Plecoptera	Chloroperlidae (larvae)	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0
Trichoptera	Dipseudopsidae (larvae)	0	14	43	72	0	0	0	0	0	0	0	0	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	0	0	14	0	0	14	0	0	58	0	0	0	0	0
	Limnephilidae (larvae)	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	14	0	14	0	0	0	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceratopogonidae	Ceratopogonidae (larvae)	231	14	0	361	0	0	0	0	0	289	0	0	14	0	0
Chaoboridae	Chaoboridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	Chironomidae (larvae + pupae)	3463	1385	3232	245	0	317	736	923	447	4761	0	0	101	0	14
All Other Taxa	Hirudinida (leeches)	0	0	58	14	0	29	0	0	0	14	0	0	0	0	0
	Cambaridae (crayfish)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrachnidae (water mites)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrozoa (hydra)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	14	0	0	0	0	29	0	0	0	0	0	0	0	0	0
	Corixidae (water boatmen)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A2-5: Continued.

	Sample ID	Zone 4														
		ZONE4-IE-R1	ZONE4-IE-R2	ZONE4-IE-R3	ZONE4-IE-R4	ZONE4-IE-R5	ZONE4-PW-R1	ZONE4-PW-R2	ZONE4-PW-R3	ZONE4-PW-R4	ZONE4-PW-R5	ZONE4-OS-R1	ZONE4-OS-R2	ZONE4-OS-R3	ZONE4-OS-R4	ZONE4-OS-R5
	Water Depth (mean,m)	0.9	0.6	0.3	0.8	0.8	2.1	1.5	1.5	2.6	1.5	4.4	4.3	4.7	3.7	4.8
Taxa	Sub-sampling correction factor	0.125	0	0	0.125	0	0.25	0	0.125	0.125	0	0	0	0	0	0
Oligochaeta	Clitellata (aquatic oligochaete worms)	6694	3693	5713	15582	332	346	144	231	1616	144	0	115	0	144	0
Crustacea	Gammaridae	0	0	0	58	260	58	173	0	43	43	0	0	0	0	0
	Hyalellidae	1731	1053	43	577	159	1039	1587	577	346	779	0	0	0	0	0
	Pontoporeiidae	0	433	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca	Dreissenidae (zebra mussels)	0	0	0	0	0	462	29	0	0	0	43	245	115	0	0
	Pisidiidae (fingernail clams)	0	0	0	0	0	289	101	115	14	0	0	0	0	0	0
	Gastropoda (snails) - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrobiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae	0	0	0	14	29	0	0	0	0	0	0	0	0	0	0
	Planorbidae	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0
	Valvatidae	0	0	0	0	0	58	87	115	72	0	0	0	0	14	0
Odonata	Aeshnidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coenagrionidae (larvae)	0	0	0	0	0	0	29	0	0	0	0	0	0	0	0
Coleoptera	Dytiscidae (larvae + adult)	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemeroptera	Baetidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0
	Ephemerellidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae (larvae)	0	0	0	0	0	0	0	0	0	0	29	87	72	144	0
	Heptageniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plecoptera	Chloroperlidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Dipseudopsidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	0	0	0	0	0	14	0	0	0	0	14	0	0	0
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0
Ceratopogonidae	Ceratopogonidae (larvae)	115	0	14	115	0	0	0	0	0	0	0	0	0	58	14
Chaoboridae	Chaoboridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	Chironomidae (larvae + pupae)	8657	1702	1327	2886	289	620	1414	3578	1399	433	43	115	43	159	43
All Other Taxa	Hirudinida (leeches)	115	29	14	144	43	72	29	0	87	58	0	0	0	0	0
	Cambaridae (crayfish)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrachnidae (water mites)	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0
	Hydrozoa (hydra)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0	14	14	0	0	29
	Corixidae (water boatmen)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A2-5: Continued.

	Sample ID	Zone 12														
		ZONE12-IE-R1	ZONE12-IE-R2	ZONE12-IE-R3	ZONE12-IE-R4	ZONE12-IE-R5	ZONE12-PW-R1	ZONE12-PW-R2	ZONE12-PW-R3	ZONE12-PW-R4	ZONE12-PW-R5	ZONE12-OS-R1	ZONE12-OS-R2	ZONE12-OS-R3	ZONE12-OS-R4	ZONE12-OS-R5
	Water Depth (mean,m)	0.5	0.2	0.7	0.9	0.9	2.4	2.6	1.9	2.3	2.3	3.6	3.2	4.0	3.7	3.6
Taxa	Sub-sampling correction factor	0.125	0	0.125	0.125	0.125	0.125	0.03125	0.0625	0.0625	0.25	0.5	0.125	0.0625	0.0625	0.125
Oligochaeta	Clitellata (aquatic oligochaete worms)	159	375	115	231	462	14	115	462	43	58	404	361	159	115	245
Crustacea	Gammaridae	462	29	115	462	29	0	29	0	14	0	0	0	0	0	0
	Hyalellidae	2078	1544	1154	923	707	491	101	693	592	346	14	462	115	72	14
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca	Dreissenidae (zebra mussels)	29	0	245	14	0	0	0	0	0	0	635	115	29	43	14
	Pisidiidae (fingernail clams)	0	0	0	0	462	0	0	0	58	58	0	0	14	14	0
	Gastropoda (snails) - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrobiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae	245	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Planorbidae	0	29	14	577	0	0	0	0	0	0	0	0	0	0	0
	Valvatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odonata	Aeshnidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coenagrionidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coleoptera	Dytiscidae (larvae + adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemeroptera	Baetidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae (larvae)	0	0	0	0	0	0	0	0	0	0	29	14	0	14	115
	Ephemerellidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae (larvae)	0	0	0	0	0	0	0	0	0	0	72	0	0	72	29
	Heptageniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
	Leptophlebiidae (larvae)	0	0	0	0	115	0	0	0	0	0	115	29	0	29	0
Plecoptera	Chloroperlidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Dipseudopsidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	14	0	0	0	231	14	0	0	0	14	0	0
Ceratopogonidae	Ceratopogonidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaoboridae	Chaoboridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	Chironomidae (larvae + pupae)	2366	592	577	808	231	736	43	923	101	995	635	1284	1154	2078	1371
All Other Taxa	Hirudinida (leeches)	0	14	0	0	0	0	0	0	0	0	72	0	0	0	14
	Cambaridae (crayfish)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrachnidae (water mites)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrozoa (hydra)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Corixidae (water boatmen)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A2-5: Continued.

	Sample ID	Zone 1B														
		UPPER GULL-IE-R1	UPPER GULL-IE-R2	UPPER GULL-IE-R3	UPPER GULL-IE-R4	UPPER GULL-IE-R5	UPPER GULL-PW-R1	UPPER GULL-PW-R2	UPPER GULL-PW-R3	UPPER GULL-PW-R4	UPPER GULL-PW-R5	UPPER GULL-OS-R1	UPPER GULL-OS-R2	UPPER GULL-OS-R3	UPPER GULL-OS-R4	UPPER GULL-OS-R5
	Water Depth (mean,m)	0.3	0.6	0.4	0.4	0.4	2.6	1.9	2.2	1.5	2.1	3.8	4.9	4.4	5.4	3.2
Taxa	Sub-sampling correction factor	0.5	0.25	0	0	0	0.0625	0.25	0.25	0.5	0.125	0.125	0.25	0.25	0.125	0.25
Oligochaeta	Clitellata (aquatic oligochaete worms)	173	2366	0	29	620	462	58	289	173	115	231	462	231	0	462
Crustacea	Gammaridae	87	404	0	14	58	0	58	87	346	14	0	0	0	0	0
	Hyalellidae	1270	1962	87	462	231	707	923	693	375	808	0	115	58	0	289
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca	Dreissenidae (zebra mussels)	0	0	0	0	0	0	0	14	0	0	0	58	43	0	43
	Pisidiidae (fingernail clams)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gastropoda (snails) - unidentified	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0
	Hydrobiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae	0	0	0	0	0	0	0	43	87	0	0	0	0	0	0
	Planorbidae	87	0	0	0	0	0	0	58	29	0	0	0	0	0	0
	Valvatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odonata	Aeshnidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coenagrionidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coleoptera	Dytiscidae (larvae + adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemeroptera	Baetidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae (larvae)	0	115	0	0	0	1775	115	58	231	43	0	0	0	0	0
	Ephemerellidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae (larvae)	0	0	0	0	0	375	14	144	29	130	58	72	274	144	159
	Heptageniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	0	0	0	0	0	29	0	0	0	14	0	58	0	0	0
Plecoptera	Chloroperlidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Dipseudopsidae (larvae)	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	29	0	0	0	0	0	0	0	0	0	14	0	0	0	0
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	0	0	0	0	0	58	0	14	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	130	0	0	43	115	0	0	0	0	72
Ceratopogonidae	Ceratopogonidae (larvae)	58	0	0	0	0	58	0	58	29	14	115	58	0	0	0
Chaoboridae	Chaoboridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	Chironomidae (larvae + pupae)	202	346	0	188	101	779	1904	1443	808	2092	693	577	519	361	519
All Other Taxa	Hirudinida (leeches)	43	130	0	0	0	0	43	58	29	14	0	0	0	0	0
	Cambaridae (crayfish)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrachnidae (water mites)	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0
	Hydrozoa (hydra)	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Corixidae (water boatmen)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A2-5: Continued.

	Sample ID	Zone 8														
		ZONE8-IE-R1	ZONE8-IE-R2	ZONE8-IE-R3	ZONE8-IE-R4	ZONE8-IE-R5	ZONE8-PW-R1	ZONE8-PW-R2	ZONE8-PW-R3	ZONE8-PW-R4	ZONE8-PW-R5	ZONE8-OS-R1	ZONE8-OS-R2	ZONE8-OS-R3	ZONE8-OS-R4	ZONE8-OS-R5
	Water Depth (mean,m)	0.7	0.9	0.5	0.5	0.5	2.1	2.5	2.4	2.1	1.9	3.9	4.5	4.7	5.2	3.7
Taxa	Sub-sampling correction factor	0.25	0.25	0	0.25	0.0625	0.125	0.125	0	0.25	0.25	0.125	0.5	0.0625	0.25	0
Oligochaeta	Clitellata (aquatic oligochaete worms)	1270	577	1140	260	43	592	923	260	1226	519	577	779	404	1385	115
Crustacea	Gammaridae	404	404	101	173	87	0	0	58	188	0	0	0	0	0	0
	Hyalellidae	3578	693	981	923	794	577	231	274	750	231	115	173	14	0	14
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca	Dreissenidae (zebra mussels)	0	0	0	0	0	231	14	0	0	0	29	29	43	0	29
	Pisidiidae (fingernail clams)	0	0	0	0	0	0	14	58	58	0	0	0	0	317	0
	Gastropoda (snails) - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrobiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae	14	14	0	0	0	0	0	0	0	0	0	0	0	0	0
	Planorbidae	115	0	0	58	0	14	0	0	0	0	0	0	0	0	0
	Valvatidae	0	0	0	0	0	0	0	43	173	0	0	0	0	0	0
Odonata	Aeshnidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coenagrionidae (larvae)	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0
Coleoptera	Dytiscidae (larvae + adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae)	0	0	29	0	0	0	0	0	0	0	0	0	0	0	0
Ephemeroptera	Baetidae (larvae)	0	0	0	0	0	0	0	14	0	0	14	0	0	0	0
	Baetiscidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae (larvae)	58	0	0	0	0	0	0	0	0	0	0	0	0	0	14
	Ephemerellidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae (larvae)	0	0	0	0	0	14	0	0	0	0	245	0	14	14	58
	Heptageniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	58	0	0	0	0	0	0	0	0	0	0	0	58	0	14
Plecoptera	Chloroperlidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Dipseudopsidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	14	0	0	14	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	0	0	0	0	0	14	29	0	0	0
Ceratopogonidae	Ceratopogonidae (larvae)	115	0	101	58	0	0	0	0	0	0	0	0	0	58	58
Chaoboridae	Chaoboridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	Chironomidae (larvae + pupae)	3650	750	606	274	58	115	346	938	1039	2207	808	260	505	995	188
All Other Taxa	Hirudinida (leeches)	72	58	130	115	29	14	115	0	58	72	0	29	0	0	0
	Cambaridae (crayfish)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrachnidae (water mites)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrozoa (hydra)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	29	14	0	0
	Corixidae (water boatmen)	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A2-5: Continued.

	Sample ID	Zone 2														
		LOWER GULL-IE-R1	LOWER GULL-IE-R2	LOWER GULL-IE-R3	LOWER GULL-IE-R4	LOWER GULL-IE-R5	LOWER GULL-PW-R1	LOWER GULL-PW-R2	LOWER GULL-PW-R3	LOWER GULL-PW-R4	LOWER GULL-PW-R5	LOWER GULL-OS-R1	LOWER GULL-OS-R2	LOWER GULL-OS-R3	LOWER GULL-OS-R4	LOWER GULL-OS-R5
	Water Depth (mean,m)	0.3	0.3	0.2	0.2	0.3	1.9	1.8	1.8	2.3	2.0	5.9	4.0	4.8	6.4	6.3
Taxa	Sub-sampling correction factor	0	0	0	0	0	0.125	0.0625	0.0625	0.0625	0.25	0	0	0.125	0.125	0.125
Oligochaeta	Clitellata (aquatic oligochaete worms)	0	0	0	0	0	0	390	0	0	0	43	29	115	115	346
Crustacea	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	58	58	0	43	29	58	260	1154	130	635	0	0	0	14	0
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca	Dreissenidae (zebra mussels)	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0
	Pisidiidae (fingernail clams)	0	0	0	0	0	14	0	231	0	0	0	0	0	0	0
	Gastropoda (snails) - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrobiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0
	Planorbidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Valvatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odonata	Aeshnidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coenagrionidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coleoptera	Dytiscidae (larvae + adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemeroptera	Baetidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae (larvae)	0	0	0	0	0	0	0	0	0	519	0	0	0	0	0
	Ephemerellidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae (larvae)	0	0	0	0	0	0	0	0	43	404	231	72	29	779	375
	Heptageniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	0	0	0	0	0	0	0	0	0	173	0	0	0	0	0
Plecoptera	Chloroperlidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Dipseudopsidae (larvae)	0	0	0	0	0	43	0	289	0	0	0	29	14	0	14
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	0	0	0	231	58	0	0	0	0	0
Ceratopogonidae	Ceratopogonidae (larvae)	0	0	0	0	0	231	0	0	693	173	0	14	0	0	0
Chaoboridae	Chaoboridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	Chironomidae (larvae + pupae)	29	0	0	0	0	3924	1154	693	1630	1847	43	289	1039	0	577
All Other Taxa	Hirudinida (leeches)	0	0	0	0	0	0	14	0	0	0	43	0	0	0	0
	Cambaridae (crayfish)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrachnidae (water mites)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrozoa (hydra)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0
	Corixidae (water boatmen)	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A2-6: Benthic sediment analysis output, Keeyask reservoir, 2023.

Zone 1A										
Habitat Type	Sample ID	Water Depth (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	DSBDAY-IE-R1	1.3	0.820	6.83	12.7	11.9	2.3	86.5	11.2	Silt
	DSBDAY-IE-R2	0.9	1.01	8.41	18.8	17.8	1.2	91.8	6.9	Silt
	DSBDAY-IE-R3	0.9	0.814	6.78	26.0	25.2	<1.0	72.3	26.9	Silt loam
	DSBDAY-IE-R4	0.9	0.425	3.54	21.4	21.0	2.0	82.4	15.6	Silt loam
	DSBDAY-IE-R5	1.0	1.67	13.9	9.33	7.66	7.1	81.7	11.2	Silt
Predominantly Wetted	DSBDAY-PW-R1	1.3	0.932	7.77	18.7	17.8	10.8	58.7	30.5	Silty clay loam
	DSBDAY-PW-R2	1.7	1.28	10.7	18.8	17.5	7.4	88.7	3.9	Silt
	DSBDAY-PW-R3	2.8	1.94	16.1	10.3	8.36	45.9	49.6	4.5	Silt loam
	DSBDAY-PW-R4	2.2	2.93	24.4	5.03	2.10	26.8	51.4	21.8	Silt loam
	DSBDAY-PW-R5	1.1	1.05	8.77	5.84	4.79	69.8	28.9	1.2	Sandy loam
Offshore	DSBDAY-OS-R1	4.9	1.72	14.3	3.73	2.01	30.9	56.2	12.9	Silt loam
	DSBDAY-OS-R2	5.7	1.75	14.6	3.83	2.08	35.4	55.0	9.6	Silt loam
	DSBDAY-OS-R3	4.5	1.72	14.3	3.33	1.61	46.8	35.6	17.6	Loam
	DSBDAY-OS-R4	5.2	1.60	13.4	3.69	2.09	47.3	34.4	18.3	Loam
	DSBDAY-OS-R5	5.3	1.59	13.2	3.33	1.74	33.7	60.6	5.6	Silt loam

Table A2-6: Continued.

Zone 4											
Habitat Type	**Sample ID**	**Water Depth (m)**	**Inorganic Carbon (%)**	**$CaCO_3$ Equivalent**	**Total Carbon by Combustion (%)**	**Total Organic Carbon (%)**	**% Sand (2.0-0.05 mm)**	**% Silt (0.05-2 µm)**	**% Clay (<2 µm)**	**Texture**
Intermittently Exposed	ZONE4-IE-R1	0.9	0.531	4.42	37.8	37.3	<1.0	90.4	9.4	Silt
	ZONE4-IE-R2	0.6	0.639	5.32	38.8	38.2	<1.0	92.4	7.4	Silt
Predominantly Wetted	ZONE4-PW-R1	2.3	0.197	1.64	4.90	4.70	22.0	59.5	18.5	Silt loam
	ZONE4-PW-R2	1.7	0.592	4.94	16.2	15.6	1.7	50.4	47.9	Silty clay
	ZONE4-PW-R3	1.4	0.262	2.18	26.5	26.2	<1.0	60.1	39.9	Silty clay loam
	ZONE4-PW-R4	2.8	0.339	2.82	29.7	29.4	<1.0	67.0	32.6	Silty clay loam
	ZONE4-PW-R5	1.8	0.357	2.98	26.4	26.0	<1.0	80.3	19.1	Silt loam
Offshore	ZONE4-OS-R1	4.2	1.42	11.9	5.47	4.05	4.3	83.4	12.3	Silt loam
	ZONE4-OS-R2	4.3	0.803	6.69	4.72	3.92	38.8	51.4	9.8	Silt loam
	ZONE4-OS-R3	4.3	1.70	14.2	4.32	2.62	25.5	66.3	8.2	Silt loam
	ZONE4-OS-R4	3.8	1.31	10.9	3.25	1.94	49.0	42.4	8.7	Loam
	ZONE4-OS-R5	4.8	1.76	14.7	4.56	2.80	2.4	84.5	13.1	Silt loam

Table A2-6: Continued.

Zone 12										
Habitat Type	Sample ID	Water Depth (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	ZONE12-IE-R1	0.4	0.507	4.22	35.4	34.9	<1.0	76.4	23.6	Silt loam
	ZONE12-IE-R2	0.2	0.723	6.02	32.4	31.7	2.0	81.2	16.8	Silt loam
	ZONE12-IE-R3	n/a	0.369	3.08	24.8	24.4	<1.0	62.7	37.3	Silty clay loam
	ZONE12-IE-R4	0.9	0.402	3.35	22.4	22.0	<1.0	62.0	38.0	Silty clay loam
	ZONE12-IE-R5	0.7	0.402	3.35	38.2	37.8	<1.0	79.8	20.2	Silt loam
Predominantly Wetted	ZONE12-PW-R1	2.3	0.525	4.38	45.5	45.0	<1.0	98.9	1.0	Silt
	ZONE12-PW-R2	2.5	0.560	4.67	43.0	42.4	<1.0	99.6	<1.0	Silt
	ZONE12-PW-R3	1.9	0.480	4.00	43.1	42.6	3.7	92.0	4.3	Silt
	ZONE12-PW-R4	2.2	0.510	4.25	37.8	37.3	1.9	92.3	5.7	Silt
	ZONE12-PW-R5	2.2	0.485	4.04	32.5	32.0	6.2	76.8	17.0	Silt loam
Offshore	ZONE12-OS-R1	n/a	0.576	4.80	9.29	8.71	15.7	62.8	21.5	Silt loam
	ZONE12-OS-R2	n/a	0.533	4.44	39.6	39.1	13.9	78.8	7.2	Silt loam / Silt
	ZONE12-OS-R3	4.1	0.609	5.08	26.2	25.6	2.3	83.7	14.0	Silt loam
	ZONE12-OS-R4	3.8	0.590	4.92	26.9	26.3	1.5	96.3	2.2	Silt
	ZONE12-OS-R5	3.5	0.790	6.58	15.0	14.2	2.9	54.1	43.0	Silty clay

Table A2-6: Continued.

Habitat Type	Sample ID	Water Depth (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05-2 µm)	% Clay (<2 µm)	Texture
Zone 1B										
Intermittently Exposed	UPPERGULL-IE-R1	0.3	0.517	4.31	36.6	36.1	1.0	90.6	8.4	Silt
	UPPERGULL-IE-R3	0.3	0.166	1.39	0.775	0.609	87.7	10.2	2.1	Sand
	UPPERGULL-IE-R4	0.3	0.183	1.53	1.16	0.977	69.8	22.5	7.7	Sandy loam
	UPPERGULL-IE-R5	0.3	0.114	0.95	2.74	2.63	49.3	44.4	6.3	Sandy loam
Predominantly Wetted	UPPERGULL-PW-R1	2.4	0.610	5.08	23.5	22.9	3.5	61.1	35.4	Silty clay loam
	UPPERGULL-PW-R2	1.5	0.426	3.55	23.3	22.9	26.5	68.1	5.4	Silt loam
	UPPERGULL-PW-R3	2.4	0.480	4.00	16.1	15.6	29.0	58.0	13.1	Silt loam
	UPPERGULL-PW-R4	1.8	0.468	3.90	28.5	28.0	13.7	71.2	15.1	Silt loam
	UPPERGULL-PW-R5	2.1	0.448	3.74	37.7	37.2	1.9	76.4	21.7	Silt loam
Offshore	UPPERGULL-OS-R1	3.8	0.493	4.11	2.20	1.71	67.0	22.3	10.7	Sandy loam
	UPPERGULL-OS-R2	4.8	0.386	3.22	12.5	12.1	1.2	87.4	11.3	Silt
	UPPERGULL-OS-R3	4.1	0.570	4.75	15.0	14.4	4.2	81.6	14.1	Silt loam
	UPPERGULL-OS-R4	5.7	0.367	3.06	18.5	18.1	6.0	71.7	22.3	Silt loam
	UPPERGULL-OS-R5	3.7	0.549	4.58	20.2	19.6	<1.0	70.8	28.5	Silty clay loam

Table A2-6: Continued.

Zone 8											
Habitat Type	**Sample ID**	**Water Depth (m)**	**Inorganic Carbon (%)**	**$CaCO_3$ Equivalent**	**Total Carbon by Combustion (%)**	**Total Organic Carbon (%)**	**% Sand (2.0-0.05 mm)**	**% Silt (0.05-2 µm)**	**% Clay (<2 µm)**	**Texture**
Intermittently Exposed	ZONE8-IE-R1	0.5	0.530	4.42	40.3	39.8	<1.0	85.0	15.0	Silt loam
	ZONE8-IE-R2	0.8	0.464	3.87	40.7	40.2	<1.0	43.7	56.3	Silty clay
	ZONE8-IE-R4	0.5	0.543	4.52	35.9	35.4	<1.0	83.7	16.2	Silt loam
	ZONE8-IE-R5	0.6	0.474	3.95	35.2	34.7	<1.0	82.8	17.2	Silt loam
Predominantly Wetted	ZONE8-PW-R1	2.2	0.414	3.46	25.4	25.0	<1.0	60.2	39.4	Silty clay loam
	ZONE8-PW-R3	2.5	0.353	2.94	34.2	33.8	<1.0	71.0	28.9	Silty clay loam
	ZONE8-PW-R4	2.2	0.445	3.71	33.4	33.0	<1.0	77.7	22.2	Silt loam
	ZONE8-PW-R5	1.7	0.504	4.20	37.0	36.5	<1.0	83.4	16.2	Silt loam
Offshore	ZONE8-OS-R1	3.9	0.442	3.68	27.6	27.2	<1.0	66.9	33.0	Silty clay loam
	ZONE8-OS-R2	5.1	0.541	4.51	18.3	17.8	<1.0	60.8	39.2	Silty clay loam
	ZONE8-OS-R3	5.0	0.499	4.16	28.1	27.6	<1.0	70.0	29.8	Silty clay loam
	ZONE8-OS-R4	5.0	0.359	2.99	17.4	17.0	<1.0	63.6	36.4	Silty clay loam
	ZONE8-OS-R5	3.4	0.422	3.52	21.9	21.5	<1.0	54.5	45.3	Silty clay

Table A2-6: Continued.

Zone 2											
Habitat Type	**Sample ID**	**Water Depth (m)**	**Inorganic Carbon (%)**	**$CaCO_3$ Equivalent**	**Total Carbon by Combustion (%)**	**Total Organic Carbon (%)**	**% Sand (2.0-0.05 mm)**	**% Silt (0.05-2 µm)**	**% Clay (<2 µm)**	**Texture**
Intermittently Exposed	LOWERGULL-IE-R1	0.1	1.77	14.8	2.12	0.350	83.1	8.9	8.0	Loamy sand
	LOWERGULL-IE-R2	0.3	0.487	4.06	0.673	0.186	98.0	1.4	<1.0	Sand
	LOWERGULL-IE-R3	0.3	0.446	3.72	1.18	0.734	96.3	2.9	<1.0	Sand
	LOWERGULL-IE-R4	0.2	0.220	1.83	0.426	0.206	99.0	<1.0	<1.0	Sand
	LOWERGULL-IE-R5	0.2	0.211	1.76	1.31	1.10	95.0	3.8	1.1	Sand
Predominantly Wetted	LOWERGULL-PW-R1	1.9	0.460	3.84	23.1	22.6	1.0	92.4	6.5	Silt
	LOWERGULL-PW-R2	1.6	0.476	3.97	30.7	30.2	2.4	86.5	11.1	Silt
	LOWERGULL-PW-R3	1.9	0.523	4.36	21.5	21.0	2.6	97.0	<1.0	Silt
	LOWERGULL-PW-R4	2.1	0.616	5.13	16.5	15.9	1.7	77.0	21.3	Silt loam
	LOWERGULL-PW-R5	2.0	0.399	3.33	7.30	6.90	55.4	35.5	9.1	Sandy loam
Offshore	LOWERGULL-OS-R1	6.2	1.26	10.5	5.38	4.12	48.6	39.1	12.2	Loam
	LOWERGULL-OS-R2	4.1	0.688	5.73	8.39	7.70	36.6	57.8	5.6	Silt loam
	LOWERGULL-OS-R3	4.7	0.531	4.43	4.44	3.91	60.3	30.0	9.7	Sandy loam
	LOWERGULL-OS-R4	6.4	1.35	11.3	8.32	6.97	4.5	76.5	19.0	Silt loam
	LOWERGULL-OS-R5	6.2	1.38	11.5	11.9	10.5	2.8	80.4	16.8	Silt loam

Table A2-7: Site and habitat data measured at benthic invertebrate monitoring sites in Stephens Lake, 2023.

Site ID	Habitat Type	Date	UTM coordinates (Zone 15U)		Water Temp (°C)	Water Depth (m)	Water Velocity (m/s)	Secchi Depth (m)	Algae Type	Dominant Substrate
			Easting	Northing						
STL-POST-001	Downstream of GS	23-Sep	366716	6248458	16	6.1	0.01	2.0	None	silt/organic matter/clay/sand
STL3KM-IE	Intermittently Exposed	24-Sep	365773	6248818	16	0.3	0.00	>0.5	None	clay/silt/sand/organic matter
STL3KM-PW	Predominantly Wetted	24-Sep	365811	6248883	15	2.8	0.01	1.4	None	clay/silt/organic matter/sand
STL3KM-OS	Offshore	24-Sep	366028	6248856	16	3.8	0.01	1.4	None	organic matter/silt/clay
STL11KM-IE	Intermittently Exposed	23-Sep	376311	6248926	15	0.2	0.00	>0.5	Attached	gravel/fine sand
STL11KM-PW	Predominantly Wetted	23-Sep	376472	6248735	15	1.1	0.01	>1	None	clay/fine sand/organic matter/silt/gravel
STL11KM-OS	Offshore	22-Sep	376441	6248693	16	3.4	0.01	1.2	None	clay/organic matter
ONB-GR-IE	Intermittently Exposed	24-Sep	365968	6250601	16	0.6	0.00	>0.5	None	fine sand/organic matter
ONB-PW	Predominantly Wetted	24-Sep	365810	6250701	15	1.8	0.00	1.3	None	silt/clay/organic matter
ONB-OS	Offshore	22-Sep	364962	6250850	15	4.0	0.01	0.9	None	clay/silt/organic matter

Table A2-8: Benthic invertebrate analysis output, Stephens Lake, 2023.

	Sample ID	Stephens Lake - Downstream		
		STL-POST-001	STL-POST-002	STL-POST-003
	Water Depth (mean,m)	6.1	10.2	1.1
Taxa	Sub-sampling correction factor	0.25	0.25	0
Oligochaeta	Clitellata (aquatic oligochaete worms)	0	58	0
Crustacea	Gammaridae	0	0	0
	Hyalellidae	0	0	130
	Pontoporeiidae	0	0	0
Mollusca	Dreissenidae (zebra mussels)	29	173	29
	Pisidiidae (fingernail clams)	0	0	0
	Gastropoda (snails) - unidentified	0	0	0
	Hydrobiidae	0	0	29
	Lymnaeidae	0	0	0
	Physidae	0	0	0
	Planorbidae	0	0	0
	Valvatidae	0	0	0
Odonata	Aeshnidae (larvae)	0	0	0
	Coenagrionidae (larvae)	0	0	0
Coleoptera	Dytiscidae (larvae + adult)	0	0	0
	Haliplidae (larvae)	0	0	0
Ephemeroptera	Baetidae (larvae)	0	0	0
	Baetiscidae (larvae)	0	0	0
	Caenidae (larvae)	0	0	14
	Ephemerellidae (larvae)	0	0	0
	Ephemeridae (larvae)	231	72	72
	Heptageniidae (larvae)	0	0	0
	Leptophlebiidae (larvae)	0	0	0
Plecoptera	Chloroperlidae (larvae)	0	0	0
Trichoptera	Dipseudopsidae (larvae)	0	0	0
	Helicopsychidae (larvae)	0	0	0
	Hydropsychidae (larvae)	0	0	0
	Lepidostomatidae (larvae)	0	0	0
	Leptoceridae (larvae)	0	0	43
	Limnephilidae (larvae)	0	0	0
	Molannidae (larvae)	0	0	0
	Phryganeidae (larvae)	0	0	0
	Polycentropodidae (larvae)	0	0	0
Ceratopogonidae	Ceratopogonidae (larvae)	0	0	0
Chaoboridae	Chaoboridae (larvae)	0	0	0
Chironomidae	Chironomidae (larvae + pupae)	0	0	1544
All Other Taxa	Hirudinida (leeches)	0	0	0
	Cambaridae (crayfish)	0	0	0
	Hydrachnidae (water mites)	0	0	0
	Hydrozoa (hydra)	0	0	0
	Sialidae (larvae)	0	14	14
	Corixidae (water boatmen)	0	0	0
	Empididae (larvae)	0	0	0
	Limoniidae (larvae)	0	0	0
	Tabanidae (larvae)	0	0	0

Table A2-8: Continued.

		Stephens Lake – O'Neil Bay														
	Sample ID	**ONB-GR-IE-R1**	**ONB-GR-IE-R2**	**ONB-GR-IE-R3**	**ONB-GR-IE-R4**	**ONB-GR-IE-R5**	**ONB-PW-R1**	**ONB-PW-R2**	**ONB-PW-R3**	**ONB-PW-R4**	**ONB-PW-R5**	**ONB-OS-R1**	**ONB-OS-R2**	**ONB-OS-R3**	**ONB-OS-R4**	**ONB-OS-R5**
	Water Depth (mean,m)	0.6	0.4	0.4	0.3	0.3	1.8	2.2	2.1	2.3	2.8	4.0	4.3	3.8	5.1	4.5
Taxa	Sub-sampling correction factor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oligochaeta	Clitellata (aquatic oligochaete worms)	0	0	0	14	0	29	58	43	0	0	0	0	72	0	0
Crustacea	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	0	0	0	0	0	0	14	72	0	0	0	14	0	14	0
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca	Dreissenidae (zebra mussels)	0	0	0	0	0	144	87	8931	58	101	0	0	72	0	0
	Pisidiidae (fingernail clams)	0	0	0	0	0	0	0	14	14	14	14	0	14	0	0
	Gastropoda (snails) - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrobiidae	0	0	0	0	0	0	0	332	14	0	0	0	0	0	0
	Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Planorbidae	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0
	Valvatidae	0	0	0	0	0	159	0	58	14	0	0	0	0	0	0
Odonata	Aeshnidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coenagrionidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coleoptera	Dytiscidae (larvae + adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemeroptera	Baetidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemerellidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae (larvae)	0	0	0	0	0	87	144	188	202	173	245	231	130	231	58
	Heptageniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0
Plecoptera	Chloroperlidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Dipseudopsidae (larvae)	0	0	0	0	0	0	0	14	0	14	0	0	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceratopogonidae	Ceratopogonidae (larvae)	0	0	0	0	0	447	159	115	58	101	43	0	0	14	14
Chaoboridae	Chaoboridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	Chironomidae (larvae + pupae)	14	0	29	72	0	1515	375	173	144	231	159	72	87	216	43
All Other Taxa	Hirudinida (leeches)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cambaridae (crayfish)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrachnidae (water mites)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrozoa (hydra)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Corixidae (water boatmen)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A2-8: Continued.

Taxa	Sample ID	Stephens Lake - 3 KM Downstream														
		STL3KM-IE-R1	STL3KM-IE-R2	STL3KM-IE-R3	STL3KM-IE-R4	STL3KM-IE-R5	STL3KM-PW-R1	STL3KM-PW-R2	STL3KM-PW-R3	STL3KM-PW-R4	STL3KM-PW-R5	STL3KM-OS-R1	STL3KM-OS-R2	STL3KM-OS-R3	STL3KM-OS-R4	STL3KM-OS-R5
	Water Depth (mean,m)	0.3	0.3	0.4	0.3	0.3	2.8	2.6	2.7	2.0	2.1	3.8	4.2	4.4	4.2	4.2
Taxa	Sub-sampling correction factor	0	0-Jan	0	0	0	0	0	0	0	0	0.125	0	0.25	0	0
Oligochaeta	Clitellata (aquatic oligochaete worms)	58	6925	1255	14	101	29	29	0	130	0	693	0	173	0	29
Crustacea	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	0	173	14	29	0	0	0	0	0	0	0	0	0	0	0
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca	Dreissenidae (zebra mussels)	0	0	0	0	0	0	0	29	0	0	130	0	0	14	0
	Pisidiidae (fingernail clams)	0	14	72	0	0	0	0	0	0	0	0	14	0	0	0
	Gastropoda (snails) - unidentified	0	0	0	0	0	0	14	14	0	0	0	0	0	0	0
	Hydrobiidae	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0
	Lymnaeidae	0	58	101	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Planorbidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Valvatidae	0	58	0	0	0	14	14	0	0	0	0	0	0	0	0
Odonata	Aeshnidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coenagrionidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coleoptera	Dytiscidae (larvae + adult)	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemeroptera	Baetidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemerellidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae (larvae)	0	0	0	0	0	130	144	332	130	101	418	72	260	144	216
	Heptageniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plecoptera	Chloroperlidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Dipseudopsidae (larvae)	0	0	0	0	0	0	0	29	0	0	0	14	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	0	0	0	0	14	14	29	14	14	0	0	0	0	0
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceratopogonidae	Ceratopogonidae (larvae)	0	0	14	0	0	115	332	404	231	390	115	14	289	14	0
Chaoboridae	Chaoboridae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	Chironomidae (larvae + pupae)	5410	14846	9811	2684	4184	592	2842	1371	3953	1731	995	58	462	202	130
All Other Taxa	Hirudinida (leeches)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cambaridae (crayfish)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrachnidae (water mites)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
	Hydrozoa (hydra)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0
	Corixidae (water boatmen)	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A2-8: Continued.

Taxa	Sample ID	Stephens Lake - 11 KM Downstream STL11KM-IE-R1	STL11KM-IE-R2	STL11KM-IE-R3	STL11KM-IE-R4	STL11KM-IE-R5	STL11KM-PW-R1	STL11KM-PW-R2	STL11KM-PW-R3	STL11KM-PW-R4	STL11KM-PW-R5	STL11KM-OS-R1	STL11KM-OS-R2	STL11KM-OS-R3	STL11KM-OS-R4	STL11KM-OS-R5
	Water Depth (mean,m)	0.2	0.2	0.2	0.3	0.2	1.1	1.2	2.3	1.8	1.2	3.4	4.3	3.6	3.9	3.1
Taxa	Sub-sampling correction factor	0	0	0	0	0.25	0	0	0.5	0.5	0	0	0	0	0	0
Oligochaeta	Clitellata (aquatic oligochaete worms)	58	29	87	14	577	0	0	115	0	361	0	0	0	14	0
Crustacea	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	245	202	144	101	289	0	72	0	1096	635	0	0	0	0	0
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca	Dreissenidae (zebra mussels)	0	0	0	0	0	0	188	0	0	14	0	0	0	0	101
	Pisidiidae (fingernail clams)	43	0	14	14	0	14	0	0	0	101	0	0	0	0	0
	Gastropoda (snails) - unidentified	14	14	14	0	0	72	0	29	0	14	0	0	0	0	0
	Hydrobiidae	0	0	0	0	0	606	649	173	173	909	0	0	0	0	0
	Lymnaeidae	72	29	14	14	289	87	289	0	0	0	0	0	0	0	0
	Physidae	245	87	101	72	173	14	29	0	0	0	0	0	0	0	0
	Planorbidae	43	0	72	14	173	72	245	0	29	14	0	0	0	0	0
	Valvatidae	14	0	0	0	0	1255	4112	202	115	1053	0	0	0	0	0
Odonata	Aeshnidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coenagrionidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coleoptera	Dytiscidae (larvae + adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemeroptera	Baetidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae (larvae)	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0
	Caenidae (larvae)	0	0	0	0	0	43	29	58	693	72	0	0	0	0	0
	Ephemerellidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae (larvae)	0	0	0	0	0	447	144	577	606	43	216	202	317	173	159
	Heptageniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0
Plecoptera	Chloroperlidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Dipseudopsidae (larvae)	14	0	0	0	0	0	0	29	58	14	29	29	29	58	29
	Helicopsychidae (larvae)	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	14	0	0	0	144	101	29	317	14	0	0	0	0	14
	Limnephilidae (larvae)	0	0	87	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	14	0	0	87	0	0	0	0	0
	Phryganeidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	0	29	0	317	14	0	0	0	0	0
Ceratopogonidae	Ceratopogonidae (larvae)	0	0	0	0	0	144	87	115	173	43	0	0	0	14	0
Chaoboridae	Chaoboridae (larvae)	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	Chironomidae (larvae + pupae)	1702	1226	995	1140	6002	4400	1399	1154	4732	2323	87	58	130	72	476
All Other Taxa	Hirudinida (leeches)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cambaridae (crayfish)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrachnidae (water mites)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrozoa (hydra)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0
	Corixidae (water boatmen)	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0

Table A2-9: Benthic sediment analysis output, Stephens Lake, 2023.

Habitat Type	Sample ID	Water Depth (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05-2 µm)	% Clay (<2 µm)	Texture
	Stephens Lake - Downstream									
Downstream	STL-POST-001	6.4	1.95	16.3	4.33	2.38	30.0	58.4	11.5	Silt loam
	STL-POST-002	10.6	1.50	12.5	8.42	6.92	17.3	73.7	9.0	Silt loam
	STL-POST-003	1.1	2.30	19.2	4.61	2.31	17.9	70.2	11.9	Silt loam

Table A2-9: Continued.

Habitat Type	Sample ID	Water Depth (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05-2 µm)	% Clay (<2 µm)	Texture
	Stephens Lake - 3 KM Downstream									
Intermittently Exposed	STL3KM-IE-R1	0.3	3.92	32.6	4.52	<0.632	2.2	49.1	48.7	Silty clay
	STL3KM-IE-R2	0.4	2.84	23.7	4.26	1.42	14.6	41.4	44.0	Silty clay
	STL3KM-IE-R3	0.4	2.25	18.8	3.23	0.980	17.2	45.8	37.0	Silty clay loam
	STL3KM-IE-R4	0.4	2.62	21.9	3.11	0.490	8.8	47.9	43.3	Silty clay
	STL3KM-IE-R5	0.4	2.37	19.8	2.85	0.480	15.8	56.2	28.0	Silt loam / Silty clay loam
Predominantly Wetted	STL3KM-PW-R1	2.8	2.47	20.6	4.57	2.10	7.5	71.6	20.8	Silt loam
	STL3KM-PW-R2	2.5	3.07	25.6	4.52	1.45	6.9	71.8	21.3	Silt loam
	STL3KM-PW-R3	2.6	2.36	19.6	5.05	2.69	15.1	63.8	21.1	Silt loam
	STL3KM-PW-R4	1.8	2.40	20.0	4.35	1.95	23.9	58.4	17.7	Silt loam
	STL3KM-PW-R5	2.3	2.53	21.1	4.36	1.83	23.4	68.2	8.4	Silt loam
Offshore	STL3KM-OS-R1	4.0	2.13	17.8	4.29	2.16	22.5	63.4	14.1	Silt loam
	STL3KM-OS-R2	4.0	2.18	18.1	3.78	1.60	38.8	50.4	10.7	Silt loam
	STL3KM-OS-R3	4.4	2.31	19.2	4.23	1.92	15.3	72.0	12.6	Silt loam
	STL3KM-OS-R4	4.2	2.25	18.7	4.34	2.09	13.8	74.2	12.0	Silt loam
	STL3KM-OS-R5	4.1	2.34	19.5	4.29	1.95	10.5	79.0	10.4	Silt loam / Silt

Table A2-9: Continued.

Habitat Type	Stephens Lake - 11 KM Downstream									
	Sample ID	Water Depth (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	STL11KM-IE-R1	0.3	2.57	21.4	3.04	0.470	95.1	4.1	<1.0	Sand
	STL11KM-IE-R2	0.3	2.52	21.0	3.21	0.690	92.8	5.5	1.7	Sand
	STL11KM-IE-R3	0.2	2.45	20.4	3.25	0.800	94.9	4.0	1.1	Sand
	STL11KM-IE-R4	0.2	2.40	20.0	2.96	0.560	87.1	10.8	2.1	Sand
	STL11KM-IE-R5	0.2	2.53	21.0	5.57	3.04	94.6	5.8	<1.0	n/a
Predominantly Wetted	STL11KM-PW-R1	1.2	1.92	16.0	3.13	1.21	74.8	23.6	1.6	Loamy sand
	STL11KM-PW-R2	1.2	3.16	26.4	4.13	0.970	30.6	56.0	13.4	Silt loam
	STL11KM-PW-R3	2.3	2.26	18.8	5.32	3.06	18.3	74.9	6.8	Silt loam
	STL11KM-PW-R4	2.0	1.72	14.3	4.45	2.73	62.4	33.7	3.8	Sandy loam
	STL11KM-PW-R5	1.2	1.73	14.4	4.36	2.63	63.3	32.4	4.2	Sandy loam
Offshore	STL11KM-OS-R1	3.5	2.65	22.1	4.30	1.65	1.6	92.6	5.8	Silt
	STL11KM-OS-R2	4.6	2.46	20.5	4.47	2.01	2.3	89.6	8.1	Silt
	STL11KM-OS-R3	3.5	2.61	21.8	4.59	1.98	4.4	83.1	12.5	Silt loam
	STL11KM-OS-R4	3.8	2.74	22.9	4.59	1.85	3.8	89.0	7.2	Silt
	STL11KM-OS-R5	3.3	2.61	21.8	5.73	3.12	5.2	88.8	6.0	Silt

Table A2-9: Continued.

Habitat Type	Sample ID	Water Depth (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05-2 µm)	% Clay (<2 µm)	Texture
	Stephens Lake - O'Neil Bay									
Intermittently Exposed	ONB-GR_IE-R1	0.5	1.65	13.8	2.84	1.19	78.0	14.1	7.9	Sandy loam / Loamy sand
	ONB-GR_IE-R2	0.4	1.41	11.7	2.33	0.920	76.3	15.0	8.7	Sandy loam
	ONB-GR_IE-R3	0.5	3.83	32.0	4.13	<0.599	2.7	45.7	51.6	Silty clay
	ONB-GR_IE-R4	0.4	4.25	35.4	4.54	<0.660	1.6	48.2	50.2	Silty clay
	ONB-GR_IE-R5	0.4	3.92	32.6	4.81	0.890	1.4	52.2	46.4	Silty clay
Predominantly Wetted	ONB-PW-R1	1.7	2.56	21.4	4.35	1.79	30.2	51.7	18.0	Silt loam
	ONB-PW-R2	2.1	2.64	22.0	4.52	1.88	23.4	57.0	19.6	Silt loam
	ONB-PW-R3	2.0	2.71	22.6	4.64	1.93	16.0	64.0	20.0	Silt loam
	ONB-PW-R4	2.3	2.69	22.4	6.14	3.45	<1.0	70.6	29.1	Silty clay loam
	ONB-PW-R5	2.6	2.73	22.7	5.24	2.51	<1.0	74.5	25.2	Silt loam
Offshore	ONB-OS-R1	3.9	2.68	22.3	4.32	1.64	8.1	65.7	26.2	Silt loam
	ONB-OS-R2	4.3	2.89	24.1	4.41	1.52	6.8	56.1	37.0	Silty clay loam
	ONB-OS-R3	3.8	2.77	23.1	4.08	1.31	19.2	47.3	33.5	Silty clay loam
	ONB-OS-R4	4.9	2.77	23.1	4.57	1.80	14.8	57.2	28.0	Silt loam / Silty clay loam
	ONB-OS-R5	4.3	2.80	23.3	4.34	1.54	7.3	60.2	32.5	Silty clay loam

APPENDIX 3: KEEYASK RESERVIOR MAINSTEM BENTHIC INVERTEBRATE SUMMARY ASSESSMENT DATA

Table A3-1: Keeyask Reservoir Zone 1a - supporting site data, intermittently exposed (IE, kicknet), pre-Project (2013) and Operation (2021). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing	Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2013	336049	6244039	1.1	0.5	2.6	55.1	44.9	Sandy loam
		336064	6244063	1.0	0.5	4.4	29.9	70.1	Silt loam / Loam
		336088	6244089	1.1	0.5	4.5	43.7	56.3	Loam
		336104	6244117	1.0	0.5	0.9	70.7	29.3	Sandy loam
		336110	6244145	1.0	0.5	1.6	68.8	31.1	Sandy loam
Operation	2021	335702	6244811	0.8	0.1	1.0	8.9	91.1	Silty clay
		335732	6244822	0.6	0.1	2.0	2.1	97.9	Clay
		335854	6244873	0.7	0.1	1.1	60.9	39.1	Sandy loam
		335883	6244870	0.5	0.1	0.4	44.0	56.0	Loam
		335919	6244866	0.5	0.1	0.3	46.3	53.7	Loam
		337693	6245455	0.5	0.1	0.7	97.2	2.7	Sand
		337679	6245439	0.5	0.1	0.3	96.3	3.7	Sand
		337664	6245425	0.6	0.1	1.1	74.3	25.2	Loamy sand
		337649	6245411	0.5	0.1	1.4	87.6	12.3	Sand
		337625	6245394	0.5	0.1	0.8	87.8	12.2	Sand

Table A3-2: Keeyask Reservoir Zone 1a - benthic invertebrate community metrics, intermittently exposed (IE, kicknet), pre-Project (2013) and Operation (2021).

Phase	Year	Total Abundance (no. per sample)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2013	599	44.9	15.7	2.9	18	7	0.82	0.31
		974	48.0	8.7	5.5	20	8	0.81	0.27
		636	36.3	10.4	3.7	18	6	0.83	0.34
		1224	33.7	8.8	4.3	20	7	0.79	0.24
		1496	39.0	0.3	--	9	3	0.79	0.52
Operation	2021	620	7.1	70.6	4.4	8	2	0.50	0.25
		1590	4.5	78.7	1.5	10	2	0.41	0.17
		1316	6.1	74.5	0.6	8	2	0.56	0.28
		471	13.2	55.6	3.1	9	2	0.69	0.36
		539	1.9	88.3	--	9	1	0.22	0.14
		498	2.4	9.4	1.5	10	3	0.34	0.15
		192	5.2	33.3	0.6	8	2	0.59	0.31
		354	5.6	36.7	2.9	12	3	0.72	0.29
		314	1.3	55.4	0.3	9	2	0.60	0.28
		180	4.4	37.2	2.0	14	3	0.65	0.20

Table A3-3: Keeyask Reservoir Zone 1a - Intermittently exposed (IE, kicknet)- substrate statistics and assessment results.

ZONE 1a IE KICKNET	Water Depth (m)		Total Organic Carbon (%)		Sand (%)		Silt/Clay (%)	
	2013	2021	2013	2021	2013	2021	2013	2021
No. of Samples (n)	5	10	5	10	5	10	5	10
Minimum	1.0	0.5	0.94	0.28	29.90	2.10	29.30	2.70
Maximum	1.1	0.8	4.54	1.96	70.70	97.20	70.10	97.90
1st Quartile	1.0	0.5	1.61	0.47	43.70	44.58	31.10	12.23
Median	1.0	0.5	2.63	0.92	55.10	67.60	44.90	32.15
3rd Quartile	1.1	0.6	4.36	1.12	68.80	87.75	56.30	55.43
Mean	1.0	0.6	2.82	0.90	53.64	60.54	46.34	39.39
Standard Deviation (n-1)	0.05	0.11	1.61	0.53	17.21	34.71	17.24	34.76
Standard Error	0.02	0.03	0.72	0.17	7.70	10.98	7.71	10.99
More than ±50% of Pre-impoundment Mean	--	--	--	lower	--	no	--	no

Table A3-4: Keeyask Reservoir Zone 1a - Intermittently exposed (IE, kicknet)- benthic invertebrate statistics and assessment results.

ZONE 1a IE KICKNET	Total Abundance (no. per sample)		EPT Index (%)		O+C Index (%)		EPT:C		Total Richness (no. of taxa)		EPT Richness (no. of taxa)		Diversity Index (Simpson's D)		Evenness Index (Simpson's E)	
	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021
No. of Samples (n)	5	10	5	10	5	10	4	9	5	10	5	10	5	10	5	10
Minimum	599	180	34	1	0	9	3	0	9	8	3	1	0.79	0.22	0.24	0.14
Maximum	1496	1590	48	13	16	88	6	4	20	14	8	3	0.83	0.72	0.52	0.36
1st Quartile	636	324	36	3	9	37	4	1	18	8	6	2	0.79	0.43	0.27	0.18
Median	974	485	39	5	9	56	4	2	18	9	7	2	0.81	0.58	0.31	0.26
3rd Quartile	1224	600	45	6	10	74	5	3	20	10	7	3	0.82	0.64	0.34	0.29
Mean	986	607	40	5	9	54	4	2	17	10	6	2	0.81	0.53	0.33	0.24
Standard Deviation (n-1)	383.78	472.41	5.97	3.39	5.54	24.68	1.09	1.37	4.58	1.95	1.92	0.63	0.02	0.16	0.11	0.07
Standard Error	171.63	149.39	2.67	1.07	2.48	7.81	0.54	0.46	2.05	0.62	0.86	0.20	0.01	0.05	0.05	0.02
More than ±50% of Pre-impoundment Mean	--	no	--	lower		higher	--	lower	--	no	--	lower	--	no	--	no

Table A3-5: Keeyask Reservoir Zone 1a - supporting site data, intermittently exposed (IE, benthic grab samples), pre-Project (2002) and Operation (2022 and 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing	Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2002	335964	6244010	0.6	0.6	5.8	53.3	40.0	--
		335964	6244010	0.6	0.6	5.1	22.4	70.0	--
		335964	6244010	0.6	--	--	--	--	--
		335964	6244010	0.6	--	--	--	--	--
Operation	2022	336043	6243866	1.0	--	--	--	--	--
		336072	6243880	1.0	1.0	31.6	1.5	98.5	Silt loam
		336036	6243852	0.8	--	--	--	--	--
	2023	336024	6243919	1.2	1.3	11.9	2.3	97.7	Silt
		335996	6243882	0.9	0.9	17.8	1.2	98.7	Silt
		336049	6243917	0.9	0.9	25.2	**0.5**	99.2	Silt loam
		335922	6243885	0.8	0.9	21.0	2.0	98.0	Silt loam
		335877	6243893	0.8	1.0	7.7	7.1	92.9	Silt

Table A3-6: Keeyask Reservoir Zone 1a - benthic invertebrate community metrics, intermittently exposed (IE, benthic grab samples), pre-Project (2002) and Operation (2022 and 2023).

Phase	Year	Total Abundance (no. per m^2)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2002	4372	4.0	19.8	0.2	6	2	0.45	0.30
		10042	0.9	63.8	0.0	6	1	0.55	0.37
		7445	0.0	45.3	0.0	8	0	0.65	0.36
		5670	2.3	26.0	0.1	9	2	0.56	0.25
Operation	2022	1399	3.1	72.2	0.1	9	3	0.58	0.26
		1342	1.1	36.6	0.1	8	1	0.81	0.66
		1399	3.1	25.8	0.1	9	3	0.75	0.45
	2023	4790	2.1	81.9	0.0	10	3	0.46	0.18
		8195	14.6	39.4	0.9	9	3	0.70	0.37
		9003	6.6	66.7	0.2	13	6	0.74	0.30
		3174	4.5	25.9	0.6	12	4	0.65	0.24
		0	--	--	--	0	0	--	--

Table A3-7: Keeyask Reservoir Zone 1a - Intermittently exposed (grab) - substrate statistics and assessment results.

ZONE 1a IE GRAB	Water Depth (m)			Total Organic Carbon (%)			Sand (%)			Silt/Clay (%)		
	2002	2022	2023	2002	2022	2023	2002	2022	2023	2002	2022	2023
No. of Samples (n)	4	3	5	2	1	5	2	1	5	2	1	5
Minimum	0.6	0.8	0.8	5.07	31.60	7.66	22.36	1.50	0.50	40.04	98.50	92.90
Maximum	0.6	1.0	1.2	5.76	31.60	25.20	53.35	1.50	7.10	70.02	98.50	99.20
1st Quartile	0.6	0.9	0.8	5.24	31.60	11.90	30.11	1.50	1.20	47.53	98.50	97.70
Median	0.6	1.0	0.9	5.42	31.60	17.80	37.85	1.50	2.00	55.03	98.50	98.00
3rd Quartile	0.6	1.0	0.9	5.59	31.60	21.00	45.60	1.50	2.30	62.52	98.50	98.70
Mean	0.6	0.9	0.9	5.42	31.60	16.71	37.85	1.50	2.62	55.03	98.50	97.30
Standard Deviation (n-1)	0.00	0.12	0.14	0.49		7.01	21.91		2.60	21.20		2.53
Standard Error	0.00	0.07	0.06	0.35		3.14	15.49		1.16	14.99		1.13
More than ±50% of Pre-impoundment Mean	--	--	--	--	higher	higher	--	lower	lower	--	higher	higher

Table A3-8: Keeyask Reservoir Zone 1a - Intermittently exposed (grab) - benthic invertebrate statistics and assessment results.

ZONE 1a IE GRAB	Total Abundance (no. per m^2)			EPT Index (%)			O+C Index (%)			EPT:C		
	2002	2022	2023	2002	2022	2023	2002	2022	2023	2002	2022	2023
No. of Samples (n)	4	3	5	4	3	4	4	3	4	4	3	4
Minimum	4372	1342	0	0	1	2	20	26	26	0	0	0
Maximum	10042	1399	9003	4	3	15	64	72	82	0	0	1
1st Quartile	5345	1371	3174	1	2	4	24	31	36	0	0	0
Median	6557	1399	4790	2	3	6	36	37	53	0	0	0
3rd Quartile	8094	1399	8195	3	3	9	50	54	70	0	0	1
Mean	6882	1380	5032	2	2	7	39	45	53	0	0	0
Standard Deviation (n-1)	2454.29	33.32	3694.66	1.73	1.16	5.42	19.95	24.28	25.43	0.09	0.04	0.38
Standard Error	1227.14	19.24	1652.30	0.87	0.67	2.71	9.97	14.02	12.72	0.05	0.02	0.19
More than ±50% of Pre-impoundment Mean	--	lower	no	--	no	higher	--	no	no	--	no	higher

Table A3-8: Continued.

ZONE 1a IE GRAB	Total Richness (no. of taxa)			EPT Richness (no. of taxa)			Diversity Index (Simpson's D)			Evenness Index (Simpson's E)		
	2002	2022	2023	2002	2022	2023	2002	2022	2023	2002	2022	2023
No. of Samples (n)	4	3	5	4	3	5	4	3	4	4	3	4
Minimum	6	8	0	0	1	0	0.45	0.58	0.46	0.25	0.26	0.18
Maximum	9	9	13	2	3	6	0.65	0.81	0.74	0.37	0.66	0.37
1st Quartile	6	9	9	1	2	3	0.52	0.67	0.60	0.29	0.36	0.23
Median	7	9	10	2	3	3	0.55	0.75	0.68	0.33	0.45	0.27
3rd Quartile	8	9	12	2	3	4	0.58	0.78	0.71	0.36	0.56	0.32
Mean	7	9	9	1	2	3	0.55	0.71	0.64	0.32	0.46	0.27
Standard Deviation (n-1)	1.50	0.58	5.17	0.96	1.15	2.17	0.08	0.12	0.13	0.05	0.20	0.08
Standard Error	0.75	0.33	2.31	0.48	0.67	0.97	0.04	0.07	0.06	0.03	0.12	0.04
More than ±50% of Pre-impoundment Mean	--	no	no	--	higher	higher	--	no	no	--	no	no

Table A3-9: Keeyask Reservoir Zone 1a - supporting site data, predominantly wetted (PW), pre-Project (2001, 2004, and 2013) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing	Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2001	335989	6243894	2.4	2.4	2.9	53.3	43.6	--
		335989	6243894	2.4	--	--	--	--	--
		335989	6243894	2.4	--	--	--	--	--
		335989	6243894	2.4		--	--	--	--
	2004	335974	6244009	1.3	1.3	11.3	15.7	73.0	--
		335974	6244009	1.3	--	--	--	--	--
		335974	6244009	1.3	--	--	--	--	--
		335974	6244009	1.3	--	--	--	--	--
	2013	335916	6244117	2.5	2.7	1.3	43.6	56.5	Loam
		335922	6244095	2.5	2.4	1.4	33.9	66.1	Loam
		335941	6244078	2.2	2.3	1.1	53.0	47.0	Loam / Sandy loam
		335952	6244071	2.2	2.3	1.3	56.2	43.9	Sandy loam
		335985	6244085	2.3	2.4	1.2	43.1	56.9	Loam
Operation	2021	336112	6244150	2.4	2.4	1.0	47.3	52.7	Sandy clay loam
		336106	6244129	1.4	1.2	2.5	54.7	45.3	Sandy loam
		336101	6244105	1.3	1.4	3.0	64.7	35.4	Sandy loam
		336087	6244080	1.3	1.3	3.2	57.2	42.8	Sandy loam
		336116	6244176	1.1	1.1	0.3	94.0	6.0	Sand
	2022	335910	6243895	2.3	2.1	12.1	2.2	97.8	Silty clay loam
		335932	6243890	2.4	2.7	10.2	4.8	95.2	Silty clay loam
		335946	6243880	2.1	2.2	14.4	0.5	99.5	Silty clay
		335989	6243895	2.2	2.8	8.1	16.2	83.7	Silty clay loam
		336025	6243916	2.7	2.7	12.8	8.4	91.5	Silt loam
	2023	336113	6244145	1.3	1.3	17.8	10.8	89.2	Silty clay loam
		336102	6244132	1.7	1.7	17.5	7.4	92.6	Silt
		336098	6244104	2.7	2.8	8.4	45.9	54.1	Silt loam
		336087	6244089	2.3	2.2	2.1	26.8	73.2	Silt loam
		336112	6244177	1.2	1.1	4.8	69.8	30.1	Sandy loam

Table A3-10: Keeyask Reservoir Zone 1a - benthic invertebrate community metrics, predominantly wetted (PW), pre-Project (2001, 2004, and 2013) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m^2)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2001	563	30.8	69.2	0.4	2	1	0.43	0.87
		1039	25.0	37.5	0.7	4	1	0.68	0.79
		1212	42.9	39.3	1.1	4	1	0.65	0.71
		693	25.0	56.3	0.5	4	1	0.65	0.71
	2004	8397	0.0	84.5	0.0	5	0	0.49	0.39
		6060	0.7	74.3	0.0	8	1	0.65	0.35
		7055	1.2	84.0	0.0	7	1	0.51	0.29
		8094	1.1	84.0	0.0	9	2	0.55	0.25
	2013	831	13.5	22.9	0.6	8	1	0.80	0.62
		883	12.7	5.9	2.2	6	1	0.74	0.63
		1013	8.5	20.5	0.4	5	1	0.59	0.49
		1489	7.6	15.1	0.5	6	2	0.76	0.69
		1489	9.3	18.0	0.5	8	2	0.71	0.42
Operation	2021	2121	19.0	48.3	0.4	12	5	0.71	0.29
		3982	10.1	66.7	0.2	10	5	0.67	0.30
		10200	9.5	71.3	0.1	12	6	0.57	0.19
		8642	5.5	70.8	0.1	10	3	0.53	0.21
		2741	2.1	81.1	0.0	9	3	0.40	0.19
	2022	2409	3.0	89.8	0.1	10	2	0.58	0.24
		4155	4.9	87.5	0.1	10	3	0.58	0.24
		736	2.0	82.4	0.0	5	1	0.40	0.33
		2943	2.0	82.4	0.1	6	1	0.60	0.42
		5093	0.3	89.5	0.0	5	1	0.56	0.45
	2023	4689	12.0	7.4	1.8	10	2	0.62	0.26
		1169	29.6	63.0	0.5	8	4	0.56	0.29
		1226	12.9	84.7	0.2	7	3	0.41	0.24
		462	3.1	96.9	0.0	2	1	0.06	0.53
		9046	14.0	69.5	0.3	17	6	0.68	0.18

Table A3-11: Keeyask Reservoir Zone 1a - Predominantly wetted (PW) - substrate statistics and assessment results.

ZONE 1a PW GRAB	Water Depth (m)						Total Organic Carbon (%)						Sand (%)						Silt/Clay (%)					
	2001	2004	2013	2021	2022	2023	2001	2004	2013	2021	2022	2023	2001	2004	2013	2021	2022	2023	2001	2004	2013	2021	2022	2023
No. of Samples (n)	4	4	5	5	5	5	1	1	5	5	5	5	1	1	5	5	5	5	1	1	5	5	5	5
Minimum	2.4	1.3	2.2	1.1	2.1	1.2	2.88	11.26	1.11	0.27	8.13	2.10	53.34	15.70	33.90	47.30	0.50	7.40	43.57	73.00	43.90	6.00	83.70	30.10
Maximum	2.4	1.3	2.5	2.4	2.7	2.7	2.88	11.26	1.41	3.20	14.40	17.80	53.34	15.70	56.20	94.00	16.20	69.80	43.57	73.00	66.10	52.70	99.50	92.60
1st Quartile	2.4	1.3	2.2	1.3	2.2	1.3	2.88	11.26	1.23	0.99	10.20	4.79	53.34	15.70	43.10	54.70	2.20	10.80	43.57	73.00	47.00	35.40	91.50	54.10
Median	2.4	1.3	2.3	1.3	2.3	1.7	2.88	11.26	1.29	2.53	12.10	8.36	53.34	15.70	43.60	57.20	4.80	26.80	43.57	73.00	56.50	42.80	95.20	73.20
3rd Quartile	2.4	1.3	2.5	1.4	2.4	2.3	2.88	11.26	1.34	3.00	12.80	17.50	53.34	15.70	53.00	64.70	8.40	45.90	43.57	73.00	56.90	45.30	97.80	89.20
Mean	2.4	1.3	2.3	1.5	2.3	1.8	2.88	11.26	1.28	2.00	11.53	10.11	53.34	15.70	45.96	63.58	6.42	32.14	43.57	73.00	54.08	36.44	93.54	67.84
Standard Deviation (n-1)	0.00	0.00	0.15	0.51	0.23	0.65			0.11	1.30	2.42	7.23			8.85	18.11	6.23	26.00			8.83	18.10	6.27	26.03
Standard Error	0.00	0.00	0.07	0.23	0.10	0.29			0.05	0.58	1.08	3.23			3.96	8.10	2.78	11.63			3.95	8.10	2.81	11.64
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	--	--	no	higher	higher	--	--	--	no	lower	no	--	--	--	no	higher	no

Table A3-12: Keeyask Reservoir Zone 1a - Predominantly wetted (PW) - benthic invertebrate statistics and assessment results.

ZONE 1a PW GRAB	Total Abundance (no. per m^2)						EPT Index (%)						O+C Index (%)						EPT:C					
	2001	2004	2013	2021	2022	2023	2001	2004	2013	2021	2022	2023	2001	2004	2013	2021	2022	2023	2001	2004	2013	2021	2022	2023
No. of Samples (n)	4	4	5	5	5	5	4	4	5	5	5	5	4	4	5	5	5	5	4	4	5	5	5	5
Minimum	563	6060	831	2121	736	462	25	0	8	2	0	3	38	74	6	48	82	7	0.44	0.00	0.42	0.03	0.00	0.03
Maximum	1212	8397	1489	10200	5093	9046	43	1	14	19	5	30	69	85	23	81	90	97	1.09	0.02	2.17	0.39	0.09	1.77
1st Quartile	660	6806	883	2741	2409	1169	25	1	9	6	2	12	39	82	15	67	82	63	0.49	0.01	0.50	0.08	0.03	0.17
Median	866	7574	1013	3982	2943	1226	28	1	9	9	2	13	48	84	18	71	88	70	0.58	0.02	0.53	0.15	0.06	0.27
3rd Quartile	1082	8170	1489	8642	4155	4689	34	1	13	10	3	14	59	84	21	71	90	85	0.77	0.02	0.59	0.19	0.08	0.47
Mean	876	7401	1141	5537	3067	3318	31	1	10	9	2	14	51	82	16	68	86	64	0.68	0.01	0.84	0.17	0.05	0.54
Standard Deviation (n-1)	300.65	1063.14	324.50	3650.07	1671.12	3600.12	8.42	0.55	2.65	6.36	1.68	9.58	15.04	4.95	6.60	12.02	3.72	34.45	0.29	0.01	0.74	0.14	0.03	0.71
Standard Error	150.33	531.57	145.12	1632.36	747.35	1610.02	4.21	0.27	1.18	2.85	0.75	4.28	7.52	2.48	2.95	5.38	1.66	15.40	0.15	0.00	0.33	0.06	0.02	0.32
More than ±50% of Pre-impoundment Mean	--	--	--	higher	no	no	--	--	--	no	lower	no	--	--	--	no	higher	no	--	--	--	lower	lower	no

Table A3-12: Continued.

ZONE 1a PW GRAB	Total Richness (no. of taxa)						EPT Richness (no. of taxa)						Diversity Index (Simpson's D)						Evenness Index (Simpson's E)					
	2001	2004	2013	2021	2022	2023	2001	2004	2013	2021	2022	2023	2001	2004	2013	2021	2022	2023	2001	2004	2013	2021	2022	2023
No. of Samples (n)	4	4	5	5	5	5	4	4	5	5	5	5	4	4	5	5	5	5	4	4	5	5	5	5
Minimum	2	5	5	9	5	2	1	0	1	3	1	1	0.43	0.49	0.59	0.40	0.40	0.06	0.71	0.25	0.42	0.19	0.24	0.18
Maximum	4	9	8	12	10	17	1	2	2	6	3	6	0.68	0.65	0.80	0.71	0.60	0.68	0.87	0.39	0.69	0.30	0.45	0.53
1st Quartile	4	7	6	10	5	7	1	1	1	3	1	2	0.59	0.51	0.71	0.53	0.56	0.41	0.71	0.28	0.49	0.19	0.24	0.24
Median	4	8	6	10	6	8	1	1	1	5	1	3	0.65	0.53	0.74	0.57	0.58	0.56	0.75	0.32	0.62	0.21	0.33	0.26
3rd Quartile	4	8	8	12	10	10	1	1	2	5	2	4	0.66	0.57	0.76	0.67	0.58	0.62	0.81	0.36	0.63	0.29	0.42	0.29
Mean	4	7	7	11	7	9	1	1	1	4	2	3	0.60	0.55	0.72	0.58	0.54	0.47	0.77	0.32	0.57	0.24	0.34	0.30
Standard Deviation (n-1)	1.00	1.71	1.34	1.34	2.59	5.45	0.00	0.82	0.55	1.34	0.89	1.92	0.12	0.07	0.08	0.12	0.08	0.25	0.08	0.06	0.11	0.05	0.10	0.13
Standard Error	0.50	0.85	0.60	0.60	1.16	2.44	0.00	0.41	0.24	0.60	0.40	0.86	0.06	0.03	0.03	0.05	0.04	0.11	0.04	0.03	0.05	0.02	0.04	0.06
More than ±50% of Pre-impoundment Mean	--	--	--	higher	no	higher	--	--	--	higher	no	higher	--	--	--	no	no	no	--	--	--	lower	no	no

Table A3-13: Keeyask Reservoir Zone 1a - supporting site data, offshore (OS), pre-Project (1999, 2001, and 2002) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing	Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	1999	338710	6244871	3.9	3.9	1.7	61.5	36.8	--
		338710	6244871	3.9	3.9	1.5	75.4	23.0	--
	2001	338721	6244886	6.6	6.6	1.7	72.3	22.7	--
		338721	6244886	6.6	--	--	--	--	--
		338721	6244886	6.6	--	--	--	--	--
	2002	335958	6244236	3.6	--	--	--	--	--
		335958	6244236	3.6	--	--	--	--	--
		335958	6244236	3.6	--	--	--	--	--
Operation	2021	335924	6244306	5.2	5.2	1.1	42.3	57.7	Loam / Clay loam
		335935	6244286	5.5	5.5	1.5	33.7	66.3	Silt loam
		335987	6244280	4.5	4.5	1.4	41.6	58.4	Loam
		335958	6244257	5.5	5.5	1.3	22.6	77.4	Clay loam
		336032	6244278	3.8	3.8	1.6	33.7	66.2	Silt loam
	2022	335944	6244048	5.0	5.0	2.1	46.6	53.4	Loam
		335979	6244031	5.0	5.0	2.0	40.6	59.3	Loam
		336012	6244040	4.8	5.0	1.7	50.4	49.6	Loam
		335910	6244033	3.8	3.2	2.2	45.9	54.1	Loam
		335938	6244004	4.2	3.7	2.8	29.5	70.5	Loam / Clay loam
	2023	335911	6244316	5.1	4.9	2.0	30.9	69.1	Silt loam
		335933	6244288	5.4	5.7	2.1	35.4	64.6	Silt loam
		335988	6244284	4.6	4.5	1.6	46.8	53.2	Loam
		335955	6244265	5.4	5.2	2.1	47.3	52.7	Loam
		336033	6244279	4.7	5.3	1.7	33.7	66.2	Silt loam

Table A3-14: Keeyask Reservoir Zone 1a - benthic invertebrate community metrics, offshore (OS), pre-Project (1999, 2001, and 2002) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m^2)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	1999	2510	12.1	58.6	0.2	5	1	0.60	0.50
		822	26.3	73.7	0.4	2	1	0.39	0.82
	2001	519	33.3	66.7	0.5	2	1	0.45	0.90
		779	38.9	44.4	1.0	4	1	0.67	0.75
		1298	63.3	23.3	2.7	4	2	0.60	0.63
	2002	260	83.3	0.0	--	2	1	0.28	0.69
		216	40.0	20.0	2.0	3	1	0.64	0.93
		303	28.6	14.3	2.0	3	1	0.57	0.78
Operation	2021	72	80.0	0.0	--	3	2	0.57	0.77
		245	82.4	5.9	14.0	4	1	0.31	0.36
		447	61.3	19.4	6.3	5	1	0.59	0.48
		620	48.8	2.3	21.0	6	1	0.65	0.47
		866	35.0	43.3	3.5	7	1	0.74	0.54
	2022	58	50.0	50.0	--	2	1	0.51	--
		87	83.3	16.7	5.0	2	1	0.28	0.70
		188	76.9	23.1	10.0	3	1	0.38	0.54
		58	50.0	50.0	2.0	4	2	0.76	--
		231	56.3	37.5	1.8	5	2	0.69	0.65
	2023	29	100.0	0.0	--	1	1	0.00	1.00
		29	100.0	0.0	--	1	1	0.00	1.00
		289	10.0	35.0	0.3	4	1	0.62	0.65
		274	21.1	0.0	--	2	1	0.33	0.75
		173	8.3	25.0	1.0	4	1	0.52	0.52

Table A3-15: Keeyask Reservoir Zone 1a - Offshore (OS) - substrate statistics and assessment results.

ZONE 1a OS GRAB	Water Depth (m)						Total Organic Carbon (%)						Sand (%)						Silt/Clay (%)					
	1999	2001	2002	2021	2022	2023	1999	2001	2002	2021	2022	2023	1999	2001	2002	2021	2022	2023	1999	2001	2002	2021	2022	2023
No. of Samples (n)	2	3	3	5	5	5	2	1	0	5	5	5	2	1	0	5	5	5	2	1	0	5	5	5
Minimum	3.9	6.6	3.6	3.8	3.8	4.6	1.53	1.67		1.05	1.73	1.61	61.53	72.31		22.60	29.50	30.90	23.04	22.67		57.70	49.60	52.70
Maximum	3.9	6.6	3.6	5.5	5.0	5.4	1.72	1.67		1.62	2.82	2.09	75.43	72.31		42.30	50.40	47.30	36.76	22.67		77.40	70.50	69.10
1st Quartile	3.9	6.6	3.6	4.5	4.2	4.7	1.58	1.67		1.28	2.00	1.74	65.00	72.31		33.70	40.60	33.70	26.47	22.67		58.40	53.40	53.20
Median	3.9	6.6	3.6	5.2	4.8	5.1	1.62	1.67		1.40	2.05	2.01	68.48	72.31		33.70	45.90	35.40	29.90	22.67		66.20	54.10	64.60
3rd Quartile	3.9	6.6	3.6	5.5	5.0	5.4	1.67	1.67		1.47	2.17	2.08	71.96	72.31		41.60	46.60	46.80	33.33	22.67		66.30	59.30	66.20
Mean	3.9	6.6	3.6	4.9	4.6	5.1	1.62	1.67		1.36	2.15	1.91	68.48	72.31		34.78	42.60	38.82	29.90	22.67		65.20	57.38	61.16
Standard Deviation (n-1)	0.00	0.00	0.00	0.74	0.54	0.39	0.13			0.21	0.41	0.22	9.83			7.96	8.11	7.68	9.70			7.96	8.11	7.67
Standard Error	0.00	0.00	0.00	0.33	0.24	0.17	0.09			0.10	0.18	0.10	6.95			3.56	3.63	3.44	6.86			3.56	3.63	3.43
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	--	--	no	no	no	--	--	--	lower	no	no	--	--	--	higher	higher	higher

Table A3-16: Keeyask Reservoir Zone 1a - Offshore (OS) -benthic invertebrate statistics and assessment results.

ZONE 1a OS GRAB	Total Abundance (no. per m^2)						EPT Index (%)						O+C Index (%)						EPT:C					
	1999	2001	2002	2021	2022	2023	1999	2001	2002	2021	2022	2023	1999	2001	2002	2021	2022	2023	1999	2001	2002	2021	2022	2023
No. of Samples (n)	2	3	3	5	5	5	2	3	3	5	5	5	2	3	3	5	5	5	2	3	2	4	4	2
Minimum	822	519	216	72	58	29	12	33	29	35	50	8	59	23	0	0	17	0	0.22	0.50	2.00	3.50	1.80	0.29
Maximum	2510	1298	303	866	231	289	26	63	83	82	83	100	74	67	20	43	50	35	0.36	2.71	2.00	21.00	10.00	1.00
1st Quartile	1244	649	238	245	58	29	16	36	34	49	50	10	62	34	7	2	23	0	0.25	0.75	2.00	5.63	1.95	0.46
Median	1666	779	260	447	87	173	19	39	40	61	56	21	66	44	14	6	38	0	0.29	1.00	2.00	10.17	3.50	0.64
3rd Quartile	2088	1039	281	620	188	274	23	51	62	80	77	100	70	56	17	19	50	25	0.32	1.86	2.00	15.75	6.25	0.82
Mean	1666	866	260	450	124	159	19	45	51	61	63	48	66	45	11	14	35	12	0.29	1.40	2.00	11.21	4.70	0.64
Standard Deviation (n-1)	1193.61	396.69	43.28	310.85	80.07	126.60	10.07	15.96	28.89	20.25	15.74	47.83	10.65	21.67	10.30	17.94	15.28	16.81	0.10	1.16	0.00	7.89	3.82	0.51
Standard Error	844.01	229.03	24.99	139.01	35.81	56.62	7.12	9.21	16.68	9.05	7.04	21.39	7.53	12.51	5.95	8.02	6.83	7.52	0.07	0.67	0.00	3.95	1.91	0.36
More than ±50% of Pre-impoundment Mean	--	--	--	no	lower	lower	--	--	--	higher	higher	no	--	--	--	lower	no	lower	--	--	--	higher	higher	no

Table A3-16: Continued.

ZONE 1a OS GRAB	Total Richness (no. of taxa)						EPT Richness (no. of taxa)						Diversity Index (Simpson's D)						Evenness Index (Simpson's E)					
	1999	2001	2002	2021	2022	2023	1999	2001	2002	2021	2022	2023	1999	2001	2002	2021	2022	2023	1999	2001	2002	2021	2022	2023
No. of Samples (n)	2	3	3	5	5	5	2	3	3	5	5	5	2	3	3	5	5	5	2	3	3	5	3	5
Minimum	2	2	2	3	2	1	1	1	1	1	1	1	0.39	0.45	0.28	0.31	0.28	0.00	0.50	0.63	0.69	0.36	0.54	0.52
Maximum	5	4	3	7	5	4	1	2	1	2	2	1	0.60	0.67	0.64	0.74	0.76	0.62	0.82	0.90	0.93	0.77	0.70	1.00
1st Quartile	3	3	3	4	2	1	1	1	1	1	1	1	0.44	0.52	0.43	0.57	0.38	0.00	0.58	0.69	0.74	0.47	0.59	0.65
Median	4	4	3	5	3	2	1	1	1	1	1	1	0.50	0.60	0.57	0.59	0.51	0.33	0.66	0.75	0.78	0.48	0.65	0.75
3rd Quartile	4	4	3	6	4	4	1	2	1	1	2	1	0.55	0.64	0.61	0.65	0.69	0.52	0.74	0.83	0.86	0.54	0.67	1.00
Mean	4	3	3	5	3	2	1	1	1	1	1	1	0.50	0.57	0.50	0.57	0.52	0.29	0.66	0.76	0.80	0.53	0.63	0.78
Standard Deviation (n-1)	2.12	1.15	0.58	1.58	1.30	1.52	0.00	0.58	0.00	0.45	0.55	0.00	0.15	0.11	0.19	0.16	0.20	0.29	0.22	0.14	0.12	0.15	0.08	0.21
Standard Error	1.50	0.67	0.33	0.71	0.58	0.68	0.00	0.33	0.00	0.20	0.24	0.00	0.11	0.07	0.11	0.07	0.09	0.13	0.16	0.08	0.07	0.07	0.05	0.10
More than ±50% of Pre-impoundment Mean	--	--	--	higher	no	no	--	--	--	no	no	no	--	--	--	no	no	no	--	--	--	no	no	no

Table A3-17: Keeyask Reservoir Zone 1b - supporting site data, intermittently exposed (IE, kicknet samples), pre-Project (2013) and Operation (2021). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2013	353974	6245609	Kick Net	0.3	0.5	1.3	83.6	16.4	Loamy sand
		353867	6245730	Kick Net	0.3	0.5	2.2	74.1	25.8	Sandy loam
		353841	6245739	Kick Net	0.6	0.5	0.7	81.6	18.4	Loamy sand
		353812	6245736	Kick Net	0.6	0.5	0.6	86.6	13.4	Loamy sand
		353784	6245741	Kick Net	0.6	0.5	3.5	52.7	47.3	Sandy clay/loam
Operation	2021	354135	6243402	Kick Net	0.7	0.1	0.2	97.7	2.3	Sand
		354120	6243404	Kick Net	0.7	0.1	0.3	97.4	2.6	Sand
		354140	6243427	Kick Net	0.5	0.1	1.2	32.2	67.8	Silt loam
		354160	6243439	Kick Net	0.6	0.2	0.8	15.3	84.8	Silty clay
		354160	6243402	Kick Net	0.7	0.1	0.2	99.0	1.0	Sand

Table A3-18: Keeyask Reservoir Zone 1b - benthic invertebrate community metrics, intermittently exposed (IE, kicknet samples), pre-Project (2013) and Operation (2021).

Phase	Year	Total Abundance (no. per sample)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2013	1361	21.2	3.2	7.2	12	5	0.61	0.21
		1345	36.5	4.5	12.9	18	6	0.69	0.18
		1917	27.4	5.6	5.7	20	5	0.69	0.16
		1192	39.6	5.7	6.9	11	6	0.70	0.30
		658	25.4	7.1	3.6	18	7	0.64	0.15
Operation	2021	936	6.0	16.2	0.7	11	1	0.53	0.19
		44	6.8	13.6	0.6	6	1	0.55	0.37
		1152	2.8	4.9	0.7	11	2	0.35	0.14
		2728	1.8	10.9	0.2	10	2	0.37	0.16
		1905	2.5	27.7	0.1	10	1	0.56	0.23

Table A3-19: Keeyask Reservoir Zone 1b - Intermittently exposed (IE, kicknet)- substrate statistics and assessment results.

ZONE 1b IE KICKNET	Water Depth (m)		Total Organic Carbon (%)		Sand (%)		Silt/Clay (%)	
	2013	2021	2013	2021	2013	2021	2013	2021
No. of Samples (n)	5	5	5	5	5	5	5	5
Minimum	0.3	0.5	0.64	0.20	52.70	15.30	13.40	1.00
Maximum	0.6	0.7	3.51	1.18	86.60	99.00	47.30	84.80
1st Quartile	0.3	0.6	0.74	0.22	74.10	32.20	16.40	2.30
Median	0.6	0.7	1.31	0.25	81.60	97.40	18.38	2.60
3rd Quartile	0.6	0.7	2.22	0.83	83.60	97.70	25.80	67.80
Mean	0.5	0.6	1.68	0.54	75.72	68.32	24.26	31.70
Standard Deviation (n-1)	0.16	0.09	1.20	0.45	13.67	41.13	13.67	41.16
Standard Error	0.07	0.04	0.54	0.20	6.11	18.39	6.11	18.41
More than ±50% of Pre-impoundment Mean	--	--	--	lower	--	no	--	no

Table A3-20: Keeyask Reservoir Zone 1b - Intermittently exposed (kicknet)- benthic invertebrate statistics and assessment results.

ZONE 1b IE KICKNET	Total Abundance (no. per sample)		EPT Index (%)		O+C Index (%)		EPT:C		Total Richness (no. of taxa)		EPT Richness (no. of taxa)		Diversity Index (Simpson's D)		Evenness Index (Simpson's E)	
	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	658	44	21	2	3	5	3.55	0.10	11	6	5	1	0.61	0.35	0.15	0.14
Maximum	1917	2728	40	7	7	28	12.92	0.70	20	11	9	3	0.70	0.56	0.30	0.37
1st Quartile	1192	936	25	3	4	11	5.72	0.17	12	10	6	2	0.64	0.37	0.16	0.16
Median	1345	1152	27	3	6	14	6.94	0.60	18	10	7	2	0.69	0.53	0.18	0.19
3rd Quartile	1361	1905	37	6	6	16	7.20	0.67	18	11	9	2	0.69	0.55	0.21	0.23
Mean	1295	1353	30	4	5	15	7.27	0.45	16	10	7	2	0.66	0.47	0.20	0.22
Standard Deviation (n-1)	450.03	1015.27	7.75	2.27	1.47	8.43	3.47	0.29	4.02	2.07	1.79	0.71	0.04	0.10	0.06	0.09
Standard Error	201.26	454.04	3.47	1.01	0.66	3.77	1.55	0.13	1.80	0.93	0.80	0.32	0.02	0.05	0.03	0.04
More than ±50% of Pre-impoundment Mean	--	no	--	lower	--	higher	--	lower	--	no	--	lower	--	no	--	no

Table A3-21: Keeyask Reservoir Zone 1b - supporting site data, intermittently exposed (IE, benthic grab samples), pre-Project (2002 and 2004) and Operation (2022 and 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2002	350632	6245043	Ekman (tall)	0.3	0.3	17.0	14.6	68.4	na
		350632	6245043	Ekman (tall)	0.3	--	--	--	--	--
		350632	6245043	Ekman (tall)	0.3	--	--	--	--	--
		350632	6245043	Ekman (tall)	0.3	--	--	--	--	--
	2004	350659	6245033	Ekman (tall)	0.6	0.6	19.7	16.8	63.6	na
		350659	6245033	Ekman (tall)	0.6	--	--	--	--	--
		350659	6245033	Ekman (tall)	0.6	--	--	--	--	--
		350659	6245033	Ekman (tall)	0.6	--	--	--	--	--
Operation	2022	353217	6245908	Petite Ponar	0.9	0.9	36.2	5.3	94.7	Silt
		353260	6245906	Petite Ponar	0.9	--	--	--	--	--
		353306	6245916	Petite Ponar	0.9	--	--	--	--	--
	2023	353221	6245902	Petite Ponar	0.3	0.3	36.1	1.0	99.0	Silt
		353231	6245877	Petite Ponar	0.6	--	--	--	--	Flooded terrestrial
		353240	6245832	Petite Ponar	0.4	0.3	0.6	87.7	12.3	Sand
		353240	6245813	Petite Ponar	0.4	0.3	1.0	69.8	30.2	Sandy loam
		353198	6245899	Petite Ponar	0.4	0.3	2.6	49.3	50.7	Sandy loam

Table A3-22: Keeyask Reservoir Zone 1b - benthic invertebrate community metrics, intermittently exposed (IE, benthic grab samples), pre-Project (2002 and 2004) and Operation (2022 and 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2002	10994	2.4	51.6	0.1	10	2	0.60	0.25
		10907	0.8	55.6	0.0	9	2	0.64	0.31
		13850	0.3	53.8	0.0	7	1	0.57	0.33
		27441	0.6	42.6	0.0	10	1	0.61	0.26
	2004	2251	0.0	76.9	0.0	6	0	0.64	0.46
		1558	0.0	75.0	0.0	5	0	0.65	0.57
		693	0.0	68.8	0.0	5	0	0.63	0.55
		2597	0.0	76.7	0.0	5	0	0.59	0.49
Operation	2022	17212	2.0	46.3	0.1	9	2	0.62	0.29
		9984	4.0	41.0	0.1	10	4	0.63	0.27
		20732	0.6	73.2	0.0	9	2	0.48	0.22
	2023	1948	1.5	19.3	0.1	8	1	0.55	0.28
		5324	2.2	50.9	0.3	6	1	0.66	0.48
		87	0.0	0.0	--	1	0	0.00	1.00
		693	0.0	31.3	0.0	4	0	0.48	0.48
		1010	0.0	71.4	0.0	4	0	0.56	0.57

Table A3-23: Keeyask Reservoir Zone 1b - Intermittently exposed (grab) - substrate statistics and assessment results.

ZONE 1a IE GRAB	Water Depth (m)				Total Organic Carbon (%)				Sand (%)				Silt/Clay (%)			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	4	4	3	5	1	1	1	4	1	1	1	4	1	1	1	4
Minimum	0.3	0.6	0.9	0.3	17.01	19.66	36.20	0.61	14.61	16.79	5.30	1.00	68.38	63.55	94.70	12.30
Maximum	0.3	0.6	0.9	0.6	17.01	19.66	36.20	36.10	14.61	16.79	5.30	87.70	68.38	63.55	94.70	99.00
1st Quartile	0.3	0.6	0.9	0.4	17.01	19.66	36.20	0.89	14.61	16.79	5.30	37.23	68.38	63.55	94.70	25.73
Median	0.3	0.6	0.9	0.4	17.01	19.66	36.20	1.80	14.61	16.79	5.30	59.55	68.38	63.55	94.70	40.45
3rd Quartile	0.3	0.6	0.9	0.4	17.01	19.66	36.20	11.00	14.61	16.79	5.30	74.28	68.38	63.55	94.70	62.78
Mean	0.3	0.6	0.9	0.4	17.01	19.66	36.20	10.08	14.61	16.79	5.30	51.95	68.38	63.55	94.70	48.05
Standard Deviation (n-1)	0.00	0.00	0.00	0.12				17.37				37.41				37.41
Standard Error	0.00	0.00	0.00	0.05				8.68				18.71				18.71
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	higher	no	--	--	lower	higher	--	--	no	no

Table A3-24: Keeyask Reservoir Zone 1b - Intermittently exposed (grab) - benthic invertebrate statistics and assessment results.

ZONE 1a IE GRAB	Total Abundance (no. per m²)				EPT Index (%)				O+C Index (%)				EPT:C			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	4	4	3	5	4	4	3	5	4	4	3	5	4	4	3	4
Minimum	10907	693	9984	87	0	0	1	0	43	69	41	0	0.01	0.00	0.01	0.00
Maximum	27441	2597	20732	5324	2	0	4	2	56	77	73	71	0.05	0.00	0.13	0.33
1st Quartile	10972	1342	13598	693	1	0	1	0	49	73	44	19	0.01	0.00	0.03	0.00
Median	12422	1904	17212	1010	1	0	2	0	53	76	46	31	0.02	0.00	0.05	0.07
3rd Quartile	17248	2337	18972	1948	1	0	3	1	54	77	60	51	0.03	0.00	0.09	0.19
Mean	15798	1775	15976	1812	1	0	2	1	51	74	54	35	0.02	0.00	0.07	0.12
Standard Deviation (n-1)	7881.54	840.77	5479.80	2075.12	0.91	0.00	1.72	1.03	5.75	3.82	17.26	27.69	0.02	0.00	0.06	0.16
Standard Error	3940.77	420.38	3163.77	928.02	0.46	0.00	0.99	0.46	2.88	1.91	9.97	12.38	0.01	0.00	0.04	0.08
More than ±50% of Pre-impoundment Mean	--	--	higher	lower	--	--	higher	no	--	--	no	no	--	--	higher	higher

Table A3-24: Continued.

ZONE 1a IE GRAB	Total Richness (no. of taxa)				EPT Richness (no. of taxa)				Diversity Index (Simpson's D)				Evenness Index (Simpson's E)			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	4	4	3	5	4	4	3	5	4	4	3	5	4	4	3	5
Minimum	7	5	9	1	1	0	2	0	0.57	0.59	0.48	0.00	0.25	0.46	0.22	0.28
Maximum	10	6	10	8	2	0	4	1	0.64	0.65	0.63	0.66	0.33	0.57	0.29	1.00
1st Quartile	9	5	9	4	1	0	2	0	0.59	0.62	0.55	0.48	0.26	0.48	0.24	0.48
Median	10	5	9	4	2	0	2	0	0.61	0.64	0.62	0.55	0.28	0.52	0.27	0.48
3rd Quartile	10	5	10	6	2	0	3	1	0.62	0.64	0.62	0.56	0.31	0.55	0.28	0.57
Mean	9	5	9	5	2	0	3	0	0.60	0.63	0.58	0.45	0.29	0.52	0.26	0.56
Standard Deviation (n-1)	1.41	0.50	0.58	2.61	0.58	0.00	1.15	0.55	0.03	0.03	0.08	0.26	0.04	0.05	0.04	0.27
Standard Error	0.71	0.25	0.33	1.17	0.29	0.00	0.67	0.24	0.01	0.01	0.05	0.12	0.02	0.02	0.02	0.12
More than ±50% of Pre-impoundment Mean	--	--	no	no	--	--	higher	no	--	--	no	no	--	--	no	no

Table A3-25: Keeyask Reservoir Zone 1b - supporting site data, predominantly wetted (PW), pre-Project (1999, 2001, 2002, and 2013) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	1999	353935	6245478	Ekman (tall)	1.1	1.1	8.4	0.6	91.0	na
		353935	6245478	Ekman (tall)	1.1	1.1	10.1	1.2	88.7	na
		353935	6245478	Ekman (tall)	1.1	1.1	8.8	0.5	90.7	na
		353935	6245478	Ekman (tall)	1.1	1.1	9.5	1.0	89.5	na
		345485	6244940	Ekman (tall)	2.0	2.0	2.0	66.7	31.3	na
		345485	6244940	Ekman (tall)	2.0	2.0	1.4	80.5	18.1	na
		345485	6244940	Ekman (tall)	2.0	2.0	1.1	82.3	16.6	na
		345485	6244940	Ekman (tall)	2.0	2.0	1.1	79.9	19.0	na
	2001	353879	6245272	Ekman (tall)	1.4	1.4	8.4	17.5	74.0	na
		353879	6245272	Ekman (tall)	1.4	--	--	--	--	--
		353879	6245272	Ekman (tall)	1.4	--	--	--	--	--
		353879	6245272	Ekman (tall)	1.4	--	--	--	--	--
		356732	6245183	Ekman (tall)	1.9	1.9	2.9	50.6	46.3	na
		356732	6245183	Ekman (tall)	1.9	--	--	--	--	--
		356732	6245183	Ekman (tall)	1.9	--	--	--	--	--
		356732	6245183	Ekman (tall)	1.9	--	--	--	--	--
		356400	6245328	Ekman (tall)	2.7	2.7	3.0	47.2	47.3	na
		356400	6245328	Ekman (tall)	2.7	--	--	--	--	--
		356400	6245328	Ekman (tall)	2.7	--	--	--	--	--
		356400	6245328	Ekman (tall)	2.7	--	--	--	--	--
		350530	6244982	Ekman (tall)	1.2	1.2	9.9	1.6	88.6	na
		350530	6244982	Ekman (tall)	1.2	1.2	16.9	56.4	26.7	na
		350530	6244982	Ekman (tall)	1.2	--	--	--	--	--
		350530	6244982	Ekman (tall)	1.2	--	--	--	--	--
		355358	6243834	Ekman (tall)	2.3	2.3	7.6	1.4	90.9	na
		355358	6243834	Ekman (tall)	2.3	--	--	--	--	--
		355358	6243834	Ekman (tall)	2.3	--	--	--	--	--
		355358	6243834	Ekman (tall)	2.3	--	--	--	--	--

Table A3-25: Continued.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2002	354070	6245212	Ekman (tall)	1.7	1.7	2.3	56.1	41.0	na
		354070	6245212	Ekman (tall)	1.7	--	--	--	--	--
		354070	6245212	Ekman (tall)	1.7	--	--	--	--	--
		354070	6245212	Ekman (tall)	1.7	--	--	--	--	--
		345433	6245032	Ekman (tall)	2.6	2.6	2.5	32.7	30.9	na
		345433	6245032	Ekman (tall)	2.6	--	--	--	--	--
		345433	6245032	Ekman (tall)	2.6	--	--	--	--	--
		345433	6245032	Ekman (tall)	2.6	--	--	--	--	--
		350621	6245055	Ekman (tall)	1.1	1.1	17.0	14.6	68.4	na
		350621	6245055	Ekman (tall)	1.1	--	--	--	--	--
		350621	6245055	Ekman (tall)	1.1	--	--	--	--	--
		350621	6245055	Ekman (tall)	1.1	--	--	--	--	--
		355301	6244114	Ekman (tall)	2.2	2.2	7.0	10.1	82.9	na
		355301	6244114	Ekman (tall)	2.2	--	--	--	--	--
		355301	6244114	Ekman (tall)	2.2	--	--	--	--	--
		355301	6244114	Ekman (tall)	2.2	--	--	--	--	--
	2013	353702	6245424	Petite Ponar	2.0	2.2	1.7	16.1	83.9	Silt loam
		353674	6245374	Petite Ponar	2.2	2.3	1.6	19.4	80.5	Silt loam
		353632	6245342	Petite Ponar	2.3	2.3	1.1	55.3	44.7	Sandy loam
		353617	6245346	Petite Ponar	2.3	2.3	0.9	60.2	39.9	Sandy loam
		353631	6245364	Petite Ponar	2.3	2.2	1.1	39.7	60.4	Loam
Operation	2021	354379	6243809	Petite Ponar	2.8	2.9	7.0	23.9	76.1	Silt loam
		354403	6243797	Petite Ponar	2.6	2.6	16.4	19.5	80.4	Silt loam
		354429	6243793	Petite Ponar	2.0	2.0	3.0	16.7	83.2	Silt
		354449	6243793	Petite Ponar	2.5	2.5	10.4	13.7	86.2	Silt
		354470	6243789	Petite Ponar	2.3	2.3	6.7	11.2	88.9	Silt
	2022	353131	6245893	Petite Ponar	2.0	2.0	35.2	4.6	95.4	Silt loam
		353032	6245980	Petite Ponar	1.9	2.0	12.1	41.6	58.3	Silt loam
		352999	6246054	Petite Ponar	2.2	2.0	30.8	4.8	95.2	Silt loam
		352993	6246102	Petite Ponar	1.8	1.8	22.8	33.1	66.8	Silt loam
		352921	6246124	Petite Ponar	2.4	2.1	39.1	1.0	99.0	Silt

Table A3-25: Continued.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Operation	2023	353123	6245889	Petite Ponar	2.6	2.4	22.9	3.5	96.5	Silty clay loam
		353035	6245978	Petite Ponar	1.9	1.5	22.9	26.5	73.5	Silt loam
		352995	6246052	Petite Ponar	2.2	2.4	15.6	29.0	71.1	Silt loam
		352989	6246103	Petite Ponar	1.5	1.8	28.0	13.7	86.3	Silt loam
		352919	6246126	Petite Ponar	2.1	2.1	37.2	1.9	98.1	Silt loam

Table A3-26: Keeyask Reservoir Zone 1b - benthic invertebrate community metrics, predominantly wetted (PW), pre-Project (1999, 2001, 2002, and 2013) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	1999	1082	36.0	44.0	1.0	7	2	0.74	0.56
		909	52.4	38.1	1.4	4	1	0.58	0.59
		1169	48.1	25.9	1.9	5	1	0.67	0.61
		1255	41.4	27.6	1.7	6	2	0.72	0.59
		5843	2.2	37.0	0.1	6	1	0.61	0.43
		7142	1.2	66.7	0.1	6	1	0.71	0.57
		779	11.1	50.0	0.2	4	1	0.66	0.74
		4501	1.0	48.1	0.0	7	1	0.71	0.50
	2001	909	19.0	71.4	0.3	5	2	0.46	0.37
		563	15.4	84.6	0.2	2	1	0.26	0.68
		390	0.0	100.0	0.0	1	0	0.00	1.00
		909	4.8	71.4	0.1	4	1	0.45	0.45
		2164	50.0	26.0	2.3	5	1	0.67	0.60
		866	40.0	35.0	1.3	4	1	0.69	0.80
		1212	46.4	35.7	1.3	3	1	0.63	0.89
		1298	56.7	23.3	2.4	4	1	0.60	0.62
		2337	29.6	29.6	1.0	6	1	0.75	0.66
		1342	48.4	32.3	2.5	5	1	0.69	0.64
		2597	40.0	28.3	1.4	7	2	0.70	0.48
		2727	31.7	27.0	1.2	4	1	0.72	0.90
		4328	0.0	70.0	0.0	4	0	0.47	0.48
		4198	3.1	69.1	0.0	5	2	0.47	0.38
		4025	4.3	55.9	0.1	5	1	0.62	0.53
		2034	0.0	61.7	0.0	4	0	0.55	0.56
		260	16.7	16.7	1.0	4	1	0.67	0.76
		519	8.3	75.0	0.1	3	1	0.40	0.56
		519	8.3	58.3	0.1	5	1	0.61	0.52
		779	5.6	44.4	0.1	4	1	0.66	0.74
	2002	3679	16.5	20.0	1.6	7	1	0.66	0.42
		2467	14.0	1.8	--	5	1	0.55	0.44
		3592	21.7	3.6	6.0	7	2	0.61	0.37
		4285	18.2	7.1	6.0	8	1	0.55	0.28
		433	40.0	20.0	2.0	4	1	0.70	0.84
		87	50.0	0.0	--	2	1	0.51	--
		216	100.0	0.0	--	1	1	0.00	1.00
		216	40.0	0.0	--	3	1	0.64	0.93
		8397	1.0	53.1	0.0	6	2	0.65	0.47
		6492	0.7	42.0	0.0	6	1	0.56	0.38
		10215	1.3	57.2	0.0	6	1	0.52	0.35

Table A3-26: Continued.

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2002	8224	1.1	58.9	0.0	6	1	0.54	0.36
		1125	15.4	15.4	1.0	5	1	0.77	0.88
		2857	27.3	4.5	9.0	6	2	0.63	0.45
		260	0.0	0.0	--	2	0	0.28	0.69
		346	0.0	0.0	--	2	0	0.38	0.80
	2013	970	33.9	17.0	2.1	8	1	0.69	0.40
		1264	19.2	19.9	1.2	7	1	0.83	0.84
		2130	0.0	0.0	--	2	0	0.42	0.86
		4562	2.5	3.6	0.7	11	2	0.57	0.21
		2017	8.2	12.9	0.6	6	1	0.66	0.50
Operation	2021	7762	21.2	61.0	0.4	10	5	0.68	0.32
		2958	23.4	64.4	0.4	10	4	0.58	0.24
		1731	6.7	76.7	0.1	5	2	0.40	0.33
		6882	7.3	87.2	0.1	8	3	0.29	0.18
		4170	19.7	63.7	0.4	9	3	0.69	0.35
	2022	1096	13.2	57.9	0.3	9	3	0.67	0.34
		750	3.8	78.8	0.1	7	2	0.47	0.27
		606	2.4	71.4	0.0	6	1	0.53	0.36
		1515	1.9	56.2	0.0	9	2	0.66	0.33
		3924	4.4	77.9	0.1	8	3	0.54	0.27
	2023	4314	53.5	28.8	3.0	8	4	0.75	0.50
		3116	4.2	63.0	0.1	7	2	0.54	0.31
		3001	8.7	57.7	0.2	12	3	0.70	0.28
		2236	13.5	43.9	0.4	13	3	0.80	0.38
		3390	9.4	65.1	0.2	12	5	0.56	0.19

Table A3-27: Keeyask Reservoir Zone 1b - Predominantly wetted (PW) - substrate statistics and assessment results.

ZONE 1b PW GRAB	Water Depth (m)							Total Organic Carbon (%)							Sand (%)							Silt/Clay (%)						
	1999	2001	2002	2013	2021	2022	2023	1999	2001	2002	2013	2021	2022	2023	1999	2001	2002	2013	2021	2022	2023	1999	2001	2002	2013	2021	2022	2023
No. of Samples (n)	8	20	16	5	5	5	5	8	6	4	5	5	5	5	8	6	4	5	5	5	5	8	6	4	5	5	5	5
Minimum	1.1	1.2	1.1	2.0	2.0	1.8	1.5	1.09	2.87	2.28	0.86	3.00	12.10	15.60	0.50	1.44	10.09	16.10	11.20	1.00	1.90	16.62	26.73	30.94	39.90	76.10	58.30	71.10
Maximum	2.0	2.7	2.6	2.3	2.8	2.4	2.6	10.08	16.87	17.01	1.69	16.40	39.10	37.20	82.30	56.41	56.13	60.20	23.90	41.60	29.00	91.00	90.93	82.91	83.90	88.90	99.00	98.10
1st Quartile	1.1	1.4	1.6	2.2	2.3	1.9	1.9	1.36	4.15	2.42	1.11	6.69	22.80	22.90	0.91	5.57	13.48	19.40	13.70	4.60	3.50	18.79	46.59	38.46	44.70	80.40	66.80	73.50
Median	1.6	1.9	2.0	2.3	2.5	2.0	2.1	5.19	8.02	4.73	1.14	6.98	30.80	22.90	33.98	32.38	23.68	39.70	16.70	4.80	13.70	59.99	60.67	54.67	60.40	83.20	95.20	86.30
3rd Quartile	2.0	2.3	2.3	2.3	2.6	2.2	2.2	8.94	9.50	9.50	1.57	10.40	35.20	28.00	80.01	49.74	38.59	55.30	19.50	33.10	26.50	89.82	84.93	72.02	80.50	86.20	95.40	96.50
Mean	1.6	1.9	1.9	2.2	2.4	2.1	2.1	5.29	8.10	7.19	1.27	8.69	28.00	25.32	39.08	29.13	28.39	38.14	17.00	17.02	14.92	55.62	62.32	55.80	61.88	82.96	82.94	85.10
Standard Deviation (n-1)	0.48	0.59	0.56	0.13	0.30	0.24	0.42	4.20	5.17	6.90	0.35	5.04	10.76	7.98	41.16	25.26	20.93	20.13	4.96	18.86	12.59	37.01	26.04	24.02	20.08	4.99	18.92	12.56
Standard Error	0.17	0.13	0.14	0.06	0.14	0.11	0.19	1.48	2.11	3.45	0.15	2.25	4.81	3.57	14.55	10.31	10.46	9.00	2.22	8.43	5.63	13.08	10.63	12.01	8.98	2.23	8.46	5.62
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	--	--	--	--	higher	higher	higher	--	--	--	--	lower	lower	lower	--	--	--	--	no	no	no

Table A3-28: Keeyask Reservoir Zone 1b - Predominantly wetted (PW) - benthic invertebrate statistics and assessment results.

ZONE 1b PW GRAB	Total Abundance (no. per m^2)							EPT Index (%)							O+C Index (%)							EPT:C						
	1999	2001	2002	2013	2021	2022	2023	1999	2001	2002	2013	2021	2022	2023	1999	2001	2002	2013	2021	2022	2023	1999	2001	2002	2013	2021	2022	2023
No. of Samples (n)	8	20	16	5	5	5	5	8	20	16	5	5	5	5	8	20	16	5	5	5	5	8	20	10	4	5	5	5
Minimum	779	260	87	970	1731	606	2236	1	0	0	0	7	2	4	26	17	0	0	61	56	29	0.03	0.00	0.02	0.63	0.09	0.04	0.07
Maximum	7142	4328	10215	4562	7762	3924	4314	52	57	100	34	23	13	54	67	100	59	20	87	79	65	1.86	2.50	9.00	2.11	0.40	0.26	2.96
1st Quartile	1039	725	325	1264	2958	750	3001	2	5	1	2	7	2	9	35	29	0	4	64	58	44	0.07	0.08	0.02	0.70	0.09	0.04	0.15
Median	1212	1255	2662	2017	4170	1096	3116	24	16	16	8	20	4	9	41	50	6	13	64	71	58	0.61	0.22	1.28	0.94	0.38	0.05	0.18
3rd Quartile	4837	2402	4837	2130	6882	1515	3390	43	40	30	19	21	4	14	49	70	26	17	77	78	63	1.46	1.31	5.00	1.40	0.38	0.07	0.38
Mean	2835	1699	3306	2188	4700	1578	3212	24	21	22	13	16	5	18	42	51	18	11	71	68	52	0.79	0.77	2.56	1.16	0.26	0.09	0.75
Standard Deviation (n-1)	2581.66	1304.75	3372.18	1414.85	2562.57	1357.48	750.27	22.44	19.49	26.36	13.96	8.02	4.60	20.21	13.20	23.86	22.25	8.56	11.09	10.83	15.25	0.79	0.87	3.24	0.68	0.16	0.10	1.24
Standard Error	912.75	291.75	843.05	632.74	1146.02	607.08	335.53	7.93	4.36	6.59	6.24	3.59	2.06	9.04	4.67	5.34	5.56	3.83	4.96	4.84	6.82	0.28	0.19	1.03	0.34	0.07	0.04	0.56
More than ±50% of Pre-impoundment Mean	--	--	--	--	higher	no	no	--	--	--	--	no	lower	no	--	--	--	--	higher	higher	no	--	--	--	--	lower	lower	no

Table A3-28: Continued.

ZONE 1b PW GRAB	Total Richness (no. of taxa)							EPT Richness (no. of taxa)							Diversity Index (Simpson's D)							Evenness Index (Simpson's E)						
	1999	2001	2002	2013	2021	2022	2023	1999	2001	2002	2013	2021	2022	2023	1999	2001	2002	2013	2021	2022	2023	1999	2001	2002	2013	2021	2022	2023
No. of Samples (n)	8	20	16	5	5	5	5	8	20	16	5	5	5	5	8	20	16	5	5	5	5	8	20	15	5	5	5	5
Minimum	4	1	1	2	5	6	7	1	0	0	0	2	1	2	0.58	0.00	0.00	0.42	0.29	0.47	0.54	0.43	0.37	0.28	0.21	0.18	0.27	0.19
Maximum	7	7	8	11	10	9	13	2	2	2	2	5	3	5	0.74	0.75	0.77	0.83	0.69	0.67	0.80	0.74	1.00	1.00	0.86	0.35	0.36	0.50
1st Quartile	5	4	3	6	8	7	8	1	1	1	1	3	2	3	0.65	0.47	0.52	0.57	0.40	0.53	0.56	0.54	0.51	0.37	0.40	0.24	0.27	0.28
Median	6	4	6	7	9	8	12	1	1	1	1	3	2	3	0.69	0.62	0.56	0.66	0.58	0.54	0.70	0.58	0.61	0.45	0.50	0.32	0.33	0.31
3rd Quartile	6	5	6	8	10	9	12	1	1	1	1	4	3	4	0.72	0.67	0.64	0.69	0.68	0.66	0.75	0.60	0.74	0.82	0.84	0.33	0.34	0.38
Mean	6	4	5	7	8	8	10	1	1	1	1	3	2	3	0.68	0.55	0.53	0.63	0.53	0.58	0.67	0.57	0.63	0.58	0.56	0.28	0.31	0.33
Standard Deviation (n-1)	1.19	1.32	2.14	3.27	2.07	1.30	2.70	0.46	0.56	0.57	0.71	1.14	0.84	1.14	0.06	0.18	0.19	0.15	0.18	0.09	0.12	0.09	0.17	0.25	0.28	0.07	0.04	0.12
Standard Error	0.42	0.30	0.54	1.46	0.93	0.58	1.21	0.16	0.13	0.14	0.32	0.51	0.37	0.51	0.02	0.04	0.05	0.07	0.08	0.04	0.05	0.03	0.04	0.06	0.13	0.03	0.02	0.05
More than ±50% of Pre-impoundment Mean	--	--	--	--	higher	higher	higher	--	--	--	--	higher	higher	higher	--	--	--	--	no	no	no	--	--	--	--	lower	no	no

Table A3-29: Keeyask Reservoir Zone 1b - supporting site data, offshore (OS), pre-Project (1999, 2001, 2002, 2008, and 2013) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	1999	353470	6245065	Ekman (tall)	3.1	3.1	1.7	72.3	26.0	na
		353470	6245065	Ekman (tall)	3.1	3.1	1.6	67.7	30.7	na
		353470	6245065	Ekman (tall)	3.1	3.1	2.3	65.7	32.0	na
		353470	6245065	Ekman (tall)	3.1	3.1	3.0	52.0	45.1	na
		353476	6244792	Ekman (tall)	5.2	5.2	0.7	72.2	27.1	na
		353476	6244792	Ekman (tall)	5.2	5.2	2.6	54.5	42.9	na
		353476	6244792	Ekman (tall)	5.2	5.2	1.4	72.3	26.4	na
		353476	6244792	Ekman (tall)	5.2	5.2	2.0	61.6	36.4	na
	2001	353484	6244877	Ekman (tall)	3.4	3.4	3.9	66.8	29.2	na
		353484	6244877	Ekman (tall)	3.4	--	--	--	--	--
		353484	6244877	Ekman (tall)	3.4	--	--	--	--	--
		353484	6244877	Ekman (tall)	3.4	--	--	--	--	--
		345495	6244778	Ekman (tall)	3.7	3.7	4.8	35.7	59.4	na
		345495	6244778	Ekman (tall)	3.7	--	--	--	--	--
		345495	6244778	Ekman (tall)	3.7	--	--	--	--	--
		345495	6244778	Ekman (tall)	3.7	--	--	--	--	--
	2002	353496	6244897	Ekman (tall)	5.8	5.8	0.8	73.9	3.9	na
		353496	6244897	Ekman (tall)	5.8	--	--	--	--	--
		353496	6244897	Ekman (tall)	5.8	--	--	--	--	--
		353496	6244897	Ekman (tall)	5.8	--	--	--	--	--
		353526	6244600	Ekman (tall)	6.1	6.1	1.5	20.4	33.1	na
		353526	6244600	Ekman (tall)	6.1	--	--	--	--	--
		353526	6244600	Ekman (tall)	6.1	--	--	--	--	--
		353526	6244600	Ekman (tall)	6.1	--	--	--	--	--
		356788	6245610	Ekman (tall)	4.0	4.0	1.7	73.7	22.1	na
		356788	6245610	Ekman (tall)	4.0	--	--	--	--	--
		356788	6245610	Ekman (tall)	4.0	--	--	--	--	--
		356788	6245610	Ekman (tall)	4.0	--	--	--	--	--
		356412	6245759	Ekman (tall)	9.6	9.6	1.7	10.5	15.7	na
		356412	6245759	Ekman (tall)	9.6	--	--	--	--	--

Table A3-29: Continued.

Phase	Year	NAD83 UTM Z15 Easting	NAD83 UTM Z15 Northing	BMI Sampler	Water Depths (m) Invertebrate	Water Depths (m) Sediment	Supporting Sediment Analysis % Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2002	356412	6245759	Ekman (tall)	9.6	--	--	--	--	--
		356412	6245759	Ekman (tall)	9.6	--	--	--	--	--
	2008	352372	6243324	Petite Ponar	9.0	9.0	--	--	--	Gravel/sand
		352330	6243316	Petite Ponar	9.6	9.6	--	--	--	Cobble
		352468	6243299	Petite Ponar	5.0	5.0	--	--	--	Cobble/gravel
		352376	6243287	Petite Ponar	6.0	6.0	--	--	--	Cobble/gravel
		353804	6244024	Petite Ponar	9.3	9.3	--	--	--	Sand
		353908	6244066	Petite Ponar	9.8	9.8	--	--	--	Gravel
		354005	6244106	Petite Ponar	10.9	10.9	--	--	--	Cobble
		354044	6244118	Petite Ponar	11.2	11.2	--	--	--	Gravel/sand
		354095	6244160	Petite Ponar	10.5	10.5	--	--	--	Gravel/sand
	2013	353553	6245227	Petite Ponar	3.3	3.3	0.7	64.9	35.1	Sandy loam
		353515	6245228	Petite Ponar	3.1	3.2	1.4	33.5	66.6	Loam / Clay loam
		353487	6245210	Petite Ponar	4.1	3.9	4.7	11.2	88.8	Silty clay
		353459	6245223	Petite Ponar	3.2	3.1	1.6	9.7	90.3	Silty clay
		353417	6245227	Petite Ponar	3.3	3.0	1.7	21.8	78.2	Silt loam
Operation	2021	354733	6244006	Petite Ponar	8.0	8.8	1.7	35.6	64.4	Loam / Clay loam
		354704	6244025	Petite Ponar	7.8	8.0	1.2	56.3	43.7	Sandy loam
		354675	6244010	Petite Ponar	7.9	7.9	1.9	43.2	56.8	Loam
		354642	6244036	Petite Ponar	8.0	8.0	1.5	40.3	59.7	Loam
		354602	6244034	Petite Ponar	7.8	7.9	2.2	57.2	42.9	Sandy loam
	2022	353094	6245711	Petite Ponar	4.3	4.2	1.8	17.0	83.1	Silt loam
		353024	6245804	Petite Ponar	4.8	4.8	13.9	0.5	99.9	Silt Clay loam / Silty clay
		352982	6245825	Petite Ponar	4.4	4.8	16.9	0.5	99.9	Silty clay loam
		352924	6245857	Petite Ponar	5.0	5.0	13.0	0.5	99.3	Silty clay
		352859	6245895	Petite Ponar	3.2	3.0	35.3	0.5	99.4	Silt loam / Silty clay loam
	2023	353086	6245713	Petite Ponar	3.8	3.8	1.7	67.0	33.0	Sandy loam
		353015	6245812	Petite Ponar	4.9	4.8	12.1	1.2	98.7	Silt
		352973	6245822	Petite Ponar	4.4	4.1	14.4	4.2	95.7	Silt loam
		352922	6245866	Petite Ponar	5.4	5.7	18.1	6.0	94.0	Silt loam
		352858	6245896	Petite Ponar	3.2	3.7	19.6	0.5	99.3	Silty clay loam

Table A3-30: Keeyask Reservoir Zone 1b - benthic invertebrate community metrics, offshore (OS), pre-Project (1999, 2001, 2002, 2008, and 2013) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	1999	5021	15.5	11.2	2.0	6	1	0.71	0.57
		3549	22.0	8.5	3.6	6	1	0.62	0.44
		7055	14.1	6.1	5.8	7	2	0.62	0.38
		5973	13.8	3.6	6.3	6	2	0.61	0.43
		1558	11.1	69.4	0.4	5	1	0.70	0.67
		1039	29.2	45.8	7.0	4	1	0.68	0.78
		2597	16.7	51.7	2.5	5	1	0.68	0.62
		1645	15.8	42.1	1.5	7	1	0.75	0.56
	2001	2467	56.1	29.8	2.1	5	1	0.60	0.50
		3895	56.7	10.0	5.7	4	2	0.67	0.75
		2597	40.0	11.7	3.4	4	2	0.67	0.76
		1558	2.8	16.7	0.2	4	1	0.51	0.51
		216	0.0	20.0	--	3	0	0.56	0.76
		173	75.0	25.0	3.0	2	1	0.38	0.80
		303	71.4	14.3	5.0	3	1	0.45	0.61
		303	28.6	71.4	--	2	1	0.41	0.85
	2002	2467	17.5	22.8	1.1	5	2	0.59	0.49
		1212	10.7	67.9	0.2	4	1	0.68	0.79
		952	18.2	18.2	--	6	2	0.72	0.59
		433	20.0	30.0	--	4	1	0.70	0.84
		476	45.5	0.0	--	2	1	0.50	0.99
		1039	87.5	4.2	21.0	5	3	0.48	0.38
		1125	80.8	11.5	10.5	5	2	0.49	0.40
		5367	39.5	20.2	9.8	6	3	0.68	0.53
		6622	69.3	7.8	13.3	8	2	0.62	0.33
		2467	21.1	29.8	2.0	8	2	0.74	0.48
		2597	58.3	8.3	11.7	6	2	0.59	0.41
		4069	71.3	16.0	9.6	9	2	0.65	0.32
		87	0.0	50.0	0.0	2	0	0.51	--
		10691	90.7	2.0	44.8	5	2	0.19	0.25
		909	95.2	4.8	20.0	2	1	0.09	0.55
		2857	92.4	3.0	30.5	3	1	0.14	0.39
	2008	1212	82.1	14.3	5.8	3	1	0.30	0.48
		4501	46.2	52.9	0.9	3	1	0.51	0.68
		2164	58.0	34.0	1.7	3	1	0.54	0.73
		346	75.0	25.0	3.0	2	1	0.38	0.80
		1645	55.3	7.9	7.0	3	1	0.55	0.75
		7358	79.4	16.5	4.8	8	5	0.38	0.20
		563	92.3	7.7	12.0	3	2	0.27	0.46
		4891	83.2	15.9	5.5	5	2	0.30	0.29
		2294	81.1	9.4	8.6	3	1	0.32	0.49
	2013	416	75.0	18.8	5.1	5	1	0.41	0.34

Table A3-30: Continued.

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2013	1238	54.5	12.6	6.5	6	2	0.62	0.44
		216	68.0	24.0	2.8	5	2	0.53	0.43
		424	67.3	24.5	4.1	5	1	0.51	0.41
		441	47.1	19.6	2.7	7	2	0.70	0.47
Operation	2021	1847	57.8	19.5	5.3	14	4	0.65	0.20
		1428	50.5	8.1	8.3	10	1	0.67	0.31
		1096	0.0	98.7	--	2	0	0.03	0.51
		1024	40.8	29.6	2.2	7	1	0.76	0.59
		1645	47.4	22.8	3.0	8	2	0.74	0.48
	2022	216	20.0	60.0	0.3	4	1	0.58	0.60
		1154	30.0	55.0	0.9	7	3	0.79	0.68
		1832	19.7	25.2	1.6	6	1	0.74	0.64
		231	50.0	25.0	2.0	4	2	0.75	--
		1154	6.3	67.5	0.2	8	2	0.73	0.45
	2023	1125	7.7	82.1	0.1	6	3	0.57	0.38
		1399	9.3	74.2	0.2	7	2	0.71	0.49
		1125	24.4	66.7	0.5	5	1	0.68	0.63
		505	28.6	71.4	0.4	2	1	0.41	0.85
		1544	15.0	63.6	0.4	6	2	0.75	0.66

Table A3-31: Keeyask Reservoir Zone 1b - Offshore (OS) - substrate statistics and assessment results.

ZONE 1b OS GRAB	Water Depth (m)								Total Organic Carbon (%)							
	1999	2001	2002	2008	2013	2021	2022	2023	1999	2001	2002	2008	2013	2021	2022	2023
No. of Samples (n)	8	8	16	9	5	5	5	5	8	2	4	0	5	5	5	5
Minimum	3.1	3.4	4.0	5.0	3.1	7.8	3.2	3.2	0.68	3.91	0.80		0.69	1.21	1.78	1.71
Maximum	5.2	3.7	9.6	11.2	4.1	8.0	5.0	5.4	2.96	4.79	1.68		4.69	2.15	35.30	19.60
1st Quartile	3.1	3.4	5.4	9.0	3.2	7.8	4.3	3.8	1.58	4.13	1.30		1.44	1.47	13.00	12.10
Median	4.2	3.5	6.0	9.6	3.3	7.9	4.4	4.4	1.87	4.35	1.57		1.63	1.73	13.90	14.40
3rd Quartile	5.2	3.7	7.0	10.5	3.3	8.0	4.8	4.9	2.34	4.57	1.68		1.69	1.92	16.90	18.10
Mean	4.2	3.5	6.4	9.0	3.4	7.9	4.3	4.3	1.90	4.35	1.41		2.03	1.70	16.18	13.18
Standard Deviation (n-1)	1.12	0.16	2.11	2.14	0.40	0.10	0.70	0.88	0.71	0.62	0.42		1.54	0.37	12.13	7.06
Standard Error	0.40	0.06	0.53	0.71	0.18	0.04	0.31	0.39	0.25	0.44	0.21		0.69	0.17	5.43	3.16
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	--	--	--	--	--	--	no	higher	higher

Table A3-31: Continued.

ZONE 1b OS GRAB	Sand (%)								Silt/Clay (%)							
	1999	2001	2002	2008	2013	2021	2022	2023	1999	2001	2002	2008	2013	2021	2022	2023
No. of Samples (n)	8	2	4	0	5	5	5	5	8	2	4	0	5	5	5	5
Minimum	51.98	35.68	10.54		9.71	35.60	0.50	0.50	25.97	29.18	3.85		35.10	42.90	83.10	33.00
Maximum	72.29	66.82	73.94		64.90	57.20	17.00	67.00	45.06	59.37	33.10		90.30	64.40	99.90	99.30
1st Quartile	59.87	43.46	17.93		11.20	40.30	0.50	1.20	26.94	36.73	12.75		66.60	43.70	99.30	94.00
Median	66.71	51.25	47.04		21.80	43.20	0.50	4.20	31.33	44.28	18.91		78.20	56.80	99.40	95.70
3rd Quartile	72.20	59.03	73.74		33.50	56.30	0.50	6.00	37.99	51.82	24.85		88.80	59.70	99.90	98.70
Mean	64.79	51.25	44.64		28.22	46.52	3.80	15.78	33.31	44.28	18.69		71.80	53.50	96.32	84.14
Standard Deviation (n-1)	8.06	22.02	33.92		22.62	9.73	7.38	28.72	7.45	21.35	12.22		22.62	9.70	7.40	28.67
Standard Error	2.85	15.57	16.96		10.12	4.35	3.30	12.84	2.63	15.10	6.11		10.11	4.34	3.31	12.82
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	no	lower	lower	--	--	--	--	--	no	higher	higher

Table A3-32: Keeyask Reservoir Zone 1b - Offshore (OS) -benthic invertebrate statistics and assessment results.

ZONE 1b OS GRAB	Total Abundance (no. per m^2)								EPT Index (%)							
	1999	2001	2002	2008	2013	2021	2022	2023	1999	2001	2002	2008	2013	2021	2022	2023
No. of Samples (n)	8	8	16	9	5	5	5	5	8	8	16	9	5	5	5	5
Minimum	1039	173	87	346	216	1024	216	505	11	0	0	46	47	0	6	8
Maximum	7055	3895	10691	7358	1238	1847	1832	1544	29	75	95	92	75	58	50	29
1st Quartile	1623	281	941	1212	416	1096	231	1125	14	22	20	58	55	41	20	9
Median	3073	931	1840	2164	424	1428	1154	1125	16	48	52	79	67	47	20	15
3rd Quartile	5259	2500	3160	4501	441	1645	1154	1399	18	60	82	82	68	51	30	24
Mean	3555	1439	2711	2775	547	1408	918	1140	17	41	51	73	62	39	25	17
Standard Deviation (n-1)	2240.26	1420.48	2816.58	2333.99	396.90	351.13	691.36	398.13	5.72	28.92	33.37	15.53	11.31	22.80	16.24	9.20
Standard Error	792.05	502.22	704.14	778.00	177.50	157.03	309.19	178.05	2.02	10.22	8.34	5.18	5.06	10.20	7.26	4.11
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	no	lower	lower	--	--	--	--	--	no	no	lower

Table A3-32: Continued.

ZONE 1b OS GRAB	O+C Index (%)								EPT:C							
	1999	2001	2002	2008	2013	2021	2022	2023	1999	2001	2002	2008	2013	2021	2022	2023
No. of Samples (n)	8	8	16	9	5	5	5	5	8	6	13	9	5	4	5	5
Minimum	4	10	0	8	13	8	25	64	0.44	0.17	0.00	0.87	2.67	2.23	0.16	0.13
Maximum	69	71	68	53	24	99	68	82	7.00	5.67	44.80	12.00	6.50	8.33	2.00	0.53
1st Quartile	8	14	5	9	19	20	25	67	1.88	2.35	2.00	3.00	2.83	2.81	0.33	0.23
Median	27	18	14	16	20	23	55	71	3.05	3.21	10.50	5.53	4.13	4.14	0.86	0.40
3rd Quartile	47	26	25	25	24	30	60	74	5.90	4.61	20.00	7.00	5.14	6.05	1.56	0.44
Mean	30	25	19	20	20	36	47	72	3.64	3.23	13.42	5.48	4.25	4.71	0.98	0.34
Standard Deviation (n-1)	25.36	19.97	18.67	14.88	4.82	36.04	20.07	7.16	2.44	1.99	13.08	3.48	1.61	2.74	0.79	0.17
Standard Error	8.97	7.06	4.67	4.96	2.15	16.12	8.98	3.20	0.86	0.81	3.63	1.16	0.72	1.37	0.35	0.07
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	higher	higher	higher	--	--	--	--	--	no	lower	lower

Table A3-32: Continued.

ZONE 1b OS GRAB	Total Richness (no. of taxa)								EPT Richness (no. of taxa)							
	1999	2001	2002	2008	2013	2021	2022	2023	1999	2001	2002	2008	2013	2021	2022	2023
No. of Samples (n)	8	8	16	9	5	5	5	5	8	8	16	9	5	5	5	5
Minimum	4	2	2	2	5	2	4	2	1	0	0	1	1	0	1	1
Maximum	7	5	9	8	7	14	8	7	2	2	3	5	2	4	3	3
1st Quartile	5	3	4	3	5	7	4	5	1	1	1	1	1	1	1	1
Median	6	4	5	3	5	8	6	6	1	1	2	1	2	1	2	2
3rd Quartile	6	4	6	3	6	10	7	6	1	1	2	2	2	2	2	2
Mean	6	3	5	4	6	8	6	5	1	1	2	2	2	2	2	2
Standard Deviation (n-1)	1.04	1.06	2.16	1.80	0.89	4.38	1.79	1.92	0.46	0.64	0.79	1.32	0.55	1.52	0.84	0.84
Standard Error	0.37	0.38	0.54	0.60	0.40	1.96	0.80	0.86	0.16	0.23	0.20	0.44	0.24	0.68	0.37	0.37
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	higher	no	no	--	--	--	--	--	no	no	no

Table A3-32: Continued.

ZONE 1b OS GRAB	Diversity Index (Simpson's D)								Evenness Index (Simpson's E)							
	1999	2001	2002	2008	2013	2021	2022	2023	1999	2001	2002	2008	2013	2021	2022	2023
No. of Samples (n)	8	8	16	9	5	5	5	5	8	8	15	9	5	5	4	5
Minimum	0.61	0.38	0.09	0.27	0.41	0.03	0.58	0.41	0.38	0.50	0.25	0.20	0.34	0.20	0.45	0.38
Maximum	0.75	0.67	0.74	0.55	0.70	0.76	0.79	0.75	0.78	0.85	0.99	0.80	0.47	0.59	0.68	0.85
1st Quartile	0.62	0.44	0.49	0.30	0.51	0.65	0.73	0.57	0.43	0.58	0.39	0.46	0.41	0.31	0.56	0.49
Median	0.68	0.54	0.	0.38	0.53	0.67	0.74	0.68	0.57	0.75	0.48	0.49	0.43	0.48	0.62	0.63
3rd Quartile	0.70	0.62	0.68	0.51	0.62	0.74	0.75	0.71	0.63	0.77	0.57	0.73	0.44	0.51	0.65	0.66
Mean	0.67	0.53	0.52	0.40	0.55	0.57	0.72	0.62	0.55	0.69	0.51	0.54	0.42	0.42	0.59	0.60
Standard Deviation (n-1)	0.05	0.11	0.21	0.11	0.11	0.31	0.08	0.14	0.13	0.13	0.21	0.21	0.05	0.16	0.10	0.18
Standard Error	0.02	0.04	0.05	0.04	0.05	0.14	0.04	0.06	0.05	0.05	0.05	0.07	0.02	0.07	0.05	0.08
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	no	no	no	--	--	--	--	--	no	no	no

Table A3-33: Keeyask Reservoir Zone 2 - supporting site data, intermittently exposed (IE, kicknet samples), pre-Project (2013) and Operation (2021). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2013	356594	6248391	Kick Net	0.7	0.5	0.5	90.9	9.1	Sand
	2013	356565	6248408	Kick Net	0.8	0.5	0.7	75.4	24.6	Sandy loam
	2013	356530	6248410	Kick Net	1.0	0.5	0.3	89.9	10.1	Sand
	2013	356501	6248414	Kick Net	1.1	0.5	0.3	90.9	9.1	Sand
	2013	356459	6248423	Kick Net	1.1	0.5	0.8	89.1	10.9	Sand
Operation	2021	356169	6248573	Kick Net	0.6	0.1	0.0	98.7	1.0	Sand
	2021	356201	6248577	Kick Net	0.9	0.1	0.0	97.7	2.1	Sand
	2021	356233	6248588	Kick Net	0.9	0.1	0.0	98.8	1.0	Sand
	2021	356281	6248576	Kick Net	0.7	0.1	0.9	22.0	78.0	Clay
	2021	356331	6248560	Kick Net	1.0	0.1	1.1	74.8	25.2	Sandy loam

Table A3-34: Keeyask Reservoir Zone 2 - benthic invertebrate community metrics, intermittently exposed (IE, kicknet samples), pre-Project (2013) and Operation (2021).

Phase	Year	Total Abundance (no. per sample)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2013	699	7.2	11.4	1.5	14	5	0.80	0.35
	2013	1013	6.9	8.9	2.9	20	5	0.60	0.12
	2013	760	11.1	33.9	1.4	26	11	0.85	0.25
	2013	1120	9.1	15.7	2.0	18	7	0.84	0.36
	2013	608	8.2	6.9	2.5	15	5	0.80	0.34
Operation	2021	3072	1.3	2.9	0.5	10	5	0.14	0.12
	2021	1484	1.1	2.4	0.4	8	2	0.25	0.17
	2021	622	0.0	0.0		5	0	0.20	0.25
	2021	1080	2.2	5.2	0.6	11	3	0.29	0.13
	2021	271	1.1	4.1	0.4	9	3	0.20	0.14

Table A3-35: Keeyask Reservoir Zone 2 - Intermittently exposed (IE, kicknet)- substrate statistics and assessment results.

ZONE Z2 IE KICKNET	Water Depth (m)		Total Organic Carbon (%)		Sand (%)		Silt/Clay (%)	
	2013	2021	2013	2021	2013	2021	2013	2021
No. of Samples (n)	5	5	5	5	5	5	5	5
Minimum	0.7	0.6	0.29	0.03	75.40	22.00	9.09	1.00
Maximum	1.1	1.0	0.80	1.06	90.90	98.80	24.58	78.00
1st Quartile	0.8	0.7	0.31	0.03	89.10	74.80	9.10	1.00
Median	1.0	0.9	0.53	0.03	89.90	97.70	10.10	2.10
3rd Quartile	1.1	0.9	0.69	0.92	90.90	98.70	10.93	25.20
Mean	0.9	0.8	0.52	0.41	87.24	78.40	12.76	21.46
Standard Deviation (n-1)	0.18	0.16	0.23	0.53	6.66	33.15	6.65	33.25
Standard Error	0.08	0.07	0.10	0.24	2.98	14.82	2.97	14.87
More than ±50% of Pre-impoundment Mean	--	--	--	no	--	no	--	higher

Table A3-36: Keeyask Reservoir Zone 2 - Intermittently exposed (IE, kicknet) - benthic invertebrate statistics and assessment results.

ZONE Z2 IE KICKNET	Total Abundance (no. per sample)		EPT Index (%)		O+C Index (%)		EPT:C		Total Richness (no. of taxa)		EPT Richness (no. of taxa)		Diversity Index (Simpson's D)		Evenness Index (Simpson's E)	
	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021
No. of Samples (n)	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5
Minimum	608	271	7	0	7	0	1.40	0.43	14	5	5	0	0.60	0.14	0.12	0.12
Maximum	1120	3072	11	2	34	5	2.92	0.60	26	11	11	5	0.85	0.29	0.36	0.25
1st Quartile	699	622	7	1	9	2	1.47	0.44	15	8	5	2	0.80	0.20	0.25	0.13
Median	760	1080	8	1	11	3	2.04	0.45	18	9	5	3	0.80	0.20	0.34	0.14
3rd Quartile	1013	1484	9	1	16	4	2.50	0.49	20	10	7	3	0.84	0.25	0.35	0.17
Mean	840	1306	8	1	15	3	2.07	0.48	19	9	7	3	0.78	0.22	0.28	0.16
Standard Deviation (n-1)	217.04	1088.65	1.68	0.79	10.89	1.95	0.65	0.08	4.77	2.30	2.61	1.82	0.10	0.06	0.10	0.05
Standard Error	97.07	486.86	0.75	0.35	4.87	0.87	0.29	0.04	2.14	1.03	1.17	0.81	0.05	0.02	0.04	0.02
More than ±50% of Pre-impoundment Mean	--	higher	--	lower	--	lower	--	lower	--	lower	--	lower	--	lower	--	no

Table A3-37: Keeyask Reservoir Zone 2 - supporting site data, intermittently exposed (IE, benthic grab samples), pre-Project (2002 and 2004) and Operation (2022 and 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2002	356281	6248485	Ekman (tall)	0.5	0.5	2.3	63.6	13.0	na
	2002	356281	6248485	Ekman (tall)	0.5	--	--	--	--	--
	2002	356281	6248485	Ekman (tall)	0.5	--	--	--	--	--
	2002	356281	6248485	Ekman (tall)	0.5	--	--	--	--	--
	2002	355165	6248448	Ekman (tall)	0.8	0.8	20.0	41.8	38.2	na
	2002	355165	6248448	Ekman (tall)	0.8	--	--	--	--	--
	2002	355165	6248448	Ekman (tall)	0.8	--	--	--	--	--
	2002	355165	6248448	Ekman (tall)	0.8	--	--	--	--	--
	2004	355170	6248449	Ekman (tall)	0.6	0.6	27.3	0.9	71.8	na
	2004	355170	6248449	Ekman (tall)	0.6	--	--	--	--	--
	2004	355170	6248449	Ekman (tall)	0.6	--	--	--	--	--
	2004	355170	6248449	Ekman (tall)	0.6	--	--	--	--	--
Operation	2022	356356	6248537	Petite Ponar	0.5	0.5	0.4	81.9	18.1	Loamy sand
	2022	356333	6248557	Petite Ponar	0.5	0.5	0.4	94.2	5.8	Sand
	2022	356236	6248586	Petite Ponar	0.4	0.4	0.1	97.5	2.5	Sand
	2023	356358	6248539	Petite Ponar	0.3	0.1	0.4	83.1	16.9	Loamy sand
	2023	356337	6248550	Petite Ponar	0.3	0.3	0.2	98.0	1.9	Sand
	2023	356241	6248584	Petite Ponar	0.2	0.3	0.7	96.3	3.4	Sand
	2023	356216	6248583	Petite Ponar	0.2	0.2	0.2	99.0	1.0	Sand
	2023	356187	6248572	Petite Ponar	0.3	0.2	1.1	95.0	4.9	Sand

Table A3-38: Keeyask Reservoir Zone 2 - benthic invertebrate community metrics, intermittently exposed (IE, benthic grab samples), pre-Project (2002 and 2004) and Operation (2022 and 2023).

Phase	Year	Total Abundance (no. per m^2)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2002	1904	47.7	29.5	1.6	5	1	0.66	0.59
		1515	48.6	28.6	2.1	7	2	0.75	0.56
		3073	40.8	39.4	1.1	9	2	0.71	0.38
		2207	9.8	66.7	0.2	7	2	0.54	0.31
		5021	6.0	36.2	0.2	6	2	0.60	0.41
		6060	9.3	26.4	0.4	4	2	0.51	0.51
		2943	16.2	50.0	0.4	5	1	0.69	0.65
		4848	15.2	38.4	0.4	8	2	0.68	0.39
	2004	28869	0.0	96.0	0.0	7	0	0.52	0.30
		9868	0.0	94.3	0.0	5	0	0.55	0.44
		9912	0.0	95.2	0.0	6	0	0.52	0.35
		14630	0.0	96.4	0.0	6	0	0.53	0.36
Operation	2022	1111	1.3	2.6	1.0	6	1	0.17	0.20
		29	0.0	0.0		1	0	0.00	1.00
		14	0.0	0.0		1	0	0.00	1.00
	2023	87	0	33.3	0	2	0	0.45	0.91
		72	0	0	--	2	0	0.32	0.74
		0	--	--	--	0	0	--	--
		43	0	0	--	1	0	0.00	1
		29	0	0	--	1	0	0.00	1

Table A3-39: Keeyask Reservoir Zone 2 - Intermittently exposed (grab) - substrate statistics and assessment results.

ZONE Z2 IE GRAB	Water Depth (m)				Total Organic Carbon (%)				Sand (%)				Silt/Clay (%)			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	8	4	3	5	2	1	3	5	2	1	3	5	2	1	3	5
Minimum	0.5	0.6	0.4	0.2	2.29	27.28	0.09	0.19	41.81	0.90	81.90	83.10	12.96	71.83	2.50	1.00
Maximum	0.8	0.6	0.5	0.3	20.02	27.28	0.44	1.10	63.63	0.90	97.50	99.00	38.17	71.83	18.10	16.90
1st Quartile	0.5	0.6	0.5	0.2	6.72	27.28	0.22	0.21	47.27	0.90	88.05	95.00	19.26	71.83	4.15	1.90
Median	0.6	0.6	0.5	0.3	11.15	27.28	0.36	0.35	52.72	0.90	94.20	96.30	25.57	71.83	5.80	3.40
3rd Quartile	0.8	0.6	0.5	0.3	15.58	27.28	0.40	0.73	58.17	0.90	95.85	98.00	31.87	71.83	11.95	4.90
Mean	0.6	0.6	0.5	0.3	11.15	27.28	0.30	0.52	52.72	0.90	91.20	94.28	25.57	71.83	8.80	5.62
Standard Deviation (n-1)	0.13	0.00	0.06	0.06	12.54		0.19	0.39	15.42		8.22	6.44	17.83		8.22	6.48
Standard Error	0.05	0.00	0.03	0.03	8.86		0.11	0.18	10.91		4.75	2.88	12.60		4.75	2.90
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	lower	lower	--	--	higher	higher	--	--	lower	lower

Table A3-40: Keeyask Reservoir Zone 2 - Intermittently exposed (grab) - benthic invertebrate statistics and assessment results.

ZONE Z2 IE GRAB	Total Abundance (no. per m^2)				EPT Index (%)				O+C Index (%)				EPT:C			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	8	4	3	5	8	4	3	4	8	4	3	4	8	4	1	1
Minimum	1515	9868	14	0	6	0	0	0	26	94	0	0	0.15	0.00	1.00	0.00
Maximum	6060	28869	1111	87	49	0	1	0	67	96	3	33	2.13	0.00	1.00	0.00
1st Quartile	2132	9901	22	29	10	0	0	0	29	95	0	0	0.32	0.00	1.00	0.00
Median	3008	12271	29	43	16	0	0	0	37	96	0	0	0.42	0.00	1.00	0.00
3rd Quartile	4891	18189	570	72	43	0	1	0	42	96	1	8	1.21	0.00	1.00	0.00
Mean	3446	15820	385	46	24	0	0	0	39	95	1	8	0.80	0.00	1.00	0.00
Standard Deviation (n-1)	1660.76	8982.11	628.94	34.45	18.24	0.00	0.75	0.00	13.36	0.94	1.50	16.67	0.73	0.00		
Standard Error	587.17	4491.06	363.12	15.40	6.45	0.00	0.43	0.00	4.72	0.47	0.87	8.33	0.26	0.00		
More than ±50% of Pre-impoundment Mean	--	--	lower	lower	--	--	lower	lower	--	--	lower	lower	--	--	higher	lower

Table A3-40: Continued.

ZONE Z2 IE GRAB	Total Richness (no. of taxa)				EPT Richness (no. of taxa)				Diversity Index (Simpson's D)				Evenness Index (Simpson's E)			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	8	4	3	5	8	4	3	5	8	4	3	4	8	4	3	4
Minimum	4	5	1	0	1	0	0	0	0.51	0.52	0.00	0.00	0.31	0.30	0.20	0.74
Maximum	9	7	6	2	2	0	1	0	0.75	0.55	0.17	0.45	0.65	0.44	1.00	1.00
1st Quartile	5	6	1	1	2	0	0	0	0.58	0.52	0.00	0.00	0.39	0.34	0.60	0.87
Median	7	6	1	1	2	0	0	0	0.67	0.53	0.00	0.16	0.46	0.35	1.00	0.95
3rd Quartile	7	6	4	2	2	0	1	0	0.70	0.54	0.09	0.36	0.57	0.38	1.00	1.00
Mean	6	6	3	1	2	0	0	0	0.64	0.53	0.06	0.19	0.48	0.36	0.73	0.91
Standard Deviation (n-1)	1.69	0.82	2.89	0.84	0.46	0.00	0.58	0.00	0.08	0.01	0.10	0.23	0.12	0.06	0.46	0.12
Standard Error	0.60	0.41	1.67	0.37	0.16	0.00	0.33	0.00	0.03	0.01	0.06	0.11	0.04	0.03	0.27	0.06
More than ±50% of Pre-impoundment Mean	--	--	lower	lower	--	--	lower	lower	--	--	lower	lower	--	--	higher	higher

Table A3-41: Keeyask Reservoir Zone 2 - supporting site data, predominantly wetted (PW), pre-Project (1999, 2001, 2002, 2004, and 2013) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	1999	356180	6248208	Ekman (tall)	1.2	1.2	5.2	10.7	84.1	na
		356180	6248208	Ekman (tall)	1.2	1.2	4.9	9.6	85.5	na
		356180	6248208	Ekman (tall)	1.2	1.2	4.9	7.7	87.4	na
		356180	6248208	Ekman (tall)	1.2	1.2	5.8	0.0	94.2	na
	2001	355245	6248452	Ekman (tall)	1.37	1.2	8.0	61.7	30.2	na
		355245	6248452	Ekman (tall)	1.37	--	--	--	--	--
		355245	6248452	Ekman (tall)	1.37	--	--	--	--	--
		355245	6248452	Ekman (tall)	1.37	--	--	--	--	--
	2002	356198	6247660	Ekman (tall)	1.34		1.6	64.6	33.4	na
		356198	6247660	Ekman (tall)	1.34	--	--	--	--	--
		356198	6247660	Ekman (tall)	1.34	--	--	--	--	--
		356198	6247660	Ekman (tall)	1.34	--	--	--	--	--
		355262	6248454	Ekman (tall)	1.62		9.1	0.4	90.5	na
		355262	6248454	Ekman (tall)	1.62	--	--	--	--	--
		355262	6248454	Ekman (tall)	1.62	--	--	--	--	--
		355262	6248454	Ekman (tall)	1.62	--	--	--	--	--
	2004	356273	6248483	Ekman (tall)	1.4	1.4	2.3	43.5	25.0	na
		356273	6248483	Ekman (tall)	1.4	--	--	--	--	--
		356273	6248483	Ekman (tall)	1.4	--	--	--	--	--
		356273	6248483	Ekman (tall)	1.4	--	--	--	--	--
	2013	355828	6248235	Petite Ponar	2.2	2.2	1.5	13.5	86.5	Silt loam
		355788	6248246	Petite Ponar	2.1	2.1	1.4	17.0	83.0	Silt loam
		355709	6248239	Petite Ponar	2	2.0	1.5	16.5	83.5	Silt loam
		355659	6248282	Petite Ponar	2.3	2.4	1.6	23.2	76.8	Silt loam
		355694	6248274	Petite Ponar	2.3	2.3	1.5	17.4	82.6	Silt loam

Table A3-41: Continued.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Operation	2021	354612	6247574	Petite Ponar	2.7	2.9	8.2	1.7	98.3	Silty clay
		354577	6247509	Petite Ponar	2.8	2.7	10.4	1.6	98.4	Silt loam
		354590	6247546	Petite Ponar	2.9	2.8	5.9	3.9	96.1	Silty clay / Clay
		354560	6247488	Petite Ponar	2.7	2.9	12.7	17.0	83.0	Silt loam
	2022	356127	6248532	Petite Ponar	2.7	2.7	20.1	10.1	89.9	Silt loam
		356191	6248554	Petite Ponar	2	1.7	22.1	12.0	88.0	Silt loam
		356253	6248543	Petite Ponar	2.7	2.6	5.7	25.7	74.2	Clay loam
		356296	6248533	Petite Ponar	2.2	2.0	31.3	2.5	97.5	Silty clay loam
		356357	6248499	Petite Ponar	2.1	2.2	38.9	10.2	89.8	Silty clay loam
	2023	356122	6248539	Petite Ponar	1.9	5.0	1.7	50.9	49.1	Loam / Sandy loam
		356192	6248552	Petite Ponar	1.8	1.6	30.2	2.4	97.6	Silt
		356232	6248554	Petite Ponar	1.8	1.9	21.0	2.6	97.5	Silt
		356298	6248529	Petite Ponar	2.3	2.1	15.9	1.7	98.3	Silt loam
		356341	6248503	Petite Ponar	2.0	2.0	6.9	55.4	44.6	Sandy loam

Table A3-42: Keeyask Reservoir Zone 2 - benthic invertebrate community metrics, predominantly wetted (PW), pre-Project (1999, 2001, 2002, 2004, and 2013) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	1999	822	15.8	36.8	0.5	6	1	0.78	0.76
		1298	30.0	36.7	0.8	7	1	0.75	0.57
		952	31.8	36.4	1.2	6	1	0.78	0.75
		736	29.4	47.1	0.6	4	1	0.66	0.73
	2001	2164	40.0	48.0	0.8	5	1	0.60	0.50
		1948	26.7	71.1	0.4	3	1	0.42	0.58
		1948	35.6	60.0	0.6	4	1	0.51	0.51
		1818	52.4	45.2	1.2	3	1	0.52	0.70
	2002	2727	31.7	12.7	4.0	9	3	0.79	0.54
		2640	19.7	31.1	0.7	9	3	0.79	0.52
		4977	13.9	5.2	2.7	6	2	0.64	0.47
		1342	25.8	51.6	1.3	5	1	0.76	0.84
		1472	58.8	17.6	3.3	4	1	0.59	0.61
		1688	71.8	5.1	14.0	4	1	0.44	0.45
		1298	36.7	26.7	2.2	7	2	0.80	0.72
		649	33.3	26.7	1.3	4	1	0.70	0.84
	2004	3160	1.4	97.3	0.0	4	1	0.20	0.31
		6189	7.0	86.0	0.1	5	1	0.48	0.39
		2813	0.0	100.0	0.0	2	0	0.26	0.68
		4025	5.4	91.4	0.1	7	2	0.30	0.21
	2013	6163	28.7	24.2	1.2	6	1	0.75	0.67
		1489	33.7	12.2	2.8	6	1	0.77	0.72
		3411	33.0	10.2	3.3	6	2	0.71	0.58
		3359	23.2	3.4	8.2	8	1	0.66	0.36
		2207	21.2	5.1	4.2	6	1	0.71	0.58
Operation	2021	3953	3.6	88.7	0.0	12	5	0.28	0.12
		1356	19.1	73.4	0.3	7	4	0.45	0.26
		2251	3.8	82.1	0.1	10	2	0.54	0.22
		2106	29.5	67.1	0.4	8	5	0.48	0.24
	2022	1385	13.5	44.8	0.3	6	2	0.67	0.51
		462	12.5	0.0		3	1	0.41	0.56
		837	6.9	79.3	0.1	5	2	0.45	0.36
		1342	17.2	50.5	0.4	9	4	0.72	0.39
		1904	6.1	63.6	0.1	5	2	0.65	0.57
	2023	4285	1.0	91.6	0.0	6	1	0.16	0.20
		1818	0.0	84.9	0.0	4	0	0.53	0.53
		2366	12.2	29.3	0.4	4	1	0.65	0.72
		2727	10.1	59.8	0.2	5	2	0.57	0.46
		3809	30.3	48.5	0.6	7	4	0.70	0.48

Table A3-43: Keeyask Reservoir Zone 2 - Predominantly wetted (PW) - substrate statistics and assessment results.

ZONE Z2 PW GRAB	Water Depth (m)								Total Organic Carbon (%)							
	1999	**2001**	**2002**	**2004**	**2013**	**2021**	**2022**	**2023**	**1999**	**2001**	**2002**	**2004**	**2013**	**2021**	**2022**	**2023**
No. of Samples (n)	4	4	8	4	5	4	5	5	4	1	2	1	5	4	5	5
Minimum	1.2	1.4	1.3	1.4	2.0	2.7	2.0	1.8	4.87	8.03	1.61	2.34	1.35	5.92	5.70	1.66
Maximum	1.2	1.4	1.6	1.4	2.3	2.9	2.7	2.3	5.78	8.03	9.09	2.34	1.57	12.70	38.90	30.20
1st Quartile	1.2	1.4	1.3	1.4	2.1	2.7	2.1	1.8	4.88	8.03	3.48	2.34	1.47	7.59	20.10	6.90
Median	1.2	1.4	1.5	1.4	2.2	2.8	2.2	1.9	5.04	8.03	5.35	2.34	1.52	9.28	22.10	15.90
3rd Quartile	1.2	1.4	1.6	1.4	2.3	2.8	2.7	2.0	5.34	8.03	7.22	2.34	1.52	10.98	31.30	21.00
Mean	1.2	1.4	1.5	1.4	2.2	2.8	2.3	2.0	5.19	8.03	5.35	2.34	1.49	9.29	23.62	15.13
Standard Deviation (n-1)	0.00	0.00	0.15	0.00	0.13	0.10	0.34	0.19	0.42		5.29		0.08	2.92	12.53	11.31
Standard Error	0.00	0.00	0.05	0.00	0.06	0.05	0.15	0.08	0.21		3.74		0.04	1.46	5.60	5.06
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	--	--	--	--	--	--	higher	higher	higher

Table A3-43: Continued.

ZONE Z2 PW GRAB	Sand (%)								Silt/Clay (%)							
	1999	**2001**	**2002**	**2004**	**2013**	**2021**	**2022**	**2023**	**1999**	**2001**	**2002**	**2004**	**2013**	**2021**	**2022**	**2023**
No. of Samples (n)	4	1	2	1	5	4	5	5	4	1	2	1	5	4	5	5
Minimum	0.00	61.74	0.43	43.51	13.50	1.60	2.50	1.70	84.09	30.17	33.43	25.04	76.80	83.00	74.20	44.60
Maximum	10.71	61.74	64.64	43.51	23.20	17.00	25.70	55.40	94.22	30.17	90.48	25.04	86.50	98.40	97.50	98.30
1st Quartile	5.76	61.74	16.48	43.51	16.50	1.68	10.10	2.40	85.16	30.17	47.69	25.04	82.60	92.83	88.00	49.10
Median	8.63	61.74	32.54	43.51	17.00	2.80	10.20	2.60	86.49	30.17	61.96	25.04	83.00	97.20	89.80	97.50
3rd Quartile	9.87	61.74	48.59	43.51	17.40	7.18	12.00	50.90	89.14	30.17	76.22	25.04	83.50	98.33	89.90	97.60
Mean	7.00	61.74	32.54	43.51	17.52	6.05	12.10	22.60	87.82	30.17	61.96	25.04	82.48	93.95	87.88	77.42
Standard Deviation (n-1)	4.83		45.40		3.53	7.38	8.44	27.94	4.48		40.34		3.53	7.38	8.48	27.95
Standard Error	2.41		32.11		1.58	3.69	3.77	12.49	2.24		28.52		1.58	3.69	3.79	12.50
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	lower	no	no	--	--	--	--	--	no	no	no

Table A3-44: Keeyask Reservoir Zone 2 - Predominantly wetted (PW) - benthic invertebrate statistics and assessment results.

ZONE Z2 PW GRAB	Total Abundance (no. per m^2)								EPT Index (%)							
	1999	2001	2002	2004	2013	2021	2022	2023	1999	2001	2002	2004	2013	2021	2022	2023
No. of Samples (n)	4	4	8	4	5	4	5	5	4	4	8	4	5	4	5	5
Minimum	736	1818	649	2813	1489	1356	462	1818	16	27	14	0	21	4	6	0
Maximum	1298	2164	4977	6189	6163	3953	1904	4285	32	52	72	7	34	29	17	30
1st Quartile	801	1915	1331	3073	2207	1919	837	2366	26	33	24	1	23	4	7	1
Median	887	1948	1580	3592	3359	2179	1342	2727	30	38	33	3	29	11	13	10
3rd Quartile	1039	2002	2662	4566	3411	2676	1385	3809	30	43	42	6	33	22	14	12
Mean	952	1969	2099	4047	3326	2417	1186	3001	27	39	36	3	28	14	11	11
Standard Deviation (n-1)	247.38	143.55	1354.96	1516.54	1780.83	1096.84	553.76	1022.17	7.38	10.70	19.58	3.29	5.65	12.59	4.69	12.20
Standard Error	123.69	71.78	479.05	758.27	796.41	548.42	247.65	457.13	3.69	5.35	6.92	1.65	2.53	6.29	2.10	5.46
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	no	lower	no	--	--	--	--	--	lower	lower	lower

Table A3-44: Continued.

ZONE Z2 PW GRAB	O+C Index (%)								EPT:C							
	1999	2001	2002	2004	2013	2021	2022	2023	1999	2001	2002	2004	2013	2021	2022	2023
No. of Samples (n)	4	4	8	4	5	4	5	5	4	4	8	4	5	4	4	5
Minimum	36	45	5	86	3	67	0	29	0.50	0.38	0.71	0.00	1.19	0.04	0.10	0.00
Maximum	47	71	52	100	24	89	79	92	1.17	1.16	14.00	0.10	8.18	0.44	0.41	0.63
1st Quartile	37	47	11	90	5	72	45	48	0.59	0.54	1.31	0.01	2.76	0.05	0.12	0.01
Median	37	54	22	94	10	78	51	60	0.72	0.71	2.43	0.04	3.25	0.16	0.23	0.17
3rd Quartile	39	63	28	98	12	84	64	85	0.91	0.91	3.50	0.07	4.15	0.31	0.36	0.42
Mean	39	56	22	94	11	78	48	63	0.78	0.74	3.69	0.05	3.91	0.20	0.24	0.24
Standard Deviation (n-1)	5.22	11.89	15.47	6.24	8.20	9.48	29.77	25.77	0.29	0.34	4.31	0.05	2.62	0.19	0.16	0.27
Standard Error	2.61	5.95	5.47	3.12	3.66	4.74	13.31	11.52	0.15	0.17	1.52	0.02	1.17	0.09	0.08	0.12
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	higher	no	higher	--	--	--	--	--	lower	lower	lower

Table A3-44: Continued.

ZONE Z2 PW GRAB	Total Richness (no. of taxa)								EPT Richness (no. of taxa)							
	1999	2001	2002	2004	2013	2021	2022	2023	1999	2001	2002	2004	2013	2021	2022	2023
No. of Samples (n)	4	4	8	4	5	4	5	5	4	4	8	4	5	4	5	5
Minimum	4	3	4	2	6	7	3	4	1	1	1	0	1	2	1	0
Maximum	7	5	9	7	8	12	9	7	1	1	3	2	2	5	4	4
1st Quartile	6	3	4	4	6	8	5	4	1	1	1	1	1	4	2	1
Median	6	4	6	5	6	9	5	5	1	1	2	1	1	5	2	1
3rd Quartile	6	4	8	6	6	11	6	6	1	1	2	1	1	5	2	2
Mean	6	4	6	5	6	9	6	5	1	1	2	1	1	4	2	2
Standard Deviation (n-1)	1.26	0.96	2.14	2.08	0.89	2.22	2.19	1.30	0.00	0.00	0.89	0.82	0.45	1.41	1.10	1.52
Standard Error	0.63	0.48	0.76	1.04	0.40	1.11	0.98	0.58	0.00	0.00	0.31	0.41	0.20	0.71	0.49	0.68
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	higher	no	no	--	--	--	--	--	higher	higher	no

Table A3-44: Continued.

ZONE Z2 PW GRAB	Diversity Index (Simpson's D)								Evenness Index (Simpson's E)							
	1999	2001	2002	2004	2013	2021	2022	2023	1999	2001	2002	2004	2013	2021	2022	2023
No. of Samples (n)	4	4	8	4	5	4	5	5	4	4	8	4	5	4	5	5
Minimum	0.66	0.42	0.44	0.20	0.66	0.28	0.41	0.16	0.57	0.50	0.45	0.21	0.36	0.12	0.36	0.20
Maximum	0.78	0.60	0.80	0.48	0.77	0.54	0.72	0.70	0.76	0.70	0.84	0.68	0.72	0.26	0.57	0.72
1st Quartile	0.73	0.49	0.63	0.25	0.71	0.41	0.45	0.53	0.69	0.51	0.51	0.29	0.58	0.19	0.39	0.46
Median	0.76	0.52	0.73	0.28	0.71	0.47	0.65	0.57	0.74	0.55	0.57	0.35	0.58	0.23	0.51	0.48
3rd Quartile	0.78	0.54	0.79	0.35	0.75	0.50	0.67	0.65	0.75	0.61	0.75	0.46	0.67	0.25	0.56	0.53
Mean	0.74	0.51	0.69	0.31	0.72	0.44	0.58	0.52	0.70	0.57	0.62	0.40	0.58	0.21	0.48	0.48
Standard Deviation (n-1)	0.06	0.07	0.13	0.12	0.04	0.11	0.14	0.21	0.09	0.09	0.16	0.20	0.14	0.06	0.10	0.19
Standard Error	0.03	0.04	0.04	0.06	0.02	0.06	0.06	0.10	0.05	0.04	0.06	0.10	0.06	0.03	0.04	0.08
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	no	no	no	--	--	--	--	--	lower	no	no

Table A3-45: Keeyask Reservoir Zone 2 - supporting site data, offshore (OS), pre-Project (1999, 2001, 2002, 2008, and 2013) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	1999	356335	6247974	Ekman (tall)	3.0	3	1.0	88.0	11.0	na
		356335	6247974	Ekman (tall)	3.0	3	1.3	74.0	24.6	na
		356335	6247974	Ekman (tall)	3.0	3	1.5	71.4	27.0	na
		356335	6247974	Ekman (tall)	3.0	3	1.6	71.6	26.8	na
		356175	6247839	Ekman (tall)	5.0	5	1.4	78.4	20.2	na
		356175	6247839	Ekman (tall)	5.0	5	1.3	76.3	22.4	na
		356175	6247839	Ekman (tall)	5.0	5	1.1	79.7	19.2	na
		356175	6247839	Ekman (tall)	5.0	5	1.3	76.9	21.9	na
	2001	356180	6248208	Ekman (tall)	3.1	3.1	4.2	5.7	90.1	na
		356180	6248208	Ekman (tall)	3.1	--	--	--	--	--
		356180	6248208	Ekman (tall)	3.1	--	--	--	--	--
		356180	6248208	Ekman (tall)	3.1	--	--	--	--	--
		356344	6247968	Ekman (tall)	6.2	6.15	0.5	89.2	9.4	na
		356344	6247968	Ekman (tall)	6.2	--	--	--	--	--
		356344	6247968	Ekman (tall)	6.2	--	--	--	--	--
		356344	6247968	Ekman (tall)	6.2	--	--	--	--	--
		356183	6247635	Ekman (tall)	6.1	6.12	0.7	87.2	12.2	na
		356183	6247635	Ekman (tall)	6.1	--	--	--	--	--
		356183	6247635	Ekman (tall)	6.1	--	--	--	--	--
		356183	6247635	Ekman (tall)	6.1	--	--	--	--	--
	2002	356220	6248233	Ekman (tall)	4.1	4.11	--	--	--	--
		356220	6248233	Ekman (tall)	4.1	4.11	2.9	37.0	51.1	na
		356220	6248233	Ekman (tall)	4.1	--	--	--	--	--
		356220	6248233	Ekman (tall)	4.1	--	--	--	--	--
		356346	6247969	Ekman (tall)	6.7		0.4	94.9	4.1	na
		356346	6247969	Ekman (tall)	6.7	--	--	--	--	--
		356346	6247969	Ekman (tall)	6.7	--	--	--	--	--

Table A3-45: Continued.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water depths ((m)		Supporting Sediment Analysis			
		Easting	Northing		Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture	Texture
Pre-Project	2008	357226	6248154	Petite Ponar	13.0	13	--	--	--	Sand
		357283	6248150	Petite Ponar	13.2	13.2	--	--	--	Sand
		357372	6248135	Petite Ponar	11.6	11.6	--	--	--	na
		357284	6248075	Petite Ponar	9.8	9.8	--	--	--	Sand
		357306	6248226	Petite Ponar	4.3	4.3	--	--	--	Silty sand
		356439	6248045	Petite Ponar	7.6	7.6	--	--	--	Sand
		356352	6248060	Petite Ponar	8.7	8.7	--	--	--	Sand
		356365	6248192	Petite Ponar	5.5	5.5	--	--	--	Silt/clay
	2013	355950	6247807	Petite Ponar	9.1	9.1	0.3	98.9	1.06	Sand
		356056	6247872	Petite Ponar	7.7	7.7	0.2	96.0	4.03	Sand
		356136	6247914	Petite Ponar	7.4	7.5	0.4	97.1	2.89	Sand
		356227	6247962	Petite Ponar	7.3	7.7	0.1	98.4	1.57	Sand
		356278	6247987	Petite Ponar	7.6	7.6	0.2	95.8	4.16	Sand
Operation	2021	356259	6248416	Petite Ponar	7.4	7.4	2.4	1.6	98.4	Silt
		356203	6248435	Petite Ponar	7.0	7	2.4	1.5	98.6	Silt
		356154	6248446	Petite Ponar	7.4	7.4	2.1	0.5	99.1	Silt
		356109	6248451	Petite Ponar	7.0	7	2.7	0.5	99.4	Silt
		356066	6248462	Petite Ponar	5.6	5.7	1.5	72.0	28	Sandy loam
	2022	356325	6248477	Petite Ponar	4.9	5	1.7	50.9	49.1	Loam / Sandy loam
		356266	6248524	Petite Ponar	4.0	3.8	9.7	4.7	95.3	Silty clay loam
		356219	6248524	Petite Ponar	4.6	4.9	7.3	6.4	93.5	Silty clay
		356163	6248515	Petite Ponar	4.8	4.8	1.4	23.5	76.5	Clay
		356114	6248502	Petite Ponar	4.9	5	5.1	30.8	69.2	Loam
	2023	356316	6248475	Petite Ponar	5.9	6.2	4.1	48.6	51.3	Loam
		356258	6248525	Petite Ponar	4.0	4.1	7.7	36.6	63.4	Silt loam
		356215	6248524	Petite Ponar	4.8	4.7	3.9	60.3	39.7	Sandy loam
		356161	6248504	Petite Ponar	6.4	6.4	7.0	4.5	95.5	Silt loam
		356119	6248496	Petite Ponar	6.3	6.2	10.5	2.8	97.2	Silt loam

Table A3-46: Keeyask Reservoir Zone 2 - benthic invertebrate community metrics, offshore (OS), pre-Project (1999, 2001, 2002, 2008, and 2013) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	1999	5497	9.4	5.5	12.0	9	2	0.45	0.20
		9219	4.7	2.8	5.0	7	2	0.42	0.25
		23502	3.7	3.9	2.5	9	2	0.46	0.20
		3419	8.9	12.7	0.9	5	1	0.59	0.49
		10085	2.6	6.0	0.7	5	1	0.47	0.37
		4891	16.8	18.6	6.3	7	2	0.74	0.54
		3116	16.7	16.7	3.0	8	2	0.65	0.35
		4891	5.3	15.0	0.9	5	1	0.66	0.58
	2001	2554	23.7	32.2	0.7	6	1	0.77	0.74
		1255	51.7	10.3	7.5	5	1	0.65	0.58
		2251	32.7	21.2	1.5	5	1	0.78	0.90
		1558	44.4	27.8	1.6	4	1	0.69	0.80
		1125	3.8	26.9	0.1	4	1	0.50	0.50
		87	100.0	0.0		1	1	0.00	1.00
		346	0.0	87.5	0.0	2	0	0.22	0.64
		43	100.0	0.0		1	1	0.00	1.00
		346	0.0	25.0	0.0	4	0	0.66	0.73
		1212	0.0	46.4	0.0	4	0	0.61	0.64
		606	0.0	35.7	0.0	4	0	0.58	0.60
		130	0.0	33.3		2	0	0.45	0.91
	2002	4372	3.0	5.9	0.5	5	1	0.71	0.70
		3073	9.9	2.8	3.5	5	1	0.65	0.58
		5280	4.1	6.6	0.6	6	1	0.66	0.50
		7704	5.6	10.7	0.8	7	2	0.74	0.55
		390	11.1	77.8	0.1	3	1	0.37	0.53
		563	23.1	23.1	1.0	4	1	0.75	0.99
		43	0.0	0.0		1	0	0.00	1.00
	2008	2121	18.4	51.0	0.4	4	1	0.68	0.79
		3030	22.9	45.7	0.5	5	1	0.66	0.59
		1255	3.4	79.3	0.0	3	1	0.34	0.51
		43	0.0	0.0		1	0	0.00	1.00
		1991	15.2	15.2	1.0	7	5	0.49	0.28
		43	0.0	100.0	0.0	1	0	0.00	1.00
		43	0.0	100.0	0.0	1	0	0.00	1.00
		3030	7.1	28.6	0.3	7	3	0.56	0.32
	2013	1480	57.9	39.8	1.5	5	2	0.51	0.41
		467	7.4	83.3	0.1	6	2	0.30	0.24
		615	0.0	100.0	0.0	1	0	0.00	1.00
		346	0.0	100.0	0.0	1	0	0.00	1.00
		26	0.0	100.0	0.0	1	0	0.00	1.00

Table A3-46: Continued.

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Operation	2021	649	77.8	13.3	7.0	7	1	0.38	0.23
		1082	72.0	18.7	3.9	4	1	0.44	0.45
		1327	75.0	20.7	6.3	7	3	0.48	0.27
		837	79.3	15.5	7.7	6	2	0.43	0.29
		1659	63.5	32.2	3.2	8	2	0.55	0.28
	2022	332	52.2	21.7	3.0	6	2	0.69	0.54
		895	16.1	64.5	0.3	5	2	0.55	0.44
		1010	11.4	75.7	0.2	7	2	0.63	0.39
		159	54.5	36.4	2.0	4	1	0.62	0.65
		693	58.3	33.3	2.0	8	3	0.69	0.40
	2023	361	64.0	24.0	5.3	4.0	1	0.55	0.55
		462	21.9	68.8	0.4	7.0	2	0.58	0.34
		1197	3.6	96.4	0.0	4.0	2	0.24	0.33
		909	85.7	12.7	--	3.0	1	0.25	0.44
		1313	29.7	70.3	0.7	4.0	2	0.66	0.73

Table A3-47: Keeyask Reservoir Zone 2 - Offshore (OS) - substrate statistics and assessment results.

ZONE Z2 OS GRAB	Water Depth (m)								Total Organic Carbon (%)							
	1999	2001	2002	2008	2013	2021	2022	2023	1999	2001	2002	2008	2013	2021	2022	2023
No. of Samples (n)	8	12	7	8	5	5	5	5	8	3	2	0	5	5	5	5
Minimum	3.0	3.1	4.1	4.3	7.3	5.6	4.0	4.0	1.02	0.48	0.44		0.10	1.51	1.38	3.91
Maximum	5.0	6.2	6.7	13.2	9.1	7.4	4.9	6.4	1.62	4.20	2.87		0.35	2.73	9.67	10.50
1st Quartile	3.0	3.1	4.1	7.1	7.4	7.0	4.6	4.8	1.23	0.57	1.05		0.18	2.13	1.66	4.12
Median	4.0	6.1	4.1	9.3	7.6	7.0	4.8	5.9	1.32	0.66	1.65		0.22	2.36	5.07	6.97
3rd Quartile	5.0	6.2	6.7	12.0	7.7	7.4	4.9	6.3	1.41	2.43	2.26		0.26	2.37	7.29	7.70
Mean	4.0	5.1	5.2	9.2	7.8	6.9	4.6	5.5	1.32	1.78	1.65		0.22	2.22	5.01	6.64
Standard Deviation (n-1)	1.07	1.49	1.41	3.32	0.73	0.74	0.38	1.06	0.20	2.10	1.72		0.09	0.45	3.58	2.74
Standard Error	0.38	0.43	0.53	1.17	0.33	0.33	0.17	0.47	0.07	1.21	1.21		0.04	0.20	1.60	1.22
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	--	--	--	--	--	--	higher	higher	higher

Table A3-47: Continued.

ZONE Z2 OS GRAB	Sand (%)								Silt/Clay (%)							
	1999	2001	2002	2008	2013	2021	2022	2023	1999	2001	2002	2008	2013	2021	2022	2023
No. of Samples (n)	8	3	2	0	5	5	5	5	8	3	2	0	5	5	5	5
Minimum	71.44	5.73	37.02		95.80	0.50	4.70	2.80	11.02	9.37	4.11		1.06	28.00	49.10	39.70
Maximum	87.97	89.23	94.92		98.90	72.00	50.90	60.30	27.03	90.07	51.08		4.16	99.40	95.30	97.20
1st Quartile	73.43	46.45	51.49		96.00	0.50	6.40	4.50	19.95	10.77	15.85		1.57	98.40	69.20	51.30
Median	76.57	87.17	65.97		97.10	1.50	23.50	36.60	22.14	12.17	27.60		2.89	98.60	76.50	63.40
3rd Quartile	78.74	88.20	80.45		98.40	1.60	30.80	48.60	25.17	51.12	39.34		4.03	99.10	93.50	95.50
Mean	77.03	60.71	65.97		97.24	15.22	23.26	30.56	21.64	37.20	27.60		2.74	84.70	76.72	69.42
Standard Deviation (n-1)	5.33	47.62	40.95		1.39	31.75	19.04	25.96	5.16	45.80	33.21		1.40	31.70	19.01	25.98
Standard Error	1.89	27.50	28.95		0.62	14.20	8.51	11.61	1.82	26.44	23.48		0.63	14.18	8.50	11.62
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	lower	lower	lower	--	--	--	--	--	higher	higher	higher

Table A3-48: Keeyask Reservoir Zone 2 - Offshore (OS) -benthic invertebrate statistics and assessment results.

ZONE Z2 OS GRAB	Total Abundance (no. per m^2)								EPT Index (%)							
	1999	2001	2002	2008	2013	2021	2022	2023	1999	2001	2002	2008	2013	2021	2022	2023
No. of Samples (n)	8	12	7	8	5	5	5	5	8	12	7	8	5	5	5	5
Minimum	3116	43	43	43	26	649	159	361	3	0	0	0	0	63	11	4
Maximum	23502	2554	7704	3030	1480	1659	1010	1313	17	100	23	23	58	79	58	86
1st Quartile	4523	292	476	43	346	837	332	462	4	0	4	0	0	72	16	22
Median	5194	866	3073	1623	467	1082	693	909	7	14	6	5	0	75	52	30
3rd Quartile	9436	1331	4826	2348	615	1327	895	1197	11	46	10	16	7	78	55	64
Mean	8078	959	3061	1445	587	1111	617	848	9	30	8	8	13	74	39	41
Standard Deviation (n-1)	6724.59	848.13	2906.57	1293.30	544.45	398.91	363.48	426.82	5.60	37.79	7.64	9.20	25.27	6.26	22.75	33.24
Standard Error	2377.50	244.83	1098.58	457.25	243.48	178.40	162.55	190.88	1.98	10.91	2.89	3.25	11.30	2.80	10.18	14.87
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	lower	lower	lower	--	--	--	--	--	higher	higher	higher

Table A3-48: Continued.

ZONE Z2 OS GRAB	O+C Index (%)								EPT:C							
	1999	2001	2002	2008	2013	2021	2022	2023	1999	2001	2002	2008	2013	2021	2022	2023
No. of Samples (n)	8	12	7	8	5	5	5	5	8	9	6	7	5	5	5	4
Minimum	3	0	0	0	40	13	22	13	0.67	0.00	0.14	0.00	0.00	3.17	0.21	0.04
Maximum	19	88	78	100	100	32	76	96	12.00	7.50	3.50	1.00	1.46	7.67	3.00	5.33
1st Quartile	5	18	4	25	83	16	33	24	0.87	0.00	0.53	0.02	0.00	3.86	0.26	0.27
Median	9	27	7	48	100	19	36	69	2.75	0.14	0.70	0.25	0.00	6.27	2.00	0.51
3rd Quartile	15	34	17	84	100	21	65	70	5.33	1.55	0.94	0.47	0.09	7.00	2.00	1.84
Mean	10	29	18	52	85	20	46	54	3.90	1.28	1.09	0.32	0.31	5.59	1.49	1.60
Standard Deviation (n-1)	6.28	23.19	27.34	37.79	26.09	7.33	22.73	34.95	3.86	2.42	1.21	0.36	0.64	1.98	1.22	2.50
Standard Error	2.22	6.69	10.33	13.36	11.67	3.28	10.17	15.63	1.37	0.81	0.50	0.14	0.29	0.88	0.55	1.25
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	no	no	higher	--	--	--	--	--	higher	no	no

Table A3-48: Continued.

ZONE Z2 OS GRAB	Total Richness (no. of taxa)								EPT Richness (no. of taxa)							
	1999	2001	2002	2008	2013	2021	2022	2023	1999	2001	2002	2008	2013	2021	2022	2023
No. of Samples (n)	8	12	7	8	5	5	5	5	8	12	7	8	5	5	5	5
Minimum	5	1	1	1	1	4	4	3	1	0	0	0	0	1	1	1
Maximum	9	6	7	7	6	8	8	7	2	1	2	5	2	3	3	2
1st Quartile	5	2	4	1	1	6	5	4	1	0	1	0	0	1	2	1
Median	7	4	5	4	1	7	6	4	2	1	1	1	0	2	2	2
3rd Quartile	8	4	6	6	5	7	7	4	2	1	1	2	2	2	2	2
Mean	7	4	4	4	3	6	6	4	2	1	1	1	1	2	2	2
Standard Deviation (n-1)	1.73	1.62	1.99	2.56	2.49	1.52	1.58	1.52	0.52	0.51	0.58	1.77	1.10	0.84	0.71	0.55
Standard Error	0.61	0.47	0.75	0.91	1.11	0.68	0.71	0.68	0.18	0.15	0.22	0.63	0.49	0.37	0.32	0.24
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	no	no	no	--	--	--	--	--	higher	higher	higher

Table A3-48: Continued.

ZONE Z2 OS GRAB	Diversity Index (Simpson's D)								Evenness Index (Simpson's E)							
	1999	2001	2002	2008	2013	2021	2022	2023	1999	2001	2002	2008	2013	2021	2022	2023
No. of Samples (n)	8	12	7	8	5	5	5	5	8	12	7	8	5	5	5	5
Minimum	0.42	0.00	0.00	0.00	0.00	0.38	0.55	0.24	0.20	0.50	0.50	0.28	0.24	0.23	0.39	0.33
Maximum	0.74	0.78	0.75	0.68	0.51	0.55	0.69	0.66	0.58	1.00	1.00	1.00	1.00	0.45	0.65	0.73
1st Quartile	0.46	0.39	0.51	0.00	0.00	0.43	0.62	0.25	0.24	0.63	0.54	0.46	0.41	0.27	0.40	0.34
Median	0.53	0.60	0.66	0.41	0.00	0.44	0.63	0.55	0.36	0.74	0.58	0.69	1.00	0.28	0.44	0.44
3rd Quartile	0.65	0.67	0.73	0.58	0.30	0.48	0.69	0.58	0.50	0.90	0.84	1.00	1.00	0.29	0.54	0.55
Mean	0.55	0.49	0.56	0.34	0.16	0.46	0.64	0.45	0.37	0.75	0.69	0.69	0.73	0.30	0.49	0.48
Standard Deviation (n-1)	0.12	0.28	0.28	0.30	0.24	0.06	0.06	0.20	0.15	0.17	0.22	0.30	0.38	0.08	0.11	0.17
Standard Error	0.04	0.08	0.10	0.11	0.11	0.03	0.03	0.09	0.05	0.05	0.08	0.11	0.17	0.04	0.05	0.07
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	no	no	no	--	--	--	--	--	lower	no	no

APPENDIX 4: KEEYASK RESERVIOR BACKBAY BENTHIC INVERTEBRATE SUMMARY ASSESSMENT DATA

Table A4-1: Keeyask Reservoir Zone 4 - supporting site data, intermittently exposed (IE, benthic grab samples), pre-Project (2002 and 2004) and Operation (2022 and 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2002	338950	6245122	Ekman (tall)	0.8	0.8	13.1	9.3	77.6	na
		338950	6245122	Ekman (tall)	0.8	--	--	--	--	--
		338950	6245122	Ekman (tall)	0.8	--	--	--	--	--
		338950	6245122	Ekman (tall)	0.8	--	--	--	--	--
	2004	338963	6245112	Ekman (tall)	0.9	0.9	10.3	9.2	80.5	na
		338963	6245112	Ekman (tall)	0.9	--	--	--	--	--
		338963	6245112	Ekman (tall)	0.9	--	--	--	--	--
		338963	6245112	Ekman (tall)	0.9	--	--	--	--	--
Operation	2022	341254	6244655	Petite Ponar	1.0	1.0	41.0	3.8	96.2	Silt
		341254	6244799	Petite Ponar	0.9	--	--	--	--	--
		341254	6244826	Petite Ponar	0.8	--	--	--	--	--
	2023	341207	6244675	Petite Ponar	0.9	0.9	37.3	0.5	99.8	Silt
		341214	6244762	Petite Ponar	0.6	0.6	38.2	0.5	99.8	Silt
		341249	6244797	Petite Ponar	0.3	--	--	--	--	Flooded terrestrial
		341218	6244782	Petite Ponar	0.8	--	--	--	--	Flooded terrestrial
		341159	6244768	Petite Ponar	0.8	--	--	--	--	Flooded terrestrial

Table A4-2: Keeyask Reservoir Zone 4 - benthic invertebrate community metrics, intermittently exposed (IE, benthic grab samples), pre-Project (2002 and 2004) and Operation (2022 and 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2002	4501	1.0	57.7	0.0	7	1	0.58	0.34
		1428	15.2	78.8	0.2	4	2	0.36	0.39
		2857	13.6	75.8	0.2	5	2	0.41	0.34
		4545	11.4	79.0	0.1	8	2	0.39	0.21
	2004	3939	0.0	87.9	0.0	9	0	0.59	0.27
		9522	0.0	82.3	0.0	8	0	0.64	0.34
		5237	0.8	76.0	0.0	10	1	0.70	0.33
		3289	0.0	71.1	0.0	5	0	0.67	0.60
Operation	2022	12191	0.0	79.1	0.0	8	0	0.67	0.38
		41667	0.0	83.4	0.0	7	0	0.55	0.32
		24123	0.0	92.8	0.0	4	0	0.27	0.34
	2023	17313	0.0	88.7	0.0	5.0	0	0.59	0.49
		6925	0.0	77.9	0.0	6.0	0	0.63	0.45
		7127	0.0	98.8	0.0	6.0	0	0.32	0.25
		19391	0.1	95.2	0.0	8.0	1	0.33	0.19
		1125	1.3	55.1	0.1	7.0	1	0.77	0.63

Table A4-3: Keeyask Reservoir Zone 4 - Intermittently exposed (IE, benthic grab samples)- substrate statistics and assessment results.

ZONE 4 IE GRAB	Water Depth (m)				Total Organic Carbon (%)				Sand (%)				Silt/Clay (%)			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	8	4	3	5	2	1	1	2	2	1	1	2	2	1	1	2
Minimum	0.75	0.94	0.80	0.33	4.94	10.29	41.00	37.30	9.29	9.23	3.80	0.50	76.09	80.48	96.20	99.80
Maximum	1.37	0.94	1.00	0.90	13.08	10.29	41.00	38.20	18.97	9.23	3.80	0.50	77.63	80.48	96.20	99.80
1st Quartile	0.75	0.94	0.85	0.60	6.97	10.29	41.00	37.53	11.71	9.23	3.80	0.50	76.48	80.48	96.20	99.80
Median	1.06	0.94	0.90	0.77	9.01	10.29	41.00	37.75	14.13	9.23	3.80	0.50	76.86	80.48	96.20	99.80
3rd Quartile	1.37	0.94	0.95	0.83	11.05	10.29	41.00	37.98	16.55	9.23	3.80	0.50	77.24	80.48	96.20	99.80
Mean	1.06	0.94	0.90	0.69	9.01	10.29	41.00	37.75	14.13	9.23	3.80	0.50	76.86	80.48	96.20	99.80
Standard Deviation (n-1)	0.33	0.00	0.10	0.23	5.76			0.64	6.85			0.00	1.09			0.00
Standard Error	0.12	0.00	0.06	0.10	4.07			0.45	4.84			0.00	0.77			0.00
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	higher	higher	--	--	lower	lower	--	--	no	no

Table A4-4: Keeyask Reservoir Zone 4 - Intermittently exposed (IE, benthic grab samples)- benthic invertebrate statistics and assessment.

ZONE 4 IE GRAB	Total Abundance (no. per m²)				EPT Index (%)				O+C Index (%)				EPT:C			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	8	4	3	5	8	4	3	5	8	4	3	5	8	4	3	5
Minimum	866	3289	12191	1125	1	0	0	0	39	71	79	55	0.02	0.00	0.00	0.00
Maximum	4545	9522	41667	19391	45	1	0	1	79	88	93	99	1.13	0.02	0.00	0.05
1st Quartile	1374	3776	18157	6925	13	0	0	0	50	75	81	78	0.17	0.00	0.00	0.00
Median	1623	4588	24123	7127	16	0	0	0	59	79	83	89	0.26	0.00	0.00	0.00
3rd Quartile	3268	6308	32895	17313	36	0	0	0	77	84	88	95	0.76	0.01	0.00	0.01
Mean	2343	5497	25994	10376	22	0	0	0	60	79	85	83	0.45	0.01	0.00	0.01
Standard Deviation (n-1)	1463.11	2803.03	14826.49	7704.26	15.36	0.41	0.00	0.57	16.34	7.34	7.04	17.56	0.41	0.01	0.00	0.02
Standard Error	517.29	1401.51	8560.08	3445.45	5.43	0.21	0.00	0.25	5.78	3.67	4.07	7.85	0.14	0.01	0.00	0.01
More than ±50% of Pre-impoundment Mean	--	--	higher	higher	--	--	lower	lower	--	--	no	no	--	--	lower	lower

Table A4-4: Continued

ZONE 4 IE GRAB	Total Richness (no. of taxa)				EPT Richness (no. of taxa)				Diversity Index (Simpson's D)				Evenness Index (Simpson's E)			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	8	4	3	5	8	4	3	5	8	4	3	5	8	4	3	5
Minimum	4	5	4	5	1	0	0	0	0.36	0.59	0.27	0.32	0.21	0.27	0.32	0.19
Maximum	8	10	8	8	2	1	0	1	0.71	0.70	0.67	0.77	0.73	0.60	0.38	0.63
1st Quartile	5	7	6	6	1	0	0	0	0.40	0.62	0.41	0.33	0.34	0.32	0.33	0.25
Median	6	9	7	6	2	0	0	0	0.58	0.65	0.55	0.59	0.43	0.34	0.34	0.45
3rd Quartile	6	9	8	7	2	0	0	1	0.66	0.67	0.61	0.63	0.54	0.41	0.36	0.49
Mean	6	8	6	6	2	0	0	0	0.55	0.65	0.50	0.53	0.45	0.39	0.35	0.40
Standard Deviation (n-1)	1.41	2.16	2.08	1.14	0.53	0.50	0.00	0.55	0.14	0.05	0.20	0.20	0.16	0.15	0.03	0.18
Standard Error	0.50	1.08	1.20	0.51	0.19	0.25	0.00	0.24	0.05	0.02	0.12	0.09	0.06	0.07	0.02	0.08
More than ±50% of Pre-impoundment Mean	--	--	no	no	--	--	lower	lower	--	--	no	no	--	--	no	no

Table A4-5: Keeyask Reservoir Zone 4 - Intermittently exposed (IE, benthic grab samples) - substrate statistics and assessment results within operation years comparison.

ZONE 4 IE GRAB	Water Depth (m)		Total Organic Carbon (%)		Sand (%)		Silt/Clay (%)	
	2022	2023	2022	2023	2022	2023	2022	2023
No. of Samples (n)	3	5	1	2	1	2	1	2
Minimum	0.8	0.3	41.00	37.30	3.80	0.50	96.20	99.80
Maximum	1.0	0.9	41.00	38.20	3.80	0.50	96.20	99.80
1st Quartile	0.9	0.6	41.00	37.53	3.80	0.50	96.20	99.80
Median	0.9	0.8	41.00	37.75	3.80	0.50	96.20	99.80
3rd Quartile	1.0	0.8	41.00	37.98	3.80	0.50	96.20	99.80
Mean	0.9	0.7	41.00	37.75	3.80	0.50	96.20	99.80
Standard Deviation (n-1)	0.10	0.23		0.64		0.00		0.00
Standard Error	0.06	0.10		0.45		0.00		0.00
More than ±50% of Pre-impoundment Mean	--	--	no	no	higher	lower	no	no

Table A4-6: Keeyask Reservoir Zone 4 - Intermittently exposed (IE, benthic grab samples) - benthic invertebrate statistics and assessment results within operation years comparison.

ZONE 4 IE GRAB	Total Abundance (no. per m^2)		EPT Index (%)		O+C Index (%)		EPT:C		Total Richness (no. of taxa)		EPT Richness (no. of taxa)		Diversity Index (Simpson's D)		Evenness Index (Simpson's E)	
	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023
No. of Samples (n)	3	5	3	5	3	5	3	5	3	5	3	5	3	5	3	5
Minimum	12191	1125	0	0	79	55	0.00	0.00	4.0	5.0	0.0	0.0	0.27	0.32	0.32	0.19
Maximum	41667	19391	0	1	93	99	0.00	0.05	8.0	8.0	0.0	1.0	0.67	0.77	0.38	0.63
1st Quartile	18157	6925	0	0	81	78	0.00	0.00	5.5	6.0	0.0	0.0	0.41	0.33	0.33	0.25
Median	24123	7127	0	0	83	89	0.00	0.00	7.0	6.0	0.0	0.0	0.55	0.59	0.34	0.45
3rd Quartile	32895	17313	0	0	88	95	0.00	0.01	7.5	7.0	0.0	1.0	0.61	0.63	0.36	0.49
Mean	25994	10376	0	0	85	83	0.00	0.01	6.3	6.4	0.0	0.4	0.50	0.53	0.35	0.40
Standard Deviation (n-1)	14826.49	7704.26	0.00	0.57	7.04	17.56	0.00	0.02	2.08	1.14	0.00	0.55	0.20	0.20	0.03	0.18
Standard Error	8560.08	3445.45	0.00	0.25	4.07	7.85	0.00	0.01	1.20	0.51	0.00	0.24	0.12	0.09	0.02	0.08
More than ±50% of Pre-impoundment Mean	higher	no	lower	higher	no	no	lower	higher	no	no	lower	higher	no	no	no	no

Table A4-7: Keeyask Reservoir Zone 4 - supporting site data, predominantly wetted (PW), pre-Project (2002) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2002	338875	6245187	Ekman (tall)	1.4	1.4	4.9	19.0	76.09	na
		338875	6245187	Ekman (tall)	1.4	--	--	--	--	--
		338875	6245187	Ekman (tall)	1.4	--	--	--	--	--
		338875	6245187	Ekman (tall)	1.4	--	--	--	--	--
Operation	2021	339464	6245305	Petite Ponar	2.4	2.4	0.5	1.3	98.8	Silt loam / Silty clay loam
		339456	6245273	Petite Ponar	2.9	2.9	1.1	66.9	33	Sandy loam
		339469	6245242	Petite Ponar	2.8	2.7	1.4	59.4	40.5	Sandy clay loam
		339479	6245207	Petite Ponar	2.5	2.5	3.7	29.4	70.6	Clay loam
		339459	6245174	Petite Ponar	2.9	2.9	2.1	51.5	48.6	Sandy clay loam
	2022	339829	6245060	Petite Ponar	2.5	no data	--	--	--	--
		339859	6244867	Petite Ponar	2.0	2.0	19.9	1.5	98.4	Silty clay loam
		340021	6244745	Petite Ponar	2.0	2.2	23.0	1.8	98.2	Silt loam
		340004	6244888	Petite Ponar	2.2	2.4	22.5	4.3	95.6	Silt loam / Silty clay loam
		339967	6245074	Petite Ponar	2.0	1.9	23.6	3.2	96.8	Silt loam
	2023	339824	6245074	Petite Ponar	2.1	2.3	4.7	22	78	Silt loam
		339871	6244851	Petite Ponar	1.5	1.7	15.6	1.7	98.3	Silty clay
		340017	6244748	Petite Ponar	1.5	1.4	26.2	0.5	100	Silty clay loam
		340003	6244901	Petite Ponar	2.6	2.8	29.4	0.5	99.6	Silty clay loam
		339974	6245080	Petite Ponar	1.5	1.8	26.0	0.5	99.4	Silt loam

Table A4-8: Keeyask Reservoir Zone 4 - benthic invertebrate community metrics, predominantly wetted (PW), pre-Project (2002) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2002	1342	35.5	38.7	0.9	6	1	0.71	0.57
		1385	37.5	53.1	0.7	5	1	0.57	0.47
		1818	16.7	59.5	0.3	6	1	0.69	0.53
		866	45.0	40.0	1.1	4	2	0.66	0.73
Operation	2021	7286	11.1	47.5	0.3	9	3	0.67	0.33
		693	45.8	41.7	1.1	11	4	0.69	0.30
		2886	13.5	76.0	0.3	8	1	0.69	0.40
		3116	2.3	63.0	0.1	9	3	0.73	0.41
		1674	36.2	39.7	1.2	9	3	0.77	0.48
	2022	1183	0.0	69.5	0.0	6	0	0.72	0.59
		822	7.0	52.6	0.1	13	3	0.73	0.28
		332	0.0	56.5	0.0	4	0	0.58	0.60
		2770	0.0	60.4	0.0	6	0	0.71	0.58
		1630	0.0	76.1	0.0	5	0	0.50	0.40
	2023	2943	0.0	32.8	0.0	8	0	0.78	0.57
		3607	0.4	43.2	0.0	10	1	0.65	0.28
		4617	0.0	82.5	0.	5	0	0.38	0.32
		3592	0.0	83.9	0.0	8	0	0.64	0.34
		1457	0.0	39.6	0.0	5	0	0.61	0.52

Table A4-9: Keeyask Reservoir Zone 4 - Predominantly wetted (PW) - substrate statistics and assessment results.

ZONE 4 PW GRAB	Water Depth (m)			Total Organic Carbon (%)			Sand (%)			Silt/Clay (%)		
	2021	2022	2023	2021	2022	2023	2021	2022	2023	2021	2022	2023
No. of Samples (n)	5	5	5	5	4	5	5	4	5	5	4	5
Minimum	2.4	2.0	1.5	0.47	19.90	4.70	1.30	1.50	0.50	33.00	95.60	78.00
Maximum	2.9	2.5	2.6	3.69	23.60	29.40	66.90	4.30	22.00	98.80	98.40	100.00
1st Quartile	2.5	2.0	1.5	1.14	21.85	15.60	29.40	1.73	0.50	40.50	96.50	98.30
Median	2.8	2.0	1.5	1.43	22.75	26.00	51.50	2.50	0.50	48.60	97.50	99.40
3rd Quartile	2.9	2.2	2.1	2.09	23.15	26.20	59.40	3.48	1.70	70.60	98.25	99.60
Mean	2.7	2.1	1.8	1.76	22.25	20.38	41.70	2.70	5.04	58.30	97.25	95.06
Standard Deviation (n-1)	0.23	0.22	0.48	1.22	1.63	10.19	26.59	1.30	9.50	26.66	1.31	9.56
Standard Error	0.10	0.10	0.22	0.55	0.81	4.56	11.89	0.65	4.25	11.92	0.66	4.27
More than ±50% of Pre-impoundment Mean	--	--	--	lower	higher	no	higher	lower	lower	no	no	no

Table A4-10: Keeyask Reservoir Zone 4 - Predominantly wetted (PW) - benthic invertebrate statistics and assessment results.

ZONE 4 PW GRAB	Total Abundance (no. per m^2)			EPT Index (%)			O+C Index (%)			EPT:C		
	2021	2022	2023	2021	2022	2023	2021	2022	2023	2021	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	693	332	1457	2	0	0	40	53	33	0.08	0.00	0.00
Maximum	7286	2770	4617	46	7	0	76	76	84	1.24	0.15	0.01
1st Quartile	1674	822	2943	11	0	0	42	57	40	0.26	0.00	0.00
Median	2886	1183	3592	14	0	0	48	60	43	0.34	0.00	0.00
3rd Quartile	3116	1630	3607	36	0	0	63	70	83	1.10	0.00	0.00
Mean	3131	1348	3243	22	1	0	54	63	56	0.60	0.03	0.00
Standard Deviation (n-1)	2519.62	927.11	1164.14	18.36	3.14	0.18	15.52	9.62	24.75	0.53	0.07	0.00
Standard Error	1126.81	414.61	520.62	8.21	1.40	0.08	6.94	4.30	11.07	0.24	0.03	0.00
More than ±50% of Pre-impoundment Mean	no	no	no	higher	lower	lower	no	no	no	higher	lower	lower

Table A4-10: Continued.

ZONE 4 PW GRAB	Total Richness (no. of taxa)			EPT Richness (no. of taxa)			Diversity Index (Simpson's D)			Evenness Index (Simpson's E)		
	2021	2022	2023	2021	2022	2023	2021	2022	2023	2021	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	8	4	5	1	0	0	0.67	0.50	0.38	0.30	0.28	0.28
Maximum	11	13	10	4	3	1	0.77	0.73	0.78	0.48	0.60	0.57
1st Quartile	9	5	5	3	0	0	0.69	0.58	0.61	0.33	0.40	0.32
Median	9	6	8	3	0	0	0.69	0.71	0.64	0.40	0.58	0.34
3rd Quartile	9	6	8	3	0	0	0.73	0.72	0.65	0.41	0.59	0.52
Mean	9	7	7	3	1	0	0.71	0.65	0.61	0.38	0.49	0.41
Standard Deviation (n-1)	1.10	3.56	2.17	1.10	1.34	0.45	0.04	0.10	0.15	0.07	0.14	0.13
Standard Error	0.49	1.59	0.97	0.49	0.60	0.20	0.02	0.05	0.06	0.03	0.06	0.06
More than ±50% of Pre-impoundment Mean	no	no	no	higher	no	lower	no	no	no	no	no	no

Table A4-11: Keeyask Reservoir Zone 4 - supporting site data, offshore (OS), Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Operation	2021	338883	6245231	Petite Ponar	4.6	4.5	1.8	50.3	49.7	Loam
		338870	6245263	Petite Ponar	4.7	4.7	1.9	46.3	53.7	Sandy loam
		338907	6245252	Petite Ponar	4.5	4.6	2.5	44.7	55.3	Loam / Sandy loam
		338893	6245282	Petite Ponar	4.7	4.7	4.4	25	74.9	Silt loam
		338933	6245265	Petite Ponar	4.5	4.5	2.9	23.9	76.1	Silt loam
	2022	339036	6245352	Petite Ponar	4.9	4.8	2.9	4.6	95.4	Silty clay loam
		338845	6245365	Petite Ponar	4.6	4.2	4.1	11.6	88.4	Silt loam
		338963	6245217	Petite Ponar	4.9	4.8	2.8	28.5	71.5	Silt loam
		338991	6245170	Petite Ponar	4.1	4.1	1.2	53.2	46.8	Sandy loam
		338964	6245323	Petite Ponar	5.0	5.0	2.6	8.8	91.2	Silty clay loam
	2023	339033	6245355	Petite Ponar	4.4	4.2	4.1	4.3	95.7	Silt loam
		338853	6245370	Petite Ponar	4.3	4.3	3.9	38.8	61.2	Silt loam
		338964	6245223	Petite Ponar	4.7	4.3	2.6	25.5	74.5	Silt loam
		338993	6245169	Petite Ponar	3.7	3.8	1.9	49	51.1	Loam
		338957	6245333	Petite Ponar	4.8	4.8	2.8	2.4	97.6	Silt loam

Table A4-12: Keeyask Reservoir Zone 4 - benthic invertebrate community metrics, offshore (OS), Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Operation	2021	1039	52.8	6.9	12.7	11	2	0.64	0.25
		1039	47.2	8.3	5.7	8	2	0.68	0.39
		1558	63.0	18.5	4.9	7	2	0.61	0.37
		1789	29.0	16.1	2.3	11	3	0.74	0.34
		1327	31.5	21.7	1.8	6	1	0.71	0.58
	2022	404	53.6	17.9	3.0	6	2	0.69	0.53
		346	45.8	45.8	1.8	6	2	0.72	0.59
		361	44.0	52.0	1.4	4	1	0.66	0.74
		101	57.1	28.6	4.0	4	1	0.62	0.66
		173	50.0	25.0	2.0	5	2	0.78	0.92
	2023	130	22.2	33.3	0.7	4	1	0.72	0.90
		592	17.1	39.0	0.9	6	2	0.73	0.62
		231	31.3	18.8	1.7	3	1	0.62	0.88
		534	29.7	56.8	1.0	6	2	0.75	0.68
		101	14.3	42.9	0.3	4	1	0.70	0.84

Table A4-13: Keeyask Reservoir Zone 4 - Offshore (OS) - substrate statistics and assessment results.

ZONE 4 OS GRAB	Water Depth (m)			Total Organic Carbon (%)			Sand (%)			Silt/Clay (%)		
	2021	2022	2023	2021	2022	2023	2021	2022	2023	2021	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	4.5	4.1	3.7	1.79	1.16	1.94	23.90	4.60	2.40	49.70	46.80	51.10
Maximum	4.7	5.0	4.8	4.40	4.10	4.05	50.30	53.20	49.00	76.10	95.40	97.60
1st Quartile	4.5	4.6	4.3	1.94	2.63	2.62	25.00	8.80	4.30	53.70	71.50	61.20
Median	4.6	4.9	4.4	2.46	2.81	2.80	44.70	11.60	25.50	55.30	88.40	74.50
3rd Quartile	4.7	4.9	4.7	2.92	2.93	3.92	46.30	28.50	38.80	74.90	91.20	95.70
Mean	4.6	4.7	4.4	2.70	2.73	3.07	38.04	21.34	24.00	61.94	78.66	76.02
Standard Deviation (n-1)	0.10	0.37	0.43	1.05	1.05	0.90	12.58	19.99	20.62	12.55	19.99	20.59
Standard Error	0.04	0.16	0.19	0.47	0.47	0.40	5.63	8.94	9.22	5.61	8.94	9.21
More than ±50% of Pre-impoundment Mean	--	--	--	no	no	no	no	no	no	no	no	no

Table A4-14: Keeyask Reservoir Zone 4 - Offshore (OS) - benthic invertebrate statistics and assessment results.

ZONE 4 OS GRAB	Total Abundance (no. per m^2)			EPT Index (%)			O+C Index (%)			EPT:C		
	2021	2022	2023	2021	2022	2023	2021	2022	2023	2021	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	1039	101	101	29	44	14	7	18	19	1.81	1.38	0.33
Maximum	1789	404	592	63	57	31	22	52	57	12.67	4.00	1.67
1st Quartile	1039	173	130	32	46	17	8	25	33	2.25	1.83	0.67
Median	1327	346	231	47	50	22	16	29	39	4.86	2.00	0.88
3rd Quartile	1558	361	534	53	54	30	19	46	43	5.67	3.00	1.00
Mean	1350	277	317	45	50	23	14	34	38	5.45	2.44	0.91
Standard Deviation (n-1)	327.98	131.99	229.94	14.36	5.41	7.50	6.45	14.45	13.86	4.36	1.05	0.49
Standard Error	146.68	59.03	102.83	6.42	2.42	3.35	2.88	6.46	6.20	1.95	0.47	0.22
More than ±50% of Pre-impoundment Mean	higher	lower	lower	no	no	no	lower	no	no	higher	no	lower

Table A4-14: Continued.

ZONE 4 OS GRAB	Total Richness (no. of taxa)			EPT Richness (no. of taxa)			Diversity Index (Simpson's D)			Evenness Index (Simpson's E)		
	2021	2022	2023	2021	2022	2023	2021	2022	2023	2021	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	6	4	3	1	1	1	0.61	0.62	0.62	0.25	0.53	0.62
Maximum	11	6	6	3	2	2	0.74	0.78	0.75	0.58	0.92	0.90
1st Quartile	7	4	4	2	1	1	0.64	0.66	0.70	0.34	0.59	0.68
Median	8	5	4	2	2	1	0.68	0.69	0.72	0.37	0.66	0.84
3rd Quartile	11	6	6	2	2	2	0.71	0.72	0.73	0.39	0.74	0.88
Mean	9	5	5	2	2	1	0.67	0.69	0.71	0.39	0.69	0.78
Standard Deviation (n-1)	2.30	1.00	1.34	0.71	0.55	0.55	0.05	0.06	0.05	0.12	0.15	0.13
Standard Error	1.03	0.45	0.60	0.32	0.24	0.24	0.02	0.03	0.02	0.05	0.07	0.06
More than ±50% of Pre-impoundment Mean	no	no	no	no	no	no	no	no	no	no	no	no

Table A4-15: Keeyask Reservoir Zone 8 - supporting site data, intermittently exposed (IE, benthic grab samples), Operation (2022 and 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Operation	2022	354112	6249328	Petite Ponar	1.0	--	--	--	--	--
		354204	6249299	Petite Ponar	1.0	1.0	43.8	1.9	98.1	Silt
		354323	6249289	Petite Ponar	0.8	--	--	--	--	--
	2023	354116	6249330	Petite Ponar	0.7	0.5	39.8	0.5	100	Silt loam
		354205	6249309	Petite Ponar	0.9	0.8	40.2	0.5	100	Silty clay
		354320	6249285	Petite Ponar	0.5	--	--	--	--	Flooded terrestrial
		354346	6249268	Petite Ponar	0.5	0.5	35.4	0.5	99.9	Silt loam
		354410	6249241	Petite Ponar	0.5	0.6	34.7	0.5	100	Silt loam

Table A4-16: Keeyask Reservoir Zone 8 - benthic invertebrate community metrics, intermittently exposed (IE, benthic grab samples), Operation (2022 and 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Operation	2022	6867	0.84	68.91	0.02	7	1	0.65	0.41
		2669	0.54	73.51	0.01	6	1	0.54	0.36
		4848	0.00	73.21	0.00	6	0	0.44	0.30
	2023	9363	1.23	52.54	0.03	11	2	0.68	0.29
		2510	0.00	52.87	0.00	7	0	0.76	0.58
		3102	0.47	56.28	0.02	8	1	0.72	0.45
		1861	0.00	28.68	0.00	7	0	0.70	0.47
		1010	0.00	10.00	0.00	5	0	0.37	0.32

Table A4-17: Keeyask Reservoir Zone 8 - Intermittently exposed (IE, benthic grab samples) - substrate statistics and assessment results.

ZONE 8 IE GRAB	Water Depth (m)		Total Organic Carbon (%)		Sand (%)		Silt/Clay (%)	
	2022	2023	2022	2023	2022	2023	2022	2023
No. of Samples (n)	3	5	1	4	1	4	1	4
Minimum	0.8	0.5	43.80	34.70	1.90	0.50	98.10	99.90
Maximum	1.0	0.9	43.80	40.20	1.90	0.50	98.10	100.00
1st Quartile	0.9	0.5	43.80	35.23	1.90	0.50	98.10	99.98
Median	1.0	0.5	43.80	37.60	1.90	0.50	98.10	100.00
3rd Quartile	1.0	0.7	43.80	39.90	1.90	0.50	98.10	100.00
Mean	0.9	0.6	43.80	37.53	1.90	0.50	98.10	99.98
Standard Deviation (n-1)	0.12	0.16		2.88		0.00		0.05
Standard Error	0.07	0.07		1.44		0.00		0.02
More than ±50% of Pre-impoundment Mean	--	--	no	no	higher	no	no	no

Table A4-18: Keeyask Reservoir Zone 8 - Intermittently exposed (IE, benthic grab samples) - benthic invertebrate statistics and assessment results.

ZONE 8 IE GRAB	Total Abundance (no. per m^2)		EPT Index (%)		O+C Index (%)		EPT:C		Total Richness (no. of taxa)		EPT Richness (no. of taxa)		Diversity Index (Simpson's D)		Evenness Index (Simpson's E)	
	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023
No. of Samples (n)	3	5	3	5	3	5	3	5	3	5	3	5	3	5	3	5
Minimum	2669	1010	0	0	69	10	0.00	0.00	6	5	0	0	0.44	0.37	0.30	0.29
Maximum	6867	9363	1	1	74	56	0.02	0.03	7	11	1	2	0.65	0.76	0.41	0.58
1st Quartile	3758	1861	0	0	71	29	0.00	0.00	6	7	1	0	0.49	0.68	0.33	0.32
Median	4848	2510	1	0	73	53	0.01	0.00	6	7	1	0	0.54	0.70	0.36	0.45
3rd Quartile	5858	3102	1	0	73	53	0.01	0.02	7	8	1	1	0.60	0.72	0.39	0.47
Mean	4795	3569	0	0	72	40	0.01	0.01	6	8	1	1	0.54	0.65	0.36	0.42
Standard Deviation (n-1)	2099.70	3330.92	0.43	0.54	2.58	20.10	0.01	0.02	0.58	2.19	0.58	0.89	0.11	0.16	0.06	0.12
Standard Error	1212.26	1489.63	0.25	0.24	1.49	8.99	0.01	0.01	0.33	0.98	0.33	0.40	0.06	0.07	0.03	0.05
More than ±50% of Pre-impoundment Mean	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no

Table A4-19: Keeyask Reservoir Zone 8 - supporting site data, predominantly wetted (PW), Operation (2022 and 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Operation	2022	354231	6249088	Petite Ponar	2.8	2.8	31.7	1.9	98.1	Silt loam
		354259	6249138	Petite Ponar	2.6	--	--	--	--	--
		354146	6249266	Petite Ponar	2.2	2.4	40.6	3.3	96.7	Silt loam
		353999	6249280	Petite Ponar	2.3	2.4	30	0.5	99.5	Silt loam
		354229	6249246	Petite Ponar	2.1	2.1	40.2	2.1	97.9	Silt loam
	2023	354230	6249097	Petite Ponar	2.1	2.2	25	0.5	99.6	Silty clay loam
		354266	6249153	Petite Ponar	2.5	--	--	--	--	Flooded terrestrial
		354145	6249267	Petite Ponar	2.4	2.5	33.8	0.5	99.9	Silty clay loam
		354003	6249280	Petite Ponar	2.1	2.2	33	0.5	99.9	Silt loam
		354236	6249249	Petite Ponar	1.9	1.7	36.5	0.5	99.6	Silt loam

Table A4-20: Keeyask Reservoir Zone 8 - benthic invertebrate community metrics, predominantly wetted (PW), Operation (2022 and 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Operation	2022	1169	0.00	64.20	0.00	6	0	0.73	0.61
		375	0.00	69.23	0.00	7	0	0.71	0.50
		880	1.64	67.21	0.05	10	1	0.74	0.39
		3059	0.00	66.98	0.00	8	0	0.68	0.40
		1443	0.00	76.00	0.00	4	0	0.49	0.49
	2023	1573	1.83	44.95	0.25	8	2	0.70	0.41
		1645	0.00	77.19	0.0	6	0	0.62	0.43
		1645	0.88	72.81	0.0	7	1	0.62	0.38
		3491	0.00	64.88	0.0	7	0	0.74	0.54
		3030	0.00	90.00	0.0	4	0	0.43	0.44

Table A4-21: Keeyask Reservoir Zone 8 - Predominantly wetted (PW) - substrate statistics and assessment results.

ZONE 8 PW GRAB	Water Depth (m)		Total Organic Carbon (%)		Sand (%)		Silt/Clay (%)	
	2022	2023	2022	2023	2022	2023	2022	2023
No. of Samples (n)	5	5	4	4	4	4	4	4
Minimum	2.1	1.9	30.00	25.00	0.50	0.50	96.70	99.60
Maximum	2.8	2.5	40.60	36.50	3.30	0.50	99.50	99.90
1st Quartile	2.2	2.1	31.28	31.00	1.55	0.50	97.60	99.60
Median	2.3	2.1	35.95	33.40	2.00	0.50	98.00	99.75
3rd Quartile	2.6	2.4	40.30	34.48	2.40	0.50	98.45	99.90
Mean	2.4	2.2	35.63	32.08	1.95	0.50	98.05	99.75
Standard Deviation (n-1)	0.29	0.23	5.56	4.95	1.15	0.00	1.15	0.17
Standard Error	0.13	0.10	2.78	2.47	0.57	0.00	0.57	0.09
More than ±50% of Pre-impoundment Mean	--	--	no	no	higher	lower	no	no

Table A4-22: Keeyask Reservoir Zone 8 - Predominantly wetted (PW) - benthic invertebrate statistics and assessment results

ZONE 8 PW GRAB	Total Abundance (no. per m^2)		EPT Index (%)		O+C Index (%)		EPT:C		Total Richness (no. of taxa)		EPT Richness (no. of taxa)		Diversity Index (Simpson's D)		Evenness Index (Simpson's E)	
	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	375	1573	0	0	64	45	0.00	0.00	4	4	0	0	0.49	0.43	0.39	0.38
Maximum	3059	3491	2	2	76	90	0.05	0.25	10	8	1	2	0.74	0.74	0.61	0.54
1st Quartile	880	1645	0	0	67	65	0.00	0.00	6	6	0	0	0.68	0.62	0.40	0.41
Median	1169	1645	0	0	67	73	0.00	0.00	7	7	0	0	0.71	0.62	0.49	0.43
3rd Quartile	1443	3030	0	1	69	77	0.00	0.02	8	7	0	1	0.73	0.70	0.50	0.44
Mean	1385	2277	0	1	69	70	0.01	0.05	7	6	0	1	0.67	0.62	0.48	0.44
Standard Deviation (n-1)	1015.63	913.41	0.73	0.82	4.44	16.68	0.02	0.11	2.24	1.52	0.45	0.89	0.10	0.12	0.09	0.06
Standard Error	454.20	408.49	0.33	0.37	1.99	7.46	0.01	0.05	1.00	0.68	0.20	0.40	0.05	0.05	0.04	0.03
More than ±50% of Pre-impoundment Mean	no	no	no	no	no	no	lower	higher	no	no	no	no	no	no	no	no

Table A4-23: Keeyask Reservoir Zone 8 - supporting site data, offshore (OS), Operation (2022 and 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Operation	2022	354742	6248813	Petite Ponar	4.2	4.3	26.6	0.5	99.5	Silt loam
		354873	6248755	Petite Ponar	4.9	4.9	23.6	1.1	98.8	Silty clay loam
		354768	6248587	Petite Ponar	3.2	3.4	22.5	0.5	99.3	Silty clay loam
		354604	6248607	Petite Ponar	4.3	4.7	29.7	1.5	98.4	Silt loam
		354508	6248705	Petite Ponar	4.7	4	25.2	1.4	98.5	Silt loam
	2023	354731	6248817	Petite Ponar	3.9	3.9	27.2	0.5	99.9	Silty clay loam
		354876	6248758	Petite Ponar	4.5	5.1	17.8	0.5	100	Silty clay loam
		354773	6248583	Petite Ponar	4.7	5	27.6	0.5	99.8	Silty clay loam
		354605	6248607	Petite Ponar	5.2	5	17	0.5	100	Silty clay loam
		354512	6248709	Petite Ponar	3.7	3.4	21.5	0.5	99.8	Silty clay

Table A4-24: Keeyask Reservoir Zone 8 - benthic invertebrate community metrics, offshore (OS), Operation (2022 and 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Operation	2022	1327	21.7	52.2	1.0	5	2	0.77	0.86
		260	5.6	72.2	0.2	5	1	0.71	0.70
		159	0.0	72.7	0.0	3	0	0.67	1.00
		577	0.0	85.0	0.0	3	0	0.62	0.87
		635	11.4	77.3	0.2	6	2	0.67	0.51
	2023	1803	15.2	76.8	0.3	7	3	0.67	0.44
		1327	2.2	78.3	0.1	7	1	0.60	0.36
		1053	6.8	86.3	0.1	7	2	0.62	0.37
		2770	0.5	85.9	0.0	5	1	0.61	0.51
		491	17.6	61.8	0.5	8	3	0.77	0.53

Table A4-25: Keeyask Reservoir Zone 8 - Offshore (OS) - substrate statistics and assessment results.

ZONE 8 OS GRAB	Water Depth (m)		Total Organic Carbon (%)		Sand (%)		Silt/Clay (%)	
	2022	2023	2022	2023	2022	2023	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5
Minimum	3.2	3.7	22.50	17.00	0.50	0.50	98.40	99.80
Maximum	4.9	5.2	29.70	27.60	1.50	0.50	99.50	100.00
1st Quartile	4.2	3.9	23.60	17.80	0.50	0.50	98.50	99.80
Median	4.3	4.5	25.20	21.50	1.10	0.50	98.80	99.90
3rd Quartile	4.7	4.7	26.60	27.20	1.40	0.50	99.30	100.00
Mean	4.3	4.4	25.52	22.22	1.00	0.50	98.90	99.90
Standard Deviation (n-1)	0.66	0.60	2.81	5.03	0.48	0.00	0.48	0.10
Standard Error	0.29	0.27	1.26	2.25	0.21	0.00	0.22	0.04
More than ±50% of Pre-impoundment Mean	--	--	no	no	no	no	no	no

Table A4-26: Keeyask Reservoir Zone 8 - Offshore (OS) - benthic invertebrate statistics and assessment results.

ZONE 8 OS GRAB	Total Abundance (no. per m²)		EPT Index (%)		O+C Index (%)		EPT:C		Total Richness (no. of taxa)		EPT Richness (no. of taxa)		Diversity Index (Simpson's D)		Evenness Index (Simpson's E)	
	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	159	491	0	1	52	62	0.00	0.01	3	5	0	1	0.62	0.60	0.51	0.36
Maximum	1327	2770	22	18	85	86	1.00	0.46	6	8	2	3	0.77	0.77	1.00	0.53
1st Quartile	260	1053	0	2	72	77	0.00	0.11	3	7	0	1	0.67	0.61	0.70	0.37
Median	577	1327	6	7	73	78	0.17	0.14	5	7	1	2	0.67	0.62	0.86	0.44
3rd Quartile	635	1803	11	15	77	86	0.24	0.34	5	7	2	3	0.71	0.67	0.87	0.51
Mean	592	1489	8	8	72	78	0.28	0.21	4	7	1	2	0.69	0.65	0.79	0.44
Standard Deviation (n-1)	458.51	859.22	9.13	7.66	12.15	9.96	0.42	0.18	1.34	1.10	1.00	1.00	0.06	0.07	0.19	0.08
Standard Error	205.05	384.25	4.08	3.43	5.43	4.45	0.19	0.08	0.60	0.49	0.45	0.45	0.03	0.03	0.08	0.04
More than ±50% of Pre-impoundment Mean	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no

Table A4-27: Keeyask Reservoir Zone 12 - supporting site data, intermittently exposed (IE, benthic grab samples), pre-Project (2002 and 2004) and Operation (2022 and 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2002	352576	6242477	Ekman (tall)	0.4	--	22.4	43.9	33.7	na
		352576	6242477	Ekman (tall)	0.4	--	--	--	--	--
		352576	6242477	Ekman (tall)	0.4	--	--	--	--	--
		352576	6242477	Ekman (tall)	0.4	--	--	--	--	--
	2004	352584	6242475	Ekman (tall)	0.8	--	39.1	5.19	55.7	na
		352584	6242475	Ekman (tall)	0.8	--	--	--	--	--
		352584	6242475	Ekman (tall)	0.8	--	--	--	--	--
		352584	6242475	Ekman (tall)	0.8	--	--	--	--	--
Operation	2022	353422	6242549	Petite Ponar	0.8	0.9	27.6	<1.0	99.2	Silt loam
		353493	6242573	Petite Ponar	0.9	--	--	--	--	--
		353536	6242632	Petite Ponar	0.6	--	--	--	--	--
	2023	353351	6242556	Petite Ponar	0.5	0.4	34.9	0.5	100	Silt loam
		353464	6242593	Petite Ponar	0.2	0.2	31.7	2	98	Silt loam
		353536	6242629	Petite Ponar	0.7	0.7	24.4	0.5	100	Silty clay loam
		353578	6242634	Petite Ponar	0.9	0.9	22.0	0.5	100	Silty clay loam
		353604	6242670	Petite Ponar	0.9	0.7	37.8	0.5	100	Silt loam

Table A4-28: Keeyask Reservoir Zone 12 - benthic invertebrate community metrics, intermittently exposed (IE, benthic grab samples), pre-Project (2002 and 2004) and Operation (2022 and 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2002	6406	4.7	18.9	0.3	8	2	0.52	0.26
		1515	5.7	14.3	2.0	6	2	0.43	0.29
		2770	7.8	35.9	0.2	7	2	0.75	0.58
		3203	0.0	31.1	0.0	7	0	0.53	0.30
	2004	2164	4.0	80.0	0.1	9	2	0.59	0.27
		1039	8.3	45.8	0.2	5	2	0.64	0.55
		2251	13.5	71.2	0.2	6	2	0.62	0.44
		2986	1.4	84.1	0.0	9	1	0.47	0.21
Operation	2022	5266	3.3	31.8	0.1	9	2	0.70	0.37
		5612	3.3	50.9	0.1	12	5	0.66	0.24
		3232	0.0	25.0	0.0	9	0	0.81	0.60
	2023	5338	0.0	47.3	0.0	6.0	0	0.64	0.47
		2583	0.0	37.4	0.0	6.0	0	0.57	0.39
		2236	0.6	31.0	0.0	7.0	1	0.65	0.41
		3030	0.5	34.3	0.0	7.0	1	0.77	0.62
		2005	5.8	34.5	0.5	6.0	1	0.75	0.68

Table A4-29: Keeyask Reservoir Zone 12 - Intermittently exposed (IE, benthic grab samples) - substrate statistics and assessment results.

ZONE 12 IE GRAB	Water Depth (m)				Total Organic Carbon (%)				Sand (%)				Silt/Clay (%)			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	4	4	3	5	1	1	1	5	1	1	1	5	1	1	1	5
Minimum	0.4	0.8	0.6	0.2	22.45	39.13	27.60	22.00	43.87	5.19	0.50	0.50	33.68	55.67	99.20	98.00
Maximum	0.4	0.8	0.9	0.9	22.45	39.13	27.60	37.80	43.87	5.19	0.50	2.00	33.68	55.67	99.20	100.00
1st Quartile	0.4	0.8	0.7	0.5	22.45	39.13	27.60	24.40	43.87	5.19	0.50	0.50	33.68	55.67	99.20	100.00
Median	0.4	0.8	0.8	0.7	22.45	39.13	27.60	31.70	43.87	5.19	0.50	0.50	33.68	55.67	99.20	100.00
3rd Quartile	0.4	0.8	0.9	0.9	22.45	39.13	27.60	34.90	43.87	5.19	0.50	0.50	33.68	55.67	99.20	100.00
Mean	0.4	0.8	0.8	0.7	22.45	39.13	27.60	30.16	43.87	5.19	0.50	0.80	33.68	55.67	99.20	99.60
Standard Deviation (n-1)	0.00	0.00	0.15	0.29				6.76				0.67				0.89
Standard Error	0.00	0.00	0.09	0.13				3.02				0.30				0.40
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	no	no	--	--	lower	lower	--	--	higher	higher

Table A4-30: Keeyask Reservoir Zone 12 - Intermittently exposed (IE, benthic grab samples) - benthic invertebrate statistics and assessment results

ZONE 12 IE GRAB	Total Abundance (no. per m²)				EPT Index (%)				O+C Index (%)				EPT:C			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	4	4	3	5	4	4	3	5	4	4	3	5	4	4	3	5
Minimum	1515	1039	3232	2005	0	1	0	0	14	46	25	31	0.00	0.02	0.00	0.00
Maximum	6406	2986	5612	5338	8	13	3	6	36	84	51	47	2.00	0.23	0.11	0.50
1st Quartile	2456	1883	4249	2236	4	3	2	0	18	65	28	34	0.18	0.06	0.04	0.00
Median	2986	2207	5266	2583	5	6	3	0	25	76	32	35	0.27	0.12	0.07	0.02
3rd Quartile	4004	2435	5439	3030	6	10	3	1	32	81	41	37	0.73	0.19	0.09	0.03
Mean	3473	2110	4703	3038	5	7	2	1	25	70	36	37	0.64	0.13	0.06	0.11
Standard Deviation (n-1)	2081.88	803.84	1286.15	1342.33	3.30	5.27	1.91	2.47	10.14	17.15	13.43	6.25	0.92	0.10	0.06	0.22
Standard Error	1040.94	401.92	742.56	600.31	1.65	2.63	1.11	1.10	5.07	8.58	7.75	2.79	0.46	0.05	0.03	0.10
More than ±50% of Pre-impoundment Mean	--	--	higher	no	--	--	lower	lower	--	--	no	no	--	--	lower	lower

Table A4-30: Continued.

ZONE 12 IE GRAB	Total Richness (no. of taxa)				EPT Richness (no. of taxa)				Diversity Index (Simpson's D)				Evenness Index (Simpson's E)			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	4	4	3	5	4	4	3	5	4	4	3	5	4	4	3	5
Minimum	6	5	9	6	0	1	0	0	0.43	0.47	0.66	0.57	0.26	0.21	0.24	0.39
Maximum	8	9	12	7	2	2	5	1	0.75	0.64	0.81	0.77	0.58	0.55	0.60	0.68
1st Quartile	7	6	9	6	2	2	1	0	0.50	0.56	0.68	0.64	0.28	0.26	0.31	0.41
Median	7	8	9	6	2	2	2	1	0.53	0.61	0.70	0.65	0.30	0.36	0.37	0.47
3rd Quartile	7	9	11	7	2	2	4	1	0.59	0.63	0.76	0.75	0.37	0.47	0.48	0.62
Mean	7	7	10	6	2	2	2	1	0.56	0.58	0.72	0.68	0.36	0.37	0.40	0.51
Standard Deviation (n-1)	0.82	2.06	1.73	0.55	1.00	0.50	2.52	0.55	0.14	0.07	0.08	0.08	0.15	0.16	0.18	0.13
Standard Error	0.41	1.03	1.00	0.24	0.50	0.25	1.45	0.24	0.07	0.04	0.05	0.04	0.07	0.08	0.10	0.06
More than ±50% of Pre-impoundment Mean	--	--	no	no	--	--	no	lower	--	--	no	no	--	--	no	no

Table A4-31: Keeyask Reservoir Zone 12 - supporting site data, predominantly wetted (PW), pre-Project (2001, 2002, and 2013) and Operation (2022 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2001	352482	6242913	Ekman (tall)	2.2		2.1	63.2	33.67	na
		352482	6242913	Ekman (tall)	2.2	--	--	--	--	--
		352482	6242913	Ekman (tall)	2.2	--	--	--	--	--
		352482	6242913	Ekman (tall)	2.2	--	--	--	--	--
	2002	352455	6242936	Ekman (tall)	2.0	--	1.2	80.9	17.79	na
		352455	6242936	Ekman (tall)	2.0	--	--	--	--	--
		352455	6242936	Ekman (tall)	2.0	--	--	--	--	--
		352455	6242936	Ekman (tall)	2.0	--	--	--	--	--
	2013	352969	6242974	Petite Ponar	2.2	2.1	2.41	68.2	31.7	Sandy loam
		352968	6242995	Petite Ponar	2.1	2	2.65	71.3	28.6	Sandy loam
		352988	6243058	Petite Ponar	2.1	2	1.33	67.2	32.8	Sandy loam
		352982	6242886	Petite Ponar	2.3	2.1	0.98	59.5	40.5	Sandy loam
		352976	6243150	Petite Ponar	2.2	2.3	1.1	48.8	51.3	Loam
Operation	2022	353138	6242677	Petite Ponar	2.3	2.3	41.3	0.5	99.4	Silt
		353102	6242650	Petite Ponar	2.3	2.3	42.6	1	99	Silt
		353077	6242609	Petite Ponar	2.2	2.2	42.9	1.2	98.8	Silt
		353046	6242569	Petite Ponar	2.6	2.7	40	0.5	99.1	Silt
		353072	6242542	Petite Ponar	2.4	2.3	33.4	0.5	99.3	Silt loam
	2023	353137	6242676	Petite Ponar	2.4	2.3	45	0.5	99.9	Silt
		353099	6242647	Petite Ponar	2.6	2.5	42.4	0.5	100.1	Silt
		353072	6242608	Petite Ponar	1.9	1.9	42.6	3.7	96.3	Silt
		353049	6242567	Petite Ponar	2.3	2.2	37.3	1.9	98	Silt
		353080	6242538	Petite Ponar	2.3	2.2	32	6.2	93.8	Silt loam

Table A4-32: Keeyask Reservoir Zone 12 - benthic invertebrate community metrics, predominantly wetted (PW), (2001, 2002, and 2013) and Operation (2022 to 2023).

Phase	Year	Total Abundance (no. per m^2)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2001	390	33.3	44.4	1.0	5	1	0.74	0.78
		2078	72.9	16.7	5.0	5	2	0.47	0.37
		1818	66.7	19.0	4.0	6	2	0.55	0.37
		1039	62.5	16.7	5.0	5	2	0.60	0.50
	2002	2467	19.3	7.0	3.7	6	1	0.62	0.44
		2510	22.4	13.8	2.6	6	2	0.75	0.66
		1645	36.8	18.4	2.0	6	1	0.75	0.67
		1731	15.0	22.5	0.9	6	1	0.76	0.71
	2013	3134	41.2	11.6	4.0	7	2	0.76	0.59
		1878	43.3	13.4	5.5	8	2	0.75	0.50
		1792	32.4	16.9	2.8	9	2	0.82	0.62
		1723	34.7	26.1	2.0	8	2	0.80	0.64
		1775	59.5	18.0	4.7	9	1	0.61	0.29
Operation	2022	231	0.0	25.0	0.0	3	0	0.63	0.90
		0	0.0	0.0	--	0	0	0.00	0.00
		346	0.0	0.0	--	1	0	0.00	1.00
		418	0.0	51.7	0.0	5	0	0.74	0.76
		115	0.0	0.0		4	0	0.57	0.58
	2023	1241	0.0	60.5	0.0	3.0	0	0.49	0.66
		289	0.0	55.0	0.0	4.0	0	0.69	0.80
		2308	10.0	60.0	0.3	4.0	1	0.70	0.83
		822	1.8	17.5	0.1	6.0	1	0.46	0.31
		1457	0.0	72.3	0.0	4.0	0	0.47	0.48

Table A4-33: Keeyask Reservoir Zone 12 - Predominantly wetted (PW) - substrate statistics and assessment results.

ZONE 12 PW GRAB	Water Depth (m)					Sand (%)					Silt/Clay (%)					Total Organic Carbon (%)				
	2001	2002	2013	2022	2023	2001	2002	2013	2022	2023	2001	2002	2013	2022	2023	2001	2002	2013	2022	2023
No. of Samples (n)	4	4	5	5	5	1	1	5	5	5	1	1	5	5	5	1	1	5	5	5
Minimum	2.2	2.0	2.1	2.2	1.9	63.25	80.92	48.80	0.50	0.50	33.67	17.79	28.60	98.80	93.80	2.12	1.21	0.98	33.40	32.00
Maximum	2.2	2.0	2.3	2.6	2.6	63.25	80.92	71.30	1.20	6.20	33.67	17.79	51.30	99.40	100.10	2.12	1.21	2.65	42.90	45.00
1st Quartile	2.2	2.0	2.1	2.3	2.3	63.25	80.92	59.50	0.50	0.50	33.67	17.79	31.70	99.00	96.30	2.12	1.21	1.10	40.00	37.30
Median	2.2	2.0	2.2	2.3	2.3	63.25	80.92	67.20	0.50	1.90	33.67	17.79	32.80	99.10	98.00	2.12	1.21	1.33	41.30	42.40
3rd Quartile	2.2	2.0	2.2	2.4	2.4	63.25	80.92	68.20	1.00	3.70	33.67	17.79	40.50	99.30	99.90	2.12	1.21	2.41	42.60	42.60
Mean	2.2	2.0	2.2	2.4	2.3	63.25	80.92	63.00	0.74	2.56	33.67	17.79	36.98	99.12	97.62	2.12	1.21	1.69	40.04	39.86
Standard Deviation (n-1)	0.00	0.00	0.08	0.15	0.25			9.05	0.34	2.42			9.12	0.24	2.64			0.78	3.89	5.21
Standard Error	0.00	0.00	0.04	0.07	0.11			4.05	0.15	1.08			4.08	0.11	1.18			0.35	1.74	2.33
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	--	lower	lower	--	--	--	higher	higher	--	--	--	higher	higher

Table A4-34: Keeyask Reservoir Zone 12 - Predominantly wetted (PW) - benthic invertebrate statistics and assessment results.

ZONE 12 PW GRAB	Total Abundance (no. per m²)					EPT Index (%)					O+C Index (%)					EPT:C				
	2001	2002	2013	2022	2023	2001	2002	2013	2022	2023	2001	2002	2013	2022	2023	2001	2002	2013	2022	2023
No. of Samples (n)	4	4	5	5	5	4	4	5	5	5	4	4	5	5	5	4	4	5	2	5
Minimum	390	1645	1723	0	289	33	15	32	0	0	17	7	12	0	18	1.00	0.86	2.03	0.00	0.00
Maximum	2078	2510	3134	418	2308	73	37	60	0	10	44	23	26	52	72	5.00	3.67	5.53	0.00	0.25
1st Quartile	876	1710	1775	115	822	55	18	35	0	0	17	12	13	0	55	3.25	1.71	2.79	0.00	0.00
Median	1428	2099	1792	231	1241	65	21	41	0	0	18	16	17	0	60	4.50	2.30	4.03	0.00	0.00
3rd Quartile	1883	2478	1878	346	1457	68	26	43	0	2	25	19	18	25	60	5.00	2.87	4.69	0.00	0.14
Mean	1331	2088	2060	222	1223	59	23	42	0	2	24	15	17	15	53	3.75	2.28	3.81	0.00	0.08
Standard Deviation (n-1)	767.27	463.99	602.67	169.36	752.82	17.54	9.47	10.67	0.00	4.34	13.54	6.64	5.63	23.04	20.84	1.89	1.17	1.41	0.00	0.11
Standard Error	383.64	231.99	269.52	75.74	336.67	8.77	4.74	4.77	0.00	1.94	6.77	3.32	2.52	10.30	9.32	0.95	0.59	0.63	0.00	0.05
More than ±50% of Pre-impoundment Mean	--	--	--	lower	no	--	--	--	lower	lower	--	--	--	no	higher	--	--	--	lower	lower

Table A4-34: Continued.

ZONE 12 W GRAB	Total Richness (no. of taxa)					EPT Richness (no. of taxa)					Diversity Index (Simpson's D)					Evenness Index (Simpson's E)				
	2001	2002	2013	2022	2023	2001	2002	2013	2022	2023	2001	2002	2013	2022	2023	2001	2002	2013	2022	2023
No. of Samples (n)	4	4	5	5	5	4	4	5	5	5	4	4	5	5	5	4	4	5	5	5
Minimum	5	6	7	0	3	1	1	1	0	0	0.47	0.62	0.61	0.00	0.46	0.37	0.44	0.29	0.00	0.31
Maximum	6	6	9	5	6	2	2	2	0	1	0.74	0.76	0.82	0.74	0.70	0.78	0.71	0.64	1.00	0.83
1st Quartile	5	6	8	1	4	2	1	2	0	0	0.53	0.71	0.75	0.00	0.47	0.37	0.60	0.50	0.58	0.48
Median	5	6	8	3	4	2	1	2	0	0	0.57	0.75	0.76	0.57	0.49	0.44	0.66	0.59	0.76	0.66
3rd Quartile	5	6	9	4	4	2	1	2	0	1	0.63	0.75	0.80	0.63	0.69	0.57	0.68	0.62	0.90	0.80
Mean	5	6	8	3	4	2	1	2	0	0	0.59	0.72	0.75	0.39	0.56	0.50	0.62	0.53	0.65	0.61
Standard Deviation (n-1)	0.50	0.00	0.84	2.07	1.10	0.50	0.50	0.45	0.00	0.55	0.12	0.07	0.08	0.36	0.12	0.19	0.12	0.14	0.39	0.22
Standard Error	0.25	0.00	0.37	0.93	0.49	0.25	0.25	0.20	0.00	0.24	0.06	0.03	0.04	0.16	0.05	0.10	0.06	0.06	0.18	0.10
More than ±50% of Pre-impoundment Mean	--	--	--	lower	no	--	--	--	lower	lower	--	--	--	no	no	--	--	--	no	no

Table A4-35: Keeyask Reservoir Zone 12 - supporting site data, offshore (OS), Operation (2022 and 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Operation	2022	353061	6242770	Petite Ponar	3.8	3.7	16.5	2.0	98.0	Silty clay loam
		353137	6242826	Petite Ponar	3.0	3.0	44.2	0.5	99.1	Silt
		353157	6242882	Petite Ponar	3.8	--	--	--	--	--
		353171	6242957	Petite Ponar	4.0	--	--	--	--	--
		353189	6243029	Petite Ponar	3.6	3.5	26.4	3.0	96.9	Silty clay loam
	2023	353056	6242775	Petite Ponar	3.6	3.6	3.0	15.7	84.3	Silt loam
		353136	6242831	Petite Ponar	3.2	3.2	39.1	13.9	86.0	Silt loam / Silt
		353161	6242888	Petite Ponar	4.0	4.1	25.6	2.3	97.7	Silt loam
		353169	6242967	Petite Ponar	3.7	3.8	26.3	1.5	98.5	Silt
		353184	6243032	Petite Ponar	3.6	3.5	14.2	2.9	97.1	Silty clay

Table A4-36: Keeyask Reservoir Zone 12 - benthic invertebrate community metrics, offshore (OS), Operation (2022 and 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Operation	2022	447	6.5	38.7	0.3	6	2	0.69	0.53
		245	11.8	11.8	2.0	6	2	0.49	0.32
		866	0.0	53.3	0.0	3	0	0.64	0.93
		101	0.0	57.1	0.0	4	0	0.70	0.84
		274	15.8	36.8	0.8	7	3	0.75	0.56
	2023	1977	10.9	52.6	0.3	8	3	0.75	0.49
		2265	1.9	72.6	0.0	6	2	0.61	0.43
		1486	1.0	88.3	0.0	6	1	0.38	0.27
		2438	4.7	89.9	0.1	8	3	0.27	0.17
		1818	8.7	88.9	0.1	8	3	0.41	0.21

Table A4-37: Keeyask Reservoir Zone 12 - Offshore (OS) - substrate statistics and assessment results.

ZONE 12 OS GRAB	Water Depth (m)		Total Organic Carbon (%)		Sand (%)		Silt/Clay (%)	
	2022	2023	2022	2023	2022	2023	2022	2023
No. of Samples (n)	5	5	3	5	3	5	3	5
Minimum	3.0	3.2	16.50	3.00	0.50	1.50	96.90	84.30
Maximum	4.0	4.0	44.20	39.10	3.00	15.70	99.10	98.50
1st Quartile	3.6	3.6	21.45	14.20	1.25	2.30	97.45	86.00
Median	3.8	3.6	26.40	25.60	2.00	2.90	98.00	97.10
3rd Quartile	3.8	3.7	35.30	26.30	2.50	13.90	98.55	97.70
Mean	3.6	3.6	29.03	21.64	1.83	7.26	98.00	92.72
Standard Deviation (n-1)	0.38	0.29	14.04	13.65	1.26	6.93	1.10	6.95
Standard Error	0.17	0.13	8.10	6.10	0.73	3.10	0.64	3.11
More than ±50% of Pre-impoundment Mean	--	--	no	no	lower	no	no	no

Table A4-38: Keeyask Reservoir Zone 12 - Offshore (OS) - benthic invertebrate statistics and assessment results

ZONE 12 OS GRAB	Total Abundance (no. per m^2)		EPT Index (%)		O+C Index (%)		EPT:C		Total Richness (no. of taxa)		EPT Richness (no. of taxa)		Diversity Index (Simpson's D)		Evenness Index (Simpson's E)	
	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	101	1486	0	1	12	53	0.00	0.01	3	6	0	1	0.49	0.27	0.32	0.17
Maximum	866	2438	16	11	57	90	2.00	0.34	7	8	3	3	0.75	0.75	0.93	0.49
1st Quartile	245	1818	0	2	37	73	0.00	0.03	4	6	0	2	0.64	0.38	0.53	0.21
Median	274	1977	6	5	39	88	0.33	0.06	6	8	2	3	0.69	0.41	0.56	0.27
3rd Quartile	447	2265	12	9	53	89	0.75	0.12	6	8	2	3	0.70	0.61	0.84	0.43
Mean	387	1997	7	5	40	78	0.62	0.11	5	7	1	2	0.65	0.48	0.64	0.31
Standard Deviation (n-1)	294.69	374.23	7.04	4.30	17.89	16.15	0.83	0.13	1.64	1.10	1.34	0.89	0.10	0.19	0.24	0.14
Standard Error	131.79	167.36	3.15	1.92	8.00	7.22	0.37	0.06	0.73	0.49	0.60	0.40	0.04	0.09	0.11	0.06
More than ±50% of Pre-impoundment Mean	lower	higher	no	no	no	no	higher	lower	no	no	no	no	no	no	no	no

APPENDIX 5: STEPHENS LAKE BENTHIC INVERTEBRATE SUMMARY ASSESSMENT DATA

Table A5-1: Stephens Lake mainstem downstream of the Keeyask GS - supporting site data, pre-Project (2001 and 2002) and Operation (2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2001	366495	6247129	Ekman (tall)	1.1	--	5.1	30.4	63.9	--
		366495	6247129	Ekman (tall)	1.1	--	--	--	--	--
		366495	6247129	Ekman (tall)	1.1	--	--	--	--	--
		366495	6247129	Ekman (tall)	1.1	--	--	--	--	--
		368980	6247743	Ekman (tall)	1.7	--	1.8	13.8	23.9	--
		368980	6247743	Ekman (tall)	1.7	--	--	--	--	--
		368980	6247743	Ekman (tall)	1.7	--	--	--	--	--
		368980	6247743	Ekman (tall)	1.7	--	--	--	--	--
		366029	6248209	Ekman (tall)	2.5	--	3.2	26.1	70.5	--
		366029	6248209	Ekman (tall)	2.5	--	--	--	--	--
		366029	6248209	Ekman (tall)	2.5	--	--	--	--	--
		366029	6248209	Ekman (tall)	2.5	--		--	--	--
	2002	366501	6247132	Ekman (tall)	11.8	--	0.6	--	--	--
		366501	6247132	Ekman (tall)	11.8	--	--	--	--	--
		366501	6247132	Ekman (tall)	11.8	--	--	--	--	--
		366501	6247132	Ekman (tall)	11.8	--	--	--	--	--
		366501	6247132	Ekman (tall)	11.8	--	--	--	--	--
		366709	6248442	Ekman (tall)	6.4	--	5.3	--	--	--
		366709	6248442	Ekman (tall)	6.4	--	--	--	--	--
		366709	6248442	Ekman (tall)	6.4	--	--	--	--	--
Pre-Project	2002	366709	6248442	Ekman (tall)	6.4	--	--	--	--	--
		368980	6247745	Ekman (tall)	1.6	--	3.2	na	--	--
		368980	6247745	Ekman (tall)	1.6	--	--	--	--	--
		368980	6247745	Ekman (tall)	1.6	--	--	--	--	--
		368980	6247745	Ekman (tall)	1.6	--	--	--	--	--
		368980	6247745	Ekman (tall)	1.6	--	--	--	--	--
Operation	2023	368982	6247746	Petite Ponar	1.1	1.1	2.3	17.9	82.1	Silt loam
		366501	6247125	Petite Ponar	10.2	10.6	6.9	17.3	82.7	Silt loam
		366716	6248458	Petite Ponar	6.1	6.4	2.4	30.0	69.9	Silt loam

Table A5-2: Stephens Lake mainstem downstream of the Keeyask GS - supporting site data, pre-Project (2001 and 2002) and Operation (2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2001	2121	12.2	83.7	0.2	6	2	0.35	0.26
		2121	12.2	75.5	0.2	5	2	0.41	0.34
		2597	10.0	68.3	0.2	6	1	0.52	0.34
		4501	7.7	59.6	0.1	6	2	0.58	0.40
		2597	36.7	61.7	0.6	3	1	0.49	0.65
		952	40.9	59.1	0.7	2	1	0.48	0.97
		1688	46.2	51.3	0.9	3	1	0.52	0.70
		2640	26.2	37.7	0.7	4	2	0.67	0.75
		3852	23.6	76.4	0.4	4	2	0.52	0.53
		2813	33.8	61.5	0.6	7	2	0.58	0.34
		1125	19.2	76.9	0.3	3	1	0.37	0.53
		3030	27.1	70.0	0.4	4	1	0.49	0.49
	2002	736	11.8	47.1	0.3	4	1	0.67	0.75
		1688	2.6	87.2	0.0	5	1	0.32	0.29
		2294	5.7	84.9	0.1	4	1	0.43	0.44
		2034	8.5	83.0	0.1	6	1	0.43	0.29
		1645	5.3	81.6	0.1	4	1	0.32	0.37
		563	53.8	46.2	1.2	3	2	0.62	0.87
		1298	40.0	53.3	0.8	5	2	0.61	0.52
		1082	20.0	80.0	0.3	2	1	0.32	0.74
		433	10.0	60.0	0.2	3	1	0.54	0.73
		260	16.7	83.3	0.2	2	1	0.28	0.69
		519	25.0	75.0	0.3	2	1	0.38	0.80
		216	40.0	40.0	1.0	3	1	0.64	0.93
		303	28.6	71.4	0.4	2	1	0.41	0.85
		173	0.0	75.0	0.0	2	0	0.38	0.80
Operation	2023	317	22.7	18.2	--	4	1	0.62	0.65
		1876	6.9	82.3	0.1	8	3	0.32	0.18
		260	88.9	0.0	--	2	1	0.20	0.62

Table A5-3: Stephens Lake mainstem downstream of the Keeyask GS - substrate statistics and assessment results.

STL3KM DS GS GRAB	Water Depth (m)			Total Organic Carbon (%)			Sand (%)			Silt/Clay (%)		
	2001	2002	2023	2001	2002	2023	2001	2002	2023	2001	2002	2023
No. of Samples (n)	12	14	3	3	3	3	3	0	3	3	0	3
Minimum	1.1	1.6	1.1	1.77	0.64	2.31	13.76		17.30	23.90		69.90
Maximum	2.5	11.8	10.2	5.14	5.30	6.92	30.38		30.00	70.51		82.70
1st Quartile	1.1	1.6	3.6	2.48	1.92	2.35	19.92		17.60	43.90		76.00
Median	1.7	6.4	6.1	3.19	3.20	2.38	26.08		17.90	63.89		82.10
3rd Quartile	2.5	11.8	8.1	4.17	4.25	4.65	28.23		23.95	67.20		82.40
Mean	1.7	6.6	5.8	3.37	3.05	3.87	23.41		21.73	52.77		78.23
Standard deviation (n-1)	0.61	4.45	4.54	1.69	2.33	2.64	8.62		7.17	25.22		7.22
Standard error	0.18	1.19	2.62	0.98	1.35	1.53	4.98		4.14	14.56		4.17
More than ±50% of Pre-impoundment Mean	--	--	no	--	--	no	--	--	no	--	--	no

Table A5-4: Stephens Lake mainstem downstream of the Keeyask GS - benthic invertebrate statistics and assessment results.

STL3KM DS GS GRAB	Total Abundance (no. per m^2)			EPT Index (%)			O+C Index (%)			EPT:C		
	2001	2002	2023	2001	2002	2023	2001	2002	2023	2001	2002	2023
No. of Samples (n)	12	14	3	12	14	3	12	14	3	12	14	1
Minimum	952	173	260	8	0	7	38	40	0	0.14	0.00	0.08
Maximum	4501	2294	1876	46	54	89	84	87	82	0.90	1.17	0.08
1st Quartile	2013	335	289	12	6	15	59	55	9	0.16	0.09	0.08
Median	2597	649	317	25	14	23	65	75	18	0.39	0.23	0.08
3rd Quartile	2867	1558	1096	35	28	56	76	83	50	0.62	0.38	0.08
Mean	2503	946	818	25	19	40	65	69	33	0.43	0.34	0.08
Standard deviation (n-1)	1021.73	725.02	916.72	12.81	16.34	43.48	12.75	16.44	43.24	0.26	0.37	
Standard error	294.95	193.77	529.27	3.70	4.37	25.11	3.68	4.39	24.96	0.08	0.10	
More than ±50% of Pre-impoundment Mean	--	--	lower	--	--	higher	--	--	lower	--	--	lower

Table A5-4: Continued.

STL3KM DS GS GRAB	Total Richness (no. of taxa)			EPT Richness (no. of taxa)			Diversity Index (Simpson's D)			Evenness Index (Simpson's E)		
	2001	2002	2023	2001	2002	2023	2001	2002	2023	2001	2002	2023
No. of Samples (n)	12	14	3	12	14	3	12	14	3	12	14	3
Minimum	2	2	2	1	0	1.00	0.35	0.28	0.20	0.26	0.29	0.18
Maximum	7	6	8	2	2	3.00	0.67	0.67	0.62	0.97	0.93	0.65
1st Quartile	3	2	3	1	1	1.00	0.47	0.33	0.26	0.34	0.46	0.40
Median	4	3	4	2	1	1.00	0.50	0.42	0.32	0.51	0.73	0.62
3rd Quartile	6	4	6	2	1	2.00	0.54	0.60	0.47	0.66	0.80	0.64
Mean	4	3	5	2	1	1.67	0.50	0.45	0.38	0.52	0.65	0.49
Standard deviation (n-1)	1.56	1.34	3.06	0.52	0.47	1.15	0.09	0.14	0.22	0.21	0.22	0.26
Standard error	0.45	0.36	1.76	0.15	0.13	0.67	0.03	0.04	0.12	0.06	0.06	0.15
More than ±50% of Pre-impoundment Mean	--	--	no	--	--	no	--	--	no	--	--	no

Table A5-5: Stephens Lake 3 km downstream of the Keeyask GS - supporting site data, intermittently exposed (IE, kicknet samples), pre-Project (2013) and Operation (2021). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2013	365635	6248844	Kick Net	0.9	0.5	0.9	19.7	80.3	Clay
		365596	6248858	Kick Net	1.0	0.5	0.8	3.1	96.9	Clay
		365572	6248868	Kick Net	1.1	0.5	1.2	9.2	90.8	Clay
		365545	6248875	Kick Net	1.0	0.5	1.4	4.1	95.9	Clay
		365518	6248885	Kick Net	1.2	0.5	7.6	18.0	82.1	Clay
Operation	2021	365644	6248853	Kick Net	0.5	0.1	1.1	60.8	39.3	Sandy loam
		365599	6248866	Kick Net	0.3	0.1	1.8	57.8	42.3	Sandy loam
		365561	6248880	Kick Net	0.3	0.1	1.8	47.1	52.9	Loam
		365548	6248879	Kick Net	0.5	0.1	1.8	40.8	59.2	Loam
		365518	6248896	Kick Net	0.3	0.1	1.8	58.9	41.1	Sandy loam

Table A5-6: Stephens Lake 3 km downstream of the Keeyask GS - benthic invertebrate community metrics, intermittently exposed (IE, kicknet samples), pre-Project (2013) and Operation (2021).

Phase	Year	Total Abundance (no. per sample)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2013	202	24.3	23.8	1.4	13	4	0.83	0.46
		93	19.4	10.8	3.0	14	6	0.68	0.22
		111	29.7	7.2	4.7	16	5	0.79	0.30
		72	26.4	18.1	2.4	13	6	0.87	0.60
		258	35.7	12.4	4.0	20	9	0.85	0.33
Operation	2021	99	1.0	45.5	0.1	14	1	0.76	0.29
		196	0.5	21.4	0.1	16	1	0.65	0.18
		589	0.5	12.6	0.1	15	2	0.39	0.11
		483	0.2	17.4	0.1	16	1	0.45	0.11
		671	0.0	76.3	0.0	13	0	0.56	0.18

Table A5-7: Stephens Lake 3 km downstream of the Keeyask GS - Intermittently exposed (kicknet) - substrate statistics and assessment results.

STL3KM IE KICKNET	Water Depth (m)		Total Organic Carbon (%)		Sand (%)		Silt/Clay (%)	
	2013	2021	2013	2021	2013	2021	2013	2021
No. of Samples (n)	5	5	5	5	5	5	5	5
Minimum	0.9	0.3	0.84	1.05	3.10	40.80	80.32	39.30
Maximum	1.2	0.5	7.55	1.83	19.70	60.80	96.90	59.20
1st Quartile	1.0	0.3	0.93	1.11	4.12	47.10	82.10	41.10
Median	1.0	0.3	1.21	1.16	9.23	57.80	90.80	42.30
3rd Quartile	1.1	0.5	1.36	1.27	18.00	58.90	95.90	52.90
Mean	1.0	0.4	2.38	1.28	10.83	53.08	89.20	46.96
Standard Deviation (n-1)	0.11	0.11	2.90	0.32	7.70	8.69	7.68	8.66
Standard Error	0.05	0.05	1.30	0.14	3.45	3.89	3.44	3.87
More than ±50% of Pre-impoundment Mean	--	--	--	no	--	higher	--	no

Table A5-8: Stephens Lake 3 km downstream of the Keeyask GS - Intermittently exposed (kicknet) - benthic invertebrate statistics and assessment results.

STL3KM IE KICKNET	Total Abundance (no. per sample)		EPT Index (%)		O+C Index (%)		EPT:C		Total Richness (no. of taxa)		EPT Richness (no. of taxa)		Diversity Index (Simpson's D)		Evenness Index (Simpson's E)	
	2013	**2021**	**2013**	**2021**	**2013**	**2021**	**2013**	**2021**	**2013**	**2021**	**2013**	**2021**	**2013**	**2021**	**2013**	**2021**
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	72	99	19	0	7	13	1.36	0.00	13	13	4	0	0.68	0.39	0.22	0.11
Maximum	258	671	36	1	24	76	4.71	0.14	20	16	9	2	0.87	0.76	0.60	0.29
1st Quartile	93	196	24	0	11	17	2.38	0.06	13	14	5	1	0.79	0.45	0.30	0.11
Median	111	483	26	1	12	21	3.00	0.09	14	15	6	1	0.83	0.56	0.33	0.18
3rd Quartile	202	589	30	1	18	45	4.00	0.11	16	16	6	1	0.85	0.65	0.46	0.18
Mean	147	408	27	0	14	35	3.09	0.08	15	15	6	1	0.80	0.56	0.38	0.17
Standard Deviation (n-1)	79.35	248.99	6.10	0.38	6.52	26.52	1.32	0.06	2.95	1.30	1.87	0.71	0.08	0.15	0.15	0.07
Standard Error	35.48	111.35	2.73	0.17	2.92	11.86	0.59	0.02	1.32	0.58	0.84	0.32	0.03	0.07	0.07	0.03
More than ±50% of Pre-impoundment Mean	--	higher	--	lower	--	higher	--	lower	--	no	--	lower	--	no	--	lower

Table A5-9: Stephens Lake 3 km downstream of the Keeyask GS - supporting site data, intermittently exposed (IE, benthic grab samples), pre-Project (2002 and 2004) and Operation (2022 and 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2002	366475	6248302	Ekman (tall)	0.6	--	4.5	--	--	--
		366475	6248302	Ekman (tall)	0.6	--	--	--	--	--
		366475	6248302	Ekman (tall)	0.6	--	--	--	--	--
		366475	6248302	Ekman (tall)	0.6	--	--	--	--	--
		366475	6248302	Ekman (tall)	0.6	--	--	--	--	--
	2004	366487	6248308	Ekman (tall)	1.4	--	6.0	40.3	53.7	--
		366487	6248308	Ekman (tall)	1.4	--	--	--	--	--
		366487	6248308	Ekman (tall)	1.4	--	--	--	--	--
		366487	6248308	Ekman (tall)	1.4	--	--	--	--	--
Operation	2022	365775	6248810	Petite Ponar	0.7	0.7	1.0	11.6	88.4	Silty clay loam
		365809	6248804	Petite Ponar	0.6	0.8	1.0	9.2	90.8	Silty clay loam
		365837	6248800	Petite Ponar	0.9	0.9	1.3	35.2	64.8	Silt loam
		365859	6248785	Petite Ponar	0.5	0.7	1.3	17.0	83.1	Silt loam
		365883	6248780	Petite Ponar	0.7	0.7	1.5	19.3	80.7	Silt loam
	2023	365773	6248818	Petite Ponar	0.3	0.3	0.3	2.2	97.8	Silty clay
		365810	6248806	Petite Ponar	0.3	0.4	1.4	14.6	85.4	Silty clay
		365837	6248800	Petite Ponar	0.4	0.4	1.0	17.2	82.8	Silty clay loam
		365862	6248790	Petite Ponar	0.3	0.4	0.5	8.8	91.2	Silty clay
		365880	6248781	Petite Ponar	0.3	0.4	0.5	15.8	84.2	Silt loam / Silty clay loam

Table A5-10: Stephens Lake 3 km downstream of the Keeyask GS - benthic invertebrate community metrics, intermittently exposed (IE, benthic grab samples), pre-Project (2002 and 2004) and Operation (2022 and 2023).

Phase	Year	Total Abundance (no. per m^2)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2002	5021	0.9	69.0	0.0	5	1	0.65	0.57
		4891	0.9	73.5	0.0	6	1	0.68	0.51
		5280	0.8	68.0	0.0	4	1	0.61	0.64
		7271	2.4	70.2	0.1	5	2	0.66	0.59
		6319	2.1	49.3	0.0	5	1	0.60	0.50
	2004	1645	18.4	36.8	0.5	11	2	0.82	0.51
		2164	4.0	4.0	1.0	6	1	0.46	0.31
		779	0.0	5.6	0.0	3	0	0.29	0.47
		2337	1.9	14.8	0.2	8	1	0.53	0.27
Operation	2022	1356	5.3	69.1	0.1	10	3	0.60	0.25
		1111	11.7	75.3	0.2	10	3	0.50	0.20
		2034	15.6	45.4	0.4	11	4	0.69	0.29
		721	12.0	56.0	0.3	8	2	0.73	0.45
		1861	12.4	62.8	0.2	10	3	0.66	0.29
	2023	5482	0.0	99.7	0.0	3	0	0.03	0.34
		22089	0.0	98.6	0.0	7	0	0.45	0.26
		11268	0.0	98.2	0.0	6	0	0.23	0.22
		2741	0.0	98.4	0.0	4	0	0.04	0.26
		4285	0.0	100.0	0.0	2	0	0.05	0.52

Table A5-11: Stephens Lake 3 km downstream of the Keeyask GS - Intermittently exposed (benthic grab samples) - substrate statistics and assessment results.

STL3KM IE GRAB	Water Depth (m)				Total Organic Carbon (%)				Sand (%)				Silt/Clay (%)			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	5	4	5	5	1	1	5	5	0	1	5	5	0	1	5	5
Minimum	0.6	1.4	0.5	0.3	4.54	6.04	1.01	0.32		40.27	9.20	2.20		53.69	64.80	82.80
Maximum	0.6	1.4	0.9	0.4	4.54	6.04	1.54	1.42		40.27	35.20	17.20		53.69	90.80	97.80
1st Quartile	0.6	1.4	0.6	0.3	4.54	6.04	1.03	0.48		40.27	11.60	8.80		53.69	80.70	84.20
Median	0.6	1.4	0.7	0.3	4.54	6.04	1.26	0.49		40.27	17.00	14.60		53.69	83.10	85.40
3rd Quartile	0.6	1.4	0.7	0.3	4.54	6.04	1.30	0.98		40.27	19.30	15.80		53.69	88.40	91.20
Mean	0.6	1.4	0.7	0.3	4.54	6.04	1.23	0.74		40.27	18.46	11.72		53.69	81.56	88.28
Standard Deviation (n-1)	0.00	0.00	0.15	0.05			0.22	0.46			10.20	6.21			10.20	6.21
Standard Error	0.00	0.00	0.07	0.02			0.10	0.20			4.56	2.78			4.56	2.78
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	lower	lower	--	--	lower	lower	--	--	higher	higher

Table A5-12: Stephens Lake 3 km downstream of the Keeyask GS - Intermittently exposed (benthic grab samples) -benthic invertebrate statistics and assessment results.

STL3KM IE GRAB	Total Abundance (no. per m²)				EPT Index (%)				O+C Index (%)				EPT:C			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	5	4	5	5	5	4	5	5	5	4	5	5	5	4	5	5
Minimum	4891	779	721	2741	1	0	5	0	49	4	45	98	0.02	0.00	0.09	0.00
Maximum	7271	2337	2034	22089	2	18	16	0	73	37	75	100	0.05	1.00	0.37	0.00
1st Quartile	5021	1428	1111	4285	1	1	12	0	68	5	56	98	0.02	0.13	0.17	0.00
Median	5280	1904	1356	5482	1	3	12	0	69	10	63	99	0.02	0.35	0.22	0.00
3rd Quartile	6319	2207	1861	11268	2	8	12	0	70	20	69	100	0.05	0.65	0.25	0.00
Mean	5757	1731	1417	9173	1	6	11	0	66	15	62	99	0.03	0.43	0.22	0.00
Standard Deviation (n-1)	1015.99	699.70	538.42	7906.96	0.76	8.40	3.74	0.00	9.55	15.13	11.63	0.82	0.02	0.44	0.10	0.00
Standard Error	454.36	349.85	240.79	3536.10	0.34	4.20	1.67	0.00	4.27	7.57	5.20	0.37	0.01	0.22	0.05	0.00
More than ±50% of Pre-impoundment Mean	--	--	lower	higher	--	--	higher	lower	--	--	no	higher	--	--	no	lower

Table A5-12: Continued.

STL3KM IE GRAB	Total Richness (no. of taxa)				EPT Richness (no. of taxa)				Diversity Index (Simpson's D)				Evenness Index (Simpson's E)			
	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023	2002	2004	2022	2023
No. of Samples (n)	5	4	5	5	5	4	5	5	5	4	5	5	5	4	5	5
Minimum	4	3	8	2	1	0	2	0	0.60	0.29	0.50	0.03	0.50	0.27	0.20	0.22
Maximum	6	11	11	7	2	2	4	0	0.68	0.82	0.73	0.45	0.64	0.51	0.45	0.52
1st Quartile	5	5	10	3	1	1	3	0	0.61	0.42	0.60	0.04	0.51	0.30	0.25	0.26
Median	5	7	10	4	1	1	3	0	0.65	0.50	0.66	0.05	0.57	0.39	0.29	0.26
3rd Quartile	5	9	10	6	1	1	3	0	0.66	0.60	0.69	0.23	0.59	0.48	0.29	0.34
Mean	5	7	10	4	1	1	3	0	0.64	0.53	0.63	0.16	0.56	0.39	0.30	0.32
Standard Deviation (n-1)	0.71	3.37	1.10	2.07	0.45	0.82	0.71	0.00	0.03	0.22	0.09	0.18	0.06	0.12	0.10	0.12
Standard Error	0.32	1.68	0.49	0.93	0.20	0.41	0.32	0.00	0.01	0.11	0.04	0.08	0.02	0.06	0.04	0.05
More than ±50% of Pre-impoundment Mean	--	--	higher	no	--	--	higher	lower	--	--	no	lower	--	--	no	no

Table A5-13: Stephens Lake 3 km downstream of the Keeyask GS - supporting site data, predominantly wetted (PW), pre-Project (2013) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2013	365672	6248917	Ekman (tall)	3.0	3.0	1.5	12.6	87.4	Silty clay
		365723	6248905	Ekman (tall)	3.1	2.9	1.1	11.4	88.6	Silty clay
		365700	6248911	Ekman (tall)	2.8	3.1	1.1	9.4	90.6	Clay
		365730	6248869	Ekman (tall)	2.6	2.8	1.3	10.2	89.8	Silty clay
		365692	6248891	Ekman (tall)	2.5	2.5	1.4	12.5	87.5	Silty clay
Operation	2021	365660	6248909	Petite Ponar	2.6	2.7	2.3	31.4	68.7	Silt loam
		365699	6248917	Petite Ponar	2.4	2.4	2.0	12.9	87.1	Silt loam
		365728	6248902	Petite Ponar	2.4	2.4	3.6	22.0	78.0	Silt loam
		365726	6248858	Petite Ponar	2.3	2.4	1.9	14.5	85.5	Silt loam
		365689	6248885	Petite Ponar	1.8	1.8	2.7	11.2	88.8	Silt loam
	2022	365815	6248876	Petite Ponar	3.0	3.0	3.0	13.7	86.3	Silt loam
		365831	6248835	Petite Ponar	2.7	2.3	1.9	12.5	87.5	Silt loam
		365854	6248854	Petite Ponar	2.7	2.8	3.4	39.3	60.7	Loam
		365876	6248835	Petite Ponar	2.3	2.8	1.7	24.5	75.5	Silt loam
		365909	6248827	Petite Ponar	2.3	2.3	3.1	15.5	84.5	Silt loam
	2023	365811	6248883	Petite Ponar	2.8	2.8	2.1	7.5	92.4	Silt loam
		365834	6248837	Petite Ponar	2.6	2.5	1.5	6.9	93.1	Silt loam
		365853	6248858	Petite Ponar	2.7	2.6	2.7	15.1	84.9	Silt loam
		365875	6248840	Petite Ponar	2.0	1.8	2.0	23.9	76.1	Silt loam
		365906	6248832	Petite Ponar	2.1	2.3	1.8	23.4	76.6	Silt loam

Table A5-14: Stephens Lake 3 km downstream of the Keeyask GS - benthic invertebrate community metrics, predominantly wetted (PW), pre-Project (2013) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2013	1264	8.9	44.5	0.3	11	3	0.79	0.43
		727	13.1	31.0	0.5	9	3	0.78	0.52
		1524	6.8	27.8	0.3	8	1	0.61	0.32
		1143	4.5	37.1	0.1	10	3	0.69	0.33
		1368	3.8	25.3	0.3	9	2	0.57	0.26
Operation	2021	4314	29.4	51.2	0.7	12	4	0.71	0.29
		4357	17.5	72.2	0.3	10	3	0.49	0.19
		2352	22.7	66.9	0.4	10	3	0.66	0.30
		4949	14.9	63.6	0.2	11	2	0.56	0.21
		13519	11.4	67.9	0.2	16	5	0.54	0.14
	2022	375	46.2	46.2	1.7	5	2	0.71	0.68
		245	29.4	52.9	0.7	5	1	0.72	0.70
		635	47.7	29.5	2.3	10	5	0.81	0.52
		678	36.2	59.6	0.9	6	2	0.67	0.51
		447	38.7	48.4	1.0	6	2	0.71	0.57
	2023	895	16.1	69.4	0.2	6	2	0.52	0.35
		3390	4.7	84.7	0.1	6	2	0.29	0.23
		2207	17.6	62.1	0.3	7	3	0.56	0.32
		4487	3.2	91.0	0.0	7	2	0.22	0.18
		2236	5.2	77.4	0.1	4	2	0.37	0.40

Table A5-15: Stephens Lake 3 km downstream of the Keeyask GS - predominantly wetted - substrate statistics and assessment results.

STL3KM PW GRAB	Water Depth (m)				Total Organic Carbon (%)				Sand (%)				Silt/Clay (%)			
	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	2.5	1.8	2.3	2.0	1.13	1.93	1.74	1.45	9.38	11.20	12.50	6.90	87.40	68.70	60.70	76.10
Maximum	3.1	2.6	3.0	2.8	1.48	3.60	3.40	2.69	12.60	31.40	39.30	23.90	90.60	88.80	87.50	93.10
1st Quartile	2.6	2.3	2.3	2.1	1.14	1.95	1.94	1.83	10.20	12.90	13.70	7.50	87.50	78.00	75.50	76.60
Median	2.8	2.4	2.7	2.6	1.25	2.32	3.00	1.95	11.40	14.50	15.50	15.10	88.60	85.50	84.50	84.90
3rd Quartile	3.0	2.4	2.7	2.7	1.41	2.67	3.10	2.10	12.50	22.00	24.50	23.40	89.80	87.10	86.30	92.40
Mean	2.8	2.3	2.6	2.4	1.28	2.49	2.64	2.00	11.22	18.40	21.10	15.36	88.78	81.62	78.90	84.62
Standard Deviation (n-1)	0.25	0.30	0.30	0.36	0.16	0.69	0.74	0.45	1.41	8.36	11.21	8.23	1.41	8.32	11.21	8.21
Standard Error	0.11	0.13	0.13	0.16	0.07	0.31	0.33	0.20	0.63	3.74	5.01	3.68	0.63	3.72	5.01	3.67
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	higher	higher	higher	--	higher	higher	no	--	no	no	no

Table A5-16: Stephens Lake 3 km downstream of the Keeyask GS - predominantly wetted -benthic invertebrate statistics and assessment results.

STL3KM PW GRAB	Total Abundance (no. per m^2)				EPT Index (%)				O+C Index (%)				EPT:C			
	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	727	2352	245	895	4	11	29	3	25	51	30	62	0.13	0.17	0.71	0.04
Maximum	1524	13519	678	4487	13	29	48	18	45	72	60	91	0.46	0.65	2.33	0.28
1st Quartile	1143	4314	375	2207	5	15	36	5	28	64	46	69	0.26	0.24	0.85	0.06
Median	1264	4357	447	2236	7	18	39	5	31	67	48	77	0.27	0.25	1.00	0.07
3rd Quartile	1368	4949	635	3390	9	23	46	16	37	68	53	85	0.28	0.45	1.71	0.24
Mean	1205	5898	476	2643	7	19	40	9	33	64	47	77	0.28	0.35	1.32	0.14
Standard Deviation (n-1)	301.52	4371.35	180.49	1357.51	3.75	7.05	7.51	6.92	7.74	7.98	11.18	11.57	0.12	0.20	0.68	0.12
Standard Error	134.84	1954.93	80.72	607.10	1.68	3.15	3.36	3.10	3.46	3.57	5.00	5.18	0.05	0.09	0.31	0.05
More than ±50% of Pre-impoundment Mean	--	higher	lower	higher	--	higher	higher	no	--	higher	no	higher	--	no	higher	lower

Table A5-16: Continued.

STL3KM PW GRAB	Total Richness (no. of taxa)				EPT Richness (no. of taxa)				Diversity Index (Simpson's D)				Evenness Index (Simpson's E)			
	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	8	10	5	4	1	2	1	2	1	0.49	0.67	0.22	0.26	0.14	0.51	0.18
Maximum	11	16	10	7	3	5	5	3	1	0.71	0.81	0.56	0.52	0.30	0.70	0.40
1st Quartile	9	10	5	6	2	3	2	2	1	0.54	0.71	0.29	0.32	0.19	0.52	0.23
Median	9	11	6	6	3	3	2	2	1	0.56	0.71	0.37	0.33	0.21	0.57	0.32
3rd Quartile	10	12	6	7	3	4	2	2	1	0.66	0.72	0.52	0.43	0.29	0.68	0.35
Mean	9	12	6	6	2	3	2	2	1	0.59	0.72	0.39	0.37	0.22	0.60	0.30
Standard Deviation (n-1)	1.14	2.49	2.07	1.22	0.89	1.14	1.52	0.45	0.10	0.09	0.05	0.15	0.10	0.07	0.09	0.09
Standard Error	0.51	1.11	0.93	0.55	0.40	0.51	0.68	0.20	0.04	0.04	0.02	0.07	0.05	0.03	0.04	0.04
More than ±50% of Pre-impoundment Mean	--	no	no	no	--	no	no	no	--	no	no	no	--	no	higher	no

Table A5-17: Stephens Lake 3 km downstream of the Keeyask GS - supporting site data, offshore (OS), pre-Project (2013) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2013	366128	6248908	Petite Ponar	6.3	6.1	1.2	1.1	99.0	Silty clay
		366118	6248927	Petite Ponar	6.0	5.7	0.8	2.1	97.8	Silty clay
		366104	6248977	Petite Ponar	6.0	5.5	1.6	3.5	96.5	Clay
		366191	6248955	Petite Ponar	6.2	6.2	1.2	1.7	98.4	Silty clay
		366226	6248918	Petite Ponar	6.2	6.1	0.9	1.9	98.1	Clay
Operation	2021	366128	6248903	Petite Ponar	5.9	5.9	2.4	37.1	63.0	Silt loam
		366107	6248937	Petite Ponar	5.7	5.8	1.5	66.0	34.0	Sandy loam
		366106	6248995	Petite Ponar	5.7	5.7	2.7	44.3	55.7	Loam
		366226	6248918	Petite Ponar	5.5	5.5	1.9	22.5	77.5	Silt loam
	2022	366038	6248852	Petite Ponar	4.6	4.5	2.4	27.9	72.0	Silt loam
		365992	6248885	Petite Ponar	4.7	4.8	6.3	32.9	67.1	Silt loam
		365954	6248931	Petite Ponar	4.3	4.2	1.9	24.6	75.4	Silt loam
		365917	6248975	Petite Ponar	4.3	4.4	2.2	17.2	82.9	Silt loam
		365871	6249000	Petite Ponar	4.3	4.3	2.1	11.6	88.4	Silt loam
	2023	366028	6248856	Petite Ponar	3.8	4.0	2.2	22.5	77.5	Silt loam
		365994	6248887	Petite Ponar	4.2	4.0	1.6	38.8	61.1	Silt loam
		365945	6248937	Petite Ponar	4.4	4.4	1.9	15.3	84.6	Silt loam
		365916	6248974	Petite Ponar	4.2	4.2	2.1	13.8	86.2	Silt loam
		365865	6249004	Petite Ponar	4.2	4.1	2.0	10.5	89.4	Silt loam/Silt

Table A5-18: Stephens Lake 3 km downstream of the Keeyask GS - benthic invertebrate community metrics, offshore (OS), pre-Project (2013) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2013	1394	8.1	35.4	0.2	9	3	0.59	0.27
	2013	710	14.6	61.0	0.2	8	3	0.59	0.31
	2013	822	2.1	44.2	0.0	5	2	0.54	0.43
	2013	900	8.7	77.9	0.1	5	2	0.40	0.33
	2013	1679	8.2	80.9	0.1	10	3	0.37	0.16
Operation	2021	2280	27.8	45.6	0.7	10	2	0.74	0.39
	2021	3261	38.1	42.5	1.0	9	3	0.69	0.36
	2021	3867	26.9	50.7	0.7	11	3	0.77	0.39
	2021	736	62.7	15.7	4.0	7	3	0.61	0.36
	2022	231	18.8	56.3	0.5	5	1	0.75	0.81
	2022	404	71.4	21.4	--	5	2	0.57	0.47
	2022	346	50.0	33.3	6.0	6	3	0.73	0.61
	2022	361	44.0	28.0	3.7	7	2	0.76	0.59
	2022	289	40.0	45.0	8.0	5	2	0.69	0.65
	2023	2352	17.8	71.8	0.4	5	1	0.70	0.66
	2023	173	50.0	33.3	1.5	5	2	0.70	0.66
	2023	1183	22.0	53.7	0.6	4	1	0.72	0.89
	2023	375	38.5	53.8	0.7	4	1	0.56	0.57
	2023	390	55.6	40.7	1.7	4	1	0.57	0.59

Table A5-19: Stephens Lake 3 km downstream of the Keeyask GS - Offshore (OS) - substrate statistics and assessment results.

STL3KM OS GRAB	Water Depth (m)				Total Organic Carbon (%)				Sand (%)				Silt/Clay (%)			
	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023
No. of Samples (n)	5	4	5	5	5	4	5	5	5	4	5	5	4	4	5	5
Minimum	6.0	5.5	4.3	3.8	0.75	1.50	1.90	1.60	1.08	22.50	11.60	10.50	96.50	34.00	67.10	61.10
Maximum	6.3	5.9	4.7	4.4	1.59	2.72	6.29	2.16	3.51	66.00	32.90	38.80	98.40	77.50	88.40	89.40
1st Quartile	6.0	5.7	4.3	4.2	0.93	1.81	2.09	1.92	1.65	33.45	17.20	13.80	97.48	50.28	72.00	77.50
Median	6.2	5.7	4.3	4.2	1.16	2.14	2.18	1.95	1.90	40.70	24.60	15.30	97.95	59.35	75.40	84.60
3rd Quartile	6.2	5.8	4.6	4.2	1.16	2.46	2.37	2.09	2.12	49.73	27.90	22.50	98.18	66.63	82.90	86.20
Mean	6.1	5.7	4.4	4.1	1.12	2.13	2.97	1.94	2.05	42.48	22.84	20.18	97.70	57.55	77.16	79.76
Standard Deviation (n-1)	0.13	0.16	0.19	0.23	0.32	0.53	1.87	0.22	0.90	18.12	8.49	11.29	0.84	18.13	8.52	11.30
Standard Error	0.06	0.08	0.09	0.10	0.14	0.27	0.83	0.10	0.40	9.06	3.80	5.05	0.42	9.06	3.81	5.06
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	higher	higher	higher	--	higher	higher	higher	--	no	no	no

Table A5-20: Stephens Lake 3 km downstream of the Keeyask GS - Offshore (OS) - benthic invertebrate statistics and assessment results.

STL3KM OS GRAB	Total Abundance (no. per m^2)				EPT Index (%)				O+C Index (%)				EPT:C			
	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023
No. of Samples (n)	5	4	5	5	5	4	5	5	5	4	5	5	5	4	4	5
Minimum	710	736	231	173	2	27	19	18	35	16	21	33	0.05	0.67	0.50	0.42
Maximum	1679	3867	404	2352	15	63	71	56	81	51	56	72	0.24	4.00	8.00	1.67
1st Quartile	822	1894	289	375	8	28	40	22	44	36	28	41	0.10	0.69	2.88	0.56
Median	900	2770	346	390	8	33	44	38	61	44	33	54	0.11	0.83	4.83	0.71
3rd Quartile	1394	3412	361	1183	9	44	50	50	78	47	45	54	0.23	1.73	6.50	1.50
Mean	1101	2536	326	895	8	39	45	37	60	39	37	51	0.15	1.58	4.54	0.97
Standard Deviation (n-1)	415.67	1366.50	67.36	901.63	4.43	16.70	18.96	16.66	20.08	15.67	13.89	14.69	0.09	1.62	3.22	0.57
Standard Error	185.89	683.25	30.13	403.22	1.98	8.35	8.48	7.45	8.98	7.83	6.21	6.57	0.04	0.81	1.61	0.25
More than ±50% of Pre-impoundment Mean	--	higher	lower	no	--	higher	higher	higher	--	no	no	no	--	higher	higher	higher

Table A5-20: Continued.

STL3KM OS GRAB	Total Richness (no. of taxa)				EPT Richness (no. of taxa)				Diversity Index (Simpson's D)				Evenness Index (Simpson's E)			
	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023
No. of Samples (n)	5	4	5	5	5	4	5	5	5	4	5	5	5	4	5	5
Minimum	5	7	5	4	2	2	1	1	0.37	0.61	0.57	0.56	0.16	0.36	0.47	0.57
Maximum	10	11	7	5	3	3	3	2	0.59	0.77	0.76	0.72	0.43	0.39	0.81	0.89
1st Quartile	5	9	5	4	2	3	2	1	0.40	0.67	0.69	0.57	0.27	0.36	0.59	0.59
Median	8	10	5	4	3	3	2	1	0.54	0.72	0.73	0.70	0.31	0.37	0.61	0.66
3rd Quartile	9	10	6	5	3	3	2	1	0.59	0.75	0.75	0.70	0.33	0.39	0.65	0.66
Mean	7	9	6	4	3	3	2	1	0.50	0.70	0.70	0.65	0.30	0.37	0.63	0.67
Standard Deviation (n-1)	2.30	1.71	0.89	0.55	0.55	0.50	0.71	0.45	0.11	0.07	0.08	0.08	0.10	0.01	0.12	0.13
Standard Error	1.03	0.85	0.40	0.24	0.24	0.25	0.32	0.20	0.05	0.04	0.03	0.03	0.04	0.01	0.06	0.06
More than ±50% of Pre-impoundment Mean	--	no	no	no	--	no	no	lower	--	no	no	no	--	no	higher	higher

Table A5-21: Stephens Lake 11 km downstream of the Keeyask GS - supporting site data, intermittently exposed (IE, kicknet samples), pre-Project (2013) and Operation (2021). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2013	376303	6248934	Kick Net	1.0	0.5	0.1	96.0	4.0	Sand
		376325	6248958	Kick Net	1.1	0.5	0.4	89.6	10.4	Sand
		376284	6248907	Kick Net	1.1	0.5	0.3	96.2	3.8	Sand
		376262	6248881	Kick Net	1.2	0.5	0.3	96.0	4.0	Sand
		376240	6248860	Kick Net	1.2	0.5	0.2	97.7	2.3	Sand
Operation	2021	376308	6248929	Kick Net	0.8	0.8	2.4	98.0	1.8	Sand
		376330	6248951	Kick Net	0.9	0.9	0.9	97.0	2.6	Sand
		376289	6248911	Kick Net	0.9	0.9	1.0	97.3	2.3	Sand
		376262	6248880	Kick Net	0.9	0.9	1.2	97.3	2.5	Sand
		376239	6248850	Kick Net	0.9	0.9	1.4	97.4	2.6	Sand

Table A5-22: Stephens Lake 11 km downstream of the Keeyask GS - benthic invertebrate community metrics, intermittently exposed (IE, kicknet samples), pre-Project (2013) and Operation (2021).

Phase	Year	Total Abundance (no. per sample)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2013	226	8.8	55.8	0.4	13	7	0.73	0.29
		542	18.1	66.8	0.6	11	4	0.75	0.36
		402	12.2	39.1	0.8	10	5	0.69	0.32
		612	13.7	30.7	0.7	12	7	0.65	0.24
		1980	2.2	10.9	0.5	12	6	0.26	0.11
Operation	2021	331	0.9	68.3	0.0	16	3	0.69	0.20
		354	0.6	67.2	0.0	16	2	0.71	0.22
		489	0.8	66.5	0.0	16	2	0.71	0.22
		280	2.9	62.1	0.1	13	3	0.75	0.30
		585	0.3	78.3	0.0	13	1	0.61	0.20

Table A5-23: Stephens Lake 11 km downstream of the Keeyask GS - Intermittently exposed (kicknet) - substrate statistics and assessment results.

STL11KM IE KICKNET	Water Depth (m)		Total Organic Carbon (%)		Sand (%)		Silt/Clay (%)	
	2013	2021	2013	2021	2013	2021	2013	2021
No. of Samples (n)	5	5	5	5	5	5	5	5
Minimum	1.0	0.8	0.05	0.88	89.60	97.00	2.31	1.80
Maximum	1.2	0.9	0.44	2.41	97.70	98.00	10.43	2.60
1st Quartile	1.1	0.9	0.23	1.00	96.00	97.30	3.79	2.30
Median	1.1	0.9	0.33	1.17	96.00	97.30	3.96	2.50
3rd Quartile	1.2	0.9	0.34	1.38	96.20	97.40	3.97	2.60
Mean	1.1	0.9	0.28	1.37	95.10	97.40	4.89	2.36
Standard Deviation (n-1)	0.08	0.04	0.15	0.61	3.16	0.37	3.17	0.336
Standard Error	0.04	0.02	0.07	0.27	1.41	0.16	1.42	0.150
More than ±50% of Pre-impoundment Mean	--	--	--	higher	--	no	--	lower

Table A5-24: Stephens Lake 11 km downstream of the Keeyask GS - Intermittently exposed (kicknet) - benthic invertebrate statistics and assessment results.

STL11KM IE KICKNET	Total Abundance (no. per sample)		EPT Index (%)		O+C Index (%)		EPT:C		Total Richness (no. of taxa)		EPT Richness (no. of taxa)		Diversity Index (Simpson's D)		Evenness Index (Simpson's E)	
	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	226	280	2	0	11	62	0.35	0.02	10	13	4	1	0.26	0.61	0.11	0.20
Maximum	1980	585	18	3	67	78	0.75	0.11	13	16	7	3	0.75	0.75	0.36	0.30
1st Quartile	402	331	9	1	31	66	0.50	0.02	11	13	5	2	0.65	0.69	0.24	0.20
Median	542	354	12	1	39	67	0.63	0.03	12	16	6	2	0.69	0.71	0.29	0.22
3rd Quartile	612	489	14	1	56	68	0.72	0.05	12	16	7	3	0.73	0.71	0.32	0.22
Mean	752	408	11	1	41	68	0.59	0.05	12	15	6	2	0.62	0.69	0.26	0.23
Standard Deviation (n-1)	701.94	125.62	5.93	1.01	21.78	5.96	0.17	0.04	1.14	1.64	1.30	0.84	0.20	0.05	0.10	0.04
Standard Error	313.92	56.18	2.65	0.45	9.74	2.67	0.07	0.02	0.51	0.73	0.58	0.37	0.09	0.02	0.04	0.02
More than ±50% of Pre-impoundment Mean	--	no	--	lower	--	higher	--	lower	--	no	--	lower	--	no	--	no

Table A5-25: Stephens Lake 11 km downstream of the Keeyask GS - supporting site data, intermittently exposed (IE, benthic grab samples), pre-Project (2001) and Operation (2022 and 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2001	379029	6247538	Ekman (tall)	1.0	--	4.2	44.5	47.9	--
		379029	6247538	Ekman (tall)	1.0	--	--	--	--	--
		379029	6247538	Ekman (tall)	1.0	--	--	--	--	--
		379029	6247538	Ekman (tall)	1.0	--	--	--	--	--
		379029	6247538	Ekman (tall)	1.0	--	--	--	--	--
Operation	2022	376305	6248928	Petite Ponar	0.9	0.9	1.6	89.7	10.3	Sand
		376323	6248945	Petite Ponar	0.8	0.8	0.3	95.0	5.0	Sand
		376286	6248901	Petite Ponar	1.0	1.0	0.5	94.8	5.2	Sand
		376266	6248878	Petite Ponar	0.7	0.7	0.7	95.9	4.1	Sand
		376239	6248847	Petite Ponar	0.8	0.8	0.8	97.1	3.0	Sand
	2023	376311	6248926	Petite Ponar	0.2	0.3	0.5	95.1	4.6	Sand
		376326	6248946	Petite Ponar	0.2	0.3	0.7	92.8	7.2	Sand
		376290	6248901	Petite Ponar	0.2	0.2	0.8	94.9	5.1	Sand
		376268	6248876	Petite Ponar	0.3	0.2	0.6	87.1	12.9	Sand
		376244	6248848	Petite Ponar	0.2	0.2	3.0	94.6	6.3	--

Table A5-26: Stephens Lake 11 km downstream of the Keeyask GS - benthic invertebrate community metrics, intermittently exposed (IE, benthic grab samples), pre-Project (2001) and Operation (2022 and 2023).

Phase	Year	Total Abundance (no. per m^2)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2001	6146	26.1	71.1	0.4	6	1	0.48	0.32
		5930	39.4	46.7	0.9	5	1	0.64	0.55
		1255	20.7	62.1	0.3	5	1	0.56	0.45
		346	0.0	62.5	0.0	2	0	0.47	0.94
		1082	8.0	64.0	0.1	4	1	0.53	0.53
Operation	2022	1919	5.3	27.1	0.2	12	3	0.78	0.37
		4357	0.3	70.5	0.0	6	1	0.45	0.30
		5367	3.8	68.8	0.1	16	5	0.50	0.12
		1096	0.0	94.7	0.0	4	0	0.15	0.29
		2611	3.3	81.8	0.0	11	4	0.41	0.16
	2023	2496	1.2	70.5	0.0	11	2	0.51	0.19
		1601	0.9	78.4	0.0	6	1	0.39	0.28
		1529	5.7	70.8	0.1	8	1	0.55	0.28
		1399	1.0	82.5	0.0	9	1	0.33	0.17
		7517	0.0	87.5	0.0	7	0	0.35	0.22

Table A5-27: Stephens Lake 11 km downstream of the Keeyask GS - Intermittently exposed (benthic grab samples) - substrate statistics and assessment results.

STL11KM IE GRAB	Water Depth (m)			Total Organic Carbon (%)			Sand (%)			Silt/Clay (%)		
	2001	2022	2023	2001	2022	2023	2001	2022	2023	2001	2022	2023
No. of Samples (n)	5	5	5	1	5	5	1	5	5	1	5	5
Minimum	1.0	0.7	0.2	4.25	0.32	0.47	44.53	89.70	87.10	47.89	3.00	4.60
Maximum	1.0	1.0	0.3	4.25	1.64	3.04	44.53	97.10	95.10	47.89	10.30	12.90
1st Quartile	1.0	0.8	0.2	4.25	0.50	0.56	44.53	94.80	92.80	47.89	4.10	5.10
Median	1.0	0.8	0.2	4.25	0.74	0.69	44.53	95.00	94.60	47.89	5.00	6.30
3rd Quartile	1.0	0.9	0.2	4.25	0.80	0.80	44.53	95.90	94.90	47.89	5.20	7.20
Mean	1.0	0.8	0.2	4.25	0.80	1.11	44.53	94.50	92.90	47.89	5.52	7.22
Standard Deviation (n-1)	0.00	0.11	0.04		0.51	1.09		2.83	3.37		2.81	3.33
Standard Error	0.00	0.05	0.02		0.23	0.49		1.27	1.51		1.26	1.49
More than ±50% of Pre-impoundment Mean	--	--	--	--	lower	lower	--	higher	higher	--	lower	lower

Table A5-28: Stephens Lake 11 km downstream of the Keeyask GS - Intermittently exposed (benthic grab samples) -benthic invertebrate statistics and assessment results.

STL11KM IE GRAB	Total Abundance (no. per m^2)			EPT Index (%)			O+C Index (%)			EPT:C		
	2001	2022	2023	2001	2022	2023	2001	2022	2023	2001	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	346	1096	1399	0	0	0	47	27	71	0.00	0.00	0.00
Maximum	6146	5367	7517	39	5	6	71	95	88	0.89	0.21	0.09
1st Quartile	1082	1919	1529	8	0	1	62	69	71	0.13	0.00	0.01
Median	1255	2611	1601	21	3	1	63	71	78	0.33	0.04	0.01
3rd Quartile	5930	4357	2496	26	4	1	64	82	82	0.39	0.05	0.02
Mean	2952	3070	2909	19	3	2	61	69	78	0.35	0.06	0.03
Standard Deviation (n-1)	2838.79	1758.07	2612.17	15.42	2.28	2.23	8.92	25.42	7.40	0.34	0.08	0.03
Standard Error	1269.54	786.23	1168.20	6.90	1.02	1.00	3.99	11.37	3.31	0.15	0.04	0.02
More than ±50% of Pre-impoundment Mean	--	no	no	--	lower	lower	--	no	no	--	lower	lower

Table A5-28: Continued.

STL11KM IE GRAB	Total Richness (no. of taxa)			EPT Richness (no. of taxa)			Diversity Index (Simpson's D)			Evenness Index (Simpson's E)		
	2001	2022	2023	2001	2022	2023	2001	2022	2023	2001	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	2	4	6	0	0	0	0.47	0.15	0.33	0.32	0.12	0.17
Maximum	6	16	11	1	5	2	0.64	0.78	0.55	0.94	0.37	0.28
1st Quartile	4	6	7	1	1	1	0.48	0.41	0.35	0.45	0.16	0.19
Median	5	11	8	1	3	1	0.53	0.45	0.39	0.53	0.29	0.22
3rd Quartile	5	12	9	1	4	1	0.56	0.50	0.51	0.55	0.30	0.28
Mean	4	10	8	1	3	1	0.53	0.46	0.43	0.56	0.25	0.23
Standard Deviation (n-1)	1.52	4.82	1.92	0.45	2.07	0.71	0.07	0.22	0.10	0.23	0.11	0.05
Standard Error	0.68	2.15	0.86	0.20	0.93	0.32	0.03	0.10	0.04	0.10	0.05	0.02
More than ±50% of Pre-impoundment Mean	--	higher	higher	--	higher	no	--	no	no	--	lower	lower

Table A5-29: Stephens Lake 11 km downstream of the Keeyask GS - supporting site data, predominantly wetted (PW), pre-Project (2001, 2002, and 2013) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2001	375897	6249364	Ekman (tall)	1.1	--	66.6	0.3	33.0	--
		375897	6249364	Ekman (tall)	1.1	--	--	--	--	--
		375897	6249364	Ekman (tall)	1.1	--	--	--	--	--
		375897	6249364	Ekman (tall)	1.1	--	--	--	--	--
		375897	6249364	Ekman (tall)	1.1	--	--	--	--	--
	2002	379029	6247545	Ekman (tall)	1.3	--	4.5	--	--	--
		379029	6247545	Ekman (tall)	1.3	--	--	--	--	--
		379029	6247545	Ekman (tall)	1.3	--	--	--	--	--
		379029	6247545	Ekman (tall)	1.3	--	--	--	--	--
		375901	6249368	Ekman (tall)	1.4	--	5.8	--	--	--
		375901	6249368	Ekman (tall)	1.4	--	--	--	--	--
		375901	6249368	Ekman (tall)	1.4	--	--	--	--	--
		375901	6249368	Ekman (tall)	1.4	--	--	--	--	--
		375901	6249368	Ekman (tall)	1.4	--	--	--	--	--
	2013	376454	6248753	Ekman (tall)	3.0	3.6	2.0	4.0	96.0	Silt loam
		376472	6248766	Ekman (tall)	2.2	2.2	0.5	75.7	24.3	Sandy loam
		376479	6248783	Ekman (tall)	2.2	2.5	1.6	54.6	45.4	Sandy loam
		376491	6248805	Ekman (tall)	2.1	2.3	1.7	49.6	50.4	Loam
		376517	6248831	Ekman (tall)	2.6	2.5	3.6	10.3	89.7	Silt loam
Operation	2021	376456	6248750	Ekman (tall)	2.5	2.5	3.2	4.5	95.5	Silt
		376470	6248750	Ekman (tall)	2.2	2.2	4.0	18.0	82.0	Silt loam
		376494	6248817	Ekman (tall)	1.7	3.4	3.3	1.4	98.6	Silt loam

Table A5-29: Continued.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Operation	2021	376511	6248819	Petite Ponar	1.2	1.7	4.3	50.8	49.3	Loam
		376465	6248800	Ekman (tall)	3.4	1.2	3.2	60.4	39.6	Sandy loam
	2022	376460	6248738	Petite Ponar	2.2	2.0	1.8	46.7	53.3	Loam
		376472	6248708	Petite Ponar	1.4	1.5	0.5	20.6	79.3	Silt loam /Silty clay loam / Clay loam
		376466	6248770	Petite Ponar	2.1	2.0	1.4	71.9	28.0	Sandy loam / Loamy sand
		376482	6248801	Petite Ponar	1.6	1.5	1.7	61.5	38.5	Sandy loam
		376512	6248815	Petite Ponar	1.4	1.2	1.2	61.4	38.6	Sandy loam
	2023	376472	6248735	Petite Ponar	1.1	1.2	1.2	74.8	25.2	Loamy sand
		376473	6248712	Petite Ponar	1.2	1.2	1.0	30.6	69.4	Silt loam
		376464	6248777	Petite Ponar	2.3	2.3	3.1	18.3	81.7	Silt loam
		376482	6248803	Petite Ponar	1.8	2.0	2.7	62.4	37.5	Sandy loam
		376499	6248827	Petite Ponar	1.2	1.2	2.6	63.3	36.6	Sandy loam

Table A5-30: Stephens Lake 11 km downstream of the Keeyask GS - benthic invertebrate community metrics, predominantly wetted (PW), pre-Project (2001, 2002, and 2013) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2001	7055	30.1	49.7	0.6	7	2	0.64	0.40
		7401	9.9	49.7	0.2	8	2	0.64	0.35
		519	0.0	58.3	0.0	4	0	0.58	0.60
		13331	40.3	33.8	1.2	3	1	0.66	0.97
		10388	20.0	59.2	0.3	6	1	0.60	0.41
	2002	2510	55.2	27.6	6.4	5	1	0.63	0.54
		909	42.9	19.0	3.0	5	1	0.68	0.63
		649	66.7	26.7	3.3	4	1	0.51	0.51
		2207	52.9	37.3	1.9	5	1	0.63	0.54
		4545	67.6	21.9	4.7	9	1	0.51	0.23
		649	73.3	26.7	2.8	2	1	0.39	0.82
		519	16.7	8.3	2.0	3	1	0.40	0.56
		1645	68.4	18.4	4.3	5	1	0.49	0.40
		649	20.0	33.3	0.8	7	2	0.82	0.79
	2013	3298	70.9	7.6	13.5	8	3	0.48	0.24
		2329	53.2	11.9	8.4	8	2	0.63	0.34
		3740	63.7	14.4	10.6	9	2	0.56	0.25
		1567	51.4	14.4	5.5	10	3	0.69	0.32
		4242	71.6	20.0	4.2	12	5	0.48	0.16
Operation	2021	2121	17.0	59.2	0.3	14	3	0.63	0.19
		2914	18.3	62.4	0.3	11	2	0.60	0.23
		4977	5.8	63.2	0.1	12	3	0.63	0.22
		5064	0.9	70.4	0.0	15	2	0.64	0.19
		1616	28.6	44.6	0.7	13	3	0.75	0.31
	2022	1414	14.3	63.3	0.2	10	2	0.61	0.25
		1284	16.9	38.2	0.5	13	3	0.82	0.42
		1010	21.4	45.7	0.6	10	2	0.78	0.46
		2222	7.8	68.2	0.1	15	4	0.64	0.19
		5208	1.7	90.6	0.0	11	2	0.24	0.12
	2023	7315	8.9	60.2	0.1	12	4	0.60	0.21
		7387	4.3	18.9	0.2	14	5	0.64	0.20
		2482	27.9	51.2	0.6	9	4	0.71	0.39
		8339	24.2	56.7	0.4	12	6	0.64	0.23
		5713	4.3	47.0	0.1	15	6	0.76	0.28

Table A5-31: Stephens Lake 11 km downstream of the Keeyask GS - predominantly wetted - substrate statistics and assessment results.

STL11KM PW GRAB	Water Depth (m)						Total Organic Carbon (%)						Sand (%)						Silt/Clay (%)					
	2001	2002	2013	2021	2022	2023	2001	2002	2013	2021	2022	2023	2001	2002	2013	2021	2022	2023	2001	2002	2013	2021	2022	2023
No. of Samples (n)	5	9	5	5	5	5	1	2	5	5	5	5	1	0	5	5	5	5	1	0	5	5	5	5
Minimum	1.1	1.3	2.1	1.2	1.4	1.1	66.65	4.52	0.49	3.20	0.46	0.97	0.35		4.01	1.40	20.60	18.30	33.01		24.32	39.60	28.00	25.20
Maximum	1.1	1.4	3.0	3.4	2.2	2.3	66.65	5.79	3.61	4.30	1.75	3.06	0.35		75.70	60.40	71.90	74.80	33.01		96.00	98.60	79.30	81.70
1st Quartile	1.1	1.3	2.2	1.7	1.4	1.2	66.65	4.84	1.57	3.22	1.23	1.21	0.35		10.30	4.50	46.70	30.60	33.01		45.40	49.30	38.50	36.60
Median	1.1	1.4	2.2	2.2	1.6	1.2	66.65	5.16	1.68	3.30	1.36	2.63	0.35		49.60	18.00	61.40	62.40	33.01		50.40	82.00	38.60	37.50
3rd Quartile	1.1	1.4	2.6	2.5	2.1	1.8	66.65	5.47	1.97	4.03	1.65	2.73	0.35		54.60	50.80	61.50	63.30	33.01		89.70	95.50	53.30	69.40
Mean	1.1	1.3	2.4	2.2	1.7	1.5	66.65	5.16	1.86	3.61	1.29	2.12	0.35		38.84	27.02	52.42	49.88	33.01		61.16	73.00	47.54	50.08
Standard Deviation (n-1)	0.00	0.06	0.38	0.83	0.38	0.50		0.90	1.13	0.52	0.51	0.96			30.62	27.04	19.92	24.12			30.62	27.02	19.91	24.15
Standard Error	0.00	0.02	0.17	0.37	0.17	0.22		0.64	0.50	0.23	0.23	0.43			13.69	12.09	8.91	10.79			13.69	12.08	8.90	10.80
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	--	--	lower	lower	lower	--	--	--	no	higher	higher	--	--	--	no	no	no

Table A5-32: Stephens Lake 11 km downstream of the Keeyask GS - predominantly wetted -benthic invertebrate statistics and assessment results.

STL11KM PW GRAB	Total Abundance (no. per m²)						EPT Index (%)						O+C Index (%)						EPT:C					
	2001	2002	2013	2021	2022	2023	2001	2002	2013	2021	2022	2023	2001	2002	2013	2021	2022	2023	2001	2002	2013	2021	2022	2023
No. of Samples (n)	5	9	5	5	5	5	5	9	5	5	5	5	5	9	5	5	5	5	5	9	5	5	5	5
Minimum	519	519	1567	1616	1010	2482	0	17	51	1	2	4	34	8	8	45	38	19	0.00	0.75	4.23	0.02	0.02	0.11
Maximum	13331	4545	4242	5064	5208	8339	40	73	72	29	21	28	59	37	20	70	91	60	1.19	6.40	13.50	0.70	0.56	0.60
1st Quartile	7055	649	2329	2121	1284	5713	10	43	53	6	8	4	50	19	12	59	46	47	0.20	2.00	5.47	0.10	0.13	0.15
Median	7401	909	3298	2914	1414	7315	20	55	64	17	14	9	50	27	14	62	63	51	0.34	3.00	8.41	0.30	0.23	0.23
3rd Quartile	10388	2207	3740	4977	2222	7387	30	68	71	18	17	24	58	28	14	63	68	57	0.60	4.33	10.58	0.30	0.45	0.43
Mean	7739	1587	3035	3339	2228	6247	20	52	62	14	12	14	50	24	14	60	61	47	0.47	3.25	8.44	0.28	0.28	0.30
Standard Deviation (n-1)	4769.47	1333.53	1081.24	1604.20	1726.26	2306.51	15.91	21.06	9.55	10.95	7.77	11.32	10.21	8.62	4.50	9.48	20.52	16.37	0.46	1.70	3.77	0.26	0.22	0.21
Standard Error	2132.97	444.51	483.55	717.42	772.01	1031.50	7.12	7.02	4.27	4.90	3.47	5.06	4.57	2.87	2.01	4.24	9.18	7.32	0.21	0.57	1.68	0.12	0.10	0.09
More than ±50% of Pre-impoundment Mean	--	--	--	no	no	higher	--	--	--	lower	lower	lower	--	--	--	higher	higher	higher	--	--	--	lower	lower	lower

Table A5-32: Continued.

STL11KM PW GRAB	Total Richness (no. of taxa)						EPT Richness (no. of taxa)						Diversity Index (Simpson's D)						Evenness Index (Simpson's E)					
	2001	2002	2013	2021	2022	2023	2001	2002	2013	2021	2022	2023	2001	2002	2013	2021	2022	2023	2001	2002	2013	2021	2022	2023
No. of Samples (n)	5	9	5	5	5	5	5	9	5	5	5	5	5	9	5	5	5	5	5	9	5	5	5	5
Minimum	3	2	8	11	10	9	0	1	2	2	2	4	0.58	0.39	0.48	0.60	0.24	0.60	0.35	0.23	0.16	0.19	0.12	0.20
Maximum	8	9	12	15	15	15	2	2	5	3	4	6	0.66	0.82	0.69	0.75	0.82	0.76	0.97	0.82	0.34	0.31	0.46	0.39
1st Quartile	4	4	8	12	10	12	1	1	2	2	2	4	0.60	0.49	0.48	0.63	0.61	0.64	0.40	0.51	0.24	0.19	0.19	0.21
Median	6	5	9	13	11	12	1	1	3	3	2	5	0.64	0.51	0.56	0.63	0.64	0.64	0.41	0.54	0.25	0.22	0.25	0.23
3rd Quartile	7	5	10	14	13	14	2	1	3	3	3	6	0.64	0.63	0.63	0.64	0.78	0.71	0.60	0.63	0.32	0.23	0.42	0.28
Mean	6	5	9	13	12	12	1	1	3	3	3	5	0.62	0.56	0.57	0.65	0.62	0.67	0.55	0.56	0.26	0.23	0.29	0.26
Standard Deviation (n-1)	2.07	2.06	1.67	1.58	2.17	2.30	0.84	0.33	1.22	0.55	0.89	1.00	0.03	0.14	0.09	0.06	0.23	0.06	0.26	0.18	0.07	0.05	0.15	0.08
Standard Error	0.93	0.69	0.75	0.71	0.97	1.03	0.37	0.11	0.55	0.24	0.40	0.45	0.01	0.05	0.04	0.03	0.10	0.03	0.11	0.06	0.03	0.02	0.07	0.03
More than ±50% of Pre-impoundment Mean	--	--	--	higher	higher	higher	--	--	--	higher	higher	higher	--	--	--	no	no	no	--	--	--	lower	no	no

Table A5-33: Stephens Lake 11 km downstream of the Keeyask GS - supporting site data, offshore (OS), pre-Project (2013), and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2013	376340	6248573	Ekman (tall)	6.6	6.7	1.1	0.5	99.5	Silt loam
		376285	6248550	Ekman (tall)	7.3	7.3	1.4	0.5	99.4	Silt loam
		376318	6248633	Ekman (tall)	7.1	7.2	1.2	0.6	99.4	Silt loam
		376322	6248669	Ekman (tall)	7.2	7.3	1.2	0.5	99.5	Silty clay loam
		376320	6248717	Ekman (tall)	6.5	6.5	1.3	0.3	99.8	Silty clay loam
Operation	2021	376323	6248583	Ekman (tall)	5.9	5.9	2.5	1.3	98.6	Silt loam
		376285	6248555	Ekman (tall)	6.6	6.1	2.4	1.6	98.4	Silt loam
		376315	6248641	Ekman (tall)	7.0	7.2	2.1	0.5	99.5	Silt loam
		376322	6248714	Ekman (tall)	6.4	6.3	2.2	0.5	99.7	Silt loam
	2022	376439	6248691	Petite Ponar	3.7	6.6	2.3	0.5	99.4	Silt loam
		376437	6248762	Petite Ponar	4.5	3.7	1.9	1.2	98.8	Silt loam
		376453	6248794	Petite Ponar	3.9	4.4	3.6	0.5	99.1	Silt loam
		376462	6248830	Petite Ponar	3.4	3.9	2.2	1.9	98.1	Silt loam
		376470	6248864	Petite Ponar	3.2	3.4	3.0	1.7	98.3	Silt loam
	2023	376441	6248693	Petite Ponar	3.4	3.1	2.9	1.3	98.7	Silt
		376439	6248771	Petite Ponar	4.3	4.6	2.0	2.3	97.7	Silt
		376454	6248796	Petite Ponar	3.6	3.5	2.0	4.4	95.6	Silt loam
		376461	6248831	Petite Ponar	3.9	3.8	1.9	3.8	96.2	Silt
		376476	6248866	Petite Ponar	3.1	3.3	3.1	5.2	94.8	Silt

Table A5-34: Stephens Lake 11 km downstream of the Keeyask GS - benthic invertebrate community metrics, offshore (OS), pre-Project (2013), and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m^2)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2013	2190	82.2	7.9	10.4	6	1	0.31	0.24
		2225	81.7	11.3	7.5	6	1	0.32	0.24
		2779	81.9	15.0	5.8	6	1	0.31	0.24
		2199	87.4	9.1	11.7	6	2	0.24	0.22
		0	0.0	0.0		0	0	0.00	0.00
Operation	2021	1645	40.4	16.7	3.1	8	2	0.68	0.39
		1385	40.6	15.6	2.6	8	2	0.74	0.48
		1212	38.1	17.9	2.7	8	2	0.71	0.43
		981	45.6	13.2	3.4	7	3	0.73	0.53
	2022	173	25.0	25.0	1.0	6	3	0.74	0.64
		144	40.0	30.0	4.0	6	1	0.77	0.71
		101	57.1	42.9	1.3	2	1	0.49	0.99
		130	66.7	11.1	6.0	4	1	0.52	0.52
		447	51.6	38.7	1.3	3	1	0.58	0.79
	2023	346	70.8	25.0	2.8	4	2	0.54	0.54
		289	80.0	20.0	4.0	3	2	0.46	0.62
		476	72.7	27.3	2.7	3	2	0.48	0.64
		332	69.6	26.1	3.2	5	2	0.65	0.57
		779	25.9	61.1	0.4	5	3	0.57	0.46

Table A5-35: Stephens Lake 11 km downstream of the Keeyask GS - Offshore (OS) - substrate statistics and assessment results.

STL11KM OS GRAB	Water Depth (m)				Total Organic Carbon (%)				Sand (%)				Silt/Clay (%)			
	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023
No. of Samples (n)	5	4	5	5	5	4	5	5	5	4	5	5	5	4	5	5
Minimum	6.5	5.9	3.2	3.1	1.11	2.13	1.93	1.85	0.27	0.50	0.50	1.30	99.40	98.40	98.10	94.80
Maximum	7.3	7.0	4.5	4.3	1.36	2.47	3.60	3.12	0.57	1.60	1.90	5.20	99.80	99.70	99.40	98.70
1st Quartile	6.6	6.3	3.4	3.4	1.20	2.20	2.19	1.98	0.47	0.50	0.50	2.30	99.40	98.55	98.30	95.60
Median	7.1	6.5	3.7	3.6	1.23	2.32	2.30	2.01	0.50	0.90	1.20	3.80	99.50	99.05	98.80	96.20
3rd Quartile	7.2	6.7	3.9	3.9	1.30	2.43	3.00	2.90	0.53	1.38	1.70	4.40	99.50	99.55	99.10	97.70
Mean	6.9	6.5	3.7	3.7	1.24	2.31	2.60	2.37	0.47	0.98	1.16	3.40	99.52	99.05	98.74	96.60
Standard Deviation (n-1)	0.36	0.46	0.50	0.47	0.10	0.16	0.68	0.59	0.12	0.56	0.65	1.58	0.16	0.65	0.54	1.58
Standard Error	0.16	0.23	0.22	0.21	0.04	0.08	0.31	0.26	0.05	0.28	0.29	0.71	0.07	0.32	0.24	0.71
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	higher	higher	higher	--	higher	higher	higher	--	no	no	no

Table A5-36: Stephens Lake 11 km downstream of the Keeyask GS - Offshore (OS) - benthic invertebrate statistics and assessment results.

STL11KM OS GRAB	Total Abundance (no. per m^2)				EPT Index (%)				O+C Index (%)				EPT:C			
	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023
No. of Samples (n)	5	4	5	5	5	4	5	5	5	4	5	5	4	4	5	5
Minimum	0	981	101	289	0	38	25	26	0	13	11	20	5.84	2.60	1.00	0.42
Maximum	2779	1645	447	779	87	46	67	80	15	18	43	61	11.68	3.44	6.00	4.00
1st Quartile	2190	1154	130	332	82	40	40	70	8	15	25	25	7.09	2.65	1.33	2.67
Median	2199	1298	144	346	82	40	52	71	9	16	30	26	8.95	2.87	1.33	2.83
3rd Quartile	2225	1450	173	476	82	42	57	73	11	17	39	27	10.72	3.16	4.00	3.20
Mean	1878	1306	199	444	67	41	48	64	9	16	30	32	8.86	2.94	2.73	2.62
Standard Deviation (n-1)	1079.20	280.13	141.14	199.76	37.33	3.16	16.11	21.56	5.53	1.96	12.47	16.57	2.66	0.39	2.19	1.33
Standard Error	482.63	140.07	63.12	89.33	16.70	1.58	7.20	9.64	2.47	0.98	5.58	7.41	1.33	0.20	0.98	0.60
More than ±50% of Pre-impoundment Mean	--	no	lower	lower	--	no	no	no	--	higher	higher	higher	--	lower	lower	lower

Table A5-36: Continued.

STL11KM OS GRAB	Total Richness (no. of taxa)				EPT Richness (no. of taxa)				Diversity Index (Simpson's D)				Evenness Index (Simpson's E)			
	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023	2013	2021	2022	2023
No. of Samples (n)	5	4	5	5	5	4	5	5	5	4	5	5	5	4	5	5
Minimum	0	7	2	3	0	2	1	2	0.00	0.68	0.49	0.46	0.00	0.39	0.52	0.46
Maximum	6	8	6	5	2	3	3	3	0.32	0.74	0.77	0.65	0.24	0.53	0.99	0.64
1st Quartile	6	8	3	3	1	2	1	2	0.24	0.70	0.52	0.48	0.22	0.42	0.64	0.54
Median	6	8	4	4	1	2	1	2	0.31	0.72	0.58	0.54	0.24	0.46	0.71	0.57
3rd Quartile	6	8	6	5	1	2	1	2	0.31	0.73	0.74	0.57	0.24	0.49	0.79	0.62
Mean	5	8	4	4	1	2	1	2	0.24	0.72	0.62	0.54	0.19	0.46	0.73	0.57
Standard Deviation (n-1)	2.68	0.50	1.79	1.00	0.71	0.50	0.89	0.45	0.14	0.03	0.13	0.07	0.11	0.06	0.17	0.07
Standard Error	1.20	0.25	0.80	0.45	0.32	0.25	0.40	0.20	0.06	0.01	0.06	0.03	0.05	0.03	0.08	0.03
More than ±50% of Pre-impoundment Mean	--	higher	no	no	--	higher	no	higher	--	higher	higher	higher	--	higher	higher	higher

APPENDIX 6: O'NEIL BAY AND SPLIT LAKE BENTHIC INVERTEBRATE SUMMARY ASSESSMENT DATA

Table A6-1: Stephens Lake O'Neil Bay - supporting site data, intermittently exposed (IE, kicknet samples), pre-Project (2013) and Operation (2021). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2013	365956	6250596	Kick Net	1.1	0.5	16.9	15.4	84.6	Silt loam
		365925	6250603	Kick Net	1.1	0.5	1.9	7.7	92.3	Clay
		365895	6250606	Kick Net	1.1	0.5	1.2	7.3	92.7	Clay
		365866	6250618	Kick Net	1.2	0.5	1.1	41.9	58.1	Clay
		365836	6250623	Kick Net	1.1	0.5	1.2	7.7	92.3	Clay
Operation	2021	365969	6250595	Kick Net	0.7	--	--	--	--	--
		365921	6250599	Kick Net	0.7	0.1	2.1	2.8	97.2	Clay
		365874	6250608	Kick Net	0.6	0.1	0.4	5.0	95.0	Silty clay
		365847	6250612	Kick Net	0.5	0.1	0.4	0.5	99.0	Clay
		365819	6250617	Kick Net	0.6	0.1	0.2	60.2	39.9	Sandy clay loam

Table A6-2: Stephens Lake O'Neil Bay - benthic invertebrate community metrics, intermittently exposed (IE, kicknet samples), pre-Project (2013) and Operation (2021).

Phase	Year	Total Abundance (no. per sample)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2013	280	6.4	7.5	0.9	13	6	0.41	0.13
		66	7.6	1.5	--	10	4	0.44	0.18
		64	12.5	3.1	8.0	10	3	0.61	0.26
		62	8.1	4.8	1.7	9	3	0.51	0.23
		142	12.7	1.4	9.0	8	4	0.42	0.22
Operation	2021	27	3.7	44.4	0.1	6	1	0.76	0.70
		80	0.0	27.5	0.0	7	0	0.73	0.54
		39	2.6	38.5	0.1	9	1	0.78	0.50
		56	0.0	41.1	0.0	9	0	0.80	0.56
		35	0.0	37.1	0.0	6	0	0.63	0.45

Table A6-3: Stephens Lake O'Neil Bay - Intermittently exposed (kicknet) - substrate statistics and assessment results.

STL-ONB IE KICKNET	Water Depth (m)		Total Organic Carbon (%)		Sand (%)		Silt/Clay (%)	
	2013	2021	2013	2021	2013	2021	2013	2021
No. of Samples (n)	5	5	5	4	5	4	5	4
Minimum	1.1	0.5	1.09	0.19	7.29	0.50	58.10	39.90
Maximum	1.2	0.7	16.90	2.07	41.90	60.20	92.70	99.00
1st Quartile	1.1	0.6	1.15	0.32	7.70	2.23	84.60	81.23
Median	1.1	0.6	1.21	0.38	7.74	3.90	92.30	96.10
3rd Quartile	1.1	0.7	1.91	0.81	15.40	18.80	92.30	97.65
Mean	1.1	0.6	4.45	0.75	16.01	17.13	84.00	82.78
Standard Deviation (n-1)	0.04	0.08	6.97	0.88	14.87	28.78	14.87	28.63
Standard Error	0.02	0.04	3.12	0.44	6.65	14.39	6.65	14.32
More than ±50% of Pre-impoundment Mean	--	--	--	lower	--	no	--	no

Table A6-4: Stephens Lake O'Neil Bay - Intermittently exposed (kicknet) - benthic invertebrate statistics and assessment results.

STL-ONB IE KICKNET	Total Abundance (no. per sample)		EPT Index (%)		O+C Index (%)		EPT:C		Total Richness (no. of taxa)		EPT Richness (no. of taxa)		Diversity Index (Simpson's D)		Evenness Index (Simpson's E)	
	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021
No. of Samples (n)	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5
Minimum	62	27	6	0	1	28	0.86	0.00	8	6	3	0	0.41	0.63	0.13	0.45
Maximum	280	80	13	4	8	44	9.00	0.10	13	9	6	1	0.61	0.80	0.26	0.70
1st Quartile	64	35	8	0	2	37	1.46	0.00	9	6	3	0	0.42	0.73	0.18	0.50
Median	66	39	8	0	3	38	4.83	0.00	10	7	4	0	0.44	0.76	0.22	0.54
3rd Quartile	142	56	13	3	5	41	8.25	0.08	10	9	4	1	0.51	0.78	0.23	0.56
Mean	123	47	9	1	4	38	4.88	0.04	10	7	4	0	0.48	0.74	0.20	0.55
Standard Deviation (n-1)	94.16	21.08	2.93	1.76	2.55	6.36	4.21	0.05	1.87	1.52	1.22	0.55	0.08	0.07	0.05	0.09
Standard Error	42.11	9.43	1.31	0.79	1.14	2.84	2.11	0.02	0.84	0.68	0.55	0.24	0.04	0.03	0.02	0.04
More than ±50% of Pre-impoundment Mean	--	lower	--	lower	--	higher	--	lower	--	no	--	lower	--	higher	--	higher

Table A6-5: Stephens Lake O'Neil Bay - supporting site data, intermittently exposed (IE, benthic grab samples), Operation (2022 and 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Operation	2022	365970	6250600	Petite Ponar	0.8	0.8	3.4	93.7	6.3	Sand
		365922	6250597	Petite Ponar	0.7	0.7	5.4	71.7	28.3	Sandy loam
		365871	6250606	Petite Ponar	0.6	0.6	1.2	35.7	64.2	Silt loam
		365843	6250612	Petite Ponar	0.6	0.8	1.0	41.6	58.4	Loam
	2023	365968	6250601	Petite Ponar	0.6	0.5	1.2	78.0	22.0	Sandy loam / Loamy sand
		365920	6250596	Petite Ponar	0.4	0.4	0.9	76.3	23.7	Sandy loam
		365870	6250607	Petite Ponar	0.4	0.5	0.3	2.7	97.3	Silty clay
		365844	6250612	Petite Ponar	0.3	0.4	0.3	1.6	98.4	Silty clay
		365818	6250612	Petite Ponar	0.3	0.4	0.9	1.4	98.6	Silty clay

Table A6-6: Stephens Lake O'Neil Bay - benthic invertebrate community metrics, intermittently exposed (IE, benthic grab samples), Operation (2022 and 2023).

Phase	Year	Total Abundance (no. per m^2)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Operation	2022	14	0.0	0.0	--	1	0	0.00	--
		0	0.0	0.0	--	0	0	0.00	0.00
		0	0.0	0.0	--	0	0	0.00	0.00
		29	0.0	50.0	--	2	0	0.52	--
	2023	14	0.0	100.0	0.0	1	0	0.0	1.0
		0	--	--	--	0	0	--	--
		29	0.0	100.0	0.0	1	0	0	1
		87	0.0	100.0	0.0	2	0	0.28	0.70
		0	--	--	--	0	0	--	--

Table A6-7: Stephens Lake O'Neil Bay - Intermittently exposed (benthic grab samples) - substrate statistics and assessment results.

STL-ONB IE GRAB	Water Depth (m)		Total Organic Carbon (%)		Sand (%)		Silt/Clay (%)	
	2022	2023	2022	2023	2022	2023	2022	2023
No. of Samples (n)	4	5	4	5	4	5	4	5
Minimum	0.6	0.3	1.03	0.30	35.70	1.40	6.30	22.00
Maximum	0.8	0.6	5.44	1.19	93.70	78.00	64.20	98.60
1st Quartile	0.6	0.3	1.18	0.33	40.13	1.60	22.80	23.70
Median	0.7	0.4	2.33	0.89	56.65	2.70	43.35	97.30
3rd Quartile	0.8	0.4	3.93	0.92	77.20	76.30	59.85	98.40
Mean	0.7	0.4	2.78	0.73	60.68	32.00	39.30	68.00
Standard Deviation (n-1)	0.09	0.12	2.08	0.39	27.08	41.22	27.05	41.22
Standard Error	0.05	0.05	1.04	0.18	13.54	18.44	13.52	18.44
More than ±50% of Pre-impoundment Mean	--	--	higher	lower	no	no	no	no

Table A6-8: Stephens Lake O'Neil Bay - Intermittently exposed (benthic grab samples) -benthic invertebrate statistics and assessment results.

STL-ONB IE GRAB	Total Abundance (no. per m²)		EPT Index (%)		O+C Index (%)		EPT:C		Total Richness (no. of taxa)		EPT Richness (no. of taxa)		Diversity Index (Simpson's D)		Evenness Index (Simpson's E)	
	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023
No. of Samples (n)	4	5	4	3	4	3	0	3	4	5	4	5	4	3	3	3
Minimum	0	0	0	0	0	100		0	0	0	0	0	0.00	0.00	0.00	0.70
Maximum	29	87	0	0	50	100		0	2	2	0	0	0.52	0.28	1.00	1.00
1st Quartile	0	0	0	0	0	100		0	0	0	0	0	0.00	0.00	0.00	0.85
Median	7	14	0	0	0	100		0	1	1	0	0	0.00	0.00	0.00	1.00
3rd Quartile	18	29	0	0	13	100		0	1	1	0	0	0.13	0.14	0.50	1.00
Mean	11	26	0	0	13	100		0	1	1	0	0	0.13	0.09	0.33	0.90
Standard Deviation (n-1)	13.81	35.92	0.00	0.00	25.00	0.00		0.00	0.96	0.84	0.00	0.00	0.26	0.16	0.58	0.18
Standard Error	6.91	16.07	0.00	0.00	12.50	0.00		0.00	0.48	0.37	0.00	0.00	0.13	0.09	0.33	0.10
More than ±50% of Pre-impoundment Mean	no	no	--	--	lower	higher	--	--	no	no	--	--	no	no	no	no

Table A6-9: Stephens Lake O'Neil Bay - supporting site data, predominantly wetted (PW), pre-Project (2006 and 2013) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2006	365250	6252150	Ekman (tall)	--	--	--	--	--	Thin silt mineral
	2013	365828	6250712	Ekman (tall)	3.1	2.2	0.7	54.2	45.8	Sandy loam
		365915	6250692	Ekman (tall)	3.1	3.3	7.0	17.9	82.0	Silt loam
		365821	6250685	Ekman (tall)	2.2	2.9	1.2	54.6	45.5	Sandy loam
		365869	6250683	Ekman (tall)	2.7	2.5	1.7	8.8	91.2	Silt loam
		365901	6250689	Ekman (tall)	2.8	3.0	1.2	18.2	81.7	Silt loam
Operation	2021	365818	6250688	Petite Ponar	1.9	1.9	1.3	66.7	33.3	Sandy loam
		365843	6250721	Petite Ponar	2.6	2.6	2.9	20.1	79.9	Silt loam
		365872	6250688	Petite Ponar	2.7	2.5	1.8	36.2	63.8	Loam
		365902	6250693	Petite Ponar	2.6	2.6	2.2	35.1	64.9	Silt loam
		365925	6250723	Petite Ponar	3.6	3.6	3.7	2.5	97.5	Silt loam
	2022	365819	6250668	Petite Ponar	1.8	1.8	0.9	76.9	23.2	Loamy sand
		365848	6250723	Petite Ponar	2.2	2.2	2.0	20.6	79.3	Silt loam
		365873	6250690	Petite Ponar	2.2	2.1	1.9	39.7	60.3	Loam
		365909	6250694	Petite Ponar	2.1	2.2	1.4	60.9	39.1	Sandy loam
		365936	6250697	Petite Ponar	2.4	2.5	2.6	6.5	93.5	Silt loam
	2023	365810	6250701	Petite Ponar	1.8	1.7	1.8	30.2	69.7	Silt loam
		365851	6250727	Petite Ponar	2.2	2.1	1.9	23.4	76.6	Silt loam
		365878	6250690	Petite Ponar	2.1	2.0	1.9	16.0	84.0	Silt loam
		365905	6250693	Petite Ponar	2.3	2.3	3.5	0.5	99.7	Silty clay loam
		365932	6250699	Petite Ponar	2.8	2.6	2.5	0.5	99.7	Silt loam

Table A6-10: Stephens Lake O'Neil Bay - benthic invertebrate community metrics, predominantly wetted (PW), pre-Project (2006 and 2013) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2006	736	17.6	58.8	0.3	5	2	0.61	0.51
	2013	545	79.4	11.1	7.1	6	2	0.40	0.28
		502	60.3	20.7	3.2	7	2	0.61	0.36
		407	8.5	19.1	0.4	7	3	0.55	0.32
		632	27.4	16.4	2.9	9	3	0.77	0.48
		467	70.4	13.0	7.6	8	1	0.49	0.24
Operation	2021	16231	1.8	5.0	0.5	11	2	0.23	0.12
		721	50.0	20.0	2.5	8	2	0.74	0.48
		4848	14.6	8.3	2.2	12	2	0.60	0.21
		4400	22.3	21.0	1.1	9	2	0.75	0.44
		635	59.1	18.2	3.3	6	3	0.63	0.46
	2022	635	0.0	18.2	0.0	6	0	0.69	0.53
		375	23.1	46.2	0.7	7	1	0.79	0.69
		7791	2.2	2.2	1.0	4	1	0.11	0.28
		765	30.2	32.1	0.9	9	2	0.79	0.52
		750	38.5	32.7	1.3	7	1	0.74	0.54
	2023	2381	3.6	64.8	0.1	6	1	0.55	0.37
		837	17.2	51.7	0.4	6	1	0.72	0.59
		9955	2.0	2.2	1.2	11	2	0.19	0.11
		505	40.0	28.6	1.4	7	1	0.73	0.53
		635	29.5	36.4	0.8	6	2	0.74	0.65

Table A6-11: Stephens Lake O'Neil Bay - predominantly wetted - substrate statistics and assessment results.

STL-ONB PW GRAB	Water Depth (m)					Total Organic Carbon (%)					Sand (%)					Silt/Clay (%)				
	2006	2013	2021	2022	2023	2006	2013	2021	2022	2023	2006	2013	2021	2022	2023	2006	2013	2021	2022	2023
No. of Samples (n)	0	5	5	5	5	0	5	5	5	5	0	5	5	5	5	0	5	5	5	5
Minimum		2.2	1.9	1.8	1.8		0.65	1.31	0.90	1.79		8.77	2.50	6.50	0.50		45.50	33.30	23.20	69.70
Maximum		3.1	3.6	2.4	2.8		7.00	3.70	2.60	3.45		54.60	66.70	76.90	30.20		91.20	97.50	93.50	99.70
1st Quartile		2.7	2.6	2.1	2.1		1.18	1.84	1.38	1.88		17.90	20.10	20.60	0.50		45.80	63.80	39.10	76.60
Median		2.8	2.6	2.2	2.2		1.24	2.16	1.87	1.93		18.20	35.10	39.70	16.00		81.70	64.90	60.30	84.00
3rd Quartile		3.1	2.7	2.2	2.3		1.66	2.90	1.98	2.51		54.20	36.20	60.90	23.40		82.00	79.90	79.30	99.70
Mean		2.8	2.7	2.1	2.3		2.35	2.38	1.75	2.31		30.73	32.12	40.92	14.12		69.24	67.88	59.08	85.94
Standard Deviation (n-1)		0.37	0.61	0.22	0.34		2.63	0.94	0.64	0.70		21.93	23.68	28.69	13.41		21.87	23.68	28.64	13.54
Standard Error		0.17	0.27	0.10	0.15		1.17	0.42	0.29	0.31		9.81	10.59	12.83	6.00		9.78	10.59	12.81	6.06
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	no	no	no	--	--	no	no	lower	--	--	no	no	no

Table A6-12: Stephens Lake O'Neil Bay - predominantly wetted -benthic invertebrate statistics and assessment results.

STL-ONB PW GRAB	Total Abundance (no. per m²)					EPT Index (%)					O+C Index (%)					EPT:C				
	2006	2013	2021	2022	2023	2006	2013	2021	2022	2023	2006	2013	2021	2022	2023	2006	2013	2021	2022	2023
No. of Samples (n)	1	5	5	5	5	1	5	5	5	5	1	5	5	5	5	1	5	5	5	5
Minimum	736	407	635	375	505	18	9	2	0	2	59	11	5	2	2	0.30	0.44	0.50	0.00	0.06
Maximum	736	632	16231	7791	9955	18	79	59	38	40	59	21	21	46	65	0.30	7.60	3.25	1.25	1.40
1st Quartile	736	467	721	635	635	18	27	15	2	4	59	13	8	18	29	0.30	2.86	1.06	0.67	0.38
Median	736	502	4400	750	837	18	60	22	23	17	59	16	18	32	36	0.30	3.18	2.23	0.94	0.81
3rd Quartile	736	545	4848	765	2381	18	70	50	30	30	59	19	20	33	52	0.30	7.14	2.50	1.00	1.17
Mean	736	511	5367	2063	2862	18	49	30	19	18	59	16	14	26	37	0.30	4.25	1.91	0.77	0.76
Standard Deviation (n-1)		84.59	6387.59	3205.70	4036.08		30.06	24.18	17.05	16.42		4.04	7.32	16.69	23.86		3.05	1.11	0.48	0.55
Standard Error		37.83	2856.62	1433.63	1804.99		13.44	10.81	7.63	7.34		1.81	3.28	7.46	10.67		1.36	0.50	0.21	0.25
More than ±50% of Pre-impoundment Mean	--	--	higher	higher	higher	--	--	no	lower	lower	--	--	no	no	higher	--	--	no	lower	lower

Table A6-12: Continued.

STL-ONB PW GRAB	Total Richness (no. of taxa)					EPT Richness (no. of taxa)					Diversity Index (Simpson's D)					Evenness Index (Simpson's E)				
	2006	2013	2021	2022	2023	2006	2013	2021	2022	2023	2006	2013	2021	2022	2023	2006	2013	2021	2022	2023
No. of Samples (n)	1	5	5	5	5	1	5	5	5	5	1	5	5	5	5	1	5	5	5	5
Minimum	5	6	6	4	6	2	1	2	0	1	0.61	0.40	0.23	0.11	0.19	0.51	0.24	0.12	0.28	0.11
Maximum	5	9	12	9	11	2	3	3	2	2	0.61	0.77	0.75	0.79	0.74	0.51	0.48	0.48	0.69	0.65
1st Quartile	5	7	8	6	6	2	2	2	1	1	0.61	0.49	0.60	0.69	0.55	0.51	0.28	0.21	0.52	0.37
Median	5	7	9	7	6	2	2	2	1	1	0.61	0.55	0.63	0.74	0.72	0.51	0.32	0.44	0.53	0.53
3rd Quartile	5	8	11	7	7	2	3	2	1	2	0.61	0.61	0.74	0.79	0.73	0.51	0.36	0.46	0.54	0.59
Mean	5	7	9	7	7	2	2	2	1	1	0.61	0.56	0.59	0.62	0.59	0.51	0.34	0.34	0.51	0.45
Standard Deviation (n-1)		1.14	2.39	1.82	2.17		0.84	0.45	0.71	0.55		0.14	0.21	0.29	0.23		0.09	0.17	0.15	0.22
Standard Error		0.51	1.07	0.81	0.97		0.37	0.20	0.32	0.24		0.06	0.09	0.13	0.10		0.04	0.07	0.07	0.10
More than ±50% of Pre-impoundment Mean	--	--	no	no	no	--	--	no	lower	no	--	--	no	no	no	--	--	no	no	no

Table A6-13: Stephens Lake O'Neil Bay - supporting site data, offshore (OS), pre-Project (2006) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2006	365250	6250750	Ekman (tall)	--	--	--	--	--	Thin silt mineral
		365450	6250750	Ekman (tall)	--	--	--	--	--	Thin silt mineral
		365650	6251750	Ekman (tall)	--	--	--	--	--	Thin silt mineral
		366050	6252150	Ekman (tall)	--	--	--	--	--	Thin silt mineral
Operation	2021	364973	6250846	Petite Ponar	4.1	4.1	1.6	10.0	90.0	Silt loam
		365006	6250823	Petite Ponar	4.2	4.5	2.0	8.0	92.1	Silt loam
		365055	6250839	Petite Ponar	4.7	4.8	1.5	24.3	75.7	Silt loam
		365094	6250862	Petite Ponar	5.8	5.8	1.5	3.6	96.4	Silt loam
		365136	6250851	Petite Ponar	5.7	5.9	1.1	1.3	98.7	Silt loam
	2022	364967	6250850	Petite Ponar	4.5	4.4	1.6	16.6	83.5	Silt loam
		365014	6250829	Petite Ponar	4.8	4.8	2.3	16.2	83.8	Silt loam
		365055	6250840	Petite Ponar	4.8	4.8	1.4	2.8	97.1	Silt loam
		365109	6250811	Petite Ponar	3.6	3.1	1.6	23.2	76.8	Silt loam
		365160	6250822	Petite Ponar	4.9	4.8	1.7	21.4	78.5	Silt loam
	2023	364962	6250850	Petite Ponar	4.0	3.9	1.6	8.1	91.9	Silt loam
		365024	6250827	Petite Ponar	4.3	4.3	1.5	6.8	93.1	Silty clay loam
		365070	6250837	Petite Ponar	3.8	3.8	1.3	19.2	80.8	Silty clay loam
		365109	6250834	Petite Ponar	5.1	4.9	1.8	14.8	85.2	Silt loam / Silty clay loam
		365166	6250824	Petite Ponar	4.5	4.3	1.5	7.3	92.7	Silty clay loam

Table A6-14: Stephens Lake O'Neil Bay - benthic invertebrate community metrics, offshore (OS), pre-Project (2006) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2006	952	18.2	81.8	0.2	3	1	0.37	0.53
		563	23.1	76.9	0.3	3	2	0.38	0.54
		1818	16.7	81.0	0.2	3	1	0.32	0.49
		606	28.6	64.3	0.4	4	2	0.53	0.53
Operation	2021	1385	39.6	42.7	1.2	10	2	0.78	0.46
		1270	43.2	38.6	1.4	8	2	0.76	0.52
		1226	37.6	47.1	0.8	9	2	0.72	0.40
		794	67.3	20.0	4.6	9	2	0.57	0.26
		822	75.4	12.3	6.1	7	2	0.49	0.28
	2022	231	56.3	25.0	9.0	6	1	0.64	0.46
		144	80.0	20.0	4.0	2	1	0.32	0.74
		58	50.0	25.0	2.0	3	1	0.64	0.92
		159	90.9	9.1	10.0	2	1	0.17	0.60
		173	66.7	16.7	4.0	4	2	0.60	0.63
	2023	462	53.1	34.4	1.5	4	1	0.59	0.61
		332	73.9	21.7	3.4	4	2	0.47	0.47
		375	34.6	42.3	1.5	5	1	0.75	0.81
		476	48.5	45.5	1.1	4	1	0.56	0.57
		115	50.0	37.5	1.3	3	1	0.60	0.83

Table A6-15: Stephens Lake O'Neil Bay - Offshore (OS) - substrate statistics and assessment results.

STL-ONB OS GRAB	Water Depth (m)				Total Organic Carbon (%)				Sand (%)				Silt/Clay (%)			
	2006	2021	2022	2023	2006	2021	2022	2023	2006	2021	2022	2023	2006	2021	2022	2023
No. of Samples (n)	0	5	5	5	0	5	5	5	0	5	5	5	0	5	5	5
Minimum		4.1	3.6	3.8		1.06	1.40	1.31		1.30	2.80	6.80		75.70	76.80	80.80
Maximum		5.8	4.9	5.1		2.01	2.26	1.80		24.30	23.20	19.20		98.70	97.10	93.10
1st Quartile		4.2	4.5	4.0		1.45	1.61	1.52		3.60	16.20	7.30		90.00	78.50	85.20
Median		4.7	4.8	4.3		1.54	1.61	1.54		8.00	16.60	8.10		92.10	83.50	91.90
3rd Quartile		5.7	4.8	4.5		1.64	1.72	1.64		10.00	21.40	14.80		96.40	83.80	92.70
Mean		4.9	4.5	4.3		1.54	1.72	1.56		9.44	16.04	11.24		90.58	83.94	88.74
Standard Deviation (n-1)		0.81	0.54	0.51		0.34	0.32	0.18		8.99	7.99	5.50		9.00	7.97	5.48
Standard Error		0.36	0.24	0.23		0.15	0.14	0.08		4.02	3.58	2.46		4.02	3.56	2.45
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table A6-16: Stephens Lake O'Neil Bay - Offshore (OS) -benthic invertebrate statistics and assessment results.

STL-ONB OS GRAB	Total Abundance (no. per m^2)				EPT Index (%)				O+C Index (%)				EPT:C			
	2006	2021	2022	2023	2006	2021	2022	2023	2006	2021	2022	2023	2006	2021	2022	2023
No. of Samples (n)	4	5	5	5	4	5	5	5	4	5	5	5	4	5	5	5
Minimum	563	794	58	115	17	38	50	35	64	12	9	22	0.21	0.84	2.00	1.07
Maximum	1818	1385	231	476	29	75	91	74	82	47	25	45	0.44	6.14	10.00	3.40
1st Quartile	595	822	144	332	18	40	56	48	74	20	17	34	0.23	1.19	4.00	1.33
Median	779	1226	159	375	21	43	67	50	79	39	20	38	0.27	1.41	4.00	1.50
3rd Quartile	1169	1270	173	462	24	67	80	53	81	43	25	42	0.34	4.63	9.00	1.55
Mean	985	1099	153	352	22	53	69	52	76	32	19	36	0.30	2.84	5.80	1.77
Standard Deviation (n-1)	582.17	272.49	62.56	145.21	5.38	17.45	16.81	14.14	8.09	15.15	6.64	9.18	0.11	2.39	3.49	0.93
Standard Error	291.09	121.86	27.98	64.94	2.69	7.81	7.52	6.32	4.05	6.78	2.97	4.11	0.05	1.07	1.56	0.42
More than ±50% of Pre-impoundment Mean	--	no	lower	lower	--	higher	higher	higher	--	lower	lower	lower	--	higher	higher	higher

Table A6-16: Continued.

STL-ONB OS GRAB	Total Richness (no. of taxa)				EPT Richness (no. of taxa)				Diversity Index (Simpson's D)				Evenness Index (Simpson's E)			
	2006	2021	2022	2023	2006	2021	2022	2023	2006	2021	2022	2023	2006	2021	2022	2023
No. of Samples (n)	4	5	5	5	4	5	5	5	4	5	5	5	4	5	5	5
Minimum	3	7	2	3	1	2	1	1	0.32	0.49	0.17	0.47	0.49	0.26	0.46	0.47
Maximum	4	10	6	5	2	2	2	2	0.53	0.78	0.64	0.75	0.54	0.52	0.92	0.83
1st Quartile	3	8	2	4	1	2	1	1	0.36	0.57	0.32	0.56	0.52	0.28	0.60	0.57
Median	3	9	3	4	2	2	1	1	0.37	0.72	0.60	0.59	0.53	0.40	0.63	0.61
3rd Quartile	3	9	4	4	2	2	1	1	0.42	0.76	0.64	0.60	0.53	0.46	0.74	0.81
Mean	3	9	3	4	2	2	1	1	0.40	0.66	0.47	0.59	0.52	0.38	0.67	0.66
Standard Deviation (n-1)	0.50	1.14	1.67	0.71	0.58	0.00	0.45	0.45	0.09	0.13	0.22	0.10	0.02	0.11	0.17	0.16
Standard Error	0.25	0.51	0.75	0.32	0.29	0.00	0.20	0.20	0.05	0.06	0.10	0.05	0.01	0.05	0.08	0.07
More than ±50% of Pre-impoundment Mean	--	higher	no	no	--	no	no	no	--	higher	no	no	--	no	no	no

Table A6-17: Split Lake - supporting site data, intermittently exposed (IE, kicknet samples), pre-Project (2010 to 2013) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2010	673611	6232633	Kick Net	0.7	0.7	0.1	96.4	3.6	Sand
		673581	6232634	Kick Net	1.0	0.8	0.1	94.4	5.6	Sand
		673552	6232679	Kick Net	1.0	0.5	0.3	58.6	41.4	Sandy loam
		673540	6232669	Kick Net	1.0	0.8	0.2	81.3	18.7	Loamy sand
		673514	6232690	Kick Net	0.9	1.2	3.7	2.4	97.6	Silt
	2011	673587	6232633	Kick Net	1.0	1.0	0.7	63.6	36.4	Sandy clay loam
		673564	6232602	Kick Net	1.0	1.0	0.9	7.5	92.5	Clay
		673550	6232638	Kick Net	1.0	1.0	0.9	59.0	41.0	Sandy clay loam
		673534	6232667	Kick Net	1.0	1.0	0.3	92.4	7.6	Sand
		673513	6232685	Kick Net	1.0	1.0	0.9	39.6	60.4	Loam
	2012	673614	6232627	Kick Net	1.0	0.8	14.2	53.1	46.9	Sandy loam
		673577	6232647	Kick Net	1.0	0.6	5.6	7.4	92.6	Silt loam
		673550	6232661	Kick Net	1.0	0.6	3.4	35.8	64.2	Loam
		673479	6232751	Kick Net	1.0	0.6	2.2	6.5	93.5	Silty clay loam
		673512	6232690	Kick Net	0.8	0.4	3.6	28.4	71.6	Clay loam
	2013	673605	6232635	Kick Net	0.8	0.8	0.5	91.6	8.4	Sand
		673572	6232646	Kick Net	0.8	0.8	0.1	95.2	4.8	Sand
		673547	6232663	Kick Net	1.0	0.5	0.3	61.5	38.5	Sandy loam / Sandy clay loam
		673480	6232755	Kick Net	1.0	0.5	3.6	72.6	27.4	Sandy clay loam
		673516	6232696	Kick Net	1.0	1.0	2.3	35.8	64.2	Loam
Operation	2021	673617	6232655	Kick Net	0.7	0.5	6.7	9.8	90.3	Silty clay loam
		673593	6232666	Kick Net	1.0	0.7	4.7	2.1	97.9	Silt loam
		673559	6232684	Kick Net	1.0	0.4	3.7	17.0	83.0	Silt loam
		673527	6232710	Kick Net	0.7	0.5	2.1	1.5	98.5	Silty clay loam
		673500	6232778	Kick Net	0.8	0.8	3.4	9.0	91.0	Silt loam

Table A6-17: Continued.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Operation	2022	673601	6232627	Kick Net	1.0	0.5	0.6	43.3	56.7	Clay
		673581	6232638	Kick Net	1.0	0.5	0.3	83.5	16.5	Sandy loam / Loamy sand
		673533	6232664	Kick Net	1.0	0.5	1.5	40.9	59.1	Clay
		673497	6232710	Kick Net	1.1	0.6	2.0	78.7	21.3	Sandy loam
		673460	6232763	Kick Net	1.0	0.5	1.2	71.7	28.3	Sandy clay loam
	2023	673615	6232643	Kick Net	0.6	0.1	9.3	79.2	20.9	Loamy sand
		673571	6232660	Kick Net	0.6	0.3	21.1	24.7	75.3	Silt loam
		673553	6232676	Kick Net	0.5	0.2	7.7	13.8	86.2	Silt loam
		673521	6232704	Kick Net	0.3	0.2	1.7	8.2	91.9	Silty clay loam
		673480	6232774	Kick Net	0.4	0.1	1.2	3.3	96.6	Silty clay

Table A6-18: Split Lake - benthic invertebrate community metrics, intermittently exposed (IE, kicknet samples), pre-Project (2010 to 2013) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per sample)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2010	155	19.4	34.8	1.2	13	3	0.82	0.42
		191	29.3	44.5	1.6	11	5	0.83	0.54
		107	27.1	38.3	1.4	11	3	0.85	0.60
		728	22.8	25.4	1.2	17	7	0.73	0.22
		245	17.6	18.0	1.4	12	4	0.72	0.30
	2011	1333	8.2	14.4	0.7	14	5	0.47	0.13
		922	2.0	8.2	0.3	14	4	0.30	0.10
		1257	1.6	17.8	0.1	12	3	0.43	0.15
		364	3.0	36.5	0.1	13	4	0.71	0.27
		835	3.1	14.1	0.2	14	4	0.47	0.13
	2012	1444	56.3	26.1	2.2	16	6	0.78	0.28
		1358	53.9	25.0	2.5	15	5	0.77	0.29
		3024	36.3	16.9	2.6	20	6	0.81	0.27
		1130	15.4	20.4	1.3	22	8	0.66	0.13
		3768	8.8	22.7	0.6	18	5	0.59	0.14
	2013	391	41.4	24.3	3.1	13	5	0.82	0.42
		662	35.3	34.1	2.0	15	7	0.83	0.38
		1613	39.4	21.1	5.1	15	5	0.76	0.28
		513	2.7	16.0	0.4	16	4	0.46	0.12
		882	3.9	8.8	2.1	12	4	0.45	0.15
Operation	2021	377	32.4	43.8	4.4	18	6	0.77	0.24
		215	31.6	22.8	4.0	19	5	0.85	0.34
		512	22.5	37.9	1.7	21	8	0.82	0.27
		1616	8.7	72.0	0.2	20	7	0.73	0.18
		433	10.9	57.5	0.6	20	7	0.77	0.22
	2022	70	2.9	20.0	0.1	5	1	0.64	0.56
		51	0.0	68.6	0.0	6	0	0.63	0.46
		74	8.1	13.5	0.6	11	4	0.71	0.31
		40	25.0	5.0	5.0	8	3	0.85	0.84
		109	5.5	43.1	0.5	11	3	0.77	0.40
	2023	457	8.8	2.9	7.5	16	6	0.32	0.09
		619	9.5	6.0	1.8	13	5	0.38	0.12
		567	18.3	4.2	6.0	19	7	0.48	0.10
		1691	4.4	6.9	0.7	15	3	0.48	0.13
		1805	6.9	13.0	0.7	18	6	0.44	0.10

Table A6-19: Split Lake - Intermittently exposed (kicknet) - substrate statistics and assessment results.

SPLIT LAKE IE KICKNET	Water Depth (m)							Total Organic Carbon (%)							Sand (%)							Silt/Clay (%)						
	2010	2011	2012	2013	2021	2022	2023	2010	2011	2012	2013	2021	2022	2023	2010	2011	2012	2013	2021	2022	2023	2010	2011	2012	2013	2021	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	0.7	1.0	0.8	0.8	0.7	1.0	0.3	0.05	0.30	2.23	0.11	2.10	0.34	1.17	2.40	7.49	6.53	35.80	1.50	40.90	3.30	3.58	7.60	46.92	4.80	83.00	16.50	20.90
Maximum	1.0	1.0	1.0	1.0	1.0	1.1	0.6	3.74	0.92	14.20	3.56	6.66	2.00	21.10	96.40	92.40	53.10	95.20	17.00	83.50	79.20	97.56	92.50	93.50	64.20	98.50	59.10	96.60
1st Quartile	0.9	1.0	1.0	0.8	0.7	1.0	0.4	0.05	0.70	3.35	0.29	3.40	0.63	1.66	58.60	39.60	7.39	61.50	2.10	43.30	8.20	5.61	36.41	64.20	8.38	90.30	21.30	75.30
Median	1.0	1.0	1.0	1.0	0.8	1.0	0.5	0.21	0.89	3.58	0.45	3.70	1.18	7.70	81.30	59.00	28.40	72.60	9.00	71.70	13.80	18.73	41.00	71.60	27.43	91.00	28.30	86.20
3rd Quartile	1.0	1.0	1.0	1.0	1.0	1.0	0.6	0.27	0.89	5.56	2.26	4.70	1.46	9.25	94.40	63.60	35.80	91.60	9.80	78.70	24.70	41.40	60.40	92.60	38.50	97.90	56.70	91.90
Mean	0.9	1.0	1.0	0.9	0.8	1.0	0.5	0.86	0.74	5.78	1.33	4.11	1.12	8.18	66.62	52.42	26.24	71.34	7.88	63.62	25.84	33.38	47.58	73.76	28.66	92.14	36.38	74.18
Standard Deviation (n-1)	0.10	0.00	0.09	0.11	0.15	0.04	0.12	1.61	0.26	4.86	1.52	1.70	0.66	8.06	38.93	31.42	19.76	24.19	6.37	20.11	30.87	38.91	31.42	19.76	24.20	6.36	20.11	30.83
Standard Error	0.04	0.00	0.04	0.05	0.07	0.02	0.05	0.72	0.12	2.17	0.68	0.76	0.30	3.61	17.41	14.05	8.84	10.82	2.85	8.99	13.81	17.40	14.05	8.83	10.82	2.84	8.99	13.79
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	--	--	--	--	higher	no	higher	--	--	--	--	lower	no	lower	--	--	--	--	higher	no	higher

Table A6-20: Split Lake - Intermittently exposed (kicknet) - benthic invertebrate statistics and assessment results.

SPLIT LAKE IE KICKNET	Total Abundance (no. per sample)							EPT Index (%)							O+C Index (%)						
	2010	2011	2012	2013	2021	2022	2023	2010	2011	2012	2013	2021	2022	2023	2010	2011	2012	2013	2021	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	107	364	1130	391	215	40	457	18	2	9	3	9	0	4	18	8	17	9	23	5	3
Maximum	728	1333	3768	1613	1616	109	1805	29	8	56	41	32	25	18	45	37	26	34	72	69	13
1st Quartile	155	835	1358	513	377	51	567	19	2	15	4	11	3	7	25	14	20	16	38	14	4
Median	191	922	1444	662	433	70	619	23	3	36	35	22	6	9	35	14	23	21	44	20	6
3rd Quartile	245	1257	3024	882	512	74	1691	27	3	54	39	32	8	10	38	18	25	24	58	43	7
Mean	285	942	2145	812	631	69	1028	23	4	34	25	21	8	10	32	18	22	21	47	30	7
Standard Deviation (n-1)	252.62	386.66	1177.68	483.64	561.51	26.41	661.38	4.99	2.66	21.68	19.54	11.17	9.81	5.28	10.54	10.80	3.70	9.44	18.82	25.79	3.89
Standard Error	112.98	172.92	526.68	216.29	251.11	11.81	295.78	2.23	1.19	9.70	8.74	5.00	4.39	2.36	4.71	4.83	1.65	4.22	8.41	11.53	1.74
More than ±50% of Pre-impoundment Mean	--	--	--	--	no	lower	no	--	--	--	--	no	lower	lower	--	--	--	--	higher	no	lower

Table A6-20: Continued.

SPLIT LAKE IE KICKNET	Total Richness (no. of taxa)							EPT Richness (no. of taxa)							Diversity Index (Simpson's D)							Evenness Index (Simpson's E)						
	2010	2011	2012	2013	2021	2022	2023	2010	2011	2012	2013	2021	2022	2023	2010	2011	2012	2013	2021	2022	2023	2010	2011	2012	2013	2021	2022	2023
No. of Samples (n)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Minimum	11	12	15	12	18	5	13	3	3	5	4	5	0	3	0.72	0.30	0.59	0.45	0.73	0.63	0.32	0.22	0.10	0.13	0.12	0.18	0.31	0.09
Maximum	17	14	22	16	21	11	19	7	5	8	7	8	4	7	0.85	0.71	0.81	0.83	0.85	0.85	0.48	0.60	0.27	0.29	0.42	0.34	0.84	0.13
1st Quartile	11	13	16	13	19	6	15	3	4	5	4	6	1	5	0.73	0.43	0.66	0.46	0.77	0.64	0.38	0.30	0.13	0.14	0.15	0.22	0.40	0.10
Median	12	14	18	15	20	8	16	4	4	6	5	7	3	6	0.82	0.47	0.77	0.76	0.77	0.71	0.44	0.42	0.13	0.27	0.28	0.24	0.46	0.10
3rd Quartile	13	14	20	15	20	11	18	5	4	6	5	7	3	6	0.83	0.47	0.78	0.82	0.82	0.77	0.48	0.54	0.15	0.28	0.38	0.27	0.56	0.12
Mean	13	13	18	14	20	8	16	4	4	6	5	7	2	5	0.79	0.48	0.72	0.66	0.79	0.72	0.42	0.42	0.16	0.22	0.27	0.25	0.51	0.11
Standard Deviation (n-1)	2.49	0.89	2.86	1.64	1.14	2.77	2.39	1.67	0.71	1.22	1.22	1.14	1.64	1.52	0.06	0.15	0.09	0.19	0.05	0.09	0.07	0.16	0.06	0.08	0.14	0.06	0.20	0.02
Standard Error	1.11	0.40	1.28	0.73	0.51	1.24	1.07	0.75	0.32	0.55	0.55	0.51	0.73	0.68	0.03	0.07	0.04	0.09	0.02	0.04	0.03	0.07	0.03	0.04	0.06	0.03	0.09	0.01
More than ±50% of Pre-impoundment Mean	--	--	--	--	no	no	no	--	--	--	--	no	lower	no	--	--	--	--	no	no	no	--	--	--	--	no	higher	lower

Table A6-21: Split Lake - supporting site data, predominantly wetted (PW), pre-Project (2001, 2002, and 2009) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2001	678110	6226579	Ekman (tall)	2.1	2.1	5.1	16.4	78.5	--
		678110	6226579	Ekman (tall)	2.1	--	--	--	--	--
		678110	6226579	Ekman (tall)	2.1	--	--	--	--	--
		678110	6226579	Ekman (tall)	2.1	--	--	--	--	--
	2002	678110	6226579	Ekman (tall)	1.8	1.8	--	--	--	--
		678110	6226579	Ekman (tall)	1.8	--	--	--	--	--
		678110	6226579	Ekman (tall)	1.8	--	--	--	--	--
		678110	6226579	Ekman (tall)	1.8	--	--	--	--	--
	2009	673635	6232803	Ekman (tall)	2.4	--	--	--	--	--
		673687	6232772	Ekman (tall)	2.4	--	--	--	--	--
		673742	6232711	Ekman (tall)	2.5	--	--	--	--	--
		673703	6232742	Ekman (tall)	2.7	--	--	--	--	--
		673617	6232721	Ekman (tall)	2.7	2.7	2.9	6.0	94.0	Silty clay
		673612	6232774	Ekman (tall)	2.7	--	--	--	--	--
		673659	6232751	Ekman (tall)	2.7	--	--	--	--	--
		673767	6232727	Ekman (tall)	2.4	2.4	3.2	6.0	94.0	Silty clay
		673715	6232668	Ekman (tall)	2.6	--	--	--	--	--
		673584	6232777	Ekman (tall)	2.7	--	--	--	--	--
		673750	6232771	Ekman (tall)	2.6	--	--	--	--	--
		673600	6232738	Ekman (tall)	2.7	--	--	--	--	--
		673673	6232805	Ekman (tall)	2.9	--	--	--	--	--
		673750	6232686	Ekman (tall)	2.3	--	--	--	--	--
		673564	6232750	Ekman (tall)	2.0	2.0	3.1	5.0	94.0	Silty clay loam

Table A6-21: Continued.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Operation	2021	673659	6233003	Petite Ponar	1.2	1.2	2.1	17.5	82.6	Silt loam
		673662	6233009	Petite Ponar	1.1	1.1	2.5	30.3	69.7	Silt loam
		673690	6233051	Petite Ponar	1.0	1.0	2.4	43.9	56.1	Loam
		673717	6233076	Petite Ponar	1.0	1.0	1.4	63.3	36.7	Sandy loam
		673748	6233088	Petite Ponar	1.1	1.2	1.0	64.3	35.7	Sandy loam
	2022	673656	6233022	Petite Ponar	2.8	3.3	3.0	8.5	91.5	Silt loam
		673663	6233005	Petite Ponar	3.3	2.8	4.5	29.4	70.6	Silt loam
		673683	6233055	Petite Ponar	3.0	3.0	4.2	25.5	74.5	Silt loam
		673721	6233075	Petite Ponar	3.4	3.4	1.6	47.2	52.8	Loam
		673756	6233085	Petite Ponar	3.5	3.5	1.6	32.1	67.9	Silt loam
	2023	673665	6233005	Ekman (tall)	1.3	1.3	3.0	33.5	66.6	Loam
		673659	6233020	Ekman (tall)	1.0	1.0	3.1	51.1	48.9	Loam
		673691	6233045	Ekman (tall)	1.3	1.3	3.3	31.7	68.3	Loam
		673714	6233079	Ekman (tall)	1.2	1.2	2.1	54.3	45.8	Sandy loam
		673755	6233089	Ekman (tall)	1.6	1.6	1.8	44.0	56.0	Loam

Table A6-22: Split Lake - benthic invertebrate community metrics, predominantly wetted (PW), pre-Project (2001, 2002, and 2009) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2001	2381	27.3	60.0	0.5	5	1	0.56	0.45
		2640	31.1	59.0	0.5	6	1	0.57	0.39
		2900	22.4	59.7	0.4	8	2	0.63	0.33
		3549	15.9	78.0	0.3	6	1	0.55	0.37
	2002	866	30.0	40.0	0.8	4	1	0.70	0.84
		1255	55.2	34.5	1.6	5	1	0.57	0.47
		3030	41.4	38.6	1.1	8	2	0.69	0.40
		2424	30.4	55.4	0.5	6	1	0.60	0.41
	2009	433	40.0	0.0	--	4	1	0.70	0.84
		260	16.7	16.7	1.0	4	1	0.67	0.76
		173	50.0	50.0	--	2	1	0.50	--
		43	100.0	0.0	--	1	1	0	--
		260	33.3	16.7	2.0	5	1	0.8	0.9
		476	72.7	0.0	--	3	1	0.4	0.6
		216	40.0	0.0	--	3	1	0.6	0.9
		346	12.5	62.5	0.2	4	1	0.6	0.6
		1601	18.9	78.4	0.3	5	2	0.4	0.3
		173	50.0	25.0	--	3	1	0.6	0.9
		260	33.3	0.0	--	3	1	0.6	0.9
		43	0.0	0.0	--	1	0	0	--
		1212	42.9	42.9	1.0	5	1	0.63	0.53
		87	50.0	50.0	1.0	2	1	0.51	--
		43	100.0	0.0	--	1	1	0	--
Operation	2021	822	45.6	26.3	5.2	9	1	0.74	0.42
		664	2.2	50.0	0.1	9	1	0.81	0.57
		2381	30.9	6.1	12.8	13	4	0.78	0.35
		635	4.5	15.9	1.0	8	1	0.81	0.65
		880	57.4	4.9	35.0	9	1	0.64	0.31
	2022	909	27.0	0.0	--	9	2	0.82	0.61
		519	22.2	0.0	--	6	1	0.82	0.92
		1169	33.3	9.9	--	11	3	0.83	0.52
		2150	11.4	62.4	0.2	8	1	0.58	0.30
		1226	36.5	20.0	1.8	7	1	0.78	0.64
	2023	2741	22.11	61.58	0.36	8	2	0.57	0.29
		22334	1.10	13.44	0.09	16	3	0.31	0.09
		10648	4.74	8.81	0.54	15	5	0.33	0.10
		8036	3.59	9.34	0.40	14	4	0.31	0.10
		1731	34.17	51.67	0.66	8	2	0.62	0.33

Table A6-23: Split Lake – Predominantly wetted (PW) - substrate statistics and assessment results.

SPLIT LAKE PW GRAB	Water Depth (m)						Total Organic Carbon (%)						Sand (%)						Silt/Clay (%)					
	2001	2002	2009	2021	2022	2023	2001	2002	2009	2021	2022	2023	2001	2002	2009	2021	2022	2023	2001	2002	2009	2021	2022	2023
No. of Samples (n)	4	4	15	5	5	5	1	0	3	5	5	5	1	0	3	5	5	5	1	0	3	5	5	5
Minimum	2.13	1.83	2.00	1.00	2.80	0.95	5.08		2.92	0.96	1.55	1.76	16.38		5.00	17.50	8.50	31.70	78.48		94.00	35.70	52.80	45.80
Maximum	2.13	1.83	2.90	1.20	3.50	1.55	5.08		3.20	2.48	4.45	3.32	16.38		6.00	64.30	47.20	54.30	78.48		94.00	82.60	91.50	68.30
1st Quartile	2.13	1.83	2.40	1.00	3.00	1.20	5.08		2.99	1.44	1.62	2.06	16.38		5.50	30.30	25.50	33.50	78.48		94.00	36.70	67.90	48.90
Median	2.13	1.83	2.60	1.10	3.30	1.25	5.08		3.06	2.08	3.00	2.95	16.38		6.00	43.90	29.40	44.00	78.48		94.00	56.10	70.60	56.00
3rd Quartile	2.13	1.83	2.70	1.10	3.40	1.30	5.08		3.13	2.41	4.18	3.06	16.38		6.00	63.30	32.10	51.10	78.48		94.00	69.70	74.50	66.60
Mean	2.13	1.83	2.55	1.08	3.20	1.25	5.08		3.06	1.87	2.96	2.63	16.38		5.67	43.86	28.54	42.92	78.48		94.00	56.16	71.46	57.12
Standard Deviation (n-1)	0.00	0.00	0.22	0.08	0.29	0.22			0.14	0.66	1.37	0.68			0.58	20.46	13.90	10.15			0.00	20.49	13.90	10.15
Standard Error	0.00	0.00	0.06	0.04	0.13	0.10			0.08	0.29	0.61	0.30			0.33	9.15	6.21	4.54			0.00	9.16	6.21	4.54
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	--	--	no	no	no	--	--	--	higher	higher	higher	--	--	--	no	no	no

Table A6-24: Split Lake – Predominantly wetted (PW) - benthic invertebrate community metrics.

SPLIT LAKE PW GRAB	Total Abundance (no. per m^2)						EPT Index (%)						O+C Index (%)						EPT:C					
	2001	2002	2009	2021	2022	2023	2001	2002	2009	2021	2022	2023	2001	2002	2009	2021	2022	2023	2001	2002	2009	2021	2022	2023
No. of Samples (n)	4	4	15	5	5	5	4	4	15	5	5	5	4	4	15	5	5	5	4	4	6	5	2	5
Minimum	2381	866	43	635	519	1731	16	30	0	2	11	1	59	34	0	5	0	9	0.25	0.55	0.20	0.13	0.18	0.09
Maximum	3549	3030	1601	2381	2150	22334	31	55	100	57	36	34	78	55	78	50	62	62	0.54	1.60	2.00	35.00	1.82	0.66
1st Quartile	2575	1158	130	664	909	2741	21	30	26	5	22	4	60	38	0	6	0	9	0.36	0.70	0.44	1.00	0.59	0.36
Median	2770	1840	260	822	1169	8036	25	36	40	31	27	5	60	39	17	16	10	13	0.42	0.93	1.00	5.20	1.00	0.40
3rd Quartile	3062	2575	390	880	1226	10648	28	45	50	46	33	22	65	44	46	26	20	52	0.48	1.24	1.00	12.75	1.41	0.54
Mean	2867	1894	375	1076	1195	9098	24	39	44	28	26	13	64	42	23	21	18	29	0.41	1.00	0.91	10.82	1.00	0.41
Standard Deviation (n-1)	501.50	1006.03	445.52	736.41	602.37	8267.28	6.60	11.87	29.00	24.49	9.89	14.40	9.25	9.14	27.08	18.55	25.93	25.55	0.12	0.46	0.66	14.41	1.16	0.21
Standard Error	250.75	503.01	115.03	329.33	269.39	3697.24	3.30	5.94	7.49	10.95	4.42	6.44	4.62	4.57	6.99	8.30	11.60	11.43	0.06	0.23	0.27	6.45	0.82	0.10
More than ±50% of Pre-impoundment Mean	--	--	--	no	no	higher	--	--	--	no	no	lower	--	--	--	no	no	no	--	--	--	higher	no	no

Table A6-24: Continued.

SPLIT LAKE PW GRAB	Total Richness (no. of taxa)						EPT Richness (no. of taxa)						Diversity Index (Simpson's D)						Evenness Index (Simpson's E)					
	2001	2002	2009	2021	2022	2023	2001	2002	2009	2021	2022	2023	2001	2002	2009	2021	2022	2023	2001	2002	2009	2021	2022	2023
No. of Samples (n)	4	4	15	5	5	5	4	4	15	5	5	5	4	4	15	5	5	5	4	4	13	5	5	5
Minimum	5	4	1	8	6	8	1	1	0	1	1	2	0.55	0.57	0.00	0.64	0.58	0.31	0.33	0.40	0.33	0.31	0.30	0.09
Maximum	8	8	5	13	11	16	2	2	2	4	3	5	0.63	0.70	0.78	0.81	0.83	0.62	0.45	0.84	1.00	0.65	0.92	0.33
1st Quartile	6	5	2	9	7	8	1	1	1	1	1	2	0.56	0.59	0.41	0.74	0.78	0.31	0.36	0.41	0.59	0.35	0.52	0.10
Median	6	6	3	9	8	14	1	1	1	1	1	3	0.56	0.64	0.56	0.78	0.82	0.33	0.38	0.44	0.86	0.42	0.61	0.10
3rd Quartile	7	7	4	9	9	15	1	1	1	1	2	4	0.58	0.69	0.64	0.81	0.82	0.57	0.40	0.56	0.93	0.57	0.64	0.29
Mean	6	6	3	10	8	12	1	1	1	2	2	3	0.58	0.64	0.47	0.76	0.76	0.43	0.39	0.53	0.79	0.46	0.60	0.18
Standard Deviation (n-1)	1.26	1.71	1.44	1.95	1.92	3.90	0.50	0.50	0.38	1.34	0.89	1.30	0.03	0.06	0.26	0.07	0.11	0.15	0.05	0.21	0.21	0.14	0.22	0.12
Standard Error	0.63	0.85	0.37	0.87	0.86	1.74	0.25	0.25	0.10	0.60	0.40	0.58	0.02	0.03	0.07	0.03	0.05	0.07	0.03	0.10	0.06	0.06	0.10	0.05
More than ±50% of Pre-impoundment Mean	--	--	--	higher	higher	higher	--	--	--	no	no	higher	--	--	--	no	no	no	--	--	--	no	no	lower

Table A6-25: Split Lake - supporting site data, offshore (OS), pre-Project (2001, 2002, and 2009 to 2013) and Operation (2021 to 2023). Red text refers to parameters recalculated as one half of the detection limit.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water Depths (m)		Supporting Sediment Analysis			
		Easting	Northing		Invertebrate	Sediment	% Total Organic Carbon	% Sand	% Silt/Clay	Texture
Pre-Project	2001	678458	6233994	Ekman (tall)	6.5	6.5	4.1	5.9	90.0	--
		678458	6233994	Ekman (tall)	6.5	--	--	--	--	--
		678458	6233994	Ekman (tall)	6.5	--	--	--	--	--
		678458	6233994	Ekman (tall)	6.5	--	--	--	--	--
		675280	6231471	Ekman (tall)	7.3	7.3	3.6	0.8	95.6	--
		675280	6231471	Ekman (tall)	7.3	--	--	--	--	--
		675280	6231471	Ekman (tall)	7.3	--	--	--	--	--
		675280	6231471	Ekman (tall)	7.3					--
	2002	678458	6233994	Ekman (tall)	5.9	5.9	4.7	--	--	--
		678458	6233994	Ekman (tall)	5.9	--	--	--	--	--
		678458	6233994	Ekman (tall)	5.9	--	--	--	--	--
		678458	6233994	Ekman (tall)	5.9	--	--	--	--	--
		675280	6231471	Ekman (tall)	7.5	7.5	4.4	--	--	--
		675280	6231471	Ekman (tall)	7.5	--	--	--	--	--
		675280	6231471	Ekman (tall)	7.5	--	--	--	--	--
		675280	6231471	Ekman (tall)	7.5	--	--	--	--	--
	2009	678472	6233989	Ekman (tall)	7.0	--	--	--	--	--
		678552	6234040	Ekman (tall)	7.0	--	--	--	--	--
		678422	6233990	Ekman (tall)	9.6	--	--	--	--	--
		678504	6233967	Ekman (tall)	6.8	6.8	1.3	14.0	87.0	Silt loam
		678444	6234012	Ekman (tall)	9.4	--	--	--	--	--
		678478	6233956	Ekman (tall)	6.9	--	--	--	--	--
		678521	6234051	Ekman (tall)	7.7	--	--	--	--	--
		678529	6233934	Ekman (tall)	9.1	--	--	--	--	--
		678378	6233967	Ekman (tall)	9.8	--	--	--	--	--
		678530	6234004	Ekman (tall)	6.6	--	--	--	--	--
		678563	6233955	Ekman (tall)	8.4	--	--	--	--	--
		678400	6234049	Ekman (tall)	9.8	--	--	--	--	--
		678436	6234042	Ekman (tall)	9.8	9.8	1.0	16.0	84.0	Silty clay loam

Table A6-25: Continued.

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water depth (max, m)	Sediment depth (m)	Supporting Sediment Analysis			
		Easting	Northing				TOC (%)	% Sand	% Silt + Clay	Texture
Pre-Project	2009	678367	6233995	Ekman (tall)	10.4	--	--	--	--	--
		678474	6234054	Ekman (tall)	10.5	10.5	0.7	27.0	73.0	Loam
	2010	678456	6233986	Ekman (tall)	6.0	4.6	1.1	6.1	93.9	Silty clay loam
		678491	6233977	Ekman (tall)	7.2	7.3	1.1	5.6	94.4	Silt loam
		678433	6234002	Ekman (tall)	8.8	7.8	1.5	1.0	99.0	Silty clay
		678496	6233948	Ekman (tall)	6.5	6.9	1.4	4.4	95.7	Silty clay loam
		678498	6234042	Ekman (tall)	8.3	7.7	1.4	4.9	95.0	Silty clay loam
	2011	678457	6233993	Ekman (tall)	8.2	8.2	1.3	17.8	82.2	Silt loam/Silty clay loam
		678487	6233980	Ekman (tall)	7.2	7.2	1.2	18.7	81.2	Silt loam
		678508	6233951	Ekman (tall)	7.1	10.3	1.3	16.2	83.9	Silty clay loam
		678509	6234052	Ekman (tall)	9.6	7.1	1.4	14.1	85.9	Silt loam
		678432	6234008	Ekman (tall)	10.3	9.4	1.2	11.4	88.5	Silty clay loam
	2012	678461	6233977	Petite Ponar	6.3	6.1	1.2	24.9	75.2	Silt loam
		678507	6233972	Petite Ponar	5.7	5.6	1.3	20.9	79.1	Silt loam
		678429	6234003	Petite Ponar	6.8	6.7	1.3	16.5	83.5	Silt loam
		678490	6233954	Petite Ponar	5.7	5.8	1.3	16.8	83.2	Silt loam
		678500	6234041	Petite Ponar	6.7	6.5	1.4	21.9	78.1	Silt loam
	2013	678461	6233976	Ekman (tall)	7.0	6.9	1.1	17.8	82.2	Silt loam
		678510	6233979	Ekman (tall)	6.3	6.2	1.2	17.6	82.4	Silt
		678436	6234005	Ekman (tall)	9.1	9.1	1.0	19.0	80.9	Silty clay loam
		678489	6233960	Ekman (tall)	6.4	6.3	1.0	19.5	80.5	Silt loam
		678506	6234046	Ekman (tall)	8.3	8.2	1.1	19.0	81.0	Silt loam
Operation	2021	678452	6233988	Petite Ponar	5.7	5.6	1.4	11.3	88.7	Silty clay loam
		678506	6233968	Petite Ponar	5.0	4.5	1.1	29.0	71.0	Silt loam
		678435	6234001	Petite Ponar	7.4	7.3	1.2	21.2	78.8	Silt loam
		678515	6233945	Petite Ponar	4.6	5.8	1.4	25.9	74.0	Silt loam
		678492	6234037	Petite Ponar	7.1	6.8	1.4	17.7	82.3	Silty clay loam

Table A6-25: Continued

Phase	Year	NAD83 UTM Z15		BMI Sampler	Water depth (max, m)	Sediment depth (m)	Supporting Sediment Analysis			
		Easting	Northing				TOC (%)	% Sand	% Silt + Clay	Texture
Operation	2022	678455	6233993	Petite Ponar	8.3	8.3	1.9	9.4	90.6	Silty clay loam
		678531	6233974	Petite Ponar	6.9	6.9	1.7	10.6	89.4	Silty clay loam
		678435	6234006	Petite Ponar	9.2	9.2	1.5	18.5	81.5	Silt loam
		678513	6233944	Petite Ponar	7.4	7.4	1.5	13.1	86.9	Silty clay loam
		678491	6234040	Petite Ponar	10.2	10.2	1.5	24.1	75.9	Silt loam
	2023	678441	6233979	Petite Ponar	6.2	6.1	1.3	23.8	76.3	Silt loam
		678513	6233976	Petite Ponar	8.5	8.5	1.3	23.4	76.5	Silt loam
		678439	6234013	Petite Ponar	5.4	5.4	1.3	7.7	92.3	Silt loam
		678515	6233951	Petite Ponar	5.9	5.9	1.3	20.8	79.2	Silt loam
		678492	6234043	Petite Ponar	8.6	8.6	1.3	23.6	76.4	Silt loam

Table A6-26: Split Lake - benthic invertebrate community metrics, offshore (OS), pre-Project (2001, 2002, and 2009 to 2013) and Operation (2021 to 2023).

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2001	1775	22.0	22.0	--	5	1	0.72	0.72
		866	25.0	40.0	1.7	6	1	0.79	0.78
		1342	12.9	35.5	--	7	2	0.73	0.53
		1212	14.3	39.3	--	6	1	0.73	0.62
		866	30.0	10.0	6.0	7	2	0.75	0.56
		1688	15.4	17.9	1.0	7	1	0.75	0.57
		2337	27.8	18.5	2.5	9	2	0.84	0.68
		2034	10.6	19.1	1.0	8	2	0.83	0.72
	2002	1169	48.1	18.5	4.3	4	1	0.64	0.69
		1298	36.7	10.0	3.7	4	1	0.66	0.73
		649	73.3	20.0	3.7	3	1	0.42	0.57
		476	63.6	18.2	3.5	4	1	0.55	0.55
		1039	29.2	29.2	1.4	6	1	0.80	0.85
		260	33.3	16.7	2.0	5	1	0.78	0.91
		390	11.1	33.3	0.5	5	1	0.72	0.71
		260	66.7	0.0	--	2	1	0.45	0.90
	2009	5757	24.1	2.3	10.7	6	1	0.68	0.52
		4328	10.0	0.0	--	4	1	0.50	0.50
		6016	34.5	3.6	24.0	8	3	0.68	0.39
		5973	24.6	6.5	4.9	7	2	0.66	0.42
		8137	34.6	0.0	--	5	2	0.63	0.54
		4285	23.2	2.0	23.0	6	1	0.63	0.45
		6968	19.9	0.6	32.0	5	1	0.40	0.34
		4545	60.0	0.0	--	6	2	0.56	0.38
		5973	43.5	0.0	--	4	1	0.63	0.68
		4501	14.4	0.0	--	7	2	0.70	0.48
		5021	51.7	2.6	30.0	5	1	0.55	0.44
		2467	15.8	3.5	9.0	8	2	0.62	0.33
		1775	14.6	0.0	--	4	2	0.62	0.66
		7488	32.4	0.6	56.0	8	3	0.70	0.41
		1212	25.0	3.6	7.0	5	1	0.63	0.55
	2010	4574	31.2	12.3	3.3	12	3	0.77	0.37
		6420	11.9	5.8	2.1	10	2	0.67	0.30
		4747	18.2	10.0	1.9	9	1	0.76	0.46
		3996	38.6	8.7	4.9	8	1	0.75	0.49
		4848	15.2	10.1	1.6	8	2	0.77	0.55
	2011	4530	23.6	1.6	14.8	10	4	0.75	0.41
		6593	20.6	2.2	9.4	10	4	0.68	0.31
		5064	29.3	3.1	11.4	10	3	0.77	0.44
		4732	19.8	2.7	7.2	8	3	0.70	0.42
		4271	24.7	3.7	8.1	9	2	0.76	0.46

Table A6-26: Continued.

Phase	Year	Total Abundance (no. per m²)	EPT Index	O+C Index	EPT:C	Total Richness	EPT Richness	Simpson's Diversity Index	Simpson's Evenness Index
Pre-Project	2012	2986	26.1	16.4	1.6	7	3	0.74	0.56
		2611	21.0	14.9	1.7	8	1	0.71	0.43
		3160	21.0	13.7	1.8	9	2	0.74	0.43
		2179	22.5	13.9	1.8	7	1	0.79	0.67
		3968	16.7	9.8	2.1	7	2	0.65	0.41
	2013	4040	41.8	5.7	7.8	10	3	0.69	0.32
		12162	13.3	4.0	3.5	10	2	0.78	0.46
		19362	14.0	4.9	3.2	10	2	0.80	0.51
		12595	13.3	2.7	4.8	7	2	0.65	0.40
		25104	3.4	1.4	3.0	7	2	0.66	0.42
Operation	2021	58	50.0	0.0	--	3	2	0.64	0.92
		404	21.4	7.1	--	7	1	0.69	0.45
		418	3.4	6.9	0.5	5	1	0.62	0.52
		1587	4.5	0.0	--	4	1	0.23	0.33
		1068	10.8	2.7	8.0	6	1	0.51	0.34
	2022	260	55.6	16.7	3.3	4	1	0.61	0.65
		245	47.1	47.1	1.3	4	1	0.64	0.69
		72	60.0	20.0	3.0	3	1	0.57	0.77
		216	53.3	40.0	1.3	3	1	0.55	0.75
		851	16.9	10.2	5.0	7	3	0.47	0.27
	2023	2121	5.4	1.4	4	8	4	0.16	0.15
		159	36.4	18.2	2	4	2	0.68	0.79
		188	46.2	30.8	1.5	5	2	0.73	0.73
		231	37.5	18.8	2	6	2	0.78	0.77
		1125	3.8	1.3	3	5	2	0.12	0.23

Table A6-27: Split Lake - Offshore - benthic invertebrate community metrics.

SPLIT LAKE OS GRAB	Water Depth (m)										Total Organic Carbon (%)									
	2001	2002	2009	2010	2011	2012	2013	2021	2022	2023	2001	2002	2009	2010	2011	2012	2013	2021	2022	2023
No. of Samples (n)	8	8	15	5	5	5	5	5	5	5	2	2	3	5	5	5	5	5	5	5
Minimum	6.5	5.9	6.6	6.0	7.1	5.7	6.3	4.6	6.9	5.4	3.63	4.40	0.70	1.09	1.16	1.19	1.01	1.13	1.48	1.27
Maximum	7.3	7.5	10.5	8.8	10.3	6.8	9.1	7.4	10.2	8.6	4.09	4.70	1.28	1.54	1.43	1.37	1.15	1.37	1.88	1.30
1st Quartile	6.5	5.9	7.0	6.5	7.2	5.7	6.4	5.0	7.4	5.9	3.74	4.48	0.84	1.13	1.17	1.28	1.04	1.17	1.52	1.27
Median	6.9	6.7	9.1	7.2	8.2	6.3	7.0	5.7	8.3	6.2	3.86	4.55	0.97	1.38	1.30	1.30	1.05	1.35	1.53	1.27
3rd Quartile	7.3	7.5	9.8	8.3	9.6	6.7	8.3	7.1	9.2	8.5	3.97	4.63	1.13	1.40	1.33	1.34	1.08	1.35	1.69	1.29
Mean	6.9	6.7	8.6	7.4	8.5	6.2	7.4	6.0	8.4	6.9	3.86	4.55	0.98	1.31	1.28	1.30	1.07	1.27	1.62	1.28
Standard Deviation (n-1)	0.45	0.83	1.44	1.17	1.43	0.54	1.23	1.25	1.34	1.52	0.32	0.21	0.29	0.19	0.11	0.07	0.05	0.11	0.17	0.01
Standard Error	0.16	0.29	0.37	0.52	0.64	0.24	0.55	0.56	0.60	0.68	0.23	0.15	0.17	0.09	0.05	0.03	0.02	0.05	0.07	0.01
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	no	no	no

Table A6-27: Continued.

SPLIT LAKE OS GRAB	Sand (%)										Silt/Clay (%)									
	2001	2002	2009	2010	2011	2012	2013	2021	2022	2023	2001	2002	2009	2010	2011	2012	2013	2021	2022	2023
No. of Samples (n)	2	0	3	5	5	5	5	5	5	5	2	0	3	5	5	5	5	5	5	5
Minimum	0.77		14.00	0.99	11.40	16.50	17.60	11.30	9.40	7.70	90.00		73.00	93.90	81.20	75.16	80.50	71.00	75.90	76.30
Maximum	5.92		27.00	6.08	18.70	24.90	19.50	29.00	24.10	23.80	95.60		87.00	99.00	88.50	83.47	82.42	88.70	90.60	92.30
1st Quartile	2.06		15.00	4.35	14.10	16.80	17.80	17.70	10.60	20.80	91.40		78.50	94.40	82.20	78.14	80.90	74.00	81.50	76.40
Median	3.35		16.00	4.94	16.20	20.90	19.00	21.20	13.10	23.40	92.80		84.00	95.00	83.90	79.11	81.00	78.80	86.90	76.50
3rd Quartile	4.63		21.50	5.59	17.80	21.90	19.00	25.90	18.50	23.60	94.20		85.50	95.70	85.90	83.15	82.20	82.30	89.40	79.20
Mean	3.35		19.00	4.39	15.64	20.20	18.58	21.02	15.14	19.86	92.80		81.33	95.60	84.34	79.81	81.40	78.96	84.86	80.14
Standard Deviation (n-1)	3.64		7.00	2.01	2.94	3.56	0.83	6.95	6.11	6.91	3.96		7.37	2.02	2.93	3.52	0.85	6.96	6.11	6.91
Standard Error	2.57		4.04	0.90	1.32	1.59	0.37	3.11	2.73	3.09	2.80		4.26	0.90	1.31	1.57	0.38	3.11	2.73	3.09
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	no	no	no	--	--	--	--	--	--	--	no	no	no

Table A6-28: Split Lake – Offshore - substrate statistics and assessment results.

SPLIT LAKE OS GRAB	Total Abundance (no. per m^2)										EPT Index (%)									
	2001	2002	2009	2010	2011	2012	2013	2021	2022	2023	2001	2002	2009	2010	2011	2012	2013	2021	2022	2023
No. of Samples (n)	8	8	15	5	5	5	5	5	5	5	8	8	15	5	5	5	5	5	5	5
Minimum	866	260	1212	3996	4271	2179	4040	58	72	159	11	11	10	12	20	17	3	3	17	4
Maximum	2337	1298	8137	6420	6593	3968	25104	1587	851	2121	30	73	60	39	29	26	42	50	60	46
1st Quartile	1125	357	4307	4574	4530	2611	12162	404	216	188	14	32	18	15	21	21	13	5	47	5
Median	1515	563	5021	4747	4732	2986	12595	418	245	231	19	42	25	18	24	21	13	11	53	36
3rd Quartile	1840	1071	5995	4848	5064	3160	19362	1068	260	1125	26	64	35	31	25	23	14	21	56	38
Mean	1515	693	4963	4917	5038	2981	14653	707	329	765	20	45	29	23	24	21	17	18	47	26
Standard Deviation (n-1)	535.63	419.00	1999.49	902.64	916.54	668.17	7976.10	612.62	301.32	859.44	7.37	21.49	14.36	11.39	3.80	3.37	14.44	19.24	17.21	19.74
Standard Error	189.37	148.14	516.27	403.67	409.89	298.81	3567.02	273.97	134.76	384.35	2.61	7.60	3.71	5.09	1.70	1.51	6.46	8.60	7.70	8.83
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	lower	lower	lower	--	--	--	--	--	--	--	no	higher	no

Table A6-28: Continued.

SPLIT LAKE OS GRAB	O+C Index (%)										EPT:C									
	2001	2002	2009	2010	2011	2012	2013	2021	2022	2023	2001	2002	2009	2010	2011	2012	2013	2021	2022	2023
No. of Samples (n)	8	8	15	5	5	5	5	5	5	5	5	7	9	5	5	5	5	2	5	5
Minimum	10	0	0	6	2	10	1	0	10	1	1	1	5	2	7	2	3	1	1	2
Maximum	40	33	7	12	4	16	6	7	47	31	6	4	56	5	15	2	8	8	5	4
1st Quartile	18	15	0	9	2	14	3	0	17	1	1	2	9	2	8	2	3	2	1	2
Median	21	18	1	10	3	14	4	3	20	18	2	4	23	2	9	2	4	4	3	2
3rd Quartile	36	22	3	10	3	15	5	7	40	19	3	4	30	3	11	2	5	6	3	3
Mean	25	18	2	9	3	14	4	3	27	14	2	3	22	3	10	2	4	4	3	3
Standard Deviation (n-1)	11.33	10.37	1.97	2.37	0.82	2.45	1.73	3.53	15.89	12.68	2.09	1.43	16.36	1.34	3.02	0.18	1.99	5.30	1.54	1.00
Standard Error	4.01	3.67	0.51	1.06	0.37	1.10	0.77	1.58	7.11	5.67	0.93	0.54	5.45	0.60	1.35	0.08	0.89	3.75	0.69	0.45
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	lower	higher	no	--	--	--	--	--	--	--	no	lower	lower

Table A6-28: Continued.

SPLIT LAKE OS GRAB	Total Richness (no. of taxa)										EPT Richness (no. of taxa)									
	2001	2002	2009	2010	2011	2012	2013	2021	2022	2023	2001	2002	2009	2010	2011	2012	2013	2021	2022	2023
No. of Samples (n)	8	8	15	5	5	5	5	5	5	5	8	8	15	5	5	5	5	5	5	5
Minimum	5	2	4	8	8	7	7	3	3	4	1	1	1	1	2	1	2	1	1	2
Maximum	9	6	8	12	10	9	10	7	7	8	2	1	3	3	4	3	3	2	3	4
1st Quartile	6	4	5	8	9	7	7	4	3	5	1	1	1	1	3	1	2	1	1	2
Median	7	4	6	9	10	7	10	5	4	5	2	1	2	2	3	2	2	1	1	2
3rd Quartile	7	5	7	10	10	8	10	6	4	6	2	1	2	2	4	2	2	1	1	2
Mean	7	4	6	9	9	8	9	5	4	6	2	1	2	2	3	2	2	1	1	2
Standard Deviation (n-1)	1.25	1.25	1.46	1.67	0.89	0.89	1.64	1.58	1.64	1.52	0.53	0.00	0.72	0.84	0.84	0.84	0.45	0.45	0.89	0.89
Standard Error	0.44	0.44	0.38	0.75	0.40	0.40	0.73	0.71	0.73	0.68	0.19	0.00	0.19	0.37	0.37	0.37	0.20	0.20	0.40	0.40
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	no	no	no	--	--	--	--	--	--	--	no	no	no

Table A6-28: Continued.

SPLIT LAKE OS GRAB	Diversity Index (Simpson's D)										Evenness Index (Simpson's E)									
	2001	2002	2009	2010	2011	2012	2013	2021	2022	2023	2001	2002	2009	2010	2011	2012	2013	2021	2022	2023
No. of Samples (n)	8	8	15	5	5	5	5	5	5	5	8	8	15	5	5	5	5	5	5	5
Minimum	0.72	0.42	0.40	0.67	0.68	0.65	0.65	0.23	0.47	0.12	0.53	0.55	0.33	0.30	0.31	0.41	0.32	0.33	0.27	0.15
Maximum	0.84	0.80	0.70	0.77	0.77	0.79	0.80	0.69	0.64	0.78	0.78	0.91	0.68	0.55	0.46	0.67	0.51	0.92	0.77	0.79
1st Quartile	0.73	0.52	0.59	0.75	0.70	0.71	0.66	0.51	0.55	0.16	0.57	0.66	0.40	0.37	0.41	0.43	0.40	0.34	0.65	0.23
Median	0.75	0.65	0.63	0.76	0.75	0.74	0.69	0.62	0.57	0.68	0.65	0.72	0.45	0.46	0.42	0.43	0.42	0.45	0.69	0.73
3rd Quartile	0.80	0.73	0.67	0.77	0.76	0.74	0.78	0.64	0.61	0.73	0.72	0.86	0.53	0.49	0.44	0.56	0.46	0.52	0.75	0.77
Mean	0.77	0.63	0.61	0.74	0.73	0.73	0.72	0.54	0.57	0.49	0.65	0.74	0.47	0.43	0.41	0.50	0.42	0.51	0.63	0.53
Standard Deviation (n-1)	0.05	0.14	0.08	0.04	0.04	0.05	0.07	0.18	0.06	0.33	0.09	0.14	0.10	0.10	0.06	0.11	0.07	0.24	0.20	0.32
Standard Error	0.02	0.05	0.02	0.02	0.02	0.02	0.03	0.08	0.03	0.15	0.03	0.05	0.03	0.05	0.03	0.05	0.03	0.11	0.09	0.14
More than ±50% of Pre-impoundment Mean	--	--	--	--	--	--	--	no	no	no	--	--	--	--	--	--	--	no	no	no

APPENDIX 7: RESULTS OF PRE- VS POST-IMPOUNDMENT BENTHIC INVERTEBRATE STATISTICAL COMPARISONS

Table A7-1: Sediment statistics results for Keeyask reservoir Zone 1a intermittently exposed habitat (at kicknet sites) comparing pre-impoundment (2013) and post-impoundment (2021). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	5	2.82	Mann-Whitney	**0.019**
	2021	10	0.90		
Sand (%)	Pre-impoundment	5	53.64	Two sample t-test	0.686
	2021	10	60.54		
Silt + Clay (%)	Pre-impoundment	5	46.34	Two sample t-test	0.684
	2021	10	39.39		

Table A7-2: Benthic invertebrate statistics results for Keeyask reservoir Zone 1a intermittently exposed habitat (kicknet) comparing pre-impoundment (2013) and post-impoundment (2021). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Abundance (no. per sample)	Pre-impoundment	5	986	Two sample t-test	0.146
	2021	10	607		
EPT Index (%)	Pre-impoundment	5	40	Mann-Whitney	**<0.001**
	2021	10	5		
O+C Index (%)	Pre-impoundment	5	9	Two sample t-test	**<0.001**
	2021	10	54		
EPT:C	Pre-impoundment	5	4	Two sample t-test	**0.015**
	2021	10	2		
Total Richness (no. of taxa)	Pre-impoundment	5	17	Mann-Whitney	**0.017**
	2021	10	10		
EPT Richness (no. of taxa)	Pre-impoundment	5	6	Mann-Whitney	**<0.0001**
	2021	10	2		
Diversity Index	Pre-impoundment	5	0.81	Two sample t-test	**<0.001**
	2021	10	0.53		
Evenness Index	Pre-impoundment	5	0.33	Two sample t-test	0.081
	2021	10	0.24		

Table A7-3: Sediment statistics results for Keeyask reservoir Zone 1a intermittently exposed habitat (grab) comparing pre-impoundment (2002) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	2	5.42	ANOVA	-
	2022	1	31.60		0.019
	2023	5	16.71		0.084
Sand (%)	Pre-impoundment	2	37.85	Kruskal-Wallis	-
	2022	1	1.50		0.134
	2023	5	2.62		0.057
Silt + Clay (%)	Pre-impoundment	2	55.03	Kruskal-Wallis	-
	2022	1	98.50		0.134
	2023	5	97.30		0.057

Table A7-4: Benthic invertebrate statistics results for Keeyask reservoir Zone 1a intermittently exposed habitat (grab) comparing pre-impoundment (2002) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	4	6882	ANOVA	-
	2022	3	1380		0.032
	2023	5	5032		0.357
EPT Index (%)	Pre-impoundment	4	2	Kruskal-Wallis	-
	2022	3	2		0.598
	2023	4	7		0.054
O+C Index (%)	Pre-impoundment	4	39	ANOVA	-
	2022	3	45		0.739
	2023	4	53		0.395
EPT:C	Pre-impoundment	4	0.08	Kruskal-Wallis	-
	2022	3	0.08		0.742
	2023	4	0.42		0.136
Total Richness (no. of taxa)	Pre-impoundment	4	7	ANOVA	-
	2022	3	9		0.615
	2023	5	9		0.533
EPT Richness (no. of taxa)	Pre-impoundment	4	1	ANOVA	-
	2022	3	2		0.410
	2023	5	3		0.110
Diversity Index	Pre-impoundment	4	0.55	ANOVA	-
	2022	3	0.71		0.092
	2023	4	0.64		0.301
Evenness Index	Pre-impoundment	4	0.32	ANOVA	-
	2022	3	0.46		0.156
	2023	4	0.27		0.587

Table A7-5: Sediment statistics results for Keeyask reservoir Zone 1a predominantly wetted habitat comparing pre-impoundment (2001, 2004, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	7	2.93	Kruskal-Wallis	-
	2021	5	2.00		0.910
	2022	5	11.53		0.009
	2023	5	10.11		0.028
Sand (%)	Pre-impoundment	7	42.69	ANOVA	-
	2021	5	63.58		0.054
	2022	5	6.42		**0.002**
	2023	5	32.14		0.311
Silt + Clay (%)	Pre-impoundment	7	55.28	ANOVA	-
	2021	5	36.44		0.068
	2022	5	93.54		**0.001**
	2023	5	67.84		0.212

Table A7-6: Benthic invertebrate statistics results for Keeyask reservoir Zone 1a predominantly wetted habitat comparing pre-impoundment (2001, 2004, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	13	2986	Kruskal-Wallis	-
	2021	5	5537		0.062
	2022	5	3067		0.504
	2023	5	3318		0.765
EPT Index (%)	Pre-impoundment	13	14	Kruskal-Wallis	-
	2021	5	9		0.980
	2022	5	2		0.055
	2023	5	14		0.368
O+C Index (%)	Pre-impoundment	13	47	Kruskal-Wallis	-
	2021	5	68		0.455
	2022	5	86		**0.004**
	2023	5	64		0.245
EPT:C	Pre-impoundment	13	0.54	Kruskal-Wallis	-
	2021	5	0.17		0.327
	2022	5	0.05		0.037
	2023	5	0.54		0.972
Total Richness (no. of taxa)	Pre-impoundment	13	6	ANOVA	-
	2021	5	11		**0.005**
	2022	5	7		0.387
	2023	5	9		0.066
EPT Richness (no. of taxa)	Pre-impoundment	13	1	Kruskal-Wallis	-
	2021	5	4		**<0.001**
	2022	5	2		0.469
	2023	5	3		0.014
Diversity Index	Pre-impoundment	13	0.63	Kruskal-Wallis	-
	2021	5	0.58		0.398
	2022	5	0.54		0.136
	2023	5	0.47		0.136
Evenness Index	Pre-impoundment	13	0.56	Kruskal-Wallis	-
	2021	5	0.24		**0.002**
	2022	5	0.34		0.061
	2023	5	0.30		0.013

Table A7-7: Sediment statistics results for Keeyask reservoir Zone 1a offshore habitat comparing pre-impoundment (1999, 2001, and 2002) and post-impoundment (2021, 2022, and 2023). ***n*** **= number of observations used in analysis; bolded p-values indicate a statistically significant difference.**

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	3	1.64	ANOVA	-
	2021	5	1.36		0.193
	2022	5	2.15		0.022
	2023	5	1.91		0.201
Sand (%)	Pre-impoundment	3	69.76	ANOVA	-
	2021	5	34.78		**<0.0001**
	2022	5	42.60		**<0.001**
	2023	5	38.82		**<0.0001**
Silt + Clay (%)	Pre-impoundment	3	27.49	Kruskal-Wallis	-
	2021	5	65.20		**0.004**
	2022	5	57.38		0.058
	2023	5	61.16		0.029

Table A7-8: Benthic invertebrate statistics results for Keeyask reservoir Zone 1a offshore habitat comparing pre-impoundment (1999, 2001, and 2002) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	8	839	Kruskal-Wallis	-
	2021	5	450		0.449
	2022	5	124		**0.005**
	2023	5	159		0.012
EPT Index (%)	Pre-impoundment	8	41	ANOVA	-
	2021	5	61		0.215
	2022	5	63		0.180
	2023	5	48		0.664
O+C Index (%)	Pre-impoundment	8	38	ANOVA	-
	2021	5	14		0.066
	2022	5	35		0.858
	2023	5	12		0.046
EPT:C	Pre-impoundment	7	1.26	Kruskal-Wallis	-
	2021	4	11.21		**0.006**
	2022	4	4.70		0.118
	2023	2	0.64		0.565
Total Richness (no. of taxa)	Pre-impoundment	8	3	ANOVA	-
	2021	5	5		0.025
	2022	5	3		0.924
	2023	5	2		0.360
EPT Richness (no. of taxa)	Pre-impoundment	8	41	Kruskal-Wallis	-
	2021	5	61		0.734
	2022	5	63		0.213
	2023	5	48		0.572
Diversity Index	Pre-impoundment	8	0.53	Kruskal-Wallis	-
	2021	5	0.57		0.669
	2022	5	0.52		0.948
	2023	5	0.29		0.166
Evenness Index	Pre-impoundment	8	0.75	ANOVA	-
	2021	5	0.53		0.023
	2022	3	0.63		0.260
	2023	5	0.78		0.723

Table A7-9: Sediment statistics results for Keeyask reservoir Zone 1b intermittently exposed habitat (at kicknet sites) comparing pre-impoundment (2013) and post-impoundment (2021). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	5	1.68	Mann-Whitney	0.095
	2021	5	0.54		
Sand (%)	Pre-impoundment	5	75.72	ANOVA	0.713
	2021	5	68.32		
Silt + Clay (%)	Pre-impoundment	5	24.26	Two sample t-test	0.711
	2021	5	31.70		

Table A7-10: Benthic invertebrate statistics results for Keeyask reservoir Zone 1b intermittently exposed habitat (kicknet) comparing pre-impoundment (2013) and post-impoundment (2021). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Abundance (no. per sample)	Pre-impoundment	5	1295	ANOVA	0.909
	2021	5	1353		
EPT Index (%)	Pre-impoundment	5	30	ANOVA	**<0.0001**
	2021	5	4		
O+C Index (%)	Pre-impoundment	5	5	Mann-Whitney	0.056
	2021	5	15		
EPT:C	Pre-impoundment	5	7.27	Mann-Whitney	**0.008**
	2021	5	0.45		
Total Richness (no. of taxa)	Pre-impoundment	5	16	ANOVA	**0.016**
	2021	5	10		
EPT Richness (no. of taxa)	Pre-impoundment	5	7	ANOVA	**<0.001**
	2021	5	2		
Diversity Index	Pre-impoundment	5	0.66	ANOVA	**0.004**
	2021	5	0.47		
Evenness Index	Pre-impoundment	5	0.20	Mann-Whitney	1.000
	2021	5	0.22		

Table A7-11: Sediment statistics results for Keeyask reservoir Zone 1b intermittently exposed habitat (grab) comparing pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	2	18.33	ANOVA	-
	2022	1	36.20		0.388
	2023	4	10.08		0.561
Sand (%)	Pre-impoundment	2	15.70	ANOVA	-
	2022	1	5.30		0.806
	2023	4	51.95		0.266
Silt + Clay (%)	Pre-impoundment	2	65.97	ANOVA	-
	2022	1	94.70		0.510
	2023	4	48.05		0.558

Table A7-12: Benthic invertebrate statistics results for Keeyask reservoir Zone 1b intermittently exposed habitat (grab) comparing pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	8	8786	Kruskal-Wallis	-
	2022	3	15976		0.245
	2023	5	1812		0.087
EPT Index (%)	Pre-impoundment	8	1	Kruskal-Wallis	-
	2022	3	2		0.094
	2023	5	1		0.969
O+C Index (%)	Pre-impoundment	8	63	ANOVA	-
	2022	3	54		0.501
	2023	5	35		0.025
EPT:C	Pre-impoundment	8	0.01	Kruskal-Wallis	-
	2022	3	0.07		0.115
	2023	4	0.12		0.322
Total Richness (no. of taxa)	Pre-impoundment	8	7	ANOVA	-
	2022	3	9		0.161
	2023	5	5		0.065
EPT Richness (no. of taxa)	Pre-impoundment	8	1	Kruskal-Wallis	-
	2022	3	3		0.030
	2023	5	<1		0.545
Diversity Index	Pre-impoundment	8	0.62	Kruskal-Wallis	-
	2022	3	0.58		0.438
	2023	5	0.45		0.071
Evenness Index	Pre-impoundment	8	0.40	Kruskal-Wallis	-
	2022	3	0.26		0.124
	2023	5	0.56		0.343

Table A7-13: Sediment statistics results for Keeyask reservoir Zone 1b predominantly wetted habitat comparing pre-impoundment (1999, 2001, 2002, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	49	5.48	Kruskal-Wallis	-
	2021	5	8.69		0.278
	2022	5	28.00		**<0.001**
	2023	5	25.32		**<0.001**
Sand (%)	Pre-impoundment	23	34.42	Kruskal-Wallis	-
	2021	5	17.00		0.481
	2022	5	17.02		0.277
	2023	5	14.92		0.285
Silt + Clay (%)	Pre-impoundment	23	58.76	Kruskal-Wallis	-
	2021	5	82.96		0.169
	2022	5	82.94		0.046
	2023	5	85.10		0.050

Table A7-14: Benthic invertebrate statistics results for Keeyask reservoir Zone 1b predominantly wetted habitat comparing pre-impoundment (1999, 2001, 2002, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	49	2459	Kruskal-Wallis	-
	2021	5	4700		0.038
	2022	5	1578		0.535
	2023	5	3212		0.115
EPT Index (%)	Pre-impoundment	49	21	Kruskal-Wallis	-
	2021	5	16		0.770
	2022	5	5		0.124
	2023	5	18		0.877
O+C Index (%)	Pre-impoundment	49	34	Kruskal-Wallis	-
	2021	5	71		**0.003**
	2022	5	68		**0.006**
	2023	5	52		0.164
EPT:C	Pre-impoundment	49	1.24	Kruskal-Wallis	-
	2021	5	0.26		0.610
	2022	5	0.09		0.045
	2023	5	0.75		0.908
Total Richness (no. of taxa)	Pre-impoundment	49	5	Kruskal-Wallis	-
	2021	5	8		**0.004**
	2022	5	8		**0.006**
	2023	5	10		**<0.001**
EPT Richness (no. of taxa)	Pre-impoundment	49	1	Kruskal-Wallis	-
	2021	5	3		**<0.0001**
	2022	5	2		**0.008**
	2023	5	3		**<0.0001**
Diversity Index	Pre-impoundment	49	0.58	Kruskal-Wallis	-
	2021	5	0.53		0.551
	2022	5	0.58		0.567
	2023	5	0.67		0.192
Evenness Index	Pre-impoundment	49	0.60	Kruskal-Wallis	-
	2021	5	0.28		**<0.001**
	2022	5	0.31		**0.001**
	2023	5	0.33		**0.005**

Table A7-15: Sediment statistics results for Keeyask reservoir Zone 1b offshore habitat comparing pre-impoundment (1999, 2001, 2002, 2008, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	19	2.09	Kruskal-Wallis	-
	2021	5	1.70		0.933
	2022	5	16.18		**0.004**
	2023	5	13.18		**0.006**
Sand (%)	Pre-impoundment	19	49.50	Kruskal-Wallis	-
	2021	5	46.52		0.609
	2022	5	3.80		**0.001**
	2023	5	15.78		0.019
Silt + Clay (%)	Pre-impoundment	19	41.51	Kruskal-Wallis	-
	2021	5	53.50		0.227
	2022	5	96.32		**<0.001**
	2023	5	84.14		0.010

Table A7-16: Benthic invertebrate statistics results for Keeyask reservoir Zone 1b offshore habitat comparing pre-impoundment (1999, 2001, 2002, 2008, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	46	2414	Kruskal-Wallis	-
	2021	5	1408		0.720
	2022	5	918		0.132
	2023	5	1140		0.370
EPT Index (%)	Pre-impoundment	46	49	Kruskal-Wallis	-
	2021	5	39		0.507
	2022	5	25		0.113
	2023	5	17		0.019
O+C Index (%)	Pre-impoundment	46	22	Kruskal-Wallis	-
	2021	5	36		0.315
	2022	5	47		0.017
	2023	5	72		**<0.001**
EPT:C	Pre-impoundment	41	7.16	Kruskal-Wallis	-
	2021	4	4.71		0.983
	2022	5	0.98		**0.006**
	2023	5	0.34		**0.001**
Total Richness (no. of taxa)	Pre-impoundment	46	5	Kruskal-Wallis	-
	2021	5	8		0.027
	2022	5	6		0.216
	2023	5	5		0.458
EPT Richness (no. of taxa)	Pre-impoundment	46	2	Kruskal-Wallis	-
	2021	5	2		0.864
	2022	5	2		0.381
	2023	5	2		0.381
Diversity Index	Pre-impoundment	46	0.53	Kruskal-Wallis	-
	2021	5	0.57		0.163
	2022	5	0.72		**0.004**
	2023	5	0.62		0.178
Evenness Index	Pre-impoundment	45	0.55	ANOVA	-
	2021	5	0.42		0.133
	2022	5	0.60		0.621
	2023	5	0.59		0.521

Table A7-17: Sediment statistics results for Keeyask reservoir Zone 2 intermittently exposed habitat (at kicknet sites) comparing pre-impoundment (2013) and post-impoundment (2021). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	5	0.52	ANOVA	0.673
	2021	5	0.41		
Sand (%)	Pre-impoundment	5	87.24	Mann Whitney	0.651
	2021	5	78.40		
Silt + Clay (%)	Pre-impoundment	5	12.76	Mann Whitney	0.635
	2021	5	21.46		

Table A7-18: Benthic invertebrate statistics results for Keeyask reservoir Zone 2 intermittently exposed habitat (kicknet) comparing pre-impoundment (2013) and post-impoundment (2021). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Abundance (no. per sample)	Pre-impoundment	5	840	Mann Whitney	0.690
	2021	5	1306		
EPT Index (%)	Pre-impoundment	5	8	ANOVA	**<0.0001**
	2021	5	1		
O+C Index (%)	Pre-impoundment	5	15	Mann Whitney	**0.008**
	2021	5	3		
EPT:C	Pre-impoundment	5	2.07	ANOVA	**0.002**
	2021	5	0.48		
Total Richness (no. of taxa)	Pre-impoundment	5	19	ANOVA	**0.003**
	2021	5	9		
EPT Richness (no. of taxa)	Pre-impoundment	5	7	ANOVA	**0.023**
	2021	4	3		
Diversity Index	Pre-impoundment	5	0.78	Mann Whitney	**0.008**
	2021	5	0.22		
Evenness Index	Pre-impoundment	5	0.28	Mann Whitney	0.151
	2021	5	0.16		

Table A7-19: Sediment statistics results for Keeyask reservoir Zone 2 intermittently exposed habitat (grab) comparing pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	3	16.53	Kruskal-Wallis	-
	2022	3	0.30		0.027
	2023	5	0.52		0.032
Sand (%)	Pre-impoundment	3	35.44	Kruskal-Wallis	-
	2022	3	91.20		0.110
	2023	5	94.28		**0.010**
Silt + Clay (%)	Pre-impoundment	3	40.99	Kruskal-Wallis	-
	2022	3	8.80		0.218
	2023	5	5.62		0.028

Table A7-20: Benthic invertebrate statistics results for Keeyask reservoir Zone 2 intermittently exposed habitat (grab) comparing pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	21	7571	Kruskal-Wallis	-
	2022	3	385		**0.010**
	2023	5	46		**0.001**
EPT Index (%)	Pre-impoundment	12	16	Kruskal-Wallis	-
	2022	3	0		0.150
	2023	4	0		0.027
O+C Index (%)	Pre-impoundment	12	58	Kruskal-Wallis	-
	2022	3	1		**0.010**
	2023	4	8		**0.008**
EPT:C	Pre-impoundment	12	0.5	Kruskal-Wallis	-
	2022	1	1.0		0.422
	2023	1	0.0		0.282
Total Richness (no. of taxa)	Pre-impoundment	12	6	ANOVA	-
	2022	3	3		**0.002**
	2023	5	1		**<0.0001**
EPT Richness (no. of taxa)	Pre-impoundment	12	1	Kruskal-Wallis	-
	2022	3	0		0.181
	2023	5	0		**0.014**
Diversity Index	Pre-impoundment	12	0.61	Kruskal-Wallis	-
	2022	3	0.06		**0.005**
	2023	4	0.19		**0.005**
Evenness Index	Pre-impoundment	12	0.44	Kruskal-Wallis	-
	2022	3	0.73		0.213
	2023	4	0.91		**0.009**

Table A7-21: Sediment statistics results for Keeyask reservoir Zone 2 predominantly wetted habitat comparing pre-impoundment (1999, 2001, 2002, 2004, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	13	3.79	Kruskal-Wallis	-
	2021	4	9.29		0.039
	2022	5	23.62		**0.001**
	2023	5	15.13		0.016
Sand (%)	Pre-impoundment	13	21.99	Kruskal-Wallis	-
	2021	4	6.05		0.116
	2022	5	12.10		0.618
	2023	5	22.60		0.568
Silt + Clay (%)	Pre-impoundment	13	72.52	Kruskal-Wallis	-
	2021	4	93.95		0.020
	2022	5	87.88		0.183
	2023	5	77.42		0.168

Table A7-22: Benthic invertebrate statistics results for Keeyask reservoir Zone 2 predominantly wetted habitat comparing pre-impoundment (1999, 2001, 2002, 2004, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	25	2452	Kruskal-Wallis	-
	2021	4	2417		0.713
	2022	5	1186		0.048
	2023	5	3001		0.188
EPT Index (%)	Pre-impoundment	25	28	Kruskal-Wallis	-
	2021	4	14		0.085
	2022	5	11		0.030
	2023	5	11		0.018
O+C Index (%)	Pre-impoundment	25	40	ANOVA	-
	2021	4	78		0.017
	2022	5	48		0.563
	2023	5	63		0.104
EPT:C	Pre-impoundment	25	2.21	Kruskal-Wallis	-
	2021	4	0.20		0.018
	2022	4	0.24		0.035
	2023	5	0.24		0.012
Total Richness (no. of taxa)	Pre-impoundment	25	5	ANOVA	-
	2021	4	9		**<0.001**
	2022	5	6		0.860
	2023	5	5		0.792
EPT Richness (no. of taxa)	Pre-impoundment	25	1	Kruskal-Wallis	-
	2021	4	4		**0.001**
	2022	5	2		0.049
	2023	5	2		0.736
Diversity Index	Pre-impoundment	25	0.62	Kruskal-Wallis	-
	2021	4	0.44		0.048
	2022	5	0.58		0.427
	2023	5	0.52		0.249
Evenness Index	Pre-impoundment	25	0.58	ANOVA	-
	2021	4	0.21		**<0.0001**
	2022	5	0.48		0.179
	2023	5	0.48		0.175

Table A7-23: Sediment statistics results for Keeyask reservoir Zone 2 offshore habitat comparing pre-impoundment (1999, 2001, 2002, 2008, and 2013) and post-impoundment (2021, 2022, and 2023). ***n*** **= number of observations used in analysis; bolded p-values indicate a statistically significant difference.**

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	18	1.13	Kruskal-Wallis	-
	2021	5	2.22		0.045
	2022	5	5.01		**0.004**
	2023	5	6.64		**<0.001**
Sand (%)	Pre-impoundment	18	78.70	Kruskal-Wallis	-
	2021	5	15.22		**<0.001**
	2022	5	23.26		**0.006**
	2023	5	30.56		**0.007**
Silt + Clay (%)	Pre-impoundment	18	19.65	Kruskal-Wallis	-
	2021	5	84.70		**<0.001**
	2022	5	76.72		**0.005**
	2023	5	69.42		**0.006**

Table A7-24: Benthic invertebrate statistics results for Keeyask reservoir Zone 2 offshore habitat comparing pre-impoundment (1999, 2001, 2002, 2008, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	40	2801	Kruskal-Wallis	-
	2021	5	1111		0.859
	2022	5	617		0.128
	2023	5	848		0.403
EPT Index (%)	Pre-impoundment	40	15	Kruskal-Wallis	-
	2021	5	74		**<0.001**
	2022	5	39		0.035
	2023	5	41		0.040
O+C Index (%)	Pre-impoundment	40	35	Kruskal-Wallis	-
	2021	5	20		0.577
	2022	5	46		0.185
	2023	5	54		0.228
EPT:C	Pre-impoundment	35	1.52	Kruskal-Wallis	-
	2021	5	5.59		**0.002**
	2022	5	1.49		0.411
	2023	4	1.60		0.826
Total Richness (no. of taxa)	Pre-impoundment	40	4	Kruskal-Wallis	-
	2021	5	6		0.045
	2022	5	6		0.106
	2023	5	4		0.834
EPT Richness (no. of taxa)	Pre-impoundment	40	1	Kruskal-Wallis	-
	2021	5	2		0.061
	2022	5	2		0.016
	2023	5	2		0.108
Diversity Index	Pre-impoundment	40	0.44	Kruskal-Wallis	-
	2021	5	0.46		0.404
	2022	5	0.64		0.111
	2023	5	0.45		0.719
Evenness Index	Pre-impoundment	40	0.65	Kruskal-Wallis	-
	2021	5	0.30		**0.003**
	2022	5	0.49		0.215
	2023	5	0.48		0.196

Table A7-25: Sediment statistics results for Keeyask reservoir Zone 4 intermittently exposed habitat (grab) comparing pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	3	9.43	ANOVA	-
	2022	1	41.00		**0.004**
	2023	2	37.75		**0.003**
Sand (%)	Pre-impoundment	3	12.50	ANOVA	-
	2022	1	3.80		0.199
	2023	2	0.50		0.598
Silt + Clay (%)	Pre-impoundment	3	78.07	ANOVA	-
	2022	1	96.20		**0.003**
	2023	2	99.80		**0.001**

Table A7-26: Sediment statistics results for Keeyask reservoir Zone 4 intermittently exposed habitat (grab) comparing post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	2022	1	41.00	ANOVA	0.150
	2023	2	37.75		
Sand (%)	2022	1	3.80	Mann-Whitney	0.480
	2023	2	0.50		
Silt + Clay (%)	2022	1	96.20	Mann-Whitney	0.480
	2023	2	99.80		

Table A7-27: Benthic invertebrate statistics results for Keeyask reservoir Zone 4 intermittently exposed habitat (grab) comparing pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	12	3394	Kruskal-Wallis	-
	2022	3	25994		**0.005**
	2023	5	10376		0.098
EPT Index (%)	Pre-impoundment	12	15	Kruskal-Wallis	-
	2022	3	0		0.026
	2023	5	<1		0.068
O+C Index (%)	Pre-impoundment	12	67	ANOVA	-
	2022	3	85		0.091
	2023	5	83		0.069
EPT:C	Pre-impoundment	12	0.3	Kruskal-Wallis	-
	2022	3	0.0		0.026
	2023	5	0.0		0.068
Total Richness (no. of taxa)	Pre-impoundment	12	6	ANOVA	-
	2022	3	6		0.945
	2023	5	6		0.987
EPT Richness (no. of taxa)	Pre-impoundment	12	1	Kruskal-Wallis	-
	2022	3	0		0.027
	2023	5	<1		0.113
Diversity Index	Pre-impoundment	12	0.58	Kruskal-Wallis	-
	2022	3	0.50		0.359
	2023	5	0.53		0.546
Evenness Index	Pre-impoundment	12	0.43	ANOVA	-
	2022	3	0.35		0.423
	2023	5	0.40		0.745

Table A7-28: Benthic invertebrate statistics results for Keeyask reservoir Zone 4 intermittently exposed habitat (grab) comparing post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Abundance (no. per sample)	2022	3	25994	ANOVA	0.091
	2023	5	10376		
EPT Index (%)	2022	3	0	N/A	N/A
	2023	5	<1		
O+C Index (%)	2022	3	85	ANOVA	0.865
	2023	5	83		
EPT:C	2022	3	0.00	N/A	N/A
	2023	5	0.01		
Total Richness (no. of taxa)	2022	3	6	ANOVA	0.954
	2023	5	6		
EPT Richness (no. of taxa)	2022	3	0	N/A	N/A
	2023	5	<1		
Diversity Index	2022	3	0.50	ANOVA	0.832
	2023	5	0.53		
Evenness Index	2022	3	0.35	ANOVA	0.639
	2023	5	0.40		

Table A7-29: Sediment statistics results for Keeyask reservoir Zone 4 predominantly wetted habitat comparing post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value	Significance
Total Organic Carbon (%)	2021	5	1.76	Kruskal-Wallis	**0.011**	**A**
	2022	4	22.25			AB
	2023	5	20.38			**B**
Sand (%)	2021	5	41.70	Kruskal-Wallis	**0.052**	**A**
	2022	4	2.70			AB
	2023	5	5.04			**B**
Silt + Clay (%)	2021	5	58.30	Kruskal-Wallis	**0.053**	**A**
	2022	4	97.25			AB
	2023	5	95.06			**B**

Table A7-30: Benthic invertebrate statistics results for Keeyask reservoir Zone 4 predominantly wetted habitat comparing post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value	Significance
Total Density (no. per m^2)	2021	5	3131	ANOVA	0.180	A
	2022	5	1348			A
	2023	5	3243			A
EPT Index (%)	2021	5	22	Kruskal-Wallis	**0.006**	**A**
	2022	5	1			**B**
	2023	5	<1			**B**
O+C Index (%)	2021	5	54	ANOVA	0.695	A
	2022	5	63			A
	2023	5	56			A
EPT:C	2021	5	0.6	Kruskal-Wallis	**0.006**	**A**
	2022	5	0.0			**B**
	2023	5	0.0			**B**
Total Richness (no. of taxa)	2021	5	9	ANOVA	0.300	A
	2022	5	7			A
	2023	5	7			A
EPT Richness (no. of taxa)	2021	5	3	Kruskal-Wallis	**0.012**	**A**
	2022	5	1			**B**
	2023	5	<1			**B**
Diversity Index	2021	5	0.71	ANOVA	0.362	A
	2022	5	0.65			A
	2023	5	0.61			A
Evenness Index	2021	5	0.38	ANOVA	0.380	A
	2022	5	0.49			A
	2023	5	0.41			A

Table A7-31: Sediment statistics results for Keeyask reservoir Zone 4 offshore habitat comparing post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	n	Mean	Statistical Test	p-value	Significance
Total Organic Carbon (%)	2021	5	2.70	ANOVA	0.816	A
	2022	5	2.73			A
	2023	5	3.07			A
Sand (%)	2021	5	38.04	ANOVA	0.327	A
	2022	5	21.34			A
	2023	5	24.00			A
Silt + Clay (%)	2021	5	61.94	ANOVA	0.325	A
	2022	5	78.66			A
	2023	5	76.020			A

Table A7-32: Benthic invertebrate statistics results for Keeyask reservoir Zone 4 offshore habitat comparing post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value	Significance
Total Density (no. per m^2)	2021	5	1350	Kruskal-Wallis	**0.009**	**A**
	2022	5	277			**B**
	2023	5	317			**B**
EPT Index (%)	2021	5	45	ANOVA	**0.002**	**A**
	2022	5	50			**A**
	2023	5	23			**B**
O+C Index (%)	2021	5	14	ANOVA	0.021	**A**
	2022	5	34			AB
	2023	5	38			**B**
EPT:C	2021	5	5.5	Kruskal-Wallis	**0.008**	**A**
	2022	5	2.4			AB
	2023	5	0.9			**B**
Total Richness (no. of taxa)	2021	5	9	Kruskal-Wallis	**0.014**	**A**
	2022	5	5			AB
	2023	5	5			**B**
EPT Richness (no. of taxa)	2021	5	2	Kruskal-Wallis	0.330	A
	2022	5	2			A
	2023	5	1			A
Diversity Index	2021	5	0.67	ANOVA	0.685	A
	2022	5	0.69			A
	2023	5	0.71			A
Evenness Index	2021	5	0.39	ANOVA	**0.001**	**A**
	2022	5	0.69			**B**
	2023	5	0.78			**B**

Table A7-33: Sediment statistics results for Keeyask reservoir Zone 12 intermittently exposed habitat (grab) comparing pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	2	30.79	ANOVA	-
	2022	1	27.60		0.759
	2023	5	30.16		0.929
Sand (%)	Pre-impoundment	2	24.53	Kruskal-Wallis	-
	2022	1	0.50		0.086
	2023	5	0.80		0.029
Silt + Clay (%)	Pre-impoundment	2	44.68	Kruskal-Wallis	-
	2022	1	99.20		0.375
	2023	5	99.60		0.025

Table A7-34: Benthic invertebrate statistics results for Keeyask reservoir Zone 12 intermittently exposed habitat (grab) comparing pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	8	2792	ANOVA	-
	2022	3	4703		0.082
	2023	5	3038		0.777
EPT Index (%)	Pre-impoundment	8	6	Kruskal-Wallis	-
	2022	3	2		0.165
	2023	5	1		0.057
O+C Index (%)	Pre-impoundment	8	48	ANOVA	-
	2022	3	36		0.425
	2023	5	37		0.388
EPT:C	Pre-impoundment	8	0.4	Kruskal-Wallis	-
	2022	3	0.1		0.325
	2023	5	0.1		0.146
Total Richness (no. of taxa)	Pre-impoundment	8	7	Kruskal-Wallis	-
	2022	3	10		0.043
	2023	5	6		0.403
EPT Richness (no. of taxa)	Pre-impoundment	8	2	Kruskal-Wallis	-
	2022	3	2		0.989
	2023	5	1		0.041
Diversity Index	Pre-impoundment	8	0.57	ANOVA	-
	2022	3	0.72		0.032
	2023	5	0.68		0.069
Evenness Index	Pre-impoundment	8	0.36	ANOVA	-
	2022	3	0.40		0.695
	2023	5	0.51		0.096

Table A7-35: Sediment statistics results for Keeyask reservoir Zone 12 predominantly wetted habitat comparing pre-impoundment (2001, 2002, and 2013) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	7	1.69	Kruskal-Wallis	-
	2022	5	40.04		**0.004**
	2023	5	39.86		**0.004**
Sand (%)	Pre-impoundment	7	65.60	Kruskal-Wallis	-
	2022	5	0.74		**0.001**
	2023	5	2.56		**0.011**
Silt + Clay (%)	Pre-impoundment	7	33.77	Kruskal-Wallis	-
	2022	5	99.12		**0.002**
	2023	5	97.62		**0.007**

Table A7-36: Benthic invertebrate statistics results for Keeyask reservoir Zone 12 predominantly wetted habitat comparing pre-impoundment (2001, 2002, and 2013) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	13	1845	ANOVA	-
	2022	5	222		**<0.0001**
	2023	5	1223		0.073
EPT Index (%)	Pre-impoundment	13	42	Kruskal-Wallis	-
	2022	5	<1		**<0.001**
	2023	5	2		**0.003**
O+C Index (%)	Pre-impoundment	13	19	Kruskal-Wallis	-
	2022	5	15		0.498
	2023	5	53		**0.014**
EPT:C	Pre-impoundment	13	3.3	Kruskal-Wallis	-
	2022	2	0.0		**0.014**
	2023	5	0.1		**0.002**
Total Richness (no. of taxa)	Pre-impoundment	13	7	ANOVA	-
	2022	5	3		**<0.0001**
	2023	5	4		**0.007**
EPT Richness (no. of taxa)	Pre-impoundment	13	2	Kruskal-Wallis	-
	2022	5	<1		**<0.001**
	2023	5	<1		**0.007**
Diversity Index	Pre-impoundment	13	0.69	Kruskal-Wallis	-
	2022	5	0.39		0.034
	2023	5	0.56		0.051
Evenness Index	Pre-impoundment	13	0.55	ANOVA	-
	2022	5	0.65		0.431
	2023	5	0.61		0.592

Table A7-37: Sediment statistics results for Keeyask reservoir Zone 12 offshore habitat comparing post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	2022	3	29.03	ANOVA	0.490
	2023	5	21.64		
Sand (%)	2022	3	1.83	Two-sample t-test	0.240
	2023	5	7.26		
Silt + Clay (%)	2022	3	98.00	Mann-Whitney	0.393
	2023	5	92.72		

Table A7-38: Benthic invertebrate statistics results for Keeyask reservoir Zone 12 offshore habitat comparing post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Abundance (no. per sample)	2022	5	387	ANOVA	**<0.0001**
	2023	5	1997		
EPT Index (%)	2022	5	7	ANOVA	0.725
	2023	5	5		
O+C Index (%)	2022	5	40	ANOVA	**0.007**
	2023	5	78		
EPT:C	2022	5	0.62	Mann-Whitney	0.071
	2023	5	0.11		
Total Richness (no. of taxa)	2022	5	5	ANOVA	0.053
	2023	5	7		
EPT Richness (no. of taxa)	2022	5	1	Mann-Whitney	1
	2023	5	2		
Diversity Index	2022	5	0.65	ANOVA	0.118
	2023	5	0.48		
Evenness Index	2022	5	0.64	ANOVA	**0.034**
	2023	5	0.31		

Table A7-39: Sediment statistics results for Keeyask reservoir Zone 8 intermittently exposed habitat (grab) comparing post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	2022	1	43.80	—	—
	2023	4	37.53		
Sand (%)	2022	1	1.90	Mann-Whitney	0.134
	2023	4	0.50		
Silt + Clay (%)	2022	1	98.10	Mann-Whitney	0.236
	2023	4	99.98		

A statistical comparison of mean values for total organic carbon was not possible because n=1 for 2022.

Table A7-40: Benthic invertebrate statistics results for Keeyask reservoir Zone 8 intermittently exposed habitat (grab) comparing post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	2022	3	4795	Two sample t-test	0.594
	2023	5	3569		
EPT Index (%)	2022	3	<1	Two sample t-test	0.754
	2023	5	<1		
O+C Index (%)	2022	3	72	Two sample t-test	**0.023**
	2023	5	40		
EPT:C	2022	3	0.01	Mann-Whitney	0.800
	2023	5	0.01		
Total Richness (no. of taxa)	2022	3	6	Two sample t-test	0.377
	2023	5	8		
EPT Richness (no. of taxa)	2022	3	1	Mann-Whitney	0.800
	2023	5	1		
Diversity Index	2022	3	0.54	Two sample t-test	0.366
	2023	5	0.65		
Evenness Index	2022	3	0.36	Two sample t-test	0.429
	2023	5	0.42		

Table A7-41: Sediment statistics results for Keeyask reservoir Zone 8 predominantly wetted habitat comparing post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	2022	4	35.63	Two sample t-test	0.377
	2023	4	32.08		
Sand (%)	2022	4	1.95	Mann-Whitney	0.860
	2023	4	0.50		
Silt + Clay (%)	2022	4	98.05	Mann-Whitney	**0.029**
	2023	4	99.75		

The statistical comparison result for silt + clay was suspect; assumed no significant difference between mean values.

Table A7-42: Benthic invertebrate statistics results for Keeyask reservoir Zone 8 predominantly wetted habitat comparing post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	2022	5	1385	Two sample t-test	0.183
	2023	5	2277		
EPT Index (%)	2022	5	<1	Mann-Whitney	0.714
	2023	5	1		
O+C Index (%)	2022	5	69	Two sample t-test	0.879
	2023	5	70		
EPT:C	2022	5	0.01	Mann-Whitney	0.714
	2023	5	0.05		
Total Richness (no. of taxa)	2022	5	7	Two sample t-test	0.633
	2023	5	6		
EPT Richness (no. of taxa)	2022	5	<1	Mann-Whitney	0.714
	2023	5	1		
Diversity Index	2022	5	0.67	Mann-Whitney	0.686
	2023	5	0.62		
Evenness Index	2022	5	0.48	Two sample t-test	0.487
	2023	5	0.44		

Table A7-43: Sediment statistics results for Keeyask reservoir Zone 8 offshore habitat comparing post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	2022	5	25.52	Two sample t-test	0.236
	2023	5	22.22		
Sand (%)	2022	5	1.00	Mann-Whitney	0.167
	2023	5	0.50		
Silt + Clay (%)	2022	5	98.90	Mann-Whitney	**0.012**
	2023	5	99.90		

The statistical comparison result for silt + clay was suspect; assumed no significant difference between mean values.

Table A7-44: Benthic invertebrate statistics results for Keeyask reservoir Zone 8 offshore habitat comparing post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	2022	5	592	Two sample t-test	0.073
	2023	5	1489		
EPT Index (%)	2022	5	8	Two sample t-test	0.892
	2023	5	8		
O+C Index (%)	2022	5	72	Two sample t-test	0.423
	2023	5	78		
EPT:C	2022	5	0.28	Mann-Whitney	0.786
	2023	5	0.21		
Total Richness (no. of taxa)	2022	5	4	Two sample t-test	**0.015**
	2023	5	7		
EPT Richness (no. of taxa)	2022	5	1	Two sample t-test	0.153
	2023	5	2		
Diversity Index	2022	5	0.69	Two sample t-test	0.430
	2023	5	0.65		
Evenness Index	2022	5	0.79	Two sample t-test	**0.006**
	2023	5	0.44		

Table A7-45: Sediment statistics results for Stephens Lake downstream of the Keeyask GS comparing pre-impoundment (2001 and 2002) and post-impoundment (2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	6	3.21	Two sample t-test	0.669
	2023	3	3.87		
Sand (%)	Pre-impoundment	3	23.41	Two sample t-test	0.809
	2023	3	21.73		
Silt + Clay (%)	Pre-impoundment	3	52.77	Kruskal-Wallis	0.127
	2023	3	78.23		

Table A7-46: Benthic invertebrate statistics results for Stephens Lake downstream of the Keeyask GS comparing pre-impoundment (2001 and 2002) and post-impoundment (2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	26	1665	Kruskal-Wallis	0.210
	2023	3	818		
EPT Index (%)	Pre-impoundment	26	22	Kruskal-Wallis	0.720
	2023	3	40		
O+C Index (%)	Pre-impoundment	26	67	Kruskal-Wallis	0.197
	2023	3	33		
EPT:C	Pre-impoundment	26	0.38	Kruskal-Wallis	0.248
	2023	1	0.08		
Total Richness (no. of taxa)	Pre-impoundment	26	4	Kruskal-Wallis	0.715
	2023	3	5		
EPT Richness (no. of taxa)	Pre-impoundment	26	1	Kruskal-Wallis	0.607
	2023	3	2		
Diversity Index	Pre-impoundment	26	0.47	Two sample t-test	0.221
	2023	3	0.38		
Evenness Index	Pre-impoundment	26	0.59	Two sample t-test	0.452
	2023	3	0.49		

Table A7-47: Sediment statistics results for Stephens Lake 3 KM downstream of the Keeyask GS intermittently exposed habitat (kicknet) comparing pre-impoundment (2013) and post-impoundment (2021). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	5	2.38	Mann Whitney	1.000
	2021	5	1.28		
Sand (%)	Pre-impoundment	5	10.83	Two sample t-test	**<0.0001**
	2021	5	53.08		
Silt + Clay (%)	Pre-impoundment	5	89.20	Two sample t-test	**<0.0001**
	2021	5	46.96		

Table A7-48: Benthic invertebrate statistics results for Stephens Lake 3 KM downstream of the Keeyask GS intermittently exposed habitat (kicknet) comparing pre-impoundment (2013) and post-impoundment (2021). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Abundance (no. per sample)	Pre-impoundment	5	147	Mann Whitney	0.151
	2021	5	408		
EPT Index (%)	Pre-impoundment	5	27	Mann Whitney	**0.008**
	2021	5	<1		
O+C Index (%)	Pre-impoundment	5	14	Mann Whitney	0.151
	2021	5	35		
EPT:C	Pre-impoundment	5	3.09	Mann Whitney	**0.008**
	2021	5	0.08		
Total Richness (no. of taxa)	Pre-impoundment	5	15	Mann Whitney	0.905
	2021	5	15		
EPT Richness (no. of taxa)	Pre-impoundment	5	6	Two sample t-test	**0.001**
	2021	5	1		
Diversity Index	Pre-impoundment	5	0.80	Two sample t-test	**0.012**
	2021	5	0.56		
Evenness Index	Pre-impoundment	5	0.38	Two sample t-test	**0.023**
	2021	5	0.17		

Table A7-49: Sediment statistics results for Stephens Lake 3 KM downstream of the Keeyask GS intermittently exposed habitat (grab) for comparing pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	2	5.29	Kruskal-Wallis	-
	2022	5	1.23		0.154
	2023	5	0.74		**0.011**
Sand (%)	Pre-impoundment	9	40.27	ANOVA	-
	2022	5	18.46		0.046
	2023	5	11.72		**0.015**
Silt + Clay (%)	Pre-impoundment	9	53.69	ANOVA	-
	2022	5	81.56		0.017
	2023	5	88.28		**0.006**

Table A7-50: Benthic invertebrate statistics results for Stephens Lake 3 KM downstream of the Keeyask GS intermittently exposed habitat (grab) comparing pre-impoundment (2002 and 2004) and post-impoundment (2022 and 2023 *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	9	3968	Kruskal-Wallis	-
	2022	5	1417		0.039
	2023	5	9173		0.210
EPT Index (%)	Pre-impoundment	9	3	Kruskal-Wallis	-
	2022	5	11		0.064
	2023	5	0		0.028
O+C Index (%)	Pre-impoundment	9	43	ANOVA	-
	2022	5	62		0.145
	2023	5	99		**<0.001**
EPT:C	Pre-impoundment	9	0.2	Kruskal-Wallis	-
	2022	5	0.2		0.231
	2023	5	0.0		**0.015**
Total Richness (no. of taxa)	Pre-impoundment	9	6	ANOVA	-
	2022	5	10		**0.003**
	2023	5	4		0.210
EPT Richness (no. of taxa)	Pre-impoundment	9	1	Kruskal-Wallis	-
	2022	5	3		0.021
	2023	5	0		0.037
Diversity Index	Pre-impoundment	9	0.59	Kruskal-Wallis	-
	2022	5	0.63		0.630
	2023	5	0.16		**0.006**
Evenness Index	Pre-impoundment	9	0.49	ANOVA	-
	2022	5	0.30		**0.011**
	2023	5	0.32		0.022

Table A7-51: Sediment statistics results for Stephens Lake 3 KM downstream of the Keeyask GS predominantly wetted habitat comparing pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	5	1.28	ANOVA	-
	2021	5	2.49		**0.004**
	2022	5	2.64		**0.002**
	2023	5	2.00		0.059
Sand (%)	Pre-impoundment	5	11.22	Kruskal-Wallis	-
	2021	5	18.40		0.092
	2022	5	21.10		0.028
	2023	5	15.36		0.297
Silt + Clay (%)	Pre-impoundment	5	88.78	Kruskal-Wallis	-
	2021	5	81.62		0.092
	2022	5	78.90		0.028
	2023	5	84.62		0.297

Table A7-52: Benthic invertebrate statistics results for Stephens Lake 3 KM downstream of the Keeyask GS predominantly wetted habitat comparing pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	5	1205	Kruskal-Wallis	-
	2021	5	5898		0.025
	2022	5	476		0.121
	2023	5	2643		0.262
EPT Index (%)	Pre-impoundment	5	7	Kruskal-Wallis	-
	2021	5	19		0.078
	2022	5	40		**0.001**
	2023	5	9		0.708
O+C Index (%)	Pre-impoundment	5	33	ANOVA	-
	2021	5	64		**<0.001**
	2022	5	47		0.036
	2023	5	77		**<0.0001**
EPT:C	Pre-impoundment	5	0.28	Kruskal-Wallis	-
	2021	5	0.35		0.957
	2022	5	1.32		0.025
	2023	5	0.14		0.219
Total Richness (no. of taxa)	Pre-impoundment	5	9	ANOVA	-
	2021	5	12		0.054
	2022	5	6		0.019
	2023	5	6		0.009
EPT Richness (no. of taxa)	Pre-impoundment	5	2	Kruskal-Wallis	-
	2021	5	3		0.221
	2022	5	2		0.569
	2023	5	2		0.589
Diversity Index	Pre-impoundment	5	1	ANOVA	-
	2021	5	0.59		0.151
	2022	5	0.72		0.630
	2023	5	0.39		**<0.001**
Evenness Index	Pre-impoundment	5	0.37	ANOVA	-
	2021	5	0.22		0.018
	2022	5	0.60		**0.001**
	2023	5	0.30		0.204

Table A7-53: Sediment statistics results for Stephens Lake 3 KM downstream of the Keeyask GS offshore habitat comparing pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	5	1.12	Kruskal-Wallis	-
	2021	4	2.13		0.018
	2022	5	2.97		**0.002**
	2023	5	1.94		0.030
Sand (%)	Pre-impoundment	5	2.05	ANOVA	-
	2021	4	42.48		**<0.0001**
	2022	5	22.84		0.009
	2023	5	20.18		0.019
Silt + Clay (%)	Pre-impoundment	4	97.70	ANOVA	-
	2021	4	57.55		**<0.001**
	2022	5	77.16		0.017
	2023	5	79.76		0.033

Table A7-54: Benthic invertebrate statistics results Stephens Lake 3 KM downstream of the Keeyask GS offshore habitat comparing pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m²)	Pre-impoundment	5	1101	Kruskal-Wallis	-
	2021	4	2536		0.347
	2022	5	326		0.028
	2023	5	895		0.339
EPT Index (%)	Pre-impoundment	5	8	ANOVA	-
	2021	4	39		**0.009**
	2022	5	45		**0.002**
	2023	5	37		**0.010**
O+C Index (%)	Pre-impoundment	5	60	ANOVA	-
	2021	4	39		0.071
	2022	5	37		0.041
	2023	5	51		0.386
EPT:C	Pre-impoundment	5	0.15	Kruskal-Wallis	-
	2021	4	1.58		0.015
	2022	5	4.54		**0.002**
	2023	5	0.97		0.028
Total Richness (no. of taxa)	Pre-impoundment	5	7	Kruskal-Wallis	-
	2021	4	9		0.285
	2022	5	6		0.340
	2023	5	4		0.018
EPT Richness (no. of taxa)	Pre-impoundment	5	3	Kruskal-Wallis	-
	2021	4	3		0.767
	2022	5	2		0.232
	2023	5	1		**0.007**
Diversity Index	Pre-impoundment	5	0.50	Kruskal-Wallis	-
	2021	4	0.70		0.014
	2022	5	0.70		0.011
	2023	5	0.65		0.116
Evenness Index	Pre-impoundment	5	0.30	ANOVA	-
	2021	4	0.37		0.312
	2022	5	0.63		**<0.001**
	2023	5	0.67		**<0.0001**

Table A7-55: Sediment statistics results for Stephens Lake 11 KM downstream of the Keeyask GS intermittently exposed habitat (at kicknet sites) comparing pre-impoundment (2013) and post-impoundment (2021). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	5	0.28	Two sample t-test	**0.015**
	2021	5	1.37		
Sand (%)	Pre-impoundment	5	95.10	Mann Whitney	0.103
	2021	5	97.40		
Silt + Clay (%)	Pre-impoundment	5	4.89	Mann Whitney	**0.048**
	2021	5	2.36		

Table A7-56: Benthic invertebrate statistics results for Stephens Lake 11 KM downstream of the Keeyask GS intermittently exposed habitat (kicknet) comparing pre-impoundment (2013) and post-impoundment (2021). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Abundance (no. per sample)	Pre-impoundment	5	752	Mann Whitney	0.421
	2021	5	408		
EPT Index (%)	Pre-impoundment	5	11	Mann Whitney	**0.016**
	2021	5	1		
O+C Index (%)	Pre-impoundment	5	41	Two sample t-test	**0.044**
	2021	5	68		
EPT:C	Pre-impoundment	5	0.59	Mann Whitney	**0.008**
	2021	5	0.05		
Total Richness (no. of taxa)	Pre-impoundment	5	12	Two sample t-test	**0.007**
	2021	5	15		
EPT Richness (no. of taxa)	Pre-impoundment	5	6	Two sample t-test	**0.001**
	2021	5	2		
Diversity Index	Pre-impoundment	5	0.62	Mann Whitney	0.841
	2021	5	0.69		
Evenness Index	Pre-impoundment	5	0.26	Two sample t-test	0.456
	2021	5	0.23		

Table A7-57: Sediment statistics results for Stephens Lake 11 KM downstream of the Keeyask GS intermittently exposed habitat (grab) comparing pre-impoundment (2001) and post-impoundment (2022 and 2023). ***n*** **= number of observations used in analysis; bolded p-values indicate a statistically significant difference.**

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	1	4.25	Kruskal-Wallis	-
	2022	5	0.80		0.116
	2023	5	1.11		0.144
Sand (%)	Pre-impoundment	1	44.53	Kruskal-Wallis	-
	2022	5	94.50		0.069
	2023	5	92.90		0.226
Silt + Clay (%)	Pre-impoundment	1	47.89	Kruskal-Wallis	-
	2022	5	5.52		0.069
	2023	5	7.22		0.226

Table A7-58: Benthic invertebrate statistics results for Stephens Lake 11 KM downstream of the Keeyask GS intermittently exposed habitat (grab) comparing pre-impoundment (2001) and post-impoundment (2022 and 2023). ***n*** **= number of observations used in analysis; bolded p-values indicate a statistically significant difference.**

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	5	2952	Kruskal-Wallis	-
	2022	5	3070		0.480
	2023	5	2909		0.572
EPT Index (%)	Pre-impoundment	5	19	Kruskal-Wallis	-
	2022	5	3		0.103
	2023	5	2		0.076
O+C Index (%)	Pre-impoundment	5	61	ANOVA	-
	2022	5	69		0.488
	2023	5	78		0.129
EPT:C	Pre-impoundment	5	0.35	Kruskal-Wallis	-
	2022	5	0.06		0.156
	2023	5	0.03		0.076
Total Richness (no. of taxa)	Pre-impoundment	5	4	ANOVA	-
	2022	5	10		0.018
	2023	5	8		0.078
EPT Richness (no. of taxa)	Pre-impoundment	5	1	Kruskal-Wallis	-
	2022	5	3		0.133
	2023	5	1		0.729
Diversity Index	Pre-impoundment	5	0.53	ANOVA	-
	2022	5	0.46		0.425
	2023	5	0.43		0.276
Evenness Index	Pre-impoundment	5	0.56	Kruskal-Wallis	-
	2022	5	0.25		0.020
	2023	5	0.23		**0.006**

Table A7-59: Sediment statistics results for Stephens Lake 11 KM downstream of the Keeyask GS predominantly wetted habitat comparing pre-impoundment (2001, 2002, and 2013) and post-impoundment (2021, 2022, and 2023). ***n*** **= number of observations used in analysis; bolded p-values indicate a statistically significant difference.**

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	6	10.78	Kruskal-Wallis	-
	2021	5	3.61		0.397
	2022	5	1.29		0.036
	2023	5	2.12		0.203
Sand (%)	Pre-impoundment	6	32.43	Kruskal-Wallis	-
	2021	5	27.02		0.709
	2022	5	52.42		0.221
	2023	5	49.88		0.166
Silt + Clay (%)	Pre-impoundment	6	56.47	Kruskal-Wallis	-
	2021	5	73.00		0.224
	2022	5	47.54		0.664
	2023	5	50.08		0.552

Table A7-60: Benthic invertebrate statistics results for Stephens Lake 11 KM downstream of the Keeyask GS predominantly wetted habitat comparing pre-impoundment (2001, 2002, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	19	3587	Kruskal-Wallis	-
	2021	5	3339		0.624
	2022	5	2228		0.556
	2023	5	6247		0.027
EPT Index (%)	Pre-impoundment	19	46	Kruskal-Wallis	-
	2021	5	14		0.017
	2022	5	12		0.008
	2023	5	14		0.015
O+C Index (%)	Pre-impoundment	19	28	ANOVA	-
	2021	5	60		**0.001**
	2022	5	61		**<0.001**
	2023	5	47		0.030
EPT:C	Pre-impoundment	19	3.88	Kruskal-Wallis	-
	2021	5	0.28		**0.006**
	2022	5	0.28		**0.007**
	2023	5	0.30		0.009
Total Richness (no. of taxa)	Pre-impoundment	19	6	ANOVA	-
	2021	5	13		**<0.0001**
	2022	5	12		**<0.001**
	2023	5	12		**<0.0001**
EPT Richness (no. of taxa)	Pre-impoundment	19	2	Kruskal-Wallis	-
	2021	5	3		0.057
	2022	5	3		0.079
	2023	5	5		**<0.0001**
Diversity Index	Pre-impoundment	19	1	Kruskal-Wallis	-
	2021	5	0.65		0.265
	2022	5	0.62		0.217
	2023	5	0.67		0.067
Evenness Index	Pre-impoundment	19	0.48	Kruskal-Wallis	-
	2021	5	0.23		**0.005**
	2022	5	0.29		0.078
	2023	5	0.26		0.034

Table A7-61: Sediment statistics results for Stephens Lake 11 KM downstream of the Keeyask GS offshore habitat comparing pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	5	1.24	ANOVA	-
	2021	4	2.31		**0.004**
	2022	5	2.60		**<0.001**
	2023	5	2.37		**0.002**
Sand (%)	Pre-impoundment	5	0.47	Kruskal-Wallis	-
	2021	4	0.98		0.332
	2022	5	1.16		0.173
	2023	5	3.40		**0.001**
Silt + Clay (%)	Pre-impoundment	5	99.52	Kruskal-Wallis	-
	2021	4	99.05		0.418
	2022	5	98.74		0.081
	2023	5	96.60		**0.001**

Table A7-62: Benthic invertebrate statistics results for Stephens Lake 11 KM downstream of the Keeyask GS offshore habitat comparing pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023). ***n*** **= number of observations used in analysis; bolded p-values indicate a statistically significant difference.**

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	5	1878	Kruskal-Wallis	-
	2021	4	1306		0.853
	2022	5	199		**0.007**
	2023	5	444		0.103
EPT Index (%)	Pre-impoundment	5	67	ANOVA	-
	2021	4	41		0.131
	2022	5	48		0.237
	2023	5	64		0.853
O+C Index (%)	Pre-impoundment	5	9	ANOVA	-
	2021	4	16		0.349
	2022	5	30		0.009
	2023	5	32		**0.005**
EPT:C	Pre-impoundment	4	8.86	Kruskal-Wallis	-
	2021	4	2.94		0.026
	2022	5	2.73		0.012
	2023	5	2.62		0.016
Total Richness (no. of taxa)	Pre-impoundment	5	5	ANOVA	-
	2021	4	8		0.024
	2022	5	4		0.597
	2023	5	4		0.483
EPT Richness (no. of taxa)	Pre-impoundment	5	1	Kruskal-Wallis	-
	2021	4	2		0.021
	2022	5	1		0.568
	2023	5	2		0.018
Diversity Index	Pre-impoundment	5	0.24	ANOVA	-
	2021	4	0.72		**<0.0001**
	2022	5	0.62		**<0.0001**
	2023	5	0.54		**<0.001**
Evenness Index	Pre-impoundment	5	0.19	ANOVA	-
	2021	4	0.46		**0.003**
	2022	5	0.73		**<0.0001**
	2023	5	0.57		**<0.001**

Table A7-63: Sediment statistics results for O'Neil Bay intermittently exposed habitat (at kicknet sites) comparing pre-impoundment (2013) and post-impoundment (2021). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	5	4.45	Mann Whitney	0.200
	2021	5	0.75		
Sand (%)	Pre-impoundment	5	16.01	Mann Whitney	0.343
	2021	5	17.13		
Silt + Clay (%)	Pre-impoundment	5	84.00	Mann Whitney	0.343
	2021	5	82.78		

Table A7-64: Benthic invertebrate statistics results for O'Neil Bay intermittently exposed habitat (kicknet) comparing pre-impoundment (2013) and post-impoundment (2021). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Abundance (no. per sample)	Pre-impoundment	5	123	Mann Whitney	0.114
	2021	5	47		
EPT Index (%)	Pre-impoundment	5	9	Two sample t-test	**0.001**
	2021	5	1		
O+C Index (%)	Pre-impoundment	5	4	Mann Whitney	**0.029**
	2021	5	38		
EPT:C	Pre-impoundment	5	4.88	Mann Whitney	**0.027**
	2021	5	0.04		
Total Richness (no. of taxa)	Pre-impoundment	5	10	Two sample t-test	**0.042**
	2021	5	7		
EPT Richness (no. of taxa)	Pre-impoundment	5	4	Two sample t-test	**<0.001**
	2021	5	<1		
Diversity Index	Pre-impoundment	5	0.48	Two sample t-test	**0.001**
	2021	5	0.74		
Evenness Index	Pre-impoundment	5	0.20	Two sample t-test	**<0.0001**
	2021	5	0.55		

Table A7-65: Sediment statistics results for O'Neil Bay intermittently exposed habitat (grab) comparing post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	2022	4	2.78	Mann Whitney	0.100
	2023	5	0.73		
Sand (%)	2022	4	60.68	Two sample t-test	0.272
	2023	5	32.00		
Silt + Clay (%)	2022	4	39.30	Two sample t-test	0.271
	2023	5	68.00		

Table A7-66: Benthic invertebrate statistics results for O'Neil Bay intermittently exposed habitat (grab) comparing post-impoundment (2022 and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	2022	4	11	Mann Whitney	0.200
	2023	5	26		
EPT Index (%)	2022	4	0	-	-
	2023	3	0		
O+C Index (%)	2022	4	13	Mann Whitney	**0.047**
	2023	3	100		
EPT:C	2022	0	-	-	-
	2023	3	-		
Total Richness (no. of taxa)	2022	4	1	Mann Whitney	0.300
	2023	5	1		
EPT Richness (no. of taxa)	2022	4	0	-	**-**
	2023	5	0		
Diversity Index	2022	4	0.13	Mann Whitney	**<0.0001**
	2023	3	0.09		
Evenness Index	2022	3	0.33	Mann Whitney	0.400
	2023	3	0.90		

Table A7-67: Sediment statistics results for O'Neil Bay predominantly wetted habitat comparing pre-impoundment (2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	5	2.35	Kruskal-Wallis	-
	2021	5	2.38		0.121
	2022	5	1.75		0.521
	2023	5	2.31		0.121
Sand (%)	Pre-impoundment	5	30.73	ANOVA	-
	2021	5	32.12		0.924
	2022	5	40.92		0.487
	2023	5	14.12		0.262
Silt + Clay (%)	Pre-impoundment	5	69.24	ANOVA	-
	2021	5	67.88		0.925
	2022	5	59.08		0.487
	2023	5	85.94		0.260

Table A7-68: Benthic invertebrate statistics results for O'Neil Bay predominantly wetted habitat comparing pre-impoundment (2006 and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	6	548	Kruskal-Wallis	-
	2021	5	5367		0.010
	2022	5	2063		0.156
	2023	5	2862		0.048
EPT Index (%)	Pre-impoundment	6	44	ANOVA	-
	2021	5	30		0.317
	2022	5	19		0.089
	2023	5	18		0.086
O+C Index (%)	Pre-impoundment	6	23	ANOVA	-
	2021	5	14		0.422
	2022	5	26		0.775
	2023	5	37		0.218
EPT:C	Pre-impoundment	6	3.59	Kruskal-Wallis	-
	2021	5	1.91		0.873
	2022	5	0.77		0.110
	2023	5	0.76		0.110
Total Richness (no. of taxa)	Pre-impoundment	6	7	ANOVA	-
	2021	5	9		0.080
	2022	5	7		0.739
	2023	5	7		0.868
EPT Richness (no. of taxa)	Pre-impoundment	6	2	Kruskal-Wallis	-
	2021	5	2		0.874
	2022	5	1		0.016
	2023	5	1		0.092
Diversity Index	Pre-impoundment	6	0.57	Kruskal-Wallis	-
	2021	5	0.59		0.529
	2022	5	0.62		0.186
	2023	5	0.59		0.638
Evenness Index	Pre-impoundment	6	0.37	ANOVA	-
	2021	5	0.34		0.810
	2022	5	0.51		0.151
	2023	5	0.45		0.393

Table A7-69: Sediment statistics results for O'Neil Bay offshore habitat for post-impoundment only (2021, 2022, and 2023), no pre-impoundment samples were collected. *n* = number of observations; na = data were not available for analysis.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	0	-	na	-
	2021	5	1.54		-
	2022	5	1.72		-
	2023	5	1.56		-
Sand (%)	Pre-impoundment	0	-	na	-
	2021	5	9.44		-
	2022	5	16.04		-
	2023	5	11.24		-
Silt + Clay (%)	Pre-impoundment	0	-	na	-
	2021	5	90.58		-
	2022	5	83.94		-
	2023	5	88.74		-

Table A7-70: Benthic invertebrate statistics results for O'Neil Bay offshore habitat comparing pre-impoundment (2006) and post-impoundment (2021, 2022, and 2023 *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	4	984.68	ANOVA	-
	2021	5	1099		0.586
	2022	5	153		**0.001**
	2023	5	352		**0.008**
EPT Index (%)	Pre-impoundment	4	22	ANOVA	-
	2021	5	53		**0.007**
	2022	5	69		**<0.001**
	2023	5	52		**0.008**
O+C Index (%)	Pre-impoundment	4	76	ANOVA	-
	2021	5	32		**<0.0001**
	2022	5	19		**<0.0001**
	2023	5	36		**<0.0001**
EPT:C	Pre-impoundment	4	0.30	Kruskal-Wallis	-
	2021	5	2.84		0.028
	2022	5	5.80		**0.001**
	2023	5	1.77		0.060
Total Richness (no. of taxa)	Pre-impoundment	4	3	Kruskal-Wallis	-
	2021	5	9		**0.004**
	2022	5	3		0.968
	2023	5	4		0.366
EPT Richness (no. of taxa)	Pre-impoundment	4	2	Kruskal-Wallis	-
	2021	5	2		0.146
	2022	5	1		0.383
	2023	5	1		0.383
Diversity Index	Pre-impoundment	4	0.40	ANOVA	-
	2021	5	0.66		0.017
	2022	5	0.47		0.468
	2023	5	0.59		0.066
Evenness Index	Pre-impoundment	4	0.52	ANOVA	-
	2021	5	0.38		0.143
	2022	5	0.67		0.126
	2023	5	0.66		0.152

Table A7-71: Sediment statistics results for Split Lake intermittently exposed habitat (at kicknet sites) comparing pre-impoundment (2010, 2011, 2012, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	20	2.18	Kruskal-Wallis	-
	2021	5	4.11		0.026
	2022	5	1.12		0.876
	2023	5	8.18		0.021
Sand (%)	Pre-impoundment	20	54.16	Kruskal-Wallis	-
	2021	5	7.88		**0.007**
	2022	5	63.62		0.539
	2023	5	25.84		0.125
Silt + Clay (%)	Pre-impoundment	20	45.85	Kruskal-Wallis	-
	2021	5	92.14		**0.007**
	2022	5	36.38		0.539
	2023	5	74.18		0.125

Table A7-72: Benthic invertebrate statistics results for Split Lake intermittently exposed habitat (kicknet) comparing pre-impoundment (2010, 2011, 2012, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Abundance (no. per sample)	Pre-impoundment	20	1046.10	Kruskal-Wallis	-
	2021	5	630.6		0.396
	2022	5	68.80		**0.001**
	2023	5	1027.87		0.605
EPT Index (%)	Pre-impoundment	20	21.37	Kruskal-Wallis	-
	2021	5	21.19		0.585
	2022	5	8.29		0.079
	2023	5	9.59		0.329
O+C Index (%)	Pre-impoundment	20	23.38	Kruskal-Wallis	-
	2021	5	46.80		0.034
	2022	5	30.05		0.977
	2023	5	6.62		**0.005**
EPT:C	Pre-impoundment	20	1.51	Kruskal-Wallis	-
	2021	5	2.19		0.646
	2022	5	1.25		0.223
	2023	5	3.35		0.215
Total Richness (no. of taxa)	Pre-impoundment	20	14.65	ANOVA	-
	2021	5	19.60		**0.001**
	2022	5	8.20		**<0.0001**
	2023	5	16.20		0.253
EPT Richness (no. of taxa)	Pre-impoundment	20	4.85	ANOVA	-
	2021	5	6.60		0.019
	2022	5	2.20		**0.001**
	2023	5	5.40		0.442
Diversity Index	Pre-impoundment	20	0.66	Kruskal-Wallis	-
	2021	5	0.79		0.123
	2022	5	0.72		0.682
	2023	5	0.42		0.018
Evenness Index	Pre-impoundment	20	0.27	Kruskal-Wallis	-
	2021	5	0.25		0.953
	2022	5	0.51		0.018
	2023	5	0.11		**0.005**

Table A7-73: Sediment statistics results for Split Lake predominantly wetted habitat comparing pre-impoundment (2001, 2002, and 2009) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	4	3.57	ANOVA	-
	2021	5	1.87		0.020
	2022	5	2.96		0.172
	2023	5	2.63		0.367
Sand (%)	Pre-impoundment	4	8.34	ANOVA	-
	2021	5	43.86		**0.002**
	2022	5	28.54		0.048
	2023	5	42.92		**0.002**
Silt + Clay (%)	Pre-impoundment	4	90.12	ANOVA	-
	2021	5	56.16		**0.003**
	2022	5	71.46		0.070
	2023	5	57.12		**0.004**

Table A7-74: Benthic invertebrate statistics results for Split Lake predominantly wetted habitat comparing pre-impoundment (2001, 2002, and 2009) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	23	1073	Kruskal-Wallis	-
	2021	5	1076		0.606
	2022	5	1195		0.379
	2023	5	9098		**0.001**
EPT Index (%)	Pre-impoundment	23	40	Kruskal-Wallis	-
	2021	5	28		0.447
	2022	5	26		0.261
	2023	5	13		0.018
O+C Index (%)	Pre-impoundment	23	33	Kruskal-Wallis	-
	2021	5	21		0.502
	2022	5	18		0.354
	2023	5	29		0.992
EPT:C	Pre-impoundment	14	0.79	Kruskal-Wallis	-
	2021	5	10.82		0.177
	2022	2	1.00		0.858
	2023	5	0.41		0.197
Total Richness (no. of taxa)	Pre-impoundment	23	4	Kruskal-Wallis	-
	2021	5	10		**0.001**
	2022	5	8		**0.007**
	2023	5	12		**<0.001**
EPT Richness (no. of taxa)	Pre-impoundment	23	1	Kruskal-Wallis	-
	2021	5	2		0.520
	2022	5	2		0.206
	2023	5	3		**<0.0001**
Diversity Index	Pre-impoundment	23	0.52	Kruskal-Wallis	-
	2021	5	0.76		**0.006**
	2022	5	0.76		**0.005**
	2023	5	0.43		0.250
Evenness Index	Pre-impoundment	21	0.66	Kruskal-Wallis	-
	2021	5	0.46		0.183
	2022	5	0.60		0.705
	2023	5	0.18		**<0.001**

Table A7-75: Sediment statistics results for Split Lake offshore habitat comparing pre-impoundment (2001, 2002, 2009, 2010, 2011, 2012, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Organic Carbon (%)	Pre-impoundment	27	1.65	Kruskal-Wallis	-
	2021	5	1.27		0.901
	2022	5	1.62		0.009
	2023	5	1.28		0.768
Sand (%)	Pre-impoundment	25	14.31	ANOVA	-
	2021	5	21.02		0.062
	2022	5	15.14		0.813
	2023	5	19.86		0.120
Silt + Clay (%)	Pre-impoundment	25	85.41	ANOVA	-
	2021	5	78.96		0.062
	2022	5	84.86		0.870
	2023	5	80.14		0.124

Table A7-76: Benthic invertebrate statistics results for Split Lake offshore habitat comparing pre-impoundment (2001, 2002, 2009, 2010, 2011, 2012, and 2013) and post-impoundment (2021, 2022, and 2023). *n* = number of observations used in analysis; bolded p-values indicate a statistically significant difference.

Metric	Monitoring Period	*n*	Mean	Statistical Test	p-value
Total Density (no. per m^2)	Pre-impoundment	51	4510	Kruskal-Wallis	-
	2021	5	706		**0.005**
	2022	5	328		**<0.001**
	2023	5	764		**0.003**
EPT Index (%)	Pre-impoundment	51	26	Kruskal-Wallis	-
	2021	5	18		0.149
	2022	5	46		0.033
	2023	5	25		0.958
O+C Index (%)	Pre-impoundment	51	10	Kruskal-Wallis	-
	2021	5	3		0.150
	2022	5	26		0.011
	2023	5	14		0.544
EPT:C	Pre-impoundment	41	7.90	Kruskal-Wallis	-
	2021	2	4.25		0.512
	2022	5	2.80		0.195
	2023	5	2.50		0.185
Total Richness (no. of taxa)	Pre-impoundment	51	7	ANOVA	-
	2021	5	5		0.057
	2022	5	4		**0.008**
	2023	5	6		0.188
EPT Richness (no. of taxa)	Pre-impoundment	51	2	Kruskal-Wallis	-
	2021	5	1		0.127
	2022	5	1		0.254
	2023	5	2		0.099
Diversity Index	Pre-impoundment	51	0.69	Kruskal-Wallis	-
	2021	5	0.54		0.026
	2022	5	0.57		0.010
	2023	5	0.49		0.303
Evenness Index	Pre-impoundment	51	0.53	ANOVA	-
	2021	5	0.51		0.832
	2022	5	0.63		0.253
	2023	5	0.53		0.969