Keeyask Generation Project

Aquatic Effects Monitoring Plan

Mercury in Fish from the Keeyask Reservoir, Stephens Lake, and Split Lake Report

AEMP-2024-09

KEEYASK

Manitoba Environment and Climate Change Client File 5550.00
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KEEYASK GENERATION PROJECT

AQUATIC EFFECTS MONITORING PLAN

REPORT #AEMP-2024-09

MERCURY IN FISH FLESH FROM THE KEEYASK RESERVOIR, STEPHENS LAKE, AND SPLIT LAKE, 2023

Prepared for

Manitoba Hydro

By

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June 2024

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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. Besides measuring the accuracy of the predictions made and actual effects of the GS on the environment, monitoring results provide information on how construction and operation of the GS affect the environment and if 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.

Fish mercury is one of the key components for monitoring because it affects the suitability of fish for consumption by people. Flooding is predicted to increase mercury levels in fish in the Keeyask reservoir and Stephens Lake, though the increase in Stephens Lake will be much less than when the lake was first created by construction of the Kettle GS in the early 1970's. There are no predicted effects of reservoir flooding on mercury in fish caught from Split Lake, but there is a potential for fish from the Keeyask reservoir to move in and out of it, so monitoring will be carried out to confirm there are no impacts.

This report provides results of mercury concentrations measured in jackfish (Northern Pike), pickerel (Walleye), and whitefish (Lake Whitefish) collected from the Keeyask reservoir, Stephens Lake, and Split Lake in 2023. These data were collected in the third year after impoundment of the Keeyask reservoir in the fall of 2020. Monitoring will continue annually on all three waterbodies to measure the effect of impoundment on mercury in fish.

Though not targeted for mercury monitoring, sturgeon (Lake Sturgeon) that die during Keeyask monitoring work are also analysed for mercury and the results are reported here.

Why is the study being done?

Monitoring in 2023 was done to answer the following questions:

- *What are mercury concentrations in jackfish, pickerel, and whitefish in the Keeyask reservoir, Stephens Lake, and Split Lake after impoundment of the Keeyask reservoir compared to pre-Project?*
- *What are the peak mercury concentrations in the three species and how long does it take to reach these values?*

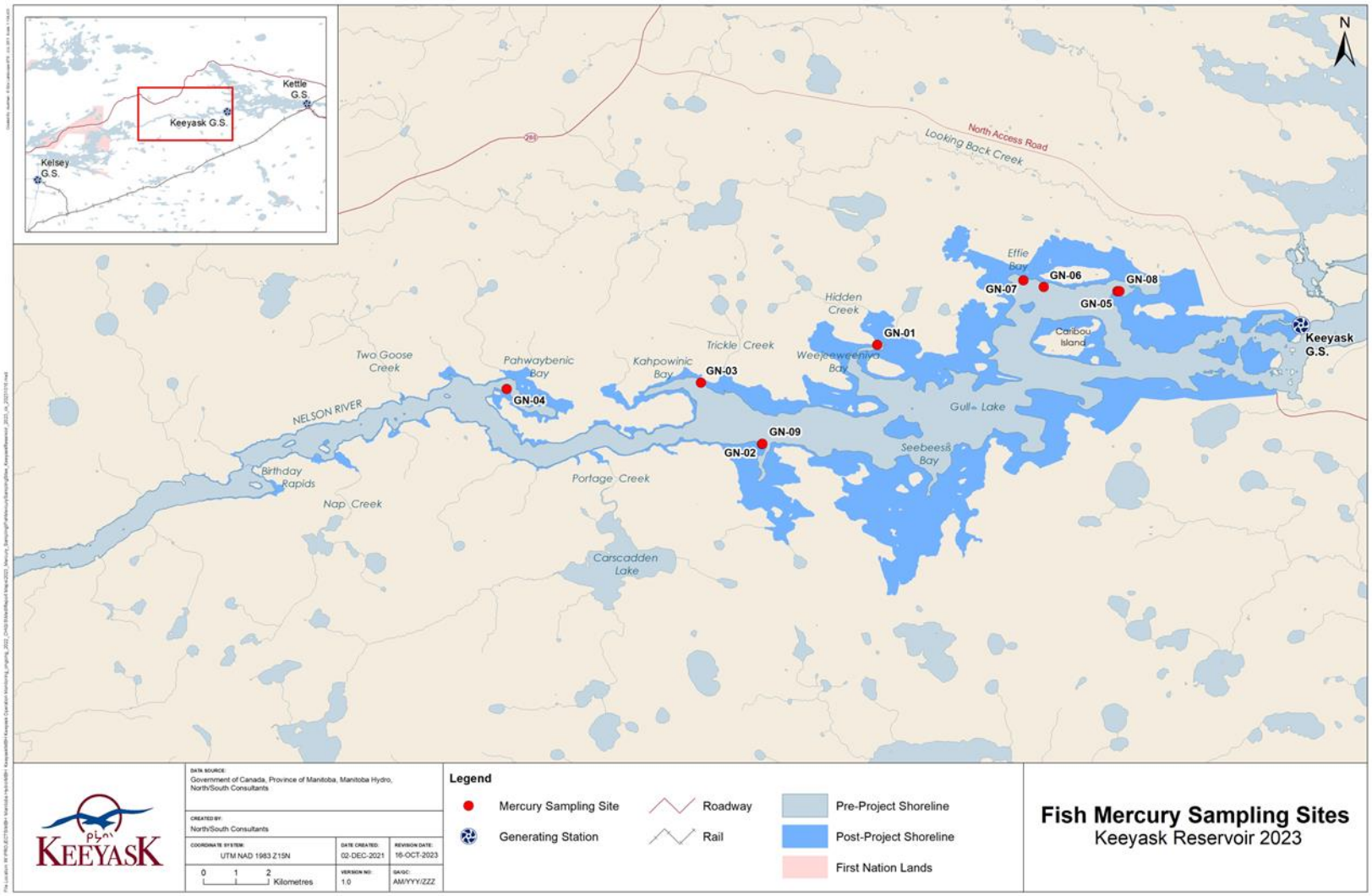
Frozen pickerel muscle sample being prepared for mercury analysis.

What was done?

Mercury was analyzed in 36 jackfish, 36 pickerel, and 21 whitefish from the Keeyask reservoir (see map below), 36 jackfish, 36 pickerel, and 12 whitefish from Stephens Lake, and 36 jackfish, 36 pickerel, and 11 whitefish from Split Lake. Two Lake Sturgeon that died during monitoring work in Split Lake were also analyzed for mercury. All fish were caught in August 2023 except for five whitefish that were caught in October to increase the sample size.

Fish from all three waterbodies were measured for length and weight, and a structure to determine the fish's age was collected from each one. A piece of muscle was taken from each fish for mercury analysis. Mercury was measured at a certified laboratory in Winnipeg.

Using the mercury concentration measured in each fish, the average mercury concentration of all fish from each species was calculated. This concentration is referred to as the **arithmetic mean**. Because the concentration of mercury in fish typically increases with the length of the fish, a second value was calculated that adjusts the concentration to a standard fish length of 550 mm for jackfish, 400 mm for pickerel, and 350 mm for whitefish. Standard fish lengths are consistent with those used for many years during studies done by scientists in northern Manitoba and have been used consistently during the Project. This second value is called the **standard mean**. Comparison of mercury concentrations between years and waterbodies based on the standard mean is more meaningful than the arithmetic mean since the standard mean accounts for differences in the size of fish sampled each year. Standard means can only be calculated if the fish that were sampled show an increase in mercury concentration with fish length. Therefore, a standard mean is not always available. A statistical model was also used to see if there were differences in mercury concentrations before and after impoundment.



Map of the Keeyask reservoir showing sampling sites for fish mercury in 2023.

What was found?

Within the Keeyask reservoir:

- The standard mean mercury concentrations for fish caught in 2023 are 0.84 ppm in a 550 mm jackfish, 0.78 ppm in a 400 mm pickerel, and 0.30 ppm in a 350 mm whitefish.
- The mean mercury concentration in jackfish, pickerel, and whitefish caught in the Keeyask reservoir in 2023 is the highest observed since 1999, when monitoring began.

For fish from Stephens Lake:

- The standard mean mercury concentrations for fish caught in 2023 are 0.62 ppm in a 550 mm jackfish and 0.59 ppm in a 400 mm pickerel. The mercury concentration of both species measured in 2023 is the highest observed since 1999.
- A standard mean could not be calculated for whitefish in 2023 because very few were caught. The mercury concentration of individual whitefish captured in 2023 is comparable to concentrations found in individual whitefish caught in previous years.

For fish from Split Lake:

- The standard mean mercury concentrations in fish collected from Split Lake in 2023 are 0.52 ppm in a 550 mm jackfish, 0.48 ppm in a 400 mm pickerel, and 0.14 ppm in a 350 mm whitefish.
- The mercury concentrations of all three species in 2023 are the highest values observed since 2001.

What does it mean?

Mercury concentrations in jackfish, pickerel, and whitefish caught from the Keeyask reservoir in 2023 have increased in response to flooding the reservoir. This is a predicted effect of the Keeyask Project. Despite this increase, the mercury in jackfish and pickerel caught from the Keeyask reservoir is below the predicted peak estimated before the Project (1 ppm). Concentrations in whitefish are higher than the predicted peak estimated (0.2 ppm).

The concentrations found in jackfish and pickerel from Stephens Lake in 2023 were higher than in all previous years when mercury was measured and exceeded the predicted peak of 0.5 ppm. Mercury concentrations were also higher in all three species sampled from Split Lake in 2023 compared to results collected in previous years. Based on the results, it is unclear if higher mercury concentrations in Stephens Lake are being caused by the Project or the fluctuations that occur naturally, or both.

Movement monitoring shows that more Walleye moved upstream out of the Keeyask reservoir into Split Lake in 2023 and did not return before winter; before this year, these upstream

movements were rare. It is not likely that the increased mercury concentrations in Split Lake observed are from fish moving upstream since mercury concentrations in all three species appear to have been increasing over time since particularly low values in the early 2000s. Fluctuations in mercury are typical when measuring mercury in fish on any given lake because of many interacting factors in the environment and in individual fish that affect the results.

Whitefish captured from the Keeyask reservoir in August 2023.

What will be done next?

Mercury in fish will be monitored again in the Keeyask reservoir, Stephens Lake, and Split Lake in 2024 to continue to track changes and compare the results to the predictions. Because the mercury concentration in Stephens Lake exceeded the predictions by more than 10% in 2023, there is a commitment in the AEMP to measure mercury in fish further downstream in 2024 from the Long Spruce forebay. This will be done to determine if more mercury is also being transported farther downstream than was predicted.

ACKNOWLEDGEMENTS

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

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

The collection of biological samples described in this report was authorized by Manitoba Natural Resources and Northern Development, Fish and Wildlife Branch, under terms of the Scientific Collection Permits #56925467 (SCP 17-2023) and #57172605 (SCP 19-2023).

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1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt (MW) hydroelectric generating station on the lower Nelson River in northern Manitoba. The GS is approximately 725 kilometres (km) northeast of Winnipeg, 35 km upstream of the existing Kettle Generating Station, 60 km east of the community of Split Lake, 180 km east-northeast of Thompson and 30 km west of Gillam. Construction of the GS began in July 2014 and the seven generating units were all in-service in March 2022.

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). 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. This includes monitoring mercury concentrations in fish flesh of four species during the construction and operation phases of the Project.

The waterbodies included in the fish mercury component of the AEMP are the Keeyask reservoir (formerly known as Gull Lake), Stephens Lake, Split Lake, and the Aiken/Landing River, which is a tributary of Split Lake. In the event that the mercury concentration in fish from Stephens Lake should exceed predicted maximum concentrations by more than 10%, the fish mercury monitoring program will be extended further downstream on the Nelson River by sampling within the Long Spruce forebay.

Fish mercury is one of the key components of monitoring because it affects the suitability of fish for consumption by people. Flooding of the Keeyask reservoir is predicted to increase mercury levels in fish in the Keeyask reservoir and Stephens Lake, though the increase in Stephens Lake is predicted to be much less than when it was first created by construction of the Kettle GS in the early 1970s. The average concentration of mercury in fish in upstream waterbodies such as Split Lake and the Aiken/Landing River could be affected if a large proportion of the fish in these waterbodies also spend extended periods in the Keeyask reservoir. Given that fish moving out of the Keeyask reservoir are expected to form only a small proportion of the fish in Split Lake and the Aiken/Landing River, no measurable effects to average mercury concentrations of fish collected from these waterbodies are predicted. Sampling will be conducted to confirm these predictions.

The primary parameter of concern for the mercury monitoring program is the concentration of total mercury in fish skeletal muscle (*i.e.*, flesh) from the following species: Lake Whitefish (*Coregonus clupeaformis*), Northern Pike (*Esox lucius*), and Walleye (*Sander vitreus*). These species are sampled because they are important in domestic, commercial, and recreational fisheries and form the primary pathway by which humans ingest (methyl) mercury.

Impoundment of the Keeyask reservoir was completed on September 5, 2020 and sampling in 2023 represents the third year of sampling after the reservoir reached full supply level. Sampling was conducted in 2023 to determine whether concentrations have changed in the reservoir and Stephens Lake, post flooding, as well as to track the changes since monitoring began in 1999, prior to the Project. This report also includes results from Split Lake to provide a regional context for results observed in the reservoir and Stephens Lake, and to monitor for potential increases caused by fish accumulating mercury in the Keeyask reservoir and moving upstream. Fish were sampled from Split Lake in 2023 under the auspices of the Coordinated Aquatic Monitoring Program (CAMP).

The monitoring in 2023 was done to answer the following questions:

- *What are the concentrations of mercury in Northern Pike, Walleye, and Lake Whitefish caught in the Keeyask reservoir, Stephens Lake, and Split Lake following final impoundment of the Keeyask reservoir in comparison to pre-Project levels?*
- *What are the peak mercury concentrations in Northern Pike, Walleye, and Lake Whitefish and how many years after the start of operation are the peak concentrations reached?*

Results reported herein add to the dataset of mercury concentrations in fish flesh from the Keeyask study area since 1999 (as reported in Jansen 2016a, 2018; Holm 2020; Holm and Aiken 2022, 2023).

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 1). This section of river offers a diversity of physical habitat conditions, including a variety of substrate types, and variable water depths (range 0–30 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 (ASL) (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. The area between Clark Lake and Birthday Rapids is referred to herein as the upper Keeyask reservoir.

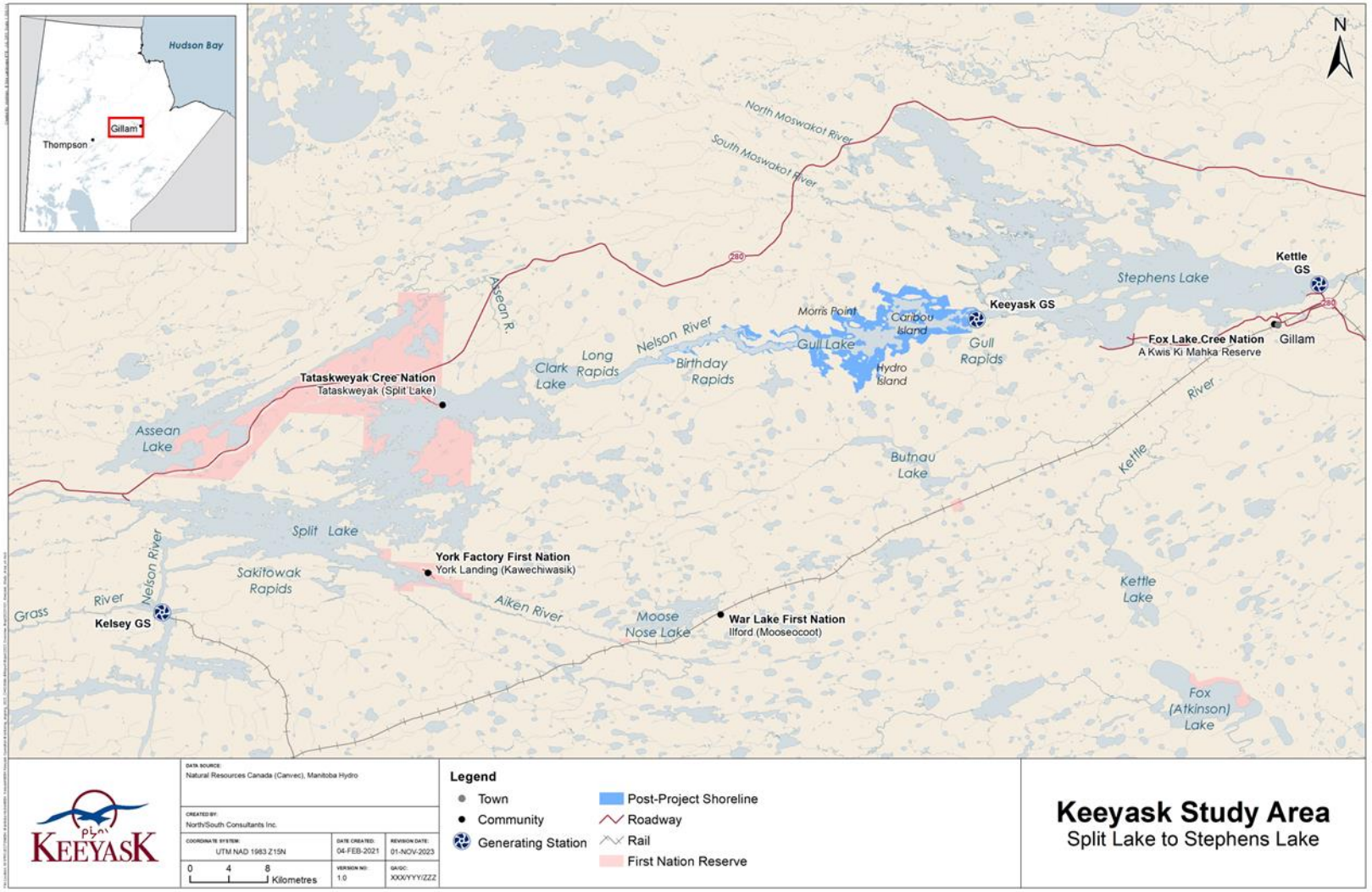
Birthday Rapids is located approximately 10 km downstream of Clark Lake and 30 km upstream of the Keeyask GS and marks the upstream end of major water level changes because of impoundment by the Keeyask GS. The drop in elevation from the upstream to downstream side of Birthday Rapids was approximately 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, and is referred to herein as the middle Keeyask reservoir.

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. Although this area is larger than prior to impoundment, the portion of the Keeyask reservoir is referred to herein as Gull Lake.

Just below the Keeyask GS, the Nelson River enters Stephens Lake. Stephens Lake was formed in 1971 by 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 1: Map of the Nelson River showing the site of Keeyask Generating Station and the fish mercury study setting.

3.0 METHODS

3.1 FIELD COLLECTIONS

The 2023 mercury sampling program in the Keeyask reservoir and Stephens Lake was conducted using similar methodologies as those used during previous sampling programs conducted between 1999 and 2022. Methodologies and sampling locations for previous years can be found in the reports listed in Table 1. Gillnetting was conducted in 2023 specifically to capture the target number of 36 fish of each species for mercury analysis.

Lake Whitefish, Walleye, and Northern Pike were captured using gill nets composed of six 22.9 m long by 2.5 m deep panels made of twisted nylon mesh, each 38, 51, 76, 95, 108, and 127 mm stretched. Fish were collected for mercury analysis from nine sites within the Keeyask reservoir including one site in the middle reservoir and eight in Gull Lake from August 16–23, 2023 (Map 2). Samples were collected from 20 sites in Stephens Lake immediately downstream of the Keeyask GS from August 18–23, 2023 (Map 3). Information on the sampling locations is summarized in Appendix 1. In addition, five Lake Whitefish mortalities from the fall Floy-tagging program (Morrison and Hrenchuk 2024) were sampled for mercury to increase the sample size: one fish was sampled on 20 October, 2023 in the Keeyask reservoir (Map 3) and four were sampled on 16–17 October, 2023 in Stephens Lake (Map 4). Mercury samples were also collected from Lake Sturgeon mortalities that occurred during fish monitoring programs in the Keeyask Study Area.

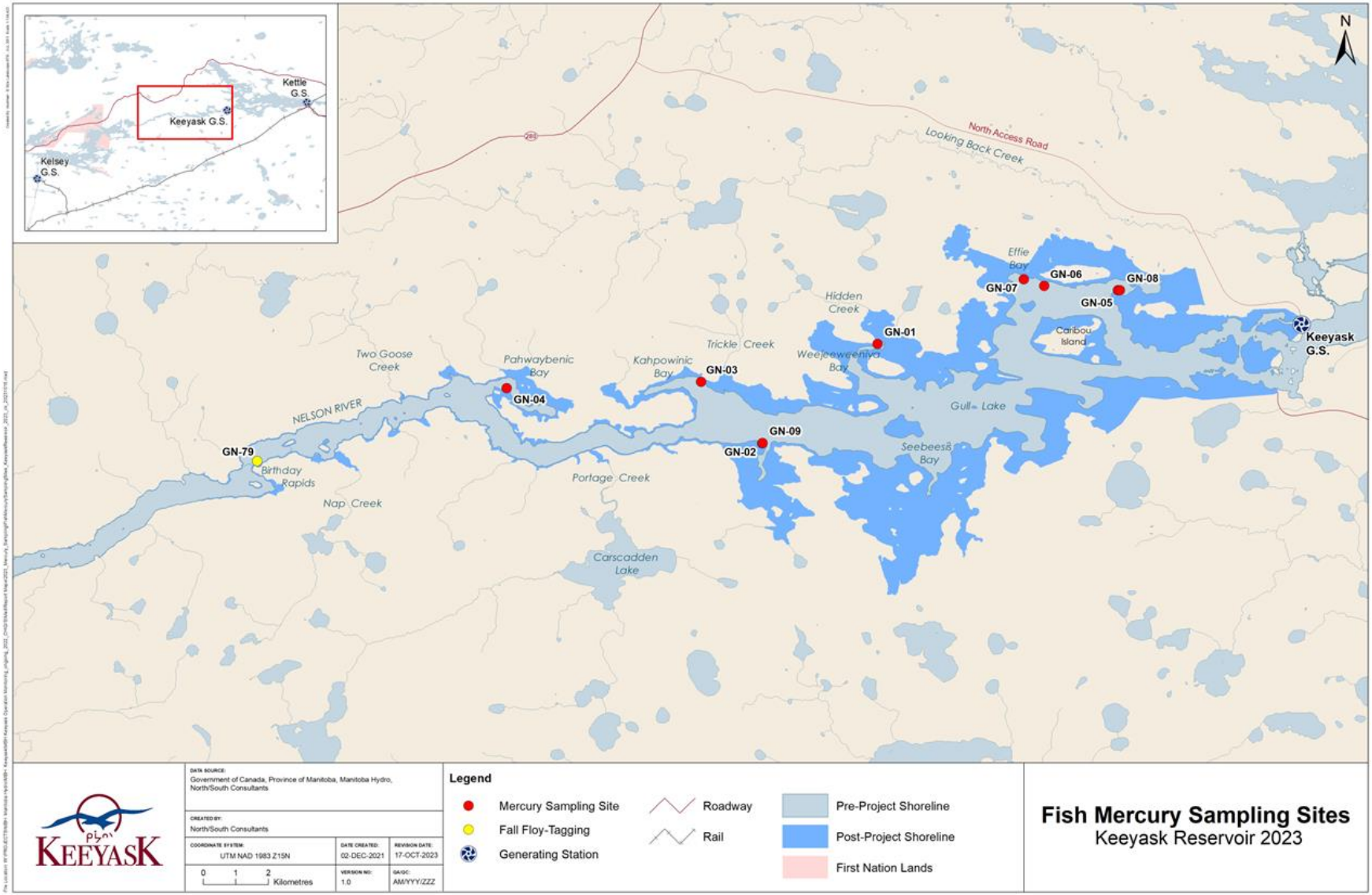
Fish sampled for mercury analysis from Split Lake as part of CAMP were collected from the same six panel gangs, but at some sites, small mesh panels consisting of three 10 m long by 1.8 m deep gillnet panels of 16, 20, and 25 mm stretch mesh were attached to the 38 mm end of the gill net. Fish analysed for mercury were captured at ten sites in Split Lake from August 25–30, 2023 (Map 4).

Table 1: Summary of sampling conducted for fish mercury monitoring in Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2023.

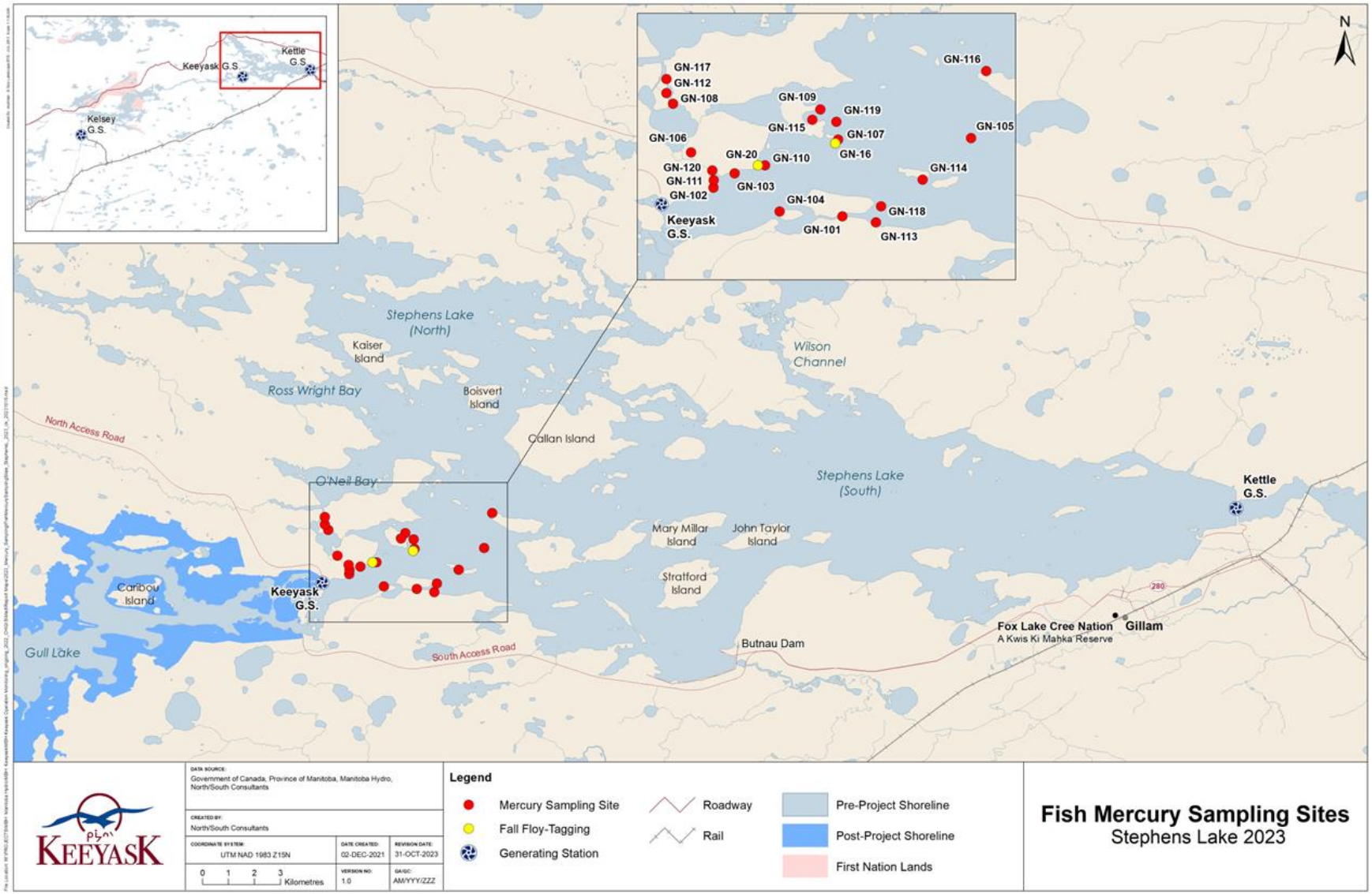
Waterbody	Year	Sampling Dates	# Sites	Sample Source
Gull Lake	1999	6–10 Oct	12	Remnant and Barth 2003
	2001	15–25 Aug	14	Remnant *et al*. 2004; Jansen and Strange 2007b
	2002	6–14 Aug	17	Johnson and Parks 2005; Jansen and Strange 2007b
	2004	6–9 Oct	2	Holm *et al*. 2007
	2006	31 May–30 Jun, 18–27 Aug	21	Jansen and Strange 2009
	2014	1–16 Sep	33	Jansen 2016a
	2016	14–24 Sep	16	Jansen 2018
	2019	8–15 Aug	21	Holm 2020; Burnett and Hrenchuk 2020
Keeyask reservoir	2021	4–14 Aug, 17-22 Sep	24	Holm and Aiken 2022; Burnett *et al*. 2022
	2022	8 Jun, 11–18 Aug	20	Holm and Aiken 2023
	2023	16–23 Aug, 16 Oct	10	This report
Stephens Lake	1999	13–19 Aug	6	Bretecher and MacDonell 2000
	2001	31 Aug, 1–29 Sep	11	Pisiak *et al*. 2004; Jansen and Strange 2007b
	2002	24 Jul–8 Aug	16	Pisiak 2005a; Jansen and Strange 2007b
	2003	23 Jul–5 Aug	42	Pisiak 2005b; Jansen and Strange 2007b
	2004	12–13 Oct	1	Holm *et al*. 2007
	2005	25–27 Aug, 29 Sep, 4–11 Oct	12	Jansen and Strange 2007b
	2007	19 Sep–2 Oct	21	Jansen 2010
	2009	4–17 Sep	8	CAMP 2014
	2012	4–9 Sep	10	CAMP 2017
	2015	7–9 Sep	11	CAMP, unpubl. data
	2018	30 Aug–4 Sep	14	CAMP, unpubl. data

Table 1: Summary of sampling conducted for fish mercury monitoring in Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2023 (continued).

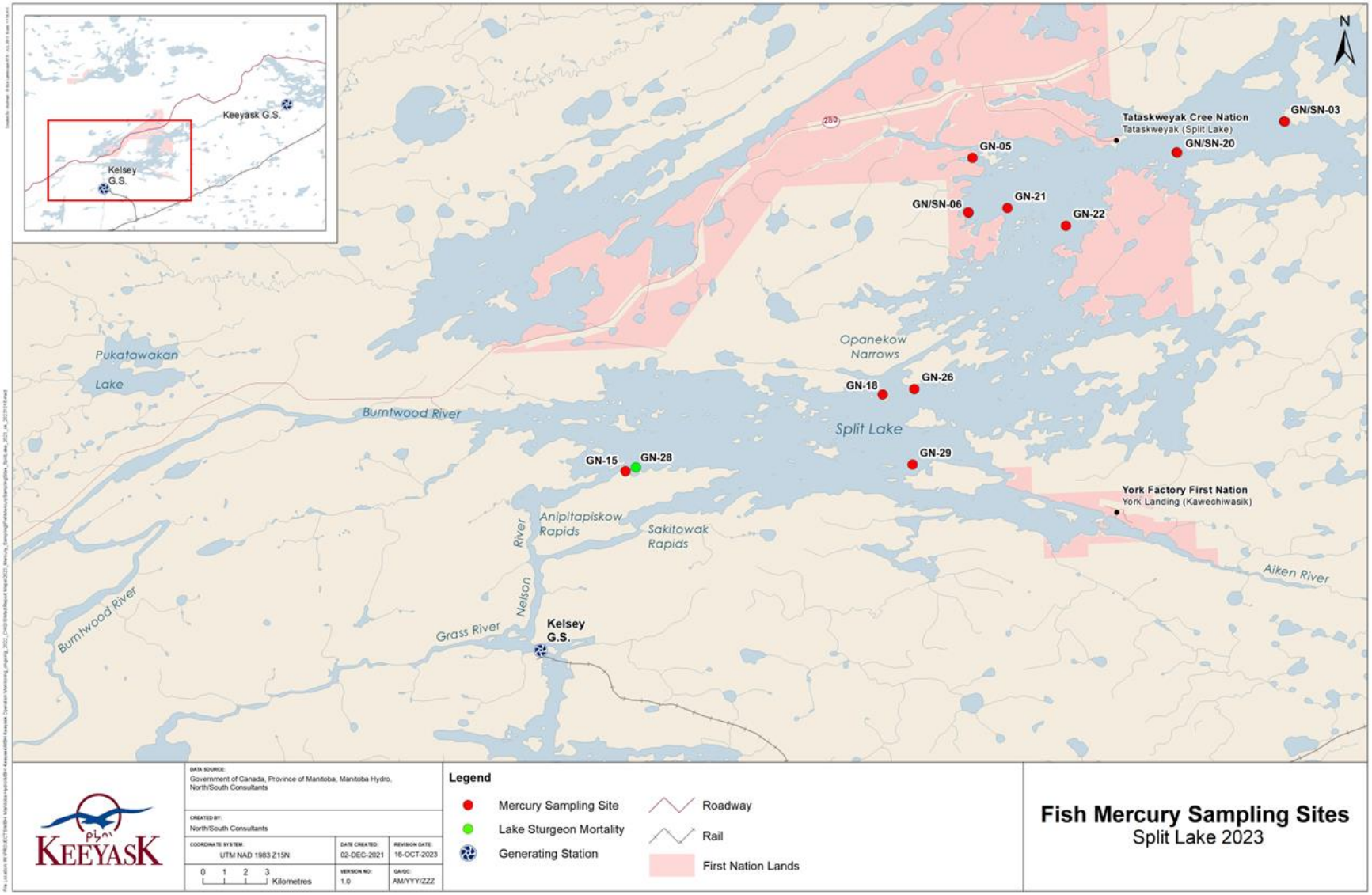
Waterbody	Year	Sampling Dates	# Sites	Sample Source
Stephens Lake	2021	1-4 Sep, 12-13 Oct	10	CAMP, unpubl. data; Funk and Hrenchuk 2022
	2022	25-29 Aug	12	Holm and Aiken 2023
	2023	18-23 Aug, 16-17 Oct	22	This report
Split Lake	2001	15-26 Aug	13	Dunmall *et al*. 2004; Jansen and Strange 2007b
	2002	13-21 Aug,10 Oct	13	Holm and Remnant 2004; Jansen and Strange 2007b
	2004	6–10 Oct	2	Holm *et al*. 2007
	2005	20-23 Aug, 6-9 Oct	15	Jansen and Strange 2007b
	2007	9 Oct	8	Jansen 2010
	2010	21-25 Aug	8	CAMP 2014
	2013	14-19 Aug	12	CAMP 2017
	2016	14-18 Aug	13	CAMP, unpubl. data
	2019	23-28 Aug, 5-6 Sep	10	CAMP, unpubl. data
	2021	24-27 Aug	11	Holm and Aiken 2022
	2022	28 Aug-1 Sep	11	CAMP, unpubl. data
	2023	25-30 Aug	10	This report



Map 2: Map of the Keeyask reservoir showing sites where fish were captured for mercury analysis in 2023.



Map 3: Map of Stephens Lake showing sampling sites where fish were captured for mercury analysis in 2023.



Map 4: Map of Split Lake showing sampling sites where fish were captured for mercury analysis in 2023.

To be consistent with the methodology described in earlier Manitoba fish mercury monitoring programs (Jansen and Strange 2007a), a broad size range of the large-bodied fish was collected. A tally of the fish captured within each consecutive 50 mm length interval (starting at 100 mm) was kept, aiming for an equal distribution of length classes within a target size of 36 fish per species. Upon capture, fish were measured for fork length (±1 mm) and round weight. Small fish that were less than approximately 100 g were weighed using a digital balance (±1 g), while heavier fish were weighed on a mechanical pan balance (±25 g). Bony structures were removed from fish for age analysis: cleithra were collected from Northern Pike, and otoliths were removed from Lake Whitefish and Walleye. A portion of axial muscle weighing between 10 and 40 g was removed from each fish, anterior to the caudal (tail) fin, for mercury analysis of the large-bodied species. The muscle, with the skin attached, was wrapped tightly in commercial “cling-wrap”, placed in mercury-free, internally and externally labelled Whirl-Pac bags or Zip-lock bags, and stored on ice until they could be frozen. Frozen tissue samples were shipped to North/South Consultants Inc. in Winnipeg for further processing.

3.2 LABORATORY DETERMINATIONS

Muscle samples were weighed and shipped frozen to ALS Laboratories in Winnipeg for analysis of total mercury, ensuring the holding time requirement between catching the fish and its analysis was less than one year. Fish muscle samples from the Keeyask reservoir were analyzed for mercury on 8 and 15 September, 2023, those from Stephens Lake were analyzed between 2–3 October, 2023, and those from Split Lake were analyzed on 15 September and 6, 18, and 19 October, 2023. Additional Lake Whitefish samples from the fall Floy-tagging program were analyzed on 16 November, 2023. The skin and a thin surface layer of the exposed muscle tissue on the opposite side were sliced away before the remaining sample was homogenized (see below). This procedure helped to ensure that the percentage of water in the muscle sample was representative of the original sample taken from the fish.

Mercury analysis was conducted by cold-vapor atomic absorption spectrometry (CVAAS) applying a modification of EPA Method 200.3/1631E and using a Teledyne Leeman M-7600 mercury analyzer (Teledyne Leeman Labs, Hudson, NH). Quality control results are presented in Appendix 2. The results all fall within the control limits for the QC sample (ALS Data Quality Objective).

Dried ageing structures were prepared and analyzed using a variety of techniques. Northern Pike cleithra were boiled to remove any remaining tissue and typically examined without a microscope (*i.e.*, free hand), although a dissecting microscope or magnified light ring was used when required. Lake Whitefish and Walleye otoliths were aged using the “crack and toast” method and examined under a microscope with reflected light. Annuli from all fish ageing structures were counted by a single reader without knowledge of length or weight of the fish. Quality assurance and quality control (QA/QC) procedures were conducted, which included re-ageing a random sample of at least 10% of all structures by an ageing technician not involved in the initial age determination.

3.3 DATA ANALYSIS

A condition factor (K) was calculated for each fish as:

$$K = W \times 10^5 / L^3$$

where: W = total weight (g); and

L = fork length (mm).

Fish obtained in different years from a group of lakes will invariably differ in mean size between years and lakes. Because fish accumulate mercury over their lifetime, older and, normally, larger individuals have higher levels than younger, smaller fish (Green 1986; Evans *et al*. 2005). In addition to calculating arithmetic mean mercury concentrations (also referred to as arithmetic means), mean mercury concentrations have been standardized to a common fish length under earlier Manitoba fish mercury monitoring programs (Jansen and Strange 2007a) and CAMP (CAMP 2017) to facilitate comparisons for the same species of fish over time or between waterbodies. The standard lengths used for Northern Pike, Walleye, and Lake Whitefish were 550, 400, and 350 mm, respectively.

Length-standardized mean mercury concentrations (also referred to as standard means) were calculated from unique regression equations, by species and location, based on the analysis of logarithmic transformations of muscle mercury concentration and fork lengths using the following relationship:

$$Log_{10}\ Hg = a + b \times Log_{10}\ L$$

where: Hg = muscle mercury concentration (ppm);

L = fork length (mm);

a = Y-intercept (constant); and

b = slope of the regression line (coefficient).

Standard means were not calculated when the relationship between mercury concentration and fish length was not significant. Linear regression analysis was completed using XLSTAT (Version 2022.1.1; Addinsoft 2023). To present data in more familiar units, all standard means and their measures of variance presented in the tables and figures have been back-transformed to arithmetic values (*i.e*., inverse log). All fish mercury concentrations were expressed as parts per million (ppm), which is the equivalent of mg/kg or µg/g wet weight muscle tissue.

A second statistical analysis was conducted to compare length-standardized mercury concentrations between pre- and post-impoundment. To remove the effect of fish length on fish total mercury concentration, similar to Eagles-Smith *et al*. (2016), a linear mixed effects model was fit for each species which included log_{10} transformed total mercury concentration as the dependent variable, log_{10} transformed fork length as a fixed covariate and waterbody as a random effect. This analysis removed the typically positive relationship between length and mercury, but retained the variation in mercury concentration.

For each species, a model was fit to all of the data from all of the waterbodies, but included random (*i.e.*, different) intercepts for each waterbody to account for differences between waterbodies, and fixed (*i.e.*, the same) slopes for each waterbody to account for the similar positive slopes observed for each waterbody. To standardize mercury concentrations at standard lengths of 350 mm for Lake Whitefish, 400 mm for Walleye, and 550 mm for Northern Pike, the residuals from each fitted model were then added back to the values predicted by the model at each standard length to calculate standardized mercury values for each individual fish, and standardized means for each sampled waterbody and year. The significance of the effect of total length on total mercury was assessed by calculating p-values using the Satterthwaite approximation for degrees of freedom (Satterthwaite 1941). To present data in more familiar units, all standardized means and their measures of variance presented in the tables and figures were back-transformed to arithmetic values.

For each species, differences in the standardized mercury concentrations for each waterbody were then assessed among years using ridgeline plots. Ridgeline plots graphically summarize the distribution of a numeric variable (*i.e.*, length-standardized mercury concentration) for several groups (*i.e.*, years). Additionally, each species length-standardized mercury concentrations were compared pre- and post-impoundment. To do this, a model was fit that included one fixed effect: a variable that identified whether the sample was collected pre- or post-impoundment (TimePeriod). In addition, the model also included the year in which the sample was collected as a random effect. The significance of the effect of TimePeriod was assessed by calculating p-values using the Satterthwaite approximation for degrees of freedom (Satterthwaite 1941). Estimated marginal means were then estimated for each TimePeriod. All mercury analyses were run using the lme4, lmerTest and emmeans packages (Bates *et al*. 2015; Kuznetsova *et al*. 2017; Lenth 2023) in R version 4.2.2 R Core Team (2023).

3.4 BENCHMARKS

The benchmarks included in the Keeyask AEMP have been dropped as they are no longer relevant and not appropriate to apply to subsistence fishers (discussed in Jansen 2016a, b).

The key reason for measuring mercury in fish is to determine the risk of it to consumers. For this reason, the mercury data collected under the AEMP is shared with the *Keeyask Mercury and Human Health Implementation Group* for use in that process.

4.0 RESULTS

4.1 SAMPLE DESCRIPTION AND BIOLOGICAL DATA

4.1.1 KEEYASK RESERVOIR

The target number of 36 Northern Pike and Walleye were captured for mercury analysis from the Keeyask reservoir in 2023 (Table 2). Only 21 Lake Whitefish were analyzed for mercury in 2023 (including a sample from a mortality during the Floy-tagging program). This species is not abundant in the Keeyask reservoir (KHLP 2012), and it has been difficult to catch the target number for mercury monitoring in previous years, even with additional, targeted sampling.

The average length of Northern Pike (486 mm) and Walleye (322 mm) analyzed for mercury in 2023 were about 12% and 20% shorter than the standard lengths for the species (550 mm and 400 mm, respectively) (Table 2). In contrast, the average length of Lake Whitefish analyzed for mercury (348 mm) was within 1% of the standard length for the species (350 mm) (Table 2).

The Walleye and Northern Pike analyzed for mercury varied in length (168–535 mm and 209–874 mm, respectively) and age (1–14 years) (Figure 1). The Lake Whitefish sampled showed a wide range of lengths (151–566 mm) and ages (1–14) but no fish between 332–438 mm were captured (Figure 1).

Biological data for individual fish of all species analyzed for mercury in 2023 are presented in Appendix 3 (Table A3-2). Box plots of lengths of Lake Whitefish, Northern Pike, and Walleye captured for mercury analysis from 1999–2023 are presented in Appendix 4. Lake Whitefish analyzed from 2014–2019 had a narrower range of lengths than those from 1999–2002 and 2021–2023. Prior to impoundment, Lake Whitefish <350 mm in length had not been collected for mercury since 2002. More than half of the Lake Whitefish analyzed for mercury (57%) in 2023 were <350 mm in length. Since 2006, the Northern Pike analyzed for mercury have generally skewed toward smaller fish. There has been some variation in the size of Walleye analyzed each year, but the mean and range has varied less than the other species.

Table 2: Size and age (mean ± SE) and mercury concentration ([Hg], arithmetic mean ± SE and standardized mean ± 95% confidence interval, CI) of Lake Whitefish, Northern Pike, and Walleye sampled for mercury analysis from Gull Lake/Keeyask reservoir from 1999–2023.

Species/ Year	n	Fork Length (mm)	n	Weight (g)	n	Age (y)	n	Arithmetic Mean [Hg] (ppm)	Standard Mean [Hg] (ppm) *	95% CI
Lake Whitefish										
1999	22	356 ± 22	21	1018 ± 152	22	5.8 ± 0.7	22	0.098 ± 0.016	0.075	0.055–0.103
2001	21	415 ± 23	21	1585 ± 256	21	7.7 ± 1.1	21	0.088 ± 0.010	0.062	0.053–0.073
2002	26	367 ±30	25	1406 ± 235	26	7.8 ± 1.2	26	0.102 ± 0.014	0.082	0.070–0.097
2014	4	498 ± 17	4	2300 ± 334	4	11.8 ± 1.9	4	0.225 ± 0.052	not significant	
2016	19	500 ± 9	19	2372 ± 129	19	10.6 ± 0.9	19	0.182 ± 0.020	*0.034*	*0.014–0.085*
2019	33	491 ± 9	33	2209 ± 118	33	11.1 ± 0.8	33	0.218 ± 0.020	*0.038*	*0.024–0.058*
2021	27	368 ± 30	27	1396 ± 235	16	9.5 ± 1.6	27	0.235 ± 0.020	*0.063*	*0.029–0.135*
2022	20	376 ± 33	19	1380 ± 314	18	7.8 ± 1.4	20	0.318 ± 0.035	*0.216*	*0.138–0.336*
2023	21	348 ± 30	21	1221 ± 268	19	5.5 ± 0.9	21	0.300 ± 0.026	0.300	0.273–0.328
Northern Pike										
1999	40	694 ± 27	40	3440 ± 407	39	8.0 ± 0.5	40	0.572 ± 0.048	0.314	0.278–0.355
2001	33	688 ± 30	33	2967 ± 375	31	7.5 ± 0.5	33	0.447 ± 0.059	0.220	0.181–0.268
2002	35	700 ± 29	35	3299 ± 406	35	9.2 ± 0.6	35	0.466 ± 0.049	0.226	0.196–0.261
2004	20	637 ± 10	20	1821 ± 116	20	6.7 ± 0.6	20	0.211 ± 0.014	not significant	
2006	66	552 ± 22	66	1590 ± 164	44	5.3 ± 0.5	66	0.231 ± 0.018	0.208	0.187–0.230
2014	31	707 ± 17	31	2774 ± 227	29	7.1 ± 0.4	31	0.572 ± 0.039	0.338	0.274–0.417
2016	36	554 ± 33	36	1729 ± 294	36	5.5 ± 0.5	36	0.378 ± 0.041	0.342	0.313–0.373
2019	36	541 ± 26	36	1441 ± 196	35	6.4 ± 0.5	36	0.630 ± 0.050	0.611	0.557–0.670
2021	36	377 ± 26	36	650 ± 177	36	3.3 ± 0.3	36	0.403 ± 0.044	0.527	0.438–0.634
2022	36	460 ± 34	36	1220 ± 296	35	4.0 ± 0.5	36	0.608 ± 0.092	0.636	0.538–0.753
2023	36	486 ± 32	36	1464 ± 234	36	5.5 ± 0.6	36	0.759 ± 0.079	0.844	0.753–0.964

Table 2: Size and age (mean ± SE) and mercury concentration ([Hg], arithmetic mean ± SE and standardized mean ± 95% confidence interval, CI) of Lake Whitefish, Northern Pike, and Walleye sampled for mercury analysis from Gull Lake/Keeyask reservoir from 1999–2023 (continued).

Species/ Year	n	Fork Length (mm)	n	Weight (g)	n	Age (y)	n	Arithmetic Mean [Hg] (ppm)	Standard Mean [Hg] (ppm)	95% CI
Walleye										
1999	22	445 ± 13	22	1350 ± 128	22	8.5 ± 0.8	22	0.414 ± 0.041	0.293	0.244–0.353
2001	26	422 ± 20	26	1181 ± 162	24	7.0 ± 1.0	26	0.273 ± 0.045	0.190	0.167–0.217
2002	32	423 ± 23	32	1340 ± 198	32	9.1 ± 1.1	32	0.371 ± 0.050	0.263	0.227–0.304
2006	44	478 ± 16	44	1521 ± 125	34	9.9 ± 0.9	44	0.432 ± 0.044	0.212	0.170–0.253
2014	38	391 ± 18	38	904 ± 128	38	8.6 ± 1.2	38	0.364 ± 0.045	0.325	0.294–0.358
2016	36	394 ± 17	35	862 ± 114	36	9.1 ± 1.5	36	0.369 ±0.057	0.302	0.254–0.358
2019	36	378 ± 15	36	761 ± 138	36	6.8 ± 0.5	36	0.437 ± 0.038	0.438	0.387–0.497
2021	36	343 ± 17	36	569 ± 66	36	6.4 ± 0.4	36	0.506 ± 0.042	0.515	0.424–0.625
2022	36	348 ± 17	35	579 ± 76	35	7.8 ± 0.6	36	0.504 ± 0.040	not significant	
2023	36	322 ± 18	36	605 ± 101	36	5.8 ± 0.7	36	0.649 ± 0.053	0.776	0.647–0.929

* Italics indicate the standard mean could only be calculated using larger (>350 mm) Lake Whitefish.

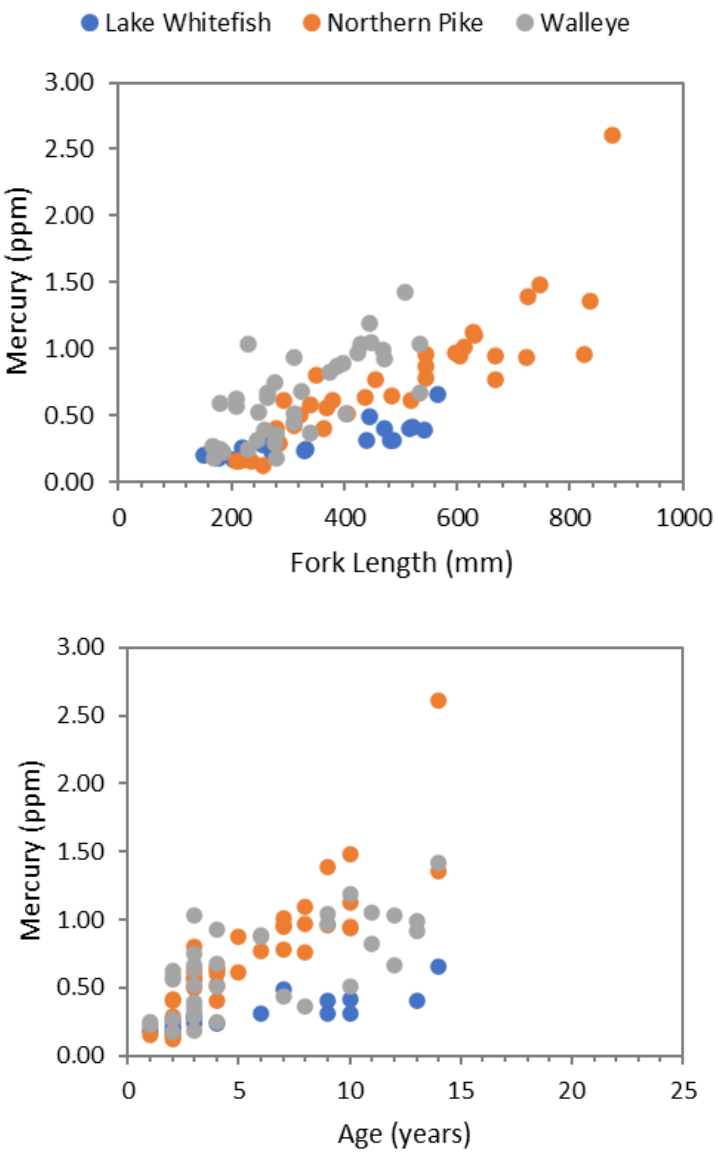


Figure 1: **Mercury concentration versus fork length (top) and age (bottom) for Lake Whitefish, Northern Pike, and Walleye captured from the Keeyask reservoir in 2023.**

4.1.2 STEPHENS LAKE

Thirty-six Walleye and Northern Pike, and 12 Lake Whitefish (including four mortalities from the Floy-tagging program) were captured for mercury analysis from Stephens Lake in 2023 (Table 3). Lake Whitefish have been difficult to catch in Stephens Lake in previous sampling years. Differences in the ability to capture Lake Whitefish is likely related to the timing of sampling and locations fished (refer to the reports listed in Table 1 for information about sampling

methodologies used in each year) as Lake Whitefish are known to make spawning migrations in Stephens Lake (KHLP 2012).

Lake Whitefish analysed for mercury in 2023 averaged 440 mm in length and were 26% longer than the standard length for the species (350 mm) (Table 3). In contrast, the average lengths of Northern Pike (545 mm) and Walleye (384 mm) were about equal to the standard lengths for the species, falling within 5% (Table 3).

Walleye analyzed for mercury varied in age (2–20 years) and length (192–570 mm) (Figure 2). Northern Pike analyzed for mercury measured between 227–975 mm and ranged in age from 2–16 years. Lake Whitefish analyzed for mercury from Stephens Lake ranged from 229–515 mm in length and in age from 3–15 years.

Biological data for individual fish of all species analyzed in 2023 are presented in Appendix 3 (Table A3-3). The lengths of Lake Whitefish, Northern Pike, and Walleye captured for mercury analysis from 1999–2023 are presented as box plots in Appendix 4. The box plot shows there has been a considerable amount of variation in the length of Lake Whitefish analyzed for mercury in each year. Only 12 Lake Whitefish <350 mm FL have been collected for mercury since 2003. In 1999, the range of Northern Pike collected for mercury analysis was very narrow compared to other years and very few large Northern Pike were captured in 2022 compared to what was typically observed in other years. The length of Walleye analyzed each year has been relatively consistent over time, although Walleye analyzed for mercury in 2007 were skewed toward larger fish.

Table 3: Size and age (mean ± SE) and mercury concentration ([Hg], arithmetic mean ± SE and standardized mean ± 95% confidence interval, CI) of Lake Whitefish, Northern Pike, and Walleye sampled for mercury analysis from Stephens Lake from 1999–2023.

Species/ Year	n	Fork Length (mm)	n	Weight (g)	n	Age (y)	n	Arithmetic Mean [Hg] (ppm)	Standard Mean [Hg] (ppm)	95% CI
Lake Whitefish										
1999	6	365 ± 33	0	-	6	4.8 ± 0.9	6	0.091 ± 0.019	0.077	0.050–0.119
2001	15	489 ± 9	15	2180 ± 119	9	13.2 ± 1.3	15	0.153 ± 0.014	not significant	
2002	25	403 ± 23	25	1364 ± 185	25	8.1 ± 0.9	25	0.134 ± 0.013	0.112	0.096–0.131
2003	78	394 ± 15	65	1797 ± 132	75	9.6 ± 0.7	78	0.125 ± 0.008	0.104	0.096–0.113
2004	10	478 ± 10	10	1915 ± 129	10	10.6 ± 1.0	10	0.085 ± 0.006	not significant	
2005	25	488 ± 9	25	2234 ± 136	25	12.2 ± 0.7	25	0.108 ± 0.009	0.029	0.020–0.042
2007	33	463 ± 10	32	1931 ± 123	32	10.1 ± 0.7	33	0.138 ± 0.009	0.069	0.056–0.085
2009	7	483 ± 26	7	2410 ± 397	6	12.7 ± 1.9	7	0.159 ± 0.027	0.046	0.025–0.084
2012	5	526 ± 20	5	2718 ± 307	5	16.0 ± 2.3	5	0.168 ± 0.018	0.053	0.024–0.115
2015	11	302 ± 61	11	1138 ± 361	11	7.2 ± 2.6	11	0.110 ± 0.036	0.107	0.081–0.141
2018	13	441 ± 22	13	1626 ± 226	13	10.8 ± 1.6	13	0.116 ± 0.018	0.059	0.045–0.078
2021	6	457 ± 31	6	1632 ± 251	6	13.5 ± 2.1	6	0.142 ± 0.021	not significant	
2022	7	380 ± 26	7	799 ± 168	7	8.7 ± 1.8	7	0.142 ± 0.026	not significant	
2023	12	440 ± 20	12	1572 ± 161	8	9.4 ± 1.3	12	0.151 ± 0.015	not significant	
Northern Pike										
1999	14	501 ± 17	14	1620 ± 120	14	4.6 ± 0.4	14	0.369 ± 0.067	0.432	0.316–0.591
2001	27	641 ± 35	27	2377 ± 399	26	6.5 ± 0.5	27	0.573 ± 0.097	0.316	0.276–0.361
2002	35	700 ± 30	35	2955 ± 352	33	9.3 ± 0.7	35	0.663 ± 0.082	0.332	0.280–0.395
2003	76	632 ± 18	76	2277 ± 202	73	9.4 ± 0.5	76	0.448 ± 0.038	0.272	0.246–0.301
2005	52	583 ± 20	52	1743 ± 205	52	6.7 ± 0.4	52	0.250 ± 0.030	0.180	0.165–0.196
2007	40	669 ± 29	20	1828 ± 364	40	8.2 ± 0.6	40	0.521 ± 0.052	0.339	0.302–0.381

Table 3: Size and age (mean ± SE) and mercury concentration ([Hg], arithmetic mean ± SE and standardized mean ± 95% confidence interval, CI) of Lake Whitefish, Northern Pike, and Walleye sampled for mercury analysis from Stephens Lake from 1999–2023 (continued).

Species/ Year	n	Fork Length (mm)	n	Weight (g)	n	Age (y)	n	Arithmetic Mean [Hg] (ppm)	Standard Mean [Hg] (ppm)	95% CI
Northern Pike										
2009	36	526 ± 32	36	1501 ± 224	28	6.8 ± 0.7	36	0.295 ± 0.042	0.261	0.230–0.297
2012	42	511 ± 22	42	1206 ± 143	42	6.0 ± 0.5	42	0.266 ± 0.022	0.275	0.249–0.304
2015	36	532 ± 27	36	1424 ± 220	34	5.9 ± 0.4	36	0.372 ± 0.051	0.333	0.284–0.390
2018	36	540 ± 23	36	1327 ± 180	36	5.0 ± 0.3	36	0.372 ± 0.049	0.329	0.289–0.375
2021	27	512 ± 35	27	1438 ± 294	27	4.9 ± 0.4	27	0.479 ± 0.082	0.448	0.385–0.520
2022	29	426 ± 18	29	591 ± 80	28	3.9 ± 0.3	29	0.315 ± 0.024	0.388	0.317–0.475
2023	36	545 ± 33	36	1894 ± 340	36	6.7 ± 0.6	36	0.650 ± 0.057	0.623	0.567–0.685
Walleye										
1999	24	380 ± 20	17	1504 ± 250	23	7.8 ± 0.8	24	0.444 ± 0.057	0.425	0.356–0.508
2001	29	419 ± 20	29	1217 ± 171	27	8.7 ± 1.0	29	0.373 ± 0.049	0.277	0.243–0.316
2002	34	438 ± 21	33	1342 ± 173	33	10.4 ± 0.9	34	0.469 ± 0.035	0.405	0.378–0.434
2003	70	433 ± 12	69	1240 ± 94	67	10.2 ± 0.6	70	0.418 ± 0.027	0.329	0.298–0.364
2004	1	421	1	900	1	7	1	0.15	too few samples	
2005	69	401 ± 13	69	1141 ± 95	69	10.1 ± 0.7	69	0.249 ± 0.022	0.204	0.183–0.227
2007	18	522 ± 17	15	2113 ± 171	18	14.4 ± 1.0	18	0.685 ± 0.058	0.394	0.282–0.551
2009	36	419 ± 18	36	1241 ± 141	33	11.5 ± 1.2	36	0.315 ± 0.030	0.262	0.236–0.291
2012	41	462 ± 15	41	1425 ± 120	41	9.2 ± 0.9	41	0.431 ± 0.045	0.283	0.248–0.322
2015	36	416 ± 18	36	961 ± 95	36	12.0 ± 1.2	36	0.592 ± 0.050	0.498	0.427–0.582
2018	36	403 ± 19	36	862 ± 106	35	8.7 ± 0.9	36	0.447 ± 0.051	0.380	0.336–0.431
2021	36	344 ± 18	36	571 ± 70	36	7.7 ± 0.7	36	0.372 ± 0.032	0.442	0.401–0.488
2022	36	342 ± 17	36	550 ± 72	35	8.1 ± 0.8	36	0.431 ± 0.047	0.503	0.441–0.574
2023	36	384 ± 16	36	879 ± 95	35	9.2 ± 0.8	36	0.591 ± 0.040	0.590	0.528–0.659

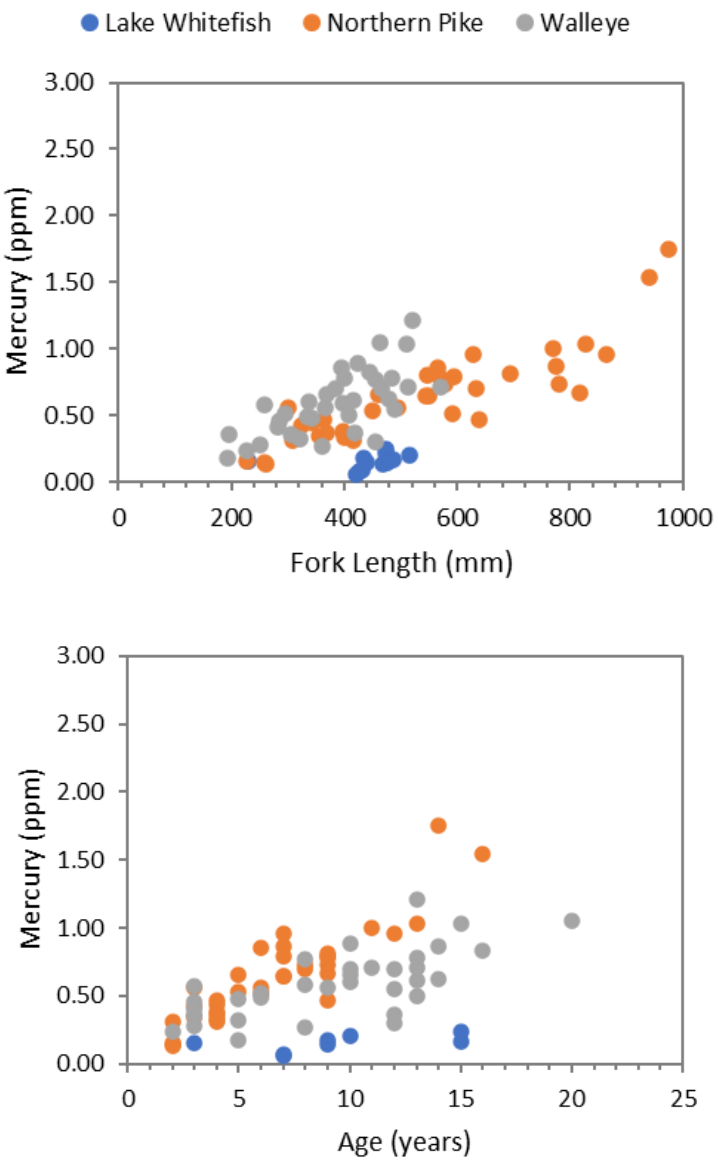


Figure 2: Mercury concentration versus fork length (top) and age (bottom) for Lake Whitefish, Northern Pike, and Walleye captured from Stephens Lake in 2023.

4.1.3 SPLIT LAKE

Thirty-six Walleye, 36 Northern Pike, and 11 Lake Whitefish were collected for mercury analysis from Split Lake in 2023 (Table 4). Lake Whitefish are not as common in Split Lake in the summer compared to the other two species (KHLP 2012).

Lake Whitefish analysed for mercury in 2023 averaged 416 mm in length, which is 19% longer than the standard length for the species (350 mm) (Table 4). In contrast, the average length of

Walleye (343 mm) and Northern Pike (508 mm) were shorter than the standard means for the species by 14% (400 mm) and 8% (550 mm), respectively (Table 4).

Walleye and Northern Pike analyzed for mercury ranged in length from 158–602 mm and 224–930 mm, respectively, and in age from 1–17 and 1–12 years, respectively (Figure 3). Only one small Lake Whitefish was analyzed for mercury (138 mm, 2 years), with the other fish ranging from 404–488 mm and 8–15 years.

Biological data for individual fish of all species analyzed in 2023 are presented in Appendix 3 (Table A3-4). The lengths of Lake Whitefish, Northern Pike, and Walleye captured for mercury analysis from 1999–2023 are presented as box plots in Appendix 4. Since 2004, Lake Whitefish analyzed for mercury have had a narrower range of lengths and have generally been longer than in 2001 and 2002. While there has been some variation in the size of Northern Pike and Walleye collected over time, the means and ranges have been more similar when compared to Lake Whitefish. A narrower range of lengths of both species was collected in 2007 since the samples were obtained from commercial and local fishers (Jansen 2010). Walleye analyzed in 2004 had a very narrow length range because only a small number of adult fish were sampled for trace element analysis (Holm *et al*. 2007). In 2019 very few large Walleye were collected for mercury analysis compared to what was observed in other years due to logistical issues experienced in the field that year.

Table 4: Size and age (mean ± SE) and mercury concentration ([Hg], arithmetic mean ± SE and standardized mean ± 95% confidence interval, CI) of Lake Whitefish, Northern Pike, and Walleye sampled for mercury analysis from Split Lake from 2001–2023.

Species/ Year	n	Fork Length (mm)	n	Weight (g)	n	Age (y)	n	Arithmetic Mean [Hg] (ppm)	Standard Mean [Hg] (ppm)	95% CI
Lake Whitefish										
2001	27	333 ± 22	26	799 ± 140	27	6.6 ± 1.0	27	0.069 ± 0.010	0.066	0.058–0.075
2002	21	391 ± 23	21	1272 ± 194	21	7.8 ± 0.8	21	0.079 ± 0.013	0.054	0.042–0.070
2004	3	449 ± 20	3	1833 ± 412	3	9.0 ± 0.5	3	0.057 ± 0.007	not significant	
2005	37	465 ± 6	37	1930 ± 80	37	11.3 ± 0.4	37	0.075 ± 0.004	0.030	0.021–0.042
2007	17	439 ± 8	17	1725 ± 130	17	9.8 ± 0.6	17	0.128 ± 0.013	0.059	0.035–0.101
2010	16	412 ± 19	16	1324 ± 154	15	17.5 ± 0.9	16	0.092 ± 0.012	0.062	0.049–0.078
2013	20	413 ± 11	20	1177 ± 109	19	8.5 ± 0.7	20	0.150 ± 0.013	0.102	0.082–0.128
2016	22	429 ± 8	22	1409 ± 95	22	8.6 ± 0.5	22	0.072 ± 0.005	0.037	0.030–0.047
2019	21	443 ± 11	21	1640 ± 147	21	10.4 ± 0.6	21	0.102 ± 0.009	0.065	0.048–0.090
2021	25	446 ± 10	25	1489 ± 108	25	12.1 ± 0.6	25	0.155 ± 0.010	0.082	0.066–0.101
2022	24	406 ± 12	24	1088 ± 92	24	11.5 ± 0.7	24	0.131 ± 0.009	0.094	0.080–0.110
2023	11	416 ± 28	11	1243 ± 160	11	10.5 ± 1.0	11	0.171 ± 0.020	0.144	0.112–0.186
Northern Pike										
2001	23	599 ± 23	23	1791 ± 204	23	6.0 ± 0.3	23	0.337 ± 0.041	0.239	0.200–0.285
2002	26	632 ± 31	26	2274 ± 353	22	7.0 ± 0.5	26	0.340 ± 0.054	0.204	0.174–0.239
2005	51	574 ± 17	51	1572 ± 141	51	6.8 ± 0.4	51	0.237 ± 0.023	0.182	0.164–0.202
2007	35	630 ± 13	35	2026 ± 194	35	7.5 ± 0.3	35	0.443 ± 0.024	not significant	
2010	24	584 ± 32	24	1936 ± 313	24	6.0 ± 0.6	24	0.363 ± 0.042	0.289	0.249–0.335
2013	37	506 ± 22	37	1070 ± 146	36	5.3 ± 0.3	37	0.354 ± 0.032	0.375	0.333–0.422
2016	34	504 ± 25	34	1120 ± 166	34	4.7 ± 0.4	34	0.262 ± 0.029	0.278	0.251–0.308
2019	36	446 ± 20	36	714 ± 121	36	4.0 ± 0.3	36	0.312 ± 0.064	0.383	0.381–0.461

Table 4: Size and age (mean ± SE) and mercury concentration ([Hg], arithmetic mean ± SE and standardized mean ± 95% confidence interval, CI) of Lake Whitefish, Northern Pike, and Walleye sampled for mercury analysis from Split Lake from 2001–2023 (continued).

Species/ Year	n	Fork Length (mm)	n	Weight (g)	n	Age (y)	n	Arithmetic Mean [Hg] (ppm)	Standard Mean [Hg] (ppm)	95% CI
Northern Pike										
2021	37	504 ± 27	35	1381 ± 289	37	4.7 ± 0.3	37	0.401 ± 0.044	0.415	0.376–0.458
2022	33	439 ± 24	33	760 ± 153	33	4.4 ± 0.4	33	0.339 ± 0.038	0.416	0.355–0.488
2023	36	508 ± 31	36	1339 ± 270	36	5.3 ± 0.5	36	0.511 ± 0.060	0.516	0.461–0.578
Walleye										
2001	26	392 ± 21	26	981 ± 151	25	7.0 ± 0.7	26	0.209 ± 0.028	0.190	0.166–0.217
2002	28	401 ± 22	27	1098 ± 170	26	7.2 ± 0.8	28	0.212 ± 0.019	0.198	0.171–0.230
2004	15	427 ± 9	15	920 ± 84	15	7.7 ± 0.6	15	0.155 ± 0.010	not significant	
2005	53	330 ± 16	53	634 ± 83	53	6.1 ± 0.3	53	0.099 ± 0.007	0.118	0.108–0.128
2007	66	392 ± 6	66	805 ± 44	66	7.9 ± 0.3	66	0.359 ± 0.023	0.331	0.295–0.372
2010	33	376 ± 19	33	854 ± 120	33	5.2 ± 0.5	33	0.197 ± 0.023	0.196	0.173–0.222
2013	37	345 ± 21	37	689 ± 132	37	6.4 ± 0.8	37	0.368 ± 0.042	0.413	0.355–0.481
2016	36	343 ± 22	36	668 ± 151	35	5.7 ± 0.8	36	0.238 ± 0.032	0.262	0.230–0.298
2019	32	270 ± 12	32	257 ± 32	30	4.6 ± 0.4	32	0.231 ± 0.020	0.370	0.284–0.482
2021	35	322 ± 17	35	461 ± 59	35	6.5 ± 0.5	36	0.351 ± 0.032	0.452	0.397–0.516
2022	36	341 ± 16	36	543 ± 70	36	7.4 ± 0.6	36	0.328 ± 0.027	0.366	0.311–0.431
2023	36	343 ± 21	36	595 ± 98	36	7.3 ± 0.8	36	0.416 ± 0.043	0.480	0.435–0.529

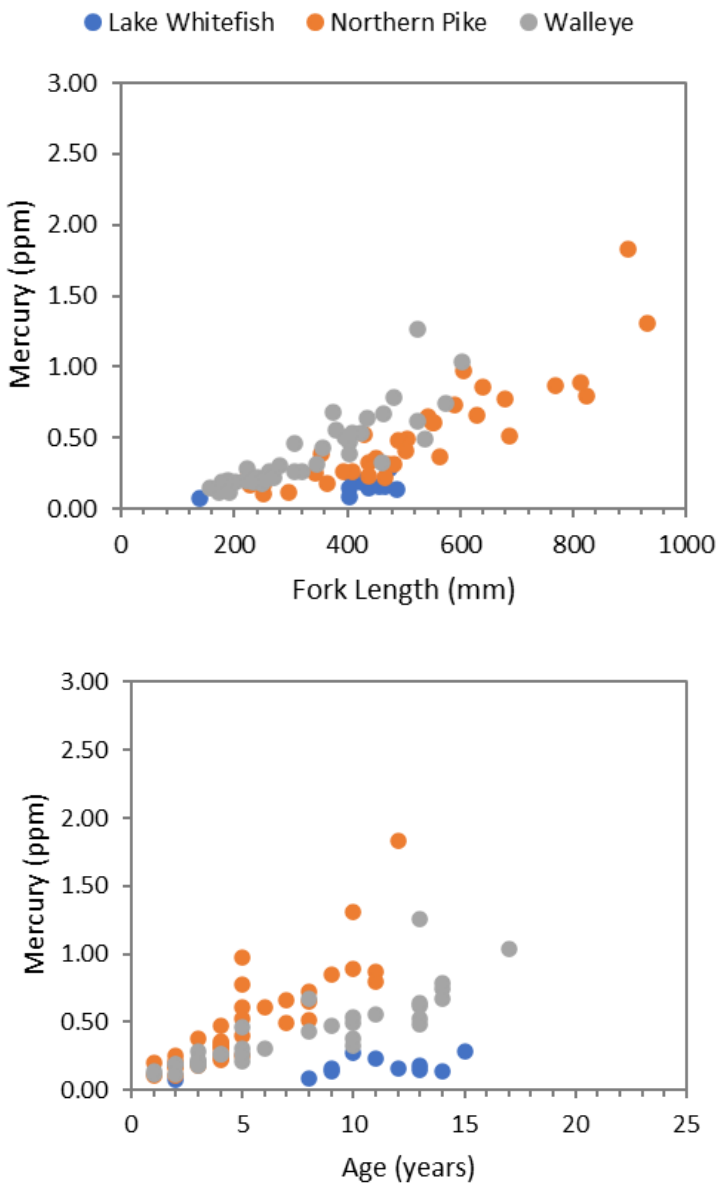


Figure 3: **Mercury concentration versus fork length (top) and age (bottom) for Northern Pike, Walleye, and Lake Whitefish captured from Split Lake in 2023.**

4.2 MERCURY CONCENTRATIONS

4.2.1 KEEYASK RESERVOIR

4.2.1.1 RESULTS FOR 2023

All three species showed a significant positive relationship between mercury concentration and fork length (Appendix 5), allowing for average concentrations to be standardized by fish length. Standard means were 0.30 ppm for Lake Whitefish, 0.84 ppm for Northern Pike, and 0.78 ppm for Walleye (Table 2). The standard mean for Northern Pike and Walleye was below the predicted peak of 1 ppm, while the standard mean for Lake Whitefish was above the predicted peak of 0.19 ppm in 2023 (KHLP 2012).

4.2.1.2 COMPARISON TO PREVIOUS YEARS

The standard mean mercury concentration of a 550 mm Northern Pike in 2023 (0.84 ppm) was higher than in the two previous post-impoundment years, 2022 (0.64 ppm) and 2021 (0.53 ppm), and exceeded the pre-Project maximum value (0.61 ppm) measured in 2019 (Figure 4). Prior to 2019, values ranged from 0.21 ppm in 2006 to 0.34 ppm in 2016.

The standard mean mercury for Walleye in 2023 (0.78 ppm) was higher than the 2021 value (0.52 ppm) as well as the range observed pre-impoundment (0.19–0.44 ppm) (Figure 4). A standard mean could not be calculated in 2022.

This year is the first post-impoundment year that there has been a significant relationship between the mercury concentration and fork length in Lake Whitefish of all lengths (0.30 ppm) (Figure 4). In the two previous post-impoundment years, because of differences in the accumulation of mercury of different length classes, a standard mean could only be calculated using the larger (>350 mm) Lake Whitefish (0.06 ppm in 2021 and 0.22 ppm in 2022) (Figure 5). Prior to impoundment, the standard mean ranged from 0.03 to 0.08 ppm (Figure 4).

These results suggest that mercury concentrations are increasing as a result of impoundment, as expected, but are still below the 1 ppm prediction for the piscivorous species but have exceeded the predicted peak of 0.19 ppm for Lake Whitefish (KHLP 2012).

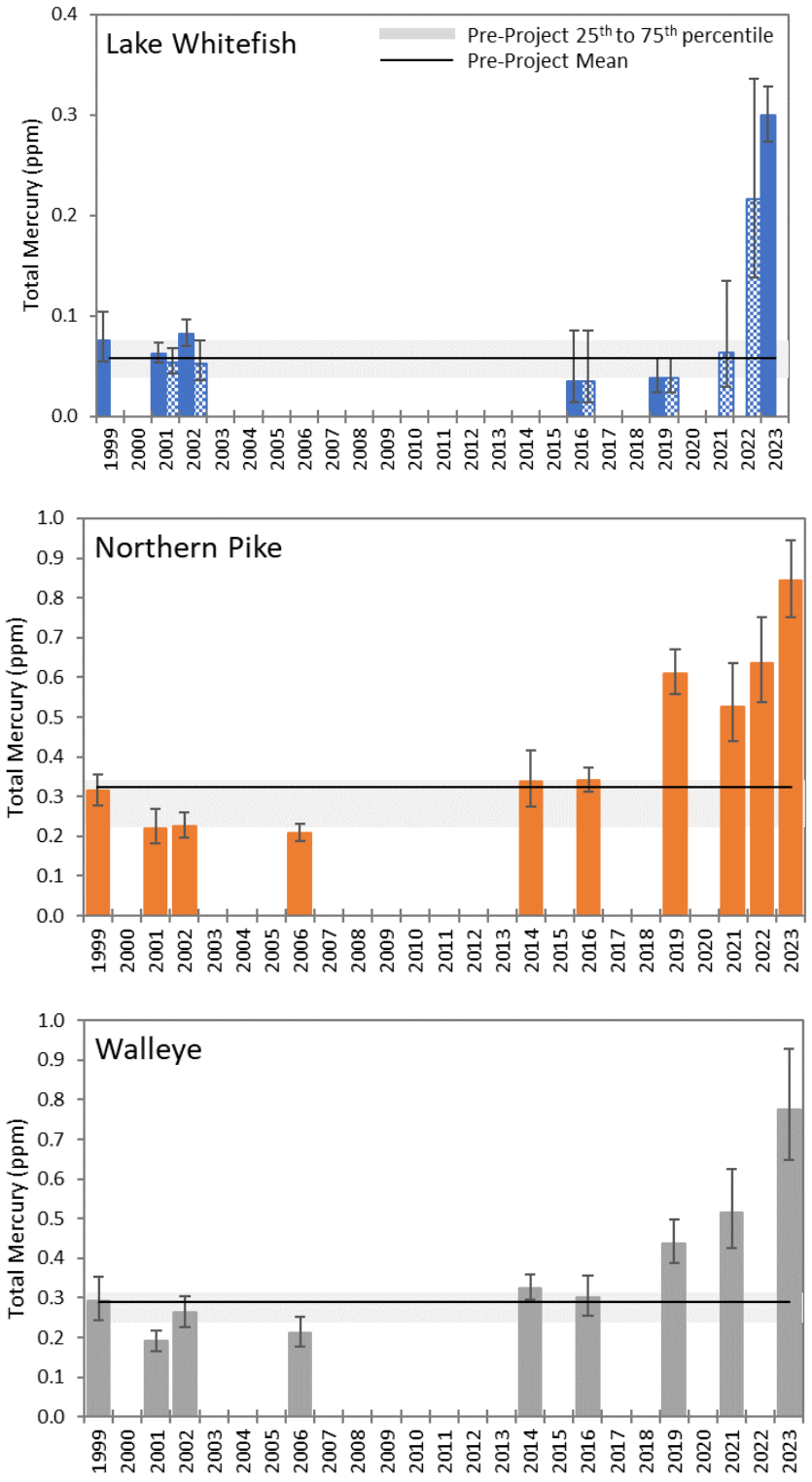


Figure 4: **Length-standardized mean (±95% confidence limits) muscle mercury concentrations of a 350 mm Lake Whitefish (hashed bars show the results when only large fish >350 mm included), a 550 mm Northern Pike, and a 400 mm Walleye from Gull Lake/Keeyask reservoir for 1999–2023.**

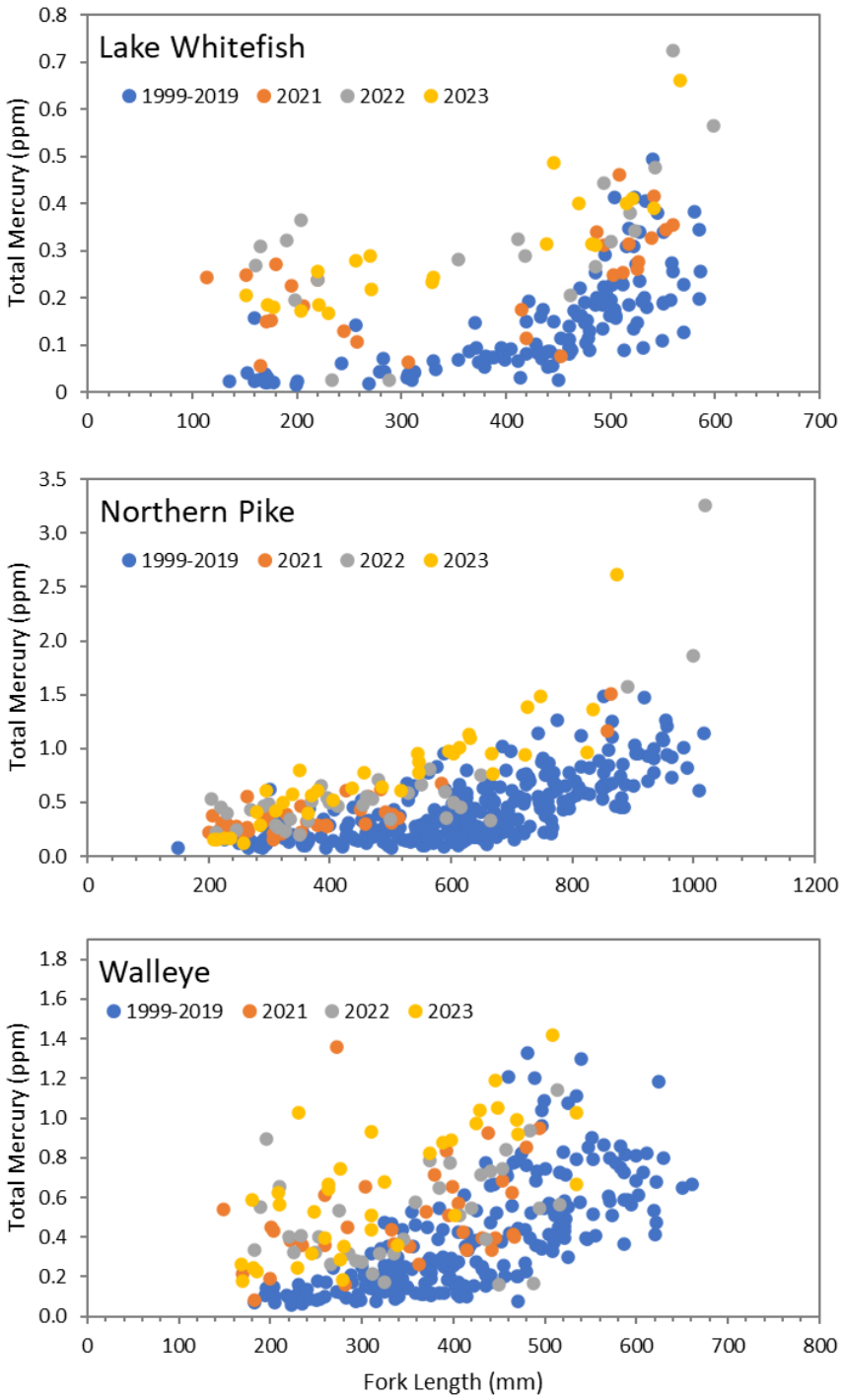


Figure 5: **Muscle mercury concentrations of Lake Whitefish, Northern Pike, and Walleye as a function of fork length from the Keeyask reservoir in 2021, 2022, and 2023 compared to pre-impoundment (1999–2019).**

Statistical analysis of the length-corrected dataset indicated that there were significant differences between pre- and post-impoundment mercury concentrations of a 550 mm Northern Pike, 400 mm Walleye, and 350 mm Lake Whitefish from the Keeyask reservoir. Comparisons of all three species showed significantly higher mercury concentrations in 2021, 2022, and 2023 (post-impoundment) than in all previous sampling years prior to 2019 (pre-impoundment) (Figure 6).

The length-corrected data were also used to create density ridgeline plots (Figure 7) that show the distribution of mercury concentrations estimated for a 350 mm Lake Whitefish, a 550 mm Northern Pike, and a 400 mm Walleye. Prior to 2019, mercury concentrations varied little among years (*i.e.*, the curves in Figure 7 are of a similar shape and colour prior to 2019). In each year during this time, half of the fish (*i.e.*, the median) would be expected to have mercury concentrations less than 0.06–0.15 ppm in Lake Whitefish, 0.17–0.37 ppm in Northern Pike, and 0.18–0.30 ppm in Walleye. Since 2021, there is more variation in the mercury concentrations in fish of a standard length, with a portion of the fish having higher mercury concentrations since impoundment (*i.e.*, curves are flatter and more spread out). Mercury concentrations in individual fish have increased, half of the fish in 2021, 2022, and 2023 are expected to have mercury concentrations less than 0.20–0.30 ppm in Lake Whitefish, 0.73–0.85 ppm in Northern Pike, and 0.60–0.89 ppm in Walleye. The maximum mercury concentrations modelled for 2023 are approximately twice as high as observed pre-impoundment for Lake Whitefish and Walleye. For Northern Pike the maximum in 2023 was similar to that in 2019, but was about twice as high as observed in 2016. However, for all three species, the maximum concentration modelled was lower in 2023 compared to 2022.

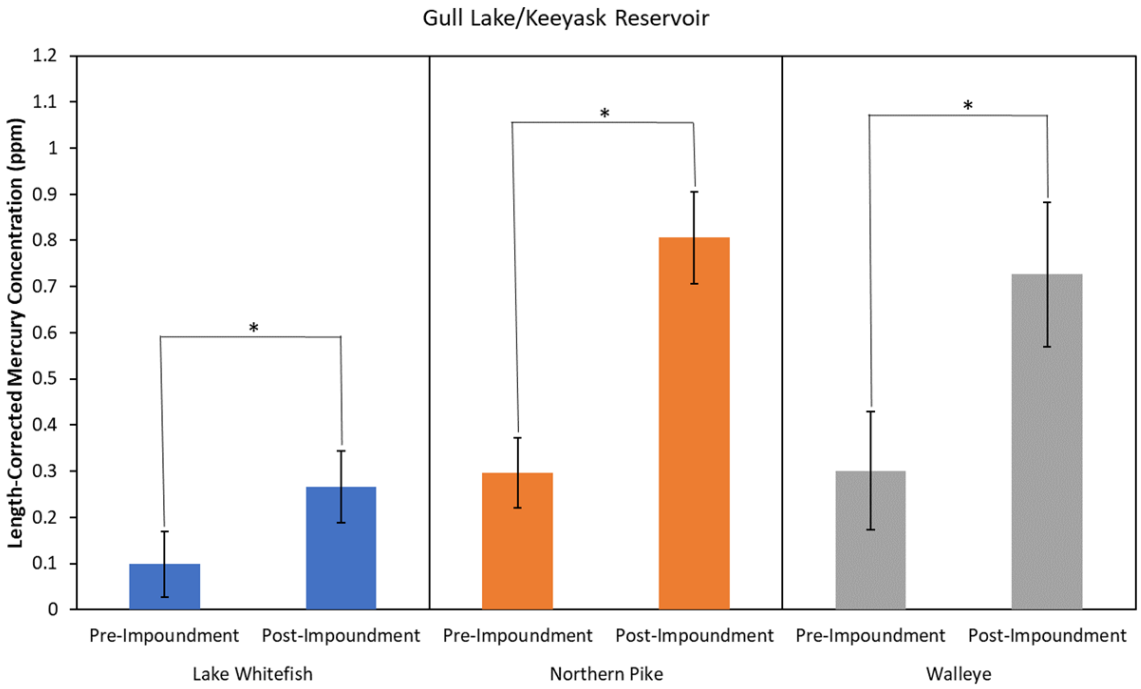


Figure 6: **Estimated marginal mean length-corrected mercury concentration (ppm) for a 350 mm Lake Whitefish, a 550 mm Northern Pike, and a 400 mm Walleye from Gull Lake/Keeyask reservoir pre- (1999–2019) and post-impoundment (2021–2032). Asterisks indicate statistical significance ($p < 0.05$).**

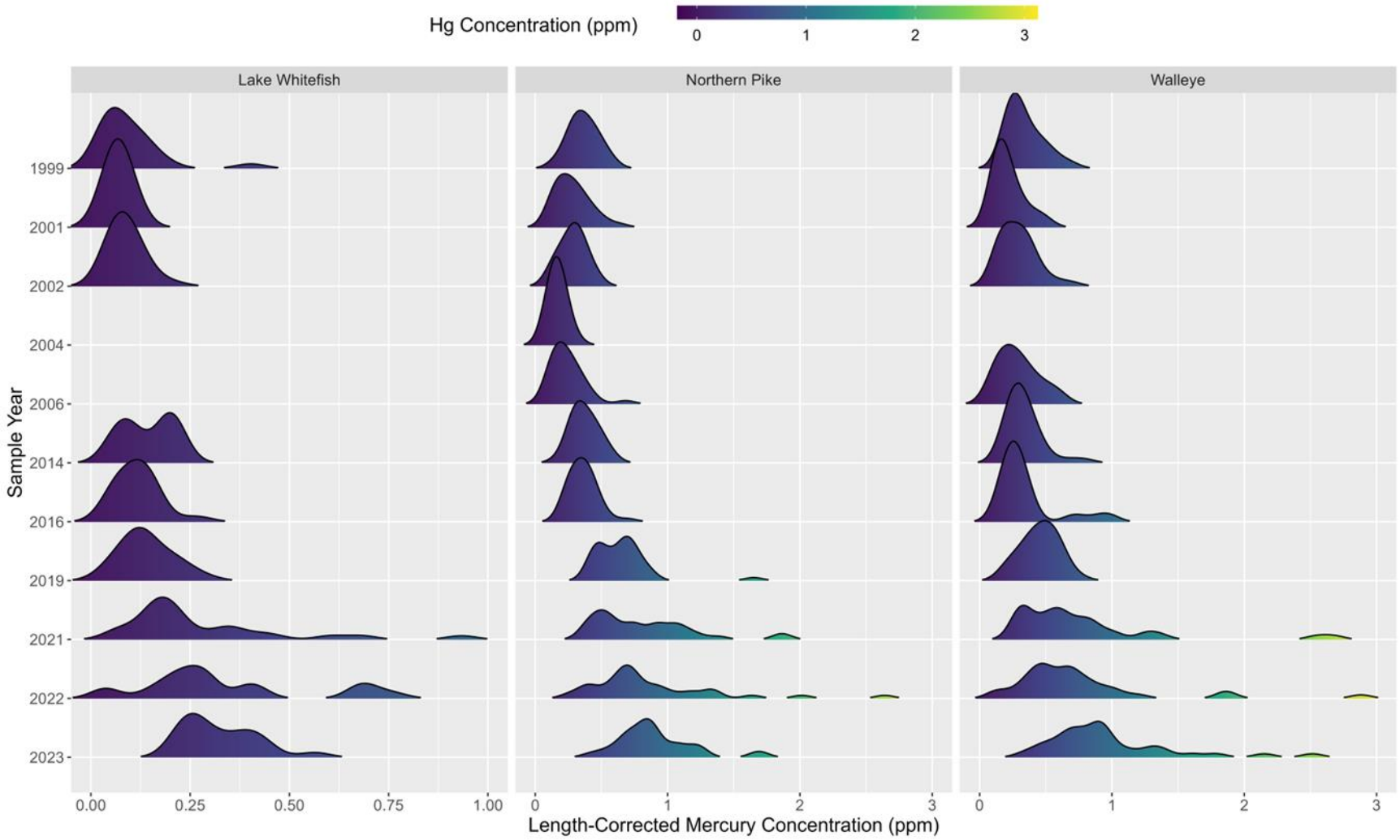


Figure 7: Ridgeline plot of length-corrected mercury concentration (ppm) estimated for a 350 mm Lake Whitefish, 500 mm Northern Pike, and 400 mm Walleye from Gull Lake/Keeyask reservoir from 1999–2023.

4.2.2 STEPHENS LAKE

4.2.2.1 RESULTS FOR 2023

Walleye and Northern Pike showed a significant positive relationship between mercury concentration and fork length (Appendix 5), allowing for average concentrations to be standardized by fish length. The standard mean was 0.59 ppm and 0.62 ppm, respectively (Table 3). The standard mean for both species was above the predicted peak of 0.5 ppm (KHLP 2012) in 2023.

The relationship between mercury and length was not significant for Lake Whitefish, which had a smaller sample size (n = 12 fish) over a very narrow range of lengths.

4.2.2.2 COMPARISONS TO PREVIOUS YEARS

Mercury concentrations in Northern Pike and Walleye from Stephens Lake in 2023 were higher than values measured in all previous years (Figure 8). Prior to the Project, mercury concentrations in a 550 mm Northern Pike ranged from 0.14 ppm in 2005 to 0.43 ppm in 1999 and from 0.20 ppm in 2005 to 0.50 ppm in 2015 in a 400 mm Walleye. Standard means in 2021 and 2022 were on the higher end of this range for both Northern Pike (0.39-0.45 ppm) and Walleye (0.44-0.50 ppm). However, with the inclusion of the 2023 data, it appears that mercury concentrations may have been increasing in both species since 2018. The exception to this trend, a particularly low standard mean calculated for Northern Pike in 2022 compared to 2021 and 2023, may have been an artifact of sampling since very few large pike were collected for mercury in that year, with only one fish being larger than the standard length (see Section 4.1.2).

Larger Walleye (>350 mm) and Northern Pike (>600 mm) sampled for mercury in 2023 had mercury concentrations that are on the higher end but were typically still within the range of mercury concentrations measured pre-impoundment (Figure 9). However, several of the smaller fish had concentrations that were higher than pre-impoundment values.

While a standard mean mercury concentration could not be calculated for Lake Whitefish in any of the three post-impoundment years (see Section 4.2.2.1), the mercury concentrations of individual fish fell within the range of fish analyzed in previous years (Figure 9).

Statistical analysis of the length-corrected dataset indicated that there was no difference among time periods (pre- versus post-impoundment) in the mercury concentration of 350 mm Lake Whitefish from Stephens Lake, but there were significant differences for a 550 mm Northern Pike, and a 400 mm Walleye (Figure 10). For the piscivorous species, the comparisons showed significantly higher mercury concentrations in 2021, 2022, and 2023 (post-impoundment) than in all previous sampling years prior to 2019 (pre-impoundment).

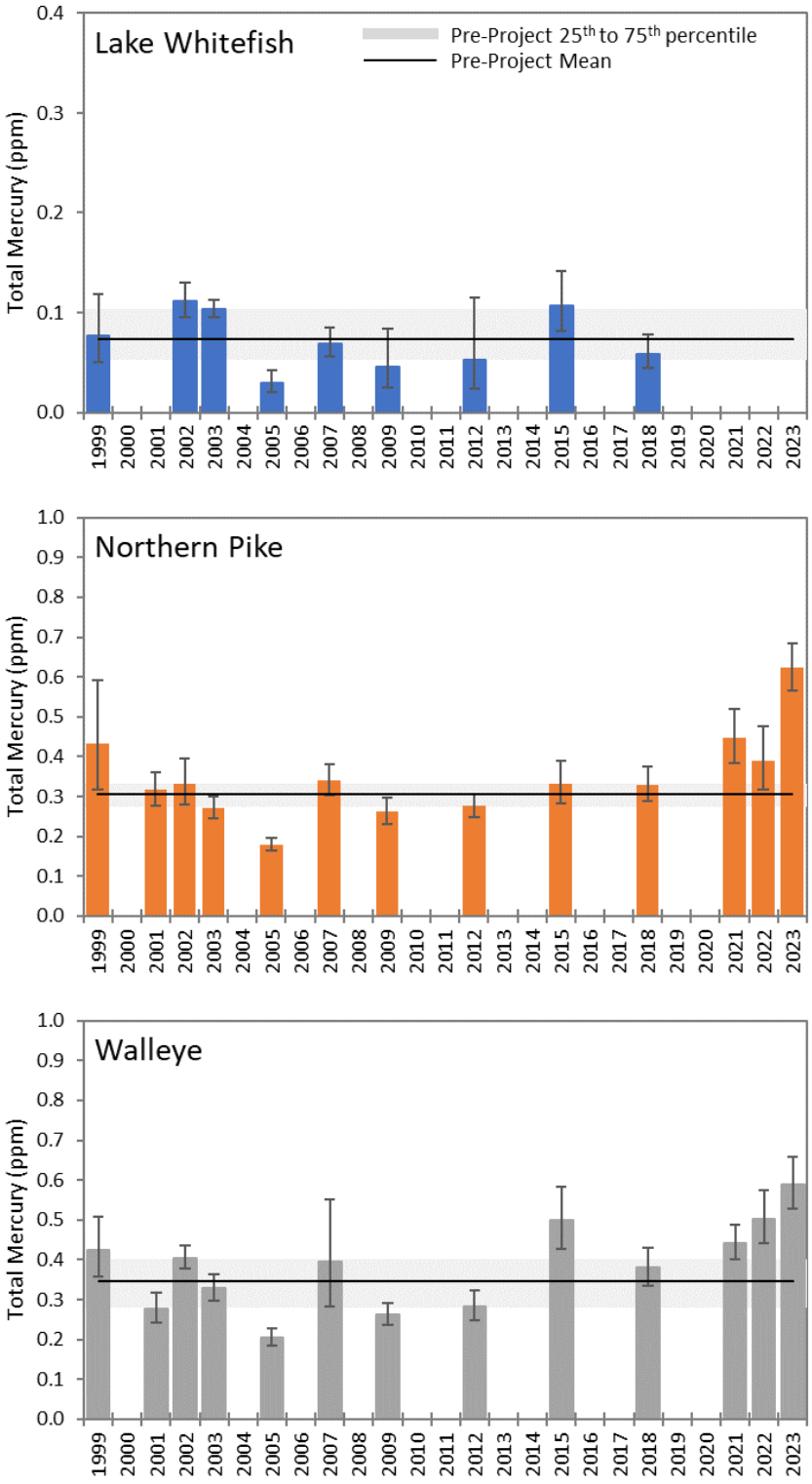


Figure 8: **Length-standardized mean (±95% confidence limits) muscle mercury concentrations of a 350 mm Lake Whitefish, a 550 mm Northern Pike, and a 400 mm Walleye from Stephens Lake for 1999–2023.**

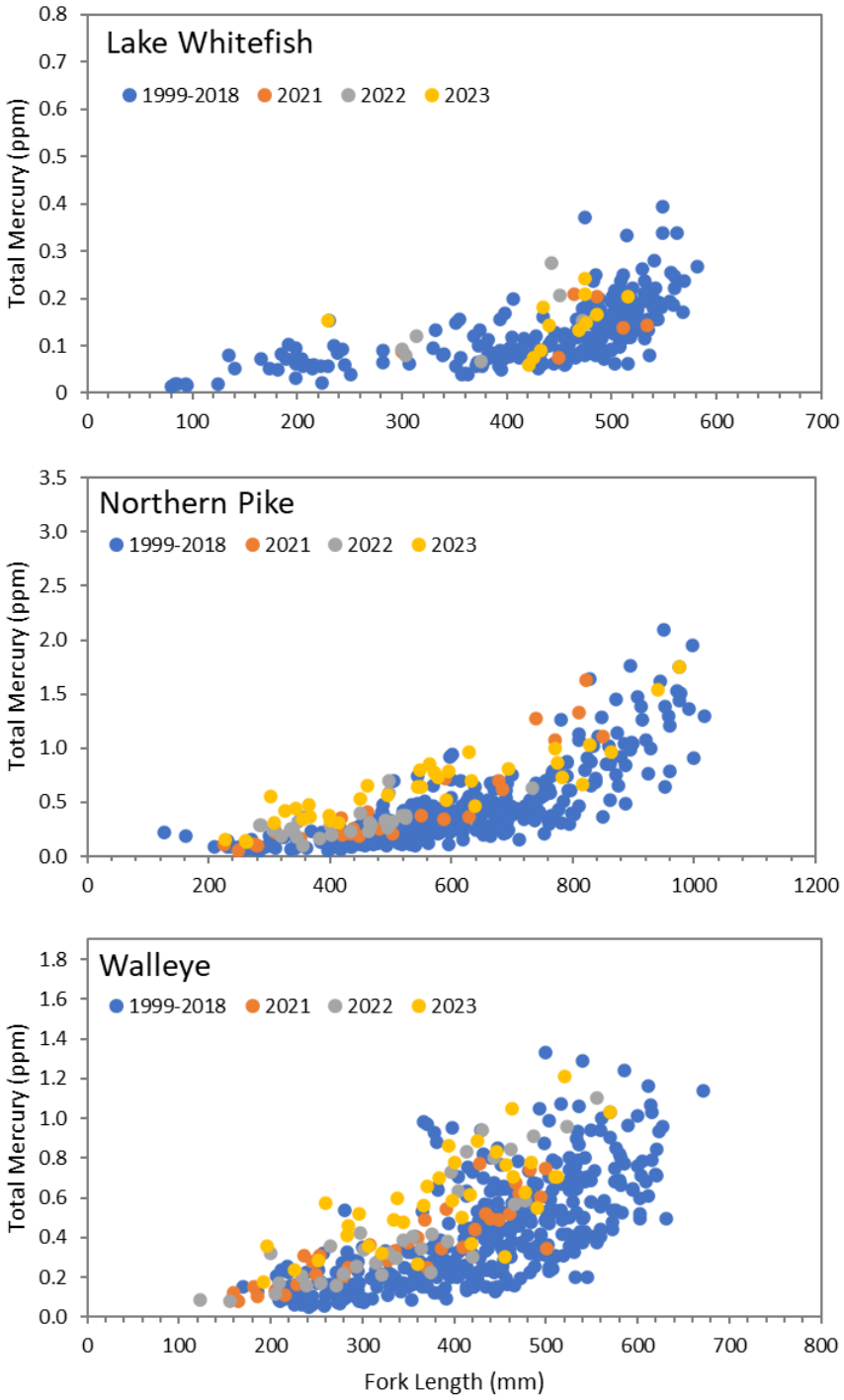


Figure 9: **Muscle mercury concentrations of Lake Whitefish, Northern Pike, and Walleye as a function of fork length from Stephens Lake in 2021, 2022, and 2023 compared to pre-impoundment (1999–2018).**

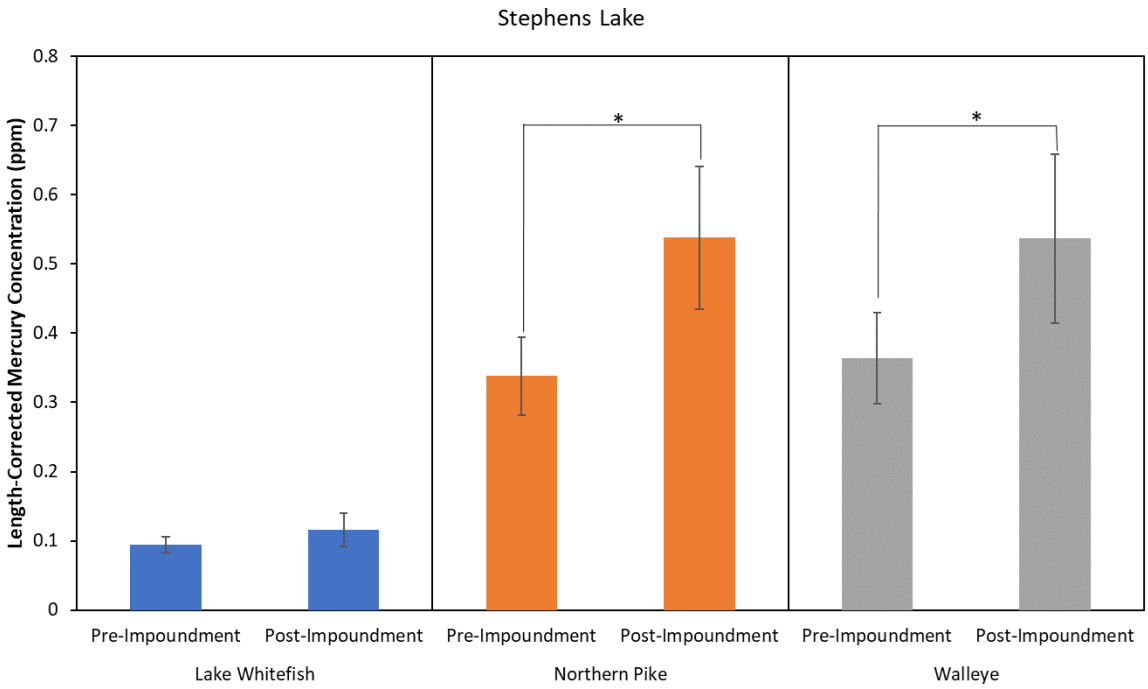


Figure 10: Estimated marginal mean length-corrected mercury concentration (ppm) for a 350 mm Lake Whitefish, 550 mm Northern Pike, and 400 mm Walleye from Stephens Lake pre- (1999–2019) and post-impoundment (2021–2023). Asterisks indicate statistical significance (p <0.05).

The length-corrected data were also used to create density ridgeline plots that show the distribution of mercury concentrations estimated for a 350 mm Lake Whitefish, a 550 mm Northern Pike, and a 400 mm Walleye from Stephens Lake (Figure 11). Since 1999, the mercury concentration of individual Lake Whitefish has been similar and there have been no obvious changes since impoundment (*i.e.*, the colour and distribution of the curves has been consistent among sampling periods). In each year, half of the Lake Whitefish (*i.e.*, the median) are expected to have mercury concentrations less than 0.06–0.11 ppm. The maximum mercury concentration modelled in 2023 (0.26 ppm) was higher than in most years but was similar to what was observed in 2003 (0.26 ppm) and 2015 (0.23 ppm). In contrast, mercury concentrations in Northern Pike and Walleye have changed over time (*i.e.*, in recent years, there has been a shift in the colour of the curves with a greater proportion of the curves being blue rather than purple). In each year prior to 2023, half of the fish are expected to have mercury concentrations less than 0.19–0.41 ppm in Northern Pike and 0.14–0.48 ppm in Walleye. In 2023, the median mercury concentration was higher than in all other years, with half of the catch expected to have mercury concentrations less than 0.66 ppm in Northern Pike and 0.62 ppm Walleye. The maximum mercury concentration modelled in 2023 was higher than most of the previous years, but was still below mercury concentrations observed in 2015 for Northern Pike and similar to 2015 concentrations for Walleye.

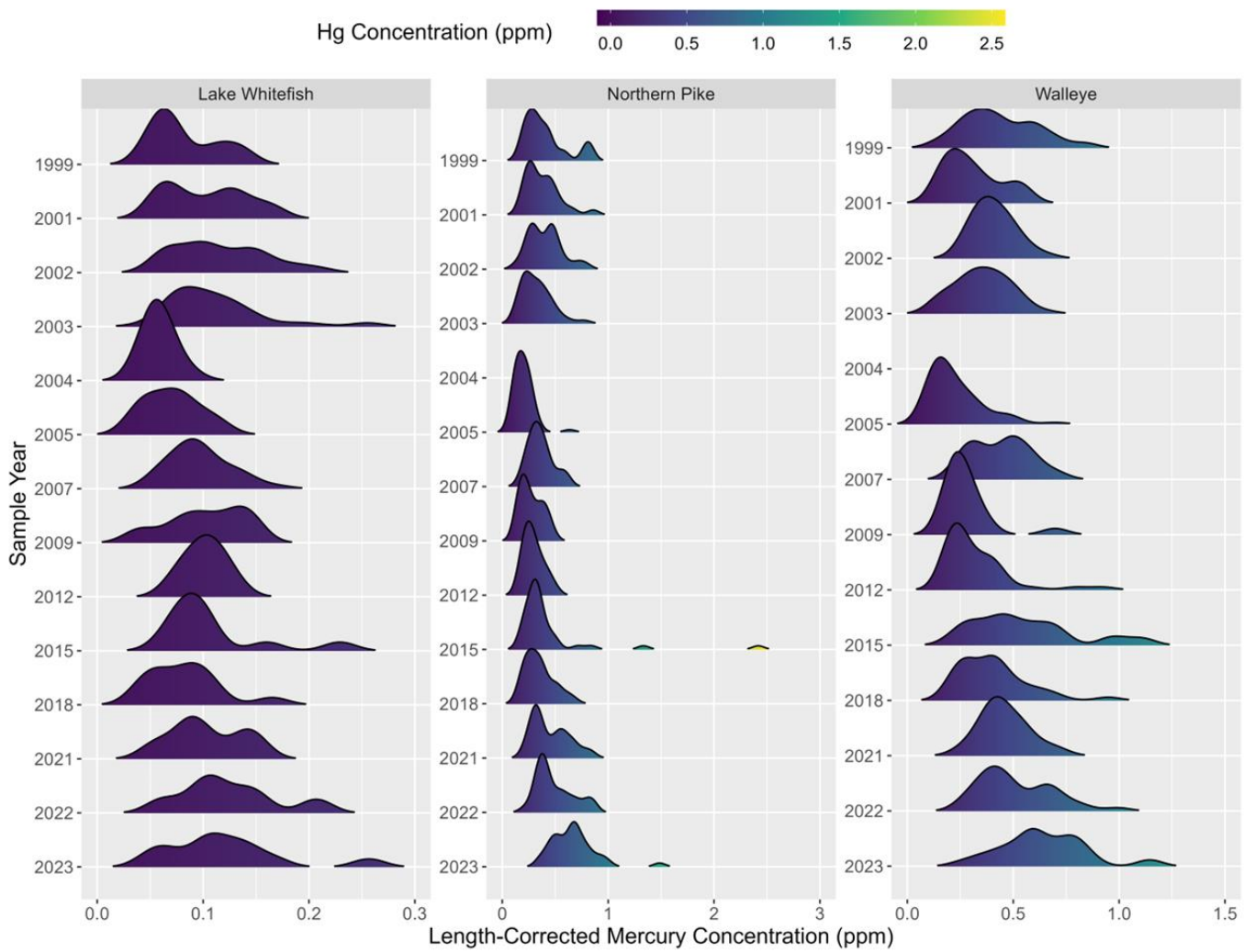


Figure 11: Ridgeline plot of length-corrected mercury concentration (ppm) estimated for a 350 mm Lake Whitefish, 550 mm Northern Pike, and 400 mm Walleye collected from Stephens Lake from 1999–2023.

4.2.3 SPLIT LAKE

4.2.3.1 RESULTS FOR 2023

All three species showed a significant positive relationship between mercury concentration and fork length (Appendix 5), allowing for average concentrations to be standardized by fish length. Standard means were 0.14 ppm for Lake Whitefish, 0.52 ppm for Northern Pike, and 0.48 ppm for Walleye (Table 4).

4.2.3.2 COMPARISONS TO PREVIOUS YEARS

Standard mean mercury concentrations in the three large-bodied species from Split Lake have fluctuated between 2001 and 2016 (Figure 12). Since 2016, mercury concentrations have generally shown an increasing trend. The one exception to this trend was 2022 when mercury concentrations in Northern Pike were equal to and in Walleye were lower than values in 2021.

Prior to impoundment, the standard mean of a 350 mm Lake Whitefish ranged from 0.04 ppm in 2016 to 0.10 ppm in 2013. The standard mean of a 350 mm Lake Whitefish in both 2021 and 2022 fell within this range (0.08 and 0.09 ppm, respectively), but exceeded the maximum pre-impoundment value in 2023 (0.14 ppm). However, the high standard mean in 2023 was largely the result of the mercury concentration of one small fish. If this fish was left out of the linear regression, the relationship between mercury and length was not significant ($p = 0.274$). In contrast, when one small fish analyzed for mercury in 2022 was left out of the regression, the relationship remains significant ($p = 0.001$). Therefore, the interpretation of the standard mean for 2023 should be considered with caution as it is highly contingent on a single sample.

The standard mean of a 550 mm Northern Pike prior to impoundment ranged from 0.18 ppm in 2005 to 0.38 ppm in 2013 and 2019. The standard mean of Northern Pike was greater than the maximum pre-Project value in all three post-impoundment years, ranging from 0.42 ppm in 2021 and 2022 to 0.52 ppm in 2023.

The standard mean of a 400 mm Walleye pre-Project ranged from 0.12 in 2005 to 0.41 in 2013. Since impoundment, the standard mean was within the pre-Project range in 2022 (0.37 ppm), but slightly exceeded the maximum pre-Project value in both 2021 (0.45 ppm) and 2023 (0.48 ppm).

In individual fish, the mercury concentrations of all three species in post-impoundment years are on the higher end, but still typically within the range of mercury concentrations measured in previous years (Figure 13).

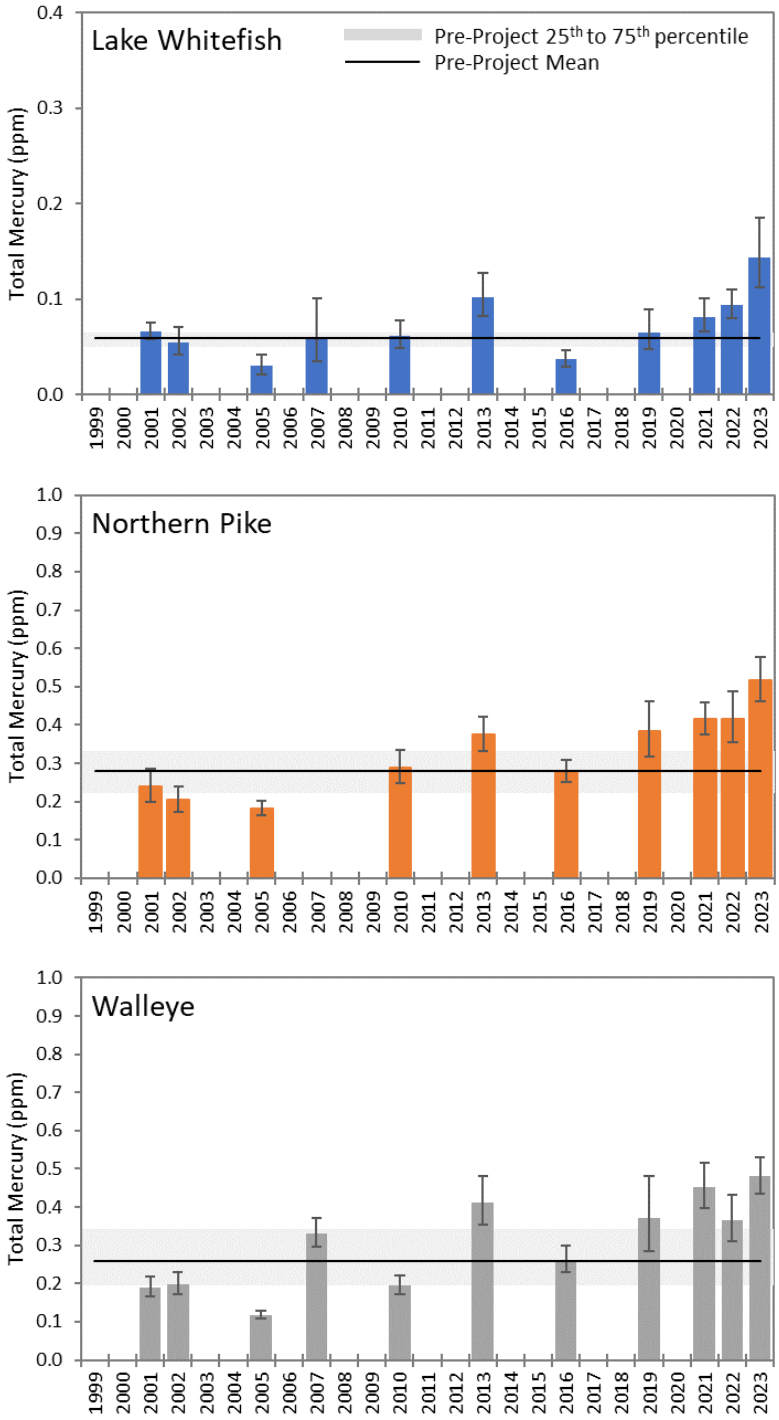


Figure 12: Length-standardized mean (±95% confidence limits) muscle mercury concentrations of a 350 mm Lake Whitefish, a 550 mm Northern Pike, and a 400 mm Walleye from Split Lake for 2001–2023.

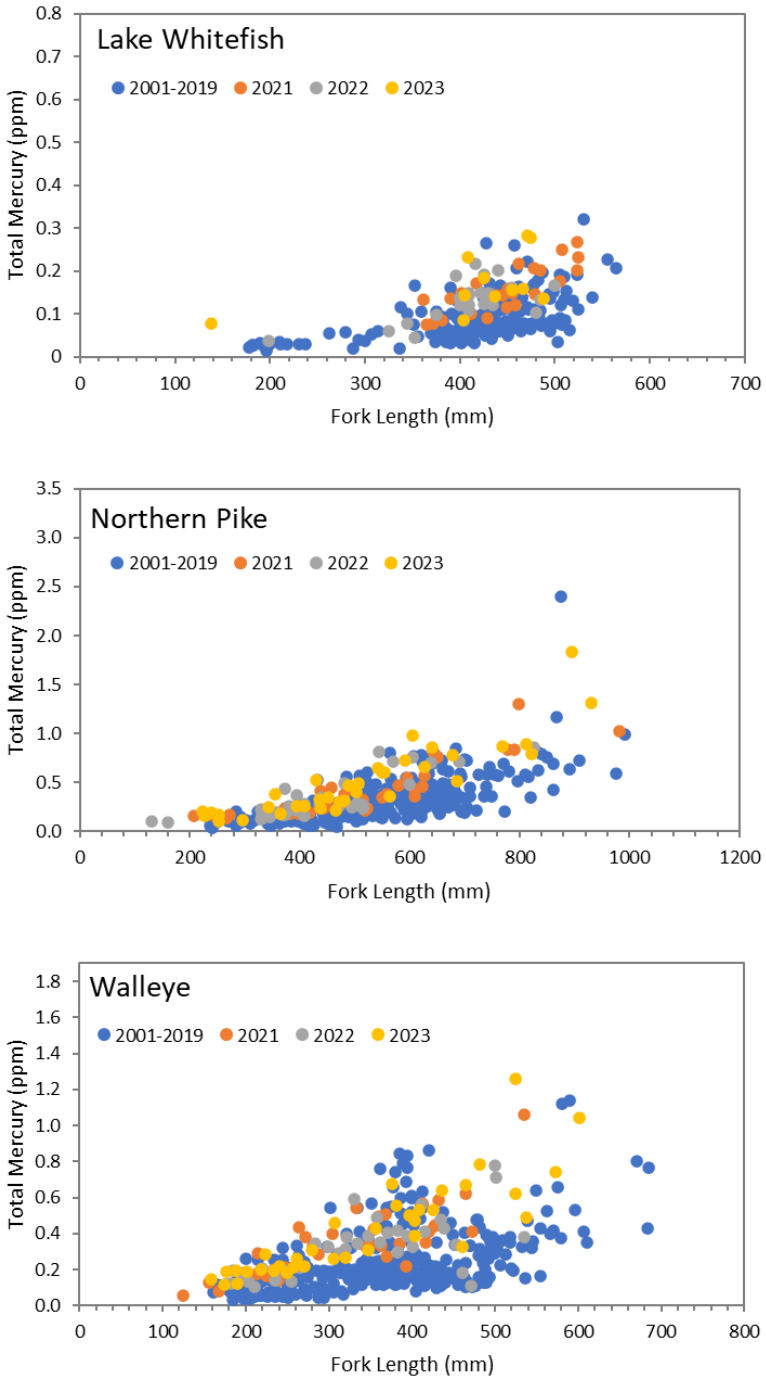


Figure 13: Muscle mercury concentrations of Lake Whitefish, Northern Pike, and Walleye as a function of fork length from Split Lake in 2021, 2022, and 2023 compared to pre-impoundment (2001–2019).

Statistical analysis of the length-corrected dataset indicated that there were significant differences among time periods (pre- versus post-impoundment) in the mercury concentration of a 550 mm Northern Pike, a 400 mm Walleye, or a 350 mm Lake Whitefish from Split Lake (Figure 14). Comparisons showed significantly higher mercury concentrations in 2021, 2022, and 2023 (post-impoundment) than in all previous sampling years prior to 2019 (pre-impoundment).

The length-corrected data were also used to create density ridge plots that show the distribution of mercury concentrations modelled for a 350 mm Lake Whitefish, a 550 mm Northern Pike, and a 400 mm Walleye from Split Lake (Figure 15). A larger proportion of Northern Pike, Walleye, and Lake Whitefish have shifted to higher mercury concentrations over the period of record (*i.e.*, the colour of the curves shifted from dark purple to green over time for the piscivores and from purple to blue for the benthivore). Mercury concentrations in individual Lake Whitefish have typically been higher since 2021, with one exception in 2013. The mercury concentration of half of the fish (*i.e.*, the median) in 2021, 2022, and 2023 are expected to be less than 0.11–0.12 ppm compared to 0.05–0.08 ppm in the previous years. The median concentration (0.11 ppm) of Lake Whitefish was similar to the more recent data. The mercury concentration of Northern Pike has increased over time, with half the fish expected to have concentrations less than 0.17–0.26 ppm from 2001–2005, 0.28–0.36 ppm from 2007–2019, and 0.40–0.54 ppm from 2021–2023. Mercury concentrations in Walleye have also increased over time, with periodic fluctuations. The median concentration was 0.13–0.19 ppm from 2001–2010 except for 2007 when the median concentration increased to 0.28 ppm. Median concentrations were higher (0.39–0.51 ppm) from 2013–2023 except in 2016 when concentrations decreased to 0.28 ppm. The maximum mercury concentration modelled in 2023 for Northern Pike (0.91 ppm) was below the maximum values in 2019 and 2022 (1.12 and 1.08 ppm), while the maximum value for Walleye (0.81 ppm) in 2023 was similar to or slightly below the maximum values in 2007 (0.90), 2013 (0.79), 2019 (0.86), 2021 (0.85), and 2022 (0.81).

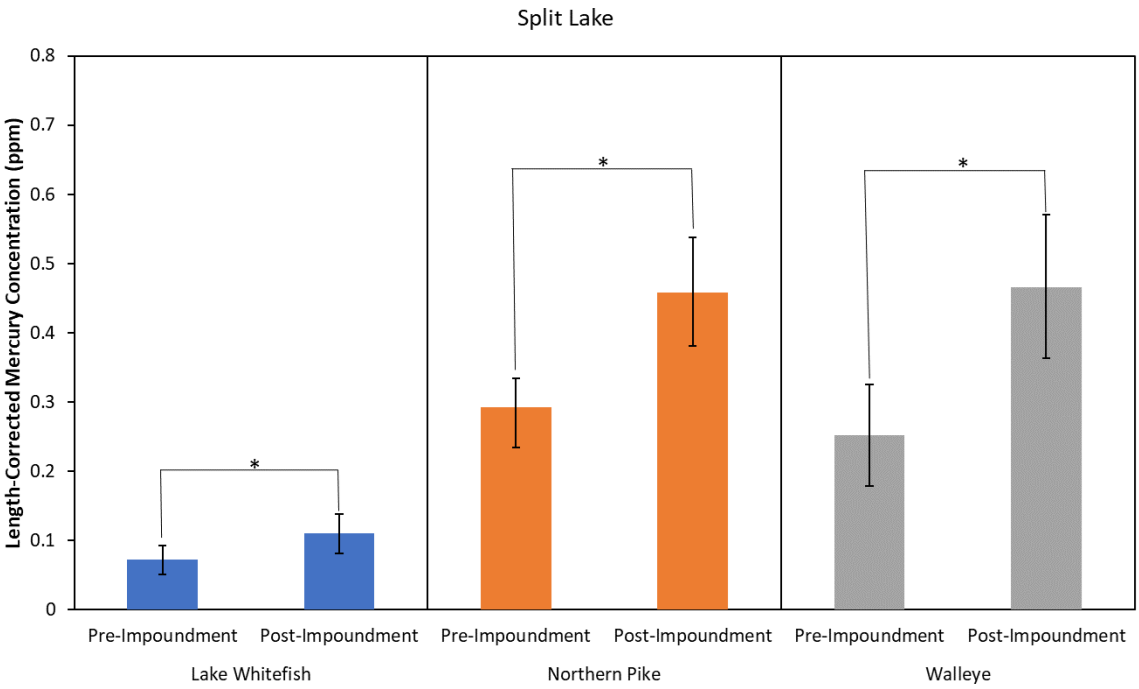


Figure 14: Estimated marginal mean length-corrected mercury concentration (ppm) for a 350 mm Lake Whitefish, 550 mm Northern Pike, and 400 mm Walleye from Split Lake pre- (2001–2019) and post-impoundment (2021–2023). Asterisks indicate statistical significance ($p < 0.05$).

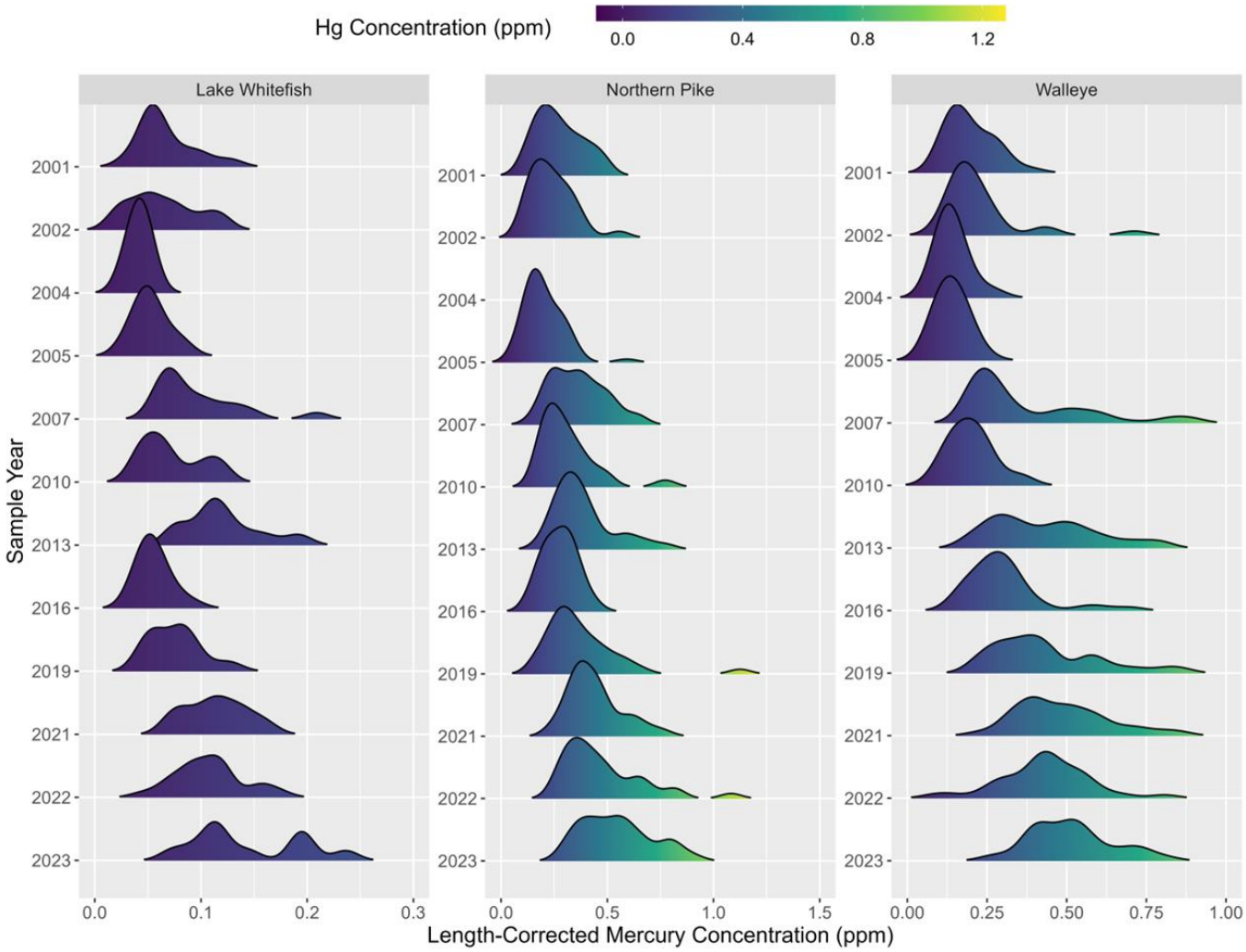


Figure 15: Ridgeline plots of length-corrected mercury concentration (ppm) estimated for a 350 mm Lake Whitefish, 550 mm Northern Pike, and 400 mm Walleye from Split Lake from 2001–2023.

4.3 LAKE STURGEON MORTALITIES

Because Lake Sturgeon are a species of concern and have special cultural significance to the First Nation communities, they are not a target species in the mercury monitoring program to measure the effects of Keeyask. However, should a Lake Sturgeon inadvertently die during other monitoring work, they are analyzed for mercury.

Mercury samples were collected from two Lake Sturgeon mortalities collected during the fish community program in Split Lake (CAMP unpubl. data). Biological information and mercury concentration of Lake Sturgeon analyzed for mercury in 2023 are summarized in Appendix 3 (Table A3-5). The capture locations of these fish are shown in Map 4.

The mercury concentrations of the Lake Sturgeon collected as part of the 2023 CAMP fish community monitoring studies in Split Lake were 0.0688 and 0.131 ppm. The individual mercury concentrations of the incidental mortalities from 2011–2023 are plotted in relation to fork length (Figure 16).

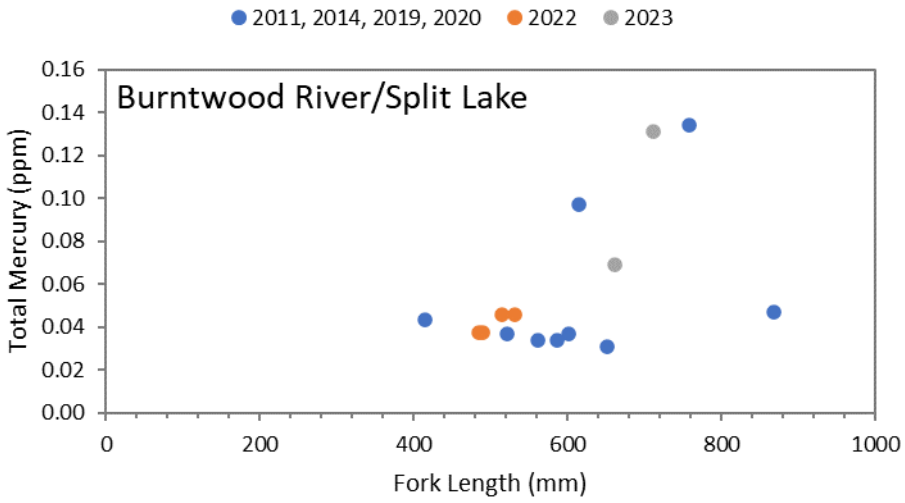


Figure 16: Mercury concentration versus total length for Lake Sturgeon collected from Split Lake/Burntwood River downstream of First Rapids from 2011–2023.

5.0 DISCUSSION

In the EIS, it was predicted that mercury concentrations in fish would be affected by the Project in response to flooding of wetlands and terrestrial soils associated with the impoundment of the Keeyask reservoir. After flooding, maximum mean mercury concentrations in the reservoir were predicted to be reached within 3–5 years in Lake Whitefish and within 4–7 years in Northern Pike and Walleye of a standard size (350, 550, and 400 mm, respectively). Mercury concentrations are predicted to reach 1 ppm in Northern Pike and Walleye and 0.19 ppm in Lake Whitefish from the Keeyask reservoir. Some of the mercury generated in the Keeyask reservoir will be transported downstream into Stephens Lake in the water and biota, and average mercury concentrations are predicted to reach a peak of 0.5 ppm in Northern Pike and Walleye and 0.12 ppm in Lake Whitefish. Once the peak mercury levels are reached in the Keeyask reservoir and Stephens Lake, it is predicted that it will take 20 to 30 years for levels to return to pre-impoundment levels or to reach a stable new baseline.

It was predicted that the Project would have no or minimal effect on mercury concentrations in Split Lake. While Split Lake is upstream from the flooding associated with the Keeyask Project, there is a possibility that fish with elevated mercury concentrations from the Keeyask reservoir could move upstream into Split Lake, so monitoring is being conducted to measure changes, if any.

This report presents the results of the third year of monitoring mercury concentrations in fish flesh of Northern Pike, Walleye, and Lake Whitefish from the Keeyask reservoir, Stephens Lake, and Split Lake after final impoundment of the Keeyask reservoir in September 2020.

5.1 KEEYASK RESERVOIR

The standard mean mercury concentration of a 550 mm Northern Pike from the Keeyask reservoir in 2023 (0.84 ppm) was higher than the values recorded in 2022 (0.64 ppm) and 2021 (0.53 ppm). Mercury concentrations in all three post-impoundment years were higher than the range collected between 1999 and 2016. While there has been an increase in mercury concentrations since impoundment, the standard mean in 2023 was still below the predicted peak of 1 ppm (KHLP 2012).

Walleye collected from the Keeyask reservoir in 2023 showed a significant positive relationship between fork length and mercury unlike in 2022, when Walleye showed a wide range of mercury concentrations, with smaller fish (<300 mm) appearing to be accumulating mercury faster than larger fish, and a standard mean could not be calculated. The standard mean mercury concentration of a 400 mm Walleye in 2023 (0.78 ppm) was higher than in 2021 (0.52 ppm), and both post-impoundment years showed higher values than those observed during pre-impoundment monitoring (0.19 ppm in 2001 to 0.44 ppm in 2019). This suggests Project-related increases in mercury in Walleye in the Keeyask reservoir have continued to occur. Mercury concentrations in Walleye in 2023 were still well below the predicted peak of 1 ppm (KHLP 2012).

For the first time since impoundment Lake Whitefish collected from the Keeyask reservoir in 2023 showed a significant positive relationship between fork length and mercury across the entire length range. The standard mean in 2023 (0.30 ppm) was higher than those calculated in 2022 and 2021 using only larger (>350 mm) Lake Whitefish (0.22 and 0.06 ppm, respectively). Standard mean mercury concentrations in 2022 and 2023 were higher than in all previous years and were above the predicted peak of 0.19 ppm (KHLP 2012).

Modelling of the mercury data showed that all three species had significantly higher mercury concentrations post-impoundment (2021–2023) compared to pre-impoundment (1999–2019). The distribution of mercury concentrations among fish of a standard length have been more variable since impoundment and a greater proportion of the catch has higher concentrations than pre-impoundment.

No Lake Sturgeon mortalities were collected from the Keeyask reservoir in 2023.

5.2 STEPHENS LAKE

Mercury concentrations in a 550 mm Northern Pike and a 400 mm Walleye collected in 2023 were 0.62 and 0.59 ppm, respectively. The standard means for both species were higher than the range of values measured since 1999 and were above the predicted peak of 0.5 ppm by 24 and 18%, respectively (KHLP 2012). As a result of mercury concentrations exceeding the predicted peak by more than 10%, fish mercury monitoring will be extended further downstream on the Nelson River by sampling within the Long Spruce forebay in 2024.

A standard mean could not be calculated for Lake Whitefish from Stephens Lake in 2023 because of the smaller number of fish collected, combined with the narrow range of lengths available. The concentrations of individual Lake Whitefish in 2023 fell within the range of mercury concentrations measured from 1999 to 2022.

Modelling of the mercury data showed that Northern Pike and Walleye had significantly higher mercury concentrations post-impoundment (2021–2023) compared to pre-impoundment (1999–2019), but that there was not a statistically significant difference in the mercury concentration of Lake Whitefish between periods. The distributions of mercury concentrations among Lake Whitefish of a standard length have varied over time but have not changed appreciably since impoundment. For Northern Pike and Walleye, there has been an increase in the proportion of the catch with higher mercury concentrations in recent years.

It is unclear at this time if observed increases in mercury concentrations in fish from Stephens Lake are associated with the Project or natural variations in mercury concentrations. Increases in mercury were also observed in 2023 in Split Lake, which is upstream of the hydrologic effects of the Project (Section 5.3).

No Lake Sturgeon mortalities were collected from Stephens Lake in 2023.

5.3 SPLIT LAKE

Standard mean mercury concentration of a 550 mm Northern Pike, a 400 mm Walleye, and a 350 mm Lake Whitefish collected from Split Lake in 2023 was 0.52, 0.48, and 0.14 ppm, respectively. The length-standardized mercury concentrations of all three species were above the range of values measured since data collected for the EIS commenced in 2001. Mercury concentrations in all three species have generally shown an increasing trend in Split Lake since 2016.

Modelling of the mercury data showed that all three species had significantly higher mercury concentrations post-impoundment (2021–2023) compared to pre-impoundment (1999–2019). In 2023, there was a greater proportion of Lake Whitefish with higher mercury concentrations and the maximum modelled concentration was higher than in previous years. For Northern Pike and Walleye, a larger proportion of the catch has been shifting toward higher mercury concentrations since the early 2000s.

Mercury concentrations in Split Lake were not directly impacted by the Project since there was no Project-related flooding upstream of Long Rapids. However, fish that have accumulated mercury in the reservoir could move upstream into Split Lake. Movement monitoring of Walleye using acoustic telemetry suggest that an increased number of Walleye have moved upstream out of the Keeyask reservoir into Split Lake in both 2023 compared to pre-impoundment, with few fish returning to the Keeyask reservoir (Funk and Hrenchuk 2024). However, prior to 2023, monitoring shows that upstream movements of Walleye into Split Lake were rare. It is unlikely that the observed increases in mercury concentrations in fish from Split Lake are attributable to the Project since all three species may have shown a consistent increasing trend since 2016, prior to impoundment. It is more likely that the observed changes in fish mercury are the result of natural variation.

Two juvenile Lake Sturgeon mortalities were analyzed for mercury from Split Lake in 2023 and had mercury concentrations of 0.07 and 0.13 ppm.

5.4 KEY QUESTIONS

The key questions to be answered about mercury in fish in relation to post-impoundment monitoring are:

What are the concentrations of mercury in Northern Pike, Walleye, and Lake Whitefish caught in the Keeyask reservoir, Stephens Lake, and Split Lake following final impoundment of the Keeyask reservoir in comparison to pre-Project levels?

The standard mean mercury concentration of fish caught in the Keeyask reservoir in 2023 was 0.84 ppm for a 550 mm Northern Pike, 0.78 ppm for a 400 mm Walleye, and 0.30 ppm for a 350 mm Lake Whitefish. The mercury concentrations of all three species were higher in 2023 than in previous years.

In Stephens Lake, the standard mean mercury concentration in 2023 was 0.62 ppm in Northern Pike and 0.59 ppm in Walleye. These values are higher than all values measured since 1999. A standard mean could not be calculated for Lake Whitefish in 2023.

The standard mean mercury concentrations from Split Lake in 2023 were 0.52 ppm in Northern Pike, 0.48 ppm in Walleye, and 0.14 ppm in Lake Whitefish. These values are higher than all values measured since 2001.

What are the peak mercury concentrations in Northern Pike, Walleye, and Lake Whitefish and how many years after the start of operation are the peak concentrations reached?

2023 sampling is the third year after flooding. The EIS predicted that peak mercury concentrations in the Keeyask reservoir would be reached within 3–5 years following impoundment for Lake Whitefish and within 4–7 years for Northern Pike and Walleye of a standard size (350, 550, and 400 mm, respectively). While mercury uptake by fish has accelerated, the peak concentrations may not be observed for up to another 4 years.

6.0 CONCLUSIONS AND NEXT STEPS

The EIS predicted that mercury concentrations in fish would be affected by the Project in response to flooding of wetlands and terrestrial soils associated with the impoundment of the reservoir. Maximum mean mercury concentrations were predicted to be reached after final impoundment within 3–5 years in Lake Whitefish and within 4–7 years in Northern Pike and Walleye of a standard size (350, 550, and 400 mm, respectively). Mercury concentrations were predicted to reach 1 ppm in Northern Pike and Walleye and 0.2 ppm in Lake Whitefish from the Keeyask reservoir. For the first time since impoundment, there was a significant positive relationship between fish length and mercury concentration for all three species. Length-standardized mercury concentrations in Northern Pike and Walleye from the Keeyask reservoir in 2023 were higher than pre-impoundment concentrations but were still below the predicted peak. Concentrations in Lake Whitefish from the reservoir were also higher in 2023 compared to previous years and exceeded the predicted peak of 0.2 ppm.

The EIS predicted that some of the mercury generated in the Keeyask reservoir would be transported downstream into Stephens Lake. Maximum mean mercury concentrations were predicted to reach 0.5 ppm in Northern Pike and Walleye and 0.12 ppm in Lake Whitefish. Length-standardized mercury concentrations in Northern Pike and Walleye in 2023 exceeded the predicted peak. An average mercury concentration could not be calculated for a standard length of Lake Whitefish from Stephens Lake in 2023, but the mercury concentrations of individual fish were within the range observed since 1999. Mercury concentrations in Northern Pike and Walleye from Stephens Lake in 2023 were higher than values measured in all previous years. Larger Walleye (>350 mm) and Northern Pike (>600 mm) sampled for mercury in 2023 had concentrations that fell within those measured pre-impoundment, but several of the smaller fish had concentrations that were higher than pre-impoundment values.

The EIS predicted that the Project would have no or minimal effect on mercury concentrations in Split Lake. The length-standardized mercury concentrations in all three species in 2023 were above the range of values measured since data collected for the EIS commenced in 2001. Movement monitoring using acoustic telemetry shows an increase in Walleye movements upstream out of the Keeyask reservoir into Split Lake in 2023 (Funk and Hrenchuk 2024). However, prior to 2023, upstream movements of Walleye out of the Keeyask reservoir were rare. It is unlikely that immigration from the reservoir has caused the observed increasing trend in fish mercury, since an increasing trend in fish mercury has been observed in all three species since particularly low values observed in the early 2000s, prior to impoundment.

Monitoring of mercury in fish flesh will take place again in all three waterbodies in 2024. As described in the AEMP, mercury concentrations in fish from the Keeyask reservoir and Stephens Lake will be monitored annually for several years after final impoundment of the reservoir until peak concentrations have been reached. Because mercury concentrations exceeded the predicted peak by more than 10%, fish mercury monitoring will extend further downstream on the Nelson River by sampling within the Long Spruce forebay in 2024.

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APPENDICES

APPENDIX 1:
SITE AND CATCH INFORMATION FOR GILLNETTING CONDUCATED IN THE KEEYASK RESERVOIR IN 2023 TO CAPTURE FISH FOR MERCURY ANALYSIS

Table A1-1. Mercury gillnetting set information in the Keeyask reservoir and Stephens Lake, 2023.

Waterbody	Site	UTM Coordinates			Pull Date	Duration (h)	Depth (m)	
		Zone	Easting	Northing			At Start	At End
Keeyask Reservoir	GN-01	15	350856	6246604	17-Aug-23	29.8	3.9	5.8
	GN-02	15	347303	6243545	17-Aug-23	27.4	5.8	8.4
	GN-03	15	345416	6245436	17-Aug-23	25.2	6.3	5.9
	GN-04	15	339425	6245243	17-Aug-23	22.2	4.0	4.0
	GN-05	15	358266	6248258	18-Aug-23	16.1	6.8	5.9
	GN-06	15	355994	6248392	18-Aug-23	16.4	6.9	9.2
	GN-07	15	355364	6248591	18-Aug-23	17.2	6.9	6.6
	GN-08	15	358328	6248256	23-Aug-23	15.8	6.2	5.8
	GN-09	15	347313	6243557	23-Aug-23	5.6	7.1	8.0
Stephens Lake	GN-101	15	367556	6246961	19-Aug-23	21.6	8.7	10.6
	GN-102	15	364960	6247535	19-Aug-23	22.2	4.2	8.7
	GN-103	15	365389	6247822	19-Aug-23	23.3	7.1	7.4
	GN-104	15	366290	6247059	19-Aug-23	3.2	4.9	11.8
	GN-105	15	370141	6248532	20-Aug-23	22.7	18.6	16.8
	GN-106	15	364510	6248242	20-Aug-23	22.9	5.0	5.3
	GN-107	15	367468	6248504	20-Aug-23	24.0	4.0	3.2
	GN-108	15	364150	6249226	21-Aug-23	21.9	2.3	2.4
	GN-109	15	367112	6249109	21-Aug-23	20.4	2.9	3.0
	GN-110	15	366000	6247983	21-Aug-23	22.0	11.9	8.5
	GN-111	15	364969	6247683	21-Aug-23	21.9	2.6	7.2
	GN-112	15	364017	6249436	22-Aug-23	23.5	3.0	2.7
	GN-113	15	368228	6246837	22-Aug-23	23.6	7.9	7.6
	GN-114	15	369167	6247698	22-Aug-23	22.4	7.9	2.2
	GN-115	15	366948	6248900	22-Aug-23	23.7	2.9	2.2
	GN-116	15	370445	6249882	22-Aug-23	24.3	2.9	5.1
	GN-117	15	364017	6249718	23-Aug-23	28.0	6.2	3.6
	GN-118	15	368331	6247164	23-Aug-23	24.6	2.9	3.4
	GN-119	15	367434	6248859	23-Aug-23	19.9	4.8	6.3
	GN-120	15	364939	6247882	23-Aug-23	21.0	5.4	2.4

Table A1-2. Mercury gillnetting catch summaries from the Keeyask reservoir, 2023.

Site	Species														
	Burbot	Cisco	Emerald Shiner	Lake Chub	Lake Sturgeon	Lake Whitefish	Longnose Sucker	Mooneye	Northern Pike	Sauger	Shorthead Redhorse	Walleye	White Sucker	Yellow Perch	Total
GN-01	-	-	-	-	-	4	1	-	15	-	-	2	-	2	24
GN-02	-	-	-	-	-	4	2	-	4	6	1	10	1	2	30
GN-03	1	-	1	-	-	2	-	-	8	-	-	6	1	5	24
GN-04	-	1	-	-	-	2	-	-	8	1	1	7	-	-	20
GN-05	-	-	1	-	1	2	-	-	4	1	-	5	4	1	19
GN-06	-	-	-	-	-	-	2	-	3	15	-	1	9	-	30
GN-07	-	-	-	-	-	5	-	-	3	1	1	4	4	-	18
GN-08	-	-	-	-	-	1	-	-	5	3	-	-	3	2	14
GN-09	-	-	-	-	-	-	-	-	1	2	-	2	-	-	5
Total	1	1	2	-	1	20	5	-	51	29	3	37	22	12	184

Table A1-3. Mercury gillnetting catch summaries from Stephens Lake, 2023.

Site	Species														Total
	Burbot	Cisco	Emerald Shiner	Lake Chub	Lake Sturgeon	Lake Whitefish	Longnose Sucker	Mooneye	Northern Pike	Sauger	Shorthead Redhorse	Walleye	White Sucker	Yellow Perch	
GN-101	-	-	-	-	-	-	2	-	-	2	4	9	3	-	20
GN-102	-	-	-	-	-	-	-	-	2	1	1	2	-	-	6
GN-103	1	-	-	-	-	-	-	-	1	1	2	2	1	-	8
GN-104	-	-	-	-	-	-	-	-	-	-	-	3	-	-	3
GN-105	-	-	-	1	10	-	12	-	-	13	-	2	-	-	38
GN-106	-	-	-	-	1	1	1	-	3	2	4	2	1	-	15
GN-107	-	-	-	-	-	-	-	-	5	-	8	6	1	-	20
GN-108	-	1	-	-	-	2	-	-	-	1	-	1	-	-	5
GN-109	-	-	-	-	-	-	-	-	5	3	2	5	4	-	19
GN-110	-	-	-	-	-	1	-	-	-	12	1	1	6	-	21
GN-111	-	-	-	-	-	-	1	-	-	2	7	7	3	-	20
GN-112	-	-	-	-	-	4	-	-	3	-	-	3	1	-	11
GN-113	-	-	-	-	1	-	-	-	5	3	1	7	1	-	18
GN-114	-	-	-	-	-	-	-	-	2	-	8	11	13	1	35
GN-115	-	-	-	-	-	-	-	-	3	3	-	3	9	-	18
GN-116	-	-	-	-	-	-	-	11	5	7	7	7	8	-	45
GN-117	-	1	-	-	-	-	-	-	1	-	1	2	1	-	6
GN-118	-	-	-	-	-	-	-	-	3	1	2	6	2	-	14
GN-119	-	-	-	-	-	-	-	-	1	9	4	5	5	-	24
GN-120	-	-	-	-	-	-	-	1	4	2	1	5	-	2	15
Total	1	2	-	1	12	8	16	12	43	62	53	89	59	3	361

APPENDIX 2:
ALS LABORATORY REPORTS

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CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WP2327256**	Page	: 1 of 3
Client	: **North/South Consultants Inc.**	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	: 204 284 3366	Telephone	: +1 204 255 9720
Project	: KEEYASK FISH	Date Samples Received	: 23-Oct-2023 11:50
PO	: ----	Date Analysis Commenced	: 15-Nov-2023
C-O-C number	: ----	Issue Date	: 30-Nov-2023 16:24
Sampler	: ----		
Site	: LAKE WHITEFISH		
Quote number	: Keeyask 2023		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Oleksandr Busel		Metals, Winnipeg, Manitoba

No Breaches Found

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

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When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/kg wwt	milligrams per kilogram wet weight

>: greater than.
<: less than.
Red shading is applied where the result or the LOR is greater than the Guideline Upper Limit (or lower than the Guideline Lower Limit, if applicable).
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	KEEYASK RESERVOIR 144 LKWH	STEPHENS LAKE 101 LKWH	STEPHENS LAKE 102 LKWH	STEPHENS LAKE 147 LKWH	STEPHENS LAKE 140 LKWH	----	----
				Sampling date/time	23-Oct-2023 00:00	23-Oct-2023 00:00	23-Oct-2023 00:00	23-Oct-2023 00:00	23-Oct-2023 00:00	----	----
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	----	----
					WP2327256-001	WP2327256-002	WP2327256-003	WP2327256-004	WP2327256-005	--------	--------
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.390	0.134	0.0899	0.149	0.204	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Key:

CERTIFICATE OF ANALYSIS

Work Order	: **WP2327256**	Page	: 1 of 2
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Telephone	: 204 284 3366	Telephone	: +1 204 255 9720
Project	: KEEYASK FISH	Date Samples Received	: 23-Oct-2023 11:50
PO	: ----	Date Analysis Commenced	: 15-Nov-2023
C-O-C number	: ----	Issue Date	: 30-Nov-2023 16:23
Sampler	: ----		
Site	: LAKE WHITEFISH		
Quote number	: Keeyask 2023		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Oleksandr Busel		Metals, Winnipeg, Manitoba

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.
Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/kg wwt	milligrams per kilogram wet weight

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	*CAS Number*	*Method/Lab*	*LOR*	*Unit*	*Client sample ID*	KEEYASK RESERVOIR 144 LKWH	STEPHENS LAKE 101 LKWH	STEPHENS LAKE 102 LKWH	STEPHENS LAKE 147 LKWH	STEPHENS LAKE 140 LKWH
					Client sampling date / time	23-Oct-2023 00:00	23-Oct-2023 00:00	23-Oct-2023 00:00	23-Oct-2023 00:00	23-Oct-2023 00:00
						WP2327256-001	WP2327256-002	WP2327256-003	WP2327256-004	WP2327256-005
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.390	0.134	0.0899	0.149	0.204

Please refer to the General Comments section for an explanation of any result qualifiers detected.

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QUALITY CONTROL INTERPRETIVE REPORT

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Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	: 204 284 3366	Telephone	: +1 204 255 9720
Project	: KEEYASK FISH	Date Samples Received	: 23-Oct-2023 11:50
PO	: ----	Issue Date	: 30-Nov-2023 16:23
C-O-C number	: ----		
Sampler	: ----		
Site	: LAKE WHITEFISH		
Quote number	: Keeyask 2023		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag KEEYASK RESERVOIR 144 - LKWH	E510A	23-Oct-2023	15-Nov-2023	365 days	24 days	✓	16-Nov-2023	365 days	25 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag STEPHENS LAKE 101 - LKWH	E510A	23-Oct-2023	15-Nov-2023	365 days	24 days	✓	16-Nov-2023	365 days	25 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag STEPHENS LAKE 102 - LKWH	E510A	23-Oct-2023	15-Nov-2023	365 days	24 days	✓	16-Nov-2023	365 days	25 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag STEPHENS LAKE 140 - LKWH	E510A	23-Oct-2023	15-Nov-2023	365 days	24 days	✓	16-Nov-2023	365 days	25 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag STEPHENS LAKE 147 - LKWH	E510A	23-Oct-2023	15-Nov-2023	365 days	24 days	✓	16-Nov-2023	365 days	25 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Biota**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	1237839	1	5	20.0	5.0	✓
Laboratory Control Samples (LCS)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	1237839	2	5	40.0	10.0	✓
Method Blanks (MB)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	1237839	1	5	20.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Mercury in Biota by CVAAS (WET units, Routine)	E510A ALS Environmental - Winnipeg	Biota	EPA 200.3/1631 Appendix (mod)	Samples are homogenized and sub-sampled prior to hotblock digestion with HNO3, HCl, and H2O2. Analysis is by CVAAS.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals and Mercury Biota Digestion	EP440 ALS Environmental - Winnipeg	Biota	EPA 200.3	This method uses a heated strong acid digestion with HNO3, HCl, and H2O2 and is intended to provide a conservative estimate of bio-available metals.

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QUALITY CONTROL REPORT

Work Order	: **WP2327256**	Page	: 1 of 3
Client	: North/South Consultants Inc.	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	:	Telephone	: +1 204 255 9720
Project	: KEEYASK FISH	Date Samples Received	: 23-Oct-2023 11:50
PO	: ----	Date Analysis Commenced	: 15-Nov-2023
C-O-C number	: ----	Issue Date	: 30-Nov-2023 16:23
Sampler	: ---- 204 284 3366		
Site	: LAKE WHITEFISH		
Quote number	: Keeyask 2023		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Oleksandr Busel		Winnipeg Metals, Winnipeg, Manitoba

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Biota**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Metals (QC Lot: 1237839)											
WP2327256-001	KEEYASK RESERVOIR 144 LKWH	Mercury	7439-97-6	E510A	0.0010	mg/kg wwt	0.390	0.375	3.88%	40%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Biota**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 1237839)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Biota**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 1237839)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	90.1	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 1237839)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	103	70.0	130	----

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # Keeyask GS

Report to:				Report Format / Distribution			Service Requested: (rush - subject to availability)
Company:	North South Consultants			☑ Standard ☐ Other			◉ Regular (Default)
Contact:	Jodi Holm			☑ PDF ☑ Excel ☑ Digital			○ Priority (2-3 Business Days) - 50% Surcharge
Address:	83 Scurfield Blvd, Winnipeg			Email 1: jholm@nscons.ca			○ Emergency (1 Business Day) - 100% Surcharge
				Email 2:			○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	284 3366 ext 227	Fax:	477 4173				Analysis Request
Invoice To:	Same as Report ? ◉ Yes ○ No			Client / Project Information:			Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:				Job #: Keeyask Fish			
Contact:				PO / AFE:			
Address:				Legal Site Description:			
Phone:	284 3366	Fax:	477 4173	Quote #: Keeyask 2023			
Lab Work Order # (lab use only)				ALS Contact:	Sampler:		

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	SAMPLE DISPOSAL-WP	HG-WET-CVAA-WP	Number of Containers
	Lake Whiefish: See attached sheet			Tissue	X	X	5
	samples are organized by: Waterbody						

Environmental Division
Winnipeg
Work Order Reference
WP2327256

Telephone : +1 204 255 9720

Special Instructions / Regulations / Hazardous Details

Analyze muscle tissue with skin and scales removed

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:	Observations: Yes / No ? If Yes attach SIF
	Oct 23 2023	OCT 23 2023		11:50	-2.8 °C			

Lake Whitefish Hg samples October 2023

Submitted 23 Oct 2023

Location	Fish#	Species	FL
Keeyask Reservoir	144	LKWH	542
Stephens Lake	102	LKWH	432
Stephens Lake	101	LKWH	370
Stephens Lake	147	LKWH	476
Stephens Lake	140	LKWH	515

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CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WP2321085**	Page	: 1 of 8
Client	: **North/South Consultants Inc.**	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	: 204 284 3366	Telephone	: +1 204 255 9720
Project	: KEEYASK	Date Samples Received	: 28-Aug-2023 13:10
PO	: ----	Date Analysis Commenced	: 29-Sep-2023
C-O-C number	: ----	Issue Date	: 10-Oct-2023 14:07
Sampler	: ----		
Site	: STEPHENS LAKE		
Quote number	: Do Not Use_V2		
No. of samples received	: 80		
No. of samples analysed	: 80		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Lee McTavish		Metals, Winnipeg, Manitoba

No Breaches Found

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/kg wwt	milligrams per kilogram wet weight

>: greater than.
<: less than.
Red shading is applied where the result or the LOR is greater than the Guideline Upper Limit (or lower than the Guideline Lower Limit, if applicable).
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	1044 LKWH	1091 LKWH	1092 LKWH	1112 LKWH	1145 LKWH	1146 LKWH	1147 LKWH
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321085-001	WP2321085-002	WP2321085-003	WP2321085-004	WP2321085-005	WP2321085-006	WP2321085-007
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.0755	0.208	0.144	0.154	0.180	0.167	0.241

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	1148 LKWH	1017 NRPK	1018 NRPK	1022 NRPK	1045 NRPK	1046 NRPK	1047 NRPK
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321085-008	WP2321085-009	WP2321085-010	WP2321085-011	WP2321085-012	WP2321085-013	WP2321085-014
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.0604	0.869	0.314	0.655	0.962	0.959	0.142

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	1086 NRPK	1088 NRPK	1095 NRPK	1096 NRPK	1097 NRPK	1098 NRPK	1099 NRPK
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321085-015	WP2321085-016	WP2321085-017	WP2321085-018	WP2321085-019	WP2321085-020	WP2321085-021
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.668	0.814	0.998	0.730	1.03	0.734	0.334

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	1155 NRPK	1154 NRPK	1157 NRPK	1158 NRPK	1159 NRPK	1160 NRPK	1161 NRPK
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321085-022	WP2321085-023	WP2321085-024	WP2321085-025	WP2321085-026	WP2321085-027	WP2321085-028
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.138	0.792	1.75	0.854	0.797	0.473	0.424

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	1197 NRPK	1198 NRPK	1199 NRPK	1200 NRPK	1201 NRPK	1225 NRPK	1226 NRPK
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321085-029	WP2321085-030	WP2321085-031	WP2321085-032	WP2321085-033	WP2321085-034	WP2321085-035
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.561	0.345	1.54	0.365	0.382	0.516	0.468

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	1227 NRPK	1228 NRPK	1229 NRPK	1244 NRPK	1245 NRPK	1246 NRPK	1256 NRPK
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321085-036	WP2321085-037	WP2321085-038	WP2321085-039	WP2321085-040	WP2321085-041	WP2321085-042
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.700	0.311	0.440	0.779	0.647	0.558	0.647

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	1276 NRPK	1279 NRPK	1008 WALL	1009 WALL	1011 WALL	1013 WALL	1014 WALL
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321085-043	WP2321085-044	WP2321085-045	WP2321085-046	WP2321085-047	WP2321085-048	WP2321085-049
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.156	0.533	0.627	1.05	0.614	0.861	0.780

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	1015 WALL	1016 WALL	1019 WALL	1020 WALL	1023 WALL	1024 WALL	1027 WALL
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321085-050	WP2321085-051	WP2321085-052	WP2321085-053	WP2321085-054	WP2321085-055	WP2321085-056
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.173	0.355	1.21	0.574	0.888	0.234	0.409

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	1028 WALL	1029 WALL	1048 WALL	1049 WALL	1064 WALL	1065 WALL	1080 WALL
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321085-057	WP2321085-058	WP2321085-059	WP2321085-060	WP2321085-061	WP2321085-062	WP2321085-063
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.478	0.268	0.768	0.282	0.708	0.600	0.657

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	1081 WALL	1082 WALL	1083 WALL	1084 WALL	1085 WALL	1093 WALL	1100 WALL
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321085-064	WP2321085-065	WP2321085-066	WP2321085-067	WP2321085-068	WP2321085-069	WP2321085-070
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.367	0.517	0.558	0.697	0.488	0.703	0.708

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	1101 WALL	1104 WALL	1113 WALL	1132 WALL	1133 WALL	1134 WALL	1135 WALL
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321085-071	WP2321085-072	WP2321085-073	WP2321085-074	WP2321085-075	WP2321085-076	WP2321085-077
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.829	0.588	1.03	0.300	0.777	0.359	0.456

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	1136 WALL	1137 WALL	1138 WALL	----	----	----	----
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	----	----	----	----
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	----	----	----	----
					WP2321085-078	WP2321085-079	WP2321085-080	--------	--------	--------	--------
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.320	0.551	0.502	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Key:

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WP2321085**	Page	: 1 of 15
Client	: **North/South Consultants Inc.**	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	: 204 284 3366	Telephone	: +1 204 255 9720
Project	: KEEYASK	Date Samples Received	: 28-Aug-2023 13:10
PO	: ----	Issue Date	: 10-Oct-2023 14:07
C-O-C number	: ----		
Sampler	: ----		
Site	: STEPHENS LAKE		
Quote number	: Do Not Use_V2		
No. of samples received	: 80		
No. of samples analysed	: 80		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Biota**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Metals	QC-1160892-002	----	Mercury	7439-97-6	E510A	73.2 %	80.0-120%	Recovery less than lower control limit

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1017 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1018 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1022 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1044 - LKWH	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1045 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1046 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1047 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1086 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1088 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1091 - LKWH	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1092 - LKWH	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1095 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1096 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1097 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1098 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1099 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1112 - LKWH	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1145 - LKWH	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1146 - LKWH	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1147 - LKWH	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1148 - LKWH	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1154 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1155 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1157 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1158 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1159 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1160 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1161 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1197 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1198 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1199 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1200 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1201 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1225 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1226 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1227 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1228 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1229 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1244 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1245 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	02-Oct-2023	365 days	36 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1008 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1009 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1011 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1013 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1014 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1015 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1016 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1019 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1020 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1023 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1024 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1027 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1028 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1029 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1048 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1049 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1064 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1065 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1080 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1081 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1082 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1083 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1084 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1085 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1093 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1100 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1101 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1104 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1113 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1132 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1133 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1134 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1135 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1136 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1137 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1138 - WALL	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1246 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1256 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1276 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag										
1279 - NRPK	E510A	28-Aug-2023	29-Sep-2023	365 days	32 days	✓	03-Oct-2023	365 days	37 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Biota**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	1160889	4	80	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	1160889	8	80	10.0	10.0	✓
Method Blanks (MB)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	1160889	4	80	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Mercury in Biota by CVAAS (WET units, Routine)	E510A ALS Environmental - Winnipeg	Biota	EPA 200.3/1631 Appendix (mod)	Samples are homogenized and sub-sampled prior to hotblock digestion with HNO3, HCl, and H2O2. Analysis is by CVAAS.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals and Mercury Biota Digestion	EP440 ALS Environmental - Winnipeg	Biota	EPA 200.3	This method uses a heated strong acid digestion with HNO3, HCl, and H2O2 and is intended to provide a conservative estimate of bio-available metals.

QUALITY CONTROL REPORT

Work Order	: **WP2321085**	Page	: 1 of 4
Client	: North/South Consultants Inc.	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	:	Telephone	: +1 204 255 9720
Project	: KEEYASK	Date Samples Received	: 28-Aug-2023 13:10
PO	: ----	Date Analysis Commenced	: 29-Sep-2023
C-O-C number	: ----	Issue Date	: 10-Oct-2023 14:07
Sampler	: ---- 204 284 3366		
Site	: STEPHENS LAKE		
Quote number	: Do Not Use_V2		
No. of samples received	: 80		
No. of samples analysed	: 80		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Lee McTavish		Winnipeg Metals, Winnipeg, Manitoba

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Biota**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 1160889)											
WP2321085-002	1091 LKWH	Mercury	7439-97-6	E510A	0.0010	mg/kg wwt	0.208	0.210	1.38%	40%	----
Metals (QC Lot: 1160890)											
WP2321085-021	1099 NRPK	Mercury	7439-97-6	E510A	0.0010	mg/kg wwt	0.334	0.351	5.12%	40%	----
Metals (QC Lot: 1160891)											
WP2321085-041	1246 NRPK	Mercury	7439-97-6	E510A	0.0094	mg/kg wwt	0.558	0.580	3.76%	40%	----
Metals (QC Lot: 1160892)											
WP2321085-061	1064 WALL	Mercury	7439-97-6	E510A	0.0101	mg/kg wwt	0.708	0.669	5.63%	40%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Biota**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 1160889)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----
Metals (QCLot: 1160890)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----
Metals (QCLot: 1160891)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----
Metals (QCLot: 1160892)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Biota**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 1160889)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	84.9	80.0	120	----
Metals (QCLot: 1160890)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	89.2	80.0	120	----
Metals (QCLot: 1160891)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	98.9	80.0	120	----
Metals (QCLot: 1160892)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	# 73.2	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

Reference Material (RM) Report								
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Metals (QCLot: 1160889)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	110	70.0	130	----
Metals (QCLot: 1160890)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	112	70.0	130	----
Metals (QCLot: 1160891)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	109	70.0	130	----
Metals (QCLot: 1160892)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	109	70.0	130	----

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # Keeyask GS

Report to:			
Company:	North South Consultants		
Contact:	Jodi Holm		
Address:	83 Scurfield Blvd, Winnipeg		
Phone:	284 3366 ext 227	Fax:	477 4173

Invoice To:	Same as Report ? (●) Yes ( ) No		
Company:			
Contact:			
Address:			
Phone:	284 3366	Fax:	477 4173

Lab Work Order # (lab use only):

Report Format / Distribution

- [x] Standard [ ] Other
- [x] PDF [x] Excel [x] Digital
- Email 1: jholm@nscons.ca
- Email 2:

Client / Project Information:

- Job #: Keeyask Fish
- PO / AFE:
- Legal Site Description:
- Quote #: WP2022NSCI

ALS Contact: **Sampler:**

Service Requested: (rush - subject to availability)

- (●) Regular (Default)
- ( ) Priority (2-3 Business Days) - 50% Surcharge
- ( ) Emergency (1 Business Day) - 100% Surcharge
- ( ) For Emergency < 1 Day, ASAP or Weekend - Contact ALS

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	SAMPLE DISPOSAL-WP	HG-WET-CVAA-WP	Number of Containers
	Stephens Lake Lake: See attached sheet			Tissue	X	X	80
	samples are organized by: Species and Collector's ID						

Environmental Division
Winnipeg
Work Order Reference
WP2321085

Telephone : +1 204 265 9720

Special Instructions / Regulations / Hazardous Details

Analyze muscle tissue with skin and scales removed

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:	Observations: Yes / No ? If Yes attach SIF
	28 Aug 2023		AUG 28 2023	1:10	1.6			

Fish with Hg samples from Stephens Lake in 2023

Submitted 28 Aug 2023

	Location	Fish#	Species	Length
1	Stephens LaKe	1044	LKWH	426
2	Stephens LaKe	1091	LKWH	475
3	Stephens LaKe	1092	LKWH	486
4	Stephens LaKe	1112	LKWH	229
5	Stephens LaKe	1145	LKWH	435
6	Stephens LaKe	1146	LKWH	486
7	Stephens LaKe	1147	LKWH	474
8	Stephens LaKe	1148	LKWH	421
9	Stephens LaKe	1017	NRPK	775
10	Stephens LaKe	1018	NRPK	309
1	Stephens LaKe	1022	NRPK	461
2	Stephens LaKe	1045	NRPK	864
3	Stephens LaKe	1046	NRPK	629
4	Stephens LaKe	1047	NRPK	260
5	Stephens LaKe	1086	NRPK	817
6	Stephens LaKe	1088	NRPK	695
7	Stephens LaKe	1095	NRPK	770
8	Stephens LaKe	1096	NRPK	782
9	Stephens LaKe	1097	NRPK	829
20	Stephens LaKe	1098	NRPK	578
1	Stephens LaKe	1099	NRPK	400
2	Stephens LaKe	1155	NRPK	262
3	Stephens LaKe	1154	NRPK	595
4	Stephens LaKe	1157	NRPK	975
5	Stephens LaKe	1158	NRPK	565
6	Stephens LaKe	1159	NRPK	548
7	Stephens LaKe	1160	NRPK	365
8	Stephens LaKe	1161	NRPK	325
9	Stephens LaKe	1197	NRPK	495
30	Stephens LaKe	1198	NRPK	356
1	Stephens LaKe	1199	NRPK	940
2	Stephens LaKe	1200	NRPK	368
3	Stephens LaKe	1201	NRPK	398
4	Stephens LaKe	1225	NRPK	591
5	Stephens LaKe	1226	NRPK	639
6	Stephens LaKe	1227	NRPK	634
7	Stephens LaKe	1228	NRPK	415
8	Stephens LaKe	1229	NRPK	344
9	Stephens LaKe	1244	NRPK	572
40	Stephens LaKe	1245	NRPK	545
1	Stephens LaKe	1246	NRPK	302
2	Stephens LaKe	1256	NRPK	550
43	Stephens LaKe	1276	NRPK	227

Fish with Hg samples from Stephens Lake in 2023

Submitted 28 Aug 2023

	Location	Fish#	Species	Length
44	Stephens LaKe	1279	NRPK	449
5	Stephens LaKe	1008	WALL	478
6	Stephens LaKe	1009	WALL	463
7	Stephens LaKe	1011	WALL	417
8	Stephens LaKe	1013	WALL	394
9	Stephens LaKe	1014	WALL	401
50	Stephens LaKe	1015	WALL	192
1	Stephens LaKe	1016	WALL	196
2	Stephens LaKe	1019	WALL	520
3	Stephens LaKe	1020	WALL	260
4	Stephens LaKe	1023	WALL	425
5	Stephens LaKe	1024	WALL	226
6	Stephens LaKe	1027	WALL	283
7	Stephens LaKe	1028	WALL	344
8	Stephens LaKe	1029	WALL	360
9	Stephens LaKe	1048	WALL	456
60	Stephens LaKe	1049	WALL	252
1	Stephens LaKe	1064	WALL	570
2	Stephens LaKe	1065	WALL	338
3	Stephens LaKe	1080	WALL	370
4	Stephens LaKe	1081	WALL	419
5	Stephens LaKe	1082	WALL	296
6	Stephens LaKe	1083	WALL	367
7	Stephens LaKe	1084	WALL	384
8	Stephens LaKe	1085	WALL	334
9	Stephens LaKe	1093	WALL	465
70	Stephens LaKe	1100	WALL	512
1	Stephens LaKe	1101	WALL	446
2	Stephens LaKe	1104	WALL	398
3	Stephens LaKe	1113	WALL	570
4	Stephens LaKe	1132	WALL	455
5	Stephens LaKe	1133	WALL	484
6	Stephens LaKe	1134	WALL	307
7	Stephens LaKe	1135	WALL	285
8	Stephens LaKe	1136	WALL	321
9	Stephens LaKe	1137	WALL	490
80	Stephens LaKe	1138	WALL	409

ALS Canada Ltd.

right solutions.
right partner.

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WP2321069**	Page	: 1 of 9
Amendment	: **1**		
Client	: **North/South Consultants Inc.**	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	: 204 284 3366	Telephone	: +1 204 255 9720
Project	: KEEYASK	Date Samples Received	: 28-Aug-2023 13:10
PO	: ----	Date Analysis Commenced	: 07-Sep-2023
C-O-C number	: ----	Issue Date	: 25-Oct-2023 08:39
Sampler	: ----		
Site	: ----		
Quote number	: Keeyask 2023		
No. of samples received	: 92		
No. of samples analysed	: 92		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Oleksandr Busel		Metals, Winnipeg, Manitoba

No Breaches Found

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/kg wwt	milligrams per kilogram wet weight

>: greater than.
<: less than.
Red shading is applied where the result or the LOR is greater than the Guideline Upper Limit (or lower than the Guideline Lower Limit, if applicable).
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit.

Workorder Comments

Amendment (25-Oct-23): This report has been amended as a result of a request to change sample identification numbers for -032 and -060. All analysis results are as per the previous report.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	3 LKWH	4 LKWH	21 LKWH	22 LKWH	40 LKWH	41 LKWH	42 LKWH
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-001	WP2321069-002	WP2321069-003	WP2321069-004	WP2321069-005	WP2321069-006	WP2321069-007
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.311	0.401	0.411	0.401	0.279	0.314	0.313

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	43 LKWH	63 LKWH	64 LKWH	65 LKWH	66 LKWH	86 LKWH	87 LKWH
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-008	WP2321069-009	WP2321069-010	WP2321069-011	WP2321069-012	WP2321069-013	WP2321069-014
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.487	0.171	0.168	0.219	0.234	0.661	0.243

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	132 LKWH	133 LKWH	134 LKWH	135 LKWH	136 LKWH	154 LKWH	1 NRPK
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-015	WP2321069-016	WP2321069-017	WP2321069-018	WP2321069-019	WP2321069-020	WP2321069-021
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.180	0.186	0.185	0.256	0.205	0.288	0.949

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	5 NRPK	7 NRPK	8 NRPK	9 NRPK	10 NRPK	11 NRPK	12 NRPK
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-022	WP2321069-023	WP2321069-024	WP2321069-025	WP2321069-026	WP2321069-027	WP2321069-028
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.418	0.939	1.39	0.948	0.631	0.765	1.01

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	24 NRPK	25 NRPK	26 NRPK	27 NRPK	28 NRPK	29 NRPK	30 NRPK
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-029	WP2321069-030	WP2321069-031	WP2321069-032	WP2321069-033	WP2321069-034	WP2321069-035
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		2.61	0.781	0.402	0.517	0.500	0.169	0.118

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	31 NRPK	45 NRPK	46 NRPK	67 NRPK	68 NRPK	69 NRPK	70 NRPK
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-036	WP2321069-037	WP2321069-038	WP2321069-039	WP2321069-040	WP2321069-041	WP2321069-042
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.288	0.974	0.406	1.13	0.647	0.872	1.48

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	71 NRPK	72 NRPK	74 NRPK	75 NRPK	76 NRPK	77 NRPK	78 NRPK
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-043	WP2321069-044	WP2321069-045	WP2321069-046	WP2321069-047	WP2321069-048	WP2321069-049
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		1.10	0.611	0.151	0.772	0.958	0.576	0.161

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	79 NRPK	80 NRPK	88 NRPK	89 NRPK	103 NRPK	104 NRPK	44 NRPK
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-050	WP2321069-051	WP2321069-052	WP2321069-053	WP2321069-054	WP2321069-055	WP2321069-056
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.153	0.561	0.607	0.614	0.961	1.36	0.800

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	2 WALL	14 WALL	15 WALL	17 WALL	18 WALL	19 WALL	20 WALL
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-057	WP2321069-058	WP2321069-059	WP2321069-060	WP2321069-061	WP2321069-062	WP2321069-063
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.664	1.19	0.973	0.874	0.891	0.362	0.245

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	32 WALL	33 WALL	34 WALL	35 WALL	36 WALL	37 WALL	47 WALL
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-064	WP2321069-065	WP2321069-066	WP2321069-067	WP2321069-068	WP2321069-069	WP2321069-070
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.512	0.824	0.351	0.288	0.315	0.563	0.667

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	48 WALL	49 WALL	50 WALL	51 WALL	52 WALL	53 WALL	54 WALL
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-071	WP2321069-072	WP2321069-073	WP2321069-074	WP2321069-075	WP2321069-076	WP2321069-077
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		1.42	1.04	0.921	0.265	0.247	0.587	0.623

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	55 WALL	83 WALL	84 WALL	90 WALL	91 WALL	92 WALL	93 WALL
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-078	WP2321069-079	WP2321069-080	WP2321069-081	WP2321069-082	WP2321069-083	WP2321069-084
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.393	0.440	0.183	0.679	0.931	0.745	1.03

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	94 WALL	116 WALL	137 WALL	138 WALL	139 WALL	140 WALL	161 WALL
				Sampling date/time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
				Sub-Matrix	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue	Animal Tissue
					WP2321069-085	WP2321069-086	WP2321069-087	WP2321069-088	WP2321069-089	WP2321069-090	WP2321069-091
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.991	0.640	0.509	0.525	0.228	1.03	0.176

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Animal Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	162 WALL	----	----	----	----	----	----
				Sampling date/time	28-Aug-2023 00:00	----	----	----	----	----	----
				Sub-Matrix	Animal Tissue	----	----	----	----	----	----
					WP2321069-092	--------	--------	--------	--------	--------	--------
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		1.05	----	----	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Key:

CERTIFICATE OF ANALYSIS

Work Order	: **WP2321069**	Page	: 1 of 9
Amendment	: **1**		
Client	: **North/South Consultants Inc.**	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg MB Canada R2J 3T4
Telephone	: 204 284 3366	Telephone	: +1 204 255 9720
Project	: KEEYASK	Date Samples Received	: 28-Aug-2023 13:10
PO	: ----	Date Analysis Commenced	: 07-Sep-2023
C-O-C number	: ----	Issue Date	: 25-Oct-2023 08:39
Sampler	: ----		
Site	: ----		
Quote number	: Keeyask 2023		
No. of samples received	: 92		
No. of samples analysed	: 92		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Oleksandr Busel		Metals, Winnipeg, Manitoba

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.
Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/kg wwt	milligrams per kilogram wet weight

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Workorder Comments

Amendment (25-Oct-23): This report has been amended as a result of a request to change sample identification numbers for -032 and -060. All analysis results are as per the previous report.

Analytical Results

Sub-Matrix: **Animal Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	3 LKWH	4 LKWH	21 LKWH	22 LKWH	40 LKWH
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
						WP2321069-001	WP2321069-002	WP2321069-003	WP2321069-004	WP2321069-005
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.311	0.401	0.411	0.401	0.279

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **Animal Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	41 LKWH	42 LKWH	43 LKWH	63 LKWH	64 LKWH
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
						WP2321069-006	WP2321069-007	WP2321069-008	WP2321069-009	WP2321069-010
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.314	0.313	0.487	0.171	0.168

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **Animal Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	65 LKWH	66 LKWH	86 LKWH	87 LKWH	132 LKWH
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
						WP2321069-011	WP2321069-012	WP2321069-013	WP2321069-014	WP2321069-015
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.219	0.234	0.661	0.243	0.180

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **Animal Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	133 LKWH	134 LKWH	135 LKWH	136 LKWH	154 LKWH
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
						WP2321069-016	WP2321069-017	WP2321069-018	WP2321069-019	WP2321069-020
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.186	0.185	0.256	0.205	0.288

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **Animal Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	1 NRPK	5 NRPK	7 NRPK	8 NRPK	9 NRPK
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
						WP2321069-021	WP2321069-022	WP2321069-023	WP2321069-024	WP2321069-025
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.949	0.418	0.939	1.39	0.948

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	10 NRPK	11 NRPK	12 NRPK	24 NRPK	25 NRPK
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-026	WP2321069-027	WP2321069-028	WP2321069-029	WP2321069-030
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.631	0.765	1.01	2.61	0.781

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	26 NRPK	27 NRPK	28 NRPK	29 NRPK	30 NRPK
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-031	WP2321069-032	WP2321069-033	WP2321069-034	WP2321069-035
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.402	0.517	0.500	0.169	0.118

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	31 NRPK	45 NRPK	46 NRPK	67 NRPK	68 NRPK
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-036	WP2321069-037	WP2321069-038	WP2321069-039	WP2321069-040
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.288	0.974	0.406	1.13	0.647

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	69 NRPK	70 NRPK	71 NRPK	72 NRPK	74 NRPK
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-041	WP2321069-042	WP2321069-043	WP2321069-044	WP2321069-045
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.872	1.48	1.10	0.611	0.151

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	75 NRPK	76 NRPK	77 NRPK	78 NRPK	79 NRPK
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-046	WP2321069-047	WP2321069-048	WP2321069-049	WP2321069-050
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.772	0.958	0.576	0.161	0.153

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	80 NRPK	88 NRPK	89 NRPK	103 NRPK	104 NRPK
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-051	WP2321069-052	WP2321069-053	WP2321069-054	WP2321069-055
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.561	0.607	0.614	0.961	1.36

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	44 NRPK	2 WALL	14 WALL	15 WALL	17 WALL
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-056	WP2321069-057	WP2321069-058	WP2321069-059	WP2321069-060
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.800	0.664	1.19	0.973	0.874

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	18 WALL	19 WALL	20 WALL	32 WALL	33 WALL
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-061	WP2321069-062	WP2321069-063	WP2321069-064	WP2321069-065
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.891	0.362	0.245	0.512	0.824

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	34 WALL	35 WALL	36 WALL	37 WALL	47 WALL
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-066	WP2321069-067	WP2321069-068	WP2321069-069	WP2321069-070
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.351	0.288	0.315	0.563	0.667

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	48 WALL	49 WALL	50 WALL	51 WALL	52 WALL
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-071	WP2321069-072	WP2321069-073	WP2321069-074	WP2321069-075
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		1.42	1.04	0.921	0.265	0.247

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	53 WALL	54 WALL	55 WALL	83 WALL	84 WALL
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-076	WP2321069-077	WP2321069-078	WP2321069-079	WP2321069-080
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.587	0.623	0.393	0.440	0.183

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	90 WALL	91 WALL	92 WALL	93 WALL	94 WALL
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-081	WP2321069-082	WP2321069-083	WP2321069-084	WP2321069-085
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.679	0.931	0.745	1.03	0.991

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	116 WALL	137 WALL	138 WALL	139 WALL	140 WALL
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00	28-Aug-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-086	WP2321069-087	WP2321069-088	WP2321069-089	WP2321069-090
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.640	0.509	0.525	0.228	1.03

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Animal Tissue (Matrix: Biota)					Client sample ID	161 WALL	162 WALL	----	----	----
					Client sampling date / time	28-Aug-2023 00:00	28-Aug-2023 00:00	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2321069-091	WP2321069-092	--------	--------	--------
						Result	Result	----	----	----
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.176	1.05	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

ALS Canada Ltd.

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WP2321069**	Page	: 1 of 15
Amendment	: 1		
Client	: **North/South Consultants Inc.**	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	: 204 284 3366	Telephone	: +1 204 255 9720
Project	: KEEYASK	Date Samples Received	: 28-Aug-2023 13:10
PO	: ----	Issue Date	: 25-Oct-2023 08:40
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: Keeyask 2023		
No. of samples received	: 92		
No. of samples analysed	: 92		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 10 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 11 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 12 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 132 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 133 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 134 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 135 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 136 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 154 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 21 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 22 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 24 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 25 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 26 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 27 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 28 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 29 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 30 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 31 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 3 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 40 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 41 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 42 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 43 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times* Rec	*Holding Times* Actual	*Eval*	*Analysis Date*	*Holding Times* Rec	*Holding Times* Actual	*Eval*
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 45 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 46 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 4 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 5 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 63 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 64 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 65 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 66 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 67 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 68 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 7 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 86 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 87 - LKWH	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 8 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 9 - NRPK	E510A	28-Aug-2023	07-Sep-2023	365 days	11 days	✓	08-Sep-2023	365 days	12 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 103 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 104 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 116 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 137 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 138 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 139 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 140 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 14 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 15 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 161 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 162 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 17 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 18 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 19 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 20 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 2 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 32 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 33 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 34 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 35 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 36 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 37 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 44 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 47 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 48 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 49 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 50 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 51 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 52 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 53 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 54 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 55 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 69 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 70 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 71 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 72 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 74 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 75 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 76 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 77 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 78 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 79 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 80 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 83 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 84 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 88 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 89 - NRPK	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 90 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 91 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 92 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 93 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 94 - WALL	E510A	28-Aug-2023	14-Sep-2023	365 days	18 days	✓	15-Sep-2023	365 days	19 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Biota**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	1123351	5	97	5.1	5.0	✓
Laboratory Control Samples (LCS)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	1123351	10	97	10.3	10.0	✓
Method Blanks (MB)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	1123351	5	97	5.1	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Mercury in Biota by CVAAS (WET units, Routine)	E510A ALS Environmental - Winnipeg	Biota	EPA 200.3/1631 Appendix (mod)	Samples are homogenized and sub-sampled prior to hotblock digestion with HNO_3, HCl, and H_2O_2. Analysis is by CVAAS.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals and Mercury Biota Digestion	EP440 ALS Environmental - Winnipeg	Biota	EPA 200.3	This method uses a heated strong acid digestion with HNO_3, HCl, and H_2O_2 and is intended to provide a conservative estimate of bio-available metals.

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QUALITY CONTROL REPORT

Work Order	: **WP2321069**	Page	: 1 of 4
Amendment	: **1**		
Client	: North/South Consultants Inc.	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	:	Telephone	: +1 204 255 9720
Project	: KEEYASK	Date Samples Received	: 28-Aug-2023 13:10
PO	: ----	Date Analysis Commenced	: 07-Sep-2023
C-O-C number	: ----	Issue Date	: 25-Oct-2023 08:39
Sampler	: ---- 204 284 3366		
Site	: ----		
Quote number	: Keeyask 2023		
No. of samples received	: 92		
No. of samples analysed	: 92		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Oleksandr Busel		Winnipeg Metals, Winnipeg, Manitoba

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Biota**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 1123351)											
WP2321069-001	3 LKWH	Mercury	7439-97-6	E510A	0.0010	mg/kg wwt	0.311	0.322	3.40%	40%	----
Metals (QC Lot: 1123352)											
WP2321069-021	1 NRPK	Mercury	7439-97-6	E510A	0.0100	mg/kg wwt	0.949	0.934	1.53%	40%	----
Metals (QC Lot: 1133991)											
WP2321069-041	69 NRPK	Mercury	7439-97-6	E510A	0.0099	mg/kg wwt	0.872	0.867	0.558%	40%	----
Metals (QC Lot: 1133992)											
WP2321069-061	18 WALL	Mercury	7439-97-6	E510A	0.0096	mg/kg wwt	0.891	0.858	3.87%	40%	----
Metals (QC Lot: 1133993)											
WP2321069-081	90 WALL	Mercury	7439-97-6	E510A	0.0099	mg/kg wwt	0.679	0.738	8.31%	40%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Biota**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 1123351)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----
Metals (QCLot: 1123352)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----
Metals (QCLot: 1133991)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----
Metals (QCLot: 1133992)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----
Metals (QCLot: 1133993)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Biota**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 1123351)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	92.1	80.0	120	----
Metals (QCLot: 1123352)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	81.3	80.0	120	----
Metals (QCLot: 1133991)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	97.9	80.0	120	----
Metals (QCLot: 1133992)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	87.8	80.0	120	----
Metals (QCLot: 1133993)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	86.2	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

Reference Material (RM) Report								
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Metals (QCLot: 1123351)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	107	70.0	130	----
Metals (QCLot: 1123352)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	111	70.0	130	----
Metals (QCLot: 1133991)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	110	70.0	130	----
Metals (QCLot: 1133992)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	109	70.0	130	----
Metals (QCLot: 1133993)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	104	70.0	130	----

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # Keeyask GS

Report to:				Report Format / Distribution			Service Requested: (rush - subject to availability)
Company:	North South Consultants			☑ Standard ☐ Other			◉ Regular (Default)
Contact:	Jodi Holm			☑ PDF ☑ Excel ☑ Digital			○ Priority (2-3 Business Days) - 50% Surcharge
Address:	83 Scurfield Blvd, Winnipeg			Email 1: jholm@nscons.ca			○ Emergency (1 Business Day) - 100% Surcharge
				Email 2:			○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	284 3366 ext 227	Fax:	477 4173				Analysis Request
Invoice To:	Same as Report ? ◉ Yes ○ No			Client / Project Information:			Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:				Job #: Keeyask Fish			
Contact:				PO / AFE:			
Address:				Legal Site Description:			
Phone:	284 3366	Fax:	477 4173	Quote #: WP2022NSCI			
Lab Work Order # (lab use only)				ALS Contact:	Sampler:		

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	SAMPLE DISPOSAL-WP	HG-WET-CVAA-WP	Number of Containers
	Gull Lake: See attached sheet			Tissue	X	X	92
	samples are organized by: Species and Collector's ID						

Environmental Division
Winnipeg
Work Order Reference
WP2321069

Telephone : +1 204 255 9720

Special Instructions / Regulations / Hazardous Details

Analyze muscle tissue with skin and scales removed

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:	Observations: Yes / No ? If Yes attach SIF
	28 Aug 2023	AUG	28 2023	1:10	1.6			

Fish with Hg samples from Keeyask Reservoir in 2023

Submitted 28Aug 2023

	Location	Fish#	Species	FL
1	Keeyask Reservoir	3	LKWH	488
2	Keeyask Reservoir	4	LKWH	470
3	Keeyask Reservoir	21	LKWH	521
4	Keeyask Reservoir	22	LKWH	515
5	Keeyask Reservoir	40	LKWH	256
6	Keeyask Reservoir	41	LKWH	482
7	Keeyask Reservoir	42	LKWH	439
8	Keeyask Reservoir	43	LKWH	446
9	Keeyask Reservoir	63	LKWH	204
10	Keeyask Reservoir	64	LKWH	230
11	Keeyask Reservoir	65	LKWH	271
12	Keeyask Reservoir	66	LKWH	329
13	Keeyask Reservoir	86	LKWH	566
14	Keeyask Reservoir	87	LKWH	331
15	Keeyask Reservoir	132	LKWH	178
16	Keeyask Reservoir	133	LKWH	221
17	Keeyask Reservoir	134	LKWH	172
18	Keeyask Reservoir	135	LKWH	220
19	Keeyask Reservoir	136	LKWH	151
20	Keeyask Reservoir	154	LKWH	270
1	Keeyask Reservoir	1	NRPK	668
2	Keeyask Reservoir	5	NRPK	310
3	Keeyask Reservoir	7	NRPK	722
4	Keeyask Reservoir	8	NRPK	726
5	Keeyask Reservoir	9	NRPK	604
6	Keeyask Reservoir	10	NRPK	437
7	Keeyask Reservoir	11	NRPK	669
8	Keeyask Reservoir	12	NRPK	613
9	Keeyask Reservoir	24	NRPK	874
30	Keeyask Reservoir	25	NRPK	546
31	Keeyask Reservoir	26	NRPK	364
32	Keeyask Reservoir	27	NRPK	406
33	Keeyask Reservoir	28	NRPK	322
34	Keeyask Reservoir	29	NRPK	225
35	Keeyask Reservoir	30	NRPK	257
36	Keeyask Reservoir	31	NRPK	285
37	Keeyask Reservoir	45	NRPK	596
38	Keeyask Reservoir	46	NRPK	280
39	Keeyask Reservoir	67	NRPK	629
40	Keeyask Reservoir	68	NRPK	485
41	Keeyask Reservoir	69	NRPK	546
42	Keeyask Reservoir	70	NRPK	747
43	Keeyask Reservoir	71	NRPK	632

Fish with Hg samples from Keeyask Reservoir in 2023

Submitted 28Aug 2023

Location	Fish#	Species	FL
Keeyask Reservoir	72	NRPK	518
Keeyask Reservoir	74	NRPK	209
Keeyask Reservoir	75	NRPK	456
Keeyask Reservoir	76	NRPK	544
Keeyask Reservoir	77	NRPK	339
Keeyask Reservoir	78	NRPK	235
Keeyask Reservoir	79	NRPK	214
Keeyask Reservoir	80	NRPK	370
Keeyask Reservoir	88	NRPK	380
Keeyask Reservoir	89	NRPK	294
Keeyask Reservoir	103	NRPK	825
Keeyask Reservoir	104	NRPK	835
Keeyask Reservoir	123	NRPK	350
Keeyask Reservoir	2	WALL	264
Keeyask Reservoir	14	WALL	446
Keeyask Reservoir	15	WALL	425
Keeyask Reservoir	17	WALL	388
Keeyask Reservoir	18	WALL	397
Keeyask Reservoir	19	WALL	339
Keeyask Reservoir	20	WALL	229
Keeyask Reservoir	32	WALL	402
Keeyask Reservoir	33	WALL	374
Keeyask Reservoir	34	WALL	280
Keeyask Reservoir	35	WALL	277
Keeyask Reservoir	36	WALL	245
Keeyask Reservoir	37	WALL	210
Keeyask Reservoir	47	WALL	534
Keeyask Reservoir	48	WALL	509
Keeyask Reservoir	49	WALL	429
Keeyask Reservoir	50	WALL	470
Keeyask Reservoir	51	WALL	168
Keeyask Reservoir	52	WALL	181
Keeyask Reservoir	53	WALL	180
Keeyask Reservoir	54	WALL	209
Keeyask Reservoir	55	WALL	260
Keeyask Reservoir	83	WALL	310
Keeyask Reservoir	84	WALL	279
Keeyask Reservoir	90	WALL	325
Keeyask Reservoir	91	WALL	310
Keeyask Reservoir	92	WALL	277
Keeyask Reservoir	93	WALL	535
Keeyask Reservoir	94	WALL	469
Keeyask Reservoir	116	WALL	264

Fish with Hg samples from Keeyask Reservoir in 2023

Submitted 28Aug 2023

Location	Fish#	Species	FL
Keeyask Reservoir	137	WALL	310
Keeyask Reservoir	138	WALL	248
Keeyask Reservoir	139	WALL	185
Keeyask Reservoir	140	WALL	231
Keeyask Reservoir	161	WALL	170
Keeyask Reservoir	162	WALL	448

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CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WP2322179**	Page	: 1 of 9
Client	: **North/South Consultants Inc.**	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	: 204 284 3366	Telephone	: +1 204 255 9720
Project	: KEEYASK FISH	Date Samples Received	: 06-Sep-2023 12:21
PO	: ----	Date Analysis Commenced	: 14-Sep-2023
C-O-C number	: ----	Issue Date	: 19-Oct-2023 15:54
Sampler	: ----		
Site	: SPLIT LAKE		
Quote number	: Keeyask 2023		
No. of samples received	: 85		
No. of samples analysed	: 85		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Oleksandr Busel		Metals, Winnipeg, Manitoba

No Breaches Found

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/kg wwt	milligrams per kilogram wet weight

>: greater than.
<: less than.
Red shading is applied where the result or the LOR is greater than the Guideline Upper Limit (or lower than the Guideline Lower Limit, if applicable).
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	334 LKST	335 LKST	103 LKWH	121 LKWH	133 LKWH	175 LKWH	181 LKWH
				Sampling date/time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
					WP2322179-001	WP2322179-002	WP2322179-003	WP2322179-004	WP2322179-005	WP2322179-006	WP2322179-007
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.131	0.0688	0.142	0.0860	0.137	0.283	0.183

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	209 LKWH	216 LKWH	230 LKWH	231 LKWH	263 LKWH	410 LKWH	32 NRPK
				Sampling date/time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
					WP2322179-008	WP2322179-009	WP2322179-010	WP2322179-011	WP2322179-012	WP2322179-013	WP2322179-014
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.157	0.144	0.279	0.159	0.233	0.0771	0.233

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	33 NRPK	63 NRPK	64 NRPK	71 NRPK	72 NRPK	92 NRPK	98 NRPK
				Sampling date/time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
					WP2322179-015	WP2322179-016	WP2322179-017	WP2322179-018	WP2322179-019	WP2322179-020	WP2322179-021
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.261	0.494	0.651	0.661	0.604	0.252	0.325

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	99 NRPK	100 NRPK	104 NRPK	105 NRPK	108 NRPK	109 NRPK	122 NRPK
				Sampling date/time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
					WP2322179-022	WP2322179-023	WP2322179-024	WP2322179-025	WP2322179-026	WP2322179-027	WP2322179-028
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.257	0.180	0.310	0.476	0.728	0.220	0.872

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	123 NRPK	172 NRPK	182 NRPK	186 NRPK	187 NRPK	188 NRPK	191 NRPK
				Sampling date/time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
					WP2322179-029	WP2322179-030	WP2322179-031	WP2322179-032	WP2322179-033	WP2322179-034	WP2322179-035
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.517	0.109	0.977	0.890	1.83	0.404	0.527

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	192 NRPK	196 NRPK	197 NRPK	210 NRPK	232 NRPK	233 NRPK	242 NRPK
				Sampling date/time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
					WP2322179-036	WP2322179-037	WP2322179-038	WP2322179-039	WP2322179-040	WP2322179-041	WP2322179-042
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.351	0.165	0.210	0.796	0.778	0.607	0.383

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	243 NRPK	244 NRPK	251 NRPK	262 NRPK	264 NRPK	317 NRPK	388 NRPK
				Sampling date/time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
					WP2322179-043	WP2322179-044	WP2322179-045	WP2322179-046	WP2322179-047	WP2322179-048	WP2322179-049
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.111	0.198	0.170	0.854	0.362	0.316	1.31

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	5 WALL	8 WALL	9 WALL	16 WALL	18 WALL	21 WALL	28 WALL
				Sampling date/time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
					WP2322179-050	WP2322179-051	WP2322179-052	WP2322179-053	WP2322179-054	WP2322179-055	WP2322179-056
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.182	0.286	0.201	0.221	0.263	0.186	0.308

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	29 WALL	30 WALL	60 WALL	70 WALL	79 WALL	101 WALL	102 WALL
				Sampling date/time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
					WP2322179-057	WP2322179-058	WP2322179-059	WP2322179-060	WP2322179-061	WP2322179-062	WP2322179-063
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.194	0.189	0.309	0.213	0.216	0.265	0.468

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	106 WALL	107 WALL	116 WALL	120 WALL	124 WALL	126 WALL	127 WALL
				Sampling date/time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
					WP2322179-064	WP2322179-065	WP2322179-066	WP2322179-067	WP2322179-068	WP2322179-069	WP2322179-070
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.529	0.498	0.328	0.622	0.533	0.259	0.384

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	134 WALL	157 WALL	161 WALL	174 WALL	189 WALL	194 WALL	199 WALL
				Sampling date/time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
					WP2322179-071	WP2322179-072	WP2322179-073	WP2322179-074	WP2322179-075	WP2322179-076	WP2322179-077
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.642	0.117	0.120	1.26	0.460	0.676	0.193

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	200 WALL	228 WALL	229 WALL	271 WALL	283 WALL	333 WALL	368 WALL
				Sampling date/time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
				Sub-Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
					WP2322179-078	WP2322179-079	WP2322179-080	WP2322179-081	WP2322179-082	WP2322179-083	WP2322179-084
Metals											
Mercury	7439-97-6	E510A/WP	mg/kg wwt		0.143	0.553	0.427	1.04	0.743	0.487	0.786

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results Evaluation

Matrix: **Tissue**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	----	----	----	----	----	----
				369 WALL	----	----	----	----	----	----
				Sampling date/time: 06-Sep-2023 00:00	----	----	----	----	----	----
				Sub-Matrix: Tissue	----	----	----	----	----	----
				WP2322179-085	--------	--------	--------	--------	--------	--------
Metals										
Mercury	7439-97-6	E510A/WP	mg/kg wwt	0.669	----	----	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Key:

CERTIFICATE OF ANALYSIS

Work Order	: **WP2322179**	Page	: 1 of 9
Client	: **North/South Consultants Inc.**	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg MB Canada R2J 3T4
Telephone	: 204 284 3366	Telephone	: +1 204 255 9720
Project	: KEEYASK FISH	Date Samples Received	: 06-Sep-2023 12:21
PO	: ----	Date Analysis Commenced	: 14-Sep-2023
C-O-C number	: ----	Issue Date	: 19-Oct-2023 15:52
Sampler	: ----		
Site	: SPLIT LAKE		
Quote number	: Keeyask 2023		
No. of samples received	: 85		
No. of samples analysed	: 85		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Oleksandr Busel		Metals, Winnipeg, Manitoba

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.
Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/kg wwt	milligrams per kilogram wet weight

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	334 LKST	335 LKST	103 LKWH	121 LKWH	133 LKWH
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
						WP2322179-001	WP2322179-002	WP2322179-003	WP2322179-004	WP2322179-005
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.131	0.0688	0.142	0.0860	0.137

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	175 LKWH	181 LKWH	209 LKWH	216 LKWH	230 LKWH
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
						WP2322179-006	WP2322179-007	WP2322179-008	WP2322179-009	WP2322179-010
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.283	0.183	0.157	0.144	0.279

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	231 LKWH	263 LKWH	410 LKWH	32 NRPK	33 NRPK
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
						WP2322179-011	WP2322179-012	WP2322179-013	WP2322179-014	WP2322179-015
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.159	0.233	0.0771	0.233	0.261

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	63 NRPK	64 NRPK	71 NRPK	72 NRPK	92 NRPK
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
						WP2322179-016	WP2322179-017	WP2322179-018	WP2322179-019	WP2322179-020
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.494	0.651	0.661	0.604	0.252

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	98 NRPK	99 NRPK	100 NRPK	104 NRPK	105 NRPK
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
						WP2322179-021	WP2322179-022	WP2322179-023	WP2322179-024	WP2322179-025
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.325	0.257	0.180	0.310	0.476

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Tissue (Matrix: Biota)					Client sample ID	108 NRPK	109 NRPK	122 NRPK	123 NRPK	172 NRPK
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2322179-026	WP2322179-027	WP2322179-028	WP2322179-029	WP2322179-030
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.728	0.220	0.872	0.517	0.109

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Tissue (Matrix: Biota)					Client sample ID	182 NRPK	186 NRPK	187 NRPK	188 NRPK	191 NRPK
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2322179-031	WP2322179-032	WP2322179-033	WP2322179-034	WP2322179-035
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.977	0.890	1.83	0.404	0.527

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Tissue (Matrix: Biota)					Client sample ID	192 NRPK	196 NRPK	197 NRPK	210 NRPK	232 NRPK
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2322179-036	WP2322179-037	WP2322179-038	WP2322179-039	WP2322179-040
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.351	0.165	0.210	0.796	0.778

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	233 NRPK	242 NRPK	243 NRPK	244 NRPK	251 NRPK
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
						WP2322179-041	WP2322179-042	WP2322179-043	WP2322179-044	WP2322179-045
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.607	0.383	0.111	0.198	0.170

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	262 NRPK	264 NRPK	317 NRPK	388 NRPK	5 WALL
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
						WP2322179-046	WP2322179-047	WP2322179-048	WP2322179-049	WP2322179-050
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.854	0.362	0.316	1.31	0.182

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	8 WALL	9 WALL	16 WALL	18 WALL	21 WALL
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
						WP2322179-051	WP2322179-052	WP2322179-053	WP2322179-054	WP2322179-055
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.286	0.201	0.221	0.263	0.186

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Tissue (Matrix: Biota)					Client sample ID	28 WALL	29 WALL	30 WALL	60 WALL	70 WALL
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2322179-056	WP2322179-057	WP2322179-058	WP2322179-059	WP2322179-060
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.308	0.194	0.189	0.309	0.213

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Tissue (Matrix: Biota)					Client sample ID	79 WALL	101 WALL	102 WALL	106 WALL	107 WALL
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2322179-061	WP2322179-062	WP2322179-063	WP2322179-064	WP2322179-065
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.216	0.265	0.468	0.529	0.498

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Tissue (Matrix: Biota)					Client sample ID	116 WALL	120 WALL	124 WALL	126 WALL	127 WALL
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2322179-066	WP2322179-067	WP2322179-068	WP2322179-069	WP2322179-070
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.328	0.622	0.533	0.259	0.384

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Tissue (Matrix: Biota)					Client sample ID	134 WALL	157 WALL	161 WALL	174 WALL	189 WALL
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2322179-071	WP2322179-072	WP2322179-073	WP2322179-074	WP2322179-075
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.642	0.117	0.120	1.26	0.460

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Tissue (Matrix: Biota)					Client sample ID	194 WALL	199 WALL	200 WALL	228 WALL	229 WALL
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2322179-076	WP2322179-077	WP2322179-078	WP2322179-079	WP2322179-080
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		0.676	0.193	0.143	0.553	0.427

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Tissue (Matrix: Biota)					Client sample ID	271 WALL	283 WALL	333 WALL	368 WALL	369 WALL
					Client sampling date / time	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00	06-Sep-2023 00:00
Analyte	CAS Number	Method/Lab	LOR	Unit		WP2322179-081	WP2322179-082	WP2322179-083	WP2322179-084	WP2322179-085
						Result	Result	Result	Result	Result
Metals										
Mercury	7439-97-6	E510A/WP	0.0010	mg/kg wwt		1.04	0.743	0.487	0.786	0.669

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WP2322179**	Page	: 1 of 14
Client	: **North/South Consultants Inc.**	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	: 204 284 3366	Telephone	: +1 204 255 9720
Project	: KEEYASK FISH	Date Samples Received	: 06-Sep-2023 12:21
PO	: ----	Issue Date	: 19-Oct-2023 15:53
C-O-C number	: ----		
Sampler	: ----		
Site	: SPLIT LAKE		
Quote number	: Keeyask 2023		
No. of samples received	: 85		
No. of samples analysed	: 85		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 100 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 103 - LKWH	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 104 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 105 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 108 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 109 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 121 - LKWH	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 122 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 123 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 133 - LKWH	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 172 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 175 - LKWH	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 181 - LKWH	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 182 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 186 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 187 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 188 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 191 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 192 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 196 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 197 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 209 - LKWH	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 210 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 216 - LKWH	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 230 - LKWH	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 231 - LKWH	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 232 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 263 - LKWH	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 32 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 334 - LKST	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 335 - LKST	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 33 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 410 - LKWH	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 63 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 64 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 71 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 72 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 92 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 98 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 99 - NRPK	E510A	06-Sep-2023	05-Oct-2023	365 days	30 days	✓	06-Oct-2023	365 days	31 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 16 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 18 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 21 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 233 - NRPK	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 242 - NRPK	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 243 - NRPK	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 244 - NRPK	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 251 - NRPK	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 262 - NRPK	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 264 - NRPK	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 28 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 29 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 30 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 317 - NRPK	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 388 - NRPK	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 5 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 60 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 70 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 8 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 9 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	18-Oct-2023	365 days	43 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 101 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 102 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 106 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 107 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 116 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 120 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 124 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 126 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 127 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 134 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 157 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 161 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 174 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 189 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 194 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 199 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 200 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 228 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 229 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 79 - WALL	E510A	06-Sep-2023	17-Oct-2023	365 days	42 days	✓	19-Oct-2023	365 days	44 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 271 - WALL	E510A	06-Sep-2023	14-Sep-2023	365 days	9 days	✓	15-Sep-2023	365 days	10 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 283 - WALL	E510A	06-Sep-2023	14-Sep-2023	365 days	9 days	✓	15-Sep-2023	365 days	10 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 333 - WALL	E510A	06-Sep-2023	14-Sep-2023	365 days	9 days	✓	15-Sep-2023	365 days	10 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 368 - WALL	E510A	06-Sep-2023	14-Sep-2023	365 days	9 days	✓	15-Sep-2023	365 days	10 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 369 - WALL	E510A	06-Sep-2023	14-Sep-2023	365 days	9 days	✓	15-Sep-2023	365 days	10 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Biota**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	1133993	5	97	5.1	5.0	✓
Laboratory Control Samples (LCS)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	1133993	10	97	10.3	10.0	✓
Method Blanks (MB)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	1133993	5	97	5.1	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Mercury in Biota by CVAAS (WET units, Routine)	E510A ALS Environmental - Winnipeg	Biota	EPA 200.3/1631 Appendix (mod)	Samples are homogenized and sub-sampled prior to hotblock digestion with HNO3, HCl, and H2O2. Analysis is by CVAAS.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals and Mercury Biota Digestion	EP440 ALS Environmental - Winnipeg	Biota	EPA 200.3	This method uses a heated strong acid digestion with HNO3, HCl, and H2O2 and is intended to provide a conservative estimate of bio-available metals.

QUALITY CONTROL REPORT

Work Order	: **WP2322179**	Page	: 1 of 4
Client	: North/South Consultants Inc.	Laboratory	: ALS Environmental - Winnipeg
Contact	: Jodi Holm	Account Manager	: Judy Dalmaijer
Address	: 83 Scurfield Boulevard Winnipeg MB Canada R3Y 1G4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	:	Telephone	: +1 204 255 9720
Project	: KEEYASK FISH	Date Samples Received	: 06-Sep-2023 12:21
PO	: ----	Date Analysis Commenced	: 14-Sep-2023
C-O-C number	: ----	Issue Date	: 19-Oct-2023 15:55
Sampler	: ---- 204 284 3366		
Site	: SPLIT LAKE		
Quote number	: Keeyask 2023		
No. of samples received	: 85		
No. of samples analysed	: 85		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Oleksandr Busel		Winnipeg Metals, Winnipeg, Manitoba

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Biota**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 1133993)											
WP2321069-081	Anonymous	Mercury	7439-97-6	E510A	0.0099	mg/kg wwt	0.679	0.738	8.31%	40%	----
Metals (QC Lot: 1170459)											
WP2322179-001	334 LKST	Mercury	7439-97-6	E510A	0.0010	mg/kg wwt	0.131	0.125	4.17%	40%	----
Metals (QC Lot: 1170460)											
WP2322179-021	98 NRPK	Mercury	7439-97-6	E510A	0.0010	mg/kg wwt	0.325	0.312	3.80%	40%	----
Metals (QC Lot: 1189539)											
WP2322179-041	233 NRPK	Mercury	7439-97-6	E510A	0.0101	mg/kg wwt	0.607	0.592	2.57%	40%	----
Metals (QC Lot: 1189540)											
WP2322179-061	79 WALL	Mercury	7439-97-6	E510A	0.0010	mg/kg wwt	0.216	0.230	6.29%	40%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Biota**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 1133993)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----
Metals (QCLot: 1170459)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----
Metals (QCLot: 1170460)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----
Metals (QCLot: 1189539)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----
Metals (QCLot: 1189540)						
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Biota**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 1133993)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	86.2	80.0	120	----
Metals (QCLot: 1170459)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	100	80.0	120	----
Metals (QCLot: 1170460)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	96.9	80.0	120	----
Metals (QCLot: 1189539)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	96.8	80.0	120	----
Metals (QCLot: 1189540)									
Mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	89.0	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

Reference Material (RM) Report								
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method					
Metals (QCLot: 1133993)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	104	70.0	130	----
Metals (QCLot: 1170459)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	113	70.0	130	----
Metals (QCLot: 1170460)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	113	70.0	130	----
Metals (QCLot: 1189539)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	117	70.0	130	----
Metals (QCLot: 1189540)									
	RM	Mercury	7439-97-6	E510A	0.331 mg/kg wwt	107	70.0	130	----

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # Keeyask GS

Report to:				Report Format / Distribution	Service Requested: (rush - subject to availability)
Company:	North South Consultants			☑ Standard ☐ Other	◉ Regular (Default)
Contact:	Jodi Holm			☑ PDF ☑ Excel ☑ Digital	○ Priority (2-3 Business Days) - 50% Surcharge
Address:	83 Scurfield Blvd, Winnipeg			Email 1: jholm@nscons.ca	○ Emergency (1 Business Day) - 100% Surcharge
				Email 2:	○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	284 3366 ext 227	Fax:	477 4173		
Invoice To:	Same as Report ? ◉ Yes ○ No			**Client / Project Information:**	Please indicate below
Company:				Job #: Keeyask Fish	
Contact:				PO / AFE:	
Address:				Legal Site Description:	
Phone:	284 3366	Fax:	477 4173	Quote #: Keeyask 2023	

Lab Work Order # (lab use only)

ALS Contact:

Sampler:

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	SAMPLE DISPOSAL-WP	HG-WET-CVAA-WP	Number of Containers
	Split Lake: See attached sheet			Tissue	X	X	85
	samples are organized by: Species and Collector's ID						

Environmental Division Winnipeg
Work Order Reference
WP2322179

Telephone : +1 204 255 9720

Special Instructions / Regulations / Hazardous Details

Analyze muscle tissue with skin and scales removed

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:	Observations: Yes / No ? If Yes attach SIF
	Sept 6 2023		SEP 06 2023	1221	3.4			

Fish with Hg samples from Split Lake in 2023

Submitted 6 Sep 2023

Location	Fish#	Species	Length
Split Lake	334	LKST	711
Split Lake	335	LKST	661
Split Lake	103	LKWH	437
Split Lake	121	LKWH	404
Split Lake	133	LKWH	488
Split Lake	175	LKWH	471
Split Lake	181	LKWH	425
Split Lake	209	LKWH	455
Split Lake	216	LKWH	405
Split Lake	230	LKWH	475
Split Lake	231	LKWH	467
Split Lake	263	LKWH	408
Split Lake	410	LKWH	138
Split Lake	32	NRPK	438
Split Lake	33	NRPK	408
Split Lake	63	NRPK	507
Split Lake	64	NRPK	542
Split Lake	71	NRPK	628
Split Lake	72	NRPK	551
Split Lake	92	NRPK	344
Split Lake	98	NRPK	437
Split Lake	99	NRPK	394
Split Lake	100	NRPK	365
Split Lake	104	NRPK	473
Split Lake	105	NRPK	489
Split Lake	108	NRPK	591
Split Lake	109	NRPK	466
Split Lake	122	NRPK	768
Split Lake	123	NRPK	687
Split Lake	172	NRPK	252
Split Lake	182	NRPK	605
Split Lake	186	NRPK	812
Split Lake	187	NRPK	896
Split Lake	188	NRPK	504
Split Lake	191	NRPK	431
Split Lake	192	NRPK	451
Split Lake	196	NRPK	227
Split Lake	197	NRPK	224
Split Lake	210	NRPK	823
Split Lake	232	NRPK	678
Split Lake	233	NRPK	554
Split Lake	242	NRPK	355
Split Lake	243	NRPK	297

Fish with Hg samples from Split Lake in 2023

Submitted 6 Sep 2023

Location	Fish#	Species	Length
Split Lake	244	NRPK	239
Split Lake	251	NRPK	252
Split Lake	262	NRPK	640
Split Lake	264	NRPK	565
Split Lake	317	NRPK	482
Split Lake	388	NRPK	930
Split Lake	5	WALL	250
Split Lake	8	WALL	224
Split Lake	9	WALL	219
Split Lake	16	WALL	240
Split Lake	18	WALL	262
Split Lake	21	WALL	201
Split Lake	28	WALL	280
Split Lake	29	WALL	189
Split Lake	30	WALL	177
Split Lake	60	WALL	347
Split Lake	70	WALL	258
Split Lake	79	WALL	270
Split Lake	101	WALL	320
Split Lake	102	WALL	404
Split Lake	106	WALL	425
Split Lake	107	WALL	397
Split Lake	116	WALL	461
Split Lake	120	WALL	524
Split Lake	124	WALL	409
Split Lake	126	WALL	306
Split Lake	127	WALL	403
Split Lake	134	WALL	436
Split Lake	157	WALL	174
Split Lake	161	WALL	190
Split Lake	174	WALL	524
Split Lake	189	WALL	307
Split Lake	194	WALL	376
Split Lake	199	WALL	234
Split Lake	200	WALL	158
Split Lake	228	WALL	381
Split Lake	229	WALL	357
Split Lake	271	WALL	602
Split Lake	283	WALL	573
Split Lake	333	WALL	538
Split Lake	368	WALL	482
Split Lake	369	WALL	465

APPENDIX 3:
MUSCLE MERCURY CONCENTRATIONS AND BIOLOGICAL DATA FOR INDIVIDUAL FISH FROM THE KEEYASK RESERVOIR, STEPHENS LAKE, AND SPLIT LAKE IN 2023

Table A3-1: Definitions of codes used in Appendix 3 tables.

Term	Code	Definition
Species	LKST	Lake Sturgeon
	LKWH	Lake Whitefish
	NRPK	Northern Pike
	WALL	Walleye
Sex	F	Female
	M	Male
Maturity	IMM	Immature
	MAT	Mature
K		Condition factor

Table A3-2: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from the Keeyask reservoir in 2023.

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg (ppm)
3	GN-04	17-Aug-23	LKWH	486	2300	2.00	M	MAT	10	0.311
4	GN-04	17-Aug-23	LKWH	470	2200	2.12	F	MAT	9	0.401
21	GN-03	17-Aug-23	LKWH	521	3050	2.16	F	MAT	10	0.411
22	GN-03	17-Aug-23	LKWH	515	2600	1.90	F	IMM	13	0.401
40	GN-02	17-Aug-23	LKWH	256	250	1.49	-	IMM	3	0.279
41	GN-02	17-Aug-23	LKWH	482	2200	1.96	F	MAT	9	0.314
42	GN-02	17-Aug-23	LKWH	439	1700	2.01	F	MAT	6	0.313
43	GN-02	17-Aug-23	LKWH	446	2000	2.25	M	MAT	7	0.487
63	GN-01	17-Aug-23	LKWH	204	100	1.18	-	IMM	2	0.171
64	GN-01	17-Aug-23	LKWH	230	175	1.44	-	IMM	2	0.168
65	GN-01	17-Aug-23	LKWH	271	225	1.13	-	IMM	2	0.219
66	GN-01	17-Aug-23	LKWH	329	500	1.40	-	IMM	3	0.234
86	GN-05	18-Aug-23	LKWH	566	3900	2.15	F	MAT	14	0.661
87	GN-05	18-Aug-23	LKWH	331	610	1.68	M	IMM	4	0.243
132	GN-07	18-Aug-23	LKWH	178	75	1.33	-	IMM	2	0.180
133	GN-07	18-Aug-23	LKWH	221	175	1.62	M	IMM	2	0.186
134	GN-07	18-Aug-23	LKWH	172	50	0.98	-	IMM	1	0.185
135	GN-07	18-Aug-23	LKWH	220	150	1.41	M	IMM	2	0.256
136	GN-07	18-Aug-23	LKWH	151	50	1.45	-	IMM	-	0.205
144	GN-79	20-Oct-23	LKWH	542	2980	1.87	M	MAT	-	0.390
154	GN-08	23-Aug-23	LKWH	270	350	1.78	M	IMM	3	0.288
1	GN-02	16-Aug-23	NRPK	668	2500	0.84	F	MAT	10	0.949
5	GN-04	17-Aug-23	NRPK	310	250	0.84	M	IMM	2	0.418
7	GN-04	17-Aug-23	NRPK	722	3550	0.94	F	MAT	10	0.939
8	GN-04	17-Aug-23	NRPK	726	3700	0.97	F	MAT	9	1.39
9	GN-04	17-Aug-23	NRPK	604	1950	0.88	M	MAT	7	0.948
10	GN-04	17-Aug-23	NRPK	437	700	0.84	M	MAT	4	0.631

Table A3-2: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from the Keeyask reservoir in 2023 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg (ppm)
11	GN-04	17-Aug-23	NRPK	669	2800	0.94	F	MAT	8	0.765
12	GN-04	17-Aug-23	NRPK	613	2500	1.09	M	MAT	7	1.01
24	GN-03	17-Aug-23	NRPK	874	4250	0.64	F	MAT	14	2.61
25	GN-03	17-Aug-23	NRPK	546	1500	0.92	M	MAT	7	0.781
26	GN-03	17-Aug-23	NRPK	364	450	0.93	F	IMM	4	0.402
27	GN-03	17-Aug-23	NRPK	406	400	0.60	F	IMM	4	0.517
28	GN-03	17-Aug-23	NRPK	322	200	0.60	M	IMM	3	0.500
29	GN-03	17-Aug-23	NRPK	225	75	0.66	-	IMM	2	0.169
30	GN-03	17-Aug-23	NRPK	257	100	0.59	-	IMM	2	0.118
31	GN-03	17-Aug-23	NRPK	285	150	0.65	-	IMM	2	0.288
44	GN-02	16-Aug-23	NRPK	350	250	0.58	F	IMM	3	0.800
45	GN-02	17-Aug-23	NRPK	596	1850	0.87	M	MAT	8	0.974
46	GN-02	17-Aug-23	NRPK	280	200	0.91	-	IMM	2	0.406
67	GN-01	17-Aug-23	NRPK	629	2325	0.93	F	MAT	10	1.13
68	GN-01	17-Aug-23	NRPK	485	1050	0.92	M	MAT	4	0.647
69	GN-01	17-Aug-23	NRPK	546	1400	0.86	F	MAT	5	0.872
70	GN-01	17-Aug-23	NRPK	747	3800	0.91	F	MAT	10	1.48
71	GN-01	17-Aug-23	NRPK	632	2200	0.87	F	MAT	8	1.10
72	GN-01	17-Aug-23	NRPK	518	1325	0.95	F	IMM	5	0.611
74	GN-01	17-Aug-23	NRPK	209	100	1.10	-	IMM	1	0.151
75	GN-01	17-Aug-23	NRPK	456	900	0.95	M	MAT	6	0.772
76	GN-01	17-Aug-23	NRPK	544	1700	1.06	F	MAT	7	0.958
77	GN-01	17-Aug-23	NRPK	339	300	0.77	M	IMM	3	0.576
78	GN-01	17-Aug-23	NRPK	235	150	1.16	-	IMM	2	0.161
79	GN-01	17-Aug-23	NRPK	214	125	1.28	-	IMM	2	0.153
80	GN-01	17-Aug-23	NRPK	370	400	0.79	M	M6	3	0.561
88	GN-05	18-Aug-23	NRPK	380	495	0.90	F	IMM	4	0.607

Table A3-2: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from the Keeyask reservoir in 2023 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg (ppm)
89	GN-05	18-Aug-23	NRPK	294	200	0.79	F	IMM	3	0.614
103	GN-06	18-Aug-23	NRPK	825	4650	0.83	F	MAT	9	0.961
104	GN-06	18-Aug-23	NRPK	835	4200	0.72	F	MAT	14	1.36
2	GN-02	16-Aug-23	WALL	264	275	1.49	-	IMM	3	0.664
14	GN-04	17-Aug-23	WALL	446	1300	1.47	F	MAT	10	1.19
15	GN-04	17-Aug-23	WALL	425	1100	1.43	F	MAT	9	0.973
17	GN-04	17-Aug-23	WALL	388	700	1.20	F	MAT	6	0.874
18	GN-04	17-Aug-23	WALL	397	850	1.36	F	IMM	6	0.891
19	GN-04	17-Aug-23	WALL	339	450	1.16	F	IMM	8	0.362
20	GN-04	17-Aug-23	WALL	229	100	0.83	-	IMM	4	0.245
32	GN-03	17-Aug-23	WALL	402	1000	1.54	F	MAT	10	0.512
33	GN-03	17-Aug-23	WALL	374	800	1.53	M	MAT	11	0.824
34	GN-03	17-Aug-23	WALL	280	300	1.37	F	IMM	3	0.351
35	GN-03	17-Aug-23	WALL	277	200	0.94	M	IMM	3	0.288
36	GN-03	17-Aug-23	WALL	245	150	1.02	-	IMM	3	0.315
37	GN-03	17-Aug-23	WALL	210	100	1.08	-	IMM	2	0.563
47	GN-02	17-Aug-23	WALL	534	2100	1.38	F	MAT	12	0.667
48	GN-02	17-Aug-23	WALL	509	1850	1.40	F	MAT	14	1.42
49	GN-02	17-Aug-23	WALL	429	1000	1.27	M	MAT	9	1.04
50	GN-02	17-Aug-23	WALL	470	1400	1.35	M	MAT	13	0.921
51	GN-02	17-Aug-23	WALL	168	50	1.05	-	IMM	2	0.265
52	GN-02	17-Aug-23	WALL	181	50	0.84	-	IMM	1	0.247
53	GN-02	17-Aug-23	WALL	180	50	0.86	-	IMM	2	0.587
54	GN-02	17-Aug-23	WALL	209	100	1.10	F	IMM	2	0.623
55	GN-02	17-Aug-23	WALL	260	175	1.00	F	IMM	3	0.393
83	GN-01	17-Aug-23	WALL	310	250	0.84	F	IMM	7	0.440
84	GN-01	17-Aug-23	WALL	279	250	1.15	F	IMM	3	0.183

Table A3-2: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from the Keeyask reservoir in 2023 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg (ppm)
90	GN-05	18-Aug-23	WALL	325	495	1.44	F	IMM	4	0.679
91	GN-05	18-Aug-23	WALL	310	400	1.34	F	IMM	4	0.931
92	GN-05	18-Aug-23	WALL	277	250	1.18	F	IMM	3	0.745
93	GN-05	18-Aug-23	WALL	535	2000	1.31	F	MAT	12	1.03
94	GN-05	18-Aug-23	WALL	469	1700	1.65	F	MAT	13	0.991
116	GN-06	18-Aug-23	WALL	264	225	1.22	M	IMM	3	0.640
137	GN-07	18-Aug-23	WALL	310	350	1.17	F	IMM	4	0.509
138	GN-07	18-Aug-23	WALL	248	175	1.15	F	IMM	3	0.525
139	GN-07	18-Aug-23	WALL	185	50	0.79	M	IMM	1	0.228
140	GN-07	18-Aug-23	WALL	231	150	1.22	-	IMM	3	1.03
161	GN-09	23-Aug-23	WALL	170	50	1.02	M	IMM	2	0.176
162	GN-09	23-Aug-23	WALL	448	1325	1.47	F	MAT	11	1.05

Table A3-3: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Stephens Lake in 2023.

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg (ppm)
101	GN-16	16-Oct-23	LKWH	469	1500	1.454028	M	MAT	-	0.134
102	GN-16	16-Oct-23	LKWH	432	1220	1.513243	M	MAT	-	0.0899
140	GN-20	17-Oct-23	LKWH	515	2210	1.61797	M	MAT	-	0.204
147	GN-20	17-Oct-23	LKWH	476	1630	1.511356	M	MAT	-	0.149
1044	GN-106	20-Aug-23	LKWH	426	1325	1.713906	M	IMM	7	0.0755
1091	GN-108	21-Aug-23	LKWH	475	1700	1.586237	M	MAT	10	0.208
1092	GN-108	21-Aug-23	LKWH	440	1525	1.790242	M	MAT	9	0.144
1112	GN-110	21-Aug-23	LKWH	229	150	1.249064	F	IMM	3	0.154
1145	GN-112	22-Aug-23	LKWH	435	1500	1.822315	F	MAT	9	0.180
1146	GN-112	22-Aug-23	LKWH	486	2250	1.96008	F	MAT	15	0.167
1147	GN-112	22-Aug-23	LKWH	474	2350	2.206647	F	MAT	15	0.241
1148	GN-112	22-Aug-23	LKWH	421	1500	2.010226	M	MAT	7	0.0604
1017	GN-102	19-Aug-23	NRPK	775	3700	0.794871	F	MAT	7	0.869
1018	GN-102	19-Aug-23	NRPK	309	200	0.677883	F	IMM	2	0.314
1022	GN-103	19-Aug-23	NRPK	461	600	0.612419	F	MAT	5	0.655
1045	GN-106	20-Aug-23	NRPK	864	5000	0.775227	F	MAT	12	0.962
1046	GN-106	20-Aug-23	NRPK	629	2150	0.863946	M	MAT	7	0.959
1047	GN-106	20-Aug-23	NRPK	260	175	0.995676	F	IMM	2	0.142
1086	GN-107	20-Aug-23	NRPK	817	4100	0.751827	F	MAT	9	0.668
1088	GN-107	20-Aug-23	NRPK	695	2500	0.744707	F	MAT	9	0.814
1095	GN-109	21-Aug-23	NRPK	770	4100	0.898073	F	MAT	11	0.998
1096	GN-109	21-Aug-23	NRPK	782	3800	0.794627	F	MAT	9	0.730
1097	GN-109	21-Aug-23	NRPK	829	5150	0.903948	F	MAT	13	1.03
1098	GN-109	21-Aug-23	NRPK	578	1600	0.828584	F	MAT	8	0.734
1099	GN-109	21-Aug-23	NRPK	400	500	0.78125	F	IMM	4	0.334
1154	GN-112	22-Aug-23	NRPK	595	1700	0.807046	F	MAT	9	0.792
1155	GN-112	22-Aug-23	NRPK	262	150	0.834041	-	IMM	2	0.138
1157	GN-113	22-Aug-23	NRPK	975	7800	0.841552	F	MAT	14	1.75

Table A3-3: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Stephens Lake in 2023 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg (ppm)
1158	GN-113	22-Aug-23	NRPK	565	1700	0.942548	M	MAT	6	0.854
1159	GN-113	22-Aug-23	NRPK	548	1250	0.759571	F	IMM	7	0.797
1160	GN-113	22-Aug-23	NRPK	365	300	0.61694	M	IMM	4	0.473
1161	GN-113	22-Aug-23	NRPK	325	200	0.582613	M	IMM	3	0.424
1197	GN-114	22-Aug-23	NRPK	495	1000	0.824488	M	IMM	6	0.561
1198	GN-114	22-Aug-23	NRPK	356	300	0.664923	M	IMM	3	0.345
1199	GN-115	22-Aug-23	NRPK	940	8100	0.975217	F	MAT	16	1.54
1200	GN-115	22-Aug-23	NRPK	368	325	0.652139	M	IMM	4	0.365
1201	GN-115	22-Aug-23	NRPK	398	350	0.555161	M	IMM	4	0.382
1225	GN-116	22-Aug-23	NRPK	591	1950	0.944653	F	IMM	6	0.516
1226	GN-116	22-Aug-23	NRPK	639	1925	0.737782	F	IMM	9	0.468
1227	GN-116	22-Aug-23	NRPK	634	1950	0.765186	M	MAT	8	0.700
1228	GN-116	22-Aug-23	NRPK	415	600	0.839473	M	IMM	4	0.311
1229	GN-116	22-Aug-23	NRPK	344	375	0.921204	M	IMM	4	0.440
1244	GN-118	23-Aug-23	NRPK	572	1325	0.707991	F	MAT	9	0.779
1245	GN-118	23-Aug-23	NRPK	545	1125	0.694965	F	MAT	7	0.647
1246	GN-118	23-Aug-23	NRPK	302	275	0.998417	F	IMM	3	0.558
1256	GN-119	23-Aug-23	NRPK	550	1150	0.69121	F	MAT	7	0.647
1276	GN-120	23-Aug-23	NRPK	227	50	0.427457	M	IMM	2	0.156
1279	GN-120	23-Aug-23	NRPK	449	725	0.800938	F	MAT	5	0.533
1008	GN-101	19-Aug-23	WALL	478	1400	1.281871	M	MAT	14	0.627
1009	GN-101	19-Aug-23	WALL	463	1150	1.158657	M	MAT	20	1.05
1011	GN-101	19-Aug-23	WALL	417	850	1.172224	F	MAT	13	0.614
1013	GN-101	19-Aug-23	WALL	394	950	1.553227	M	MAT	14	0.861
1014	GN-101	19-Aug-23	WALL	401	975	1.512069	M	MAT	13	0.780
1015	GN-101	19-Aug-23	WALL	192	150	2.119276	-	IMM	5	0.173
1016	GN-101	19-Aug-23	WALL	196	100	1.328103	-	IMM	3	0.355
1019	GN-102	19-Aug-23	WALL	520	1800	1.280155	F	MAT	13	1.21

Table A3-3: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Stephens Lake in 2023 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg (ppm)
1020	GN-102	19-Aug-23	WALL	260	200	1.137915	M	IMM	3	0.574
1023	GN-103	19-Aug-23	WALL	425	1150	1.498066	F	MAT	10	0.888
1024	GN-103	19-Aug-23	WALL	226	125	1.082891	M	IMM	2	0.234
1027	GN-104	19-Aug-23	WALL	283	225	0.992712	F	IMM	3	0.409
1028	GN-104	19-Aug-23	WALL	344	550	1.3511	M	MAT	5	0.478
1029	GN-104	19-Aug-23	WALL	360	550	1.178841	M	MAT	8	0.268
1048	GN-106	20-Aug-23	WALL	456	1300	1.371036	M	MAT	8	0.768
1049	GN-106	20-Aug-23	WALL	252	200	1.249765	F	IMM	3	0.282
1064	GN-105	20-Aug-23	WALL	570	2600	1.403941	F	MAT	13	0.708
1065	GN-105	20-Aug-23	WALL	338	350	0.906396	F	IMM	10	0.600
1080	GN-107	20-Aug-23	WALL	370	750	1.480663	M	MAT	10	0.657
1081	GN-107	20-Aug-23	WALL	419	800	1.087547	F	IMM	12	0.367
1082	GN-107	20-Aug-23	WALL	296	400	1.542357	F	IMM	6	0.517
1083	GN-107	20-Aug-23	WALL	367	725	1.466695	F	MAT	9	0.558
1084	GN-107	20-Aug-23	WALL	384	925	1.633609	M	MAT	10	0.697
1085	GN-107	20-Aug-23	WALL	334	550	1.476126	M	MAT	6	0.488
1093	GN-108	21-Aug-23	WALL	465	1200	1.1935	F	MAT	12	0.703
1100	GN-109	21-Aug-23	WALL	512	1825	1.359731	F	MAT	11	0.708
1101	GN-109	21-Aug-23	WALL	446	1200	1.352623	M	MAT	16	0.829
1104	GN-109	21-Aug-23	WALL	398	950	1.506865	F	MAT	8	0.588
1113	GN-110	21-Aug-23	WALL	510	1650	1.243865	F	MAT	15	1.03
1132	GN-111	21-Aug-23	WALL	455	1050	1.114693	F	MAT	12	0.300
1133	GN-111	21-Aug-23	WALL	484	1650	1.455284	F	MAT		0.777
1134	GN-111	21-Aug-23	WALL	307	450	1.55524	M	IMM	3	0.359
1135	GN-111	21-Aug-23	WALL	285	250	1.079954	M	IMM	3	0.456
1136	GN-111	21-Aug-23	WALL	321	425	1.284913	M	IMM	5	0.320
1137	GN-111	21-Aug-23	WALL	490	1450	1.23248	F	MAT	12	0.551
1138	GN-111	21-Aug-23	WALL	409	775	1.132744	F	MAT	13	0.502

Table A3-4: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Split Lake in 2023.

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg (ppm)
334	GN-28	30-Aug-23	LKST	711	2090	0.58	M	IMM	10	0.131
335	GN-28	30-Aug-23	LKST	661	1890	0.65	M	IMM	9	0.0688
103	GN-03	25-Aug-23	LKWH	437	1210	1.45	F	MAT	9	0.142
121	GN-03	25-Aug-23	LKWH	404	1010	1.53	M	MAT	8	0.0860
133	GN-21	26-Aug-23	LKWH	488	2100	1.81	M	MAT	14	0.137
175	GN-05	26-Aug-23	LKWH	471	1510	1.45	F	MAT	15	0.283
181	GN-05	26-Aug-23	LKWH	425	1190	1.55	M	MAT	13	0.183
209	GN-06	26-Aug-23	LKWH	455	1640	1.74	F	MAT	9	0.157
216	GN-06	26-Aug-23	LKWH	405	940	1.42	M	MAT	13	0.144
230	GN-06	26-Aug-23	LKWH	475	1750	1.63	F	MAT	10	0.279
231	GN-06	26-Aug-23	LKWH	467	1490	1.46	M	MAT	12	0.159
263	GN-18	28-Aug-23	LKWH	408	800	1.18	F	IMM	11	0.233
410	GN-15	30-Aug-23	LKWH	138	28	1.07	-	IMM	2	0.0771
32	SN-20	25-Aug-23	NRPK	438	510	0.61	M	MAT	4	0.233
33	SN-20	25-Aug-23	NRPK	408	380	0.56	F	IMM	4	0.261
63	GN-22	25-Aug-23	NRPK	507	600	0.46	F	IMM	7	0.494
64	GN-22	25-Aug-23	NRPK	542	890	0.56	F	IMM	8	0.651
71	GN-22	25-Aug-23	NRPK	628	1500	0.61	F	MAT	7	0.661
72	GN-22	25-Aug-23	NRPK	551	1200	0.72	F	MAT	6	0.604
92	GN-03	25-Aug-23	NRPK	344	260	0.64	F	IMM	2	0.252
98	GN-03	25-Aug-23	NRPK	437	520	0.62	M	MAT	4	0.325
99	GN-03	25-Aug-23	NRPK	394	410	0.67	M	MAT	5	0.257
100	GN-03	25-Aug-23	NRPK	365	310	0.64	M	MAT	3	0.180
104	GN-03	25-Aug-23	NRPK	473	790	0.75	M	MAT	4	0.310
105	GN-03	25-Aug-23	NRPK	489	740	0.63	M	MAT	4	0.476
108	GN-03	25-Aug-23	NRPK	591	1250	0.61	M	MAT	8	0.728
109	GN-03	25-Aug-23	NRPK	466	840	0.83	M	MAT	4	0.220
122	GN-03	25-Aug-23	NRPK	768	3310	0.73	F	MAT	11	0.872

Table A3-4: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Split Lake in 2023 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg (ppm)
123	GN-03	25-Aug-23	NRPK	687	2350	0.72	F	MAT	8	0.517
172	GN-21	26-Aug-23	NRPK	252	95	0.59	M	IMM	1	0.109
182	GN-05	26-Aug-23	NRPK	605	1450	0.65	M	MAT	5	0.977
186	GN-05	26-Aug-23	NRPK	812	5020	0.94	M	MAT	10	0.890
187	GN-05	26-Aug-23	NRPK	896	6980	0.97	F	MAT	12	1.83
188	GN-05	26-Aug-23	NRPK	504	780	0.61	M	MAT	5	0.404
191	GN-05	26-Aug-23	NRPK	431	510	0.64	M	MAT	5	0.527
192	GN-05	26-Aug-23	NRPK	451	580	0.63	F	MAT	4	0.351
196	GN-05	26-Aug-23	NRPK	227	66	0.56	M	IMM	2	0.165
197	GN-05	26-Aug-23	NRPK	224	67	0.60	F	IMM	2	0.210
210	GN-06	26-Aug-23	NRPK	823	4210	0.76	F	MAT	11	0.796
232	GN-06	26-Aug-23	NRPK	678	1840	0.59	F	MAT	5	0.778
233	GN-06	26-Aug-23	NRPK	554	1100	0.65	F	MAT	5	0.607
242	GN-06	26-Aug-23	NRPK	355	270	0.60	M	IMM	3	0.383
243	GN-06	26-Aug-23	NRPK	297	170	0.65	F	IMM	2	0.111
244	GN-06	26-Aug-23	NRPK	239	83	0.61	F	IMM	1	0.198
251	GN-06	26-Aug-23	NRPK	252	88	0.55	M	IMM	2	0.170
262	GN-18	28-Aug-23	NRPK	640	1570	0.60	M	MAT	9	0.854
264	GN-18	28-Aug-23	NRPK	565	1420	0.79	M	MAT	4	0.362
317	GN-29	29-Aug-23	NRPK	482	700	0.63	F	MAT	4	0.316
388	GN-15	30-Aug-23	NRPK	930	5360	0.67	F	MAT	10	1.31
5	GN-20	25-Aug-23	WALL	250	156	1.00	M	IMM	3	0.182
8	GN-20	25-Aug-23	WALL	224	111	0.99	M	IMM	3	0.286
9	GN-20	25-Aug-23	WALL	219	104	0.99	F	IMM	3	0.201
16	GN-20	25-Aug-23	WALL	240	129	0.93	F	IMM	3	0.221
18	GN-20	25-Aug-23	WALL	262	200	1.11	F	IMM	4	0.263
21	GN-20	25-Aug-23	WALL	201	67	0.83	F	IMM	3	0.186
28	SN-20	25-Aug-23	WALL	280	210	0.96	F	IMM	5	0.308

Table A3-4: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Split Lake in 2023 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg (ppm)
29	SN-20	25-Aug-23	WALL	189	62	0.92	F	IMM	2	0.194
30	SN-20	25-Aug-23	WALL	177	49	0.88	M	IMM	2	0.189
60	GN-22	25-Aug-23	WALL	347	420	1.01	F	IMM	6	0.309
70	GN-22	25-Aug-23	WALL	258	159	0.93	F	IMM	3	0.213
79	GN-22	25-Aug-23	WALL	270	210	1.07	M	IMM	5	0.216
101	GN-03	25-Aug-23	WALL	320	330	1.01	M	IMM	5	0.265
102	GN-03	25-Aug-23	WALL	404	700	1.06	F	MAT	9	0.468
106	GN-03	25-Aug-23	WALL	425	870	1.13	F	MAT	13	0.529
107	GN-03	25-Aug-23	WALL	397	700	1.12	F	MAT	10	0.498
116	GN-03	25-Aug-23	WALL	461	950	0.97	F	MAT	10	0.328
120	GN-03	25-Aug-23	WALL	524	1500	1.04	F	MAT	13	0.622
124	SN-03	25-Aug-23	WALL	409	640	0.94	F	MAT	10	0.533
126	SN-03	25-Aug-23	WALL	306	300	1.05	M	IMM	4	0.259
127	SN-03	25-Aug-23	WALL	403	670	1.02	F	IMM	10	0.384
134	GN-21	26-Aug-23	WALL	436	970	1.17	F	IMM	13	0.642
157	GN-21	26-Aug-23	WALL	174	49	0.93	M	IMM	1	0.117
161	GN-21	26-Aug-23	WALL	190	64	0.93	F	IMM	2	0.120
174	GN-05	26-Aug-23	WALL	524	1270	0.88	F	MAT	13	1.26
189	GN-05	26-Aug-23	WALL	307	330	1.14	F	IMM	5	0.460
194	GN-05	26-Aug-23	WALL	376	550	1.03	F	IMM	8	0.676
199	SN-06	26-Aug-23	WALL	234	136	1.06	F	IMM	3	0.193
200	SN-06	26-Aug-23	WALL	158	34	0.86	-	IMM	1	0.143
228	GN-06	26-Aug-23	WALL	381	600	1.08	M	MAT	11	0.553
229	GN-06	26-Aug-23	WALL	357	490	1.08	F	IMM	8	0.427
271	GN-26	27-Aug-23	WALL	602	2200	1.01	F	MAT	17	1.04
283	GN-26	27-Aug-23	WALL	573	2170	1.15	F	MAT	14	0.743
333	GN-29	29-Aug-23	WALL	538	1700	1.09	F	MAT	13	0.487

Table A3-4: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Split Lake in 2023 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg (ppm)
368	GN-15	30-Aug-23	WALL	482	1260	1.13	F	MAT	14	0.786
369	GN-15	30-Aug-23	WALL	465	1060	1.05	F	MAT	14	0.669

Table A3-5: Muscle mercury concentrations (Hg) and biological data for Lake Sturgeon mortalities from the Keeyask Study Area in 2023.

Location	Site	Sampling Date	Fish #	Species	Fork Length (mm)	Total Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg (ppm)
Split Lake	GN-28	30-Aug-23	334	LKST	711	795	2090	0.58	M	IMM	10	0.131
Split Lake	GN-28	30-Aug-23	335	LKST	661	732	1890	0.65	M	IMM	9	0.0688

APPENDIX 4:
LENGTH OF FISH SAMPLED FOR MERCURY 1999–2023

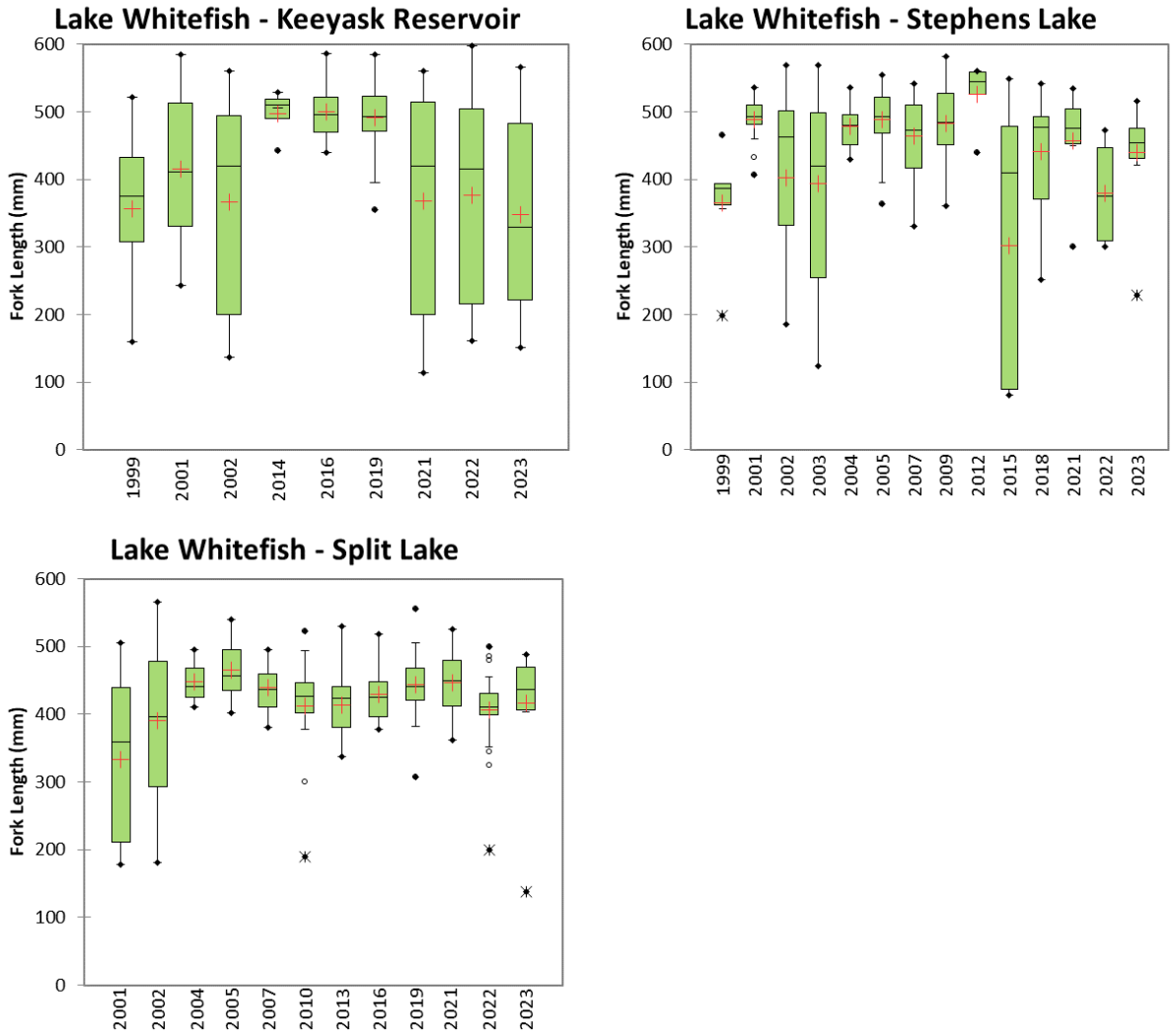

Figure A4-1: Box plots of the fork length of Lake Whitefish analyzed for mercury from the Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2023.

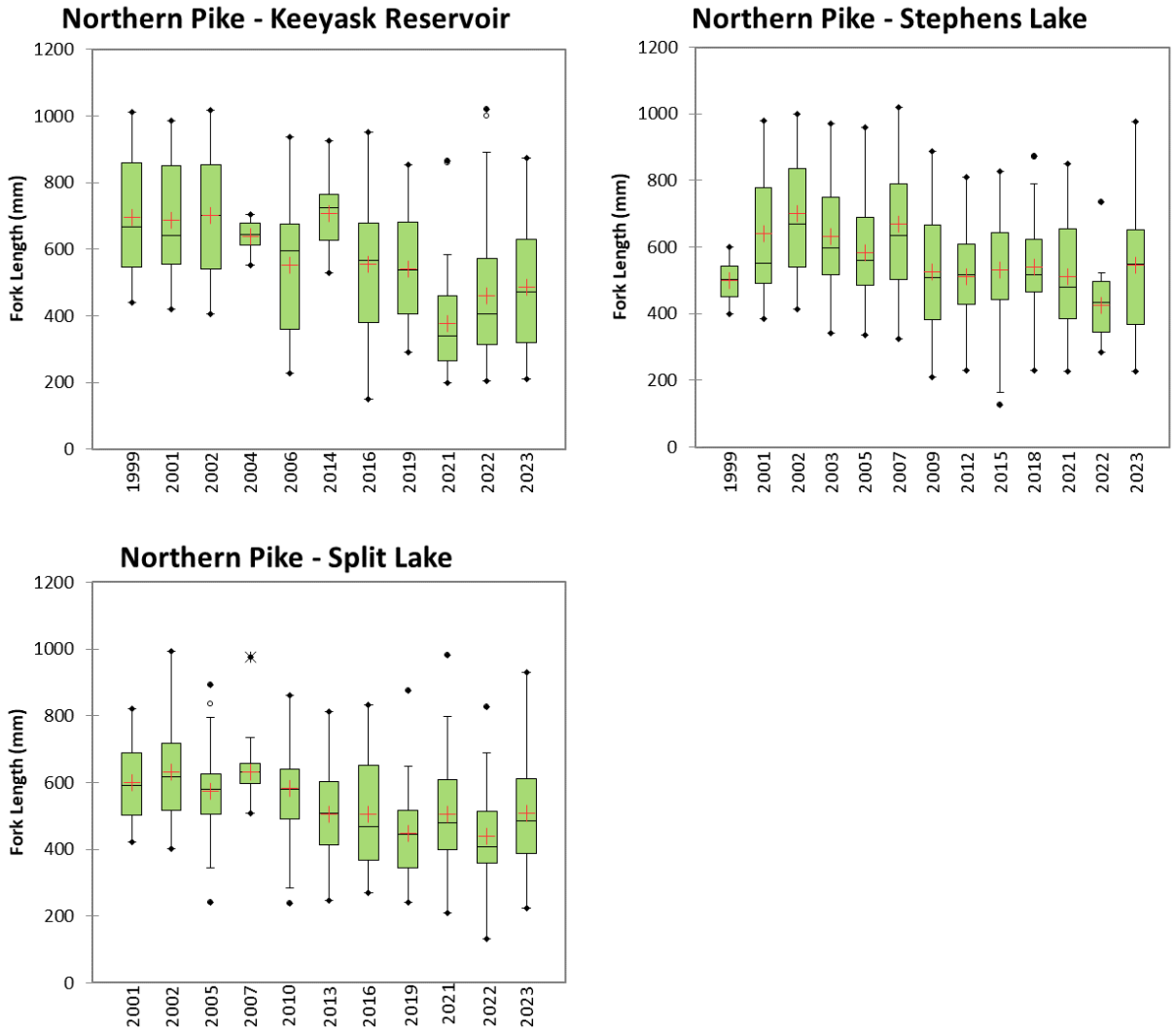

Figure A4-2: Box plots of the fork length of Northern Pike analyzed for mercury from the Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2023.

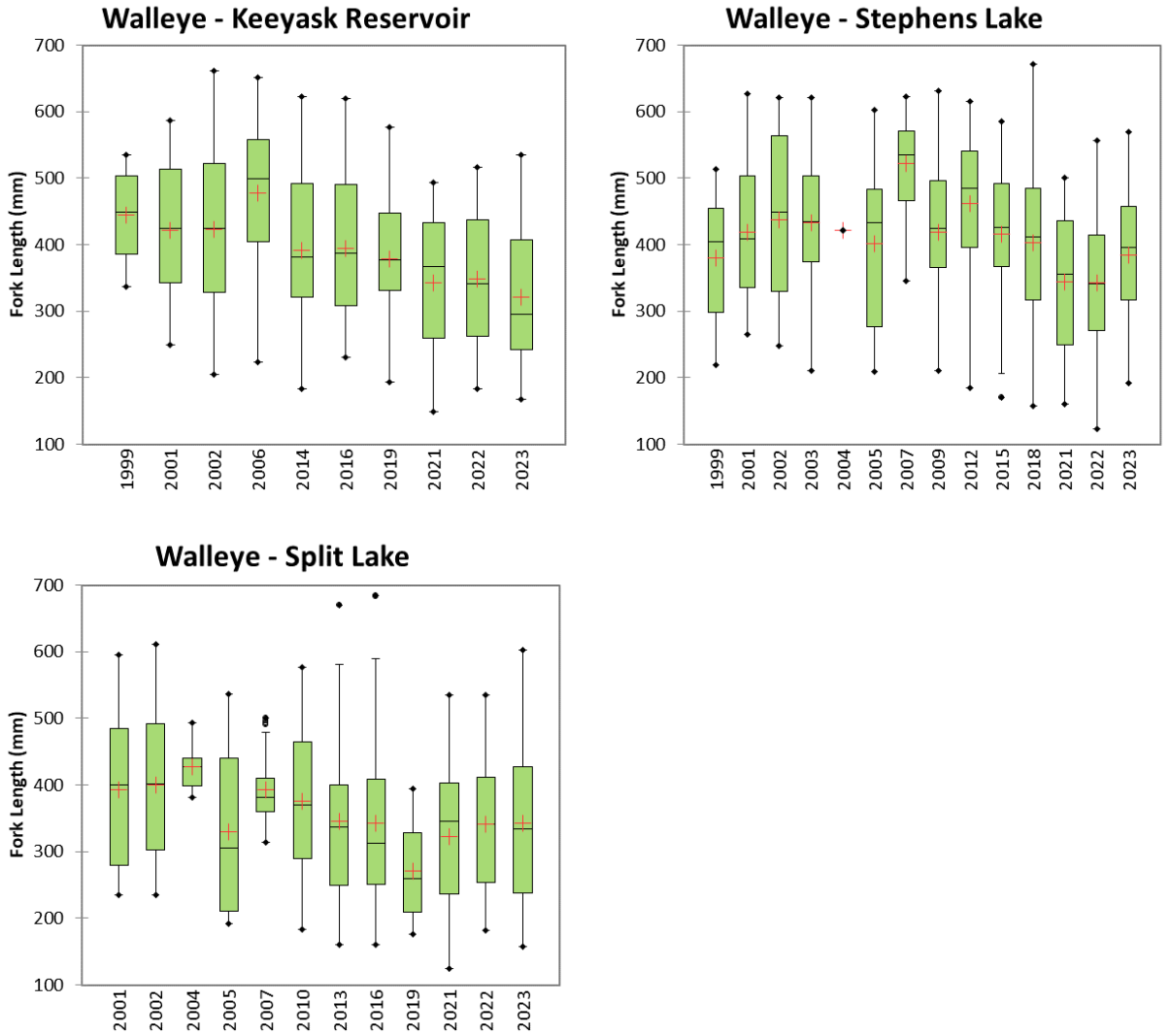

Figure A4-3: Box plots of the fork length of Walleye analyzed for mercury from the Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2023.

APPENDIX 5:
RESULTS OF LINEAR REGRESSION ANALYSIS

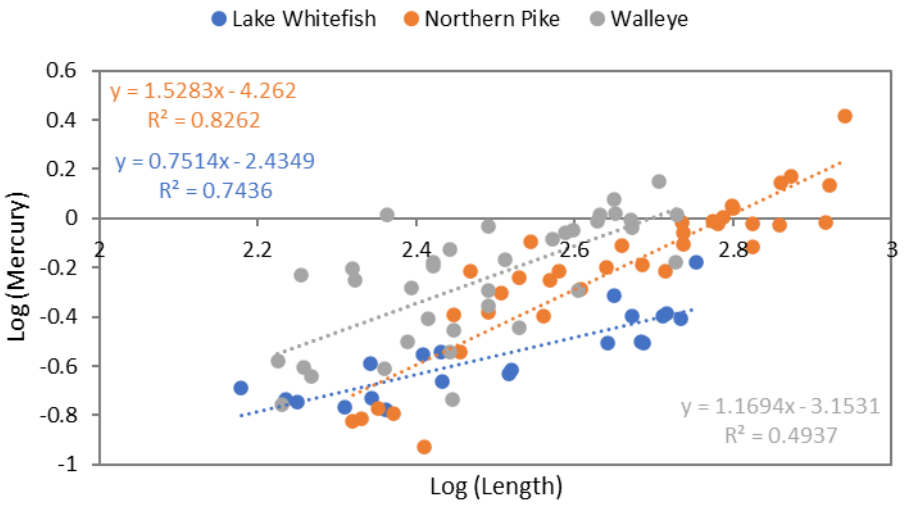

Figure A5-1: Plot of Log_{10} fork length (mm) and Log_{10} total mercury (ppm) in Lake Whitefish, Northern Pike, and Walleye (p <0.0001) collected from the Keeyask reservoir in 2023.

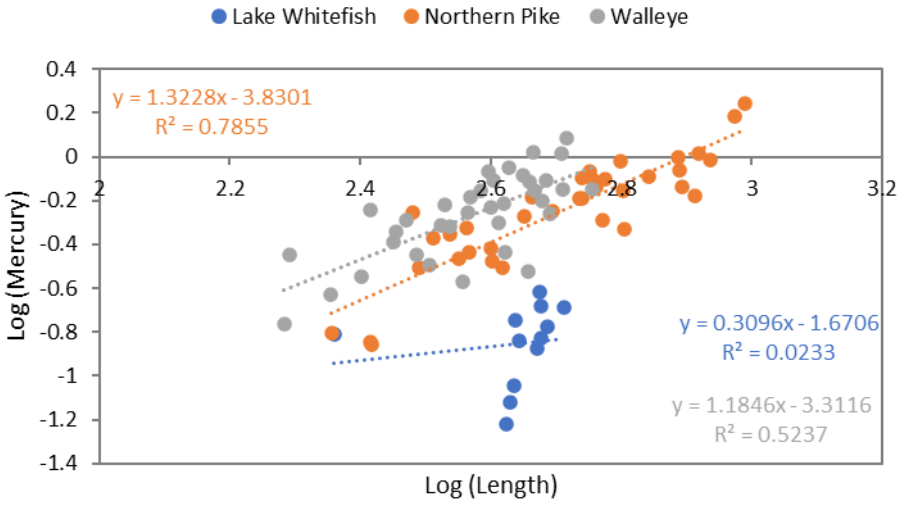

Figure A5-2: Plot of Log_{10} fork length (mm) and Log_{10} total mercury (ppm) in Lake Whitefish (p = 0.636), Northern Pike, and Walleye (p <0.0001) collected from Stephens Lake in 2023.

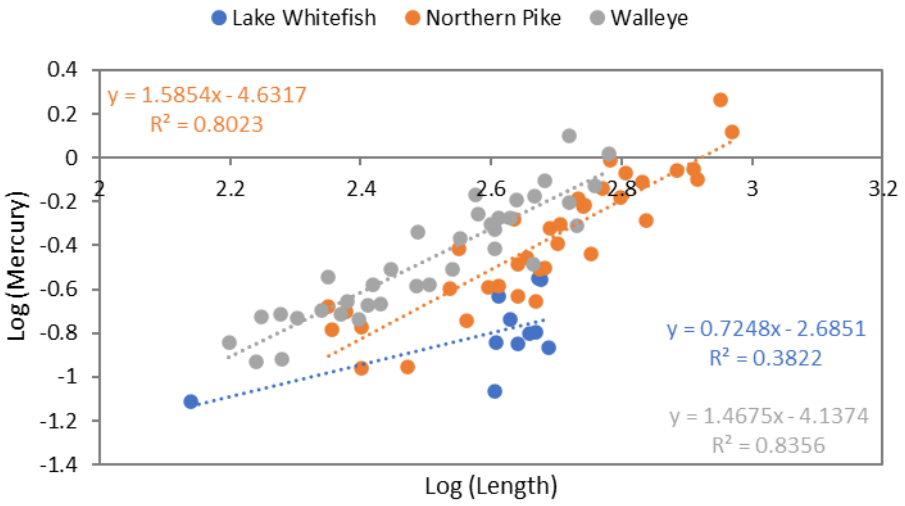

Figure A5-3: Plot of Log_{10} fork length (mm) and Log_{10} total mercury (ppm) in Lake Whitefish (p = 0.043), Northern Pike, and Walleye (p <0.0001) collected from Split Lake in 2023.