Site C Methylmercury Monitoring Plan (MMP) – Indigenous Community Sampling Program

2021 Halfway River Pilot Study

FINAL

Prepared for:

BC Hydro

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Project No.: BCH-22-01

EXECUTIVE SUMMARY

The Indigenous Community Sampling Program (ICSP) is an Indigenous Nations led fish mercury monitoring program within the Site C Methylmercury Monitoring Program (MMP) program. The objective of the ICSP is to partner with Nations within the Peace River watershed to collect tissue samples from fish caught for consumption. These tissue samples supplement samples collected under the Core MMP and are typically collected in areas of the watershed not covered by Core MMP sampling in the Peace River.

Training

In 2021 a pilot ICSP sampling program was conducted in partnership with Halfway River First Nation, McLeod Lake Indian Band, and Blueberry River First Nation to conduct sampling in the Halfway River watershed. Fish mercury sampling workshops were held on July 28th and August 16, 2021. Seven representatives from the three Nations ('Community Champions') were trained in tissue sampling techniques, data recording, and sample storage. Sampling was conducted solely by Community Champions, who were also provided with all the necessary sampling equipment.

- July 28 & Aug 16 Training
- Sampling from August through October 2021

- 3 Nations involved
- 7 Community Champions

Sampling

Community Champions collected nineteen tissue samples from three species of fish: Bull Trout, Rainbow Trout, and Mountain Whitefish. Sampling was conducted from August 26 to October 3 throughout the Halfway River (**Figure E-1**). Labeled codes on the map correspond to individual fish samples at a given location and are recorded in the format of 'species - fish # - sampler's initials - date'.

Following collection, samples were submitted for analysis of mercury and stable isotopes; Stable Isotope Analysis (SIA) measures carbon and nitrogen isotopes in fish tissue to help understand feeding relationships in the aquatic food web.

- Focus on Halfway River watershed
- 3 species of fish caught
- 19 fish samples collected

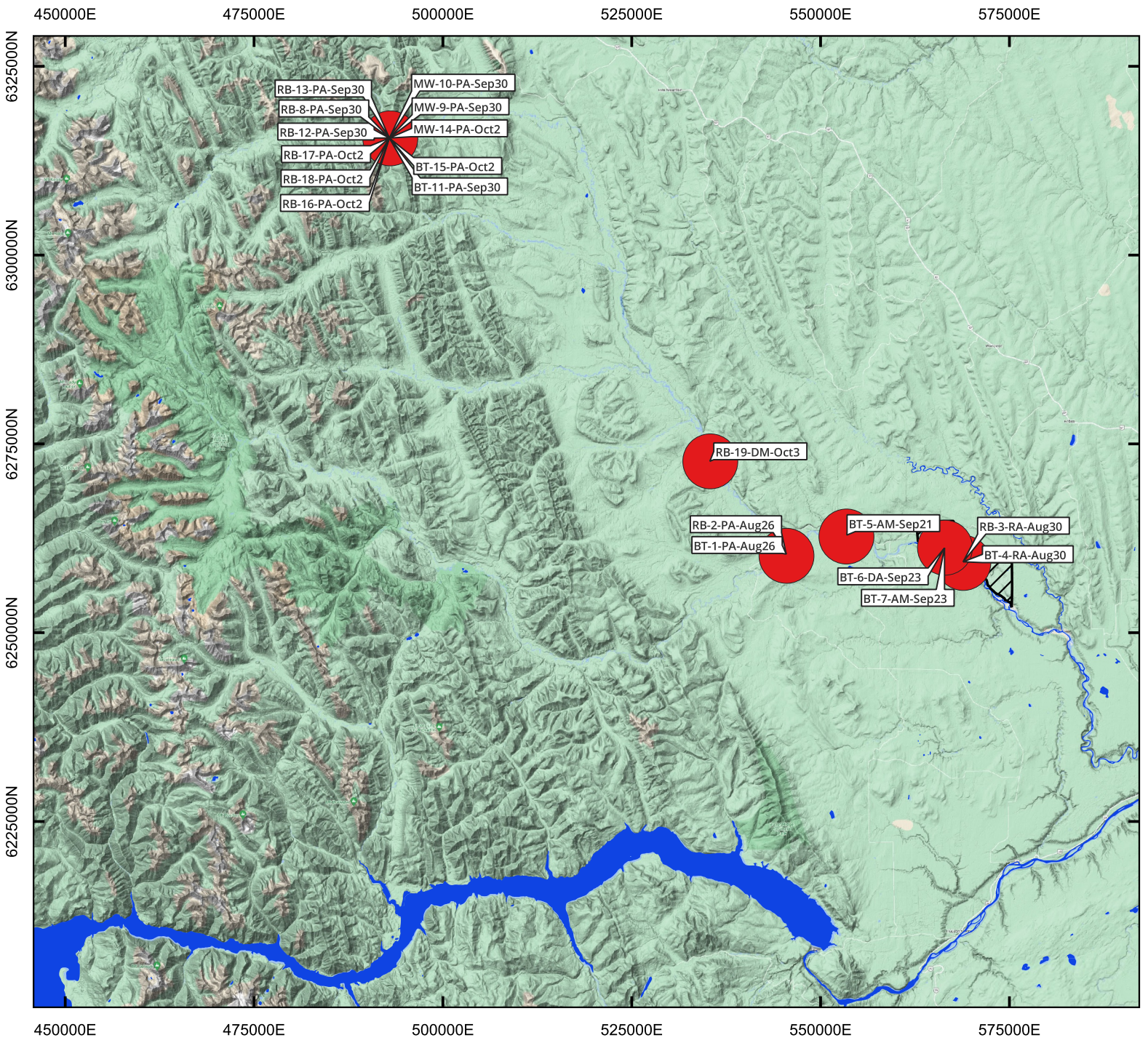


Figure E-1. Sampling locations on the Halfway River watershed

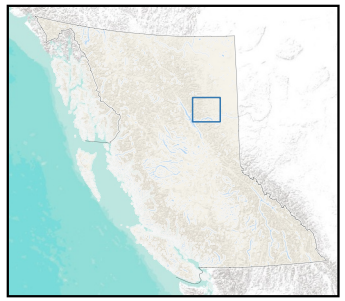
Version Date: November 2022

Legend

Catch Locations

Halfway River FN

RB-19-DM-Oct2 Sample code: ("species-fish#-initials-date")



Data Sources

Google - DEM, terrain layers
GeoBC - water features
Azimuth - station & dam locations

Projection: UTM 10 NAD83

Halfway River Watershed 2021 ICSP

AZIMUTH

Results

The ICSP results for the Halfway River were compared to those from the Core MMP, which targets the mainstem of the Peace River. Overall, tissue mercury concentrations generally fell within the ranges found from Core MMP sampling (**Table E1**). There were a few samples of Mountain Whitefish and Rainbow Trout with higher mercury concentrations than generally seen for the same species in the Peace River. These cases are considered outliers at present as the low number of samples in the Halfway River hampers our ability to draw conclusions about these fish. Additional data for these species in the Halfway River watershed would help to determine how commonly these mercury levels occur for these species.

Fish Consumption Advice

A primary objective of both the Core MMP and the ICSP is to better understand fish mercury concentrations in relation to Site C to support informed management of health risks from consuming fish. The 2021 ICSP results are generally consistent with the Core MMP results, so it is reasonable that the consumption guidance based on the Core MMP can be applied to consumption of fish from Halfway River.

Table E-1. Consumption advice for the Peace River.

Number of servings per month			
Fish type	**Children under 12**	**Pregnant or could be**	**Others**
Peace River between Hudson's Hope, B.C. and Many Islands, A.B.			
Bull Trout (22")	10	18	41
Mountain whitefish (14")	22	39	93
Rainbow Trout (12")	54	94	222

General consumption information
Safe to eat
Every day
Every second day
Twice a week
Once a week

Note: see **Appendix D** for more details.

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ACRONYMS

BT	Bull Trout
Hg	Mercury
ICSP	Indigenous Community Sampling Program
MMP	Methylmercury Monitoring Program
MW	Mountain Whitefish
RB	Rainbow Trout
SIA	Stable Isotope Analysis

1 INTRODUCTION

1.1 Background

Azimuth Consulting Group Inc. (Azimuth) prepared this report on behalf of BC Hydro to present the results of the 2021 pilot fish mercury sampling program conducted on the Halfway River through the Indigenous Community Sampling Program (ICSP). The ICSP characterize mercury concentrations in fish sampled in 2021 through a pilot of the Indigenous Community Sampling Program (ICSP), a component of the overall Site C Methylmercury Monitoring Plan (MMP; BC Hydro 2022). Fish mercury data collected for the MMP will be used to provide timely advice for consuming fish.

The two primary sources of fish mercury data for the MMP are described below.

1.1.1 Core Methylmercury Monitoring Plan (Core MMP)

The Core MMP was implemented in 2022 to guide the monitoring of fish mercury concentrations over time, in relation to the construction and operation of the Site C dam. Fish mercury concentrations are expected to increase after reservoir formation in 2023, peak approximately 10 years post inundation, followed by a more gradual decline to levels that are similar to natural lakes and rivers in the region.

The Core MMP focuses on 6 target species (Bull Trout, Mountain Whitefish, Rainbow Trout, Longnose Sucker, Redside Shiner, and Walleye) in the Peace River from the Peace Canyon Dam down to Many Islands, Alberta. Baseline data were initially collected in 2010/2011, as part of the environmental assessment process, and then later between 2017 and 2020, to improve the baseline dataset. Formal monitoring under the MMP starts in 2022, with the collection of additional pre-inundation baseline data, and will continue until fish mercury concentrations stabilize, which is anticipated to be 20 to 30 years after reservoir creation.

1.1.2 Indigenous Community Sampling Program (ICSP)

The ICSP is an Indigenous Nations led, and BC Hydro funded, fish mercury collection program within the broader MMP program. It was initiated as a pilot study of the Halfway River watershed in 2021 (this report), but has been expanded in 2022, the first year of formal MMP implementation. Results of the 2022 ICSP will be reported in 2023.

The sampling locations and fish species of interest are not generally assigned for this program. Instead, the ICSP focuses on species of recreational, cultural or subsistence value, and sampling locations of interest to Indigenous Nations. That said, certain species may be targeted where they are known to be important to Indigenous communities and where additional information can

support the Core MMP dataset. Examples of the latter include focusing on Bull Trout in the 2021 pilot sampling program in the Halfway River watershed and on Northern Pike and Walleye for the upcoming ICSP sampling at the confluence of the Peace and Smoky Rivers.

The unique data collected by Community Champions trained under the ICSP is important to the overall Site C MMP for the following key reasons:

- Fish characteristics – Tissue collected by Community Champions represents fish species and size classes that may not be directly targeted in the Core MMP's Peace River focused fish tissue monitoring program. For instance, the Core MMP program utilizes electrofishing sampling, while the ICSP utilizes angling methods.
- Catch locations – Local communities have the ability to access areas and watersheds that are relevant for fish consumption but are outside the Core MMP's Peace River monitoring boundaries.

2 COMMUNITY CHAMPION ENGAGMENT

Within the ICSP, Community Champions are the link between BC Hydro, Azimuth, and Indigenous communities. Community Champions are community scientists tasked with collecting fish tissue samples for mercury analysis.

The 2021 study in the Halfway River watershed was a pilot of the ICSP before full implementation in 2022 under the MMP. The pilot study allowed for a trial run to highlight any deficiencies before full project initiation across the wider Peace Region in 2022. The pilot study also provides additional baseline mercury data for Bull Trout, Rainbow Trout, and Mountain Whitefish which may be resident to the Halfway watershed, or may spend part of their life in the Peace River. Engagement with local Indigenous Nations and Community Champions through the Site C Environment Forum and Methylmercury Sub-committee involved three key components including training, equipping, and communication. These are outlined in the following sections.

2.1 Training

Two methylmercury fish tissue sampling training events were held at Northern Lights College in Fort St. John on July 28 and August 16, 2021. The workshops provided background information on methylmercury in reservoirs, provided background on the MMP, and trained Community Champions in sampling fish tissue.

Training included:

- A presentation on methylmercury in reservoirs, bioaccumulation effects, fish consumption guidance, and an overview of the MMP and ICSP;
- A demonstration of techniques for collecting fish tissue samples and filling in data sheets, followed by a hands-on practice.

The technical demonstration and hands-on session met the following training objectives:

- Recording information on datasheets and sample bags;
- Measuring and photographing a fish;
- Collecting dorsal muscle tissue for mercury and stable isotope analysis (SIA);

- Collecting aging structures:
    - Bull trout head (otoliths for aging analysis);
    - Scales for rainbow trout and mountain whitefish;
    - Pectoral fin clips for all other species of fish;
- Post-sampling storage and data communication.

Seven Community Champions, which included representatives of the McLeod Lake Indian Band, Blueberry River First Nation, and Halfway River First Nation, were trained over the two training sessions. A copy of the workshop agenda and presentation from July 28th can be found in **Appendix B**.

2.2 Fish Kit Distribution

Fish sampling kits ('Fish Kits') were distributed to each of the participants during the training sessions. Fish kits included all necessary equipment for fish tissue sampling including: a filet knife and tweezers for extracting muscle tissue, nail clippers for removing fin rays, various bags for storing samples, nitrile gloves, soap and a scrub brush for cleaning sampling equipment. Data sheets and a manual summarizing the tissue sampling procedures were also included (**Appendix C**).

Fish Kit Contents

- ✓ Disposable nitrile gloves
- ✓ Measuring tape
- ✓ Fillet knife and sharpener
- ✓ Plastic cutting board
- ✓ Forceps (tweezers)
- ✓ Nail clippers (for fin clips)
- ✓ Age structure envelopes
- ✓ Whirl-Pak© bags
- ✓ Large bags for fish heads (Bull trout)
- ✓ Garbage bags (white)
- ✓ Soap and scrub brush
- ✓ Clipboard
- ✓ Instructions & datasheets
- ✓ Sharpie markers and pencils
- ✓ Paper towel
- ✓ Wax paper

2.3 Continued Engagement

The Halfway River pilot study continued through the summer of 2021 with Community Champions sending the following data to Azimuth on a weekly basis, or when new samples were collected:

- Datasheets – photos of data sheets were emailed or texted to Azimuth for transcription into a database. The datasheet was also provided in digital form that could be emailed;

- Fish photos – photos of each fish that was sampled.

At the end of the fishing season, sample transport was organised from each of the three communities to the Azimuth office in Vancouver where samples were verified against datasheets. Tissue samples were then shipped to ALS Laboratories (Burnaby, BC) for mercury analysis and to the University of New Brunswick's Stable Isotopes in Nature Laboratory (SINLAB; Fredericton, NB) for stable isotope analysis (SIA). Aging structures were shipped to Golder Associates (Castlegar, BC), where they are being retained if needed for further analysis.

In total, Community Champions collected 19 fish tissues samples from the Halfway River watershed.

3 DATA ANALYSIS

Analysis of the ICSP fish mercury data, incorporated the following variables:

- Mercury (Hg) – measured total mercury concentrations in fish tissues (mg/kg wet weight). It is assumed that all mercury in fish tissues is present as methylmercury.
- Length – fish fork length (nose to fork in tail) was used to account for the known influence of fish size on tissue concentrations. Because weight was not collected for ICSP fish, length serves as the lone metric for fish size.
- Stable isotopes of nitrogen –This metric serves as an estimate of trophic position of fish species (see **Section 4.3** for further information).

These measures are reported in each fish-specific section below. All data plotting and statistical analyses were conducted using R software version 4.1.1 (R Core Team 2022).

Laboratory reports, as well as the compiled field datasheets are provided in **Appendix E** and **Appendix F** respectively.

Quality Assurance and Quality Control (QA/QC) procedures were adhered to throughout field sampling and laboratory analysis. **Appendix A** summarizes the QA/QC findings. No issues with data quality were identified that have the potential to impact the interpretation of the results in the 2021 ICSP pilot study.

4 SUMMARY OF CATCH, FISH MERCURY, AND FEEDING RELATIONSHIPS

4.1 Fish Catch

Methylmercury data are available for 19 fish collected during the ICSP 2021 pilot study (**Table 4-1**). These samples were collected from the Halfway River or its tributaries and represent three fish species (Bull Trout, Rainbow Trout, and Mountain Whitefish). The majority of fish (n=11), representing all three species, were caught on the Upper Halfway at the confluence with Headstone Creek. The remaining six fish, comprised of Rainbow Trout and Bull Trout, were caught in the Lower Halfway River between Ground Birch and Blue Grave creeks as well as two fish, comprised of a Rainbow Trout and Bull Trout, were caught in the lower reaches of the Graham River. (**Figure E-1**).

To provide context, the fish catch from the baseline Peace River fish mercury monitoring between 2016 and 2019 is presented in Table 4-2.

Table 4-1. Number of fish by species captured during the 2021 ICSP.

Species Name	Species Code	Fish N
Bull Trout	BT	7
Rainbow Trout	RB	9
Mountain Whitefish	MW	3

Table 4-2. Fish species captured between 2016 and 2020 in baseline Peace River fish mercury monitoring.

Species Name	Species Code	Fish N
Bull Trout	BT	75
Rainbow Trout	RB	55
Mountain Whitefish	MW	100
Longnose Sucker	LSU	66
Lake Trout	LT	3
Arctic Grayling	GR	3
Northern Pike	NP	6
Burbot	BB	1

4.2 Fish Mercury Concentrations

Fish mercury concentrations are strongly influenced by diet. As a result, mercury is generally lower in species that consume zooplankton and benthic invertebrates, like Mountain Whitefish and Rainbow Trout, and higher in species that feed higher in the food web, like piscivorous (fish eating) Bull Trout. In addition, larger, older fish tend to have higher mercury concentration than smaller fish of the same species. For the purposes of this assessment, the position of a given fish species within the food web is assessed using stable isotope analysis (SIA) (see **Section 4.3** for further details). Without weight and age data for the ICSP fish samples, length alone is used as a representative metric for size.

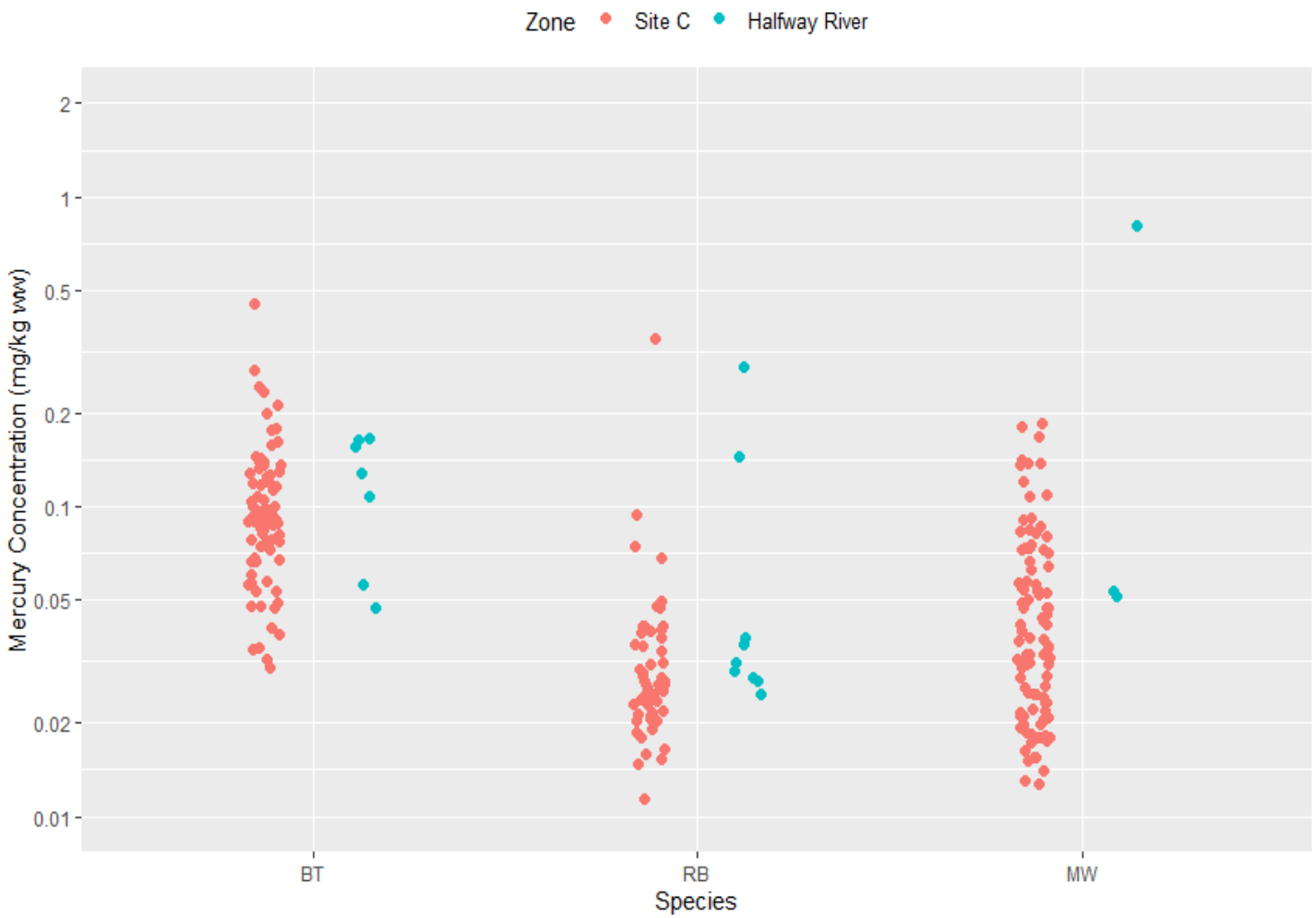
Fish mercury concentrations for fish collected in 2021 through the ICSP (Halfway River watershed) and the baseline Peace River fish mercury monitoring, are shown in **Figure 4-1**. Note that at this stage of the assessment fish size is not considered, although size is an important factor when comparing fish mercury concentrations. Further exploration of fish mercury concentrations in relation to fish size is detailed in **Section 5**.

4.3 Feeding Relationships

Insights into the feeding relationships among and within species, and across waterbodies can be obtained from stable isotope analysis. Stable isotopes are slightly different forms of the same element (light & heavy) that are naturally occurring and stable in the environment. Both types participate in chemical and biological reactions, but at different rates, which leads to patterns in the ratios of these isotopes in the environment.

To assess the position of a given fish species within the food web (i.e., 'trophic position'), we look at nitrogen isotopes. With increasing trophic position, fish tissue will accumulate more of the heavy nitrogen isotope (^{15}N) compared to the light isotope (^{14}N). The ratio of ^{15}N to ^{14}N, which is expressed as $\delta^{15}N$, in the tissue of the fish can thus serve as a relative measure of trophic position.

Figure 4-1. Tissue mercury concentrations for Bull Trout, Rainbow Trout and Mountain Whitefish by waterbody zone.



Species Codes: BT = Bull Trout, RB = Rainbow Trout, MW = Mountain Whitefish

5 FISH MERCURY RESULTS BY SPECIES

5.1 Bull Trout

5.1.1 Catch and Data Overview

A total of seven Bull Trout were sampled for mercury during the 2021 ICSP. The data overview for Bull Trout sampled in both the ICSP sampling efforts (Halfway River watershed), and the baseline Peace River fish mercury monitoring (2016-2021; Azimuth 2021) is presented by location in **Table 5-1**. Given that seven Bull Trout samples were collected in the 2021 ICSP, these data do not provide a full characterization of fish mercury concentrations in the Halfway River watershed, but are informative in the context of the broader baseline Peace River Bull Trout dataset.

5.1.2 Length-Mercury Relationships

The 2021 ICSP Bull Trout fish mercury results are plotted relative to recent baseline data (2017 – 2020) for the Peace River in **Figure 5-1**. The plot shows the strong positive relationship between length and tissue mercury concentrations (i.e., higher mercury concentrations in larger fish). Overall, the ICSP data from the Halfway River watershed are consistent with the broader Peace River baseline data. Visually, the only sample that appeared different from the broader Peace River dataset; sample DV-2-RA-Aug30 had low mercury for its size.

5.1.3 Stable Isotopes and Mercury

There is a strong positive relationship for δ^{15}N-mercury, indicating that larger Bull Trout feed higher in the food chain and have higher tissue mercury concentrations than smaller Bull Trout (**Figure 5-2**). The samples collected during the ICSP from the Halfway River watershed are within the expected range for tissue mercury concentrations when adjusted for trophic position (δ^{15}N), relative to the Core MMP data. The only sample that seems to deviate from the trend, visually, is 'BT-11-PA-Sep30', which has a relatively low tissue mercury concentration given the δ^{15}N concentration for this fish.

Table 5-1. Mean Bull Trout size, condition, age, mercury concentration, and stable isotope results by location.

Zone	Length (mm)	Weight (g)	Condition (K)	Age (yrs)	Hg (ppm ww)	d13C (‰)	d15N (‰)
Halfway River	n=7; 505 (406.4-584.2)	n=0; NA (NA)	n=0; NA (NA)	n=0; NA (NA)	n=7; 0.118 (0.047-0.166)	n=7; -29.9 (-31.3–28.2)	n=7; 11.1 (9.4-12.2)
Site C	n=75; 415 (222-860)	n=73; 837 (110-4195)	n=73; 1.02 (0.84-1.46)	n=48; 4 (1-7)	n=75; 0.106 (0.03-0.449)	n=45; -29.1 (-33.2–27)	n=45; 10.7 (8.7-12.3)

Note: n = sample size; bracketed values = data ranges; ww = wet weight; ppm ww equivalent to mg/kg ww.

Figure 5-1. Length-mercury relationship for Bull Trout in the Halfway River watershed (blue), and at Site C (grey).

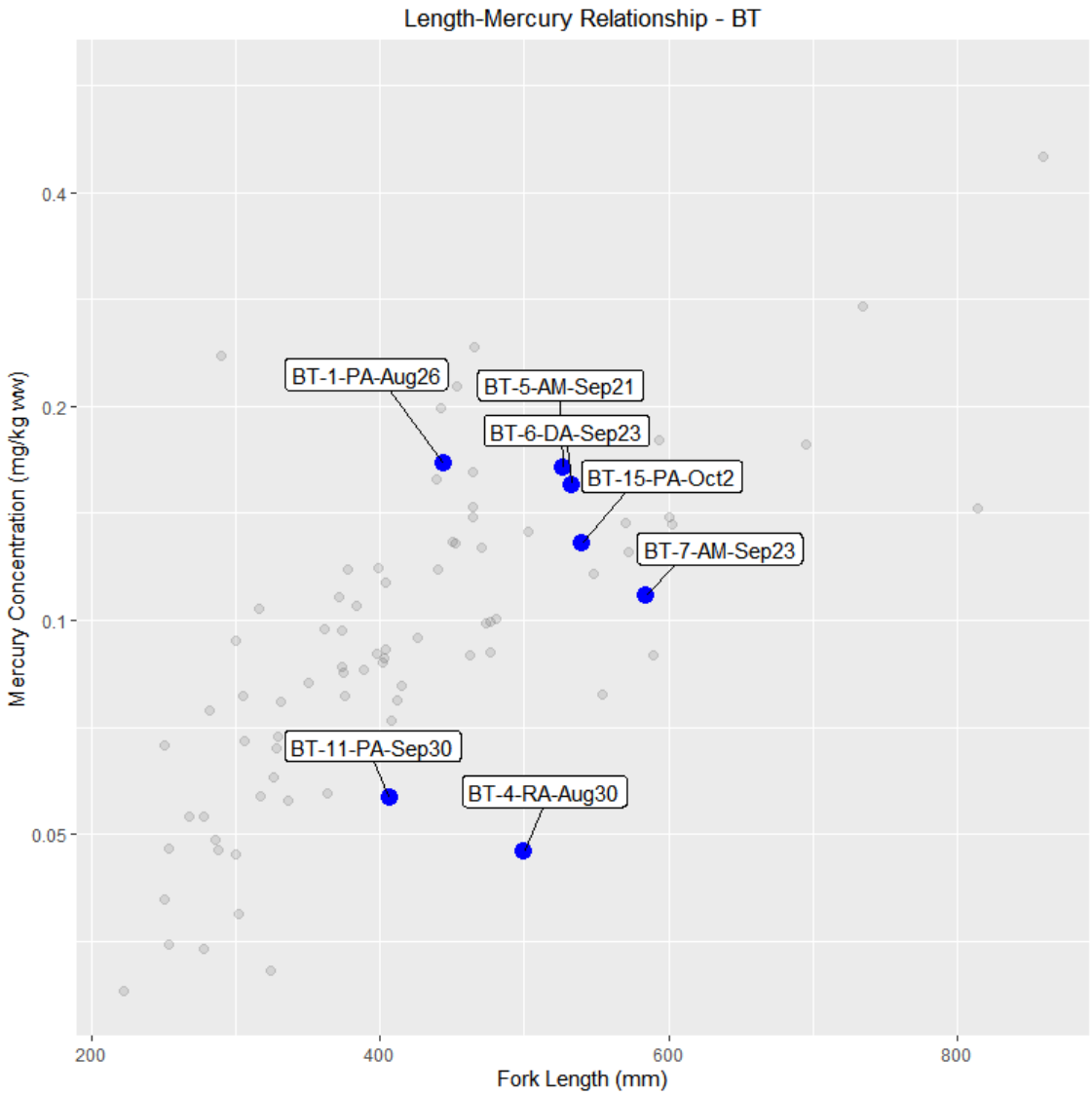


Figure 5-2. δ ^{15}N-mercury relationship for Bull Trout in the Halfway River watershed (blue), and at Site C (grey).

5.2 Rainbow Trout

5.2.1 Catch and Data Overview

Nine Rainbow Trout were sampled for mercury during the 2021 ICSP. The data overview for Rainbow Trout sampled in both the ICSP sampling efforts (Halfway River watershed), and the recent Core MMP sampling efforts (2016-2021; Azimuth 2021) are presented by location in **Table 5-2**. Given that nine Rainbow Trout samples were collected in the 2021 ICSP, these data do not provide a full characterization of fish mercury concentrations in the Halfway River watershed, but are informative in the context of the broader baseline Peace River Rainbow Trout dataset.

Generally, fish sampled in the Halfway River watershed during the ICSP, were longer on average, and had elevated tissue mercury concentrations relative to fish sampled near the Site C dam (as would be expected in longer fish).

5.2.2 Length-Mercury Relationships

There is a positive relationship between length and tissue mercury concentrations in Rainbow Trout (**Figure 5-3**). Compared to samples collected during the Core MMP, fish collected during the ICSP from Halfway River watershed are generally within the expected range for tissue mercury concentrations when adjusted for length. Visually, the samples which deviate slightly from the trend are 'RB-3-RA-Aug30' and 'RB-8-PA-Sep30'. However, mercury concentrations for both fish are below the maximum from the Core MMP fish.

5.2.3 Stable Isotopes and Mercury

There is a strong positive relationship between $\delta^{15}N$ and mercury, indicating that larger Rainbow Trout feed higher in the food chain, and accumulate higher tissue mercury concentrations than smaller Rainbow Trout (**Figure 5-4**). The samples collected during the ICSP are generally within the expected range for tissue mercury concentrations when adjusted for trophic position ($\delta^{15}N$), relative to data from the Core MMP sampling program. The only samples which seemed to diverge slightly from the trend are 'RB-3-RA-Aug30' and 'RB-8-PA-Sep30'. Similar to the results of the length-mercury relationship, the mercury concentrations for these fish are below the maximum from the Core MMP sampling program.

Table 5-2. Mean Rainbow Trout size, condition, age, mercury concentration, and stable isotope results by location.

Zone	Length (mm)	Weight (g)	Condition (K)	Age (yrs)	Hg (ppm ww)	d13C (‰)	d15N (‰)
Halfway River	n=9; 345 (285.75-419.1)	n=0; NA (NA)	n=0; NA (NA)	n=0; NA (NA)	n=9; 0.071 (0.025-0.282)	n=9; -30.7 (-33.4--27.8)	n=9; 9.5 (7.6-11)
Site C	n=55; 310 (200-430)	n=55; 371 (80-1039)	n=55; 1.12 (0.91-1.33)	n=48; 3 (1-7)	n=55; 0.036 (0.004-0.348)	n=41; -28.3 (-32.2--26.2)	n=41; 8.4 (5.8-10.5)

Note: n = sample size; bracketed values = data ranges; ww = wet weight; ppm ww equivalent to mg/kg ww.

Figure 5-3. Length-mercury relationship for Rainbow Trout in the Halfway River watershed (blue), and at Site C (grey).

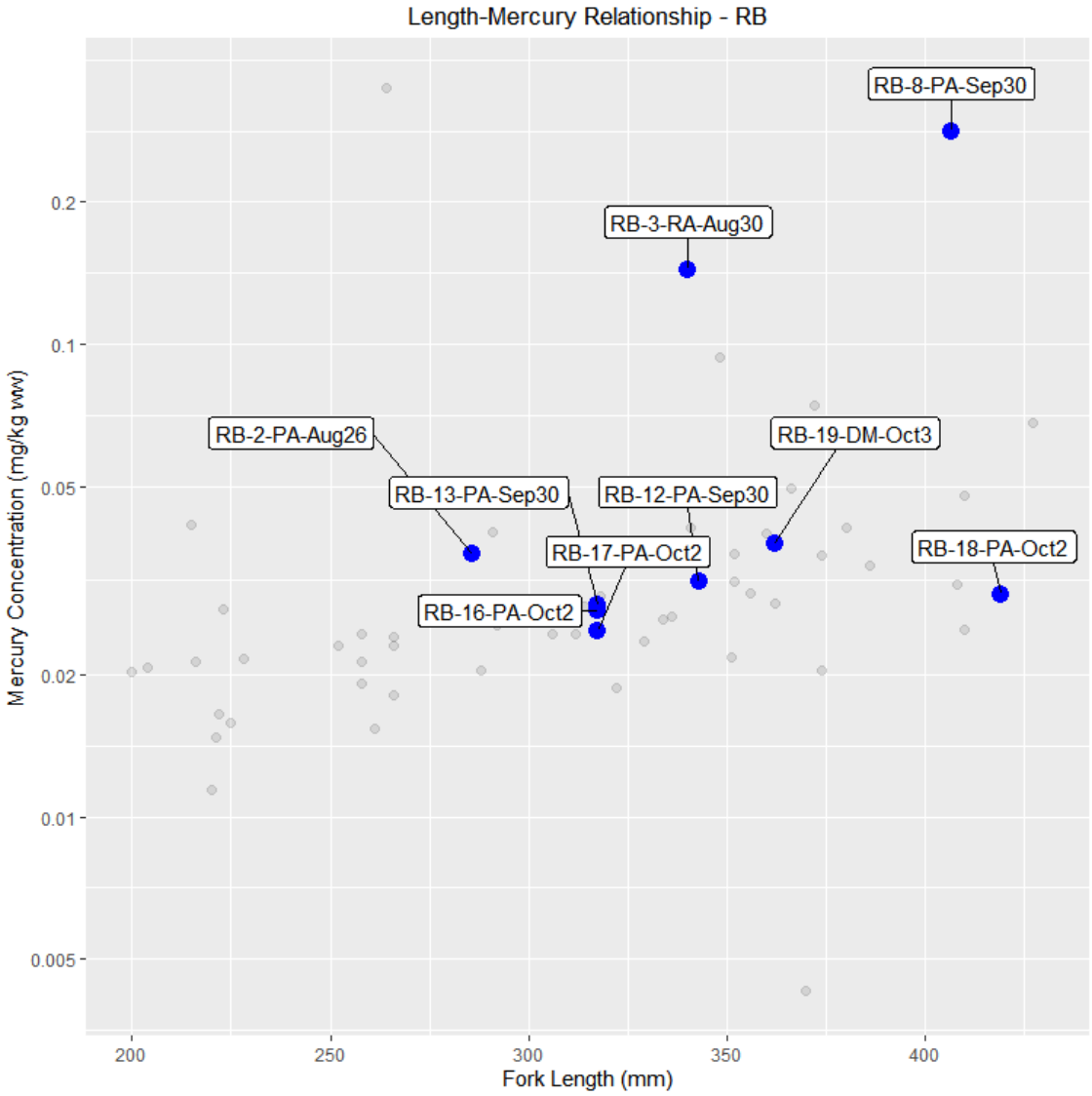
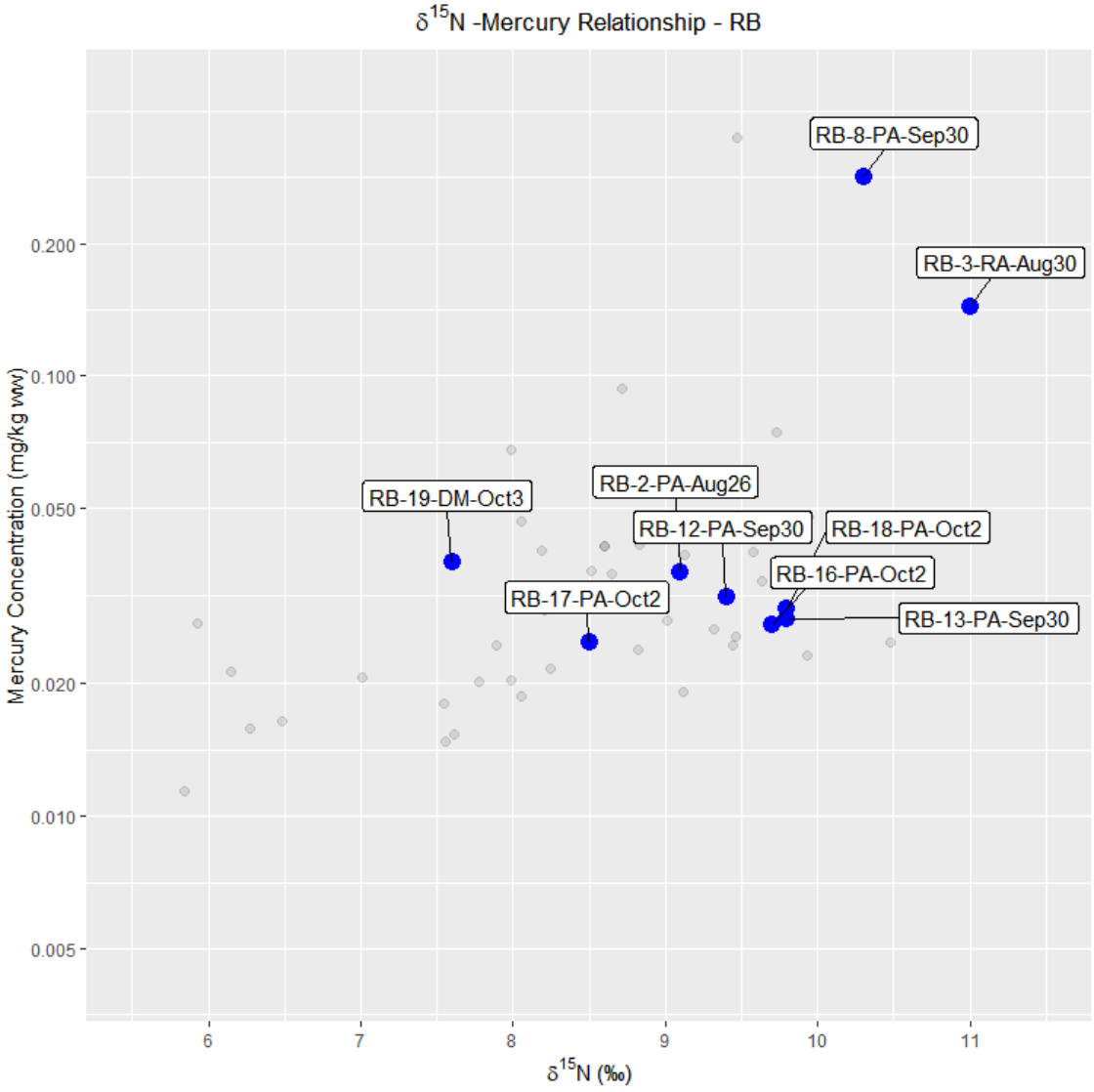


Figure 5-4. δ ^{15}N -mercury relationship for Rainbow Trout in the Halfway River watershed (blue), and at Site C (grey).



5.3 Mountain Whitefish

5.3.1 Catch and Data Overview

Three Mountain Whitefish were sampled for mercury during the 2021 ICSP. The data overview for Mountain Whitefish sampled in both the ICSP sampling efforts (Halfway River), and the recent Core MMP sampling efforts (2016-2021; Azimuth 2021) are presented by location in **Table 5-3**. Given that three Mountain Whitefish were sampled in the 2021 ICSP, these data do not provide a full characterization of fish mercury concentrations in the Halfway River watershed, but are informative in the context of the broader baseline Peace River Mountain Whitefish dataset.

Fish sampled in the Halfway River during the ICSP were longer on average, and had elevated tissue mercury concentrations compared to fish sampled near the Site C dam. These results are in line with the expectation that as a fish grows in size, higher levels of tissue mercury will accumulate.

5.3.2 Length-Mercury Relationships

There is a strong positive relationship between fish length and tissue mercury concentrations in Mountain Whitefish (**Figure 5-5**). Generally, fish collected from the Halfway River during the ICSP are within the expected range for tissue mercury concentrations when adjusted for length, relative to those fish collected during the Core MMP. Visually, the sample 'MW-9-PA-Sep30' deviates substantially from the trend with a tissue mercury concentration well above the maximum established by Core MMP samples (i.e., it is more than 4 times higher than any other Mountain Whitefish in the Core MMP dataset). This sample was collected in the upper Halfway River at the confluence with Headstone Creek. The low number of Mountain Whitefish samples (n = 3) limits our ability to draw conclusions about this data point. It is unclear how this elevated mercury concentration compares to the tissue concentrations in the wider Whitefish population within the Halfway River.

5.3.3 Stable Isotopes and Mercury

There is a positive relationship between $\delta^{15}N$ and mercury, indicating that larger Mountain Whitefish feed higher in the food chain, and accumulated higher tissue mercury concentrations than smaller Mountain Whitefish (**Figure 5-6**). As with the length-mercury relationship described above, the ICSP samples tended to fall within the expected range for mercury concentrations adjusted for trophic position, based on Core MMP sampling data, with the exception of 'MW-9-PA-Sep30'. This sample was well above the maximum established by Core MMP samples,

however limited sampling number again inhibits inferences about the cause of this elevated result, or representativeness of this sample.

Table 5-3. Mean Mountain Whitefish size, condition, age, mercury concentration, and stable isotope results by location.

Zone	Length (mm)	Weight (g)	Condition (K)	Age (yrs)	Hg (ppm ww)	d13C (‰)	d15N (‰)
Halfway River	n=3; 356 (317.5-381)	n=0; NA (NA)	n=0; NA (NA)	n=0; NA (NA)	n=3; 0.305 (0.051-0.811)	n=3; -31.8 (-31.9--31.5)	n=3; 10 (9.2-11)
Site C	n=100; 333 (145-502)	n=99; 452 (27-1346)	n=99; 1.06 (0.83-1.41)	n=30; 6 (2-11)	n=100; 0.05 (0.013-0.185)	n=86; -29.7 (-35.9--27.1)	n=86; 8.8 (6.8-11.8)

Note: n = sample size; bracketed values = data ranges; ww = wet weight; ppm ww equivalent to mg/kg ww.

Figure 5-5. Length-mercury relationship for Mountain Whitefish in the Halfway River watershed (blue), and at Site C (grey).

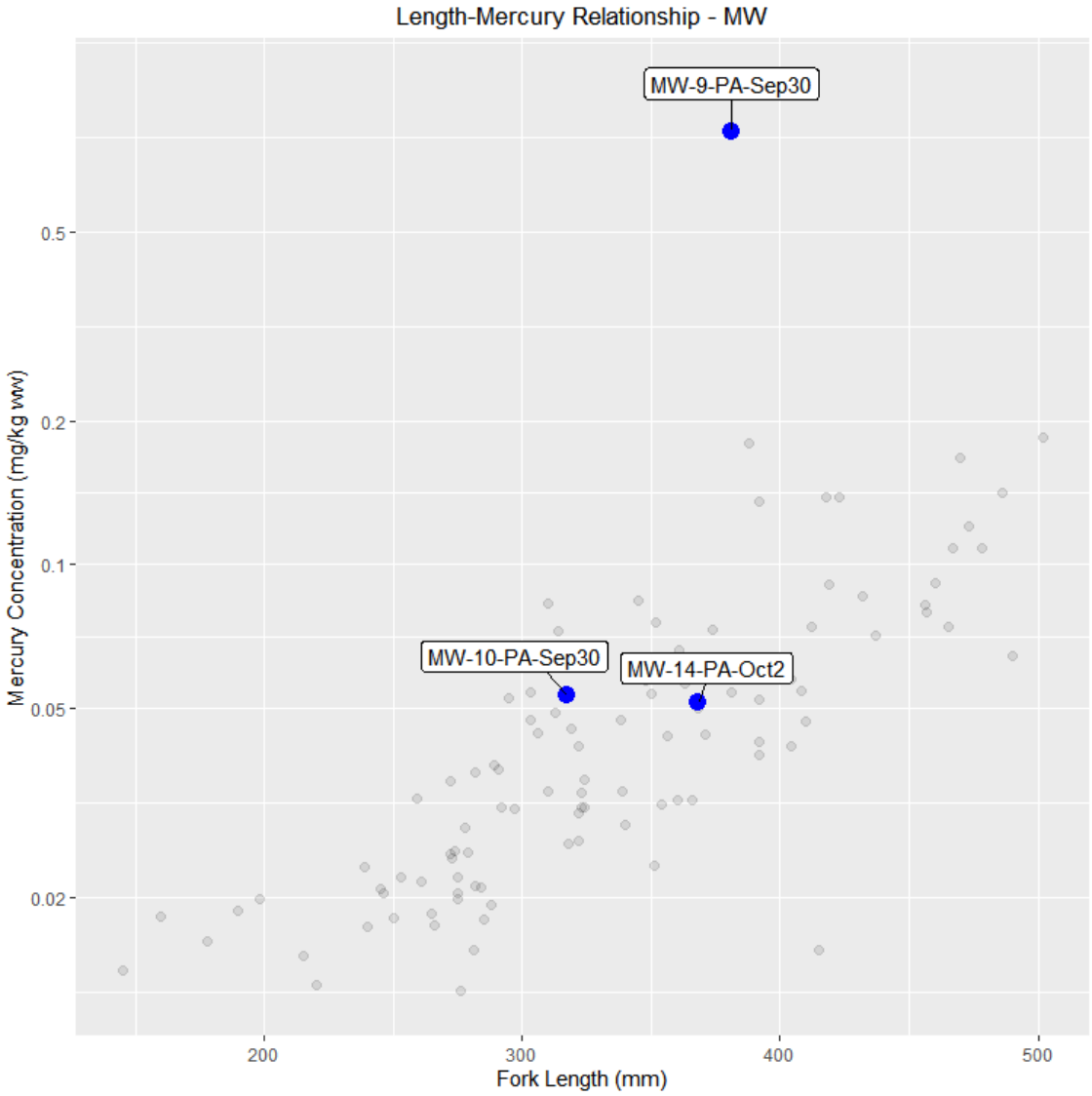
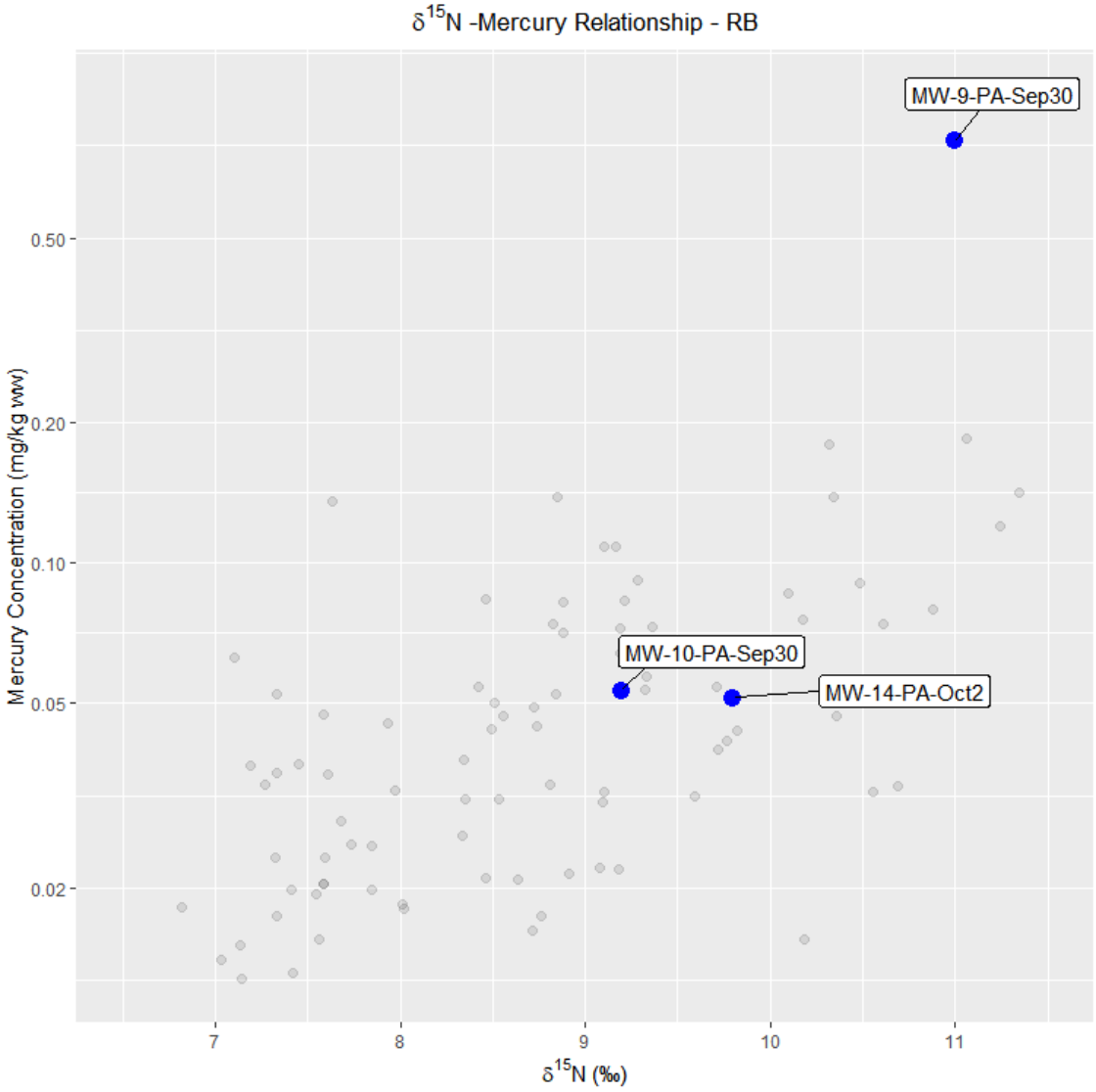


Figure 5-6. δ ^{15}N -mercury relationship for Mountain Whitefish in the Halfway River watershed (blue), and at Site C (grey).



6 FISH CONSUMPTION GUIDANCE

A primary objective of both the Core MMP and ICSP is to support the development of meaningful fish consumption guidance for community members in the vicinity of the Site C Project. Due to limited sampling numbers for all species sampled in the 2021 ICSP, fish consumption guidance specific to the Halfway River cannot be developed. However, since the ICSP results are generally within the range of tissue mercury concentrations established in the Core MMP, it is reasonable that the consumption guidance based on the Core program be applied to consumption of fish from Halfway River.

Consumption guidance based on the Core sampling program, is presented in **Appendix D** and is available online at: https://www.sitecproject.com/sites/default/files/CS-2496%20-%20MethylmercuryBrochure-1.pdf

Please view this document for guidance on consumption guidance for various fish species in Williston Reservoir, Dinosaur Reservoir, and the Peace River. Consumption guidance relating to fish from the Peace River have been shown through this assessment to be reasonably suited for application to fish from the Halfway River.

7 REFERENCES

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APPENDIX A
QUALITY ASSURANCE & QUALITY CONTROL

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1. INTRODUCTION

The objective of quality assurance and quality control (QA/QC) for the 2021 Indigenous Communities Sampling Program (ICSP) pilot study was to ensure that the chemical and biological data collected were representative of the populations being sampled, were of known quality, had sufficient laboratory precision to be highly repeatable, were properly documented, and were scientifically defensible. QA/QC approaches followed closely with those employed in the Core Methylmercury Monitoring Program (Core MMP). Data quality was assured throughout sample collection and analysis using specified standardized procedures, by employing laboratories that have been certified for all applicable methods, and by staffing the program with trained Community Champions.

Quality assurance and quality control practices are briefly described here.

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

QA/QC practices were applied across each component of the 2021 ICSP pilot study. The study dataset is comprised of the following key components:

- Fish characterization and geographic information – Fork length and fish catch location measured in the field. Photos accompanied each sample to verify length measurements and species identification.
- Tissue chemistry – Mercury (and moisture) analyzed in an analytical laboratory using the tissue sample extracted from the muscle directly below the dorsal fin.
- Tissue stable isotopes analysis (SIA) – Limited to carbon and nitrogen only; analyzed in an analytical laboratory using the tissue sample outlined above.

The remainder of this appendix outlines the methods of QA/QC assessment (**Section 0**) as well as the QA/QC results (**Section 0**) for each of the three dataset components outlined above.

2. DATA QUALITY METHODS OF ASSESSMENT

This section focuses on the methods utilized to ensure the overall quality of the 2021 ICSP pilot study dataset, with subsections on Quality Assurance (**Section 2.1**) and Quality Control (**Section 2.2**).

2.1. Quality Assurance

Careful collection, documentation and handling of all samples and data, regardless of media, data type, or frequency is a key component of QA on a field program. Below is a summary of the QA components of the 2021 ICSP pilot study.

Field Datasheets

The 2021 ICSP pilot study relied on Community Champions recording field-collected information in datasheets initially, followed by scanning the data sheets and sending them to Azimuth staff who then transcribed the data into Excel. Community Champions took photographs with reference scales so that species and length information could be verified. A standardized sample code was used to provide an efficient labeling system which could then be cross checked with datasheets when samples were received by Azimuth.

Community Champion Training

Community Champions were trained at workshops on 28 July and 16 Aug 2021. These workshops reviewed tissue sampling techniques, responsibilities, and the sequence of steps required to collect samples. Champions were also instructed on the need to avoid cross-contamination by dawning nitrile gloves and using metals free soap to clean sample tools and surfaces.

Azimuth Verification of Sample Integrity

Samples were submitted by Community Champions to Azimuth to verify that bagged samples matched datasheets and that samples were divided appropriately to meet minimum sample mass requirements.

Certified Laboratories

Shipments of samples to the analytical laboratories were accompanied by chain-of-custody (CoC) forms detailing sample identification, reporting requirements, and sample handling information. CoC forms not only inform the laboratory of sample details, they also help ensure that sample handling instructions are followed, sample hold-times are met, and that all samples are accounted for. A summary of the QA protocols at each of the labs conducting tissue mercury and SIA are outlined below:

- Tissue mercury – All tissue analyses for mercury and moisture in the pilot study dataset have been conducted by ALS Environmental (ALS), a CALA-accredited lab in Burnaby, BC. The BC environmental laboratory QA/QC procedures are detailed in Austin (2020).

- Tissue SIA – All SIA analyses were completed by the University of New Brunswick's (UNB) Stable Isotopes in Nature lab (SINLAB). SINLAB was established in 1999 as part of UNB's Canadian Rivers Institute under the direction of Dr. Rick Cunjak. They specialize in SIA in environmental samples to support academic, private and government researchers.

2.2. Quality Control

This section provides the results of QC samples for the field and lab, where appropriate, followed by an overall statement of data quality for each of the four main data types.

Fish Characterization and Geographic Information

As noted above, fish characteristics and geographic information were collected on the field datasheets which were then transcribed to digital form. The QC assessment was conducted by Azimuth staff and involved reviewing photographs to ensure correct characterization of fish and verifying location information (e.g. provided coordinates corresponded to logical locations). At a minimum, 10% of transcribed e-data were reviewed independently by a second experienced professional to check for completeness and accuracy.

Tissue Chemistry

The following laboratory samples were included in the QC assessment by ALS for tissue mercury analysis.

Laboratory duplicates (LD)

LDs are aliquots taken from the samples and run through the laboratory analytical process separately. Laboratory duplicates provide an estimate of the precision of the analytical method (reproducibility). Data Quality Objectives (DQOs) are based on Relative Percent Difference (RPD) between the original and duplicate samples or the absolute difference between original and duplicate samples.

The DQOs for laboratory duplicates are parameter specific. The DQO for mercury in tissue is an RPD between lab duplicate samples of less than 40%. The DQO for moisture in tissue is 20%.

The equation used to calculate the RPD is as follows:

$$RPD = \frac{(A - B)}{\left(\frac{A + B}{2}\right)} x\ 100$$

where: A = analytical result; B = duplicate result.

RPD values may be either positive or negative, and ideally should provide a mix of the two, clustered around zero. Consistently positive or negative values may indicate a bias.

Method blanks (MB)

MBs are samples of analyte-free medium used to assess background interference or contamination that exists in the lab environment and reagents that could lead to elevated concentrations or false positive data.

The DQO for method blanks is a result less than the Detection Limit (DL).

Laboratory control samples (LCS)

An 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

The DQO for LCSs is a percent recovery between 80 to 120% for metals in tissue and 90 to 110% for moisture in tissue.

Reference Material (RM)

An 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.

The DQO for RMs is a percent recovery between 70 and 130% for metals in tissue. There is no DQO for moisture in tissue.

Tissue SIA

SINLAB provides an Interpretation Guide (**Appendix A1**) with all laboratory data results, which includes discussion of QC standards. It is updated occasionally to reflect updated acceptability values for standards. The types of QC samples that SINLAB uses to ensure their laboratory processes are working properly are described below.

Laboratory duplicates (LD)

As discussed above, SIA LDs provide an estimate of the precision of the analytical method (reproducibility). LDs are identified in SINLAB analytical results by an "R" appended to the end of the sample ID. SINLAB does not have a set DQO for LDs, based on the following rationale:

> "Different tissues have different matrices and things such as lipid content, how finely ground, residual shells, to name a few, can make the replicates more variable. As such, a "set" acceptable range [for LDs] does not exist. Typically, a duplicate sample with a difference of greater than 0.5 per mil is flagged, and when possible, run again."
>
> (Anne McGeachy, pers. comm. 2021).

Secondary standards and check standards (Standards)

SINLAB's internal working standards are calibrated against and traceable to International Atomic Energy Agency (IAEA) primary standards (CH6, CH7, N1, and N2) and are subjected to round robin testing for verification as a part of SINLAB's QA/QC protocol. Check standards are commercially available standards and are analyzed in each SINLAB run (batch of samples).

3. DATA QUALITY RESULTS

3.1. Fish Characterization and Geographic Information

The QC assessment conducted by Azimuth staff on fish characteristics and location information identified no data quality issues. The QA/QC assessment conducted by an independent party at Azimuth identified no data quality issues. Confirmation with the Community Champions adequately addressed any uncertainties in recorded data.

3.2. Tissue Chemistry

A summary of the data quality assessment for laboratory QC samples is provided in **Table A-1** for the tissue metals analysis conducted by ALS. No issues with data quality were identified that have the potential to impact the interpretation of the results in the 2021 ICSP pilot study. All QC samples met the DQOs as discussed above. A Certificates of Analysis (COA) from ALS for tissue metals analysis is provided in **Appendix E** where a full summary of QC results is available.

Table A-1. Data quality assessment for tissue metal samples collected for the 2021 ICSP pilot study.

QA/QC Component	Summary
Submissions	VA21C7109 = Fish tissue samples
Sample integrity issues	No sample integrity issues were documented. The shipments arrived at the lab with ice packs and/or ice.
Hold-time exceedances	None
Detection limits	Target DLs were met
Laboratory QC Summary	
Laboratory Duplicates	DQOs were met
Method Blanks	DQOs were met
Matrix Spike	DQOs were met
Laboratory Control Sample	DQOs were met
Reference Samples	DQOs were met

3.3. Stable Isotope Analysis (SIA)

A summary of the data quality assessment for laboratory QC samples is provided in **Table A-2** for the tissue metals analysis conducted by SINLAB. No issues with data quality were identified that have the potential to impact the interpretation of the results in the 2021 ICSP pilot study. All QC samples met the

requirements discussed above. A laboratory report from SINLAB for SIA analysis is provided in **Appendix E**.

Table A- 2. Data quality assessment for tissue SIA samples collected for the 2021 ICSP pilot study.

QA/QC Component	Summary
Submissions	Fish tissue samples
Sample integrity issues	No sample integrity issues were documented. The shipments arrived at the lab with ice packs and/or ice.
Hold-time exceedances	None
Detection limits	Target DLs were met
Laboratory QC Summary	
Laboratory Duplicates	No LDs with a difference of greater than 0.5 per mil occurred

4. REFERENCES

Austin, Joyce. (editor). 2020. British Columbia Environmental Laboratory Manual. Analysis, Reporting and Knowledge Services, Knowledge Management Branch, B.C. Ministry of Environment and Climate Change Strategy, Victoria, BC.

Stable Isotopes in Nature Lab (SINLAB). Undated. Interpretation Guide.

APPENDIX A1
SINLAB INTERPRETATION GUIDE

SINLAB INTERPRETATION GUIDE

For further information please visit our website:
https://www.isotopeecology.com/

Instrumentation

Continuous Flow-Isotope Ratio Mass Spectrometry (CF-IRMS) is used for stable isotope analysis of $\delta^{13}C$, $\delta^{15}N$ and $\delta^{2}H$. The SINLAB currently operates the following mass spectrometer/conflo combinations:

- Delta^{Plus} XP – Conflo III
- Delta V Plus – Conflo IV

(All manufactured by Thermo Finnigan; Bremen, Germany)

Carbon & Nitrogen Methodology

Dried, ground and homogeneous samples are weighed into tin capsules and analyzed for $\delta^{13}C$ and $\delta^{15}N$ by an Elemental Analyzer (EA) coupled to one of the IRMS/Conflo combinations listed above. Samples are introduced into the EA by an autosampler where complete combustion occurs in the presence of oxygen to generate CO_2 and nitrogen oxide (N_xO_x) gases. Combustion occurs in a quartz tube filled with chromium oxide and silvered cobaltous oxide. A second quartz tube filled with fine copper wire is used for the reduction of nitrogen oxides (N_xO_x) to N_2 gas. Gas Chromatography (GC) is used to separate CO2 and N2 peaks with helium as a carrier gas. A water trap of magnesium perchlorate & silica chips is located before the GC column to remove water.

The SINLAB currently utilizes two elemental analyzers for $\delta^{13}C$ and $\delta^{15}N$ analyses.

Elemental Analyzer	Autosampler	Combustion Temperature	Reduction Temperature	GC Length	GC Temperature
CE NC2500 (Carlo Erba; Milan, Italy)	PN150	1050ºC	650ºC	4m	50ºC
Costech 4010 (Costech; California, USA)	Zero Blank	1000ºC	650ºC	3m	40ºC

Stable isotope measurements are reported as isotope delta δ in parts per thousand (‰) relative to the international standard: Vienna Pee Dee Belemnite (VPDB) for carbon, and atmospheric air (AIR) for nitrogen. Isotope values are normalized using secondary standards: USGS61, BLS, and MLS for animal tissues; and CMS, SPS, SPL and EPS for sediments and plant material. All of these standards were calibrated against IAEA standards. See below for standard descriptions.

Hydrogen Methodology

Samples are weighed into silver capsules and loaded into a Costech Zeroblank autosampler. Samples are converted to hydrogen (H_2) gas by pyrolysis using a Thermo-Finnigan High Temperature Conversion Elemental Analyzer (TC/EA). Pyrolysis occurs in a ceramic tube lined with a glassy carbon reactor and filled with glassy carbon chips at a temperature of 1400ºC. Helium is used as the carrier gas and a 1.5m GC column held at 100ºC separates H_2 sample gas and other interfering gases produced

Stable-hydrogen isotope (δ^2H) measurements for keratin tissues are normalized to the international standard VSMOW (Vienna Standard Mean Ocean Water). We determine the non-exchangeable δ^2H of samples using the comparative equilibration approach (Wassenaar and Hobson 2003) with two secondary keratin standards (EC1 and EC2). These standards were previously calibrated to account for the H exchangeability between the H atoms of ambient water vapor and tissues (Wassenaar and Hobson 2000, 2003). This technique requires that samples along with these standards of known H isotope ratios are left to exchange with local atmospheric hydrogen for 72 hours prior to analysis. See below for standard descriptions.

Standards

Secondary Standards – These are SINLAB working standards used to bring data to the international scale. They are calibrated against and traceable to IAEA primary standards (CH6, CH7, N1, and N2). These standards are subjected to round robin testing for verification as a part of our QA/QC protocol. Values below- used as check standards within a run

USGS61 = commercially available pure compound (caffeine)
$\delta^2H_{(VSMOW)}$ = 96.9 ‰ +/- 0.9
$\delta^{13}C_{(VPDB)}$ = –35.05‰ +/- 0.04
$\delta^{15}N_{(AIR)}$ = -2.87 ‰ +/- 0.04

BLS = Bovine Liver Standard developed by SINLAB
$\delta^{13}C_{(VPDB)}$ = –18.76 ‰ +/- 0.14
$\delta^{15}N_{(AIR)}$ = 7.17 ‰ +/- 0.17

MLS = Muskellunge muscle standard developed by SINLAB
$\delta^{13}C_{(VPDB)}$ = –22.30 ‰ +/- 0.18
$\delta^{15}N_{(AIR)}$ = 14.00 ‰ +/- 0.11

CMS = Corn Meal Standard developed by SINLAB
$\delta^{13}C_{(VPDB)}$ = –13.25 ‰ +/- 0.11
$\delta^{15}N_{(AIR)}$ = 4.42 ‰ +/- 0.12

EPS = Ephedra Plant Standard developed by SINLAB
$\delta^{13}C_{(VPDB)}$ = -30.96 ‰ +/- 0.09
$\delta^{15}N_{(AIR)}$ = 0.35 ‰ +/- 0.12

SPL = Spirulina standard developed by SINLAB
$\delta^{13}C_{(VPDB)}$ = -24.97 ‰ +/- 0.12
$\delta^{15}N_{(AIR)}$ = 12.94 ‰ +/- 0.09

SPS = Seaweed plant standard developed by SINLAB
$\delta^{13}C_{(VPDB)}$ = -28.40 ‰ +/- 0.10
$\delta^{15}N_{(AIR)}$ = 21.10 ‰ +/- 0.10

EC1 = caribou hoof keratin standard- Environment Canada, Saskatoon, Canada
$\delta^{2}H_{(VSMOW)}$ = –197.00 ‰ +/- 1.8
$\delta^{18}O_{(VSMOW)}$ = 2.40 ‰ +/- 0.6

EC2 = kudu horn keratin standard - Environment Canada, Saskatoon, Canada
$\delta^{2}H_{(VSMOW)}$ = –54.10 ‰ +/- 0.6
$\delta^{18}O_{(VSMOW)}$ = 21.20 ‰ +/- 0.6

KERATIN STANDARD = Keratin powder purchased from Spectrum. B/N SJ1400
$\delta^{2}H_{(VSMOW)}$ = –121.60 ‰ +/- 2.0
$\delta^{18}O_{(VSMOW)}$ = 10.60 ‰ +/- 0.6

THS = Topi horn keratin standard developed by SINLAB, $\delta^{18}O$ unverified
$\delta^{2}H_{(VSMOW)}$ = –40.60 ‰ +/- 2.0
$\delta^{18}O_{(VSMOW)}$ = 20.28 ‰ +/- 0.6 (unverified)

Check Standards – These standards are analyzed in each analytical run as part of SINLAB's QA/QC protocol to assess the analytical accuracy.

ACETANILIDE = commercially available pure compound
Batch 2880 (Feb 2010 – Apr 2011) - $\delta^{13}C_{(VPDB)}$ = –27.87 ‰ +/- 0.12
$\delta^{15}N_{(AIR)}$ = –2.05 ‰ +/- 0.13

Batch 149699 (Apr 2011-Aug 2012) - $\delta^{13}C_{(VPDB)}$ = –31.59 ‰ +/- 0.12
$\delta^{15}N_{(AIR)}$ = –2.32 ‰ +/- 0.23

Costech (Aug 2012 – July 2020) - $\delta^{13}C_{(VPDB)}$ = –33.81 ‰ +/- 0.14
$\delta^{15}N_{(AIR)}$ = –0.92 ‰ +/- 0.23

Batch 317490 (July 2020 – Present) - $\delta^{13}C_{(VPDB)}$ = –26.54 ‰ +/- 0.06
$\delta^{15}N_{(AIR)}$ = –5.09 ‰ +/- 0.37

NICOTINAMIDE = commercially available pure compound
Batch 237264 (Mar 2018 – Present) - $\delta^{13}C_{(VPDB)}$ = –32.50 ‰ +/-0.1
$\delta^{15}N_{(AIR)}$ = –2.00 ‰ +/- 0.1

BENZOIC ACID = commercially available pure compound, $\delta^{18}O$ unverified
HEKAtech (Feb 2010 – Present) $\delta^{2}H_{(VSMOW)}$ = -76‰ +/- 2.0 (unverified)
$\delta^{18}O_{(VSMOW)}$ = 25.7‰ +/- 0.6 (unverified)

N2 = ammonium sulfate – Primary standard certified by IAEA.
$\delta^{15}N_{(AIR)}$ = 20.3 ‰ +/- 0.14

CH7 = polyethylene foil – Primary standard certified by IAEA.
$\delta^{13}C_{(VPDB)}$ = –32.2 ‰ +/- 0.1
$\delta^{2}H_{(VSMOW)}$ = 100.3 ‰ +/- 2.0

PROTEIN = casein – Certified by Elemental Microanalysis Ltd.
$\delta^{13}C_{(VPDB)}$ = –26.98 ‰ +/- 0.13
$\delta^{15}N_{(AIR)}$ = 5.94 ‰ +/- 0.08

***HIGH ORGANIC SEDIMENT*=** Certified by Elemental Microanalysis Ltd.
$\delta^{13}C_{(VPDB)}$ = –26.27 ‰ +/- 0.15
$\delta^{15}N_{(AIR)}$ = 4.42 ‰ +/- 0.2

***SORGHUM FLOUR*=** Certified by Elemental Microanalysis Ltd.
$\delta^{13}C_{(VPDB)}$ = –13.68 ‰ +/- 0.19
$\delta^{15}N_{(AIR)}$ = 1.58 ‰ +/- 0.15

PEACH LEAF = NIST 1547 peach leaves - not certified
$\delta^{13}C_{(VPDB)}$ = –26.17 ‰ +/- 0.08
$\delta^{15}N_{(AIR)}$ = 1.94 ‰ +/- 0.12

ATS = Atlantic salmon standard developed by SINLAB
$\delta^{2}H_{(VSMOW)}$ = –113.8 ‰ +/- 2.0
$\delta^{18}O_{(VSMOW)}$ = 17.50 ‰ +/- 0.6 (unverified)

LAT = Lake trout standard developed by SINLAB, $\delta^{18}O$ unverified
$\delta^{2}H_{(VSMOW)}$ = –165.60 ‰ +/- 2.0
$\delta^{18}O_{(VSMOW)}$ = 4.70 ‰ +/- 0.6 (unverified)

Column Headings

CLIENT ID = ID code assigned to sample by the client.

SINLAB ID = ID code assigned to the client's samples; starting with the year, each client is given a two or three letter identifier and samples numbered sequentially; ex, 15ABC 001.

Date = date sample was analyzed.

Position = position in the analytical run for that particular day; samples are weighed into 96-well ELISA trays, a typical animal tissue run will consist of approximately 73 samples, 22 standards, and 1 blank.

Weight = weight of the tissue analyzed; animal tissues are weighed at 1.000 ± 0.100 milligrams and plant tissues are weighed at 3.100 ± 0.100 milligrams for C and N isotope analysis. Keratin tissues are weighed at 0.200 ± 0.020mg for H isotope analysis.

CO2 ampl = the relative amount of CO_2 gas measured by the mass spectrometer in volts (V), a function of the weight of tissue used and the total amount of carbon (%C) it contains.

N2 ampl = the relative amount of N_2 gas measured by the mass spectrometer in volts (V), a function of the weight of tissue used and the total amount of nitrogen (%N) it contains.

H2 ampl = the relative amount of H_2 gas measured by the mass spectrometer in volts (V), a function of the weight of tissue used and the total amount of hydrogen (%H) it contains.

δ^{13}C = the relative isotope ratio difference between the sample and the international standard (VPDB) according to the formula:

$\delta^{13}C = [(R_{sample}/R_{standard})-1]*1000$ where R is the isotopic ratio of the heavy to light ($^{13}C/^{12}C$)

δ^{15}N = the relative isotope ratio difference between the sample and the international standard (AIR) according to the formula:

$\delta^{15}N = [(R_{sample}/R_{standard})-1]*1000$ where R is the isotopic ratio of the heavy to light ($^{15}N/^{14}N$)

δ^{2}H = the relative isotope ratio difference between the sample and the international standard (VSMOW) according to the formula:

$\delta^{2}H = [(R_{sample}/R_{standard})-1]*1000$ where R is the isotopic ratio of the heavy to light ($^{2}H/^{1}H$)

%C = percent of carbon in the sample by weight; calculated with NICOTINIMIDE for animals and ACETANILIDE for plants

%N = percent of nitrogen in the sample by weight; calculated with NICOTINIMIDE for animals and ACETANILIDE for plants

C/N = ratio of carbon to nitrogen in the sample; simple division of %C by %N.

%H= percent of hydrogen in the sample by weight; calculated with BENZOIC ACID

***%O*=** percent of oxygen in the sample by weight; calculated with BENZOIC ACID

Comment Codes

NR = no repeat; not enough sample tissue to allow another analysis

No drop = equipment malfunction wherein autosampler fails to turn; often leads to a "double-up" with the following sample

Double-up = two samples drop together

LR = lipid-rich. Samples may contain high lipid content according to the C/N ratio (Logan et al. 2008)

Whole bug = individual analyzed without grinding

1/4, 1/8, 1/16, 1/32 = indicates the size of a filter paper sample that was cut into a "pie-slice" for analysis

Scraped from paper = filtered material was scraped from the top of filter rather than analyzed as a "pie slice"

LE = Lipid extracted, a common technique to remove lipids from tissues such as liver, eggs, and muscle of some fishes. Lipids have different $\delta^{13}C$ than proteins and carbohydrates.

AT = Acid treated, a common technique to remove carbonates (that have different $\delta^{13}C$ values than organic tissues) from organisms such as crustaceans.

Colours

Gray shading = repeated sample as part of regular QA/QC routine (four of every 73 samples)
Red text = highlights low amplitude peaks or a poor repeat

Please address any questions about this document to:

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http://www.unb.ca/research/institutes/cri/sinlab/

References

Logan, J.M., Jardine, T.D., Miller, T.J., Bunn, S.E., Cunjak, R.A., and Lutcavage, M.E. 2008. Lipid corrections in carbon and nitrogen stable isotope analyses: comparison of chemical extraction and modelling methods. *Journal of Animal Ecology* 77(4): 838-846.

Wassenaar, L.I., and Hobson, K.A. 2000. Improved method for determining the stable-hydrogen isotopic composition (δD) of complex organic materials of environmental interest. *Environmental Science and Technology* 34(11): 2354-2360.

Wassenaar, L.I., and Hobson, K.A. 2003. Comparative equilibration and online technique for determination of non-exchangeable hydrogen of keratins for use in animal migration studies. *Isotopes in Environmental and Health Studies* 39(3): 211-217.

APPENDIX B
2021 ICSP TRAINING WORKSHOP AGENDA AND PRESENTATION

Indigenous Community Sampling Program – Training Session

July 28th, 2021

Northern Lights College, Fort St. John Main Campus,
Room 150; 9820 – 120 Avenue, Fort St. John.

Training Objective: to provide information about the Halfway River Watershed Site C Indigenous Community Sampling Program pilot, provide background information on the issue of mercury in fish and to train community members how to collect samples for mercury analysis. As representatives for your community, we are training you to be able to collect, document and store tissue samples from fishing events in your community.

Agenda

(10:45 - 11:15 AM) **Registration Sign-In & introductions**– There will be an introduction to the program and study team.

(11:15 – 12:15 AM) **Background information on mercury & study information** – To put this issue into perspective, all participants, including our study partners will receive training on the science of mercury in the environment, including in air, water, land and animals, with an emphasis on fish. Also, an overview of why the program is being run, and the ultimate the goals of the project.

(12:15 – 1:00) **Lunch (Provided)**

(1:00 – 1:30 PM) **Fish tissue extraction techniques** – A demonstration of each step in the technical procedure to record the appropriate information (species, length, weight) on a data recording sheet, steps to remove, package and label a tissue sample, handling, storage and shipping will be discussed. Both a lethal and a non-lethal sampling technique will be presented

(1:30 – 2:30 PM) **On-hands experience** – All participants will be able to work with fish supplied by Azimuth to practice using fillet and biopsy techniques to collect a non-lethal tissue sample from a fish for mercury analysis. This will include all steps in the collection, handing, labeling, and storage of tissue.

(2:30 PM – 3:00 PM) **Questions and Answers** – Participants will have an opportunity to ask questions, conduct further practice and speak with the team and each other as to how we can achieve the project goals!

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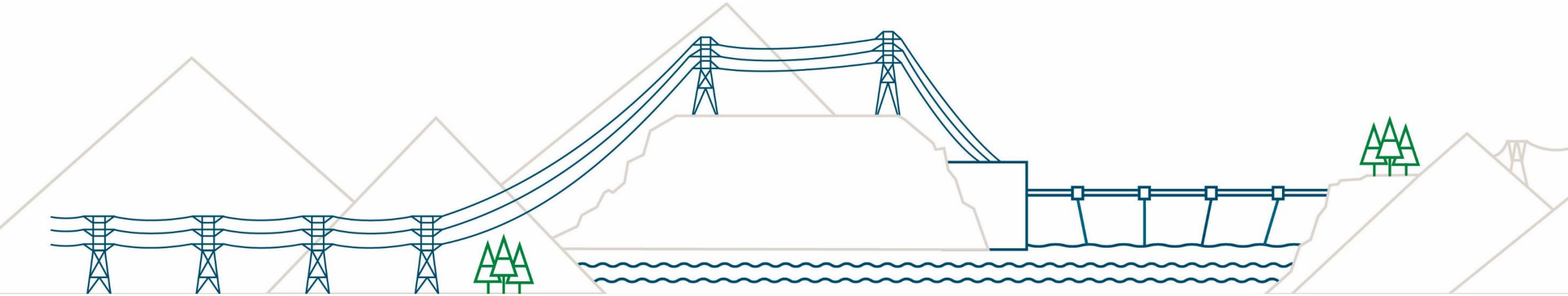
Indigenous Community Sampling Program Training Session

Halfway River Watershed Pilot

July 28, 2021



Laura Bekar
Azimuth Consulting Group Inc.

BC Hydro
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Training Session: Agenda

(11:00 - 11:15 AM) **Sign-In & introductions**

(11:15 – 12:15 AM) **Background information on mercury & study information**

(12:15 – 1:00) **Lunch Break**

(1:00 – 1:30 PM) **Fish tissue extraction techniques**

(1:30 – 2:30 PM) **On-hands experience**

(2:30 PM – 3:00 PM) **Questions and Answers**

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Purpose of Today's Training Session

1. Discuss mercury behaviour in lakes and rivers
2. Discuss Site C and the Methylmercury Monitoring Plan (MMP)
   - Indigenous Community Sampling Program
3. How to collect tissue samples from fish
   - Non-lethal sampling = biopsy punch sample
   - Lethal sampling = fillet sample

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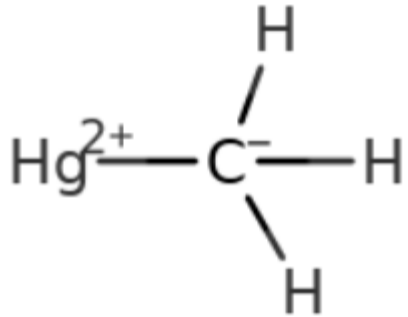
Introduction To Mercury

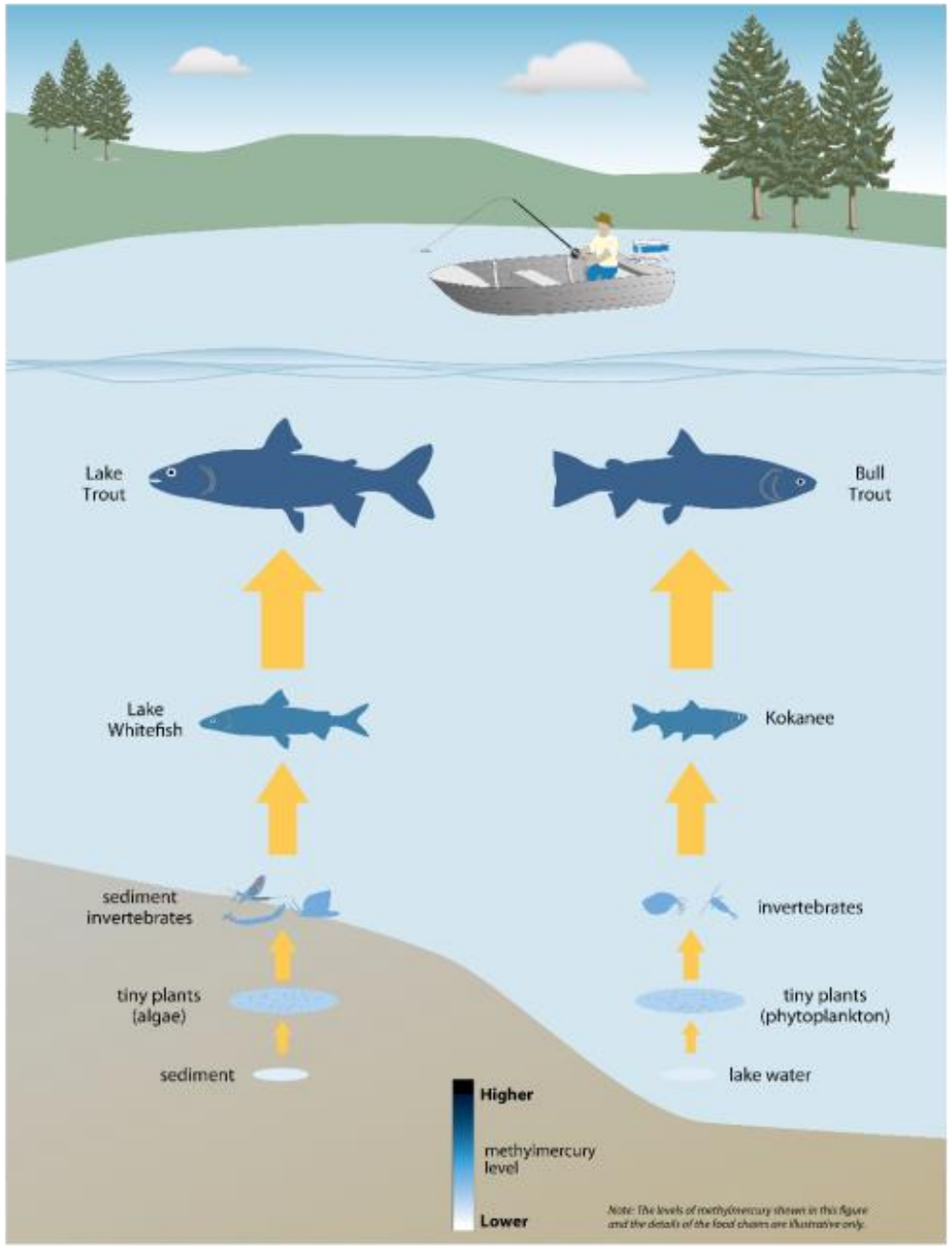
Elemental mercury

Inorganic mercury

Methylmercury

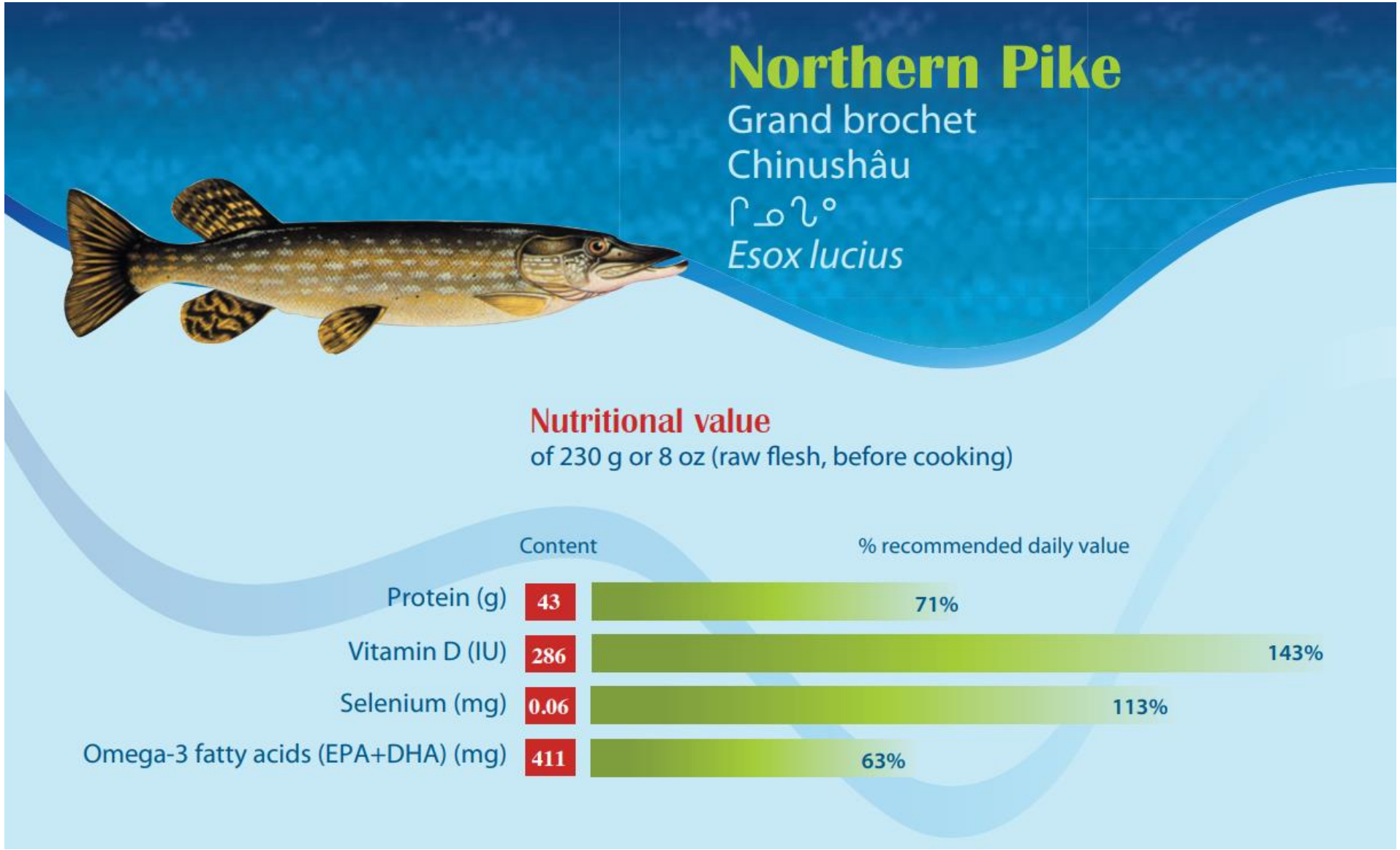


Methylmercury builds up in the food chains in lakes, rivers and oceans



All fish have some methylmercury

Larger, predatory fish have higher levels



Source: The Northern Fish Nutrition Guide

Purpose of Today's Training

1. Discuss mercury behaviour in lakes and rivers
2. Discuss Site C and the Methylmercury Monitoring Plan
   - Indigenous Community Sampling Program
3. How to collect tissue samples from fish
   - Non-lethal sampling = biopsy punch sample
   - Lethal sampling = fillet sample

BC Hydro
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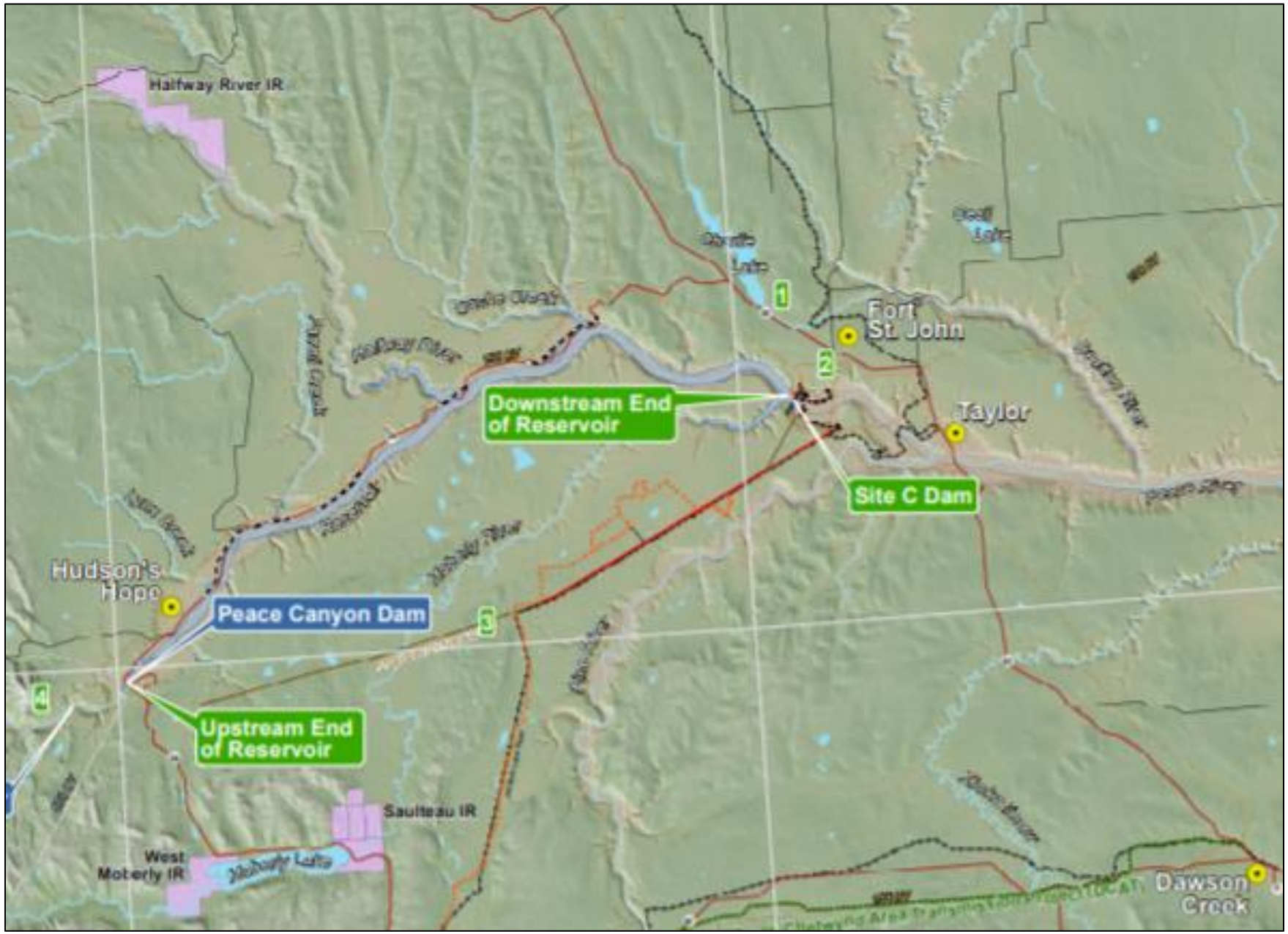
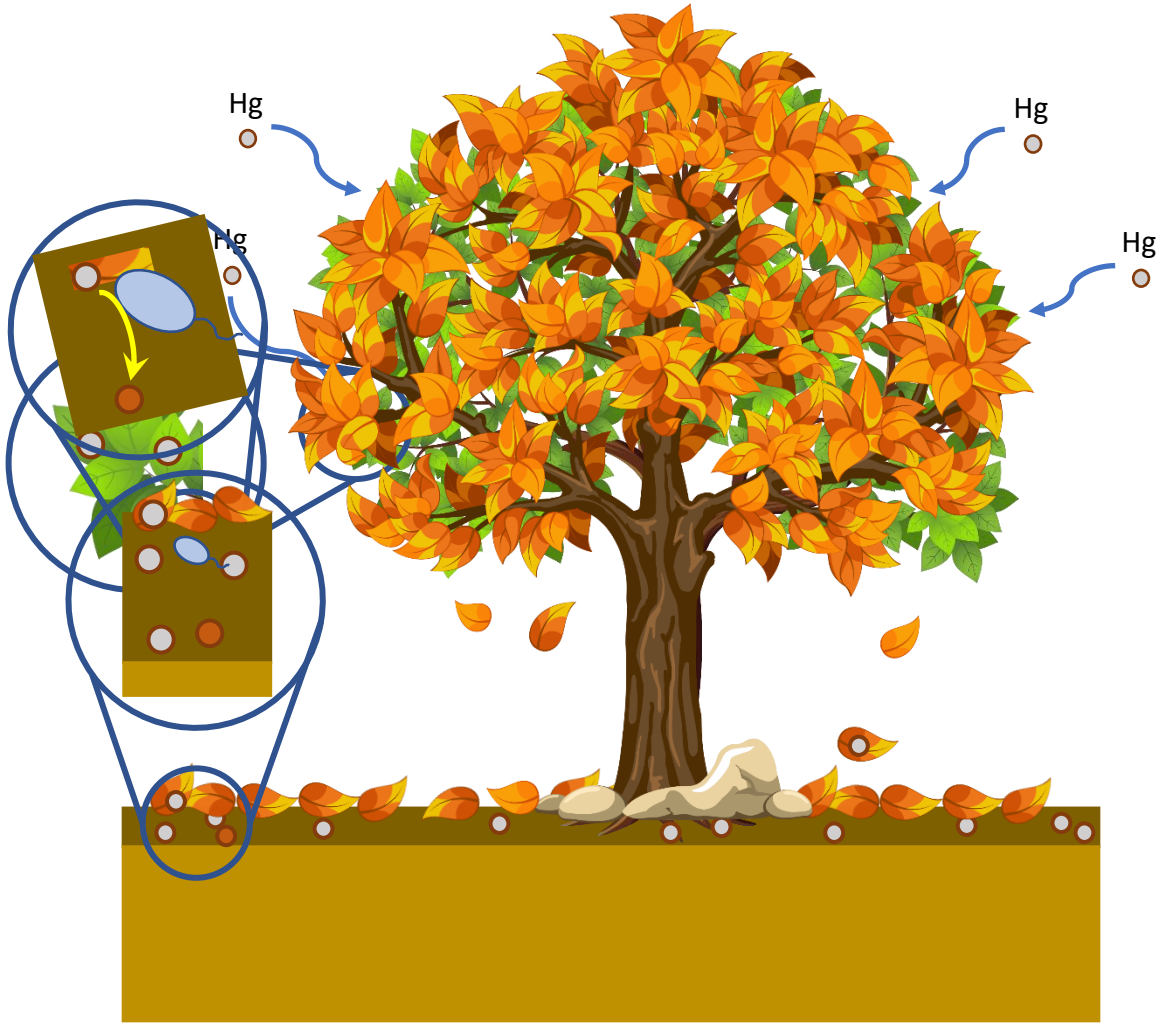
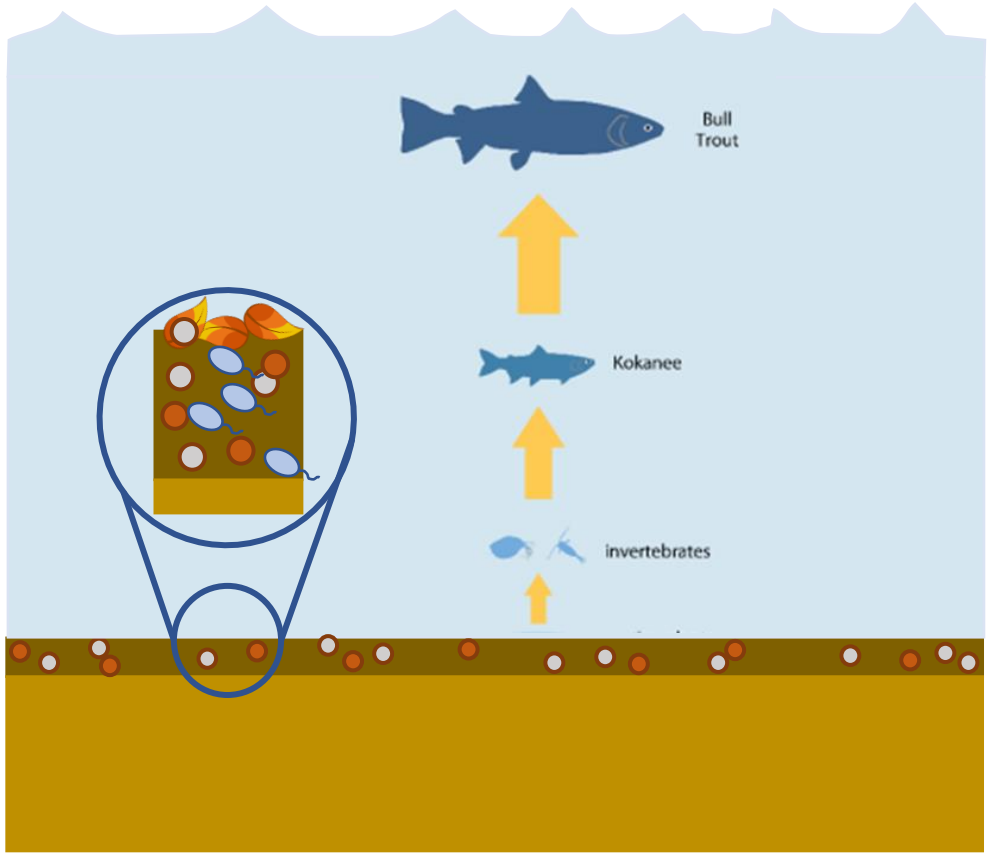
Site C


Halfway River IR
Fort St. John
Taylor
Downstream End of Reservoir
Site C Dam
Hudson's Hope
Peace Canyon Dam
Upstream End of Reservoir
Saulteau IR
West Moberly IR
Dawson Creek

What happens in reservoirs?

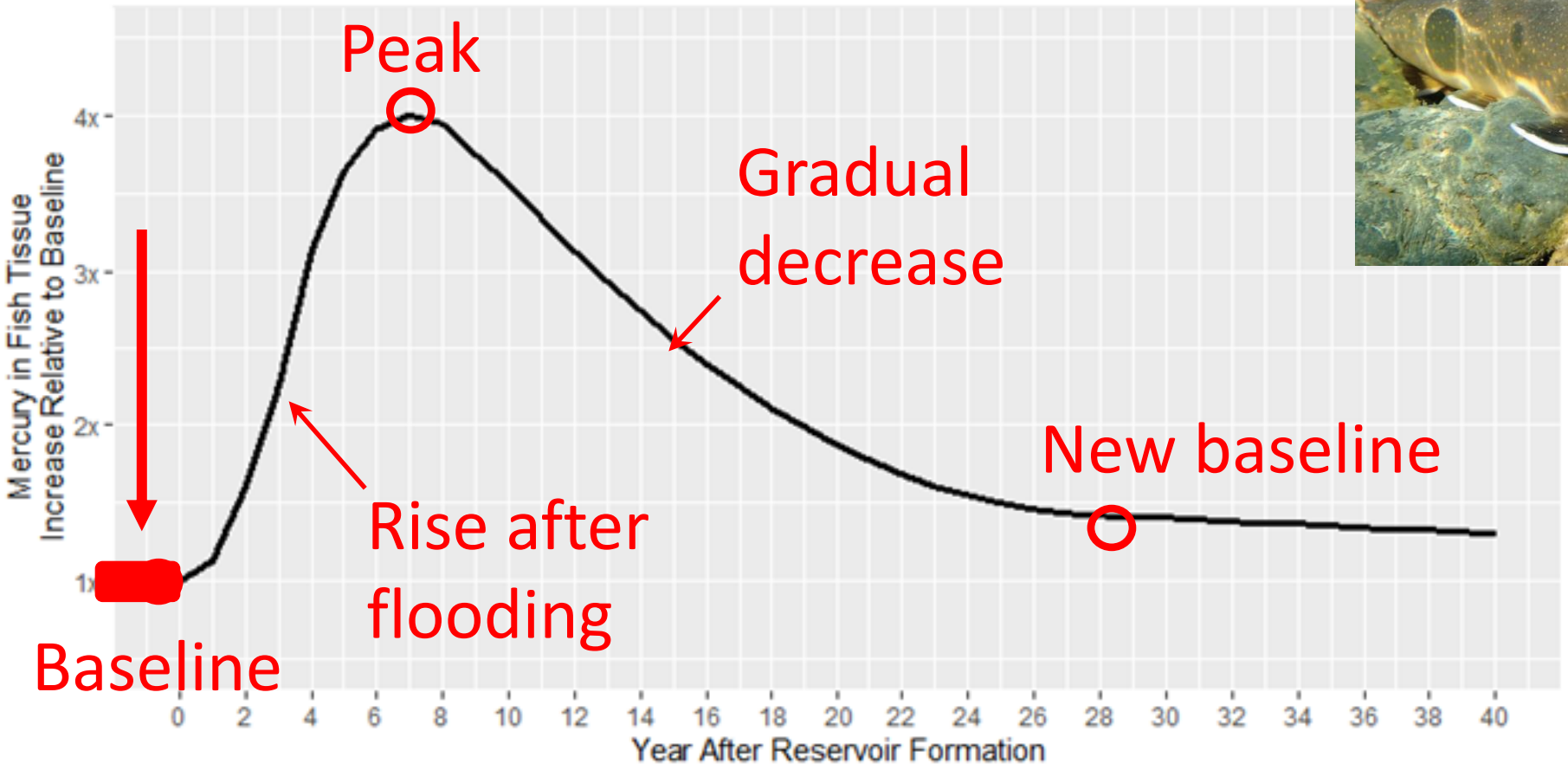


Land



Reservoir Creation (land now under water)

Example of methylmercury levels in fish after a reservoir is formed



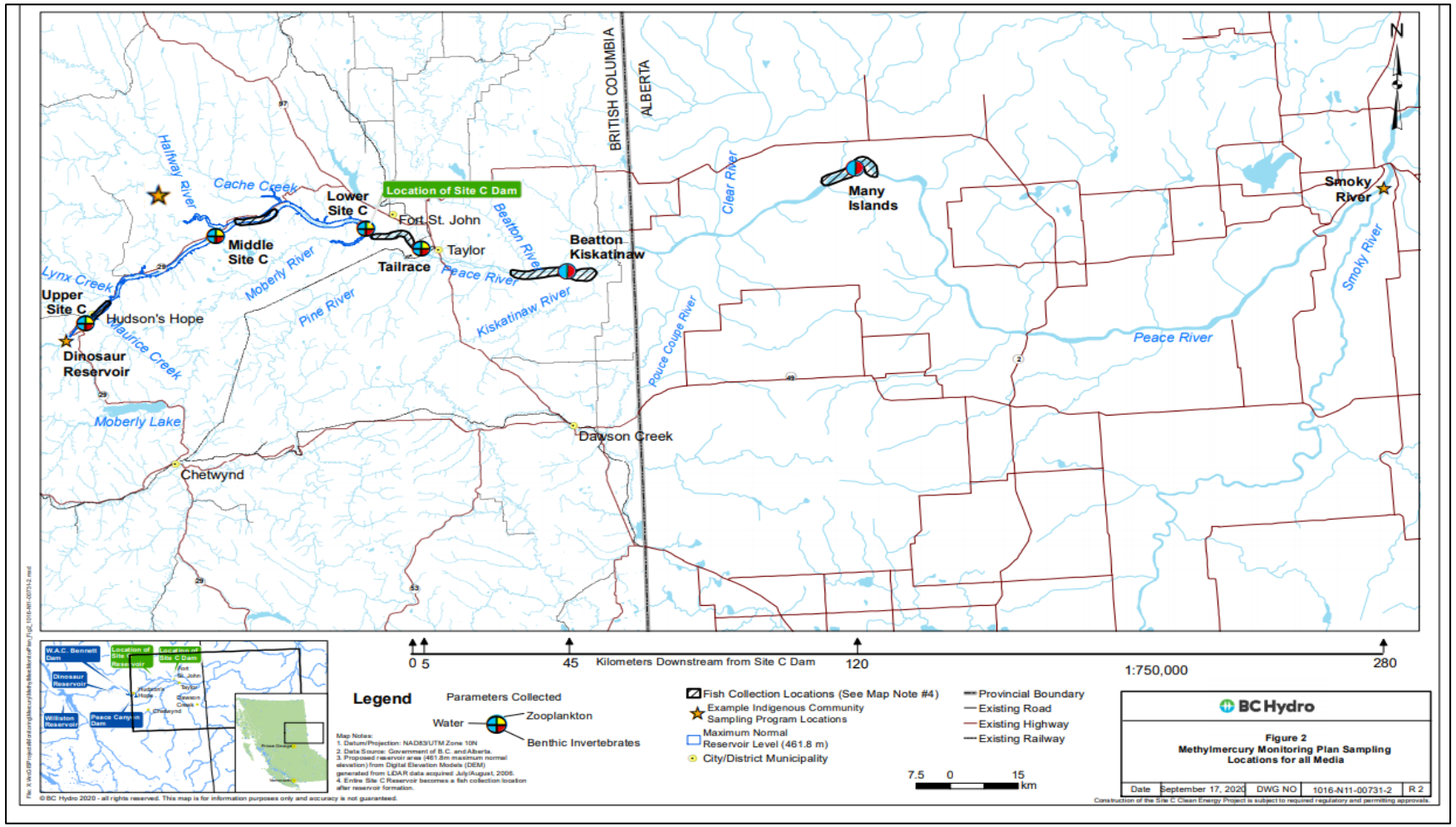
Draft Methylmercury Monitoring Plan (MMP)

- Currently a Draft Plan
  - Developed by BC Hydro in accordance with Site C Project Environmental Assessment Certificate and Federal Decision Statement conditions
  - Sent to Indigenous Nations, Impact Assessment Agency of Canada, First Nations Health Authority, Northern Health Authority, and Indigenous Nations in May 2021
- Feedback from Indigenous Nations and Health Authorities will support MMP implementation in 2022

Draft Methylmercury Monitoring Plan Overview: Three Components

1. **Monitoring Program:** provides the bulk of the monitoring data for methylmercury levels in fish and supporting environmental media.
2. **Indigenous Community Sampling Program:** provides an opportunity for community members to collect fish tissue samples for species/locations of interest from the Peace River.
3. **Fish Consumption Program:** provides the opportunity to collaborate with both Indigenous Nations and non-Indigenous communities to understand human exposure to methylmercury through fish consumption within the MMP study area.

Project Study Area



MMP Indigenous Community Sampling Program: Community Champion

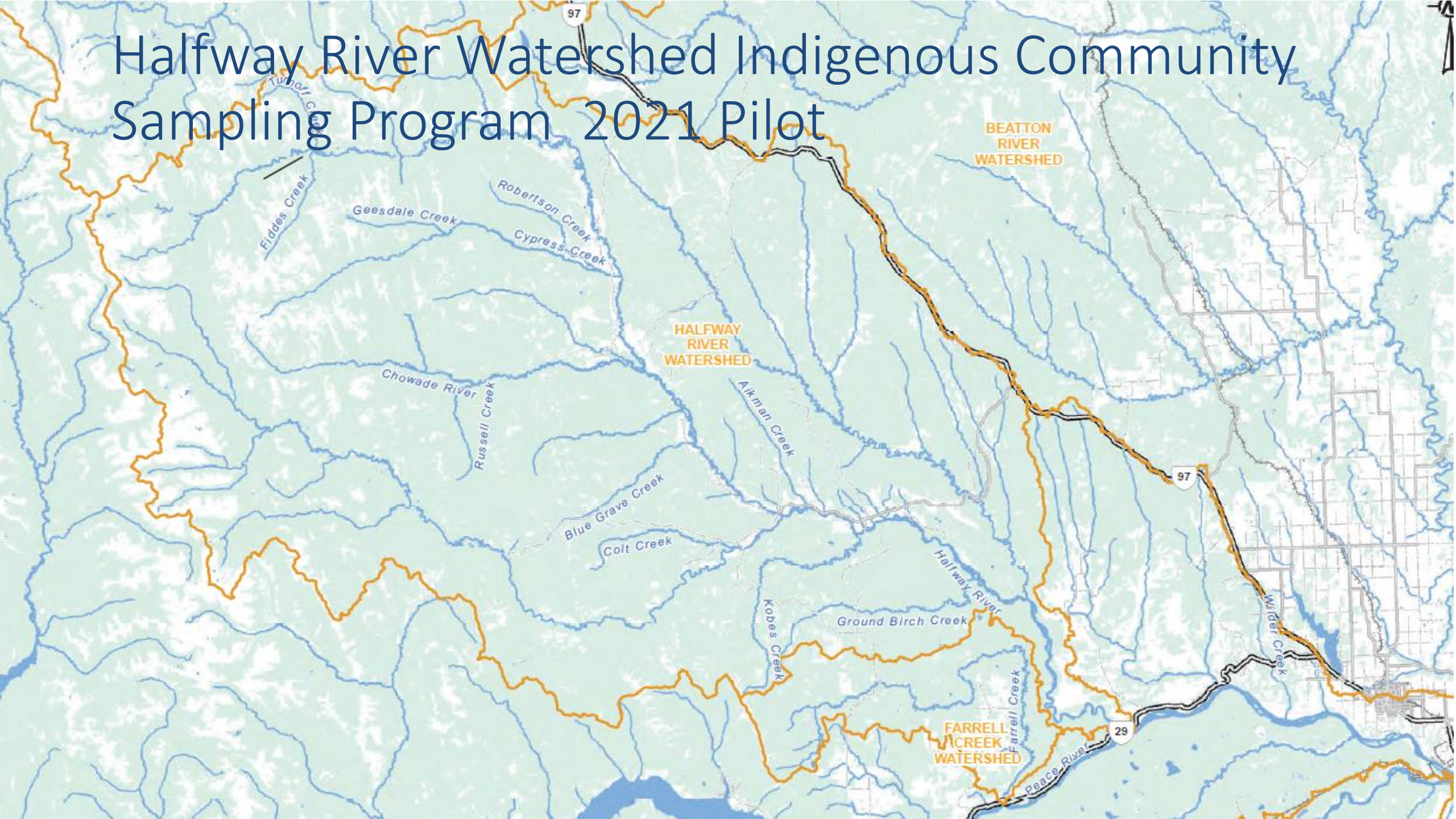
- A Community Champion, through support from a per fish stipend, will assist with coordination of the activities associated with community collection of fish tissue including:
  - communications;
  - collection of field data and samples; and
  - safe storage and transportation of samples.

Halfway River Watershed Indigenous Community Sampling Program: 2021 Pilot

2021 (August – September) Community Champion focus on fish tissue sampling from fish harvested in the Halfway River watershed

- Halfway River, Graham River, Chowade River, Cypress Creek).
- Focus is on large Bull Trout
- Pilot Program Champions Duties:
  - Collect Tissues
  - Record and Report Data
  - Store Samples

Halfway River Watershed Indigenous Community Sampling Program 2021 Pilot



Indigenous Community Sampling Program: Community Champion

Supplies

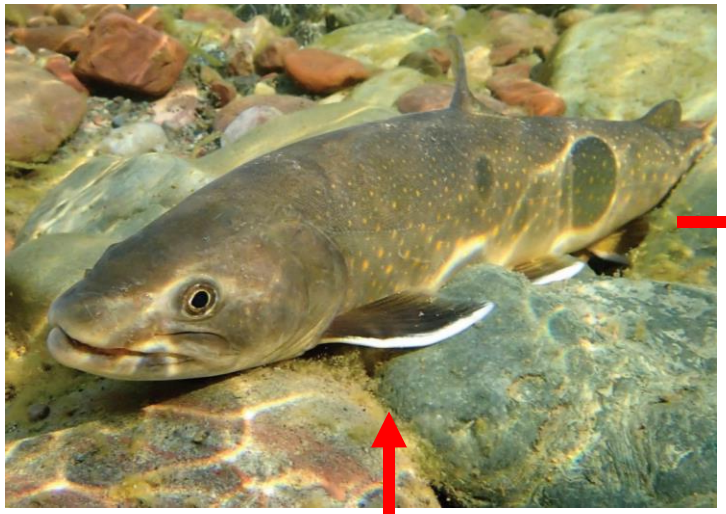
Purpose of Today's Training

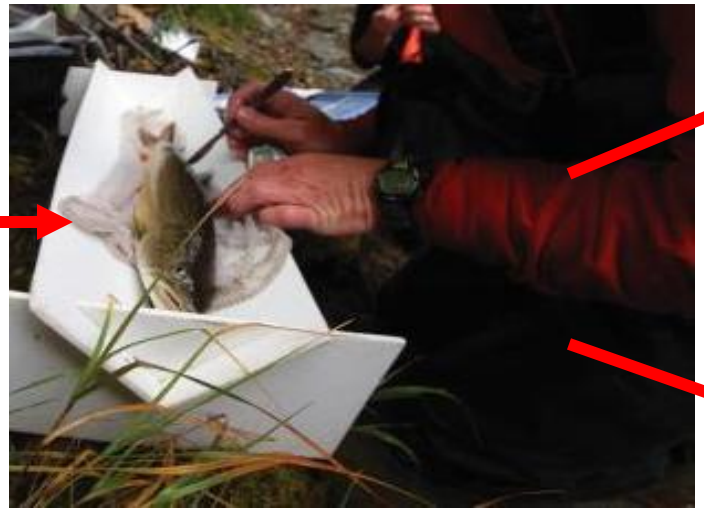
1. Discuss mercury behaviour in lakes and rivers
2. Discuss Site C and the Methylmercury Monitoring Program (MMP)
   - Indigenous Community Sampling Program
3. How to collect and record data for tissue samples from fish
   - Non-lethal sampling = biopsy punch sample
   - Lethal sampling = fillet sample

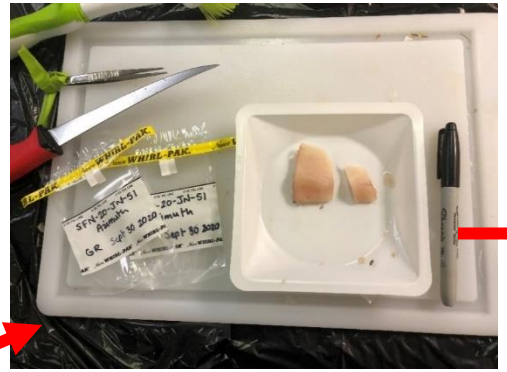
BC Hydro
Power smart

Indigenous Community Sampling Program: Community Champion

Training







Video Demonstrating non-lethal sampling of tissue…

https://www.youtube.com/watch?v=pmVO_Nt9QjU

Thank You!

APPENDIX C
2021 SAMPLING PROCEDURES AND DATASHEETS INCLUDED IN FISH KITS

HALFWAY RIVER WATERSHED INDIGENOUS COMMUNITY SAMPLING PROGRAM PILOT - FISH KIT

BC Hydro Site C Methylmercury Monitoring Plan (MMP)

Version: July 2021

Each sampling kit is contained within a Rubbermaid tote and has the following materials for collecting fillet tissue samples from fish:

- Disposable nitrile gloves
- Measuring tape
- Fillet knife and sharpener
- Plastic cutting board
- Forceps (tweezers)
- Nail clippers (for fin clips)
- Age structure envelopes
- Small vials for **SIA samples**
- Whirl-Pak© bags for **Mercury samples**
- Large bags for fish heads (Bull trout)
- Garbage bags (white)
- Soap and scrub brush
- Clipboard with these procedures & datasheets
- Sharpie markers and pencils
- Paper towel
- Wax paper
- Ice-pack

Many thanks to you for participating in the 2021 Halfway River Watershed Indigenous Community Sampling Program training and being a Community Champion for this program! You are a designated representative for your community responsible for the proper collection and storage of fish tissue samples for mercury analysis as well as accurate recording of fish information for this program.

As Community Champion, you will work with BC Hydro and Azimuth to collect:

1. Fish tissues for the lab assessment of Mercury, Stable Isotopes (SIA) and Age.
    a. Fish datasheets will be maintained
    b. Tissue samples will be collected, stored, and shipped

It is important that you communicate with BC Hydro and Azimuth on a regular (weekly) basis so that we can help you maximize the number of samples you collect during the course of the program. The information you collect is key to this program's success.

Fish Tissue Collection and Recording Procedures

1. RECORD KEEPING

The datasheets are printed on waterproof paper; a pencil should be used to write on this type of paper. Fill in a separate line for every individual fish sampled. Fill in the following information:

- Datasheet Information:
  - **Year** the record was taken
  - **Name** of Community Champion
- Fishing Information:
  - **Number** sample (Start at 1. Each datasheet has 15 rows.)
  - **Date** the fish was caught
  - **Name** of the person who caught the fish
  - **Catch Location**: Include which area of the Halfway system and UTM or Latitude/Longitude location coordinates if readily available. If outside the Halfway River, be sure to state what waterbody the fish was caught.
- Fish Sample Information:
  - Fish **species** sampled (use species code listed on the datasheet)
  - **Sample ID** that is written on the sample (vial or bag); assign an ID using the 4-letter fish species code, followed by the initials of the Community Champion recording the data, followed by a sequential number, followed by the date caught.

    For example, the first Arctic Grayling recorded by Sarah Jane on July 4 would be assigned the code- **AG-1-SJ-July 4**

    *note that the "1" stands for the first AG to be caught that day. If many AG caught and sampled that day then each must be numbered. 1, 2, 3 etc.
  - **Fork length** of the fish in millimeters (mm) – from tip of snout to fork in middle of tail
  - Fish **picture** number (same as Sample ID or if auto-generated by camera/phone, use that number)
  - Confirm collection of **Mercury and SIA tissue sample**
  - Confirm collection of **Age structure sample**

Contact Laura Bekar at Azimuth Consulting Group in Vancouver if you have any questions:

- phone: 604-340-3376 Email: lbekar@azimuthgroup.ca

2. SAMPLE COLLECTION

Fillet Sample Collection (for Mercury and SIA)

Only a small amount of fillet is needed and can be collected from an area that doesn't impact the take-home fillet. Collecting the tissue sample can be done by one person or multiple people working together.

1. Put on a pair of nitrile gloves and ensure that all equipment (fillet knife, tweezers, cutting board) is clean. Note that the Liquinox soap provided is biodegradable and safe to use directly in rivers and lakes.
2. Record all required information on the datasheet. Each fish caught and tissue collected gets a new row in the datasheet (room for 15 fish per datasheet).
3. Place the fish on its side with measuring tape in view. Prior to cutting up the fish you should:
    - Take a picture of the fish and record picture number on datasheet.
    - Measure the fish's fork length in mm and record on datasheet.
    - Record fish species and all other information required.
4. Collect fish muscle tissue (fillet): using the clean fillet knife, cut out a small section of muscle (size of ½ a pack of cards, or a large marshmallow, or a small pack of gum). The area just beneath the dorsal fin is a good location (see red X on diagram below), but any area of the fish fillet will do (near head or tail is just fine).
5. Place fillet onto the clean plastic cutting board:
    - Using tweezers and knife, remove any skin or bones. The sample should only have fish muscle (flesh).
    - Divide sample in two unevenly (see picture next page): ¼ (SIA sample) and ¾ (Mercury sample).
        - Using tweezers, place smaller tissue sample into small plastic vial. Label vial with sample ID (same as datasheet).
        - Place larger tissue sample into small Whirl-Pak© bag. Label bag with sample ID (same as datasheet).
    - If available, put the tissue samples (one vial and one Whirl-Pak bag, both labelled with the same Sample ID) on ice in a cooler in the short term and transfer to a freezer as soon as possible. Samples should remain frozen until shipped to Azimuth at start of October.

Age Structure Collection

6. The type of structure you collect depends on the species fish age structure:
    - Bull Trout (Head): collect fish head. Put head into large bag provided and label with Sample ID. Put on ice and freeze as soon as possible.
    - Rainbow Trout and Mountain Whitefish (Scales): use fillet knife to scrape away some scales from the fish's side. Put scales in a small piece of wax paper and put scales with wax paper inside a small envelope. Label with Sample ID. No need to hold on ice. The scales will dry naturally at room temperature.
    - All other species (Pectoral Fin): use nail clippers to collect pectoral fin clip from the leading edge of the fish's fin. <u>Be sure to clip as close to the body as possible.</u> See diagram below for pelvic fin leading-edge location (yellow star). Place fin in wax paper and put fin with wax paper inside a small envelope. Label with Sample ID. No need to hold on ice. The fin will dry naturally at room temperature.

Check your data and samples. You have now collected three tissues from the fish and filled out the datasheet. Doublecheck that your datasheet row is complete and that all bags, vials and envelopes are labelled with the same Sample ID.

Clean all materials. To do this, use a drop of the soap (it's quite concentrated) and the brush to scrub clean. Use the lake/river water for rinsing (this soap is safe for the environment).

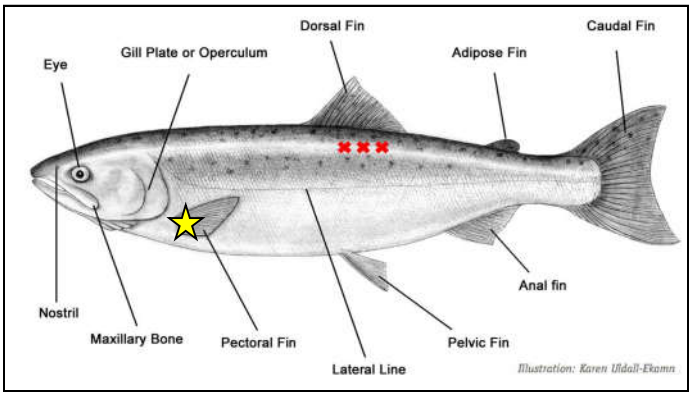


Figure Left: Red X is suggested area to collect fillet sample (mercury and SIA sample) and yellow star is leading edge of pectoral fin (age structure).

Figure Right: split of Mercury sample (big) and SIA sample (small).

3. STORAGE & REPORTING

Storage of Samples: Samples should be stored at the Community Band Office

- All Mercury, SIA, and Fish Head samples should be ***frozen as soon as possible*** after sampling.
- Fin clips and scales in envelopes can be kept at room temperature (or frozen).
- Datasheets should be left with the fish samples (in freezer is fine). They will be shipped with the samples at the end of the program.

Reporting of Data:

- Datasheets should be scanned (or picture taken) and pictures of each fish uploaded. All files should be sent electronically to Laura at the end of each week. Laura will send out reminder emails to all Community Champions once per week.
    - Laura Bekar Email: lbekar@azimuthgroup.ca
- We anticipate the Halfway River Watershed Indigenous Community Sampling Program ending October 1, 2021. At which time we will put out a final call for any outstanding datasheets and fish photos and coordinate shipping of all samples (Mercury, SIA and Age) with the Band Office.

Indigenous Community Sampling Program **Community Champion: _____** **Year:_____**

Site C Methylmercury Monitoring Program (MMP)

#	Date	Caught by? (first & last name)	Catch Location (Lake/River name and/or coordinates - UTMs or Lat/Long)	Species Code	Sample ID	Fish Length (mm)	Fish Photo #	Hg & SIA Samples? (yes/no)	Age Structure? (yes/no)
#	*July 4 2021*	*Sarah Jane*	*Halfway River Main Channel*	*BT*	*BT-1-SJ-July 4*	*300 mm*	*BT-1-SJ-July 4*	*yes*	*yes*

Catch Location: If you have the ability to include exact location using coordinates, please include.

Species Codes: BT = Bull Trout, RB = Rainbow Trout, MW = Mountain Whitefish, LSU = Longnose Sucker, LT = Lake Trout, GR = grayling, NP = Northern Pike, BB = Burbot, WP = Walleye

Sample ID: Species Code - Fish Number - Champion's Initials - Date of Capture.

Fish Photo #: same as Sample ID

Age Structure: BT = head; RB and MW = scale; all other species = fin clip; BB = no age structure

APPENDIX D
BC HYDRO METHYLMERCURY AND FISH CONSUMPTION GUIDANCE

Methylmercury and fish consumption information in the Peace River system

NOVEMBER 2021

Through our work with Indigenous Nations and local communities, we've heard concerns about how reservoir creation on the Peace River system has affected methylmercury levels in fish. The Site C project is the third dam on the Peace River and will result in temporary changes in fish methylmercury levels once the reservoir begins filling in 2023.

Explore this document to learn more about methylmercury in fish and consumption information for the Peace River as well as Williston, Dinosaur and Site C reservoirs.[1]

Methylmercury occurs naturally

Mercury is a naturally occurring element that is found in low levels everywhere in the environment—in air, water, soil, plants, animals and humans. Mercury is released to the environment from natural sources such as volcanoes and forest fires, and from human activities such as burning fossil fuels.

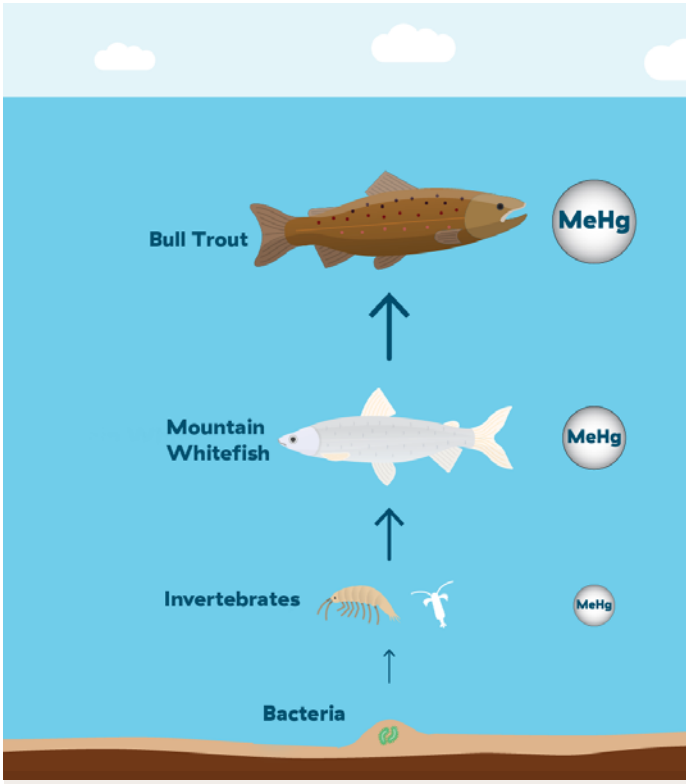
Mercury in oceans, lakes and rivers is naturally changed by bacteria into methylmercury. Methylmercury levels increase with each step up the food chain as animals absorb methylmercury from their food (e.g. invertebrates eat plankton, big fish eat small fish).

Some fish have more methylmercury than others

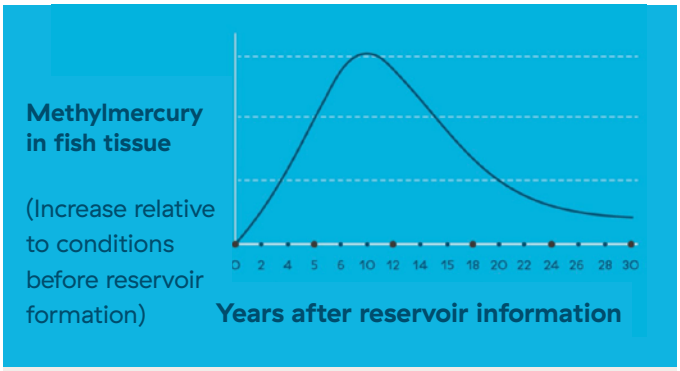
All fish contain methylmercury. Insect–eating fish like rainbow trout, kokanee and whitefish have lower levels of methylmercury than fish that eat other fish like bull trout, lake trout, northern pike (jackfish) and walleye. For a given species, large fish have higher levels of methylmercury than small fish.

Reservoir creation increases methylmercury levels in fish

When a reservoir is created, including Site C reservoir, the levels of methylmercury in fish gradually increase for approximately 10 years as bacteria in the newly submerged areas change mercury to methylmercury. Methylmercury levels in fish from the Site C reservoir are predicted to increase by 3–4 times current levels following reservoir filling in 2023. This is followed by a decrease over the next 20–30 years to levels that are similar to natural lakes and rivers in the area.



MeHg = methylmercury.



Methylmercury in fish tissue.

[1] Peace River consumption information applies for the Peace River between Hudson's Hope, B.C. and Many Islands, Alberta where fish mercury data have been collected.

Health Canada provides guidelines to safely eat fish

Although people are exposed to methylmercury when they eat fish, they can safely tolerate some exposure to methylmercury. Eating fish can provide health benefits including adding healthy fats, vitamins and essential elements to your diet.

Health Canada provides guidelines as to how much methylmercury Canadians can be exposed to without risk to their health. The amount differs depending on age, gender and weight.

HOW BIG IS A SERVING OF FISH?

100 g serving size for children.

163 g serving size for adult.

The table specifies how many servings of fish you can eat to remain within Health Canada's recommendations for methylmercury exposure.

General consumption information
Safe to eat
Every day
Every second day
Twice a week
Once a week

Number of servings per month			
Fish type	**Children under 12**	**Pregnant or could be**	**Others**
Williston Reservoir and Tributaries			
Lake Trout (22")	7	12	28
Bull Trout (22")	7	12	28
Lake whitefish (12")	10	18	42
Kokanee (12")	19	33	78
Rainbow Trout (12")	30	53	124
Dinosaur Reservoir and Tributaries			
Bull Trout (22")	17	30	71
Lake Trout (22")	19	33	78
Rainbow Trout (12")	41	71	168
Peace River between Hudson's Hope, B.C. and Many Islands, A.B.			
Bull Trout (22")	10	18	41
Mountain whitefish (14")	22	39	93
Rainbow Trout (12")	54	94	222

What if I eat more than one type of fish in a month?

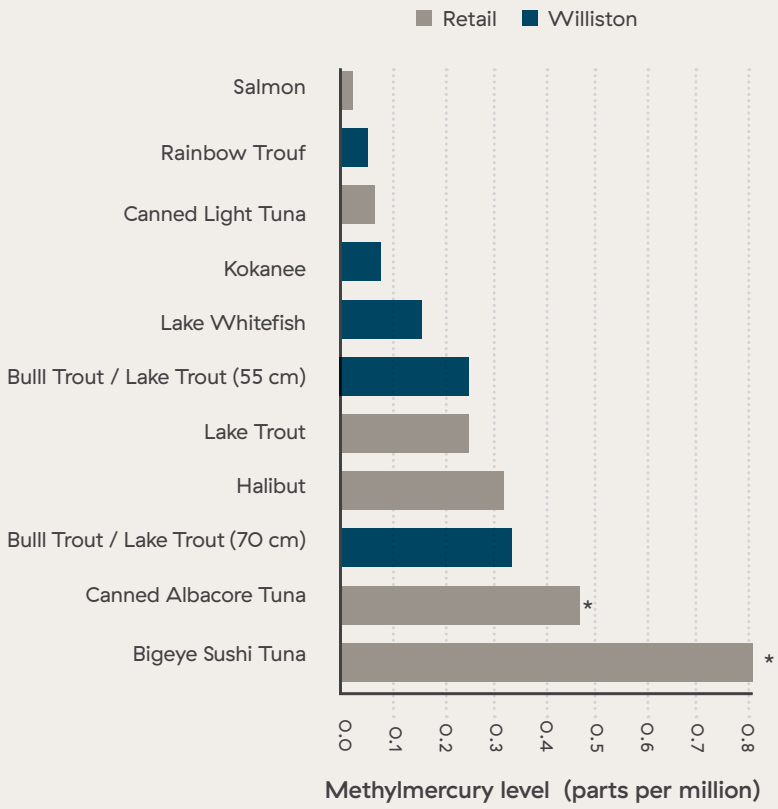
The consumption information is only for the type of fish shown and does not account for methylmercury from eating other types of fish. If you eat the indicated number of servings and you regularly eat other types of fish, you will go over Health Canada's guidance for methylmercury intake.

Serving size recommendations are valid for the period prior to Site C reservoir filling beginning in 2023.

Methylmercury facts

- **Are fish from the Williston Reservoir and Peace River tributaries high in methylmercury?**
  In a recent study, it was found that fish from Williston Reservoir and its tributaries have methylmercury levels similar to fish from natural lakes and rivers in B.C. Levels were also lower than the levels of methylmercury in some types of fish sold in stores and restaurants. The study[2] was funded by the Fish & Wildlife Compensation Program Peace Region.
- **Can you only eat fish once a month?**
  Many types of fish are safe to eat more than once a month. Please see the map for details.
- **Does methylmercury cause cancer?**
  Current scientific evidence has not linked exposure to methylmercury from eating fish as a cause of cancer. If exposed to high levels of methylmercury, it can harm the brain and nerves and cause issues with memory, concentration, coordination and balance.
- **Is methylmercury located in the belly fat of fish?**
  Methylmercury occurs in all fish tissues, especially muscle, and cannot be removed by trimming belly fat or cooking the fish.

METHYLMERCURY LEVELS IN FISH CAN BE LOWER THAN SOME SPECIES SOLD IN STORES



* Refer to Health Canada for consumption guidelines for canned albacore tuna and fresh bigeye sushi tuna.

Data for retail fish (sold in restaurants and grocery stores) are from Health Canada (2007) and Lowenstein et al. (2010).

2 The 2016 – 2018 FWCP mercury study report can be found at fwcp.ca/mercury

To watch a video on this information visit:

- **Sitecproject.com/methylmercury-program**
- **Fwcp.ca/mercury**

Health Canada provides health information about the levels of mercury in fish bought from the store. For further information visit: **canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/environmental-contaminants/mercury/mercury-fish.html**

BC Ministry of Health provides health information about the levels of mercury in fish caught from rivers and lakes in B.C. For **further information visit: healthlinkbc.ca/healthlinkbc-files/mercury-fish**

Health Canada. 2007. Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption. Ottawa, ON, Health Canada, Health Products and Food Branch, Food Directorate, Bureau of Chemical Safety

Lowenstein, J H., J. Burger, C. W. Jeitner, A. George, K. Sergios-Orestis and M. Gochfeld. 2010. DNA barcodes reveal species-specific mercury levels in tuna sushi that pose a health risk to consumers. Biol. Lett. 6: 692–695

BC Hydro Power smart | FWCP Fish & Wildlife Compensation Program

APPENDIX E
LABORATORY REPORTS

Table E-1. Conversion table outlining the laboratory sample IDs corresponding to the fish IDs used in the report.

Lab ID	Fish ID
1-PA-Aug26	BT-1-PA-Aug26
RB-2-PA-Aug26	RB-2-PA-Aug26
RB-1-RA-Aug30	RB-3-RA-Aug30
DV-2-RA-Aug30	BT-4-RA-Aug30
BT-3-AM-Sept21	BT-5-AM-Sep21
BT-4-DA-Sept23	BT-6-DA-Sep23
BT-5-AM-Sept23	BT-7-AM-Sep23
RB-1-PA-Sept30	RB-8-PA-Sep30
2-PA-Sept30	MW-9-PA-Sep30
3-PA-Sept30	MW-10-PA-Sep30
4-PA-Sept30	BT-11-PA-Sep30
RB-5-PA-Sept-30	RB-12-PA-Sep30
RB-6-PA-Sept30	RB-13-PA-Sep30
GR-1-PA-Oct2	MW-14-PA-Oct2
2-PA-Oct2	BT-15-PA-Oct2
RB-3-PA-Oct2	RB-16-PA-Oct2
RB-4-PA-Oct2	RB-17-PA-Oct2
RB-5-PA-Oct2	RB-18-PA-Oct2
RB-6-DM-Oct3	RB-19-DM-Oct3

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA21C7109**	Page	: 1 of 10
Client	: **Azimuth Consulting Group Inc.**	Laboratory	: Vancouver - Environmental
Contact	: Laura Bekar	Account Manager	: Brent Mack
Address	: # 218 - 2902 West Broadway Vancouver BC Canada V6K 2G8	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: 778-370-3279
Project	: BCHydro-Site C-MMP-ICSP	Date Samples Received	: 03-Dec-2021 15:55
PO	: ----	Date Analysis Commenced	: 31-Jan-2022
C-O-C number	: ----	Issue Date	: 08-Feb-2022 15:40
Sampler	: HR FN		
Site	: ----		
Quote number	: Q75925		
No. of samples received	: 19		
No. of samples analysed	: 19		

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*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Ragini Saini	Lab Assistant	Metals, Burnaby, British Columbia

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*
%	percent
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	LOR	Unit	Client sample ID	1-PA-AUG26	RB-2-PA-AUG26	RB-1-RA-AUG30	DV-2-RA-AUG30	BT-3-AM-SEPT21
					Client sampling date / time	26-Aug-2021	26-Aug-2021	30-Aug-2021	30-Aug-2021	21-Sep-2021
						VA21C7109-001	VA21C7109-002	VA21C7109-003	VA21C7109-004	VA21C7109-005
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.50	%		76.8	78.8	77.4	76.3	78.1
Metals										
aluminum	7429-90-5	E440A	0.40	mg/kg wwt		1.16	1.06	1.26	0.98	<0.40
antimony	7440-36-0	E440A	0.0020	mg/kg wwt		0.0046	0.0041	<0.0020	<0.0020	<0.0020
arsenic	7440-38-2	E440A	0.0040	mg/kg wwt		0.0072	0.0045	0.0105	0.0088	0.0065
barium	7440-39-3	E440A	0.010	mg/kg wwt		0.175	0.142	0.189	0.184	0.144
beryllium	7440-41-7	E440A	0.0020	mg/kg wwt		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
bismuth	7440-69-9	E440A	0.0020	mg/kg wwt		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
boron	7440-42-8	E440A	0.20	mg/kg wwt		<0.20	<0.20	<0.20	<0.20	<0.20
cadmium	7440-43-9	E440A	0.0010	mg/kg wwt		0.0032	0.0018	<0.0010	0.0013	<0.0010
calcium	7440-70-2	E440A	4.0	mg/kg wwt		66.5	207	474	253	142
cesium	7440-46-2	E440A	0.0010	mg/kg wwt		0.0051	0.0033	0.0080	0.0176	0.0069
chromium	7440-47-3	E440A	0.010	mg/kg wwt		0.026	0.082	0.019	<0.010	<0.010
cobalt	7440-48-4	E440A	0.0040	mg/kg wwt		0.0158	0.0163	0.0082	0.0062	0.0046
copper	7440-50-8	E440A	0.020	mg/kg wwt		0.544	0.429	0.234	0.162	0.172
iron	7439-89-6	E440A	0.60	mg/kg wwt		7.42	7.94	4.08	3.74	2.91
lead	7439-92-1	E440A	0.0040	mg/kg wwt		0.0402	0.221	<0.0040	<0.0040	<0.0040
lithium	7439-93-2	E440A	0.10	mg/kg wwt		<0.10	<0.10	<0.10	<0.10	<0.10
magnesium	7439-95-4	E440A	0.40	mg/kg wwt		284	294	292	351	279
manganese	7439-96-5	E440A	0.010	mg/kg wwt		0.185	0.100	0.144	0.124	0.114
mercury	7439-97-6	E510A	0.0010	mg/kg wwt		0.175	0.0346	0.148	0.0509	0.163
molybdenum	7439-98-7	E440A	0.0040	mg/kg wwt		<0.0040	0.0041	0.0042	<0.0040	<0.0040
nickel	7440-02-0	E440A	0.040	mg/kg wwt		<0.040	<0.040	<0.040	<0.040	<0.040
phosphorus	7723-14-0	E440A	2.0	mg/kg wwt		2820	2890	2640	3140	2740
potassium	7440-09-7	E440A	4.0	mg/kg wwt		4720	4800	4480	5060	4800
rubidium	7440-17-7	E440A	0.010	mg/kg wwt		1.41	1.29	3.37	1.93	1.83
selenium	7782-49-2	E440A	0.010	mg/kg wwt		1.23	1.44	0.753	1.45	1.00
sodium	7440-23-5	E440A	4.0	mg/kg wwt		431	341	563	265	317
strontium	7440-24-6	E440A	0.010	mg/kg wwt		0.058	0.153	0.348	0.169	0.080
tellurium	13494-80-9	E440A	0.0040	mg/kg wwt		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
thallium	7440-28-0	E440A	0.00040	mg/kg wwt		0.0155	0.0133	0.00927	0.00711	0.00702

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	1-PA-AUG26	RB-2-PA-AUG26	RB-1-RA-AUG30	DV-2-RA-AUG30	BT-3-AM-SEPT21
					Client sampling date / time	26-Aug-2021	26-Aug-2021	30-Aug-2021	30-Aug-2021	21-Sep-2021
						VA21C7109-001	VA21C7109-002	VA21C7109-003	VA21C7109-004	VA21C7109-005
						Result	Result	Result	Result	Result
Metals										
tin	7440-31-5	E440A	0.020	mg/kg wwt		0.057	0.070	0.033	0.036	0.050
uranium	7440-61-1	E440A	0.00040	mg/kg wwt		<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
vanadium	7440-62-2	E440A	0.020	mg/kg wwt		<0.020	<0.020	<0.020	<0.020	<0.020
zinc	7440-66-6	E440A	0.10	mg/kg wwt		5.05	4.30	3.34	3.47	3.46
zirconium	7440-67-7	E440A	0.040	mg/kg wwt		<0.040	<0.040	<0.040	<0.040	<0.040

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BT-4-DA-SEPT23	BT-5-AM-SEPT23	RB-1-PA-SEPT30	2-PA-SEPT30	3-PA-SEPT30
					Client sampling date / time	23-Sep-2021	23-Sep-2021	30-Sep-2021	30-Sep-2021	30-Sep-2021
						VA21C7109-006	VA21C7109-007	VA21C7109-008	VA21C7109-009	VA21C7109-010
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.50	%		75.9	73.0	75.0	78.3	78.4
Metals										
aluminum	7429-90-5	E440A	0.40	mg/kg wwt		<0.40	0.47	1.34	0.76	0.47
antimony	7440-36-0	E440A	0.0020	mg/kg wwt		<0.0020	<0.0020	0.0028	<0.0020	<0.0020
arsenic	7440-38-2	E440A	0.0040	mg/kg wwt		0.0095	0.0103	0.0107	0.0421	0.0172
barium	7440-39-3	E440A	0.010	mg/kg wwt		0.060	0.076	0.183	0.204	0.154
beryllium	7440-41-7	E440A	0.0020	mg/kg wwt		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
bismuth	7440-69-9	E440A	0.0020	mg/kg wwt		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
boron	7440-42-8	E440A	0.20	mg/kg wwt		<0.20	<0.20	<0.20	<0.20	<0.20
cadmium	7440-43-9	E440A	0.0010	mg/kg wwt		<0.0010	<0.0010	0.0030	0.0107	0.0056
calcium	7440-70-2	E440A	4.0	mg/kg wwt		53.8	252	107	60.3	146
cesium	7440-46-2	E440A	0.0010	mg/kg wwt		0.0092	0.0076	0.0046	0.0029	0.0026
chromium	7440-47-3	E440A	0.010	mg/kg wwt		<0.010	<0.010	0.242	0.053	0.010
cobalt	7440-48-4	E440A	0.0040	mg/kg wwt		0.0074	0.0062	0.0405	0.0251	0.0438
copper	7440-50-8	E440A	0.020	mg/kg wwt		0.334	0.291	1.16	0.543	0.921
iron	7439-89-6	E440A	0.60	mg/kg wwt		2.86	2.23	12.9	12.2	13.0
lead	7439-92-1	E440A	0.0040	mg/kg wwt		<0.0040	<0.0040	0.0061	<0.0040	<0.0040
lithium	7439-93-2	E440A	0.10	mg/kg wwt		<0.10	<0.10	<0.10	<0.10	<0.10
magnesium	7439-95-4	E440A	0.40	mg/kg wwt		310	330	234	261	259
manganese	7439-96-5	E440A	0.010	mg/kg wwt		0.084	0.099	0.143	0.099	0.158
mercury	7439-97-6	E510A	0.0010	mg/kg wwt		0.170	0.133	0.0321	0.0800	0.0530
molybdenum	7439-98-7	E440A	0.0040	mg/kg wwt		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
nickel	7440-02-0	E440A	0.040	mg/kg wwt		<0.040	<0.040	0.069	<0.040	<0.040
phosphorus	7723-14-0	E440A	2.0	mg/kg wwt		3020	3060	2560	2620	2590
potassium	7440-09-7	E440A	4.0	mg/kg wwt		5060	4830	3790	4520	4140
rubidium	7440-17-7	E440A	0.010	mg/kg wwt		2.77	2.40	1.33	0.908	0.838
selenium	7782-49-2	E440A	0.010	mg/kg wwt		1.20	1.16	1.52	1.89	1.63
sodium	7440-23-5	E440A	4.0	mg/kg wwt		248	243	695	362	590
strontium	7440-24-6	E440A	0.010	mg/kg wwt		0.023	0.151	0.114	0.096	0.170
tellurium	13494-80-9	E440A	0.0040	mg/kg wwt		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
thallium	7440-28-0	E440A	0.00040	mg/kg wwt		0.00996	0.0139	0.0447	0.0550	0.0587
tin	7440-31-5	E440A	0.020	mg/kg wwt		0.046	0.028	0.081	0.070	0.050

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BT-4-DA-SEPT23	BT-5-AM-SEPT23	RB-1-PA-SEPT30	2-PA-SEPT30	3-PA-SEPT30
					Client sampling date / time	23-Sep-2021	23-Sep-2021	30-Sep-2021	30-Sep-2021	30-Sep-2021
						VA21C7109-006	VA21C7109-007	VA21C7109-008	VA21C7109-009	VA21C7109-010
						Result	Result	Result	Result	Result
Metals										
uranium	7440-61-1	E440A	0.00040	mg/kg wwt		<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
vanadium	7440-62-2	E440A	0.020	mg/kg wwt		<0.020	<0.020	<0.020	<0.020	<0.020
zinc	7440-66-6	E440A	0.10	mg/kg wwt		3.94	3.65	6.30	3.42	4.14
zirconium	7440-67-7	E440A	0.040	mg/kg wwt		<0.040	<0.040	<0.040	<0.040	<0.040

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	4-PA-SEPT30	RB-5-PA-SEPT30	RB-6-PA-SEPT30	GR-1-PA-OCT2	2-PA-OCT2
					Client sampling date / time	30-Sep-2021	30-Sep-2021	30-Sep-2021	02-Oct-2021	02-Oct-2021
						VA21C7109-011	VA21C7109-012	VA21C7109-013	VA21C7109-014	VA21C7109-015
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.50	%		78.1	76.9	77.2	76.6	78.9
Metals										
aluminum	7429-90-5	E440A	0.40	mg/kg wwt		<0.40	<0.40	<0.40	0.67	<0.40
antimony	7440-36-0	E440A	0.0020	mg/kg wwt		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
arsenic	7440-38-2	E440A	0.0040	mg/kg wwt		0.0064	0.0082	0.0063	0.0167	0.0066
barium	7440-39-3	E440A	0.010	mg/kg wwt		0.112	0.097	0.162	0.246	0.192
beryllium	7440-41-7	E440A	0.0020	mg/kg wwt		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
bismuth	7440-69-9	E440A	0.0020	mg/kg wwt		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
boron	7440-42-8	E440A	0.20	mg/kg wwt		<0.20	<0.20	<0.20	<0.20	<0.20
cadmium	7440-43-9	E440A	0.0010	mg/kg wwt		<0.0010	0.0010	0.0010	0.0078	<0.0010
calcium	7440-70-2	E440A	4.0	mg/kg wwt		137	72.6	369	242	61.5
cesium	7440-46-2	E440A	0.0010	mg/kg wwt		0.0047	0.0046	0.0035	0.0028	0.0063
chromium	7440-47-3	E440A	0.010	mg/kg wwt		<0.010	<0.010	0.040	0.033	0.010
cobalt	7440-48-4	E440A	0.0040	mg/kg wwt		0.0196	0.0142	0.0198	0.0356	0.0115
copper	7440-50-8	E440A	0.020	mg/kg wwt		0.531	0.526	0.495	0.745	0.570
iron	7439-89-6	E440A	0.60	mg/kg wwt		4.96	5.95	7.42	10.6	5.45
lead	7439-92-1	E440A	0.0040	mg/kg wwt		<0.0040	<0.0040	<0.0040	0.0088	<0.0040
lithium	7439-93-2	E440A	0.10	mg/kg wwt		<0.10	<0.10	<0.10	<0.10	<0.10
magnesium	7439-95-4	E440A	0.40	mg/kg wwt		273	277	266	272	233
manganese	7439-96-5	E440A	0.010	mg/kg wwt		0.103	0.086	0.105	0.194	0.098
mercury	7439-97-6	E510A	0.0010	mg/kg wwt		0.0591	0.0325	0.0291	0.0546	0.123
molybdenum	7439-98-7	E440A	0.0040	mg/kg wwt		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
nickel	7440-02-0	E440A	0.040	mg/kg wwt		<0.040	<0.040	<0.040	0.040	<0.040
phosphorus	7723-14-0	E440A	2.0	mg/kg wwt		2750	2820	2790	2600	2470
potassium	7440-09-7	E440A	4.0	mg/kg wwt		4500	4570	4280	4240	4250
rubidium	7440-17-7	E440A	0.010	mg/kg wwt		1.42	1.46	1.14	0.927	1.43
selenium	7782-49-2	E440A	0.010	mg/kg wwt		1.07	1.66	1.43	1.83	1.00
sodium	7440-23-5	E440A	4.0	mg/kg wwt		386	450	492	564	645
strontium	7440-24-6	E440A	0.010	mg/kg wwt		0.123	0.069	0.283	0.262	0.044
tellurium	13494-80-9	E440A	0.0040	mg/kg wwt		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
thallium	7440-28-0	E440A	0.00040	mg/kg wwt		0.0376	0.0237	0.0254	0.0533	0.0258
tin	7440-31-5	E440A	0.020	mg/kg wwt		0.057	0.074	0.047	0.054	0.060

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	4-PA-SEPT30	RB-5-PA-SEPT30	RB-6-PA-SEPT30	GR-1-PA-OCT2	2-PA-OCT2
					Client sampling date / time	30-Sep-2021	30-Sep-2021	30-Sep-2021	02-Oct-2021	02-Oct-2021
						VA21C7109-011	VA21C7109-012	VA21C7109-013	VA21C7109-014	VA21C7109-015
						Result	Result	Result	Result	Result
Metals										
uranium	7440-61-1	E440A	0.00040	mg/kg wwt		<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
vanadium	7440-62-2	E440A	0.020	mg/kg wwt		<0.020	<0.020	<0.020	<0.020	<0.020
zinc	7440-66-6	E440A	0.10	mg/kg wwt		4.04	4.39	4.76	3.76	4.28
zirconium	7440-67-7	E440A	0.040	mg/kg wwt		<0.040	<0.040	<0.040	<0.040	<0.040

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RB-3-PA-OCT2	RB-4-PA-OCT2	RB-5-PA-OCT2	RB-6-DM-OCT3	----
					Client sampling date / time	02-Oct-2021	02-Oct-2021	02-Oct-2021	03-Oct-2021	----
						VA21C7109-016	VA21C7109-017	VA21C7109-018	VA21C7109-019	--------
						Result	Result	Result	Result	----
Physical Tests										
moisture	----	E144	0.50	%		76.4	75.5	75.4	76.4	----
Metals										
aluminum	7429-90-5	E440A	0.40	mg/kg wwt		<0.40	<0.40	<0.40	<0.40	----
antimony	7440-36-0	E440A	0.0020	mg/kg wwt		<0.0020	<0.0020	<0.0020	<0.0020	----
arsenic	7440-38-2	E440A	0.0040	mg/kg wwt		0.0071	0.0203	0.0068	0.0056	----
barium	7440-39-3	E440A	0.010	mg/kg wwt		0.146	0.136	0.178	0.113	----
beryllium	7440-41-7	E440A	0.0020	mg/kg wwt		<0.0020	<0.0020	<0.0020	<0.0020	----
bismuth	7440-69-9	E440A	0.0020	mg/kg wwt		<0.0020	<0.0020	<0.0020	<0.0020	----
boron	7440-42-8	E440A	0.20	mg/kg wwt		<0.20	<0.20	<0.20	<0.20	----
cadmium	7440-43-9	E440A	0.0010	mg/kg wwt		0.0018	0.0021	0.0010	0.0015	----
calcium	7440-70-2	E440A	4.0	mg/kg wwt		161	168	145	274	----
cesium	7440-46-2	E440A	0.0010	mg/kg wwt		0.0039	0.0054	0.0052	0.0050	----
chromium	7440-47-3	E440A	0.010	mg/kg wwt		0.019	0.023	0.016	<0.010	----
cobalt	7440-48-4	E440A	0.0040	mg/kg wwt		0.0335	0.0267	0.0235	0.0062	----
copper	7440-50-8	E440A	0.020	mg/kg wwt		0.409	0.653	0.438	0.171	----
iron	7439-89-6	E440A	0.60	mg/kg wwt		4.72	5.55	4.96	3.00	----
lead	7439-92-1	E440A	0.0040	mg/kg wwt		<0.0040	<0.0040	<0.0040	<0.0040	----
lithium	7439-93-2	E440A	0.10	mg/kg wwt		<0.10	<0.10	<0.10	<0.10	----
magnesium	7439-95-4	E440A	0.40	mg/kg wwt		291	274	242	327	----
manganese	7439-96-5	E440A	0.010	mg/kg wwt		0.076	0.093	0.086	0.109	----
mercury	7439-97-6	E510A	0.0010	mg/kg wwt		0.0292	0.0276	0.0331	0.0405	----
molybdenum	7439-98-7	E440A	0.0040	mg/kg wwt		<0.0040	<0.0040	<0.0040	<0.0040	----
nickel	7440-02-0	E440A	0.040	mg/kg wwt		<0.040	<0.040	<0.040	<0.040	----
phosphorus	7723-14-0	E440A	2.0	mg/kg wwt		2790	2820	2370	2840	----
potassium	7440-09-7	E440A	4.0	mg/kg wwt		4490	4320	3730	4730	----
rubidium	7440-17-7	E440A	0.010	mg/kg wwt		1.22	1.52	1.30	1.73	----
selenium	7782-49-2	E440A	0.010	mg/kg wwt		1.53	1.63	1.72	1.33	----
sodium	7440-23-5	E440A	4.0	mg/kg wwt		766	678	774	266	----
strontium	7440-24-6	E440A	0.010	mg/kg wwt		0.139	0.154	0.155	0.235	----
tellurium	13494-80-9	E440A	0.0040	mg/kg wwt		<0.0040	<0.0040	<0.0040	<0.0040	----
thallium	7440-28-0	E440A	0.00040	mg/kg wwt		0.0289	0.0634	0.0232	0.00813	----
tin	7440-31-5	E440A	0.020	mg/kg wwt		0.036	0.041	0.060	0.059	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RB-3-PA-OCT2	RB-4-PA-OCT2	RB-5-PA-OCT2	RB-6-DM-OCT3	----
					Client sampling date / time	02-Oct-2021	02-Oct-2021	02-Oct-2021	03-Oct-2021	----
						VA21C7109-016	VA21C7109-017	VA21C7109-018	VA21C7109-019	--------
						Result	Result	Result	Result	----
Metals										
uranium	7440-61-1	E440A	0.00040	mg/kg wwt		<0.00040	<0.00040	<0.00040	<0.00040	----
vanadium	7440-62-2	E440A	0.020	mg/kg wwt		<0.020	<0.020	<0.020	<0.020	----
zinc	7440-66-6	E440A	0.10	mg/kg wwt		4.32	5.00	4.43	3.26	----
zirconium	7440-67-7	E440A	0.040	mg/kg wwt		<0.040	<0.040	<0.040	<0.040	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21C7109**	Page	: 1 of 10
Client	: **Azimuth Consulting Group Inc.**	Laboratory	: Vancouver - Environmental
Contact	: Laura Bekar	Account Manager	: Brent Mack
Address	: # 218 - 2902 West Broadway Vancouver BC Canada V6K 2G8	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: 778-370-3279
Project	: BCHydro-Site C-MMP-ICSP	Date Samples Received	: 03-Dec-2021 15:55
PO	: ----	Issue Date	: 08-Feb-2022 15:40
C-O-C number	: ----		
Sampler	: HR FN		
Site	: ----		
Quote number	: Q75925		
No. of samples received	: 19		
No. of samples analysed	: 19		

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 Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

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 Matrix Spike 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 / 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 RB-6-DM-OCT3	E510A	03-Oct-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	122 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 2-PA-OCT2	E510A	02-Oct-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	123 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag GR-1-PA-OCT2	E510A	02-Oct-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	123 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag RB-3-PA-OCT2	E510A	02-Oct-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	123 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag RB-4-PA-OCT2	E510A	02-Oct-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	123 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag RB-5-PA-OCT2	E510A	02-Oct-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	123 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 2-PA-SEPT30	E510A	30-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	125 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 3-PA-SEPT30	E510A	30-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	125 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 4-PA-SEPT30	E510A	30-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	125 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag RB-1-PA-SEPT30	E510A	30-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	125 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag RB-5-PA-SEPT30	E510A	30-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	125 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag RB-6-PA-SEPT30	E510A	30-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	125 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag BT-4-DA-SEPT23	E510A	23-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	132 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag BT-5-AM-SEPT23	E510A	23-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	132 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag BT-3-AM-SEPT21	E510A	21-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	134 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag DV-2-RA-AUG30	E510A	30-Aug-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	156 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 RB-1-RA-AUG30	E510A	30-Aug-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	156 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag 1-PA-AUG26	E510A	26-Aug-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	160 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Routine)										
LDPE bag RB-2-PA-AUG26	E510A	26-Aug-2021	02-Feb-2022	----	----		02-Feb-2022	365 days	160 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag RB-6-DM-OCT3	E440A	03-Oct-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	122 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag 2-PA-OCT2	E440A	02-Oct-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	123 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag GR-1-PA-OCT2	E440A	02-Oct-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	123 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag RB-3-PA-OCT2	E440A	02-Oct-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	123 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag RB-4-PA-OCT2	E440A	02-Oct-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	123 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag RB-5-PA-OCT2	E440A	02-Oct-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	123 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 : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag 2-PA-SEPT30	E440A	30-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	125 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag 3-PA-SEPT30	E440A	30-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	125 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag 4-PA-SEPT30	E440A	30-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	125 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag RB-1-PA-SEPT30	E440A	30-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	125 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag RB-5-PA-SEPT30	E440A	30-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	125 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag RB-6-PA-SEPT30	E440A	30-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	125 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag BT-4-DA-SEPT23	E440A	23-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	132 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag BT-5-AM-SEPT23	E440A	23-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	132 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag BT-3-AM-SEPT21	E440A	21-Sep-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	134 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 : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag DV-2-RA-AUG30	E440A	30-Aug-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	156 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag RB-1-RA-AUG30	E440A	30-Aug-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	156 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag 1-PA-AUG26	E440A	26-Aug-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	160 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Routine)										
LDPE bag RB-2-PA-AUG26	E440A	26-Aug-2021	02-Feb-2022	----	----		02-Feb-2022	730 days	160 days	✓
Physical Tests : Moisture Content by Gravimetry										
LDPE bag 1-PA-AUG26	E144	26-Aug-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag 2-PA-OCT2	E144	02-Oct-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag 2-PA-SEPT30	E144	30-Sep-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag 3-PA-SEPT30	E144	30-Sep-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag 4-PA-SEPT30	E144	30-Sep-2021	----	----	----		31-Jan-2022	----	----	

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
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BT-3-AM-SEPT21	E144	21-Sep-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BT-4-DA-SEPT23	E144	23-Sep-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BT-5-AM-SEPT23	E144	23-Sep-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag DV-2-RA-AUG30	E144	30-Aug-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag GR-1-PA-OCT2	E144	02-Oct-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag RB-1-PA-SEPT30	E144	30-Sep-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag RB-1-RA-AUG30	E144	30-Aug-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag RB-2-PA-AUG26	E144	26-Aug-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag RB-3-PA-OCT2	E144	02-Oct-2021	----	----	----		31-Jan-2022	----	----	

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
Physical Tests : Moisture Content by Gravimetry										
LDPE bag RB-4-PA-OCT2	E144	02-Oct-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag RB-5-PA-OCT2	E144	02-Oct-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag RB-5-PA-SEPT30	E144	30-Sep-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag RB-6-DM-OCT3	E144	03-Oct-2021	----	----	----		31-Jan-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag RB-6-PA-SEPT30	E144	30-Sep-2021	----	----	----		31-Jan-2022	----	----	

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	398793	1	19	5.2	5.0	✓
Metals in Biota by CRC ICPMS (WET units, Routine)	E440A	398794	2	19	10.5	5.0	✓
Moisture Content by Gravimetry	E144	398800	1	19	5.2	5.0	✓
Laboratory Control Samples (LCS)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	398793	2	19	10.5	10.0	✓
Metals in Biota by CRC ICPMS (WET units, Routine)	E440A	398794	2	19	10.5	10.0	✓
Moisture Content by Gravimetry	E144	398800	1	19	5.2	5.0	✓
Method Blanks (MB)							
Mercury in Biota by CVAAS (WET units, Routine)	E510A	398793	1	19	5.2	5.0	✓
Metals in Biota by CRC ICPMS (WET units, Routine)	E440A	398794	1	19	5.2	5.0	✓
Moisture Content by Gravimetry	E144	398800	1	19	5.2	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
Moisture Content by Gravimetry	E144 Vancouver - Environmental	Biota	Puget Sound Water Quality Authority/CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Metals in Biota by CRC ICPMS (WET units, Routine)	E440A Vancouver - Environmental	Biota	EPA 200.3/6020B (mod)	Tissue samples are homogenized and sub-sampled prior to hotblock digestion with HNO3, HCl, and H2O2. Analysis is by Collision/Reaction Cell ICPMS. Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.
Mercury in Biota by CVAAS (WET units, Routine)	E510A Vancouver - Environmental	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 Vancouver - Environmental	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.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **VA21C7109**	Page	: 1 of 10
Client	: Azimuth Consulting Group Inc.	Laboratory	: Vancouver - Environmental
Contact	: Laura Bekar	Account Manager	: Brent Mack
Address	: # 218 - 2902 West Broadway Vancouver BC Canada V6K 2G8	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: 778-370-3279
Project	: BCHydro-Site C-MMP-ICSP	Date Samples Received	: 03-Dec-2021 15:55
PO	: ----	Date Analysis Commenced	: 31-Jan-2022
C-O-C number	: ----	Issue Date	: 08-Feb-2022 15:40
Sampler	: HR FN		
Site	: ----		
Quote number	: Q75925		
No. of samples received	: 19		
No. of samples analysed	: 19		

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 Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

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*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Ragini Saini	Lab Assistant	Metals, Burnaby, British Columbia

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 Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

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
Physical Tests (QC Lot: 398800)											
VA21C7109-003	RB-1-RA-AUG30	moisture	----	E144	0.50	%	77.4	77.3	0.129%	20%	----
Metals (QC Lot: 398793)											
VA21C7109-003	RB-1-RA-AUG30	mercury	7439-97-6	E510A	0.0012	mg/kg wwt	0.148	0.143	3.10%	40%	----
Metals (QC Lot: 398794)											
VA21C7109-003	RB-1-RA-AUG30	calcium	7440-70-2	E440A	4.0	mg/kg wwt	474	439	7.73%	60%	----
		manganese	7439-96-5	E440A	0.010	mg/kg wwt	0.144	0.134	7.22%	40%	----
		strontium	7440-24-6	E440A	0.010	mg/kg wwt	0.348	0.347	0.244%	60%	----
VA21C7109-003	RB-1-RA-AUG30	aluminum	7429-90-5	E440A	0.40	mg/kg wwt	1.26	1.22	0.04	Diff <2x LOR	----
		antimony	7440-36-0	E440A	0.0020	mg/kg wwt	<0.0020	<0.0020	0	Diff <2x LOR	----
		arsenic	7440-38-2	E440A	0.0040	mg/kg wwt	0.0105	0.0111	0.0006	Diff <2x LOR	----
		barium	7440-39-3	E440A	0.010	mg/kg wwt	0.189	0.258	30.8%	40%	----
		beryllium	7440-41-7	E440A	0.0020	mg/kg wwt	<0.0020	<0.0020	0	Diff <2x LOR	----
		bismuth	7440-69-9	E440A	0.0020	mg/kg wwt	<0.0020	<0.0020	0	Diff <2x LOR	----
		boron	7440-42-8	E440A	0.20	mg/kg wwt	<0.20	<0.20	0	Diff <2x LOR	----
		cadmium	7440-43-9	E440A	0.0010	mg/kg wwt	<0.0010	0.0010	0.000005	Diff <2x LOR	----
		cesium	7440-46-2	E440A	0.0010	mg/kg wwt	0.0080	0.0077	3.77%	40%	----
		chromium	7440-47-3	E440A	0.010	mg/kg wwt	0.019	0.010	0.008	Diff <2x LOR	----
		cobalt	7440-48-4	E440A	0.0040	mg/kg wwt	0.0082	0.0080	0.0003	Diff <2x LOR	----
		copper	7440-50-8	E440A	0.020	mg/kg wwt	0.234	0.221	5.72%	40%	----
		iron	7439-89-6	E440A	0.60	mg/kg wwt	4.08	4.39	7.39%	40%	----
		lead	7439-92-1	E440A	0.0040	mg/kg wwt	<0.0040	<0.0040	0	Diff <2x LOR	----
		lithium	7439-93-2	E440A	0.10	mg/kg wwt	<0.10	<0.10	0	Diff <2x LOR	----
		magnesium	7439-95-4	E440A	0.40	mg/kg wwt	292	330	12.2%	40%	----
		molybdenum	7439-98-7	E440A	0.0040	mg/kg wwt	0.0042	<0.0040	0.0002	Diff <2x LOR	----
		nickel	7440-02-0	E440A	0.040	mg/kg wwt	<0.040	<0.040	0	Diff <2x LOR	----
		phosphorus	7723-14-0	E440A	2.0	mg/kg wwt	2640	3360	24.1%	40%	----
		potassium	7440-09-7	E440A	4.0	mg/kg wwt	4480	4520	0.965%	40%	----
		rubidium	7440-17-7	E440A	0.010	mg/kg wwt	3.37	3.38	0.460%	40%	----
		selenium	7782-49-2	E440A	0.010	mg/kg wwt	0.753	0.767	1.93%	40%	----
		sodium	7440-23-5	E440A	4.0	mg/kg wwt	563	581	3.18%	40%	----
		tellurium	13494-80-9	E440A	0.0040	mg/kg wwt	<0.0040	<0.0040	0	Diff <2x LOR	----

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: 398794) - continued											
VA21C7109-003	RB-1-RA-AUG30	thallium	7440-28-0	E440A	0.00040	mg/kg wwt	0.00927	0.0105	12.3%	40%	----
		tin	7440-31-5	E440A	0.020	mg/kg wwt	0.033	<0.020	0.013	Diff <2x LOR	----
		uranium	7440-61-1	E440A	0.00040	mg/kg wwt	<0.00040	0.00052	0.00012	Diff <2x LOR	----
		vanadium	7440-62-2	E440A	0.020	mg/kg wwt	<0.020	<0.020	0	Diff <2x LOR	----
		zinc	7440-66-6	E440A	0.10	mg/kg wwt	3.34	4.18	22.6%	40%	----
		zirconium	7440-67-7	E440A	0.040	mg/kg wwt	<0.040	<0.040	0	Diff <2x LOR	----

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
Physical Tests (QCLot: 398800)						
moisture	----	E144	0.5	%	<0.50	----
Metals (QCLot: 398793)						
mercury	7439-97-6	E510A	0.001	mg/kg wwt	<0.0010	----
Metals (QCLot: 398794)						
aluminum	7429-90-5	E440A	0.4	mg/kg wwt	<0.40	----
antimony	7440-36-0	E440A	0.002	mg/kg wwt	<0.0020	----
arsenic	7440-38-2	E440A	0.004	mg/kg wwt	<0.0040	----
barium	7440-39-3	E440A	0.01	mg/kg wwt	<0.010	----
beryllium	7440-41-7	E440A	0.002	mg/kg wwt	<0.0020	----
bismuth	7440-69-9	E440A	0.002	mg/kg wwt	<0.0020	----
boron	7440-42-8	E440A	0.2	mg/kg wwt	<0.20	----
cadmium	7440-43-9	E440A	0.001	mg/kg wwt	<0.0010	----
calcium	7440-70-2	E440A	4	mg/kg wwt	<4.0	----
cesium	7440-46-2	E440A	0.001	mg/kg wwt	<0.0010	----
chromium	7440-47-3	E440A	0.01	mg/kg wwt	<0.010	----
cobalt	7440-48-4	E440A	0.004	mg/kg wwt	<0.0040	----
copper	7440-50-8	E440A	0.02	mg/kg wwt	<0.020	----
iron	7439-89-6	E440A	0.6	mg/kg wwt	<0.60	----
lead	7439-92-1	E440A	0.004	mg/kg wwt	<0.0040	----
lithium	7439-93-2	E440A	0.1	mg/kg wwt	<0.10	----
magnesium	7439-95-4	E440A	0.4	mg/kg wwt	<0.40	----
manganese	7439-96-5	E440A	0.01	mg/kg wwt	<0.010	----
molybdenum	7439-98-7	E440A	0.004	mg/kg wwt	<0.0040	----
nickel	7440-02-0	E440A	0.04	mg/kg wwt	<0.040	----
phosphorus	7723-14-0	E440A	2	mg/kg wwt	<2.0	----
potassium	7440-09-7	E440A	4	mg/kg wwt	<4.0	----
rubidium	7440-17-7	E440A	0.01	mg/kg wwt	<0.010	----
selenium	7782-49-2	E440A	0.01	mg/kg wwt	<0.010	----
sodium	7440-23-5	E440A	4	mg/kg wwt	<4.0	----
strontium	7440-24-6	E440A	0.01	mg/kg wwt	<0.010	----
tellurium	13494-80-9	E440A	0.004	mg/kg wwt	<0.0040	----
thallium	7440-28-0	E440A	0.0004	mg/kg wwt	<0.00040	----
tin	7440-31-5	E440A	0.02	mg/kg wwt	<0.020	----

Sub-Matrix: **Biota**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 398794) - continued						
uranium	7440-61-1	E440A	0.0004	mg/kg wwt	<0.00040	----
vanadium	7440-62-2	E440A	0.02	mg/kg wwt	<0.020	----
zinc	7440-66-6	E440A	0.1	mg/kg wwt	<0.10	----
zirconium	7440-67-7	E440A	0.04	mg/kg wwt	<0.040	----

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
Physical Tests (QCLot: 398800)									
moisture	----	E144	0.5	%	50 %	100	90.0	110	----
Metals (QCLot: 398793)									
mercury	7439-97-6	E510A	0.001	mg/kg wwt	0.02 mg/kg wwt	102	80.0	120	----
Metals (QCLot: 398794)									
aluminum	7429-90-5	E440A	0.4	mg/kg wwt	20 mg/kg wwt	103	80.0	120	----
antimony	7440-36-0	E440A	0.002	mg/kg wwt	10 mg/kg wwt	109	80.0	120	----
arsenic	7440-38-2	E440A	0.004	mg/kg wwt	10 mg/kg wwt	104	80.0	120	----
barium	7440-39-3	E440A	0.01	mg/kg wwt	2.5 mg/kg wwt	108	80.0	120	----
beryllium	7440-41-7	E440A	0.002	mg/kg wwt	1 mg/kg wwt	103	80.0	120	----
bismuth	7440-69-9	E440A	0.002	mg/kg wwt	10 mg/kg wwt	100	80.0	120	----
boron	7440-42-8	E440A	0.2	mg/kg wwt	10 mg/kg wwt	103	80.0	120	----
cadmium	7440-43-9	E440A	0.001	mg/kg wwt	1 mg/kg wwt	101	80.0	120	----
calcium	7440-70-2	E440A	4	mg/kg wwt	500 mg/kg wwt	104	80.0	120	----
cesium	7440-46-2	E440A	0.001	mg/kg wwt	0.5 mg/kg wwt	103	80.0	120	----
chromium	7440-47-3	E440A	0.01	mg/kg wwt	2.5 mg/kg wwt	104	80.0	120	----
cobalt	7440-48-4	E440A	0.004	mg/kg wwt	2.5 mg/kg wwt	104	80.0	120	----
copper	7440-50-8	E440A	0.02	mg/kg wwt	2.5 mg/kg wwt	103	80.0	120	----
iron	7439-89-6	E440A	0.6	mg/kg wwt	10 mg/kg wwt	106	80.0	120	----
lead	7439-92-1	E440A	0.004	mg/kg wwt	5 mg/kg wwt	103	80.0	120	----
lithium	7439-93-2	E440A	0.1	mg/kg wwt	2.5 mg/kg wwt	109	80.0	120	----
magnesium	7439-95-4	E440A	0.4	mg/kg wwt	500 mg/kg wwt	106	80.0	120	----
manganese	7439-96-5	E440A	0.01	mg/kg wwt	2.5 mg/kg wwt	104	80.0	120	----
molybdenum	7439-98-7	E440A	0.004	mg/kg wwt	2.5 mg/kg wwt	105	80.0	120	----
nickel	7440-02-0	E440A	0.04	mg/kg wwt	5 mg/kg wwt	101	80.0	120	----
phosphorus	7723-14-0	E440A	2	mg/kg wwt	100 mg/kg wwt	111	80.0	120	----
potassium	7440-09-7	E440A	4	mg/kg wwt	500 mg/kg wwt	105	80.0	120	----
rubidium	7440-17-7	E440A	0.01	mg/kg wwt	1 mg/kg wwt	106	80.0	120	----
selenium	7782-49-2	E440A	0.01	mg/kg wwt	10 mg/kg wwt	102	80.0	120	----
sodium	7440-23-5	E440A	4	mg/kg wwt	500 mg/kg wwt	106	80.0	120	----
strontium	7440-24-6	E440A	0.01	mg/kg wwt	2.5 mg/kg wwt	106	80.0	120	----
tellurium	13494-80-9	E440A	0.004	mg/kg wwt	1 mg/kg wwt	103	80.0	120	----
thallium	7440-28-0	E440A	0.0004	mg/kg wwt	10 mg/kg wwt	103	80.0	120	----
tin	7440-31-5	E440A	0.02	mg/kg wwt	5 mg/kg wwt	104	80.0	120	----

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: 398794) - continued									
uranium	7440-61-1	E440A	0.0004	mg/kg wwt	0.05 mg/kg wwt	107	80.0	120	----
vanadium	7440-62-2	E440A	0.02	mg/kg wwt	5 mg/kg wwt	107	80.0	120	----
zinc	7440-66-6	E440A	0.1	mg/kg wwt	5 mg/kg wwt	99.6	80.0	120	----
zirconium	7440-67-7	E440A	0.04	mg/kg wwt	1 mg/kg wwt	100	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: **Biota**

					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: 398793)									
QC-398793-003	RM	mercury	7439-97-6	E510A	0.331 mg/kg wwt	115	70.0	130	----
Metals (QCLot: 398794)									
QC-398794-003	RM	aluminum	7429-90-5	E440A	11.2 mg/kg wwt	98.0	70.0	130	----
QC-398794-003	RM	arsenic	7440-38-2	E440A	34.6 mg/kg wwt	97.6	70.0	130	----
QC-398794-003	RM	bismuth	7440-69-9	E440A	0.0247 mg/kg wwt	87.3	60.0	140	----
QC-398794-003	RM	cadmium	7440-43-9	E440A	14.5 mg/kg wwt	93.8	70.0	130	----
QC-398794-003	RM	calcium	7440-70-2	E440A	550 mg/kg wwt	97.5	70.0	130	----
QC-398794-003	RM	cesium	7440-46-2	E440A	0.0712 mg/kg wwt	95.8	70.0	130	----
QC-398794-003	RM	chromium	7440-47-3	E440A	1.96 mg/kg wwt	101	70.0	130	----
QC-398794-003	RM	cobalt	7440-48-4	E440A	0.267 mg/kg wwt	97.8	70.0	130	----
QC-398794-003	RM	copper	7440-50-8	E440A	35 mg/kg wwt	99.1	70.0	130	----
QC-398794-003	RM	iron	7439-89-6	E440A	1070 mg/kg wwt	98.9	70.0	130	----
QC-398794-003	RM	lead	7439-92-1	E440A	0.162 mg/kg wwt	110	70.0	130	----
QC-398794-003	RM	magnesium	7439-95-4	E440A	940 mg/kg wwt	96.6	70.0	130	----
QC-398794-003	RM	manganese	7439-96-5	E440A	8.91 mg/kg wwt	97.3	70.0	130	----
QC-398794-003	RM	molybdenum	7439-98-7	E440A	1.41 mg/kg wwt	98.2	70.0	130	----
QC-398794-003	RM	nickel	7440-02-0	E440A	1.57 mg/kg wwt	108	70.0	130	----
QC-398794-003	RM	phosphorus	7723-14-0	E440A	11500 mg/kg wwt	99.7	70.0	130	----
QC-398794-003	RM	potassium	7440-09-7	E440A	14400 mg/kg wwt	100	70.0	130	----
QC-398794-003	RM	rubidium	7440-17-7	E440A	5.11 mg/kg wwt	95.5	70.0	130	----
QC-398794-003	RM	selenium	7782-49-2	E440A	8 mg/kg wwt	97.8	70.0	130	----
QC-398794-003	RM	sodium	7440-23-5	E440A	10673 mg/kg wwt	98.6	70.0	130	----
QC-398794-003	RM	strontium	7440-24-6	E440A	3.92 mg/kg wwt	92.4	70.0	130	----
QC-398794-003	RM	thallium	7440-28-0	E440A	0.013 mg/kg wwt	89.2	70.0	130	----
QC-398794-003	RM	uranium	7440-61-1	E440A	0.0786 mg/kg wwt	104	70.0	130	----
QC-398794-003	RM	vanadium	7440-62-2	E440A	0.51 mg/kg wwt	97.2	70.0	130	----
QC-398794-003	RM	zinc	7440-66-6	E440A	105.3 mg/kg wwt	96.9	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 21 -

Page 1 of 1

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

Report To	Contact and company name below will appear on the final report
Company:	Azimuth Consulting Group
Contact:	Laura Bekar
Phone:	604-340-3376
	Company address below will appear on the final report
Street:	2902 West Broadway
City/Province:	Vancouver
Postal Code:	v6k2g8
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	Azimuth Consulting Group
Contact:	604-340-3376

Reports / Recipients

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax lbekar@azimuthgroup.ca

Email 2 gmann@azimuthgroup.ca

Email 3

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax lbekar@azimuthgroup.ca

Email 2 gmann@azimuthgroup.ca

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges apply
☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum
☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum
☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum
☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum
☐ Same day [E2] if received by 10am M-S - 200% rush surcharge.

Additional fees may apply to rush requests on weekends, statutory holidays and for non-routine tests.

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm am/pm

For all tests with rush TATs requested, please contact your AM to confirm availability.

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Project Information

ALS Account # / Quote #:	Q75925
Job #:	BC Hydro Site C - MMP ICSP
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (ALS use only):

ALS Contact: Brent Mack **Sampler:** HR FN

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Metals including mercury	moisture	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	1-PA-Aug26	26-Aug-21		tissue		R	R			
	RB-2-PA-Aug26	26-Aug-21		tissue		R	R			
	RB-1-RA-Aug30	30-Aug-21		tissue		R	R			
	DV-2-RA-Aug30	30-Aug-21		tissue		R	R			
	BT-3-AM-Sept21	21-Sep-21		tissue		R	R			
	BT-4-DA-Sept23	23-Sep-21		tissue		R	R			
	BT-5-AM-Sept23	23-Sep-21		tissue		R	R			
	RB-1-PA-Sept30	30-Sep-21		tissue		R	R			
	2-PA-Sept30	30-Sep-21		tissue		R	R			
	3-PA-Sept30	30-Sep-21		tissue		R	R			

Environmental Division
Vancouver
Work Order Reference
VA21C7109

Telephone : +1 604 253 4188

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☑ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				5.4			

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
LB	Dec 3	

INITIAL SHIPMENT RECEPTION (ALS use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (ALS use only)

Received by:	Date:	Time:
RJ	DEC 3	15:55

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

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.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

COC Number: 21 -

Page 2 of 2

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Report To	Contact and company name below will appear on the final report
Company:	Azimuth Consulting Group
Contact:	Laura Bekar
Phone:	604-340-3376
	Company address below will appear on the final report
Street:	2902 West Broadway
City/Province:	Vancouver
Postal Code:	v6k2g8
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	Azimuth Consulting Group
Contact:	604-340-3376

Reports / Recipients

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax lbekar@azimuthgroup.ca

Email 2 gmann@azimuthgroup.ca

Email 3

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax lbekar@azimuthgroup.ca

Email 2 gmann@azimuthgroup.ca

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge.

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Additional fees may apply to rush requests on weekends, statutory holidays and for non-routine tests.

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm am/pm

For all tests with rush TATs requested, please contact your AM to confirm availability.

Project Information

ALS Account # / Quote #:	Q75925
Job #:	BC Hydro Site C - MMP ICSP
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (ALS use only):

ALS Contact: Brent Mack **Sampler:** HR FN

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Metals including mercury	moisture	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	4-PA-Sept30	30-Sep-21		tissue		R	R			
	RB-5-PA-Sept-30	30-Sep-21		tissue		R	R			
	RB-6-PA-Sept30	30-Sep-21		tissue		R	R			
	GR-1-PA-Oct2	2-Oct-21		tissue		R	R			
	2-PA-Oct2	2-Oct-21		tissue		R	R			
	RB-3-PA-Oct2	2-Oct-21		tissue		R	R			
	RB-4-PA-Oct2	2-Oct-21		tissue		R	R			
	RB-5-PA-Oct2	2-Oct-21		tissue		R	R			
	RB-6-DM-Oct3	3-Oct-21		tissue		R	R			

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

[redacted]

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☑ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				5.4			

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
LB	Dec 3	

INITIAL SHIPMENT RECEPTION (ALS use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (ALS use only)

Received by:	Date:	Time:
RJ	DEC-3	15:55

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

ALIQ 2020 FRONT

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.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Project	Sample ID	SINLAB ID	Date	Row	Amount
BC Hydro MMP - ICSP	1-PA-Aug26	21LAB 264	27-Jan-22	74	1.053
BC Hydro MMP - ICSP	RB-2-PA-Aug26	21LAB 265	27-Jan-22	75	1.111
BC Hydro MMP - ICSP	RB-1-RA-Aug30	21LAB 266	27-Jan-22	76	1.088
BC Hydro MMP - ICSP	DV-2-RA-Aug30	21LAB 267	27-Jan-22	82	1.182
BC Hydro MMP - ICSP	DV-2-RA-Aug30	21LAB 267R	27-Jan-22	98	1.065
BC Hydro MMP - ICSP	BT-3-AM-Sept21	21LAB 268	27-Jan-22	83	0.992
BC Hydro MMP - ICSP	BT-4-DA-Sept23	21LAB 269	27-Jan-22	84	1.061
BC Hydro MMP - ICSP	BT-5-AM-Sept23	21LAB 270	27-Jan-22	85	1.009
BC Hydro MMP - ICSP	RB-1-PA-Sept30	21LAB 271	27-Jan-22	86	0.998
BC Hydro MMP - ICSP	2-PA-Sept30	21LAB 272	27-Jan-22	87	1.117
BC Hydro MMP - ICSP	3-PA-Sept30	21LAB 273	27-Jan-22	88	1.164
BC Hydro MMP - ICSP	4-PA-Sept30	21LAB 274	27-Jan-22	89	1.091
BC Hydro MMP - ICSP	RB-5-PA-Sept-30	21LAB 275	27-Jan-22	90	1.038
BC Hydro MMP - ICSP	RB-6-PA-Sept30	21LAB 276	27-Jan-22	91	1.127
BC Hydro MMP - ICSP	GR-1-PA-Oct2	21LAB 277	27-Jan-22	92	1.100
BC Hydro MMP - ICSP	2-PA-Oct2	21LAB 278	27-Jan-22	93	1.129
BC Hydro MMP - ICSP	RB-3-PA-Oct2	21LAB 279	27-Jan-22	94	1.160
BC Hydro MMP - ICSP	RB-4-PA-Oct2	21LAB 280	27-Jan-22	95	1.205
BC Hydro MMP - ICSP	RB-5-PA-Oct2	21LAB 281	27-Jan-22	96	1.196
BC Hydro MMP - ICSP	RB-6-DM-Oct3	21LAB 282	27-Jan-22	97	1.123

CO2 Ampl	N2 Ampl	d13C	d15N	%C	%N	C/N	Comment	Preparation
6.040	6.004	-30.3	10.8	49.00	14.33	3.42		DELTA V-4010
6.010	6.489	-30.2	9.1	46.40	14.68	3.16		DELTA V-4010
5.970	6.223	-29.3	11.0	46.92	14.39	3.26		DELTA V-4010
6.183	6.387	-28.2	9.4	44.65	13.54	3.30		DELTA V-4010
5.661	6.004	-28.0	9.2	45.03	14.14	3.18		DELTA V-4010
5.522	5.921	-29.7	11.3	47.18	14.98	3.15		DELTA V-4010
5.926	6.216	-29.2	11.3	47.63	14.72	3.24		DELTA V-4010
5.612	5.506	-30.4	10.8	47.18	13.74	3.43		DELTA V-4010
5.949	5.798	-32.0	10.3	50.80	14.61	3.48		DELTA V-4010
6.281	6.624	-31.9	11.0	48.28	14.89	3.24		DELTA V-4010
6.619	6.925	-31.5	9.2	48.99	14.93	3.28		DELTA V-4010
5.973	6.244	-31.3	12.2	46.61	14.33	3.25		DELTA V-4010
5.843	5.880	-30.3	9.4	47.58	14.16	3.36		DELTA V-4010
6.207	6.424	-31.0	9.8	47.12	14.30	3.30		DELTA V-4010
6.138	6.455	-31.9	9.8	47.47	14.65	3.24		DELTA V-4010
6.257	6.143	-30.5	12.2	47.38	13.62	3.48		DELTA V-4010
6.320	6.764	-31.1	9.7	46.74	14.65	3.19		DELTA V-4010
6.560	6.622	-33.4	8.5	46.84	13.78	3.40		DELTA V-4010
6.611	6.742	-31.1	9.8	47.38	14.11	3.36		DELTA V-4010
6.095	6.610	-27.8	7.6	46.24	14.76	3.13		DELTA V-4010

APPENDIX F
FIELD COLLECTED DATA

Table F-1. Field collected data recorded by Community Champions during the 2021 Halfway River Pilot Study.

Fish ID	Species	Fish #	Sampler	Sample Date (yyyy-mm-dd)	Fork Length (mm)	Sample Location (UTM Zone 10)	
						Easting	Northing
BT-1-PA-Aug26	BT	1	Patricia Apannah	2021-08-26	444.5	545444	6260418
RB-2-PA-Aug26	RB	2	Patricia Apannah	2021-08-26	285.75	545444	6260418
RB-3-RA-Aug30	RB	3	Rider Achla	2021-08-30	340	568864	6259397
BT-4-RA-Aug30	BT	4	Rider Achla	2021-08-30	500	568864	6259397
BT-5-AM-Sep21	BT	5	Amanda Metecheah	2021-09-21	527.05	553468	6262938
BT-6-DA-Sep23	BT	6	Danny Apsassin	2021-09-23	533.4	566398	6261230
BT-7-AM-Sep23	BT	7	Amanda Metecheah	2021-09-23	584.2	566398	6261230
RB-8-PA-Sep30	RB	8	Patricia Apannah	2021-09-30	406.4	492905	6315504
MW-9-PA-Sep30	MW	9	Patricia Apannah	2021-09-30	381	492905	6315504
MW-10-PA-Sep30	MW	10	Patricia Apannah	2021-09-30	317.5	492905	6315504
BT-11-PA-Sep30	BT	11	Patricia Apannah	2021-09-30	406.4	492905	6315504
RB-12-PA-Sep30	RB	12	Patricia Apannah	2021-09-30	342.9	492905	6315504
RB-13-PA-Sep30	RB	13	Patricia Apannah	2021-09-30	317.5	492905	6315504
MW-14-PA-Oct2	MW	14	Patricia Apannah	2021-10-02	368.3	492905	6315504
BT-15-PA-Oct2	BT	15	Patricia Apannah	2021-10-02	539.75	492905	6315504
RB-16-PA-Oct2	RB	16	Patricia Apannah	2021-10-02	317.5	492905	6315504
RB-17-PA-Oct2	RB	17	Patricia Apannah	2021-10-02	317.5	492905	6315504
RB-18-PA-Oct2	RB	18	Patricia Apannah	2021-10-02	419.1	492905	6315504
RB-19-DM-Oct3	RB	19	Delphus Metecheah	2021-10-03	361.95	535333	6272704