



Great Bear Lake Sites

2017 Annual Water Licence Report (# S17L8-002)

APPENDIX C – 2017 Water Quality Monitoring Report



Great Bear Lake Sites

2017 Water Quality Monitoring Report

FINAL



Prepared for: **Indigenous and Northern Affairs Canada**
 Contaminants and Remediation Division

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1 INTRODUCTION AND BACKGROUND

1.1 THE GREAT BEAR LAKE SITES

Indigenous and Northern Affairs Canada (INAC) has the responsibility to manage a number of contaminated sites that are no longer maintained by the original occupant. INAC's portfolio of contaminated sites in the north originates from private sector mining, oil and gas activities, government, military activity and other users of the land dating back over half a century, many years before the environmental impacts of such activities were adequately understood. The abandoned Great Bear Lake (GBL) Sites are amongst these legacy properties. Under the Contaminated Sites Management Program (CSMP), the INAC Contaminants and Remediation Division (CARD) aims to complete remediation of the GBL Sites to improve environmental conditions and reduce environmental/safety risks.

The GBL Sites refer collectively to the abandoned historic industrial properties of Silver Bear Mines (made up of the larger Terra Mine and smaller satellite sites of Northrim, Norex, Graham Vein and Smallwood), El Bonanza/Bonanza Mine, Contact Lake Mine and the Sawmill Bay site. The GBL Sites are located on or adjacent to the eastern shore of Great Bear Lake, within the Sahtu Region of the Northwest Territories (Appendix A, Figure A1). The properties lie within the boundaries of the Sahtu Dene and Metis Comprehensive Land Claim Agreement and a portion of the Silver Bear Mines also overlap with the Tłıchǫ Mǫwhì Gogha Dè Nìjìlèè Boundary. GBL Sites are 400-440 km north-northwest of Yellowknife, 175-220 km north of Gamètì and 215-275 km east of Délne (the nearest community within the Sahtu Land Claim). The sites are within 60 km of one another and have therefore been logically consolidated for the purposes of monitoring and remediation. While the properties are remote and none are accessible by public or private roadway, they may be reached by rotary wing, fixed wing (floats at all sites or wheels at the abandoned airstrips at Terra Mine and Sawmill Bay) or by barge/boat.

Silver Bear Mines were underground mining properties (with a small volume of surface work), which produced primarily silver, copper and bismuth and were in operation from 1969 to 1985. The Contact Lake Mine was significantly smaller in scale and was originally an underground silver mine during the 1930s which was also mined for uranium in 1949/50. El Bonanza and Bonanza Mines are both located on the Dowdell Peninsula and were small scale silver mines operational 1934-1936, 1956-1957, and in 1965. The Sawmill Bay Site was established as a sawmill in the 1930's, after which it was used for barging and air transportation of uranium ore from Port Radium (1940's-1950). It was subsequently used for various military activities (1950s) and, later, as a fishing lodge (late 1950s to 1987). All GBL Sites now fall under the custodial responsibility of INAC-CARD.

The GBL Sites have been the subject of numerous assessments and studies to characterize the nature of environmental contamination and physical hazards. INAC's efforts to date have included Site Assessments, Hazardous Material Surveys, Risk Assessments and focused geochemical studies to name a few. Water quality monitoring has been conducted over multiple years, the results of which were relied upon to help determine the nature of site contamination, the impacts to the receiving environment and the requirements for site remediation. Efforts culminated in the production of Remedial Action Plans (RAPs) for each of the project sites, which summarized site conditions, interpreted results of sampling/assessment, evaluated remedial options and presented the selected remedial approach based on technical input and community consultations.

Remediation of the GBL Sites was first initiated as the Phase I Remediation Project completed in 2010-2011. Efforts focussed on work activities which could be completed without mobilization of heavy equipment at Contact Lake Mine, El Bonanza/Bonanza Mine and Sawmill Bay. This included drum consolidation, product consolidation/removal, building destruction (Contact Lake and El Bonanza/Bonanza mines only) and debris consolidation. This was followed with the ongoing consolidation and removal of drums with residual fuel/product in 2016, including at the Silver Bear Mines. While these efforts have reduced site risks, there have been no earthworks or other site alterations to date which could be expected to substantially alter the receiving environment or aquatic conditions.

Remaining work activities to complete the remediation as outlined in the RAPs will be completed as the GBL Sites Phase II Remediation Project, tentatively scheduled to require approximately five years. This will include completion of earthworks at Contact Lake Mine, El Bonanza/Bonanza Mine and Sawmill Bay, as well as the comprehensive remediation of the Silver Bear Mines.

1.2 THE 2017 WATER SAMPLING PROGRAM OVERVIEW

Water quality assessment and monitoring at the GBL sites has been conducted since the early 1990s, through which an extensive water quality database has been amassed. In keeping with INAC's objectives of environmental management at its project sites and requirements of regulatory authorizations, water quality monitoring continued in 2017.

The objectives, rationale, monitoring methodologies and stations were presented within the *GBL Sites 2017 Water Sampling Plan* (the Plan), produced September 2017 and provided to the Sahtu Land and Water Board. As detailed in the Plan, the scope of the monitoring activities

included the specific requirements of the Water Licence Surveillance Network Program (SNP), as well as extended monitoring reflecting the recommendations of the *Great Bear Lake Sites Proposed Long-Term, Status of Environment and Construction Monitoring Plan* (SENES 2009), and the *2016 Water Quality Monitoring Report* (SLR 2017).

The program was implemented by INAC and Public Services and Procurement Canada (PSPC) with assistance from DXB Projects and community members of Déljne through Techit?q Ltd. The field program operated September 6-15, 2017 utilizing the available facilities at the former Terra Mine as a basecamp. Fixed wing aircraft (on wheels and floats) and watercraft were used to access the various satellite sites. In keeping with the recommendations of predecessor documents, sample collection and field measurements were collected at each of the Silver Bear Mines (Terra, Northrim, Norex, Graham Vein and Smallwood), Contact Lake Mine, El Bonanza Mine and Sawmill Bay. This included sample collection at a total of 71 stations (plus multiple depth sampling at select stations and quality assurance/quality control samples), with analysis preformed by ALS Laboratories.

While water quality monitoring was the primary driver of the 2017 field program, additional work activities, inspections and gap filling was opportunistically implemented further to input from Inspectors and other regulatory agencies. The results of these secondary tasks have been reported as necessary to the INAC Land Use Inspector to address outstanding questions and concerns.

Upon completion of the field program, field observations and data were integrated with results of laboratory analyses. **As directed by the Sahtu Land and Water Board, these findings have been synthesized into a concise data report presenting only 2017 findings.** Per the requirements of the most recent Water Licence (S17L8-002, amended October 30, 2017), a *Baseline Water Quality Monitoring Report* will be produced at least six months prior to remediation which synthesizes the 2017 results with previous monitoring data to complete multi-year spatial and temporal trend analysis. While statistical analysis was not to be included within the 2017 data report, for the primary parameters of concern a summary level comparison of current and previous results was conducted.

2 DESIGN CONSIDERATIONS AND OBJECTIVES

The *GBL Sites 2017 Water Sampling Plan* (INAC-CARD 2017b) presented the design considerations and monitoring objectives used to develop the 2017 sampling program. These considerations include continuation of monitoring at previously established stations, recommendations of predecessor documents, regulatory requirements and additional monitoring where necessary to meet site objectives and refinements of remedial designs.

2.1 PREVIOUS MONITORING AT THE GBL SITES

Water quality assessment first commenced at the GBL Sites in 1992, followed by monitoring programs on an ad-hoc basis. A full itemization of the reports which include water quality assessment and monitoring data is provided in Table 1 below. These work activities helped in identifying aquatic concerns at the project sites and in characterizing the mobility of contaminant sources.

Table 1 List of GBL Water Quality Assessment and Monitoring Reports

Year	Report Name	Author
1992	Environmental Assessment and Reclamation Options for Abandoned Mines in the Northwest Territories (Mine Sites in the Camsell River Area)	EBA Engineering Consultants Ltd.
1993	Site Characterization and Environmental Assessment of Seven Abandoned Mine Sites in the Northwest Territories, Volume 1 - Environmental Assessment Summary Report	EBA Engineering Consultants Ltd.
1993	Environmental Assessment of the Abandoned Contact Lake Mine Site. Prepared for Public Works Canada, Architecture and Engineering Services Architecture and Engineering Services Branch	EBA Engineering Consultants Ltd.
1997	1996 AES Abandoned Mine Assessments Volume II	Vista Engineering
2005	Silver Bear Mine Sites, Northwest Territories Water Quality Monitoring Program. Final Report 2002 to 2004.	INAC Water Resources Division
2005	Aquatic Pre-Remediation Studies 2004, Silver Bear Mines	Rescan Environmental Services Ltd.
2005	Enhanced Phase I Environmental Site Assessment (El Bonanza Mine).	Golder Associates Ltd.
2006	Summary Report Update: 2005 Monitoring Data for Contact Lake Mine.	INAC Water Resources Division
2006	Silver Bear Mine Sites, Northwest Territories, Hydrologic Monitoring Program	INAC Water Resources Division
2006	Silver Bear Mine Sites, Northwest Territories, Water Quality Monitoring Program	INAC Water Resources Division
2006	Phase I, II, and III Investigations of the Historic Northern Uranium Transportation Network in the Northwest Territories and Northern Alberta	SRK Consulting (Canada) Inc
2006	Contact Lake Mine Site Assessment Report on July 2006 Field Activities and Follow-Up Site Assessment	SENES Consultants Ltd.
2007	Silver Bear Mine Sites, Northwest Territories, 2006 Hydrologic Monitoring Program	INAC Water Resources Division
2007	Silver Bear Mine Sites, Northwest Territories, 2006 Water Quality Monitoring Program	INAC Water Resources Division

Year	Report Name	Author
2007	Contact Lake Mine Site Assessment Report on July 2006 Field Activities and Follow-Up Site Assessment	SENES Consultants Ltd.
2007	El Bonanza Mine - Report on July 2006 Field Activities and Follow-Up Site Assessment	SENES Consultants Ltd.
2007	Phase III A Environmental Site Assessment, Sawmill Bay - SM 204, Northwest Territories, prepared by Franz Environmental Inc., 2007	FRANZ Environmental Inc. and Ecometrix Incorporated
2007	Contact Lake Mine Supplemental 2007 Site Assessment - June 2007 Field Activities and Follow-Up Site Assessment	SENES Consultants Ltd.
2007	El Bonanza Mine Supplemental 2007 Site Assessment - June 2007 Field Activities and Follow-Up Site Assessment	SENES Consultants Ltd.
2008	Silver Bear Mine Sites, Northwest Territories, 2007 Hydrologic Monitoring Program	INAC Water Resources Division
2008	Silver Bear Mine Sites, Northwest Territories, 2007 Water Quality Monitoring Program,	INAC Water Resources Division
2008	Detailed Environmental Site Assessment, Sawmill Bay, Northwest Territories NM-180	FRANZ Environmental Inc. and EcoMetrix Incorporated
2009	Silver Bear Mine Sites, Northwest Territories, 2008 Water Quality Monitoring Program	INAC Water Resources Division
2009	Silver Bear Mine Sites, Northwest Territories, 2008 Hydrologic Monitoring Program	INAC Water Resources Division
2009	El Bonanza Mine Supplemental 2008 Site Assessment - June 2008 Field Activities and Follow-Up Site Assessment	SENES Consultants Ltd.
2009	Contact Lake Supplemental Site Assessment - Report on June 2008 Field Activities and Follow-Up Site Assessment	SENES Consultants Ltd.
2010	Silver Bear Mine Sites, Northwest Territories, 2009 Hydrologic Monitoring Program	INAC Water Resources Division
2011	Silver Bear Mine Sites, Northwest Territories, 2009 Water Quality Monitoring Program	INAC Water Resources Division
2010	Great Bear Lake Sites 2009 Baseline Monitoring Program.	SENES Consultants Ltd.
2014	Silver Bear Mine Sites, Northwest Territories, 2013 Water Quality Monitoring Program	AANDC Water Resources Division
2016	2015 Water Quality Monitoring of Terra Mine	Arcadis Canada Inc.
2017	2016 Water Quality Monitoring Program at the Great Bear Lake Sites - Final Report	SLR Consulting (Canada) Ltd.

The results of these assessment and monitoring campaigns informed remedial decision making, serve as a pre-remediation baseline and were also incorporated into on-going monitoring to ensure pre-remediation site conditions remained stable and remedial assumptions continued to hold true. As much as possible, the monitoring methodologies from these earlier programs were evaluated and carried forward in 2017 to enable data comparison over the multi-year dataset.

2.2 PREDECESSOR MONITORING PLANS

As part of the Federal Contaminated Sites Action Plan (FCSAP) 10-Step Process, INAC-CARD has taken preliminary steps to outline monitoring requirements before, during and after

remediation. In 2009, SENES Consultants Ltd. produced the *Great Bear Lake Sites Proposed Long-Term, Status of Environment and Construction Monitoring Plan* (SENES 2009), including recommendations for pre-remediation monitoring. This document utilized the available RAPs to develop preliminary monitoring requirements for the Silver Bear Mines, Contact Lake Mine and El Bonanza/Bonanza Mine and incorporated a review of all water monitoring conducted at the sites. However, the RAP for Sawmill Bay had not yet been designed and monitoring components were consequently not included. Following the finalization of the SENES *Long-Term, Status of Environment and Construction Monitoring Plan*, the project advanced to the detailed design and engineering stage which resulted in minor updates to several of the concepts that were presented in the RAPs.

Monitoring at the GBL Sites has continued after development of the *Long-Term, Status of Environment and Construction Monitoring Plan*. This was implemented to ensure site conditions have been adequately characterized and are remaining stable. In addition to monitoring activities in 2010, 2013 and 2015, in 2016 SLR Consulting Ltd. (SLR) conducted monitoring at the project sites and produced the associated report *2016 Water Quality Monitoring Program at the GBL Sites* (SLR 2017). The report included a summary of site conditions, discussion of previous monitoring programs, synthesis of current and historic water quality data and recommended revisions to the monitoring outlined in the 2009 SENES report (primarily the addition of monitoring stations for Sawmill Bay).

The information provided within the 2009 SENES report and 2017 SLR report together provide a comprehensive evaluation of site conditions and monitoring requirements. The *GBL Sites 2017 Water Sampling Plan* compiled the recommendations of these predecessor documents to create a concise monitoring plan to ensure consistent application of site monitoring in the 2017 season. The 2017 monitoring program, as presented in the current report, generally implemented the recommendations as presented by SENES (2009) and SLR (2017), with adjustments to reflect current site conditions and remedial plans for the sites.

2.3 REGULATORY CONSIDERATIONS

In support of the GBL Sites Phase II Remediation Project, INAC has obtained the applicable regulatory authorizations through the Sahtu Land and Water Board (SLWB). This includes an updated Water Licence (S17L8-002), replacing the earlier Water Licence (S09L8-001), and taking effect on July 25, 2017. The Water Licence outlines the requirements of the site-specific Surveillance Network Program (SNP), including monitoring stations, analytical parameters and sampling frequency. These stations represent a small sub-set of the overall water monitoring

program implemented in 2017. The SNP monitoring requirements were conducted as part of the larger water quality monitoring program and have been included with this Plan to provide a comprehensive listing of all 2017 water sampling stations at the GBL Sites.

As required by the regulatory issuances, the Land Use Inspector was notified of the 2017 Water Sampling Program prior to commencement.

2.4 MONITORING OBJECTIVES

Based on the predecessor documents, regulatory considerations, best practice in environmental management and the pre-remedial phase at the GBL sites, the following general 2017 monitoring objectives were presented in the *GBL Sites 2017 Water Sampling Plan* (INAC-CARD 2017b):

- Continue monitoring at select established sampling stations to build upon the dataset at the project sites;
- Confirm pre-remediation conditions of the aquatic environment and potential source terms (e.g. water at waste rock piles, adit water) are remaining stable;
- Ensure there is sufficient pre-remediation (i.e., baseline) monitoring data at the stations identified in the *Great Bear Lake Sites Proposed Long-Term, Status of Environment and Construction Monitoring Plan* (SENEC 2009);
- Incorporate technical recommendations where appropriate from the *2016 Water Quality Monitoring Program at the Great Bear Lake Sites* (SLR 2017) and from the review of this document by the Sahtu Land and Water Board;
- Where refinements have been made to the remedial strategies for the sites, include additional monitoring stations if necessary to collect baseline data (e.g. locations of proposed soil treatment areas and the Terra Mine landfill); and,
- Meet the requirements of the Water Licence Surveillance Network Program (SNP) at the project sites, including compliance with the approved Quality Assurance and Quality Control Plan (INAC-CARD 2017a) as provided to the Sahtu Land and Water Board.

It is important to note that 2017 monitoring was confirmatory in nature and not an attempt to generate additional data for site characterization.

3 GENERAL PROGRAM APPROACH

3.1 PROGRAM PLANNING, DATES AND ROLES

INAC and PSPC completed the program internally, with project management assistance from DXB Projects and assistance/support from Déljne through Techit? Ltd. The program was planned and commenced within two weeks, running September 6-15, 2017 and using Terra Mine as a base of operations.

In addition to the resources of the INAC-CARD Project Manager (Candace DeCoste) and logistics support (Patricia Garbutt) both in Yellowknife, a team of personnel mobilized to Terra Mine to conduct work activities at the various GBL Sites. PSPC maintained responsibility for staffing and personnel, the field camp, charter aircraft, health and safety and general site logistics. INAC staff and their contractors planned, implemented and delegated the various work tasks, with the assistance of PSPC and Techit? Ltd.

Some personnel were present for the duration of the program, while others were on-site for limited periods. The full list of personnel which participated in field activities (water quality sampling, support and ancillary tasks) is as follows:

- Candace DeCoste (INAC-CARD) – INAC-CARD Project Manager
- Michael Bernardin (PSPC) – PSPC Project Manager
- Rebecca Studer-Halbach (PSPC) – PSPC Site Manager
- Caitlin Moore (PSPC) – PSPC Program Assistance
- Stanley Yee (INAC-CARD) – INAC Project Officer
- Claire Brown (DXB Projects) – Project Management Assistance
- Barbara Perrott (INAC-CARD) – Drone Operator
- Joel Gowman (INAC-CARD) – Drone Operator
- Aaron Jaque (Cascom) – Telecommunications Technician
- Chris Yukon (Techit? Ltd.) – Déljne Team Lead
- Dave Taniton (Techit? Ltd.) – Wildlife Monitor/Field Assistant
- Greg Kenny (Techit? Ltd.) – Wildlife Monitor/Field Assistant
- Dennis Kenny (Techit? Ltd.) – Wildlife Monitor/Field Assistant
- Walter Modeste (Techit? Ltd.) – Wildlife Monitor/Field Assistant
- Brent Taniton (Techit? Ltd.) – Wildlife Monitor/Field Assistant
- Ed Reeves (Techit? Ltd.) – Camp/Vehicle Services
- Elaine Kenny (Techit? Ltd.) – Camp Cook
- Whitney Andre (Techit? Ltd.) – Cook's Helper
- Ray Rhine (Break-Away Drilling and Blasting Ltd.) – Blasting Disposal Specialist

During most days two separate water quality monitoring teams worked to accomplish the sampling plan. Each team was composed of two specialists with support personnel.

3.2 FIELD CAMP AND ACCESS

The scope of work, as discussed in Sections 7 through 12, required transport to the smaller satellite Silver Bear Sites (Northrim, Norex, Graham Vein and Smallwood), as well as to Contact Lake Mine, El Bonanza Mine and Sawmill Bay. The *GBL Sites 2017 Water Sampling Plan* (INAC-CARD 2017b) was based primarily on the design of the SENES Consultants Ltd. *Great Bear Lake Sites Proposed Long-Term, Status of Environment and Construction Monitoring Plan* (2009), which made access/sampling assumptions based on the use of float equipped aircraft. Consequently, the decision was made to use float equipped aircraft for the 2017 monitoring activities (Twin Otter and Caravan).

Within each project site, transport was conducted by foot, boat, truck and with all terrain vehicles (ATVs) where available. On-site aluminum boats at Terra Mine, Contact Lake Mine and Sawmill Bay were used to conduct open water sampling, while an inflatable zodiac was transported to site for use at Smallwood Mine. Outboard motors scaled to the boat size were mobilized/available at site. Techit?q Ltd provided a larger landing craft boat (mobilized from Dél?ne) used to transport the field team and equipment from Terra Mine to the satellite Silver Bear sites. This same watercraft was used to sample Camsell River stations at these properties.

The pre-existing facilities at the former Terra Mine were used as a camp and base of operations. The Bunkhouse, Administration Building and pre-constructed tent frames provided sleeping facilities for staff. The kitchen and dining facilities of the Administration Building were also used, as well as the office space on the second floor. Temporary telecommunications were installed in the Administration Building, including satellite phone and internet (with Wi-Fi), which was removed at the completion of the field program. The small wooden building near the Bunkhouse was used as a storage facility, laboratory and equipment staging area.

3.3 FIELD DATA AND OBSERVATIONS

In addition to sample collection, *in situ* field data and observations were compiled to assist with the characterization of site conditions. Considerations included approaches applied during

earlier assessment programs, recommendations for ongoing monitoring (SENES 2009) and toxicity modifying factors which are required to assess performance relative to applicable guidelines (e.g., Canadian Council of Ministers of the Environment (CCME) Protection of Aquatic Life (PAL) - Freshwater Aquatic Life (FAL) guidelines). Based on these factors, the following field measurements were collected at aquatic monitoring stations: temperature, pH, dissolved oxygen, turbidity and specific conductivity. The two water quality monitoring teams used a Horiba U-52-2 Multiparameter Water Quality Meter and YSI ProDSS Multiparameter Water Quality Meter provided with 1-10m cables for *in-situ* measurements at depth. These meters were provided serviced and calibrated by the respective rental companies. Field calibration was conducted routinely to ensure ongoing data quality.

At on-land water stations (e.g. adit water and standing water), the shallow water depth limited the use of the large multiparameter units. Given these stations are not aquatic habitat, a smaller pen style Hanna meter was used to measure pH, conductivity and temperature.

For open water stations which required sampling at surface and depth, temperature measurements were collected at 1m intervals to approximately 10m (i.e. the limit of the apparatus) or to the pre-defined sampling depths. This was conducted to determine the stratification depths of the epilimnion, metalimnion or hypolimnion.

Additional information recorded at each sampling station included: date/time, sampling personnel, coordinates, general location description, access methodology (e.g. boat, shoreline), weather, waterbody condition (e.g. wave height estimate), potential contaminant sources (e.g. sheen, tailings), sampling methodology (syringe/pole/grab/column), water column depth, collection depth, number of sample bottles, sample parameters and any other pertinent information.

Figures documenting each of the 2017 sample locations are provided in Appendix A. Compiled field data and observations, including GPS coordinates and in-situ measurements are provided in Appendix C. Photographic documentation of sampling stations may be found in Appendix D.

3.4 SAMPLE COLLECTION

INAC and PSPC implemented the 2017 water sampling activities with the assistance of monitoring specialists and working closely with community members from Délı̨nę. The methodologies listed below were selected for consistency with earlier sampling programs,

considerations of the receiving water body, access limitations, efficiency and cost. Sample collection was conducted as surface grabs and water column sampling as discussed below.

Grab Sampling

Open water grab samples were collected by submerging bottles under the water surface. At shoreline stations, a sampling pole was used to enable collection of water samples while minimizing disruption of sediment in shallow water conditions. Similarly, when sampling shallow on-land standing water, sterile syringes were used to collect representative water samples.

Water Column Sampling

Water column sampling was performed using a vertical Van Dorn sampler. The apparatus was rinsed in triplicate before sample collection. Sampling was conducted at prescribed depths, including surface and at depth at select stations, using a metered line.

3.5 LABORATORY ANALYSIS

Analytical parameters outlined in the *GBL Sites 2017 Water Sampling Plan* were selected based on: a) historic land-use; b) terrestrial and aquatic contaminants of concern identified during site characterization; c) cost effectiveness; d) anticipated remedial activities; e) post-remediation site conditions; and, f) recommendations within the *Proposed Long-Term, Status of Environment and Construction Monitoring Plans* (SENES 2009). To the extent possible, analytes were selected to be consistent with previous monitoring activities at the sites.

As indicated in the Water Licence (Annex A, Part A, Item 5), “All analyses shall be performed in a laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA) for the specific analyses to be performed or as approved by an Analyst.”. ALS Laboratories was selected based on this requirement, the availability of Yellowknife services and cost considerations.

The laboratory parameters fell into the following categories discussed in sections below: General Chemistry, Metals, Petroleum Hydrocarbons, Radionuclides and specific SNP Parameters.

3.5.1 General Chemistry

General chemistry parameters for laboratory analysis are listed below, with any parameters with CCME-FAL guidelines underlined:

<i>Physical Parameters</i>	<i>Major Ions</i>	<i>Nutrients</i>
Alkalinity	Calcium	<u>Ammonia (as N)</u>
Conductivity	<u>Chloride</u>	<u>Total Phosphorous</u>
<u>pH</u>	<u>Fluoride</u>	Dissolved Phosphorous
Turbidity	Total Hardness	<u>Nitrate</u>
Total Dissolved Solids	Magnesium	<u>Nitrite</u>
Total Suspended Solids	Potassium	Total Organic Carbon
	Sodium	Dissolved Organic Carbon
	Sulphate	
	Sulphide	

3.5.2 Metals

As former mining properties, metals are the dominant constituent of potential concern (COPC) at the GBL Sites. The current standard for metals analysis is inductively coupled plasma-mass spectrometry (ICP-MS), which was employed for all samples. In addition to the ICP-MS element scan, mercury analysis was conducted by Cold Vapour Atomic Absorption (CVAA). Standard ICP-MS scans for metals often include parameters that have not been assigned a relevant water quality criterion (CCME-FAL or otherwise). To address the potential that water quality criteria may be developed in the future and requirements of the Water Licence SNP, the following metals were included in the suite (with those parameters possessing CCME-FAL guidelines underlined):

<u>Aluminum</u>	Cobalt	Silicon
Antimony	<u>Copper</u>	<u>Silver</u>
<u>Arsenic</u>	<u>Iron</u>	Strontium
Barium	<u>Lead</u>	<u>Thallium</u>
Beryllium	Lithium	Tin
Bismuth	Manganese	Titanium
<u>Boron</u>	<u>Mercury</u>	<u>Uranium</u>
<u>Cadmium</u>	<u>Molybdenum</u>	Vanadium
Cesium	<u>Nickel</u>	<u>Zinc</u>
Chromium	<u>Selenium</u>	Zirconium

While the total metal concentration measures all physical and chemical forms of the metal present in the water sample, the dissolved concentration includes only forms of the metal that are less than 0.45 µm in size. Based on this operational definition, dissolved concentrations generally exclude particle bound metals (>0.45 µm), which are more readily removed from the water column. Dissolved metal forms are also more readily available for uptake, although uptake is ultimately determined by many factors (SENES 2008a). The total metal concentrations are of greater interest as CCME-FAL water quality guidelines are generally based on total concentrations; however, determining the proportions of particulate and dissolved metal phases of the total concentration may provide insight into the ultimate fate and transport of metals in the water body. While previous monitoring at the GBL sites has included analysis of both total and dissolved metals from many stations, generally consistent relationships between the two fractions were observed. On this basis, SENES concluded that ongoing collection of samples for dissolved metals analyses from all stations was not justified (SENES 2009). Nonetheless, in areas where elevated suspended sediment loadings were anticipated (e.g., site runoff, tailings containment areas), dissolved metals analysis was recommended, as well as approximately 10% of all other stations analyzed to confirm general relationships between dissolved and total metal fractions (SENES 2009). The 2017 sampling program was conducted on that basis.

Avoiding sample contamination during the field filtration process has proven to be challenging during previous monitoring campaigns, thus putting some of the dissolved metal results into question (SENES 2009). Given dissolved metals samples were submitted within the 14-day timeframe recommended by ALS Laboratories, dissolved metal filtration/preservation was conducted upon submission to the laboratory.

3.5.3 Petroleum Hydrocarbons

Site assessment work at the GBL sites has confirmed the presence of petroleum hydrocarbon (PHC) contamination at some locations in or near receiving waters. Remedial measures will include excavation and treatment of soils with PHC concentrations above prescribed criteria. Areas with concentrations below criteria will typically be left in place and monitored to confirm that migration to receiving waters is not occurring. Monitoring is therefore required in receiving waters adjacent to locations with historic and/or residual PHC concentrations and where soil treatment areas are to be sited (SENES 2009).

Samples collected for the purpose of PHC monitoring were analyzed for BTEX compounds (i.e.

benzene, toluene, ethylbenzene and total xylene) and F1 to F4 hydrocarbon fractions, as well as specific parameters as outlined in the Water Licence SNP (e.g. Oil and Grease).

3.5.4 Radionuclides

In addition to uranium which was analyzed as part of the metals scan, previous monitoring activities at Contact Lake Mine and Sawmill Bay have measured radium-226 and lead-210 as surrogates for a full radionuclide scan. Although none of the receiving waters were found to have detectable concentrations of these parameters, elevated results were observed in mine drainage and groundwater monitoring wells at some locations at Contact Lake Mine. Historic uranium ore handling at Sawmill Bay has also led to monitoring of radionuclides in the aquatic environment, though no concerns were identified. For consistency with previous monitoring, the 2017 monitoring program included the analysis of a number of samples for both radium-226 and lead-210 at these sites. Samples were tested using alpha spectrometry for radium-226 and beta counting for lead-210.

3.5.5 Surveillance Network Protocol Parameters

The GBL Sites 2017 Water Licence (S17L8-002) includes an expanded SNP. In addition to the assessment of general chemistry, metals, petroleum hydrocarbons and radionuclides discussed above, the SNP requires analysis of the following parameters at discrete stations:

- Cesium, Lithium and Bismuth: In addition to the standard ICP-MS element scan;
- Oil and Grease: By Gravimetric Analysis
- Volatile Hydrocarbons: Head Space Trap Gas Chromatography/Flame Ionization Detector/Mass Spectrometry (HS GC/FID/MS)
- Extractable Hydrocarbons: Gas Chromatography/Flame Ionization Detector (GC/FID);
- Non-Aqueous Phase Liquid/Free Product: Visual Exam
- Phenols: By Colourimetry
- Biochemical Oxygen Demand (BOD): 5 day, Seeded Incubation
- Fecal Coliforms: Colilert-18
- Phenols: Colourimetric
- Polychlorinated Biphenyls (PCBs): Gas Chromatography – Electron Capture Detection (GC-ECD)

It is important to note that many of these parameters were analyzed during site characterization and found not to be a concern at the GBL Sites. It is also noted that many of these parameters are specific to SNP stations which are not yet active (e.g. landfill monitoring, soil treatment monitoring).

3.6 QUALITY ASSURANCE AND QUALITY CONTROL

Adherence to best practices in Quality Assurance and Quality Control (QA/QC) is a crucial element of all sampling programs and provides confidence in data collection and analysis. In keeping with this consideration and as required within the Water Licence, INAC has produced a site-specific *Great Bear Lake Sites – Quality Assurance and Quality Control Plan* (INAC-CARD 2017a) tailored to SNP sampling. These same approaches were applied to all 2017 water sampling activities where applicable.

As part of this process, personnel experienced in sampling were a vital asset when implementing the sampling plan and facing unexpected field conditions. Notwithstanding the need to evaluate field conditions and apply additional QA/QC procedures accordingly, the following minimum QA/QC procedures were applied during sampling and analysis.

3.6.1 Sampling QA/QC

Field activities have the greatest potential to cause sample contamination and are a primary focus of QA procedures. The following QA approaches were applied during field sampling to reduce the risk of sample contamination and to ensure the reliability of data:

- Prior to sampling, all vehicles (e.g. boats, ATVs), work areas and equipment were inspected for potential contaminant sources, such as fuel leaks, fouled boat hulls or soiled sampling lines;
- All equipment used for the collection of field data (e.g. multi-meters) was calibrated per manufacturer specifications;
- As much as possible, single-use equipment and supplies were used to prevent cross contamination between sampling stations;
- Sampling equipment was an accepted brand, an approved design and made of non-contaminating materials;
- Where possible, sampling was conducted from the area of least impacts to greatest,

thereby minimizing the potential for cross contamination;

- Any water sampling apparatus used (e.g. pole, Van Dorn) was decontaminated prior to initial use and triple rinsed prior to sampling at each station;
- Sample bottles and preservatives were single-use and provided by the contract laboratory;
- All sampling and sample bottle handling was conducted wearing single-use unpowdered nitrile gloves, replaced at each sampling station;
- Before, during and after collection, sample bottles were kept away from contaminant sources as much as possible (e.g. fuel, dust);
- Where not pre-charged with preservatives, sample bottles were triple rinsed with the sample water prior to filling;
- Rinse water was discarded away from the sampling station, without disrupting the water column or sediments;
- Where sampling by boat, collection was conducted from the front of the boat, with rinse water discarded at the back;
- All laboratory requirements for sample preservation, headspace, etc. were adhered to;
- Samples were labelled with (at minimum) the sample identifier (i.e. SNP station), date, time, project name, requested analyte, preservative and filtration;
- Samples were kept cool prior to and during transport to the laboratories;
- Every effort was made to enable sample analysis within recommended hold times (all samples provided to ALS within four days, with only a small number of general chemistry parameters exceeding hold times); and,
- Chain of Custody (COC) forms were completed for all samples, with one copy retained and another included in sealed sample coolers.

Several standard QC approaches were used to confirm data precision and accuracy and to identify any potential field contamination:

- Duplicate samples were collected at a rate of 10% and submitted blind to the laboratory (i.e. the laboratory was not aware of which sample was duplicated).
- Field blanks (three full sets) were submitted to identify any potential contamination from the sampling procedures. Sampling methodology directly mirrored site samples (e.g. gloves, preservation); however, laboratory provided deionized water was used.
- Trip blanks were provided by the laboratory, transported to the field and returned unopened to identify any potential contamination from transport. A single trip blank was submitted with each sample shipment (as recommended in CCME (2011)) and put on hold pending results of field blank analysis.

Evaluation of QC sample results is an important final step. Due to the natural heterogeneity of environmental media, duplicate samples generally will not correspond perfectly with the original sample. To validate the data, the relative percent difference (RPD) was calculated and evaluated. Results of field and trip blanks were also reviewed to ensure sample contamination was not occurring during collection, handling or transportation.

3.6.2 Laboratory QA/QC

All samples were submitted for analysis to a CALA accredited laboratory (ALS) that has an internal approved QA/QC plan. Laboratory procedures included equipment calibration, Certified Reference Materials, Laboratory Control Samples, Method Blanks and Matrix Spikes. Results of these procedures are provided in the appended Laboratory Certificates (Appendix E). The methods applied by contract laboratories may vary; however, as part of CALA accreditation, all must meet rigorous requirements in conformance to standard methods of analysis.

4 DATA EVALUATION METHODOLOGY

Evaluation of 2017 water sampling data was conducted using applicable Water Licence Effluent Quality Criteria, Site-Specific Target Levels, results from background/reference station sampling, federal CCME guidelines and in consideration of historic monitoring results.

4.1 WATER LICENCE EFFLUENT QUALITY CRITERIA

The renewed Water Licence (S17L8-002) includes Effluent Quality Criteria (EQC) for several stations within the associated SNP. The Mackenzie Valley Land and Water Board defines EQC as “Numerical or narrative limits on the quality or quantity of the waste deposited to the receiving environment” (MVLWB 2011).

While the Water Licence SNP includes numerous station-specific EQC, several of these stations only apply during and after site remediation (e.g. sewage, greywater, landfill, landfarm and process water effluent, as well as potable water sources). However, one station within the Ho-Hum TCA (S17L8-002(7A), corresponding with station T-8) and one downstream station within Moose Bay (S18L8-002(7B) corresponding with station T-10) were sampled in 2017. Data tables within Appendix B include the EQC at these discrete stations.

4.2 SITE SPECIFIC TARGET LEVELS

The Ho Hum Tailings Containment Area (TCA), the associated wetland and downstream receiving environments at Terra Mine were studied extensively during the assessment phase due to the potential for downstream contaminant migration from the area. While the concentrations of multiple metals were elevated in water samples, arsenic concentrations represented the greatest potential concern from this system. In support of remedial decision making and design, INAC developed a site-specific target level (SSTL) for arsenic in surface water. A full report documenting the derivation of the SSTL is found within the *Site-Specific Target Level for Arsenic in Surface Water Associated with the Terra Mine Wetland* (SENES 2014). SSTLs are risk-based acceptable levels of contaminants (e.g., arsenic) that are not expected to result in adverse effects to humans and ecological receptors, based on the assumed receptor characteristics and exposures from the site. The recommended arsenic SSTL for water at the outlet of the wetland was 78 µg/L. It was recommended that the SSTL be applied to average annual measurements, to be confirmed with routine monitoring or additional studies if exceeding these levels (SENES 2014).

While active remedial measures have not yet been implemented at the Ho Hum TCA or wetland, 2017 water sampling results at the discharge point of the wetland into Moose Bay (station T-6) were evaluated with the SSTL to determine if arsenic concentrations may be predicted to have an adverse effect.

4.3 REFERENCE STATION SAMPLING

The *GBL Sites 2017 Water Sampling Plan* included previously established background or reference stations. In an effort to capture the natural influences of local mineralized zones, these stations are located upstream of historic site operations within the same watershed. Previous monitoring at these stations has confirmed the presence of naturally elevated metal concentrations in select waterbodies at the GBL Sites (SENES 2009), the results of which must be taken into consideration when evaluating results from potentially impacted stations. Due to the era of the industrial operations, baseline water quality sampling was not conducted prior to mining activities.

In addition to background stations upstream of project sites, sampling was also conducted at “reference lakes” that are further afield but still within the general project area. The results of reference lake sampling may be applicable to one or more of the project sites (e.g. Contact Lake and El Bonanza are approximately 11 km apart and share the same reference lake stations).

Results of background and reference station sampling has been incorporated within the data tables found in Appendix B and are integral in understanding natural site conditions and anthropogenic effects at the sites. Figures provided in Appendix A display the location of these stations, with coordinates provided in Appendix C.

4.4 CCME GUIDELINES

The Northwest Territories does not at present have territorial water quality guidelines for the aquatic environment. However, at the federal level CCME have developed the Canadian Water Guidelines for the Protection of Aquatic Life (PAL), both for the freshwater and marine environments. The following excerpt from the *CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life – Introduction* summarizes the intent and applicability of the guideline:

“Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQGs-PAL) are nationally approved limits of substances and other attributes (such as pH and temperature) in

the water column where no adverse toxic effects are expected to aquatic plants and animals. The guidelines are one of a set of management tools developed to ensure that societal stresses, particularly the introduction of toxic substances, do not lead to the degradation of Canadian fresh and marine waters.” (CCME 1999)

CCME notes that these guidelines are generic national recommendations and meant to “protect all forms of aquatic life and all aspects of the aquatic life cycles, including the most sensitive life stage of the most sensitive species over the long term”. CCME provides additional national guidelines to assist in the derivation of site-specific guidelines tailored to the species present and site conditions (CCME 1999).

While the “most sensitive species” used to develop the CCME-PAL may not be present at the GBL sites, the guidelines have been used as a primary data evaluation threshold to identify the potential for aquatic effects. Specifically, the Freshwater Aquatic Guidelines (FAL) were applied to samples from aquatic waterbodies and are provided within the data tables of Appendix B. Where guidelines must be calculated based on toxicity-modifying factors (e.g. pH, temperature and hardness), the calculated guideline value is provided for each sample at the base of the table. Long-term exposure guidelines were selected as an appropriate and conservative measure.

CCME has developed guidelines for select total metal parameters, but not for dissolved metal fractions. Consistent with previous monitoring programs, the available total metal guidelines were applied to dissolved metal results.

As previously mentioned, CCME-FAL guidelines have been derived to ensure the protection of aquatic species. On-land stations, such as mine adit water, waste rock seepage and shallow standing water pools are not aquatic habitat and consequently CCME-FAL guidelines were not applied to these samples. Where the presence of aquatic life was in question (e.g. shallow ponds, small discharge streams), CCME-FAL guidelines were conservatively applied as a screening tool for elevated contaminant concentrations and do not indicate aquatic effects.

4.5 HISTORIC RESULTS

Full synthesis of 2017 data with historic sampling results is beyond the scope of the current data report, as directed by the Sahtu Land and Water Board. Instead, the synthesis will be implemented as part of a comprehensive Baseline Monitoring Report that will be prepared a minimum of six months prior to the commencement of site remediation.

While full historical data analysis was not conducted as part of the current study, elevated concentrations reported from 2017 sampling were evaluated within a historical context to confirm no new contaminants were identified at the sampling station (i.e. emerging contaminants).

5 QA/QC SAMPLE EVALUATION

In keeping with the requirements of the *Great Bear Lake Sites - Quality Assurance and Quality Control Plan* (INAC-CARD 2017a), duplicates, field blanks and travel blanks were collected during the 2017 monitoring program and evaluated below.

5.1 DUPLICATE EVALUATION

To assess the precision of sampling procedures and laboratory results, duplicate samples were collected at approximately 10% of sampling stations. During the 2017 monitoring program a total of nine blind duplicate samples were collected, distributed throughout the GBL Sites. While duplicates were collected at the same location and using identical procedures, due to the natural heterogeneity of environmental media, duplicate samples generally will not correspond perfectly with the original sample. To validate the data, the relative percent difference (RPD) was calculated using the following equation:

$$RPD = \frac{|X_1 - X_2|}{X_{avg}} \times 100$$

Where X_1 and X_2 are the sample/duplicate results and X_{avg} is the mean of these values.

The RPDs were then evaluated using criteria presented by Zeiner (1994), which were developed using guidelines developed by the United States Environmental Protection Agency (USEPA). These criteria indicate the RPD for duplicate samples should be less than 20% for aqueous samples; however, the RPD may only be calculated where the result is detected in both the original and the duplicate sample at a concentration five times greater than the reportable detection limit (RDL). Where one or more result is less than five times the RDL, alternate criteria are applied. If both are below, the RPD may not be calculated. These evaluation criteria are provided in Table 2.

Table 2 Duplicate Evaluation Criteria

Scenario	Result A	Result B	Criteria for Acceptance of Aqueous Samples
A	< RDL	< RDL	Acceptable precision
B	< RDL	Positive	Result B – (0.5x RDL) < RDL
C	Positive and ≤ 5x RDL	Positive	Result B – Result A < 2x RDL
D	Positive and >5x RDL	Positive and >5x RDL	RPD <20%

QA/QC sample and evaluation results are provided in Appendix B, Tables B-23 and B-24. Duplicate evaluation showed a strong correlation indicating sufficient precision in laboratory analysis and field methods. Despite these findings, there were expectedly some analytes which exceeded the acceptable limits as follows:

- Sample T-8-A and T-DUP-1: Turbidity and total titanium;
- Sample T-12 and T-DUP-2: Turbidity, total barium and total uranium;
- Sample T-19 and T-DUP-3: Total suspended solids, chloride, total dissolved phosphorous, total phosphorous and total potassium;
- Sample NX-6 and NX-DUP-1: Total suspended solids and total chromium;
- Sample SW-B-2 and SW-DUP-1: Total chromium and total manganese; and
- Sample CL-3 and CL-DUP-2: Total zinc.

A total of 730 individual results were evaluated for duplicate precision with a passing rate of 98%, demonstrating the high reliability of the results.

5.2 FIELD AND TRAVEL BLANK EVALUATION

Table B-23 and B-24 (Appendix B) provides the results of field blank analysis from the 2017 monitoring program. Three discrete field blanks were submitted, one each from Terra Mine, El Bonanza Mine and Contact Lake Mine. These samples were handled with the same procedures as site samples, but were filled with laboratory provided deionized water. All results were below reportable detection limits, indicating that sampling procedures were sound and there was no contamination introduced. The sole exception was a detectable concentration of total chromium in the Contact Lake field blank (notably the dissolved chromium concentration was below detection). Given the same procedures were applied to all field blanks, the remainder of which were below chromium detection limits, the elevated result may be an artefact of laboratory error. It is noted the pH values of 5.0-5.5 are typical for deionized water samples.

Trip blanks were also submitted to the laboratory and placed on hold pending results of field blank analysis. Based on the results of Field Blank analysis and the standard methodologies as proposed in the *Great Bear Lake Sites - Quality Assurance and Quality Control Plan*, these samples were not analyzed.

6 TERRA MINE – WATER QUALITY MONITORING

6.1 TERRA MINE – SITE SUMMARY

The Silver Bear Mines are five former mining properties located along the Camsell River, the largest of which is Terra Mine. Mineral claims in the area occupied by Terra Mine were first staked in the 1940's, though extensive exploration activities began decades later. Drilling completed in 1967 and 1968 indicated high-grade silver deposits and a decision was quickly made to put the site into production. The first large scale production began in 1969 and continued to 1985, though with several interruptions. By 1985 the Silver Bear Mines were abandoned by their developers and are now the responsibility of INAC (SENES and SRK 2008).

The primary mining method used at Terra Mine was shrinkage stoping. Narrow stopes followed the mineralized veins and the stopes were typically left un-filled at the end of the process. Ore was drawn from the stopes and hauled to the surface with diesel-powered mobile equipment, using a network of inclined ramps. The original ore processing plant had a nominal capacity of 300 short tons per day. The plant employed gravity separation methods to produce a silver-bismuth concentrate and froth flotation to produce a silver-copper concentrate. The gravity concentration process did not require the use of chemicals to extract the minerals. However, the froth flotation process required the use of lime as a pH modifier, xanthates as mineral collectors, and polypropylene glycol as a frothing agent (SENES and SRK 2008).

In addition to the 460,000 t of ore produced from the Terra Mine, an additional 63,000 t of ore from Norex Mine and Smallwood Mine were processed in the mill at Terra Mine. The total tailings production from the processing of this ore was approximately 500,000 t (SENES and SRK 2008).

Currently, the site has several openings into the underground mine and a small open cut (referred to as the open pit). Surface facilities include an ore processing plant, assay lab, power/heating and compressor plants, fuel storage tanks, maintenance shops, warehouses, offices and a camp. A dock is located on the Camsell River and a 1,500 m long airstrip sits on the northern shore of Moose Bay. Waste rock has been placed on the shore of Ho Hum Lake TCA and levelled to create storage yards for mining equipment and supplies. Tailings from ore processing have been disposed of in and adjacent to Ho Hum Lake TCA. Unpaved roads connect the various facilities including an 8 km haul road connecting the Terra Mine with the Northrim, Norex and Graham Vein sites to the east (SENES and SRK 2008).

6.2 TERRA MINE – WATERBODIES, CONCERNS AND MONITORING APPROACH

A large number of aquatic waterbodies lie within and surrounding Terra Mine. This includes the Camsell River, the largest of the Great Bear Lake tributaries (MacDonald *et al.* 2004), as well as numerous lakes, ponds and small streams. Some of these waterbodies have shorelines altered during operational periods (e.g. dykes, weirs, dock walls), or have been used to contain mine waste (e.g. tailings storage). However, the majority of waterbodies remain physically unaltered. Many of the waterbodies also lie downstream of previous mining/industrial activities and/or ongoing source terms such as waste rock, tailings or hydrocarbon impacted soils.

Aquatic assessment and monitoring has been conducted over many decades at Terra Mine. This has included water, sediment, benthos, fish and sediment pore water sampling. SLR provided a summary of the principal water related concerns identified at Tera Mine as follows (SLR 2017):

- The main contaminants of concern at the Terra Mine were arsenic and copper. Sampling results indicated there were elevated levels of arsenic, copper, aluminum and a small number of other metals in the inflow to Moose Bay from the Ho-Hum TCA.
- Sampling further downstream showed that metal concentrations reached background levels before the end of the airstrip, prior to entering the main flow of the Camsell River (SENES 2009). The elevated concentrations of arsenic in Ho-Hum TCA and Moose Bay were attributed primarily to tailings, and to a lesser extent to waste rock.
- Elevated metals were identified in waters from the adit and vent shaft samples with additional exceedances of cadmium, lead, silver and zinc in the Open Pit Adit, and copper and lead exceedances in the Vent Shaft (INAC–WRD 2011).
- Multi-year sampling reported little to no change in copper levels and a slight decrease in arsenic in Ho-Hum TCA.
- It was concluded that the berm and small wetland area above the outlet of Ho-Hum TCA is having a positive effect on water quality with respect to the uptake of metals. Metals concentrations return to background levels at the mid-way point of Moose Bay with generally good water quality found downstream in Camsell River (INAC-WRD 2013).
- The later desktop studies of arsenic at the Terra Mine indicate that the waste rock, exposed tailings and/or underground workings continue to be a source of arsenic loading at the site. Hemmera identified the submerged tailings in Ho-Hum TCA remains the major arsenic source, an order of magnitude greater than that of the waste rock or exposed tailings beaches combined (Hemmera 2015).

Based on these findings, previous monitoring and recommendations of predecessor documents,

the 2017 sampling program was designed for the Terra Mine as documented in Table 3 below, which also displays the revisions required based on field observations.

Table 3 Terra Mine 2017 Sampling Stations

WATERBODY	STATION	SAMPLE TYPE	DEPTH	GENERAL LOCATION	General Chemistry	Total Metals	Dissolved Metals	PHC, BTEX	SNP Stn.	RATIONALE
Little Ho-Hum Lake	T-2	Shoreline	Surface	Shoreline, east end	x	x				Ho Hum drainage pathway within mineralized zone, upstream of TCA
Ho Hum Tailings Containment Area (TCA)	T-3	Shoreline	Surface	Shoreline, east end, north shore at tailings beach	x	x	x	x		Immediately offshore of tailings beach within TCA, to be covered during remediation; downstream of soil treatment area.
	T-5	Shoreline	Surface	Shoreline, west end, north shore below mill	x	x		x		Downstream of mill and outlet; downstream of future soil treatment area.
	T-16	Open Water	Surface (A) - 1 m	Open water, middle, in line with tailings beach pipe	x	x				Characterization of Ho Hum TCA water
			Bottom (B) - 10 m		x	x				
	T-8	Open Water	Surface (A) - 1 m	Open water, west end, middle of lake	x	x	x	x	Y	Characterization of Ho Hum TCA water; SNP requirement (S17L8-002 (7A))
			Middle (B) - 5 m		x	x				
			Bottom (C)-13 m		x	x	x			
Ho Hum TCA Wetlands	T-9	Shoreline	Surface	Shoreline, west end, at outlet weir	x	x	x			Water quality leaving TCA and entering wetland
	MB-1	Shoreline	Surface	Lower Wetland, at discharge of water emerging from toe of airstrip	x	x	x			Characterize influence of water from toe of airstrip ADDED BASED ON FIELD OBS. (substitute for MB-4)
	MB-9	Shoreline	Surface	Lower Wetland, mid way between weir and Moose Bay Proper	x	x				Characterize downstream flow from wetland ADDED BASED ON FIELD OBS.
Camsell River (Including Moose Bay)	T-6	Open Water	Surface	Moose Bay, Ho-Hum discharge	x	x	x			Discharge point from Ho-Hum wetland to Moose Bay
	T-10	Open Water	Surface	Moose Bay, halfway down airstrip	x	x	x		Y	Moose Bay downstream of Ho-Hum discharge (S17L8-002 (7B))
	T-12	Open Water	Surface	Moose Bay, west end, end of airstrip	x	x				Location where Moose Bay meets Camsell River
	T-31	Shoreline	Surface	NEW STATION Moose Bay, half way along airstrip	x	x	x			Downstream of Ho Hum TCA and adjacent to airstrip

WATERBODY	STATION	SAMPLE TYPE	DEPTH	GENERAL LOCATION	General Chemistry	Total Metals	Dissolved Metals	PHC, BTEX	SNP Stn.	RATIONALE
Camsell River (Including Moose Bay)	T-30	Open Water	Surface	NEW STATION, Camsell River, Approx 300m downstream of site	x	x				Downstream of Ho Hum TCA
	T-19B	Shoreline	Surface	Shore sample of Camsell River by water intake	x	x				Potable water sampling NO POTABLE WATER USE – Not sampled in 2017
	T-1	Open Water	Surface	Jackfish Bay	x	x				Landfills adjacent and to be remediated
	T-4	Shoreline	Surface	Rainy Lake, south shore at Terra dock	x	x		x		Camsell Dock area (Rainy Lake); to be removed during remediation
On-land Water	T-18	On-land	Surface	Boggy seep from landfill (scummy pond), near Jackfish Bay						Monitor conditions downstream of landfill and near to Jackfish Bay DRY – Not sampled in 2017
	T-25	On-land	Surface	Pool below landfill, near Jackfish Bay	x	x		x		Monitor conditions downstream of landfill and near to Jackfish Bay
	T-19	On-land	Surface	Northwest adit, uphill from open pit adit, along trail	x	x				Monitor adit water as potential source term and before closure
	T-20	On-land	Surface	North zone adit, upstream of Terra dock	x	x				Monitor adit water as potential source term and before closure
	T-22	On-land	Surface	Standing water in adit near airstrip						Monitor adit water as potential source term and before closure DRY – Not sampled in 2017
Site Samples					22	22	8	5	2	

6.3 TERRA MINE – 2017 MONITORING RESULTS

Sampling figures are provided in Appendix A, with Figure A1 documenting the location of Terra Mine within the larger GBL Sites project area, Figure A2 the specific location of the each of the Silver Bear Mines and Figure A3 the location of the individual Terra Mine sampling stations. Results of sample analysis are provided in Appendix B, Tables B1-B4. Field data and observations are presented in Appendix C and site photographs in Appendix D.

6.3.1 Terra Mine – Aquatic Observations

During the 2017 field campaign, the Camsell River water level was found to be slightly higher than documented during previous sampling campaigns. Water was at or slightly above the Camsell River dock, and during high wave conditions was clearly breaching the dock surface. Conversely, there was limited standing water observed at the on-land stations and several were found to be completely dry. This included one of the adit sampling stations (T-22) and the wetland station near Jackfish Bay (T-18).

Ground conditions at the Ho Hum TCA and downstream dyke, weir and wetland were per earlier field campaigns, with no change or notable degradation to site features observed. The water level upstream of the weir was approximately 0.6 m higher than downstream, confirming the direction of any potential water flow. However, limited water was observed exiting the weir through the culvert between the upper and lower wetland. In contrast, a small volume of visible water flow was observed at the downstream corner of the weir pad and the airstrip, confirming earlier observations of subsurface water flow through waste rock into the lower wetland. Given the observations and overlapping coordinates of stations T-9 and MB-4, station MB-1 was sampled at the discharge location of subsurface water flow into the lower wetland (substitution for MB-4). A second station, MB-9, was added at the downstream reaches of the lower wetland.

The aquatic waterbodies within and surrounding Terra Mine were generally clear and consistent with earlier classifications of primarily oligotrophic conditions.

6.3.2 Terra Mine – General Chemistry

Both field and analytical results indicate neutral to slightly alkaline pH at all stations, including Little Ho Hum Lake, Ho Hum TCA, the Upper and Lower Wetland and the Camsell River. This is consistent with reference stations and there is no evidence of acidic conditions at the sample sites. Water hardness ranged from soft to moderately hard and electrical conductivity was consistent with reference stations (with the exception of a single elevated measurement of adit water at station T-20). This corresponds with expectedly low total dissolved solids. Total suspended solids are similarly low, with most results below detection and reaching a maximum of 10 mg/L.

With respect to anions and nutrients, ammonia, chloride, nitrate, and nitrite were below the associated CCME guidelines. Fluoride concentrations exceeded the CCME guideline of 0.12 mg/L at all 2017 sampling stations, including reference sites (0.15 mg/L), consistent with earlier sampling campaigns at Terra Mine (Arcadis 2016). The amount of fluoride in water is

governed by climate, composition of rocks and hydrogeology. Sources of fluoride in surface water are the weathering or leaching of minerals fluor spar, fluor apatite, topaz and cryolite. Digging up of deeper aquifers during mining activities may result in higher levels of fluoride (Arcadis 2016), though the presence of tailings with high surface area may also provide opportunity for enhanced fluoride leaching. The highest concentrations in aquatic waterbodies were reported from within the Ho Hum TCA, Wetlands and discharge point (0.6-0.8 mg/L), reducing to background concentrations in Moose Bay (~0.15 mg/L). Little Ho Hum Lake fluoride concentrations were also elevated (0.376 mg/L), though tailings deposition is not known to have occurred at this location. Based on these findings, local mineralogy may have resulted in elevated fluoride concentrations within the Ho Hum drainage pathway, with additional contributions possibly coming from mining activities and/or tailings deposition.

Sulphide concentrations were below detection limit for all samples. Sulphate concentrations were approximately consistent with reference stations (2-15 mg/L), with the exception of the Ho Hum Wetland stations MB-1 and MB-9 (27.7 and 24.7 mg/L sulphate respectively), station T-6 within Moose Bay (25.6 mg/L) and from within standing water at the T-20 adit sampling station (91.6 mg/L). Total and dissolved organic carbon concentrations were low across all sampling sites, ranging from 4-30 mg/L. Results indicate carbon is found primarily in the dissolved phase.

All other general chemistry results were below applicable CCME-FAL guidelines and SNP Effluent Quality Guidelines (EQG) as provided in the updated water licence for stations T-8 and T-10.

In keeping with previous monitoring programs, in-situ measurements of temperature were collected to identify temperature stratifications in the water columns. A YSI Instruments multi-meter probe was used at stations T-8 and T-16 to a depth of 10m (cable limit). Clear temperature changes were evident at depth and were used to determine sample depths within the epilimnion, metalimnion and/or hypolimnion as required within the sampling plan.

6.3.3 Terra Mine – Total and Dissolved Metals

Total and dissolved metal sampling results from Terra Mine's Ho Hum drainage system (including Moose Bay), other Camsell River sampling stations, and the on-land stations are discussed below.

6.3.3.1 Ho Hum Drainage System

Waterbodies from the Ho Hum drainage system that were sampled include: Little Ho Hum Lake (T-2), Ho Hum TCA (T-16 and T-8 at multiple depths, T-5 and T-3), the Upper Wetland (T-9), Lower Wetland (MB-1 and MB-9) and within Moose Bay and the Camsell River (T-6, T-10, T-31,

T-12 and T-30).

Arsenic and copper have been identified in previous years as the main parameters of environmental concern in the Ho Hum drainage system. Water Licence S17L8-002 provides discrete EQG for stations T-8 and stations T-10 (corresponding SNP identifiers are provided in the Data Tables within Appendix B). All metal concentrations, including arsenic and copper, were below the EQGs provided for these stations. In 2017 samples, only arsenic and copper exceeded CCME-FAL guidelines.

As in previous years, arsenic concentrations in Little Ho Hum Lake, Ho Hum TCA, the Upper/Lower Wetland and the nearest station in Moose Bay (T-6) exceeded the CCME-FAL guideline of 0.005 mg/L (or 5 µg/L). Figure 1 below graphs 2017 total arsenic concentrations with dissolved arsenic concentrations (where sampled) in the Ho Hum drainage basin. Arsenic concentrations were found to be primarily in the dissolved phase at all stations. Added to the figure is the CCME-FAL guideline, the Site-Specific Target Level (SSTL) developed for Moose Bay and the maximum background concentration reported in 2017. The Water Licence EQC has not been added as all results are well below these levels.

As reported during previous monitoring events, the figure demonstrates elevated arsenic concentrations within the Ho Hum TCA (60-78 µg/L) relative to Little Ho Hum Lake (approximately 5 µg/L). Arsenic concentrations in the wetlands reduced to 47.2-54.4 µg/L. Within Moose Bay, station T-6 (the assumed point of discharge from the Lower Wetland) had an arsenic concentration of 28.7 µg/L. This result is generally consistent with earlier monitoring programs and well below the SSTL of 78 µg/L (SENES 2009). All other Moose Bay sampling stations (T-10, T-31, T-12 and T-30) were well below both the SSTL and CCME-FAL guideline for arsenic.

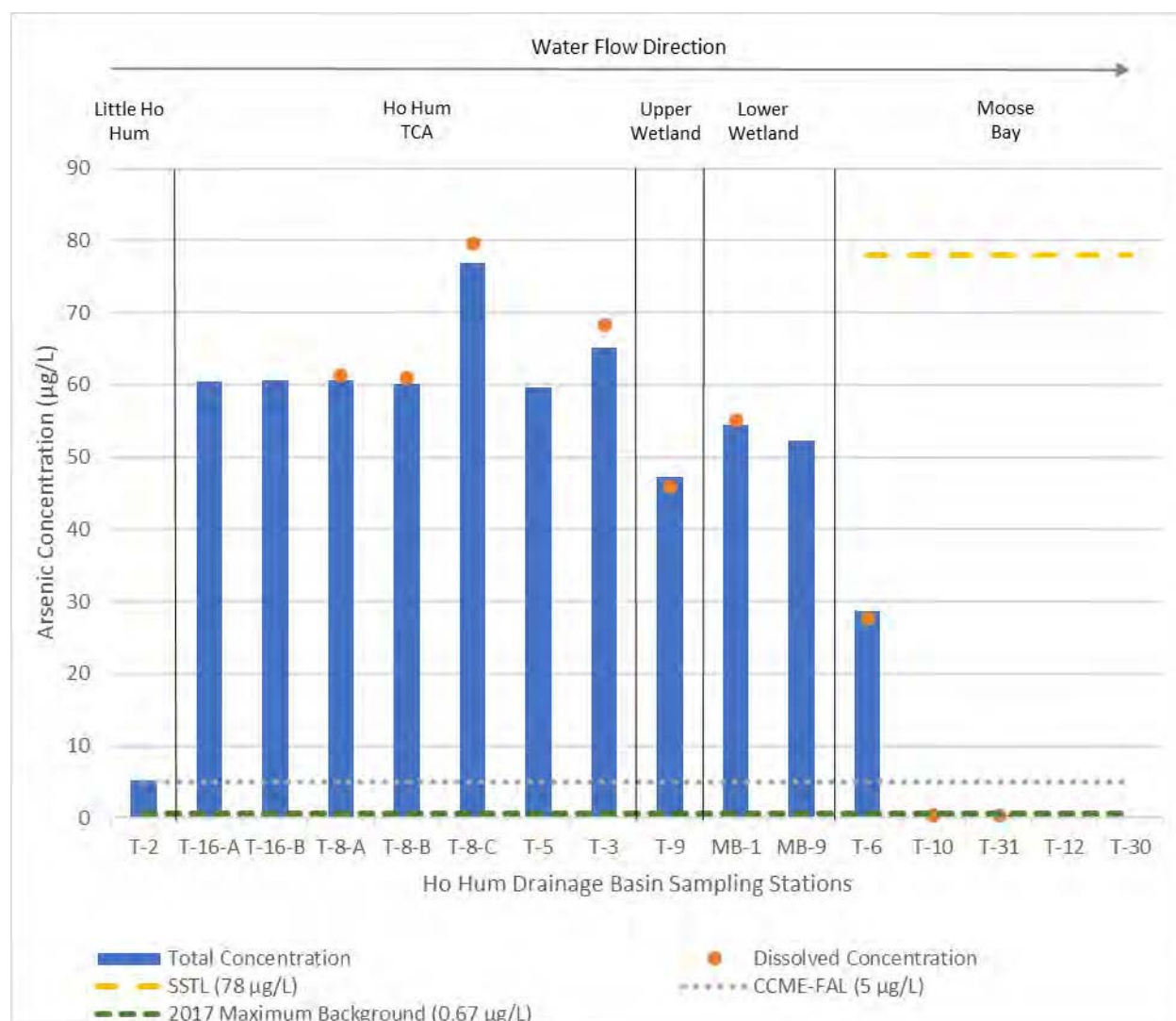


Figure 1 2017 Arsenic Concentrations in Ho Hum Drainage System Samples

While there were no exceedances of the copper EQC at the applicable stations (T-8 and T-10), concentrations exceeded the CCME-FAL guideline (2-4 µg/L based on water hardness). Total and dissolved copper concentrations of 2017 samples are plotted within Figure 2, with the lowest CCME-FAL guideline of 2 µg/L and maximum observed background concentration also incorporated. As shown in Figure 2, copper concentrations were primarily in the dissolved phase at all stations assessed. Little Ho Hum Lake, Ho Hum TCA and the Upper Wetland reported copper concentrations of 5-10 µg/L. There was no visible trend observed in sample depth, or in proximity to shoreline tailings. These concentrations rose sharply in the Lower Wetland samples MB-1 and MB-9 (40-50 µg/L). This may be attributable to subsurface water flow entering the

Lower Wetland from the toe of the airstrip near the weir. Based on this observation, station MB-9 was added in 2017 to provide greater spatial delineation of arsenic and copper concentrations. Within Moose Bay, station T-6 (proximal to the wetland) was above CCME-FAL copper guidelines, though all other downstream stations were below.

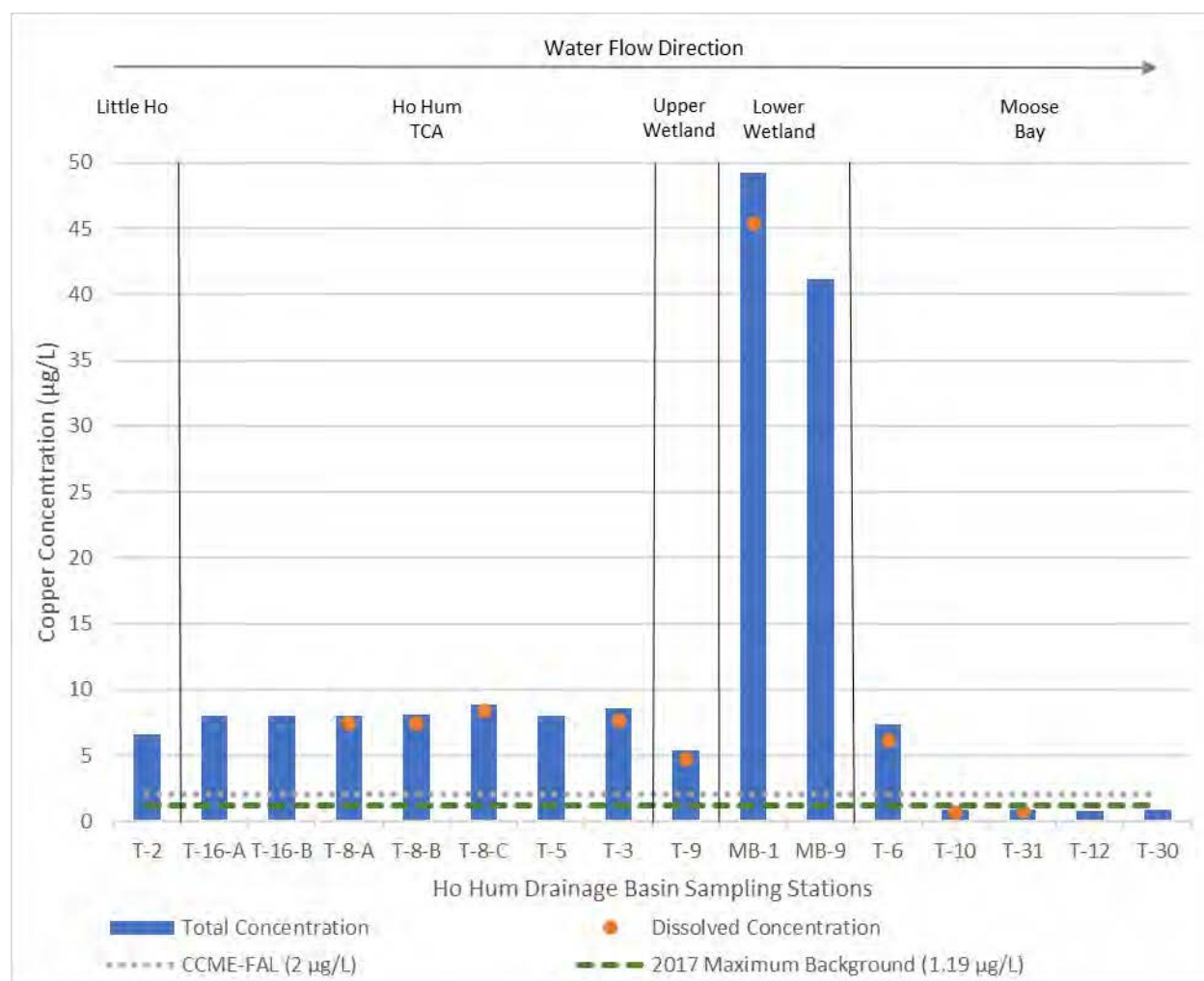


Figure 2 2017 Copper Concentrations in Ho Hum Drainage System Samples

6.3.3.2 Other Camsell River Sampling Stations

In addition to the previously discussed sampling in Moose Bay, stations were sampled at the Camsell River dock (T-4) and within Jackfish Bay downgradient of the former disposal area (T-1). At station T-4 a single exceedance of CCME-FAL guidelines was reported for total copper.

The calculated guideline (based on hardness) at this station was 2 µg/L and total copper concentration 3.48 µg/L, while dissolved copper concentration was 1.36 µg/L. This sample was the only aquatic water body sample collected on September 8, 2017, during which extreme wind and wave height was observed across the Silver Bear sites. Visible suspended solid entrainment and high turbidity was noted during sampling and waves breached the shoreline at the T-4 station. Total suspended solids at the sample was 10 mg/L, while other Terra Mine samples were below detection (< 3 mg/L).

The 2017 findings at station T-4 were higher than reported in previous years, prompting opportunistic resampling during a return visit to the site on September 22, 2017. When resampled, copper concentration was 0.8 µg/L, well below the CCME-FAL guideline and total suspended solids were less than detection limit. These findings confirm the earlier elevated copper concentration was attributable to anomalous wave heights and sediment/soil entrainment. Results of resampling are provided in Appendix E Laboratory Certificates (Laboratory Report L1998184), though the data table maintains the original September 8, 2017 result as a conservative measure.

Sample T-1 from Jackfish Bay of the Camsell River exceeded CCME-FAL guidelines for total aluminum and total copper. Total aluminum concentration was 152 µg/L, while the guideline value is 100 µg/L. Similarly, the total copper concentration of 4.21 µg/L exceeded the calculated CCME-FAL guideline of 2 µg/L. These results are consistent with findings from previous years at station T-1, though concentrations vary considerably at this location (SLR 2017). This may be attributable to shallow water conditions with fine sediments at this location.

6.3.3.3 On-Land Water

Samples were collected from ponded water at two adit openings (T-19 and T-20), and a third adit sampling station was found to be dry (T-22). While CCME-FAL guidelines are not applicable at these stations, it is noted that elevated aluminum, arsenic and copper in these waters were reported. Field notes provided in Appendix C document pooled conditions, with no downstream overland flow observed from the adit openings. Elevated metal concentrations in adit waters were documented during previous sampling at Terra Mine (SLR 2017).

Adjacent to the Jackfish Bay waste disposal area, the wetland station T-18 was found to be dry and no sample collected. In contrast, abundant water was observed at the pond station T-25, on the southern margin of the landfill/buried debris area. Given the potential for aquatic habitat at this station, sample results were evaluated with CCME-FAL guidelines. With the exception of total iron, all results were below the CCME-FAL guidelines. The total iron concentration of

402 µg/L was above the guideline of 300 µg/L, though consistent with the range of iron concentrations reported from previous sampling events at this station (200-1740 µg/L). Along the margin of the pond there is visible metal debris and the area was used for waste disposal during the operational period of the mine, which may be contributing to elevated iron concentrations at this location.

6.3.4 Terra Mine – Hydrocarbons

Based on known PHC contamination of soils (e.g. from drum storage areas and fuel handling activities), reports of hydrocarbon sheens from earlier sampling campaigns, and analytical requirements of the Water Licence SNP, select stations were sampled for PHC analysis. This included three stations within the Ho Hum TCA: one open-water station (T-8, sampled at three depths) and two shoreline stations adjacent to known PHC contamination of soil/waste rock (T-5 and T-3). Within Moose Bay, station T-10 was sampled for PHCs in keeping with requirements of the SNP. Based on the earlier findings of hydrocarbon contamination in soils at the Camsell River Dock, station T-4 was sampled for PHCs, as was station the pond station T-25.

All 2017 water sample results were below detection limits for volatile organic compounds and PHCs.

7 NORTHRIM MINE – WATER QUALITY MONITORING

7.1 NORTHRIM MINE – SITE SUMMARY

As summarized by SENES/SRK (2008), initial development and underground exploration of the Northrim Mine was completed 1933-1935, after which a new adit was driven by Silver Bear Mines Limited in 1968. Intermittent work continued until 1978 under various ownership, with underground workings reaching a depth of approximately 100 m. Milling was conducted onsite, including the use of a small portable mill beginning in 1971 and applying gravity separation methods. In 1972 a larger underground mill was constructed and used both gravity separation and froth flotation methods. Milling was conducted in 1971-1972 and again from 1976 to 1978. Historical documentation and sampling activities indicate that during initial milling activities tailings were deposited in Hermandy Lake before transitioning to the Camsell River (near the mine entrance). An estimated 10,800 t of ore was milled at Northrim Mine during the operational period, producing approximately 10,000 t of tailings (SENES and SRK 2009).

7.2 NORTHRIM MINE – WATERBODIES, CONCERNS AND MONITORING APPROACH

In addition to several dilapidated building structures, mine openings are found throughout the site and a dock is located on the Camsell River. Waste rock is found on the shore of the river and in a small pile to the southeast, above the river. As well as the deposition of tailings in Hermandy Lake and the Camsell River, the Leachate Pond immediately southeast of Hermandy Lake was used to contain smelter waste and discarded debris (e.g. crucibles on shoreline) and determined to be a potential source of metal loadings. Hermandy Lake TCA currently discharges to the south-east, through the Leachate Pond and towards the Camsell River. However, historical documentation suggests the original drainage of Hermandy Lake was to the west, an alteration made during the operational period.

SLR provided a summary of Northrim Mine water quality monitoring data and trends up to 2016 (SLR 2017). From 2002 to 2004 concentrations of arsenic, copper, lead, iron and zinc regularly exceeded guidelines at Northrim Mine. From 2005 to 2007 these same exceedances were observed with the addition of aluminum and cadmium exceedances. It was determined that water with elevated concentrations of these metals was draining into the Camsell River from the mine adit and the Hermandy Lake outlet stream (INAC – WRD 2011); however, it did not appear to have a significant impact on the overall river water quality (SENES 2009).

Based on Water Resource Division (WRD) sampling and analysis, arsenic may be entering the system somewhere between Hermandy Lake and the Leachate Pond. Conversely, WRD concluded that copper concentrations were dropping between Hermandy Lake and the

Leachate Pond, before increasing again between the pond and the outlet stream. Lead concentrations were reportedly variable, fluctuating throughout the years and potential sources of zinc contamination were suggested between Hermandy Lake, the Leachate Pond and the outlet stream (INAC – WRD 2011).

Hydrocarbon contamination in the sediments in the area of the dock was also noted during earlier terrestrial and aquatic sampling events (INAC – WRD 2011).

Based on these findings, previous monitoring and recommendations of predecessor documents, the 2017 sampling program was designed for the Northrim Mine as documented in Table 4 below, in which revisions based on field observations are reported.

Table 4 Northrim Mine 2017 Sampling Stations

AREA	STATION	SAMPLE TYPE	DEPTH	GENERAL LOCATION	General Chemistry	Total Metals	Dissolved Metals	PHC, BTEX	SNP Station	RATIONALE
Hermandy Lake	NO-7	Shoreline	Surface	Hermandy Lake, Southeast end	x	x	x	x	Y	Current drainage pathway, near Leachate Pond, SNP Station (S17L8-002 (8C))
	NO-11	Shoreline	Surface	North end, submerged tailings	x	x				Tailings deposition in Hermandy Lake
Leachate Ponds	NO-2	Shoreline	Surface	North shore of leachate pond	x	x	x	x		Leachate pond elevated in metals from smelter waste
Stream	NO-4/ NO-8	On-land	Surface	Hermandy Lake outlet stream	x	x		x		Metals and detectable hydrocarbons in discharge water
On-land Water	NO-21	On-land	From Pipe	Leaking Pipe						Pipe of unknown origin discharging water. NOT LOCATED – Assumed submerged and not sampled in 2017
	NO-1	On-land	Surface	Standing water below adit	x	x		x		Metals in discharge water
	NO-9	On-land	Surface	Standing water in adit						Metals and detectable hydrocarbons in discharge water INSUFFICIENT WATER DEPTH – Not sampled in 2017
Camsell River	NO-27	Open Water	Surface	NEW STATION, Camsell River downstream of site	x	x				Receiving environment downstream of Northrim and Norex
	NO-25	Open Water	Surface	NEW STATION, Camsell River, at original drainage	x	x	x			Original drainage pathway from Hermandy Lake to Camsell River

AREA	STATION	SAMPLE TYPE	DEPTH	GENERAL LOCATION	General Chemistry	Total Metals	Dissolved Metals	PHC, BTEX	SNP Station	RATIONALE
Camsell River	NO-5	Shoreline	Surface	Northrim dock	x	x		x		Metal and hydrocarbon contamination of soils
	NO-6	Shoreline	Surface	Suspected entry point of current drainage pathway from Hermandy Lake	x	x	x	x	Y	Metals and detectable hydrocarbons in drainage waters from Hermandy Lake and the Leachate Pond, SNP Station (S17L8-002 (9D))
Sample Numbers					9	9	4	6	2	

7.3 NORTHTRIM MINE – 2017 MONITORING RESULTS

Sampling figures are provided in Appendix A, with Figure A1 documenting the location of Northrim Mine within the larger GBL Sites project area, Figure A2 the specific location of the each of the Silver Bear Mines and Figure A4 the location of the individual Northrim Mine Sampling Stations. Results of sample analysis are provided in Appendix B, Tables B5-B8. Field data and observations are tabled in Appendix C and site photographs in Appendix D.

7.3.1 Northrim Mine – Aquatic Observations

During the 2017 field campaign the Camsell River water levels were high and topped the dock wall at the Northrim Mine. Due to increased water levels, the formerly reported discharge pipe along the Camsell River shoreline (NO-21) could not be located and was suspected to be submerged. In contrast, Hermandy Lake TCA, the Leachate Pond and discharge stream water levels were generally consistent with earlier sampling campaigns. Water within the shoreline adit (NO-9) was approximately 3 cm deep and insufficient for sample collection.

Ground conditions were consistent with observations of previous assessment/monitoring programs.

7.3.2 Northrim Mine – General Chemistry

Both field and analytical results indicated neutral to slightly alkaline pH at all stations. This is consistent with reference stations and there is no evidence of acidic conditions at the sample

sites. Water hardness was considered to be soft to moderately hard and electrical conductivity was consistent with reference stations (R-2, R-3 and R-4). Total dissolved solids were low and total suspended solids were equal to or below the detection limit.

With respect to anions and nutrients, ammonia, chloride, nitrate, and nitrite were below the associated CCME-FAL guidelines. Fluoride concentrations exceeded the CCME guideline of 0.12 mg/L at all 2017 Northrim Mine sampling stations, ranging from 0.128 mg/L to 0.185 mg/L. However, these results are generally consistent with background stations and anthropogenic influence is not suspected.

Total and dissolved organic carbon concentrations were low in Camsell River sampling stations, though higher in Hermandy Lake, the Leachate Pond and discharge stream. Sulphide concentrations were below detection limit for all samples and sulphate concentrations were consistent with reference stations (~15 mg/L).

7.3.3 Northrim Mine – Total and Dissolved Metals

Total metal concentrations were analyzed in the nine samples collected from Northrim Mine (plus one duplicate), as well as dissolved metal concentrations in four samples (plus one duplicate). Exceedances of arsenic and copper CCME-FAL guidelines were reported for Hermandy Lake samples (NO-11 and NO-7), the Leachate Pond (NO-2) and the discharge stream (NO-4/NO-8). The adit water sample NO-1 is also elevated in arsenic, copper and lead; however, CCME-FAL guidelines are not applicable. All other total and dissolved metal results were below applicable CCME-FAL guidelines, including all stations within the Camsell River.

Results of arsenic and copper analysis for the Northrim Mine samples are provided below in Figures 3 and 4 respectively. Associated CCME-FAL guideline values and maximum 2017 reference station concentrations have been incorporated in the figures. Figures 3 and 4 demonstrate that concentrations of both arsenic and copper are primarily in the dissolved phase. Minor exceedances of arsenic in Hermandy Lake, increase in the Leachate Pond, with the presence of smelter waste the most probable cause. These concentrations decrease in the discharge stream and are below maximum background and CCME-FAL guidelines in the Camsell River stations.

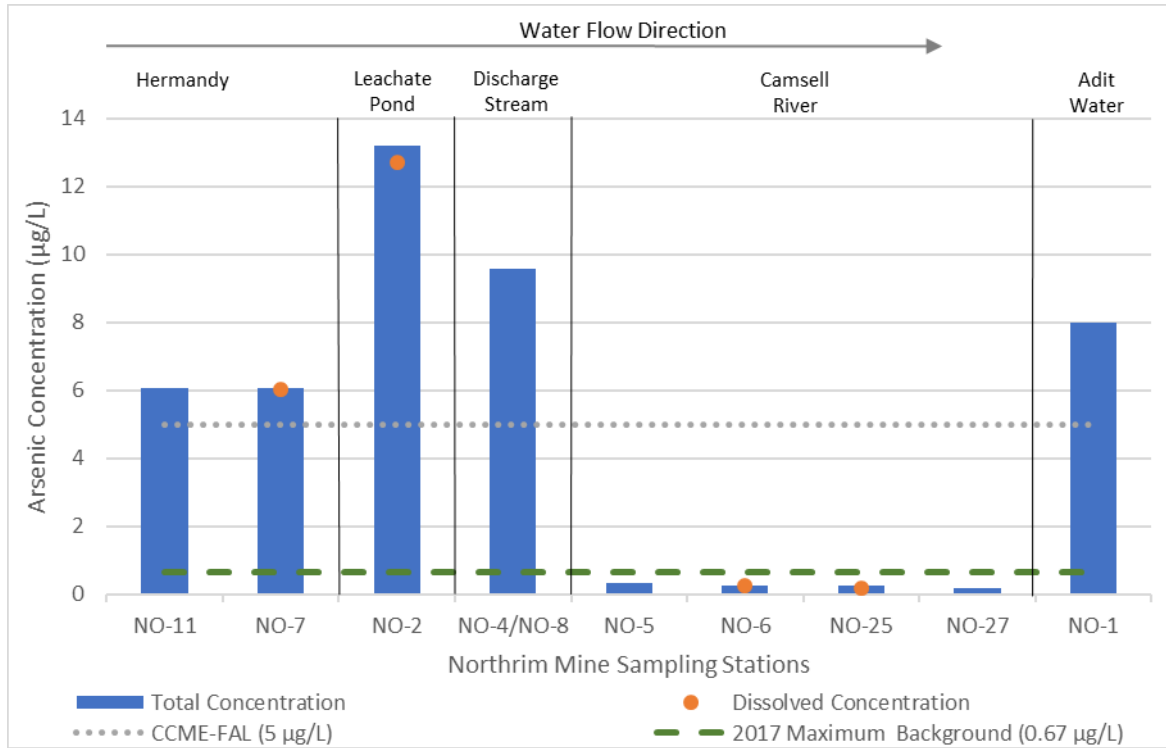


Figure 3 2017 Arsenic Concentrations in Northrim Mine Samples

A similar trend is noted for copper concentrations, though the maximum observed concentration was in the discharge stream (Figure 4). This may indicate an alternative source of copper concentration as the stream cascades over waste rock, debris and exposed mineralized bedrock.

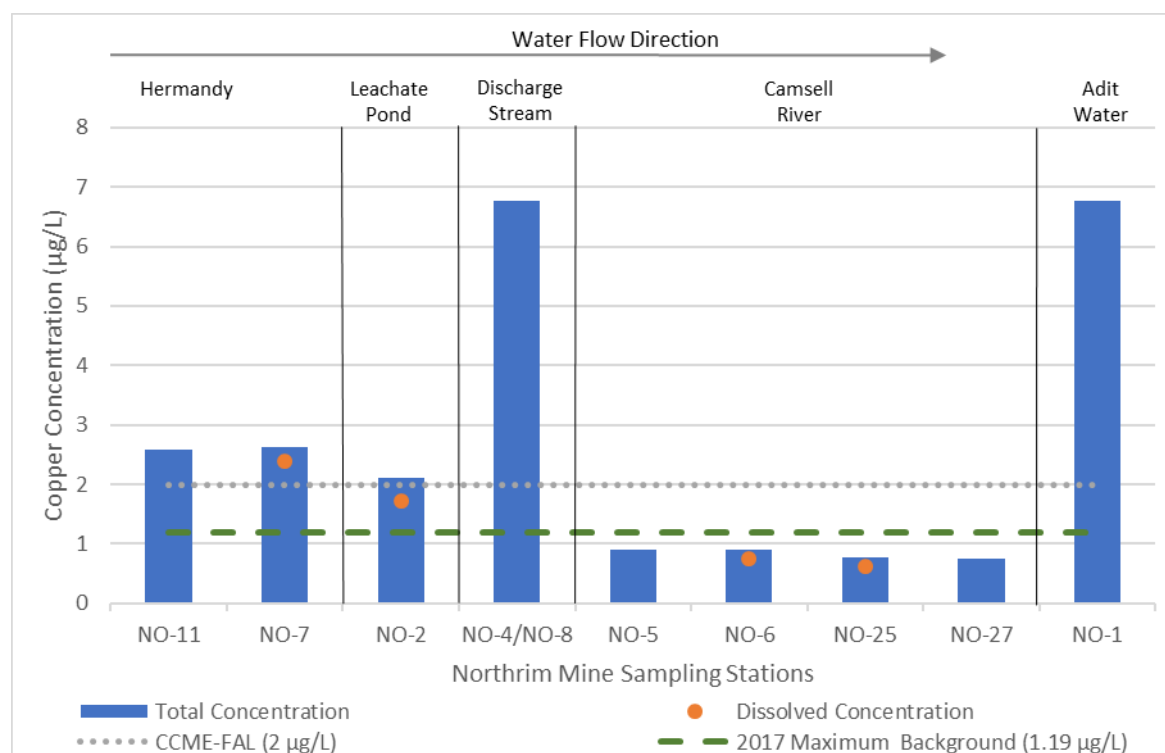


Figure 4 2017 Copper Concentrations in Northrim Mine Samples

As previously stated, all other total and dissolved metal concentrations in 2017 Northrim Mine water samples were below the CCME-FAL guidelines. Review of historical monitoring reports indicates these findings are generally consistent with previous results at the Northrim Mine (SLR 2017) and no emergent metal concerns are identified.

7.3.4 Northrim Mine – Hydrocarbons

Based on findings of terrestrial PHC contamination, reports of detectable PHC concentrations during earlier water sampling campaigns, and analytical requirements of the Water Licence SNP, select stations were sampled for PHC analysis. This included one station within Hermandy Lake (NO-7), one in the Leachate Pond (NO-2 plus duplicate), one in the Discharge Stream (NO-4/NO-8), two in the Camsell River (NO-5 and NO-6) and one from the pooled water below the lower adit (NO-1).

All 2017 water sample results were below detection limits for volatile organic compounds and PHCs.

8 NOREX AND GRAHAM VEIN MINE – WATER QUALITY MONITORING

8.1 NOREX AND GRAHAM VEIN – SITE SUMMARY

The development and operational history of the Norex and Graham Vein sites is provided in the associated Remedial Action Plan (SENES/SRK 2009). The sites were amongst the last to be developed at the Silver Bear Mines. Ore was first mined using open pit methodology from Graham Vein in 1970-1971, during which a small test mill was used and applied gravity separation methods. It is believed these tailings were deposited in and around the adjacent Xeron Pond. During the same time period, excavation of the decline to Norex Mine was advanced. The Norex Mine and Graham Vein trench were originally mined independently and later connected when the Norex workings were used to mine the Graham Vein from below. In 1973 a small volume of ore was transported to Terra Mine for processing using a winter road, after which an all-weather road was constructed to facilitate transport. Continuous production began in 1977, during which underground workings reached a depth of 180 m. During these time periods, approximately 1,000 t of ore was milled on site and an additional 45,000 t of ore hauled to Terra Mine for processing (SENES/SRK 2009).

The current surface features at Norex include two portals, three ventilation raises, a waste rock pile of approximately 40,000 m³ located just below the main adit entrance, a maintenance garage, a ventilation and compressor plant and fuel tanks. At Graham Vein, the features include an open mining trench, an old wooden ore bin, the remains of a crushing plant and approximately 4,000 m³ of waste rock (SENES/SRK 2009).

8.2 NOREX AND GRAHAM VEIN – WATERBODIES, CONCERNS AND MONITORING APPROACH

Seepages emerging from the Norex Mine waste rock pile have been routinely monitored since 2002. The majority of seepage occurs on the northeast side of the pile and was found to have elevated levels of arsenic, cadmium, copper, lead and zinc. The source of most of this water is drainage from the main portal, which enters the waste rock pile soon after it emerges from the mine. From June through August 2006, the volume of mine drainage was estimated to vary from 30 to 60 litres per minute, with the lower flow rate occurring later in the year. Significant geochemical changes are reported as the adit water flows through the waste rock pile. Iron, manganese and arsenic concentrations reduce, while concentrations of zinc and to a lesser extent copper, cobalt and lead, increase. The concentration of these metals was found not to have a material effect on the downstream Camsell River (SENES/SRK 2009).

Xeron pond is found down-gradient of the Graham Vein trench and workings. As previously mentioned, historical records suggest approximately 1,000 t of tailings were deposited in the pond during early milling activities. Intermittent monitoring since 2002 indicates the tailings are having a limited impact on water quality and, with the exception of silver and one anomalous lead result, metal concentrations in water samples were either below CCME-FAL or consistent with background findings (SENES/SRK 2009). Sampling at Xeron Pond was deemed unnecessary (INAC-WRD 2009) and not included in the 2017 monitoring program. However, minor elevations in silver concentration were noted in the small wetland bordering Xeron Pond, leading to inclusion of a single sampling station in 2017.

Based on these findings, previous monitoring and recommendations of predecessor documents, the 2017 sampling program was designed for the Norex Mine as documented in Table 5 below. It is noted that station NX-13 was opportunistically added and sampled while in field to confirm dock materials, and any potential contamination from previous fuel handling, is not impacting Camsell River water quality.

Table 5 Norex and Graham Vein Mine 2017 Sampling Stations

AREA	STATION	SAMPLE TYPE	DEPTH	GENERAL LOCATION	General Chemistry	Total Metals	Dissolved Metals	PHC, BTEX	SNP Station	RATIONALE
Camsell River	NX-12	Open Water	Surface	NEW STATION, Camsell River, at drainage from Norex	x	x	x	x	Y	Location where suspected Norex and Graham Vein drainage enters the Camsell River, SNP Station S17L8-002 (11F))
	NX-13	Shoreline	Surface	NEW STATION, Camsell River, at Norex dock	x	x		x		Potential for hydrocarbon contamination or elevated metals
On-land Water	NX-1	On-land	Surface	Outflow from adit	x	x				Monitor adit water as potential source term
	NX-2	On-land	Surface	Waste rock pile, east seep	x	x		x		Waste Rock seepage in area with hydrocarbon contamination
	NX-3	On-land	Surface	Waste rock pile, west seep	x	x	x	x	Y	Waste Rock seepage in area with hydrocarbon contamination, SNP Station (S17L8-002 (10E))
	NX-4A	On-land	Surface	Small creek downstream of waste rock	x	x				Site drainage pathway toward Camsell River*
Xeron Pond	NX-6	Shoreline	Surface	Pond connected to Xeron Pond	x	x				Downstream of mining activities
Sample Numbers					7	7	2	4	2	

* Station coordinates align with 2016 station NX-4A. However, all previous monitoring events utilized NX-4 for the Norex discharge pathway station, and NX-4A was located within the Camsell River at the discharge point of the drainage pathway.

8.3 NOREX AND GRAHAM VEIN – 2017 MONITORING RESULTS

Sampling figures are provided in Appendix A, with Figure A1 documenting the location of Norex and Graham Vein Mines within the larger GBL Sites project area, Figure A2 the specific location of each of the Silver Bear Mines and Figure A4 the location of the individual Norex and Graham Vein sampling stations. Results of sample analysis are provided in Appendix B, Tables B5-B8. Field data and observations are tabled in Appendix C and site photographs in Appendix D.

8.3.1 Norex and Graham Vein – Aquatic Observations

During the 2017 field campaign the Camsell River water levels were high, though did not surpass the level of the Norex dock. At the mine area proper, water flow was observed coming from the adit and the ice plug was melted back from the portal opening. At the toe of the waste rock slope, monitoring stations had sufficient water to sample, though were lower than has been observed during previous sampling events. No material changes to ground conditions were noted within or around the aquatic waterbodies.

8.3.2 Norex and Graham Vein – General Chemistry

Both field and analytical results indicated neutral to slightly alkaline pH at all stations. This is consistent with reference stations and despite obvious iron staining in water flowing from the adit, there is no evidence of acidic pH. All samples were classified as moderately hard to hard and electrical conductivity was elevated above reference stations in waters flowing from the adit (NX-1) and at the toe of the waste rock slope (NX-2, NX-3 and NX-4A). This corresponds with higher total dissolved solids at these locations, as well as elevated suspended solids.

Samples from the Camsell River (NX-12 and NX-13) and from the marsh adjacent to Xeron Pond (NX-6 plus duplicate) exceed CCME-FAL guidelines for fluoride; however, are within the range of normal for reference station concentrations. Alternatively, at the Norex Mine discharge stream (NX-4A) fluoride concentrations are greater than CCME guidelines and reference stations.

The sulphate and sulphide concentrations in the Camsell River were low and consistent with reference stations. These parameters were expectedly higher in seepage samples from waste rock drainage (NX-3 and NX-4A) and from within Xeron Pond (NX-6). Elevated sulphate may indicate increased sulphide concentration in waste rock resulting in enhanced metal leaching,

though based on neutral to alkaline pH, any acid generation is sufficiently buffered under current conditions.

8.3.3 Norex and Graham Vein – Total and Dissolved Metals

Samples from the Camsell River (NX-12 at the discharge of Norex site drainage and NX-13 at the dock) and from the marsh connected to Xeron Pond (NX-6) were below CCME-FAL guidelines for all total and dissolved metal parameters.

Consistent with earlier monitoring programs, elevated metals were identified in water discharging from the Norex adit (NX-1), in seeps from the toe of the waste rock pile (NX-2 and NX-3) and in the shallow discharge stream (NX-4A). Unlike results from other Silver Bear Sites at which arsenic and copper were the only pervasive metals of concern, a larger number of metal parameters were enriched in waters discharging from the Norex Mine. As reported earlier, a more complicated geochemical environment is observed at the Norex Mine waste rock pile and resultant metal concentrations change as water discharging from the adit passes through the waste rock pile. Concentrations of aluminum, cadmium, copper, iron, lead and zinc in many cases appear to increase at the toe of the waste rock slope relative to the adit discharge water. Conversely, arsenic concentrations decrease during passage through the waste rock pile. Within the discharge stream at station NX-4A, aluminum, arsenic, copper, iron and zinc exceed CCME-FAL guidelines (one to four times the guideline value). The source of the elevated aluminum concentration is undetermined given the absence of this concern in adit and waste rock seepage water and may be attributable to high suspended solids (23 mg/L) and associated aluminosilicates. In future, this station would benefit from dissolved metal sample analysis. Results from the Camsell River near the discharge of these waters (NX-12), is below all CCME-FAL metal guidelines.

While minor differences were observed, metal trends were generally consistent with those reported in earlier monitoring programs compiled by SLR (2017). Exceedances of CCME-FAL guidelines at stations NX-4A (stream discharge) and NX-6 (marsh adjacent to Xeron Pond) are however, lower than reported during 2016 monitoring events.

8.3.4 Norex and Graham Vein – Hydrocarbons

Based on findings of terrestrial PHC contamination reported on the waste rock pile and analytical requirements of the Water Licence SNP, select stations were sampled for

hydrocarbon analysis. This included two waste rock seepage stations (NX-2 and NX-3), the discharge point of site drainage to the Camsell River (NX-12) and at the Camsell River dock (NX-13).

A single detectable result was reported for F2 fraction hydrocarbons in sample NX-3. Due to the elevated total organic carbon reported in the sample (27.3 mg/L) and the known potential for organic material to cause false positive hydrocarbon concentrations, reanalysis with silica gel cleanup was requested and reported a low but detectable F2 concentration of 0.7 mg/L. All other 2017 water sample results were below detection limits for volatile organic compounds and PHCs.

9 SMALLWOOD MINE – WATER QUALITY MONITORING

9.1 SMALLWOOD MINE – SITE SUMMARY

The development and operational history of Smallwood Mine is provided in the Remedial Action Plan (SENES/SRK 2009). Work by Terra Mining and Exploration Limited identified silver mineralization at the Smallwood Mine in 1978, beginning underground development using a decline ramp in 1979. Underground workings reached a total depth of approximately 120 m and from 1979 to 1983 approximately 18,000 t of ore was hauled from Smallwood Mine to Terra Mine for processing (SENES/SRK 2009).

Due to the small scale of operations and the intervening decades, there is limited infrastructure remaining at Smallwood Mine. This includes a few small service buildings, a fuel tank, adit and an estimated 53,000 m³ of waste rock downslope of the main mine portal and immediately upgradient of Smallwood Lake (SLR 2017).

9.2 SMALLWOOD MINE – WATERBODIES, CONCERNS AND MONITORING APPROACH

Two connected upland lakes drain via an intermittent stream into the north end of Smallwood Lake, and a natural wetland named Timler Slough drains into its south end. Smallwood Lake discharges to the northeast into a large chain of lakes that are thought to subsequently drain into the Camsell River. Smallwood Mine is found on the northwest shore of Smallwood Lake and the waste rock pile borders the shoreline (SLR 2017).

Earlier monitoring reports document discrete elevated metals in the thermally stratified Smallwood Lake, including arsenic, copper, lead, silver and zinc (INAC-WRD 2011). These exceedances have typically been lower magnitude than observed at the other Silver Bear Sites and there has been no documentation of increasing concentrations. Spatial trends in metal concentration adjacent to mining activity have not been identified (WRD 2010).

In keeping with these minor concerns, three sampling stations were assessed during the 2017 field program, including one open water station sampled at both surface and depth as documented in Table 6 below.

Table 6 Smallwood Mine 2017 Sampling Stations

AREA	STATION	SAMPLE TYPE	DEPTH	GENERAL LOCATION	General Chemistry	Total Metals	Dissolved Metals	PHC, BTEX	SNP Station	RATIONALE
Smallwood Lake	SM-1	Shoreline	Surface	Smallwood Lake shoreline, below waste rock pile, southwest side	x	x	x	x		Downstream of waste rock pile, evidence of PHC impacts within mine footprint
	SM-2	Shoreline	Surface	Smallwood Lake shoreline, below waste rock pile, northeast side	x	x		x		Downstream of waste rock pile, evidence of PHC impacts within mine footprint
	SM-6	Open Water	Surface (A) -2m	Smallwood Lake, Open water in north end	x	x				Offshore of waste rock pile
			Bottom (B) -5m		x	x				
Sample Numbers					4	4	1	2	0	

9.3 SMALLWOOD MINE – 2017 MONITORING RESULTS

Sampling figures are provided in Appendix A, with Figure A1 documenting the location of Smallwood Mine within the larger GBL Sites project area, Figure A2 the specific location of the each of the Silver Bear Mines and Figure A4 the location of the individual Smallwood Mine sampling stations. Results of sample analysis are provided in Appendix B, Tables B5-B8. Field data and observations are tabled in Appendix C and site photographs in Appendix D.

9.3.1 Smallwood Mine – Aquatic Observations

Smallwood Lake conditions during the 2017 field program appeared consistent with earlier sampling events, though the previously installed dock has since been removed.

9.3.2 Smallwood Mine – General Chemistry

Both field and analytical results indicated neutral to slightly alkaline pH at the four stations in Smallwood Lake, consistent with Silver Bear reference stations (R-2, R-3 and R-4). Water was considered to be soft and the electrical conductivity comparable to reference stations. Total suspended solids were below or marginally above detection limit, and total dissolved solids in keeping with reference stations.

With respect to anions and nutrients, ammonia, chloride, nitrate, and nitrite are all below the associated CCME-FAL guidelines. Fluoride concentrations exceeded the CCME-FAL guideline of 0.12 mg/L at all 2017 Smallwood Mine sampling stations, ranging from 0.142 mg/L to 0.263 mg/L. These concentrations are higher than reported at reference stations (maximum 0.150 mg/L) and may represent contribution from waste rock or natural variation.

Sulphide concentrations were below detection limit for all samples and sulphate concentrations consistent with reference stations. Total and dissolved organic carbon concentrations were low at all stations (~ 6 mg/L).

9.3.3 Smallwood Mine – Total and Dissolved Metals

Sample SM-2 collected from the shoreline of Smallwood Lake at the southern toe of the waste rock pile did not exceed CCME-FAL guidelines for any metal parameters. In contrast, station SM-1 at the northern toe of the waste rock pile on the shoreline of Smallwood Lake marginally exceeded the cadmium guideline (concentration of 0.102 µg/L and guideline of 0.0979 µg/L). Notably, the dissolved metal concentration was below the guideline. The sample demonstrated a greater exceedance of zinc, with a reported result of 82.7 µg/L and guideline of 30 µg/L. At the open water station SM-6, no exceedances were reported in the surface water sample; however, the sample from 4 m depth reported a marginal total zinc exceedance (38.1 µg/L).

The 2017 cadmium concentration in sample SM-1 is approximately 3x higher than was reported at the same station in 2016 (SLR 2017). However, concentrations in 2007, 2008 and 2009 are consistent with 2017 findings. During these earlier sampling events, cadmium was not reported as an exceedance based on use of the previously higher CCME guideline (updated in 2014). Some of the 2017 zinc concentrations are higher than reported during previous sampling events. No definitive cause of increased zinc concentration was observed, and additional sampling may be conducted to help identify potential trends.

9.3.4 Smallwood Mine – Hydrocarbons

Based on findings of terrestrial PHC contamination reported on the waste rock pile at Smallwood Lake, two shoreline samples were selected for hydrocarbon analysis (SM-1 and SM-2). Both 2017 water sample results were below detection limits for volatile organic compounds and PHCs.

10 CONTACT LAKE MINE – WATER QUALITY MONITORING

10.1 CONTACT LAKE MINE – SITE SUMMARY

The development and operational history of Contact Lake Mine is provided in the associated Remedial Action Plan (INAC-CARD and SENES 2008a). The site operated intermittently from 1930 to 1980, after which the mine was finally abandoned. The property was first explored and mined for silver and a short adit developed underground. Milling activities began in 1935 and in 1938 the recovery of pitchblende, a uranium-rich mineral, became another focus of the operation. The site changed ownership multiple times, with exploration and underground development continuing intermittently. Milling of the silver and uranium ore was conducted both on site and in later years, was transported by barge and all-weather haul road to the Echo Bay Mines milling plant at Port Radium. During on-site milling activities, the tailings were contained within a pond immediately downgradient of the mine openings (i.e. the Tailings Pond), though in some areas were also left on ground surface. Waste rock was used to construct pads, roads and working areas throughout the site.

Upon abandonment, the large majority of site infrastructure remained standing though reached a dilapidated state. In 2010, the GBL Phase I Remediation Project was implemented and focussed on work activities which could be successfully completed without the use of heavy equipment. This included destruction of most buildings; burning of combustible building materials and debris; and consolidation of non-combustible materials (SENES 2011). In 2016 a drum removal program continued these efforts by removing all drums with residual product for off-site management. As with the other GBL Sites, completion of remediation will be conducted in the coming years and per the approaches detailed within the Contact Lake Mine Remedial Action Plan (INAC-CARD and SENES 2008a).

The Contact Lake Mine is distributed over three discrete areas: the Camp Area on the east shore of Contact Lake, the Mine Area on the bedrock ridge east of the lake and the Fuel Storage Area at Echo Bay (part of the East Arm of Great Bear Lake). These areas are connected by roadways which are now largely overgrown. In addition to the main adit, an open stope and raise/ventilation shaft are also observed in the Mine Area, as well as a small number of remaining buildings and debris piles. The total estimated volume of waste rock at the site is 29,000 m³ and approximately 1,000 m³ of gravity mill tailings are found as a thin layer (up to 20 cm) on ground surface between the mill and Tailings Pond, with additional tailings in the pond itself. At the Echo Bay East Arm Fuel Storage Area, a single above ground fuel storage tank and dock wall are the only significant items remaining.

10.2 CONTACT LAKE MINE – WATERBODIES, CONCERNS AND MONITORING APPROACH

Extensive study and monitoring of aquatic conditions has been conducted since 2002 at the Contact Lake Mine. Upper Lake is found topographically above the Contact Lake Mine and may represent aquatic conditions within the mineralized zone (due to uncertainty regarding deposition of dust from the mining operation, the site was not sampled as a reference station). The Mine Area lies on a tiered plateau, with water draining from the waste rock pile below the adit, through the tailings into the marsh area and Tailings Pond. The highest reported metal concentrations during assessment and monitoring at the Contact Lake Mine have been measured in this area, and from surrounding pools of standing water (SLR 2017). The principal concerns were arsenic, cadmium, copper, manganese, silver and uranium. Due to the presence of uranium rich minerals and processed tailings, assessment and monitoring has included radionuclides lead-210 and radium-226, which were similarly found to be exceeding applicable guidelines in the Tailings Pond and standing water within the main mine area (SENES 2007).

The Tailings Pond discharges to Contact Lake via a small cascading stream. Concentrations of metals and radionuclides were reduced from those documented in the Tailings Pond, though continued to exceed applicable guidelines for both the principal metals of concern and radionuclides. While this stream discharges into Contact Lake, no concerns were identified in shoreline or off shore samples in Contact Lake (SENES 2007).

The principal concerns identified at the East Arm Echo Bay Fuel Storage Area relate to fuel management and both terrestrial and aquatic releases of PHCs. Detailed studies of this area were previously conducted to determine the influence of these releases on the aquatic environment. This resulted in the identification of PHCs in sediments surrounding the dock area.

To address these concerns, the recommendations of the predecessor documents and the requirements of the Water Licence SNP, a detailed 2017 water monitoring plan was designed for Contact Lake Mine. The sampling stations, locations, parameters and rationale are provided in Table 7 below.

Table 7 Contact Lake Mine 2017 Sampling Stations

AREA	STATION	SAMPLE TYPE	DEPTH	GENERAL LOCATION	General Chemistry	Total Metals	Dissolved Metals	PHC, BTEX	SNP	RATIONALE
Contact Lake	CL-6	Open Water	Surface (A) -2m	Contact Lake; NW of island midway across lake from dock area	x	x	x			Contact Lake characterization station at offshore from mine
		Open Water	Depth (B) - 10m		x	x	x			
	CL-9	Shoreline	Surface	Contact Lake; Shoreline water 700-m SE of main mine site	x	x				Receiving environment downstream of mine
	CL-5	Shoreline	Surface	At stream inflow from tailings pond into lake	x	x	x			Inflow from tailings pond
	CL-24	Shoreline	Surface	Contact Lake; Camp Area	x	x				Characterize influences from shoreline activities
	CL-26	Open Water	Surface	Contact Lake; offshore at outflow of stream from tailings pond	x	x	x	x	Y	Offshore from tailings pond discharge, SNP Station (S17L8-002 (13H))
Great Bear Lake	CL-7	Shoreline	Surface	Great Bear Lake-East Arm; From dock at fuel storage area	x	x	x	x		PHC contaminated soil and sediments; dock/tank removal planned INSUFFICIENT DEPTH – Only surface sample collected
			Depth							
	CL-16	Open Water	Surface (A) - 2m	East Arm, north of dock	x	x				Remediation includes removal of dock wall and any impacted soils
			Depth (B) - 10m		x	x		x		
	CL-20	Open Water	Surface	Great Bear Lake-East Arm; ~ 250 m SE of dock	x	x				Remediation includes removal of dock wall and any impacted soils
Tailings Pond	CL-3	Shoreline	Surface	Tailings Pond; Outflow into stream flowing from pond	x	x	x	x	Y	Tailings pond monitoring, SNP Station (S17L8-002 (12G))
	CL-29	Shoreline	Surface	NEW STATION, Tailings Pond north end	x	x				Tailings pond monitoring
Stream	CL-2b	On-land	Surface	Stream flow between tailings pond and Contact Lake	x	x	x			Discharge pathway from Tailings Pond to Contact Lake
On-land Water	CL-2	On-land	Surface	Toe of waste rock	x	x				Elevated metals; remediation to drainage pathway planned
	CL-15	On-land	Surface	On-land; Upstream of inflow into tailings pond	x	x				Elevated metals; remediation to drainage pathway planned
Reference	CL-8	Open Water	2 meters	Contact Lake; Background Station in far NW of Lake	x	x				Background conditions
	CL-RL- 1B	Open Water	Surface	Regional Lake 1 Sample B - NW end of Thompson Lake	x	x		x		Background conditions
Sample Numbers					17	17	7	5	2	

10.3 CONTACT LAKE MINE – 2017 MONITORING RESULTS

Sampling figures are provided in Appendix A, with Figure A1 documenting the location of Contact Lake Mine within the larger GBL Sites project area, Figure A5 providing an overview of the Contact Lake Mine areas, Figure A6 showing the Camp and Mine Area and Figure A7 the Echo Bay Fuel Area. Results of sample analysis are provided in Appendix B, Tables B9-B13. Field data and observations are tabled in Appendix C and site photographs in Appendix D.

10.3.1 Contact Lake Mine – Aquatic Observations

Contact Lake conditions during the 2017 field program appeared consistent with earlier sampling events, though the previously installed dock by the Camp Area has since been removed.

10.3.2 Contact Lake Mine – General Chemistry

Field and analytical results indicated neutral to slightly alkaline pH at all Contact Lake Mine sample stations, consistent with reference stations (CL-RL-1B and CL-8). Water sampled from Great Bear Lake, Contact Lake proper and the reference stations was classified as soft. This is in contrast with on-land water, the Tailings Pond and discharge stream samples which were moderately hard to hard water. The same general trend is noted for electrical conductivity which is low and at reference stations and Contact Lake (40-60 $\mu\text{S}/\text{cm}$) and elevated in waters within the mine footprint and discharge stream (100-130 $\mu\text{S}/\text{cm}$). Conductivity in Great Bear Lake is also elevated (~155 $\mu\text{S}/\text{cm}$). All samples reported total suspended solids below detection, with the exception of the discharge stream (CL-2B) which was marginally above detection (3.1 mg/L)

Ammonia, chloride, nitrate, and nitrite were all below the associated CCME-FAL guidelines in all aquatic waterbodies. Fluoride concentrations exceeded the CCME guideline of 0.12 mg/L in samples from the Tailings Pond (CL-3 plus duplicate and CL-29) and in the discharge stream (CL-2B plus duplicate). Concentrations ranged from 0.262 mg/L to 0.299 mg/L, though it is noted that reference station CL-RL-1B from Thompson Lake also exceeded the CCME-FAL guideline and reported a concentration of 0.209 mg/L. These results confirm the natural abundance of fluoride, though mining and milling activities may be contributing to these concentrations.

Sulphide concentrations were below detection limit for all samples. However, sulphate

concentrations were significantly higher at on-land sample stations CL-2 and CL-15 (14.7 mg/L and 8.97 mg/L respectively). These samples were collected from shallow water pools surrounded by waste rock and tailings. Sulphate concentrations were lower in the Tailings Pond samples CL-3 and CL-29 (6.28 mg/L and 6.29 mg/L respectively) and equal to background in the discharge stream sample CL-2B. Sulphate concentrations in Great Bear Lake samples CL-7, CL-16 and CL-20 were 14.9 mg/L, despite the absence of mined materials and indicating the potential for natural variability in sulphate concentration. Total and dissolved organic carbon concentrations were low at all stations (<10 mg/L).

10.3.3 Contact Lake Mine – Total and Dissolved Metals

Consistent with earlier monitoring, concentrations of arsenic, copper, mercury, silver and uranium were elevated in pooled surface water samples (CL-2 and CL-15). Within the downstream Tailings Pond (CL-3 plus duplicate and CL-29), concentrations of mercury and silver were well below the CCME-FAL guidelines, though arsenic, copper and uranium concentrations exceeded. This same trend was observed in the discharge stream sample CL-2B (and duplicate), and while lower in concentration than the Tailings Pond, arsenic, copper and uranium exceeded guidelines. However, at the discharge point of the stream into Contact Lake (CL-5) all metal concentrations were below CCME-FAL guidelines. The same result is noted for the remaining four Contact Lake stations (CL-26, CL-6 at 2 m and 10 m, CL-9 and CL-24) and no exceedances of aquatic guidelines were reported. Summaries of the arsenic, copper and uranium concentrations in the Tailings Pond, discharge stream and Contact Lake are provided in Figures 5 through 7 below. The figures demonstrate that the Tailings Pond metal concentrations are expectedly the highest of the aquatic waterbodies sampled and are a maximum of approximately four times the associated CCME-FAL guideline values.

Analysis of dissolved metal concentration was conducted at stations CL-3 (plus duplicate), CL-2B (plus duplicate), CL-5, CL-26, CL-6 (2 m and 10 m depth) and station CL-7. Dissolved arsenic and uranium concentrations were approximately equal to total concentrations (+/- 10% in keeping with natural variability and analytical accuracy). Dissolved copper concentrations were 76-95% of those reported in corresponding total copper results.

Comparison with 2016 findings indicate an increase in mercury and silver concentrations at the standing water station CL-2 below the waste rock pile; however, arsenic has decreased. In contrast, a notable decrease in metal concentration was reported at station CL-5. Further evaluation determined the 2016 sample at station CL-5 was erroneously sampled from within the discharge creek and not at the shoreline of Contact Lake, as was previously conducted during other monitoring programs. With the exception of these two observations, 2017 data shows the same general concentration trends as earlier sampling programs.

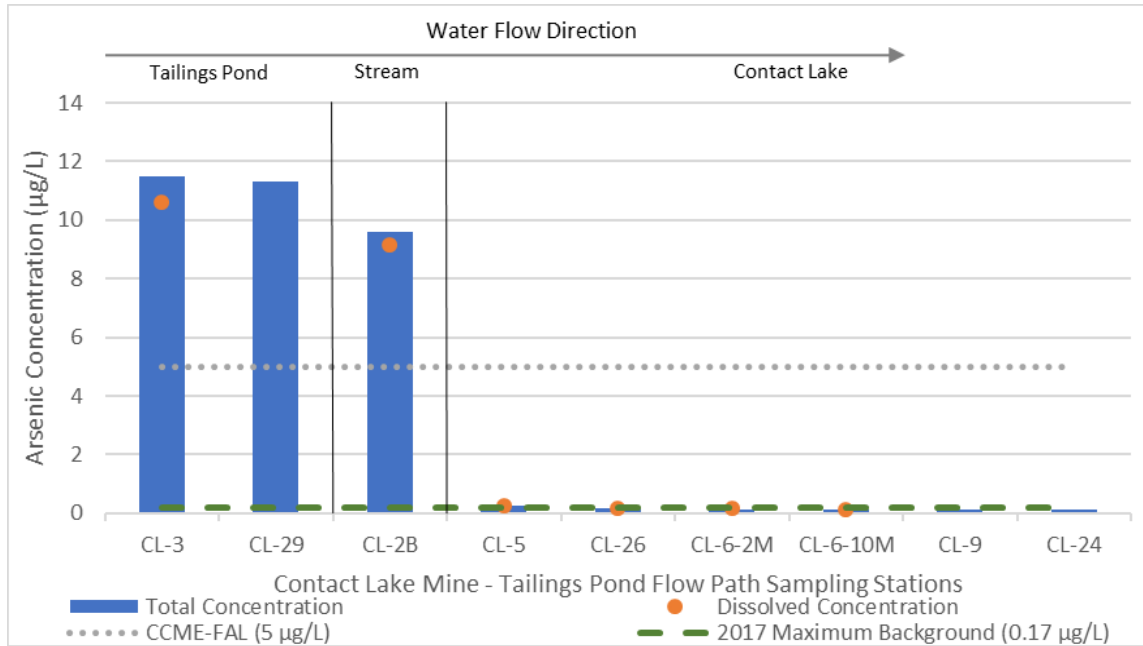


Figure 5 2017 Arsenic Concentrations in Contact Lake Mine Flow Path Samples

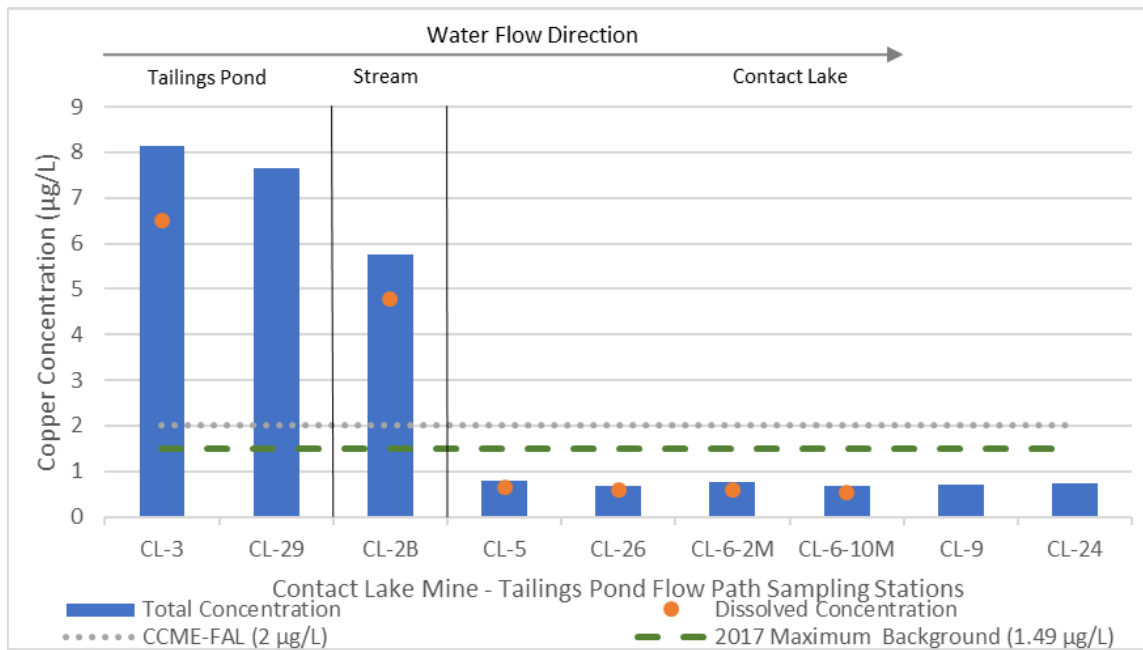


Figure 6 2017 Copper Concentrations in Contact Lake Mine Flow Path Samples

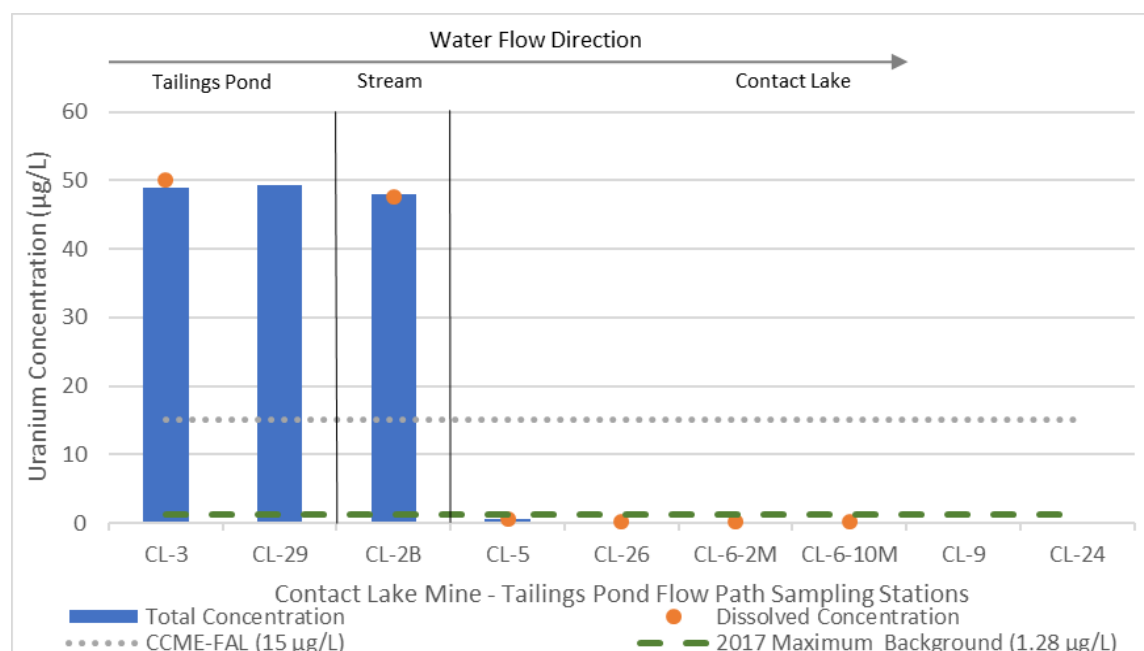


Figure 7 2017 Uranium Concentrations in Contact Lake Mine Flow Path Samples

Sampling at the Echo Bay East Arm fuel storage area on Great Bear Lake was conducted at three stations (CL-7, CL-20 and CL-16 at two depths). All total metal results were below CCME-FAL guidelines.

10.3.4 Contact Lake Mine – Hydrocarbons

Based on findings of terrestrial PHC contamination reported at the main mine site, camp area and at the East Arm Echo Bay fuel storage area, samples were collected from the Tailings Pond (CL-3 plus duplicate), Contact Lake offshore of mine discharge (CL-26) and at the former East Arm fuel storage area (CL-7 and CL-16). All 2017 sample results were below detection limits for volatile organic compounds and PHCs.

10.3.5 Contact Lake Mine – Radionuclides

Radium-226 and lead-210 were analyzed in samples from reference stations (CL-RL-1B and CL-8) and stations associated with mine activities and waste deposition (e.g. tailings, waste rock). This included the two on-land stations of pooled standing water in the waste rock and

tailings areas (CL-2 and CL-15), one station within the tailings pond (CL-3 plus duplicate), one station within the discharge stream (CL-2B plus duplicate) and three stations within Contact Lake (CL-5, CL-26 and CL-6 at two depths). The Echo Bay East Arm fuel storage area on Great Bear Lake also housed the barge docking area used to transport ore to the Echo Bay mill at Port Radium. The dock wall station (CL-7) was therefore analyzed for radionuclides.

To date, environmental criteria for radionuclides in water have not been developed for protection of aquatic species. The measured concentration of radionuclides in water has instead been compared to Canadian Guidelines for Drinking Water Quality (CGDWQ) published by Health Canada on behalf of the Federal-Provincial-Territorial Committee on Drinking Water (Health Canada 2009). This approach was applied during previous assessment and monitoring, ensuring the consistency in result evaluation.

Within Contact Lake and Great Bear Lake, all radium-226 and lead-210 concentrations were below detection limits in 2017. Radium-226 concentrations were above detection in on-land standing water (CL-2 and CL-15), the Tailings Pond (CL-3) and the discharge stream (CL-2B); however, concentrations were below the CGDWG. At station CL-2 (pooled standing water in tailings/waste rock area), the lead-210 concentration of 0.35 Bq/L exceeded the CDWQG of 0.2 Bq/L. However, all other reported lead-210 results were below detection limits.

11 EL BONANZA MINE – WATER QUALITY MONITORING

11.1 EL BONANZA MINE – SITE SUMMARY

The development and operational history of the El Bonanza Mine is provided in the associated Remedial Action Plan (INAC-CARD and SENES 2008b). A rich silver deposit was discovered at the property in 1931 and in 1934 the site was acquired by the El Bonanza Mining Corporation Limited, a subsidiary of Eldorado Gold Mines Limited. The claims and deposits fell in two distinct areas, the El Bonanza mine on the shore of Silver Lake and Bonanza Mine on Whale Lake approximately 1.5 km to the northwest. Both surface and underground work commenced in 1934 at El Bonanza, with ore hand picked through vein systems and transported to British Columbia for processing. Additional ore was stockpiled for shipment to Eldorado Mine for milling; however, due to declining silver prices, operations were suspended. Exploration for uranium was conducted at the El Bonanza property in the 1940s by the federal government; however, there was no record of uranium mining having been conducted at the property.

Silver activities recommenced intermittently in 1956 and again in 1965, including ongoing underground development and sinking of the shaft. By 1972 approximately 2,500 t of ore were reportedly stockpiled. Additional exploration was conducted at the property, though no economic silver encountered.

A similar operational history is documented at the Bonanza Mine, with work commencing in 1937 to explore for silver potential. A short shaft was developed with lateral extensions and a small volume of ore extracted which was shipped to the Eldorado Mill at Labine Point (i.e. Port Radium Mine). The property changed hands multiple times over the following decades and work included exploration, trenching, drilling and bulk sampling (680 kg of ore) before abandonment.

Access roads were constructed to connect Mile Lake and Great Bear Lake to the El Bonanza Mine. Access to the Bonanza Mine likely occurred across the ice on the small lakes between Great Bear Lake and the mine site, though a former trail is also observed.

In 2010, the GBL Phase I Remediation Project was implemented and focussed on work activities which could be successfully implemented without the use of heavy equipment. This included destruction of most buildings; burning of combustible building materials and debris; and consolidation of non-combustible materials. In 2016, a drum removal program continued these efforts by removing all drums with residual product for off-site management. As with the other GBL Sites, completion of the site remediation will be conducted in the coming years per the approaches detailed within the El Bonanza Mine 2007 Remedial Action Plan (INAC-CARD and

SENES 2008b).

In its current form, infrastructure at the property is distributed over three discrete areas: El Bonanza Mine on Silver Lake (adjacent to Mile Lake), Bonanza Mine to the northwest on Whale Lake and the Great Bear Lake former airstrip and fuel storage area. However, following the 2010 remedial activities, there is limited infrastructure remaining at the small operation. This includes a small number of buildings which require heavy equipment for demolition (e.g. headframes), empty drums, debris, four above-ground storage tanks, mine openings (four at el Bonanza and one at Bonanza) and waste rock (3,000 m³ at El Bonanza Mine and 600 m³ at Bonanza Mine).

11.2 EL BONANZA MINE – WATERBODIES, CONCERNS AND MONITORING APPROACH

El Bonanza Mine is located at the base of a rock ridge and glacial till outcrop between Mile Lake and the small Silver Lake (INAC-CARD and SENES 2008b). Mile Lake discharges into Silver Lake through a culvert installed in the narrow strip of land separating the lakes. This causeway is believed to have been constructed during mining operations (SENES 2007b). At the northern tip of Silver Lake, a small stream discharges Silver Lake to the northwest. The El Bonanza Mine waste rock pile extends into Silver Lake; however, no milling activities were conducted onsite and there were no tailings identified. The Bonanza Mine also contains no tailings, though a small waste rock pile is found upgradient of the Whale Lake shoreline. The fuel storage area and former airstrip lie near the shore of Great Bear Lake, within a shallow bay with a gravel and sand beach (INAC-CARD and SENES 2008b).

Assessment and water quality monitoring has been conducted intermittently at the sites since 2004. While a small number of early sample results exceeded the CCME-FAL for copper in Mile Lake and equaled the guideline in Silver Lake, subsequent monitoring results were below all guidelines (INAC-CARD and SENES 2008b). Previous investigations concluded that the El Bonanza Mine has had negligible impacts on the water quality of Mile Lake. Metal concentrations observed in Silver Lake (adjacent to the mine and waste rock) are likely attributable to the presence of waste rock in and near the lake. However, given the concentrations were below CCME-FAL, any impacts that were occurring are considered to be immaterial (INAC-CARD and SENES 2008b). Based on results from previous monitoring activities at the Bonanza Mine and an absence of residual contaminant sources (e.g., tailings or waste rock in water), sampling in Whale Lake adjacent to the Bonanza Mine was not considered justified and was not included in the *Great Bear Lake Sites Proposed Long-Term, State of Environment and Construction Monitoring Plans* (SENES 2009).

The 2017 water quality monitoring program primarily aimed to build upon the baseline state of knowledge. This included sampling at proposed soil treatment areas, which were not known during the early phase of monitoring activities. As per earlier monitoring programs and due to the close proximity of the Contact Lake Mine, the two reference stations sampled as part of the Contact Lake program (CL-8 and CL-RL-1B), were used as reference water quality stations for the El Bonanza Mine as well. The sampling stations, locations, parameters and rationale are provided in Table 8 below.

Table 8 El Bonanza Mine 2017 Sampling Stations

AREA	STATION	SAMPLE TYPE	DEPTH	GENERAL LOCATION	General Chemistry	Total Metals	Dissolved Metals	PHC, BTEX	SNP	RATIONALE
Great Bear Lake	ELB-1G-GBL	Shoreline	Surface	Great Bear Lake; Airstrip; North end of bay	x	x	x	x		PHC contaminated soil excavation and treatment area planned
	ELB-2G-GBL	Shoreline	Surface	Great Bear Lake; Airstrip; South end of bay	x	x		x		PHC contaminated soils and soil treatment area planned
	ELB-9-GBL	Open Water	Surface	Great Bear Lake by Airstrip, approximately 200m from shore	x	x		x		PHC contaminated soils and soil treatment area planned
Mile Lake	ELB-4-ML-2M	Shoreline	Surface	Mile Lake; Near shore station; Directly east of mine	x	x				Identify potential contaminant migration from mine
	ELB-10-ML	Open Water	Surface	Mile Lake; Narrows of small bay E of mine site	x	x				Identify potential contaminant migration from mine
Silver Lake	ELB-6-SL	Shoreline	Surface	Silver Lake; At culvert between Mile Lake and Silver Lake	x	x				Identify any contaminant migration; baseline measurements prior to culvert removal
	ELB-7-SL	Shoreline	Surface	Silver Lake; Shoreline region at waste rock pile	x	x	x	x		Waste rock influence
	ELB-8-SL	Shoreline	Surface	Silver Lake; Shoreline region at outflow of Silver Lake	x	x				Waste rock influence
Stream	ELB-SW-2	On-land	Surface	On-land; Small stream outflow of Silver Lake; 50-m from Silver Lake	x	x	x			Waste rock influence and migration
Reference	CL-8	Open Water	2 meters	Contact Lake; Background Station in far NW bay of Lake	x	x				Background conditions
	CL-RL-1B	Open Water	Surface	Regional Lake 1 - Sample B - NW end of Thompson Lake	x	x		x		Background conditions
Sample Numbers					11	11	3	5		

11.3 EL BONANZA MINE – 2017 MONITORING RESULTS

Sampling figures are provided in Appendix A, with Figure A1 documenting the location of El Bonanza Mine within the larger GBL Sites project area and Figure A8 the individual El Bonanza sampling stations. Results of sample analysis are provided in Appendix B, Tables B14-B17. Field data and observations are tabled in Appendix C and site photographs in Appendix D.

11.3.1 El Bonanza Mine – Aquatic Observations

Water levels in Mile Lake were higher than reported in previous years, resulting in difficulty in plane docking. Despite this observation, there was no visible change in ground conditions at the project site.

11.3.2 El Bonanza Mine – General Chemistry

Field and analytical results indicated neutral to slightly alkaline pH all El Bonanza Mine sample stations, consistent with reference stations (CL-RL-1B and CL-8). Silver Lake, Mile Lake and the discharge stream were classified as soft water (29.8-32.5 mg/L as CaCO_3), and Great Bear Lake as moderately hard (71.6-74.5 mg/L as CaCO_3). Conductivity in Great Bear Lake is also elevated (157-158 $\mu\text{S}/\text{cm}$) relative to the other aquatic water bodies sampled (43.6-64.5 $\mu\text{S}/\text{cm}$).

Ammonia, chloride, nitrate, nitrite and fluoride were below the associated CCME-FAL guidelines in all samples. Sulphide concentrations were below detection limit for all samples. Sulphate concentrations reported from Mile Lake, Silver Lake and the discharge stream were above detection (1.45-1.24 mg/L); however, were less than reported at the Thompson Lake reference station (1.84 mg/L). Sulphate concentrations in Great Bear Lake samples ELB-1G-GBL, ELB-2G-GBL and ELB-9-GBL were 14.9-15.0 mg/L despite the absence of mined materials and indicating the potential for natural variability in sulphate concentration. Total and dissolved organic carbon concentrations were low at all stations (<5 mg/L).

11.3.3 El Bonanza Mine – Total and Dissolved Metals

All 2017 total and dissolved metal results were below applicable CCME-FAL guidelines. This included results from Mile Lake, Silver Lake, the discharge stream and Great Bear Lake at the former airstrip/fuel storage area.

11.3.4 El Bonanza Mine – Hydrocarbons

Based on findings of terrestrial PHC reported at the main mine site and in the vicinity of the Great Bear Lake fuel storage tanks, select sampling stations were also assessed for PHCs. Samples analyzed for hydrocarbon concentration included one station in Silver Lake at the waste rock pile (ELB-7-SL) and three stations at the Great Bear Lake former airstrip/fuel storage area (ELB-1G-GBL, ELB-2G-GBL and ELB-9-GBL). All 2017 sample results were below detection limits for volatile organic compounds and PHCs.

12 SAWMILL BAY – WATER QUALITY MONITORING

12.1 SAWMILL BAY – SITE SUMMARY

The development and operational history of Sawmill Bay is provided in the associated Remedial Action Plan (INAC-CARD and Franz 2010). The first reported industrial use of the site was as a sawmill from the 1930s to 1940s. In the 1940s to 1960s, the site was used for barge and air transportation of uranium ore from the Port Radium Mine. From 1947 to 1950, an airfield and basecamp were established at Sawmill Bay for the Loran Navigation System (a hyperbolic radio system developed during World War II). Sawmill Bay was also used from the late 1940s to early 1950s to support refuelling and supply for Royal Canadian Air Force photographic operations and aerial mapping. From 1944-1947 the site airstrip and lodge provided support for construction of the Distant Early Warning (DEW) Line stations. In the late 1950s, Sawmill Bay became the site of a commercial fishing camp. Unlike the other GBL Sites, Sawmill bay did not host any mining or milling activities.

Due to the diverse range of site uses, some areas of infrastructure served distinct purposes while others had overlapping uses. The site is broken into six principal areas as follows:

1. Two intersecting airstrips
2. Former Great Bear Lake Lodge (i.e. fishing lodge between airstrip and Sawmill Bay)
3. Former fishing dock area (at shoreline of Great Bear Lake, apex of Sawmill Bay)
4. Main Barrel Cache with approximately 8,000 drums (south shore of Sawmill Bay)
5. Beach Landing and former Arctic Enterprises Lease Area (south shore of sawmill Bay)
6. Former Sawmill Site (south shore of Sawmill Bay).

The principal site infrastructure in support of these operations was building structures, totalling 1,800 m² of floor area. In addition, a substantial volume of drums, debris and vehicles were found discarded throughout the site and in consolidated piles. Assessment activities documented large areas of PHC contaminated soils, though metal impacts and low-level radiological impacts (from uranium ore transport) were also reported in discrete areas. Based on site evaluations, arsenic, cobalt, copper lead and uranium were identified as metals of concern at the site. Metal impacts at the site are generally attributed to debris (e.g. metal, broken batteries) and uranium ore also rich in other metals (including arsenic).

Comprehensive site remediation has not yet been conducted; however, discrete work programs have been implemented to address specific concerns. While a 1996 investigation concluded that under the current land use at Sawmill Bay no remedial action was required, a clean-up was completed at the site in September 1998 by the Low Level Radioactive Waste Management Office (LLRWMO) to remove approximately 22 m³ of soil containing more than 500 ppm of

uranium. Cleanup of uranium contaminated soil was conducted at the Beach Landing, Great Bear Lodge and Airstrip areas, with soil removed for offsite management (Franz/Ecometrix 2008). In 2010/2011, the GBL Phase I Remediation Project was implemented and focussed on work activities which could be successfully implemented without the use of heavy equipment. At Sawmill Bay, this work primarily focussed on the consolidation of debris and the management of drums and residual product. Drums with residual product were consolidated, fuel product transported off-site and the emptied drums washed and crushed (SENES 2011 and SENES 2012). The remainder of remedial activities specified within the RAP (e.g. contaminated soil management, building demolition and debris management) will be implemented over the coming years as part of the large scale GBL Sites Phase II Remediation Project.

12.2 SAWMILL BAY – WATERBODIES, CONCERNS AND MONITORING APPROACH

Sawmill Bay lies on the southeast corner of Great Bear Lake, on the eastern margin of the Leith Peninsula. The narrow east/west oriented shallow bay is largely protected by Richardson Island to the east. Numerous smaller lakes are found to the south and west, though these are beyond the footprint of industrial activities. A small ravine situated south of the airstrip runs through the Lodge Area before draining into Sawmill Bay via an ephemeral stream (SLR 2017). Unlike the other GBL sites, there is little topographic elevation change at the Sawmill Bay site.

Assessment and water quality monitoring has been conducted intermittently at the sites since 1992. Despite the presence of terrestrial PHC contamination, there was no evidence of PHCs in surface waters and only one sediment sample reported PHC concentrations exceeding applicable guidelines. A sunken barge was identified in the Beach Landing and former Arctic Enterprises Lease Area, around which sediment samples slightly exceeded total chromium guidelines, though no other metal concerns associated with ore handling were identified in surface water or sediment. Elevated iron has been documented in the site drainage between the Main Lodge Area and Sawmill Bay proper, though based on background sampling these concentrations were suggested to be natural in origin. Radionuclide analysis failed to identify any concerns in the waterbodies sampled (SLR 2017).

Given the absence of aquatic water quality concerns at Sawmill Bay, the 2017 water quality monitoring program primarily aimed to build upon the baseline state of knowledge. This included sampling areas at which remedial activities and infrastructure will occur (e.g. soil treatment area, soil cleanup area). Recommendations by SLR were used as the primary guidance document in the design of the 2017 monitoring activities, with minor adjustments to address remedial plans and recommendations from Sahtu Land and Water Board reviews. The

sampling stations, locations, parameters and rationale are provided in Table 9 below, in which revisions based on field conditions are reported.

Table 9 Sawmill Bay 2017 Sampling Stations

AREA	STATION	SAMPLE TYPE	DEPTH	GENERAL LOCATION	General Chemistry	Total Metals	Dissolved Metals	PHC, BTEX	SNP	RATIONALE
Sawmill Bay	A3-SW08-05	Open Water	Surface (2m)	Sawmill Bay, at mouth of ravine	x	x				Receiving water downgradient of creek monitoring
	SW-B-2	Open Water	Surface (2m)	APEC 1 + 5a, Beach Landing, barge transect	x	x	x	x		Area of sunken barge
	SW07-3	Open Water	Surface	APEC 1 + 5a, Beach Landing	x	x		x		Area of PHC impacted sediment
	SW16-01	Open Water	Surface - 2 m	Sawmill Bay, deeper area out from Beach Landing, epilimnion and hypolimnion	x	x		x		Offshore of Beach Landing and remedial activities
			Depth - 6 m		x	x				
	A5-SW08-11	Open Water	Surface	Sawmill Bay, shoreline at Arctic Enterprises	x	x	x	x		Shoreline excavation of contaminated soil planned during remediation
	SW16-02	Open Water	Surface	Sawmill Bay, deeper area, out from former Arctic Enterprises area, epilimnion and hypolimnion	x	x				Offshore of Arctic Enterprises and remedial activities
			Depth - 6 m		x	x		x		
Ravine Creek Pathway	SW07-5	On-land	Surface	APEC 7j, Camp Landfill / Dump						Monitoring downstream of landfill/dump areas DRY – No 2017 sample collected
	A3-SW08-01	Shoreline	Surface	AEC 3, Sawmill Bay, d/g and south of fishing dock	x	x				Monitoring downstream of landfill/dump areas
On-land Water	A2-SW08-03	On-land	Surface	AEC 2j, Lodge area, dumps						Monitoring downstream of landfill/dump areas DRY – No 2017 sample collected
Reference	BG-SW08-04	Shoreline	Surface	Small Lk 1	x	x	x			Background station
	BG-SW08-01	Open Water	Surface - 2 m	Sawmill Bay Background, Along N shore, epilimnion	x	x				Background station
Sample Numbers					11	11	3	5		

12.3 SAWMILL BAY – 2017 MONITORING RESULTS

Sampling figures are provided in Appendix A, with Figure A1 documenting the location of Sawmill Bay within the larger GBL Sites project area and Figure A9 the individual Sawmill Bay sampling stations. Results of sample analysis are provided in Appendix B, Tables B18-B22. Field data and observations are tabled in Appendix C and site photographs in Appendix D.

12.3.1 Sawmill Bay – Aquatic Observations

Water levels in Sawmill Bay were found to be generally consistent with earlier monitoring events. During 2017 monitoring there was light rain and some wave action; however, the water column was clear and any increased sediment entrainment was expected to be minimal. As was observed at Terra Mine, on-land water levels were low as expected during late season sampling. At station SW07-5 (drainage channel downgradient of dump) and station A2-SW08-03 (drainage channel from camp area), no water was observed despite extensive reconnaissance and samples were not collected.

12.3.2 Sawmill Bay – General Chemistry

Field and analytical results indicated neutral to slightly alkaline pH all Sawmill Bay sample stations, consistent with reference stations (BG-SW08-04 and BG-SW08-01). Water hardness was classified as moderately hard to hard and fell within the bounds of results reported at background stations (71.2-153 mg/L as CaCO₃). The same trend was noted for conductivity, with site samples consistent with background measurements of 160-262 µS/cm. With the exception of the total suspended solids results from sample A3-SW08-01 at the discharge of ravine creek into Sawmill Bay (14 mg/L), all other total suspended solids were below detection.

Ammonia, chloride, nitrate, nitrite and fluoride were all below the associated CCME-FAL guidelines. Sulphide concentrations were below detection limit for all samples. Sulphate concentrations reported from stations within Sawmill Bay were 15.7-17.7 mg/L, and a minor increase reported at the station A3-SW08-01 where the ravine creek discharges to Sawmill Bay (21.3 mg/L). Total and dissolved organic carbon concentrations were very low at all stations (<3 mg/L).

12.3.3 Sawmill Bay – Total and Dissolved Metals

Collected at the discharge point of ravine creek into Sawmill Bay, sample A3-SW08-01 concentrations of aluminum (0.201 mg/L) and iron (0.698 mg/L) exceeded the CCME-FAL guidelines of 0.1 mg/L and 0.3 mg/L respectively. The total suspended solids result in this sample was elevated (14 mg/L) and field notes document visibly high turbidity. However, aluminum and iron have not been identified as COPC from the various source terms at the site. Consequently, these concentrations are expected to be associated with suspended solids transported by the creek or through wave action at the shallow apex of the bay.

All other total and dissolved metal sample results were below the associated CCME-FAL

guidelines. These findings are consistent with earlier monitoring programs at which a small number of exceedances have been reported at station A3-SW08-01, though not at downstream stations in Sawmill Bay (SLR 2017).

12.3.4 Sawmill Bay – Hydrocarbons

Based on findings of terrestrial contamination in shoreline environments and remedial plans for the excavation/treatment of these soils, 2017 monitoring included PHC and VOC analysis at discrete stations. Five stations were sampled for PHCs (plus one duplicate), all of which were located immediately offshore of the former barrel cache and Beach Landing/Arctic Enterprises area. All 2017 sample results were below detection limits for volatile organic compounds and PHCs.

12.3.5 Sawmill Bay – Radionuclides

Radium-226 and lead-210 were analyzed at one reference station (BG-SW08-01), and in areas associated with the Beach Landing Area and ore transport infrastructure (A5-SW08-11, SW-B-2 plus duplicate and SW16-02-2m).

All sample results were below the CDWQG for lead-210 and radium-226. With the exception of radium-226 at reference station BG-SW08-01, all results were below detection limits.

13 CONCLUSIONS

The results of 2017 monitoring were generally consistent with findings from earlier aquatic assessment and monitoring campaigns. The principal conclusions of 2017 monitoring are summarized as follows:

- Terra Mine:
 - There were no exceedances of the Water Licence EQC at the sampling stations.
 - Elevated fluoride above CCME-FAL guidelines was reported at all stations (including reference stations), with the greatest concentrations in the Ho Hum TCA and downstream wetlands. The extent to which fluoride concentrations are due to anthropogenic activity is difficult to confirm without pre-mining data.
 - The Ho Hum TCA demonstrated arsenic and copper concentrations in exceedance of CCME-FAL guidelines due to the presence of tailings (submerged and shoreline) and waste rock. Arsenic concentrations decrease in the downstream Upper and Lower Wetland; however, copper concentrations increase in the Lower Wetland where visible water flow was observed entering the wetland from the toe of the airstrip. Further downstream, arsenic concentrations at the discharge point of the Lower Wetland to Moose Bay decrease dramatically. While still in exceedance of CCME-FAL guidelines, arsenic concentrations are below the SSTL derived for this location (SENES 2014). All other stations within Moose Bay are below CCME-FAL guidelines for arsenic and copper and are generally consistent with reference stations.
 - Samples from on-land monitoring stations (adits and pond adjacent to buried debris area) reported elevated concentrations of aluminum, arsenic, copper and/or iron.
 - All PHC and VOC samples from Terra Mine were below detection limits.
- Northrim Mine:
 - Fluoride concentrations exceeded the CCME-FAL guidelines but were consistent with reference station concentrations.
 - Concentrations of arsenic and copper marginally exceeded CCME-FAL guidelines in the Hermandy Lake TCA. Concentrations of arsenic increase in the Leachate Pond, after which copper concentration increases in the discharge stream which cascades over waste rock and exposed bedrock. Adit water was similarly enriched in arsenic and copper, as well as lead. However, all metal concentrations were below guidelines in the Camsell River stations.
 - All PHC and VOC samples from Northrim Mine were below detection limits.

- Norex and Graham Vein Mine:
 - Fluoride concentrations in Xeron Pond and Camsell River stations were consistent with reference stations. The greatest fluoride concentrations were reported in seepage water from the adit and waste rock piles.
 - As documented during earlier monitoring programs, adit seepage water appeared to change geochemically during flow through the waste rock pile. Concentrations of aluminum, cadmium, copper, iron, lead and zinc in many cases increased at the toe of the waste rock slope relative to the adit discharge water. Conversely, arsenic concentrations decreased during passage through the waste rock pile. Aluminum, arsenic, copper, iron and zinc exceed CCME-FAL guidelines in the discharge pathway (one to four times the guideline values); however, all sample results were below guidelines in Camsell River samples.
 - One station at the toe of the waste rock slope (NX-3) demonstrated low but detectable concentrations of PHCs in the F2 range, which may represent migration from PHC contaminated waste rock or be attributable to higher organic carbon at this station. All other PHC and VOC sample results were below detection limits.
- Smallwood Mine:
 - Fluoride concentrations within Smallwood Lake exceeded CCME-FAL guidelines and were higher than reported at reference stations (though lower than in TCAs). This may represent contribution from waste rock or a natural elevation in Smallwood Lake.
 - Metal concentrations were generally low within Smallwood Lake, with the exception of a single cadmium exceedance and zinc above CCME-FAL guidelines in two samples. One sample reported zinc concentrations higher than were documented during earlier sampling programs.
 - All PHC and VOC samples from Smallwood Mine were below detection limits.
- Contact Lake Mine:
 - Fluoride concentrations exceeded the CCME-FAL guideline in samples from the Tailings Pond and in the discharge stream.
 - Concentrations of arsenic, copper, mercury, silver and uranium were elevated in pooled surface water samples (aquatic guidelines not applicable). Within the downstream Tailings Pond the concentrations of mercury and silver dropped below the associated CCME-FAL guidelines, though arsenic, copper and uranium concentrations continued to exceed (maximum of approximately four times CCME-FAL guidelines). This same trend was observed in the discharge

stream sample CL-2B (and duplicate), and while lower in concentration than the Tailings Pond, arsenic, copper and zinc exceeded guidelines. However, at the discharge point of the stream into Contact Lake and at all other Contact Lake sampling stations, metal concentrations were below CCME-FAL guidelines. Similarly, metal concentrations were below guideline values at the Great Bear Lake East Arm monitoring stations.

- Despite extensive sampling in the Mine Area and at the East Arm fuel storage area, all samples were below detection limit for PHCs and VOCs.
 - Analysis of radionuclides (lead-210 and radium-226) was conducted throughout the site, though no aquatic guidelines are available for these parameters and Canadian Drinking Water Quality Guidelines (CDWQG) were applied. A single exceedance of the lead-210 guideline was identified at shallow standing water below the waste rock pile (CL-2), though no other exceedances were noted. All results from Contact Lake proper and Echo Bay were below detection limits for both radionuclides.
- El Bonanza Mine:
 - There were no exceedances of any CCME-FAL guidelines at the project site. This includes fluoride, metals (in total or dissolved fraction) and PHCs/VOCs (below detection limits).
 - Sawmill Bay:
 - Sample results in Sawmill Bay were below CCME-FAL guidelines for general chemistry, metals and PHC parameters. The sole exception was the sample collected at the discharge point of the Ravine Creek into Sawmill Bay (A3-SW08-01), at which aluminum and iron exceeded the associated guidelines. It is noted that these parameters were not identified as COPC during the extensive site assessments and given the high suspended solids and visible turbidity at this shallow water station, it is predicted that these concentrations are attributable to transport of suspended sediments from the shallow creek and not representative of aquatic contamination.

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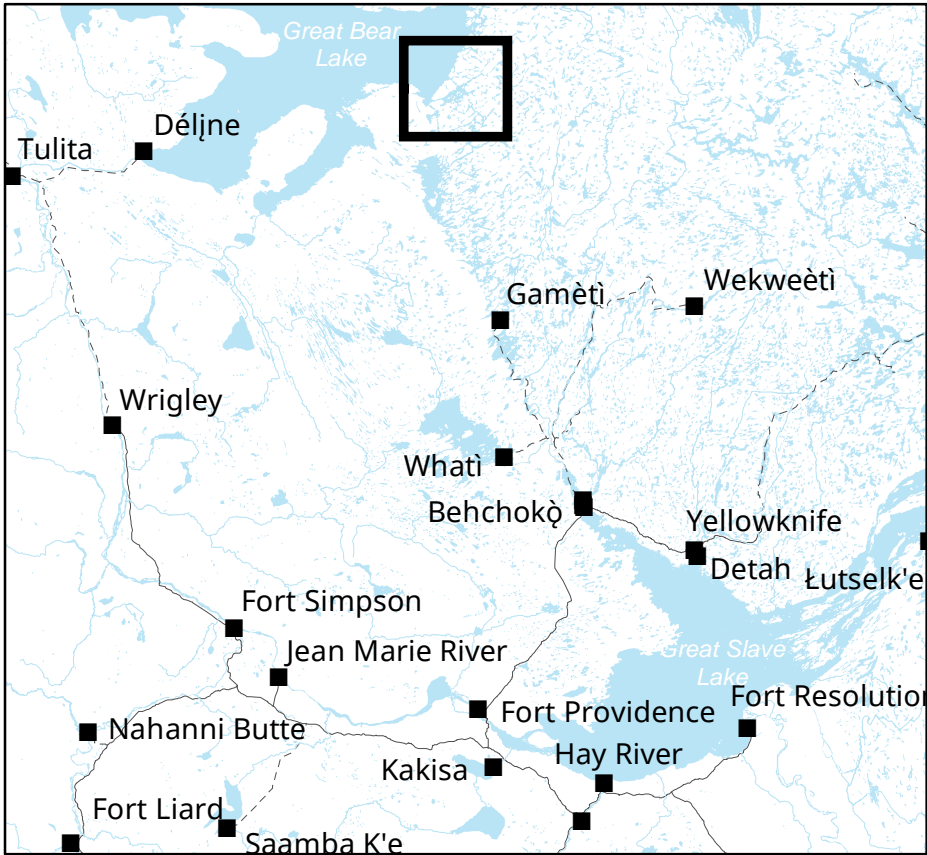
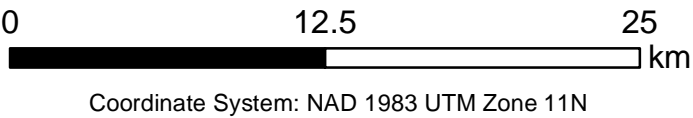
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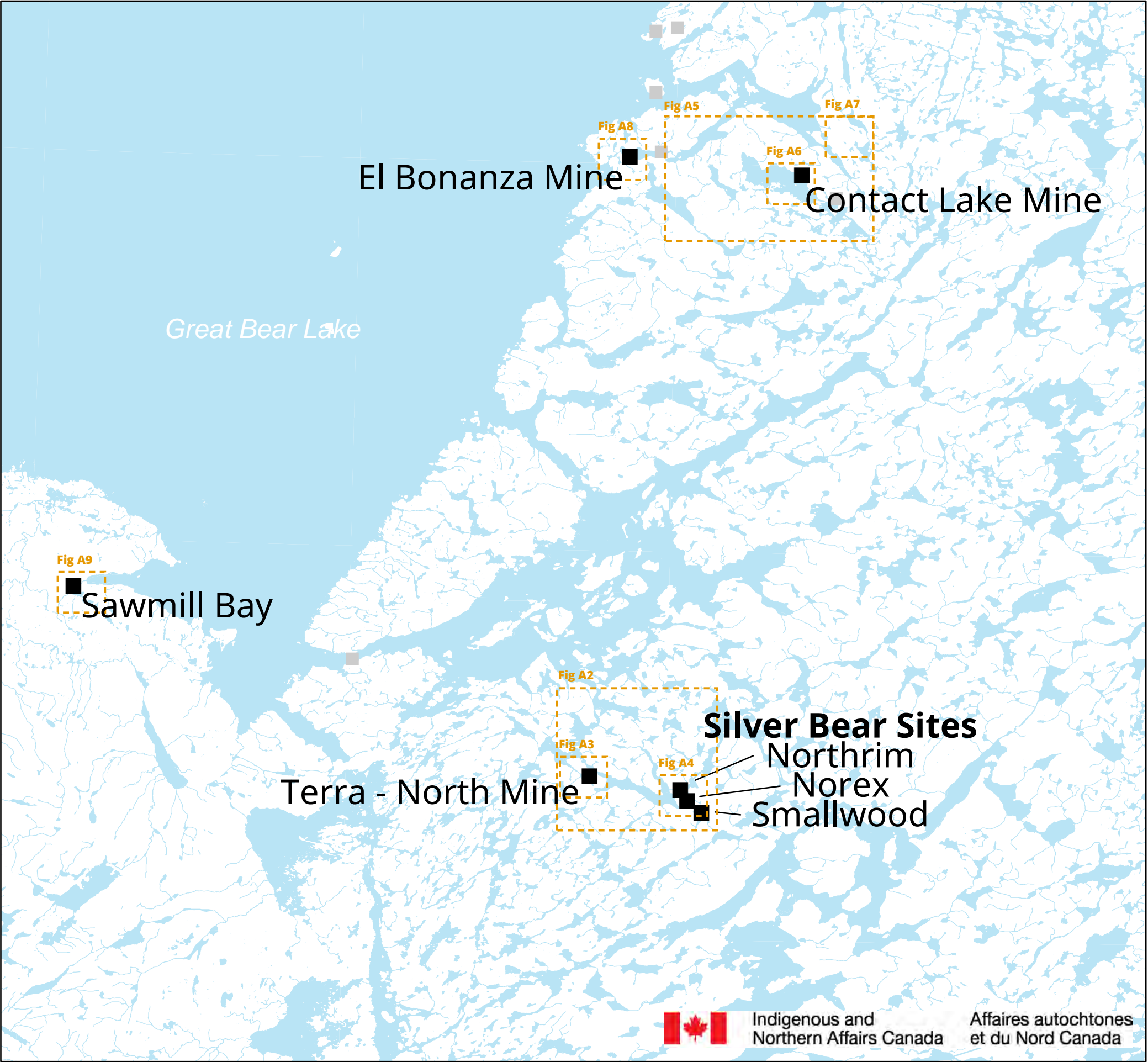
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APPENDIX A – Figures

Figure A1: Great Bear Lake - Site Overview
Contaminated Sites and Remediation Division



Date: 11/20/2017

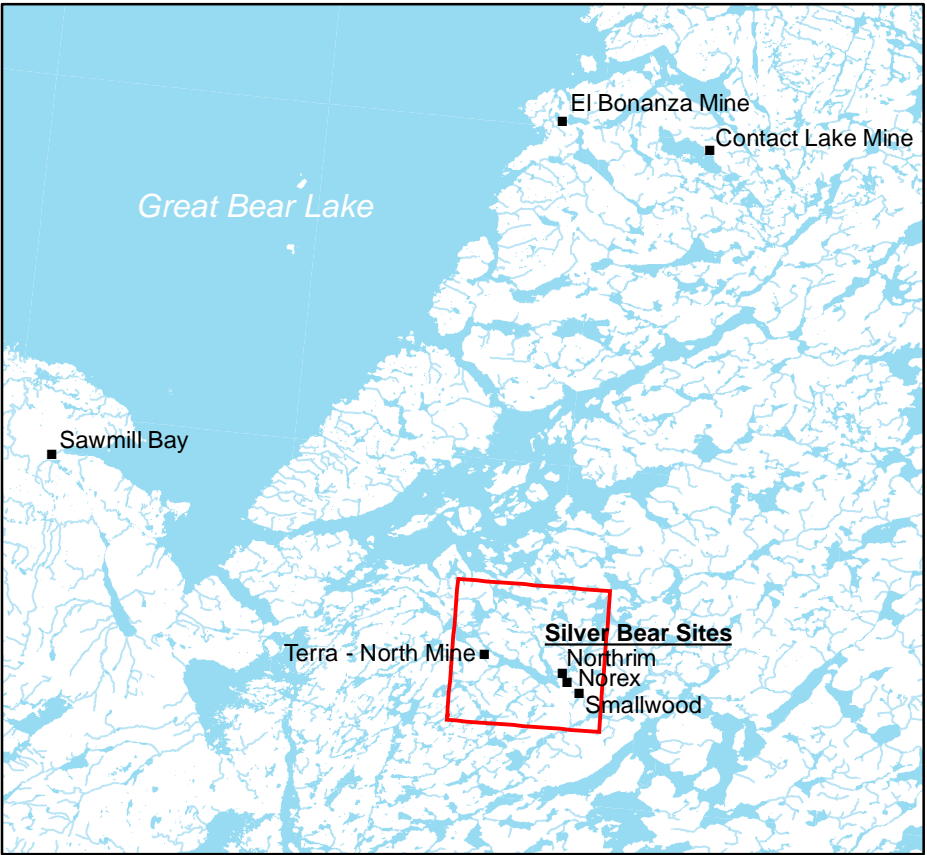


**Figure A2: Great Bear Lake
Silver Bear Overview**
Contaminated Sites and Remediation Division

0 2.5 5 km

Coordinate System: NAD 1983 UTM Zone 11N

- ▲ Sample Station
- ▲ SNP Station



Date: 11/20/2017

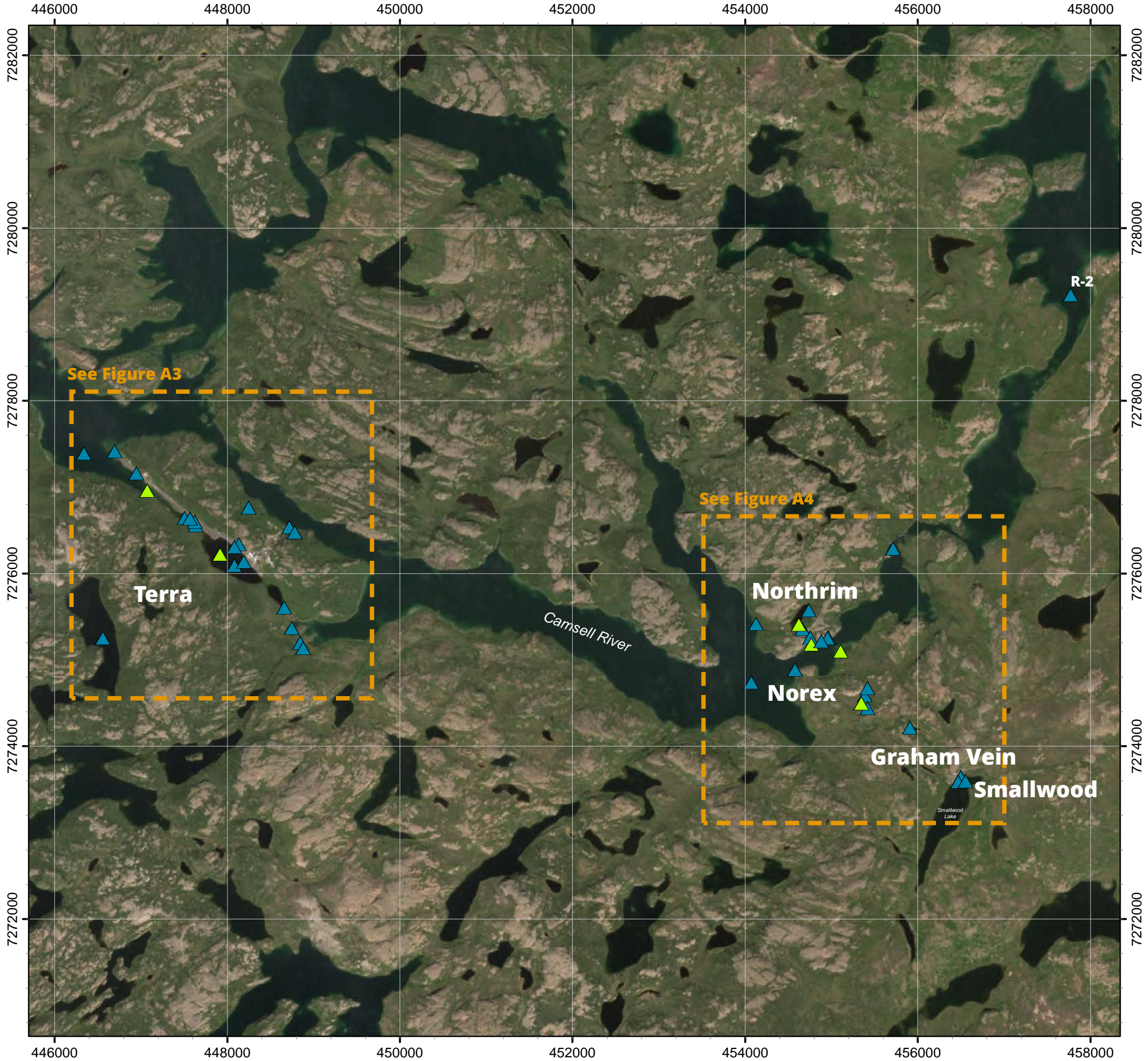
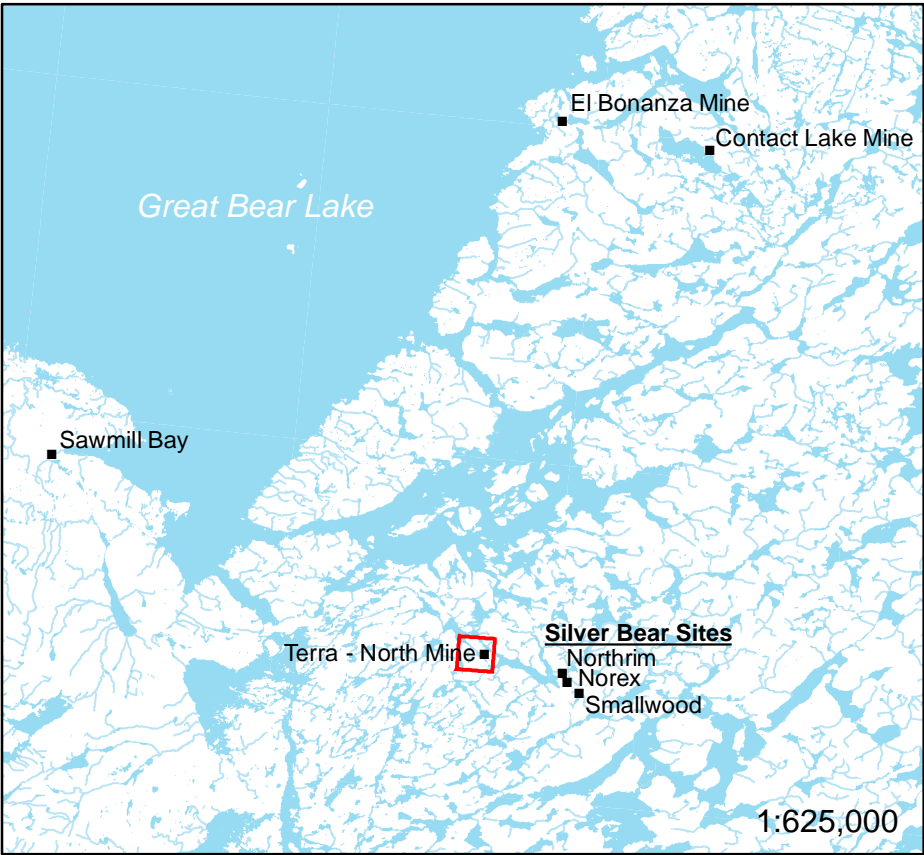
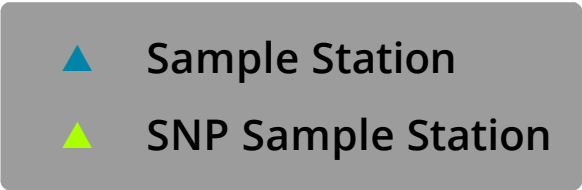
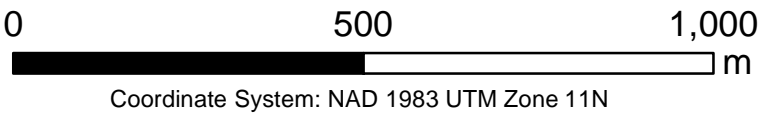


Figure A3: Great Bear Lake - Terra Mine
Contaminated Sites and Remediation Division



Date: 11/20/2017

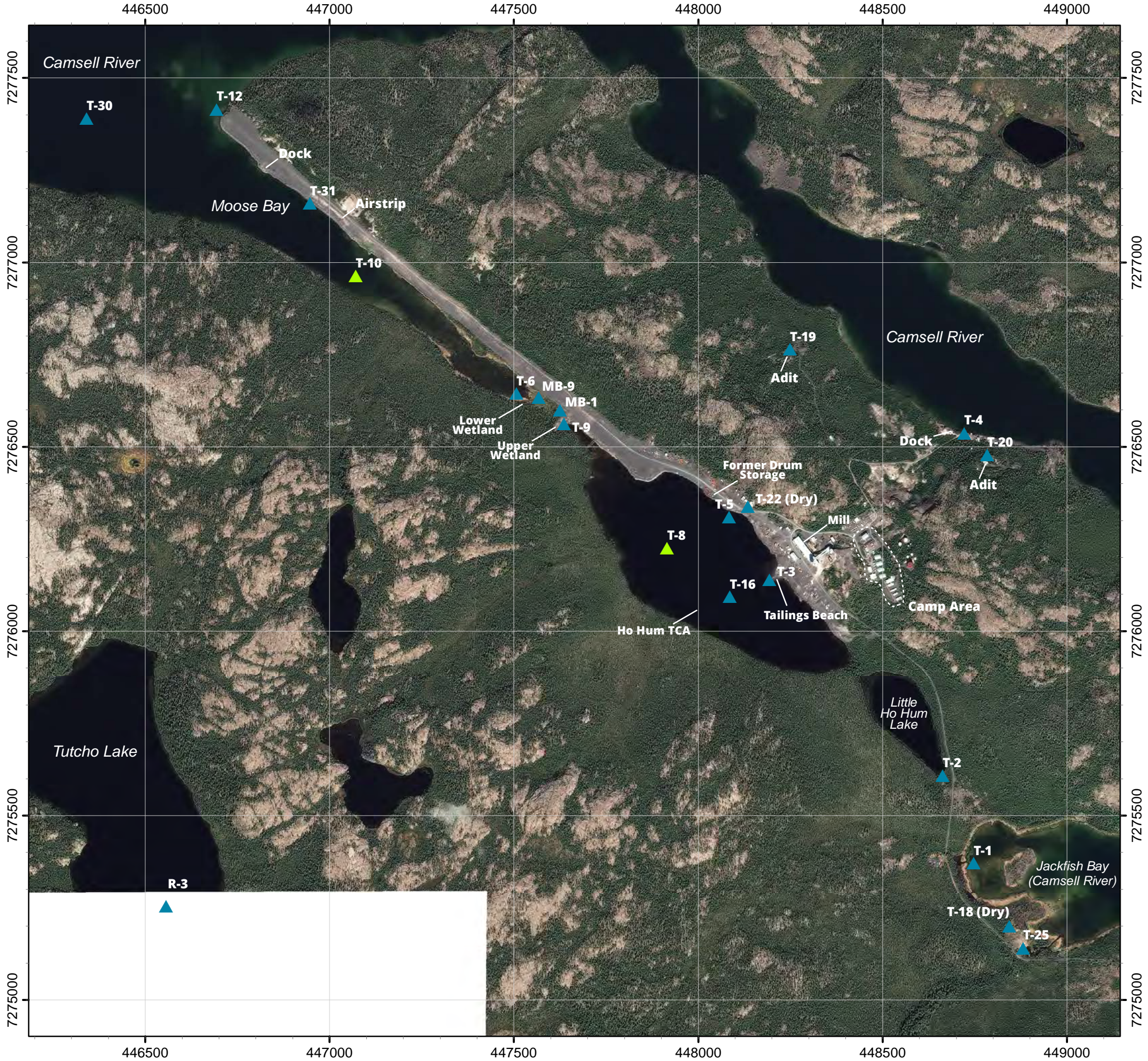
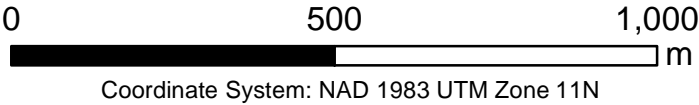
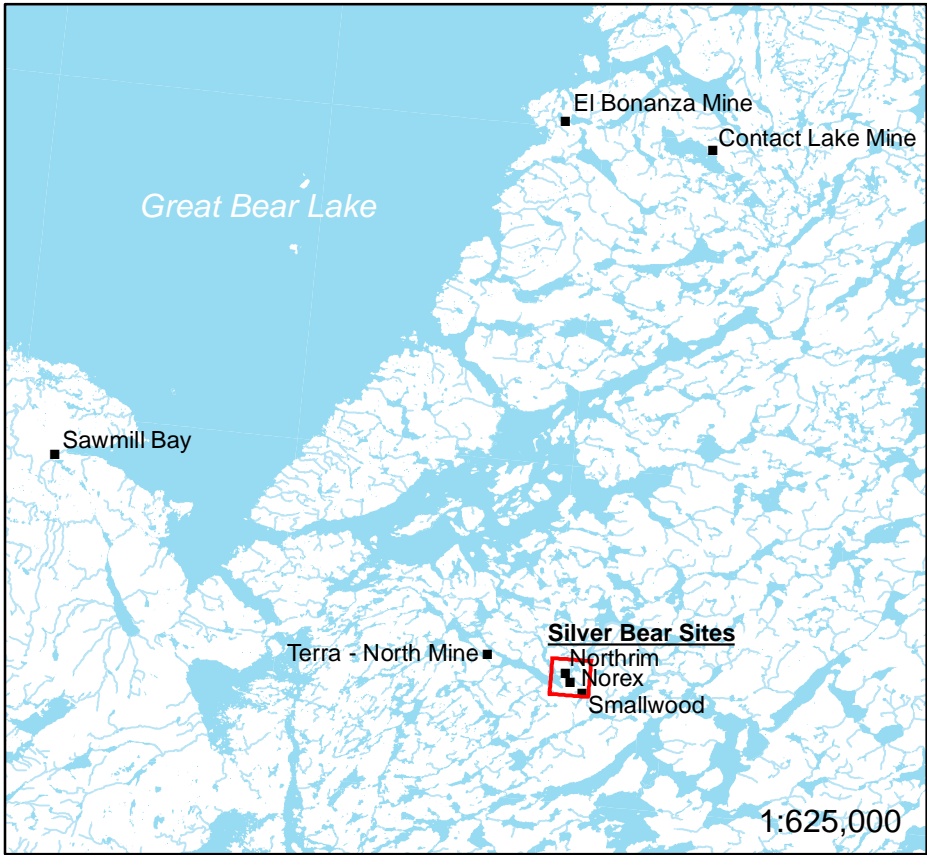


Figure A4: Great Bear Lake
Northrim, Norex, Graham Vein & Smallwood
Contaminated Sites and Remediation Division



- ▲ Sample Station
- ▲ SNP Station



Date: 11/20/2017

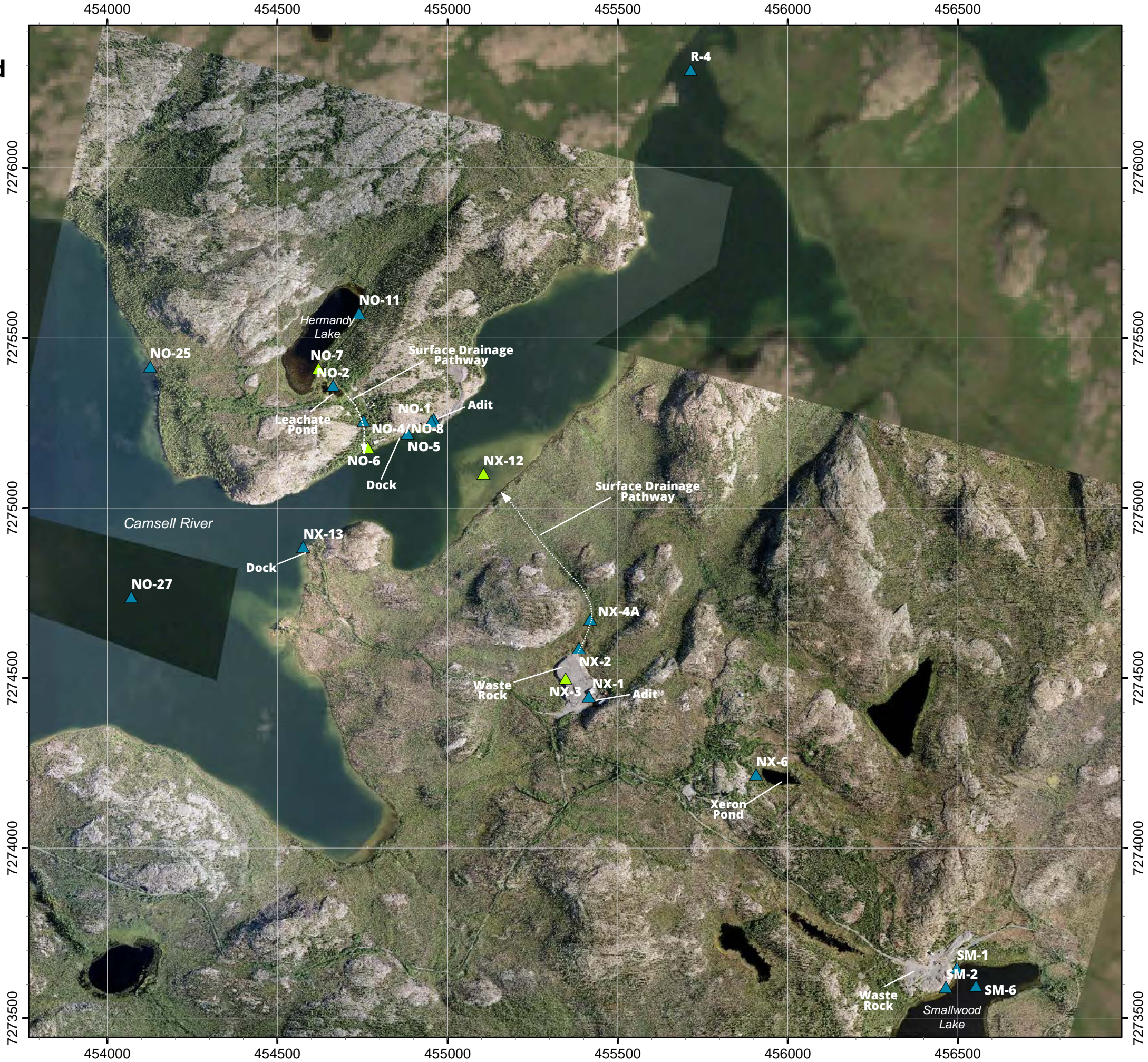
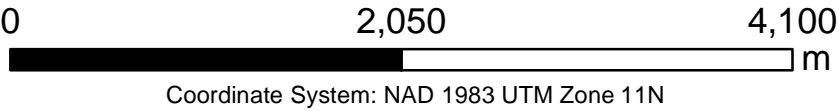
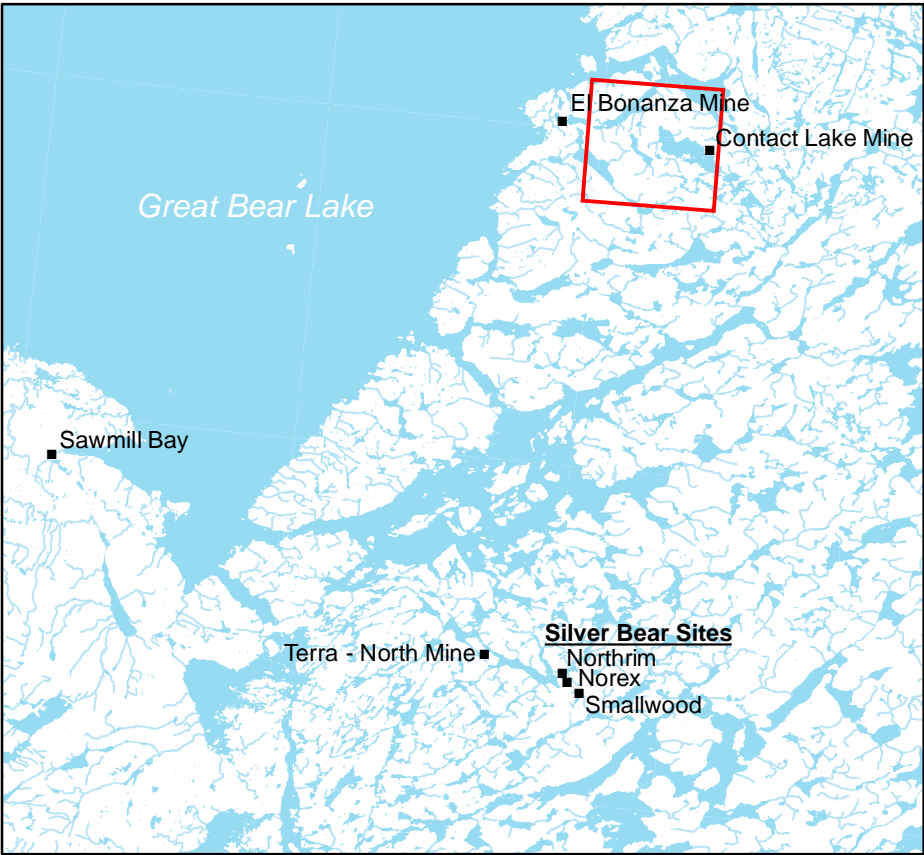


Figure A5: Great Bear Lake
Contact Lake Overview

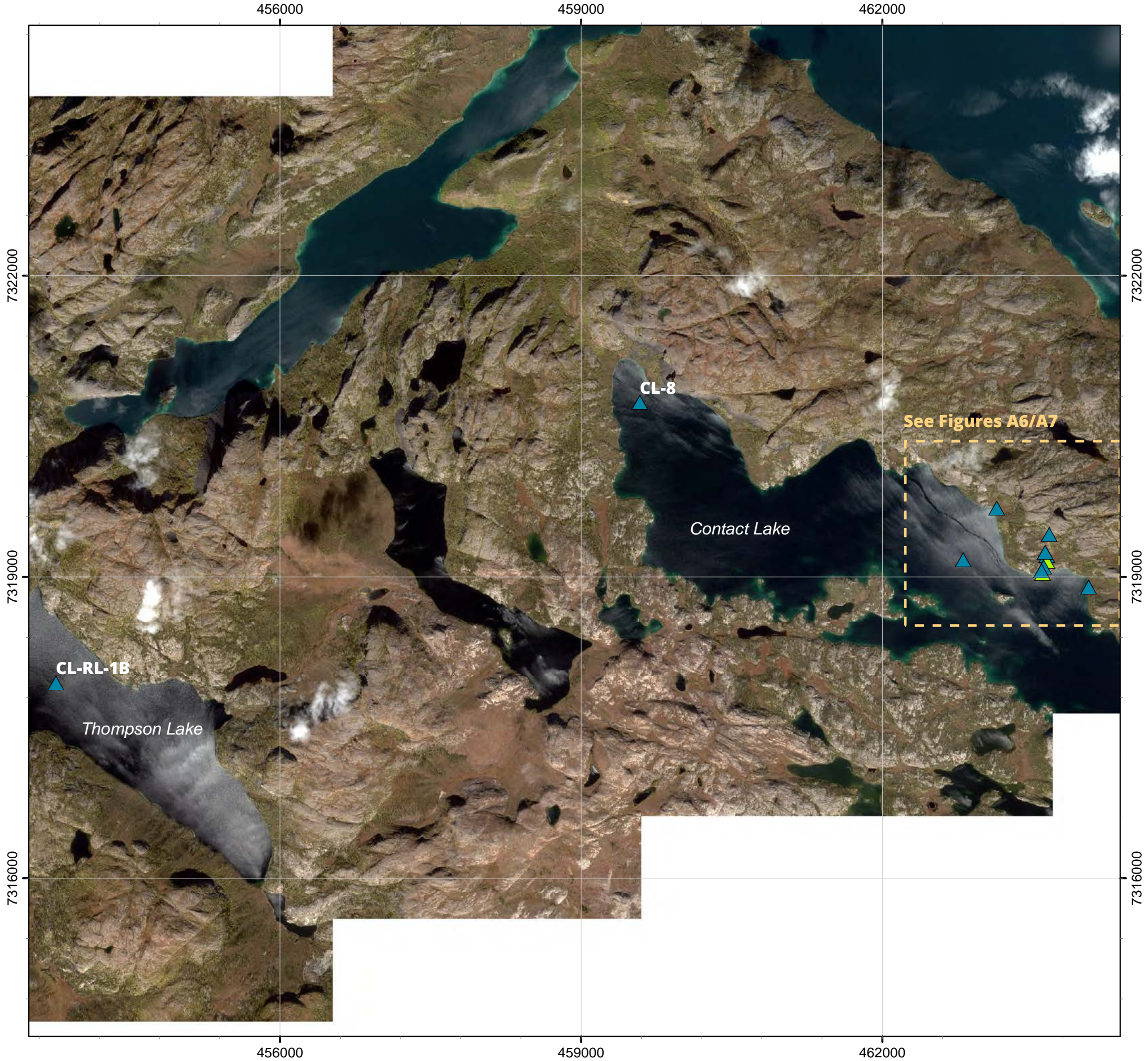
Contaminated Sites and Remediation Division



- ▲ Sample Station
- ▲ SNP Station

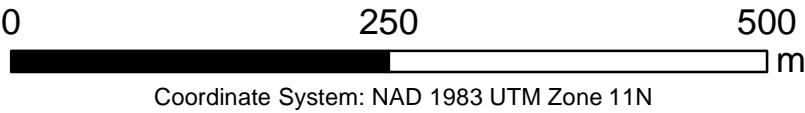


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**Figure A6: Great Bear Lake
Contact Lake West**

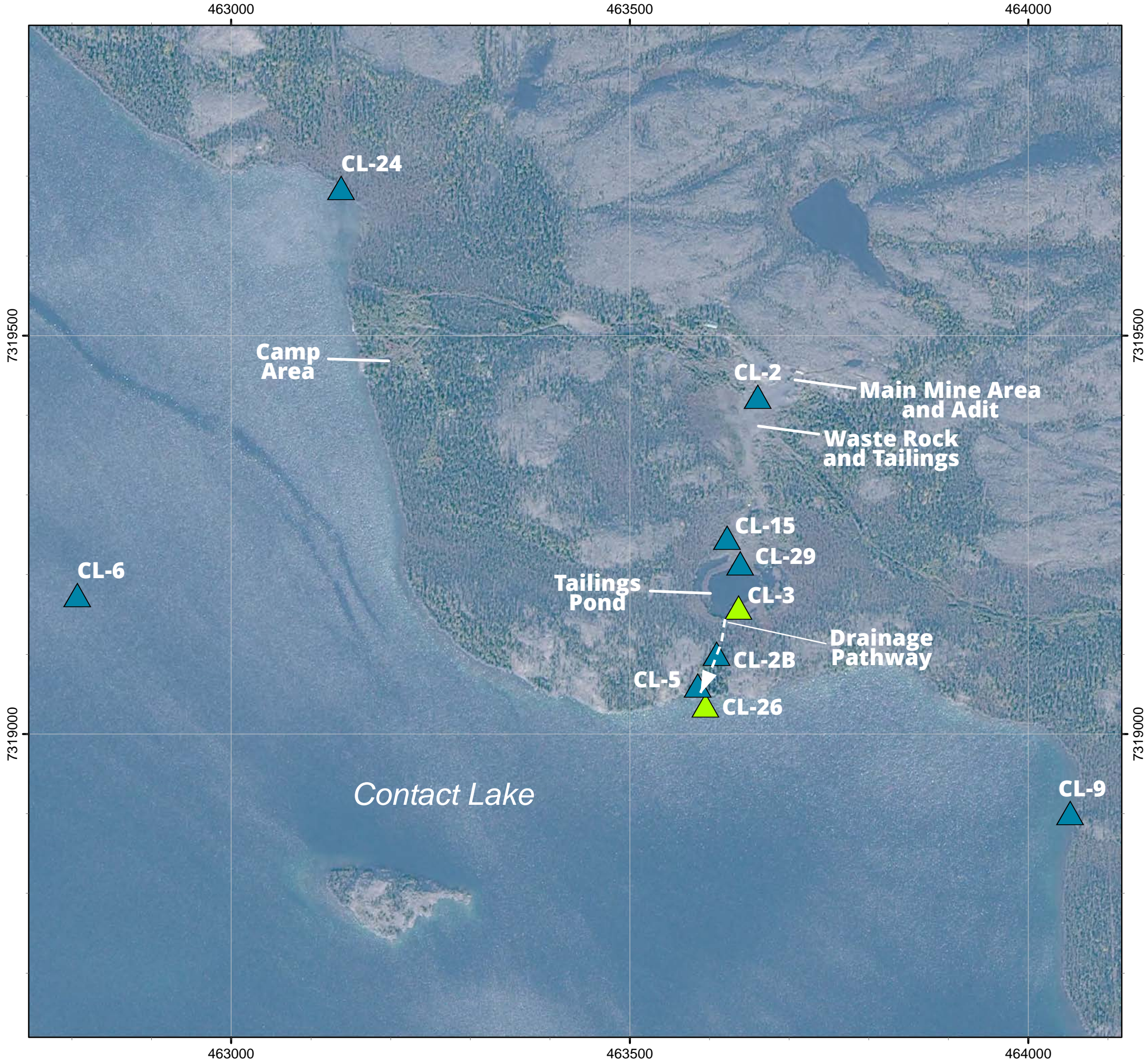
Contaminated Sites and Remediation Division



- ▲ Sample Station
- ▲ SNP Station

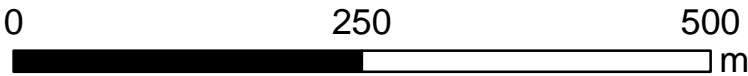


Date: 11/20/2017



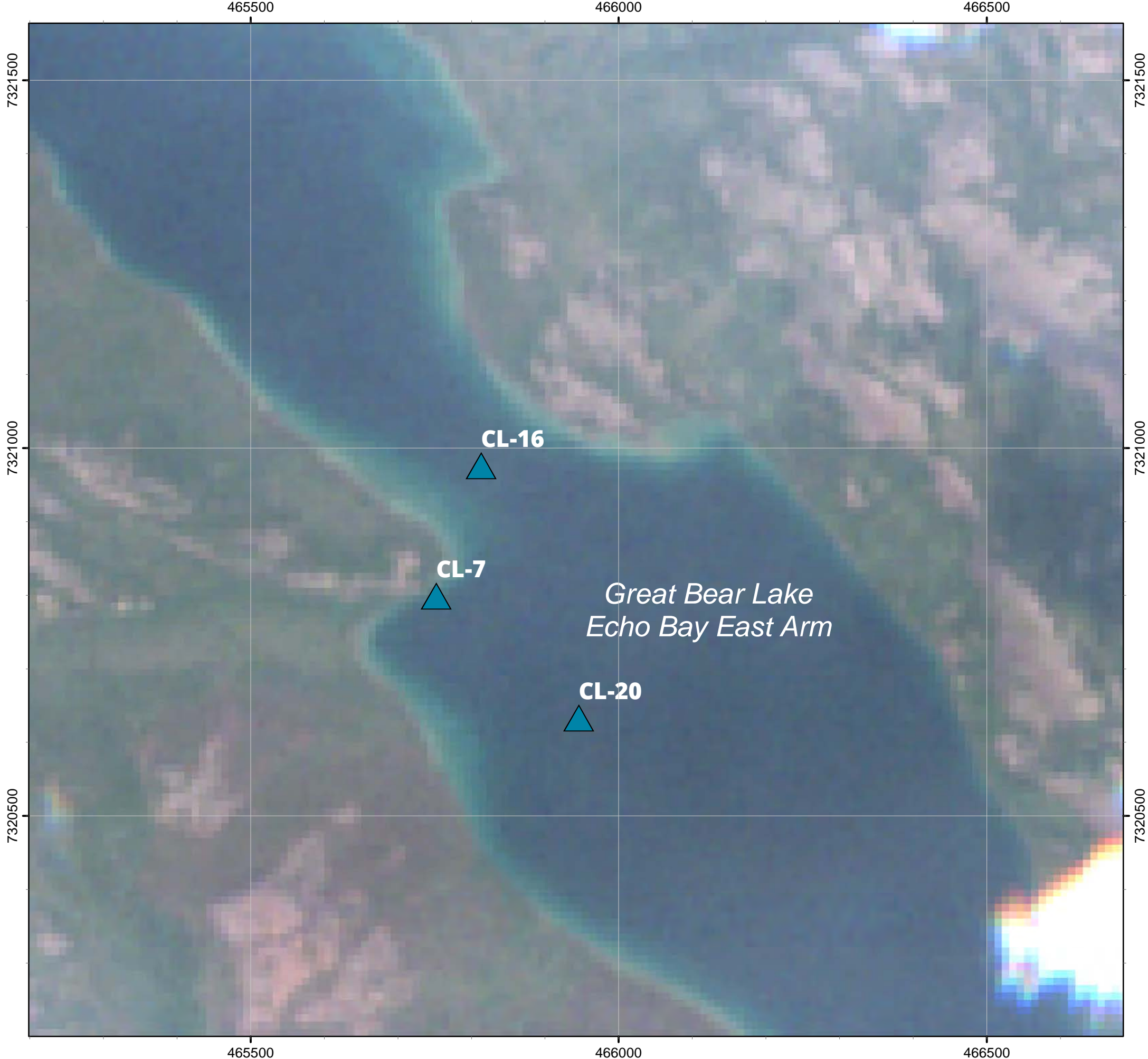
**Figure A7: Great Bear Lake
Contact Lake East**

Contaminated Sites and Remediation Division



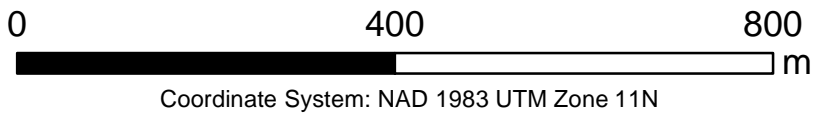
Coordinate System: NAD 1983 UTM Zone 11N

- ▲ Sample Station
- ▲ SNP Station



Date: 11/20/2017

Figure A8: Great Bear Lake - El Bonanza
Contaminated Sites and Remediation Division



Date: 11/20/2017

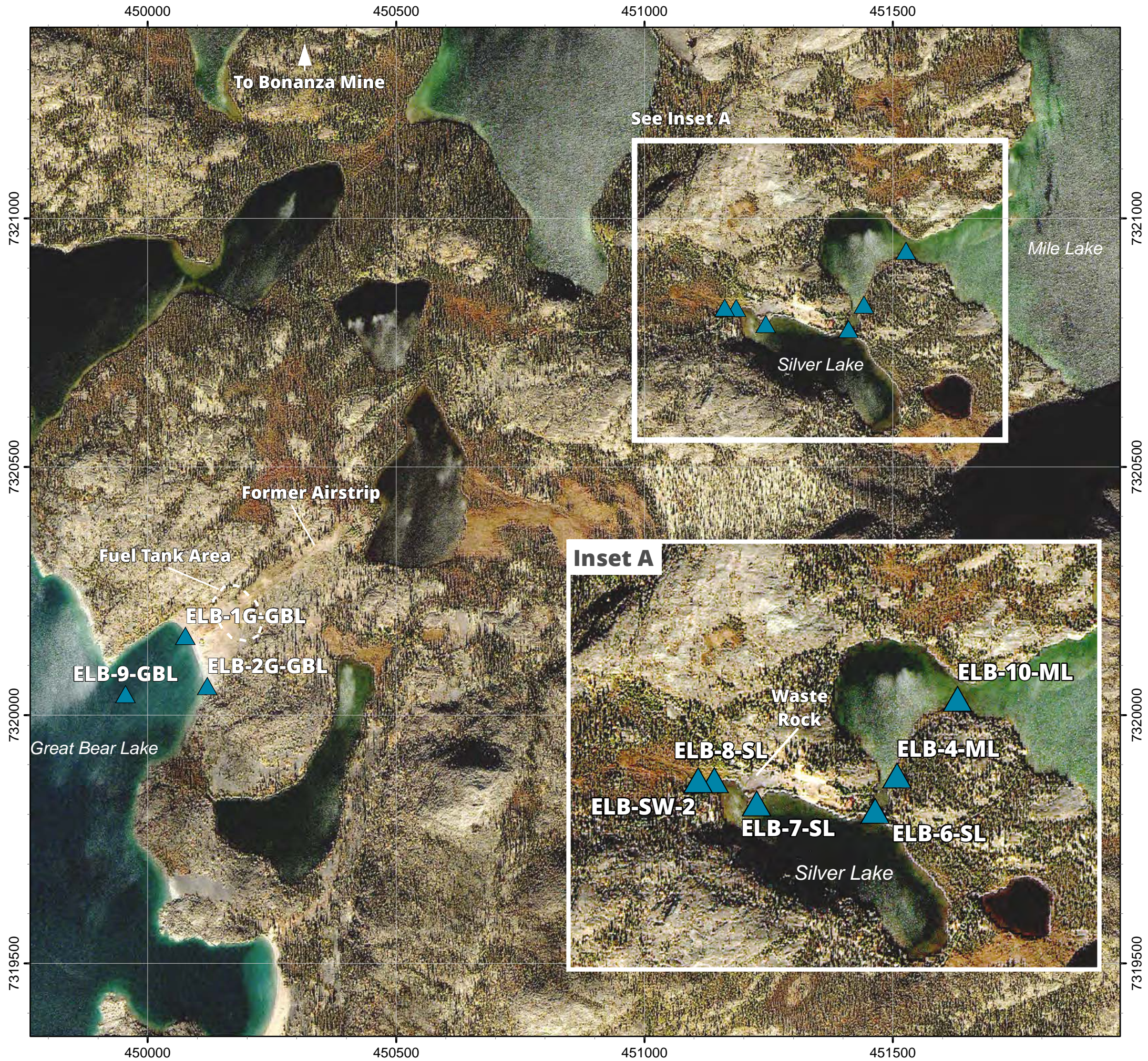
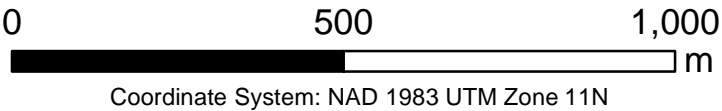
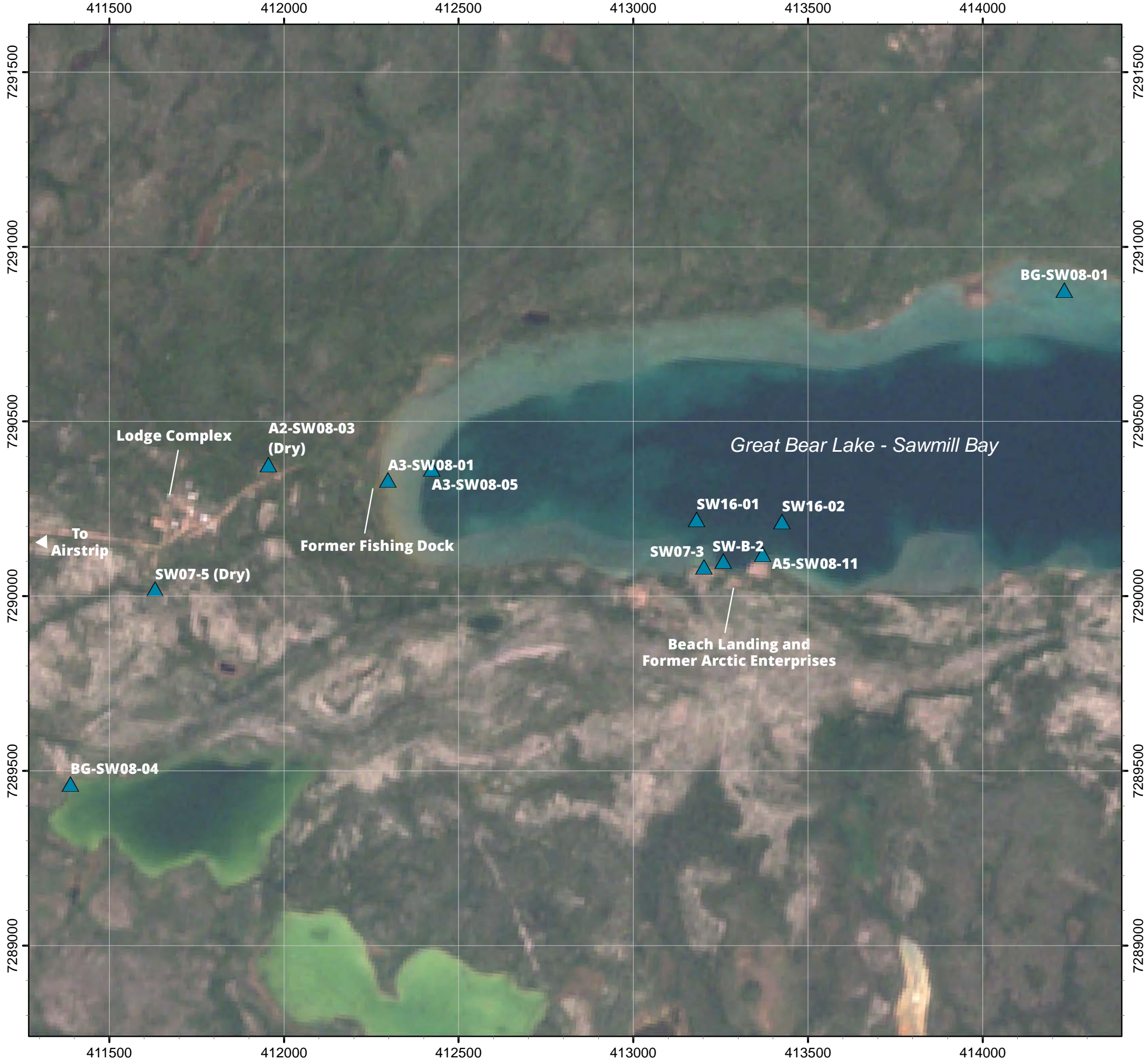


Figure A9: Great Bear Lake - Sawmill Bay
Contaminated Sites and Remediation Division



Date: 11/20/2017



APPENDIX B – Data Tables

Table B1 - Terra Mine: General Chemistry

Sample Area			CCME Guidelines ^A	SNP Effluent Quality Criteria (EQC) for T-8 and T-10 ^B	Reference Stations			Little Ho Hum Lake	Ho Hum Tailings Containment Area (TCA)							
Sample ID					R-2	R-4	R-3	T-2	T-16-A	T-16-B	T-8-A	T-DUP-1	T-8-B	T-8-C	T-5	T-3
SNP Sample ID											S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)		
PARAMETER	Lowest Detection Limit	Units			13-Sep-2017	12-Sep-2017	10-Sep-2017	8-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017
Physical Tests																
Conductivity	2.0	uS/cm			152	147	75.0	85.8	197	195	196	196	197	235	197	196
Hardness (as CaCO3)	0.50	mg/L			70	69.3	38.8	46.5	77	76.5	78.3	78.7	79.1	92.6	76.3	78.9
pH	0.10	pH	Between 6.5 and 9.0	Between 6.0 and 9.0	7.96	7.91	7.75	7.56	7.93	7.94	7.93	7.92	7.93	7.90	7.94	7.92
Total Suspended Solids	3.0	mg/L		30	<3.0	<3.0	<3.0	3.2	<3.0	5.5	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	13	mg/L			89	98	61	90	140	132	134	137	129	160	136	133
Turbidity	0.10	NTU			0.90	0.44	0.64	1.69	0.79	0.73	0.69	0.86	0.83	0.45	0.68	1.11
Anions and Nutrients																
Alkalinity, Total (as CaCO3)	1.0	mg/L			58.8	56.4	36.8	36.1	61.9	62.7	62.9	62.3	63.2	75.8	62.9	61.1
Ammonia, Total (as N)	0.0050	mg/L	0.021-231 ^D	10	0.0132	0.0084	0.0057	0.0075	0.0117	0.0057	0.0118	<0.0050	0.0082	<0.0050	0.0059	0.0073
Bromide (Br)	0.050	mg/L			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.054	<0.050	<0.050
Chloride (Cl)	0.50	mg/L	120		2.45	2.41	0.53	<0.50	11.5	11.6	11.5	11.5	11.5	14.6	11.5	11.5
Fluoride (F)	0.020	mg/L	0.12		0.148	0.150	0.131	0.376	0.683	0.685	0.683	0.682	0.681	0.765	0.685	0.685
Nitrate (as N)	0.0050	mg/L	13	10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0064	0.0051	0.0051	<0.0050	0.0843	<0.0050	0.0072
Nitrite (as N)	0.0010	mg/L	0.06	0.8	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	0.0020	mg/L			<0.0020	<0.0020	0.0026	0.0086	0.0040	0.0041	0.0039	0.0040	0.0042	0.0044	0.0040	0.0039
Phosphorus (P)-Total	0.0020	mg/L			0.0028	<0.0020	0.0048	0.0138	0.0050	0.0054	0.0051	0.0059	0.0041	0.0037	0.0050	0.0166
Sulfate (SO4)	0.30	mg/L			15.1	14.9	2.41	5.86	16.1	16.1	16.1	16.1	16.1	18.6	16.1	16.1
Sulphide as S	0.018	mg/L			<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon																
Dissolved Organic Carbon	0.50	mg/L			4.81	5.31	7.31	21.3	11.9	12.0	12.5	12.5	12.1	12.7	11.6	11.8
Total Organic Carbon	0.50	mg/L			4.73	4.63	7.77	20.6	12.1	12.2	12.3	12.3	12.6	12.6	11.7	11.5

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

B Water Licence S17L8-002 Amend (September 11, 2017)

D Minimum CCME guideline based on temperature and pH x 0.8224 mg/L total ammonia - N

* Not aquatic habitat; CCME-FAL guidelines not applicable

0.5880 0.5880 0.5880 1.8257 0.8553 12.5827 0.5880 0.5880 0.8553 12.5827 0.5880 0.5880

Table B1 - Terra Mine: General Chemistry

Sample Area			CCME Guidelines ^A	SNP Effluent Quality Criteria (EQC) for T-8 and T-10 ^B	Ho Hum Wetland			Camsell River (Including Moose Bay)							
Sample ID		T-9			MB-1	MB-9	T-6	T-10	T-31	T-12	T-DUP-2	T-30	T-4	T-1	
SNP Sample ID								S17L8-002 (7B)							
PARAMETER	Lowest Detection Limit	Units			13-Sep-2017	14-Sep-2017	14-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	8-Sep-2017	13-Sep-2017
Physical Tests															
Conductivity	2.0	uS/cm		190	244	237	254	148	147	147	147	146	145	134	
Hardness (as CaCO3)	0.50	mg/L		77.3	96.3	97.9	108	67.9	67.8	68	67.8	67.5	69.8	62.7	
pH	0.10	pH	Between 6.5 and 9.0	7.93	7.93	7.96	8.02	7.95	7.95	7.96	7.96	7.92	7.86	7.87	
Total Suspended Solids	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	7.0	<3.0	
Total Dissolved Solids	13	mg/L		124	161	154	168	95	97	91	92	92	94	93	
Turbidity	0.10	NTU		0.84	0.81	0.69	1.12	0.83	0.57	0.65	0.89	0.51	2.43	3.33	
Anions and Nutrients															
Alkalinity, Total (as CaCO3)	1.0	mg/L		62.6	79.3	78.9	89.9	57.9	57.8	58.0	57.6	57.9	57.7	56.2	
Ammonia, Total (as N)	0.0050	mg/L	0.021-231 ^D	0.0125	0.0076	0.0110	<0.0050	<0.0050	<0.0050	0.0072	0.0106	0.0088	<0.0050	0.0121	
Bromide (Br)	0.050	mg/L		<0.050	0.053	0.052	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	
Chloride (Cl)	0.50	mg/L	120	11.3	10.9	11.1	9.52	2.34	2.34	2.34	2.33	2.33	2.36	1.71	
Fluoride (F)	0.020	mg/L	0.12	0.682	0.795	0.786	0.641	0.147	0.146	0.144	0.144	0.144	0.158	0.211	
Nitrate (as N)	0.0050	mg/L	13	<0.0050	0.0797	0.0401	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	
Nitrite (as N)	0.0010	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Phosphorus (P)-Total Dissolved	0.0020	mg/L		0.0057	0.0095	0.0059	0.0048	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0021	0.0036	
Phosphorus (P)-Total	0.0020	mg/L		0.0075	0.0080	0.0065	0.0057	0.0025	0.0029	0.0020	0.0023	0.0024	0.0037	0.0097	
Sulfate (SO4)	0.30	mg/L		15.5	27.7	24.7	25.6	14.2	14.2	14.2	14.2	14.2	14.5	10.6	
Sulphide as S	0.018	mg/L		<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	
Organic / Inorganic Carbon															
Dissolved Organic Carbon	0.50	mg/L		11.8	9.58	9.49	9.03	4.77	4.98	4.83	4.77	4.53	4.66	6.81	
Total Organic Carbon	0.50	mg/L		11.7	9.54	9.53	9.10	4.69	4.82	4.82	4.56	4.74	5.42	6.90	

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic

B Water Licence S17L8-002 Amend (September 11, 2017)

D Minimum CCME guideline based on temperature and pH x 0.8224 mg/L total ammonia - N

* Not aquatic habitat; CCME-FAL guidelines not applicable

2.6810	1.8257	1.8257	0.8553	0.5880	0.5880	0.5880	0.5880	0.5880	0.5880	0.1966	0.8553
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Table B1 - Terra Mine: General Chemistry

Sample Area			CCME Guidelines ^A	SNP Effluent Quality Criteria (EQC) for T-8 and T-10 ^B	On-Land Water			
Sample ID					T-20 *	T-19 *	T-DUP-3 *	T-25
SNP Sample ID								
PARAMETER	Lowest Detection Limit	Units			8-Sep-2017	8-Sep-2017	8-Sep-2017	14-Sep-2017
Physical Tests								
Conductivity	2.0	uS/cm			398	155	152	191
Hardness (as CaCO3)	0.50	mg/L			204	87.7	86.4	89.8
pH	0.10	pH	Between 6.5 and 9.0	Between 6.0 and 9.0	8.09	7.72	7.70	7.92
Total Suspended Solids	3.0	mg/L		30	4.4	3.0	10.0	3.7
Total Dissolved Solids	13	mg/L			298	159	156	150
Turbidity	0.10	NTU			1.49	2.04	2.37	1.14
Anions and Nutrients								
Alkalinity, Total (as CaCO3)	1.0	mg/L			122	61.1	61.0	80.7
Ammonia, Total (as N)	0.0050	mg/L	0.021-231 ^D	10	<0.0050	0.0158	0.0159	0.0103
Bromide (Br)	0.050	mg/L			<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	0.50	mg/L	120		0.54	1.06	<0.50	2.46
Fluoride (F)	0.020	mg/L	0.12		0.727	0.332	0.334	0.281
Nitrate (as N)	0.0050	mg/L	13	10	<0.0050	0.0720	0.0676	<0.0050
Nitrite (as N)	0.0010	mg/L	0.06	0.8	<0.0010	0.0011	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	0.0020	mg/L			0.0148	0.0185	0.0259	0.0094
Phosphorus (P)-Total	0.0020	mg/L			0.0479	0.0159	0.0253	0.0140
Sulfate (SO4)	0.30	mg/L			91.6	15.9	16.0	15.6
Sulphide as S	0.018	mg/L			<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon								
Dissolved Organic Carbon	0.50	mg/L			10.9	29.8	30.5	7.86
Total Organic Carbon	0.50	mg/L			12.6	29.1	29.4	8.65

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life

B Water Licence S17L8-002 Amend (September 11, 2017)

D Minimum CCME guideline based on temperature and pH x 0.8224 mg/L total ammonia - N

* Not aquatic habitat; CCME-FAL guidelines not applicable

2.6810 12.5827 12.5827 2.6810

Table B2 - Terra Mine: Total Metals

Sample Area			CCME Guidelines ^A	SNP Effluent Quality Criteria (EQC) for T-8 and T-10 ^B	SSTL for Discharge Point from Ho Hum Wetland at T-6 ^C	Reference Stations			Little Ho Hum Lake	Ho Hum Tailings Containment Area (TCA)							
Sample ID						R-2	R-4	R-3	T-2	T-16-A	T-16-B	T-8-A	T-DUP-1	T-8-B	T-8-C	T-5	T-3
SNP Sample ID												S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)		
PARAMETER	Lowest Detection Limit	Units				13-Sep-2017	12-Sep-2017	10-Sep-2017	8-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017
Total Metals																	
Aluminium (Al)-Total	0.0030	mg/L	0.005- 0.100 ^F	0.8		0.0194	0.0234	0.0077	0.0573	0.0338	0.0357	0.0339	0.0327	0.0339	0.0190	0.0329	0.0580
Antimony (Sb)-Total	0.00010	mg/L				<0.00010	<0.00010	<0.00010	0.00015	0.00132	0.00129	0.00129	0.00131	0.00129	0.00138	0.00124	0.00127
Arsenic (As)-Total	0.00010	mg/L	0.005	1 @T-8 and 0.2@T-10	0.078	0.00017	0.00020	0.00067	0.00524	0.0605	0.0607	0.0607	0.0608	0.0602	0.0769	0.0596	0.0652
Barium (Ba)-Total	0.000050	mg/L				0.0106	0.0104	0.00565	0.00731	0.0162	0.0159	0.0157	0.0159	0.0161	0.0183	0.0159	0.0162
Beryllium (Be)-Total	0.000020	mg/L				<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total	0.000050	mg/L				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000222
Boron (B)-Total	0.010	mg/L	1.5			0.012	0.011	0.010	<0.010	0.027	0.027	0.027	0.028	0.028	0.033	0.027	0.027
Cadmium (Cd)-Total	0.0000050	mg/L	0.00009-0.00037 ^G			<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000077	0.0000057	0.0000066	0.0000076	0.0000070	0.0000080	0.0000069	0.0000116
Calcium (Ca)-Total	0.050	mg/L				16.3	15.7	9.57	12.3	23.2	23.2	22.9	23.0	23.4	28.1	23.0	23.1
Cesium (Cs)-Total	0.000010	mg/L				<0.000010	<0.000010	<0.000010	<0.000010	0.000048	0.000048	0.000047	0.000048	0.000047	0.000044	0.000044	0.000079
Chromium (Cr)-Total	0.00010	mg/L				0.00010	<0.00010	<0.00010	0.00019	0.00017	0.00015	0.00015	0.00019	0.00015	0.00010	0.00015	0.00018
Cobalt (Co)-Total	0.00010	mg/L				<0.00010	<0.00010	<0.00010	0.00014	0.00014	0.00013	0.00013	0.00013	0.00013	0.00011	0.00014	0.00103
Copper (Cu)-Total	0.00050	mg/L	0.002-0.004 ^H	0.02		0.00071	0.00077	0.00119	0.00657	0.00797	0.00797	0.00797	0.00812	0.00808	0.00882	0.00797	0.00859
Iron (Fe)-Total	0.010	mg/L	0.3			0.019	0.022	0.012	0.199	0.038	0.037	0.035	0.037	0.038	0.027	0.039	0.085
Lead (Pb)-Total	0.000050	mg/L	0.001-0.007 ^I	0.02		<0.000050	<0.000050	<0.000050	0.000075	0.000146	0.000147	0.000131	0.000137	0.000136	0.000080	0.000152	0.00128
Lithium (Li)-Total	0.0010	mg/L				0.0026	0.0026	0.0013	0.0016	0.0073	0.0074	0.0075	0.0075	0.0077	0.0092	0.0076	0.0075
Magnesium (Mg)-Total	0.10	mg/L				7.10	6.97	2.73	3.82	4.67	4.51	4.67	4.68	4.55	5.36	4.55	4.53
Manganese (Mn)-Total	0.00010	mg/L				0.00106	0.00116	0.00113	0.0168	0.00306	0.00312	0.00299	0.00304	0.00303	0.00533	0.00313	0.00673
Mercury (Hg)-Total	0.0000050	mg/L	0.000026			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	0.000050	mg/L	0.073			0.000269	0.000245	0.000221	0.000193	0.00255	0.00258	0.00254	0.00250	0.00255	0.00287	0.00256	0.00258
Nickel (Ni)-Total	0.00050	mg/L	0.025-0.150 ^J	0.1		<0.00050	<0.00050	<0.00050	0.00118	0.00374	0.00375	0.00377	0.00385	0.00380	0.00438	0.00376	0.00406
Phosphorus (P)-Total	0.050	mg/L				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	0.10	mg/L				0.97	0.92	0.72	1.08	1.94	1.96	1.95	1.97	1.96	2.34	1.94	1.96
Selenium (Se)-Total	0.000050	mg/L	0.001			<0.000050	<0.000050	<0.000050	0.000056	0.000065	0.000062	0.000051	<0.000050	0.000051	0.000055	<0.000050	<0.000050
Silicon (Si)-Total	0.10	mg/L				0.83	0.78	1.00	1.08	0.73	0.74	0.73	0.73	0.73	1.43	0.71	0.74
Silver (Ag)-Total	0.000010	mg/L	0.00025	0.004		<0.000010	<0.000010	<0.000010	<0.000010	0.000018	0.000017	0.000015	0.000017	0.000026	0.000013	0.000017	0.000063
Sodium (Na)-Total	0.050	mg/L				2.56	2.51	1.61	1.11	7.63	7.55	7.60	7.77	7.55	9.40	7.48	7.63
Strontium (Sr)-Total	0.00020	mg/L				0.0571	0.0553	0.0210	0.0175	0.0736	0.0730	0.0742	0.0736	0.0745	0.0904	0.0752	0.0740
Sulfur (S)-Total	0.50	mg/L				5.41	4.71	0.95	2.13	5.48	5.40	5.36	5.53	5.60	6.29	5.44	5.32
Thallium (Tl)-Total	0.000010	mg/L	0.0008			<0.000010	<0.000010	<0.000010	0.000016	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total	0.00010	mg/L				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L				<0.00060	0.00086	<0.00030	<0.0012	0.00062	<0.00090	<0.00090	0.00090	0.00067	0.00039	<0.00090	<0.0012
Uranium (U)-Total	0.000010	mg/L	0.015			0.000486	0.000528	0.000162	0.000149	0.00250	0.00255	0.00245	0.00251	0.00253	0.00324	0.00247	0.00258
Vanadium (V)-Total	0.00050	mg/L				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.03	0.04		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0032	0.0040	0.0042	0.0048	0.0036	0.0040
Zirconium (Zr)-Total	0.00030	mg/L				<0.00030	<0.00030	<0.00030	0.00031	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

B Water Licence S17L8-002 Amend (September 11, 2017)

C Site-Specific Target Level for Arsenic in Surface Waters Associated with the Terra Mine Wetland (SENES Consultants Ltd. 2014)

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH ≥ 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sample.

H Copper calculated from hardness per CCME guidance, provided for each sample

I Lead calculated from hardness per CCME guidance, provided for each sample

J Nickel calculated from hardness per CCME guidance, provided for each sample

* Not aquatic habitat; CCME-FAL guidelines not applicable

0.0001179	0.0001169	0.0000722	0.0000839	0.0001276	0.0001269	0.0001294	0.0001299	0.0001305	0.0001487	0.0001266	0.0001302
0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0022	0.0020	0.0020
0.00202	0.00199	0.00100	0.00100	0.00228	0.00226	0.00233	0.00235	0.00236	0.00288	0.00225	0.00235
0.07288	0.07233	0.02500	0.02500	0.07836	0.07797	0.07936	0.07967	0.07998	0.09015	0.07782	0.07982

Table B2 - Terra Mine: Total Metals

Sample Area			CCME Guidelines ^A	SNP Effluent Quality Criteria (EQC) for T-8 and T-10 ^B	SSTL for Discharge Point from Ho Hum Wetland at T-6 ^C	Ho Hum Wetland			Camsell River (Including Moose Bay)								
Sample ID						T-9	MB-1	MB-9	T-6	T-10	T-31	T-12	T-DUP-2	T-30	T-4	T-1	
SNP Sample ID										S17L8-002 (7B)							
PARAMETER	Lowest Detection Limit	Units				13-Sep-2017	14-Sep-2017	14-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	8-Sep-2017	13-Sep-2017
Total Metals																	
Aluminum (Al)-Total	0.0030	mg/L	0.005- 0.100 ^F	0.8		0.0299	0.0285	0.0261	0.0549	0.0276	0.0232	0.0243	0.0231	0.0239	0.0862	0.152	
Antimony (Sb)-Total	0.00010	mg/L				0.00116	0.00142	0.00123	0.00092	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00011	
Arsenic (As)-Total	0.00010	mg/L	0.005	1 @T-8 and 0.2@T-10	0.078	0.0472	0.0544	0.0522	0.0287	0.00036	0.00035	0.00024	0.00032	0.00024	0.00130	0.00180	
Barium (Ba)-Total	0.000050	mg/L				0.0108	0.0207	0.0208	0.0243	0.0108	0.0107	0.0104	0.0154	0.0106	0.0114	0.0128	
Beryllium (Be)-Total	0.000020	mg/L				<0.000020	0.000041	0.000040	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	
Bismuth (Bi)-Total	0.000050	mg/L				<0.000050	0.000064	0.000051	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000247	<0.000050	
Boron (B)-Total	0.010	mg/L	1.5			0.024	0.024	0.024	0.027	0.012	0.011	0.011	0.011	0.012	0.010	0.012	
Cadmium (Cd)-Total	0.0000050	mg/L	0.00009-0.00037 ^G			<0.0000050	0.0000648	0.0000572	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000055	
Calcium (Ca)-Total	0.050	mg/L				22.6	30.1	29.9	30.9	16.0	16.1	16.0	15.6	15.7	17.5	15.7	
Cesium (Cs)-Total	0.000010	mg/L				0.000024	0.000287	0.000266	0.000048	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000037	0.000027	
Chromium (Cr)-Total	0.00010	mg/L				0.00010	0.00015	0.00014	0.00015	0.00013	0.00011	0.00011	<0.00010	0.00145	0.00018	0.00037	
Cobalt (Co)-Total	0.00010	mg/L				0.00015	0.00348	0.00406	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00051	<0.00010	
Copper (Cu)-Total	0.00050	mg/L	0.002-0.004 ^H	0.02		0.00535	0.0492	0.0412	0.00739	0.00088	0.00089	0.00078	0.00077	0.00084	0.00348	0.00421	
Iron (Fe)-Total	0.010	mg/L	0.3			0.065	0.036	0.088	0.072	0.026	0.023	0.024	0.022	0.029	0.122	0.208	
Lead (Pb)-Total	0.000050	mg/L	0.001-0.007 ^I	0.02		0.000085	0.000161	0.000134	0.000055	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000945	0.000219	
Lithium (Li)-Total	0.0010	mg/L				0.0072	0.0075	0.0073	0.0073	0.0024	0.0022	0.0023	0.0023	0.0023	0.0022	0.0023	
Magnesium (Mg)-Total	0.10	mg/L				4.54	5.52	5.68	7.30	6.84	6.67	6.84	7.02	6.88	6.56	5.72	
Manganese (Mn)-Total	0.00010	mg/L				0.00737	0.0539	0.105	0.00752	0.00189	0.00171	0.00155	0.00157	0.00160	0.00531	0.00638	
Mercury (Hg)-Total	0.0000050	mg/L	0.000026			<0.0000050	<0.0000050	0.0000051	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000057	<0.0000050	
Molybdenum (Mo)-Total	0.000050	mg/L	0.073			0.00238	0.00371	0.00327	0.00232	0.000262	0.000262	0.000263	0.000259	0.000428	0.000262	0.000221	
Nickel (Ni)-Total	0.00050	mg/L	0.025-0.150 ^J	0.1		0.00348	0.00614	0.00601	0.00227	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00062	0.00055	
Phosphorus (P)-Total	0.050	mg/L				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	
Potassium (K)-Total	0.10	mg/L				1.97	1.93	1.91	1.70	1.00	1.01	0.98	1.00	1.01	0.97	0.94	
Selenium (Se)-Total	0.000050	mg/L	0.001			<0.000050	0.000066	0.000069	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
Silicon (Si)-Total	0.10	mg/L				0.34	1.43	1.41	1.25	0.82	0.80	0.81	0.80	0.81	0.92	1.10	
Silver (Ag)-Total	0.000010	mg/L	0.00025	0.004		0.000014	0.000115	0.000143	0.000018	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000170	<0.000010	
Sodium (Na)-Total	0.050	mg/L				7.31	7.18	7.32	7.14	2.54	2.48	2.48	2.48	2.46	2.31	2.37	
Strontium (Sr)-Total	0.00020	mg/L				0.0738	0.0827	0.0827	0.105	0.0541	0.0541	0.0530	0.0525	0.0531	0.0547	0.0414	
Sulfur (S)-Total	0.50	mg/L				5.07	9.12	8.23	8.36	4.63	4.60	4.61	4.76	4.60	4.91	3.36	
Thallium (Tl)-Total	0.000010	mg/L	0.0008			<0.000010	0.000020	0.000021	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Tin (Sn)-Total	0.00010	mg/L				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Titanium (Ti)-Total	0.00030	mg/L				<0.00060	0.00035	<0.00030	<0.00060	0.00108	0.00103	0.00077	0.00081	<0.00090	<0.0036	0.00546	
Uranium (U)-Total	0.000010	mg/L	0.015			0.00218	0.00142	0.00124	0.00194	0.000545	0.000539	0.000534	0.000240	0.000547	0.000532	0.000377	
Vanadium (V)-Total	0.00050	mg/L				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Zinc (Zn)-Total	0.0030	mg/L	0.03	0.04		<0.0030	0.0265	0.0215	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0037	<0.0030	
Zirconium (Zr)-Total	0.00030	mg/L				<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life

B Water Licence S17L8-002 Amend (September 11, 2017)

C Site-Specific Target Level for Arsenic in Surface Waters Associated with the Terra Mine Wetland (SENES)

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH ≥ 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sample.

H Copper calculated from hardness per CCME guidance, provided for each sample

I Lead calculated from hardness per CCME guidance, provided for each sample

J Nickel calculated from hardness per CCME guidance, provided for each sample

* Not aquatic habitat; CCME-FAL guidelines not applicable

0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.0001280	0.0001536	0.0001557	0.0001689	0.0001149	0.0001148	0.0001151	0.0001148	0.0001144	0.0001176	0.0001076						
0.0020	0.0023	0.0023	0.0025	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020						
0.00229	0.00303	0.00310	0.00351	0.00194	0.00194	0.00195	0.00194	0.00193	0.00194	0.00176						
0.07859	0.09288	0.09405	0.10133	0.07122	0.07114											

Table B2 - Terra Mine: Total Metals

Sample Area			CCME Guidelines ^A	SNP Effluent Quality Criteria (EQC) for T-8 and T-10 ^B	SSTL for Discharge Point from Ho Hum Wetland at T-6 ^C	On-Land Water			
Sample ID						T-20 *	T-19 *	T-DUP-3 *	T-25
SNP Sample ID									
PARAMETER	Lowest Detection Limit	Units				8-Sep-2017	8-Sep-2017	8-Sep-2017	14-Sep-2017
Total Metals									
Aluminum (Al)-Total	0.0030	mg/L	0.005- 0.100 ^F	0.8		0.0044	0.197	0.201	0.0258
Antimony (Sb)-Total	0.00010	mg/L				0.00088	0.00520	0.00529	<0.00010
Arsenic (As)-Total	0.00010	mg/L	0.005	1 @T-8 and 0.2@T-10	0.078	0.0325	0.286	0.284	0.00237
Barium (Ba)-Total	0.000050	mg/L				0.0166	0.00945	0.00895	0.0131
Beryllium (Be)-Total	0.000020	mg/L				<0.000020	0.000049	0.000044	<0.000020
Bismuth (Bi)-Total	0.000050	mg/L				<0.000050	0.00162	0.00159	<0.000050
Boron (B)-Total	0.010	mg/L	1.5			0.029	0.013	0.012	0.105
Cadmium (Cd)-Total	0.0000050	mg/L	0.00009- 0.00037 ^G			0.0000058	0.0000441	0.0000498	<0.0000050
Calcium (Ca)-Total	0.050	mg/L				59.4	26.4	25.9	22.6
Cesium (Cs)-Total	0.000010	mg/L				0.000027	0.000016	0.000015	0.000015
Chromium (Cr)-Total	0.00010	mg/L				<0.00010	0.00058	0.00059	0.00021
Cobalt (Co)-Total	0.00010	mg/L				0.00099	0.0179	0.0178	0.00019
Copper (Cu)-Total	0.00050	mg/L	0.002-0.004 ^H	0.02		0.00469	0.0267	0.0267	0.00135
Iron (Fe)-Total	0.010	mg/L	0.3			0.032	0.235	0.236	0.402
Lead (Pb)-Total	0.000050	mg/L	0.001-0.007 ^I	0.02		<0.000050	0.000568	0.000566	0.000114
Lithium (Li)-Total	0.0010	mg/L				0.0036	0.0021	0.0021	0.0039
Magnesium (Mg)-Total	0.10	mg/L				13.4	5.30	5.26	8.10
Manganese (Mn)-Total	0.00010	mg/L				0.0604	0.0688	0.0639	0.0203
Mercury (Hg)-Total	0.0000050	mg/L	0.000026			<0.0000050	0.0000179	0.0000178	<0.0000050
Molybdenum (Mo)-Total	0.000050	mg/L	0.073			0.00208	0.0152	0.0150	0.000218
Nickel (Ni)-Total	0.00050	mg/L	0.025-0.150 ^J	0.1		0.00175	0.0281	0.0280	0.00085
Phosphorus (P)-Total	0.050	mg/L				0.077	<0.050	<0.050	<0.050
Potassium (K)-Total	0.10	mg/L				5.73	1.49	1.16	1.72
Selenium (Se)-Total	0.000050	mg/L	0.001			0.000073	0.000122	0.000110	<0.000050
Silicon (Si)-Total	0.10	mg/L				2.66	3.63	3.58	0.90
Silver (Ag)-Total	0.000010	mg/L	0.00025	0.004		<0.000010	0.000104	0.000104	<0.000010
Sodium (Na)-Total	0.050	mg/L				5.28	1.28	1.26	3.53
Strontium (Sr)-Total	0.00020	mg/L				0.100	0.0337	0.0332	0.0627
Sulfur (S)-Total	0.50	mg/L				34.1	5.95	6.02	5.29
Thallium (Tl)-Total	0.000010	mg/L	0.0008			<0.000010	0.000027	0.000027	<0.000010
Tin (Sn)-Total	0.00010	mg/L				<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L				<0.00030	<0.0048	<0.0042	0.00067
Uranium (U)-Total	0.000010	mg/L	0.015			0.00291	0.00239	0.00239	0.000252
Vanadium (V)-Total	0.00050	mg/L				<0.00050	0.00064	0.00063	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.03	0.04		<0.0030	0.0154	0.0141	<0.0030
Zirconium (Zr)-Total	0.00030	mg/L				<0.00030	0.00190	0.00186	<0.00030

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life

B Water Licence S17L8-002 Amend (September 11, 2017)

C Site-Specific Target Level for Arsenic in Surface Waters Associated with the Terra Mine Wetland (SENES)

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH ≥ 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sample.

H Copper calculated from hardness per CCME guidance, provided for each sample

I Lead calculated from hardness per CCME guidance, provided for each sample

J Nickel calculated from hardness per CCME guidance, provided for each sample

* Not aquatic habitat; CCME-FAL guidelines not applicable

0.1	0.1	0.1	0.1
0.0002864	0.0001421	0.0001404	0.0001450
0.0040	0.0021	0.0021	0.0022
0.00700	0.00269	0.00264	0.00277
0.15000	0.08650	0.08553	0.08807

Table B3 - Terra Mine: Dissolved Metals

Sample Area			CCME Guidelines ^A	SNP Effluent Quality Criteria (EQC) for T-8 and T-10 ^B	SSTL for Discharge Point from Ho Hum Wetland at T-6 ^C	Reference Stations		Ho Hum Tailings Containment Area (TCA)				
Sample ID						R-4	R-3	T-8-A	T-DUP-1	T-8-B	T-8-C	T-3
SNP Sample ID								S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	
PARAMETER	Lowest Detection Limit	Units				12-Sep-2017	10-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017
Dissolved Metals												
Aluminum (Al)-Dissolved	0.0010	mg/L	0.005-0.100 ^F	0.8		0.0021	0.0026	0.0093	0.0100	0.0102	0.0082	0.0075
Antimony (Sb)-Dissolved	0.00010	mg/L				<0.00010	<0.00010	0.00129	0.00127	0.00128	0.00139	0.00136
Arsenic (As)-Dissolved	0.00010	mg/L	0.005	1 @T-8 and 0.2@T-10	0.078	0.00019	0.00061	0.0614	0.0612	0.0610	0.0796	0.0683
Barium (Ba)-Dissolved	0.000050	mg/L				0.0113	0.00560	0.0165	0.0164	0.0167	0.0192	0.0169
Beryllium (Be)-Dissolved	0.000020	mg/L				<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved	0.000050	mg/L				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	0.010	mg/L	1.5			0.011	0.010	0.026	0.026	0.026	0.031	0.026
Cadmium (Cd)-Dissolved	0.0000050	mg/L	0.00009-0.00037 ^G			<0.0000050	<0.0000050	0.0000063	0.0000055	<0.0000050	0.0000082	0.0000085
Calcium (Ca)-Dissolved	0.050	mg/L				16.5	10.40	23.6	23.9	23.9	28.2	24.3
Cesium (Cs)-Dissolved	0.000010	mg/L				<0.000010	<0.000010	0.000043	0.000040	0.000041	0.000039	0.000046
Chromium (Cr)-Dissolved	0.00010	mg/L				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved	0.00010	mg/L				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00038
Copper (Cu)-Dissolved	0.00020	mg/L	0.002-0.004 ^H	0.02		0.00060	0.00104	0.00742	0.00741	0.00746	0.00839	0.00759
Iron (Fe)-Dissolved	0.010	mg/L	0.3			<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010
Lead (Pb)-Dissolved	0.000050	mg/L	0.001-0.007 ^I	0.02		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00015
Lithium (Li)-Dissolved	0.0010	mg/L				0.0025	0.0011	0.0078	0.0080	0.0080	0.0095	0.0079
Magnesium (Mg)-Dissolved	0.10	mg/L				6.80	3.11	4.73	4.64	4.72	5.41	4.39
Manganese (Mn)-Dissolved	0.00010	mg/L				<0.00010	<0.00010	0.00012	0.00012	0.00016	0.00141	0.00010
Mercury (Hg)-Dissolved	0.0000050	mg/L	0.000026			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	0.000050	mg/L	0.073			0.000243	0.000201	0.00253	0.00255	0.00255	0.00285	0.00259
Nickel (Ni)-Dissolved	0.00050	mg/L	0.025-0.150 ^J	0.1		<0.00050	<0.00050	0.00375	0.00374	0.00375	0.00437	0.00400
Phosphorus (P)-Dissolved	0.050	mg/L				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	0.10	mg/L				1.07	0.81	1.99	1.98	2.03	2.40	1.99
Selenium (Se)-Dissolved	0.000050	mg/L	0.001			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon (Si)-Dissolved	0.050	mg/L				0.74	0.99	0.65	0.66	0.67	1.39	0.58
Silver (Ag)-Dissolved	0.000010	mg/L	0.00025	0.004		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	0.050	mg/L				2.51	1.81	7.78	7.53	7.72	9.47	7.55
Strontium (Sr)-Dissolved	0.00020	mg/L				0.0582	0.0216	0.0755	0.0754	0.0756	0.0916	0.0744
Sulfur (S)-Dissolved	0.50	mg/L				4.60	0.80	5.15	5.24	5.28	6.10	5.05
Thallium (Tl)-Dissolved	0.000010	mg/L	0.0008			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved	0.00010	mg/L				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	0.00030	mg/L				<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved	0.000010	mg/L	0.015			0.000556	0.000208	0.00251	0.00248	0.00260	0.00319	0.00227
Vanadium (V)-Dissolved	0.00050	mg/L				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	0.0010	mg/L	0.03	0.04		<0.0010	<0.0010	0.0027	0.0027	0.0023	0.0047	0.0029
Zirconium (Zr)-Dissolved	0.00030	mg/L				<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

B Water Licence S17L8-002 Amend (September 11, 2017)

C Site-Specific Target Level for Arsenic in Surface Waters Associated with the Terra Mine Wetland (SENES Consultants Ltd. 2014)

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH >= 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sample.

H Copper calculated from hardness per CCME guidance, provided for each sample

I Lead calculated from hardness per CCME guidance, provided for each sample

J Nickel calculated from hardness per CCME guidance, provided for each sample

0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.0001169	0.0000722	0.0001294	0.0001299	0.0001305	0.0001487	0.0001302
0.0020	0.0020	0.0020	0.0020	0.0020	0.0022	0.0020
0.0020	0.0010	0.0023	0.0023	0.0024	0.0029	0.0024
0.0723	0.0250	0.0794	0.0797	0.0800	0.0902	0.0798

Table B3 - Terra Mine: Dissolved Metals

Sample Area			CCME Guidelines ^A	SNP Effluent Quality Criteria (EQC) for T-8 and T-10 ^B	SSTL for Discharge Point from Ho Hum Wetland at T-6 ^C	Ho Hum Wetland		Camsell River (Including Moose Bay)			
Sample ID						T-9	MB-1	T-6	T-10	T-31	T-4
SNP Sample ID									S17L8-002 (7B)		
PARAMETER	Lowest Detection Limit	Units				13-Sep-2017	14-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	8-Sep-2017
Dissolved Metals											
Aluminum (Al)-Dissolved	0.0010	mg/L	0.005-0.100 ^F	0.8		0.0071	0.0155	0.0051	0.0028	0.0026	0.0030
Antimony (Sb)-Dissolved	0.00010	mg/L				0.00114	0.00144	0.00092	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	0.00010	mg/L	0.005	1 @T-8 and 0.2@T-10	0.078	0.0460	0.0552	0.0277	0.00034	0.00031	0.00056
Barium (Ba)-Dissolved	0.000050	mg/L				0.0110	0.0227	0.0245	0.0110	0.0106	0.0107
Beryllium (Be)-Dissolved	0.000020	mg/L				<0.000020	0.000039	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved	0.000050	mg/L				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	0.010	mg/L	1.5			0.023	0.023	0.026	0.011	0.011	0.011
Cadmium (Cd)-Dissolved	0.0000050	mg/L	0.00009-0.00037 ^G			<0.0000050	0.0000683	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	0.050	mg/L				23.3	29.4	31.2	16.2	16.3	16.9
Cesium (Cs)-Dissolved	0.000010	mg/L				0.000022	0.000272	0.000043	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	0.00010	mg/L				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved	0.00010	mg/L				<0.00010	0.00285	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	0.00020	mg/L	0.002-0.004 ^H	0.02		0.00473	0.0454	0.00615	0.00071	0.00073	0.00136
Iron (Fe)-Dissolved	0.010	mg/L	0.3			0.013	0.016	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Dissolved	0.000050	mg/L	0.001-0.007 ^I	0.02		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	0.0010	mg/L				0.0078	0.0074	0.0077	0.0025	0.0025	0.0024
Magnesium (Mg)-Dissolved	0.10	mg/L				4.64	5.57	7.22	6.65	6.61	6.72
Manganese (Mn)-Dissolved	0.00010	mg/L				0.00023	0.0490	0.00014	<0.00010	<0.00010	<0.00010
Mercury (Hg)-Dissolved	0.0000050	mg/L	0.000026			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	0.000050	mg/L	0.073			0.00241	0.00352	0.00233	0.000256	0.000259	0.000266
Nickel (Ni)-Dissolved	0.00050	mg/L	0.025-0.150 ^J	0.1		0.00326	0.00597	0.00211	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved	0.050	mg/L				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	0.10	mg/L				1.99	1.88	1.73	1.00	0.96	1.02
Selenium (Se)-Dissolved	0.000050	mg/L	0.001			<0.000050	0.000060	<0.000050	<0.000050	<0.000050	<0.000050
Silicon (Si)-Dissolved	0.050	mg/L				0.26	1.39	1.15	0.76	0.75	0.75
Silver (Ag)-Dissolved	0.000010	mg/L	0.00025	0.004		<0.000010	0.000070	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	0.050	mg/L				7.48	7.07	7.15	2.43	2.40	2.44
Strontium (Sr)-Dissolved	0.00020	mg/L				0.0753	0.0802	0.104	0.0537	0.0546	0.0538
Sulfur (S)-Dissolved	0.50	mg/L				5.05	9.12	8.43	4.58	4.59	4.84
Thallium (Tl)-Dissolved	0.000010	mg/L	0.0008			<0.000010	0.000022	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved	0.00010	mg/L				0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	0.00030	mg/L				<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved	0.000010	mg/L	0.015			0.00220	0.00139	0.00196	0.000551	0.000552	0.000503
Vanadium (V)-Dissolved	0.00050	mg/L				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	0.0010	mg/L	0.03	0.04		<0.0010	0.0266	0.0012	<0.0010	<0.0010	<0.0010
Zirconium (Zr)-Dissolved	0.00030	mg/L				<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

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B Water Licence S17L8-002 Amend (September 11, 2017)

C Site-Specific Target Level for Arsenic in Surface Waters Associated with the Terra Mine Wetland (SENES Consultants Ltd. 20

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH >= 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sample.

H Copper calculated from hardness per CCME guidance, provided for each sample

I Lead calculated from hardness per CCME guidance, provided for each sample

J Nickel calculated from hardness per CCME guidance, provided for each sample

0.1	0.1	0.1	0.1	0.1	0.1
0.0001280	0.0001536	0.0001689	0.0001149	0.0001148	0.0001176
0.0020	0.0023	0.0025	0.0020	0.0020	0.0020
0.0023	0.0030	0.0035	0.0019	0.0019	0.0020
0.0786	0.0929	0.1013	0.0712	0.0711	0.0727

Table B4 - Terra Mine: Hydrocarbons

Sample Area			CCME Guidelines ^A	SNP Effluent Quality Criteria (EQC) for T-8 and T-10 ^B	Ho Hum Tailings Containment Area (TCA)						Camsell River (Including Moose Bay)		On-Land Water
Sample ID					T-8-A	T-DUP-1	T-8-B	T-8-C	T-5	T-3	T-10	T-4	T-25
SNP Sample ID					S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)			S17L8-002 (7B)		
PARAMETER	Lowest Detection Limit	Units			13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	13-Sep-2017	8-Sep-2017	14-Sep-2017
Volatile Organic Compounds													
Benzene	0.00050	mg/L	0.37		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Ethylbenzene	0.00050	mg/L	0.9		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Methyl t-butyl ether (MTBE)	0.00050	mg/L			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Styrene	0.00050	mg/L			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Toluene	0.00045	mg/L	0.002		<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	
Xylenes	0.00075	mg/L			<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	
F1 (C6-C10)	0.10	mg/L			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
Hydrocarbons													
F1-BTEX	0.10	mg/L			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
F2 (C10-C16)	0.30	mg/L			<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	
F3 (C16-C34)	0.30	mg/L			<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	
F4 (C34-C50)	0.30	mg/L			<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	
Aggregate Organics													
Oil and Grease			5	5	<5.0	<5.0	<5.0	<5.0		<5.0			

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

B Water Licence S17L8-002 Amend (September 11, 2017)

Table B5 - Silver Bear Mines: General Chemistry

Site			CCME Guidelines ^A	REFERENCE			NORTHTRIM									
Sample Area				Reference Stations			Hermandy Lake		Leachate Pond		Discharge Stream	Camsell River				On-Land Water
Sample ID				R-2	R-4	R-3	NO-11	NO-7	NO-2	NO-DUP-1	NO-4/NO-8	NO-5	NO-6	NO-25	NO-27	NO-1 *
SNP Sample ID								S17L8-002 (8C)					S17L8-002 (9D)			
PARAMETER	Lowest Detection Limit	Units		13-Sep-2017	12-Sep-2017	10-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017
Physical Tests																
Conductivity	2.0	uS/cm		152	147	75.0	138	139	150	153	214	148	148	152	144	149
Hardness (as CaCO3)	0.50	mg/L		70	69.3	38.8	70.9	72.3	79.5	79.1	116	70.2	70.6	68.5	66.2	70.6
pH	0.10	pH	Between 6.5 and 9.0	7.96	7.91	7.75	7.91	7.91	7.95	7.94	8.17	7.92	7.90	7.87	7.91	7.92
Total Suspended Solids	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	3.0	<3.0	<3.0	<3.0	3.0	<3.0	3.0	<3.0	<3.0
Total Dissolved Solids	13	mg/L		89	98	61	115	111	116	121	158	94	93	96	96	93
Turbidity	0.10	NTU		0.90	0.44	0.64	0.53	0.51	0.43	0.45	0.65	0.47	0.48	0.48	0.52	0.76
Anions and Nutrients																
Alkalinity, Total (as CaCO3)	1.0	mg/L		58.8	56.4	36.8	62.3	62.8	69.5	71.5	122	55.9	59.2	54.5	57.8	60.0
Ammonia, Total (as N)	0.0050	mg/L	0.021-231 ^D	0.0132	0.0084	0.0057	0.0127	0.0114	0.0122	0.0083	0.0105	0.0054	<0.0050	0.0087	<0.0050	<0.0050
Bromide (Br)	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	0.50	mg/L	120	2.45	2.41	0.53	<0.50	<0.50	<0.50	<0.50	<0.50	2.39	2.38	2.35	2.34	2.39
Fluoride (F)	0.020	mg/L	0.12	0.148	0.150	0.131	0.128	0.129	0.169	0.166	0.185	0.143	0.143	0.142	0.141	0.149
Nitrate (as N)	0.0050	mg/L	13	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.0010	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	0.0020	mg/L		<0.0020	<0.0020	0.0026	0.0047	0.0045	0.0063	0.0065	0.0021	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total	0.0020	mg/L		0.0028	<0.0020	0.0048	0.0058	0.0043	0.0086	0.0072	<0.0020	0.0024	0.0026	<0.0020	<0.0020	0.0037
Sulfate (SO4)	0.30	mg/L		15.1	14.9	2.41	8.94	8.95	8.52	8.51	<0.30	14.8	14.8	14.5	14.5	15.2
Sulphide as S	0.018	mg/L		<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon																
Dissolved Organic Carbon	0.50	mg/L		4.81	5.31	7.31	14.1	13.9	13.6	13.8	12.2	4.78	4.92	4.84	5.26	4.66
Total Organic Carbon	0.50	mg/L		4.73	4.63	7.77	14.4	14.3	13.9	14.0	14.0	4.60	4.77	4.72	4.82	4.67

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

B Water Licence S17L8-002 Amend (September 11, 2017)

D Minimum CCME guideline based on temperature and pH x 0.8224 mg/L total amnr

* Not aquatic habitat; CCME-FAL guidelines not applicable

0.5880 0.5880 0.5880 0.8553 0.8553 0.8553 0.8553 0.8553 0.5880 0.5880 0.5880 0.5880 1.8257

Table B5 - Silver Bear Mines: General Chemistry

Site			CCME Guidelines ^A	NOREX AND GRAHAM VEIN								SMALLWOOD			
Sample Area				On-Land Water				Marsh Adjacent to Xeron Pond		Camsell River		Smallwood Lake			
Sample ID				NX-1 *	NX-2 *	NX-3 *	NX-4A	NX-6	NX-DUP-1	NX-12	NX-13	SM-1	SM-2	SM-6-1M	SM-6-4M
SNP Sample ID						S17L8-002 (10E)				S17L8-002 (11F)					
PARAMETER	Lowest Detection Limit	Units		10-Sep-2017	10-Sep-2017	10-Sep-2017	10-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	10-Sep-2017	10-Sep-2017	10-Sep-2017	10-Sep-2017
Physical Tests															
Conductivity	2.0	uS/cm		363	441	508	158	53.0	49.9	152	155	119	112	113	114
Hardness (as CaCO3)	0.50	mg/L		165	206	313	81.8	21.7	22	70.8	65.2	56	54.8	53.5	56.6
pH	0.10	pH	Between 6.5 and 9.0	8.28	8.39	7.66	7.22	7.32	7.33	7.97	7.90	7.83	7.83	7.86	7.82
Total Suspended Solids	3.0	mg/L		<3.0	9.0	69.8	23.8	9.7	<3.0	<3.0	3.1	<3.0	3.2	<3.0	<3.0
Total Dissolved Solids	13	mg/L		223	290	397	333	44	64	92	94	76	70	75	83
Turbidity	0.10	NTU		3.39	0.30	23.4	5.15	1.02	1.14	0.42	0.37	0.61	0.50	0.57	0.52
Anions and Nutrients															
Alkalinity, Total (as CaCO3)	1.0	mg/L		174	157	77.4	51.3	21.4	21.0	58.6	56.4	42.4	42.6	43.1	42.8
Ammonia, Total (as N)	0.0050	mg/L	0.021-231 ^B	0.197	0.0283	0.285	0.0354	0.0090	0.0064	<0.0050	0.0073	<0.0050	0.0160	<0.0050	<0.0050
Bromide (Br)	0.050	mg/L		<0.050	<0.050	<0.050	<0.25	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	0.50	mg/L	120	1.36	1.25	<0.50	<2.5	<0.50	<0.50	2.39	2.36	<0.50	<0.50	<0.50	<0.50
Fluoride (F)	0.020	mg/L	0.12	0.716	0.751	0.496	0.37	0.173	0.167	0.144	0.142	0.261	0.260	0.259	0.263
Nitrate (as N)	0.0050	mg/L	13	0.0055	0.304	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	0.0073	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.0010	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	0.0020	mg/L		<0.0020	0.0196	0.0028	0.121	0.0077	0.0064	<0.0020	<0.0020	0.0026	0.0023	0.0025	0.0024
Phosphorus (P)-Total	0.0020	mg/L		<0.0020	0.302	0.113	0.184	0.0227	0.0261	0.0038	0.0039	0.0026	0.0084	0.0030	0.0022
Sulfate (SO4)	0.30	mg/L		29.2	84.5	186	21.6	2.16	2.15	14.8	14.4	17.7	13.2	13.1	15.0
Sulphide as S	0.018	mg/L		<0.018	<0.018	0.432	0.146	0.022	0.021	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon															
Dissolved Organic Carbon	0.50	mg/L		5.29	4.96	22.7	120	18.3	18.7	5.06	4.88	6.49	6.65	6.62	6.53
Total Organic Carbon	0.50	mg/L		5.51	21.7	27.3	116	19.5	19.4	4.94	4.78	6.62	6.81	6.64	6.68

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the P

B Water Licence S17L8-002 Amend (September 11, 2017)

D Minimum CCME guideline based on temperature and pH x 0.8224 mg/L total amr 3.9804 2.6810 8.4707 5.7404 8.4707 8.4707 0.5880 0.5880 0.5880 0.5880 0.5880 0.5880

* Not aquatic habitat; CCME-FAL guidelines not applicable

Table B6 - Silver Bear Mines: Total Metals

Site			CCME Guidelines ^A	REFERENCE			NORTHTRIM									
Sample Area				Reference Stations			Hermandy Lake		Leachate Pond		Discharge Stream	Camsell River				On-Land Water
				R-2	R-4	R-3	NO-11	NO-7	NO-2	NO-DUP-1	NO-4/NO-8	NO-5	NO-6	NO-25	NO-27	NO-1 *
Sample ID								S17L8-002 (8C)					S17L8-002 (9D)			
SNP Sample ID																
PARAMETER	Lowest Detection Limit	Units		13-Sep-2017	12-Sep-2017	10-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	
Total Metals																
Aluminum (Al)-Total	0.0030	mg/L	0.005-0.100 ^F	0.0194	0.0234	0.0077	0.0164	0.0184	0.0058	0.0051	0.0051	0.0157	0.0262	0.0329	0.0254	0.0637
Antimony (Sb)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00018	0.00019	0.00019	0.00018	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00016
Arsenic (As)-Total	0.00010	mg/L	0.005	0.00017	0.00020	0.00067	0.00606	0.00605	0.0132	0.0125	0.00958	0.00032	0.00027	0.00024	0.00019	0.00799
Barium (Ba)-Total	0.000050	mg/L		0.0106	0.0104	0.00565	0.00702	0.00725	0.00561	0.00536	0.00731	0.0107	0.0108	0.0106	0.0101	0.0102
Beryllium (Be)-Total	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000161
Boron (B)-Total	0.010	mg/L	1.5	0.012	0.011	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	0.011	0.010	0.011	0.013
Cadmium (Cd)-Total	0.000050	mg/L	0.00009-0.00037 ^G	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.0000107	<0.000050	<0.000050	<0.000050	<0.000050	0.0000572
Calcium (Ca)-Total	0.050	mg/L		16.3	15.7	9.57	20.8	21.3	23.1	22.9	34.5	16.2	16.1	15.8	15.6	16.7
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	0.00010	mg/L		0.00010	<0.00010	<0.00010	<0.00010	0.00013	0.00014	<0.00010	0.00017	<0.00010	0.00015	0.00013	<0.00010	0.00020
Cobalt (Co)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00018	0.00019	0.00069	0.00065	0.00082	<0.00010	<0.00010	<0.00010	<0.00010	0.00178
Copper (Cu)-Total	0.00050	mg/L	0.002-0.004 ^H	0.00071	0.00077	0.00119	0.00259	0.00262	0.00210	0.00197	0.00677	0.00090	0.00090	0.00078	0.00075	0.00677
Iron (Fe)-Total	0.010	mg/L	0.3	0.019	0.022	0.012	0.045	0.046	0.096	0.089	0.071	0.015	0.030	0.032	0.023	0.104
Lead (Pb)-Total	0.000050	mg/L	0.001-0.007 ^I	<0.000050	<0.000050	<0.000050	0.000272	0.000297	0.00223	0.00218	0.000737	0.000311	0.000092	<0.000050	<0.000050	0.0120
Lithium (Li)-Total	0.0010	mg/L		0.0026	0.0026	0.0013	0.0016	0.0017	0.0017	0.0017	0.0013	0.0027	0.0027	0.0025	0.0026	0.0025
Magnesium (Mg)-Total	0.10	mg/L		7.10	6.97	2.73	4.58	4.71	4.84	4.43	7.36	7.19	6.99	6.75	6.58	7.05
Manganese (Mn)-Total	0.00010	mg/L		0.00106	0.00116	0.00113	0.0129	0.0127	0.0148	0.0132	0.0923	0.00093	0.00146	0.00183	0.00128	0.00569
Mercury (Hg)-Total	0.000050	mg/L	0.000026	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Total	0.000050	mg/L	0.073	0.000269	0.000245	0.000221	0.000668	0.000717	0.000543	0.000555	0.00156	0.000276	0.000287	0.000271	0.000285	0.000423
Nickel (Ni)-Total	0.00050	mg/L	0.025-0.150 ^J	<0.00050	<0.00050	<0.00050	0.00086	0.00085	0.00103	0.00092	0.00157	<0.00050	0.00052	<0.00050	<0.00050	0.00186
Phosphorus (P)-Total	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	0.10	mg/L		0.97	0.92	0.72	0.61	0.63	0.75	0.69	1.34	0.94	0.94	0.90	0.89	0.97
Selenium (Se)-Total	0.000050	mg/L	0.001	<0.000050	<0.000050	<0.000050	<0.000050	0.000056	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon (Si)-Total	0.10	mg/L		0.83	0.78	1.00	0.84	0.86	0.89	0.83	1.73	0.81	0.82	0.83	0.79	0.82
Silver (Ag)-Total	0.000010	mg/L	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000014	<0.000010	<0.000010	<0.000010	<0.000010	0.000065
Sodium (Na)-Total	0.050	mg/L		2.56	2.51	1.61	1.49	1.54	2.22	2.06	2.63	2.58	2.52	2.42	2.38	2.54
Strontium (Sr)-Total	0.00020	mg/L		0.0571	0.0553	0.0210	0.0259	0.0271	0.0268	0.0264	0.0406	0.0578	0.0567	0.0551	0.0546	0.0559
Sulfur (S)-Total	0.50	mg/L		5.41	4.71	0.95	3.09	3.06	3.10	2.92	<0.50	4.71	4.82	4.72	4.57	4.96
Thallium (Tl)-Total	0.000010	mg/L	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00060	0.00086	<0.00030	<0.00030	0.00033	<0.00030	<0.00030	<0.00030	0.00040	0.00078	0.00120	0.00095	0.00195
Uranium (U)-Total	0.000010	mg/L	0.015	0.000486	0.000528	0.000162	0.000191	0.000200	0.000120	0.000111	0.000175	0.000559	0.000520	0.000521	0.000534	0.000654
Vanadium (V)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.03	<0.0030	<0.0030	<0.0030	0.0031	0.0057	0.0075	0.0060	0.0102	<0.0030	<0.0030	0.0045	0.0032	0.0276
Zirconium (Zr)-Total	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH >= 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sample

H Copper calculated from hardness per CCME guidance, provided for each sample

I Lead calculated from hardness per CCME guidance, provided for each sample

J Nickel calculated from hardness per CCME guidance, provided for each sample

* Not aquatic habitat; CCME-FAL guidelines not applicable

0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.0001179	0.0001169	0.0000722	0.0001191	0.0001211	0.0001310	0.0001305	0.0001793	0.0001182	0.0001187	0.0001158	0.0001125	0.0001187	0.0001187	0.0001187	0.0001187	0.0001187
0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0027	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
0.00202	0.00199	0.00100	0.00205	0.00211	0.00238	0.00236	0.00384	0.00203	0.00204	0.00197	0.00188	0.00204	0.00197	0.00188	0.00204	0.00204
0.07288	0.07233	0.02500	0.07359	0.07470	0.08028	0.07998	0.10699	0.07304	0.07336	0.07169	0.06986	0.07336	0.07169	0.06986	0.07336	0.07336

Table B6 - Silver Bear Mines: Total Metals

Site			CCME Guidelines ^A	NOREX AND GRAHAM VEIN								SMALLWOOD			
Sample Area				On-Land Water				Marsh Adjacent to Xeron Pond		Camsell River		Smallwood Lake			
Sample ID				NX-1 *	NX-2 *	NX-3 *	NX-4A	NX-6	NX-DUP-1	NX-12	NX-13	SM-1	SM-2	SM-6-1M	SM-6-4M
SNP Sample ID						S17L8-002 (10E)				S17L8-002 (11F)					
PARAMETER	Lowest Detection Limit	Units		10-Sep-2017	10-Sep-2017	10-Sep-2017	10-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	10-Sep-2017	10-Sep-2017	10-Sep-2017	10-Sep-2017
Total Metals															
Aluminum (Al)-Total	0.0030	mg/L	0.005-0.100 ^F	0.0037	0.0055	0.0336	0.293	0.0561	0.0573	0.0269	0.0261	0.0143	0.0158	0.0181	0.0179
Antimony (Sb)-Total	0.00010	mg/L		0.00048	0.00100	0.00099	0.00060	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	0.00016	0.00010	0.00011
Arsenic (As)-Total	0.00010	mg/L	0.005	0.0647	0.0520	0.0391	0.0133	0.00056	0.00058	0.00020	0.00022	0.00049	0.00054	0.00048	0.00057
Barium (Ba)-Total	0.000050	mg/L		0.0554	0.0334	0.0258	0.0164	0.00571	0.00578	0.0110	0.0114	0.00648	0.00711	0.00671	0.00780
Beryllium (Be)-Total	0.000020	mg/L		0.000021	<0.000020	<0.000020	0.000024	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total	0.000050	mg/L		0.000056	0.000112	0.000094	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000060	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	1.5	0.089	0.083	0.055	0.041	<0.010	<0.010	0.011	0.011	0.010	0.011	0.011	0.011
Cadmium (Cd)-Total	0.000050	mg/L	0.00009-0.00037 ^G	0.0000138	0.000882	0.000765	0.0000555	<0.000050	<0.000050	<0.000050	<0.000050	0.000102	0.0000192	0.0000125	0.0000435
Calcium (Ca)-Total	0.050	mg/L		50.2	65.9	92.1	24.7	5.23	5.29	15.0	14.9	16.3	15.1	14.9	15.6
Cesium (Cs)-Total	0.000010	mg/L		0.000073	0.000101	0.000040	0.000031	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	0.00010	mg/L		<0.00010	0.00022	0.00037	0.00168	0.00018	0.00038	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010
Cobalt (Co)-Total	0.00010	mg/L		0.00117	0.0212	0.0554	0.00441	0.00022	0.00022	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00012
Copper (Cu)-Total	0.00050	mg/L	0.002-0.004 ^H	<0.00050	0.00988	0.00153	0.00351	<0.00050	<0.00050	0.00078	0.00079	0.00154	0.00168	0.00157	0.00174
Iron (Fe)-Total	0.010	mg/L	0.3	1.84	0.021	3.23	1.14	0.142	0.147	0.028	0.027	0.020	0.023	0.023	0.027
Lead (Pb)-Total	0.000050	mg/L	0.001-0.007 ^I	0.0156	0.00977	0.0367	0.00232	0.000160	0.000120	<0.000050	<0.000050	<0.000050	0.000062	<0.000050	0.000061
Lithium (Li)-Total	0.0010	mg/L		0.0110	0.0107	0.0069	0.0118	<0.0010	0.0010	0.0022	0.0022	0.0011	<0.0010	0.0011	0.0011
Magnesium (Mg)-Total	0.10	mg/L		9.62	10.1	10.9	4.87	2.10	2.13	6.59	6.79	4.09	4.13	3.96	4.31
Manganese (Mn)-Total	0.00010	mg/L		0.345	0.0632	1.39	0.0390	0.0168	0.0176	0.00131	0.00144	0.0105	0.0112	0.0111	0.0144
Mercury (Hg)-Total	0.000050	mg/L	0.000026	<0.000050	<0.000050	<0.000050	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Total	0.000050	mg/L	0.073	0.0140	0.0159	0.00511	0.00187	0.000056	0.000075	0.000247	0.000243	0.00110	0.00109	0.00107	0.00110
Nickel (Ni)-Total	0.00050	mg/L	0.025-0.150 ^J	0.00096	0.00913	0.0109	0.00377	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total	0.050	mg/L		<0.050	<0.050	0.069	0.263	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	0.10	mg/L		2.29	2.36	2.20	0.50	0.41	0.41	1.00	1.03	0.64	0.68	0.66	0.68
Selenium (Se)-Total	0.000050	mg/L	0.001	<0.000050	0.000314	0.000252	0.000231	0.000052	<0.000050	<0.000050	<0.000050	0.000064	0.000116	0.000073	0.000087
Silicon (Si)-Total	0.10	mg/L		4.61	4.34	4.42	3.97	1.91	1.93	0.85	0.86	0.62	0.58	0.57	0.58
Silver (Ag)-Total	0.000010	mg/L	0.00025	<0.000010	0.000016	0.000027	0.000022	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	0.050	mg/L		14.5	13.5	6.01	16.5	2.18	2.26	2.53	2.57	2.52	2.62	2.51	2.71
Strontium (Sr)-Total	0.00020	mg/L		0.269	0.254	0.160	0.0841	0.0101	0.0103	0.0522	0.0514	0.0285	0.0272	0.0267	0.0275
Sulfur (S)-Total	0.50	mg/L		10.2	30.1	79.3	10.2	1.07	1.13	5.07	4.85	6.57	4.66	4.69	5.62
Thallium (Tl)-Total	0.000010	mg/L	0.0008	<0.000010	0.000024	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000054	<0.000010	<0.000010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00017	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		0.00042	<0.00030	0.00137	<0.0063	0.00040	<0.00030	0.00077	<0.00090	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total	0.000010	mg/L	0.015	0.00982	0.00863	0.000921	0.00169	0.000074	0.000077	0.000505	0.000529	0.000321	0.000300	0.000305	0.000316
Vanadium (V)-Total	0.00050	mg/L		0.00074	<0.00050	0.00104	0.00063	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.03	0.0162	0.636	1.25	0.0315	0.0039	0.0037	<0.0030	<0.0030	0.0827	0.0146	0.0170	0.0381
Zirconium (Zr)-Total	0.00030	mg/L		0.00081	<0.00030	0.00034	0.00113	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

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F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH ≥ 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sample

H Copper calculated from hardness per CCME guidance, provided for each sample

I Lead calculated from hardness per CCME guidance, provided for each sample

J Nickel calculated from hardness per CCME guidance, provided for each sample

* Not aquatic habitat; CCME-FAL guidelines not applicable

0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.0002402	0.0002887	0.0003700	0.0001341	0.0000446	0.0000451	0.0001190	0.0001111	0.0000979	0.0000962	0.0000943	0.0000988				
0.0036	0.0040	0.0040	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020				
0.00602	0.00700	0.00700	0.00246	0.00100	0.00100	0.00205	0.00185	0.00100	0.00100	0.00100	0.00100				
0.13984	0.15000	0.15000	0.08204	0.02500	0.02500	0.07352	0.06905	0.02500	0.02500	0.02500	0.02500				

Table B7 - Silver Bear Mines: Dissolved Metals

Site			CCME Guidelines ^A	NORTHTRIM					NOREX AND GRAHAM VEIN		SMALLWOOD
Sample Area				Hermandy Lake	Leachate Pond		Camsell River		On-Land Water	Camsell River	Smallwood Lake
Sample ID				NO-7	NO-2	NO-DUP-1	NO-6	NO-25	NX-3 *	NX-12	SM-1
SNP Sample ID				S17L8-002 (8C)			S17L8-002 (9D)		S17L8-002 (10E)	S17L8-002 (11F)	
PARAMETER	Lowest Detection Limit	Units		12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	10-Sep-2017	12-Sep-2017	10-Sep-2017
Dissolved Metals											
Aluminum (Al)-Dissolved	0.0010	mg/L	0.005-0.100 ^F	0.0101	0.0037	0.0054	0.0026	0.0026	0.0106	0.0031	0.0052
Antimony (Sb)-Dissolved	0.00010			0.00018	0.00019	0.00019	<0.00010	<0.00010	0.00127	<0.00010	<0.00010
Arsenic (As)-Dissolved	0.00010	mg/L	0.005	0.00603	0.0127	0.0128	0.00026	0.00019	0.0117	0.00020	0.00045
Barium (Ba)-Dissolved	0.000050	mg/L		0.00743	0.00593	0.00619	0.0116	0.0113	0.0265	0.0115	0.00627
Beryllium (Be)-Dissolved	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000085	<0.000050	<0.000050
Boron (B)-Dissolved	0.010	mg/L	1.5	<0.010	<0.010	<0.010	0.011	0.011	0.048	0.011	0.011
Cadmium (Cd)-Dissolved	0.0000050	mg/L	0.00009-0.00037 ^G	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000898	<0.0000050	0.000072
Calcium (Ca)-Dissolved	0.050			21.0	23.6	23.5	16.4	15.9	107.0	16.6	15.5
Cesium (Cs)-Dissolved	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000053	<0.000010	<0.000010
Chromium (Cr)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00020	<0.00010	<0.00010
Cobalt (Co)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.1260	<0.00010	<0.00010
Copper (Cu)-Dissolved	0.00020	mg/L	0.002-0.004 ^H	0.00239	0.00172	0.00174	0.00075	0.00063	0.00136	0.00063	0.00139
Iron (Fe)-Dissolved	0.010	mg/L	0.3	0.025	0.041	0.042	<0.010	<0.010	0.57	<0.010	<0.010
Lead (Pb)-Dissolved	0.000050	mg/L	0.001-0.007 ^I	0.000067	0.00061	0.00059	<0.000050	<0.000050	0.0274	<0.000050	<0.000050
Lithium (Li)-Dissolved	0.0010			0.0013	0.0014	0.0015	0.0025	0.0024	0.0082	0.0025	0.0015
Magnesium (Mg)-Dissolved	0.10	mg/L		4.83	4.98	4.99	7.19	7.03	11.4	7.15	4.17
Manganese (Mn)-Dissolved	0.00010	mg/L		0.0005	0.0003	0.0003	<0.00010	<0.00010	1.83	<0.00010	0.0001
Mercury (Hg)-Dissolved	0.0000050	mg/L	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	0.000050	mg/L	0.073	0.000639	0.000534	0.000532	0.000260	0.000254	0.00762	0.000238	0.00107
Nickel (Ni)-Dissolved	0.00050	mg/L	0.025-0.150 ^J	0.00069	0.00084	0.00086	<0.00050	<0.00050	0.0250	<0.00050	<0.00050
Phosphorus (P)-Dissolved	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	0.10	mg/L		0.72	0.88	0.82	1.13	1.03	2.83	1.12	0.72
Selenium (Se)-Dissolved	0.000050	mg/L	0.001	<0.000050	0.000051	<0.000050	<0.000050	<0.000050	0.000459	<0.000050	0.000051
Silicon (Si)-Dissolved	0.050	mg/L		0.81	0.85	0.87	0.78	0.76	4.20	0.75	0.55
Silver (Ag)-Dissolved	0.000010	mg/L	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000022	<0.000010	<0.000010
Sodium (Na)-Dissolved	0.050	mg/L		1.61	2.31	2.34	2.67	2.59	5.06	2.62	2.68
Strontium (Sr)-Dissolved	0.00020	mg/L		0.0264	0.0272	0.0276	0.0580	0.0562	0.158	0.0590	0.0277
Sulfur (S)-Dissolved	0.50	mg/L		3.20	3.04	3.03	4.89	4.71	86.6	4.71	5.62
Thallium (Tl)-Dissolved	0.000010	mg/L	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000017	<0.000010	<0.000010
Tin (Sn)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00046	<0.00030	<0.00030
Uranium (U)-Dissolved	0.000010	mg/L	0.015	0.000192	0.000113	0.000113	0.000549	0.000543	0.000844	0.000564	0.000305
Vanadium (V)-Dissolved	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	0.0010	mg/L	0.03	0.0013	0.0036	0.0039	<0.0010	<0.0010	3.07	<0.0010	0.0612
Zirconium (Zr)-Dissolved	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH ≥ 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sample.

H Copper calculated from hardness per CCME guidance, provided for each sample

I Lead calculated from hardness per CCME guidance, provided for each sample

J Nickel calculated from hardness per CCME guidance, provided for each sample

* Not aquatic habitat; CCME-FAL guidelines not applicable

Table B8 - Silver Bear Mines: Hydrocarbons

Sample Area			CCME Guidelines ^A	Hermady Lake	Leachate Pond		Discharge Stream	Camsell River		On-Land Water	On-Land Water		Camsell River		Smallwood Lake	
Sample ID				NO-7	NO-2	NO-DUP-1	NO-4/NO-8	NO-5	NO-6	NO-1 *	NX-2 *	NX-3 *	NX-12	NX-13	SM-1	SM-2
SNP Sample ID				S17L8-002 (8C)					S17L8-002 (9D)			S17L8-002 (10E)	S17L8-002 (11F)			
PARAMETER	Lowest Detection Limit	Units		12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	12-Sep-2017	10-Sep-2017	10-Sep-2017	12-Sep-2017	12-Sep-2017	10-Sep-2017	10-Sep-2017
Volatile Organic Compounds																
Benzene	0.00050	mg/L	0.37	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Ethylbenzene	0.00050	mg/L	0.9	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Methyl t-butyl ether (MTBE)	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Styrene	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Toluene	0.00045	mg/L	0.002	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
Xylenes	0.00075	mg/L		<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
F1 (C6-C10)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.30	<0.10	<0.10	<0.10	<0.10
Hydrocarbons																
F1-BTEX	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.30	<0.10	<0.10	<0.10	<0.10
F2 (C10-C16)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.7 ^L	<0.30	<0.30	<0.30	<0.30
F3 (C16-C34)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.3 ^L	<0.30	<0.30	<0.30	<0.30
F4 (C34-C50)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Aggregate Organics																
Oil and Grease			5													

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

L Silica gel cleanup applied due to organic constituents

* Not aquatic habitat; CCME-FAL guidelines not applicable

Table B9 - Contact Lake Mine: General Chemistry

Sample Area			CCME Guidelines ^A	Reference Stations		On-Land Water		Tailings Pond			Stream	
Sample ID				CL-RL-1B	CL-8	CL-2 *	CL-15 *	CL-3	CL-DUP-2	CL-29	CL-2B	CL-DUP-1
SNP Sample ID								S17L8-002 (12G)				
PARAMETER	Lowest Detection Limit	Units		10-Sep-2017	10-Sep-2017	9-Sep-2017	9-Sep-2017	10-Sep-2017	10-Sep-2017	10-Sep-2017	9-Sep-2017	9-Sep-2017
Physical Tests												
Conductivity	2.0	uS/cm		64.5	43.6	213	244	238	238	239	223	221
Hardness (as CaCO3)	0.50	mg/L		30.1	20.2	106	125	128	128	122	122	126
pH	0.10	pH	Between 6.5 and 9.0	7.69	7.56	8.17	8.28	8.25	8.26	8.26	8.19	8.19
Total Suspended Solids	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.1	<3.0
Total Dissolved Solids	13	mg/L		42	28	132	144	150	151	165	144	142
Turbidity	0.10	NTU		0.23	0.27	1.26	0.16	0.45	0.40	0.41	0.35	0.31
Anions and Nutrients												
Alkalinity, Total (as CaCO3)	1.0	mg/L		30.3	22.8	105	129	134	133	130	123	122
Ammonia, Total (as N)	0.0050	mg/L	0.021-231 ^D	0.0098	<0.0050	0.0073	<0.0050	0.0119	0.0137	0.0163	0.0092	0.0076
Bromide (Br)	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	0.50	mg/L	120	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F)	0.020	mg/L	0.12	0.209	0.097	0.300	0.339	0.297	0.295	0.299	0.262	0.262
Nitrate (as N)	0.0050	mg/L	13	0.172	0.0311	0.103	<0.0050	<0.0050	<0.0050	<0.0050	0.0296	0.0304
Nitrite (as N)	0.0010	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	0.0020	mg/L		0.0021	<0.0020	0.0075	0.0029	0.0032	0.0031	0.0029	0.0023	0.0024
Phosphorus (P)-Total	0.0020	mg/L		0.0022	<0.0020	0.0053	0.0150	0.0024	0.0029	0.0028	<0.0020	<0.0020
Sulfate (SO4)	0.30	mg/L		1.84	1.09	14.7	8.97	6.28	6.27	6.29	5.88	5.88
Sulphide as S	0.018	mg/L		<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon												
Dissolved Organic Carbon	0.50	mg/L		4.40	2.23	5.58	4.71	9.17	8.84	8.91	7.64	8.02
Total Organic Carbon	0.50	mg/L		4.55	2.12	5.45	5.16	8.98	9.02	9.16	7.80	8.34

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

B Water Licence S17L8-002 Amend (September 11, 2017)

D Minimum CCME guideline based on temperature and pH x 0.8224 mg/L total amr 0.5880 0.5880 8.4707 0.8553 1.8257 1.8257 1.8257 0.8553 0.8553

* Not aquatic habitat; CCME-FAL guidelines not applicable

Table B9 - Contact Lake Mine: General Chemistry

Sample Area			CCME Guidelines ^A	Contact Lake						Echo Bay - East Arm Great Bear Lake			
Sample ID				CL-5	CL-26	CL-6-2M	CL-6-10M	CL-9	CL-24	CL-7-1M	CL-20	CL-16-2M	CL-16-10M
SNP Sample ID					S17L8-002 (13H)								
PARAMETER	Lowest Detection Limit	Units		9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	10-Sep-2017	10-Sep-2017	10-Sep-2017	10-Sep-2017
Physical Tests													
Conductivity	2.0	uS/cm		47.4	48.0	44.9	43.7	47.4	44.3	155	157	157	155
Hardness (as CaCO3)	0.50	mg/L		24.5	22.9	22.3	21.8	22.9	20.3	74.6	68.4	68.6	69.3
pH	0.10	pH	Between 6.5 and 9.0	7.60	7.23	7.55	7.56	7.61	7.58	7.99	8.00	7.99	7.99
Total Suspended Solids	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	13	mg/L		31	28	23	27	29	26	88	90	100	92
Turbidity	0.10	NTU		0.31	0.24	0.26	0.25	0.28	0.31	0.28	0.38	0.29	0.30
Anions and Nutrients													
Alkalinity, Total (as CaCO3)	1.0	mg/L		24.2	24.3	23.1	22.7	24.6	22.7	59.7	60.4	61.2	60.3
Ammonia, Total (as N)	0.0050	mg/L	0.021-231 ^D	<0.0050	<0.0050	<0.0050	<0.0050	0.0078	0.0066	<0.0050	<0.0050	0.0067	<0.0050
Bromide (Br)	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	0.50	mg/L	120	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.83	4.82	4.83	4.83
Fluoride (F)	0.020	mg/L	0.12	0.098	0.097	0.097	0.094	0.099	0.096	0.080	0.080	0.080	0.079
Nitrate (as N)	0.0050	mg/L	13	0.0267	0.0272	0.0278	0.0471	0.0271	0.0269	0.125	0.125	0.126	0.136
Nitrite (as N)	0.0010	mg/L	0.06	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	0.0020	mg/L		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total	0.0020	mg/L		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0022
Sulfate (SO4)	0.30	mg/L		1.15	1.08	1.08	1.09	1.43	1.09	14.9	14.9	14.9	14.9
Sulphide as S	0.018	mg/L		<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon													
Dissolved Organic Carbon	0.50	mg/L		2.24	2.23	2.28	2.16	2.20	2.30	1.96	1.96	1.86	2.15
Total Organic Carbon	0.50	mg/L		2.64	2.65	2.51	2.26	2.46	2.33	2.02	1.93	2.47	2.09

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the P

B Water Licence S17L8-002 Amend (September 11, 2017)

D Minimum CCME guideline based on temperature and pH x 0.8224 mg/L total amr 0.5880 0.5880 0.5880 0.5880 0.5880 0.5880 0.2821 0.2821 0.2821 0.2821

* Not aquatic habitat; CCME-FAL guidelines not applicable

Table B10 - Contact Lake Mine: Total Metals

Sample Area			CCME Guidelines ^A	Reference Stations		On-Land Water		Tailings Pond			Stream	
Sample ID				CL-RL-1B	CL-8	CL-2 *	CL-15 *	CL-3	CL-DUP-2	CL-29	CL-2B	CL-DUP-1
SNP Sample ID								S17L8-002 (12G)				
PARAMETER	Lowest Detection Limit	Units		10-Sep-2017	10-Sep-2017	9-Sep-2017	9-Sep-2017	10-Sep-2017	10-Sep-2017	10-Sep-2017	9-Sep-2017	9-Sep-2017
Total Metals												
Aluminum (Al)-Total	0.0030	mg/L	0.005-0.100 ^F	0.0090	0.0030	0.0199	0.0048	0.0033	0.0038	0.0032	0.0061	0.0059
Antimony (Sb)-Total	0.00010	mg/L		<0.00010	<0.00010	0.00356	0.00159	0.00047	0.00048	0.00049	0.00027	0.00028
Arsenic (As)-Total	0.00010	mg/L	0.005	0.00017	0.00015	0.0956	0.0424	0.0115	0.0115	0.0113	0.00958	0.00966
Barium (Ba)-Total	0.000050	mg/L		0.00492	0.00365	0.0537	0.0117	0.0284	0.0279	0.0281	0.0187	0.0188
Beryllium (Be)-Total	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	0.00159	0.000131	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	1.5	<0.010	<0.010	0.051	0.038	0.034	0.035	0.036	0.027	0.028
Cadmium (Cd)-Total	0.0000050	mg/L	0.00009-0.00037 ^G	<0.0000050	<0.0000050	0.0000066	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	0.050	mg/L		7.00	4.79	29.2	33.3	30.6	30.7	30.8	28.9	28.2
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	0.000023	0.000013	0.000013	0.000014	0.000013	<0.000010	<0.000010
Chromium (Cr)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	0.00010	mg/L		<0.00010	<0.00010	0.00230	<0.00010	0.00012	0.00011	0.00012	0.00024	0.00025
Copper (Cu)-Total	0.00050	mg/L	0.002-0.004 ^H	0.00149	0.00072	0.122	0.0431	0.00813	0.00796	0.00765	0.00575	0.00520
Iron (Fe)-Total	0.010	mg/L	0.3	<0.010	<0.010	0.168	<0.010	0.041	0.041	0.031	0.036	0.036
Lead (Pb)-Total	0.000050	mg/L	0.001-0.007 ^I	<0.000050	<0.000050	0.000685	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	0.0043	0.0028	0.0031	0.0032	0.0032	0.0029	0.0029
Magnesium (Mg)-Total	0.10	mg/L		3.07	2.01	7.94	10.1	10.9	10.6	10.9	10.4	10.0
Manganese (Mn)-Total	0.00010	mg/L		0.00052	0.00086	0.0136	0.00303	0.0973	0.0970	0.0940	0.0885	0.100
Mercury (Hg)-Total	0.0000050	mg/L	0.000026	<0.0000050	<0.0000050	0.000700	0.000355	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050
Molybdenum (Mo)-Total	0.000050	mg/L	0.073	0.000370	0.000166	0.00298	0.00114	0.000435	0.000402	0.000403	0.000435	0.000426
Nickel (Ni)-Total	0.00050	mg/L	0.025-0.150 ^J	<0.00050	<0.00050	0.0124	0.00196	0.00125	0.00125	0.00122	0.00104	0.00114
Phosphorus (P)-Total	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	0.10	mg/L		0.57	0.48	2.32	1.87	1.55	1.55	1.55	1.38	1.36
Selenium (Se)-Total	0.000050	mg/L	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon (Si)-Total	0.10	mg/L		0.91	0.32	2.82	3.53	2.29	2.31	2.32	2.46	2.35
Silver (Ag)-Total	0.000010	mg/L	0.00025	<0.000010	<0.000010	0.00424	0.000289	0.000035	0.000040	0.000026	0.000031	0.000024
Sodium (Na)-Total	0.050	mg/L		1.36	0.890	4.36	4.45	4.84	4.77	4.80	4.72	4.55
Strontium (Sr)-Total	0.00020	mg/L		0.0155	0.0102	0.110	0.0805	0.0782	0.0783	0.0793	0.0703	0.0687
Sulfur (S)-Total	0.50	mg/L		0.79	<0.50	5.98	3.37	2.52	2.52	2.45	2.41	2.27
Thallium (Tl)-Total	0.000010	mg/L	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total	0.000010	mg/L	0.015	0.00128	0.000155	0.187	0.137	0.0490	0.0482	0.0494	0.0480	0.0472
Vanadium (V)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.03	<0.0030	<0.0030	0.0048	<0.0030	<0.0030	0.0055	<0.0030	<0.0030	0.0036
Zirconium (Zr)-Total	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH >= 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sam

H Copper calculated from hardness per CCME guidance, provided for each sam

I Lead calculated from hardness per CCME guidance, provided for each sampl

J Nickel calculated from hardness per CCME guidance, provided for each sam

* Not aquatic habitat; CCME-FAL guidelines not applicable

	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.0000585	0.0000420	0.0001663	0.0001907	0.0001945	0.0001945	0.0001869	0.0001869	0.0001869	0.0001869	0.0001869	0.0001869	0.0001920
0.0020	0.0020	0.0025	0.0029	0.0029	0.0029	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0029
0.00100	0.00100	0.00343	0.00423	0.00436	0.00436	0.00410	0.00410	0.00410	0.00410	0.00410	0.00427	0.00427
0.02500	0.02500	0.09990	0.11324	0.11530	0.11530	0.11117	0.11117	0.11117	0.11117	0.11117	0.11393	0.11393

Table B10 - Contact Lake Mine: Total Metals

Sample Area			CCME Guidelines ^A	Contact Lake					Echo Bay - East Arm Great Bear Lake				
Sample ID				CL-5	CL-26	CL-6-2M	CL-6-10M	CL-9	CL-24	CL-7-1M	CL-20	CL-16-2M	CL-16-10M
SNP Sample ID					S17L8-002 (13H)								
PARAMETER	Lowest Detection Limit	Units		9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	10-Sep-2017	10-Sep-2017	10-Sep-2017	10-Sep-2017
Total Metals													
Aluminum (Al)-Total	0.0030	mg/L	0.005-0.100 ^F	0.0053	0.0033	0.0042	0.0031	0.0040	0.0054	0.0127	0.0141	0.0131	0.0102
Antimony (Sb)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	0.00010	mg/L	0.005	0.00025	0.00015	0.00014	0.00014	0.00014	0.00014	0.00024	0.00020	0.00019	0.00018
Barium (Ba)-Total	0.000050	mg/L		0.00403	0.00354	0.00357	0.00359	0.00369	0.00344	0.0219	0.0217	0.0217	0.0218
Beryllium (Be)-Total	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.010	0.010	0.011
Cadmium (Cd)-Total	0.0000050	mg/L	0.00009-0.00037 ^G	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	0.050	mg/L		5.37	4.85	4.81	4.82	5.40	4.78	16.0	15.9	16.0	16.4
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011
Cobalt (Co)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	0.00050	mg/L	0.002-0.004 ^H	0.00079	0.00069	0.00076	0.00068	0.00071	0.00073	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total	0.010	mg/L	0.3	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	0.015	0.013	0.011
Lead (Pb)-Total	0.000050	mg/L	0.001-0.007 ^I	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0031	0.0031	0.0032	0.0032
Magnesium (Mg)-Total	0.10	mg/L		2.19	2.01	1.99	2.02	2.28	2.02	6.99	7.00	6.95	6.87
Manganese (Mn)-Total	0.00010	mg/L		0.00372	0.00102	0.00112	0.00082	0.00143	0.00159	0.00109	0.00105	0.00101	0.00080
Mercury (Hg)-Total	0.0000050	mg/L	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	0.000050	mg/L	0.073	0.000186	0.000170	0.000182	0.000168	0.000194	0.000160	0.000315	0.000308	0.000323	0.000329
Nickel (Ni)-Total	0.00050	mg/L	0.025-0.150 ^J	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	0.10	mg/L		0.50	0.49	0.47	0.48	0.49	0.48	0.72	0.72	0.73	0.71
Selenium (Se)-Total	0.000050	mg/L	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon (Si)-Total	0.10	mg/L		0.37	0.31	0.32	0.34	0.38	0.32	1.16	1.17	1.17	1.16
Silver (Ag)-Total	0.000010	mg/L	0.00025	0.000033	<0.000010	<0.000010	<0.000010	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	0.050	mg/L		0.981	0.910	0.887	0.907	0.966	0.893	3.97	3.97	4.00	3.90
Strontium (Sr)-Total	0.00020	mg/L		0.0112	0.0100	0.0103	0.0101	0.0113	0.0101	0.101	0.100	0.102	0.104
Sulfur (S)-Total	0.50	mg/L		0.60	0.53	0.54	<0.50	0.58	<0.50	5.32	5.31	5.12	5.29
Thallium (Tl)-Total	0.000010	mg/L	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00060	<0.00060	<0.00030
Uranium (U)-Total	0.000010	mg/L	0.015	0.000639	0.000151	0.000176	0.000150	0.000191	0.000165	0.000292	0.000280	0.000279	0.000293
Vanadium (V)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.03	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)-Total	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

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F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH >= 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sam

H Copper calculated from hardness per CCME guidance, provided for each sam

I Lead calculated from hardness per CCME guidance, provided for each sampl

J Nickel calculated from hardness per CCME guidance, provided for each sam

* Not aquatic habitat; CCME-FAL guidelines not applicable

	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.0000493	0.0000466	0.0000456	0.0000448	0.0000466	0.0000422	0.0001243	0.0001156	0.0001159	0.0001169				
0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020				
0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100				
0.02500	0.02500	0.02500	0.02500	0.02500	0.02500	0.02500	0.02500	0.02500	0.02500				

Table B11 - Contact Lake Mine: Dissolved Metals

Sample Area			CCME Guidelines ^A	Tailings Pond		Stream		Contact Lake				Echo Bay - East Arm Great Bear Lake
Sample ID				CL-3	CL-DUP-2	CL-2B	CL-DUP-1	CL-5	CL-26	CL-6-2M	CL-6-10M	CL-7-1M
SNP Sample ID				S17L8-002 (12G)	S17L8-002 (12G)				S17L8-002 (13H)			
PARAMETER	Lowest Detection Limit	Units		10-Sep-2017	10-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	10-Sep-2017
Dissolved Metals												
Aluminum (Al)-Dissolved	0.0010	mg/L	0.005-0.100 ^F	0.0018	0.0019	0.0023	0.0027	0.0016	0.0013	0.0014	<0.0010	0.0012
Antimony (Sb)-Dissolved	0.00010	mg/L		0.00047	0.00047	0.00025	0.00026	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	0.00010	mg/L	0.005	0.0106	0.0109	0.00914	0.00935	0.00024	0.00016	0.00015	0.00012	0.00021
Barium (Ba)-Dissolved	0.000050	mg/L		0.0274	0.0275	0.0182	0.0185	0.00414	0.00366	0.00369	0.00362	0.0227
Beryllium (Be)-Dissolved	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	0.010	mg/L	1.5	0.035	0.035	0.027	0.029	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	0.0000050	mg/L	0.00009-0.00037 ^G	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Calcium (Ca)-Dissolved	0.050	mg/L		32.5	32.2	30.3	31.4	5.80	5.35	5.27	5.15	17.4
Cesium (Cs)-Dissolved	0.000010	mg/L		0.000014	0.000014	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	0.00020	mg/L	0.002-0.004 ^H	0.00651	0.00669	0.00479	0.00494	0.00065	0.00060	0.00058	0.00053	0.00032
Iron (Fe)-Dissolved	0.010	mg/L	0.3	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Dissolved	0.000050	mg/L	0.001-0.007 ^I	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	0.0010	mg/L		0.0031	0.0031	0.0027	0.0029	<0.0010	<0.0010	<0.0010	<0.0010	0.0031
Magnesium (Mg)-Dissolved	0.10	mg/L		11.3	11.4	11.4	11.6	2.44	2.31	2.22	2.16	7.59
Manganese (Mn)-Dissolved	0.00010	mg/L		0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Mercury (Hg)-Dissolved	0.0000050	mg/L	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	0.000050	mg/L	0.073	0.000388	0.000371	0.000422	0.000397	0.000146	0.000144	0.000136	0.000126	0.000288
Nickel (Ni)-Dissolved	0.00050	mg/L	0.025-0.150 ^J	0.00081	0.00077	0.00074	0.00072	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	0.10	mg/L		1.63	1.65	1.49	1.55	0.54	0.53	0.52	0.51	0.78
Selenium (Se)-Dissolved	0.000050	mg/L	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon (Si)-Dissolved	0.050	mg/L		2.31	2.23	2.38	2.45	0.34	0.30	0.29	0.32	1.13
Silver (Ag)-Dissolved	0.000010	mg/L	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	0.050	mg/L		5.12	5.26	5.14	5.23	1.070	0.994	0.977	0.953	4.38
Strontium (Sr)-Dissolved	0.00020	mg/L		0.0789	0.0797	0.0716	0.0723	0.0121	0.0106	0.0107	0.0104	0.104
Sulfur (S)-Dissolved	0.50	mg/L		2.21	2.18	2.06	1.96	<0.50	<0.50	<0.50	<0.50	4.91
Thallium (Tl)-Dissolved	0.000010	mg/L	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved	0.000010	mg/L	0.015	0.0500	0.0501	0.0477	0.0503	0.000606	0.000138	0.000210	0.000140	0.000299
Vanadium (V)-Dissolved	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	0.0010	mg/L	0.03	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0014	<0.0010	<0.0010
Zirconium (Zr)-Dissolved	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

B Water Licence S17L8-002 Amend (September 11, 2017)

C Site-Specific Target Level for Arsenic in Surface Waters Associated with the Terra Mine Wetland (SENES Consultants Ltd. 2014)

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH >= 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sample.

H Copper calculated from hardness per CCME guidance, provided for each sample

I Lead calculated from hardness per CCME guidance, provided for each sample

J Nickel calculated from hardness per CCME guidance, provided for each sample

	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	0.0001945	0.0001945	0.0001869	0.0001920	0.0000493	0.0000466	0.0000466	0.0000466	0.0000466	0.0000448	0.0001243	0.0001243
	0.0029	0.0029	0.0028	0.0029	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
	0.0044	0.0044	0.0041	0.0043	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0022
	0.1153	0.1153	0.1112	0.1139	0.0250	0.0250	0.0250	0.0250	0.0250	0.0250	0.0250	0.0765

Table B12 - Contact Lake Mine: Hydrocarbons

Sample Area			CCME Guidelines ^A	Reference Stations	Tailings Pond		Contact Lake	Echo Bay - East Arm Great Bear Lake	
Sample ID				CL-RL-1B	CL-3	CL-DUP-2	CL-26	CL-7-1M	CL-16-10M
SNP Sample ID					S17L8-002 (12G)		S17L8-002 (13H)		
PARAMETER	Lowest Detection Limit	Units		10-Sep-2017	10-Sep-2017	10-Sep-2017	9-Sep-2017	10-Sep-2017	10-Sep-2017
<i>Volatile Organic Compounds</i>									
Benzene	0.00050	mg/L	0.37	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Ethylbenzene	0.00050	mg/L	0.9	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Methyl t-butyl ether (MTBE)	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Styrene	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Toluene	0.00045	mg/L	0.002	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
Xylenes	0.00075	mg/L		<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
F1 (C6-C10)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
<i>Hydrocarbons</i>									
F1-BTEX	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
F2 (C10-C16)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
F3 (C16-C34)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
F4 (C34-C50)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
<i>Aggregate Organics</i>									
Oil and Grease			5						

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

Table B13 - Contact Lake Mine: Radionuclides

Sample Area			Canadian Drinking Water Quality Guidelines ^A	Reference Stations		On-Land Water		Tailings Pond		Stream		Contact Lake				Echo Bay - East Arm Great Bear Lake
Sample ID				CL-RL-1B	CL-8	CL-2	CL-15	CL-3	CL-DUP-2	CL-2B	CL-DUP-1	CL-5	CL-26	CL-6-2M	CL-6-10M	CL-7-1M
SNP Sample ID								S17L8-002 (12G)	S17L8-002 (12G)				S17L8-002 (13H)			
PARAMETER	Lowest Detection Limit	Units		10-Sep-2017	10-Sep-2017	9-Sep-2017	9-Sep-2017	10-Sep-2017	10-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	10-Sep-2017
Radiological Parameters																
Pb-210	0.023	Bq/L	0.2	<0.023	<0.026	0.35	<0.028	<0.026	<0.025	<0.025	<0.027	<0.024	<0.023	<0.024	<0.024	<0.031
Ra-226	0.0056	Bq/L	0.5	0.0052	<0.0063	0.29	0.049	0.077	0.086	0.03	0.029	<0.0073	<0.0076	<0.0068	<0.0060	<0.0080

A CCME guidelines not developed. Applied Canadian Drinking Water Guidelines for Radiological Parameters.

Table B14 - El Bonanza Mine: General Chemistry

Sample Area			CCME Guidelines ^A	Reference Stations		Silver Lake				Stream	Mile Lake		Great Bear Lake		
Sample ID				CL-RL-1B	CL-8	ELB-7-SL	ELB-6-SL	ELB-8-SL	ELB-DUP-1	ELB-SW-2	ELB-10-ML	ELB-4-ML	ELB-1G-GBL	ELB-2G-GBL	ELB-9-GLB
SNP Sample ID															
PARAMETER	Lowest Detection Limit	Units		10-Sep-2017	10-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017
Physical Tests															
Conductivity	2.0	uS/cm		64.5	43.6	64.2	63.3	63.5	64.0	62.8	63.2	59.2	158	157	158
Hardness (as CaCO3)	0.50	mg/L		30.1	20.2	32.3	32.5	32.4	31.4	32	29.8	29.9	74.5	72.8	71.6
pH	0.10	pH	Between 6.5 and 9.0	7.69	7.56	7.67	7.69	7.71	7.70	7.70	7.54	7.68	7.99	7.99	7.98
Total Suspended Solids	3.0	mg/L		<3.0	<3.0	<3.0	3.0	<3.0	4.2	3.4	<3.0	3.2	<3.0	3.4	3.4
Total Dissolved Solids	13	mg/L		42	28	39	40	39	40	37	35	33	83	84	83
Turbidity	0.10	NTU		0.23	0.27	0.47		0.50	0.46	0.49	0.46	0.39	0.23	0.25	0.25
Anions and Nutrients															
Alkalinity, Total (as CaCO3)	1.0	mg/L		30.3	22.8	32.0	32.6	32.5	32.2	32.2	29.1	29.7	59.6	59.9	58.6
Ammonia, Total (as N)	0.0050	mg/L	0.021-231 ^D	0.0098	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0059	<0.0050	<0.0050	<0.0050
Bromide (Br)	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	0.50	mg/L	120	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.81	4.80	4.82
Fluoride (F)	0.020	mg/L	0.12	0.209	0.097	0.091	0.090	0.089	0.091	0.089	0.057	0.055	0.082	0.083	0.079
Nitrate (as N)	0.0050	mg/L	13	0.172	0.0311	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0595	0.0548	0.138	0.138	0.139
Nitrite (as N)	0.0010	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	0.0020	mg/L		0.0021	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total	0.0020	mg/L		0.0022	<0.0020	<0.0020	<0.0020	<0.0020	0.0025	0.0022	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Sulfate (SO4)	0.30	mg/L		1.84	1.09	1.27	1.25	1.27	1.27	1.26	1.45	1.45	14.9	14.9	15.0
Sulphide as S	0.018	mg/L		<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon															
Dissolved Organic Carbon	0.50	mg/L		4.40	2.23	3.86	3.58	3.83	4.07	3.74	3.60	3.57	1.97	2.09	2.35
Total Organic Carbon	0.50	mg/L		4.55	2.12	3.88	3.81	3.83	4.02	4.22	3.65	3.87	2.04	2.03	2.12

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

B Water Licence S17L8-002 Amend (September 11, 2017)

D Minimum CCME guideline based on temperature and pH x 0.8224 mg/L total amnr 0.5880 0.5880 0.0995 0.0995 0.0995 0.0995 0.0995 0.0995 0.2821 0.2821 0.2821 0.2821 0.2821

Table B15- El Bonanza Mine: Total Metals

Sample Area			CCME Guidelines ^A	Reference Stations		Silver Lake				Stream	Mile Lake		Great Bear Lake		
Sample ID				CL-RL-1B	CL-8	ELB-7-SL	ELB-6-SL	ELB-8-SL	ELB-DUP-1	ELB-SW-2	ELB-10-ML	ELB-4-ML	ELB-1G-GBL	ELB-2G-GBL	ELB-9-GLB
SNP Sample ID															
PARAMETER	Lowest Detection Limit	Units		10-Sep-2017	10-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017
Total Metals															
Aluminum (Al)-Total	0.0030	mg/L	0.005-0.100 ^F	0.0090	0.0030	0.0049	0.0059	0.0066	0.0072	0.0064	0.0121	0.0106	0.0057	0.0083	0.0074
Antimony (Sb)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00036	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	0.00010	mg/L	0.005	0.00017	0.00015	0.00021	0.00018	0.00020	0.00017	0.00017	0.00018	0.00017	0.00017	0.00020	0.00020
Barium (Ba)-Total	0.000050	mg/L		0.00492	0.00365	0.00740	0.00800	0.00768	0.00713	0.00752	0.00517	0.00503	0.0228	0.0229	0.0222
Beryllium (Be)-Total	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	1.5	<0.010	<0.010	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.010
Cadmium (Cd)-Total	0.0000050	mg/L	0.00009-0.00037 ^G	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000058
Calcium (Ca)-Total	0.050	mg/L		7.00	4.79	8.80	8.97	8.95	8.76	8.89	8.04	8.08	17.4	17.5	17.1
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	0.00050	mg/L	0.002-0.004 ^H	0.00149	0.00072	0.00113	0.00114	0.00115	0.00110	0.00110	0.00123	0.00125	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total	0.010	mg/L	0.3	<0.010	<0.010	0.086	0.099	0.087	0.082	0.106	0.025	0.019	<0.010	<0.010	<0.010
Lead (Pb)-Total	0.000050	mg/L	0.001-0.007 ^I	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0032	0.0031	0.0031
Magnesium (Mg)-Total	0.10	mg/L		3.07	2.01	2.36	2.44	2.44	2.32	2.39	2.37	2.36	7.08	7.09	7.04
Manganese (Mn)-Total	0.00010	mg/L		0.00052	0.00086	0.0138	0.0166	0.0127	0.0124	0.0258	0.00288	0.00284	0.00073	0.00093	0.00073
Mercury (Hg)-Total	0.0000050	mg/L	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	0.000050	mg/L	0.073	0.000370	0.000166	0.000189	0.000180	0.000199	0.000183	0.000176	0.000179	0.000194	0.000316	0.000324	0.000310
Nickel (Ni)-Total	0.00050	mg/L	0.025-0.150 ^J	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	0.10	mg/L		0.57	0.48	0.41	0.43	0.42	0.40	0.41	0.42	0.42	0.72	0.73	0.71
Selenium (Se)-Total	0.000050	mg/L	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon (Si)-Total	0.10	mg/L		0.91	0.32	1.02	1.06	1.06	1.00	1.00	0.52	0.52	1.17	1.17	1.16
Silver (Ag)-Total	0.000010	mg/L	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	0.050	mg/L		1.36	0.890	0.963	0.978	0.996	0.939	0.962	0.897	0.906	4.15	4.12	4.04
Strontium (Sr)-Total	0.00020	mg/L		0.0155	0.0102	0.0132	0.0133	0.0133	0.0130	0.0130	0.0123	0.0123	0.103	0.104	0.102
Sulfur (S)-Total	0.50	mg/L		0.79	<0.50	<0.50	<0.50	0.61	<0.50	<0.50	0.58	0.52	5.60	5.49	5.37
Thallium (Tl)-Total	0.000010	mg/L	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total	0.000010	mg/L	0.015	0.00128	0.000155	0.000141	0.000130	0.000135	0.000132	0.000119	0.000069	0.000068	0.000345	0.000369	0.000327
Vanadium (V)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.03	<0.0030	<0.0030	<0.0030	0.0042	<0.0030	0.0043	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)-Total	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH >= 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sam

H Copper calculated from hardness per CCME guidance, provided for each sam

I Lead calculated from hardness per CCME guidance, provided for each sampl

J Nickel calculated from hardness per CCME guidance, provided for each sam

0.0000585	0.0000420	0.0000620	0.0000624	0.0000622	0.0000606	0.0000616	0.0000580	0.0000582	0.0001241	0.0001218	0.0001201
0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00219	0.00212	0.00208
0.02500	0.02500	0.02500	0.02500	0.02500	0.02500	0.02500	0.02500	0.02500	0.07642	0.07509	0.07415

Table B16 - El Bonanza Mine: Dissolved Metals

Sample Area			CCME Guidelines ^A	Silver Lake	Stream	Great Bear Lake
Sample ID				ELB-7-SL	ELB-SW-2	ELB-1G-GBL
SNP Sample ID						
PARAMETER	Lowest Detection Limit	Units		9-Sep-2017	9-Sep-2017	9-Sep-2017
<i>Dissolved Metals</i>						
Aluminum (Al)-Dissolved	0.0010	mg/L	0.005-0.100 ^F	0.0018	0.0025	<0.0010
Antimony (Sb)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	0.00010	mg/L	0.005	0.00017	0.00017	0.00019
Barium (Ba)-Dissolved	0.000050	mg/L		0.00750	0.00735	0.0232
Beryllium (Be)-Dissolved	0.000020	mg/L		<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved	0.000050	mg/L		<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	0.010	mg/L	1.5	0.012	0.012	0.011
Cadmium (Cd)-Dissolved	0.0000050	mg/L	0.00009-0.00037 ^G	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	0.050	mg/L		8.90	8.76	17.6
Cesium (Cs)-Dissolved	0.000010	mg/L		<0.000010	<0.000010	
Chromium (Cr)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	0.00020	mg/L	0.002-0.004 ^H	0.00093	0.00088	0.00027
Iron (Fe)-Dissolved	0.010	mg/L	0.3	0.010	0.015	<0.010
Lead (Pb)-Dissolved	0.000050	mg/L	0.001-0.007 ^I	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	0.0010	mg/L		<0.0010	<0.0010	0.0034
Magnesium (Mg)-Dissolved	0.10	mg/L		2.45	2.47	7.43
Manganese (Mn)-Dissolved	0.00010	mg/L		<0.00010	0.0001	<0.00010
Mercury (Hg)-Dissolved	0.0000050	mg/L	0.000026	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	0.000050	mg/L	0.073	0.000172	0.000162	0.000289
Nickel (Ni)-Dissolved	0.00050	mg/L	0.025-0.150 ^J	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved	0.050	mg/L		<0.050	<0.050	<0.050
Potassium (K)-Dissolved	0.10	mg/L		0.42	0.44	0.77
Selenium (Se)-Dissolved	0.000050	mg/L	0.001	<0.000050	<0.000050	<0.000050
Silicon (Si)-Dissolved	0.050	mg/L		1.01	0.97	1.13
Silver (Ag)-Dissolved	0.000010	mg/L	0.00025	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	0.050	mg/L		0.992	0.988	4.24
Strontium (Sr)-Dissolved	0.00020	mg/L		0.0132	0.0126	0.104
Sulfur (S)-Dissolved	0.50	mg/L		<0.50	<0.50	5.06
Thallium (Tl)-Dissolved	0.000010	mg/L	0.0008	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	0.00030	mg/L		<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved	0.000010	mg/L	0.015	0.000112	0.000093	0.000340
Vanadium (V)-Dissolved	0.00050	mg/L		<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	0.0010	mg/L	0.03	<0.0010	<0.0010	<0.0010
Zirconium (Zr)-Dissolved	0.00030	mg/L		<0.00030	<0.00030	<0.00030

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH ≥ 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sample.

H Copper calculated from hardness per CCME guidance, provided for each sample

I Lead calculated from hardness per CCME guidance, provided for each sample

J Nickel calculated from hardness per CCME guidance, provided for each sample

0.1	0.1	0.1
0.0000620	0.0000616	0.0001241
0.0020	0.0020	0.0020
0.0010	0.0010	0.0022
0.0250	0.0250	0.0764

Table B17 - El Bonanza Mine: Hydrocarbons

Sample Area			CCME Guidelines ^A	Silver Lake	Great Bear Lake		
Sample ID				ELB-7-SL	ELB-1G-GBL	ELB-2G-GBL	ELB-9-GLB
SNP Sample ID							
PARAMETER	Lowest Detection Limit	Units		9-Sep-2017	9-Sep-2017	9-Sep-2017	9-Sep-2017
Volatile Organic Compounds							
Benzene	0.00050	mg/L	0.37	<0.00050	<0.00050	<0.00050	<0.00050
Ethylbenzene	0.00050	mg/L	0.9	<0.00050	<0.00050	<0.00050	<0.00050
Methyl t-butyl ether (MTBE)	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050
Styrene	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050
Toluene	0.00045	mg/L	0.002	<0.00045	<0.00045	<0.00045	<0.00045
Xylenes	0.00075	mg/L		<0.00075	<0.00075	<0.00075	<0.00075
F1 (C6-C10)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10
Hydrocarbons							
F1-BTEX	0.10	mg/L		<0.10	<0.10	<0.10	<0.10
F2 (C10-C16)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30
F3 (C16-C34)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30
F4 (C34-C50)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30
Aggregate Organics							
Oil and Grease			5				

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

Table B18 - Sawmill Bay: General Chemistry

Sample Area			CCME Guidelines ^A	Reference Stations		Ravine Creek Discharge	Sawmill Bay								
Sample ID				BG-SW08-04	BG-SW08-01	A3-SW08-01	A3-SW08-05	SW07-3	SW16-01-2M	SW16-01-6M	A5-SW08-11	SW-B-2	SW-DUP-1	SW16-02-2M	SW16-02-6M
SNP Sample ID															
PARAMETER	Lowest Detection Limit	Units		11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017
<i>Physical Tests</i>															
Conductivity	2.0	uS/cm		262	160	185	160	159	160	157	166	166	160	161	157
Hardness (as CaCO3)	0.50	mg/L		153	71.2	86.8	76.9	79	77.3	71.6	80.8	77.9	74	72.8	70.8
pH	0.10	pH	Between 6.5 and 9.0	8.33	7.99	8	7.97	7.95	7.96	7.95	7.96	7.99	7.97	7.98	7.97
Total Suspended Solids	3.0	mg/L		4.4	<3.0	14	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	13	mg/L		174	96	112	94	98	99	96	102	98	96	95	97
Turbidity	0.10	NTU		0.83	0.24	2.36	0.23	0.19	0.19	0.19	0.19	0.19	0.2	0.19	0.21
<i>Anions and Nutrients</i>															
Alkalinity, Total (as CaCO3)	1.0	mg/L		149	59.2	68.6	58.8	57.2	56.3	58.1	60	60	56.8	58.7	58.1
Ammonia, Total (as N)	0.0050	mg/L	0.021-231 ^D	0.0148	<0.0050	0.0154	0.0084	<0.0050	0.0061	<0.0050	<0.0050	<0.0050	<0.0050	0.0083	<0.0050
Bromide (Br)	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	0.50	mg/L	120	<0.50	4.98	4.67	4.98	4.97	4.99	4.98	4.91	4.96	4.98	4.98	4.99
Fluoride (F)	0.020	mg/L	0.12	0.042	0.08	0.085	0.079	0.081	0.08	0.079	0.081	0.08	0.079	0.079	0.079
Nitrate (as N)	0.0050	mg/L	13	<0.0050	0.135	0.108	0.137	0.139	0.14	0.141	0.138	0.139	0.141	0.14	0.141
Nitrite (as N)	0.0010	mg/L	0.06	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	0.0020	mg/L		0.0022	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total	0.0020	mg/L		0.0099	<0.0020	0.013	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Sulfate (SO4)	0.30	mg/L		3.7	15.8	21.3	15.9	16.5	15.7	15.7	17.7	16.8	16	16	15.7
Sulphide as S	0.018	mg/L		<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
<i>Organic / Inorganic Carbon</i>															
Dissolved Organic Carbon	0.50	mg/L		10.1	1.6	2.25	1.72	1.78	1.82	1.68	1.6	1.74	2.72	2.95	1.92
Total Organic Carbon	0.50	mg/L		9.74	1.65	2.71	1.65	1.8	1.69	1.87	1.62	1.67	2.21	2.09	1.96

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

B Water Licence S17L8-002 Amend (September 11, 2017)

D Minimum CCME guideline based on temperature and pH x 0.8224 mg/L total amr 0.5880 0.2821 2.6810 0.2821 0.8553 0.2821 0.2821 0.2821 0.2821 0.2821 0.2821 0.2821 0.2821

Table B19 - Sawmill Bay: Total Metals

Sample Area			CCME Guidelines ^A	Reference Stations		Ravine Creek Discharge	Sawmill Bay								
Sample ID				BG-SW08-04	BG-SW08-01	A3-SW08-01	A3-SW08-05	SW07-3	SW16-01-2M	SW16-01-6M	A5-SW08-11	SW-B-2	SW-DUP-1	SW16-02-2M	SW16-02-6M
SNP Sample ID															
PARAMETER	Lowest Detection Limit	Units		11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017
Total Metals															
Aluminum (Al)-Total	0.0030	mg/L	0.005-0.100 ^F	0.0076	0.0118	0.201	0.0055	0.0048	0.0043	0.0044	0.0054	0.0046	0.005	0.0049	0.0045
Antimony (Sb)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	0.00010	mg/L	0.005	0.00012	0.0002	0.00034	0.00021	0.00022	0.00019	0.00023	0.00019	0.0002	0.00019	0.00024	0.00021
Barium (Ba)-Total	0.000050	mg/L		0.0901	0.0224	0.0281	0.023	0.0239	0.0231	0.0227	0.0236	0.0236	0.0232	0.0232	0.0227
Beryllium (Be)-Total	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	1.5	0.073	0.012	0.017	0.013	0.012	0.013	0.011	0.013	0.013	0.013	0.011	0.011
Cadmium (Cd)-Total	0.0000050	mg/L	0.00009-0.00037 ^G	<0.0000050	<0.0000050	0.0000081	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	0.050	mg/L		22.7	16.6	19.4	18.5	19	18.3	16.7	19	18.7	18.6	17.2	16.6
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	0.000056	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	0.00010	mg/L		<0.00010	0.00011	0.00061	<0.00010	<0.00010	<0.00010	0.00015	<0.00010	<0.00010	0.00015	<0.00010	<0.00010
Cobalt (Co)-Total	0.00010	mg/L		<0.00010	<0.00010	0.00016	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	0.00050	mg/L	0.002-0.004 ^H	<0.00050	<0.00050	0.00082	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total	0.010	mg/L	0.3	0.011	0.017	0.698	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Total	0.000050	mg/L	0.001-0.007 ^I	<0.000050	<0.000050	0.000251	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	0.0010	mg/L		0.003	0.003	0.0032	0.0034	0.0031	0.0032	0.003	0.0031	0.0033	0.0031	0.0031	0.003
Magnesium (Mg)-Total	0.10	mg/L		22.7	7.2	9.3	7.45	7.68	7.65	7.24	7.74	7.55	7.54	7.22	7.14
Manganese (Mn)-Total	0.00010	mg/L		0.00394	0.00079	0.0244	0.00087	0.00077	0.00067	0.00068	0.00082	0.00084	0.00068	0.00071	0.00058
Mercury (Hg)-Total	0.0000050	mg/L	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	0.000050	mg/L	0.073	<0.000050	0.000306	0.000339	0.000352	0.000335	0.000342	0.000301	0.000357	0.000339	0.000339	0.000314	0.000314
Nickel (Ni)-Total	0.00050	mg/L	0.025-0.150 ^J	<0.00050	<0.00050	0.00057	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	0.10	mg/L		1.7	0.78	0.96	0.76	0.78	0.76	0.77	0.78	0.76	0.76	0.78	0.77
Selenium (Se)-Total	0.000050	mg/L	0.001	<0.000050	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon (Si)-Total	0.10	mg/L		0.57	1.15	1.61	1.12	1.14	1.12	1.16	1.16	1.14	1.12	1.18	1.17
Silver (Ag)-Total	0.000010	mg/L	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	0.050	mg/L		1.02	4.39	4.29	4.18	4.17	4.19	4.39	4.21	4.26	4.22	4.27	4.35
Strontium (Sr)-Total	0.00020	mg/L		0.0596	0.105	0.132	0.117	0.12	0.115	0.106	0.123	0.119	0.115	0.108	0.106
Sulfur (S)-Total	0.50	mg/L		1.69	5.97	7.55	5.57	6.01	5.32	5.72	6	5.95	5.47	5.82	5.53
Thallium (Tl)-Total	0.000010	mg/L	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00030	0.00055	0.00849	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total	0.000010	mg/L	0.015	0.000214	0.000287	0.000369	0.000306	0.00031	0.000303	0.000261	0.000319	0.000321	0.000308	0.000266	0.00026
Vanadium (V)-Total	0.00050	mg/L		<0.00050	<0.00050	0.00083	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.03	0.0039	<0.0030	<0.0030	0.0036	0.0035	<0.0030	<0.0030	<0.0030	<0.0030	0.0039	<0.0030	<0.0030
Zirconium (Zr)-Total	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH >= 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sample

H Copper calculated from hardness per CCME guidance, provided for each sample

I Lead calculated from hardness per CCME guidance, provided for each sample

J Nickel calculated from hardness per CCME guidance, provided for each sample

0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.0002256	0.0001196	0.0001409	0.0001274	0.0001303	0.0001280	0.0001201	0.0001328	0.0001288	0.0001234	0.0001218	0.0001190				
0.0034	0.0020	0.0021	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020				
0.00547	0.00206	0.00266	0.00228	0.00236	0.00229	0.00208	0.00243	0.00232	0.00217	0.00212	0.00205				
0.13204	0.07383	0.08583	0.07828	0.07990	0.07859	0.07415	0.08128	0.07905	0.07603	0.07509	0.07352				

Table B20 - Sawmill Bay: Dissolved Metals

Sample Area			CCME Guidelines ^A	Reference Stations	Sawmill Bay			
Sample ID				BG-SW08-04	A5-SW08-11	SW-B-2	SW-DUP-1	
SNP Sample ID								
PARAMETER	Lowest Detection Limit	Units		11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	
Dissolved Metals								
Aluminum (Al)-Dissolved	0.0010	mg/L	0.005-0.100 ^F	0.0022	0.0015	<0.0010	<0.0010	
Antimony (Sb)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	
Arsenic (As)-Dissolved	0.00010	mg/L	0.005	<0.00010	0.00018	0.00018	0.00018	
Barium (Ba)-Dissolved	0.000050	mg/L		0.0883	0.0237	0.0232	0.023	
Beryllium (Be)-Dissolved	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	
Bismuth (Bi)-Dissolved	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	
Boron (B)-Dissolved	0.010	mg/L	1.5	0.067	0.013	0.012	0.012	
Cadmium (Cd)-Dissolved	0.0000050	mg/L	0.00009-0.00037 ^G	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
Calcium (Ca)-Dissolved	0.050	mg/L		23	19.5	18.8	17.6	
Cesium (Cs)-Dissolved	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	
Chromium (Cr)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	
Cobalt (Co)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	
Copper (Cu)-Dissolved	0.00020	mg/L	0.002-0.004 ^H	<0.00020	0.00033	0.00027	0.00024	
Iron (Fe)-Dissolved	0.010	mg/L	0.3	<0.010	<0.010	<0.010	<0.010	
Lead (Pb)-Dissolved	0.000050	mg/L	0.001-0.007 ^I	<0.000050	<0.000050	<0.000050	<0.000050	
Lithium (Li)-Dissolved	0.0010	mg/L		0.0026	0.0034	0.0033	0.003	
Magnesium (Mg)-Dissolved	0.10	mg/L		23.2	7.82	7.49	7.3	
Manganese (Mn)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	
Mercury (Hg)-Dissolved	0.0000050	mg/L	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
Molybdenum (Mo)-Dissolved	0.000050	mg/L	0.073	<0.000050	0.000368	0.000361	0.000336	
Nickel (Ni)-Dissolved	0.00050	mg/L	0.025-0.150 ^J	<0.00050	<0.00050	<0.00050	<0.00050	
Phosphorus (P)-Dissolved	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	
Potassium (K)-Dissolved	0.10	mg/L		1.69	0.77	0.75	0.74	
Selenium (Se)-Dissolved	0.000050	mg/L	0.001	<0.000050	<0.000050	<0.000050	<0.000050	
Silicon (Si)-Dissolved	0.050	mg/L		0.517	1.14	1.11	1.11	
Silver (Ag)-Dissolved	0.000010	mg/L	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	
Sodium (Na)-Dissolved	0.050	mg/L		1	4.18	4.1	4.06	
Strontium (Sr)-Dissolved	0.00020	mg/L		0.0575	0.121	0.121	0.112	
Sulfur (S)-Dissolved	0.50	mg/L		1.54	5.8	5.81	5.51	
Thallium (Tl)-Dissolved	0.000010	mg/L	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	
Tin (Sn)-Dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	
Titanium (Ti)-Dissolved	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	
Uranium (U)-Dissolved	0.000010	mg/L	0.015	0.000212	0.000326	0.000317	0.000301	
Vanadium (V)-Dissolved	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	
Zinc (Zn)-Dissolved	0.0010	mg/L	0.03	<0.0010	<0.0010	<0.0010	<0.0010	
Zirconium (Zr)-Dissolved	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

F Aluminum: 0.005 mg/L if pH 6.5; 0.1 mg/L if pH >= 6.5

G Cadmium calculated from hardness per CCME guidance, provided for each sample.

H Copper calculated from hardness per CCME guidance, provided for each sample

I Lead calculated from hardness per CCME guidance, provided for each sample

J Nickel calculated from hardness per CCME guidance, provided for each sample

0.1	0.1	0.1	0.1
0.0002256	0.0001328	0.0001288	0.0001234
0.0034	0.0020	0.0020	0.0020
0.0055	0.0024	0.0023	0.0022
0.1320	0.0813	0.0791	0.0760

Table B21 - Sawmill Bay: Hydrocarbons

Sample Area			CCME Guidelines ^A	Sawmill Bay					
Sample ID				SW07-3	SW16-01-2M	A5-SW08-11	SW-B-2	SW-DUP-1	SW16-02-6M
SNP Sample ID									
PARAMETER	Lowest Detection Limit	Units		11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017
Volatile Organic Compounds									
Benzene	0.00050	mg/L	0.37	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Ethylbenzene	0.00050	mg/L	0.9	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Methyl t-butyl ether (MTBE)	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Styrene	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Toluene	0.00045	mg/L	0.002	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
Xylenes	0.00075	mg/L		<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
F1 (C6-C10)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Hydrocarbons									
F1-BTEX	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
F2 (C10-C16)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
F3 (C16-C34)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
F4 (C34-C50)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Aggregate Organics									
Oil and Grease			5						

A Canadian Council of Ministers of Environment - Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed October 16, 2017

Table B22 - Sawmill Bay: Radionuclides

Sample Area			Candian Drinking Water Quality Guidelines ^A	Reference Stations	Sawmill Bay				
Sample ID				BG-SW08-01	A5-SW08-11	SW-B-2	SW-DUP-1	SW16-02-2M	
SNP Sample ID									
PARAMETER	Lowest Detection Limit	Units		11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	11-Sep-2017	
Radiological Parameters									
Pb-210	0.023	Bq/L	0.2	<0.023	<0.024	<0.029	<0.023	<0.025	
Ra-226	0.0056	Bq/L	0.5	0.0066	<0.0079	<0.0077	<0.0063	<0.0086	

A CCME guidelines not developed. Applied Canadian Drinking Water Guidelines for Radiological Parameters.

Table B23 - QA/QC Sample Analysis: General Chemistry and Total Metals

Sample Area			Units	TERRA MINE									
Sample ID				T-8-A	T-DUP-1	Scenario	Value	Acceptable	T-12	T-DUP-2	Scenario	Value	Acceptable
SNP Sample ID				S17L8-002 (7A)	S17L8-002 (7A)								
Parameter	Lowest Detection Limit	5x Lowest Detection Limit (5x RDL)		13-Sep-2017	13-Sep-2017				13-Sep-2017	13-Sep-2017			
Physical Tests (Water)													
Conductivity	2.0	10.0	uS/cm	196	196	D	0	YES	147	147	D	0	YES
Hardness (as CaCO3)	0.50	2.50	mg/L	78.3	78.7	D	0.50955414	YES	68	67.8	D	0.29455081	YES
pH	0.10	0.50	pH	7.93	7.92	D	0.13	YES	7.96	7.96	D	0.00	YES
Total Suspended Solids	3.0	15.0	mg/L	<3.0	<3.0	A	Not Calculated	YES	<3.0	<3.0	A	Not Calculated	YES
Total Dissolved Solids	13	65	mg/L	134	137	D	2	YES	91	92	D	1	YES
Turbidity	0.10	0.50	NTU	0.69	0.86	D	21.94	NO	0.65	0.89	D	31.17	NO
Anions and Nutrients (Water)													
Alkalinity, Total (as CaCO3)	1.0	5.0	mg/L	62.9	62.3	D	1.0	YES	58.0	57.6	D	0.7	YES
Ammonia, Total (as N)	0.0050	0.0250	mg/L	0.0118	<0.0050	B	0.0093	NO	0.0072	0.0106	C	0.0034	YES
Bromide (Br)	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	A	Not Calculated	YES
Chloride (Cl)	0.50	2.50	mg/L	11.5	11.5	D	0.0	YES	2.34	2.33	C	0.0	YES
Fluoride (F)	0.020	0.100	mg/L	0.683	0.682	D	0.147	YES	0.144	0.144	D	0.000	YES
Nitrate (as N)	0.0050	0.0250	mg/L	0.0051	0.0051	C	0.0000	YES	<0.0050	<0.0050	A	Not Calculated	YES
Nitrite (as N)	0.0010	0.0050	mg/L	<0.0010	<0.0010	A	Not Calculated	YES	<0.0010	<0.0010	A	Not Calculated	YES
Phosphorus (P)-Total Dissolved	0.0020	0.0100	mg/L	0.0039	0.0040	C	0.0001	YES	<0.0020	<0.0020	A	Not Calculated	YES
Phosphorus (P)-Total	0.0020	0.0100	mg/L	0.0051	0.0059	C	0.0008	YES	0.0020	0.0023	C	0.0003	YES
Sulfate (SO4)	0.30	1.50	mg/L	16.1	16.1	D	0.0	YES	14.2	14.2	D	0.0	YES
Sulphide as S	0.018	0.090	mg/L	<0.018	<0.018	A	Not Calculated	YES	<0.018	<0.018	A	Not Calculated	YES
Organic / Inorganic Carbon (Water)													
Dissolved Organic Carbon	0.50	2.50	mg/L	12.5	12.5	D	0.0	YES	4.83	4.77	D	1.3	YES
Total Organic Carbon	0.50	2.50	mg/L	12.3	12.3	D	0.0	YES	4.82	4.56	D	5.5	YES
Total Metals (Water)													
Aluminum (Al)-Total	0.0030	0.0150	mg/L	0.0339	0.0327	D	3.6036	YES	0.0243	0.0231	D	5.0633	YES
Antimony (Sb)-Total	0.00010	0.00050	mg/L	0.00129	0.00131	D	1.53846	YES	<0.00010	<0.00010	A	Not Calculated	YES
Arsenic (As)-Total	0.00010	0.00050	mg/L	0.0607	0.0608	D	0.1646	YES	0.00024	0.00032	C	0.0001	YES
Barium (Ba)-Total	0.000050	0.000250	mg/L	0.0157	0.0159	D	1.2658	YES	0.0104	0.0154	D	38.7597	NO
Beryllium (Be)-Total	0.000020	0.000100	mg/L	<0.000020	<0.000020	A	Not Calculated	YES	<0.000020	<0.000020	A	Not Calculated	YES
Bismuth (Bi)-Total	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	A	Not Calculated	YES
Boron (B)-Total	0.010	0.050	mg/L	0.027	0.028	C	0.001	YES	0.011	0.011	C	0.000	YES
Cadmium (Cd)-Total	0.0000050	0.0000250	mg/L	0.0000066	0.0000076	C	0.0000010	YES	<0.0000050	<0.0000050	A	Not Calculated	YES
Calcium (Ca)-Total	0.050	0.250	mg/L	22.9	23.0	D	0.4	YES	16.0	15.6	D	2.5	YES
Cesium (Cs)-Total	0.000010	0.000050	mg/L	0.000047	0.000048	C	0.0000001	YES	<0.000010	<0.000010	A	Not Calculated	YES
Chromium (Cr)-Total	0.00010	0.00050	mg/L	0.00015	0.00019	C	0.00004	YES	0.00011	<0.00010	B	0.00006	YES
Cobalt (Co)-Total	0.00010	0.00050	mg/L	0.00013	0.00013	C	0.00000	YES	<0.00010	<0.00010	A	Not Calculated	YES
Copper (Cu)-Total	0.00050	0.00250	mg/L	0.00797	0.00812	D	1.86451	YES	0.00078	0.00077	C	0.00001	YES
Iron (Fe)-Total	0.010	0.050	mg/L	0.035	0.037	C	0.002	YES	0.024	0.022	C	0.002	YES
Lead (Pb)-Total	0.000050	0.000250	mg/L	0.000131	0.000137	C	0.0000006	YES	<0.000050	<0.000050	A	Not Calculated	YES
Lithium (Li)-Total	0.0010	0.0050	mg/L	0.0075	0.0075	D	0.0000	YES	0.0023	0.0023	C	0.0000	YES
Magnesium (Mg)-Total	0.10	0.50	mg/L	4.67	4.68	D	0.21	YES	6.84	7.02	D	2.60	YES
Manganese (Mn)-Total	0.00010	0.00050	mg/L	0.00299	0.00304	D	1.65837	YES	0.00155	0.00157	D	1.28205	YES
Mercury (Hg)-Total	0.0000050	0.0000250	mg/L	<0.0000050	<0.0000050	A	Not Calculated	YES	<0.0000050	<0.0000050	A	Not Calculated	YES
Molybdenum (Mo)-Total	0.000050	0.000250	mg/L	0.00254	0.00250	D	1.58730	YES	0.000263	0.000259	D	1.53257	YES
Nickel (Ni)-Total	0.00050	0.00250	mg/L	0.00377	0.00385	D	2.09974	YES	<0.00050	<0.00050	A	Not Calculated	YES
Phosphorus (P)-Total	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	A	Not Calculated	YES
Potassium (K)-Total	0.10	0.50	mg/L	1.95	1.97	D	1.02	YES	0.98	1.00	D	2.02	YES
Selenium (Se)-Total	0.000050	0.000250	mg/L	0.000051	<0.000050	B	0.000026	YES	<0.000050	<0.000050	A	Not Calculated	YES
Silicon (Si)-Total	0.10	0.50	mg/L	0.73	0.73	D	0.00	YES	0.81	0.80	D	1.24	YES
Silver (Ag)-Total	0.000010	0.000050	mg/L	0.000015	0.000017	C	0.0000002	YES	<0.000010	<0.000010	A	Not Calculated	YES
Sodium (Na)-Total	0.050	0.250	mg/L	7.60	7.77	D	2.21	YES	2.48	2.48	D	0.00	YES
Strontium (Sr)-Total	0.00020	0.00100	mg/L	0.0742	0.0736	D	0.8119	YES	0.0530	0.0525	D	0.9479	YES
Sulfur (S)-Total	0.50	2.50	mg/L	5.36	5.53	D	3.12	YES	4.61	4.76	D	3.20	YES
Thallium (Tl)-Total	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	A	Not Calculated	YES
Tin (Sn)-Total	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	A	Not Calculated	YES
Titanium (Ti)-Total	0.00030	0.00150	mg/L	<0.00090	0.00090	B	0.00075	NO	0.00077	0.00081	C	0.00004	YES
Uranium (U)-Total	0.000010	0.000050	mg/L	0.00245	0.00251	D	2.41935	YES	0.000534	0.000240	D	75.96899	NO
Vanadium (V)-Total	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	A	Not Calculated	YES
Zinc (Zn)-Total	0.0030	0.0150	mg/L	0.0032	0.0040	C	0.0008	YES	<0.0030	<0.0030	A	Not Calculated	YES
Zirconium (Zr)-Total	0.00030	0.00150	mg/L	<0.00030	<0.00030	A	Not Calculated	YES	<0.00030	<0.00030	A	Not Calculated	YES

Table B23 - QA/QC Sample Analysis: General Chemistry and Total Metals

Sample Area			Units	TERRA MINE					NORTHTRIM MINE				
Sample ID				T-19	T-DUP-3	Scenario	Value	Acceptable	NO-2	NO-DUP-1	Scenario	Value	Acceptable
SNP Sample ID													
Parameter	Lowest Detection Limit	5x Lowest Detection Limit (5x RDL)		8-Sep-2017	8-Sep-2017				12-Sep-2017	12-Sep-2017			
Physical Tests (Water)													
Conductivity	2.0	10.0	uS/cm	155	152	D	2.0	YES	150	153	D	2.0	YES
Hardness (as CaCO3)	0.50	2.50	mg/L	87.7	86.4	D	1.5	YES	79.5	79.1	D	0.5	YES
pH	0.10	0.50	pH	7.72	7.70	D	0.3	YES	7.95	7.94	D	0.1	YES
Total Suspended Solids	3.0	15.0	mg/L	3.0	10.0	C	7.0	NO	<3.0	<3.0	A	Not Calculated	YES
Total Dissolved Solids	13	65	mg/L	159	156	D	1.9	YES	116	121	D	4.2	YES
Turbidity	0.10	0.50	NTU	2.04	2.37	D	15.0	YES	0.43	0.45	C	0.0	YES
Anions and Nutrients (Water)													
Alkalinity, Total (as CaCO3)	1.0	5.0	mg/L	61.1	61.0	D	0.2	YES	69.5	71.5	D	2.8	YES
Ammonia, Total (as N)	0.0050	0.0250	mg/L	0.0158	0.0159	C	0.0	YES	0.0122	0.0083	C	0.0	YES
Bromide (Br)	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	A	Not Calculated	YES
Chloride (Cl)	0.50	2.50	mg/L	1.06	<0.50	B	0.8	NO	<0.50	<0.50	A	Not Calculated	YES
Fluoride (F)	0.020	0.100	mg/L	0.332	0.334	D	0.6	YES	0.169	0.166	D	1.8	YES
Nitrate (as N)	0.0050	0.0250	mg/L	0.0720	0.0676	D	6.3	YES	<0.0050	<0.0050	A	Not Calculated	YES
Nitrite (as N)	0.0010	0.0050	mg/L	0.0011	<0.0010	B	0.0	YES	<0.0010	<0.0010	A	Not Calculated	YES
Phosphorus (P)-Total Dissolved	0.0020	0.0100	mg/L	0.0185	0.0259	D	33.3	NO	0.0063	0.0065	C	0.0	YES
Phosphorus (P)-Total	0.0020	0.0100	mg/L	0.0159	0.0253	D	45.6	NO	0.0086	0.0072	C	0.0	YES
Sulfate (SO4)	0.30	1.50	mg/L	15.9	16.0	D	0.6	YES	8.52	8.51	D	0.1	YES
Sulphide as S	0.018	0.090	mg/L	<0.018	<0.018	A	Not Calculated	YES	<0.018	<0.018	A	Not Calculated	YES
Organic / Inorganic Carbon (Water)													
Dissolved Organic Carbon	0.50	2.50	mg/L	29.8	30.5	D	2.3	YES	13.6	13.8	D	1.5	YES
Total Organic Carbon	0.50	2.50	mg/L	29.1	29.4	D	1.0	YES	13.9	14.0	D	0.7	YES
Total Metals (Water)													
Aluminum (Al)-Total	0.0030	0.0150	mg/L	0.197	0.201	D	2.0	YES	0.0058	0.0051	C	0.0	YES
Antimony (Sb)-Total	0.00010	0.00050	mg/L	0.00520	0.00529	D	1.7	YES	0.00019	0.00018	C	0.0	YES
Arsenic (As)-Total	0.00010	0.00050	mg/L	0.286	0.284	D	0.7	YES	0.0132	0.0125	D	5.4	YES
Barium (Ba)-Total	0.000050	0.000250	mg/L	0.00945	0.00895	D	5.4	YES	0.00561	0.00536	D	4.6	YES
Beryllium (Be)-Total	0.000020	0.000100	mg/L	0.000049	0.000044	C	0.0	YES	<0.000020	<0.000020	A	Not Calculated	YES
Bismuth (Bi)-Total	0.000050	0.000250	mg/L	0.00162	0.00159	D	1.9	YES	<0.000050	<0.000050	A	Not Calculated	YES
Boron (B)-Total	0.010	0.050	mg/L	0.013	0.012	C	0.0	YES	<0.010	<0.010	A	Not Calculated	YES
Cadmium (Cd)-Total	0.0000050	0.0000250	mg/L	0.0000441	0.0000498	D	12.1	YES	<0.0000050	<0.0000050	A	Not Calculated	YES
Calcium (Ca)-Total	0.050	0.250	mg/L	26.4	25.9	D	1.9	YES	23.1	22.9	D	0.9	YES
Cesium (Cs)-Total	0.000010	0.000050	mg/L	0.000016	0.000015	C	0.0	YES	<0.000010	<0.000010	A	Not Calculated	YES
Chromium (Cr)-Total	0.00010	0.00050	mg/L	0.00058	0.00059	D	1.7	YES	0.00014	<0.00010	B	0.0	YES
Cobalt (Co)-Total	0.00010	0.00050	mg/L	0.0179	0.0178	D	0.6	YES	0.00069	0.00065	D	6.0	YES
Copper (Cu)-Total	0.00050	0.00250	mg/L	0.0267	0.0267	D	0.0	YES	0.00210	0.00197	C	0.0	YES
Iron (Fe)-Total	0.010	0.050	mg/L	0.235	0.236	D	0.4	YES	0.096	0.089	D	7.6	YES
Lead (Pb)-Total	0.000050	0.000250	mg/L	0.000568	0.000566	D	0.4	YES	0.00223	0.00218	D	2.3	YES
Lithium (Li)-Total	0.0010	0.0050	mg/L	0.0021	0.0021	C	0.0	YES	0.0017	0.0017	C	0.0	YES
Magnesium (Mg)-Total	0.10	0.50	mg/L	5.30	5.26	D	0.8	YES	4.84	4.43	D	8.8	YES
Manganese (Mn)-Total	0.00010	0.00050	mg/L	0.0688	0.0639	D	7.4	YES	0.0148	0.0132	D	11.4	YES
Mercury (Hg)-Total	0.0000050	0.0000250	mg/L	0.0000179	0.0000178	C	0.0	YES	<0.0000050	<0.0000050	A	Not Calculated	YES
Molybdenum (Mo)-Total	0.000050	0.000250	mg/L	0.0152	0.0150	D	1.3	YES	0.000543	0.000555	D	2.2	YES
Nickel (Ni)-Total	0.00050	0.00250	mg/L	0.0281	0.0280	D	0.4	YES	0.00103	0.00092	C	0.0	YES
Phosphorus (P)-Total	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	A	Not Calculated	YES
Potassium (K)-Total	0.10	0.50	mg/L	1.49	1.16	D	24.9	NO	0.75	0.69	D	8.3	YES
Selenium (Se)-Total	0.000050	0.000250	mg/L	0.000122	0.000110	C	0.0	YES	<0.000050	<0.000050	A	Not Calculated	YES
Silicon (Si)-Total	0.10	0.50	mg/L	3.63	3.58	D	1.4	YES	0.89	0.83	D	7.0	YES
Silver (Ag)-Total	0.000010	0.000050	mg/L	0.000104	0.000104	D	0.0	YES	<0.000010	<0.000010	A	Not Calculated	YES
Sodium (Na)-Total	0.050	0.250	mg/L	1.28	1.26	D	1.6	YES	2.22	2.06	D	7.5	YES
Strontium (Sr)-Total	0.00020	0.00100	mg/L	0.0337	0.0332	D	1.5	YES	0.0268	0.0264	D	1.5	YES
Sulfur (S)-Total	0.50	2.50	mg/L	5.95	6.02	D	1.2	YES	3.10	2.92	D	6.0	YES
Thallium (Tl)-Total	0.000010	0.000050	mg/L	0.000027	0.000027	C	0.0	YES	<0.000010	<0.000010	A	Not Calculated	YES
Tin (Sn)-Total	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	A	Not Calculated	YES
Titanium (Ti)-Total	0.00030	0.00150	mg/L	<0.0048	<0.0042	A	Not Calculated	YES	<0.00030	<0.00030	A	Not Calculated	YES
Uranium (U)-Total	0.000010	0.000050	mg/L	0.00239	0.00239	D	0.0	YES	0.000120	0.000111	D	7.8	YES
Vanadium (V)-Total	0.00050	0.00250	mg/L	0.00064	0.00063	C	0.0	YES	<0.00050	<0.00050	A	Not Calculated	YES
Zinc (Zn)-Total	0.0030	0.0150	mg/L	0.0154	0.0141	C	0.0	YES	0.0075	0.0060	C	0.0	YES
Zirconium (Zr)-Total	0.00030	0.00150	mg/L	0.00190	0.00186	D	2.1	YES	<0.00030	<0.00030	A	Not Calculated	YES

Table B23 - QA/QC Sample Analysis: General Chemistry and Total Metals

Sample Area			Units	NOREX MINE					EL BONANZA MINE				
Sample ID				NX-6	NX-DUP-1	Scenario	Value	Acceptable	ELB-8-SL	ELB-DUP-1	Scenario	Value	Acceptable
SNP Sample ID													
Parameter	Lowest Detection Limit	5x Lowest Detection Limit (5x RDL)		12-Sep-2017	12-Sep-2017				9-Sep-2017	9-Sep-2017			
Physical Tests (Water)													
Conductivity	2.0	10.0	uS/cm	53.0	49.9	D	6.0	YES	63.5	64.0	D	0.8	YES
Hardness (as CaCO3)	0.50	2.50	mg/L	21.7	22	D	1.4	YES	32.4	31.4	D	3.1	YES
pH	0.10	0.50	pH	7.32	7.33	D	0.1	YES	7.71	7.70	D	0.1	YES
Total Suspended Solids	3.0	15.0	mg/L	9.7	<3.0	B	8.2	NO	<3.0	4.2	B	2.7	YES
Total Dissolved Solids	13	65	mg/L	44	64	C	20.0	YES	39	40	C	1.0	YES
Turbidity	0.10	0.50	NTU	1.02	1.14	D	11.1	YES	0.50	0.46	C	0.0	YES
Anions and Nutrients (Water)													
Alkalinity, Total (as CaCO3)	1.0	5.0	mg/L	21.4	21.0	D	1.9	YES	32.5	32.2	D	0.9	YES
Ammonia, Total (as N)	0.0050	0.0250	mg/L	0.0090	0.0064	C	0.0	YES	<0.0050	<0.0050	A	Not Calculated	YES
Bromide (Br)	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	A	Not Calculated	YES
Chloride (Cl)	0.50	2.50	mg/L	<0.50	<0.50	A	Not Calculated	YES	<0.50	<0.50	A	Not Calculated	YES
Fluoride (F)	0.020	0.100	mg/L	0.173	0.167	D	3.5	YES	0.089	0.091	C	0.0	YES
Nitrate (as N)	0.0050	0.0250	mg/L	<0.0050	<0.0050	A	Not Calculated	YES	<0.0050	<0.0050	A	Not Calculated	YES
Nitrite (as N)	0.0010	0.0050	mg/L	<0.0010	<0.0010	A	Not Calculated	YES	<0.0010	<0.0010	A	Not Calculated	YES
Phosphorus (P)-Total Dissolved	0.0020	0.0100	mg/L	0.0077	0.0064	C	0.0	YES	<0.0020	<0.0020	A	Not Calculated	YES
Phosphorus (P)-Total	0.0020	0.0100	mg/L	0.0227	0.0261	D	13.9	YES	<0.0020	0.0025	B	0.0	YES
Sulfate (SO4)	0.30	1.50	mg/L	2.16	2.15	D	0.5	YES	1.27	1.27	C	0.0	YES
Sulphide as S	0.018	0.090	mg/L	0.022	0.021	C	0.0	YES	<0.018	<0.018	A	Not Calculated	YES
Organic / Inorganic Carbon (Water)													
Dissolved Organic Carbon	0.50	2.50	mg/L	18.3	18.7	D	2.2	YES	3.83	4.07	D	6.1	YES
Total Organic Carbon	0.50	2.50	mg/L	19.5	19.4	D	0.5	YES	3.83	4.02	D	4.8	YES
Total Metals (Water)													
Aluminum (Al)-Total	0.0030	0.0150	mg/L	0.0561	0.0573	D	2.1	YES	0.0066	0.0072	C	0.0	YES
Antimony (Sb)-Total	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	A	Not Calculated	YES
Arsenic (As)-Total	0.00010	0.00050	mg/L	0.00056	0.00058	D	3.5	YES	0.00020	0.00017	C	0.0	YES
Barium (Ba)-Total	0.000050	0.000250	mg/L	0.00571	0.00578	D	1.2	YES	0.00768	0.00713	D	7.4	YES
Beryllium (Be)-Total	0.000020	0.000100	mg/L	<0.000020	<0.000020	A	Not Calculated	YES	<0.000020	<0.000020	A	Not Calculated	YES
Bismuth (Bi)-Total	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	A	Not Calculated	YES
Boron (B)-Total	0.010	0.050	mg/L	<0.010	<0.010	A	Not Calculated	YES	0.012	0.012	C	0.0	YES
Cadmium (Cd)-Total	0.0000050	0.0000250	mg/L	<0.0000050	<0.0000050	A	Not Calculated	YES	<0.0000050	<0.0000050	A	Not Calculated	YES
Calcium (Ca)-Total	0.050	0.250	mg/L	5.23	5.29	D	1.1	YES	8.95	8.76	D	2.1	YES
Cesium (Cs)-Total	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	A	Not Calculated	YES
Chromium (Cr)-Total	0.00010	0.00050	mg/L	0.00018	0.00038	C	0.0	NO	<0.00010	<0.00010	A	Not Calculated	YES
Cobalt (Co)-Total	0.00010	0.00050	mg/L	0.00022	0.00022	C	0.0	YES	<0.00010	<0.00010	A	Not Calculated	YES
Copper (Cu)-Total	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	0.00115	0.00110	C	0.0	YES
Iron (Fe)-Total	0.010	0.050	mg/L	0.142	0.147	D	3.5	YES	0.087	0.082	D	5.9	YES
Lead (Pb)-Total	0.000050	0.000250	mg/L	0.000160	0.000120	C	0.0	YES	<0.000050	<0.000050	A	Not Calculated	YES
Lithium (Li)-Total	0.0010	0.0050	mg/L	<0.0010	0.0010	B	0.0	YES	<0.0010	<0.0010	A	Not Calculated	YES
Magnesium (Mg)-Total	0.10	0.50	mg/L	2.10	2.13	D	1.4	YES	2.44	2.32	D	5.0	YES
Manganese (Mn)-Total	0.00010	0.00050	mg/L	0.0168	0.0176	D	4.7	YES	0.0127	0.0124	D	2.4	YES
Mercury (Hg)-Total	0.0000050	0.0000250	mg/L	<0.0000050	<0.0000050	A	Not Calculated	YES	<0.0000050	<0.0000050	A	Not Calculated	YES
Molybdenum (Mo)-Total	0.000050	0.000250	mg/L	0.000056	0.000075	C	0.0	YES	0.000199	0.000183	C	0.0	YES
Nickel (Ni)-Total	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	A	Not Calculated	YES
Phosphorus (P)-Total	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	A	Not Calculated	YES
Potassium (K)-Total	0.10	0.50	mg/L	0.41	0.41	C	0.0	YES	0.42	0.40	C	0.0	YES
Selenium (Se)-Total	0.000050	0.000250	mg/L	0.000052	<0.000050	B	0.0	YES	<0.000050	<0.000050	A	Not Calculated	YES
Silicon (Si)-Total	0.10	0.50	mg/L	1.91	1.93	D	1.0	YES	1.06	1.00	D	5.8	YES
Silver (Ag)-Total	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	A	Not Calculated	YES
Sodium (Na)-Total	0.050	0.250	mg/L	2.18	2.26	D	3.6	YES	0.996	0.939	D	5.9	YES
Strontium (Sr)-Total	0.00020	0.00100	mg/L	0.0101	0.0103	D	2.0	YES	0.0133	0.0130	D	2.3	YES
Sulfur (S)-Total	0.50	2.50	mg/L	1.07	1.13	C	0.1	YES	0.61	<0.50	B	0.4	YES
Thallium (Tl)-Total	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	A	Not Calculated	YES
Tin (Sn)-Total	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	A	Not Calculated	YES
Titanium (Ti)-Total	0.00030	0.00150	mg/L	0.00040	<0.00030	B	0.0	YES	<0.00030	<0.00030	A	Not Calculated	YES
Uranium (U)-Total	0.000010	0.000050	mg/L	0.000074	0.000077	D	4.0	YES	0.000135	0.000132	D	2.2	YES
Vanadium (V)-Total	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	A	Not Calculated	YES
Zinc (Zn)-Total	0.0030	0.0150	mg/L	0.0039	0.0037	C	0.0	YES	<0.0030	0.0043	B	0.0	YES
Zirconium (Zr)-Total	0.00030	0.00150	mg/L	<0.00030	<0.00030	A	Not Calculated	YES	<0.00030	<0.00030	A	Not Calculated	YES

Table B23 - QA/QC Sample Analysis: General Chemistry and Total Metals

Sample Area			Units	CONTACT LAKE MINE									
Sample ID				CL-3	CL-DUP-2	Scenario	Value	Acceptable	CL-2B	CL-DUP-1	Scenario	Value	Acceptable
SNP Sample ID				S17L8-002 (12G)	S17L8-002 (12G)								
Parameter	Lowest Detection Limit	5x Lowest Detection Limit (5x RDL)		10-Sep-2017	10-Sep-2017				9-Sep-2017	9-Sep-2017			
Physical Tests (Water)													
Conductivity	2.0	10.0	uS/cm	238	238	D	0.0	YES	223	221	D	0.9	YES
Hardness (as CaCO3)	0.50	2.50	mg/L	128	128	D	0.0	YES	122	126	D	3.2	YES
pH	0.10	0.50	pH	8.25	8.26	D	0.1	YES	8.19	8.19	D	0.0	YES
Total Suspended Solids	3.0	15.0	mg/L	<3.0	<3.0	A	Not Calculated	YES	3.1	<3.0	B	1.6	YES
Total Dissolved Solids	13	65	mg/L	150	151	D	0.7	YES	144	142	D	1.4	YES
Turbidity	0.10	0.50	NTU	0.45	0.40	C	0.1	YES	0.35	0.31	C	0.0	YES
Anions and Nutrients (Water)													
Alkalinity, Total (as CaCO3)	1.0	5.0	mg/L	134	133	D	0.7	YES	123	122	D	0.8	YES
Ammonia, Total (as N)	0.0050	0.0250	mg/L	0.0119	0.0137	C	0.0	YES	0.0092	0.0076	C	0.0	YES
Bromide (Br)	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	A	Not Calculated	YES
Chloride (Cl)	0.50	2.50	mg/L	<0.50	<0.50	A	Not Calculated	YES	<0.50	<0.50	A	Not Calculated	YES
Fluoride (F)	0.020	0.100	mg/L	0.297	0.295	D	0.7	YES	0.262	0.262	D	0.0	YES
Nitrate (as N)	0.0050	0.0250	mg/L	<0.0050	<0.0050	A	Not Calculated	YES	0.0296	0.0304	D	2.7	YES
Nitrite (as N)	0.0010	0.0050	mg/L	<0.0010	<0.0010	A	Not Calculated	YES	<0.0010	<0.0010	A	Not Calculated	YES
Phosphorus (P)-Total Dissolved	0.0020	0.0100	mg/L	0.0032	0.0031	C	0.0	YES	0.0023	0.0024	C	0.0	YES
Phosphorus (P)-Total	0.0020	0.0100	mg/L	0.0024	0.0029	C	0.0	YES	<0.0020	<0.0020	A	Not Calculated	YES
Sulfate (SO4)	0.30	1.50	mg/L	6.28	6.27	D	0.2	YES	5.88	5.88	D	0.0	YES
Sulphide as S	0.018	0.090	mg/L	<0.018	<0.018	A	Not Calculated	YES	<0.018	<0.018	A	Not Calculated	YES
Organic / Inorganic Carbon (Water)													
Dissolved Organic Carbon	0.50	2.50	mg/L	9.17	8.84	D	3.7	YES	7.64	8.02	D	4.9	YES
Total Organic Carbon	0.50	2.50	mg/L	8.98	9.02	D	0.4	YES	7.80	8.34	D	6.7	YES
Total Metals (Water)													
Aluminum (Al)-Total	0.0030	0.0150	mg/L	0.0033	0.0038	C	0.0	YES	0.0061	0.0059	C	0.0	YES
Antimony (Sb)-Total	0.00010	0.00050	mg/L	0.00047	0.00048	C	0.0	YES	0.00027	0.00028	C	0.0	YES
Arsenic (As)-Total	0.00010	0.00050	mg/L	0.0115	0.0115	D	0.0	YES	0.00958	0.00966	D	0.8	YES
Barium (Ba)-Total	0.000050	0.000250	mg/L	0.0284	0.0279	D	1.8	YES	0.0187	0.0188	D	0.5	YES
Beryllium (Be)-Total	0.000020	0.000100	mg/L	<0.000020	<0.000020	A	Not Calculated	YES	<0.000020	<0.000020	A	Not Calculated	YES
Bismuth (Bi)-Total	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	A	Not Calculated	YES
Boron (B)-Total	0.010	0.050	mg/L	0.034	0.035	C	0.0	YES	0.027	0.028	C	0.0	YES
Cadmium (Cd)-Total	0.0000050	0.0000250	mg/L	<0.0000050	<0.0000050	A	Not Calculated	YES	<0.0000050	<0.0000050	A	Not Calculated	YES
Calcium (Ca)-Total	0.050	0.250	mg/L	30.6	30.7	D	0.3	YES	28.9	28.2	D	2.5	YES
Cesium (Cs)-Total	0.000010	0.000050	mg/L	0.000013	0.000014	C	0.0	YES	<0.000010	<0.000010	A	Not Calculated	YES
Chromium (Cr)-Total	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	A	Not Calculated	YES
Cobalt (Co)-Total	0.00010	0.00050	mg/L	0.00012	0.00011	C	0.0	YES	0.00024	0.00025	C	0.0	YES
Copper (Cu)-Total	0.00050	0.00250	mg/L	0.00813	0.00796	D	2.1	YES	0.00575	0.00520	D	10.0	YES
Iron (Fe)-Total	0.010	0.050	mg/L	0.041	0.041	C	0.0	YES	0.036	0.036	C	0.0	YES
Lead (Pb)-Total	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	A	Not Calculated	YES
Lithium (Li)-Total	0.0010	0.0050	mg/L	0.0031	0.0032	C	0.0	YES	0.0029	0.0029	C	0.0	YES
Magnesium (Mg)-Total	0.10	0.50	mg/L	10.9	10.6	D	2.8	YES	10.4	10.0	D	3.9	YES
Manganese (Mn)-Total	0.00010	0.00050	mg/L	0.0973	0.0970	D	0.3	YES	0.0885	0.100	D	12.2	YES
Mercury (Hg)-Total	0.0000050	0.0000250	mg/L	<0.0000050	<0.0000050	A	Not Calculated	YES	<0.0000050	0.0000050	B	0.0	YES
Molybdenum (Mo)-Total	0.000050	0.000250	mg/L	0.000435	0.000402	D	7.9	YES	0.000435	0.000426	D	2.1	YES
Nickel (Ni)-Total	0.00050	0.00250	mg/L	0.00125	0.00125	C	0.0	YES	0.00104	0.00114	C	0.0	YES
Phosphorus (P)-Total	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	A	Not Calculated	YES
Potassium (K)-Total	0.10	0.50	mg/L	1.55	1.55	D	0.0	YES	1.38	1.36	D	1.5	YES
Selenium (Se)-Total	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	A	Not Calculated	YES
Silicon (Si)-Total	0.10	0.50	mg/L	2.29	2.31	D	0.9	YES	2.46	2.35	D	4.6	YES
Silver (Ag)-Total	0.000010	0.000050	mg/L	0.000035	0.000040	C	0.0	YES	0.000031	0.000024	C	0.0	YES
Sodium (Na)-Total	0.050	0.250	mg/L	4.84	4.77	D	1.5	YES	4.72	4.55	D	3.7	YES
Strontium (Sr)-Total	0.00020	0.00100	mg/L	0.0782	0.0783	D	0.1	YES	0.0703	0.0687	D	2.3	YES
Sulfur (S)-Total	0.50	2.50	mg/L	2.52	2.52	D	0.0	YES	2.41	2.27	C	0.1	YES
Thallium (Tl)-Total	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	A	Not Calculated	YES
Tin (Sn)-Total	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	A	Not Calculated	YES
Titanium (Ti)-Total	0.00030	0.00150	mg/L	<0.00030	<0.00030	A	Not Calculated	YES	<0.00030	<0.00030	A	Not Calculated	YES
Uranium (U)-Total	0.000010	0.000050	mg/L	0.0490	0.0482	D	1.6	YES	0.0480	0.0472	D	1.7	YES
Vanadium (V)-Total	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	A	Not Calculated	YES
Zinc (Zn)-Total	0.0030	0.0150	mg/L	<0.0030	0.0055	B	0.0	NO	<0.0030	0.0036	B	0.0	YES
Zirconium (Zr)-Total	0.00030	0.00150	mg/L	<0.00030	<0.00030	A	Not Calculated	YES	<0.00030	<0.00030	A	Not Calculated	YES

Table B23 - QA/QC Sample Analysis: General Chemistry and Total Metals

Sample Area			Units	SAWMILL BAY					FIELD BLANKS		
Sample ID				SW-B-2	SW-DUP-1	Scenario	Value	Acceptable	T-FIELD BLANK	ELB-FIELD BLANK	CL-FIELD BLANK
SNP Sample ID											
Parameter	Lowest Detection Limit	5x Lowest Detection Limit (5x RDL)		42989	42989				Water	Water	Water
Physical Tests (Water)											
Conductivity	2.0	10.0	uS/cm	166	160	D	3.7	YES	<2.0	<2.0	<2.0
Hardness (as CaCO3)	0.50	2.50	mg/L	77.9	74	D	5.1	YES	<0.50	<0.50	<0.50
pH	0.10	0.50	pH	7.99	7.97	D	0.3	YES	5.43	5.40	5.44
Total Suspended Solids	3.0	15.0	mg/L	<3.0	<3.0	A	Not Calculated	YES	<3.0	<3.0	<3.0
Total Dissolved Solids	13	65	mg/L	98	96	D	2.1	YES	<10	<10	<10
Turbidity	0.10	0.50	NTU	0.19	0.2	C	0.0	YES	<0.10	<0.10	<0.10
Anions and Nutrients (Water)											
Alkalinity, Total (as CaCO3)	1.0	5.0	mg/L	60	56.8	D	5.5	YES	<1.0	<1.0	<1.0
Ammonia, Total (as N)	0.0050	0.0250	mg/L	<0.0050	<0.0050	A	Not Calculated	YES	<0.0050	<0.0050	<0.0050
Bromide (Br)	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	<0.050
Chloride (Cl)	0.50	2.50	mg/L	4.96	4.98	D	0.4	YES	<0.50	<0.50	<0.50
Fluoride (F)	0.020	0.100	mg/L	0.08	0.079	C	0.0	YES	<0.020	<0.020	<0.020
Nitrate (as N)	0.0050	0.0250	mg/L	0.139	0.141	D	1.4	YES	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.0010	0.0050	mg/L	<0.0010	<0.0010	A	Not Calculated	YES	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	0.0020	0.0100	mg/L	<0.0020	<0.0020	A	Not Calculated	YES	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total	0.0020	0.0100	mg/L	<0.0020	<0.0020	A	Not Calculated	YES	<0.0020	<0.0020	<0.0020
Sulfate (SO4)	0.30	1.50	mg/L	16.8	16	D	4.9	YES	<0.30	<0.30	<0.30
Sulphide as S	0.018	0.090	mg/L	<0.018	<0.018	A	Not Calculated	YES	<0.018	<0.018	<0.018
Organic / Inorganic Carbon (Water)											
Dissolved Organic Carbon	0.50	2.50	mg/L	1.74	2.72	C	1.0	YES	<0.50	<0.50	<0.50
Total Organic Carbon	0.50	2.50	mg/L	1.67	2.21	C	0.5	YES	<0.50	<0.50	<0.50
Total Metals (Water)											
Aluminum (Al)-Total	0.0030	0.0150	mg/L	0.0046	0.005	C	0.0	YES	<0.0030	<0.0030	<0.0030
Antimony (Sb)-Total	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	0.00010	0.00050	mg/L	0.0002	0.00019	C	0.0	YES	<0.00010	<0.00010	<0.00010
Barium (Ba)-Total	0.000050	0.000250	mg/L	0.0236	0.0232	D	1.7	YES	<0.000050	<0.000050	<0.000050
Beryllium (Be)-Total	0.000020	0.000100	mg/L	<0.000020	<0.000020	A	Not Calculated	YES	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	0.050	mg/L	0.013	0.013	C	0.0	YES	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	0.0000050	0.0000250	mg/L	<0.0000050	<0.0000050	A	Not Calculated	YES	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	0.050	0.250	mg/L	18.7	18.6	D	0.5	YES	<0.050	<0.050	<0.050
Cesium (Cs)-Total	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	0.00010	0.00050	mg/L	<0.00010	0.00015	B	0.0	NO	<0.00010	<0.00010	0.00036
Cobalt (Co)-Total	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total	0.010	0.050	mg/L	<0.010	<0.010	A	Not Calculated	YES	<0.010	<0.010	<0.010
Lead (Pb)-Total	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	0.0010	0.0050	mg/L	0.0033	0.0031	C	0.0	YES	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	0.10	0.50	mg/L	7.55	7.54	D	0.1	YES	<0.10	<0.10	<0.10
Manganese (Mn)-Total	0.00010	0.00050	mg/L	0.00084	0.00068	D	21.1	NO	<0.00010	<0.00010	<0.00010
Mercury (Hg)-Total	0.0000050	0.0000250	mg/L	<0.0000050	<0.0000050	A	Not Calculated	YES	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	0.000050	0.000250	mg/L	0.000339	0.000339	D	0.0	YES	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	<0.050
Potassium (K)-Total	0.10	0.50	mg/L	0.76	0.76	D	0.0	YES	<0.10	<0.10	<0.10
Selenium (Se)-Total	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	<0.000050
Silicon (Si)-Total	0.10	0.50	mg/L	1.14	1.12	D	1.8	YES	<0.10	<0.10	<0.10
Silver (Ag)-Total	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	0.050	0.250	mg/L	4.26	4.22	D	0.9	YES	<0.050	<0.050	<0.050
Strontium (Sr)-Total	0.00020	0.00100	mg/L	0.119	0.115	D	3.4	YES	<0.00020	<0.00020	<0.00020
Sulfur (S)-Total	0.50	2.50	mg/L	5.95	5.47	D	8.4	YES	<0.50	<0.50	<0.50
Thallium (Tl)-Total	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	0.00150	mg/L	<0.00030	<0.00030	A	Not Calculated	YES	<0.00030	<0.00030	<0.00030
Uranium (U)-Total	0.000010	0.000050	mg/L	0.000321	0.000308	D	4.1	YES	<0.000010	<0.000010	<0.000010
Vanadium (V)-Total	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	0.0150	mg/L	<0.0030	0.0039	B	0.0	YES	<0.0030	<0.0030	<0.0030
Zirconium (Zr)-Total	0.00030	0.00150	mg/L	<0.00030	<0.00030	A	Not Calculated	YES	<0.00030	<0.00030	<0.00030

Table B24 - QA/QC Sample Analysis: Dissolved Metals, Hydrocarbons and Radionuclides

Sample Area			Units	TERRA MINE					NORTHTRIM MINE				
Sample ID				T-8-A	T-DUP-1	Scenario	Value	Acceptable	NO-2	NO-DUP-1	Scenario	Value	Acceptable
SNP Sample ID				S17L8-002 (7A)	S17L8-002 (7A)								
Parameter	Lowest Detection Limit	5x Lowest Detection Limit (5x RDL)		13-Sep-2017	13-Sep-2017				12-Sep-2017	12-Sep-2017			
Dissolved Metals (Water)													
Aluminum (Al)-Dissolved	0.0010	0.0050	mg/L	0.0093	0.0100	D	7.2539	YES	0.0037	0.0054	C	0.0	YES
Antimony (Sb)-Dissolved	0.00010	0.00050	mg/L	0.00129	0.00127	D	1.56250	YES	0.00019	0.00019	C	0.0	YES
Arsenic (As)-Dissolved	0.00010	0.00050	mg/L	0.0614	0.0612	D	0.3263	YES	0.0127	0.0128	D	0.8	YES
Barium (Ba)-Dissolved	0.000050	0.000250	mg/L	0.0165	0.0164	D	0.6079	YES	0.00593	0.00619	D	4.3	YES
Beryllium (Be)-Dissolved	0.000020	0.000100	mg/L	<0.000020	<0.000020	A	Not Calculated	YES	<0.000020	<0.000020	A	Not Calculated	YES
Bismuth (Bi)-Dissolved	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	A	Not Calculated	YES
Boron (B)-Dissolved	0.010	0.050	mg/L	0.026	0.026	C	0.000	YES	<0.010	<0.010	A	Not Calculated	YES
Cadmium (Cd)-Dissolved	0.0000050	0.0000250	mg/L	0.0000063	0.0000055	C	0.0000008	YES	<0.0000050	<0.0000050	A	Not Calculated	YES
Calcium (Ca)-Dissolved	0.050	0.250	mg/L	23.6	23.9	D	1.3	YES	23.6	23.5	D	0.4	YES
Cesium (Cs)-Dissolved	0.000010	0.000050	mg/L	0.000043	0.000040	C	0.000003	YES	<0.000010	<0.000010	A	Not Calculated	YES
Chromium (Cr)-Dissolved	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	A	Not Calculated	YES
Cobalt (Co)-Dissolved	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	A	Not Calculated	YES
Copper (Cu)-Dissolved	0.00020	0.00100	mg/L	0.00742	0.00741	D	0.13486	YES	0.00172	0.00174	D	1.2	YES
Iron (Fe)-Dissolved	0.010	0.050	mg/L	<0.010	<0.010	A	Not Calculated	YES	0.041	0.042	C	0.0	YES
Lead (Pb)-Dissolved	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	0.000607	0.000588	D	3.2	YES
Lithium (Li)-Dissolved	0.0010	0.0050	mg/L	0.0078	0.0080	D	2.5316	YES	0.0014	0.0015	C	0.0	YES
Magnesium (Mg)-Dissolved	0.10	0.50	mg/L	4.73	4.64	D	1.92	YES	4.98	4.99	D	0.2	YES
Manganese (Mn)-Dissolved	0.00010	0.00050	mg/L	0.00012	0.00012	C	0.00000	YES	0.00033	0.00028	C	0.0	YES
Mercury (Hg)-Dissolved	0.0000050	0.0000250	mg/L	<0.0000050	<0.0000050	A	Not Calculated	YES	<0.0000050	<0.0000050	A	Not Calculated	YES
Molybdenum (Mo)-Dissolved	0.000050	0.000250	mg/L	0.00253	0.00255	D	0.78740	YES	0.000534	0.000532	D	0.4	YES
Nickel (Ni)-Dissolved	0.00050	0.00250	mg/L	0.00375	0.00374	D	0.26702	YES	0.00084	0.00086	C	0.0	YES
Phosphorus (P)-Dissolved	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	A	Not Calculated	YES
Potassium (K)-Dissolved	0.10	0.50	mg/L	1.99	1.98	D	0.50	YES	0.88	0.82	D	7.1	YES
Selenium (Se)-Dissolved	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	0.000051	<0.000050	B	0.0	YES
Silicon (Si)-Dissolved	0.050	0.250	mg/L	0.646	0.659	D	1.992	YES	0.853	0.873	D	2.3	YES
Silver (Ag)-Dissolved	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	A	Not Calculated	YES
Sodium (Na)-Dissolved	0.050	0.250	mg/L	7.78	7.53	D	3.27	YES	2.31	2.34	D	1.3	YES
Strontium (Sr)-Dissolved	0.00020	0.00100	mg/L	0.0755	0.0754	D	0.1325	YES	0.0272	0.0276	D	1.5	YES
Sulfur (S)-Dissolved	0.50	2.50	mg/L	5.15	5.24	D	1.73	YES	3.04	3.03	D	0.3	YES
Thallium (Tl)-Dissolved	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	A	Not Calculated	YES
Tin (Sn)-Dissolved	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	A	Not Calculated	YES
Titanium (Ti)-Dissolved	0.00030	0.00150	mg/L	<0.00030	<0.00030	A	Not Calculated	YES	<0.00030	<0.00030	A	Not Calculated	YES
Uranium (U)-Dissolved	0.000010	0.000050	mg/L	0.00251	0.00248	D	1.20240	YES	0.000113	0.000113	D	0.0	YES
Vanadium (V)-Dissolved	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	A	Not Calculated	YES
Zinc (Zn)-Dissolved	0.0010	0.0050	mg/L	0.0027	0.0027	C	0.0000	YES	0.0036	0.0039	C	0.0	YES
Zirconium (Zr)-Dissolved	0.00030	0.00150	mg/L	<0.00030	<0.00030	A	Not Calculated	YES	<0.00030	<0.00030	A	Not Calculated	YES
Volatile Organic Compounds (Water)													
Benzene	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	A	Not Calculated	YES
Ethylbenzene	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	A	Not Calculated	YES
Methyl t-butyl ether (MTBE)	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	A	Not Calculated	YES
Styrene	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	A	Not Calculated	YES
Toluene	0.00045	0.00225	mg/L	<0.00045	<0.00045	A	Not Calculated	YES	<0.00045	<0.00045	A	Not Calculated	YES
Xylenes	0.00075	0.00375	mg/L	<0.00075	<0.00075	A	Not Calculated	YES	<0.00075	<0.00075	A	Not Calculated	YES
F1 (C6-C10)	0.10	0.50	mg/L	<0.10	<0.10	A	Not Calculated	YES	<0.10	<0.10	A	Not Calculated	YES
Hydrocarbons (Water)													
F1-BTEX	0.10	0.50	mg/L	<0.10	<0.10	A	Not Calculated	YES	<0.10	<0.10	A	Not Calculated	YES
F2 (C10-C16)	0.30	1.50	mg/L	<0.30	<0.30	A	Not Calculated	YES	<0.30	<0.30	A	Not Calculated	YES
F3 (C16-C34)	0.30	1.50	mg/L	<0.30	<0.30	A	Not Calculated	YES	<0.30	<0.30	A	Not Calculated	YES
F4 (C34-C50)	0.30	1.50	mg/L	<0.30	<0.30	A	Not Calculated	YES	<0.30	<0.30	A	Not Calculated	YES
Aggregate Organics (Water)													
Oil and Grease		0		<5.0	<5.0	A	Not Calculated	YES					
Radiological Parameters (Misc.)													
Pb-210	0.023	0.115	Bq/L			C	0	YES					
Ra-226	0.0056	0.0280	Bq/L			C	0	YES					

Table B24 - QA/QC Sample Analysis: Dissolved Metals, Hydrocarbons and Radionuclides

Sample Area			Units	CONTACT LAKE MINE									
Sample ID				CL-3	CL-DUP-2	Scenario	Value	Acceptable	CL-2B	CL-DUP-1	Scenario	Value	Acceptable
SNP Sample ID				S17L8-002 (12G)	S17L8-002 (12G)								
Parameter	Lowest Detection Limit	5x Lowest Detection Limit (5x RDL)		10-Sep-2017	10-Sep-2017				9-Sep-2017	9-Sep-2017			
Dissolved Metals (Water)													
Aluminum (Al)-Dissolved	0.0010	0.0050	mg/L	0.0018	0.0019	C	0.0	YES	0.0023	0.0027	C	0.0	YES
Antimony (Sb)-Dissolved	0.00010	0.00050	mg/L	0.00047	0.00047	C	0.0	YES	0.00025	0.00026	C	0.0	YES
Arsenic (As)-Dissolved	0.00010	0.00050	mg/L	0.0106	0.0109	D	2.8	YES	0.00914	0.00935	D	2.3	YES
Barium (Ba)-Dissolved	0.000050	0.000250	mg/L	0.0274	0.0275	D	0.4	YES	0.0182	0.0185	D	1.6	YES
Beryllium (Be)-Dissolved	0.000020	0.000100	mg/L	<0.000020	<0.000020	A	Not Calculated	YES	<0.000020	<0.000020	A	Not Calculated	YES
Bismuth (Bi)-Dissolved	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	A	Not Calculated	YES
Boron (B)-Dissolved	0.010	0.050	mg/L	0.035	0.035	C	0.0	YES	0.027	0.029	C	0.0	YES
Cadmium (Cd)-Dissolved	0.0000050	0.0000250	mg/L	<0.0000050	<0.0000050	A	Not Calculated	YES	<0.0000050	<0.0000050	A	Not Calculated	YES
Calcium (Ca)-Dissolved	0.050	0.250	mg/L	32.5	32.2	D	0.9	YES	30.3	31.4	D	3.6	YES
Cesium (Cs)-Dissolved	0.000010	0.000050	mg/L	0.000014	0.000014	C	0.0	YES	<0.000010	<0.000010	A	Not Calculated	YES
Chromium (Cr)-Dissolved	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	A	Not Calculated	YES
Cobalt (Co)-Dissolved	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	A	Not Calculated	YES
Copper (Cu)-Dissolved	0.00020	0.00100	mg/L	0.00651	0.00669	D	2.7	YES	0.00479	0.00494	D	3.1	YES
Iron (Fe)-Dissolved	0.010	0.050	mg/L	<0.010	<0.010	A	Not Calculated	YES	<0.010	<0.010	A	Not Calculated	YES
Lead (Pb)-Dissolved	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	A	Not Calculated	YES
Lithium (Li)-Dissolved	0.0010	0.0050	mg/L	0.0031	0.0031	C	0.0	YES	0.0027	0.0029	C	0.0	YES
Magnesium (Mg)-Dissolved	0.10	0.50	mg/L	11.3	11.4	D	0.9	YES	11.4	11.6	D	1.7	YES
Manganese (Mn)-Dissolved	0.00010	0.00050	mg/L	0.00013	<0.00010	B	0.0	YES	<0.00010	<0.00010	A	Not Calculated	YES
Mercury (Hg)-Dissolved	0.0000050	0.0000250	mg/L	<0.0000050	<0.0000050	A	Not Calculated	YES	<0.0000050	<0.0000050	A	Not Calculated	YES
Molybdenum (Mo)-Dissolved	0.000050	0.000250	mg/L	0.000388	0.000371	D	4.5	YES	0.000422	0.000397	D	6.1	YES
Nickel (Ni)-Dissolved	0.00050	0.00250	mg/L	0.00081	0.00077	C	0.0	YES	0.00074	0.00072	C	0.0	YES
Phosphorus (P)-Dissolved	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	A	Not Calculated	YES
Potassium (K)-Dissolved	0.10	0.50	mg/L	1.63	1.65	D	1.2	YES	1.49	1.55	D	3.9	YES
Selenium (Se)-Dissolved	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	A	Not Calculated	YES
Silicon (Si)-Dissolved	0.050	0.250	mg/L	2.31	2.23	D	3.5	YES	2.38	2.45	D	2.9	YES
Silver (Ag)-Dissolved	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	A	Not Calculated	YES
Sodium (Na)-Dissolved	0.050	0.250	mg/L	5.12	5.26	D	2.7	YES	5.14	5.23	D	1.7	YES
Strontium (Sr)-Dissolved	0.00020	0.00100	mg/L	0.0789	0.0797	D	1.0	YES	0.0716	0.0723	D	1.0	YES
Sulfur (S)-Dissolved	0.50	2.50	mg/L	2.21	2.18	C	0.0	YES	2.06	1.96	C	0.1	YES
Thallium (Tl)-Dissolved	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	A	Not Calculated	YES
Tin (Sn)-Dissolved	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	A	Not Calculated	YES
Titanium (Ti)-Dissolved	0.00030	0.00150	mg/L	<0.00030	<0.00030	A	Not Calculated	YES	<0.00030	<0.00030	A	Not Calculated	YES
Uranium (U)-Dissolved	0.000010	0.000050	mg/L	0.0500	0.0501	D	0.2	YES	0.0477	0.0503	D	5.3	YES
Vanadium (V)-Dissolved	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	A	Not Calculated	YES
Zinc (Zn)-Dissolved	0.0010	0.0050	mg/L	<0.0010	<0.0010	A	Not Calculated	YES	<0.0010	<0.0010	A	Not Calculated	YES
Zirconium (Zr)-Dissolved	0.00030	0.00150	mg/L	<0.00030	<0.00030	A	Not Calculated	YES	<0.00030	<0.00030	A	Not Calculated	YES
Volatile Organic Compounds (Water)													
Benzene	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES					
Ethylbenzene	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES					
Methyl t-butyl ether (MTBE)	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES					
Styrene	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES					
Toluene	0.00045	0.00225	mg/L	<0.00045	<0.00045	A	Not Calculated	YES					
Xylenes	0.00075	0.00375	mg/L	<0.00075	<0.00075	A	Not Calculated	YES					
F1 (C6-C10)	0.10	0.50	mg/L	<0.10	<0.10	A	Not Calculated	YES					
Hydrocarbons (Water)													
F1-BTEX	0.10	0.50	mg/L	<0.10	<0.10	A	Not Calculated	YES					
F2 (C10-C16)	0.30	1.50	mg/L	<0.30	<0.30	A	Not Calculated	YES					
F3 (C16-C34)	0.30	1.50	mg/L	<0.30	<0.30	A	Not Calculated	YES					
F4 (C34-C50)	0.30	1.50	mg/L	<0.30	<0.30	A	Not Calculated	YES					
Aggregate Organics (Water)													
Oil and Grease		0											
Radiological Parameters (Misc.)													
Pb-210	0.023	0.115	Bq/L	<0.026	<0.025	A	Not Calculated	YES	<0.025	<0.027	A	Not Calculated	YES
Ra-226	0.0056	0.0280	Bq/L	0.077	0.086	D	11.0	YES	0.03	0.029	D	3.4	YES

Table B24 - QA/QC Sample Analysis: Dissolved Metals, Hydrocarbons and Radionuclides

Sample Area			Units	SAWMILL BAY					FIELD BLANKS		
Sample ID				SW-B-2	SW-DUP-1	Scenario	Value	Acceptable	T-FIELD BLANK	ELB-FIELD BLANK	CL-FIELD BLANK
SNP Sample ID											
Parameter	Lowest Detection Limit	5x Lowest Detection Limit (5x RDL)									
				42989	42989				Water	Water	Water
Dissolved Metals (Water)											
Aluminum (Al)-Dissolved	0.0010	0.0050	mg/L	<0.0010	<0.0010	A	Not Calculated	YES	<0.0010	<0.0010	<0.0010
Antimony (Sb)-Dissolved	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	0.00010	0.00050	mg/L	0.00018	0.00018	C	0.0	YES	<0.00010	<0.00010	<0.00010
Barium (Ba)-Dissolved	0.000050	0.000250	mg/L	0.0232	0.023	D	0.9	YES	<0.000050	<0.000050	<0.000050
Beryllium (Be)-Dissolved	0.000020	0.000100	mg/L	<0.000020	<0.000020	A	Not Calculated	YES	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	0.010	0.050	mg/L	0.012	0.012	C	0.0	YES	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	0.0000050	0.0000250	mg/L	<0.0000050	<0.0000050	A	Not Calculated	YES	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	0.050	0.250	mg/L	18.8	17.6	D	6.6	YES	<0.050	<0.050	<0.050
Cesium (Cs)-Dissolved	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	0.00020	0.00100	mg/L	0.00027	0.00024	C	0.0	YES	<0.00020	<0.00020	<0.00020
Iron (Fe)-Dissolved	0.010	0.050	mg/L	<0.010	<0.010	A	Not Calculated	YES	<0.010	<0.010	<0.010
Lead (Pb)-Dissolved	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	0.0010	0.0050	mg/L	0.0033	0.003	C	0.0	YES	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved	0.10	0.50	mg/L	7.49	7.3	D	2.6	YES	<0.10	<0.10	<0.10
Manganese (Mn)-Dissolved	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	<0.00010
Mercury (Hg)-Dissolved	0.0000050	0.0000250	mg/L	<0.0000050	<0.0000050	A	Not Calculated	YES	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	0.000050	0.000250	mg/L	0.000361	0.000336	D	7.2	YES	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Dissolved	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved	0.050	0.250	mg/L	<0.050	<0.050	A	Not Calculated	YES	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	0.10	0.50	mg/L	0.75	0.74	D	1.3	YES	<0.10	<0.10	<0.10
Selenium (Se)-Dissolved	0.000050	0.000250	mg/L	<0.000050	<0.000050	A	Not Calculated	YES	<0.000050	<0.000050	<0.000050
Silicon (Si)-Dissolved	0.050	0.250	mg/L	1.11	1.11	D	0.0	YES	<0.050	<0.050	<0.050
Silver (Ag)-Dissolved	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	0.050	0.250	mg/L	4.1	4.06	D	1.0	YES	<0.050	<0.050	<0.050
Strontium (Sr)-Dissolved	0.00020	0.00100	mg/L	0.121	0.112	D	7.7	YES	<0.00020	<0.00020	<0.00020
Sulfur (S)-Dissolved	0.50	2.50	mg/L	5.81	5.51	D	5.3	YES	<0.50	<0.50	<0.50
Thallium (Tl)-Dissolved	0.000010	0.000050	mg/L	<0.000010	<0.000010	A	Not Calculated	YES	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved	0.00010	0.00050	mg/L	<0.00010	<0.00010	A	Not Calculated	YES	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	0.00030	0.00150	mg/L	<0.00030	<0.00030	A	Not Calculated	YES	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved	0.000010	0.000050	mg/L	0.000317	0.000301	D	5.2	YES	<0.000010	<0.000010	<0.000010
Vanadium (V)-Dissolved	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	0.0010	0.0050	mg/L	<0.0010	<0.0010	A	Not Calculated	YES	<0.0010	<0.0010	<0.0010
Zirconium (Zr)-Dissolved	0.00030	0.00150	mg/L	<0.00030	<0.00030	A	Not Calculated	YES	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds (Water)											
Benzene	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050		<0.00050
Ethylbenzene	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050		<0.00050
Methyl t-butyl ether (MTBE)	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050		<0.00050
Styrene	0.00050	0.00250	mg/L	<0.00050	<0.00050	A	Not Calculated	YES	<0.00050		<0.00050
Toluene	0.00045	0.00225	mg/L	<0.00045	<0.00045	A	Not Calculated	YES	<0.00045		<0.00045
Xylenes	0.00075	0.00375	mg/L	<0.00075	<0.00075	A	Not Calculated	YES	<0.00075		<0.00075
F1 (C6-C10)	0.10	0.50	mg/L	<0.10	<0.10	A	Not Calculated	YES	<0.10		<0.10
Hydrocarbons (Water)											
F1-BTEX	0.10	0.50	mg/L	<0.10	<0.10	A	Not Calculated	YES	<0.10		<0.10
F2 (C10-C16)	0.30	1.50	mg/L	<0.30	<0.30	A	Not Calculated	YES	<0.30		<0.30
F3 (C16-C34)	0.30	1.50	mg/L	<0.30	<0.30	A	Not Calculated	YES	<0.30		<0.30
F4 (C34-C50)	0.30	1.50	mg/L	<0.30	<0.30	A	Not Calculated	YES	<0.30		<0.30
Aggregate Organics (Water)											
Oil and Grease		0									
Radiological Parameters (Misc.)											
Pb-210	0.023	0.115	Bq/L	<0.029	<0.023	A	Not Calculated	YES			<0.024
Ra-226	0.0056	0.0280	Bq/L	<0.0077	<0.0063	A	Not Calculated	YES			<0.0049

APPENDIX C – Field Data and Observations

Terra Mine - 2017 Water Quality Monitoring Field Notes

STATION	T-2	T-16		T-8			T-3
Date	08-Sep-17	13-Sep-17		13-Sep-17			13-Sep-17
Personnel	CB, SY, DK	CB, RSH, WM		CB, RSH, WM			CB, RSH, WM
Location Description	South end of Little Ho Hum Lake	Ho Hum TCA, directly offshore of tailings beach		Ho Hu TCA, midline at downstream end			Ho Hum TCA, shoreline sample at tailings beach
Latitude (Decimal Degrees N)	65.59846°	65.60272°		65.60387°			65.60315°
Longitude (Decimal Degrees W)	118.11367°	118.12638°		118.13012°			118.12407°
Sample Type	Shoreline	Open Water		Open Water			Shoreline
Access	Foot	Boat		Boat			Boat/Foot
Method	Grab-Pole	Van Dorn		Van Dorn			Grab
Water Column Depth	0.2m	11m		16m			<0.2m
Sample Depth	Surface	1m	10m	1m	7m	10m	Surface
Parameters	General, T. Metals	A: General, T. Metals	B: General, T. Metals	A: General, T. Metals, D. Metals, PHCs, O&G	B: General, T. Metals, D. Metals, PHCs, O&G	C: General, T. Metals, D. Metals, PHCs, O&G	General, T. Metals, D. Metals, PHCs
pH	7.17	7.68	7.09	7.69	7.68	7.07	7.79
Conductivity (mS/cm)	0.109	0.142	0.14	0.142	0.142	0.14	0.143
Temperature (°C)	12	11.3	4.9	11.3	10.1	4.6	11.7
Dissolved Oxygen (mg/L)	NA	9.54	4.86	9.57	9.47	4.65	10.15
Turbidity (NTU)	NA	4.6	4.6	4.5	4.5	4.5	5
QA/QC Samples	None	None	None	T-DUP-1	None	None	None
Notes	Yellow tint, some wave action, no visible turbidity	Light wind and minimal wave action, sample depths based on temperature measurements and identification of thermoclines		Light wind and minimal wave action, sample depths based on temperature measurements and identification of thermoclines			Minimal wave height, tailings beach exposed and dry enough to support walking

Terra Mine - 2017 Water Quality Monitoring Field Notes

STATION	T-5	T-9	MB-1	MB-9	T-6	T-10	T-31
Date	13-Sep-17	13-Sep-17	14-Sep-17	14-Sep-17	13-Sep-17	13-Sep-17	13-Sep-17
Personnel	CB, RSH, WM	CB, RSH, WM	CB, RSH, DK	CB, RSH, DK	CB, RSH, WM	CB, RSH, WM	CB, RSH, WM
Location Description	Ho Hum TCA, shoreline between tailings beach and wetland	Ho Hum Wetland, upper wetland immediately upgradient of weir	Lower Ho Hum Wetland, corner where weir pad meets airstrip	Lower Ho Hum Wetland, approximately mid way between weir and Moose Bay proper (NEW)	Moose Bay, discharge point from Ho Hum Wetland into Moose Bay	Moose Bay, mid channel along airstrip	Moose Bay, shoreline station mid-way down airstrip
Latitude (Decimal Degrees N)	65.60465°	65.60685°	65.60710°	65.60725°	65.60757°	65.61036°	65.61210°
Longitude (Decimal Degrees W)	118.12650°	118.13632°	118.13602°	118.13712°	118.13915°	118.14873°	118.15151°
Sample Type	Shoreline	Shoreline	Shoreline	Shoreline	Open Water	Open Water	Shoreline
Access	Boat	Foot	Foot	Foot	Boat	Boat	Foot
Method	Grab	Grab-Pole	Grab	Grab	Grab	Grab	Grab-Pole
Water Column Depth	<0.5m	0.3m	0.2m	0.2m	0.5m	2.2m	0.5m
Sample Depth	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Parameters	General, T. Metals, PHCs	General, T. Metals, D. Metals	General, T. Metals, D. Metals	General, T. Metals	General, T. Metals, D. Metals	General, T. Metals, D. Metals, PHCs, O&G	General, T. Metals, D. Metals
pH	7.74	7.58	7.26	7.12	7.85	7.93	7.97
Conductivity (mS/cm)	0.142	0.299	0.16	0.175	0.162	0.109	0.1
Temperature (°C)	11.4	10.7	12	11.2	7.7	12.4	13.2
Dissolved Oxygen (mg/L)	9.84	11.08	6.99	6.02	11.27	10.12	10.09
Turbidity (NTU)	4.5	6.7	4.1	5.4	5.4	4.5	4.3
QA/QC Samples	None	None	None	None	None	None	None
Notes	Sampled from boat due to steep waste rock shoreline, minimal wave height	No vegetation surrounding sampling station, evidence of stressed/dead vegetation within wetland (high water levels)	Visible water flow from toe of waste rock forming airstrip into wetland	Transition point to aquatic vegetation (e.g. sedges)	Sample collected as close as possible to wetland without disturbing substrate (~5m from vegetation edge)	Minimal wave action	Steep drop off, waste rock substrate and shoreline

Terra Mine - 2017 Water Quality Monitoring Field Notes

STATION	T-12	T-30	T-4	T-1	T-19	T-20
Date	13-Sep-17	13-Sep-17	08-Sep-17	13-Sep-17	08-Sep-17	08-Sep-17
Personnel	CB, RSH, WM	CB, RSH, WM	CB, SY, DK	CB, RSH, WM	CB, SY, DK	CB, SY, DK
Location Description	Camsell River, end of airstrip	Camsell River, outside of mouth of Moose Bay (NEW)	Dock at Camsell River	Camsell River, Jackfish Bay ~20m from shore	Adit northwest of Camsell Dock	North zone adit, near Camsell Dock (~50m uphill in wooded area)
Latitude (Decimal Degrees N)	65.61435°	65.61407°	65.606800°	65.59634°	65.60876°	65.60628°
Longitude (Decimal Degrees W)	118.15710°	118.16474°	118.112767°	118.11176°	118.12309°	118.11138°
Sample Type	Shoreline (~5m from shore)	Open Water	Shoreline	Open Water	On-Land	On-Land
Access	Boat	Boat	Foot	Boat	Foot	Foot
Method	Grab	Grab	Grab	Grab	Grab	Grab
Water Column Depth	1.8m	6.7m	2.8m	1.5m	0.2m where sampled (deeper at adit opening-near top)	0.2m where sampled (deeper at adit opening-near top)
Sample Depth	Surface	Surface	Surface	Surface	Surface	Surface
Parameters	General, T. Metals	General, T. Metals	General, T. Metals, PHCs	General, T. Metals	General, T. Metals	General, T. Metals
pH	7.91	7.9	8.12	7.69	6.99	7.16
Conductivity (mS/cm)	0.111	0.112	0.146	0.096	0.215	0.489
Temperature (°C)	12.8	13.3	14.4	9	2.6	6.3
Dissolved Oxygen (mg/L)	9.99	9.87	9.55	10.6	NA	NA
Turbidity (NTU)	4.3	4.3	5	6.1	NA	NA
QA/QC Samples	T-DUP-2	None	None	None	T-DUP-3	None
Notes	Minimal wave height, steep shoreline (accessed by boat)	Minimal wave height	Strong winds with wave height ~0.15m, visible suspended solids	Some wave action with shallow water conditions	Calm water, tea coloured, no visible iron, organic matter/leaves, no visible stress in surrounding vegetation, water pooled and no overland flow downstream observed, coordinates in database incorrect	Calm water, no visible iron, organic matter/leaves, no visible stress in surrounding vegetation, water pooled and no overland flow downstream observed, coordinates in database incorrect

Terra Mine - 2017 Water Quality Monitoring Field Notes

STATION	T-22	T-18	T-25	R-2	R-3
Date	08-Sep-17	14-Sep-17	14-Sep-17	13-Sep-17	10-Sep-17
Personnel	CB, SY, DK	CB, RSH, DK	CB, RSH, DK	CB, RSH, WM	CB, SY, DK
Location Description	Maintenance Shop Adit near Mill	Wetland near Jackfish Bay dump areas	Pool below landfill at Jackfish Bay	Reference station, Belachey Lake (upstream of rapids)	Reference Station, Tutcho Lake, Mid Lake
Latitude (Decimal Degrees N)	65.60492°	65.59482°	65.59430°	65.63223°	65.59494°
Longitude (Decimal Degrees W)	118.12542°	118.10960°	118.10875°	117.91731°	118.15921°
Sample Type			Shoreline	Open Water	Open Water
Access			Foot	Float Plane	Float Plane
Method			Grab-Pole	Grab-Pole	Grab
Water Column Depth			0.3m		
Sample Depth			Surface	Surface	Surface
Parameters			General, T. Metals, PHCs	General, T. Metals	General, T. Metals, D. Metals
pH			7.24	7.93	7.82
Conductivity (mS/cm)			0.297	0.114	0.076
Temperature (°C)			10.1	12.8	12.9
Dissolved Oxygen (mg/L)			NA	10.41	9.48
Turbidity (NTU)			NA	4.4	4.5
QA/QC Samples			None	None	None
Notes	DRY, no field measurements or sample collected	DRY, wetland vegetation though no standing/flowing water present	No wave action, vegetation in and around pool appears healthy	Minimal wave height	Reference Lake, calm water

Terra Mine - 2017 Water Quality Monitoring Field Notes

STATION	R-4
Date	12-Sep-17
Personnel	CB, SY, DT, CY
Location Description	Reference Station, upstream of Silver Bear Sites, immediately below rapids
Latitude (Decimal Degrees N)	65.60560°
Longitude (Decimal Degrees W)	117.96095°
Sample Type	Open Water
Access	Boat
Method	Van Dorn
Water Column Depth	
Sample Depth	Surface
Parameters	General, T. Metals, D. Metals
pH	7.94
Conductivity (mS/cm)	0.114
Temperature (°C)	13.2
Dissolved Oxygen (mg/L)	10.27
Turbidity (NTU)	4.4
QA/QC Samples	None
Notes	Water levels at rapids appear high, calm at sampling station

Northrim Mine - 2017 Water Quality Monitoring Field Notes

STATION	NO-7	NO-11	NO-2	NO-4/NO-8	NO-9	NO-1
Date	12-Sep-17	12-Sep-17	12-Sep-17	12-Sep-17	12-Sep-17	12-Sep-17
Personnel	CB, SY, DT	CB, SY, DT	CB, SY, DT	CB, SY, DT	CB, SY, DT	CB, SY, DT
Location Description	Hermandy Lake, south end, east shore	Hermandy Lake, north end, east shore	Leachate Pond, adjacent to Hermandy Lake	Drainage channel from Hermandy Lake/Leachate Pond to dock area of Camsell River	Northrim Adit	Standing water immediately below Northrim adit
Latitude (Decimal Degrees N)	65.59757°	65.59904°	65.59712°	65.59621°	65.59628°	65.59621°
Longitude (Decimal Degrees W)	117.98439°	117.98186°	117.98344°	117.98146°	117.97700°	117.97714°
Sample Type	Shoreline	Shoreline	Shoreline	On-Land		On-Land
Access	Foot	Foot	Foot	Foot		Foot
Method	Grab	Grab-Pole	Grab	Grab		Grab
Water Column Depth	0.3m	0.35m	0.15m	0.10m		0.15m
Sample Depth	Surface	Surface	Surface	Surface		Surface
Parameters	General, T. Metals, D. Metals, PHCs, NAPL	General, T. Metals	General, T. Metals, D. Metals, PHCs	General, T. Metals, PHCs		General, T. Metals, PHCs
pH	7.62	7.64	7.7	7.41		7.58
Conductivity (mS/cm)	0.102	0.102	0.109	0.529		0.229
Temperature (°C)	10.7	10.7	9.3	9.5		11.6
Dissolved Oxygen (mg/L)	9.86	9.83	10.67	NA		NA
Turbidity (NTU)	13	6.6	2	NA		NA
QA/QC Samples	None	None	NO-DUP-1	None	None	None
Notes	Some wave action, no visible suspended solids (though high turbidity), dense vegetation on shoreline	Some wave action, no visible suspended solids (though high turbidity), dense vegetation on shoreline and organic substrate	Slight wave action, waste rock on east shore, visible waste debris and metal on west shore, no visible vegetation stress	Visible iron staining and bacterial sheen/sludge, flow rate ~1-2 L/s	DRY, insufficient water depth to sample (~0.03m), blocky rock overhead, iron and iron staining in pooled water (sampled downstream at NO-1)	Influenced by high water levels in Camsell River diluting adit water, waste rock with fines, visible turbidity and bacterial sheen

Northrim Mine - 2017 Water Quality Monitoring Field Notes

STATION	NO-21	NO-6	NO-5	NO-25	NO-27
Date	12-Sep-17	12-Sep-17	12-Sep-17	12-Sep-17	12-Sep-17
Personnel	CB, SY, DT	CB, SY, DT	CB, SY, DT	CB, SY, CY, DT	CB, SY, CY, DT
Location Description	Previously reported pipe with flowing water, no coordinates provided	Camsell River, at suspected current discharge pathway from Hermandy Lake to Camsell River	Camsell River, off Northrim Dock	Camsell River, at suspected original discharge pathway from Hermandy Lake	Camsell River, Downstream of Northrim and Norex mines, mid stream (NEW)
Latitude (Decimal Degrees N)	Not Located	65.59551°	65.59589°	65.59755°	65.59146°
Longitude (Decimal Degrees W)	Not Located	117.98116°	117.97865°	117.99513°	117.99609°
Sample Type		Shoreline	Shoreline	Shoreline (~5m from shore)	Open Water
Access		Foot	Foot	Boat	Boat
Method		Grab-Pole	Grab	Van Dorn	Van Dorn
Water Column Depth		0.2m	3m	2.5m	-
Sample Depth		Surface	Surface	Surface	Surface
Parameters		General, T. Metals, D. Metals, PHC, NAPL	General, T. Metals, PHCs	General, T. Metals, D. Metals	General, T. Metals
pH		7.63	7.93	7.89	7.91
Conductivity (mS/cm)		0.12	0.114	0.113	0.113
Temperature (°C)		12.1	13	13.2	13.3
Dissolved Oxygen (mg/L)		9.88	10.3	10.18	10.18
Turbidity (NTU)		5.8	4.9	4.8	4.4
QA/QC Samples	None	None	None	None	None
Notes	Despite extensive search, pipe could not be located. Personnel were present during original sampling and indicated may be within the river in 2017 given high water levels.	Minimal water in discharge creek, Camsell River water levels high, abundant vegetation at shoreline with no visible stress	Minimal wave height, water topping dock surface	Marshy shoreline with thick vegetation, steep drop off, moderate wave action, no visible suspended solids	Moderate wave action, no visible suspended sediments

Norex and Graham Vein Mine - 2017 Water Quality Monitoring Field Notes

STATION	NX-1	NX-2	NX-3	NX-4A	NX-6	NX-12	NX-13
Date	10-Sep-17	10-Sep-17	10-Sep-17	10-Sep-17	12-Sep-17	12-Sep-17	12-Sep-17
Personnel	CM, RSH	CM, RSH	CM, RSH	CM, RSH	CB, RSH	CB, RSH	CB, RSH
Location Description	Outflow from adit	East seep of waste rock pile	West seep of waste rock pile	Downstream of east adit seep @ flagging tape	Small pond between adit and Xeron Pond at Graham Vein	Camsell River, suspected discharge location of Norex drainage	Camsell River, from Norex Dock (NEW)
Latitude (Decimal Degrees N)	65.589033°	65.590300°	65.589500°	65.591067°	65.58704°	65.59486°	65.59286°
Longitude (Decimal Degrees W)	117.966833°	117.967500°	117.968333°	117.966833°	117.95609°	117.97376°	117.98518°
Sample Type	On-land	On-land	On-land	On-land	Shoreline	Open Water	Shoreline
Access	Foot	Foot	Foot	Foot	Foot	Boat	Foot
Method	Grab-Syringe	Grab-Syringe	Grab-Syringe	Grab-Syringe	Grab-Pole	Grab-Pole	Grab-Pole
Water Column Depth	0.05m	0.05m	0.03-0.05m	0.05m	0.5m	0.5m	NA
Sample Depth	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Parameters	General, T. Metals	General, T. Metals, PHCs	General, T. Metals, D. Metals,	General, T. Metals	General, T. Metals	General, T. Metals, D. Metals, PHC,	General, T. Metals, PHCs
pH	7.23	7.21	6.96	7.1	7.06	7.93	7.89
Conductivity (mS/cm)	0.387	0.475	0.684	0.183	0.147	0.147	0.113
Temperature (°C)	5.5	8	8.9	13.3	9.3	13.2	13.3
Dissolved Oxygen (mg/L)	NA	NA	NA	NA	NA	10.29	10.15
Turbidity (NTU)	NA	NA	NA	NA	NA	4.5	4.3
QA/QC Samples	None	None	None	None	NX-DUP-1	None	None
Notes	Ponded water with some flow through waste rock, coordinates provided from earlier sampling shifted (did not align with adit)	Flowing seep, clear, debris in seep, coordinates provided from earlier sampling shifted	Stagnant water with no flow, bacterial sheen on surface, coordinates provided from earlier sampling shifted	Low flow in drainage pathway	Pond ~25m2, no visible stress in surrounding vegetation, organic substrate, expected drainage from adit toward Xeron Pond	Very shallow and boat could not reach shoreline without beaching	Dock dilapidated, no visible evidence of PHC contamination

Smallwood Mine - 2017 Water Quality Monitoring Field Notes

STATION	SM-1	SM-2	SM-6	
Date	10-Sep-17	10-Sep-17	10-Sep-17	
Personnel	CB, SY	CB, SY	CB, SY	
Location Description	Smallwood Lake, south end of roadway as it enters lake, ~20m south at toe of waste rock pile	Smallwood Lake, south end of waste rock pile	Smallwood Lake, ~mid lake across from waste rock pile	
Latitude (Decimal Degrees N)	65.58201°	65.58151°	65.58156°	
Longitude (Decimal Degrees W)	117.94312°	117.94380°	117.94188°	
Sample Type	Shoreline	Shoreline	Open Water	
Access	Foot	Boat (zodiac, though also accessible by foot)	Boat (zodiac)	
Method	Grab	Grab	Van Dorn	
Water Column Depth	0.25m	0.2m		
Sample Depth	Surface	Surface	1m	4m
Parameters	General, T. Metals, D. Metals	General, T. Metals, PHCs	General, T. Metals	General, T. Metals
pH	7.94	8.01	7.85	7.85
Conductivity (mS/cm)	0.086	0.117	0.112	0.112
Temperature (°C)	13.6	13.7	13	12.8
Dissolved Oxygen (mg/L)	8.63	10.26	9.5	9.46
Turbidity (NTU)	3.6	4.8	4.8	4.9
QA/QC Samples	None	None	None	None
Notes	Calm water, iron staining evident in adjacent waste rock	Calm water, adjacent to waste rock, cobble substrate	Calm, no visible suspended solids	

Contact Lake Mine - 2017 Water Quality Monitoring Field Notes

STATION	CL-2	CL-15	CL-3	CL-29	CL-2B	CL-5	CL-26
Date	09-Sep-17	09-Sep-17	10-Sep-17	10-Sep-17	09-Sep-17	09-Sep-17	09-Sep-17
Personnel	CB, SY, DT	CB, SY, DT	CM, RSH	CM, RSH	CB, SY, DT	CB, SY, DT	CB, SY, DT
Location Description	Mine Area, pooled water at base of waste rock pile below adit	Mine Area, shallow pool immediately upstream of where gravel road meets Tailings Pond	Tailings Pond, south shore	Tailings Pond, north shore (NEW)	Stream from Tailings Pond to Contact Lake, ~bottom 1/3 of stream	Contact Lake, at inflow point of stream into lake	Contact Lake, ~50m offshore of discharge point of stream from Tailings Pond
Latitude (Decimal Degrees N)	65.99326°	65.99167°	65.990883°	65.991383°	65.99036°	65.99000°	65.98978°
Longitude (Decimal Degrees W)	117.80037°	117.80117°	117.800833°	117.800800°	117.80142°	117.80193°	117.80171°
Sample Type	On-Land	On-Land	Shoreline	Shoreline	On-Land	Shoreline	Open Water
Access	Foot	Foot	Foot	Foot	Foot	Boat- Due to wave action	Boat
Method	Grab	Grab-Syringe	Grab-Pole	Grab-Pole	Grab	Grab	Grab
Water Column Depth	Max 0.15m	0.05m	0.5m	1m	0.05-0.15m	0.25m	11m
Sample Depth	Surface	Surface	Surface	Surfae	Surface	Surface	Surface
Parameters	General, T. Metals, Rads.	General, T. Metals, Rads.	General, T. Metals, D. Metals, Rad., PHC, O&G	General, T. Metals	General, T. Metals, D. Metals, Rads.	General, T. Metals, D. Metals, Rads.	General, T. Metals, D. Metals, PHCs, Rads., O&G
pH	6.9	8.02	7.27	7.37	7.56	7.95	7.83
Conductivity (mS/cm)	0.217	0.251	0.369	0.311	0.229	0.047	0.0453
Temperature (°C)	6.9	8.8	14	12.8	9.7	12.5	12.5
Dissolved Oxygen (mg/L)	NA	NA	NA	NA	8.9	10.1	10.05
Turbidity (NTU)	NA	NA	NA	NA	NA (too shallow)	3.8	4.3
QA/QC Samples	None	None	CL-DUP-2	None	CL-DUP-1	None	None
Notes	Pool ~25m2, waste rock and tailings surrounding, visible flow from waste rock toward Tailings Pond, surrounding vegetative stress	Pool ~0.2m wide along roadway, evidence water level typically higher, no visible tailings, adjacent road way constructed of waste rock	Calm water	Calm water	Substrate cobbles and sand, orange tint to water, no visible stress in surrounding vegetation, stream ~0.2-0.5 wide, shallow, visible flow	High wave height, no visible suspended solids	Increasing wave height, possibility for suspended solids, no visible flow from stream discharge at this location

Contact Lake Mine - 2017 Water Quality Monitoring Field Notes

STATION	CL-6		CL-9	CL-24	CL-7	CL-20	CL-16	
Date	09-Sep-17		09-Sep-17	09-Sep-17	10-Sep-17	10-Sep-17	10-Sep-17	
Personnel	CB, SY, DT		CB, SY, DT	CB, SY, DT	CB, SY, DK	CB, SY, DK	CB, SY, DK	
Location Description	Contact Lake, ~500m west of Camp Area		Contact Lake, east of mine drainage	Contact Lake, immediately north of Camp Area in small bay	Great Bear Lake - East Arm, at dock	Great Bear Lake - East Arm, open water ~200m southeast of dock	Great Bear Lake - East Arm, open water directly north of dock	
Latitude (Decimal Degrees N)	65.99093°		65.98862°	65.99555°	66.00619°	66.00474°	66.00780°	
Longitude (Decimal Degrees W)	117.81911°		117.79159°	117.81196°	117.75313°	117.75061°	117.75362°	
Sample Type	Open-Water		Shoreline	Shoreline	Shoreline	Open Water	Open Water	
Access	Boat		Boat	Boat	Float Plane	Float Plane	Float Plane	
Method	Van Dorn		Grab	Grab	Van Dorn	Grab	Van Dorn	
Water Column Depth	48m		0.9m	0.25m	2.25m			
Sample Depth	2m	10m	Surface	Surface	1m	Surface	1m	10m
Parameters	General, T. Metals, D. Metals, Rads.	General, T. Metals, D. Metals, Rads.	General, T. Metals	General, T. Metals	General, T. Metals, D. Metals, PHC, Rads.	General, T. Metals	General, T. Metals	General, T. Metals, PHCs
pH	7.85	7.83	7.81	7.84	8.11	8.13	8.12	8.1
Conductivity (mS/cm)	0.0452	0.0452	0.0477	0.0453	0.158	0.158	0.158	0.158
Temperature (°C)	12.4	12.3	12.6	12.5	8.7	8.5	8.6	8.4
Dissolved Oxygen (mg/L)	10.08	10.11	10.09	10.2	11.41	11.46	11.44	11.49
Turbidity (NTU)	3.7	3.7	3.6	3.7	4.6	4.6	4.2	3.7
QA/QC Samples	None	None	None	None	None	None	None	None
Notes	Moderate wave action, no visible suspended solids		Shoreline evidence of lower water levels, moderate wave height, no visible suspended solids	Moderate wave height, no visible suspended solids	Moderate wave action, sampled from float plane anchored to dock, water depth ~2m, not the 4m reported (no depth sample collected)	Calm water, minimal wave height, engines running	Calm water, minimal wave height, engines running	

Contact Lake Mine - 2017 Water Quality Monitoring Field Notes

STATION	CL-RL-1B	CL-8
Date	10-Sep-17	10-Sep-17
Personnel	CB, SY, DK	CB, SY, DK
Location Description	Reference Station, Thompson Lake	Reference Station, north end of Contact Lake
Latitude (Decimal Degrees N)	65.97902°	66.00485°
Longitude (Decimal Degrees W)	118.01785°	117.89067°
Sample Type	Open Water	Open Water
Access	Float Plane	Float Plane
Method	Grab	Grab
Water Column Depth		
Sample Depth	Surface	Surface
Parameters	General, T. Metals, Rad., PHCs	General, T. Metals, Rads.
pH	7.86	7.82
Conductivity (mS/cm)	0.064	0.045
Temperature (°C)	11	11.7
Dissolved Oxygen (mg/L)	10.31	10.22
Turbidity (NTU)	3.5	3.4
QA/QC Samples	None	None
Notes	Calm water	Moderate winds/wave height, engines running

El Bonanza Mine - 2017 Water Quality Monitoring Field Notes

STATION	ELB-6-SL	ELB-7-SL	ELB-8-SL	ELB-SW-2	ELB-10-ML	ELB-4-ML	ELB-1G-GBL
Date	09-Sep-17	09-Sep-17	09-Sep-17	09-Sep-17	09-Sep-17	09-Sep-17	09-Sep-17
Personnel	RSH, CM, GK	RSH, CM, GK	RSH, CM, GK	RSH, CM, GK	RSH, CM, GK	RSH, CM, GK	RSH, CM, GK
Location Description	Silver Lake @ south end of culvert	Silver Lake, end of waste rock pile	Silver Lake @ outflow of lake on NW side of culvert	50m downstream of Silver Lake outlet, in creek	At mouth of bay on Mile Lake	Mile Lake, at east end of culvert between Mile Lake and Silver Lake (south shore)	Great Bear Lake - Bay with fuel tanks, north end
Latitude (Decimal Degrees N)	66.003617°	66.003683°	66.003967°	66.003967°	66.005050°	66.004067°	65.997867°
Longitude (Decimal Degrees W)	118.070833°	118.074500°	118.075833°	118.076333°	118.068333°	118.070167°	118.100000°
Sample Type	Shoreline (2m from shore)	Shoreline (2m from shore)	Shoreline (2m from shore)	Shoreline	Shoreline (2m from shore)	Shoreline (1m from shore)	Shoreline (2m from shore)
Access	Foot	Foot	Foot	Foot	Foot	Foot	Foot
Method	Grab-Pole	Grab-Pole	Grab-Pole	Grab	Grab-Pole	Grab-Pole	Grab-pole
Water Column Depth	1m	0.75m	0.5m	0.3m	0.5m	1m	1m
Sample Depth	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Parameters	General, T.Metals	General, T. Metals, D. Metals, PHCs	General, T. Metals	General, T. Metals, D. Metals	General, T. Metals	General, T. Metals	General, T. Metals, D. Metals, PHCs
pH	8.85	8.71	8.92	8.58	8.3	8.29	8.42
Conductivity (mS/cm)	0.134	0.102	0.28	0.061	0.069	0.069	0.185
Temperature (°C)	8.9	10.05	9.65	8.91	9.57	9.62	6.27
Dissolved Oxygen (mg/L)	8.85	8.63	11.41	11.99	11.75	10.94	13.05
Turbidity (NTU)	8.5	3.7	3.9	11.4	3.7	3.9	3.6
QA/QC Samples	None	None	ELB-DUP-1	None	None	None	None
Notes	Calm water, no visible evidence of suspended sediments	Wave action (no white caps), at waste rock pile	Calm water, in-water debris (pallet, pipe)	Calm water	Intermittent rain, waves w small whitecaps	Calm water, intermittent rain	Calm water

El Bonanza Mine - 2017 Water Quality Monitoring Field Notes

STATION	ELB-2G-GBL	ELB-9-GBL
Date	09-Sep-17	09-Sep-17
Personnel	RSH, CM, GK	RSH, CM, GK
Location Description	Great Bear Lake - Bay with fuel tanks, south end	Great Bear Lake, approx. 100m offshore of beach landing area
Latitude (Decimal Degrees N)	65.996967°	65.996800°
Longitude (Decimal Degrees W)	118.099000°	118.102617°
Sample Type	Shoreline (2m from shore)	Offshore
Access	Foot	Float plane
Method	Grab-pole	Grab-pole
Water Column Depth	1m	Unknown
Sample Depth	Surface	Surface
Parameters	General, T. Metals, PHC	General Metals, T. Metals, PHCs
pH	8.42	8.32
Conductivity (mS/cm)	0.185	0.185
Temperature (°C)	6.3	6
Dissolved Oxygen (mg/L)	12.63	12.57
Turbidity (NTU)	3.4	4
QA/QC Samples	None	None
Notes	Minor wave action	30cm wave height, plane engines running due to high winds

Sawmill Bay - 2017 Water Quality Monitoring Field Notes

STATION	A3-SW08-01	BG-SW08-04	SW07-5	A2-SW08-03	SW16-02		SW16-01	
Date	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17		11-Sep-17	
Personnel	CM, DT	CM, DT	CM, DT	CM, DT	CB, RSH, WM		CB, RSH, WM	
Location Description	Shoreline downgradient of fishing dock	Shoreline of unnamed lake (background)	Drainage channel/stream downgradient from dump	Drainage channel from camp area	Sawmill Bay, offshore ~100m of Arctic Enterprises Area		Sawmill Bay, ~150m offshore of beach landing area	
Latitude (Decimal Degrees N)	65.722667°	65.71463°	65.719688°	65.722974°	65.72191°		65.72190°	
Longitude (Decimal Degrees W)	118.911833°	118.93104°	118.926134°	118.919313°	118.88718°		118.89252°	
Sample Type	Shoreline	Shoreline			Open Water		Open Water	
Access	Foot	Foot			Boat		Boat	
Method	Grab	Grab			Van Dorn		Van Dorn	
Water Column Depth	1m	1m			6.8m		6.5m	
Sample Depth	Surface	Surface			2m	6m	2m	6m
Parameters	General, T. Metals	General, T. Metals, D. Metals			General, T. Metals	General, T. Metals, PHCs	General, T. Metals, PHCs, Rads.	General, T. Metals
pH	7.14	7.89			8.18	8.15	8.14	8.12
Conductivity (mS/cm)	0.216	0.293			0.106	0.105	0.105	0.112
Temperature (°C)	9	11.6			7	6.9	7	6.9
Dissolved Oxygen (mg/L)	NA	NA			12.21	12.2	12.12	12.2
Turbidity (NTU)	NA	NA			4.6	4.6	4.6	4.6
QA/QC Samples	None	None			None	None	None	None
Notes	Light rain, visible turbidity	Light rain, calm water	DRY, no field measurements or sample collected. Coordinate represents ~ centre point of extended search for water.	DRY, no field measurements or sample collected. Coordinate represents ~ centre point of extended search for water.	Calm water, no visible suspended sediments		Calm water, clear water column	

Sawmill Bay - 2017 Water Quality Monitoring Field Notes

STATION	SW-B-2	SW07-3	A5-SW08-11	BG-SW08-01	A3-SW08-05
Date	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17
Personnel	CB, RSH, WM	CB, RSH, WM	CB, RSH, WM	CB, RSH, WM	CB, RSH, WM
Location Description	Sawmill Bay, ~5m from outer edge of sunken barge	Sawmill Bay, shoreline of Beach Landing	Sawmill Bay, 5m offshore and directly east of Beach Landing area (Arctic Enterprises)	Sawmill Bay, Reference Station on north shore of bay (~50m from shore)	Sawmill Bay, mouth of ravine, ~150m from shore
Latitude (Decimal Degrees N)	65.72085°	65.72069°	65.72105°	65.72807°	65.72299°
Longitude (Decimal Degrees W)	118.89077°	118.89196°	118.88832°	118.87001°	118.90913°
Sample Type	Open Water	Shoreline	Open Water	Open Water (too shallow to reach shore)	Open Water
Access	Boat	Foot	Boat	Boat	Boat
Method	Grab	Grab-Pole	Grab	Grab	Grab
Water Column Depth	5.9m	0.3m	3.1m	1.1m	3.2m
Sample Depth	Surface	Surface	Surface	Surface	Surface
Parameters	General, T. Metals, D. Metals, Rads., PHCs	General, T. Metals, PHCs	General, T. Metals, D. Metals, PHCs, Rads.	General, T. Metals, Rads.	General, T. Metals
pH	8.16	8.01	8.13	8.17	8.19
Conductivity (mS/cm)	0.107	0.118	0.111	0.108	0.107
Temperature (°C)	7	6.8	7.2	7.5	7.3
Dissolved Oxygen (mg/L)	12.06	11.95	12.02	12.02	12.08
Turbidity (NTU)	5	4.6	5.6	5.9	4.7
QA/QC Samples	SW-DUP-1	None	None	None	None
Notes	Calm water, clear water column	Small amount of wave action along shoreline	Calm water, clear water column	Raining, similar shoreline to site	Raining, water column still appeared clear

APPENDIX D – Photo Log

2017 GBL Water Quality Monitoring Report – Photo Log



Photo 1 Terra Mine – Station T-2: Little Ho Hum Lake, shoreline sample at south end



Photo 2 Terra Mine- Station T-16: Ho Hum TCA, offshore of mill and tailings beach



Photo 3 Terra Mine – Station T-5: Ho Hum TCA, shoreline sample downstream of mill and adjacent to waste rock and former drum storage area



Photo 4 Terra Mine – Station T-8: Ho Hum TCA, mid lake downstream of mill and tailings beach



Photo 5 Terra Mine- Station T-3: Ho Hum TCA, shoreline sample at tailings beach below former mill



Photo 6 Terra Mine- Station T-9: Upper wetland, sample collected above concrete weir



Photo 7 Terra Mine – Station MB-1: Ho Hum Lower Wetland, near junction of airstrip with weir pad, visible flow into wetland from toe of airstrip waste rock



Photo 8 Terra Mine- Station MB-9: Ho Hum Lower Wetland, mid way between weir and Moose Bay, new station



Photo 9 Terra Mine- Station T-6: Looking toward station T-6, found at junction between Lower Wetland and Moose Bay



Photo 10 Terra Mine – Station T-10: Moose Bay station, mid-channel and mid way along airstrip



Photo 11 Terra Mine- Station T-31: Shoreline station in Moose Bay, mid way along airstrip



Photo 12 Terra Mine – Station T-12: Looking south toward station T-12 at end of airstrip (float plane at dock on right)



Photo 13 Terra Mine- Station T-30: Camsell River, open water station downstream of Moose Bay



Photo 14 Terra Mine – Station T-4: Camsell River dock, note visible turbidity and white caps in background



Photo 15 Terra Mine – Station T-1: Jackfish Bay of the Camsell River, sample collected as near to shore as vegetation permitted



Photo 16 Terra Mine- Station T-19: Adit northwest of Camsell River dock, water level near top of adit, pooled in front (no downstream migration observed)



Photo 17 Terra Mine – Station T-20: Adit directly southeast of Camsell River dock, water level near top of adit, pooled in front (no downstream migration observed)



Photo 18 Terra Mine- Station T-22: Adit near mill, evidence of former water flow, however no water present



Photo 19 Terra Mine- Station T-25: Pond near Jackfish Bay and landfill area (also known as “Scummy Pond”)



Photo 20 Terra Mine – Station T-18 Wetland near Jackfish Bay, wetland vegetation; however no standing or flowing water present



Photo 21 Northrim Mine – Station NO-7: Hermandy Lake, west end, south shore, nearest to Leachate Pond



Photo 22 Northrim Mine- Station NO-11: Hermandy Lake, east end, south shore



Photo 23 Northrim Mine- Station NO-2: Leachate pond adjacent to Hermandy Lake (in background), northeast shore



Photo 24 Northrim Mine – Station NO-4/NO-8: Small discharge stream from Hermandy Lake and Leachate Pond, flowing southeast toward the Camsell River dock



Photo 25 Northrim Mine- Station NO-9: Water drainage from adit, too shallow to sample (<2 cm) in areas without rock overhang (downstream sample collected)



Photo 26 Northrim Mine – Station NO-1: Downstream of Northrim adit, high water levels of Camsell River influencing sample



Photo 27 Northrim Mine – Station NO-6: Camsell River, at discharge point of drainage from Hermandy Lake and Leachate Pond



Photo 28 Northrim Mine – Station NO-5: Camsell River at dock



Photo 29 Northrim Mine – Station NO-25: Camsell River, at suspected historic drainage point from Hermandy Lake to Camsell River, west of Hermandy Lake



Photo 30 Northrim Mine – Station NO-27: Camsell River, mid-channel and immediately downstream of Northrim and Norex mines



Photo 31 Norex Mine- Station NX-1: Sampled flowing water pooled in front of adit



Photo 32 Norex Mine – Station NX-3: Seep at southwest toe of waste rock pile



Photo 33 Norex Mine- Station NX-6: Small pond between Graham Vein workings and Xeron Pond



Photo 34 Norex Mine- Station NX-12: Discharge point of drainage from Norex Mine and Graham Vein to the Camsell River



Photo 35 Norex Mine – Station NX-13: Station at Norex dock on the Camsell River



Photo 36 Smallwood Mine- Station SM-1: Shoreline of Smallwood Lake, at toe of waste rock pile at north end



Photo 37 Silver Bear Mines- Station R-2: Reference Station, Belachey Lake upstream of Camsell River rapids and Silver Bear



Photo 38 Silver Bear Mines- Station R-3: Reference Station, Tutcho Lake, small elevated lake approximately 1.5km west of Terra Mine



Photo 39 Silver Bear Mines – Station R-4: Reference Station, Camsell River, immediately below rapids, upstream of sites



Photo 40 Contact Lake Mine- Station CL-2: Pooled water at toe of waste rock slope



Photo 41 Contact Lake Mine- Station CL-15: Pooled water at base of mine area, upgradient of Tailings Pond



Photo 42 Contact Lake Mine- Station CL-29: Tailings Pond, north shore



Photo 43 Contact Lake Mine- Station CL-3: Tailings Pond, south shore



Photo 44 Contact Lake Mine- Station CL-2B: Stream from Tailings Pond to Contact Lake



Photo 45 Contact Lake Mine- Station CL-5: Contact Lake, within Lake at discharge of stream from Tailings Pond



Photo 46 Contact Lake Mine- Station CL-26: Contact Lake, approximately 50m offshore of discharge point of stream from Tailings Pond (CL-5)



Photo 47 Contact Lake Mine- Station CL-6: Contact Lake, approximately 500m west of Camp Area



Photo 48 Contact Lake Mine- Station CL-9: Contact Lake, shoreline east of mine drainage



Photo 49 Contact Lake Mine- Station CL-24: Contact Lake, immediately north of Camp Area



Photo 50 Contact Lake Mine- Station CL-7: East Arm of Echo Bay (Great Bear Lake), at dock



Photo 51 Contact Lake Mine- Station CL-20: East Arm of Echo Bay (Great Bear Lake), approximately 200m southeast of dock



Photo 52 Contact Lake Mine- Station CL-16: East Arm of Echo Bay (Great Bear Lake), approximately 200m northeast of dock



Photo 53 Contact Lake Mine- Station CL-RL-1B: Reference Station, Thompson Lake

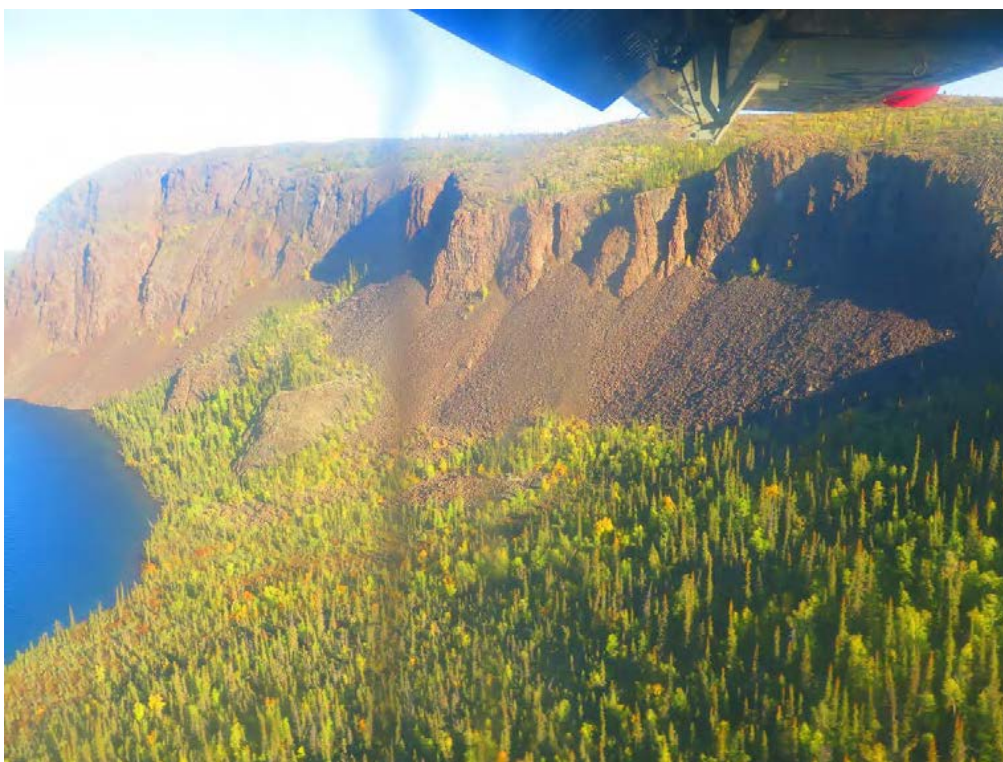


Photo 54 Contact Lake Mine- Station CL-8: Reference Station, Contact Lake at northern tip, approximately 4.5km from mine site (station on left of image)



Photo 55 Sawmill Bay- Station SW-B-2: Sawmill Bay (Great Bear Lake), approximately 5m from outer edge of sunken barge



Photo 56 Sawmill Bay- Station A5-SW08-11: Sawmill Bay (Great Bear Lake), approximately 5m off shore and directly east of Beach Landing Area



Photo 57 Sawmill Bay- Station SW16-02: Sawmill Bay (Great Bear Lake), approximately 100m offshore of Arctic Enterprises Area (looking back at sampling location)



Photo 58 Sawmill Bay- Station A3-SW08-05: Sawmill Bay (Great Bear Lake), mouth of ravine, approximately 150m from shore (looking back at sampling location)



Photo 59 Sawmill Bay- Station BG-SW08-11: Reference Station, Sawmill Bay (Great Bear Lake), northern shore

APPENDIX E – Laboratory Certificates



PUBLIC WORKS/GOV'T SERV. CANADA
ATTN: Rebecca Studer-Halbach
Northern Contaminated Sites
10025 Jasper Avenue NW
Edmonton AB T5J 1S6

Date Received: 12-SEP-17
Report Date: 06-NOV-17 17:57 (MT)
Version: FINAL REV. 3

Client Phone: 780-497-3761

Certificate of Analysis

Lab Work Order #: L1989669
Project P.O. #: R.015211.049
Job Reference:
C of C Numbers:
Legal Site Desc:

Comments: 27-OCT-2017 F2-F4 with silca gel results attached to pdf report.
6-NOV-2017 Revised F2-F4 with silca gel results attached to pdf report.

Dean Watt, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989669-1 water 10-SEP-17 NX-1	L1989669-2 water 10-SEP-17 NX-2	L1989669-3 water 10-SEP-17 NX-3	L1989669-4 water 10-SEP-17 NX-4A	
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	363	441	508	158	
	Hardness (as CaCO3) (mg/L)	165 ^{HTC}	206 ^{HTC}	313	81.8 ^{HTC}	
	pH (pH)	8.28	8.39	7.66	7.22	
	Total Suspended Solids (mg/L)	<3.0	9.0	69.8	23.8	
	Total Dissolved Solids (mg/L)	223	290	397	333	
	Turbidity (NTU)	3.39	0.30	23.4	5.15	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	174	157	77.4	51.3	
	Ammonia, Total (as N) (mg/L)	0.197	0.0283	0.285	0.0354	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.25 ^{DLDS}	
	Chloride (Cl) (mg/L)	1.36	1.25	<0.50	<2.5 ^{DLDS}	
	Fluoride (F) (mg/L)	0.716	0.751	0.496	0.37 ^{DLDS}	
	Nitrate (as N) (mg/L)	0.0055	0.304	<0.0050	<0.025 ^{DLDS}	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0050 ^{DLDS}	
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	0.0196	0.0028	0.121	
	Phosphorus (P)-Total (mg/L)	<0.0020	0.302	0.113	0.184	
	Sulfate (SO4) (mg/L)	29.2	84.5	186	21.6	
	Sulphide as S (mg/L)	<0.018	<0.018	0.432	0.146	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	5.29	4.96	22.7	120	
	Total Organic Carbon (mg/L)	5.51	21.7	27.3	116	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0037	0.0055	0.0336	0.293	
	Antimony (Sb)-Total (mg/L)	0.00048	0.00100	0.00099	0.00060	
	Arsenic (As)-Total (mg/L)	0.0647	0.0520	0.0391	0.0133	
	Barium (Ba)-Total (mg/L)	0.0554	0.0334	0.0258	0.0164	
	Beryllium (Be)-Total (mg/L)	0.000021	<0.000020	<0.000020	0.000024	
	Bismuth (Bi)-Total (mg/L)	0.000056	0.000112	0.000094	<0.000050	
	Boron (B)-Total (mg/L)	0.089	0.083	0.055	0.041	
	Cadmium (Cd)-Total (mg/L)	0.0000138	0.000882	0.000765	0.0000555	
	Calcium (Ca)-Total (mg/L)	50.2	65.9	92.1	24.7	
	Cesium (Cs)-Total (mg/L)	0.000073	0.000101	0.000040	0.000031	
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00022	0.00037	0.00168	
	Cobalt (Co)-Total (mg/L)	0.00117	0.0212	0.0554	0.00441	
	Copper (Cu)-Total (mg/L)	<0.00050	0.00988	0.00153	0.00351	
	Iron (Fe)-Total (mg/L)	1.84	0.021	3.23	1.14	
	Lead (Pb)-Total (mg/L)	0.0156	0.00977	0.0367	0.00232	
	Lithium (Li)-Total (mg/L)	0.0110	0.0107	0.0069	0.0118	
	Magnesium (Mg)-Total (mg/L)	9.62	10.1	10.9	4.87	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989669-1 water 10-SEP-17 NX-1	L1989669-2 water 10-SEP-17 NX-2	L1989669-3 water 10-SEP-17 NX-3	L1989669-4 water 10-SEP-17 NX-4A	
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.345	0.0632	1.39	0.0390		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.00010 ^{DLM}		
	Molybdenum (Mo)-Total (mg/L)	0.0140	0.0159	0.00511	0.00187		
	Nickel (Ni)-Total (mg/L)	0.00096	0.00913	0.0109	0.00377		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	0.069	0.263		
	Potassium (K)-Total (mg/L)	2.29	2.36	2.20	0.50		
	Selenium (Se)-Total (mg/L)	<0.000050	0.000314	0.000252	0.000231		
	Silicon (Si)-Total (mg/L)	4.61	4.34	4.42	3.97		
	Silver (Ag)-Total (mg/L)	<0.000010	0.000016	0.000027	0.000022		
	Sodium (Na)-Total (mg/L)	14.5	13.5	6.01	16.5		
	Strontium (Sr)-Total (mg/L)	0.269	0.254	0.160	0.0841		
	Sulfur (S)-Total (mg/L)	10.2	30.1	79.3	10.2		
	Thallium (Tl)-Total (mg/L)	<0.000010	0.000024	<0.000010	<0.000010		
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00017 ^{DLM}		
	Titanium (Ti)-Total (mg/L)	0.00042	<0.00030	0.00137	<0.0063		
	Uranium (U)-Total (mg/L)	0.00982	0.00863	0.000921	0.00169		
	Vanadium (V)-Total (mg/L)	0.00074	<0.00050	0.00104	0.00063		
	Zinc (Zn)-Total (mg/L)	0.0162	0.636	1.25	0.0315		
	Zirconium (Zr)-Total (mg/L)	0.00081	<0.00030	0.00034	0.00113		
Dissolved Metals	Dissolved Mercury Filtration Location				LAB		
	Dissolved Metals Filtration Location				LAB		
	Aluminum (Al)-Dissolved (mg/L)				0.0106		
	Antimony (Sb)-Dissolved (mg/L)				0.00127		
	Arsenic (As)-Dissolved (mg/L)				0.0117		
	Barium (Ba)-Dissolved (mg/L)				0.0265		
	Beryllium (Be)-Dissolved (mg/L)				<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)				0.000085		
	Boron (B)-Dissolved (mg/L)				0.048		
	Cadmium (Cd)-Dissolved (mg/L)				0.000898		
	Calcium (Ca)-Dissolved (mg/L)				107		
	Cesium (Cs)-Dissolved (mg/L)				0.000053		
	Chromium (Cr)-Dissolved (mg/L)				0.00020		
	Cobalt (Co)-Dissolved (mg/L)				0.126		
	Copper (Cu)-Dissolved (mg/L)				0.00136		
	Iron (Fe)-Dissolved (mg/L)				0.570		
	Lead (Pb)-Dissolved (mg/L)				0.0274		
	Lithium (Li)-Dissolved (mg/L)				0.0082		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989669-1 water 10-SEP-17 NX-1	L1989669-2 water 10-SEP-17 NX-2	L1989669-3 water 10-SEP-17 NX-3	L1989669-4 water 10-SEP-17 NX-4A	
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)			11.4		
	Manganese (Mn)-Dissolved (mg/L)			1.83		
	Mercury (Hg)-Dissolved (mg/L)			<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)			0.00762		
	Nickel (Ni)-Dissolved (mg/L)			0.0250		
	Phosphorus (P)-Dissolved (mg/L)			<0.050		
	Potassium (K)-Dissolved (mg/L)			2.83		
	Selenium (Se)-Dissolved (mg/L)			0.000459		
	Silicon (Si)-Dissolved (mg/L)			4.20		
	Silver (Ag)-Dissolved (mg/L)			0.000022		
	Sodium (Na)-Dissolved (mg/L)			5.06		
	Strontium (Sr)-Dissolved (mg/L)			0.158		
	Sulfur (S)-Dissolved (mg/L)			86.6		
	Thallium (Tl)-Dissolved (mg/L)			0.000017		
	Tin (Sn)-Dissolved (mg/L)			<0.00010		
	Titanium (Ti)-Dissolved (mg/L)			0.00046		
	Uranium (U)-Dissolved (mg/L)			0.000844		
	Vanadium (V)-Dissolved (mg/L)			<0.00050		
	Zinc (Zn)-Dissolved (mg/L)			3.07		
	Zirconium (Zr)-Dissolved (mg/L)			<0.00030		
Volatile Organic Compounds	Benzene (mg/L)		<0.00050	<0.00050		
	Ethylbenzene (mg/L)		<0.00050	<0.00050		
	Methyl t-butyl ether (MTBE) (mg/L)		<0.00050	<0.00050		
	Styrene (mg/L)		<0.00050	<0.00050		
	Toluene (mg/L)		<0.00045	<0.00045		
	ortho-Xylene (mg/L)		<0.00050	<0.00050		
	meta- & para-Xylene (mg/L)		<0.00050	<0.00050		
	Xylenes (mg/L)		<0.00075	<0.00075		
	F1 (C6-C10) (mg/L)		<0.10	<0.30		
	Surrogate: 4-Bromofluorobenzene (SS) (%)		100.1	99.7		
	Surrogate: 1,4-Difluorobenzene (SS) (%)		98.0	87.3		
Hydrocarbons	F1-BTEX (mg/L)		<0.10	<0.30		
	F2 (C10-C16) (mg/L)		<0.30	1.43		
	F3 (C16-C34) (mg/L)		<0.30	1.03		
	F4 (C34-C50) (mg/L)		<0.30	<0.30		
	Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10	<0.30		
	VPH (C6-C10) (mg/L)		<0.10	<0.30		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Sample ID Description Sampled Date Sampled Time Client ID		L1989669-1 water 10-SEP-17 NX-1	L1989669-2 water 10-SEP-17 NX-2	L1989669-3 water 10-SEP-17 NX-3	L1989669-4 water 10-SEP-17 NX-4A	
Grouping	Analyte					
WATER						
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%) Surrogate: 3,4-Dichlorotoluene (SS) (%)		92.7 91.2	95.2 46.5 ^{LSRA}		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Molybdenum (Mo)-Dissolved	MB-LOR	L1989669-3
Matrix Spike	Dissolved Organic Carbon	MS-B	L1989669-4
Matrix Spike	Total Organic Carbon	MS-B	L1989669-1, -2
Matrix Spike	Total Organic Carbon	MS-B	L1989669-4
Matrix Spike	Arsenic (As)-Total	MS-B	L1989669-1, -2, -4
Matrix Spike	Barium (Ba)-Total	MS-B	L1989669-1, -2, -4
Matrix Spike	Barium (Ba)-Total	MS-B	L1989669-3
Matrix Spike	Calcium (Ca)-Total	MS-B	L1989669-1, -2, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L1989669-3
Matrix Spike	Copper (Cu)-Total	MS-B	L1989669-3
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1989669-1, -2, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1989669-3
Matrix Spike	Manganese (Mn)-Total	MS-B	L1989669-1, -2, -4
Matrix Spike	Manganese (Mn)-Total	MS-B	L1989669-3
Matrix Spike	Sodium (Na)-Total	MS-B	L1989669-1, -2, -4
Matrix Spike	Sodium (Na)-Total	MS-B	L1989669-3
Matrix Spike	Strontium (Sr)-Total	MS-B	L1989669-1, -2, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L1989669-3
Matrix Spike	Uranium (U)-Total	MS-B	L1989669-1, -2, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
LSRA	Low surrogate recovery observed due to adsorptive material in sample (e.g. charcoal). Associated results represent solvent extractable concentrations.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

F1-BTX-CALC-VA Water F1-Total BTX CCME CWS PHC TIER 1 (2001)

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID. The F1-BTEX result is calculated as follows:

F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).

F1-HSFID-VA Water CCME F1 By Headspace with GCFID EPA 5021A/CCME CWS PHC (Pub# 1310)

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.

F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.

F2-F4-ME-FID-VA Water CCME F2-F4 Hydrocarbons in Water CCME CWS-PHC, Pub #1310, Dec 2001

F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

S2-T-COL-VA Water Total Sulphide by Colorimetric APHA 4500-S2 Sulphide

This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VH-HSFID-VA Water VH in Water by Headspace GCFID BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA Water VH Surrogates for Waters BC Env. Lab Manual (VH in Solids)

VOC7-HSMS-VA Water BTEX/MTBE/Styrene by Headspace GCMS EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA Water VOC7 and/or VOC Surrogates for Waters EPA 5035A/5021A/8260C

VPH-CALC-VA Water VPH is VH minus select aromatics BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water". The concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and, in solids, Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10).

XYLENES-CALC-VA Water Sum of Xylene Isomer Concentrations CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
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VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
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Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg ww - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1989669

Report Date: 06-NOV-17

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Client: PUBLIC WORKS/GOV'T SERV. CANADA
Northern Contaminated Sites 10025 Jasper Avenue NW
Edmonton AB T5J 1S6

Contact: Rebecca Studer-Halbach

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-TITR-VA Water								
Batch	R3835610							
WG2620974-3 CRM		VA-ALK-TITR-CONTROL						
Alkalinity, Total (as CaCO3)			99.1		%		85-115	22-SEP-17
WG2620974-1 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	22-SEP-17
BE-D-L-CCMS-VA Water								
Batch	R3833748							
WG2620123-2 LCS								
Beryllium (Be)-Dissolved			100.9		%		80-120	20-SEP-17
WG2620123-1 MB		LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	20-SEP-17
Batch	R3837648							
WG2623233-2 LCS								
Beryllium (Be)-Dissolved			97.4		%		80-120	23-SEP-17
WG2623233-1 MB		LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	23-SEP-17
BE-T-L-CCMS-VA Water								
Batch	R3835329							
WG2620295-2 LCS								
Beryllium (Be)-Total			107.8		%		80-120	20-SEP-17
WG2620295-1 MB								
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	20-SEP-17
Batch	R3836254							
WG2620295-4 MS		L1989669-1						
Beryllium (Be)-Total			95.8		%		70-130	21-SEP-17
Batch	R3837718							
WG2623288-2 LCS								
Beryllium (Be)-Total			91.2		%		80-120	23-SEP-17
WG2623288-1 MB								
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	23-SEP-17
BR-L-IC-N-VA Water								
Batch	R3829596							
WG2616764-13 LCS								
Bromide (Br)			100.9		%		85-115	15-SEP-17
WG2616764-17 LCS								
Bromide (Br)			99.9		%		85-115	15-SEP-17
WG2616764-2 LCS								
Bromide (Br)			101.7		%		85-115	15-SEP-17



Quality Control Report

Workorder: L1989669

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-L-IC-N-VA		Water						
Batch	R3829596							
WG2616764-21	LCS							
Bromide (Br)			101.9		%		85-115	15-SEP-17
WG2616764-26	LCS							
Bromide (Br)			99.1		%		85-115	15-SEP-17
WG2616764-5	LCS							
Bromide (Br)			100.7		%		85-115	15-SEP-17
WG2616764-9	LCS							
Bromide (Br)			101.0		%		85-115	15-SEP-17
WG2616764-1	MB							
Bromide (Br)			<0.050		mg/L		0.05	15-SEP-17
WG2616764-12	MB							
Bromide (Br)			<0.050		mg/L		0.05	15-SEP-17
WG2616764-16	MB							
Bromide (Br)			<0.050		mg/L		0.05	15-SEP-17
WG2616764-20	MB							
Bromide (Br)			<0.050		mg/L		0.05	15-SEP-17
WG2616764-24	MB							
Bromide (Br)			<0.050		mg/L		0.05	15-SEP-17
WG2616764-4	MB							
Bromide (Br)			<0.050		mg/L		0.05	15-SEP-17
WG2616764-8	MB							
Bromide (Br)			<0.050		mg/L		0.05	15-SEP-17
CARBONS-DOC-VA		Water						
Batch	R3831979							
WG2618879-4	LCS							
Dissolved Organic Carbon			101.5		%		80-120	18-SEP-17
WG2618879-3	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	18-SEP-17
Batch	R3835237							
WG2620436-12	LCS							
Dissolved Organic Carbon			106.9		%		80-120	20-SEP-17
WG2620436-4	LCS							
Dissolved Organic Carbon			105.5		%		80-120	20-SEP-17
WG2620436-8	LCS							
Dissolved Organic Carbon			105.6		%		80-120	20-SEP-17
WG2620436-11	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	20-SEP-17
WG2620436-3	MB							



Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CARBONS-DOC-VA								
Water								
Batch	R3835237							
WG2620436-3 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	20-SEP-17
WG2620436-7 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	20-SEP-17
CARBONS-TOC-VA								
Water								
Batch	R3831967							
WG2618541-1 LCS								
Total Organic Carbon			97.7		%		80-120	18-SEP-17
WG2618541-13 LCS								
Total Organic Carbon			98.3		%		80-120	18-SEP-17
WG2618541-5 LCS								
Total Organic Carbon			97.0		%		80-120	18-SEP-17
WG2618541-9 LCS								
Total Organic Carbon			96.7		%		80-120	18-SEP-17
WG2618541-12 MB								
Total Organic Carbon			<0.50		mg/L		0.5	18-SEP-17
WG2618541-4 MB								
Total Organic Carbon			<0.50		mg/L		0.5	18-SEP-17
WG2618541-8 MB								
Total Organic Carbon			<0.50		mg/L		0.5	18-SEP-17
Batch	R3833037							
WG2619032-2 DUP		L1989669-4						
Total Organic Carbon		116	114		mg/L	1.2	20	19-SEP-17
WG2619032-1 LCS								
Total Organic Carbon			104.0		%		80-120	19-SEP-17
WG2619032-13 LCS								
Total Organic Carbon			107.4		%		80-120	19-SEP-17
WG2619032-5 LCS								
Total Organic Carbon			111.4		%		80-120	19-SEP-17
WG2619032-9 LCS								
Total Organic Carbon			106.6		%		80-120	19-SEP-17
WG2619032-12 MB								
Total Organic Carbon			<0.50		mg/L		0.5	19-SEP-17
WG2619032-8 MB								
Total Organic Carbon			<0.50		mg/L		0.5	19-SEP-17



Quality Control Report

Workorder: L1989669

Report Date: 06-NOV-17

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CARBONS-TOC-VA		Water						
Batch	R3833584							
WG2619110-1 LCS								
Total Organic Carbon			96.5		%		80-120	19-SEP-17
WG2619110-5 LCS								
Total Organic Carbon			96.9		%		80-120	19-SEP-17
WG2619110-9 LCS								
Total Organic Carbon			100.3		%		80-120	19-SEP-17
WG2619110-4 MB								
Total Organic Carbon			<0.50		mg/L		0.5	19-SEP-17
WG2619110-8 MB								
Total Organic Carbon			<0.50		mg/L		0.5	19-SEP-17
CL-IC-N-VA		Water						
Batch	R3829596							
WG2616764-13 LCS								
Chloride (Cl)			100.8		%		90-110	15-SEP-17
WG2616764-17 LCS								
Chloride (Cl)			100.9		%		90-110	15-SEP-17
WG2616764-2 LCS								
Chloride (Cl)			100.8		%		90-110	15-SEP-17
WG2616764-21 LCS								
Chloride (Cl)			101.1		%		90-110	15-SEP-17
WG2616764-26 LCS								
Chloride (Cl)			101.0		%		90-110	15-SEP-17
WG2616764-5 LCS								
Chloride (Cl)			100.8		%		90-110	15-SEP-17
WG2616764-9 LCS								
Chloride (Cl)			100.7		%		90-110	15-SEP-17
WG2616764-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	15-SEP-17
WG2616764-12 MB								
Chloride (Cl)			<0.50		mg/L		0.5	15-SEP-17
WG2616764-16 MB								
Chloride (Cl)			<0.50		mg/L		0.5	15-SEP-17
WG2616764-20 MB								
Chloride (Cl)			<0.50		mg/L		0.5	15-SEP-17
WG2616764-24 MB								
Chloride (Cl)			<0.50		mg/L		0.5	15-SEP-17
WG2616764-4 MB								
Chloride (Cl)			<0.50		mg/L		0.5	15-SEP-17
WG2616764-8 MB								



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-VA	Water							
Batch	R3829596							
WG2616764-8 MB								
Fluoride (F)			<0.020		mg/L		0.02	15-SEP-17
F1-HSFID-VA	Water							
Batch	R3831285							
WG2621007-2 LCS								
F1 (C6-C10)			109.2		%		70-130	21-SEP-17
WG2621007-1 MB								
F1 (C6-C10)			<0.10		mg/L		0.1	21-SEP-17
F2-F4-ME-FID-VA	Water							
Batch	R3833634							
WG2621934-2 LCS								
F2 (C10-C16)			83.9		%		70-130	21-SEP-17
F3 (C16-C34)			93.5		%		70-130	21-SEP-17
F4 (C34-C50)			97.4		%		70-130	21-SEP-17
WG2621934-1 MB								
F2 (C10-C16)			<0.30		mg/L		0.3	21-SEP-17
F3 (C16-C34)			<0.30		mg/L		0.3	21-SEP-17
F4 (C34-C50)			<0.30		mg/L		0.3	21-SEP-17
Surrogate: 2-Bromobenzotrifluoride, F2-F4			87.7		%		60-140	21-SEP-17
HG-D-CVAA-VA	Water							
Batch	R3835215							
WG2621806-3 DUP		L1989669-3						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	21-SEP-17
WG2621806-2 LCS								
Mercury (Hg)-Dissolved			98.8		%		80-120	21-SEP-17
WG2621806-1 MB		LF						
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	21-SEP-17
HG-T-CVAA-VA	Water							
Batch	R3829878							
WG2617478-16 DUP		L1989669-3						
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	15-SEP-17
WG2617478-2 LCS								
Mercury (Hg)-Total			96.4		%		80-120	15-SEP-17
WG2617478-1 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	15-SEP-17



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HG-T-CVAA-VA		Water						
Batch	R3830266							
WG2617821-2	LCS							
Mercury (Hg)-Total			106.6		%		80-120	16-SEP-17
WG2617821-1	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	16-SEP-17
MET-D-CCMS-VA		Water						
Batch	R3837648							
WG2623233-2	LCS							
Aluminum (Al)-Dissolved			103.6		%		80-120	23-SEP-17
Antimony (Sb)-Dissolved			99.4		%		80-120	23-SEP-17
Arsenic (As)-Dissolved			102.5		%		80-120	23-SEP-17
Barium (Ba)-Dissolved			105.7		%		80-120	23-SEP-17
Bismuth (Bi)-Dissolved			98.7		%		80-120	23-SEP-17
Boron (B)-Dissolved			93.5		%		80-120	23-SEP-17
Cadmium (Cd)-Dissolved			98.8		%		80-120	23-SEP-17
Calcium (Ca)-Dissolved			97.3		%		80-120	23-SEP-17
Cesium (Cs)-Dissolved			100.3		%		80-120	23-SEP-17
Chromium (Cr)-Dissolved			100.2		%		80-120	23-SEP-17
Cobalt (Co)-Dissolved			98.3		%		80-120	23-SEP-17
Copper (Cu)-Dissolved			97.8		%		80-120	23-SEP-17
Iron (Fe)-Dissolved			99.8		%		80-120	23-SEP-17
Lead (Pb)-Dissolved			100.1		%		80-120	23-SEP-17
Lithium (Li)-Dissolved			100.6		%		80-120	23-SEP-17
Magnesium (Mg)-Dissolved			105.8		%		80-120	23-SEP-17
Manganese (Mn)-Dissolved			97.7		%		80-120	23-SEP-17
Molybdenum (Mo)-Dissolved			95.3		%		80-120	23-SEP-17
Nickel (Ni)-Dissolved			97.1		%		80-120	23-SEP-17
Phosphorus (P)-Dissolved			107.4		%		80-120	23-SEP-17
Potassium (K)-Dissolved			101.8		%		80-120	23-SEP-17
Selenium (Se)-Dissolved			100.9		%		80-120	23-SEP-17
Silicon (Si)-Dissolved			97.9		%		80-120	23-SEP-17
Silver (Ag)-Dissolved			97.4		%		80-120	23-SEP-17
Sodium (Na)-Dissolved			103.4		%		80-120	23-SEP-17
Strontium (Sr)-Dissolved			95.2		%		80-120	23-SEP-17
Sulfur (S)-Dissolved			100.4		%		80-120	23-SEP-17
Thallium (Tl)-Dissolved			99.0		%		80-120	23-SEP-17

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch	R3837648							
WG2623233-2 LCS								
Tin (Sn)-Dissolved			100.5		%		80-120	23-SEP-17
Titanium (Ti)-Dissolved			93.6		%		80-120	23-SEP-17
Uranium (U)-Dissolved			100.4		%		80-120	23-SEP-17
Vanadium (V)-Dissolved			101.8		%		80-120	23-SEP-17
Zinc (Zn)-Dissolved			96.4		%		80-120	23-SEP-17
Zirconium (Zr)-Dissolved			99.0		%		80-120	23-SEP-17
WG2623233-1 MB		LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	23-SEP-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-17
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	23-SEP-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	23-SEP-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-SEP-17
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	23-SEP-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	23-SEP-17
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	23-SEP-17
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	23-SEP-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-SEP-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	23-SEP-17
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	23-SEP-17
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	23-SEP-17
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	23-SEP-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	23-SEP-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	23-SEP-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	23-SEP-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	23-SEP-17
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	23-SEP-17
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	23-SEP-17
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	23-SEP-17
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	23-SEP-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	23-SEP-17



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
Water								
Batch	R3837648							
WG2623233-1 MB		LF						
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	23-SEP-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	23-SEP-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	23-SEP-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	23-SEP-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	23-SEP-17
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	23-SEP-17
Batch	R3838223							
WG2623233-1 MB		LF						
Molybdenum (Mo)-Dissolved			0.000071	MB-LOR	mg/L		0.00005	25-SEP-17
MET-T-CCMS-VA								
Water								
Batch	R3835329							
WG2620295-2 LCS								
Aluminum (Al)-Total			107.4		%		80-120	20-SEP-17
Antimony (Sb)-Total			106.2		%		80-120	20-SEP-17
Arsenic (As)-Total			105.7		%		80-120	20-SEP-17
Barium (Ba)-Total			103.1		%		80-120	20-SEP-17
Bismuth (Bi)-Total			106.4		%		80-120	20-SEP-17
Boron (B)-Total			103.4		%		80-120	20-SEP-17
Cadmium (Cd)-Total			106.3		%		80-120	20-SEP-17
Calcium (Ca)-Total			103.3		%		80-120	20-SEP-17
Cesium (Cs)-Total			102.6		%		80-120	20-SEP-17
Chromium (Cr)-Total			105.5		%		80-120	20-SEP-17
Cobalt (Co)-Total			102.7		%		80-120	20-SEP-17
Copper (Cu)-Total			101.5		%		80-120	20-SEP-17
Iron (Fe)-Total			102.1		%		80-120	20-SEP-17
Lead (Pb)-Total			105.3		%		80-120	20-SEP-17
Lithium (Li)-Total			107.3		%		80-120	20-SEP-17
Magnesium (Mg)-Total			103.1		%		80-120	20-SEP-17
Manganese (Mn)-Total			100.7		%		80-120	20-SEP-17
Molybdenum (Mo)-Total			103.7		%		80-120	20-SEP-17
Nickel (Ni)-Total			104.0		%		80-120	20-SEP-17
Phosphorus (P)-Total			118.7		%		80-120	20-SEP-17
Potassium (K)-Total			104.9		%		80-120	20-SEP-17
Selenium (Se)-Total			103.6		%		80-120	20-SEP-17



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R3835329							
WG2620295-2	LCS							
Silicon (Si)-Total			106.2		%		80-120	20-SEP-17
Silver (Ag)-Total			104.1		%		80-120	20-SEP-17
Sodium (Na)-Total			102.3		%		80-120	20-SEP-17
Strontium (Sr)-Total			103.8		%		80-120	20-SEP-17
Sulfur (S)-Total			111.3		%		80-120	20-SEP-17
Thallium (Tl)-Total			104.7		%		80-120	20-SEP-17
Tin (Sn)-Total			105.4		%		80-120	20-SEP-17
Titanium (Ti)-Total			104.1		%		80-120	20-SEP-17
Uranium (U)-Total			104.3		%		80-120	20-SEP-17
Vanadium (V)-Total			105.4		%		80-120	20-SEP-17
Zinc (Zn)-Total			98.3		%		80-120	20-SEP-17
Zirconium (Zr)-Total			106.0		%		80-120	20-SEP-17
WG2620295-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	20-SEP-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	20-SEP-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	20-SEP-17
Barium (Ba)-Total			<0.000050		mg/L		0.00005	20-SEP-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	20-SEP-17
Boron (B)-Total			<0.010		mg/L		0.01	20-SEP-17
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	20-SEP-17
Calcium (Ca)-Total			<0.050		mg/L		0.05	20-SEP-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	20-SEP-17
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	20-SEP-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	20-SEP-17
Copper (Cu)-Total			<0.00050		mg/L		0.0005	20-SEP-17
Iron (Fe)-Total			<0.010		mg/L		0.01	20-SEP-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	20-SEP-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	20-SEP-17
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	20-SEP-17
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	20-SEP-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	20-SEP-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	20-SEP-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	20-SEP-17
Potassium (K)-Total			<0.050		mg/L		0.05	20-SEP-17



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
Batch R3835329								
WG2620295-1 MB								
Selenium (Se)-Total	Water		<0.000050		mg/L		0.00005	20-SEP-17
Silicon (Si)-Total			<0.10		mg/L		0.1	20-SEP-17
Silver (Ag)-Total			<0.000010		mg/L		0.00001	20-SEP-17
Sodium (Na)-Total			<0.050		mg/L		0.05	20-SEP-17
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	20-SEP-17
Sulfur (S)-Total			<0.50		mg/L		0.5	20-SEP-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	20-SEP-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	20-SEP-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	20-SEP-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	20-SEP-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	20-SEP-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	20-SEP-17
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	20-SEP-17
Batch R3836254								
WG2620295-4 MS		L1989669-1						
Aluminum (Al)-Total			94.6		%		70-130	21-SEP-17
Antimony (Sb)-Total			104.0		%		70-130	21-SEP-17
Arsenic (As)-Total			N/A	MS-B	%		-	21-SEP-17
Barium (Ba)-Total			N/A	MS-B	%		-	21-SEP-17
Bismuth (Bi)-Total			96.0		%		70-130	21-SEP-17
Boron (B)-Total			96.4		%		70-130	21-SEP-17
Cadmium (Cd)-Total			93.6		%		70-130	21-SEP-17
Calcium (Ca)-Total			N/A	MS-B	%		-	21-SEP-17
Cesium (Cs)-Total			102.3		%		70-130	21-SEP-17
Chromium (Cr)-Total			91.6		%		70-130	21-SEP-17
Cobalt (Co)-Total			91.0		%		70-130	21-SEP-17
Copper (Cu)-Total			90.9		%		70-130	21-SEP-17
Iron (Fe)-Total			93.2		%		70-130	21-SEP-17
Lead (Pb)-Total			88.0		%		70-130	21-SEP-17
Lithium (Li)-Total			94.4		%		70-130	21-SEP-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	21-SEP-17
Manganese (Mn)-Total			N/A	MS-B	%		-	21-SEP-17
Molybdenum (Mo)-Total			95.1		%		70-130	21-SEP-17
Nickel (Ni)-Total			89.3		%		70-130	21-SEP-17



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MET-T-CCMS-VA								
Water								
Batch	R3836254							
WG2620295-4 MS		L1989669-1						
Phosphorus (P)-Total			101.4		%		70-130	21-SEP-17
Potassium (K)-Total			94.2		%		70-130	21-SEP-17
Selenium (Se)-Total			95.0		%		70-130	21-SEP-17
Silicon (Si)-Total			86.7		%		70-130	21-SEP-17
Silver (Ag)-Total			99.8		%		70-130	21-SEP-17
Sodium (Na)-Total			N/A	MS-B	%		-	21-SEP-17
Strontium (Sr)-Total			N/A	MS-B	%		-	21-SEP-17
Sulfur (S)-Total			96.5		%		70-130	21-SEP-17
Thallium (Tl)-Total			96.6		%		70-130	21-SEP-17
Tin (Sn)-Total			96.7		%		70-130	21-SEP-17
Titanium (Ti)-Total			97.4		%		70-130	21-SEP-17
Uranium (U)-Total			N/A	MS-B	%		-	21-SEP-17
Vanadium (V)-Total			96.2		%		70-130	21-SEP-17
Zinc (Zn)-Total			84.7		%		70-130	21-SEP-17
Zirconium (Zr)-Total			98.1		%		70-130	21-SEP-17
Batch	R3837718							
WG2623288-2 LCS								
Aluminum (Al)-Total			84.4		%		80-120	23-SEP-17
Antimony (Sb)-Total			90.8		%		80-120	23-SEP-17
Arsenic (As)-Total			84.3		%		80-120	23-SEP-17
Barium (Ba)-Total			84.1		%		80-120	23-SEP-17
Bismuth (Bi)-Total			88.8		%		80-120	23-SEP-17
Boron (B)-Total			85.3		%		80-120	23-SEP-17
Cadmium (Cd)-Total			83.0		%		80-120	23-SEP-17
Calcium (Ca)-Total			88.4		%		80-120	23-SEP-17
Cesium (Cs)-Total			87.9		%		80-120	23-SEP-17
Chromium (Cr)-Total			84.7		%		80-120	23-SEP-17
Cobalt (Co)-Total			84.7		%		80-120	23-SEP-17
Copper (Cu)-Total			83.8		%		80-120	23-SEP-17
Iron (Fe)-Total			87.1		%		80-120	23-SEP-17
Lead (Pb)-Total			89.9		%		80-120	23-SEP-17
Lithium (Li)-Total			93.2		%		80-120	23-SEP-17
Magnesium (Mg)-Total			84.5		%		80-120	23-SEP-17
Manganese (Mn)-Total			81.2		%		80-120	23-SEP-17



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MET-T-CCMS-VA	Water							
Batch	R3837718							
WG2623288-2 LCS								
Molybdenum (Mo)-Total			85.7		%		80-120	23-SEP-17
Nickel (Ni)-Total			86.5		%		80-120	23-SEP-17
Phosphorus (P)-Total			84.9		%		80-120	23-SEP-17
Potassium (K)-Total			83.5		%		80-120	23-SEP-17
Selenium (Se)-Total			91.7		%		80-120	23-SEP-17
Silicon (Si)-Total			86.8		%		80-120	23-SEP-17
Silver (Ag)-Total			87.8		%		80-120	23-SEP-17
Sodium (Na)-Total			85.4		%		80-120	23-SEP-17
Strontium (Sr)-Total			87.2		%		80-120	23-SEP-17
Sulfur (S)-Total			86.1		%		80-120	23-SEP-17
Thallium (Tl)-Total			89.7		%		80-120	23-SEP-17
Tin (Sn)-Total			81.6		%		80-120	23-SEP-17
Uranium (U)-Total			92.9		%		80-120	23-SEP-17
Vanadium (V)-Total			84.7		%		80-120	23-SEP-17
Zirconium (Zr)-Total			89.4		%		80-120	23-SEP-17
WG2623288-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	23-SEP-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	23-SEP-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	23-SEP-17
Barium (Ba)-Total			<0.000050		mg/L		0.00005	23-SEP-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	23-SEP-17
Boron (B)-Total			<0.010		mg/L		0.01	23-SEP-17
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	23-SEP-17
Calcium (Ca)-Total			<0.050		mg/L		0.05	23-SEP-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	23-SEP-17
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	23-SEP-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	23-SEP-17
Copper (Cu)-Total			<0.00050		mg/L		0.0005	23-SEP-17
Iron (Fe)-Total			<0.010		mg/L		0.01	23-SEP-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	23-SEP-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	23-SEP-17
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	23-SEP-17
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	23-SEP-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	23-SEP-17



Quality Control Report

Workorder: L1989669

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
Water								
Batch	R3837718							
WG2623288-1 MB								
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	23-SEP-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	23-SEP-17
Potassium (K)-Total			<0.050		mg/L		0.05	23-SEP-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	23-SEP-17
Silicon (Si)-Total			<0.10		mg/L		0.1	23-SEP-17
Silver (Ag)-Total			<0.000010		mg/L		0.00001	23-SEP-17
Sodium (Na)-Total			<0.050		mg/L		0.05	23-SEP-17
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	23-SEP-17
Sulfur (S)-Total			<0.50		mg/L		0.5	23-SEP-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	23-SEP-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	23-SEP-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	23-SEP-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	23-SEP-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	23-SEP-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	23-SEP-17
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	23-SEP-17
Batch	R3838410							
WG2623288-2 LCS								
Titanium (Ti)-Total			104.6		%		80-120	25-SEP-17
Zinc (Zn)-Total			93.4		%		80-120	25-SEP-17
NH3-F-VA								
Water								
Batch	R3832525							
WG2619035-7 DUP		L1989669-2						
Ammonia, Total (as N)		0.0283	0.0286		mg/L	1.1	20	19-SEP-17
WG2619035-6 LCS								
Ammonia, Total (as N)			95.9		%		85-115	19-SEP-17
WG2619035-5 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	19-SEP-17
WG2619035-8 MS		L1989669-2						
Ammonia, Total (as N)			95.9		%		75-125	19-SEP-17
NO2-L-IC-N-VA								
Water								
Batch	R3829596							
WG2616764-13 LCS								
Nitrite (as N)			98.5		%		90-110	15-SEP-17
WG2616764-17 LCS								



Quality Control Report

Workorder: L1989669

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-VA		Water						
Batch	R3829596							
WG2616764-17	LCS							
Nitrite (as N)			99.7		%		90-110	15-SEP-17
WG2616764-2	LCS							
Nitrite (as N)			99.1		%		90-110	15-SEP-17
WG2616764-21	LCS							
Nitrite (as N)			100.2		%		90-110	15-SEP-17
WG2616764-26	LCS							
Nitrite (as N)			99.1		%		90-110	15-SEP-17
WG2616764-5	LCS							
Nitrite (as N)			99.2		%		90-110	15-SEP-17
WG2616764-9	LCS							
Nitrite (as N)			99.9		%		90-110	15-SEP-17
WG2616764-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	15-SEP-17
WG2616764-12	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	15-SEP-17
WG2616764-16	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	15-SEP-17
WG2616764-20	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	15-SEP-17
WG2616764-24	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	15-SEP-17
WG2616764-4	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	15-SEP-17
WG2616764-8	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	15-SEP-17
NO3-L-IC-N-VA		Water						
Batch	R3829596							
WG2616764-13	LCS							
Nitrate (as N)			101.4		%		90-110	15-SEP-17
WG2616764-17	LCS							
Nitrate (as N)			101.6		%		90-110	15-SEP-17
WG2616764-2	LCS							
Nitrate (as N)			101.5		%		90-110	15-SEP-17
WG2616764-21	LCS							
Nitrate (as N)			101.6		%		90-110	15-SEP-17
WG2616764-26	LCS							
Nitrate (as N)			101.6		%		90-110	15-SEP-17
WG2616764-5	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-VA								
Batch R3829596								
WG2616764-16 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	15-SEP-17
WG2616764-20 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	15-SEP-17
WG2616764-24 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	15-SEP-17
WG2616764-4 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	15-SEP-17
WG2616764-8 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	15-SEP-17
TDS-VA								
Batch R3831176								
WG2617459-5 LCS								
Total Dissolved Solids			97.8		%		85-115	15-SEP-17
WG2617459-4 MB								
Total Dissolved Solids			<10		mg/L		10	15-SEP-17
TSS-VA								
Batch R3831132								
WG2617745-5 LCS								
Total Suspended Solids			98.1		%		85-115	16-SEP-17
WG2617745-4 MB								
Total Suspended Solids			<3.0		mg/L		3	16-SEP-17
TURBIDITY-VA								
Batch R3829244								
WG2616603-2 CRM		VA-FORM-40						
Turbidity			104.5		%		85-115	15-SEP-17
WG2616603-5 CRM		VA-FORM-40						
Turbidity			105.3		%		85-115	15-SEP-17
WG2616603-8 CRM		VA-FORM-40						
Turbidity			105.8		%		85-115	15-SEP-17
WG2616603-1 MB								
Turbidity			<0.10		NTU		0.1	15-SEP-17
WG2616603-4 MB								
Turbidity			<0.10		NTU		0.1	15-SEP-17
WG2616603-7 MB								
Turbidity			<0.10		NTU		0.1	15-SEP-17
VH-HSFID-VA								
Batch R3831176								



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Workorder: L1989669

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VH-HSFID-VA		Water						
Batch	R3831285							
WG2621007-2	LCS							
Volatile Hydrocarbons (VH6-10)			104.8		%		70-130	21-SEP-17
WG2621007-1	MB							
Volatile Hydrocarbons (VH6-10)			<0.10		mg/L		0.1	21-SEP-17
VOC7-HSMS-VA		Water						
Batch	R3833760							
WG2621007-2	LCS							
Benzene			98.9		%		70-130	20-SEP-17
Ethylbenzene			99.0		%		70-130	20-SEP-17
Methyl t-butyl ether (MTBE)			95.8		%		70-130	20-SEP-17
Styrene			107.6		%		70-130	20-SEP-17
Toluene			95.4		%		70-130	20-SEP-17
meta- & para-Xylene			100.6		%		70-130	20-SEP-17
ortho-Xylene			102.5		%		70-130	20-SEP-17
WG2621007-1	MB							
Benzene			<0.00050		mg/L		0.0005	20-SEP-17
Ethylbenzene			<0.00050		mg/L		0.0005	20-SEP-17
Methyl t-butyl ether (MTBE)			<0.00050		mg/L		0.0005	20-SEP-17
Styrene			<0.00050		mg/L		0.0005	20-SEP-17
Toluene			<0.00045		mg/L		0.00045	20-SEP-17
meta- & para-Xylene			<0.00050		mg/L		0.0005	20-SEP-17
ortho-Xylene			<0.00050		mg/L		0.0005	20-SEP-17

Quality Control Report

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1989669

Report Date: 06-NOV-17

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity by Meter							
	1	10-SEP-17	15-SEP-17 08:27	3	5	days	EHT
	2	10-SEP-17	15-SEP-17 08:27	3	5	days	EHT
	3	10-SEP-17	15-SEP-17 08:27	3	5	days	EHT
	4	10-SEP-17	15-SEP-17 08:27	3	5	days	EHT
pH by Meter (Automated)							
	1	10-SEP-17	22-SEP-17 08:28	0.25	284	hours	EHTR-FM
	2	10-SEP-17	22-SEP-17 08:28	0.25	284	hours	EHTR-FM
	3	10-SEP-17	22-SEP-17 08:28	0.25	284	hours	EHTR-FM
	4	10-SEP-17	22-SEP-17 08:28	0.25	284	hours	EHTR-FM
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	1	10-SEP-17	15-SEP-17 07:21	3	5	days	EHT
	2	10-SEP-17	15-SEP-17 07:21	3	5	days	EHT
	3	10-SEP-17	15-SEP-17 07:21	3	5	days	EHT
	4	10-SEP-17	15-SEP-17 07:21	3	5	days	EHT
Nitrite in Water by IC (Low Level)							
	1	10-SEP-17	15-SEP-17 07:21	3	5	days	EHT
	2	10-SEP-17	15-SEP-17 07:21	3	5	days	EHT
	3	10-SEP-17	15-SEP-17 07:21	3	5	days	EHT
	4	10-SEP-17	15-SEP-17 07:21	3	5	days	EHT
Total Dissolved P in Water by Colour							
	1	10-SEP-17	15-SEP-17 23:00	3	5	days	EHT
	2	10-SEP-17	15-SEP-17 23:00	3	5	days	EHT
	3	10-SEP-17	15-SEP-17 23:00	3	5	days	EHT
	4	10-SEP-17	15-SEP-17 23:00	3	5	days	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
 EHTR: Exceeded ALS recommended hold time prior to sample receipt.
 EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
 EHT: Exceeded ALS recommended hold time prior to analysis.
 Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1989669 were received on 12-SEP-17 10:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes 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 pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

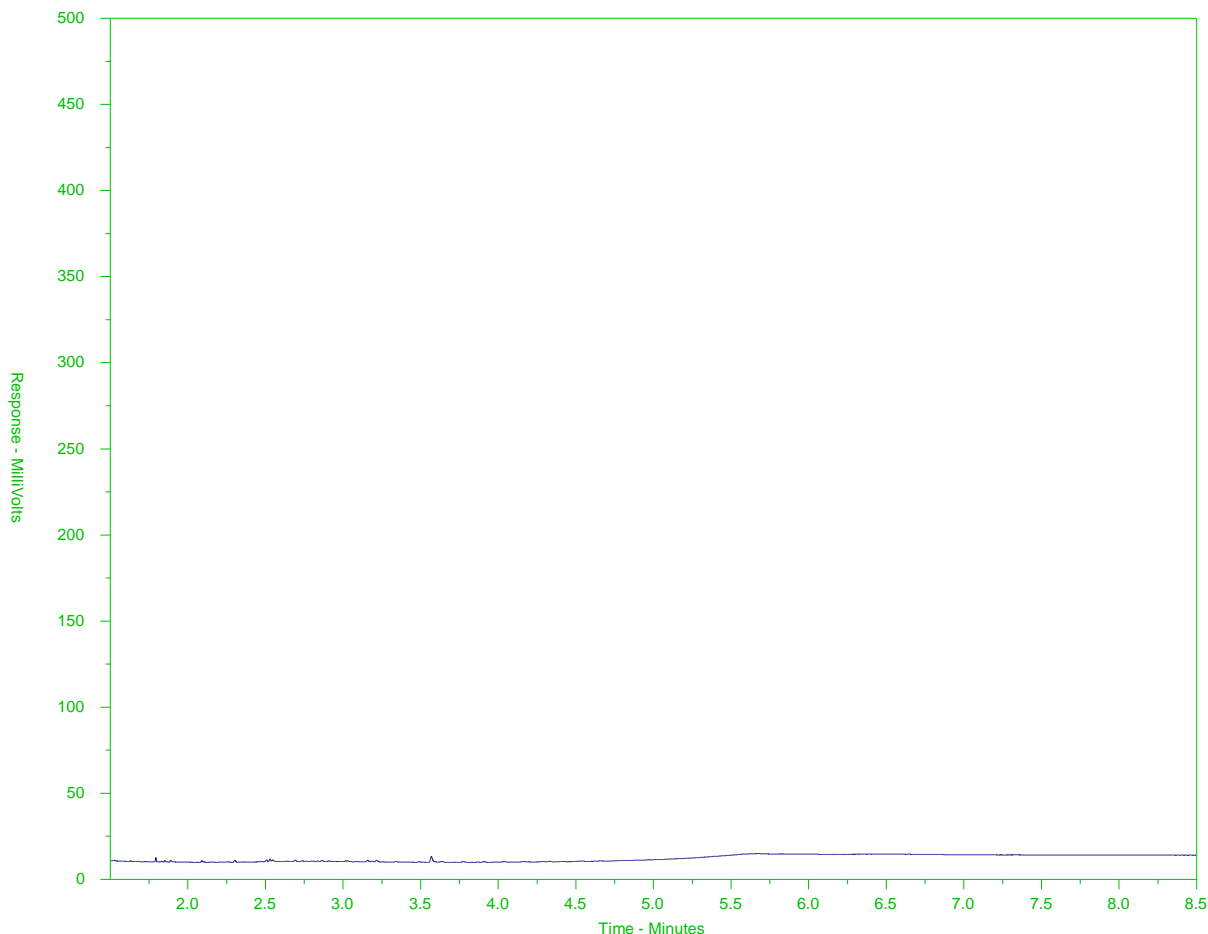
ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L1989669-3
Client ID	NX3
Matrix	WATER
Units	mg/L
Analyte	
F2(C10-16) SG	0.70
F3(C16-34) SG	<0.30
F4(C34-50) SG	<0.30
BBTF (%)	77

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989669-C-2
Client Sample ID: NX-2



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

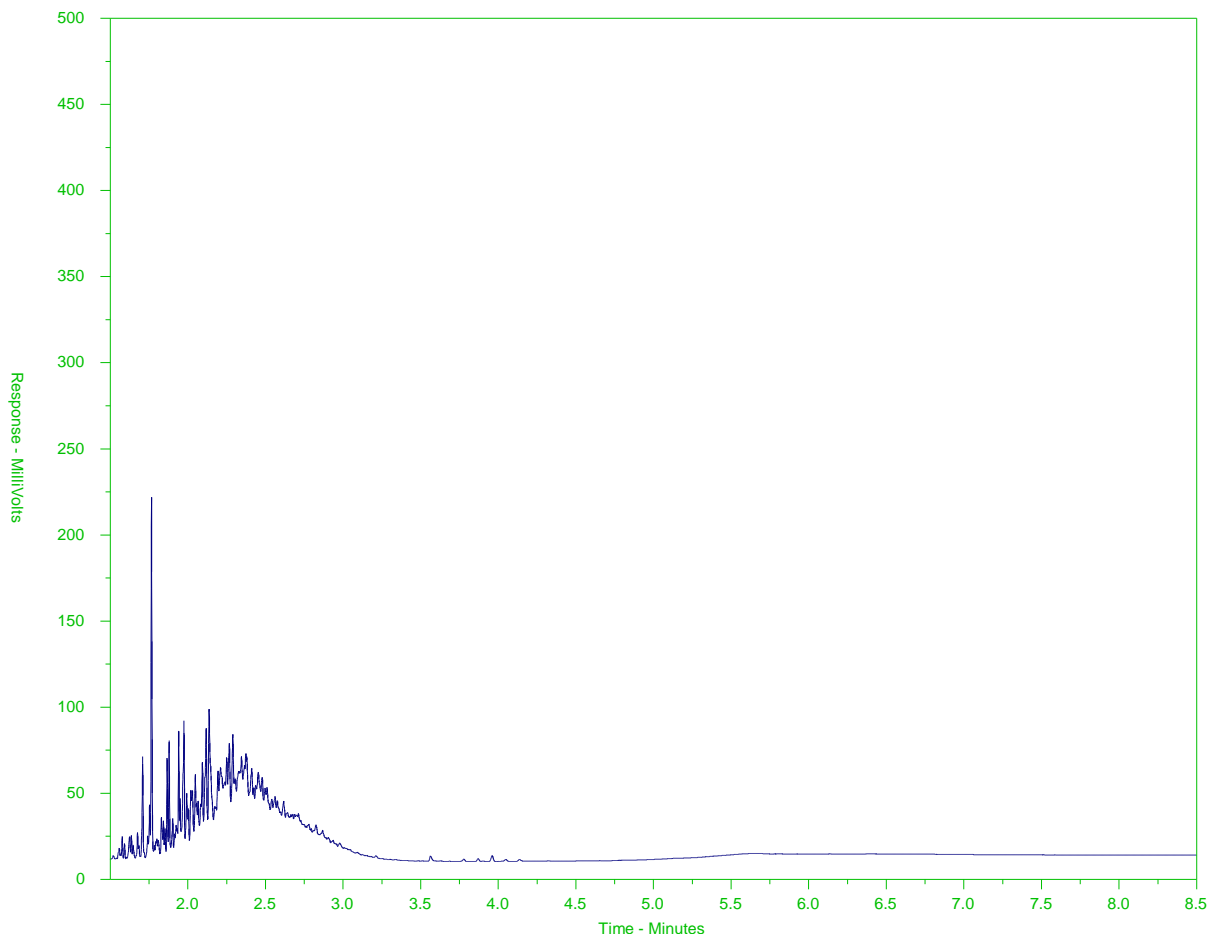
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989669-C-3
Client Sample ID: NX-3



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →			Motor Oils / Lubricants / Grease →	
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

[illegible]



PUBLIC WORKS AND GOVERNMENT
SERVICES CANADA
ATTN: Rebecca Studer-Halbach
Northern Contaminated Sites
10025 Jasper Avenue NW
Edmonton AB T5J 1S6

Date Received: 12-SEP-17
Report Date: 25-OCT-17 19:44 (MT)
Version: FINAL REV. 3

Client Phone: 780-497-3761

Certificate of Analysis

Lab Work Order #: L1989801
Project P.O. #: R.015211.049
Job Reference:
C of C Numbers:
Legal Site Desc:

Comments: 18-OCT-2017 Cs data has been added.
25-OCT-2017 Dissolved Cs data has been added.

Dean Watt, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989801-1 water 08-SEP-17 T-20	L1989801-2 water 08-SEP-17 T-19	L1989801-3 water 08-SEP-17 T-DUP-3	L1989801-4 water 08-SEP-17 T-4	L1989801-5 water 08-SEP-17 T-2
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	398	155	152	145	85.8
	Hardness (as CaCO3) (mg/L)	204 ^{HTC}	87.7 ^{HTC}	86.4 ^{HTC}	69.8	46.5 ^{HTC}
	pH (pH)	8.09	7.72	7.70	7.86	7.56
	Total Suspended Solids (mg/L)	4.4	3.0	10.0	7.0	3.2
	Total Dissolved Solids (mg/L)	298	159	156	94	90
	Turbidity (NTU)	1.49	2.04	2.37	2.43	1.69
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	122	61.1	61.0	57.7	36.1
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0158	0.0159	<0.0050	0.0075
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.54	1.06	<0.50	2.36	<0.50
	Fluoride (F) (mg/L)	0.727	0.332	0.334	0.158	0.376
	Nitrate (as N) (mg/L)	<0.0050	0.0720	0.0676	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	0.0011	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0148	0.0185	0.0259	0.0021	0.0086
	Phosphorus (P)-Total (mg/L)	0.0479	0.0159	0.0253	0.0037	0.0138
	Sulfate (SO4) (mg/L)	91.6	15.9	16.0	14.5	5.86
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	10.9	29.8	30.5	4.66	21.3
	Total Organic Carbon (mg/L)	12.6	29.1	29.4	5.42	20.6
Total Metals	Aluminum (Al)-Total (mg/L)	0.0044	0.197	0.201	0.0862	0.0573
	Antimony (Sb)-Total (mg/L)	0.00088	0.00520	0.00529	0.00011	0.00015
	Arsenic (As)-Total (mg/L)	0.0325	0.286	0.284	0.00130	0.00524
	Barium (Ba)-Total (mg/L)	0.0166	0.00945	0.00895	0.0114	0.00731
	Beryllium (Be)-Total (mg/L)	<0.000020	0.000049	0.000044	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	0.00162	0.00159	0.000247	<0.000050
	Boron (B)-Total (mg/L)	0.029	0.013	0.012	0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000058	0.0000441	0.0000498	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	59.4	26.4	25.9	17.5	12.3
	Cesium (Cs)-Total (mg/L)	0.000027	0.000016	0.000015	0.000037	<0.000010
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00058	0.00059	0.00018	0.00019
	Cobalt (Co)-Total (mg/L)	0.00099	0.0179	0.0178	0.00051	0.00014
	Copper (Cu)-Total (mg/L)	0.00469	0.0267	0.0267	0.00348	0.00657
	Iron (Fe)-Total (mg/L)	0.032	0.235	0.236	0.122	0.199
	Lead (Pb)-Total (mg/L)	<0.000050	0.000568	0.000566	0.000945	0.000075
	Lithium (Li)-Total (mg/L)	0.0036	0.0021	0.0021	0.0022	0.0016
	Magnesium (Mg)-Total (mg/L)	13.4	5.30	5.26	6.56	3.82

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989801-1 water 08-SEP-17 T-20	L1989801-2 water 08-SEP-17 T-19	L1989801-3 water 08-SEP-17 T-DUP-3	L1989801-4 water 08-SEP-17 T-4	L1989801-5 water 08-SEP-17 T-2
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.0604	0.0688	0.0639	0.00531	0.0168	
	Mercury (Hg)-Total (mg/L)	<0.0000050	0.0000179	0.0000178	0.0000057	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.00208	0.0152	0.0150	0.000262	0.000193	
	Nickel (Ni)-Total (mg/L)	0.00175	0.0281	0.0280	0.00062	0.00118	
	Phosphorus (P)-Total (mg/L)	0.077	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	5.73	1.49	1.16	0.97	1.08	
	Selenium (Se)-Total (mg/L)	0.000073	0.000122	0.000110	<0.000050	0.000056	
	Silicon (Si)-Total (mg/L)	2.66	3.63	3.58	0.92	1.08	
	Silver (Ag)-Total (mg/L)	<0.000010	0.000104	0.000104	0.000170	<0.000010	
	Sodium (Na)-Total (mg/L)	5.28	1.28	1.26	2.31	1.11	
	Strontium (Sr)-Total (mg/L)	0.100	0.0337	0.0332	0.0547	0.0175	
	Sulfur (S)-Total (mg/L)	34.1	5.95	6.02	4.91	2.13	
	Thallium (Tl)-Total (mg/L)	<0.000010	0.000027	0.000027	<0.000010	0.000016	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.0048 ^{DLM}	<0.0042 ^{DLM}	<0.0036 ^{DLM}	<0.0012 ^{DLM}	
	Uranium (U)-Total (mg/L)	0.00291	0.00239	0.00239	0.000532	0.000149	
	Vanadium (V)-Total (mg/L)	<0.00050	0.00064	0.00063	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0154	0.0141	0.0037	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	0.00190	0.00186	<0.00030	0.00031	
Dissolved Metals	Dissolved Mercury Filtration Location				LAB		
	Dissolved Metals Filtration Location				LAB		
	Aluminum (Al)-Dissolved (mg/L)				0.0030		
	Antimony (Sb)-Dissolved (mg/L)				<0.00010		
	Arsenic (As)-Dissolved (mg/L)				0.00056		
	Barium (Ba)-Dissolved (mg/L)				0.0107		
	Beryllium (Be)-Dissolved (mg/L)				<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)				<0.000050		
	Boron (B)-Dissolved (mg/L)				0.011		
	Cadmium (Cd)-Dissolved (mg/L)				<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)				16.9		
	Cesium (Cs)-Dissolved (mg/L)				<0.000010		
	Chromium (Cr)-Dissolved (mg/L)				<0.00010		
	Cobalt (Co)-Dissolved (mg/L)				<0.00010		
	Copper (Cu)-Dissolved (mg/L)				0.00136		
	Iron (Fe)-Dissolved (mg/L)				<0.010		
	Lead (Pb)-Dissolved (mg/L)				<0.000050		
	Lithium (Li)-Dissolved (mg/L)				0.0024		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989801-1 water 08-SEP-17 T-20	L1989801-2 water 08-SEP-17 T-19	L1989801-3 water 08-SEP-17 T-DUP-3	L1989801-4 water 08-SEP-17 T-4	L1989801-5 water 08-SEP-17 T-2
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)				6.72	
	Manganese (Mn)-Dissolved (mg/L)				<0.00010	
	Mercury (Hg)-Dissolved (mg/L)				<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)				0.000266	
	Nickel (Ni)-Dissolved (mg/L)				<0.00050	
	Phosphorus (P)-Dissolved (mg/L)				<0.050	
	Potassium (K)-Dissolved (mg/L)				1.02	
	Selenium (Se)-Dissolved (mg/L)				<0.000050	
	Silicon (Si)-Dissolved (mg/L)				0.749	
	Silver (Ag)-Dissolved (mg/L)				<0.000010	
	Sodium (Na)-Dissolved (mg/L)				2.44	
	Strontium (Sr)-Dissolved (mg/L)				0.0538	
	Sulfur (S)-Dissolved (mg/L)				4.84	
	Thallium (Tl)-Dissolved (mg/L)				<0.000010	
	Tin (Sn)-Dissolved (mg/L)				<0.00010	
	Titanium (Ti)-Dissolved (mg/L)				<0.00030	
	Uranium (U)-Dissolved (mg/L)				0.000503	
	Vanadium (V)-Dissolved (mg/L)				<0.00050	
	Zinc (Zn)-Dissolved (mg/L)				<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)				<0.00030	
Volatile Organic Compounds	Benzene (mg/L)				<0.00050	
	Ethylbenzene (mg/L)				<0.00050	
	Methyl t-butyl ether (MTBE) (mg/L)				<0.00050	
	Styrene (mg/L)				<0.00050	
	Toluene (mg/L)				<0.00045	
	ortho-Xylene (mg/L)				<0.00050	
	meta- & para-Xylene (mg/L)				<0.00050	
	Xylenes (mg/L)				<0.00075	
	F1 (C6-C10) (mg/L)				<0.10	
	Surrogate: 4-Bromofluorobenzene (SS) (%)				102.3	
	Surrogate: 1,4-Difluorobenzene (SS) (%)				88.2	
Hydrocarbons	F1-BTEX (mg/L)				<0.10	
	F2 (C10-C16) (mg/L)				<0.30	
	F3 (C16-C34) (mg/L)				<0.30	
	F4 (C34-C50) (mg/L)				<0.30	
	Volatile Hydrocarbons (VH6-10) (mg/L)				<0.10	
	VPH (C6-C10) (mg/L)				<0.10	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1989801-1	L1989801-2	L1989801-3	L1989801-4	L1989801-5
		Description	water	water	water	water	water
		Sampled Date	08-SEP-17	08-SEP-17	08-SEP-17	08-SEP-17	08-SEP-17
		Sampled Time					
		Client ID	T-20	T-19	T-DUP-3	T-4	T-2
Grouping	Analyte						
WATER							
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)					92.1	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					89.0	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1989801-1, -2, -3, -4
Matrix Spike	Total Organic Carbon	MS-B	L1989801-1, -4, -5
Matrix Spike	Total Organic Carbon	MS-B	L1989801-2, -3
Matrix Spike	Calcium (Ca)-Total	MS-B	L1989801-1, -2, -3, -4, -5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1989801-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
F1-BTX-CALC-VA	Water	F1-Total BTX	CCME CWS PHC TIER 1 (2001)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID. The F1-BTEX result is calculated as follows:			
F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).			
F1-HSFID-VA	Water	CCME F1 By Headspace with GCFID	EPA 5021A/CCME CWS PHC (Pub# 1310)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.			
F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.			
F2-F4-ME-FID-VA	Water	CCME F2-F4 Hydrocarbons in Water	CCME CWS-PHC, Pub #1310, Dec 2001

Reference Information

F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Weston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

S2-T-COL-VA Water Total Sulphide by Colorimetric APHA 4500-S2 Sulphide

This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

Reference Information

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.			
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			
VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.			
VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.			
VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE LABORATORY MANUAL (2005)
These results are determined according to the British Columbia Ministry of Environment Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water". The concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and, in solids, Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10).			
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Calculation of Total Xylenes			
Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

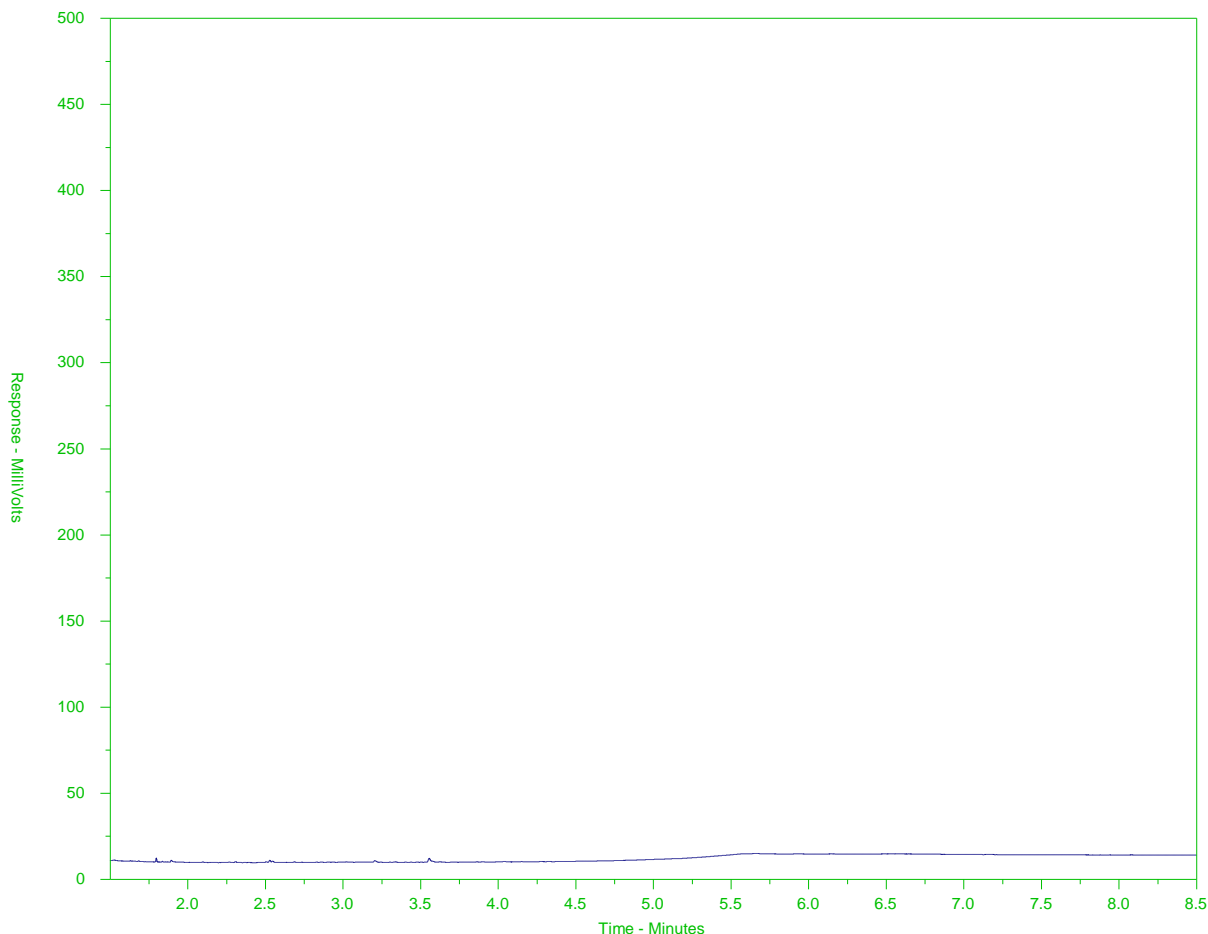
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989801-C-4
Client Sample ID: T-4



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

Canada Toll Free: 1 800 668 9878

[illegible]



PUBLIC WORKS AND GOVERNMENT
SERVICES CANADA
ATTN: Rebecca Studer-Halbach
Northern Contaminated Sites
10025 Jasper Avenue NW
Edmonton AB T5J 1S6

Date Received: 12-SEP-17
Report Date: 13-OCT-17 18:08 (MT)
Version: FINAL REV. 2

Client Phone: 780-497-3761

Certificate of Analysis

Lab Work Order #: L1989851
Project P.O. #: R.015211.049
Job Reference:
C of C Numbers:
Legal Site Desc:

Comments: New Version Report

Dean Watt, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989851-1 water 09-SEP-17 ELB-9-GLB	L1989851-2 water 09-SEP-17 ELB-DUP-1	L1989851-3 water 09-SEP-17 ELB-10-ML	L1989851-4 water 09-SEP-17 ELB-7-SL	L1989851-5 water 09-SEP-17 ELB-4-ML
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	158	64.0	63.2	64.2	59.2
	Hardness (as CaCO3) (mg/L)	71.6 ^{HTC}	31.4 ^{HTC}	29.8 ^{HTC}	32.3	29.9 ^{HTC}
	pH (pH)	7.98	7.70	7.54	7.67	7.68
	Total Suspended Solids (mg/L)	3.4	4.2	<3.0	<3.0	3.2
	Total Dissolved Solids (mg/L)	83	40	35	39	33
	Turbidity (NTU)	0.25	0.46	0.46	0.47	0.39
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	58.6	32.2	29.1	32.0	29.7
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0059
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	4.82	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.079	0.091	0.057	0.091	0.055
	Nitrate (as N) (mg/L)	0.139	<0.0050	0.0595	<0.0050	0.0548
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0025	<0.0020	<0.0020	<0.0020
	Sulfate (SO4) (mg/L)	15.0	1.27	1.45	1.27	1.45
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.35	4.07	3.60	3.86	3.57
	Total Organic Carbon (mg/L)	2.12	4.02	3.65	3.88	3.87
Total Metals	Aluminum (Al)-Total (mg/L)	0.0074	0.0072	0.0121	0.0049	0.0106
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00020	0.00017	0.00018	0.00021	0.00017
	Barium (Ba)-Total (mg/L)	0.0222	0.00713	0.00517	0.00740	0.00503
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.010	0.012	0.011	0.012	0.011
	Cadmium (Cd)-Total (mg/L)	0.0000058	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	17.1	8.76	8.04	8.80	8.08
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00110	0.00123	0.00113	0.00125
	Iron (Fe)-Total (mg/L)	<0.010	0.082	0.025	0.086	0.019
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0031	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	7.04	2.32	2.37	2.36	2.36

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989851-6 water 09-SEP-17 ELB-SW-2	L1989851-7 water 09-SEP-17 ELB-2G-GBL	L1989851-8 water 09-SEP-17 ELB-6-SL	L1989851-9 water 09-SEP-17 ELB-1G-GBL	L1989851-10 water 09-SEP-17 ELB-8-SL
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	62.8	157	63.3	158	63.5
	Hardness (as CaCO3) (mg/L)	32.0	72.8 ^{HTC}	32.5 ^{HTC}	74.5	32.4 ^{HTC}
	pH (pH)	7.70	7.99	7.69	7.99	7.71
	Total Suspended Solids (mg/L)	3.4	3.4	3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	37	84	40	83	39
	Turbidity (NTU)	0.49	0.25	0.45	0.23	0.50
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	32.2	59.9	32.6	59.6	32.5
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	4.80	<0.50	4.81	<0.50
	Fluoride (F) (mg/L)	0.089	0.083	0.090	0.082	0.089
	Nitrate (as N) (mg/L)	<0.0050	0.138	<0.0050	0.138	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0022	<0.0020	<0.0020	<0.0020	<0.0020
	Sulfate (SO4) (mg/L)	1.26	14.9	1.25	14.9	1.27
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.74	2.09	3.58	1.97	3.83
	Total Organic Carbon (mg/L)	4.22	2.03	3.81	2.04	3.83
Total Metals	Aluminum (Al)-Total (mg/L)	0.0064	0.0083	0.0059	0.0057	0.0066
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	0.00036	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00017	0.00020	0.00018	0.00017	0.00020
	Barium (Ba)-Total (mg/L)	0.00752	0.0229	0.00800	0.0228	0.00768
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.012	0.011	0.012	0.011	0.012
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	8.89	17.5	8.97	17.4	8.95
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)	0.00012	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00110	<0.00050	0.00114	<0.00050	0.00115
	Iron (Fe)-Total (mg/L)	0.106	<0.010	0.099	<0.010	0.087
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	0.0031	<0.0010	0.0032	<0.0010
	Magnesium (Mg)-Total (mg/L)	2.39	7.09	2.44	7.08	2.44

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989851-11 water 09-SEP-17 ELB-FIELD BLANK				
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	<2.0				
	Hardness (as CaCO3) (mg/L)	<0.50				
	pH (pH)	5.40				
	Total Suspended Solids (mg/L)	<3.0				
	Total Dissolved Solids (mg/L)	<10				
	Turbidity (NTU)	<0.10				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	<1.0				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	<0.020				
	Nitrate (as N) (mg/L)	<0.0050				
	Nitrite (as N) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020				
	Phosphorus (P)-Total (mg/L)	<0.0020				
	Sulfate (SO4) (mg/L)	<0.30				
	Sulphide as S (mg/L)	<0.018				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50				
	Total Organic Carbon (mg/L)	<0.50				
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030				
	Antimony (Sb)-Total (mg/L)	<0.00010				
	Arsenic (As)-Total (mg/L)	<0.00010				
	Barium (Ba)-Total (mg/L)	<0.000050				
	Beryllium (Be)-Total (mg/L)	<0.000020				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				
	Calcium (Ca)-Total (mg/L)	<0.050				
	Cesium (Cs)-Total (mg/L)	<0.000010				
	Chromium (Cr)-Total (mg/L)	<0.00010				
	Cobalt (Co)-Total (mg/L)	<0.00010				
	Copper (Cu)-Total (mg/L)	<0.00050				
	Iron (Fe)-Total (mg/L)	<0.010				
	Lead (Pb)-Total (mg/L)	<0.000050				
	Lithium (Li)-Total (mg/L)	<0.0010				
	Magnesium (Mg)-Total (mg/L)	<0.10				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989851-1 water 09-SEP-17 ELB-9-GLB	L1989851-2 water 09-SEP-17 ELB-DUP-1	L1989851-3 water 09-SEP-17 ELB-10-ML	L1989851-4 water 09-SEP-17 ELB-7-SL	L1989851-5 water 09-SEP-17 ELB-4-ML
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.00073	0.0124	0.00288	0.0138	0.00284	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000310	0.000183	0.000179	0.000189	0.000194	
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.71	0.40	0.42	0.41	0.42	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	1.16	1.00	0.52	1.02	0.52	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	4.04	0.939	0.897	0.963	0.906	
	Strontium (Sr)-Total (mg/L)	0.102	0.0130	0.0123	0.0132	0.0123	
	Sulfur (S)-Total (mg/L)	5.37	<0.50	0.58	<0.50	0.52	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Total (mg/L)	0.000327	0.000132	0.000069	0.000141	0.000068	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0043	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location				FIELD		
	Dissolved Metals Filtration Location				LAB		
	Aluminum (Al)-Dissolved (mg/L)				0.0018		
	Antimony (Sb)-Dissolved (mg/L)				<0.00010		
	Arsenic (As)-Dissolved (mg/L)				0.00017		
	Barium (Ba)-Dissolved (mg/L)				0.00750		
	Beryllium (Be)-Dissolved (mg/L)				<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)				<0.000050		
	Boron (B)-Dissolved (mg/L)				0.012		
	Cadmium (Cd)-Dissolved (mg/L)				<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)				8.90		
	Cesium (Cs)-Dissolved (mg/L)				<0.000010		
	Chromium (Cr)-Dissolved (mg/L)				<0.00010		
	Cobalt (Co)-Dissolved (mg/L)				<0.00010		
	Copper (Cu)-Dissolved (mg/L)				0.00093		
	Iron (Fe)-Dissolved (mg/L)				0.010		
	Lead (Pb)-Dissolved (mg/L)				<0.000050		
	Lithium (Li)-Dissolved (mg/L)				<0.0010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989851-6 water 09-SEP-17 ELB-SW-2	L1989851-7 water 09-SEP-17 ELB-2G-GBL	L1989851-8 water 09-SEP-17 ELB-6-SL	L1989851-9 water 09-SEP-17 ELB-1G-GBL	L1989851-10 water 09-SEP-17 ELB-8-SL
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.0258	0.00093	0.0166	0.00073	0.0127	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000176	0.000324	0.000180	0.000316	0.000199	
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.41	0.73	0.43	0.72	0.42	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	1.00	1.17	1.06	1.17	1.06	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	0.962	4.12	0.978	4.15	0.996	
	Strontium (Sr)-Total (mg/L)	0.0130	0.104	0.0133	0.103	0.0133	
	Sulfur (S)-Total (mg/L)	<0.50	5.49	<0.50	5.60	0.61	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Total (mg/L)	0.000119	0.000369	0.000130	0.000345	0.000135	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	0.0042	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location	LAB			LAB		
	Dissolved Metals Filtration Location	LAB			LAB		
	Aluminum (Al)-Dissolved (mg/L)	0.0025			<0.0010		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010			<0.00010		
	Arsenic (As)-Dissolved (mg/L)	0.00017			0.00019		
	Barium (Ba)-Dissolved (mg/L)	0.00735			0.0232		
	Beryllium (Be)-Dissolved (mg/L)	<0.000020			<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050			<0.000050		
	Boron (B)-Dissolved (mg/L)	0.012			0.011		
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050			<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)	8.76			17.6		
	Cesium (Cs)-Dissolved (mg/L)	<0.000010					
	Chromium (Cr)-Dissolved (mg/L)	<0.00010			<0.00010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00010			<0.00010		
	Copper (Cu)-Dissolved (mg/L)	0.00088			0.00027		
	Iron (Fe)-Dissolved (mg/L)	0.015			<0.010		
	Lead (Pb)-Dissolved (mg/L)	<0.000050			<0.000050		
	Lithium (Li)-Dissolved (mg/L)	<0.0010			0.0034		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989851-11 water 09-SEP-17 ELB-FIELD BLANK				
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	<0.00010					
	Mercury (Hg)-Total (mg/L)	<0.0000050					
	Molybdenum (Mo)-Total (mg/L)	<0.000050					
	Nickel (Ni)-Total (mg/L)	<0.00050					
	Phosphorus (P)-Total (mg/L)	<0.050					
	Potassium (K)-Total (mg/L)	<0.10					
	Selenium (Se)-Total (mg/L)	<0.000050					
	Silicon (Si)-Total (mg/L)	<0.10					
	Silver (Ag)-Total (mg/L)	<0.000010					
	Sodium (Na)-Total (mg/L)	<0.050					
	Strontium (Sr)-Total (mg/L)	<0.00020					
	Sulfur (S)-Total (mg/L)	<0.50					
	Thallium (Tl)-Total (mg/L)	<0.000010					
	Tin (Sn)-Total (mg/L)	<0.00010					
	Titanium (Ti)-Total (mg/L)	<0.00030					
	Uranium (U)-Total (mg/L)	<0.000010					
	Vanadium (V)-Total (mg/L)	<0.00050					
	Zinc (Zn)-Total (mg/L)	<0.0030					
	Zirconium (Zr)-Total (mg/L)	<0.00030					
Dissolved Metals	Dissolved Mercury Filtration Location	LAB					
	Dissolved Metals Filtration Location	LAB					
	Aluminum (Al)-Dissolved (mg/L)	<0.0010					
	Antimony (Sb)-Dissolved (mg/L)	<0.00010					
	Arsenic (As)-Dissolved (mg/L)	<0.00010					
	Barium (Ba)-Dissolved (mg/L)	<0.000050					
	Beryllium (Be)-Dissolved (mg/L)	<0.000020					
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050					
	Boron (B)-Dissolved (mg/L)	<0.010					
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050					
	Calcium (Ca)-Dissolved (mg/L)	<0.050					
	Cesium (Cs)-Dissolved (mg/L)						
	Chromium (Cr)-Dissolved (mg/L)	<0.00010					
	Cobalt (Co)-Dissolved (mg/L)	<0.00010					
	Copper (Cu)-Dissolved (mg/L)	<0.00020					
	Iron (Fe)-Dissolved (mg/L)	<0.010					
	Lead (Pb)-Dissolved (mg/L)	<0.000050					
	Lithium (Li)-Dissolved (mg/L)	<0.0010					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989851-1 water 09-SEP-17 ELB-9-GLB	L1989851-2 water 09-SEP-17 ELB-DUP-1	L1989851-3 water 09-SEP-17 ELB-10-ML	L1989851-4 water 09-SEP-17 ELB-7-SL	L1989851-5 water 09-SEP-17 ELB-4-ML
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)					2.45	
	Manganese (Mn)-Dissolved (mg/L)					<0.00010	
	Mercury (Hg)-Dissolved (mg/L)					<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)					0.000172	
	Nickel (Ni)-Dissolved (mg/L)					<0.00050	
	Phosphorus (P)-Dissolved (mg/L)					<0.050	
	Potassium (K)-Dissolved (mg/L)					0.42	
	Selenium (Se)-Dissolved (mg/L)					<0.000050	
	Silicon (Si)-Dissolved (mg/L)					1.01	
	Silver (Ag)-Dissolved (mg/L)					<0.000010	
	Sodium (Na)-Dissolved (mg/L)					0.992	
	Strontium (Sr)-Dissolved (mg/L)					0.0132	
	Sulfur (S)-Dissolved (mg/L)					<0.50	
	Thallium (Tl)-Dissolved (mg/L)					<0.000010	
	Tin (Sn)-Dissolved (mg/L)					<0.00010	
	Titanium (Ti)-Dissolved (mg/L)					<0.00030	
	Uranium (U)-Dissolved (mg/L)					0.000112	
	Vanadium (V)-Dissolved (mg/L)					<0.00050	
	Zinc (Zn)-Dissolved (mg/L)					<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)					<0.00030	
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				<0.00050	
	Ethylbenzene (mg/L)	<0.00050				<0.00050	
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				<0.00050	
	Styrene (mg/L)	<0.00050				<0.00050	
	Toluene (mg/L)	<0.00045				<0.00045	
	ortho-Xylene (mg/L)	<0.00050				<0.00050	
	meta- & para-Xylene (mg/L)	<0.00050				<0.00050	
	Xylenes (mg/L)	<0.00075				<0.00075	
	F1 (C6-C10) (mg/L)	<0.10				<0.10	
	Surrogate: 4-Bromofluorobenzene (SS) (%)	94.3				100.2	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	99.4				95.0	
Hydrocarbons	F1-BTEX (mg/L)	<0.10				<0.10	
	F2 (C10-C16) (mg/L)	<0.30				<0.30	
	F3 (C16-C34) (mg/L)	<0.30				<0.30	
	F4 (C34-C50) (mg/L)	<0.30				<0.30	
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10				<0.10	
	VPH (C6-C10) (mg/L)	<0.10				<0.10	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1989851-6	L1989851-7	L1989851-8	L1989851-9	L1989851-10
		Description	water	water	water	water	water
		Sampled Date	09-SEP-17	09-SEP-17	09-SEP-17	09-SEP-17	09-SEP-17
		Sampled Time					
		Client ID	ELB-SW-2	ELB-2G-GBL	ELB-6-SL	ELB-1G-GBL	ELB-8-SL
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	2.47				7.43	
	Manganese (Mn)-Dissolved (mg/L)	0.00014				<0.00010	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	0.000162				0.000289	
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				<0.00050	
	Phosphorus (P)-Dissolved (mg/L)	<0.050				<0.050	
	Potassium (K)-Dissolved (mg/L)	0.44				0.77	
	Selenium (Se)-Dissolved (mg/L)	<0.000050				<0.000050	
	Silicon (Si)-Dissolved (mg/L)	0.974				1.13	
	Silver (Ag)-Dissolved (mg/L)	<0.000010				<0.000010	
	Sodium (Na)-Dissolved (mg/L)	0.988				4.24	
	Strontium (Sr)-Dissolved (mg/L)	0.0126				0.104	
	Sulfur (S)-Dissolved (mg/L)	<0.50				5.06	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				<0.000010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010				<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				<0.00030	
	Uranium (U)-Dissolved (mg/L)	0.000093				0.000340	
	Vanadium (V)-Dissolved (mg/L)	<0.00050				<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0010				<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				<0.00030	
Volatile Organic Compounds	Benzene (mg/L)			<0.00050		<0.00050	
	Ethylbenzene (mg/L)			<0.00050		<0.00050	
	Methyl t-butyl ether (MTBE) (mg/L)			<0.00050		<0.00050	
	Styrene (mg/L)			<0.00050		<0.00050	
	Toluene (mg/L)			<0.00045		<0.00045	
	ortho-Xylene (mg/L)			<0.00050		<0.00050	
	meta- & para-Xylene (mg/L)			<0.00050		<0.00050	
	Xylenes (mg/L)			<0.00075		<0.00075	
	F1 (C6-C10) (mg/L)			<0.10		<0.10	
	Surrogate: 4-Bromofluorobenzene (SS) (%)			94.6		93.7	
	Surrogate: 1,4-Difluorobenzene (SS) (%)			97.1		94.8	
Hydrocarbons	F1-BTEX (mg/L)			<0.10		<0.10	
	F2 (C10-C16) (mg/L)			<0.30		<0.30	
	F3 (C16-C34) (mg/L)			<0.30		<0.30	
	F4 (C34-C50) (mg/L)			<0.30		<0.30	
	Volatile Hydrocarbons (VH6-10) (mg/L)			<0.10		<0.10	
	VPH (C6-C10) (mg/L)			<0.10		<0.10	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989851-11 water 09-SEP-17 ELB-FIELD BLANK				
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	<0.10				
	Manganese (Mn)-Dissolved (mg/L)	<0.00010				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	<0.10				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	<0.050				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	<0.050				
	Strontium (Sr)-Dissolved (mg/L)	<0.00020				
	Sulfur (S)-Dissolved (mg/L)	<0.50				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	<0.000010				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0010				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				
Volatile Organic Compounds	Benzene (mg/L)					
	Ethylbenzene (mg/L)					
	Methyl t-butyl ether (MTBE) (mg/L)					
	Styrene (mg/L)					
	Toluene (mg/L)					
	ortho-Xylene (mg/L)					
	meta- & para-Xylene (mg/L)					
	Xylenes (mg/L)					
	F1 (C6-C10) (mg/L)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	F1-BTEX (mg/L)					
	F2 (C10-C16) (mg/L)					
	F3 (C16-C34) (mg/L)					
	F4 (C34-C50) (mg/L)					
	Volatile Hydrocarbons (VH6-10) (mg/L)					
	VPH (C6-C10) (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1989851-1	L1989851-2	L1989851-3	L1989851-4	L1989851-5
		Description	water	water	water	water	water
		Sampled Date	09-SEP-17	09-SEP-17	09-SEP-17	09-SEP-17	09-SEP-17
		Sampled Time					
		Client ID	ELB-9-GLB	ELB-DUP-1	ELB-10-ML	ELB-7-SL	ELB-4-ML
Grouping	Analyte						
WATER							
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)	90.4				95.6	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	90.1				129.6	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1989851-6	L1989851-7	L1989851-8	L1989851-9	L1989851-10
		Description	water	water	water	water	water
		Sampled Date	09-SEP-17	09-SEP-17	09-SEP-17	09-SEP-17	09-SEP-17
		Sampled Time					
		Client ID	ELB-SW-2	ELB-2G-GBL	ELB-6-SL	ELB-1G-GBL	ELB-8-SL
Grouping	Analyte						
WATER							
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)			92.7		99.2	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)			110.8		82.5	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989851-11 water 09-SEP-17 ELB-FIELD BLANK				
Grouping	Analyte					
WATER						
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%) Surrogate: 3,4-Dichlorotoluene (SS) (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1989851-8
Matrix Spike	Total Organic Carbon	MS-B	L1989851-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L1989851-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L1989851-11
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1989851-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Total	MS-B	L1989851-11
Matrix Spike	Sodium (Na)-Total	MS-B	L1989851-11
Matrix Spike	Strontium (Sr)-Total	MS-B	L1989851-11
Matrix Spike	Ammonia, Total (as N)	MS-B	L1989851-10, -11, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
F1-BTX-CALC-VA	Water	F1-Total BTX	CCME CWS PHC TIER 1 (2001)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID. The F1-BTEX result is calculated as follows:			
F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).			
F1-HSFID-VA	Water	CCME F1 By Headspace with GCFID	EPA 5021A/CCME CWS PHC (Pub# 1310)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.			

Reference Information

F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.

F2-F4-ME-FID-VA Water CCME F2-F4 Hydrocarbons in Water CCME CWS-PHC, Pub #1310, Dec 2001
 F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.

HARDNESS-CALC-VA Water Hardness APHA 2340B
 Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)
 Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)
 Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)
 Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)
 Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
 This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)
 Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)
 Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus
 This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
 Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorus
 This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
 Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value
 This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

S2-T-COL-VA Water Total Sulphide by Colorimetric APHA 4500-S2 Sulphide
 This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)
 Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VH-HSFID-VA Water VH in Water by Headspace GCFID BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA Water VH Surrogates for Waters BC Env. Lab Manual (VH in Solids)

VOC7-HSMS-VA Water BTEX/MTBE/Styrene by Headspace GCMS EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA Water VOC7 and/or VOC Surrogates for Waters EPA 5035A/5021A/8260C

VPH-CALC-VA Water VPH is VH minus select aromatics BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water". The concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and, in solids, Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10).

XYLENES-CALC-VA Water Sum of Xylene Isomer Concentrations CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
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VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
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Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

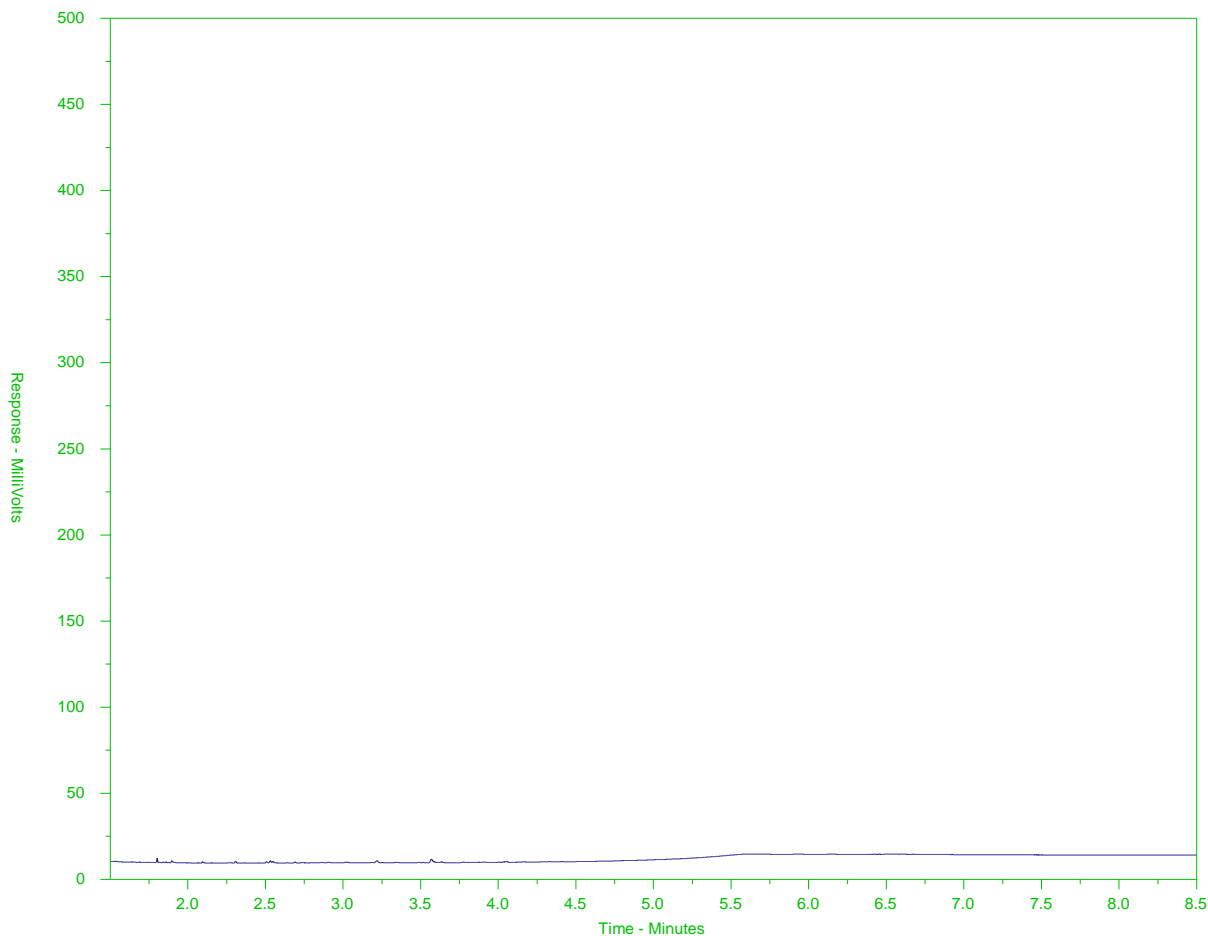
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989851-C-1
Client Sample ID: ELB-9-GLB



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

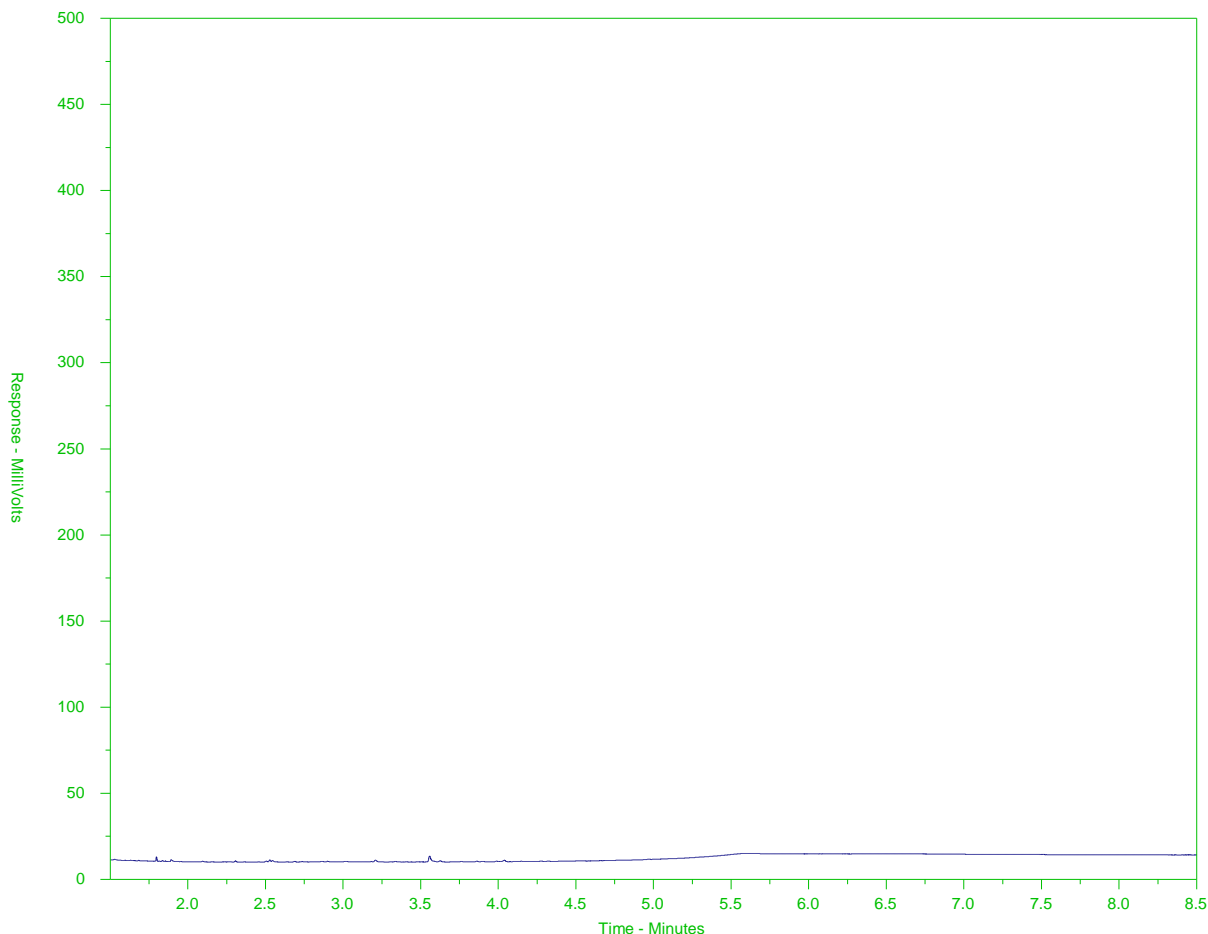
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989851-C-4
Client Sample ID: ELB-7-SL



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

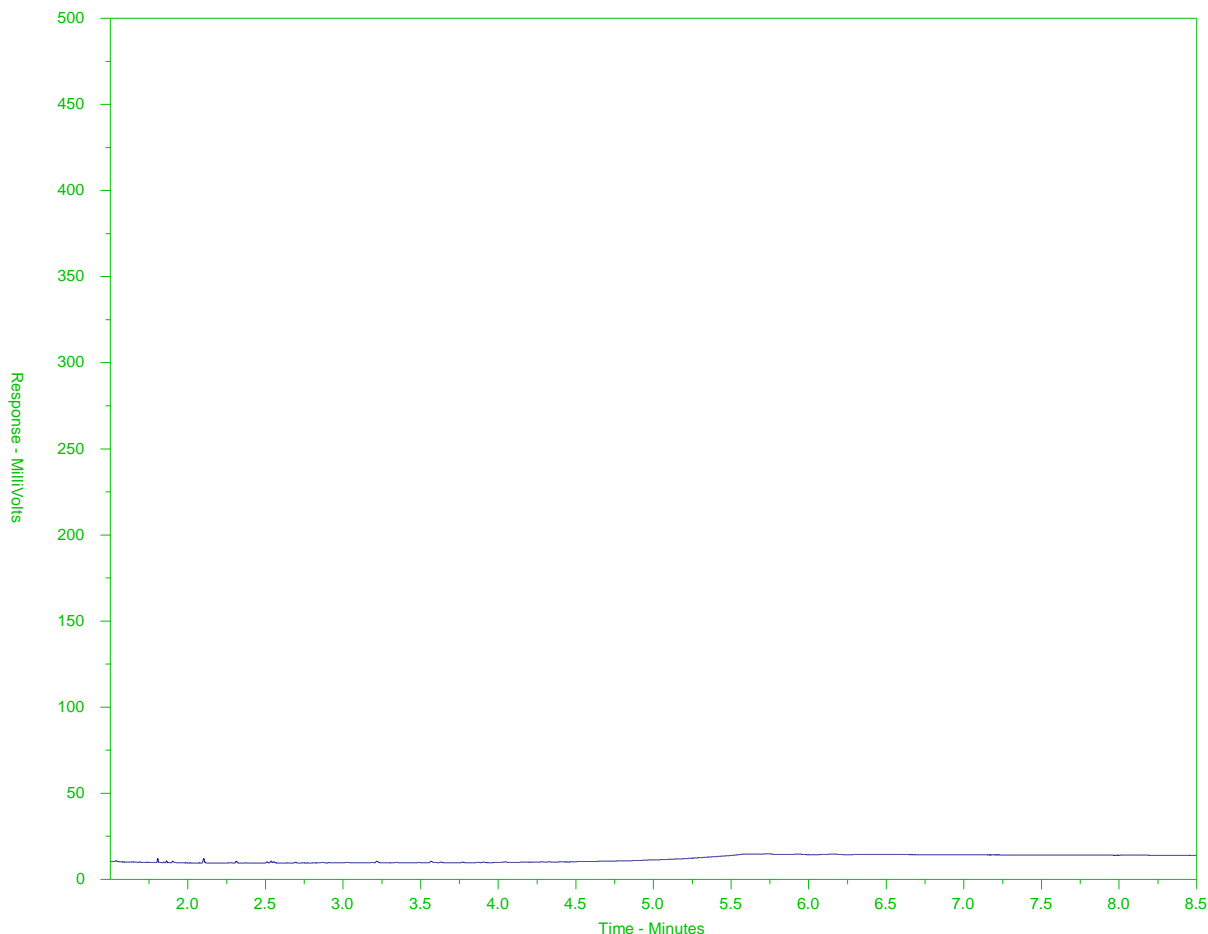
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989851-C-7
Client Sample ID: ELB-2G-GBL



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

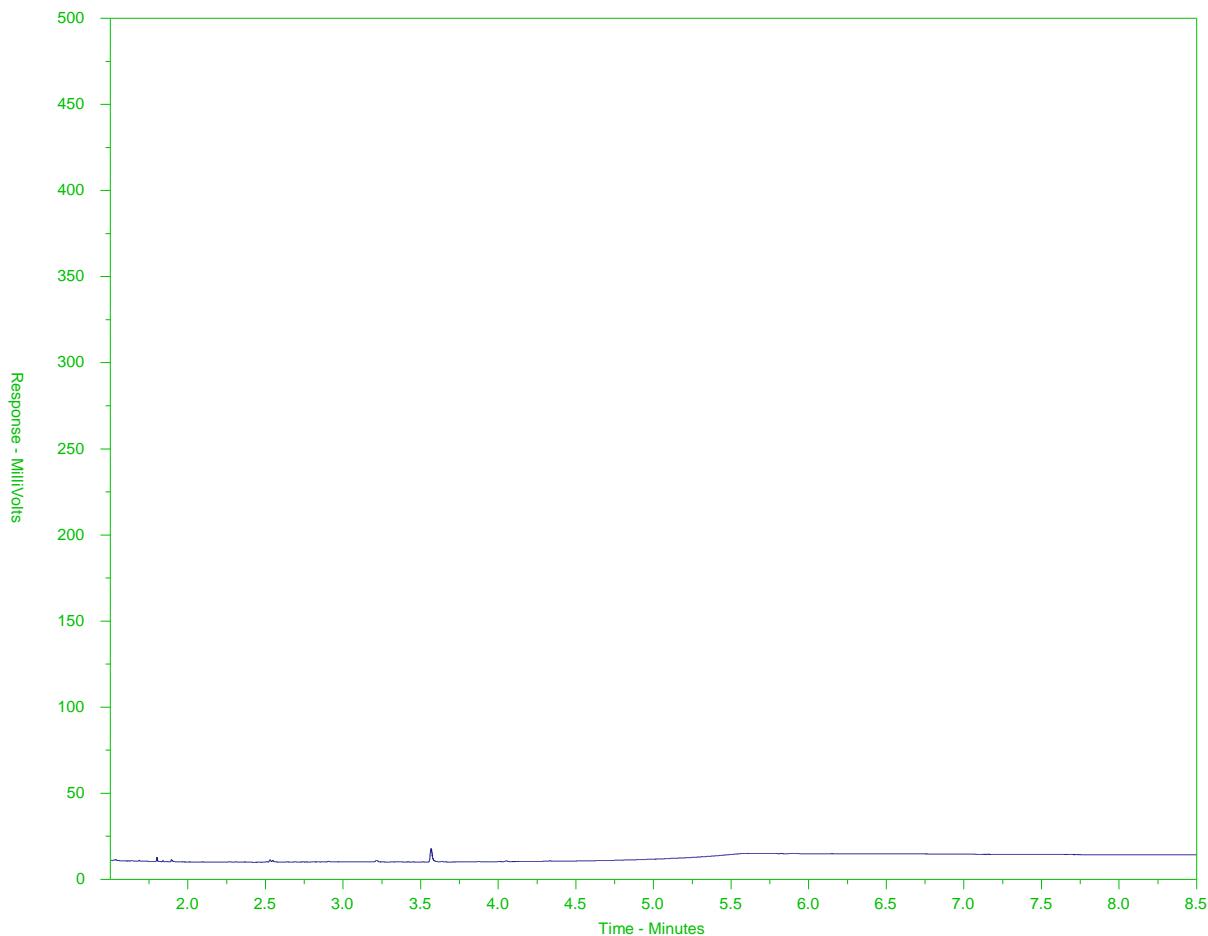
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989851-C-9
Client Sample ID: ELB-1G-GBL



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

Report To			Report Format / Distribution						Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)																	
Company: Public Services and Procurement Canada			Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)						R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)																	
Contact: Rebecca Studer-Halbach			Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No						P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT																	
Address: 10025 Jasper Avenue Edmonton, AB T5J 1S6			Criteria on Report - provide details below if box checked						E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT																	
Phone: (788) 497-3761			Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX						E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge																	
			Email 1 or Fax rebecca.studer-halbach@pwgsc.ca						Specify Date Required for E2,E or P:																	
			Email 2 claire.brown@dxbbprojects.ca						Analysis Request																	
Invoice To Same as Report To <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			Invoice Distribution						Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																	
Copy of Invoice with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																							
Company: Public Services and Procurement Canada			Email 1 or Fax rebecca.studer-halbach@pwgsc.ca																							
Contact: Rebecca Studer-Halbach			Email 2																							
Project Information			Oil and Gas Required Fields (client use)																							
ALS Quote #: Q64064			Approver ID:			Cost Center:																				
Job #:			GL Account:			Routing Code:																				
PO / AFE: R.015211.049			Activity Code:																							
LSD:			Location:																							
ALS Lab Work Order # (lab use only) L1989851			ALS Contact: Joanne Lee and Rick Zolkiewski			Sampler:																				
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Routine and per Q64064	Total Metals per Q64064	Total Mercury per Q64064	Dissolved Metals per Q64064	Dissolved Mercury per Q64064	PHC F2-F4 per Q64064	BTEX, F1 per Q64064	Radionuclides Pb-210 and Ra-226 per Q64064	NAPL per Q64064	Oil and Grease per Q64064	Number of Containers										
1	ELB-9-GBL		✓ 09-Sep-17		Water	R	R	R			R	R				11										
2	ELB-DUP-1		✓ 09-Sep-17		Water	R	R	R								7										
3	ELB-10-ML		✓ 09-Sep-17		Water	R	R	R								7										
4	ELB-7-SL		✓ 09-Sep-17		Water	R	R	R	R	R	R	R				13										
5	ELB-4-ML		✓ 09-Sep-17		Water	R	R	R								7										
6	ELB-SW-2		✓ 09-Sep-17		Water	R	R	R	R	R						9										
7	ELB-2G-GBL		✓ 09-Sep-17		Water	R	R	R			R	R				11										
8	ELB-6-SL		✓ 09-Sep-17		Water	R	R	R								7										
9	ELB-1G-GBL		✓ 09-Sep-17		Water	R	R	R	R	R	R	R				13										
10	ELB-8-SL		✓ 09-Sep-17		Water	R	R	R								7										
11	ELB-Field Blank		✓ 09-Sep-17		Water	R	R	R	R	R						9										
12	ELB-Trip Blank		✓ 09-Sep-17	HOLD for analysis	Water											11										
Drinking Water (DW) Samples¹ (client use)			Special Instructions / Specify Criteria to add on report (client Use)						SAMPLE CONDITION AS RECEIVED (lab use only)																	
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			PLEASE NOTE: This project references "routine" parameters as presented in Q64064: pH, conductivity, alkalinity, turbidity, TDS, TSS, Ammonia, Nitrate/Nitrite, total phosphorus, dissolved phosphorus, dissolved organic carbon, total organic carbon, total Hardness, calcium, magnesium, potassium, sodium, sulphate, sulphide, chloride. ALSO, please note total and dissolved metals parameters must meet detection limits of Q64064.						Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>																	
Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No									Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>																	
									Cooling Initiated <input type="checkbox"/>																	
SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)						FINAL SHIPMENT RECEPTION (lab use only)																	
Released by: [Signature]			Date: Sep 11/17			Time: 8:00am			Received by: AT			Date: 12-Sep-17			Time: 10:00			Received by:			Date:			Time:		

REFER TO BACK PAGE FOR AIS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326e v09 Front04 January 2011

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**.



PUBLIC WORKS AND GOVERNMENT
SERVICES CANADA
ATTN: Rebecca Studer-Halbach
Northern Contaminated Sites
10025 Jasper Avenue NW
Edmonton AB T5J 1S6

Date Received: 12-SEP-17
Report Date: 25-OCT-17 19:46 (MT)
Version: FINAL REV. 3

Client Phone: 780-497-3761

Certificate of Analysis

Lab Work Order #: L1989938
Project P.O. #: R.015211.049
Job Reference:
C of C Numbers:
Legal Site Desc:

Comments: 25-OCT-2017 Dissolved Cs has been added.

Dean Watt, B.Sc.
Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989938-1 water 10-SEP-17 SM-1	L1989938-2 water 10-SEP-17 SM-2	L1989938-3 water 10-SEP-17 SM-6-1M	L1989938-4 water 10-SEP-17 SM-6-4M	
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	119	112	113	114	
	Hardness (as CaCO3) (mg/L)	56.0	54.8 ^{HTC}	53.5 ^{HTC}	56.6 ^{HTC}	
	pH (pH)	7.83	7.83	7.86	7.82	
	Total Suspended Solids (mg/L)	<3.0	3.2	<3.0	<3.0	
	Total Dissolved Solids (mg/L)	76	70	75	83	
	Turbidity (NTU)	0.61	0.50	0.57	0.52	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	42.4	42.6	43.1	42.8	
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0160	<0.0050	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	
	Fluoride (F) (mg/L)	0.261	0.260	0.259	0.263	
	Nitrate (as N) (mg/L)	0.0073	<0.0050	<0.0050	<0.0050	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0026	0.0023	0.0025	0.0024	
	Phosphorus (P)-Total (mg/L)	0.0026	0.0084	0.0030	0.0022	
	Sulfate (SO4) (mg/L)	17.7	13.2	13.1	15.0	
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	6.49	6.65	6.62	6.53	
	Total Organic Carbon (mg/L)	6.62	6.81	6.64	6.68	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0143	0.0158	0.0181	0.0179	
	Antimony (Sb)-Total (mg/L)	0.00012	0.00016	0.00010	0.00011	
	Arsenic (As)-Total (mg/L)	0.00049	0.00054	0.00048	0.00057	
	Barium (Ba)-Total (mg/L)	0.00648	0.00711	0.00671	0.00780	
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Total (mg/L)	<0.000050	0.000060	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	0.010	0.011	0.011	0.011	
	Cadmium (Cd)-Total (mg/L)	0.000102	0.0000192	0.0000125	0.0000435	
	Calcium (Ca)-Total (mg/L)	16.3	15.1	14.9	15.6	
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	0.00011	<0.00010	
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00012	
	Copper (Cu)-Total (mg/L)	0.00154	0.00168	0.00157	0.00174	
	Iron (Fe)-Total (mg/L)	0.020	0.023	0.023	0.027	
	Lead (Pb)-Total (mg/L)	<0.000050	0.000062	<0.000050	0.000061	
	Lithium (Li)-Total (mg/L)	0.0011	<0.0010	0.0011	0.0011	
	Magnesium (Mg)-Total (mg/L)	4.09	4.13	3.96	4.31	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989938-1 water 10-SEP-17 SM-1	L1989938-2 water 10-SEP-17 SM-2	L1989938-3 water 10-SEP-17 SM-6-1M	L1989938-4 water 10-SEP-17 SM-6-4M	
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.0105	0.0112	0.0111	0.0144		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.00110	0.00109	0.00107	0.00110		
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	0.64	0.68	0.66	0.68		
	Selenium (Se)-Total (mg/L)	0.000064	0.000116	0.000073	0.000087		
	Silicon (Si)-Total (mg/L)	0.62	0.58	0.57	0.58		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	2.52	2.62	2.51	2.71		
	Strontium (Sr)-Total (mg/L)	0.0285	0.0272	0.0267	0.0275		
	Sulfur (S)-Total (mg/L)	6.57	4.66	4.69	5.62		
	Thallium (Tl)-Total (mg/L)	<0.000010	0.000054	<0.000010	<0.000010		
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030		
	Uranium (U)-Total (mg/L)	0.000321	0.000300	0.000305	0.000316		
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)	0.0827	0.0146	0.0170	0.0381		
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030		
Dissolved Metals	Dissolved Mercury Filtration Location	LAB					
	Dissolved Metals Filtration Location	LAB					
	Aluminum (Al)-Dissolved (mg/L)	0.0052					
	Antimony (Sb)-Dissolved (mg/L)	<0.00010					
	Arsenic (As)-Dissolved (mg/L)	0.00045					
	Barium (Ba)-Dissolved (mg/L)	0.00627					
	Beryllium (Be)-Dissolved (mg/L)	<0.000020					
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050					
	Boron (B)-Dissolved (mg/L)	0.011					
	Cadmium (Cd)-Dissolved (mg/L)	0.0000724					
	Calcium (Ca)-Dissolved (mg/L)	15.5					
	Cesium (Cs)-Dissolved (mg/L)	<0.000010					
	Chromium (Cr)-Dissolved (mg/L)	<0.00010					
	Cobalt (Co)-Dissolved (mg/L)	<0.00010					
	Copper (Cu)-Dissolved (mg/L)	0.00139					
	Iron (Fe)-Dissolved (mg/L)	<0.010					
	Lead (Pb)-Dissolved (mg/L)	<0.000050					
	Lithium (Li)-Dissolved (mg/L)	0.0015					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989938-1 water 10-SEP-17 SM-1	L1989938-2 water 10-SEP-17 SM-2	L1989938-3 water 10-SEP-17 SM-6-1M	L1989938-4 water 10-SEP-17 SM-6-4M	
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	4.17					
	Manganese (Mn)-Dissolved (mg/L)	0.00013					
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050					
	Molybdenum (Mo)-Dissolved (mg/L)	0.00107					
	Nickel (Ni)-Dissolved (mg/L)	<0.00050					
	Phosphorus (P)-Dissolved (mg/L)	<0.050					
	Potassium (K)-Dissolved (mg/L)	0.72					
	Selenium (Se)-Dissolved (mg/L)	0.000051					
	Silicon (Si)-Dissolved (mg/L)	0.545					
	Silver (Ag)-Dissolved (mg/L)	<0.000010					
	Sodium (Na)-Dissolved (mg/L)	2.68					
	Strontium (Sr)-Dissolved (mg/L)	0.0277					
	Sulfur (S)-Dissolved (mg/L)	5.62					
	Thallium (Tl)-Dissolved (mg/L)	<0.000010					
	Tin (Sn)-Dissolved (mg/L)	<0.00010					
	Titanium (Ti)-Dissolved (mg/L)	<0.00030					
	Uranium (U)-Dissolved (mg/L)	0.000305					
	Vanadium (V)-Dissolved (mg/L)	<0.00050					
	Zinc (Zn)-Dissolved (mg/L)	0.0612					
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030					
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050				
	Ethylbenzene (mg/L)	<0.00050	<0.00050				
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050				
	Styrene (mg/L)	<0.00050	<0.00050				
	Toluene (mg/L)	<0.00045	<0.00045				
	ortho-Xylene (mg/L)	<0.00050	<0.00050				
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050				
	Xylenes (mg/L)	<0.00075	<0.00075				
	F1 (C6-C10) (mg/L)	<0.10	<0.10				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	97.0	101.5				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	91.9	93.4				
Hydrocarbons	F1-BTEX (mg/L)	<0.10	<0.10				
	F2 (C10-C16) (mg/L)	<0.30	<0.30				
	F3 (C16-C34) (mg/L)	<0.30	<0.30				
	F4 (C34-C50) (mg/L)	<0.30	<0.30				
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10				
	VPH (C6-C10) (mg/L)	<0.10	<0.10				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

		Sample ID				
		Description				
		Sampled Date				
		Sampled Time				
		Client ID				
Grouping	Analyte					
WATER						
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)	94.8	91.9			
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	113.1	90.2			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L1989938-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L1989938-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1989938-1, -2, -3, -4
Matrix Spike	Ammonia, Total (as N)	MS-B	L1989938-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
F1-BTX-CALC-VA	Water	F1-Total BTX	CCME CWS PHC TIER 1 (2001)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID. The F1-BTEX result is calculated as follows:			
F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).			
F1-HSFID-VA	Water	CCME F1 By Headspace with GCFID	EPA 5021A/CCME CWS PHC (Pub# 1310)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.			
F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.			
F2-F4-ME-FID-VA	Water	CCME F2-F4 Hydrocarbons in Water	CCME CWS-PHC, Pub #1310, Dec 2001
F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.			
		Hardness	APHA 2340B

Reference Information

HARDNESS-CALC-VA Water

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Weston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

S2-T-COL-VA Water Total Sulphide by Colorimetric APHA 4500-S2 Sulphide

This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

Reference Information

Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VH-HSFID-VA Water VH in Water by Headspace GCFID BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA Water VH Surrogates for Waters BC Env. Lab Manual (VH in Solids)

VOC7-HSMS-VA Water BTEX/MTBE/Styrene by Headspace GCMS EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA Water VOC7 and/or VOC Surrogates for Waters EPA 5035A/5021A/8260C

VPH-CALC-VA Water VPH is VH minus select aromatics BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water". The concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and, in solids, Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10).

XYLENES-CALC-VA Water Sum of Xylene Isomer Concentrations CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
----------------------------	---------------------

VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
----	---

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg ww - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

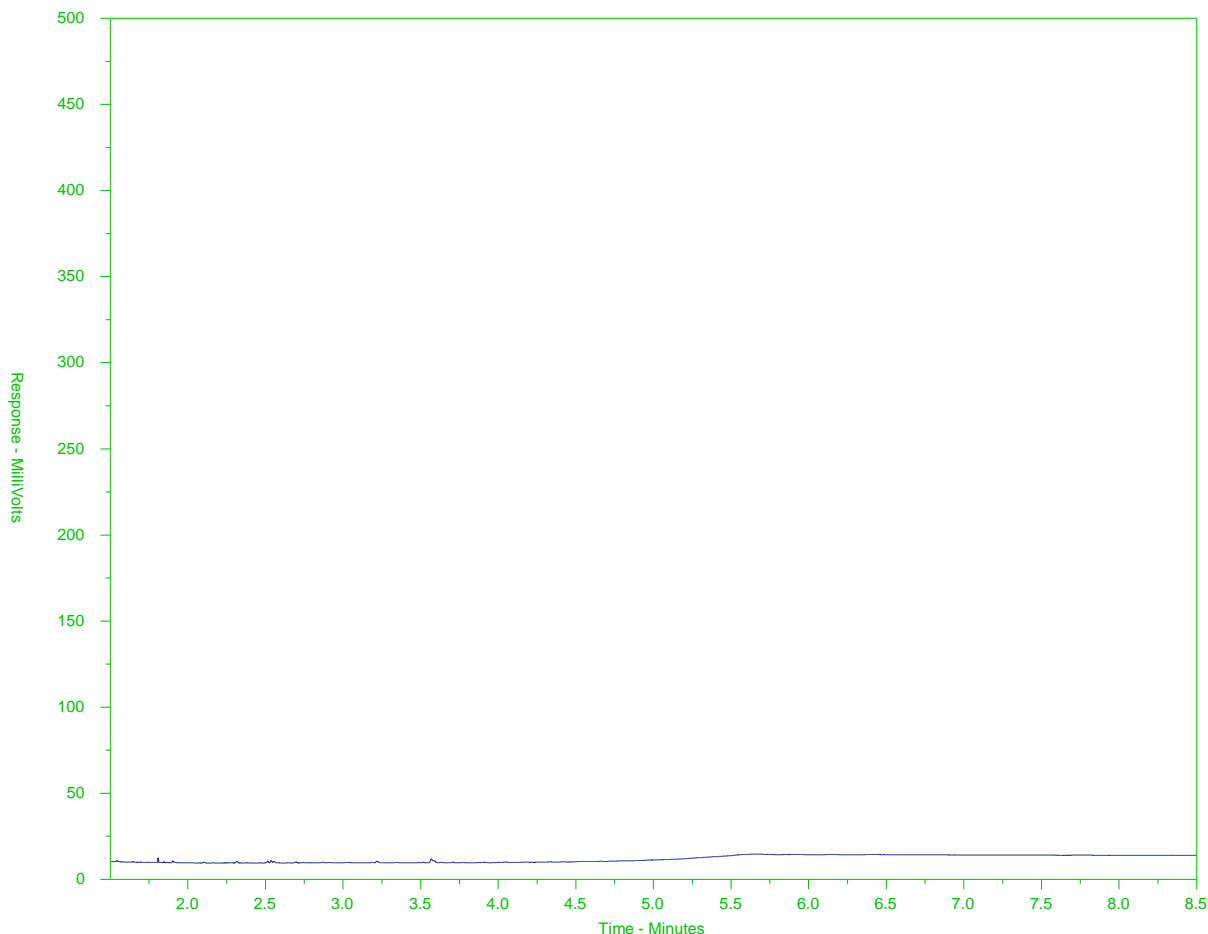
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989938-C-1
Client Sample ID: SM-1



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

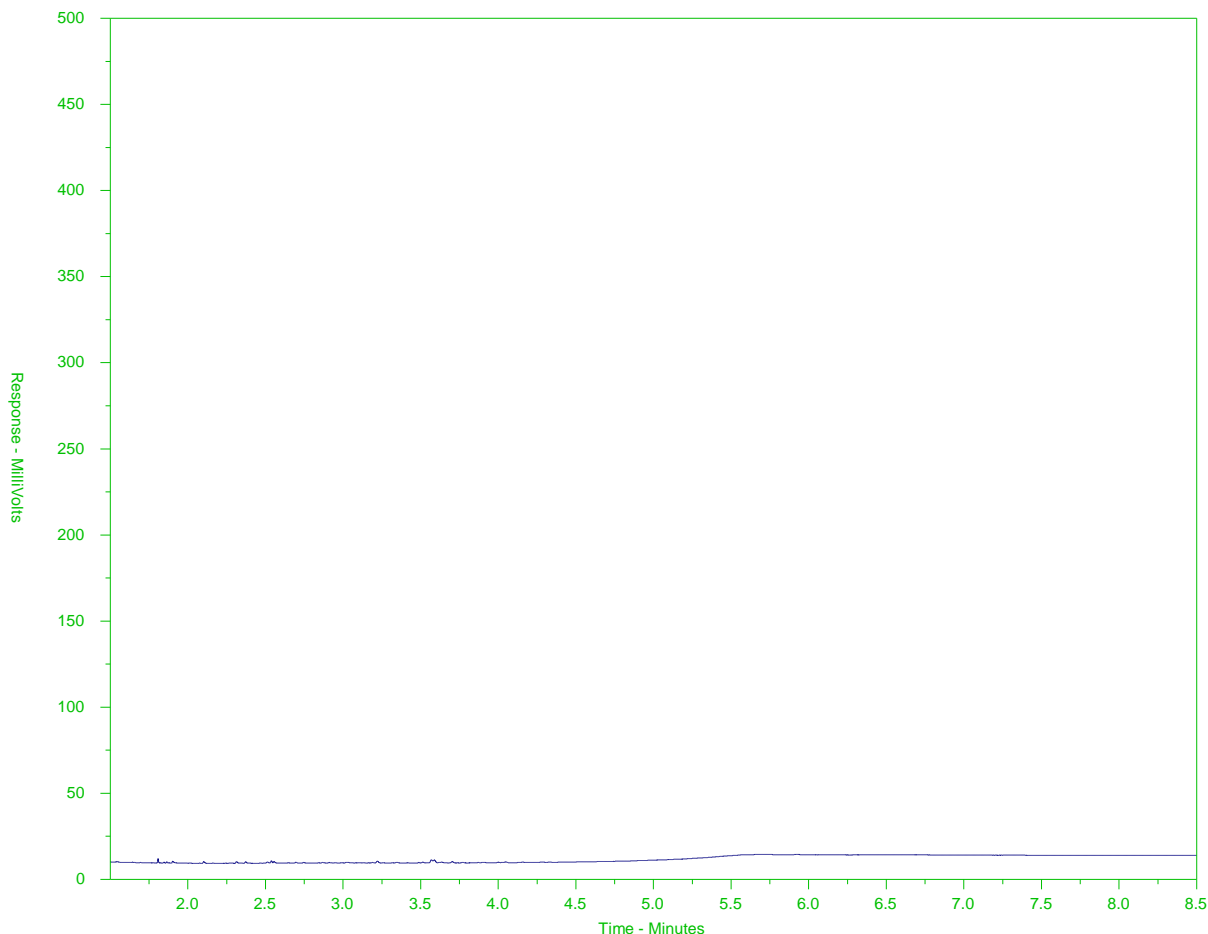
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989938-C-2
Client Sample ID: SM-2



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

[illegible]



PUBLIC WORKS AND GOVERNMENT
SERVICES CANADA
ATTN: Rebecca Studer-Halbach
Northern Contaminated Sites
10025 Jasper Avenue NW
Edmonton AB T5J 1S6

Date Received: 12-SEP-17
Report Date: 13-NOV-17 15:09 (MT)
Version: FINAL

Client Phone: 780-497-3761

Certificate of Analysis

Lab Work Order #: L1989985
Project P.O. #: R.015211.049
Job Reference:
C of C Numbers:
Legal Site Desc:

Dean Watt, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1989985-1	L1989985-2	L1989985-3	L1989985-4	L1989985-6
		Description	water	water	water	water	water
		Sampled Date	09-SEP-17	09-SEP-17	09-SEP-17	09-SEP-17	09-SEP-17
		Sampled Time					
		Client ID	CL-26	CL-DUP-1	CL-6-2M	CL-6-10M	CL-2
Grouping	Analyte						
MISC.							
Radiological Parameters	Pb-210 (Bq/L)		<0.023	<0.027	<0.024	<0.024	0.35
	Ra-226 (Bq/L)		<0.0076	0.029	<0.0068	<0.0060	0.29

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1989985-7	L1989985-8	L1989985-10	L1989985-11	L1989985-13
		Description	water	water	water	water	water
		Sampled Date	09-SEP-17	09-SEP-17	09-SEP-17	10-SEP-17	10-SEP-17
		Sampled Time					
		Client ID	CL-15	CL-5	CL-2B	CL-RL-1B	CL-8
Grouping	Analyte						
MISC.							
Radiological Parameters	Pb-210 (Bq/L)		<0.028	<0.024	<0.025	<0.023	<0.026
	Ra-226 (Bq/L)		0.049	<0.0073	0.030	0.0052	<0.0063

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1989985-14	L1989985-18	L1989985-19	L1989985-22	
		Description	water	water	water	water	
		Sampled Date	10-SEP-17	10-SEP-17	10-SEP-17	10-SEP-17	
		Sampled Time					
		Client ID	CL-7-1M	CL-3	CL-DUP-2	CL-FIELD BLANK	
Grouping	Analyte						
MISC.							
Radiological Parameters	Pb-210 (Bq/L)		<0.031	<0.026	<0.025	<0.024	
	Ra-226 (Bq/L)		<0.0080	0.077	0.086	<0.0049	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989985-1 water 09-SEP-17 CL-26	L1989985-2 water 09-SEP-17 CL-DUP-1	L1989985-3 water 09-SEP-17 CL-6-2M	L1989985-4 water 09-SEP-17 CL-6-10M	L1989985-5 water 09-SEP-17 CL-24
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	48.0	221	44.9	43.7	44.3 ^{HTC}
	Hardness (as CaCO3) (mg/L)	22.9	126	22.3	21.8	20.3
	pH (pH)	7.23	8.19	7.55	7.56	7.58
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	28	142	23	27	26
	Turbidity (NTU)	0.24	0.31	0.26	0.25	0.31
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	24.3	122	23.1	22.7	22.7
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0076	<0.0050	<0.0050	0.0066
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.097	0.262	0.097	0.094	0.096
	Nitrate (as N) (mg/L)	0.0272	0.0304	0.0278	0.0471	0.0269
	Nitrite (as N) (mg/L)	0.0011	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	0.0024	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Sulfate (SO4) (mg/L)	1.08	5.88	1.08	1.09	1.09
	Sulphide as S (mg/L)	<0.018 ^{HTD}	<0.018 ^{HTD}	<0.018 ^{HTD}	<0.018 ^{HTD}	<0.018 ^{HTD}
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.23 ^{HTD}	8.02 ^{HTD}	2.28 ^{HTD}	2.16 ^{HTD}	2.30 ^{HTD}
	Total Organic Carbon (mg/L)	2.65	8.34	2.51	2.26	2.33
Total Metals	Aluminum (Al)-Total (mg/L)	0.0033	0.0059	0.0042	0.0031	0.0054
	Antimony (Sb)-Total (mg/L)	<0.00010	0.00028	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00015	0.00966	0.00014	0.00014	0.00014
	Barium (Ba)-Total (mg/L)	0.00354	0.0188	0.00357	0.00359	0.00344
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	0.028	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	4.85	28.2	4.81	4.82	4.78
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00025	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00069	0.00520	0.00076	0.00068	0.00073
	Iron (Fe)-Total (mg/L)	<0.010	0.036	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	0.0029	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	2.01	10.0	1.99	2.02	2.02

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989985-6 water 09-SEP-17 CL-2	L1989985-7 water 09-SEP-17 CL-15	L1989985-8 water 09-SEP-17 CL-5	L1989985-9 water 09-SEP-17 CL-9	L1989985-10 water 09-SEP-17 CL-2B
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	213	244 ^{HTC}	47.4	47.4 ^{HTC}	223
	Hardness (as CaCO3) (mg/L)	106	125 ^{HTC}	24.5	22.9 ^{HTC}	122
	pH (pH)	8.17	8.28	7.60	7.61	8.19
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	3.1
	Total Dissolved Solids (mg/L)	132	144	31	29	144
	Turbidity (NTU)	1.26	0.16	0.31	0.28	0.35
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	105	129	24.2	24.6	123
	Ammonia, Total (as N) (mg/L)	0.0073	<0.0050	<0.0050	0.0078	0.0092
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.300	0.339	0.098	0.099	0.262
	Nitrate (as N) (mg/L)	0.103	<0.0050	0.0267	0.0271	0.0296
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0075 ^{RRV}	0.0029	<0.0020	<0.0020	0.0023
	Phosphorus (P)-Total (mg/L)	0.0053 ^{RRV}	0.0150	<0.0020	<0.0020	<0.0020
	Sulfate (SO4) (mg/L)	14.7	8.97	1.15	1.43	5.88
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	5.58 ^{HTD}	4.71 ^{HTD}	2.24 ^{HTD}	2.20 ^{HTD}	7.64 ^{HTD}
	Total Organic Carbon (mg/L)	5.45	5.16	2.64	2.46	7.80
Total Metals	Aluminum (Al)-Total (mg/L)	0.0199	0.0048	0.0053	0.0040	0.0061
	Antimony (Sb)-Total (mg/L)	0.00356	0.00159	<0.00010	<0.00010	0.00027
	Arsenic (As)-Total (mg/L)	0.0956	0.0424	0.00025	0.00014	0.00958
	Barium (Ba)-Total (mg/L)	0.0537	0.0117	0.00403	0.00369	0.0187
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	0.00159	0.000131	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.051	0.038	<0.010	<0.010	0.027
	Cadmium (Cd)-Total (mg/L)	0.0000066	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	29.2	33.3	5.37	5.40	28.9
	Cesium (Cs)-Total (mg/L)	0.000023	0.000013	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00012	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	0.00230	<0.00010	<0.00010	<0.00010	0.00024
	Copper (Cu)-Total (mg/L)	0.122	0.0431	0.00079	0.00071	0.00575
	Iron (Fe)-Total (mg/L)	0.168	<0.010	<0.010	<0.010	0.036
	Lead (Pb)-Total (mg/L)	0.000685	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0043	0.0028	<0.0010	<0.0010	0.0029
	Magnesium (Mg)-Total (mg/L)	7.94	10.1	2.19	2.28	10.4

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989985-11 water 10-SEP-17 CL-RL-1B	L1989985-12 water 10-SEP-17 R-3	L1989985-13 water 10-SEP-17 CL-8	L1989985-14 water 10-SEP-17 CL-7-1M	L1989985-15 water 10-SEP-17 CL-20
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	64.5	75.0	43.6	155	157
	Hardness (as CaCO3) (mg/L)	30.1 ^{HTC}	38.8	20.2 ^{HTC}	74.6	68.4 ^{HTC}
	pH (pH)	7.69	7.75	7.56	7.99	8.00
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	42	61	28	88	90
	Turbidity (NTU)	0.23	0.64	0.27	0.28	0.38
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	30.3	36.8	22.8	59.7	60.4
	Ammonia, Total (as N) (mg/L)	0.0098	0.0057	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	0.53	<0.50	4.83	4.82
	Fluoride (F) (mg/L)	0.209	0.131	0.097	0.080	0.080
	Nitrate (as N) (mg/L)	0.172	<0.0050	0.0311	0.125	0.125
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0021	0.0026	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0022	0.0048	<0.0020	<0.0020	<0.0020
	Sulfate (SO4) (mg/L)	1.84	2.41	1.09	14.9	14.9
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	4.40 ^{HTD}	7.31 ^{HTD}	2.23 ^{HTD}	1.96 ^{HTD}	1.96 ^{HTD}
	Total Organic Carbon (mg/L)	4.55	7.77	2.12	2.02	1.93
Total Metals	Aluminum (Al)-Total (mg/L)	0.0090	0.0077	0.0030	0.0127	0.0141
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00017	0.00067	0.00015	0.00024	0.00020
	Barium (Ba)-Total (mg/L)	0.00492	0.00565	0.00365	0.0219	0.0217
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	0.010	<0.010	0.010	0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	7.00	9.57	4.79	16.0	15.9
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00149	0.00119	0.00072	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	0.012	<0.010	0.014	0.015
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	0.0013	<0.0010	0.0031	0.0031
	Magnesium (Mg)-Total (mg/L)	3.07	2.73	2.01	6.99	7.00

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989985-16 water 10-SEP-17 CL-16-2M	L1989985-17 water 10-SEP-17 CL-16-10M	L1989985-18 water 10-SEP-17 CL-3	L1989985-19 water 10-SEP-17 CL-DUP-2	L1989985-20 water 10-SEP-17 CL-29
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	157	155	238	238	239
	Hardness (as CaCO3) (mg/L)	68.6 ^{HTC}	69.3 ^{HTC}	128	128	122 ^{HTC}
	pH (pH)	7.99	7.99	8.25	8.26	8.26
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	100	92	150	151	165
	Turbidity (NTU)	0.29	0.30	0.45	0.40	0.41
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	61.2	60.3	134	133	130
	Ammonia, Total (as N) (mg/L)	0.0067	<0.0050	0.0119	0.0137	0.0163
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	4.83	4.83	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.080	0.079	0.297	0.295	0.299
	Nitrate (as N) (mg/L)	0.126	0.136	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	0.0032	0.0031	0.0029
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0022	0.0024	0.0029	0.0028
	Sulfate (SO4) (mg/L)	14.9	14.9	6.28	6.27	6.29
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.86 ^{HTD}	2.15	9.17	8.84	8.91
	Total Organic Carbon (mg/L)	2.47	2.09	8.98	9.02	9.16
Total Metals	Aluminum (Al)-Total (mg/L)	0.0131	0.0102	0.0033	0.0038	0.0032
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	0.00047	0.00048	0.00049
	Arsenic (As)-Total (mg/L)	0.00019	0.00018	0.0115	0.0115	0.0113
	Barium (Ba)-Total (mg/L)	0.0217	0.0218	0.0284	0.0279	0.0281
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.010	0.011	0.034	0.035	0.036
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	16.0	16.4	30.6	30.7	30.8
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	0.000013	0.000014	0.000013
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00011	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	0.00012	0.00011	0.00012
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	0.00813	0.00796	0.00765
	Iron (Fe)-Total (mg/L)	0.013	0.011	0.041	0.041	0.031
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0032	0.0032	0.0031	0.0032	0.0032
	Magnesium (Mg)-Total (mg/L)	6.95	6.87	10.9	10.6	10.9

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989985-21 water 10-SEP-17 CL-TRIP BLANK	L1989985-22 water 10-SEP-17 CL-FIELD BLANK			
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)		<2.0			
	Hardness (as CaCO3) (mg/L)		<0.50			
	pH (pH)		5.44			
	Total Suspended Solids (mg/L)		<3.0			
	Total Dissolved Solids (mg/L)		<10			
	Turbidity (NTU)		<0.10			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)		<1.0			
	Ammonia, Total (as N) (mg/L)		<0.0050			
	Bromide (Br) (mg/L)		<0.050			
	Chloride (Cl) (mg/L)		<0.50			
	Fluoride (F) (mg/L)		<0.020			
	Nitrate (as N) (mg/L)		<0.0050			
	Nitrite (as N) (mg/L)		<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020			
	Phosphorus (P)-Total (mg/L)		<0.0020			
	Sulfate (SO4) (mg/L)		<0.30			
	Sulphide as S (mg/L)		<0.018			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)		<0.50			
	Total Organic Carbon (mg/L)		<0.50			
Total Metals	Aluminum (Al)-Total (mg/L)		<0.0030			
	Antimony (Sb)-Total (mg/L)		<0.00010			
	Arsenic (As)-Total (mg/L)		<0.00010			
	Barium (Ba)-Total (mg/L)		<0.000050			
	Beryllium (Be)-Total (mg/L)		<0.000020			
	Bismuth (Bi)-Total (mg/L)		<0.000050			
	Boron (B)-Total (mg/L)		<0.010			
	Cadmium (Cd)-Total (mg/L)		<0.0000050			
	Calcium (Ca)-Total (mg/L)		<0.050			
	Cesium (Cs)-Total (mg/L)		<0.000010			
	Chromium (Cr)-Total (mg/L)		0.00036 ^{RRV}			
	Cobalt (Co)-Total (mg/L)		<0.00010			
	Copper (Cu)-Total (mg/L)		<0.00050			
	Iron (Fe)-Total (mg/L)		<0.010			
	Lead (Pb)-Total (mg/L)		<0.000050			
	Lithium (Li)-Total (mg/L)		<0.0010			
	Magnesium (Mg)-Total (mg/L)		<0.10			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989985-1 water 09-SEP-17 CL-26	L1989985-2 water 09-SEP-17 CL-DUP-1	L1989985-3 water 09-SEP-17 CL-6-2M	L1989985-4 water 09-SEP-17 CL-6-10M	L1989985-5 water 09-SEP-17 CL-24
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.00102	0.100	0.00112	0.00082	0.00159	
	Mercury (Hg)-Total (mg/L)	<0.0000050	0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000170	0.000426	0.000182	0.000168	0.000160	
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00114	<0.00050	<0.00050	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.49	1.36	0.47	0.48	0.48	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.31	2.35	0.32	0.34	0.32	
	Silver (Ag)-Total (mg/L)	<0.000010	0.000024	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	0.910	4.55	0.887	0.907	0.893	
	Strontium (Sr)-Total (mg/L)	0.0100	0.0687	0.0103	0.0101	0.0101	
	Sulfur (S)-Total (mg/L)	0.53	2.27	0.54	<0.50	<0.50	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Total (mg/L)	0.000151	0.0472	0.000176	0.000150	0.000165	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0036	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location	LAB	LAB	LAB	LAB		
	Dissolved Metals Filtration Location	LAB	LAB	LAB	LAB		
	Aluminum (Al)-Dissolved (mg/L)	0.0013	0.0027	0.0014	<0.0010		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	0.00026	<0.00010	<0.00010		
	Arsenic (As)-Dissolved (mg/L)	0.00016	0.00935	0.00015	0.00012		
	Barium (Ba)-Dissolved (mg/L)	0.00366	0.0185	0.00369	0.00362		
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	<0.010	0.029	<0.010	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)	5.35	31.4	5.27	5.15		
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010		
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)	0.00060	0.00494	0.00058	0.00053		
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010		
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	<0.0010	0.0029	<0.0010	<0.0010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989985-6 water 09-SEP-17 CL-2	L1989985-7 water 09-SEP-17 CL-15	L1989985-8 water 09-SEP-17 CL-5	L1989985-9 water 09-SEP-17 CL-9	L1989985-10 water 09-SEP-17 CL-2B
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.0136	0.00303	0.00372	0.00143	0.0885	
	Mercury (Hg)-Total (mg/L)	0.000700	0.000355	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.00298	0.00114	0.000186	0.000194	0.000435	
	Nickel (Ni)-Total (mg/L)	0.0124	0.00196	<0.00050	<0.00050	0.00104	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	2.32	1.87	0.50	0.49	1.38	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	2.82	3.53	0.37	0.38	2.46	
	Silver (Ag)-Total (mg/L)	0.00424	0.000289	0.000033	0.000011	0.000031	
	Sodium (Na)-Total (mg/L)	4.36	4.45	0.981	0.966	4.72	
	Strontium (Sr)-Total (mg/L)	0.110	0.0805	0.0112	0.0113	0.0703	
	Sulfur (S)-Total (mg/L)	5.98	3.37	0.60	0.58	2.41	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Total (mg/L)	0.187	0.137	0.000639	0.000191	0.0480	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	0.0048	<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location			LAB		LAB	
	Dissolved Metals Filtration Location			LAB		LAB	
	Aluminum (Al)-Dissolved (mg/L)			0.0016		0.0023	
	Antimony (Sb)-Dissolved (mg/L)			<0.00010		0.00025	
	Arsenic (As)-Dissolved (mg/L)			0.00024		0.00914	
	Barium (Ba)-Dissolved (mg/L)			0.00414		0.0182	
	Beryllium (Be)-Dissolved (mg/L)			<0.000020		<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)			<0.000050		<0.000050	
	Boron (B)-Dissolved (mg/L)			<0.010		0.027	
	Cadmium (Cd)-Dissolved (mg/L)			<0.0000050		<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)			5.80		30.3	
	Cesium (Cs)-Dissolved (mg/L)			<0.000010		<0.000010	
	Chromium (Cr)-Dissolved (mg/L)			<0.00010		<0.00010	
	Cobalt (Co)-Dissolved (mg/L)			<0.00010		<0.00010	
	Copper (Cu)-Dissolved (mg/L)			0.00065		0.00479	
	Iron (Fe)-Dissolved (mg/L)			<0.010		<0.010	
	Lead (Pb)-Dissolved (mg/L)			<0.000050		<0.000050	
	Lithium (Li)-Dissolved (mg/L)			<0.0010		0.0027	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1989985-11	L1989985-12	L1989985-13	L1989985-14	L1989985-15
		Description	water	water	water	water	water
		Sampled Date	10-SEP-17	10-SEP-17	10-SEP-17	10-SEP-17	10-SEP-17
		Sampled Time					
		Client ID	CL-RL-1B	R-3	CL-8	CL-7-1M	CL-20
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.00052	0.00113	0.00086	0.00109	0.00105	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000370	0.000221	0.000166	0.000315	0.000308	
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.57	0.72	0.48	0.72	0.72	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.91	1.00	0.32	1.16	1.17	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	1.36	1.61	0.890	3.97	3.97	
	Strontium (Sr)-Total (mg/L)	0.0155	0.0210	0.0102	0.101	0.100	
	Sulfur (S)-Total (mg/L)	0.79	0.95	<0.50	5.32	5.31	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00060 ^{DLM}	
	Uranium (U)-Total (mg/L)	0.00128	0.000162	0.000155	0.000292	0.000280	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location		LAB		LAB		
	Dissolved Metals Filtration Location		LAB		LAB		
	Aluminum (Al)-Dissolved (mg/L)		0.0026		0.0012		
	Antimony (Sb)-Dissolved (mg/L)		<0.00010		<0.00010		
	Arsenic (As)-Dissolved (mg/L)		0.00061		0.00021		
	Barium (Ba)-Dissolved (mg/L)		0.00560		0.0227		
	Beryllium (Be)-Dissolved (mg/L)		<0.000020		<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050		<0.000050		
	Boron (B)-Dissolved (mg/L)		0.010		<0.010		
	Cadmium (Cd)-Dissolved (mg/L)		<0.0000050		<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)		10.4		17.4		
	Cesium (Cs)-Dissolved (mg/L)		<0.000010		<0.000010		
	Chromium (Cr)-Dissolved (mg/L)		<0.00010		<0.00010		
	Cobalt (Co)-Dissolved (mg/L)		<0.00010		<0.00010		
	Copper (Cu)-Dissolved (mg/L)		0.00104		0.00032		
	Iron (Fe)-Dissolved (mg/L)		<0.010		<0.010		
	Lead (Pb)-Dissolved (mg/L)		<0.000050		<0.000050		
	Lithium (Li)-Dissolved (mg/L)		0.0011		0.0031		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1989985-16	L1989985-17	L1989985-18	L1989985-19	L1989985-20
		Description	water	water	water	water	water
		Sampled Date	10-SEP-17	10-SEP-17	10-SEP-17	10-SEP-17	10-SEP-17
		Sampled Time					
		Client ID	CL-16-2M	CL-16-10M	CL-3	CL-DUP-2	CL-29
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.00101	0.00080	0.0973	0.0970	0.0940	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000323	0.000329	0.000435	0.000402	0.000403	
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	0.00125	0.00125	0.00122	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.73	0.71	1.55	1.55	1.55	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	1.17	1.16	2.29	2.31	2.32	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	0.000035	0.000040	0.000026	
	Sodium (Na)-Total (mg/L)	4.00	3.90	4.84	4.77	4.80	
	Strontium (Sr)-Total (mg/L)	0.102	0.104	0.0782	0.0783	0.0793	
	Sulfur (S)-Total (mg/L)	5.12	5.29	2.52	2.52	2.45	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00060 ^{DLM}	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Total (mg/L)	0.000279	0.000293	0.0490	0.0482	0.0494	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	0.0055	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location			LAB	LAB		
	Dissolved Metals Filtration Location			LAB	LAB		
	Aluminum (Al)-Dissolved (mg/L)			0.0018	0.0019		
	Antimony (Sb)-Dissolved (mg/L)			0.00047	0.00047		
	Arsenic (As)-Dissolved (mg/L)			0.0106	0.0109		
	Barium (Ba)-Dissolved (mg/L)			0.0274	0.0275		
	Beryllium (Be)-Dissolved (mg/L)			<0.000020	<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)			<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)			0.035	0.035		
	Cadmium (Cd)-Dissolved (mg/L)			<0.0000050	<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)			32.5	32.2		
	Cesium (Cs)-Dissolved (mg/L)			0.000014	0.000014		
	Chromium (Cr)-Dissolved (mg/L)			<0.00010	<0.00010		
	Cobalt (Co)-Dissolved (mg/L)			<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)			0.00651	0.00669		
	Iron (Fe)-Dissolved (mg/L)			<0.010	<0.010		
	Lead (Pb)-Dissolved (mg/L)			<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)			0.0031	0.0031		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989985-21 water 10-SEP-17 CL-TRIP BLANK	L1989985-22 water 10-SEP-17 CL-FIELD BLANK			
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)			<0.00010			
	Mercury (Hg)-Total (mg/L)			<0.0000050			
	Molybdenum (Mo)-Total (mg/L)			<0.000050			
	Nickel (Ni)-Total (mg/L)			<0.00050			
	Phosphorus (P)-Total (mg/L)			<0.050			
	Potassium (K)-Total (mg/L)			<0.10			
	Selenium (Se)-Total (mg/L)			<0.000050			
	Silicon (Si)-Total (mg/L)			<0.10			
	Silver (Ag)-Total (mg/L)			<0.000010			
	Sodium (Na)-Total (mg/L)			<0.050			
	Strontium (Sr)-Total (mg/L)			<0.00020			
	Sulfur (S)-Total (mg/L)			<0.50			
	Thallium (Tl)-Total (mg/L)			<0.000010			
	Tin (Sn)-Total (mg/L)			<0.00010			
	Titanium (Ti)-Total (mg/L)			<0.00030			
	Uranium (U)-Total (mg/L)			<0.000010			
	Vanadium (V)-Total (mg/L)			<0.00050			
	Zinc (Zn)-Total (mg/L)			<0.0030			
	Zirconium (Zr)-Total (mg/L)			<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location			LAB			
	Dissolved Metals Filtration Location			LAB			
	Aluminum (Al)-Dissolved (mg/L)			<0.0010			
	Antimony (Sb)-Dissolved (mg/L)			<0.00010			
	Arsenic (As)-Dissolved (mg/L)			<0.00010			
	Barium (Ba)-Dissolved (mg/L)			<0.000050			
	Beryllium (Be)-Dissolved (mg/L)			<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)			<0.000050			
	Boron (B)-Dissolved (mg/L)			<0.010			
	Cadmium (Cd)-Dissolved (mg/L)			<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)			<0.050			
	Cesium (Cs)-Dissolved (mg/L)			<0.000010			
	Chromium (Cr)-Dissolved (mg/L)			<0.00010			
	Cobalt (Co)-Dissolved (mg/L)			<0.00010			
	Copper (Cu)-Dissolved (mg/L)			<0.00020			
	Iron (Fe)-Dissolved (mg/L)			<0.010			
	Lead (Pb)-Dissolved (mg/L)			<0.000050			
	Lithium (Li)-Dissolved (mg/L)			<0.0010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1989985-1 water 09-SEP-17 CL-26	L1989985-2 water 09-SEP-17 CL-DUP-1	L1989985-3 water 09-SEP-17 CL-6-2M	L1989985-4 water 09-SEP-17 CL-6-10M	L1989985-5 water 09-SEP-17 CL-24
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	2.31	11.6	2.22	2.16	
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	0.000144	0.000397	0.000136	0.000126	
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00072	<0.00050	<0.00050	
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)	0.53	1.55	0.52	0.51	
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Dissolved (mg/L)	0.295	2.45	0.293	0.318	
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	0.994	5.23	0.977	0.953	
	Strontium (Sr)-Dissolved (mg/L)	0.0106	0.0723	0.0107	0.0104	
	Sulfur (S)-Dissolved (mg/L)	<0.50	1.96	<0.50	<0.50	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Dissolved (mg/L)	0.000138	0.0503	0.000210	0.000140	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0014	<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				
	Ethylbenzene (mg/L)	<0.00050				
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				
	Styrene (mg/L)	<0.00050				
	Toluene (mg/L)	<0.00045				
	ortho-Xylene (mg/L)	<0.00050				
	meta- & para-Xylene (mg/L)	<0.00050				
	Xylenes (mg/L)	<0.00075				
	F1 (C6-C10) (mg/L)	<0.10				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	106.9				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	97.7				
Hydrocarbons	F1-BTEX (mg/L)	<0.10				
	F2 (C10-C16) (mg/L)	<0.30				
	F3 (C16-C34) (mg/L)	<0.30				
	F4 (C34-C50) (mg/L)	<0.30				
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10				
	VPH (C6-C10) (mg/L)	<0.10				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989985-6 water 09-SEP-17 CL-2	L1989985-7 water 09-SEP-17 CL-15	L1989985-8 water 09-SEP-17 CL-5	L1989985-9 water 09-SEP-17 CL-9	L1989985-10 water 09-SEP-17 CL-2B
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)				2.44		11.4
	Manganese (Mn)-Dissolved (mg/L)				<0.00010		<0.00010
	Mercury (Hg)-Dissolved (mg/L)				<0.0000050		<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)				0.000146		0.000422
	Nickel (Ni)-Dissolved (mg/L)				<0.00050		0.00074
	Phosphorus (P)-Dissolved (mg/L)				<0.050		<0.050
	Potassium (K)-Dissolved (mg/L)				0.54		1.49
	Selenium (Se)-Dissolved (mg/L)				<0.000050		<0.000050
	Silicon (Si)-Dissolved (mg/L)				0.341		2.38
	Silver (Ag)-Dissolved (mg/L)				<0.000010		<0.000010
	Sodium (Na)-Dissolved (mg/L)				1.07		5.14
	Strontium (Sr)-Dissolved (mg/L)				0.0121		0.0716
	Sulfur (S)-Dissolved (mg/L)				<0.50		2.06
	Thallium (Tl)-Dissolved (mg/L)				<0.000010		<0.000010
	Tin (Sn)-Dissolved (mg/L)				<0.00010		<0.00010
	Titanium (Ti)-Dissolved (mg/L)				<0.00030		<0.00030
	Uranium (U)-Dissolved (mg/L)				0.000606		0.0477
	Vanadium (V)-Dissolved (mg/L)				<0.00050		<0.00050
	Zinc (Zn)-Dissolved (mg/L)				<0.0010		<0.0010
	Zirconium (Zr)-Dissolved (mg/L)				<0.00030		<0.00030
Volatile Organic Compounds	Benzene (mg/L)						
	Ethylbenzene (mg/L)						
	Methyl t-butyl ether (MTBE) (mg/L)						
	Styrene (mg/L)						
	Toluene (mg/L)						
	ortho-Xylene (mg/L)						
	meta- & para-Xylene (mg/L)						
	Xylenes (mg/L)						
	F1 (C6-C10) (mg/L)						
	Surrogate: 4-Bromofluorobenzene (SS) (%)						
	Surrogate: 1,4-Difluorobenzene (SS) (%)						
Hydrocarbons	F1-BTEX (mg/L)						
	F2 (C10-C16) (mg/L)						
	F3 (C16-C34) (mg/L)						
	F4 (C34-C50) (mg/L)						
	Volatile Hydrocarbons (VH6-10) (mg/L)						
	VPH (C6-C10) (mg/L)						

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989985-11 water 10-SEP-17 CL-RL-1B	L1989985-12 water 10-SEP-17 R-3	L1989985-13 water 10-SEP-17 CL-8	L1989985-14 water 10-SEP-17 CL-7-1M	L1989985-15 water 10-SEP-17 CL-20
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)			3.11		7.59	
	Manganese (Mn)-Dissolved (mg/L)			<0.00010		<0.00010	
	Mercury (Hg)-Dissolved (mg/L)			<0.0000050		<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)			0.000201		0.000288	
	Nickel (Ni)-Dissolved (mg/L)			<0.00050		<0.00050	
	Phosphorus (P)-Dissolved (mg/L)			<0.050		<0.050	
	Potassium (K)-Dissolved (mg/L)			0.81		0.78	
	Selenium (Se)-Dissolved (mg/L)			<0.000050		<0.000050	
	Silicon (Si)-Dissolved (mg/L)			0.990		1.13	
	Silver (Ag)-Dissolved (mg/L)			<0.000010		<0.000010	
	Sodium (Na)-Dissolved (mg/L)			1.81		4.38	
	Strontium (Sr)-Dissolved (mg/L)			0.0216		0.104	
	Sulfur (S)-Dissolved (mg/L)			0.80		4.91	
	Thallium (Tl)-Dissolved (mg/L)			<0.000010		<0.000010	
	Tin (Sn)-Dissolved (mg/L)			<0.00010		<0.00010	
	Titanium (Ti)-Dissolved (mg/L)			<0.00030		<0.00030	
	Uranium (U)-Dissolved (mg/L)			0.000208		0.000299	
	Vanadium (V)-Dissolved (mg/L)			<0.00050		<0.00050	
	Zinc (Zn)-Dissolved (mg/L)			<0.0010		<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)			<0.00030		<0.00030	
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				<0.00050	
	Ethylbenzene (mg/L)	<0.00050				<0.00050	
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				<0.00050	
	Styrene (mg/L)	<0.00050				<0.00050	
	Toluene (mg/L)	<0.00045				<0.00045	
	ortho-Xylene (mg/L)	<0.00050				<0.00050	
	meta- & para-Xylene (mg/L)	<0.00050				<0.00050	
	Xylenes (mg/L)	<0.00075				<0.00075	
	F1 (C6-C10) (mg/L)	<0.10				<0.10	
	Surrogate: 4-Bromofluorobenzene (SS) (%)	98.7				106.0	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	97.1				97.2	
Hydrocarbons	F1-BTEX (mg/L)	<0.10				<0.10	
	F2 (C10-C16) (mg/L)	<0.30				<0.30	
	F3 (C16-C34) (mg/L)	<0.30				<0.30	
	F4 (C34-C50) (mg/L)	<0.30				<0.30	
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10				<0.10	
	VPH (C6-C10) (mg/L)	<0.10				<0.10	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989985-16 water 10-SEP-17 CL-16-2M	L1989985-17 water 10-SEP-17 CL-16-10M	L1989985-18 water 10-SEP-17 CL-3	L1989985-19 water 10-SEP-17 CL-DUP-2	L1989985-20 water 10-SEP-17 CL-29
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)				11.3	11.4	
	Manganese (Mn)-Dissolved (mg/L)				0.00013	<0.00010	
	Mercury (Hg)-Dissolved (mg/L)				<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)				0.000388	0.000371	
	Nickel (Ni)-Dissolved (mg/L)				0.00081	0.00077	
	Phosphorus (P)-Dissolved (mg/L)				<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)				1.63	1.65	
	Selenium (Se)-Dissolved (mg/L)				<0.000050	<0.000050	
	Silicon (Si)-Dissolved (mg/L)				2.31	2.23	
	Silver (Ag)-Dissolved (mg/L)				<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)				5.12	5.26	
	Strontium (Sr)-Dissolved (mg/L)				0.0789	0.0797	
	Sulfur (S)-Dissolved (mg/L)				2.21	2.18	
	Thallium (Tl)-Dissolved (mg/L)				<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)				<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)				<0.00030	<0.00030	
	Uranium (U)-Dissolved (mg/L)				0.0500	0.0501	
	Vanadium (V)-Dissolved (mg/L)				<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)				<0.0010	<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)				<0.00030	<0.00030	
Volatile Organic Compounds	Benzene (mg/L)			<0.00050	<0.00050	<0.00050	
	Ethylbenzene (mg/L)			<0.00050	<0.00050	<0.00050	
	Methyl t-butyl ether (MTBE) (mg/L)			<0.00050	<0.00050	<0.00050	
	Styrene (mg/L)			<0.00050	<0.00050	<0.00050	
	Toluene (mg/L)			<0.00045	<0.00045	<0.00045	
	ortho-Xylene (mg/L)			<0.00050	<0.00050	<0.00050	
	meta- & para-Xylene (mg/L)			<0.00050	<0.00050	<0.00050	
	Xylenes (mg/L)			<0.00075	<0.00075	<0.00075	
	F1 (C6-C10) (mg/L)			<0.10	<0.10	<0.10	
	Surrogate: 4-Bromofluorobenzene (SS) (%)			95.5	98.8	100.1	
	Surrogate: 1,4-Difluorobenzene (SS) (%)			93.5	96.2	97.5	
Hydrocarbons	F1-BTEX (mg/L)			<0.10	<0.10	<0.10	
	F2 (C10-C16) (mg/L)			<0.30	<0.30	<0.30	
	F3 (C16-C34) (mg/L)			<0.30	<0.30	<0.30	
	F4 (C34-C50) (mg/L)			<0.30	<0.30	<0.30	
	Volatile Hydrocarbons (VH6-10) (mg/L)			<0.10	<0.10	<0.10	
	VPH (C6-C10) (mg/L)			<0.10	<0.10	<0.10	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1989985-21 water 10-SEP-17 CL-TRIP BLANK	L1989985-22 water 10-SEP-17 CL-FIELD BLANK			
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)			<0.10			
	Manganese (Mn)-Dissolved (mg/L)			<0.00010			
	Mercury (Hg)-Dissolved (mg/L)			<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)			<0.000050			
	Nickel (Ni)-Dissolved (mg/L)			<0.00050			
	Phosphorus (P)-Dissolved (mg/L)			<0.050			
	Potassium (K)-Dissolved (mg/L)			<0.10			
	Selenium (Se)-Dissolved (mg/L)			<0.000050			
	Silicon (Si)-Dissolved (mg/L)			<0.050			
	Silver (Ag)-Dissolved (mg/L)			<0.000010			
	Sodium (Na)-Dissolved (mg/L)			<0.050			
	Strontium (Sr)-Dissolved (mg/L)			<0.00020			
	Sulfur (S)-Dissolved (mg/L)			<0.50			
	Thallium (Tl)-Dissolved (mg/L)			<0.000010			
	Tin (Sn)-Dissolved (mg/L)			<0.00010			
	Titanium (Ti)-Dissolved (mg/L)			<0.00030			
	Uranium (U)-Dissolved (mg/L)			<0.000010			
	Vanadium (V)-Dissolved (mg/L)			<0.00050			
	Zinc (Zn)-Dissolved (mg/L)			<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)			<0.00030			
Volatile Organic Compounds	Benzene (mg/L)			<0.00050			
	Ethylbenzene (mg/L)			<0.00050			
	Methyl t-butyl ether (MTBE) (mg/L)			<0.00050			
	Styrene (mg/L)			<0.00050			
	Toluene (mg/L)			<0.00045			
	ortho-Xylene (mg/L)			<0.00050			
	meta- & para-Xylene (mg/L)			<0.00050			
	Xylenes (mg/L)			<0.00075			
	F1 (C6-C10) (mg/L)			<0.10			
	Surrogate: 4-Bromofluorobenzene (SS) (%)			99.9			
	Surrogate: 1,4-Difluorobenzene (SS) (%)			97.8			
Hydrocarbons	F1-BTEX (mg/L)			<0.10			
	F2 (C10-C16) (mg/L)			<0.30			
	F3 (C16-C34) (mg/L)			<0.30			
	F4 (C34-C50) (mg/L)			<0.30			
	Volatile Hydrocarbons (VH6-10) (mg/L)			<0.10			
	VPH (C6-C10) (mg/L)			<0.10			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

		Sample ID	L1989985-1	L1989985-2	L1989985-3	L1989985-4	L1989985-5
		Description	water	water	water	water	water
		Sampled Date	09-SEP-17	09-SEP-17	09-SEP-17	09-SEP-17	09-SEP-17
		Sampled Time					
		Client ID	CL-26	CL-DUP-1	CL-6-2M	CL-6-10M	CL-24
Grouping	Analyte						
WATER							
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)	74.7					
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	117.4					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1989985-6	L1989985-7	L1989985-8	L1989985-9	L1989985-10
		Description	water	water	water	water	water
		Sampled Date	09-SEP-17	09-SEP-17	09-SEP-17	09-SEP-17	09-SEP-17
		Sampled Time					
		Client ID	CL-2	CL-15	CL-5	CL-9	CL-2B
Grouping	Analyte						
WATER							
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)						
	Surrogate: 3,4-Dichlorotoluene (SS) (%)						

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

		Sample ID	Description	Sampled Date	Sampled Time	Client ID
		L1989985-11	water	10-SEP-17		CL-RL-1B
		L1989985-12	water	10-SEP-17		R-3
		L1989985-13	water	10-SEP-17		CL-8
		L1989985-14	water	10-SEP-17		CL-7-1M
		L1989985-15	water	10-SEP-17		CL-20
Grouping	Analyte					
WATER						
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)	75.9			80.2	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	115.3			110.5	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

		Sample ID	L1989985-16	L1989985-17	L1989985-18	L1989985-19	L1989985-20
		Description	water	water	water	water	water
		Sampled Date	10-SEP-17	10-SEP-17	10-SEP-17	10-SEP-17	10-SEP-17
		Sampled Time					
		Client ID	CL-16-2M	CL-16-10M	CL-3	CL-DUP-2	CL-29
Grouping	Analyte						
WATER							
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)		76.3	81.2	84.8		
	Surrogate: 3,4-Dichlorotoluene (SS) (%)		99.8	119.8	111.0		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	Description	Sampled Date	Sampled Time	Client ID
		L1989985-21	water	10-SEP-17		
		L1989985-22	water	10-SEP-17		
		CL-TRIP BLANK				
		CL-FIELD BLANK				
Grouping	Analyte					
WATER						
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)		88.4			
	Surrogate: 3,4-Dichlorotoluene (SS) (%)		113.5			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Chromium (Cr)-Total	MB-LOR	L1989985-22
Method Blank	Nickel (Ni)-Total	MB-LOR	L1989985-22
Matrix Spike	Dissolved Organic Carbon	MS-B	L1989985-17, -18, -19, -20, -22
Matrix Spike	Dissolved Organic Carbon	MS-B	L1989985-1, -10, -11, -12, -13, -14, -15, -16, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L1989985-1, -10, -11, -12, -13, -14, -15, -16, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L1989985-17, -18, -19, -20, -22
Matrix Spike	Total Organic Carbon	MS-B	L1989985-17, -18, -19, -20, -22
Matrix Spike	Total Organic Carbon	MS-B	L1989985-17, -18, -19, -20, -22
Matrix Spike	Total Organic Carbon	MS-B	L1989985-1, -10, -11, -12, -13, -14, -15, -16, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L1989985-1, -10, -11, -12, -13, -14, -15, -16, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1989985-18, -19
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1989985-22
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1989985-1, -10, -12, -14, -2, -3, -4, -8
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1989985-18, -19
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1989985-22
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1989985-1, -10, -12, -14, -2, -3, -4, -8
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1989985-18, -19
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1989985-22
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1989985-18, -19
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1989985-1, -10, -12, -14, -2, -3, -4, -8
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1989985-18, -19
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1989985-22
Matrix Spike	Barium (Ba)-Total	MS-B	L1989985-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L1989985-22
Matrix Spike	Boron (B)-Total	MS-B	L1989985-22
Matrix Spike	Calcium (Ca)-Total	MS-B	L1989985-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L1989985-22
Matrix Spike	Iron (Fe)-Total	MS-B	L1989985-22
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1989985-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1989985-22
Matrix Spike	Manganese (Mn)-Total	MS-B	L1989985-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Total	MS-B	L1989985-22
Matrix Spike	Potassium (K)-Total	MS-B	L1989985-22
Matrix Spike	Silicon (Si)-Total	MS-B	L1989985-22
Matrix Spike	Sodium (Na)-Total	MS-B	L1989985-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L1989985-22
Matrix Spike	Strontium (Sr)-Total	MS-B	L1989985-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L1989985-22
Matrix Spike	Uranium (U)-Total	MS-B	L1989985-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Phosphorus (P)-Total Dissolved	MS-B	L1989985-22

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).

Reference Information

HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
F1-BTX-CALC-VA	Water	F1-Total BTX	CCME CWS PHC TIER 1 (2001)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID. The F1-BTEX result is calculated as follows:			
F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).			
F1-HSFID-VA	Water	CCME F1 By Headspace with GC/FID	EPA 5021A/CCME CWS PHC (Pub# 1310)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.			
F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.			
F2-F4-ME-FID-VA	Water	CCME F2-F4 Hydrocarbons in Water	CCME CWS-PHC, Pub #1310, Dec 2001
F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction			

Reference Information

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

RA226-GFPC-FC Misc. Radium-226 by Gas Flow Prop. EPA 903.0

S2-T-COL-VA Water Total Sulphide by Colorimetric APHA 4500-S2 Sulphide

This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.			
VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.			
VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE LABORATORY MANUAL (2005)
These results are determined according to the British Columbia Ministry of Environment Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water". The concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and, in solids, Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10).			
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Calculation of Total Xylenes			
Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Monday, October 02, 2017

Rick Zolkiewski
ALS Environmental
314 Old Airport Road Unit 116
Yellowknife, NT X1A 3T3

Re: ALS Workorder: 1709366
Project Name:
Project Number: L1989985

Dear Mr. Zolkiewski:

Fifteen water samples were received from ALS Environmental, on 9/19/2017. The samples were scheduled for the following analyses:

Lead-210

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1709366

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

Lead-210:

The samples were analyzed for the presence of ^{210}Pb according to the current revisions of SOP 704.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1709366

Client Name: ALS Environmental

Client Project Name:

Client Project Number: L1989985

Client PO Number: L1989985

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1989985-1	1709366-1		WATER	09-Sep-17	
L1989985-2	1709366-2		WATER	09-Sep-17	
L1989985-3	1709366-3		WATER	09-Sep-17	
L1989985-4	1709366-4		WATER	09-Sep-17	
L1989985-6	1709366-5		WATER	09-Sep-17	
L1989985-7	1709366-6		WATER	09-Sep-17	
L1989985-8	1709366-7		WATER	09-Sep-17	
L1989985-10	1709366-8		WATER	09-Sep-17	
L1989985-11	1709366-9		WATER	10-Sep-17	
L1989985-13	1709366-10		WATER	10-Sep-17	
L1989985-14	1709366-11		WATER	10-Sep-17	
L1989985-18	1709366-12		WATER	10-Sep-17	
L1989985-19	1709366-13		WATER	10-Sep-17	
L1989985-22	1709366-14		WATER	10-Sep-17	
L1989985-21	1709366-15		WATER	10-Sep-17	

**L1989985**

YELLOWKNIFE

1709366

Subcontract Request Form**Subcontract To:****ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA**225 COMMERCE DRIVE
FORT COLLINS, CO 80524**NOTES:** Please reference on final report and invoice: PO# L1989985
ALS requires QC data to be provided with your final results.Please see enclosed **14** sample(s) in **28** Container(s)

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED DUE DATE	Priority Flag
L1989985-1 CL-26 1	Lead-210 by Liquid Scintillation (PB210L-FC 14) Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	9/9/2017 10/13/2017 10/13/2017	
L1989985-2 CL-DUP-1 2	Lead-210 by Liquid Scintillation (PB210L-FC 14) Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	9/9/2017 10/13/2017 10/13/2017	
L1989985-3 CL-6-2M 3	Lead-210 by Liquid Scintillation (PB210L-FC 14) Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	9/9/2017 10/13/2017 10/13/2017	
L1989985-4 CL-6-10M 4	Lead-210 by Liquid Scintillation (PB210L-FC 14) Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	9/9/2017 10/13/2017 10/13/2017	
L1989985-6 CL-2 5	Lead-210 by Liquid Scintillation (PB210L-FC 14) Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	9/9/2017 10/13/2017 10/13/2017	
L1989985-7 CL-15 6	Lead-210 by Liquid Scintillation (PB210L-FC 14) Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	9/9/2017 10/13/2017 10/13/2017	
L1989985-8 CL-5 7	Lead-210 by Liquid Scintillation (PB210L-FC 14) Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	9/9/2017 10/13/2017 10/13/2017	



L1989985

YELLOWKNIFE

1709366

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE
FORT COLLINS, CO 80524

Subcontract Info Contact: Rick Zolkiewski (867) 873-5593

Analysis and reporting info contact: Rick Zolkiewski
314 OLD AIRPORT ROAD
Unit 116
YELLOWKNIFE, NT X1A 3T3

Phone: (867) 873-5593

Email: Rick.Zolkiewski@alsglobal.com

Please email confirmation of receipt to:

Rick.Zolkiewski@alsglobal.com

Shipped By: _____ Date Shipped: _____
Received By: Shayan _____ Date Received: Sept. 14 12:00
Verified By: _____ Date Verified: _____
Temperature: 3°C AVG OF 14 COOLERS

Sample Integrity Issues: _____

Received: [Signature] 9/19/17 0910

**L1989985**

YELLOWKNIFE

Subcontract Request Form

1709366

Subcontract To:**ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA**225 COMMERCE DRIVE
FORT COLLINS, CO 80524

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED	Priority Flag
		DUE DATE	
L1989985-10 CL-2B		9/9/2017	
X 8	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/13/2017	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/13/2017	
L1989985-11 CL-RL-1B		9/10/2017	
Z 9	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/13/2017	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/13/2017	
L1989985-13 CL-8		9/10/2017	
8 10	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/13/2017	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/13/2017	
L1989985-14 CL-7-1M		9/10/2017	
4 11	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/13/2017	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/13/2017	
L1989985-18 CL-3		9/10/2017	
8 12	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/13/2017	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/13/2017	
L1989985-19 CL-DUP-2		9/10/2017	
6 13	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/13/2017	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/13/2017	
L1989985-22 CL-FIELD BLANK		9/10/2017	
7 14	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/13/2017	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/13/2017	



L1989985

YELLOWKNIFE

1709366

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

8081 LOUGHEED HWY
SUITE 100
BURNABY, BC V5A 1W9

Subcontract Info Contact: Rick Zolkiewski (867) 873-5593

Analysis and reporting info contact: Rick Zolkiewski
314 OLD AIRPORT ROAD
Unit 116
YELLOWKNIFE, NT X1A 3T3

Phone: (867) 873-5593

Email: Rick.Zolkiewski@alsglobal.com

Please email confirmation of receipt to: Rick.Zolkiewski@alsglobal.com

Shipped By:	_____	Date Shipped:	_____
Received By:	<u>Shayn</u>	Date Received:	<u>Sept 14 12:00</u>
Verified By:	_____	Date Verified:	_____
		Temperature:	<u>3C AVG OF 14 COOLERS</u>

Sample Integrity Issues: _____

Received: MM 9/19/17 0910



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS Vancouver

Workorder No: 1709366

Project Manager: SPS

Initials: DBS

Date: 9/19/17

1. Does this project require any special handling in addition to standard ALS procedures?		YES	<u>NO</u>
2. Are custody seals on shipping containers intact?	<u>NONE</u>	YES	NO
3. Are Custody seals on sample containers intact?	<u>NONE</u>	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		<u>YES</u>	NO
5. Are the COC and bottle labels complete and legible?		<u>YES</u>	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	<u>NO</u>
7. Were airbills / shipping documents present and/or removable?	DROP OFF	<u>YES</u>	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	<u>YES</u>	NO
9. Are all aqueous non-preserved samples pH 4-9?	<u>N/A</u>	YES	NO
10. Is there sufficient sample for the requested analyses?		<u>YES</u>	NO
11. Were all samples placed in the proper containers for the requested analyses?		<u>YES</u>	NO
12. Are all samples within holding times for the requested analyses?		<u>YES</u>	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		<u>YES</u>	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: _____ < green pea _____ > green pea	<u>N/A</u>	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: _____ dusting _____ moderate _____ heavy	N/A	YES	<u>NO</u>
16. Were the samples shipped on ice?		YES	<u>NO</u>
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	<u>RAD ONLY</u>	YES	<u>NO</u>
Cooler #: 1 2			
Temperature (°C): 8.0 8.0			
No. of custody seals on cooler: 0 0			
External µR/hr reading: 10			
Background µR/hr reading: 10			
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? <u>YES</u> / NO / NA (If no, see Form 008.)			

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

* There was an additional sample not listed in COC - Sample #15 on hold per client request

If applicable, was the client contacted? YES / NO / NA Contact: _____

Date/Time: _____

Project Manager Signature / Date: _____

*IR Gun #2: Oakton, SN 29922500201-0066

*IR Gun #4: Oakton, SN 2372220101-0002



Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-1

Lab ID: 1709366-1

Legal Location:

Matrix: WATER

Collection Date: 9/9/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	-0.0098 (+/- 0.013)	U	0.023	BQ/l	NA	9/28/2017 02:42
Carr: LEAD	92.4		40-110	%REC	DL = NA	9/28/2017 02:42
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.0026 (+/- 0.0045)	U	0.0076	BQ/l	NA	10/2/2017 14:04
Carr: BARIUM	94.5		40-110	%REC	DL = NA	10/2/2017 14:04

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-2

Lab ID: 1709366-2

Legal Location:

Matrix: WATER

Collection Date: 9/9/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	0.0011 (+/- 0.016)	U	0.027	BQ/l	NA	9/28/2017 04:44
Carr: LEAD	79.8		40-110	%REC	DL = NA	9/28/2017 04:44
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.029 (+/- 0.011)		0.005	BQ/l	NA	10/2/2017 14:04
Carr: BARIUM	95.1		40-110	%REC	DL = NA	10/2/2017 14:04

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-3

Lab ID: 1709366-3

Legal Location:

Matrix: WATER

Collection Date: 9/9/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	-0.0092 (+/- 0.014)	U	0.024	BQ/l	NA	9/28/2017 06:47
Carr: LEAD	88		40-110	%REC	DL = NA	9/28/2017 06:47
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.0049 (+/- 0.0046)	U	0.0068	BQ/l	NA	10/2/2017 14:04
Carr: BARIUM	93.9		40-110	%REC	DL = NA	10/2/2017 14:04

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-4

Lab ID: 1709366-4

Legal Location:

Matrix: WATER

Collection Date: 9/9/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	-0.012 (+/- 0.014)	U	0.024	BQ/l	NA	9/28/2017 08:50
Carr: LEAD	89.7		40-110	%REC	DL = NA	9/28/2017 08:50
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.0030 (+/- 0.0038)	U	0.006	BQ/l	NA	10/2/2017 14:04
Carr: BARIUM	95.6		40-110	%REC	DL = NA	10/2/2017 14:04

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-6

Lab ID: 1709366-5

Legal Location:

Matrix: WATER

Collection Date: 9/9/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	0.35 (+/- 0.089)		PAI 704		Prep Date: 9/25/2017	PrepBy: HCJ
<i>Carr: LEAD</i>	65.3		0.033 BQ/l	NA		9/28/2017 10:52
			<i>40-110 %REC</i>	DL = NA		9/28/2017 10:52
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.29 (+/- 0.075)		PAI 783		Prep Date: 9/21/2017	PrepBy: HCJ
<i>Carr: BARIUM</i>	95		0.0065 BQ/l	NA		10/2/2017 14:04
			<i>40-110 %REC</i>	DL = NA		10/2/2017 14:04

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-7

Lab ID: 1709366-6

Legal Location:

Matrix: WATER

Collection Date: 9/9/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	0.021 (+/- 0.018)	U	0.028	BQ/l	NA	9/28/2017 12:55
Carr: LEAD	75.8		40-110	%REC	DL = NA	9/28/2017 12:55
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.049 (+/- 0.016)		0.0049	BQ/l	NA	10/2/2017 14:04
Carr: BARIUM	93.3		40-110	%REC	DL = NA	10/2/2017 14:04

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-8

Lab ID: 1709366-7

Legal Location:

Matrix: WATER

Collection Date: 9/9/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	-0.00079 (+/- 0.014)	U	0.024	BQ/l	NA	9/28/2017 15:42
Carr: LEAD	89.2		40-110	%REC	DL = NA	9/28/2017 15:42
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.0041 (+/- 0.0047)	U	0.0073	BQ/l	NA	10/2/2017 14:04
Carr: BARIUM	93.4		40-110	%REC	DL = NA	10/2/2017 14:04

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-10

Lab ID: 1709366-8

Legal Location:

Matrix: WATER

Collection Date: 9/9/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	-0.0024 (+/- 0.015)	U	0.025	BQ/l	NA	9/28/2017 17:44
Carr: LEAD	84.1		40-110	%REC	DL = NA	9/28/2017 17:44
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.030 (+/- 0.011)		0.0057	BQ/l	NA	10/2/2017 14:04
Carr: BARIUM	95.3		40-110	%REC	DL = NA	10/2/2017 14:04

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-11

Lab ID: 1709366-9

Legal Location:

Matrix: WATER

Collection Date: 9/10/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	-0.0096 (+/- 0.013)	U	0.023	BQ/l	NA	9/28/2017 19:47
Carr: LEAD	92.4		40-110	%REC	DL = NA	9/28/2017 19:47
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.0052 (+/- 0.0041)	LT	0.0048	BQ/l	NA	10/2/2017 14:04
Carr: BARIUM	95.5		40-110	%REC	DL = NA	10/2/2017 14:04

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-13

Lab ID: 1709366-10

Legal Location:

Matrix: WATER

Collection Date: 9/10/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	0.024 (+/- 0.017)	U	0.026	BQ/l	NA	9/28/2017 21:49
Carr: LEAD	83.4		40-110	%REC	DL = NA	9/28/2017 21:49
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.0018 (+/- 0.0036)	U	0.0063	BQ/l	NA	10/2/2017 14:37
Carr: BARIUM	92.2		40-110	%REC	DL = NA	10/2/2017 14:37

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-14

Lab ID: 1709366-11

Legal Location:

Matrix: WATER

Collection Date: 9/10/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	0.00011 (+/- 0.018)	U	0.031	BQ/l	NA	9/28/2017 23:52
Carr: LEAD	69		40-110	%REC	DL = NA	9/28/2017 23:52
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.0063 (+/- 0.0057)	U	0.008	BQ/l	NA	10/2/2017 14:37
Carr: BARIUM	92.3		40-110	%REC	DL = NA	10/2/2017 14:37

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-18

Lab ID: 1709366-12

Legal Location:

Matrix: WATER

Collection Date: 9/10/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	0.00042 (+/- 0.015)	U	0.026	BQ/l	NA	9/29/2017 01:55
Carr: LEAD	81.8		40-110	%REC	DL = NA	9/29/2017 01:55
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.077 (+/- 0.022)		0.0069	BQ/l	NA	10/2/2017 14:37
Carr: BARIUM	87.9		40-110	%REC	DL = NA	10/2/2017 14:37

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-19

Lab ID: 1709366-13

Legal Location:

Matrix: WATER

Collection Date: 9/10/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	0.0042 (+/- 0.015)	U	0.025	BQ/l	NA	9/29/2017 03:58
Carr: LEAD	83.8		40-110	%REC	DL = NA	9/29/2017 03:58
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.086 (+/- 0.026)		0.0062	BQ/l	NA	10/2/2017 14:37
Carr: BARIUM	87.1		40-110	%REC	DL = NA	10/2/2017 14:37

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-22

Lab ID: 1709366-14

Legal Location:

Matrix: WATER

Collection Date: 9/10/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	-0.0068 (+/- 0.014)	U	0.024	BQ/l	NA	9/29/2017 06:01
Carr: LEAD	87.6		40-110	%REC	DL = NA	9/29/2017 06:01
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.0036 (+/- 0.0035)	U	0.0049	BQ/l	NA	10/2/2017 14:37
Carr: BARIUM	95.9		40-110	%REC	DL = NA	10/2/2017 14:37

Client: ALS Environmental

Date: 02-Oct-17

Project: L1989985

Work Order: 1709366

Sample ID: L1989985-21

Lab ID: 1709366-15

Legal Location:

Matrix: WATER

Collection Date: 9/10/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
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Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:

- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS -- Fort Collins

Date: 10/2/2017 4:13:

Client: ALS Environmental

QC BATCH REPORT

Work Order: 1709366

Project: L1989985

Batch ID: RE170921-2-1

Instrument ID Alpha Scin

Method: Radium-226 by Radon Emanation

LCS	Sample ID: RE170921-2				Units: BQ/I		Analysis Date: 10/2/2017 14:37				
Client ID:	Run ID: RE170921-2A				Prep Date: 9/21/2017			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.61 (+/- 0.399)	0.00697	1.715		94	67-120					P,Y1
Carr: BARIUM	16500		16390		100	40-110					Y1

LCSD	Sample ID: RE170921-2				Units: BQ/I		Analysis Date: 10/2/2017 14:37				
Client ID:	Run ID: RE170921-2A				Prep Date: 9/21/2017			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.69 (+/- 0.418)	0.00572	1.715		98.3	67-120		1.61	0.1	2.1	P,Y1
Carr: BARIUM	16300		16270		100	40-110		16500			Y1

MB	Sample ID: RE170921-2				Units: BQ/I		Analysis Date: 10/2/2017 14:37				
Client ID:	Run ID: RE170921-2A				Prep Date: 9/21/2017			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.00088 (+/- 0.0022)	0.0032									U
Carr: BARIUM	16200		16230		99.8	40-110					

The following samples were analyzed in this batch:

1709366-1	1709366-2	1709366-3
1709366-4	1709366-5	1709366-6
1709366-7	1709366-8	1709366-9
1709366-10	1709366-11	1709366-12
1709366-13	1709366-14	

Client: ALS Environmental
Work Order: 1709366
Project: L1989985

QC BATCH REPORT

Batch ID: **PB170925-1-1** Instrument ID **LIQSCINT** Method: **Lead-210 by Liquid Scintillatio**

LCS	Sample ID: PB170925-1				Units: ug		Analysis Date: 9/29/2017 10:06				
Client ID:		Run ID: PB170925-1B				Prep Date: 9/25/2017			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Carr: LEAD	899		920.2		97.7	40-110					
Pb-210	1.48 (+/- 0.365)	0.0448	1.567		94.6	75-125					P,M3

LCSD	Sample ID: PB170925-1				Units: ug		Analysis Date: 9/29/2017 10:38				
Client ID:	Run ID: PB170925-1B				Prep Date: 9/25/2017			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Carr: LEAD	879		941.1		93.4	40-110		899			
Pb-210	1.57 (+/- 0.385)	0.0468	1.567		99.9	75-125		1.48	0.2	2.1	P,M3

MB		Sample ID: PB170925-1				Units: ug		Analysis Date: 9/29/2017 08:03				
Client ID:		Run ID: PB170925-1B				Prep Date: 9/25/2017		DF: NA				
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Carr: LEAD		985		962.7		102	40-110					Y1
Pb-210		-0.0075 (+/- 0.012)	0.021									Y1,U

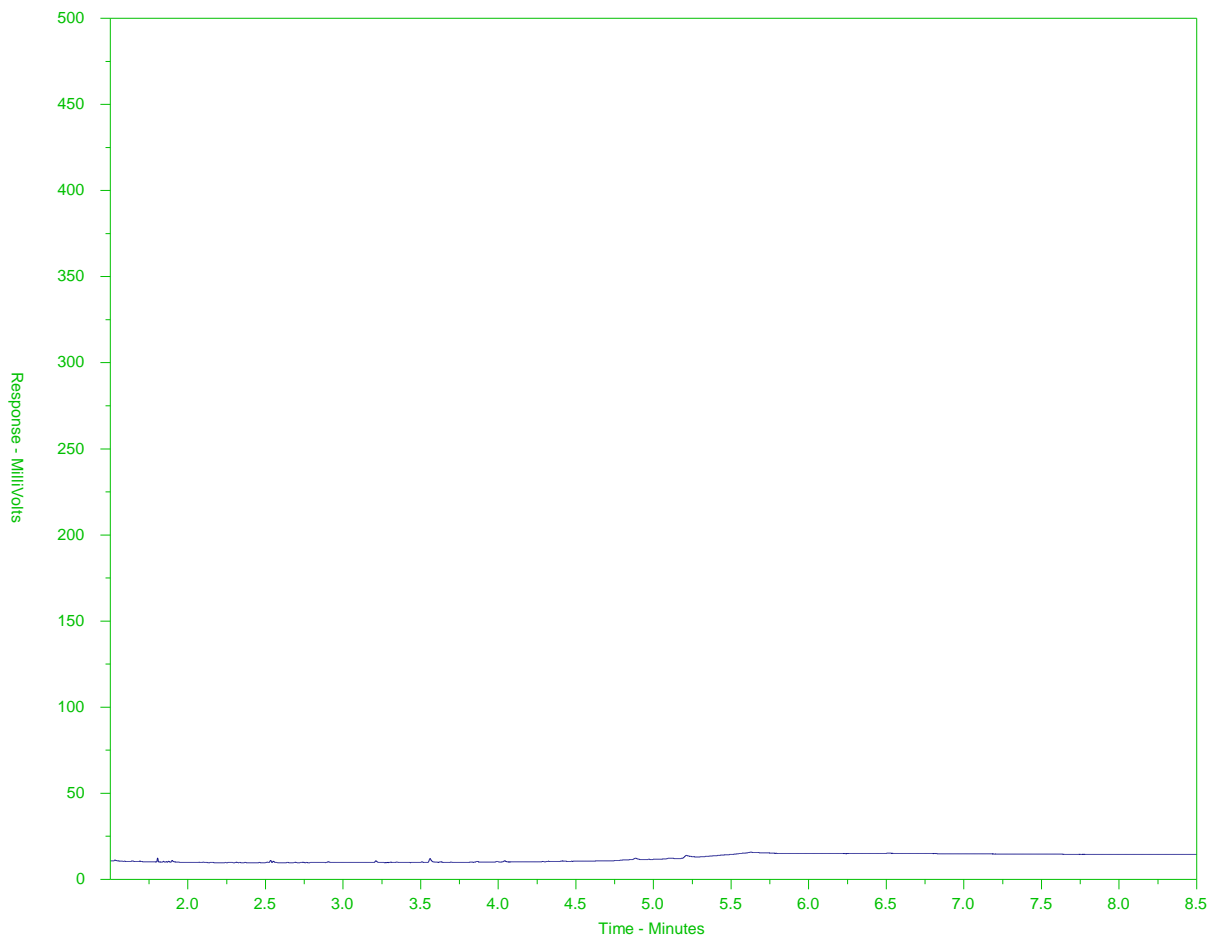
The following samples were analyzed in this batch:

1709366-1	1709366-2	1709366-3
1709366-4	1709366-5	1709366-6
1709366-7	1709366-8	1709366-9
1709366-10	1709366-11	1709366-12
1709366-13	1709366-14	

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989985-C-1
Client Sample ID: CL-26



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

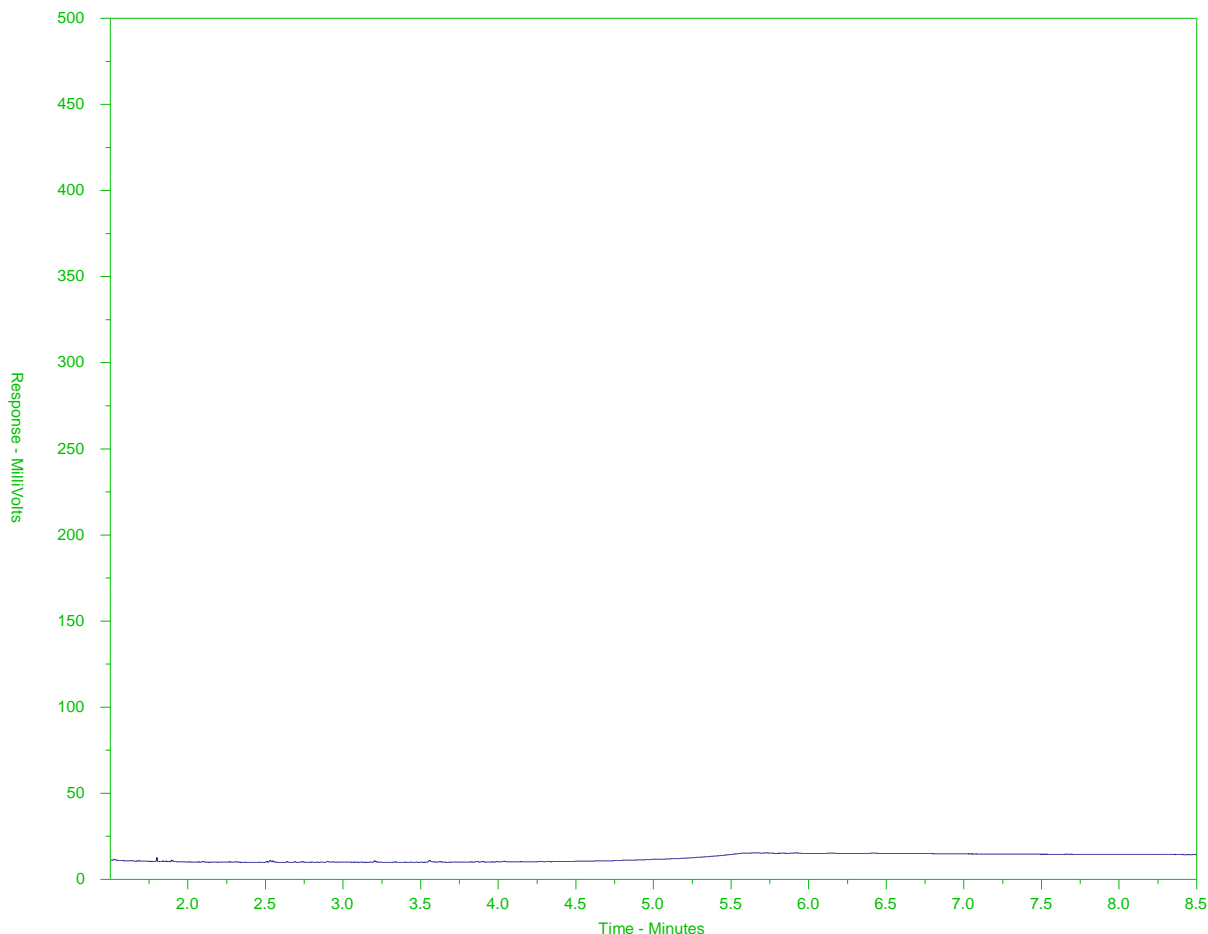
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989985-C-11
Client Sample ID: CL-RL-1B



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

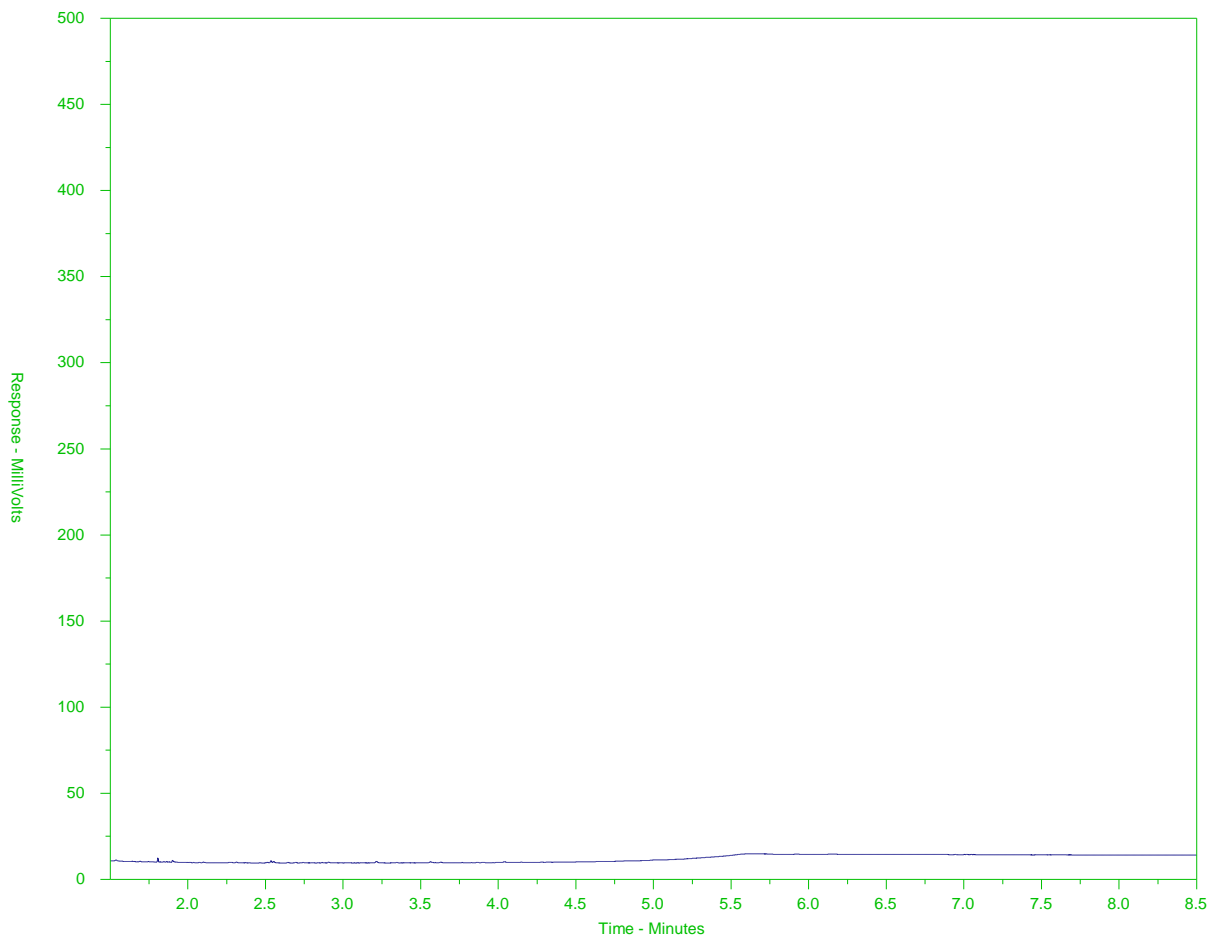
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989985-C-14
Client Sample ID: CL-7-1M



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

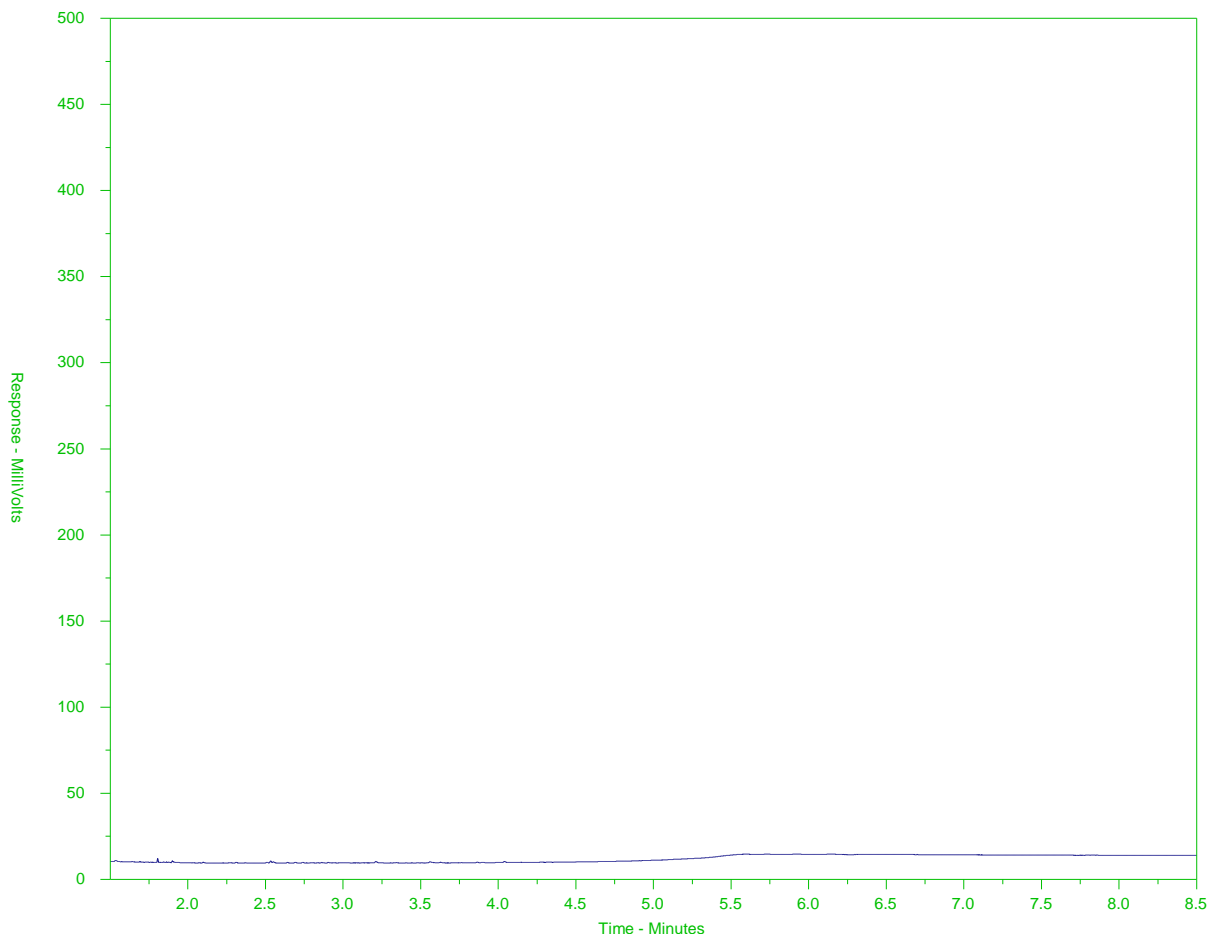
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989985-C-17
Client Sample ID: CL-16-10M



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

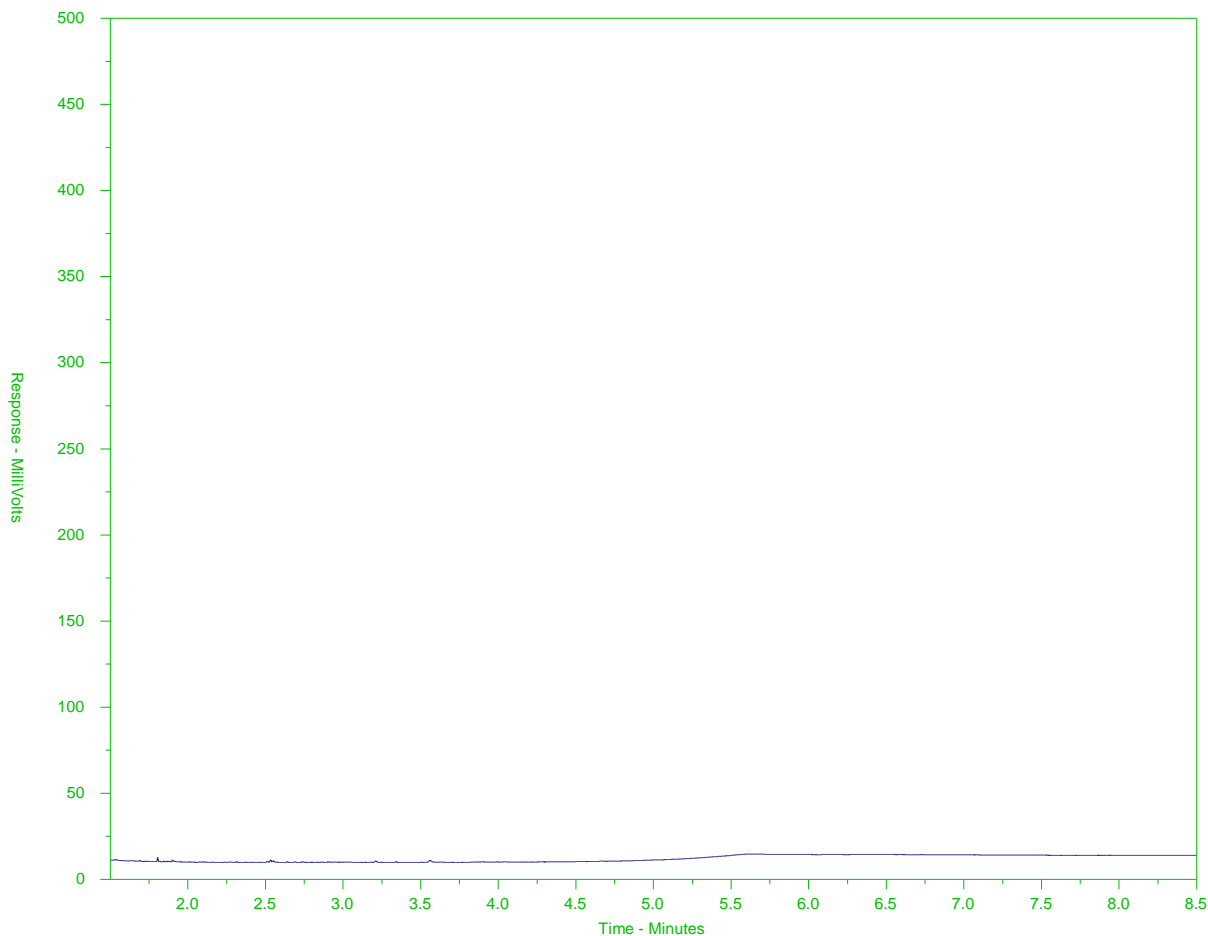
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989985-C-18
Client Sample ID: CL-3



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →			Motor Oils / Lubricants / Grease →	
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

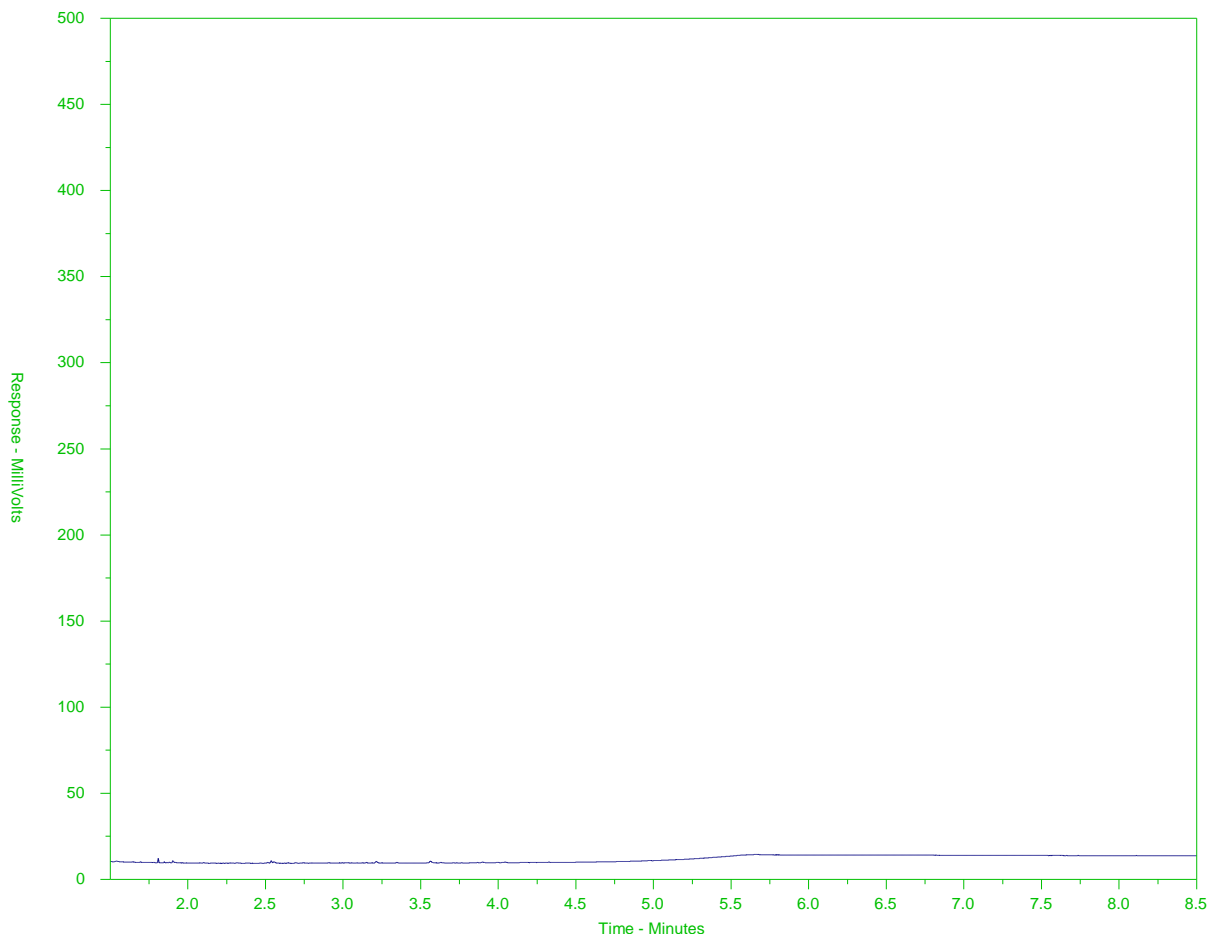
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989985-C-19
Client Sample ID: CL-DUP-2



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

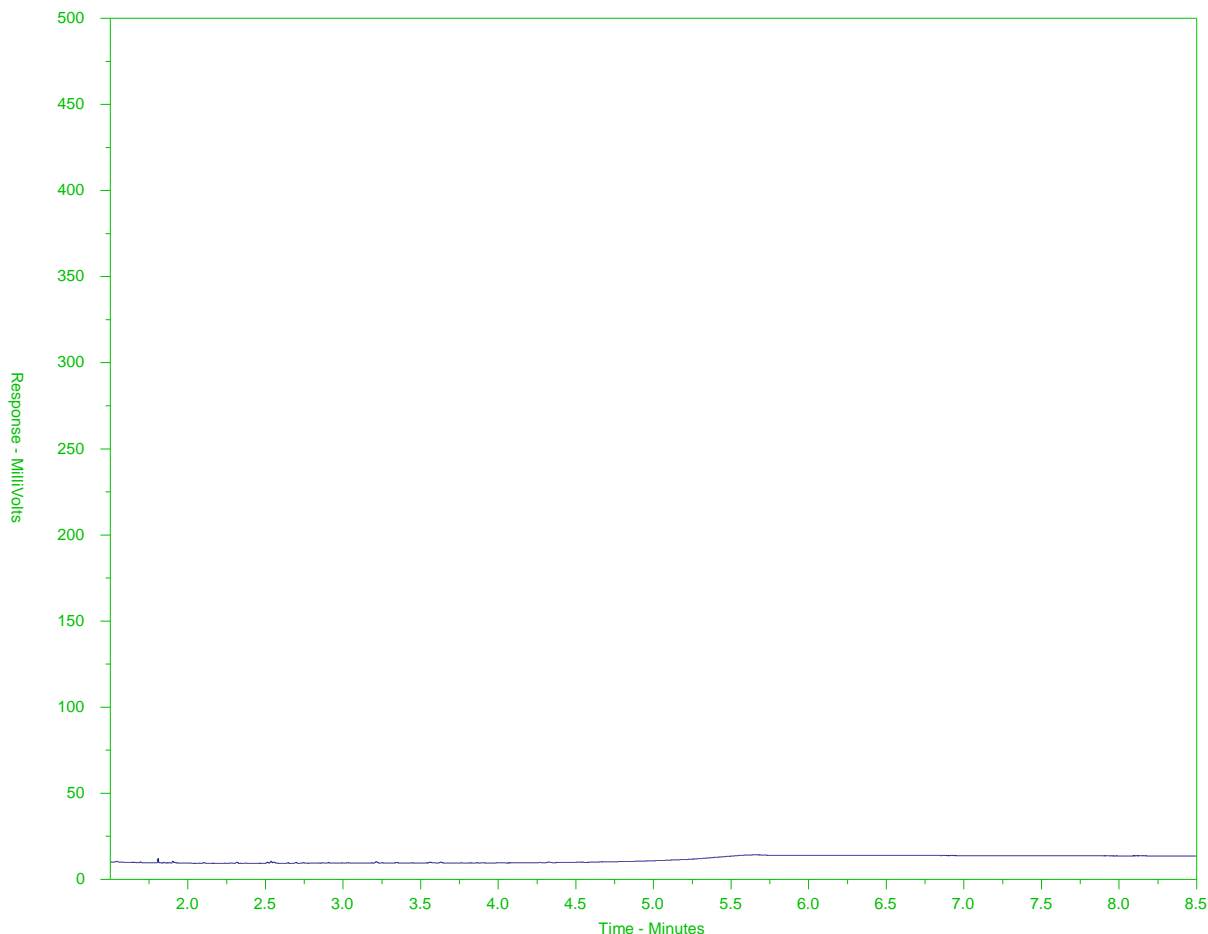
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1989985-C-22
Client Sample ID: CL-FIELD BLANK



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →			Motor Oils / Lubricants / Grease	
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.



L1989985-COFC

Report To Company: Public Services and Procurement Canada Contact: Rebecca Studer-Halbach Address: 10025 Jasper Avenue Edmonton, AB T5J 1S6 Phone: (788) 497-3761		Report Format / Distribution Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL) Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: rebecca.studer-halbach@pwgsc.ca Email 2: claire.brown@dxpprojects.ca		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days) P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge Specify Date Required for E2, E or P:																																																																																																																																																																																																		
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Project Information ALS Quote #: Q64064 Job #: PO / AFE: R.015211.049 LSD:		Oil and Gas Required Fields (client use) Approver ID: Cost Center: GL Account: Routing Code: Activity Code: Location:		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:5%;">Routine and per Q64064</td> <td style="width:5%;">Total Metals per Q64064</td> <td style="width:5%;">Total Mercury per Q64064</td> <td style="width:5%;">Dissolved Metals per Q64064</td> <td style="width:5%;">Dissolved Mercury per Q64064</td> <td style="width:5%;">PHC F2-F4 per Q64064</td> <td style="width:5%;">BTX, F1 per Q64064</td> <td style="width:5%;">Radionuclides Pb-210 and Ra-226 per Q64064</td> <td style="width:5%;">NAPL per Q64064</td> <td style="width:5%;">Oil and Grease per Q64064</td> <td style="width:5%;"></td> <td style="width:5%;"></td> <td style="width:5%;"></td> <td style="width:5%;"></td> <td rowspan="12" style="width:5%; text-align: center; vertical-align: middle;">Number of Containers</td> </tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>												Routine and per Q64064	Total Metals per Q64064	Total Mercury per Q64064	Dissolved Metals per Q64064	Dissolved Mercury per Q64064	PHC F2-F4 per Q64064	BTX, F1 per Q64064	Radionuclides Pb-210 and Ra-226 per Q64064	NAPL per Q64064	Oil and Grease per Q64064					Number of Containers																																																																																																																																																																								
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1	CL-26	09-Sep-17		Water	R	R	R	R	R	R	R	R	R	R	17																																																																																																																																																																																							
2	CL-DUP-1	09-Sep-17		Water	R	R	R	R	R			R			11																																																																																																																																																																																							
3	CL-6-2m	09-Sep-17		Water	R	R	R	R	R			R			11																																																																																																																																																																																							
4	CL-6-10m	09-Sep-17		Water	R	R	R	R	R			R			11																																																																																																																																																																																							
5	CL-24	09-Sep-17		Water	R	R	R								7																																																																																																																																																																																							
6	CL-2	09-Sep-17		Water	R	R	R					R			9																																																																																																																																																																																							
7	CL-15	09-Sep-17		Water	R	R	R					R			9																																																																																																																																																																																							
8	CL-5	09-Sep-17		Water	R	R	R	R	R			R			11																																																																																																																																																																																							
9	CL-9	09-Sep-17		Water	R	R	R								7																																																																																																																																																																																							
10	CL-2B	09-Sep-17		Water	R	R	R	R	R			R			11																																																																																																																																																																																							
11	CL-RL-1B	10-Sep-17		Water	R	R	R			R	R	R			13																																																																																																																																																																																							
12	R-3	10-Sep-17		Water	R	R	R	R	R						9																																																																																																																																																																																							

Drinking Water (DW) Samples¹ (client use)
 Are samples taken from a Regulated DW System?
☐ Yes ☒ No
 Are samples for human drinking water use?
☐ Yes ☒ No

Special Instructions / Specify Criteria to add on report (client Use)
 PLEASE NOTE: This project references "routine" parameters as presented in Q64064: pH, conductivity, alkalinity, turbidity, TDS, TSS, Ammonia, Nitrate/Nitrite, total phosphorus, dissolved phosphorus, dissolved organic carbon, total organic carbon, total Hardness, calcium, magnesium, potassium, sodium, sulphate, sulphide, chloride. ALSO, please note total and dissolved metals parameters must meet detection limits of Q64064.

SAMPLE CONDITION AS RECEIVED (lab use only)
 Frozen ☐ SIF Observations Yes ☐ No ☐
 Ice packs Yes ☐ No ☐ Custody seal intact Yes ☐ No ☐
 Cooling Initiated ☐
 INITIAL COOLER TEMPERATURES °C: 1.3
 FINAL COOLER TEMPERATURES °C:

SHIPMENT RELEASE (client use)
 Released by: [Signature] Date: Sep 17 Time: 8:00a

INITIAL SHIPMENT RECEPTION (lab use only)
 Received by: AT 12-Sep-17 Date: 17 Time: 10:00a

FINAL SHIPMENT RECEPTION (lab use only)
 Received by: Date: Time:

Report To Company: Public Services and Procurement Canada Contact: Rebecca Studer-Halbach Address: 10025 Jasper Avenue Edmonton, AB T5J 1S6 Phone: (788) 497-3761			Report Format / Distribution Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL) Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: rebecca.studer-halbach@pwgsc.ca Email 2: claire.brown@dxbbprojects.ca			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days) P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge Specify Date Required for E2,E or P:																																																									
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13	CL-8	10-Sep-17		Water	R	R	R								9																																																
14	CL-7-1m	10-Sep-17		Water	R	R	R	R	R	R	R	R			15																																																
15	CL-20	10-Sep-17		Water	R	R	R								7																																																
16	CL-16-2m	10-Sep-17		Water	R	R	R								7																																																
17	CL-16-10m	10-Sep-17		Water	R	R	R			R	R				9																																																
18	CL-3	10-Sep-17		Water	R	R	R	R	R	R	R	R	R		17																																																
19	CL-DUP-2	10-Sep-17		Water	R	R	R	R	R	R	R	R	R		17																																																
20	CL-29	10-Sep-17		Water	R	R	R								7																																																
21	CL-Trip Blank	10-Sep-17	HOLD for analysis	Water											11																																																
22	CL-Field Blank	10-Sep-17		Water	R	R	R	R	R	R	R	R			11																																																
Drinking Water (DW) Samples¹ (client use) Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					Special Instructions / Specify Criteria to add on report (client Use) PLEASE NOTE: This project references "routine" parameters as presented in Q64064: pH, conductivity, alkalinity, turbidity, TDS, TSS, Ammonia, Nitrate/Nitrite, total phosphorus, dissolved phosphorus, dissolved organic carbon, total organic carbon, total Hardness, calcium, magnesium, potassium, sodium, sulphate, sulphide, chloride. ALSO, please note total and dissolved metals parameters must meet detection limits of Q64064.					SAMPLE CONDITION AS RECEIVED (lab use only) Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/> Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/> Cooling Initiated <input type="checkbox"/> INITIAL COOLER TEMPERATURES °C: FINAL COOLER TEMPERATURES °C:																																																					
SHIPMENT RELEASE (client use) Released by: Date: Sep 18/17 Time: 8:00am					INITIAL SHIPMENT RECEPTION (lab use only) Received by: Date: Time:					FINAL SHIPMENT RECEPTION (lab use only) Received by: Date: Time:																																																					



PUBLIC WORKS AND GOVERNMENT
SERVICES CANADA
ATTN: Rebecca Studer-Halbach
Northern Contaminated Sites
10025 Jasper Avenue NW
Edmonton AB T5J 1S6

Date Received: 14-SEP-17
Report Date: 12-DEC-17 16:57 (MT)
Version: FINAL REV. 4

Client Phone: 780-497-3761

Certificate of Analysis

Lab Work Order #: L1991573
Project P.O. #: R.015211.049
Job Reference:
C of C Numbers:
Legal Site Desc:

Comments:

25-OCT-2017 Cesium data has been added to metals results.
12-DEC-2017 Parameter name for all samples has been updated from Total Dissolved P to Total P for appropriate data.

Dean Watt, B.Sc.
Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1991573-1 Water 12-SEP-17 NX-12	L1991573-2 Water 12-SEP-17 NX-6	L1991573-3 Water 12-SEP-17 NX-DUP-1	L1991573-4 Water 12-SEP-17 NX-13	
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	152	53.0	49.9	155	
	Hardness (as CaCO3) (mg/L)	70.8	21.7 ^{HTC}	22.0 ^{HTC}	65.2 ^{HTC}	
	pH (pH)	7.97	7.32	7.33	7.90	
	Total Suspended Solids (mg/L)	<3.0	9.7	<3.0	3.1	
	Total Dissolved Solids (mg/L)	92	44	64	94	
	Turbidity (NTU)	0.42	1.02	1.14	0.37	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	58.6	21.4	21.0	56.4	
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0090	0.0064	0.0073	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	2.39	<0.50	<0.50	2.36	
	Fluoride (F) (mg/L)	0.144	0.173	0.167	0.142	
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	0.0077	0.0064	<0.0020	
	Phosphorus (P)-Total (mg/L)	0.0038	0.0227	0.0261	0.0039	
	Sulfate (SO4) (mg/L)	14.8	2.16	2.15	14.4	
	Sulphide as S (mg/L)	<0.018	0.022	0.021	<0.018	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	5.06	18.3	18.7	4.88	
	Total Organic Carbon (mg/L)	4.94	19.5	19.4	4.78	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0269	0.0561	0.0573	0.0261	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Total (mg/L)	0.00020	0.00056	0.00058	0.00022	
	Barium (Ba)-Total (mg/L)	0.0110	0.00571	0.00578	0.0114	
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	0.011	<0.010	<0.010	0.011	
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Total (mg/L)	15.0	5.23	5.29	14.9	
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00018	0.00038	<0.00010	
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00022	0.00022	<0.00010	
	Copper (Cu)-Total (mg/L)	0.00078	<0.00050	<0.00050	0.00079	
	Iron (Fe)-Total (mg/L)	0.028	0.142	0.147	0.027	
	Lead (Pb)-Total (mg/L)	<0.000050	0.000160	0.000120	<0.000050	
	Lithium (Li)-Total (mg/L)	0.0022	<0.0010	0.0010	0.0022	
	Magnesium (Mg)-Total (mg/L)	6.59	2.10	2.13	6.79	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1991573-1 Water 12-SEP-17 NX-12	L1991573-2 Water 12-SEP-17 NX-6	L1991573-3 Water 12-SEP-17 NX-DUP-1	L1991573-4 Water 12-SEP-17 NX-13	
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.00131	0.0168	0.0176	0.00144		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.000247	0.000056	0.000075	0.000243		
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	1.00	0.41	0.41	1.03		
	Selenium (Se)-Total (mg/L)	<0.000050	0.000052	<0.000050	<0.000050		
	Silicon (Si)-Total (mg/L)	0.85	1.91	1.93	0.86		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	2.53	2.18	2.26	2.57		
	Strontium (Sr)-Total (mg/L)	0.0522	0.0101	0.0103	0.0514		
	Sulfur (S)-Total (mg/L)	5.07	1.07	1.13	4.85		
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010		
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)	0.00077	0.00040	<0.00030	<0.00090 ^{DLM}		
	Uranium (U)-Total (mg/L)	0.000505	0.000074	0.000077	0.000529		
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0039	0.0037	<0.0030		
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030		
Dissolved Metals	Dissolved Mercury Filtration Location	LAB					
	Dissolved Metals Filtration Location	LAB					
	Aluminum (Al)-Dissolved (mg/L)	0.0031					
	Antimony (Sb)-Dissolved (mg/L)	<0.00010					
	Arsenic (As)-Dissolved (mg/L)	0.00020					
	Barium (Ba)-Dissolved (mg/L)	0.0115					
	Beryllium (Be)-Dissolved (mg/L)	<0.000020					
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050					
	Boron (B)-Dissolved (mg/L)	0.011					
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050					
	Calcium (Ca)-Dissolved (mg/L)	16.6					
	Cesium (Cs)-Dissolved (mg/L)	<0.000010					
	Chromium (Cr)-Dissolved (mg/L)	<0.00010					
	Cobalt (Co)-Dissolved (mg/L)	<0.00010					
	Copper (Cu)-Dissolved (mg/L)	0.00063					
	Iron (Fe)-Dissolved (mg/L)	<0.010					
	Lead (Pb)-Dissolved (mg/L)	<0.000050					
	Lithium (Li)-Dissolved (mg/L)	0.0025					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1991573-1 Water 12-SEP-17 NX-12	L1991573-2 Water 12-SEP-17 NX-6	L1991573-3 Water 12-SEP-17 NX-DUP-1	L1991573-4 Water 12-SEP-17 NX-13	
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	7.15					
	Manganese (Mn)-Dissolved (mg/L)	<0.00010					
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050					
	Molybdenum (Mo)-Dissolved (mg/L)	0.000238					
	Nickel (Ni)-Dissolved (mg/L)	<0.00050					
	Phosphorus (P)-Dissolved (mg/L)	<0.050					
	Potassium (K)-Dissolved (mg/L)	1.12					
	Selenium (Se)-Dissolved (mg/L)	<0.000050					
	Silicon (Si)-Dissolved (mg/L)	0.750					
	Silver (Ag)-Dissolved (mg/L)	<0.000010					
	Sodium (Na)-Dissolved (mg/L)	2.62					
	Strontium (Sr)-Dissolved (mg/L)	0.0590					
	Sulfur (S)-Dissolved (mg/L)	4.71					
	Thallium (Tl)-Dissolved (mg/L)	<0.000010					
	Tin (Sn)-Dissolved (mg/L)	<0.00010					
	Titanium (Ti)-Dissolved (mg/L)	<0.00030					
	Uranium (U)-Dissolved (mg/L)	0.000564					
	Vanadium (V)-Dissolved (mg/L)	<0.00050					
	Zinc (Zn)-Dissolved (mg/L)	<0.0010					
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030					
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				<0.00050	
	Ethylbenzene (mg/L)	<0.00050				<0.00050	
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				<0.00050	
	Styrene (mg/L)	<0.00050				<0.00050	
	Toluene (mg/L)	<0.00045				<0.00045	
	ortho-Xylene (mg/L)	<0.00050				<0.00050	
	meta- & para-Xylene (mg/L)	<0.00050				<0.00050	
	Xylenes (mg/L)	<0.00075				<0.00075	
	F1 (C6-C10) (mg/L)	<0.10				<0.10	
	Surrogate: 4-Bromofluorobenzene (SS) (%)	97.2				95.1	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	98.9				95.7	
Hydrocarbons	F1-BTEX (mg/L)	<0.10				<0.10	
	F2 (C10-C16) (mg/L)	<0.30				<0.30	
	F3 (C16-C34) (mg/L)	<0.30				<0.30	
	F4 (C34-C50) (mg/L)	<0.30				<0.30	
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10				<0.10	
	VPH (C6-C10) (mg/L)	<0.10				<0.10	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1991573-1	L1991573-2	L1991573-3	L1991573-4	
		Description	Water	Water	Water	Water	
		Sampled Date	12-SEP-17	12-SEP-17	12-SEP-17	12-SEP-17	
		Sampled Time					
		Client ID	NX-12	NX-6	NX-DUP-1	NX-13	
Grouping	Analyte						
WATER							
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)		97.5			99.9	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)		111.5			108.2	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1991573-1, -2, -3, -4
Matrix Spike	Total Organic Carbon	MS-B	L1991573-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1991573-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1991573-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1991573-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1991573-1
Matrix Spike	Barium (Ba)-Total	MS-B	L1991573-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L1991573-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1991573-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Total	MS-B	L1991573-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L1991573-1, -2, -3, -4
Matrix Spike	Uranium (U)-Total	MS-B	L1991573-1, -2, -3, -4
Matrix Spike	Nitrate (as N)	MS-B	L1991573-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
F1-BTX-CALC-VA	Water	F1-Total BTX	CCME CWS PHC TIER 1 (2001)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by			

Reference Information

GC/FID. The F1-BTEX result is calculated as follows:

F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).

F1-HSFID-VA Water CCME F1 By Headspace with GCFID EPA 5021A/CCME CWS PHC (Pub# 1310)

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.

F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.

F2-F4-ME-FID-VA Water CCME F2-F4 Hydrocarbons in Water CCME CWS-PHC, Pub #1310, Dec 2001

F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Reference Information

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value
 This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

S2-T-COL-VA Water Total Sulphide by Colorimetric APHA 4500-S2 Sulphide
 This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)
 Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC
 This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC
 This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity
 This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VH-HSFID-VA Water VH in Water by Headspace GCFID BC Env. Lab Manual (VH in Water)
 The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA Water VH Surrogates for Waters BC Env. Lab Manual (VH in Solids)

VOC7-HSMS-VA Water BTEX/MTBE/Styrene by Headspace GCMS EPA 5021A/8260C
 The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA Water VOC7 and/or VOC Surrogates for Waters EPA 5035A/5021A/8260C

VPH-CALC-VA Water VPH is VH minus select aromatics BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water". The concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and, in solids, Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10).

XYLENES-CALC-VA Water Sum of Xylene Isomer Concentrations CALCULATION
 Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
----------------------------	---------------------

VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
----	---

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg ww - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

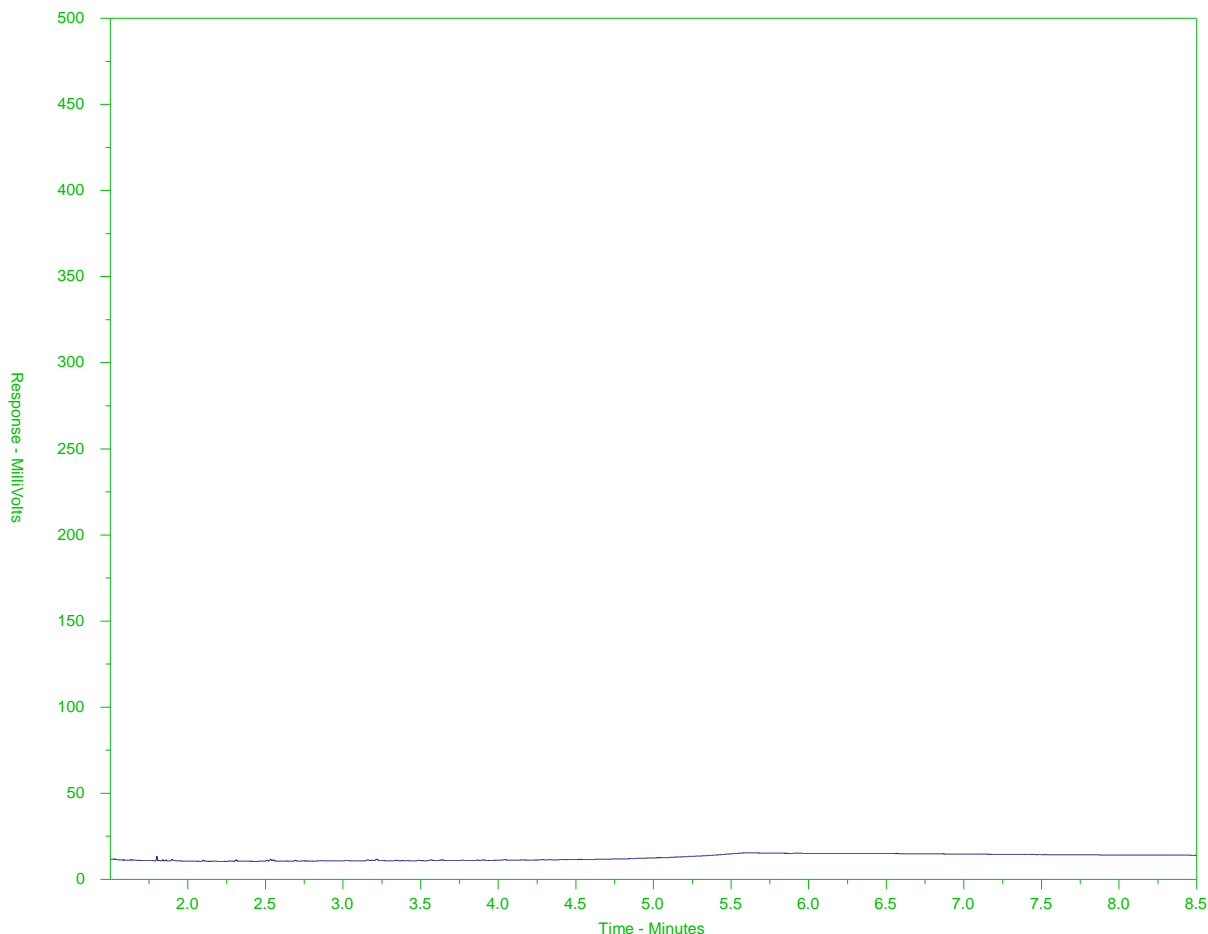
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991573-C-4
Client Sample ID: NX-13



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.



PUBLIC WORKS AND GOVERNMENT
SERVICES CANADA
ATTN: Rebecca Studer-Halbach
Northern Contaminated Sites
10025 Jasper Avenue NW
Edmonton AB T5J 1S6

Date Received: 14-SEP-17
Report Date: 03-NOV-17 17:15 (MT)
Version: FINAL REV. 3

Client Phone: 780-497-3761

Certificate of Analysis

Lab Work Order #: L1991623
Project P.O. #: R.015211.049
Job Reference:
C of C Numbers:
Legal Site Desc:

Comments: Total/Dissolved Metals Data has been added. OCT-20-2017.
3-NOV-2017 Cesium data has been added to total and dissolved metals scans.

Dean Watt, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1991623-1 water 12-SEP-17 NO-25	L1991623-2 water 12-SEP-17 NO-1	L1991623-3 water 12-SEP-17 NO-2	L1991623-4 water 12-SEP-17 NO-DUP-1	L1991623-5 water 12-SEP-17 NO-11
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	152	149	150	153	138
	Hardness (as CaCO3) (mg/L)	68.5	70.6 ^{HTC}	79.5	79.1	70.9 ^{HTC}
	pH (pH)	7.87	7.92	7.95	7.94	7.91
	Total Suspended Solids (mg/L)	3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	96	93	116	121	115
	Turbidity (NTU)	0.48	0.76	0.43	0.45	0.53
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	54.5	60.0	69.5	71.5	62.3
	Ammonia, Total (as N) (mg/L)	0.0087	<0.0050	0.0122	0.0083	0.0127
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	2.35	2.39	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.142	0.149	0.169	0.166	0.128
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	0.0063	0.0065	0.0047
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0037	0.0086	0.0072	0.0058
	Sulfate (SO4) (mg/L)	14.5	15.2	8.52	8.51	8.94
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	4.84	4.66	13.6	13.8	14.1
	Total Organic Carbon (mg/L)	4.72	4.67	13.9	14.0	14.4
Total Metals	Aluminum (Al)-Total (mg/L)	0.0329	0.0637	0.0058	0.0051	0.0164
	Antimony (Sb)-Total (mg/L)	<0.00010	0.00016	0.00019	0.00018	0.00018
	Arsenic (As)-Total (mg/L)	0.00024	0.00799	0.0132	0.0125	0.00606
	Barium (Ba)-Total (mg/L)	0.0106	0.0102	0.00561	0.00536	0.00702
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	0.000161	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.010	0.013	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	0.0000572	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	15.8	16.7	23.1	22.9	20.8
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)	0.00013	0.00020	0.00014	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00178	0.00069	0.00065	0.00018
	Copper (Cu)-Total (mg/L)	0.00078	0.00677	0.00210	0.00197	0.00259
	Iron (Fe)-Total (mg/L)	0.032	0.104	0.096	0.089	0.045
	Lead (Pb)-Total (mg/L)	<0.000050	0.0120	0.00223	0.00218	0.000272
	Lithium (Li)-Total (mg/L)	0.0025	0.0025	0.0017	0.0017	0.0016
	Magnesium (Mg)-Total (mg/L)	6.75	7.05	4.84	4.43	4.58

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1991623-6 water 12-SEP-17 NO-7	L1991623-7 water 12-SEP-17 NO-5	L1991623-8 water 12-SEP-17 NO-27	L1991623-9 water 12-SEP-17 NO-4/NO-8	L1991623-10 water 12-SEP-17 NO-6
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	139	148	144 ^{HTC}	214 ^{HTC}	148
	Hardness (as CaCO3) (mg/L)	72.3	70.2 ^{HTC}	66.2 ^{HTC}	116 ^{HTC}	70.6
	pH (pH)	7.91	7.92	7.91	8.17	7.90
	Total Suspended Solids (mg/L)	3.0	3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	111	94	96	158	93
	Turbidity (NTU)	0.51	0.47	0.52	0.65	0.48
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	62.8	55.9	57.8	122	59.2
	Ammonia, Total (as N) (mg/L)	0.0114	0.0054	<0.0050	0.0105	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	2.39	2.34	<0.50	2.38
	Fluoride (F) (mg/L)	0.129	0.143	0.141	0.185	0.143
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	0.0012	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0045	<0.0020	<0.0020	0.0021	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0043	0.0024	<0.0020	<0.0020	0.0026
	Sulfate (SO4) (mg/L)	8.95	14.8	14.5	<0.30	14.8
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	13.9	4.78	5.26	12.2	4.92
	Total Organic Carbon (mg/L)	14.3	4.60	4.82	14.0 ^M	4.77
Total Metals	Aluminum (Al)-Total (mg/L)	0.0184	0.0157	0.0254	0.0051	0.0262
	Antimony (Sb)-Total (mg/L)	0.00019	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00605	0.00032	0.00019	0.00958	0.00027
	Barium (Ba)-Total (mg/L)	0.00725	0.0107	0.0101	0.00731	0.0108
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	0.011	0.011	<0.010	0.011
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	0.0000107	<0.0000050
	Calcium (Ca)-Total (mg/L)	21.3	16.2	15.6	34.5	16.1
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)	0.00013	<0.00010	<0.00010	0.00017	0.00015
	Cobalt (Co)-Total (mg/L)	0.00019	<0.00010	<0.00010	0.00082	<0.00010
	Copper (Cu)-Total (mg/L)	0.00262	0.00090	0.00075	0.00677	0.00090
	Iron (Fe)-Total (mg/L)	0.046	0.015	0.023	0.071	0.030
	Lead (Pb)-Total (mg/L)	0.000297	0.000311	<0.000050	0.000737	0.000092
	Lithium (Li)-Total (mg/L)	0.0017	0.0027	0.0026	0.0013	0.0027
	Magnesium (Mg)-Total (mg/L)	4.71	7.19	6.58	7.36	6.99

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1991623-11 water 12-SEP-17 R-4				
Grouping	Analyte						
WATER							
Physical Tests	Conductivity (uS/cm)	147					
	Hardness (as CaCO3) (mg/L)	69.3					
	pH (pH)	7.91					
	Total Suspended Solids (mg/L)	<3.0					
	Total Dissolved Solids (mg/L)	98					
	Turbidity (NTU)	0.44					
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	56.4					
	Ammonia, Total (as N) (mg/L)	0.0084					
	Bromide (Br) (mg/L)	<0.050					
	Chloride (Cl) (mg/L)	2.41					
	Fluoride (F) (mg/L)	0.150					
	Nitrate (as N) (mg/L)	<0.0050					
	Nitrite (as N) (mg/L)	<0.0010					
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020					
	Phosphorus (P)-Total (mg/L)	<0.0020					
	Sulfate (SO4) (mg/L)	14.9					
	Sulphide as S (mg/L)	<0.018					
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	5.31					
	Total Organic Carbon (mg/L)	4.63					
Total Metals	Aluminum (Al)-Total (mg/L)	0.0234					
	Antimony (Sb)-Total (mg/L)	<0.00010					
	Arsenic (As)-Total (mg/L)	0.00020					
	Barium (Ba)-Total (mg/L)	0.0104					
	Beryllium (Be)-Total (mg/L)	<0.000020					
	Bismuth (Bi)-Total (mg/L)	<0.000050					
	Boron (B)-Total (mg/L)	0.011					
	Cadmium (Cd)-Total (mg/L)	<0.0000050					
	Calcium (Ca)-Total (mg/L)	15.7					
	Cesium (Cs)-Total (mg/L)	<0.000010					
	Chromium (Cr)-Total (mg/L)	<0.00010					
	Cobalt (Co)-Total (mg/L)	<0.00010					
	Copper (Cu)-Total (mg/L)	0.00077					
	Iron (Fe)-Total (mg/L)	0.022					
	Lead (Pb)-Total (mg/L)	<0.000050					
	Lithium (Li)-Total (mg/L)	0.0026					
	Magnesium (Mg)-Total (mg/L)	6.97					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1991623-1	L1991623-2	L1991623-3	L1991623-4	L1991623-5
		Description	water	water	water	water	water
		Sampled Date	12-SEP-17	12-SEP-17	12-SEP-17	12-SEP-17	12-SEP-17
		Sampled Time					
		Client ID	NO-25	NO-1	NO-2	NO-DUP-1	NO-11
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.00183	0.00569	0.0148	0.0132	0.0129	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000271	0.000423	0.000543	0.000555	0.000668	
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00186	0.00103	0.00092	0.00086	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.90	0.97	0.75	0.69	0.61	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.83	0.82	0.89	0.83	0.84	
	Silver (Ag)-Total (mg/L)	<0.000010	0.000065	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	2.42	2.54	2.22	2.06	1.49	
	Strontium (Sr)-Total (mg/L)	0.0551	0.0559	0.0268	0.0264	0.0259	
	Sulfur (S)-Total (mg/L)	4.72	4.96	3.10	2.92	3.09	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	0.00120	0.00195	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Total (mg/L)	0.000521	0.000654	0.000120	0.000111	0.000191	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	0.0045	0.0276	0.0075	0.0060	0.0031	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location	LAB		LAB	LAB		
	Dissolved Metals Filtration Location	LAB		LAB	LAB		
	Aluminum (Al)-Dissolved (mg/L)	0.0026		0.0037	0.0054		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010		0.00019	0.00019		
	Arsenic (As)-Dissolved (mg/L)	0.00019		0.0127	0.0128		
	Barium (Ba)-Dissolved (mg/L)	0.0113		0.00593	0.00619		
	Beryllium (Be)-Dissolved (mg/L)	<0.000020		<0.000020	<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050		<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	0.011		<0.010	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050		<0.0000050	<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)	15.9		23.6	23.5		
	Cesium (Cs)-Dissolved (mg/L)	<0.000010		<0.000010	<0.000010		
	Chromium (Cr)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)	0.00063		0.00172	0.00174		
	Iron (Fe)-Dissolved (mg/L)	<0.010		0.041	0.042		
	Lead (Pb)-Dissolved (mg/L)	<0.000050		0.000607	0.000588		
	Lithium (Li)-Dissolved (mg/L)	0.0024		0.0014	0.0015		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1991623-6 water 12-SEP-17 NO-7	L1991623-7 water 12-SEP-17 NO-5	L1991623-8 water 12-SEP-17 NO-27	L1991623-9 water 12-SEP-17 NO-4/NO-8	L1991623-10 water 12-SEP-17 NO-6
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.0127	0.00093	0.00128	0.0923	0.00146	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000717	0.000276	0.000265	0.00156	0.000287	
	Nickel (Ni)-Total (mg/L)	0.00085	<0.00050	<0.00050	0.00157	0.00052	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.63	0.94	0.89	1.34	0.94	
	Selenium (Se)-Total (mg/L)	0.000056	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.86	0.81	0.79	1.73	0.82	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	0.000014	<0.000010	
	Sodium (Na)-Total (mg/L)	1.54	2.58	2.38	2.63	2.52	
	Strontium (Sr)-Total (mg/L)	0.0271	0.0578	0.0546	0.0406	0.0567	
	Sulfur (S)-Total (mg/L)	3.06	4.71	4.57	<0.50	4.82	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	0.00033	0.00040	0.00095	<0.00030	0.00078	
	Uranium (U)-Total (mg/L)	0.000200	0.000559	0.000534	0.000175	0.000520	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	0.0057	<0.0030	0.0032	0.0102	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location	LAB				LAB	
	Dissolved Metals Filtration Location	LAB				LAB	
	Aluminum (Al)-Dissolved (mg/L)	0.0101				0.0026	
	Antimony (Sb)-Dissolved (mg/L)	0.00018				<0.00010	
	Arsenic (As)-Dissolved (mg/L)	0.00603				0.00026	
	Barium (Ba)-Dissolved (mg/L)	0.00743				0.0116	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				<0.000050	
	Boron (B)-Dissolved (mg/L)	<0.010				0.011	
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)	21.0				16.4	
	Cesium (Cs)-Dissolved (mg/L)	<0.000010				<0.000010	
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				<0.00010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				<0.00010	
	Copper (Cu)-Dissolved (mg/L)	0.00239				0.00075	
	Iron (Fe)-Dissolved (mg/L)	0.025				<0.010	
	Lead (Pb)-Dissolved (mg/L)	0.000067				<0.000050	
	Lithium (Li)-Dissolved (mg/L)	0.0013				0.0025	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID				
		L1991623-11 water 12-SEP-17 R-4				
Grouping	Analyte					
WATER						
Total Metals	Manganese (Mn)-Total (mg/L)	0.00116				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	0.000245				
	Nickel (Ni)-Total (mg/L)	<0.00050				
	Phosphorus (P)-Total (mg/L)	<0.050				
	Potassium (K)-Total (mg/L)	0.92				
	Selenium (Se)-Total (mg/L)	<0.000050				
	Silicon (Si)-Total (mg/L)	0.78				
	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	2.51				
	Strontium (Sr)-Total (mg/L)	0.0553				
	Sulfur (S)-Total (mg/L)	4.71				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	0.00086				
	Uranium (U)-Total (mg/L)	0.000528				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.00030				
Dissolved Metals	Dissolved Mercury Filtration Location	LAB				
	Dissolved Metals Filtration Location	LAB				
	Aluminum (Al)-Dissolved (mg/L)	0.0021				
	Antimony (Sb)-Dissolved (mg/L)	<0.00010				
	Arsenic (As)-Dissolved (mg/L)	0.00019				
	Barium (Ba)-Dissolved (mg/L)	0.0113				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	0.011				
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				
	Calcium (Ca)-Dissolved (mg/L)	16.5				
	Cesium (Cs)-Dissolved (mg/L)	<0.000010				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00060				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	0.0025				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1991623-1 water 12-SEP-17 NO-25	L1991623-2 water 12-SEP-17 NO-1	L1991623-3 water 12-SEP-17 NO-2	L1991623-4 water 12-SEP-17 NO-DUP-1	L1991623-5 water 12-SEP-17 NO-11
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	7.03		4.98	4.99	
	Manganese (Mn)-Dissolved (mg/L)	<0.00010		0.00033	0.00028	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050		<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	0.000254		0.000534	0.000532	
	Nickel (Ni)-Dissolved (mg/L)	<0.00050		0.00084	0.00086	
	Phosphorus (P)-Dissolved (mg/L)	<0.050		<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)	1.03		0.88	0.82	
	Selenium (Se)-Dissolved (mg/L)	<0.000050		0.000051	<0.000050	
	Silicon (Si)-Dissolved (mg/L)	0.755		0.853	0.873	
	Silver (Ag)-Dissolved (mg/L)	<0.000010		<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	2.59		2.31	2.34	
	Strontium (Sr)-Dissolved (mg/L)	0.0562		0.0272	0.0276	
	Sulfur (S)-Dissolved (mg/L)	4.71		3.04	3.03	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010		<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030		<0.00030	<0.00030	
	Uranium (U)-Dissolved (mg/L)	0.000543		0.000113	0.000113	
	Vanadium (V)-Dissolved (mg/L)	<0.00050		<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0010		0.0036	0.0039	
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030		<0.00030	<0.00030	
Volatile Organic Compounds	Benzene (mg/L)		<0.00050	<0.00050	<0.00050	
	Ethylbenzene (mg/L)		<0.00050	<0.00050	<0.00050	
	Methyl t-butyl ether (MTBE) (mg/L)		<0.00050	<0.00050	<0.00050	
	Styrene (mg/L)		<0.00050	<0.00050	<0.00050	
	Toluene (mg/L)		<0.00045	<0.00045	<0.00045	
	ortho-Xylene (mg/L)		<0.00050	<0.00050	<0.00050	
	meta- & para-Xylene (mg/L)		<0.00050	<0.00050	<0.00050	
	Xylenes (mg/L)		<0.00075	<0.00075	<0.00075	
	F1 (C6-C10) (mg/L)		<0.10	<0.10	<0.10	
	Surrogate: 4-Bromofluorobenzene (SS) (%)		94.5	94.7	93.5	
	Surrogate: 1,4-Difluorobenzene (SS) (%)		94.5	99.4	101.4	
Hydrocarbons	F1-BTEX (mg/L)		<0.10	<0.10	<0.10	
	F2 (C10-C16) (mg/L)		<0.30	<0.30	<0.30	
	F3 (C16-C34) (mg/L)		<0.30	<0.30	<0.30	
	F4 (C34-C50) (mg/L)		<0.30	<0.30	<0.30	
	Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10	<0.10	<0.10	
	VPH (C6-C10) (mg/L)		<0.10	<0.10	<0.10	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1991623-6 water 12-SEP-17 NO-7	L1991623-7 water 12-SEP-17 NO-5	L1991623-8 water 12-SEP-17 NO-27	L1991623-9 water 12-SEP-17 NO-4/NO-8	L1991623-10 water 12-SEP-17 NO-6
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	4.83					7.19
	Manganese (Mn)-Dissolved (mg/L)	0.00051					<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050					<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000639					0.000260
	Nickel (Ni)-Dissolved (mg/L)	0.00069					<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050					<0.050
	Potassium (K)-Dissolved (mg/L)	0.72					1.13
	Selenium (Se)-Dissolved (mg/L)	<0.000050					<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.814					0.777
	Silver (Ag)-Dissolved (mg/L)	<0.000010					<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.61					2.67
	Strontium (Sr)-Dissolved (mg/L)	0.0264					0.0580
	Sulfur (S)-Dissolved (mg/L)	3.20					4.89
	Thallium (Tl)-Dissolved (mg/L)	<0.000010					<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010					<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030					<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000192					0.000549
	Vanadium (V)-Dissolved (mg/L)	<0.00050					<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0013					<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030					<0.00030
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050			<0.00050	<0.00050
	Ethylbenzene (mg/L)	<0.00050	<0.00050			<0.00050	<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050			<0.00050	<0.00050
	Styrene (mg/L)	<0.00050	<0.00050			<0.00050	<0.00050
	Toluene (mg/L)	<0.00045	<0.00045			<0.00045	<0.00045
	ortho-Xylene (mg/L)	<0.00050	<0.00050			<0.00050	<0.00050
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050			<0.00050	<0.00050
	Xylenes (mg/L)	<0.00075	<0.00075			<0.00075	<0.00075
	F1 (C6-C10) (mg/L)	<0.10	<0.10			<0.10	<0.10
	Surrogate: 4-Bromofluorobenzene (SS) (%)	101.1	94.8			101.9	103.1
	Surrogate: 1,4-Difluorobenzene (SS) (%)	101.7	102.0			100.3	99.7
Hydrocarbons	F1-BTEX (mg/L)	<0.10	<0.10			<0.10	<0.10
	F2 (C10-C16) (mg/L)	<0.30	<0.30			<0.30	<0.30
	F3 (C16-C34) (mg/L)	<0.30	<0.30			<0.30	<0.30
	F4 (C34-C50) (mg/L)	<0.30	<0.30			<0.30	<0.30
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10			<0.10	<0.10
	VPH (C6-C10) (mg/L)	<0.10	<0.10			<0.10	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1991623-11 water 12-SEP-17 R-4				
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	6.80					
	Manganese (Mn)-Dissolved (mg/L)	<0.00010					
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050					
	Molybdenum (Mo)-Dissolved (mg/L)	0.000243					
	Nickel (Ni)-Dissolved (mg/L)	<0.00050					
	Phosphorus (P)-Dissolved (mg/L)	<0.050					
	Potassium (K)-Dissolved (mg/L)	1.07					
	Selenium (Se)-Dissolved (mg/L)	<0.000050					
	Silicon (Si)-Dissolved (mg/L)	0.744					
	Silver (Ag)-Dissolved (mg/L)	<0.000010					
	Sodium (Na)-Dissolved (mg/L)	2.51					
	Strontium (Sr)-Dissolved (mg/L)	0.0582					
	Sulfur (S)-Dissolved (mg/L)	4.60					
	Thallium (Tl)-Dissolved (mg/L)	<0.000010					
	Tin (Sn)-Dissolved (mg/L)	<0.00010					
	Titanium (Ti)-Dissolved (mg/L)	<0.00030					
	Uranium (U)-Dissolved (mg/L)	0.000556					
	Vanadium (V)-Dissolved (mg/L)	<0.00050					
	Zinc (Zn)-Dissolved (mg/L)	<0.0010					
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030					
Volatile Organic Compounds	Benzene (mg/L)						
	Ethylbenzene (mg/L)						
	Methyl t-butyl ether (MTBE) (mg/L)						
	Styrene (mg/L)						
	Toluene (mg/L)						
	ortho-Xylene (mg/L)						
	meta- & para-Xylene (mg/L)						
	Xylenes (mg/L)						
	F1 (C6-C10) (mg/L)						
	Surrogate: 4-Bromofluorobenzene (SS) (%)						
	Surrogate: 1,4-Difluorobenzene (SS) (%)						
Hydrocarbons	F1-BTEX (mg/L)						
	F2 (C10-C16) (mg/L)						
	F3 (C16-C34) (mg/L)						
	F4 (C34-C50) (mg/L)						
	Volatile Hydrocarbons (VH6-10) (mg/L)						
	VPH (C6-C10) (mg/L)						

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1991623-6	L1991623-7	L1991623-8	L1991623-9	L1991623-10
		Description	water	water	water	water	water
		Sampled Date	12-SEP-17	12-SEP-17	12-SEP-17	12-SEP-17	12-SEP-17
		Sampled Time					
		Client ID	NO-7	NO-5	NO-27	NO-4/NO-8	NO-6
Grouping	Analyte						
WATER							
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)		95.4	97.1		91.2	90.8
	Surrogate: 3,4-Dichlorotoluene (SS) (%)		136.8	90.5		132.2	148.6

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1991623-11 water 12-SEP-17 R-4				
Grouping	Analyte					
WATER						
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%) Surrogate: 3,4-Dichlorotoluene (SS) (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1991623-4	NO-DUP-1	VC:RHS	Volatile Analysis Compromised; Samples Received With Headspace

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1991623-1, -2, -3, -4, -5
Matrix Spike	Dissolved Organic Carbon	MS-B	L1991623-10, -11, -6, -7, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L1991623-1, -2, -3, -4, -5
Matrix Spike	Total Organic Carbon	MS-B	L1991623-10, -11, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1991623-1, -10, -11, -3, -4, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1991623-1, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1991623-1, -10, -11, -3, -4, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1991623-1, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1991623-1, -10, -11, -3, -4, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1991623-1, -10, -11, -3, -4, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1991623-1, -4
Matrix Spike	Aluminum (Al)-Total	MS-B	L1991623-2
Matrix Spike	Arsenic (As)-Total	MS-B	L1991623-2
Matrix Spike	Calcium (Ca)-Total	MS-B	L1991623-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L1991623-2
Matrix Spike	Iron (Fe)-Total	MS-B	L1991623-2
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1991623-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1991623-2
Matrix Spike	Manganese (Mn)-Total	MS-B	L1991623-2
Matrix Spike	Sodium (Na)-Total	MS-B	L1991623-2
Matrix Spike	Strontium (Sr)-Total	MS-B	L1991623-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L1991623-2
Matrix Spike	Sulfur (S)-Total	MS-B	L1991623-2
Matrix Spike	Nitrate (as N)	MS-B	L1991623-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
M	A peak has been manually integrated.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

Reference Information

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

F1-BTX-CALC-VA Water F1-Total BTX CCME CWS PHC TIER 1 (2001)

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID. The F1-BTEX result is calculated as follows:

F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).

F1-HSFID-VA Water CCME F1 By Headspace with GCFID EPA 5021A/CCME CWS PHC (Pub# 1310)

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.

F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.

F2-F4-ME-FID-VA Water CCME F2-F4 Hydrocarbons in Water CCME CWS-PHC, Pub #1310, Dec 2001

F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

S2-T-COL-VA Water Total Sulphide by Colorimetric APHA 4500-S2 Sulphide

This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VH-HSFID-VA Water VH in Water by Headspace GC/FID BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA Water VH Surrogates for Waters BC Env. Lab Manual (VH in Solids)

VOC7-HSMS-VA Water BTEX/MTBE/Styrene by Headspace GC/MS EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA Water VOC7 and/or VOC Surrogates for Waters EPA 5035A/5021A/8260C

VPH-CALC-VA Water VPH is VH minus select aromatics BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water". The concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and, in solids, Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10).

XYLENES-CALC-VA Water Sum of Xylene Isomer Concentrations CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Reference Information

Laboratory Definition Code	Laboratory Location
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VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
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Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg ww - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

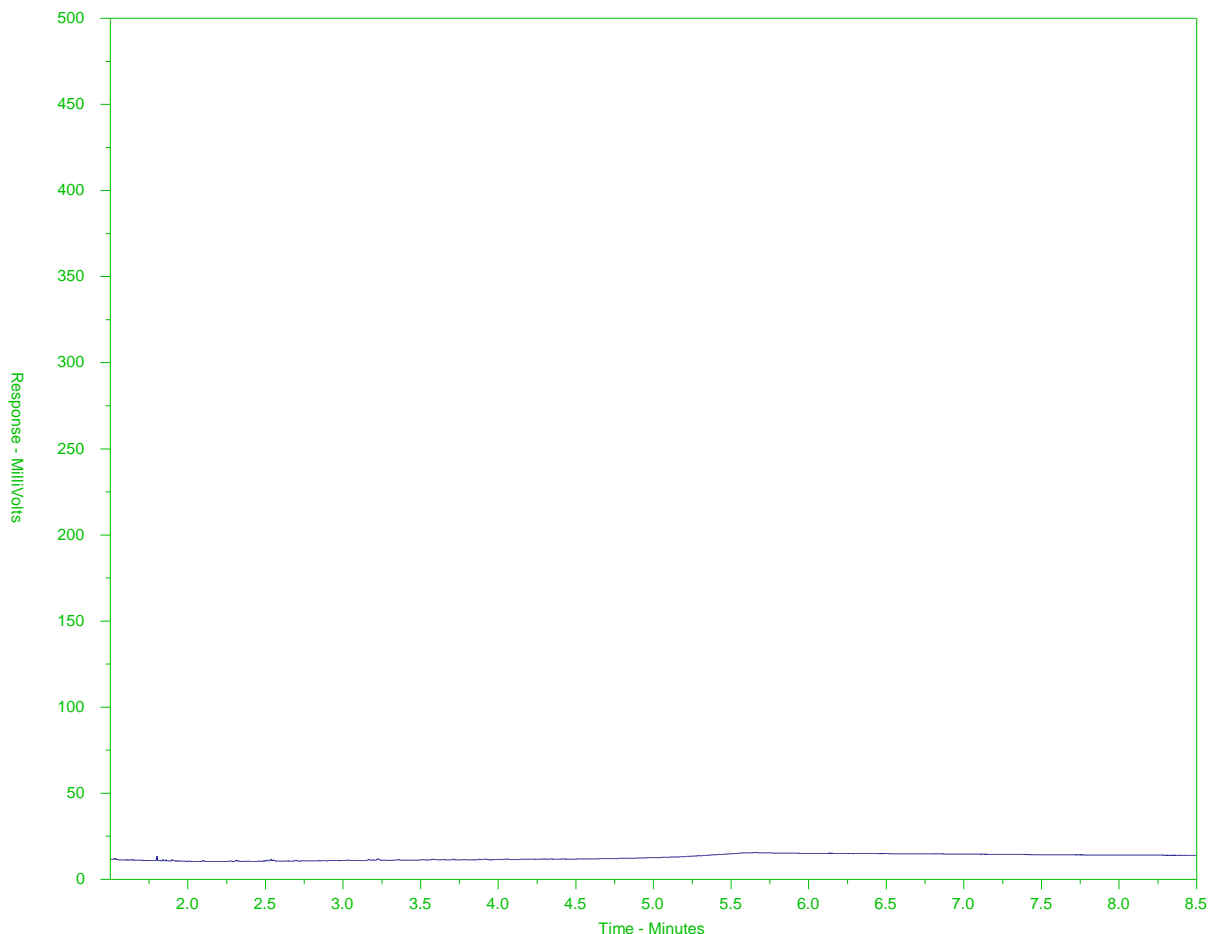
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991623-C-2
Client Sample ID: NO-1



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

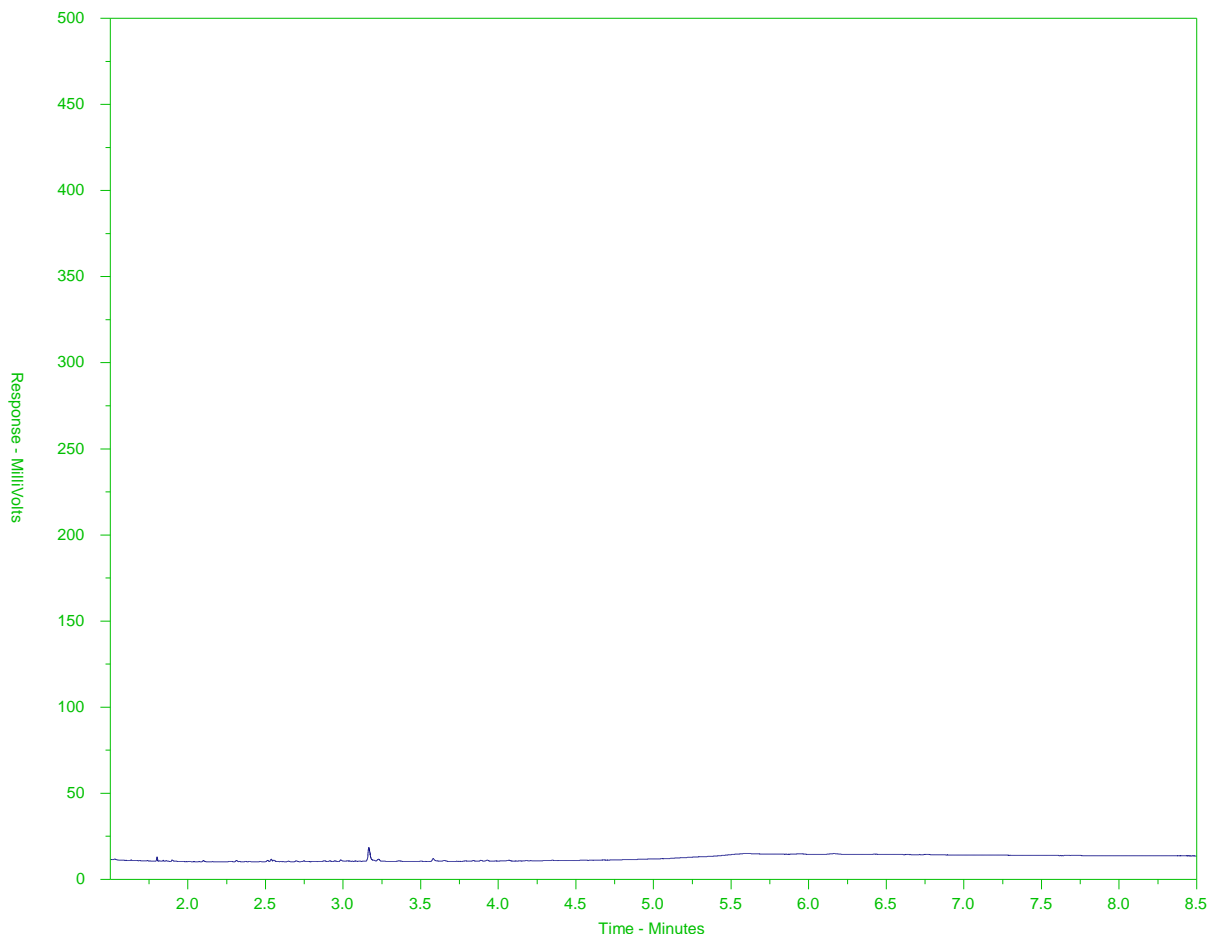
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991623-C-3
Client Sample ID: NO-2



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

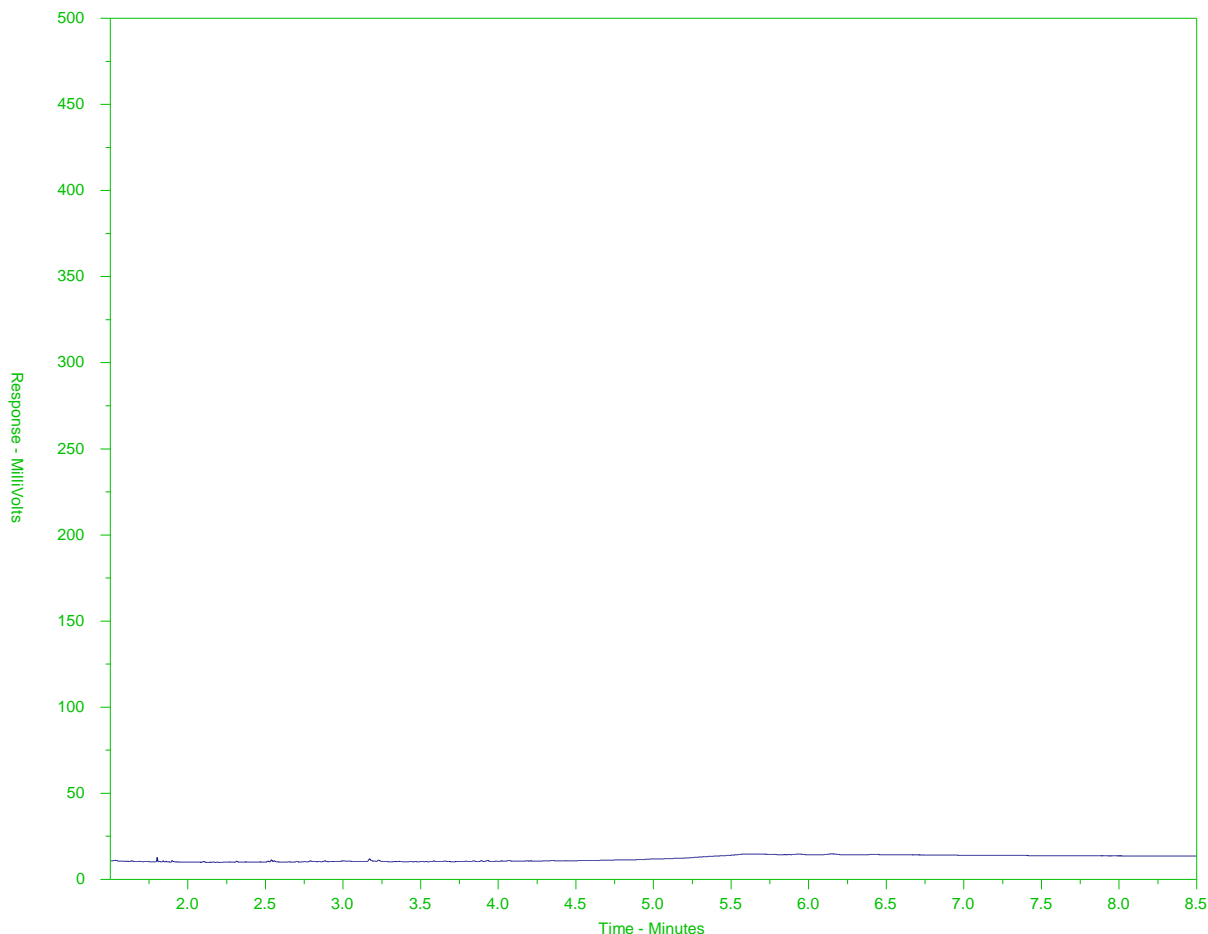
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991623-C-4
Client Sample ID: NO-DUP-1



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

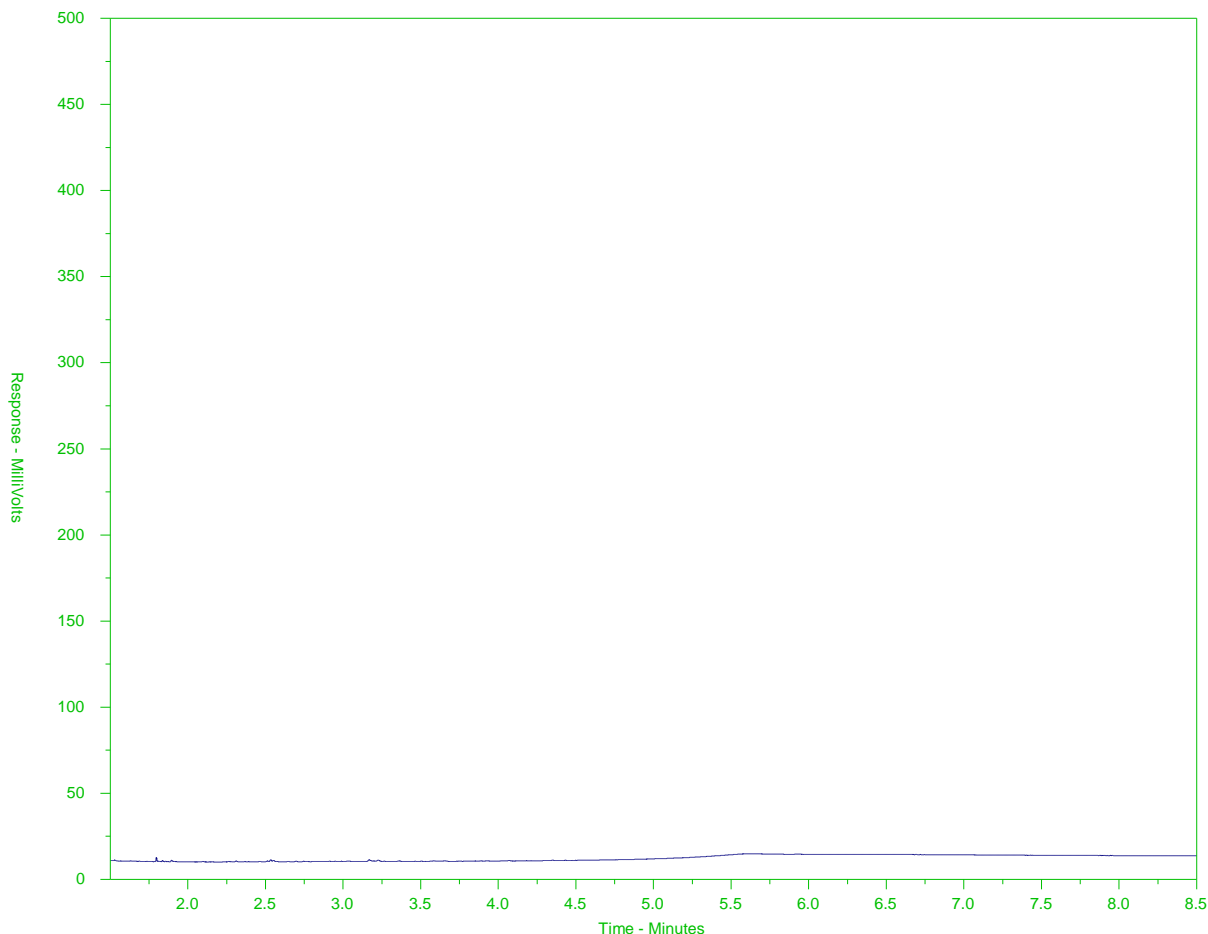
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991623-C-6
Client Sample ID: NO-7



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

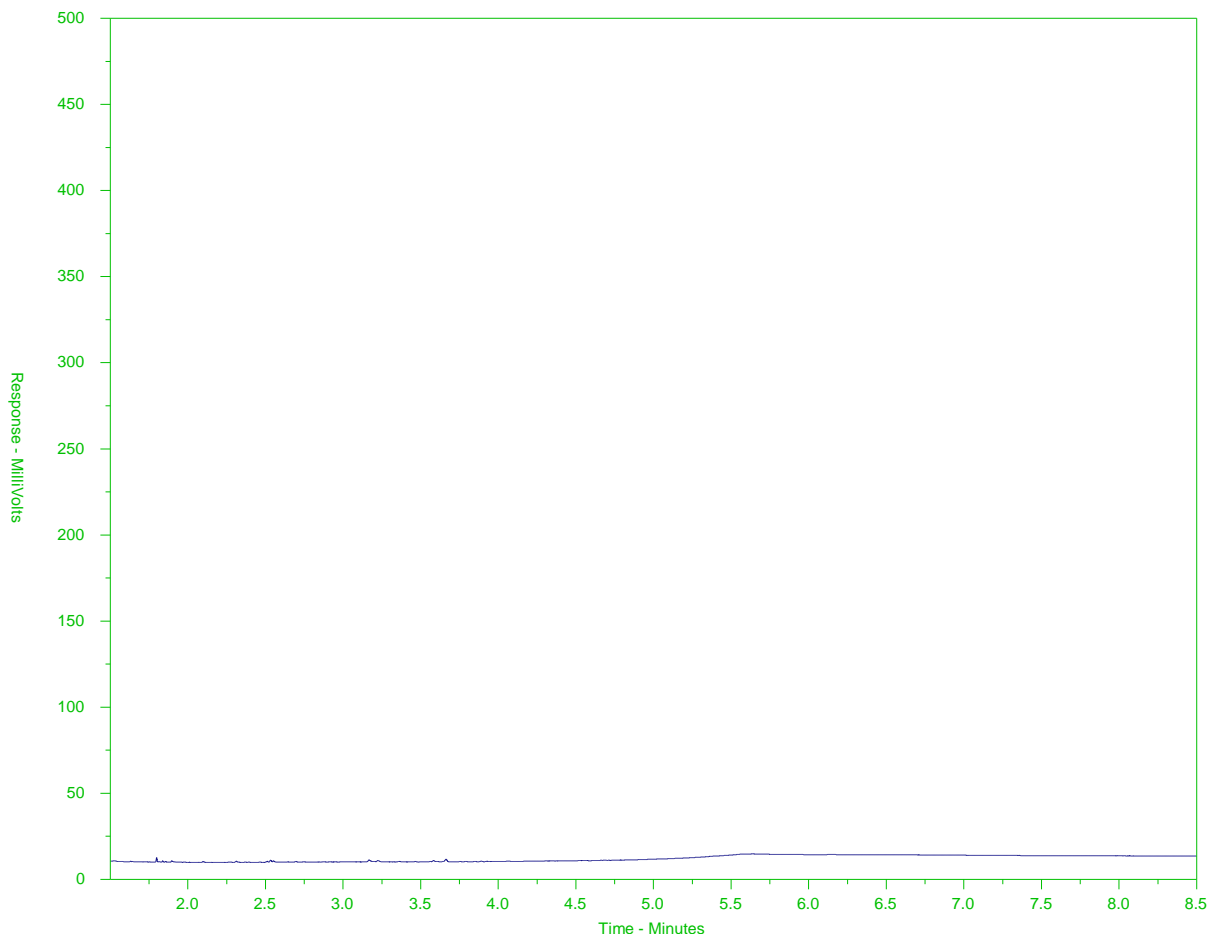
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991623-C-7
Client Sample ID: NO-5



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

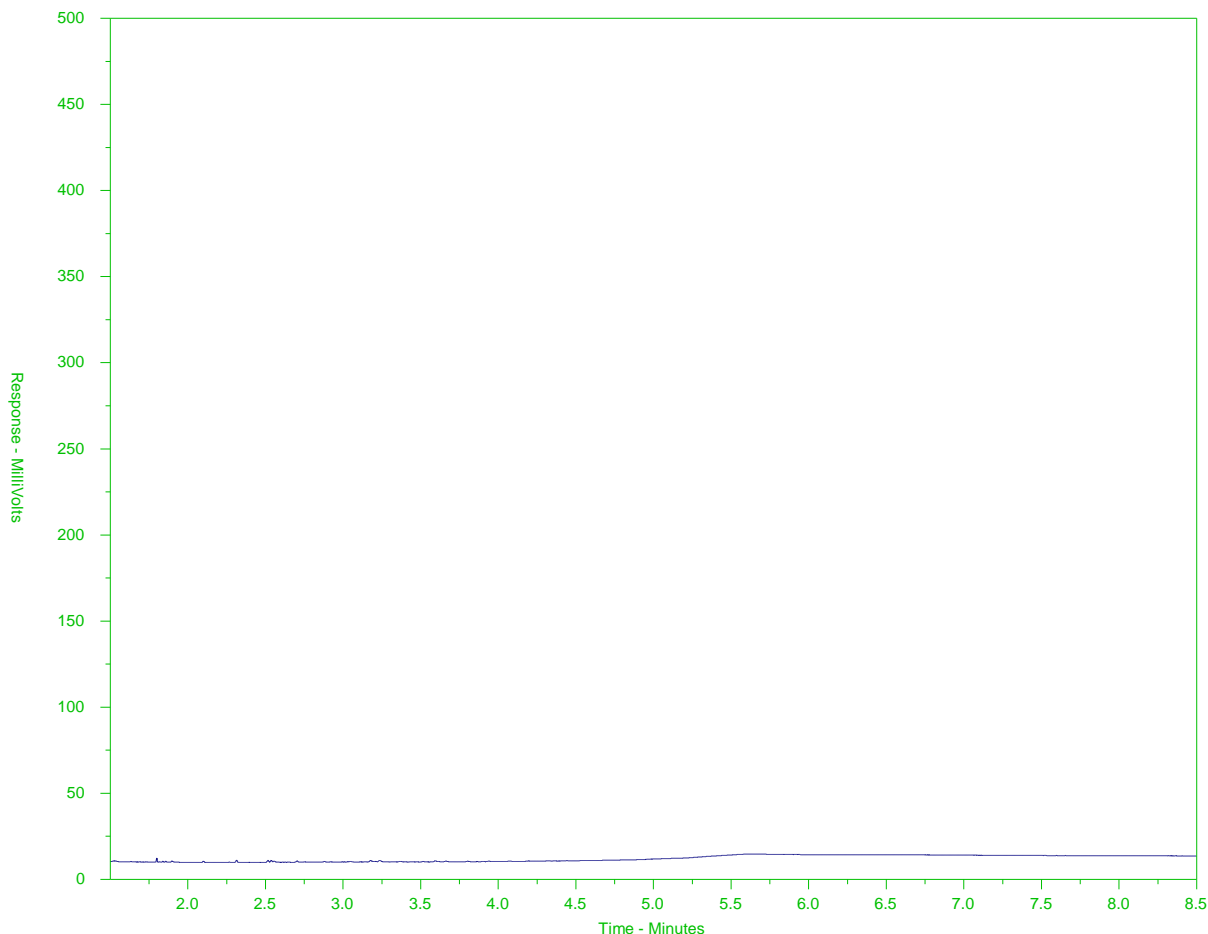
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991623-C-9
Client Sample ID: NO-4/NO-8



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

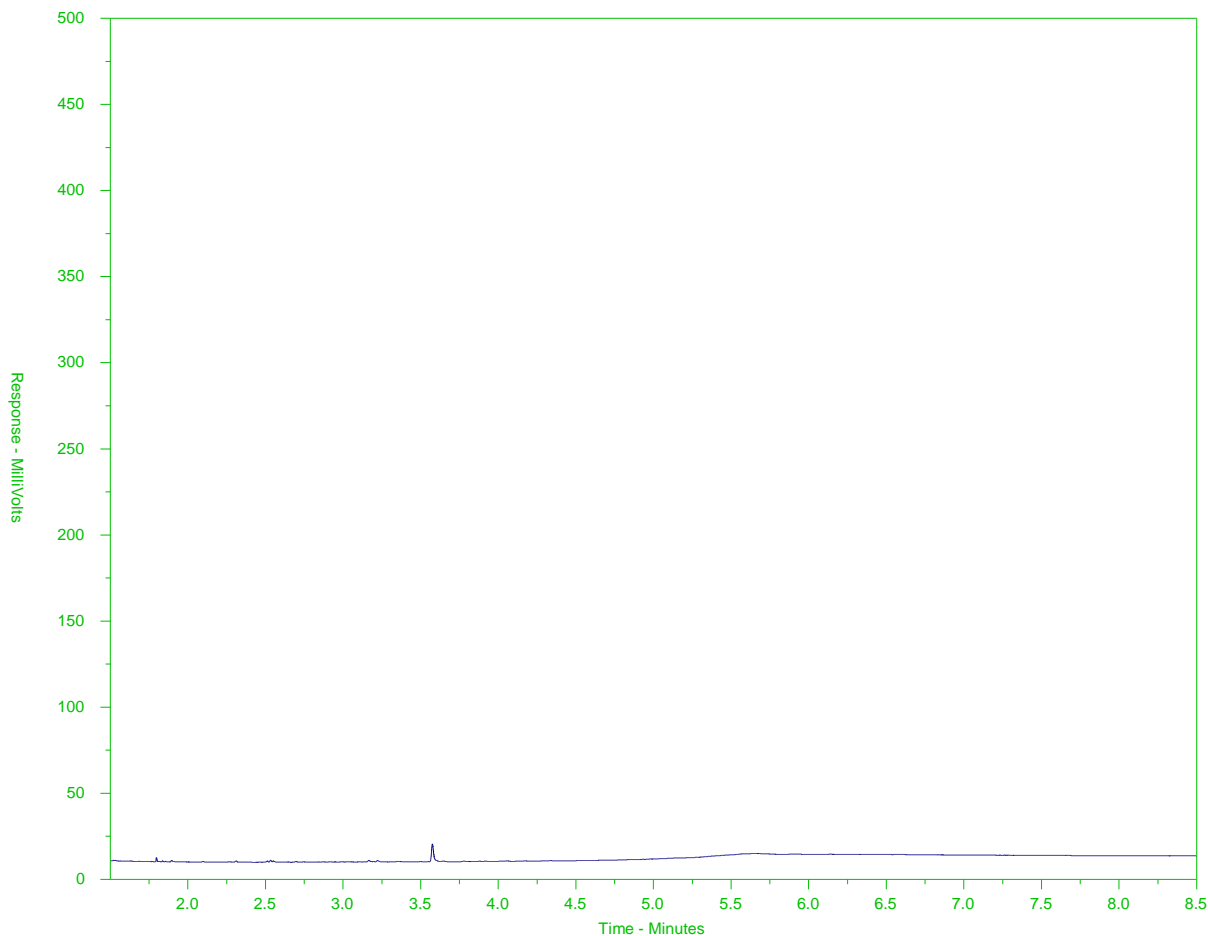
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991623-C-10
Client Sample ID: NO-6



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

[illegible]



PUBLIC WORKS AND GOVERNMENT
SERVICES CANADA
ATTN: Rebecca Studer-Halbach
Northern Contaminated Sites
10025 Jasper Avenue NW
Edmonton AB T5J 1S6

Date Received: 14-SEP-17
Report Date: 03-NOV-17 19:12 (MT)
Version: FINAL

Client Phone: 780-497-3761

Certificate of Analysis

Lab Work Order #: L1991686
Project P.O. #: NOT SUBMITTED
Job Reference: R.015211.049
C of C Numbers:
Legal Site Desc:

Comments: ADDITIONAL 03-NOV-17 19:02

Dean Watt, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1991686-5	L1991686-6	L1991686-7	L1991686-9	L1991686-12
		Description	Water	Water	Water	Water	Water
		Sampled Date	11-SEP-17	11-SEP-17	11-SEP-17	11-SEP-17	11-SEP-17
		Sampled Time					
		Client ID	A5-SW08-11	SW-DUP-1	SW-B-2	BG-SW08-01	SW16-02-2M
Grouping	Analyte						
MISC.							
Radiological Parameters	Pb-210 (Bq/L)		<0.024	<0.023	<0.029	<0.023	<0.025
	Ra-226 (Bq/L)		<0.0079	<0.0063	<0.0077	0.0066	<0.0086

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1991686-1 Water 11-SEP-17 BG-SW08-04	L1991686-2 Water 11-SEP-17 A3-SW08-01	L1991686-3 Water 11-SEP-17 SW07-3	L1991686-4 Water 11-SEP-17 SW16-01-2M	L1991686-5 Water 11-SEP-17 A5-SW08-11
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	262	185	159	160	166
	Hardness (as CaCO3) (mg/L)	153	86.8 ^{HTC}	79.0 ^{HTC}	77.3 ^{HTC}	80.8
	pH (pH)	8.33	8.00	7.95	7.96	7.96
	Total Suspended Solids (mg/L)	4.4	14.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	174	112	98	99	102
	Turbidity (NTU)	0.83	2.36	0.19	0.19	0.19
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	149	68.6	57.2	56.3	60.0
	Ammonia, Total (as N) (mg/L)	0.0148	0.0154	<0.0050	0.0061	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	4.67	4.97	4.99	4.91
	Fluoride (F) (mg/L)	0.042	0.085	0.081	0.080	0.081
	Nitrate (as N) (mg/L)	<0.0050	0.108	0.139	0.140	0.138
	Nitrite (as N) (mg/L)	<0.0010	0.0013	<0.0010	<0.0010	0.0012
	Phosphorus (P)-Total Dissolved (mg/L)	0.0022	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0099	0.0130	<0.0020	<0.0020	<0.0020
	Sulfate (SO4) (mg/L)	3.70	21.3	16.5	15.7	17.7
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	10.1	2.25	1.78	1.82	1.60
	Total Organic Carbon (mg/L)	9.74	2.71	1.80	1.69	1.62
Total Metals	Aluminum (Al)-Total (mg/L)	0.0076	0.201	0.0048	0.0043	0.0054
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00012	0.00034	0.00022	0.00019	0.00019
	Barium (Ba)-Total (mg/L)	0.0901	0.0281	0.0239	0.0231	0.0236
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.073	0.017	0.012	0.013	0.013
	Cadmium (Cd)-Total (mg/L)	<0.0000050	0.0000081	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	22.7	19.4	19.0	18.3	19.0
	Cesium (Cs)-Total (mg/L)	<0.000010	0.000056	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00061	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00016	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00082	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.011	0.698	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	0.000251	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0030	0.0032	0.0031	0.0032	0.0031
	Magnesium (Mg)-Total (mg/L)	22.7	9.30	7.68	7.65	7.74

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1991686-6 Water 11-SEP-17 SW-DUP-1	L1991686-7 Water 11-SEP-17 SW-B-2	L1991686-8 Water 11-SEP-17 A3-SW08-05	L1991686-9 Water 11-SEP-17 BG-SW08-01	L1991686-10 Water 11-SEP-17 SW16-01-6M
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	160	166	160	160 ^{HTC}	157 ^{HTC}
	Hardness (as CaCO3) (mg/L)	74.0	77.9	76.9	71.2 ^{HTC}	71.6 ^{HTC}
	pH (pH)	7.97	7.99	7.97	7.99	7.95
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	96	98	94	96	96
	Turbidity (NTU)	0.20	0.19	0.23	0.24	0.19
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	56.8	60.0	58.8	59.2	58.1
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0084	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	4.98	4.96	4.98	4.98	4.98
	Fluoride (F) (mg/L)	0.079	0.080	0.079	0.080	0.079
	Nitrate (as N) (mg/L)	0.141	0.139	0.137	0.135	0.141
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Sulfate (SO4) (mg/L)	16.0	16.8	15.9	15.8	15.7
	Sulphide as S (mg/L)	<0.018 ^{RRV}	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.72 ^{RRV}	1.74	1.72	1.60	1.68
	Total Organic Carbon (mg/L)	2.21 ^{RRV}	1.67	1.65	1.65	1.87
Total Metals	Aluminum (Al)-Total (mg/L)	0.0050	0.0046	0.0055	0.0118	0.0044
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00019	0.00020	0.00021	0.00020	0.00023
	Barium (Ba)-Total (mg/L)	0.0232	0.0236	0.0230	0.0224	0.0227
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.013	0.013	0.013	0.012	0.011
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	18.6	18.7	18.5	16.6	16.7
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)	0.00015	<0.00010	<0.00010	0.00011	0.00015
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	0.011	0.017	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0031	0.0033	0.0034	0.0030	0.0030
	Magnesium (Mg)-Total (mg/L)	7.54	7.55	7.45	7.20	7.24

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1991686-11 Water 11-SEP-17 SW16-02-6M	L1991686-12 Water 11-SEP-17 SW16-02-2M			
Grouping	Analyte						
WATER							
Physical Tests	Conductivity (uS/cm)	157	161				
	Hardness (as CaCO3) (mg/L)	70.8 ^{HTC}	72.8 ^{HTC}				
	pH (pH)	7.97	7.98				
	Total Suspended Solids (mg/L)	<3.0	<3.0				
	Total Dissolved Solids (mg/L)	97	95				
	Turbidity (NTU)	0.21	0.19				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	58.1	58.7				
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0083				
	Bromide (Br) (mg/L)	<0.050	<0.050				
	Chloride (Cl) (mg/L)	4.99	4.98				
	Fluoride (F) (mg/L)	0.079	0.079				
	Nitrate (as N) (mg/L)	0.141	0.140				
	Nitrite (as N) (mg/L)	<0.0010	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020				
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020				
	Sulfate (SO4) (mg/L)	15.7	16.0				
	Sulphide as S (mg/L)	<0.018	<0.018				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.92	2.95 ^{RRV}				
	Total Organic Carbon (mg/L)	1.96	2.09 ^{RRV}				
Total Metals	Aluminum (Al)-Total (mg/L)	0.0045	0.0049				
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010				
	Arsenic (As)-Total (mg/L)	0.00021	0.00024				
	Barium (Ba)-Total (mg/L)	0.0227	0.0232				
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020				
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050				
	Boron (B)-Total (mg/L)	0.011	0.011				
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050				
	Calcium (Ca)-Total (mg/L)	16.6	17.2				
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010				
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010				
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010				
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050				
	Iron (Fe)-Total (mg/L)	<0.010	<0.010				
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050				
	Lithium (Li)-Total (mg/L)	0.0030	0.0031				
	Magnesium (Mg)-Total (mg/L)	7.14	7.22				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1991686-1	L1991686-2	L1991686-3	L1991686-4	L1991686-5
		Description	Water	Water	Water	Water	Water
		Sampled Date	11-SEP-17	11-SEP-17	11-SEP-17	11-SEP-17	11-SEP-17
		Sampled Time					
		Client ID	BG-SW08-04	A3-SW08-01	SW07-3	SW16-01-2M	A5-SW08-11
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.00394	0.0244	0.00077	0.00067	0.00082	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	<0.000050	0.000339	0.000335	0.000342	0.000357	
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00057	<0.00050	<0.00050	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	1.70	0.96	0.78	0.76	0.78	
	Selenium (Se)-Total (mg/L)	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.57	1.61	1.14	1.12	1.16	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	1.02	4.29	4.17	4.19	4.21	
	Strontium (Sr)-Total (mg/L)	0.0596	0.132	0.120	0.115	0.123	
	Sulfur (S)-Total (mg/L)	1.69	7.55	6.01	5.32	6.00	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	0.00849	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Total (mg/L)	0.000214	0.000369	0.000310	0.000303	0.000319	
	Vanadium (V)-Total (mg/L)	<0.00050	0.00083	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	0.0039	<0.0030	0.0035	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location	LAB				LAB	
	Dissolved Metals Filtration Location	LAB				LAB	
	Aluminum (Al)-Dissolved (mg/L)	0.0022				0.0015	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010				<0.00010	
	Arsenic (As)-Dissolved (mg/L)	<0.00010				0.00018	
	Barium (Ba)-Dissolved (mg/L)	0.0883				0.0237	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				<0.000050	
	Boron (B)-Dissolved (mg/L)	0.067				0.013	
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)	23.0				19.5	
	Cesium (Cs)-Dissolved (mg/L)	<0.000010				<0.000010	
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				<0.00010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				<0.00010	
	Copper (Cu)-Dissolved (mg/L)	<0.00020				0.00033	
	Iron (Fe)-Dissolved (mg/L)	<0.010				<0.010	
	Lead (Pb)-Dissolved (mg/L)	<0.000050				<0.000050	
	Lithium (Li)-Dissolved (mg/L)	0.0026				0.0034	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1991686-6	L1991686-7	L1991686-8	L1991686-9	L1991686-10
		Description	Water	Water	Water	Water	Water
		Sampled Date	11-SEP-17	11-SEP-17	11-SEP-17	11-SEP-17	11-SEP-17
		Sampled Time					
		Client ID	SW-DUP-1	SW-B-2	A3-SW08-05	BG-SW08-01	SW16-01-6M
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.00068	0.00084	0.00087	0.00079	0.00068	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000339	0.000339	0.000352	0.000306	0.000301	
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.76	0.76	0.76	0.78	0.77	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	1.12	1.14	1.12	1.15	1.16	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	4.22	4.26	4.18	4.39	4.39	
	Strontium (Sr)-Total (mg/L)	0.115	0.119	0.117	0.105	0.106	
	Sulfur (S)-Total (mg/L)	5.47	5.95	5.57	5.97	5.72	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	0.00055	<0.00030	
	Uranium (U)-Total (mg/L)	0.000308	0.000321	0.000306	0.000287	0.000261	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	0.0039	<0.0030	0.0036	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location	LAB	LAB				
	Dissolved Metals Filtration Location	LAB	LAB				
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	<0.0010				
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010				
	Arsenic (As)-Dissolved (mg/L)	0.00018	0.00018				
	Barium (Ba)-Dissolved (mg/L)	0.0230	0.0232				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050				
	Boron (B)-Dissolved (mg/L)	0.012	0.012				
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050				
	Calcium (Ca)-Dissolved (mg/L)	17.6	18.8				
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00024	0.00027				
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	0.0030	0.0033				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1991686-11 Water 11-SEP-17 SW16-02-6M	L1991686-12 Water 11-SEP-17 SW16-02-2M			
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.00058	0.00071				
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	0.000314	0.000314				
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050				
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050				
	Potassium (K)-Total (mg/L)	0.77	0.78				
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050				
	Silicon (Si)-Total (mg/L)	1.17	1.18				
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010				
	Sodium (Na)-Total (mg/L)	4.35	4.27				
	Strontium (Sr)-Total (mg/L)	0.106	0.108				
	Sulfur (S)-Total (mg/L)	5.53	5.82				
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010				
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010				
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030				
	Uranium (U)-Total (mg/L)	0.000260	0.000266				
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030				
Dissolved Metals	Dissolved Mercury Filtration Location						
	Dissolved Metals Filtration Location						
	Aluminum (Al)-Dissolved (mg/L)						
	Antimony (Sb)-Dissolved (mg/L)						
	Arsenic (As)-Dissolved (mg/L)						
	Barium (Ba)-Dissolved (mg/L)						
	Beryllium (Be)-Dissolved (mg/L)						
	Bismuth (Bi)-Dissolved (mg/L)						
	Boron (B)-Dissolved (mg/L)						
	Cadmium (Cd)-Dissolved (mg/L)						
	Calcium (Ca)-Dissolved (mg/L)						
	Cesium (Cs)-Dissolved (mg/L)						
	Chromium (Cr)-Dissolved (mg/L)						
	Cobalt (Co)-Dissolved (mg/L)						
	Copper (Cu)-Dissolved (mg/L)						
	Iron (Fe)-Dissolved (mg/L)						
	Lead (Pb)-Dissolved (mg/L)						
	Lithium (Li)-Dissolved (mg/L)						

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1991686-1 Water 11-SEP-17 BG-SW08-04	L1991686-2 Water 11-SEP-17 A3-SW08-01	L1991686-3 Water 11-SEP-17 SW07-3	L1991686-4 Water 11-SEP-17 SW16-01-2M	L1991686-5 Water 11-SEP-17 A5-SW08-11
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	23.2					7.82
	Manganese (Mn)-Dissolved (mg/L)	<0.00010					<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050					<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050					0.000368
	Nickel (Ni)-Dissolved (mg/L)	<0.00050					<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050					<0.050
	Potassium (K)-Dissolved (mg/L)	1.69					0.77
	Selenium (Se)-Dissolved (mg/L)	<0.000050					<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.517					1.14
	Silver (Ag)-Dissolved (mg/L)	<0.000010					<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.00					4.18
	Strontium (Sr)-Dissolved (mg/L)	0.0575					0.121
	Sulfur (S)-Dissolved (mg/L)	1.54					5.80
	Thallium (Tl)-Dissolved (mg/L)	<0.000010					<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010					<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030					<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000212					0.000326
	Vanadium (V)-Dissolved (mg/L)	<0.00050					<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010					<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030					<0.00030
Volatile Organic Compounds	Benzene (mg/L)				<0.00050	<0.00050	<0.00050
	Ethylbenzene (mg/L)				<0.00050	<0.00050	<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)				<0.00050	<0.00050	<0.00050
	Styrene (mg/L)				<0.00050	<0.00050	<0.00050
	Toluene (mg/L)				<0.00045	<0.00045	<0.00045
	ortho-Xylene (mg/L)				<0.00050	<0.00050	<0.00050
	meta- & para-Xylene (mg/L)				<0.00050	<0.00050	<0.00050
	Xylenes (mg/L)				<0.00075	<0.00075	<0.00075
	F1 (C6-C10) (mg/L)				<0.10	<0.10	<0.10
	Surrogate: 4-Bromofluorobenzene (SS) (%)				94.9	99.8	98.0
	Surrogate: 1,4-Difluorobenzene (SS) (%)				97.4	92.5	96.1
Hydrocarbons	F1-BTEX (mg/L)				<0.10	<0.10	<0.10
	F2 (C10-C16) (mg/L)				<0.30	<0.30	<0.30
	F3 (C16-C34) (mg/L)				<0.30	<0.30	<0.30
	F4 (C34-C50) (mg/L)				<0.30	<0.30	<0.30
	Volatile Hydrocarbons (VH6-10) (mg/L)				<0.10	<0.10	<0.10
	VPH (C6-C10) (mg/L)				<0.10	<0.10	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1991686-6 Water 11-SEP-17 SW-DUP-1	L1991686-7 Water 11-SEP-17 SW-B-2	L1991686-8 Water 11-SEP-17 A3-SW08-05	L1991686-9 Water 11-SEP-17 BG-SW08-01	L1991686-10 Water 11-SEP-17 SW16-01-6M
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	7.30	7.49				
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	<0.00010				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000336	0.000361				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.74	0.75				
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	1.11	1.11				
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	4.06	4.10				
	Strontium (Sr)-Dissolved (mg/L)	0.112	0.121				
	Sulfur (S)-Dissolved (mg/L)	5.51	5.81				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.000301	0.000317				
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030				
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050				
	Ethylbenzene (mg/L)	<0.00050	<0.00050				
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050				
	Styrene (mg/L)	<0.00050	<0.00050				
	Toluene (mg/L)	<0.00045	<0.00045				
	ortho-Xylene (mg/L)	<0.00050	<0.00050				
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050				
	Xylenes (mg/L)	<0.00075	<0.00075				
	F1 (C6-C10) (mg/L)	<0.10	<0.10				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	94.5	95.4				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	95.7	90.8				
Hydrocarbons	F1-BTEX (mg/L)	<0.10	<0.10				
	F2 (C10-C16) (mg/L)	<0.30	<0.30				
	F3 (C16-C34) (mg/L)	<0.30	<0.30				
	F4 (C34-C50) (mg/L)	<0.30	<0.30				
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10				
	VPH (C6-C10) (mg/L)	<0.10	<0.10				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1991686-11 Water 11-SEP-17 SW16-02-6M	L1991686-12 Water 11-SEP-17 SW16-02-2M			
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)						
	Manganese (Mn)-Dissolved (mg/L)						
	Mercury (Hg)-Dissolved (mg/L)						
	Molybdenum (Mo)-Dissolved (mg/L)						
	Nickel (Ni)-Dissolved (mg/L)						
	Phosphorus (P)-Dissolved (mg/L)						
	Potassium (K)-Dissolved (mg/L)						
	Selenium (Se)-Dissolved (mg/L)						
	Silicon (Si)-Dissolved (mg/L)						
	Silver (Ag)-Dissolved (mg/L)						
	Sodium (Na)-Dissolved (mg/L)						
	Strontium (Sr)-Dissolved (mg/L)						
	Sulfur (S)-Dissolved (mg/L)						
	Thallium (Tl)-Dissolved (mg/L)						
	Tin (Sn)-Dissolved (mg/L)						
	Titanium (Ti)-Dissolved (mg/L)						
	Uranium (U)-Dissolved (mg/L)						
	Vanadium (V)-Dissolved (mg/L)						
	Zinc (Zn)-Dissolved (mg/L)						
	Zirconium (Zr)-Dissolved (mg/L)						
Volatile Organic Compounds	Benzene (mg/L)	<0.00050					
	Ethylbenzene (mg/L)	<0.00050					
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050					
	Styrene (mg/L)	<0.00050					
	Toluene (mg/L)	<0.00045					
	ortho-Xylene (mg/L)	<0.00050					
	meta- & para-Xylene (mg/L)	<0.00050					
	Xylenes (mg/L)	<0.00075					
	F1 (C6-C10) (mg/L)	<0.10					
	Surrogate: 4-Bromofluorobenzene (SS) (%)	100.5					
	Surrogate: 1,4-Difluorobenzene (SS) (%)	95.3					
Hydrocarbons	F1-BTEX (mg/L)	<0.10					
	F2 (C10-C16) (mg/L)	<0.30					
	F3 (C16-C34) (mg/L)	<0.30					
	F4 (C34-C50) (mg/L)	<0.30					
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10					
	VPH (C6-C10) (mg/L)	<0.10					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Sample ID Description Sampled Date Sampled Time Client ID		L1991686-1 Water 11-SEP-17 BG-SW08-04	L1991686-2 Water 11-SEP-17 A3-SW08-01	L1991686-3 Water 11-SEP-17 SW07-3	L1991686-4 Water 11-SEP-17 SW16-01-2M	L1991686-5 Water 11-SEP-17 A5-SW08-11
Grouping	Analyte					
WATER						
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)			89.8	87.5	88.5
	Surrogate: 3,4-Dichlorotoluene (SS) (%)			85.2	119.2	119.8

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1991686-6	L1991686-7	L1991686-8	L1991686-9	L1991686-10
		Description	Water	Water	Water	Water	Water
		Sampled Date	11-SEP-17	11-SEP-17	11-SEP-17	11-SEP-17	11-SEP-17
		Sampled Time					
		Client ID	SW-DUP-1	SW-B-2	A3-SW08-05	BG-SW08-01	SW16-01-6M
Grouping	Analyte						
WATER							
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)		92.2	90.6			
	Surrogate: 3,4-Dichlorotoluene (SS) (%)		80.2	81.1			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID				
		Description				
		Sampled Date				
		Sampled Time				
		Client ID				
Grouping	Analyte					
WATER						
Hydrocarbons	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)	87.2				
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	110.0				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Nickel (Ni)-Dissolved	MB-LOR	L1991686-1, -5, -6, -7
Matrix Spike	Dissolved Organic Carbon	MS-B	L1991686-1, -2, -3
Matrix Spike	Dissolved Organic Carbon	MS-B	L1991686-10, -11, -4, -5, -7, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L1991686-1, -2, -3
Matrix Spike	Total Organic Carbon	MS-B	L1991686-1, -2, -3
Matrix Spike	Total Organic Carbon	MS-B	L1991686-1, -2, -3
Matrix Spike	Total Organic Carbon	MS-B	L1991686-10, -11, -4, -5, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1991686-1, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1991686-1, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1991686-1, -5, -6, -7
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1991686-1, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1991686-1, -5, -6, -7
Matrix Spike	Barium (Ba)-Total	MS-B	L1991686-1, -10, -11, -12, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L1991686-1, -10, -11, -12, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L1991686-2
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1991686-1, -10, -11, -12, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1991686-2
Matrix Spike	Manganese (Mn)-Total	MS-B	L1991686-2
Matrix Spike	Sodium (Na)-Total	MS-B	L1991686-1, -10, -11, -12, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L1991686-2
Matrix Spike	Strontium (Sr)-Total	MS-B	L1991686-1, -10, -11, -12, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L1991686-2
Matrix Spike	Sulfur (S)-Total	MS-B	L1991686-2
Matrix Spike	Zinc (Zn)-Total	MS-B	L1991686-2
Matrix Spike	Nitrate (as N)	MS-B	L1991686-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			

Reference Information

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
F1-BTX-CALC-VA	Water	F1-Total BTX	CCME CWS PHC TIER 1 (2001)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID. The F1-BTEX result is calculated as follows:			
F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).			
F1-HSFID-VA	Water	CCME F1 By Headspace with GCFID	EPA 5021A/CCME CWS PHC (Pub# 1310)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.			
F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.			
F2-F4-ME-FID-VA	Water	CCME F2-F4 Hydrocarbons in Water	CCME CWS-PHC, Pub #1310, Dec 2001
F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.			

Reference Information

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

RA226-GFPC-FC Misc. Radium-226 by Gas Flow Prop. EPA 903.0

S2-T-COL-VA Water Total Sulphide by Colorimetric APHA 4500-S2 Sulphide

This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VH-HSFID-VA Water VH in Water by Headspace GCFID BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA Water VH Surrogates for Waters BC Env. Lab Manual (VH in Solids)

VOC7-HSMS-VA Water BTEX/MTBE/Styrene by Headspace GCMS EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA Water VOC7 and/or VOC Surrogates for Waters EPA 5035A/5021A/8260C

VPH-CALC-VA Water VPH is VH minus select aromatics BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water". The concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and, in solids, Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10).

XYLENES-CALC-VA Water Sum of Xylene Isomer Concentrations CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
----------------------------	---------------------

FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
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VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
----	---

Reference Information

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg ww - milligrams per kilogram based on wet weight of sample.

mg/kg lw - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Thursday, October 12, 2017

Dean Watt
ALS Environmental
8081 Lougheed Hwy, Suite 100
Burnaby, BC V5A 1W9

Re: ALS Workorder: 1709437
Project Name:
Project Number: L1991686

Dear Mr. Watt:

Five water samples were received from ALS Environmental, on 9/22/2017. The samples were scheduled for the following analyses:

Lead-210

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1709437

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

Lead-210:

The samples were analyzed for the presence of ^{210}Pb according to the current revisions of SOP 704.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1709437

Client Name: ALS Environmental

Client Project Name:

Client Project Number: L1991686

Client PO Number: L1991686

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1991686-5	1709437-1		WATER	11-Sep-17	
L1991686-6	1709437-2		WATER	11-Sep-17	
L1991686-7	1709437-3		WATER	11-Sep-17	
L1991686-9	1709437-4		WATER	11-Sep-17	
L1991686-12	1709437-5		WATER	11-Sep-17	



1709437

L1991686

YELLOWKNIFE

Subcontract Request Form**Subcontract To:****ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA**225 COMMERCE DRIVE
FORT COLLINS, CO 80524**NOTES:** Please reference on final report and invoice: PO# L1991686
ALS requires QC data to be provided with your final results.Please see enclosed **5** sample(s) in **10** Container(s)

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED	Priority Flag
		DUE DATE	
① L1991686-5 A5-SW08-11		9/11/2017	
	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/17/2017	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/17/2017	
② L1991686-6 SW-DUP-1		9/11/2017	
	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/17/2017	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/17/2017	
③ L1991686-7 SW-B-2		9/11/2017	
	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/17/2017	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/17/2017	
④ L1991686-9 BG-SW08-01		9/11/2017	
	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/17/2017	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/17/2017	
⑤ L1991686-12 SW16-02-2M		9/11/2017	
	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/17/2017	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/17/2017	



L1991686

YELLOWKNIFE

1709437

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE
FORT COLLINS, CO 80524

Subcontract Info Contact: Rick Zolkiewski (867) 873-5593

Analysis and reporting info contact: Dean Watt, B.Sc.
314 OLD AIRPORT ROAD
Unit 116
YELLOWKNIFE, NT X1A 3T3

Phone: (867) 873-5593

Email: dean.watt@alsglobal.com

Please email confirmation of receipt to:

dean.watt@alsglobal.com

Shipped By: _____ Date Shipped: _____

Received By: DE JA _____ Date Received: 9/22/17 1030

Verified By: _____ Date Verified: _____

Temperature: _____

Sample Integrity Issues: _____



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS CA Yellowknife

Workorder No: 1709437

Project Manager: SS

Initials: MS Date: 1/22/17

1. Does this project require any special handling in addition to standard ALS procedures?		YES	<input checked="" type="radio"/> NO
2. Are custody seals on shipping containers intact?	NONE	YES	NO
3. Are Custody seals on sample containers intact?	NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		<input checked="" type="radio"/> YES	NO
5. Are the COC and bottle labels complete and legible?		<input checked="" type="radio"/> YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		<input checked="" type="radio"/> YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	<input checked="" type="radio"/> YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	<input checked="" type="radio"/> YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	<input checked="" type="radio"/> N/A	YES	NO
10. Is there sufficient sample for the requested analyses?		<input checked="" type="radio"/> YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		<input checked="" type="radio"/> YES	NO
12. Are all samples within holding times for the requested analyses?		<input checked="" type="radio"/> YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		<input checked="" type="radio"/> YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: _____ < green pea _____ > green pea	<input checked="" type="radio"/> N/A	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: _____ dusting _____ moderate _____ heavy	N/A	YES	<input checked="" type="radio"/> NO
16. Were the samples shipped on ice?		<input checked="" type="radio"/> YES	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: <input checked="" type="radio"/> #2 #4	RAD ONLY	YES	<input checked="" type="radio"/> NO
Cooler #: <u>1</u>			
Temperature (°C): <u>9.6</u>			
No. of custody seals on cooler: <u>0</u>			
External µR/hr reading: <u>10</u>			
Background µR/hr reading: <u>10</u>			
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)			

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

If applicable, was the client contacted? YES / NO / ☒ NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: Shilah d. m.

SHIP DATE: 21SEP17
ACTWGT: 25.00 LB MAN
CAD: 0347419/CAFE3011

BILL SENDER

**TO SAMPLE RECEIVING
ALS ENVIRONMENTAL
225 COMMERCE DRIVE**

FORT COLLINS CO 80524

REF: SUBLETS

DEPT: SUBLET

FedEx®
Express®

10:30A

INTL PRIORITY

TRK# 7012 5069 4598

0430

80524
DEN
CO-US

XHETCA



After printing this label:

1. Fold the printed page along the horizontal line.
2. Place label in shipping pouch and affix it to your shipment.

[illegible]

Client: ALS Environmental

Date: 12-Oct-17

Project: L1991686

Work Order: 1709437

Sample ID: L1991686-5

Lab ID: 1709437-1

Legal Location:

Matrix: WATER

Collection Date: 9/11/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	0.0061 (+/- 0.014)	U	0.024	BQ/l	NA	10/11/2017 11:06
Carr: LEAD	81.9		40-110	%REC	DL = NA	10/11/2017 11:06
Dissolved Radium-226 by Radon Emanation - Method 903.						
Ra-226	0.0010 (+/- 0.0042)	U	0.0079	BQ/l	NA	10/3/2017 12:47
Carr: BARIUM	89.3		40-110	%REC	DL = NA	10/3/2017 12:47

Client: ALS Environmental

Date: 12-Oct-17

Project: L1991686

Work Order: 1709437

Sample ID: L1991686-6

Lab ID: 1709437-2

Legal Location:

Matrix: WATER

Collection Date: 9/11/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	0.0059 (+/- 0.014)	U	0.023	BQ/l	NA	10/11/2017 13:09
Carr: LEAD	84.8		40-110	%REC	DL = NA	10/11/2017 13:09
Dissolved Radium-226 by Radon Emanation - Method 903.						
Ra-226	0.0037 (+/- 0.0042)	U	0.0063	BQ/l	NA	10/3/2017 12:47
Carr: BARIUM	91		40-110	%REC	DL = NA	10/3/2017 12:47

Client: ALS Environmental

Date: 12-Oct-17

Project: L1991686

Work Order: 1709437

Sample ID: L1991686-7

Lab ID: 1709437-3

Legal Location:

Matrix: WATER

Collection Date: 9/11/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	0.0031 (+/- 0.017)	U	0.029	BQ/l	NA	10/11/2017 15:12
Carr: LEAD	67.5		40-110	%REC	DL = NA	10/11/2017 15:12
Dissolved Radium-226 by Radon Emanation - Method 903.						
Ra-226	0.0032 (+/- 0.0047)	U	0.0077	BQ/l	NA	10/3/2017 12:47
Carr: BARIUM	86.3		40-110	%REC	DL = NA	10/3/2017 12:47

Client: ALS Environmental

Date: 12-Oct-17

Project: L1991686

Work Order: 1709437

Sample ID: L1991686-9

Lab ID: 1709437-4

Legal Location:

Matrix: WATER

Collection Date: 9/11/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	0.0090 (+/- 0.014)	U	0.023	BQ/l	NA	10/11/2017 17:15
Carr: LEAD	85		40-110	%REC	DL = NA	10/11/2017 17:15
Dissolved Radium-226 by Radon Emanation - Method 903.						
Ra-226	0.0066 (+/- 0.0049)	LT	0.0056	BQ/l	NA	10/3/2017 12:47
Carr: BARIUM	91.1		40-110	%REC	DL = NA	10/3/2017 12:47

Client: ALS Environmental

Date: 12-Oct-17

Project: L1991686

Work Order: 1709437

Sample ID: L1991686-12

Lab ID: 1709437-5

Legal Location:

Matrix: WATER

Collection Date: 9/11/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liquid Scintillation						
Pb-210	0.011 (+/- 0.015)	U	0.025	BQ/l	NA	10/11/2017 19:18
Carr: LEAD	78.6		40-110	%REC	DL = NA	10/11/2017 19:18
Dissolved Radium-226 by Radon Emanation - Method 903.						
Ra-226	0.0020 (+/- 0.0049)	U	0.0086	BQ/l	NA	10/3/2017 13:20
Carr: BARIUM	90.5		40-110	%REC	DL = NA	10/3/2017 13:20

Client: ALS Environmental

Date: 12-Oct-17

Project: L1991686

Work Order: 1709437

Sample ID: L1991686-12

Lab ID: 1709437-5

Legal Location:

Matrix: WATER

Collection Date: 9/11/2017

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
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Explanation of Qualifiers**Radiochemistry:**

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:

- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS -- Fort Collins

Date: 10/12/2017 11:2

Client: ALS Environmental

QC BATCH REPORT

Work Order: 1709437

Project: L1991686

Batch ID: RE170923-2-1

Instrument ID Alpha Scin

Method: Radium-226 by Radon Emanation

LCS	Sample ID: RE170923-2			Units: BQ/I		Analysis Date: 10/3/2017 13:20					
Client ID:	Run ID: RE170923-2A					Prep Date: 9/23/2017			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.79 (+/- 0.443)	0.0114	1.715		105	67-120					P,M3
Carr: BARIUM	16000		16910		94.7	40-110					

LCSD	Sample ID: RE170923-2			Units: BQ/I			Analysis Date: 10/3/2017 13:20				
Client ID:	Run ID: RE170923-2A						Prep Date: 9/23/2017		DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.81 (+/- 0.446)	0.00672	1.715		105	67-120		1.79	0.02	2.1	P
Carr: BARIUM	16000		16910		94.9	40-110		16000			

MB	Sample ID: RE170923-2				Units: BQ/I		Analysis Date: 10/3/2017 13:20				
Client ID:		Run ID: RE170923-2A				Prep Date: 9/23/2017			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.0010 (+/- 0.0029)	0.0055									U
Carr: BARIUM	16300		16910		96.3	40-110					

The following samples were analyzed in this batch:

1709437-1	1709437-2	1709437-3
1709437-4	1709437-5	

Client: ALS Environmental
Work Order: 1709437
Project: L1991686

QC BATCH REPORT

Batch ID: **PB171002-1-1** Instrument ID **LIQSCINT** Method: **Lead-210 by Liquid Scintillation**

LCS	Sample ID: PB171002-1				Units: ug		Analysis Date: 10/11/2017 23:23				
Client ID:		Run ID: PB171002-1B				Prep Date: 10/2/2017			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Carr: LEAD	790		892.6		88.5	40-110					
Pb-210	1.64 (+/- 0.403)	0.0457	1.566		105	75-125					P,M3

LCSD	Sample ID: PB171002-1			Units: ug			Analysis Date: 10/11/2017 23:55				
Client ID:	Run ID: PB171002-1B			Prep Date: 10/2/2017			DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Carr: LEAD	787		930.7		84.6	40-110		790			
Pb-210	1.71 (+/- 0.421)	0.0478	1.566		110	75-125		1.64	0.1	2.1	P,M3

MB		Sample ID: PB171002-1				Units: ug		Analysis Date: 10/11/2017 21:20				
Client ID:		Run ID: PB171002-1B				Prep Date: 10/2/2017		DF: NA				
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Carr: LEAD		808		911.7		88.6	40-110					
Pb-210		0.0036 (+/- 0.013)	0.022									U

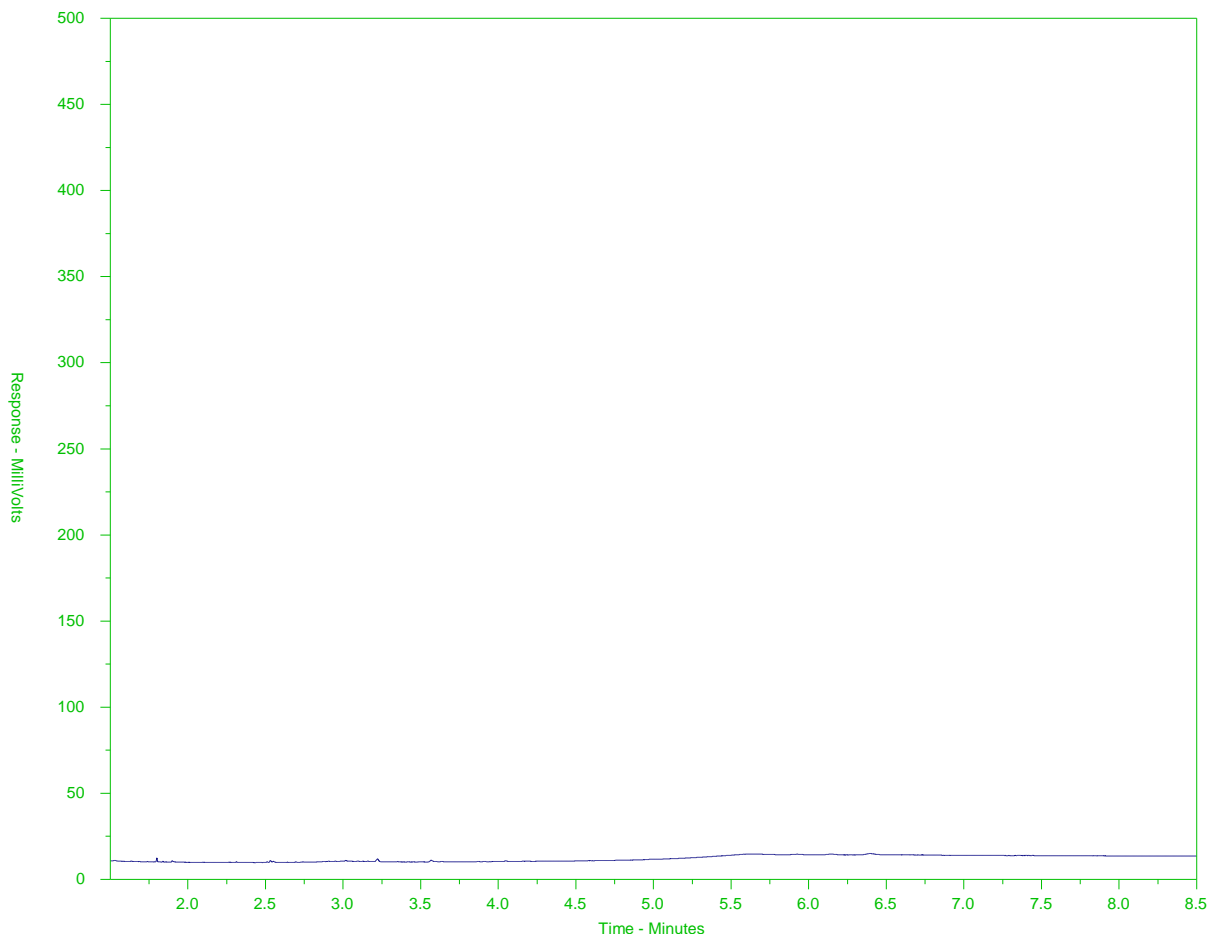
The following samples were analyzed in this batch:

1709437-1	1709437-2	1709437-3
1709437-4	1709437-5	

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991686-C-3
Client Sample ID: SW07-3



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

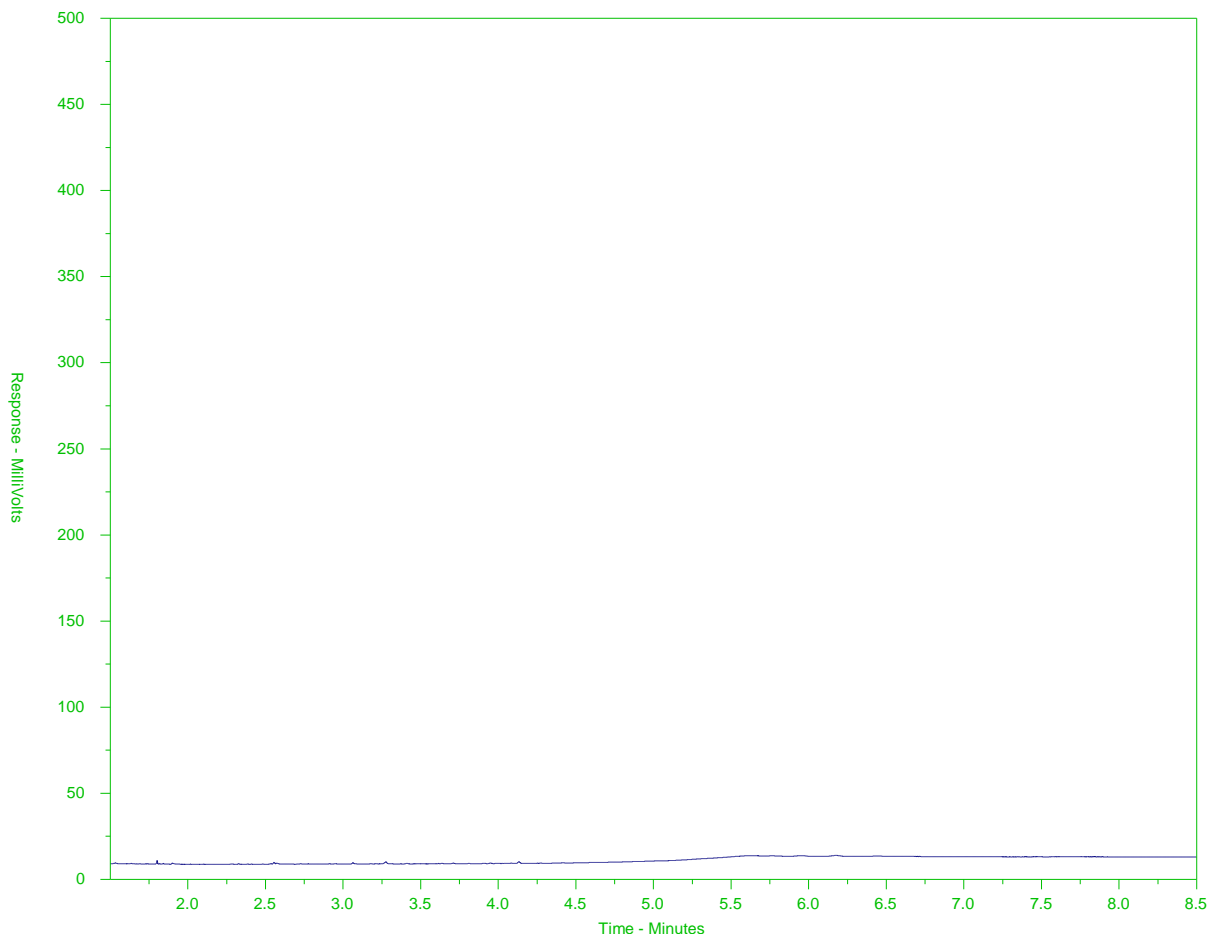
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991686-C-4
Client Sample ID: SW16-01-2M



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

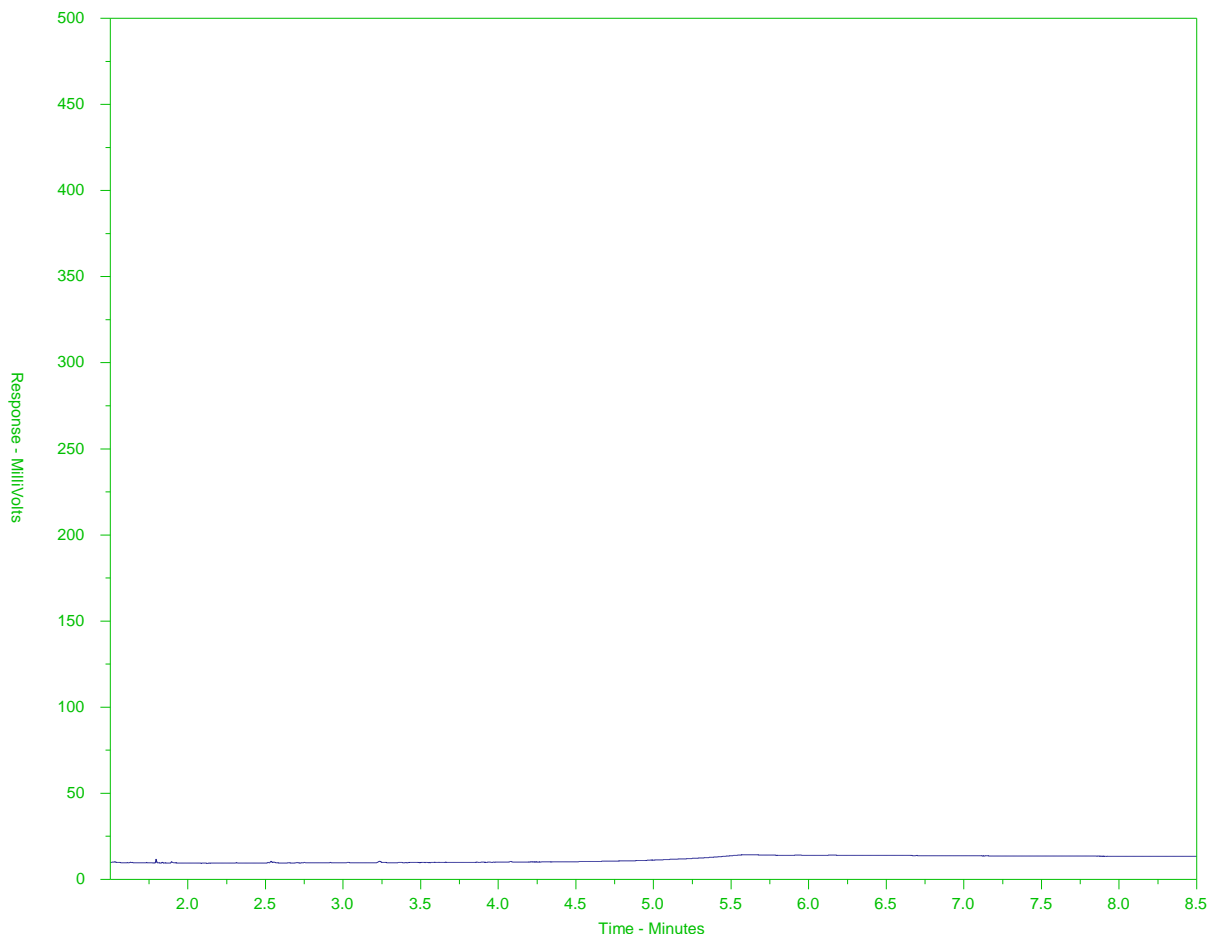
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991686-C-5
Client Sample ID: A5-SW08-11



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

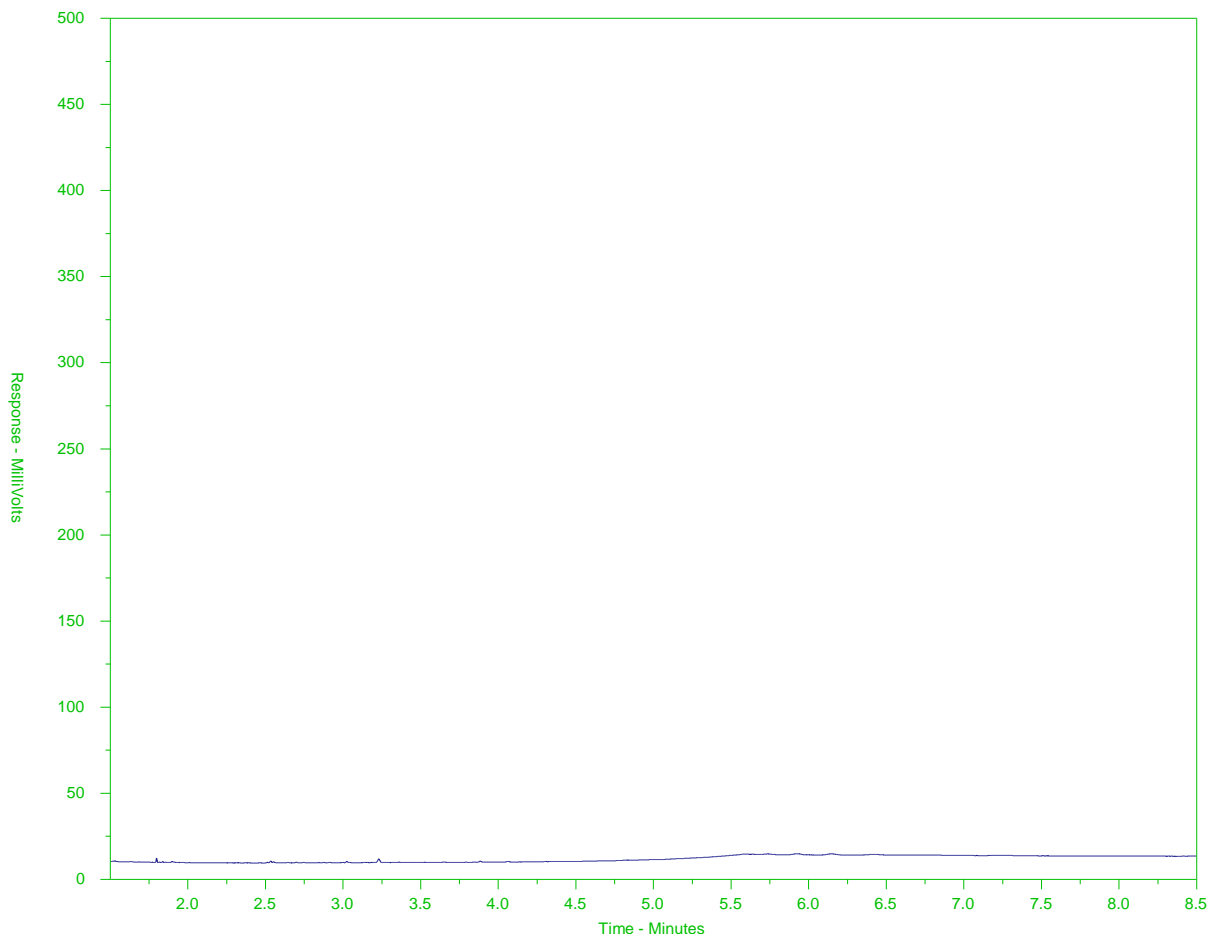
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991686-C-6
Client Sample ID: SW-DUP-1



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

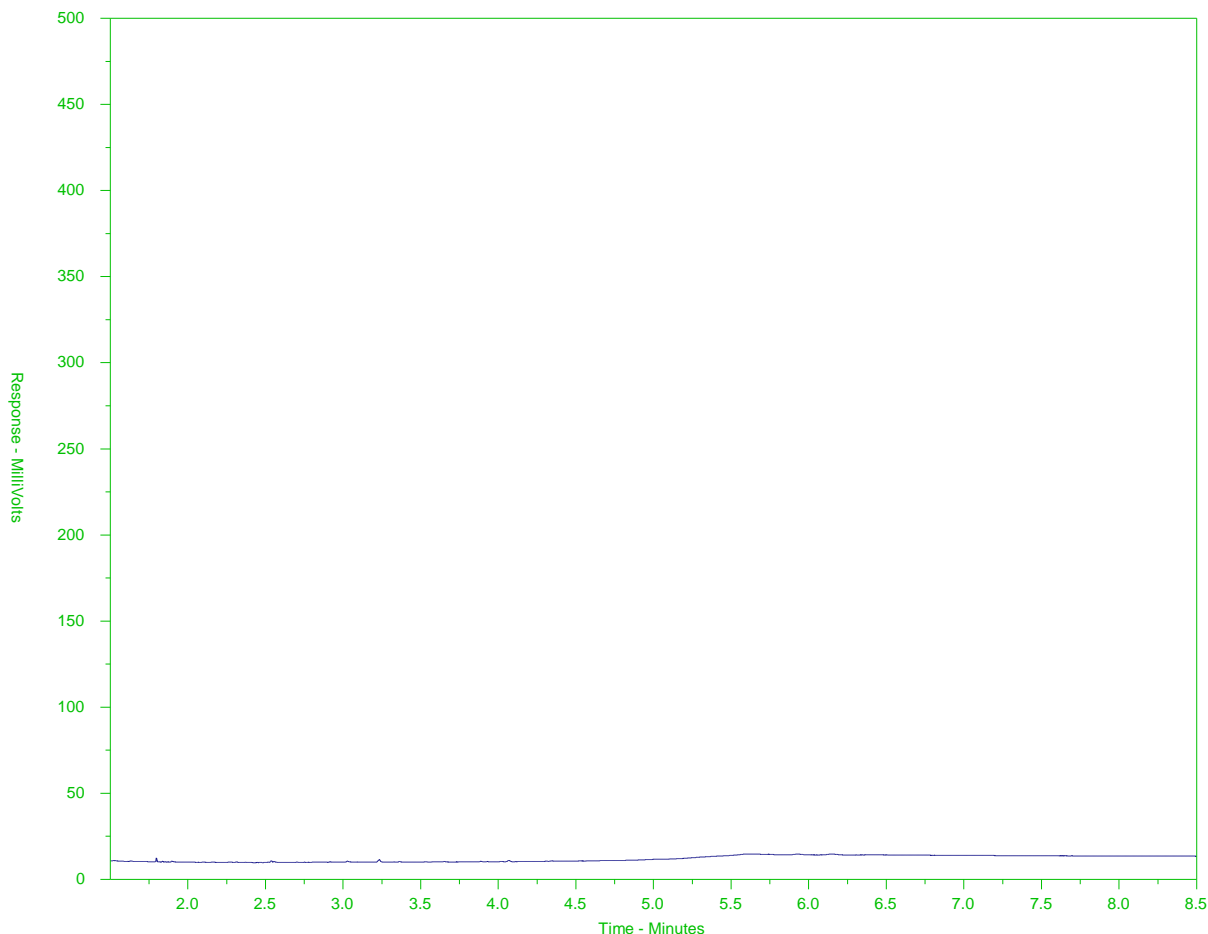
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991686-C-7
Client Sample ID: SW-B-2



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

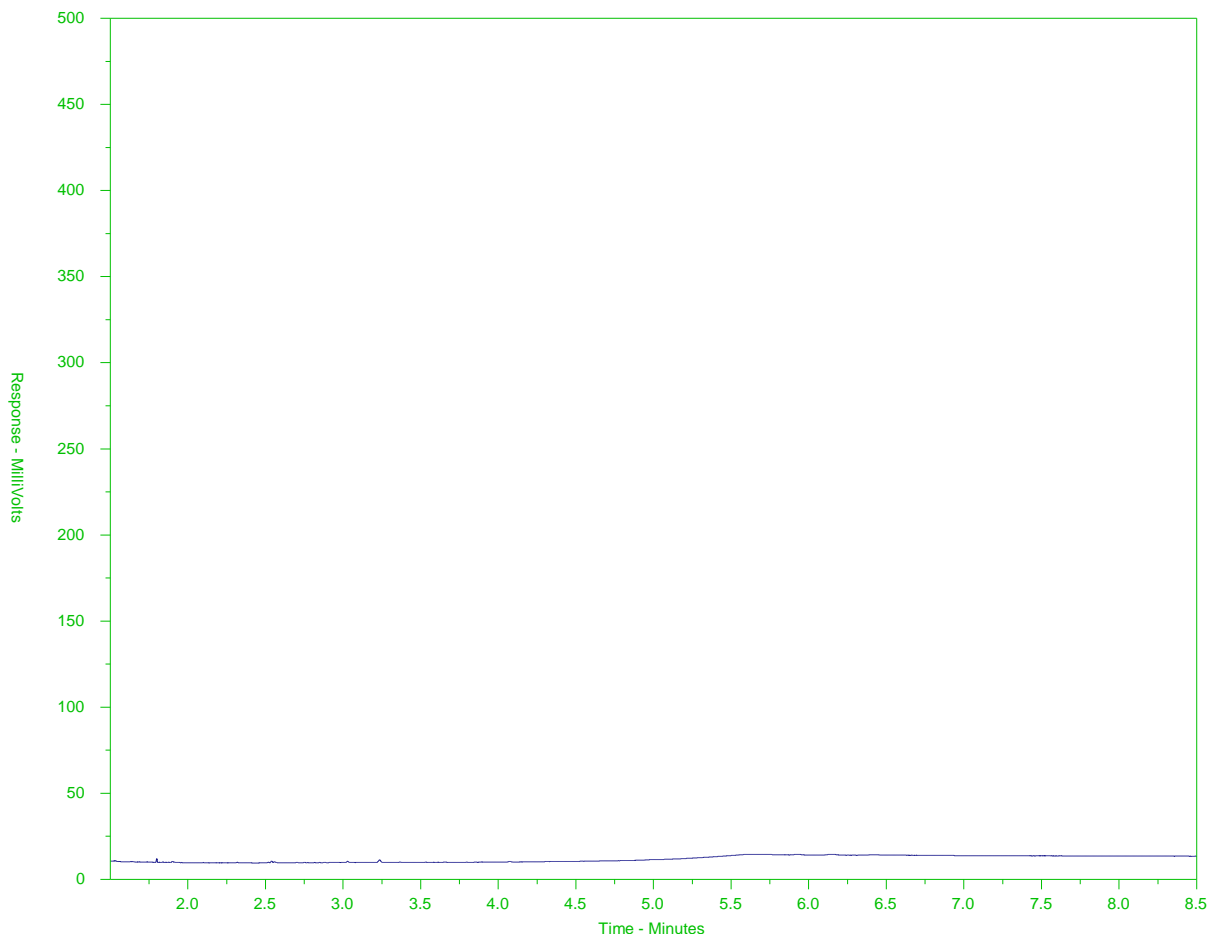
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1991686-C-11
Client Sample ID: SW16-02-6M



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.



L1991686-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)														
Company: Public Services and Procurement Canada		Select Report Format: <input type="checkbox"/> PDF <input type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days) P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge														
Contact: Rebecca Studer-Halbach		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																	
Address: 10025 Jasper Avenue Edmonton, AB T5J 1S6		<input type="checkbox"/> Criteria on Report - provide details below if box checked																	
Phone: (788) 497-3761		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																	
		Email 1 or Fax rebecca.studer-halbach@pwgsc.ca			Specify Date Required for E2, E or P:														
		Email 2 claire.brown@dxbbprojects.ca																	
Invoice To		Invoice Distribution			Analysis Request														
Same as Report To <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below														
Copy of Invoice with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Email 1 or Fax rebecca.studer-halbach@pwgsc.ca																	
Contact: Rebecca Studer-Halbach		Email 2																	
Project Information		Oil and Gas Required Fields (client use)			Number of Containers														
ALS Quote #: Q64064		Approver ID:																	
Job #:		GL Account:																	
PO / AFE: R.015211.049		Activity Code:																	
LSD:		Location:																	
ALS Lab Work Order # (lab use only) L1991686		ALS Contact: Joanne Lee and Rick Zolkiewski			Sampler:														
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Routine and per Q64064	Total Metals per Q64064	Total Mercury per Q64064	Dissolved Metals per Q64064	Dissolved Mercury per Q64064	PHC F2-F4 per Q64064	BTEX, F1 per Q64064	Radionuclides Pb-210 and Ra-226 per Q64064	NAPL per Q64064	Oil and Grease per Q64064					
1	BG-SW08-04	11-Sep-17		Water	R	R	R	R	R						9				
2	A3-SW08-01	11-Sep-17		Water	R	R	R								7				
3	SW07-3	11-Sep-17		Water	R	R	R			R	R				11				
4	SW16-01-2m	11-Sep-17		Water	R	R	R			R	R	R			13				
5	A5-SW08-11	11-Sep-17		Water	R	R	R	R	R	R	R	R			15				
6	SW-DUP-1	11-Sep-17		Water	R	R	R	R	R	R	R	R			15				
7	SW-B-2	11-Sep-17		Water	R	R	R	R	R	R	R	R			15				
8	A3-SW08-05	11-Sep-17		Water	R	R	R								7				
9	BG-SW08-01	11-Sep-17		Water	R	R	R					R			9				
10	SW16-01-6m	11-Sep-17		Water	R	R	R								7				
11	SW16-02-6m	11-Sep-17		Water	R	R	R			R	R				11				
12	SW16-02-2m	11-Sep-17		Water	R	R	R								7				
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client use)			SAMPLE CONDITION AS RECEIVED (lab use only)														
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		PLEASE NOTE: This project references "routine" parameters as presented in Q64064: pH, conductivity, alkalinity, turbidity, TDS, TSS, Ammonia, Nitrate/Nitrite, total phosphorus, dissolved phosphorus, dissolved organic carbon, total organic carbon, total Hardness, calcium, magnesium, potassium, sodium, sulphate, sulphide, chloride. ALSO, please note total and dissolved metals parameters must meet detection limits of Q64064.			Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/> Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/> Cooling Initiated <input type="checkbox"/>														
Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					INITIAL COOLER TEMPERATURES °C 4.3														
					FINAL COOLER TEMPERATURES °C														
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)														
Released by:	Date: Sep 12/17	Time: 8:00a	Received by:	Date: 11-Sep-17	Time: 9:30														

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-Q326e v09 Front 04 January 2014

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.



PUBLIC WORKS AND GOVERNMENT
SERVICES CANADA
ATTN: Rebecca Studer-Halbach
Northern Contaminated Sites
10025 Jasper Avenue NW
Edmonton AB T5J 1S6

Date Received: 16-SEP-17
Report Date: 06-OCT-17 19:16 (MT)
Version: FINAL

Client Phone: 780-497-3761

Certificate of Analysis

Lab Work Order #: L1993043
Project P.O. #: R.015211.049
Job Reference:
C of C Numbers:
Legal Site Desc:

Dean Watt, B.Sc.
Account Manager

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ADDRESS: 314 Old Airport Road, Unit 116, Yellowknife, NT X1A 3T3 Canada | Phone: +1 867 873 5593 |
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1993043-1 WATER 13-SEP-17 T-16-A	L1993043-2 WATER 13-SEP-17 T-16-B	L1993043-3 WATER 13-SEP-17 T-8-A	L1993043-4 WATER 13-SEP-17 T-DUP-1	L1993043-5 WATER 13-SEP-17 T-8-B
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	197	195 ^{HTC}	196	196	197
	Hardness (as CaCO3) (mg/L)	77.0 ^{HTC}	76.5 ^{HTC}	78.3	78.7	79.1
	pH (pH)	7.93	7.94	7.93	7.92	7.93
	Total Suspended Solids (mg/L)	<3.0	5.5	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	140	132	134	137	129
	Turbidity (NTU)	0.79	0.73	0.69	0.86	0.83
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	61.9	62.7	62.9	62.3	63.2
	Ammonia, Total (as N) (mg/L)	0.0117	0.0057	0.0118	<0.0050	0.0082
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	11.5	11.6	11.5	11.5	11.5
	Fluoride (F) (mg/L)	0.683	0.685	0.683	0.682	0.681
	Nitrate (as N) (mg/L)	<0.0050	0.0064	0.0051	0.0051	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0040	0.0041	0.0039	0.0040	0.0042
	Phosphorus (P)-Total (mg/L)	0.0050	0.0054	0.0051	0.0059	0.0041
	Sulfate (SO4) (mg/L)	16.1	16.1	16.1	16.1	16.1
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	11.9	12.0	12.5	12.5	12.1
	Total Organic Carbon (mg/L)	12.1	12.2	12.3	12.3	12.6
Total Metals	Aluminum (Al)-Total (mg/L)	0.0338	0.0357	0.0339	0.0327	0.0339
	Antimony (Sb)-Total (mg/L)	0.00132	0.00129	0.00129	0.00131	0.00129
	Arsenic (As)-Total (mg/L)	0.0605	0.0607	0.0607	0.0608	0.0602
	Barium (Ba)-Total (mg/L)	0.0162	0.0159	0.0157	0.0159	0.0161
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.027	0.027	0.027	0.028	0.028
	Cadmium (Cd)-Total (mg/L)	0.0000077	0.0000057	0.0000066	0.0000076	0.0000070
	Calcium (Ca)-Total (mg/L)	23.2	23.2	22.9	23.0	23.4
	Cesium (Cs)-Total (mg/L)	0.000048	0.000048	0.000047	0.000048	0.000047
	Chromium (Cr)-Total (mg/L)	0.00017	0.00015	0.00015	0.00019	0.00015
	Cobalt (Co)-Total (mg/L)	0.00014	0.00013	0.00013	0.00013	0.00013
	Copper (Cu)-Total (mg/L)	0.00797	0.00797	0.00797	0.00812	0.00808
	Iron (Fe)-Total (mg/L)	0.038	0.037	0.035	0.037	0.038
	Lead (Pb)-Total (mg/L)	0.000146	0.000147	0.000131	0.000137	0.000136
	Lithium (Li)-Total (mg/L)	0.0073	0.0074	0.0075	0.0075	0.0077
	Magnesium (Mg)-Total (mg/L)	4.67	4.51	4.67	4.68	4.55

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1993043-6 WATER 13-SEP-17 T-8-C	L1993043-7 WATER 13-SEP-17 T-5	L1993043-8 WATER 13-SEP-17 T-3	L1993043-9 WATER 13-SEP-17 T-9	L1993043-10 WATER 13-SEP-17 T-1
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	235	197	196	190	134
	Hardness (as CaCO ₃) (mg/L)	92.6	76.3 ^{HTC}	78.9	77.3	62.7 ^{HTC}
	pH (pH)	7.90	7.94	7.92	7.93	7.87
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	160	136	133	124	93
	Turbidity (NTU)	0.45	0.68	1.11	0.84	3.33
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)	75.8	62.9	61.1	62.6	56.2
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0059	0.0073	0.0125	0.0121
	Bromide (Br) (mg/L)	0.054	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	14.6	11.5	11.5	11.3	1.71
	Fluoride (F) (mg/L)	0.765	0.685	0.685	0.682	0.211
	Nitrate (as N) (mg/L)	0.0843	<0.0050	0.0072	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0044	0.0040	0.0039	0.0057	0.0036
	Phosphorus (P)-Total (mg/L)	0.0037	0.0050	0.0166	0.0075	0.0097
	Sulfate (SO ₄) (mg/L)	18.6	16.1	16.1	15.5	10.6
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	12.7	11.6	11.8	11.8	6.81
	Total Organic Carbon (mg/L)	12.6	11.7	11.5	11.7	6.90
Total Metals	Aluminum (Al)-Total (mg/L)	0.0190	0.0329	0.0580	0.0299	0.152
	Antimony (Sb)-Total (mg/L)	0.00138	0.00124	0.00127	0.00116	0.00011
	Arsenic (As)-Total (mg/L)	0.0769	0.0596	0.0652	0.0472	0.00180
	Barium (Ba)-Total (mg/L)	0.0183	0.0159	0.0162	0.0108	0.0128
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	0.000222	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.033	0.027	0.027	0.024	0.012
	Cadmium (Cd)-Total (mg/L)	0.0000080	0.0000069	0.0000116	<0.0000050	0.0000055
	Calcium (Ca)-Total (mg/L)	28.1	23.0	23.1	22.6	15.7
	Cesium (Cs)-Total (mg/L)	0.000044	0.000044	0.000079	0.000024	0.000027
	Chromium (Cr)-Total (mg/L)	0.00010	0.00015	0.00018	0.00010	0.00037
	Cobalt (Co)-Total (mg/L)	0.00011	0.00014	0.00103	0.00015	<0.00010
	Copper (Cu)-Total (mg/L)	0.00882	0.00797	0.00859	0.00535	0.00421
	Iron (Fe)-Total (mg/L)	0.027	0.039	0.085	0.065	0.208
	Lead (Pb)-Total (mg/L)	0.000080	0.000152	0.00128	0.000085	0.000219
	Lithium (Li)-Total (mg/L)	0.0092	0.0076	0.0075	0.0072	0.0023
	Magnesium (Mg)-Total (mg/L)	5.36	4.55	4.53	4.54	5.72

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1993043-11 WATER 13-SEP-17 T-31	L1993043-12 WATER 13-SEP-17 T-6	L1993043-13 WATER 13-SEP-17 T-30	L1993043-14 WATER 13-SEP-17 T-12	L1993043-15 WATER 13-SEP-17 T-10
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	147	254	146	147 ^{HTC}	148
	Hardness (as CaCO ₃) (mg/L)	67.8	108	67.5 ^{HTC}	68.0 ^{HTC}	67.9
	pH (pH)	7.95	8.02	7.92	7.96	7.95
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	97	168	92	91	95
	Turbidity (NTU)	0.57	1.12	0.51	0.65	0.83
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)	57.8	89.9	57.9	58.0	57.9
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0088	0.0072	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	2.34	9.52	2.33	2.34	2.34
	Fluoride (F) (mg/L)	0.146	0.641	0.144	0.144	0.147
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	0.0048	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0029	0.0057	0.0024	0.0020	0.0025
	Sulfate (SO ₄) (mg/L)	14.2	25.6	14.2	14.2	14.2
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	4.98	9.03	4.53	4.83	4.77
	Total Organic Carbon (mg/L)	4.82	9.10	4.74	4.82	4.69
Total Metals	Aluminum (Al)-Total (mg/L)	0.0232	0.0549	0.0239	0.0243	0.0276
	Antimony (Sb)-Total (mg/L)	<0.00010	0.00092	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00035	0.0287	0.00024	0.00024	0.00036
	Barium (Ba)-Total (mg/L)	0.0107	0.0243	0.0106	0.0104	0.0108
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.011	0.027	0.012	0.011	0.012
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	16.1	30.9	15.7	16.0	16.0
	Cesium (Cs)-Total (mg/L)	<0.000010	0.000048	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)	0.00011	0.00015	0.00145	0.00011	0.00013
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00014	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00089	0.00739	0.00084	0.00078	0.00088
	Iron (Fe)-Total (mg/L)	0.023	0.072	0.029	0.024	0.026
	Lead (Pb)-Total (mg/L)	<0.000050	0.000055	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0022	0.0073	0.0023	0.0023	0.0024
	Magnesium (Mg)-Total (mg/L)	6.67	7.30	6.88	6.84	6.84

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1993043-16 WATER 13-SEP-17 T-DUP-2	L1993043-17 WATER 13-SEP-17 R-2	L1993043-18 WATER 14-SEP-17 MB-9	L1993043-19 WATER 14-SEP-17 MB-1	L1993043-20 WATER 14-SEP-17 T-25
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	147	152	237	244	191
	Hardness (as CaCO3) (mg/L)	67.8 ^{HTC}	70.0 ^{HTC}	97.9 ^{HTC}	96.3	89.8 ^{HTC}
	pH (pH)	7.96	7.96	7.96	7.93	7.92
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	3.7
	Total Dissolved Solids (mg/L)	92	89	154	161	150
	Turbidity (NTU)	0.89	0.90	0.69	0.81	1.14
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	57.6	58.8	78.9	79.3	80.7
	Ammonia, Total (as N) (mg/L)	0.0106	0.0132	0.0110	0.0076	0.0103
	Bromide (Br) (mg/L)	<0.050	<0.050	0.052	0.053	<0.050
	Chloride (Cl) (mg/L)	2.33	2.45	11.1	10.9	2.46
	Fluoride (F) (mg/L)	0.144	0.148	0.786	0.795	0.281
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.0401	0.0797	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	0.0059	0.0095	0.0094
	Phosphorus (P)-Total (mg/L)	0.0023	0.0028	0.0065	0.0080	0.0140
	Sulfate (SO4) (mg/L)	14.2	15.1	24.7	27.7	15.6
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018 ^M	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	4.77	4.81	9.49	9.58	7.86
	Total Organic Carbon (mg/L)	4.56	4.73	9.53	9.54	8.65
Total Metals	Aluminum (Al)-Total (mg/L)	0.0231	0.0194	0.0261	0.0285	0.0258
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	0.00123	0.00142	<0.00010
	Arsenic (As)-Total (mg/L)	0.00032	0.00017	0.0522	0.0544	0.00237
	Barium (Ba)-Total (mg/L)	0.0154	0.0106	0.0208	0.0207	0.0131
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	0.000040	0.000041	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	0.000051	0.000064	<0.000050
	Boron (B)-Total (mg/L)	0.011	0.012	0.024	0.024	0.105
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	0.0000572	0.0000648	<0.0000050
	Calcium (Ca)-Total (mg/L)	15.6	16.3	29.9	30.1	22.6
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	0.000266	0.000287	0.000015
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00010	0.00014	0.00015	0.00021
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	0.00406	0.00348	0.00019
	Copper (Cu)-Total (mg/L)	0.00077	0.00071	0.0412	0.0492	0.00135
	Iron (Fe)-Total (mg/L)	0.022	0.019	0.088	0.036	0.402
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	0.000134	0.000161	0.000114
	Lithium (Li)-Total (mg/L)	0.0023	0.0026	0.0073	0.0075	0.0039
	Magnesium (Mg)-Total (mg/L)	7.02	7.10	5.68	5.52	8.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1993043-21 WATER 14-SEP-17 T-TRIP BLANK	L1993043-22 WATER 14-SEP-17 T-FIELD BLANK			
Grouping	Analyte						
WATER							
Physical Tests	Conductivity (uS/cm)			<2.0			
	Hardness (as CaCO3) (mg/L)			<0.50			
	pH (pH)			5.43			
	Total Suspended Solids (mg/L)			<3.0			
	Total Dissolved Solids (mg/L)			<10			
	Turbidity (NTU)			<0.10			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)			<1.0			
	Ammonia, Total (as N) (mg/L)			<0.0050			
	Bromide (Br) (mg/L)			<0.050			
	Chloride (Cl) (mg/L)			<0.50			
	Fluoride (F) (mg/L)			<0.020			
	Nitrate (as N) (mg/L)			<0.0050			
	Nitrite (as N) (mg/L)			<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020		<0.0020			
	Phosphorus (P)-Total (mg/L)			<0.0020			
	Sulfate (SO4) (mg/L)			<0.30			
	Sulphide as S (mg/L)			<0.018 ^{HTD}			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)			<0.50			
	Total Organic Carbon (mg/L)			<0.50			
Total Metals	Aluminum (Al)-Total (mg/L)			<0.0030			
	Antimony (Sb)-Total (mg/L)			<0.00010			
	Arsenic (As)-Total (mg/L)			<0.00010			
	Barium (Ba)-Total (mg/L)			<0.000050			
	Beryllium (Be)-Total (mg/L)			<0.000020			
	Bismuth (Bi)-Total (mg/L)			<0.000050			
	Boron (B)-Total (mg/L)			<0.010			
	Cadmium (Cd)-Total (mg/L)			<0.0000050			
	Calcium (Ca)-Total (mg/L)			<0.050			
	Cesium (Cs)-Total (mg/L)			<0.000010			
	Chromium (Cr)-Total (mg/L)			<0.00010			
	Cobalt (Co)-Total (mg/L)			<0.00010			
	Copper (Cu)-Total (mg/L)			<0.00050			
	Iron (Fe)-Total (mg/L)			<0.010			
	Lead (Pb)-Total (mg/L)			<0.000050			
	Lithium (Li)-Total (mg/L)			<0.0010			
	Magnesium (Mg)-Total (mg/L)			<0.10			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1993043-1 WATER 13-SEP-17 T-16-A	L1993043-2 WATER 13-SEP-17 T-16-B	L1993043-3 WATER 13-SEP-17 T-8-A	L1993043-4 WATER 13-SEP-17 T-DUP-1	L1993043-5 WATER 13-SEP-17 T-8-B
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.00306	0.00312	0.00299	0.00304	0.00303	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.00255	0.00258	0.00254	0.00250	0.00255	
	Nickel (Ni)-Total (mg/L)	0.00374	0.00375	0.00377	0.00385	0.00380	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	1.94	1.96	1.95	1.97	1.96	
	Selenium (Se)-Total (mg/L)	0.000065	0.000062	0.000051	<0.000050	0.000051	
	Silicon (Si)-Total (mg/L)	0.73	0.74	0.73	0.73	0.73	
	Silver (Ag)-Total (mg/L)	0.000018	0.000017	0.000015	0.000017	0.000026	
	Sodium (Na)-Total (mg/L)	7.63	7.55	7.60	7.77	7.55	
	Strontium (Sr)-Total (mg/L)	0.0736	0.0730	0.0742	0.0736	0.0745	
	Sulfur (S)-Total (mg/L)	5.48	5.40	5.36	5.53	5.60	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	0.00062	<0.00090 ^{DLM}	<0.00090 ^{DLM}	0.00090	0.00067	
	Uranium (U)-Total (mg/L)	0.00250	0.00255	0.00245	0.00251	0.00253	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	0.0032	0.0040	0.0042	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location			LAB	LAB	LAB	
	Dissolved Metals Filtration Location			LAB	LAB	LAB	
	Aluminum (Al)-Dissolved (mg/L)			0.0093	0.0100	0.0102	
	Antimony (Sb)-Dissolved (mg/L)			0.00129	0.00127	0.00128	
	Arsenic (As)-Dissolved (mg/L)			0.0614	0.0612	0.0610	
	Barium (Ba)-Dissolved (mg/L)			0.0165	0.0164	0.0167	
	Beryllium (Be)-Dissolved (mg/L)			<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)			<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)			0.026	0.026	0.026	
	Cadmium (Cd)-Dissolved (mg/L)			0.0000063	0.0000055	<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)			23.6	23.9	23.9	
	Cesium (Cs)-Dissolved (mg/L)			0.000043	0.000040	0.000041	
	Chromium (Cr)-Dissolved (mg/L)			<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)			<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)			0.00742	0.00741	0.00746	
	Iron (Fe)-Dissolved (mg/L)			<0.010	<0.010	<0.010	
	Lead (Pb)-Dissolved (mg/L)			<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Dissolved (mg/L)			0.0078	0.0080	0.0080	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1993043-6 WATER 13-SEP-17 T-8-C	L1993043-7 WATER 13-SEP-17 T-5	L1993043-8 WATER 13-SEP-17 T-3	L1993043-9 WATER 13-SEP-17 T-9	L1993043-10 WATER 13-SEP-17 T-1
Grouping	Analyte					
WATER						
Total Metals	Manganese (Mn)-Total (mg/L)	0.00533	0.00313	0.00673	0.00737	0.00638
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00287	0.00256	0.00258	0.00238	0.000221
	Nickel (Ni)-Total (mg/L)	0.00438	0.00376	0.00406	0.00348	0.00055
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	2.34	1.94	1.96	1.97	0.94
	Selenium (Se)-Total (mg/L)	0.000055	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	1.43	0.71	0.74	0.34	1.10
	Silver (Ag)-Total (mg/L)	0.000013	0.000017	0.000063	0.000014	<0.000010
	Sodium (Na)-Total (mg/L)	9.40	7.48	7.63	7.31	2.37
	Strontium (Sr)-Total (mg/L)	0.0904	0.0752	0.0740	0.0738	0.0414
	Sulfur (S)-Total (mg/L)	6.29	5.44	5.32	5.07	3.36
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	0.00039	<0.00090 ^{DLM}	<0.0012 ^{DLM}	<0.00060 ^{DLM}	0.00546
	Uranium (U)-Total (mg/L)	0.00324	0.00247	0.00258	0.00218	0.000377
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0048	0.0036	0.0040	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	LAB		LAB	LAB	
	Dissolved Metals Filtration Location	LAB		LAB	LAB	
	Aluminum (Al)-Dissolved (mg/L)	0.0082		0.0075	0.0071	
	Antimony (Sb)-Dissolved (mg/L)	0.00139		0.00136	0.00114	
	Arsenic (As)-Dissolved (mg/L)	0.0796		0.0683	0.0460	
	Barium (Ba)-Dissolved (mg/L)	0.0192		0.0169	0.0110	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020		<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050		<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	0.031		0.026	0.023	
	Cadmium (Cd)-Dissolved (mg/L)	0.0000082		0.0000085	<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)	28.2		24.3	23.3	
	Cesium (Cs)-Dissolved (mg/L)	0.000039		0.000046	0.000022	
	Chromium (Cr)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00010		0.00038	<0.00010	
	Copper (Cu)-Dissolved (mg/L)	0.00839		0.00759	0.00473	
	Iron (Fe)-Dissolved (mg/L)	0.010		<0.010	0.013	
	Lead (Pb)-Dissolved (mg/L)	<0.000050		0.000151	<0.000050	
	Lithium (Li)-Dissolved (mg/L)	0.0095		0.0079	0.0078	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1993043-11 WATER 13-SEP-17 T-31	L1993043-12 WATER 13-SEP-17 T-6	L1993043-13 WATER 13-SEP-17 T-30	L1993043-14 WATER 13-SEP-17 T-12	L1993043-15 WATER 13-SEP-17 T-10
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.00171	0.00752	0.00160	0.00155	0.00189	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000262	0.00232	0.000428	0.000263	0.000262	
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00227	<0.00050	<0.00050	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	1.01	1.70	1.01	0.98	1.00	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.80	1.25	0.81	0.81	0.82	
	Silver (Ag)-Total (mg/L)	<0.000010	0.000018	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	2.48	7.14	2.46	2.48	2.54	
	Strontium (Sr)-Total (mg/L)	0.0541	0.105	0.0531	0.0530	0.0541	
	Sulfur (S)-Total (mg/L)	4.60	8.36	4.60	4.61	4.63	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	0.00103	<0.00060 ^{DLM}	<0.00090 ^{DLM}	0.00077	0.00108	
	Uranium (U)-Total (mg/L)	0.000539	0.00194	0.000547	0.000534	0.000545	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location	LAB	LAB			LAB	
	Dissolved Metals Filtration Location	LAB	LAB			LAB	
	Aluminum (Al)-Dissolved (mg/L)	0.0026	0.0051			0.0028	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	0.00092			<0.00010	
	Arsenic (As)-Dissolved (mg/L)	0.00031	0.0277			0.00034	
	Barium (Ba)-Dissolved (mg/L)	0.0106	0.0245			0.0110	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			<0.000050	
	Boron (B)-Dissolved (mg/L)	0.011	0.026			0.011	
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050			<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)	16.3	31.2			16.2	
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	0.000043			<0.000010	
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010			<0.00010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			<0.00010	
	Copper (Cu)-Dissolved (mg/L)	0.00073	0.00615			0.00071	
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			<0.010	
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			<0.000050	
	Lithium (Li)-Dissolved (mg/L)	0.0025	0.0077			0.0025	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1993043-16	L1993043-17	L1993043-18	L1993043-19	L1993043-20
		Description	WATER	WATER	WATER	WATER	WATER
		Sampled Date	13-SEP-17	13-SEP-17	14-SEP-17	14-SEP-17	14-SEP-17
		Sampled Time					
		Client ID	T-DUP-2	R-2	MB-9	MB-1	T-25
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)	0.00157	0.00106	0.105	0.0539	0.0203	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	0.0000051	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000259	0.000269	0.00327	0.00371	0.000218	
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	0.00601	0.00614	0.00085	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	1.00	0.97	1.91	1.93	1.72	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	0.000069	0.000066	<0.000050	
	Silicon (Si)-Total (mg/L)	0.80	0.83	1.41	1.43	0.90	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	0.000143	0.000115	<0.000010	
	Sodium (Na)-Total (mg/L)	2.48	2.56	7.32	7.18	3.53	
	Strontium (Sr)-Total (mg/L)	0.0525	0.0571	0.0827	0.0827	0.0627	
	Sulfur (S)-Total (mg/L)	4.76	5.41	8.23	9.12	5.29	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	0.000021	0.000020	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	0.00081	<0.00060 ^{DLM}	<0.00030	0.00035	0.00067	
	Uranium (U)-Total (mg/L)	0.000240	0.000486	0.00124	0.00142	0.000252	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	0.0215	0.0265	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location				LAB		
	Dissolved Metals Filtration Location				LAB		
	Aluminum (Al)-Dissolved (mg/L)				0.0155		
	Antimony (Sb)-Dissolved (mg/L)				0.00144		
	Arsenic (As)-Dissolved (mg/L)				0.0552		
	Barium (Ba)-Dissolved (mg/L)				0.0227		
	Beryllium (Be)-Dissolved (mg/L)				0.000039		
	Bismuth (Bi)-Dissolved (mg/L)				<0.000050		
	Boron (B)-Dissolved (mg/L)				0.023		
	Cadmium (Cd)-Dissolved (mg/L)				0.0000683		
	Calcium (Ca)-Dissolved (mg/L)				29.4		
	Cesium (Cs)-Dissolved (mg/L)				0.000272		
	Chromium (Cr)-Dissolved (mg/L)				<0.00010		
	Cobalt (Co)-Dissolved (mg/L)				0.00285		
	Copper (Cu)-Dissolved (mg/L)				0.0454		
	Iron (Fe)-Dissolved (mg/L)				0.016		
	Lead (Pb)-Dissolved (mg/L)				<0.000050		
	Lithium (Li)-Dissolved (mg/L)				0.0074		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1993043-21 WATER 14-SEP-17 T-TRIP BLANK	L1993043-22 WATER 14-SEP-17 T-FIELD BLANK			
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)			<0.00010			
	Mercury (Hg)-Total (mg/L)			<0.0000050			
	Molybdenum (Mo)-Total (mg/L)			<0.000050			
	Nickel (Ni)-Total (mg/L)			<0.00050			
	Phosphorus (P)-Total (mg/L)			<0.050			
	Potassium (K)-Total (mg/L)			<0.10			
	Selenium (Se)-Total (mg/L)			<0.000050			
	Silicon (Si)-Total (mg/L)			<0.10			
	Silver (Ag)-Total (mg/L)			<0.000010			
	Sodium (Na)-Total (mg/L)			<0.050			
	Strontium (Sr)-Total (mg/L)			<0.00020			
	Sulfur (S)-Total (mg/L)			<0.50			
	Thallium (Tl)-Total (mg/L)			<0.000010			
	Tin (Sn)-Total (mg/L)			<0.00010			
	Titanium (Ti)-Total (mg/L)			<0.00030			
	Uranium (U)-Total (mg/L)			<0.000010			
	Vanadium (V)-Total (mg/L)			<0.00050			
	Zinc (Zn)-Total (mg/L)			<0.0030			
	Zirconium (Zr)-Total (mg/L)			<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location			LAB			
	Dissolved Metals Filtration Location			LAB			
	Aluminum (Al)-Dissolved (mg/L)			<0.0010			
	Antimony (Sb)-Dissolved (mg/L)			<0.00010			
	Arsenic (As)-Dissolved (mg/L)			<0.00010			
	Barium (Ba)-Dissolved (mg/L)			<0.000050			
	Beryllium (Be)-Dissolved (mg/L)			<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)			<0.000050			
	Boron (B)-Dissolved (mg/L)			<0.010			
	Cadmium (Cd)-Dissolved (mg/L)			<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)			<0.050			
	Cesium (Cs)-Dissolved (mg/L)			<0.000010			
	Chromium (Cr)-Dissolved (mg/L)			<0.00010			
	Cobalt (Co)-Dissolved (mg/L)			<0.00010			
	Copper (Cu)-Dissolved (mg/L)			<0.00020			
	Iron (Fe)-Dissolved (mg/L)			<0.010			
	Lead (Pb)-Dissolved (mg/L)			<0.000050			
	Lithium (Li)-Dissolved (mg/L)			<0.0010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1993043-1 WATER 13-SEP-17 T-16-A	L1993043-2 WATER 13-SEP-17 T-16-B	L1993043-3 WATER 13-SEP-17 T-8-A	L1993043-4 WATER 13-SEP-17 T-DUP-1	L1993043-5 WATER 13-SEP-17 T-8-B
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)			4.73	4.64	4.72
	Manganese (Mn)-Dissolved (mg/L)			0.00012	0.00012	0.00016
	Mercury (Hg)-Dissolved (mg/L)			<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)			0.00253	0.00255	0.00255
	Nickel (Ni)-Dissolved (mg/L)			0.00375	0.00374	0.00375
	Phosphorus (P)-Dissolved (mg/L)			<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)			1.99	1.98	2.03
	Selenium (Se)-Dissolved (mg/L)			<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)			0.646	0.659	0.668
	Silver (Ag)-Dissolved (mg/L)			<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)			7.78	7.53	7.72
	Strontium (Sr)-Dissolved (mg/L)			0.0755	0.0754	0.0756
	Sulfur (S)-Dissolved (mg/L)			5.15	5.24	5.28
	Thallium (Tl)-Dissolved (mg/L)			<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)			<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)			<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)			0.00251	0.00248	0.00260
	Vanadium (V)-Dissolved (mg/L)			<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)			0.0027	0.0027	0.0023
	Zirconium (Zr)-Dissolved (mg/L)			<0.00030	<0.00030	<0.00030
Aggregate Organics	Oil and Grease (mg/L)			<5.0	<5.0	<5.0
Volatile Organic Compounds	Benzene (mg/L)			<0.00050	<0.00050	<0.00050
	Ethylbenzene (mg/L)			<0.00050	<0.00050	<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)			<0.00050	<0.00050	<0.00050
	Styrene (mg/L)			<0.00050	<0.00050	<0.00050
	Toluene (mg/L)			<0.00045	<0.00045	<0.00045
	ortho-Xylene (mg/L)			<0.00050	<0.00050	<0.00050
	meta- & para-Xylene (mg/L)			<0.00050	<0.00050	<0.00050
	Xylenes (mg/L)			<0.00075	<0.00075	<0.00075
	F1 (C6-C10) (mg/L)			<0.10	<0.10	<0.10
	Surrogate: 4-Bromofluorobenzene (SS) (%)			95.4	92.0	99.8
	Surrogate: 1,4-Difluorobenzene (SS) (%)			98.5	96.4	97.5
Hydrocarbons	F1-BTEX (mg/L)			<0.10	<0.10	<0.10
	F2 (C10-C16) (mg/L)			<0.30	<0.30	<0.30
	F3 (C16-C34) (mg/L)			<0.30	<0.30	<0.30
	F4 (C34-C50) (mg/L)			<0.30	<0.30	<0.30

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1993043-6 WATER 13-SEP-17 T-8-C	L1993043-7 WATER 13-SEP-17 T-5	L1993043-8 WATER 13-SEP-17 T-3	L1993043-9 WATER 13-SEP-17 T-9	L1993043-10 WATER 13-SEP-17 T-1
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	5.41			4.39	4.64	
	Manganese (Mn)-Dissolved (mg/L)	0.00141			0.00010	0.00023	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050			<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	0.00285			0.00259	0.00241	
	Nickel (Ni)-Dissolved (mg/L)	0.00437			0.00400	0.00326	
	Phosphorus (P)-Dissolved (mg/L)	<0.050			<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)	2.40			1.99	1.99	
	Selenium (Se)-Dissolved (mg/L)	<0.000050			<0.000050	<0.000050	
	Silicon (Si)-Dissolved (mg/L)	1.39			0.579	0.261	
	Silver (Ag)-Dissolved (mg/L)	<0.000010			<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	9.47			7.55	7.48	
	Strontium (Sr)-Dissolved (mg/L)	0.0916			0.0744	0.0753	
	Sulfur (S)-Dissolved (mg/L)	6.10			5.05	5.05	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010			<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010			<0.00010	0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030			<0.00030	<0.00030	
	Uranium (U)-Dissolved (mg/L)	0.00319			0.00227	0.00220	
	Vanadium (V)-Dissolved (mg/L)	<0.00050			<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	0.0047			0.0029	<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030			<0.00030	<0.00030	
Aggregate Organics	Oil and Grease (mg/L)	<5.0					
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050		
	Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050		
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050		
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050		
	Toluene (mg/L)	<0.00045	<0.00045	<0.00045	<0.00045		
	ortho-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050		
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050		
	Xylenes (mg/L)	<0.00075	<0.00075	<0.00075	<0.00075		
	F1 (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10		
	Surrogate: 4-Bromofluorobenzene (SS) (%)	97.5	92.8	97.0			
	Surrogate: 1,4-Difluorobenzene (SS) (%)	93.9	99.1	98.3			
Hydrocarbons	F1-BTEX (mg/L)	<0.10	<0.10	<0.10			
	F2 (C10-C16) (mg/L)	<0.30	<0.30	<0.30			
	F3 (C16-C34) (mg/L)	<0.30	<0.30	<0.30			
	F4 (C34-C50) (mg/L)	<0.30	<0.30	<0.30			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1993043-11 WATER 13-SEP-17 T-31	L1993043-12 WATER 13-SEP-17 T-6	L1993043-13 WATER 13-SEP-17 T-30	L1993043-14 WATER 13-SEP-17 T-12	L1993043-15 WATER 13-SEP-17 T-10
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	6.61	7.22				6.65
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	0.00014				<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050				<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000259	0.00233				0.000256
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00211				<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050				<0.050
	Potassium (K)-Dissolved (mg/L)	0.96	1.73				1.00
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050				<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.751	1.15				0.759
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010				<0.000010
	Sodium (Na)-Dissolved (mg/L)	2.40	7.15				2.43
	Strontium (Sr)-Dissolved (mg/L)	0.0546	0.104				0.0537
	Sulfur (S)-Dissolved (mg/L)	4.59	8.43				4.58
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010				<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010				<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030				<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000552	0.00196				0.000551
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050				<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0012				<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030				<0.00030
Aggregate Organics	Oil and Grease (mg/L)						<5.0
Volatile Organic Compounds	Benzene (mg/L)						<0.00050
	Ethylbenzene (mg/L)						<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)						<0.00050
	Styrene (mg/L)						<0.00050
	Toluene (mg/L)						<0.00045
	ortho-Xylene (mg/L)						<0.00050
	meta- & para-Xylene (mg/L)						<0.00050
	Xylenes (mg/L)						<0.00075
	F1 (C6-C10) (mg/L)						<0.10
	Surrogate: 4-Bromofluorobenzene (SS) (%)						100.1
	Surrogate: 1,4-Difluorobenzene (SS) (%)						99.9
Hydrocarbons	F1-BTEX (mg/L)						<0.10
	F2 (C10-C16) (mg/L)						<0.30
	F3 (C16-C34) (mg/L)						<0.30
	F4 (C34-C50) (mg/L)						<0.30

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1993043-16 WATER 13-SEP-17 T-DUP-2	L1993043-17 WATER 13-SEP-17 R-2	L1993043-18 WATER 14-SEP-17 MB-9	L1993043-19 WATER 14-SEP-17 MB-1	L1993043-20 WATER 14-SEP-17 T-25
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)				5.57	
	Manganese (Mn)-Dissolved (mg/L)				0.0490	
	Mercury (Hg)-Dissolved (mg/L)				<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)				0.00352	
	Nickel (Ni)-Dissolved (mg/L)				0.00597	
	Phosphorus (P)-Dissolved (mg/L)				<0.050	
	Potassium (K)-Dissolved (mg/L)				1.88	
	Selenium (Se)-Dissolved (mg/L)				0.000060	
	Silicon (Si)-Dissolved (mg/L)				1.39	
	Silver (Ag)-Dissolved (mg/L)				0.000070	
	Sodium (Na)-Dissolved (mg/L)				7.07	
	Strontium (Sr)-Dissolved (mg/L)				0.0802	
	Sulfur (S)-Dissolved (mg/L)				9.12	
	Thallium (Tl)-Dissolved (mg/L)				0.000022	
	Tin (Sn)-Dissolved (mg/L)				<0.00010	
	Titanium (Ti)-Dissolved (mg/L)				<0.00030	
	Uranium (U)-Dissolved (mg/L)				0.00139	
	Vanadium (V)-Dissolved (mg/L)				<0.00050	
	Zinc (Zn)-Dissolved (mg/L)				0.0266	
	Zirconium (Zr)-Dissolved (mg/L)				<0.00030	
Aggregate Organics	Oil and Grease (mg/L)					
Volatile Organic Compounds	Benzene (mg/L)					<0.00050
	Ethylbenzene (mg/L)					<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)					<0.00050
	Styrene (mg/L)					<0.00050
	Toluene (mg/L)					<0.00045
	ortho-Xylene (mg/L)					<0.00050
	meta- & para-Xylene (mg/L)					<0.00050
	Xylenes (mg/L)					<0.00075
	F1 (C6-C10) (mg/L)					<0.10
	Surrogate: 4-Bromofluorobenzene (SS) (%)					93.6
	Surrogate: 1,4-Difluorobenzene (SS) (%)					94.0
Hydrocarbons	F1-BTEX (mg/L)					<0.10
	F2 (C10-C16) (mg/L)					<0.30
	F3 (C16-C34) (mg/L)					<0.30
	F4 (C34-C50) (mg/L)					<0.30

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1993043-21 WATER 14-SEP-17 T-TRIP BLANK	L1993043-22 WATER 14-SEP-17 T-FIELD BLANK			
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)			<0.10			
	Manganese (Mn)-Dissolved (mg/L)			<0.00010			
	Mercury (Hg)-Dissolved (mg/L)			<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)			<0.000050			
	Nickel (Ni)-Dissolved (mg/L)			<0.00050			
	Phosphorus (P)-Dissolved (mg/L)			<0.050			
	Potassium (K)-Dissolved (mg/L)			<0.10			
	Selenium (Se)-Dissolved (mg/L)			<0.000050			
	Silicon (Si)-Dissolved (mg/L)			<0.050			
	Silver (Ag)-Dissolved (mg/L)			<0.000010			
	Sodium (Na)-Dissolved (mg/L)			<0.050			
	Strontium (Sr)-Dissolved (mg/L)			<0.00020			
	Sulfur (S)-Dissolved (mg/L)			<0.50			
	Thallium (Tl)-Dissolved (mg/L)			<0.000010			
	Tin (Sn)-Dissolved (mg/L)			<0.00010			
	Titanium (Ti)-Dissolved (mg/L)			<0.00030			
	Uranium (U)-Dissolved (mg/L)			<0.000010			
	Vanadium (V)-Dissolved (mg/L)			<0.00050			
	Zinc (Zn)-Dissolved (mg/L)			<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)			<0.00030			
Aggregate Organics	Oil and Grease (mg/L)						
Volatile Organic Compounds	Benzene (mg/L)			<0.00050			
	Ethylbenzene (mg/L)			<0.00050			
	Methyl t-butyl ether (MTBE) (mg/L)			<0.00050			
	Styrene (mg/L)			<0.00050			
	Toluene (mg/L)			<0.00045			
	ortho-Xylene (mg/L)			<0.00050			
	meta- & para-Xylene (mg/L)			<0.00050			
	Xylenes (mg/L)			<0.00075			
	F1 (C6-C10) (mg/L)			<0.10			
	Surrogate: 4-Bromofluorobenzene (SS) (%)			97.6			
	Surrogate: 1,4-Difluorobenzene (SS) (%)			100.4			
Hydrocarbons	F1-BTEX (mg/L)			<0.10			
	F2 (C10-C16) (mg/L)			<0.30			
	F3 (C16-C34) (mg/L)			<0.30			
	F4 (C34-C50) (mg/L)			<0.30			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1993043-1 WATER 13-SEP-17 T-16-A	L1993043-2 WATER 13-SEP-17 T-16-B	L1993043-3 WATER 13-SEP-17 T-8-A	L1993043-4 WATER 13-SEP-17 T-DUP-1	L1993043-5 WATER 13-SEP-17 T-8-B
Grouping	Analyte						
WATER							
Hydrocarbons	Volatile Hydrocarbons (VH6-10) (mg/L)				<0.10	<0.10	<0.10
	VPH (C6-C10) (mg/L)				<0.10	<0.10	<0.10
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)				92.8	92.9	96.4
	Surrogate: 3,4-Dichlorotoluene (SS) (%)				89.4	96.0	135.3 ^{SURR-ND}

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1993043-6	L1993043-7	L1993043-8	L1993043-9	L1993043-10
		Description	WATER	WATER	WATER	WATER	WATER
		Sampled Date	13-SEP-17	13-SEP-17	13-SEP-17	13-SEP-17	13-SEP-17
		Sampled Time					
		Client ID	T-8-C	T-5	T-3	T-9	T-1
Grouping	Analyte						
WATER							
Hydrocarbons	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10			
	VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10			
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)	90.4	96.2	90.2			
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	130.6 ^{SURR-ND}	98.3	123.3			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1993043-11 WATER 13-SEP-17 T-31	L1993043-12 WATER 13-SEP-17 T-6	L1993043-13 WATER 13-SEP-17 T-30	L1993043-14 WATER 13-SEP-17 T-12	L1993043-15 WATER 13-SEP-17 T-10
Grouping	Analyte						
WATER							
Hydrocarbons	Volatile Hydrocarbons (VH6-10) (mg/L)						<0.10
	VPH (C6-C10) (mg/L)						<0.10
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)						90.8
	Surrogate: 3,4-Dichlorotoluene (SS) (%)						135.2

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1993043-16 WATER 13-SEP-17 T-DUP-2	L1993043-17 WATER 13-SEP-17 R-2	L1993043-18 WATER 14-SEP-17 MB-9	L1993043-19 WATER 14-SEP-17 MB-1	L1993043-20 WATER 14-SEP-17 T-25
Grouping	Analyte						
WATER							
Hydrocarbons	Volatile Hydrocarbons (VH6-10) (mg/L)						<0.10
	VPH (C6-C10) (mg/L)						<0.10
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)						92.4
	Surrogate: 3,4-Dichlorotoluene (SS) (%)						69.9

SURR-ND

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	Description	Sampled Date	Sampled Time	Client ID
		L1993043-21	WATER	14-SEP-17		
		L1993043-22	WATER	14-SEP-17		
		T-TRIP BLANK	T-FIELD BLANK			
Grouping	Analyte					
WATER						
Hydrocarbons	Volatile Hydrocarbons (VH6-10) (mg/L)					
	VPH (C6-C10) (mg/L)					
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)					
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1993043-1, -2, -3, -4, -5, -6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1993043-1, -2, -3, -4, -5, -6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1993043-10, -11, -12, -13, -14, -15, -16, -17, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L1993043-10, -11, -12, -13, -14, -15, -16, -17, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L1993043-18, -19, -20
Matrix Spike	Dissolved Organic Carbon	MS-B	L1993043-22
Matrix Spike	Total Organic Carbon	MS-B	L1993043-1, -2, -3, -4, -5, -6
Matrix Spike	Total Organic Carbon	MS-B	L1993043-1, -2, -3, -4, -5, -6
Matrix Spike	Total Organic Carbon	MS-B	L1993043-10, -11, -12, -13, -14, -15, -16, -17, -7, -9
Matrix Spike	Total Organic Carbon	MS-B	L1993043-18, -19, -20, -22, -8
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L1993043-3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1993043-3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1993043-3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1993043-3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1993043-3, -4, -5, -6
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1993043-3, -4, -5, -6
Matrix Spike	Arsenic (As)-Total	MS-B	L1993043-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L1993043-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1993043-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L1993043-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L1993043-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Nitrate (as N)	MS-B	L1993043-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -22, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
M	A peak has been manually integrated.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

Reference Information

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

F1-BTX-CALC-VA Water F1-Total BTX CCME CWS PHC TIER 1 (2001)

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID. The F1-BTEX result is calculated as follows:

F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).

F1-HSFID-VA Water CCME F1 By Headspace with GCFID EPA 5021A/CCME CWS PHC (Pub# 1310)

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.

F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.

F2-F4-ME-FID-VA Water CCME F2-F4 Hydrocarbons in Water CCME CWS-PHC, Pub #1310, Dec 2001

F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

OGG-SF-VA Water Oil & Grease by Gravimetric BCMOE (2010), EPA1664A

The procedure involves an extraction of the entire water sample with hexane. This extract is then evaporated to dryness, and the residue weighed to determine Oil and Grease.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

S2-T-COL-VA Water Total Sulphide by Colorimetric APHA 4500-S2 Sulphide

This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VH-HSFID-VA Water VH in Water by Headspace GCFID BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA Water VH Surrogates for Waters BC Env. Lab Manual (VH in Solids)

VOC7-HSMS-VA Water BTEX/MTBE/Styrene by Headspace GCMS EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA Water VOC7 and/or VOC Surrogates for Waters EPA 5035A/5021A/8260C

VPH-CALC-VA Water VPH is VH minus select aromatics BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water". The concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and, in solids, Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10).

XYLENES-CALC-VA Water Sum of Xylene Isomer Concentrations CALCULATION

Reference Information

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg ww - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

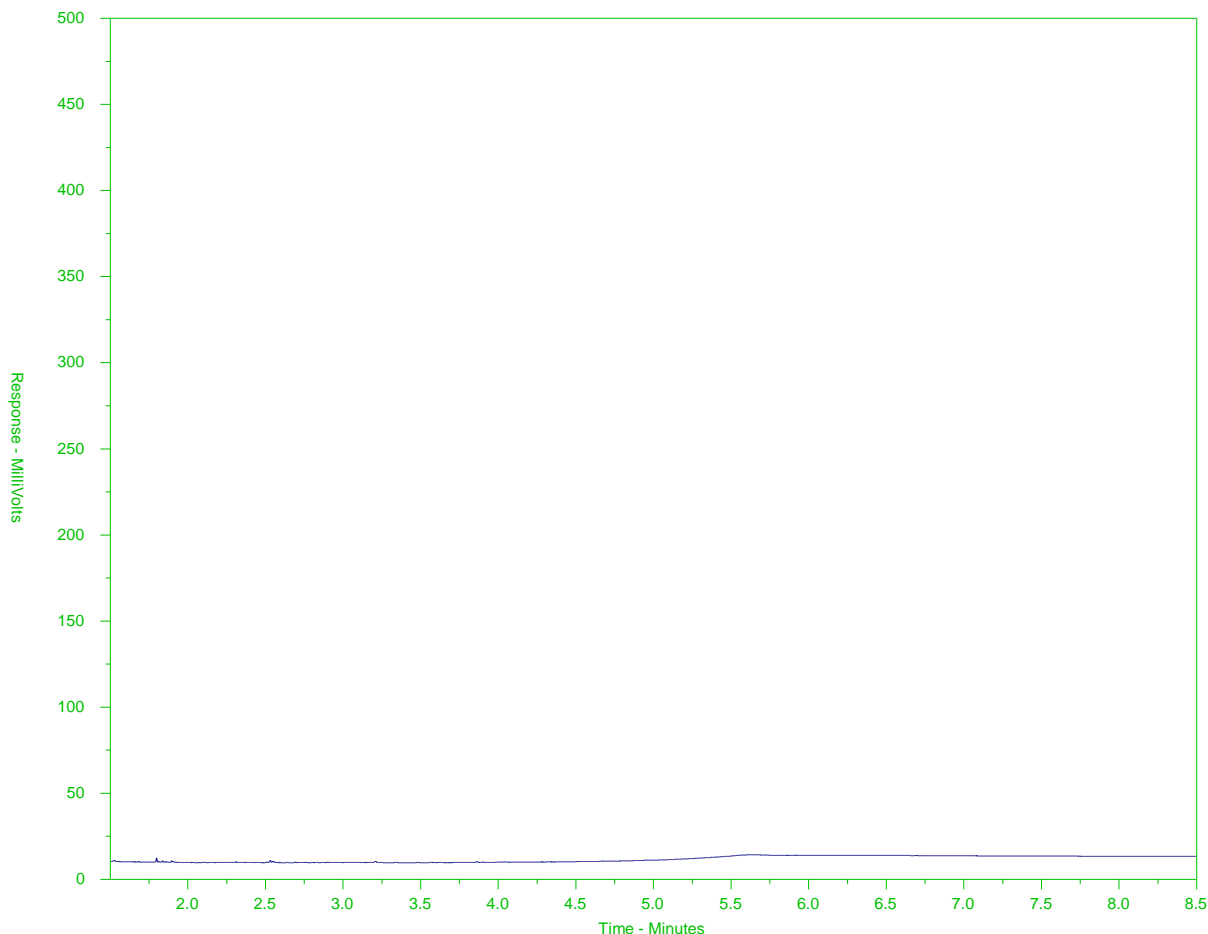
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1993043-C-3
Client Sample ID: T-8-A



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

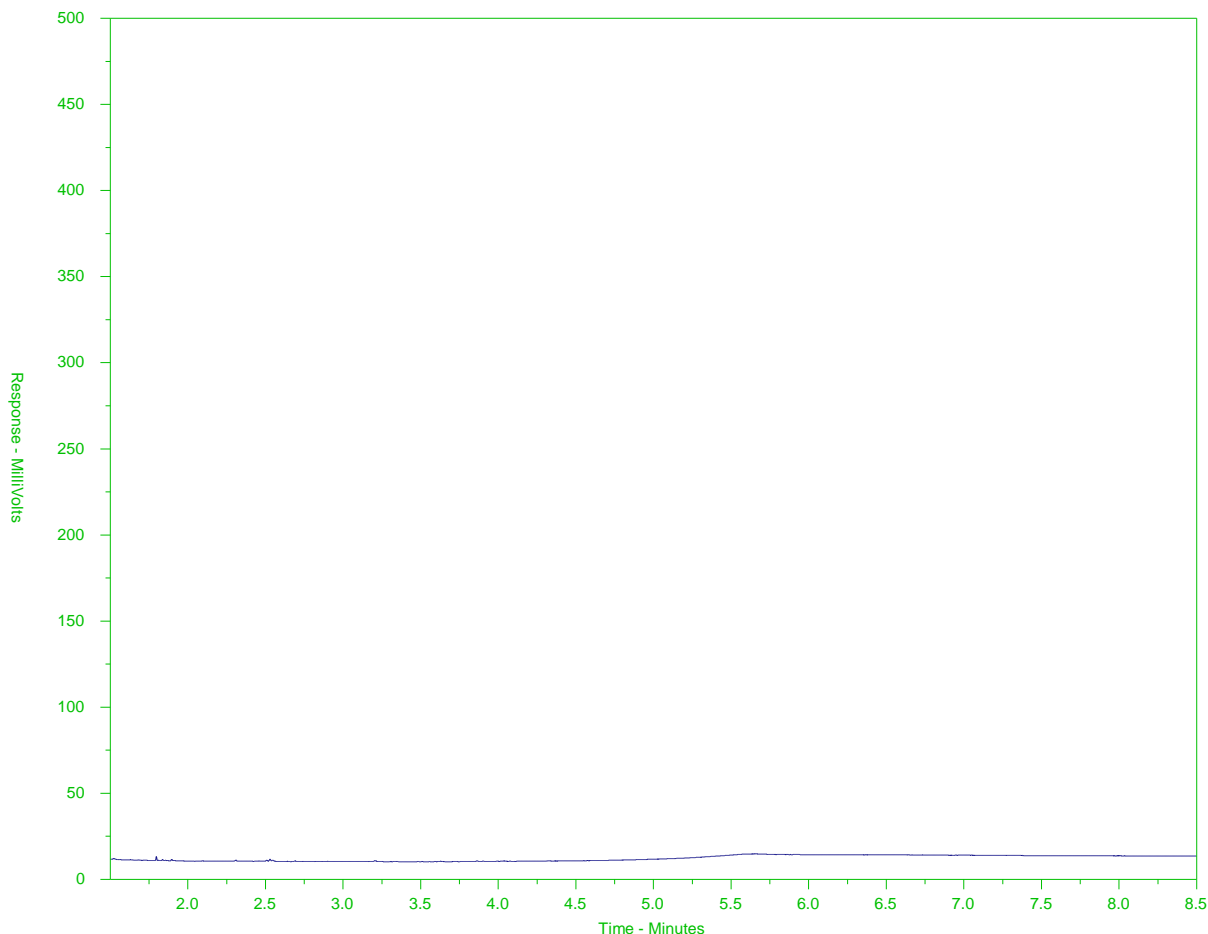
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1993043-C-4
Client Sample ID: T-DUP-1



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

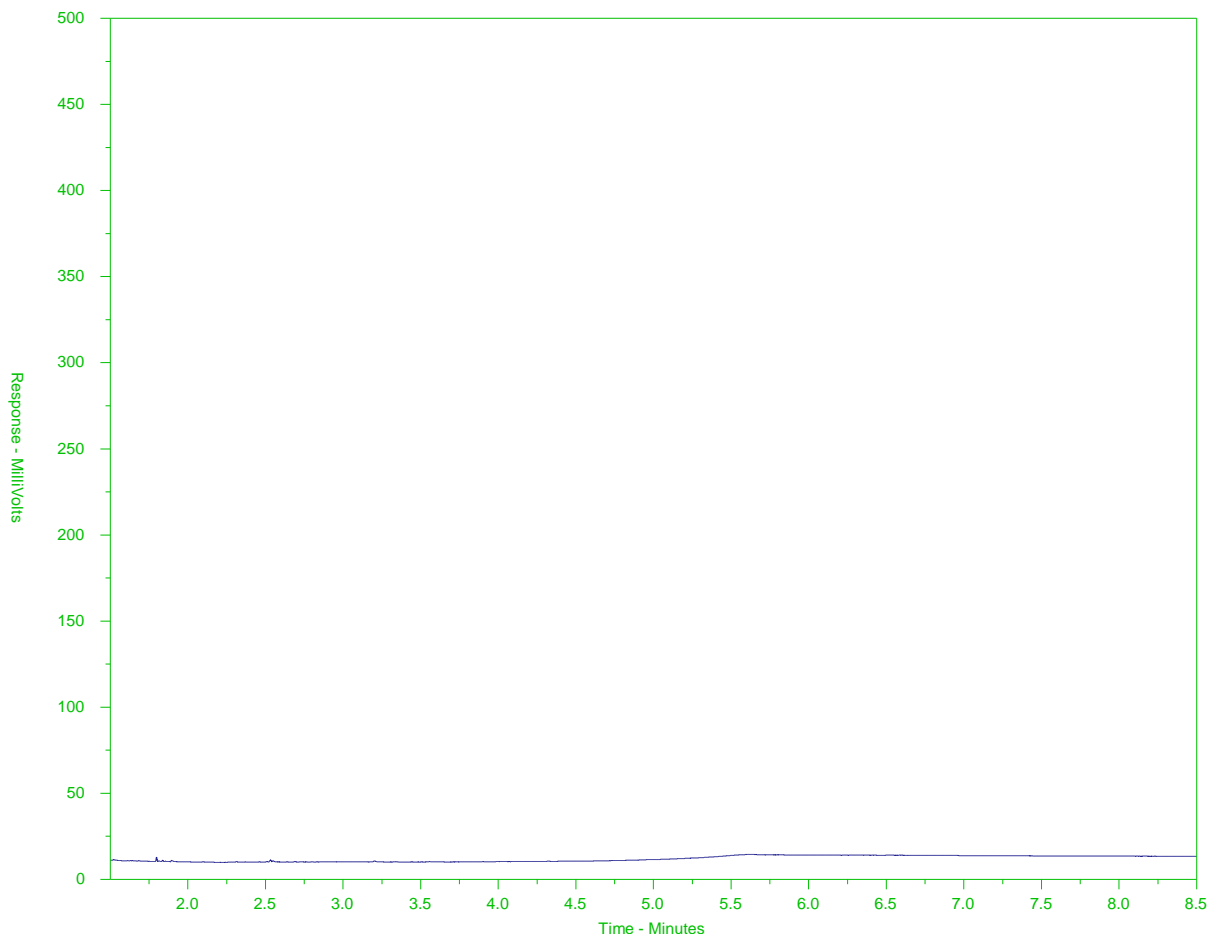
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1993043-C-5
Client Sample ID: T-8-B



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

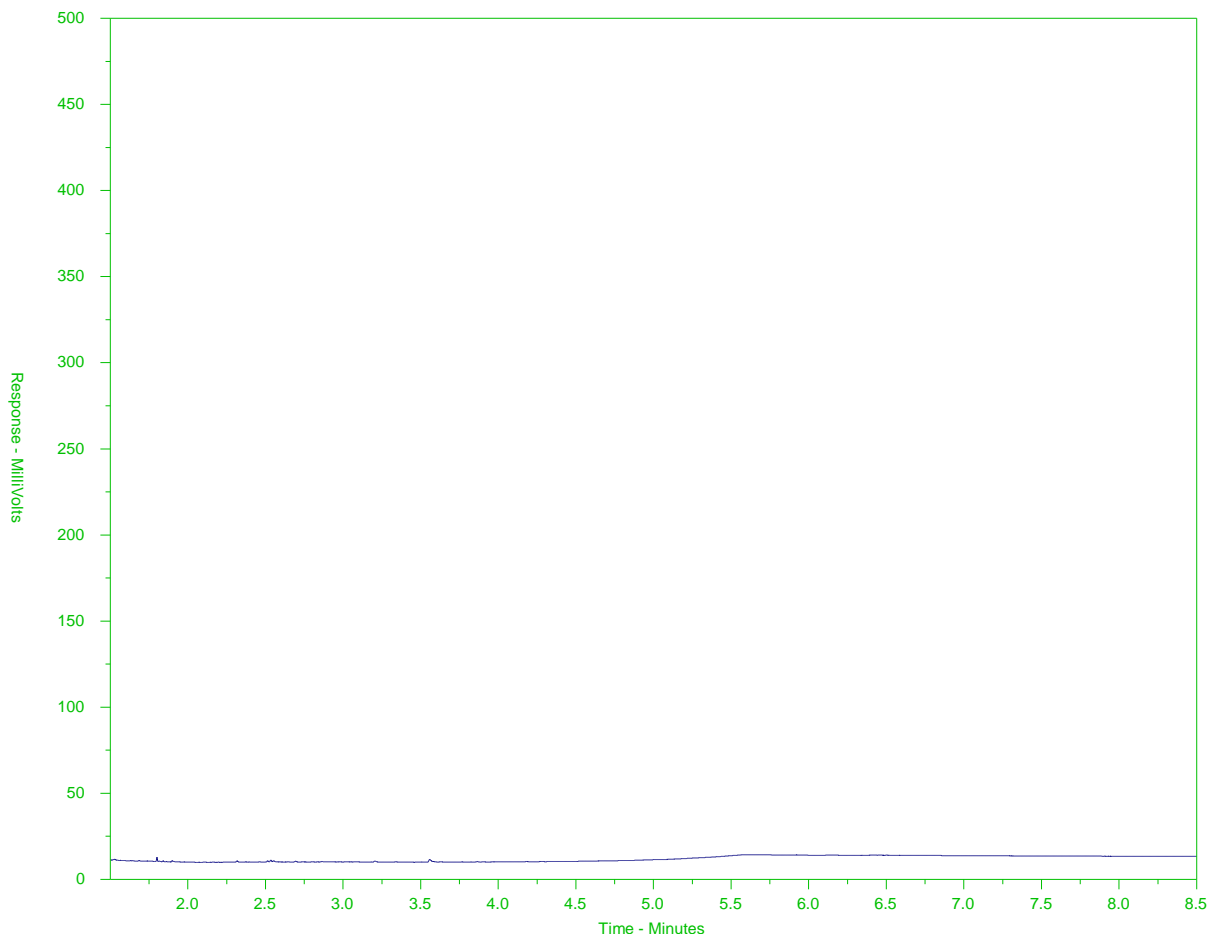
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1993043-C-6
Client Sample ID: T-8-C



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

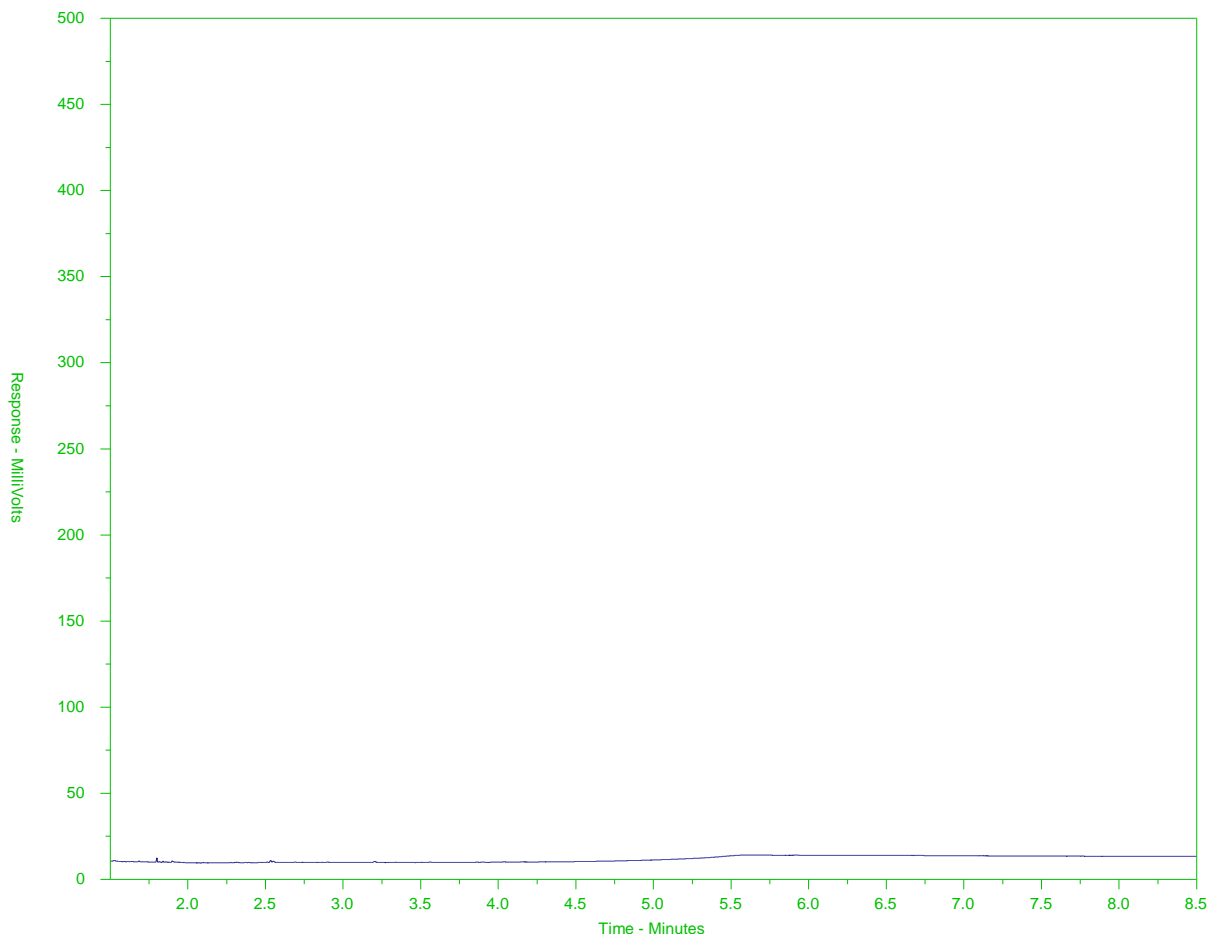
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1993043-C-7
Client Sample ID: T-5



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

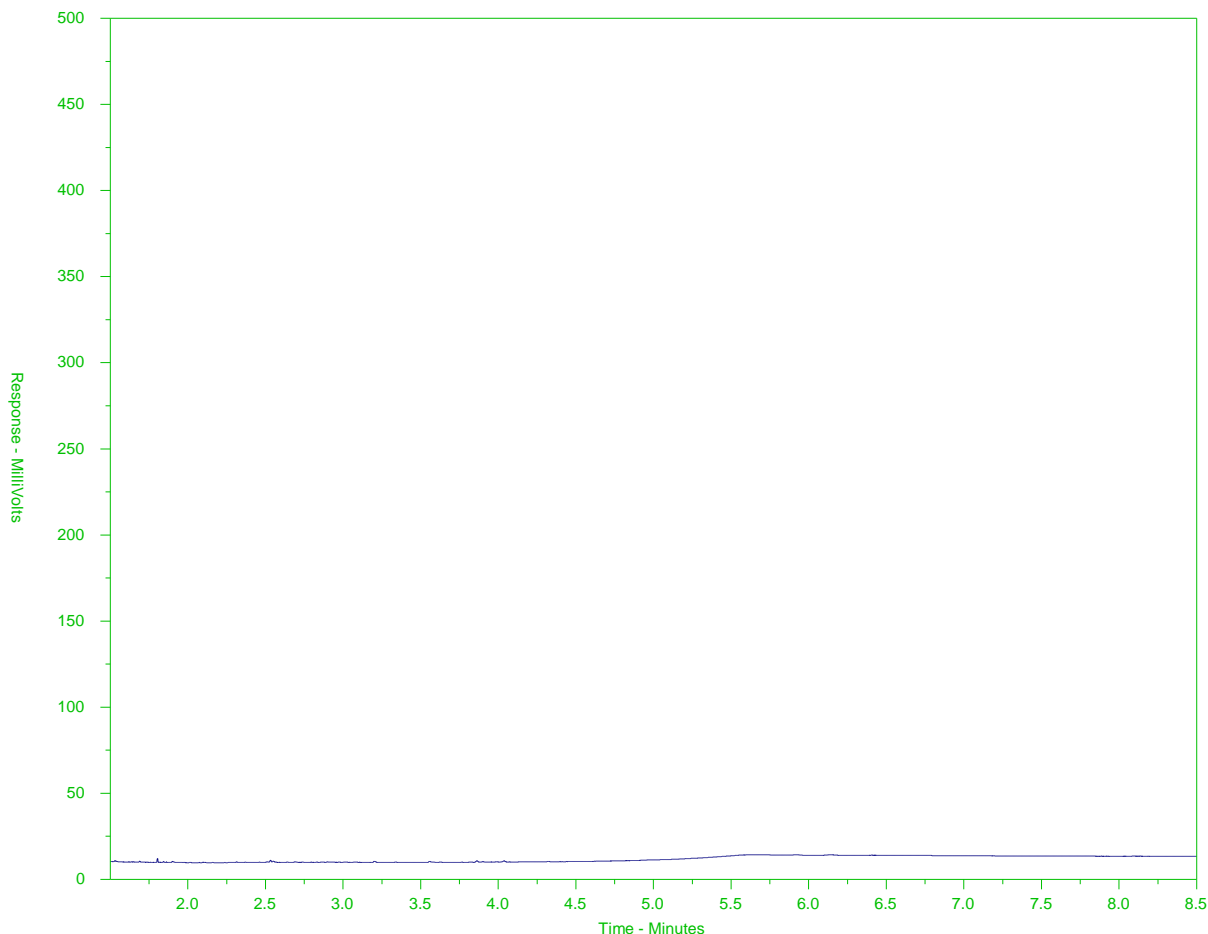
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1993043-C-8
Client Sample ID: T-3



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

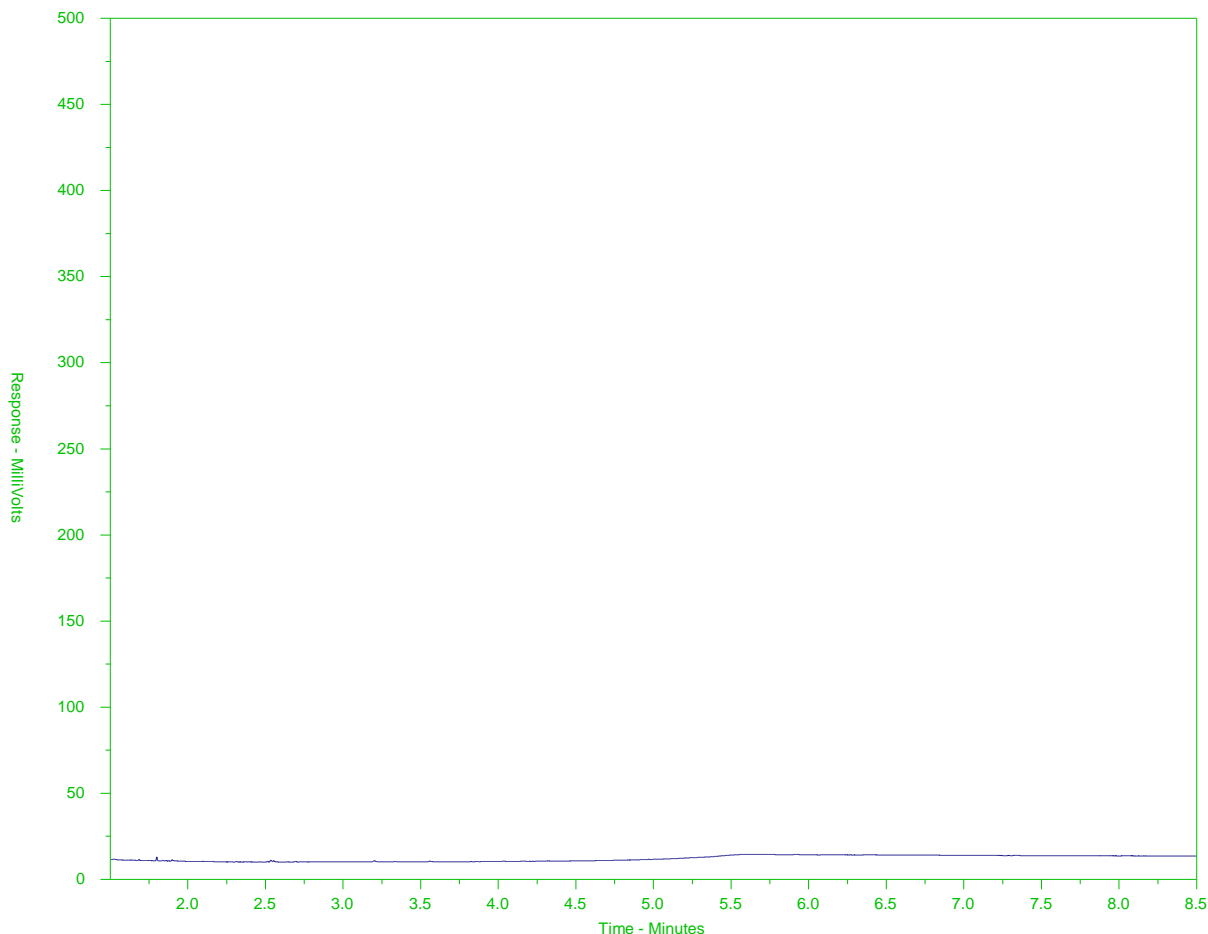
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1993043-C-15
Client Sample ID: T-10



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		← Motor Oils / Lubricants / Grease →			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

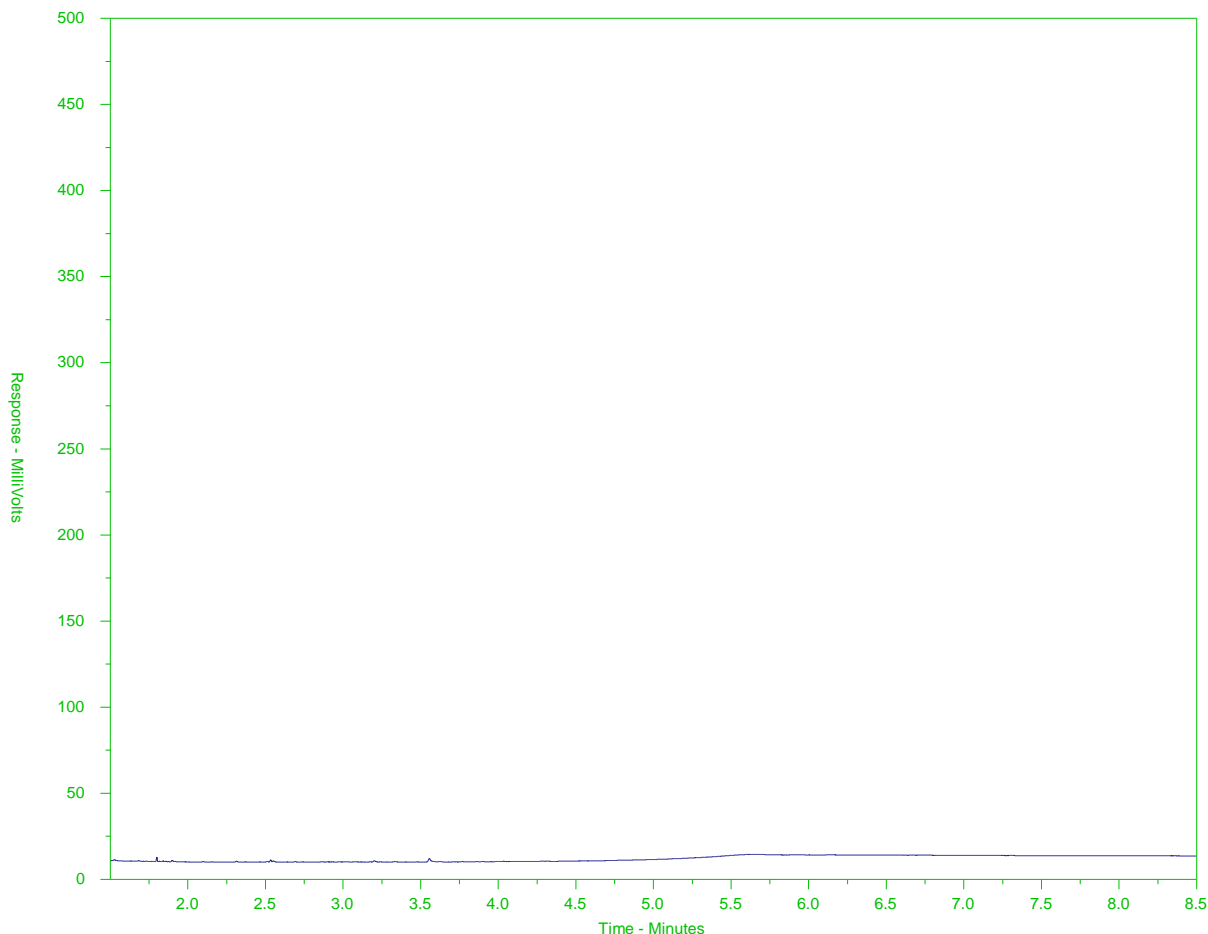
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1993043-C-20
Client Sample ID: T-25



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

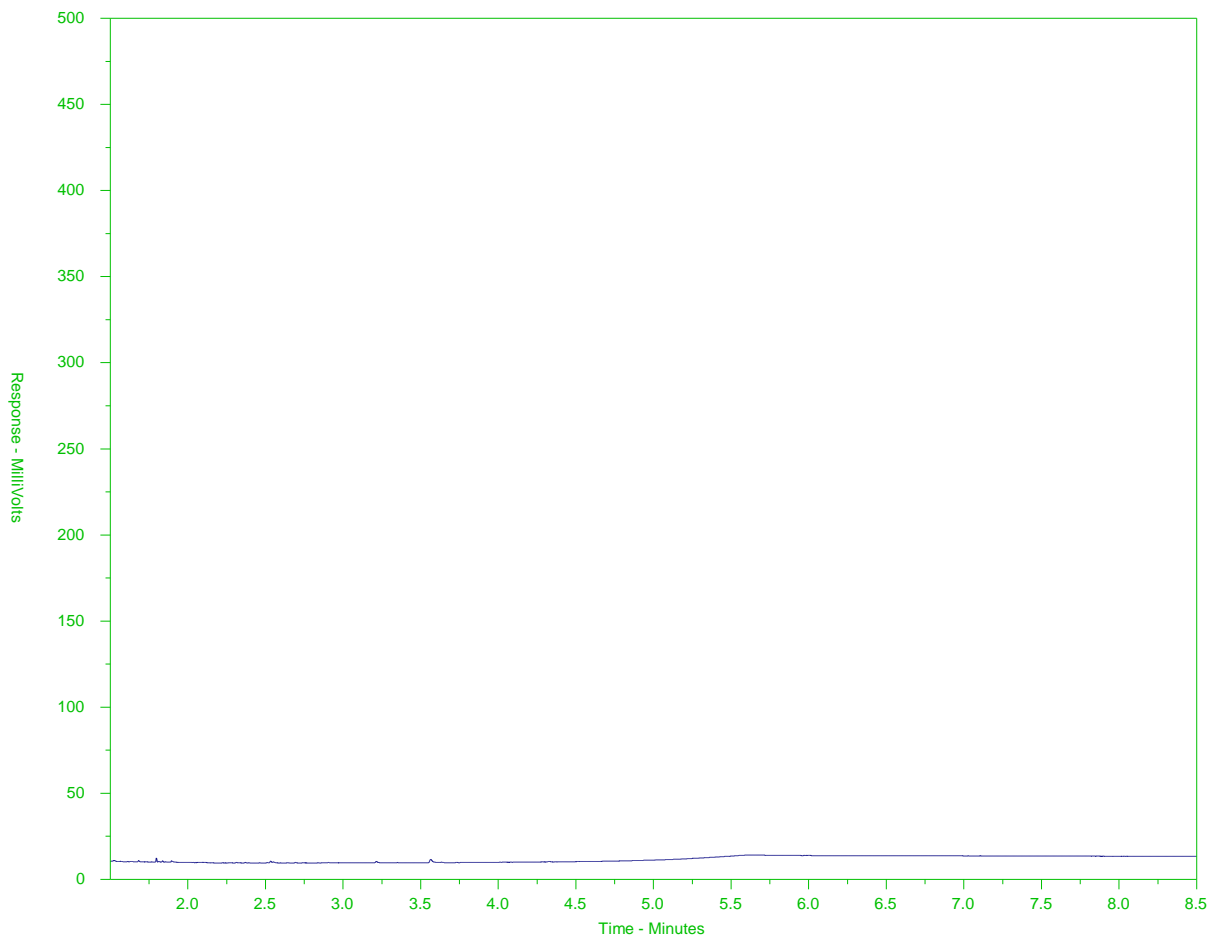
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1993043-C-22
Client Sample ID: T-FIELD BLANK



F2		F3	F4	
nC10	nC16		nC34	nC50
174°C	287°C		481°C	575°C
346°F	549°F		898°F	1067°F
← Gasoline →		Motor Oils / Lubricants / Grease →		
← Diesel / Jet Fuels →				

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.




L1993043-COFC

COC Number: 14 -

Page 1 of 2

Canada Toll Free: 1 800 668 9878

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)	
Company: Public Services and Procurement Canada		Select Report Format: <input type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)		<input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)	
Contact: Rebecca Studer-Halbach		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT	
Address: 10025 Jasper Avenue		<input type="checkbox"/> Criteria on Report - provide details below if box checked		<input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT	
Edmonton, AB T5J 1S6		Select Distribution: <input type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		<input checked="" type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge	
Phone: (788) 497-3761		Email 1 or Fax: rebecca.studer-halbach@pwgsc.ca			
		Email 2: claire.brown@dxp.projects.ca			
Invoice To		Invoice Distribution		Analysis Request	
Same as Report To <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Select Invoice Distribution: <input type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		Specify Date Required for E2,E or P:	
Copy of Invoice with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Email 1 or Fax: rebecca.studer-halbach@pwgsc.ca		Indicate Filtered (F), Preserved (P) or Filtered and Preserved (FP) below	
Company: Public Services and Procurement Canada		Email 2:			
Contact: Rebecca Studer-Halbach					
Project Information		Oil and Gas Required Fields (client use)			
ALS Quote #: Q64064		Approver ID: (Cost Center)			
Job #:		GL Account: (Routing Code)			
PO / AFE: R 015211 049		Activity Code:			
LSD:		Location:			
ALS Lab Work Order # (lab use only) L1993043		ALS Contact: Joanne Lee and Rick Zolkiewski			
Sample Identification and/or Coordinates (This description will appear on the report)		Date (dd-mm-yy)		Time (hh:mm)	
1 T-16-A		13-Sep-17		Water	
2 T-16-B		13-Sep-17		Water	
3 T-8-A		13-Sep-17		Water	
4 T-DUP-1		13-Sep-17		Water	
5 T-8-B		13-Sep-17		Water	
6 T-8-C		13-Sep-17		Water	
7 T-5		13-Sep-17		Water	
8 T-3		13-Sep-17		Water	
9 T-9		13-Sep-17		Water	
10 T-1		13-Sep-17		Water	
11 T-31		13-Sep-17		Water	
12 T-6		13-Sep-17		Water	
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client use)		SAMPLE CONDITION AS RECEIVED (lab use only)	
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		PLEASE NOTE: This project references "routine" parameters as presented in Q64064: pH, conductivity, alkalinity, turbidity, TDS, TSS, Ammonia, Nitrate/Nitrite, total phosphorus, dissolved phosphorus, dissolved organic carbon, total organic carbon, total Hardness, calcium, magnesium, potassium, sodium, sulphate, chloride, ALCO, please note total and dissolved metals parameters must meet detection limits of Q64064.		Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>	
Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>	
				Cooling Initiated <input type="checkbox"/>	
				INITIAL COOLER TEMPERATURES °C: 6.9°C FINAL COOLER TEMPERATURES °C:	
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)		FINAL SHIPMENT RECEPTION (lab use only)	
Released by: Sept 15/17 Date: Sept 15/17 Time: 5pm		Received by: AT Date: 16-Sep-17 Time: 12:15		Received by: Date: Time:	
REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION					
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					

Report To			Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)																																													
Company: Public Services and Procurement Canada			Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)																																													
Contact: Rebecca Studer-Halbach			Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT																																													
Address: 10025 Jasper Avenue Edmonton, AB T5J 1S6			<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT																																													
Phone: (788) 497-3761			Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge																																													
			Email 1 or Fax rebecca.studer-halbach@pwgsc.ca			Specify Date Required for E2, E or P:																																													
			Email 2 claire.brown@dxpprojects.ca																																																
Invoice To			Invoice Distribution			Analysis Request																																													
Same as Report To <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																																													
Copy of Invoice with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No						<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>P</td><td>P</td><td></td><td></td><td>P</td><td>P</td><td>P</td><td>P</td><td>P</td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td colspan="15" rowspan="5" style="writing-mode: vertical-rl; transform: rotate(180deg); text-align: center;">Number of Containers</td> </tr> <tr><td></td></tr> <tr><td></td></tr> <tr><td></td></tr> <tr><td></td></tr> </table>												P	P			P	P	P	P	P							Number of Containers																		
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Company: Public Services and Procurement Canada			Email 1 or Fax rebecca.studer-halbach@pwgsc.ca																																																
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ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)		Date (dd-mm-yy)	Time (hh:mm)	Sample Type	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>Routine and per Q64064</td> <td>Total Metals per Q64064</td> <td>Total Mercury per Q64064</td> <td>Dissolved Metals per Q64064</td> <td>Dissolved Mercury per Q64064</td> <td>PHC F2-F4 per Q64064</td> <td>BTEX, F1 per Q64064</td> <td>Radionuclides Pb-210 and Ra-226 per Q64064</td> <td>NAPL per Q64064</td> <td>Oil and Grease per Q64064</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>										Routine and per Q64064	Total Metals per Q64064	Total Mercury per Q64064	Dissolved Metals per Q64064	Dissolved Mercury per Q64064	PHC F2-F4 per Q64064	BTEX, F1 per Q64064	Radionuclides Pb-210 and Ra-226 per Q64064	NAPL per Q64064	Oil and Grease per Q64064																										
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15	T-30		13-Sep-17		Water	R	R	R							7																																				
16	T-12		13-Sep-17		Water	R	R	R							7																																				
15	T-10		13-Sep-17		Water	R	R	R	R	R				R	15																																				
16	T-DUP-2		13-Sep-17		Water	R	R	R		R	R				11																																				
17	R-2		13-Sep-17		Water	R	R	R							7																																				
18	MB-9		14-Sep-17		Water	R	R	R							7																																				
19	MB-1		14-Sep-17		Water	R	R	R	R	R					9																																				
20	T-25		14-Sep-17		Water	R	R	R		R	R				11																																				
21	T-Trip Blank		14-Sep-17		Water	R	R	R	R	R	R				9																																				
22	T-Field Blank		14-Sep-17		Water	R	R	R	R	R	R				13																																				
Drinking Water (DW) Samples¹ (client use)			Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)																																													
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Released by: 			Date: Sept 15/17 Time: 5:00p			Received by:			Date:			Time:																																							



PUBLIC WORKS AND GOVERNMENT
SERVICES CANADA
ATTN: Rebecca Studer-Halbach
Northern Contaminated Sites
10025 Jasper Avenue NW
Edmonton AB T5J 1S6

Date Received: 27-SEP-17
Report Date: 12-OCT-17 08:37 (MT)
Version: FINAL

Client Phone: 780-497-3761

Certificate of Analysis

Lab Work Order #: L1998184
Project P.O. #: R.015211.049
Job Reference:
C of C Numbers:
Legal Site Desc:

Rick Zolkiewski
General Manager

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ADDRESS: 314 Old Airport Road, Unit 116, Yellowknife, NT X1A 3T3 Canada | Phone: +1 867 873 5593 |
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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID				
		L1998184-1 WATER 22-SEP-17 11:00 T-4				
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	144				
	Hardness (as CaCO3) (mg/L)	70.9 ^{HTC}				
	pH (pH)	7.91				
	Total Suspended Solids (mg/L)	<3.0				
	Total Dissolved Solids (mg/L)	99				
	Turbidity (NTU)	0.53				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	58.1				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	2.43				
	Fluoride (F) (mg/L)	0.152				
	Nitrate (as N) (mg/L)	<0.0050				
	Nitrite (as N) (mg/L)	<0.0010				
	Phosphorus (P)-Total (mg/L)	0.0021				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020				
	Sulfate (SO4) (mg/L)	14.9				
	Sulphide as S (mg/L)	<0.018				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	4.74 ^{HTP}				
	Total Organic Carbon (mg/L)	4.65				
Total Metals	Aluminum (Al)-Total (mg/L)	0.0213				
	Antimony (Sb)-Total (mg/L)	<0.00010				
	Arsenic (As)-Total (mg/L)	<0.00030 ^{MB-LOR}				
	Barium (Ba)-Total (mg/L)	0.0120				
	Beryllium (Be)-Total (mg/L)	<0.000020				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	0.013				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				
	Calcium (Ca)-Total (mg/L)	16.8				
	Cesium (Cs)-Total (mg/L)	<0.000010				
	Chromium (Cr)-Total (mg/L)	<0.00010				
	Cobalt (Co)-Total (mg/L)	<0.00010				
	Copper (Cu)-Total (mg/L)	0.00081				
	Iron (Fe)-Total (mg/L)	0.023				
	Lead (Pb)-Total (mg/L)	<0.000050				
	Lithium (Li)-Total (mg/L)	0.0026				
	Magnesium (Mg)-Total (mg/L)	7.04				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID				
		L1998184-1 WATER 22-SEP-17 11:00 T-4				
Grouping	Analyte					
WATER						
Total Metals	Manganese (Mn)-Total (mg/L)	0.00125				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	0.000275				
	Nickel (Ni)-Total (mg/L)	<0.00050				
	Phosphorus (P)-Total (mg/L)	<0.050				
	Potassium (K)-Total (mg/L)	1.02				
	Selenium (Se)-Total (mg/L)	<0.000050				
	Silicon (Si)-Total (mg/L)	0.81				
	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	2.68				
	Strontium (Sr)-Total (mg/L)	0.0606				
	Sulfur (S)-Total (mg/L)	4.94				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	0.00077				
	Uranium (U)-Total (mg/L)	0.000586				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.00030				
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				
	Ethylbenzene (mg/L)	<0.00050				
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				
	Styrene (mg/L)	<0.00050				
	Toluene (mg/L)	<0.00045				
	ortho-Xylene (mg/L)	<0.00050				
	meta- & para-Xylene (mg/L)	<0.00050				
	Xylenes (mg/L)	<0.00075				
	F1 (C6-C10) (mg/L)	<0.10				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	92.0				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	91.7				
Hydrocarbons	F1-BTEX (mg/L)	<0.10				
	F2 (C10-C16) (mg/L)	<0.30				
	F3 (C16-C34) (mg/L)	<0.30				
	F4 (C34-C50) (mg/L)	<0.30				
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10				
	VPH (C6-C10) (mg/L)	<0.10				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1998184-1
Matrix Spike	Total Organic Carbon	MS-B	L1998184-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L1998184-1
Matrix Spike	Sulphide as S	MS-B	L1998184-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
HTP	Sample preparation or preservation hold time was exceeded.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
F1-BTX-CALC-VA	Water	F1-Total BTX	CCME CWS PHC TIER 1 (2001)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID. The F1-BTEX result is calculated as follows:			
F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).			
F1-HSFID-VA	Water	CCME F1 By Headspace with GCFID	EPA 5021A/CCME CWS PHC (Pub# 1310)
This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.			
F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.			
F2-F4-ME-FID-VA	Water	CCME F2-F4 Hydrocarbons in Water	CCME CWS-PHC, Pub #1310, Dec 2001
F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Reference Information

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

S2-T-COL-VA Water Total Sulphide by Colorimetric APHA 4500-S2 Sulphide

This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VH-HSFID-VA Water VH in Water by Headspace GCFID BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA Water VH Surrogates for Waters BC Env. Lab Manual (VH in Solids)

Reference Information

VOC7-HSMS-VA Water BTEX/MTBE/Styrene by Headspace GCMS EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA Water VOC7 and/or VOC Surrogates for Waters EPA 5035A/5021A/8260C

VPH-CALC-VA Water VPH is VH minus select aromatics BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water". The concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and, in solids, Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10).

XYLENES-CALC-VA Water Sum of Xylene Isomer Concentrations CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
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VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
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Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg ww - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

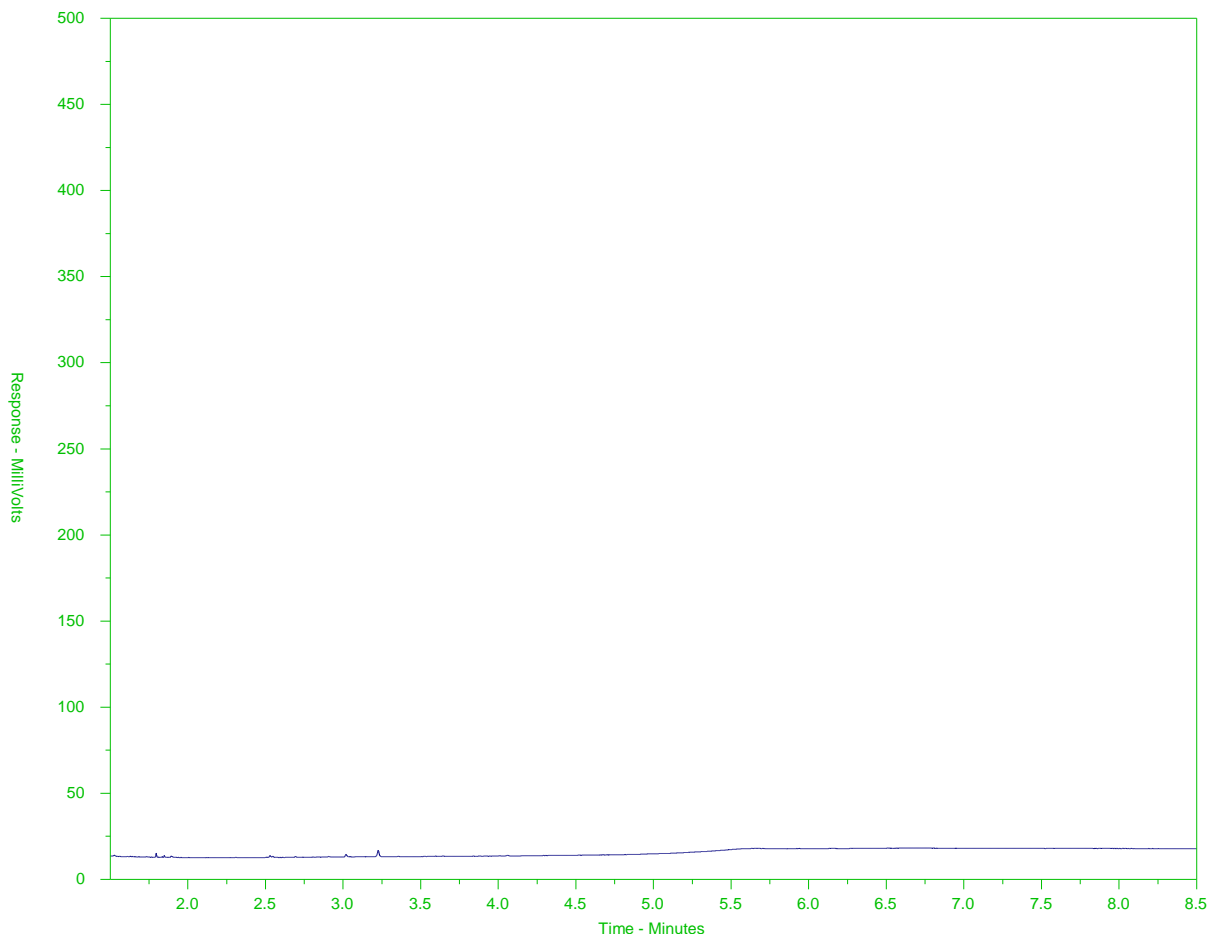
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1998184-C-1
Client Sample ID: T-4



F2		F3		F4	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →		Motor Oils / Lubricants / Grease			
← Diesel / Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

Canada Toll Free: 1 800 668 9878

Lab use only.)

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www.alsglobal.com

Report To Company: Public Services and Procurement Canada Contact: Rebecca Studer-Habach Address: 10025 Jasper Avenue Edmonton, AB T5J 1S6 Phone: (788) 497-3761		Report Format / Distribution Select Report Format: <input type="checkbox"/> PDF <input type="checkbox"/> EXCEL <input type="checkbox"/> WORD (DIGITAL) Quality Control (QC) Report with Report <input type="checkbox"/> Yes <input type="checkbox"/> No Distribute on Report - provide details below if box checked Select Distribution: <input type="checkbox"/> EMAIL <input type="checkbox"/> FAX Email 1 or Fax: rebecca.studer-habach@pwgsc.ca Email 2: claire.brown@dtdprojects.ca		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) <input checked="" type="checkbox"/> Regular (Standard TAT if received by 2 pm - business days) <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge Specify Date Required for E, E or P:	
Invoice To Same as Report To <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Copy of Invoice with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Company: Public Services and Procurement Canada Contact: Rebecca Studer-Habach		Invoice Distribution Select Invoice Distribution: <input type="checkbox"/> EMAIL <input type="checkbox"/> FAX Email 1 or Fax: rebecca.studer-habach@pwgsc.ca Email 2:		Analyte Request Indicate Filled (F), Preserved (P) or Filled and Preserved (F/P) below	
Project Information ALS Quote #: Q64064 Job #: PO / AFE: R015211.049 LSD:		Approver ID: GL Account: Activity Code: Location:		Cost Center: Routing Code:	
ALS Lab Work Order # (lab use only) L1998184		Sample Identification and/or Color (This description will appear on the label) T-4		Sampler: Time (hh:mm) Sample Type 1 11:00 Water 13	
Drinking Water (DW) Samples: (client use) Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Special Instructions / Specify Criteria to add on report (client use) PLEASE NOTE: This project references "routine" parameters as presented in Q64064: pH, conductivity, alkalinity, turbidity, TDS, TSS, Ammonia, Nitrate/Nitrite, total phosphorus, dissolved phosphorus, dissolved organic carbon, total organic carbon, total hardness, calcium, magnesium, potassium, sodium, sulphate, sulphide, chloride. ALSO, please note total and dissolved metals parameters must meet detection limits of Q64064.			
SHIPMENT RELEASE (client use) Released By: [Signature] Date: Sep 25/17 Time: 7:27 Received By: [Signature] Date: Sep 27/17 Time: 0930		INITIAL SHIPMENT RECEPTION (lab use only) Sample Condition as Received (lab use only) Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/> Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/> Cooling initiated <input type="checkbox"/> INITIAL COOLER TEMPERATURES °C: _____ FINAL COOLER TEMPERATURES °C: _____ 7.8			
SHIPMENT RELEASE (client use) Released By: [Signature] Date: Sep 25/17 Time: 7:27 Received By: [Signature] Date: Sep 27/17 Time: 0930		INITIAL SHIPMENT RECEPTION (lab use only) Sample Condition as Received (lab use only) Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/> Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/> Cooling initiated <input type="checkbox"/> INITIAL COOLER TEMPERATURES °C: _____ FINAL COOLER TEMPERATURES °C: _____ 7.8			