

Contaminants and Remediation Division P.O. Box 1500 Yellowknife, NT X1A 2R3

### Great Bear Lake Sites – 2018 Annual Water Licence Report (Licence #S17L8-002)

# Prepared for: Sahtu Land and Water Board

Date: March 29, 2019

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) – Northwest Territories Region – Contaminants and Remediation Division (CARD) received a Water Licence renewal from the Sahtu Land and Water Board effective July 25, 2017 for the Great Bear Lake Sites (GBL Sites) Remediation Project. This Water Licence was subsequently amended on September 11, 2017 and again on October 30, 2017 to reflect minor administrative changes and carries Licence # S17L8-002. The Water Licence entitles the use of water and waste deposition in support of remediation and restoration activities at the Great Bear Lake Sites (GBL Sites), including the Silver Bear Mines, Contact Lake Mine, El Bonanza/Bonanza Mine and the Sawmill Bay site. Table 1 outlines the most current Water Licence details.

#### Table 1: Licence Information

Licensee	Department of Indian Affairs and Northern Development
	Canada * – Contaminants and Remediation Division
Licensee Mailing Address	Box 1500, Yellowknife, NT X1A 2R3
Licence Number	S17L8-002 – Admin Amend
Licence Type	В
Location	Great Bear Lake Mine Sites: Sawmill Bay, Silver Bear Mines,
	El Bonanza/Bonanza Mines and Contact Lake Mine
Purpose	Water use and Waste Disposal to support remediation works
Effective Date of Licence	October 30, 2017
Expiry Date of Licence	July 24, 2024

\*Legal name of Crown-Indigenous Relations and Northern Affairs Canada

In accordance with the requirements of the Water Licence, CIRNAC-CARD has produced the following 2018 Annual Water Licence Report. This report follows the format as presented in the updated Water Licence S17L8-002 <u>Schedule 1, Part B: General Conditions</u>, in which requirements of the Annual Water Licence Report are outlined. Where necessary, additional information has been added which may be of interest to the Sahtu Land and Water Board.

It is important to note that the Water Licence was issued in support of upcoming remediation activities at the project sites. <u>However, during the 2018 period the sites remained in pre-</u><u>remediation status and no site remediation occurred.</u> The sole on-site work activities were conducted during two short field programs implemented July 10-11, 2018 and August 28-29, 2018 which included the following tasks:

July 10-11, 2018 - GBL Sites accessed daily from Yellowknife

• Unmanned Aerial Vehicle (UAV or drone) surveys of Silver Bear Mine sites, Contact Lake Mine and El Bonanza Mine;







- Placed "Danger Do Not Enter" signs at select buildings and "Danger Mine Opening" signs at select accessible openings;
- Installed new arctic-grade insta-berm at the Terra Mine airstrip for aviation fuel storage in support of future monitoring activities;
- Serviced select site vehicles; and
- Provided representatives of the Déline Got'ine Government with the opportunity to tour the GBL Sites.

August 28-29, 2018 - GBL Sites accessed daily from Déline

- Conducted the 2018 Water Quality Monitoring Program adhering to the *Great Bear Lake Sites Pre-Remediation Monitoring Plan* as approved by the Sahtu Land and Water Board on July 3, 2018;
- Water Sampling Training Program with two Déline community members as part of the 2018 Water Quality Monitoring Program; and
- Inspection of select site vehicles and buildings.

Due to the duration of the programs and daily access, no field camp was required.

# Schedule 1 Part B: General Conditions

1. The **Annual Water Licence Report** referred to in Part B, Item 15 shall include, but not be limited to the following information:

a) A summary of the calibration and status of meters and devices referred to in Part B, Item 14 of this Licence;

Water Licence Part B, Item 14 states "The Licensee shall install, operate, and maintain meters, devices or other such methods used for measuring the volumes of Water and Waste discharged to the satisfaction of an Inspector". During the 2018 period there were no remedial activities and consequently no water or waste discharges requiring the use of devices/meters.

b) The monthly and annual quantities in cubic metres of fresh water obtained from all sources;

There was no fresh water use during the 2018 period.

c) A summary of engagement activities conducted in accordance with the approved **Engagement Plan**, in Part B of this Licence, undertaken during the previous calendar year and shall include a brief description of activities planned for the forthcoming year;

The following engagement activities were conducted during the 2018 period:

• A community and leadership engagement meeting on the project was held on March 27<sup>th</sup>, 2018 in Délinę. This meeting provided regulatory updates (e.g. new Land Use Permit and Water Licence), summary of activities conducted in 2017, results of 2017 water quality monitoring, summary of planned 2018 activities and the proposed community engagement approach.





- A community and leadership engagement meeting on the project was held on November 28<sup>th</sup>, 2018 in Délinę. This included a summary of the sites, the planned remedial activities, 2018 project activities, the scope and general findings of 2018 water quality monitoring, project updates, community engagement plans and general next steps.
- Funding was provided for a part-time Community Liaison Coordinator based in Déline through a contribution agreement to assist in planning engagement meetings, communicating with community members about the project, and providing logistical support to the 2018 Water Quality Monitoring Program.
- During the July 2018 field program, two representatives of the Déline Got'ine Government Lands Department accompanied the field team to the GBL Sites. This provided an opportunity to increase familiarity with the project sites.
- As part of the August 2018 Water Quality Monitoring Program, a small-scale training program was implemented. This included training two Déline community members in sampling protocols at the site. Pre-field training was conducted followed by field-based training during sample collection.
- A general project update was provided to the Waste Sites Management Committee on November 7<sup>th</sup>.

Engagement will continue in 2019 and is currently anticipated to include the following:

- Bi-annual engagement meetings with the community and leadership will take place again; April 24<sup>th</sup>, 2019 in Dél<sub>i</sub>nę and the next date is to be determined with community input, likely occurring after the field season.
- The Community Liaison Coordinator position will continue to be funded in Déline through a contribution agreement that assists in planning engagement meetings and communicating with community members about the project.
- Additional training opportunities will be provided during the 2019 Water Quality Monitoring Program.
- Project updates will continue being provided to the Waste Sites Management Committee when they meet.
- Project updates will be provided to the Tłįchǫ Government according to the approved Engagement Plan.

d) A summary of **Construction** activities conducted in accordance with Part F of this Licence, undertaken during the previous calendar year;

No construction activities were conducted during the 2018 period.

e) An updated schedule of activities for the undertaking;

The project continues to be on hold and is awaiting confirmation of long-term funding beyond March 2020 before it can proceed. Once the schedule is confirmed, this





information will be promptly provided to the Sahtu Land and Water Board.

f) A summary of **Modification** activities and major maintenance work conducted in accordance with Part E of this Licence, undertaken during the previous calendar year;

No modification activities or major maintenance work was conducted during the 2018 period.

g) A summary of activities conducted in accordance with the approved **Waste Management Plan**, required in Part D, Item 3 of this Licence, undertaken during the previous calendar year, including:

*i.* A summary of updates or changes to the process or facilities required for the management of Waste;

No updates or changes were required to waste management processes or facilities.

*ii.* The monthly and annual quantities in cubic metres of non-hazardous and hazardous Waste(s) generated and managed during Remediation Activities;

The project is in the pre-remediation phase and no remediation activities were conducted. During the 2018 period the sites were accessed daily as necessary to implement work activities and no field camp was established. The 2018 annual volume of waste generated from vehicle maintenance, water sampling, and field lunches was estimated to be less than 0.5 m<sup>3</sup> and was returned to Yellowknife for disposal.

*iii. The monthly and annual quantities in cubic metres of all Waste deposited, identified by location;* 

No waste was deposited during the 2018 period.

*iv.* Monthly and annual quantities in cubic metres of all liquid Waste deposited, identified by location;

No liquid waste was deposited during the 2018 period.

v. Monthly and annual quantities and geochemical characteristics of all PAG and Metal Leaching Waste Rock, Tailings, soils and any other Mineral Materials deposited/managed, identified by location;





No PAG or Metal Leaching Waste Rock, Tailings, soils or any other Mineral Materials were deposited or managed during the 2018 period.

vi. The estimated monthly and annual quantities in cubic meters of Sewage deposited into the Sewage Disposal Facilities;

In the absence of active site remediation and an associated seasonal camp, no sewage was deposited in the 2018 period.

vii. Monthly and annual quantities in cubic metres of Sewage Discharged from the Sewage Disposal Facilities, identified by disposal location;

In the absence of active site remediation and an associated seasonal camp, no sewage was discharged in the 2018 period.

viii. Monthly and annual quantities in cubic metres of Wastewater Discharged from the Process Water Treatment Facilities, identified by disposal location; and

In the absence of active remediation, no process water was generated during the 2018 period.

ix. Any other item as directed by the Board.

No further requests have been received.

- *h)* A summary of activities conducted in accordance with the approved **Sediment and Erosion Control Plan**, as required in Part D, Item 5 of this Licence, including;
  - *i.* A description of any erosion susceptible areas encountered, and a summary of activities undertaken to prevent or mitigate erosion;
  - *ii.* A report of the performance of erosion mitigations applied in previous years, if applicable; and
  - iii. Any other item as directed by the Board.

As indicated in the Water Licence, the Sediment and Erosion Control Plan is not required to be submitted to the Sahtu Land and Water Board until "60 days prior to the commencement of Remediation activities". Consequently, this Plan has not yet been developed and this requirement does not yet apply. However, there were no areas of increased erosion or changing ground conditions noted during the 2018 field program. Similarly, no previous erosion mitigations have been applied which would require performance monitoring.





- *i)* A summary of activities conducted in accordance with the approved **Landfarm Management Plan**, required in Part D, Item 7 of this Licence, undertaken during the previous calendar year, including:
  - i. A summary of updates or changes to the process or facilities required for the treatment of PHC contaminated soil and rock;
  - *ii.* The monthly and annual quantities in cubic metres of PHC contaminated soil and rock placed in the Landfarms;
  - iii. The monthly and annual quantities in cubic metres of PHC contaminated Groundwater and free-phase product removed and a description of how this material was managed; and
  - iv. Any other item as directed by the Board.

As indicated in the Water Licence, the Landfarm Management Plan is not required to be submitted to the Sahtu Land and Water Board until "60 days prior to Landfarm Construction". These facilities have not been constructed, the Landfarm Management Plan not yet developed, and there were no soil treatment activities during the 2018 period.

- *j)* A summary of activities conducted in accordance with the approved **Sediment and Erosion Control Plan**, as required in Part D, Item 5 of this Licence, including;
  - *i.* A description of any erosion susceptible areas encountered, and a summary of activities undertaken to prevent or mitigate erosion;
  - *ii.* A report of the performance of erosion mitigations applied in previous years, if applicable; and
  - *iii. Any other item as directed by the Board.*

This requirement is a duplicate of Schedule 1, Part B, Item h. As discussed above, this requirement is not yet applicable.

- *k)* A summary of activities conducted in accordance with the approved **Spill Contingency** *Plan* required in Part G of this Licence, undertaken during the previous calendar year, including:
  - *i.* A list of all Unauthorized Discharges that occurred during the previous calendar year, including the date, NWT spill number, volume, location, summary of the circumstances and follow-up actions taken and status (i.e. open or closed), in accordance with the reporting requirements in Part G of this Licence; and

No Unauthorized Discharges occurred during the 2018 period.

*ii.* An outline of any spill training and communication exercises carried out during the previous calendar year.

At the commencement of the August field program, on-site workers were provided with instruction on the requirements of the approved Interim Spill Contingency Plan. This included outlining the products on site (e.g. fuels), the approaches and supplies to prevent release to environment, the location of the spill response supplies and the





procedures to follow in the event of the spill. Workers were briefed on the requirements of the Water Licence, Land Use Permit and applicable legislation. Emphasis was placed on spill prevention and measures such as the use of drip trays and preparations before handling fuel.

*I)* A summary of all results in accordance with the approved **Geochemical Verification Program**, referred to under Part D, Item 8 and Schedule 2, Item 3 of this Licence;

As indicated in the Water Licence, the Geochemical Verification Program is required to be submitted to the Sahtu Land and Water Board "90 days prior to the commencement of Remediation". Consequently, this Plan has not yet been developed and this requirement does not yet apply. There were no geochemical verification activities implemented in the 2018 period.

*m*) A summary of all results in accordance with the approved **Pre-Construction Monitoring Plan**, referred to under Part D, Item 12 of this Licence;

It is noted that Part D, Item 12 of the Water Licence refers to the Post-Construction Monitoring Plan, and the Pre-Construction/Remediation Monitoring Plan is instead referenced in Part D, Item 9. It is assumed that this request is in reference to the Pre-Construction (or Remediation) Monitoring Plan.

An initial DRAFT GBL Sites Pre-Remediation Monitoring Plan was submitted to the Sahtu Land and Water Board on June 8, 2018. Following reviews and recommendations through the Sahtu Land and Water Board, the plan was revised and submitted as the FINAL GBL Sites Pre-Remediation Monitoring Plan on June 29, 2018. On July 3, 2018 CIRNAC was provided notification that the Sahtu Land and Water Board approved the Pre-Remediation Monitoring Plan.

The Pre-Remediation Monitoring Plan includes prescribed sampling stations/parameters, as well as provision for "Responsive Monitoring" to address any concerns or questions from previous monitoring events. On August 17, 2018, the Sahtu Land and Water Board was notified that two stations at Smallwood Mine (SM-1 and SM-6) were to be added to the 2018 monitoring program as responsive monitoring stations to address specific questions regarding metal concentrations.

The Pre-Remediation Monitoring Plan, with the responsive monitoring stations, was successfully implemented August 28-29, 2018. The associated Great Bear Lake Sites 2018 Water Quality Monitoring Report is provided as Appendix C of this report. The principal findings are as follows:

- Saturated ground conditions and high-water levels were observed throughout the GBL Sites. Déline team members reported an unseasonably wet summer season in the Great Bear Lake area.
- Water sample results were below applicable Effluent Quality Criteria (EQC) at SNP Stations within the Water Licence.
- · Consistent with previous monitoring events, elevated metal concentrations above





background were reported in water samples in Ho Hum Tailings Containment Area (TCA), Hermandy Lake, waste rock seepage points, Smallwood Lake and the Contact Lake Tailings Pond. With the exception of a single elevated copper concentration at the Northrim Mine Camsell River station NO-6, metal concentrations in downstream receiving environments were below conservative generic guidelines (Canadian Council of Ministers of Environment – Protection of Aquatic Life Guidelines) and generally consistent with background stations.

- Despite analysis of multiple samples at each of the sites, there were no PHC concerns identified in any aquatic waterbody.
- At Contact Lake Mine, all radionuclide concentrations were below applicable guidelines and most results were below detection limits.

The Pre-Remediation Monitoring Plan employed the quality assurance and quality control procedures outlined in the revised Great Bear Lake Sites – Quality Assurance and Quality Control Plan (V2 dated April 30, 2018). The plan was first submitted on August 11, 2017 and was provided with interim approval. Following Sahtu Land and Water Board distribution and review, the plan was revised and resubmitted on April 30, 2018. The Sahtu Land and Water Board provided notification to CIRNAC on May 30, 2018 that the revised plan was approved.

n) A summary of all monitoring results and any Action Level exceedances in accordance with the approved **Construction Monitoring Plan**, referred to under Part D, Item 11 and Schedule 2, Item 4 of this Licence;

As indicated in the Water Licence, the Construction Monitoring Plan is required to be submitted to the Sahtu Land and Water Board "90 days prior to the commencement of Remediation". The site is currently in pre-remediation (i.e. there were no construction activities) and this plan has not yet been developed.

o) A summary of all monitoring results and Action Level exceedances in accordance with the approved **Post-Construction Monitoring Plan**, referred to under Part D, Item 13 and Schedule 2, Item 6 of this Licence;

As indicated in the Water Licence, the Post-Construction Monitoring Plan is required to be submitted to the Sahtu Land and Water Board "90 days prior to demobilization". The site is currently in pre-remediation (i.e. there were no post-construction activities) and this plan has not yet been developed.





- q) A summary of activities conducted in accordance with the approved **Remedial Action Plans** undertaken during the previous calendar year, including;
  - *i.* A summary of all Remediation and reclamation activities carried out at each site during the previous calendar year, as they relate to Water Use and Waste Disposal including progress made to develop the schedule for Phase II implementation,
  - *ii.* A summary of updates or changes to the process or facilities required for the management of Waste Rock and Tailings;
  - *iii. The monthly and annual quantities in cubic metres of excavated Tailings for placement into Landfills and any excavation contingency measures implemented;*
  - *iv.* The monthly and annual quantities in cubic metres of PAG Waste Rock excavated and deposited into trenches or adits;
  - v. The monthly and annual quantities in cubic metres of soil and rock placed below Waste Rock Covers, placed above Waste Rock Covers, and used elsewhere on site;

*vi. Any geochemical inspection reports, as appendices to the Annual Water Licence Report; viii. A camp set-up schematic;* 

viii. An outline of anticipated activities for the next year; and ix. Any other item as directed by the Board.

The GBL Sites are currently in pre-remediation and no activities related to the Remedial Action Plans were implemented during the 2018 period.

*r*) Any other details on Water Use or Waste disposal requested by the Board by November 30 of the year being reported;

CIRNAC is not aware of any other information requests from the Board.

s) Tabular summaries of all data and information generated under the Surveillance Network Program and graphical summaries of parameters with effluent quality criteria referred to in Part D, and the points of compliance (SNP Stations-001 (1), (2), (3), S17L8-002 (14I), (7A) and 7 (B), in excel or an electronic and printed format acceptable to the Board. The Licensee shall provide raw data in electronic form to the Board.

The sampling requirements of the SNP were successfully implemented during the 2018 field program. SNP sampling was integrated with the larger pre-remediation water quality monitoring program. Results from both programs are included in the <u>2018 Water Quality</u> <u>Monitoring Report</u> provided in Appendix C. The report includes multi-year graphical summaries of applicable results, description of monitoring approach/methodologies, quality assurance and quality control (QA/QC) procedures/findings, field measurements/photographs and recommendations.

Appendix A of this report includes tabular summaries of all 2018 SNP monitoring data. As part of this submission, the Sahtu Land and Water Board will also be provided with an Excel file of all 2018 SNP data.





#### 2018 SNP Sampling and Data

Currently in pre-remediation, many of the stations listed in the SNP are not yet active. This includes stations associated with discrete remedial activities (e.g. soil treatment areas, process water generation) and the operation of a remediation camp. For clarity, each of the SNP stations within Water Licence S17L8-002 is discussed below, including sampling rationale and results where applicable.

#### SNP Station S15L8-001 (1)

- Water Licence Description: Treated Sewage effluent prior to Discharge
- Water Licence Location: Camp Operations
- 2018 Sampling Rationale: Not sampled. Remediation camp and sewage treatment facility not yet constructed.

#### SNP Station S15L8-001 (2)

- Water Licence Description: Treated grey water prior to disposal
- Water Licence Location: Camp Operations
- 2018 Sampling Rationale: Not sampled. Remediation camp and grey water treatment facility not yet constructed.

#### SNP Station S15L8-001 (3 a, b, c, d....)

- Water Licence Description: Treated Process Water prior to disposal
- Water Licence Location: Camp Operations
- 2018 Sampling Rationale: Not sampled. No remediation activities conducted or process water generated.

#### SNP Station S15L8-001 (4)

- Water Licence Description: Camsell River Intake
- Water Licence Location: Camp Operations
- 2018 Sampling Rationale: Not sampled. Water Licence requires quantity measurement only. No water use from the Camsell River in 2018.

#### SNP Station S15L8-001 (5)

- Water Licence Description: Great Bear Lake Intake
- Water Licence Location: Camp Operations
- 2018 Sampling Rationale: Not sampled. Water Licence requires quantity measurement only. No water use from Great Bear Lake in 2018.

#### SNP Station S17L8-002 (6)

- Water Licence Description: Contact Lake Intake
- Water Licence Location: Camp Operations
- 2018 Sampling Rationale: Not sampled. Water Licence requires quantity measurement only. No water use from Contact Lake in 2018.

#### SNP Station S17L8-002 (7A)

- Water Licence Description: Ho Hum Tailings Containment Area (TCA) Corresponding with station T-8
- Water Licence Location: Silver Bear Terra Mine
- 2018 Sampling Rationale: Sampled once in 2018 (August) and SNP data provided





in Appendix A, Table A1. Multiple depth station with duplicate at surface. Complete dataset provided in Appendix C – 2018 Water Quality Monitoring Report.

• EQC Evaluation: Table A1 provides parameters as specified in the Water Licence with the EQC as indicated in Part D, Item 25. <u>All sample results are below the EQC.</u> Sample results are a maximum 45% of the EQC for copper in the mid-depth sample T-8-B, and all other parameters are a maximum of 11% of the respective EQCs. Given the order of magnitude difference between the sample results and the EQCs, graphical summaries are not beneficial.

#### SNP Station S17L8-002 (7B)

- Water Licence Description: Moose Bay Corresponding with station T-10
- Water Licence Location: Silver Bear Terra Mine
- 2018 Sampling Rationale: Sampled once in 2018 (August) and SNP data provided in Appendix A, Table A1. Complete dataset provided in Appendix C – 2018 Water Quality Monitoring Report.
- EQC Evaluation: Table A1 provides parameters as specified in the Water Licence with the EQC as indicated in Part D, Item 25. <u>All sample results are below the EQC values.</u> Sample results are a maximum of 5% of the respective EQCs. Given the order of magnitude difference between the sample results and the EQCs, graphical summaries are not beneficial.

## SNP Station S17L8-002 (8C)

- Water Licence Description: Hermandy Lake Corresponding with station NO-7
- Water Licence Location: Silver Bear Northrim Mine
- 2018 Sampling Rationale: Sampled once in 2018 (August) and SNP data provided in Appendix A, Table A2. Complete dataset provided in Appendix C 2018 Water Quality Monitoring Report.
- EQC Evaluation: No EQC for this station.

## SNP Station S17L8-002 (9D)

- Water Licence Description: Camsell River Corresponding with station NO-6
- Water Licence Location: Silver Bear Northrim Mine
- 2018 Sampling Rationale: Sampled once in 2018 (August) and SNP data provided in Appendix A, Table A2. Complete dataset provided in Appendix C – 2018 Water Quality Monitoring Report.
- EQC Evaluation: No EQC for this station.

#### SNP Station S17L8-002 (10E)

- Water Licence Description: Norex Waste Rock Corresponding with station Norex-3 (also known as NX-3)
- Water Licence Location: Silver Bear Norex Mine
- 2018 Sampling Rationale: Sampled once in 2018 (August) and SNP data provided in Appendix A, Table A2. Complete dataset provided in Appendix C – 2018 Water Quality Monitoring Report.
- EQC Evaluation: No EQC for this station.





#### SNP Station S17L8-002 (11F)

- Water Licence Description: Camsell River Corresponding with station NX-12
- Water Licence Location: Silver Bear Norex Mine
- 2018 Sampling Rationale: Sampled once in 2018 (August) and SNP data provided in Appendix A, Table A2. Complete dataset provided in Appendix C – 2018 Water Quality Monitoring Report.
- EQC Evaluation: No EQC for this station.

SNP Station S17L8-002 (12G)

- Water Licence Description: Tailings Pond Corresponding with established station CL-3
- Water Licence Location: Contact Lake Mine
- 2018 Sampling Rationale: Sampled once in 2018 (August) and SNP data provided in Appendix A, Table A2. Complete dataset provided in Appendix C – 2018 Water Quality Monitoring Report.
- EQC Evaluation: No EQC for this station.

#### SNP Station S17L8-002 (13H)

- Water Licence Description: Contact Lake Corresponding with established station CL-26
- Water Licence Location: Contact Lake Mine
- 2018 Sampling Rationale: Sampled once in 2018 (August) and SNP data provided in Appendix A, Table A2. Complete dataset provided in Appendix C – 2018 Water Quality Monitoring Report.
- EQC Evaluation: No EQC for this station.

#### SNP Station S17L8-002 (14I)

- Water Licence Description: Landfarm Discharge Water
- Water Licence Location: Landfarm at Silver Bear Mines, Sawmill Bay and El Bonanza/Bonanza
- 2018 Sampling Rationale: Not sampled. Landfarms not yet constructed.

#### 2018 SNP Actions

All 2018 sampling results were below respective EQCs and no response actions were required.

t) A map depicting all the SNP Stations with GPS locations;

Maps depicting the location of all SNP stations sampled during the 2018 season are provided in Appendix B. These figures include station coordinates for future reference.

It is noted that stations which are not yet active (landfarm monitoring, process water, sewage treatment discharge, etc.) are not included in the figures. The exact coordinates will be determined during the start of active remediation and incorporated in future figures.





*u*) A summary of actions taken to address concerns, non-conformances or deficiencies in any report filed by an Inspector.

CIRNAC was not provided with an Inspection Report or any associated non-conformances/concerns.





Crown-Indigenous Relations Relations Couronne-Autochtones and Northern Affairs Canada et Affaires du Nord Canada

**Great Bear Lake Sites** 

2018 Annual Water Licence Report (# S17L8-002)

**APPENDIX A – SNP Data Tables** 





Site				Terra Mine					
Sample Area					Moose Bay				
Sample ID			SNP Effluent Quality	T-8-A	T-DUP-1	Т-8-В	T-8-C	T-10	
SNP Sample ID			Criteria (EQC)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7B)	
Sample Depth				1-m	1-m (Duplicate)	6-m	Surface	Surface	
PARAMETER	Lowest Detection Limit	Units		29-Aug-2018	29-Aug-2018	29-Aug-2018	29-Aug-2018	29-Aug-2018	
Conductivity	2.0	uS/cm		183	186	184	223	146	
Hardness (as CaCO3)	0.50	mg/L		76.6	75.4	79.4	90.4	71.8	
pH	0.10	pН	Between 6.0 and 9.0	7.91	7.93	7.91	7.89	7.92	
Total Suspended Solids	3.0	mg/L	30	<3.0	<3.0	<3.0	<3.0	<3.0	
Ammonia, Total (as N)	0.0050	mg/L	10	0.0058	0.0051	0.0051	<0.0050	<0.0050	
Nitrate (as N)	0.0050	mg/L	10	<0.0050	<0.0050	<0.0050	0.0470	<0.0050	
Nitrite (as N)	0.0010	mg/L	0.8	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Sulfate (SO4)	0.30	mg/L		15.4	15.4	15.4	17.9	14.3	
Aluminum (Al)-Total	0.003	mg/L	0.8	0.0583	0.0569	0.0628	0.028	0.022	
Arsenic (As)-Total	0.0001	mg/L	1 @ 7A / 0.2 @ 7B	0.0566	0.0601	0.0565	0.0774	0.00034	
Copper (Cu)-Total	0.0005	mg/L	0.02	0.00799	0.00896	0.00813	0.00828	0.00089	
Lead (Pb)-Total	0.00005	mg/L	0.02	0.000112	0.000101	0.000118	0.000061	<0.000050	
Nickel (Ni)-Total	0.0005	mg/L	0.1	0.00393	0.00407	0.00388	0.00444	<0.00050	
Silver (Ag)-Total	0.00001	mg/L	0.004	0.000014	0.000019	0.000014	0.00002	<0.000010	
Zinc (Zn)-Total	0.003	mg/L	0.04	0.0039	0.0034	0.0034	0.0044	< 0.003	
Oil and Grease	5.0	mg/L	5	<5.0	<5.0	<5.0	<5.0	<5.0	
Oil And Grease (Visible Sheen)		-	no	no	no	no	no	no	
F1-BTEX	0.10	mg/L		<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	
F3 (C16-C34)	0.30	mg/L		<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	

#### Table A2 - Northrim Mine, Norex Mine and Contact Lake Mine: SNP Water Quality Data

	Site			m Mine	Norex	( Mine	Contact Lake Mine		
	San	nple Area	Hermandy Lake	Camsell River	On-Land	Camsell River	Tailings Pond	Contact Lake	Contact Lake
	5	Sample ID	NO-7	NO-6	NX-3	NX-12	CL-3	CL-26	CL-DUP-1
	SNP S	Sample ID	S17L8-002 (8C)	S17L8-002 (9D)	S17L8-002 (10E)	S17L8-002 (11F)	S17L8-002 (12G)	S17L8-002 (13H)	S17L8-002 (13H)
	Sam	ple Depth	Surface	Surface	Surface	Surface	Surface	Surface	Surface (Duplicate)
PARAMETER	Lowest Detection Limit	Units	28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018
Conductivity	2.0	uS/cm	137	155	371	150	214	45.6	44.5
Hardness (as CaCO3)	0.50	mg/L	71.7	78.1	163	69.7	108	21.5	21.1
pH	0.10	pН	7.90	7.94	7.73	7.95	8.16	7.47	7.50
Total Suspended Solids	3.0	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Sulfate (SO4)	0.30	mg/L	8.16	13.6	91.8	14.9	7.55	1.16	1.20
Aluminum (AI)-Total	0.0	mg/L	0.0299	0.0284	0.01	0.0217	0.0093	<0.0030	0.0034
Antimony (Sb)-Total	0.00	mg/L	0.00014	<0.00010	0.00037	<0.00010	0.00079	<0.00010	<0.00010
Arsenic (As)-Total	0.00	mg/L	0.00481	0.00089	0.0267	0.0002	0.0125	0.00016	0.00018
Barium (Ba)-Total	0.00	mg/L	0.00642	0.0108	0.0208	0.0109	0.0219	0.00358	0.00393
Beryllium (Be)-Total	0.000	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total	0.000	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0	mg/L	<0.010	0.011	0.05	0.011	0.031	<0.010	<0.010
Cadmium (Cd)-Total	0.0000	mg/L	<0.0000050	0.0000061	< 0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	0	mg/L	20.7	18.6	47.9	16	26.3	4.84	5.06
Cesium (Cs)-Total	0.000	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	0.00	mg/L	0.00032	0.00018	0.0002	0.00017	0.00013	<0.00010	<0.00010
Cobalt (Co)-Total	0.00	mg/L	0.00015	< 0.00010	0.00144	< 0.00010	0.00011	< 0.00010	<0.00010
Copper (Cu)-Total	0.00	mg/L	0.00292	0.00269	<0.00050	0.00081	0.0148	0.00073	0.00084
Iron (Fe)-Total	0	mg/L	0.063	0.028	1.24	0.021	0.038	< 0.010	<0.010
Lead (Pb)- I otal	0.000	mg/L	0.000275	0.000097	0.000126	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	0.0	mg/L	0.0012	0.0021	0.0054	0.0023	0.0023	<0.0010	<0.0010
Magnesium (Mg)- I otal	0	mg/L	4.54	6./	8.99	6./1	9.26	1.99	2.18
Manganese (Mn)- I otal	0.00	mg/L	0.00728	0.00205	0.098	0.00097	0.0478	0.00068	0.00074
Mercury (Hg)- I otal	0.0000	mg/L	<0.0000050	<0.0000050	<0.000050	<0.0000050	0.0000073	<0.0000050	<0.0000050
Molybdenum (Mo)- I otal	0.000	mg/L	0.000594	0.000314	0.00489	0.000266	0.000486	0.000159	0.000177
Nickel (NI)- I otal	0.00	mg/L	0.00084	0.00055	0.00114	<0.00050	0.00134	<0.00050	<0.00050
Phosphorus (P)-Total	0	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Polassium (K)-Tolai	0	mg/L	0.53	0.96	1.21	0.97	1.17	0.48	0.51
Selenium (Se)-Total	0.000	mg/L	0.000063	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon (SI)-Total	0	mg/L	0.87	0.93	3.04	0.78	2.23	0.29	0.32
Silver (Ag)-Total	0.000	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	0.00008	<0.000010	<0.000010
Strontium (Sr) Total	0.00	mg/L	0.0262	2.55	0.144	2.31	4.17	0.942	0.965
Subur (S) Total	0.00	mg/L	2.74	0.0344	0.144	0.0009	0.0005	<0.50	0.0109
Thallium (TI)-Total	0.000	mg/L	<0.00010	4.01 <0.00010	<0.00	<0.02	<0.00010	<0.00	<0.0
Tin (Sp) Total	0.000	mg/L	<0.000010						
Titonium (Ti) Totol	0.00	mg/L	0.00010	0.00010	<0.00010	0.00066	<0.00010	<0.00010	<0.00010
Iranium (II)-Total	0.00	mg/L	0.00039	0.00088	0.00090	0.00000	0.00030	0.00030	0.00030
Vanadium (V)-Total	0.000	mg/L	<0.000109	<0.00052	0.000230	<0.00050	<0.0477	<0.000109	<0.000105
Zinc (Zn)-Total	0.00	mg/L	<0.00030	0.00050	0.00000	<0.00030	<0.00030	<0.00030	<0.00000
Zirconium (Zr)-Total	0.0	ma/L	<0.0000	<0.004	<0.0041	<0.0000	<0.0000	<0.0000	<0.0000
Benzene	0.00	ma/L	<0.00030	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00000
Ethylbenzene	0.00050	ma/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00000
Toluene	0.00045	mg/L	<0.00030	<0.00030	<0.00045	<0.00045	<0.00045	<0.00030	<0.00030
Xvlenes	0.00075	mg/L	<0.00045	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
F1-BTEX	0.00070	ma/L	<0.00073	<0.00070	<0.00070	<0.00070	<0.00070	<0.00070	<0.00070
F2 (C10-C16)	0.10	ma/L	<0.10	<0.10	0.10	<0.10	<0.10	<0.10	<0.10
F3 (C16-C34)	0.00	ma/L	<0.00	<0.00	<0.00	<0.00	<0.00	<0.00	<0.00
F4 (C34-C50)	0.30	mg/L	<0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	<0.30



**Great Bear Lake Sites** 

2018 Annual Water Licence Report (# S17L8-002)

**APPENDIX B – SNP Location Figures** 









# Silver Bear Sites Northrim Norex Smallwood

Indigenous and Northern Affairs Canada Affaires autochtones et du Nord Canada



Date: 2/16/2018











Crown-Indigenous Relations Relations Couronne-Autochtones and Northern Affairs Canada et Affaires du Nord Canada

**Great Bear Lake Sites** 

2018 Annual Water Licence Report (# S17L8-002)

**APPENDIX C – 2018 Water Quality Monitoring Report** 







# **GREAT BEAR LAKE SITES**

2018 Water Quality Monitoring Report

FINAL



Prepared for: Prepared by: Sahtu Land and Water Board Crown-Indigenous Relations and Northern Affairs Canada Contaminants and Remediation Division With Support from DXB Projects Inc.

March 2019

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# **1 INTRODUCTION AND BACKGROUND**

# 1.1 THE GREAT BEAR LAKE SITES

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) has the responsibility to manage a number of contaminated sites that are no longer maintained by the original occupant. CIRNAC'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 CIRNAC 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 Tłįchǫ Mǫwhì Gogha Dè Nįįłèè Boundary. GBL Sites are 400-440 km north-northwest of Yellowknife, 175-220 km north of Gamètì and 215-275 km east of Délıne (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 CIRNAC-CARD.

The GBL Sites have been the subject of numerous assessments and studies to characterize the nature of environmental contamination and physical hazards. CIRNAC'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, EI Bonanza/Bonanza Mine and Sawmill Bay, as well as the comprehensive remediation of the Silver Bear Mines.

# 1.2 THE 2018 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 CIRNAC's objectives of environmental management at its project sites and requirements of regulatory authorizations, water quality monitoring continued in 2018.

The scope of work and methodologies implemented in 2018 were in keeping with those presented within the *GBL Sites Pre-Remediation Monitoring Plan* (PRMP), dated June 28, 2018 and submitted to the Sahtu Land and Water Board (SLWB). Requirements of the PRMP (INAC-CARD 2018c) were outlined within the renewed Project Water Licence S17L8-002 ("Admin

Amend" version dated October 30, 2017). Following review and revision, the PRMP was approved by the SLWB on July 3, 2018 and is to serve as the principal guidance in the implementation of monitoring prior to the commencement of the Phase II Remediation Project. As provided in the PRMP, the scope of the monitoring activities includes prescribed stations as well as responsive monitoring stations to address specific questions/concerns from ongoing sampling. On August 17, 2018 the SLWB was notified of the stations to be included as part of Responsive Monitoring program during the 2018 monitoring activities.

The program was implemented by CIRNAC with assistance from DXB Projects and community members from Délınę. The field program operated August 28-29, 2018, accessing the site daily with float-equipped fixed wing aircraft and using Délınę as a base of operations. In keeping with the PRMP and the 2018 Responsive Monitoring, sample collection and field measurements were collected at the Silver Bear Mines (Terra, Northrim, Norex and Smallwood) and Contact Lake Mine. No sampling was required at El Bonanza Mine or Sawmill Bay. Samples were submitted to ALS Laboratories Yellowknife office, and subsequently forwarded to their laboratories in Fort Collins, Colorado for radionuclide analysis and Vancouver, British Columbia for all other analyses.

Upon completion of the field program, field observations and data were integrated with results of laboratory analyses. The contents of this GBL Sites 2018 Water Quality Monitoring Report (WQMR) have been designed to meet the reporting requirements as outlined in the PRMP. 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 2018 results with previous monitoring data to complete multi-year spatial and temporal trend analysis. While statistical analysis was not to be included within the 2018 data report, for the primary parameters of concern a summary level comparison of current and previous results was conducted.

The 2018 water sampling activities also met the requirements of the new GBL Sites Quality Assurance/Quality Control Plan (QA/QC Plan). The GBL Sites QA/QC is provided as an appendix to the PRMP. Following review and revision, the QA/QC Plan V2, dated April 30, 2018 (INAC-CARD 2018b), was approved by the SLWB on May 30, 2018 and outlines the sampling methodologies and testing requirements to ensure/assess the reliability of analytical data.

# 2 PREVIOUS MONITORING, OBJECTIVES AND SCOPE

## 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.

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
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

 Table 1
 List of GBL Water Quality Assessment and Monitoring Reports

Year	Report Name	Author
2008	Silver Bear Mine Sites, Northwest Territories, 2007 Water Quality	INAC Water Resources
	Monitoring Program,	Division
2008	Detailed Environmental Site Assessment, Sawmill Bay, Northwest	FRANZ Environmental Inc.
		and Ecometrix incorporated
2009	Silver Bear Mine Sites, Northwest Territories, 2008 Water Quality	INAC Water Resources
	Monitoring Program	Division
2009	Silver Bear Mine Sites, Northwest Territories, 2008 Hydrologic Monitoring	INAC Water Resources
2000	Program	Division
2009	El Bonanza Mine Supplemental 2008 Site Assessment - June 2008 Field	SENES Consultants Ltd
2003	Activities and Follow-Up Site Assessment	CENEO CONSULANS ELA.
2009	Contact Lake Supplemental Site Assessment - Report on June 2008	SENES Consultants Ltd
2003	Field Activities and Follow-Up Site Assessment	CENEO COnsultants Etd.
2010	Silver Bear Mine Sites, Northwest Territories, 2009 Hydrologic Monitoring	INAC Water Resources
2010	Program	Division
2011	Silver Bear Mine Sites, Northwest Territories, 2009 Water Quality	INAC Water Resources
2011	Monitoring Program	Division
2010	Great Bear Lake Sites 2009 Baseline Monitoring Program.	SENES Consultants Ltd.
2014	Silver Bear Mine Sites, Northwest Territories, 2013 Water Quality	AANDC Water Resources
2014	Monitoring Program	Division
2016	2015 Water Quality Monitoring of Terra Mine	Arcadis Canada Inc.
0047	2016 Water Quality Monitoring Program at the Great Bear Lake Sites -	SLR Consulting (Canada)
2017	Final Report	Ltd.
2019	2017 Water Quality Monitoring Report (as part of 2017 Annual Water	DVP Projecto Inc.
2018	Licence Report)	DAD Projects Inc.

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. The results of these efforts were used to formulate the PRMP, and subsequently, the sampling as conducted in 2018. As much as possible, the monitoring methodologies from these earlier programs were carried forward in 2018 to enable data comparison over the multi-year dataset.

## 2.2 MONITORING OBJECTIVES

Based on the predecessor documents, regulatory considerations and the pre-remediation status of the GBL sites, the following general monitoring objectives have formed the basis of the PRMP and 2018 monitoring:

- Meet the requirements of the Water Licence Surveillance Network Program (SNP) at the project sites, including compliance with the most recent Quality Assurance and Quality Control Plan (INAC-CARD 2018b);
- Respond to any anomalous data with increased sampling; and,
- Provide data which may be synthesized with previous findings to understand any trends in water quality.

It is important to note that pre-remediation monitoring is confirmatory in nature and not an attempt to generate additional assessment data for site characterization. All pre-remediation monitoring data will be incorporated with previous monitoring data and evaluated as part of the forthcoming Baseline Water Quality Monitoring Report.

# 2.3 SAMPLING SCOPE

In keeping with the objectives, the 2018 monitoring plan directly followed the sampling scope as identified in the PRMP (INAC-CARD 2018c). These prescribed stations are identified in Table 2 below.

As identified in the PRMP, additional monitoring stations were to be added based on any anomalous results or indication of increasing concentrations from the previous year's monitoring. In 2018, this included sampling two previously established stations within Smallwood Lake at the Smallwood Mine (part of the Silver Bear sites). This was conducted to confirm 2017 results of cadmium and zinc, which were higher than documented in earlier sampling events. These stations have been incorporated within the prescribed PRMP stations in Table 2 below.

It is noted that based on the results of multi-year water sampling programs and the absence of any associated water quality concerns at the GBL Sites of El Bonanza/Bonanza Mine or Sawmill Bay, sampling at these sites is not incorporated in the PRMP.

Site	Waterbody	Station	SNP Station #	Sample Type	Depth	Location	Coordinates (Dec. Deg.)	Analysis	Rationale
			Pre-Ren	nediation Mo	onitoring Plan (PRM	P) Sampling			
	Ho Hum				Surface (A) - 1 m				
	Tailings Containment	Т-8	S17L8-002 (7A)	Open Water	Middle (B) - 5 m	Open water west end, middle TCA	65.60387° 118.13012°	DM, PHC,	SNP requirement
TERRA	Area (TCA)				Bottom (C)-13 m			000	
	Moose Bay	T-10	S17L8-002 (7B)	Open Water	Surface	Moose Bay, halfway down airstrip, mid-bay	65.61036° 118.14873°	G, TM, DM, PHC, O&G	SNP requirement
	Hermandy Lake	NO-7	S17L8-002 (8C)	Shoreline	Surface	Hermandy Lake, Southeast end	65.59757° 117.98439°	G, TM, DM, PHC	SNP requirement
NORTHRIM	Camsell River	NO-6	S17L8-002 (9D)	Shoreline	Surface	Suspected entry point of current drainage pathway from Hermandy Lake	65.59551° 117.98116°	G, TM, DM, PHC	SNP requirement
NODEX	Camsell River	NX-12	S17L8-002 (11F)	Open Water	Surface	Camsell River, at drainage from Norex	65.59486° 117.97376°	G, TM, DM, PHC	SNP requirement
NOREX	On-Land	NX-3	S17L8-002 (10E)	On-land	Surface	Waste rock pile, west seep	65.589500° 117.968333°	G, TM, DM, PHC	SNP requirement
CONTACT LAKE	Tailings Pond	CL-3	S17L8-002 (12G)	Shoreline	Surface	Tailings Pond; Outflow into stream flowing from pond	65.990883° 117.800833°	G, TM, DM, PHC, RAD	SNP requirement
	Contact Lake	CL-26	S17L8-002 (13H)	Open Water	Surface	Contact Lake; offshore at outflow of stream from tailings pond	65.98978° 117.80171°	g, TM, DM, PHC, RAD	SNP requirement

#### Table 22018 Sampling Stations

Site	Waterbody	Station	SNP Station #	Sample Type	Depth	Location	Coordinates (Dec. Deg.)	Analysis	Rationale
	Belachey Lake	R-2	N/A	Open Water	Surface	Belachey Lake outlet, upstream of Silver Bear Mines	65.63223° 117.91731°	G, TM	Background Conditions
REFERENCE	Tutcho Lake	R-3	N/A	Open Water	Surface	Tutcho Lake, elevated lake west of Terra Mine	65.59494° 118.15921°	G, TM, DM	Background Conditions
	Contact Lake (far end)	CL-8	N/A	Open Water	2 meters	Contact Lake; Background Station in far NW of Lake	66.00485° 117.89067°	G, TM	Background Conditions
	Ho Hum TCA*	Duplicate of T-8	N/A	Open Water	1 m	Open water west end, middle TCA	65.60387° 118.13012°	G, TM, DM, PHC, O&G	QA/QC
	Contact Lake Tailings Pond*	Duplicate of CL-26*	N/A	Open Water	Surface	Contact Lake; offshore at outflow of stream from tailings pond	65.98978° 117.80171°	G, TM, DM, PHC, RAD	QA/QC
QA/QC	N/A	SB-Field Blank	N/A	Blank	N/A	Silver Bear Mine Site	N/A	G, TM, DM, PHC, O&G	QA/QC
	N/A	CL-Field Blank	N/A	Blank	N/A	Contact Lake Mine Site	N/A	G, TM, DM, PHC, RAD	QA/QC
	N/A	Travel Blank	N/A	Blank	N/A	Travel Blank transported to sites	N/A	G, TM, DM, PHC,SNP	QA/QC
				Resp	onsive Sampling				
SMALLWOOD	Smallwood Lake	SM-1	N/A	Shoreline	Surface	Smallwood Lake, south end of roadway as it enters lake	65.58201° 117.94312°	G, TM, DM	Responsive Sample
	Smallwood Lake	SM-6	N/A	Open Water	1 m	Smallwood Lake, ~mid lake across from waste rock pile	65.58156° 117.94188°	G, TM	Responsive Sample

\* Duplicate sample location was proposed for CL-3; however, was revised due to field considerations N/A = Not Applicable; G=General Chemistry; TM=Total Metals; DM=Dissolved Metals; PHC=PHC F1-F4 and BTEX; O&G=Oil and Grease; RAD=Radionuclides
# 3 GENERAL PROGRAM APPROACH

### 3.1 PROGRAM PLANNING, DATES AND ROLES

CIRNAC completed the program internally, with project management assistance from DXB Projects Inc. and assistance/support from the Délįnę Got'įnę Government (DGG) Lands Department. In addition to hiring of wildlife monitors, the program included a water sampling training program to provide two Délįnę community members with direct experience and training in water sampling protocols at the GBL Sites. Délįnę was used as a base of operations, with the sites accessed daily using float equipped fixed wing aircraft. The program commenced with preliminary training and meetings in Délįnę on August 27, 2018, followed by two days of field activities on August 28 and 29, 2018.

In addition to the resources of the CIRNAC-CARD Project Manager (Candace DeCoste) and logistics support (Patricia Garbutt) both in Yellowknife, a team of personnel mobilized to the GBL Sites daily to implement the water sampling program. The full list of personnel which participated in field activities (water quality sampling, support and ancillary tasks) is as follows:

- Stanley Yee (INAC-CARD) INAC Project Officer
- Claire Brown (DXB Projects) Project Management Assistance
- Greg Kenny (Délinę Community Member) Wildlife Monitor
- Hughie Kenny (Délįnę Community Member) Wildlife Monitor
- Allison Tatti (Délinę Community Member) Water Sampling Trainee
- Joseph Modeste (Déline Community Member) Water Sampling Trainee

Personnel were split into two separate water quality monitoring teams to accomplish the sampling plan. Each team was composed of one specialist, one water sampling trainee and one wildlife monitor/boat operator.

# 3.2 STATION ACCESS

As previously mentioned, the sites were accessed daily from Déline using float-equipped fixed wing aircraft.

Within each project site, transport was conducted by foot, boat and truck (at Terra Mine only). On-site aluminum boats at Terra Mine and Contact Lake Mine were used to conduct open water sampling, while the remainder of off-shore samples were collected from the float-equipped aircraft.

### 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. These approaches met those outlined within the PRMP, in which approaches applied during earlier assessment programs and any recommendations were incorporated (SENES 2009). This included measurement of toxicity modifying factors which are required to calculate applicable guidelines (e.g., Canadian Council of Ministers of the Environment (CCME) Protection of Aquatic Life (PAL) - Freshwater Aquatic Life (FAL) guidelines). The following field measurements were collected at aquatic monitoring stations: temperature, pH, dissolved oxygen, turbidity and specific conductivity. The two water quality monitoring teams each used a 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 daily to ensure ongoing data quality. Midway through August 28, 2018, the turbidity sensor in one of the YSI units was found to be malfunctioning. Field activities were reconfigured to coordinate use of the single YSI unit with the operable turbidity sensor.

At on-land water stations (e.g. waste rock seepage water), the shallow water depth limited the use of the large multiparameter units. Given these stations are not aquatic habitat, a smaller pen style Oakton 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). This was conducted to determine the stratification depths of the epilimnion, metalimnion or hypolimnion and for subsequent sampling in these stratifications.

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. This information was documented on pre-drafted field sheets to ensure consistency and provide concise instructions to trainees.

Figures documenting 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

CIRNAC implemented the 2018 water sampling activities with the assistance of monitoring specialists and working closely with community members from Délinę. The methodologies listed below meet those outlined in the PRMP and were selected for consistency with earlier sampling programs, considerations of the receiving water body, access limitations, efficiency and cost.

#### 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 with a metered line. The apparatus was rinsed in triplicate before sample collection. Sampling was conducted at prescribed depths, including surface, mid water column and near the sediment surface.

#### 3.5 LABORATORY ANALYSIS

Analytical methods employed in the 2018 water sampling program were selected to meet the requirements as outlined in the PRMP (INAC-CARD 2018c). Analytical parameters in the PRMP were selected based on: a) regulatory requirements of the SNP program; b) historic land-use; c) terrestrial and aquatic contaminants of concern identified during site earlier aquatic monitoring; and d) 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 the conditions as outlined in the GBL Sites QA/QC Plan (INAC-CARD 2018b). On August 17, 2018 the SLWB was notified of the selected laboratory, analytical methods and associated detection limits. The laboratory was required to outline their specific procedures during sample collection, such as

sample preservation, headspace, filtration or refrigeration.

The laboratory parameters fall 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:

Physical Parameters	Major lons	Nutrients
Alkalinity	Calcium	<u>Ammonia (as N)</u>
Conductivity	<u>Chloride</u>	Total Phosphorous
<u>pH</u>	Fluoride	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 concern (COC) 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 Spectroscopy (CVAAS) or Cold Vapour Atomic Fluorescence Spectroscopy (CVAFS). 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 as well as the 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>	<u>Cadmium</u>	Lithium
Antimony	Cesium	Manganese
<u>Arsenic</u>	Chromium	Mercury
Barium	Cobalt	Molybdenum
Beryllium	<u>Copper</u>	<u>Nickel</u>
Bismuth	<u>Iron</u>	<u>Selenium</u>
Boron	Lead	Silicon

Silver	Tin	Vanadium
Strontium	Titanium	<u>Zinc</u>
Thallium	<u>Uranium</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 2007a). 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. Those stations identified within the PRMP were sampled for dissolved metals, including SNP stations.

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 all samples were submitted to the contract laboratory within 48 hours of collection, laboratory filtration/preservation was selected to reduce potential for sample contamination.

# 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 has in the past been conducted in receiving waters adjacent to locations with historic and/or residual PHC concentrations and where soil treatment areas are to be sited. An extensive number of water samples have been analyzed for PHCs and benzene, toluene, ethylbenzene and xylenes (BTEX) at the project sites, with only a small number found to be above detection limits. As outlined in the PRMP, monitoring for PHC/BTEX will continue at these locations.

Samples collected for the purpose of PHC monitoring were analyzed for F1 to F4 hydrocarbon

fractions and BTEX, as well as specific parameters as outlined in the Water Licence SNP (i.e. 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 handing 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 PRMP includes the analysis of Contact Lake stations for both radium-226 and lead-210. 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 Election Capture Detection (GC-ECD)

It is important to note that many of these parameters were analyzed during site characterization

studies 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, CIRNAC has produced a site-specific *QA/QC Plan* (INAC-CARD 2018b) tailored to SNP sampling at the sites. These same approaches were applied to all 2018 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 noncontaminating 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 48 hours), and,
- Chain of Custody 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 (two 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. These were 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, the results of which were presented in Section 5.0. Results of field 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. A description of the Laboratory QA/QC results are provided in Section 5.0.

# 4 DATA EVALUATION METHODOLOGY

Evaluation of 2018 water sampling data was conducted using applicable Water Licence Effluent Quality Criteria, 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 2018. Data tables within Appendix B include the EQC at these discrete stations.

# 4.2 **REFERENCE STATION SAMPLING**

The PRMP includes 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.

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.

#### 4.3 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. 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. Consequently, dissolved metal results have instead been used to understand the fractionation between total and dissolve metal phases.

As previously mentioned, CCME-FAL guidelines have been derived to ensure the protection of aquatic species. On-land stations, such as 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, CCME-FAL guidelines were conservatively applied as a screening tool for elevated contaminant concentrations and do not indicate aquatic effects.

# 4.4 HISTORIC RESULTS

Full synthesis of 2018 data with historic sampling results is beyond the scope of the current data report. 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 2018 sampling were evaluated within a historical context to confirm no new contaminants were identified at the sampling station (i.e. emerging contaminants). Where contaminants exceeded the CCME-FAL guidelines, concentrations were plotted with results of earlier sampling events to identify general trends.

# 5 QA/QC SAMPLE EVALUATION

In keeping with the requirements of the QA/QC Plan (INAC-CARD 2018b), duplicates, field blanks and travel blanks were collected during the 2018 monitoring program. In addition to field-based QA/QC procedures, the analytical laboratory instituted QA/QC procedures to assess and validate data. Both the field and laboratory QA/QC results are discussed below and are in keeping with the assessment methodologies presented in the site-specific QA/QC Plan (INAC-CARD 2018b).

# 5.1 FIELD QA/QC

# 5.1.1 Duplicate Evaluation

To assess the precision of sampling procedures and laboratory results, duplicate samples were collected at approximately 10% of sampling stations. During the 2018 monitoring program a total of two blind duplicate samples were collected, one at Terra Mine (T-DUP-1 corresponding to sample T-8-A from Ho Hum TCA) and one at Contact Lake Mine (CL-DUP-1 corresponding to sample CL-26 from Contact Lake). 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.

Evaluation of QC sample results is an important final step. Due to the natural heterogeneity of some environmental media, COC concentrations in duplicate samples may not correspond perfectly with the original sample. As indicated in the QA/QC Plan (INAC-CARD 2018a), the RPD for duplicate samples should be less than 30% 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 detection limit (DL). Where one or more result is less than five times the DL, alternate criteria may be applied. If both are below, the RPD may not be calculated. The evaluation criteria are provided in Table 3 below. A passing rate of greater than or equal to 90% for all individual results would indicate an acceptable reliability in results.

Scenario	Result A	Result B	Criteria for Acceptance of Aqueous Samples					
А	< RDL	< RDL	Acceptable precision					
В	< RDL	Positive	Result B – (0.5x RDL) < RDL					
С	Positive and ≤ 5x RDL	Positive	Result B – Result A  < 2x RDL					
D	Positive and >5x RDL	Positive and >5x RDL	RPD <30%					

### Table 3 Duplicate Evaluation Criteria

QA/QC sample and evaluation results are provided in Appendix B, Table B-5. A total of 216 individual results were evaluated for duplicate precision, with only a single result exceeding the acceptability criteria presented in Table 3. This represents a passing rate of 99.5% and demonstrates the high reliability of results. The single exceedance of these acceptability criteria was phosphorous in the sample/duplicate pair T-8-A/T-DUP-1. The RPD for phosphorous in this sample was 64%. Due to this result, and the relative increase in phosphorous findings across many sample stations, the laboratory was asked to confirm the validity of phosphorous results. Based on subsequent investigations and testing, the results were confirmed by the laboratory and the result is expected to represent heterogeneity in the unfiltered sample.

# 5.1.2 Field and Travel Blank Evaluation

Tables B1-B4 provide the results of field blank analysis from the 2018 monitoring program. Two discrete field blanks were submitted, one from Silver Bear Mines (SB-FIELD BLANK) and one from Contact Lake Mine (CL-FIELD BLANK). 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. It is noted the pH values of 5.0-5.5 are typical for deionized water samples.

A single trip blank was 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 *QA/QC Plan* (INAC-CARD 2018b), these samples were not analyzed.

# 5.2 LABORATORY QA/QC

As indicated in the QA/QC Plan (INAC-CARD 2018b), samples were submitted to a laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA). CALA is an

internationally recognized not-for-profit accreditation body serving both public and private sector testing laboratories in Canada and abroad, providing Accreditation, Proficiency Testing and Training. Laboratory accreditation is a means of determining the technical competence of laboratories to perform specific types of testing and measurement, thereby provide formal recognition to competent laboratories. Accreditation itself is based on satisfactory participation in the site assessment program and proficiency testing. The granting and maintenance of accreditation is made by the CALA Accreditation Council on the recommendation of the CALA Advisory Panel. CALA programs are endorsed by the Canadian Council of Ministers of the Environment.

As indicated in the Laboratory Certificates provided in Appendix E, the laboratory followed a robust QA/QC approach to ensure and test the validity of data. This included internal duplicates, matrix blanks, matrix spikes, laboratory control samples and certified reference materials. All results were within acceptable limits. In a small number of samples, the matrix spike could not be accurately calculated due to high the analyte concentration in the sample.

While all samples were submitted within 48 hours of collection, for which it is impractical to expedite further at the remote sites, some samples were not analyzed by ALS Laboratories before the sample hold time was exceeded. This issue was limited to select sample analysis of sulphide, nitrate/nitrite and total dissolved phosphorous. Based on discussions with the ALS Laboratories technical team, the exceedances of these hold times were not expected to have any impact on the reported results (correspondence provided within Appendix E – Laboratory Certificates).

# 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 CIRNAC (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. Tailings from ore processing have been disposed in and adjacent to Ho Hum Lake, now known as Ho Hum Tailings Containment Area (TCA). Waste rock has been placed on the shore of Ho Hum Lake TCA and levelled to create storage yards for mining equipment and supplies. 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 2014).
- 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 has suggested 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).

The 2018 sampling stations at Terra Mine are presented in Table 4 below and are in accordance with the PRMP (INAC 2018b). It is noted that reference stations R-2 and R-3 serve as applicable background stations for all Silver Bear Sites (per previous monitoring events).

WATERBODY	STATION	SAMPLE TYPE	DEPTH	GENERAL LOCATION	General Chemistry	Total Metals	Dissolved Metals	РНС, ВТЕХ	Oil & Grease	SNP Stn.	RATIONALE
Ho Hum			Surface (A) - 1 m	Open water	х	х	x	x	х		Characterization of Ho Hum TCA water; SNP
Tailings <b>T-8</b> Containment Area (TCA)	T-8	Open Water	Middle (B) - 5 m	Middle (B) - 5 m Bottom (C)-13 m	x	x	x	x	x	Y	requirement (S17L8- 002 (7A)), Duplicate
			Bottom (C)-13 m		х	x	x	x	x		collected of surface sample
Camsell River (Including Moose Bay)	T-10	Open Water	Surface	Moose Bay, halfway down airstrip	x	x	x	x	x	Y	Moose Bay downstream of Ho- Hum discharge, SNP requirement (S17L8- 002 (7B))
Reference Sampling	R-2	Open Water	Surface	Belachey Lake	х	х					Background measurements
	R-3	Open Water	Surface	Tutcho Lake	х	x	x				Background measurements

Table 4 Terra Mine 2018 Sampling Stations

# 6.3 TERRA MINE – 2018 MONITORING RESULTS

Sampling figures are provided in Appendix A, with Figure 1 documenting the location of Terra Mine within the larger GBL Sites project area, and Figures 2 and 3 the location of stations listed in Table 4. Results of sample analysis are provided in Appendix B, Tables B1-B3. Field data and observations are presented in Appendix C and site photographs in Appendix D.

# 6.3.1 Terra Mine – Aquatic Observations

During the 2018 field campaign, the Camsell River water level was found to be higher than documented during previous sampling campaigns (including 2017, during which only minor water elevation was reported).

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 indicated neutral to slightly alkaline pH at the Ho Hum TCA station T-8, and at Moose Bay station T-10. 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 the minor elevated electrical conductivity reported in the depth sample from the Ho

Hum TCA (T-8-C). As expected, total dissolved solids were higher from all sample depths within the Ho Hum TCA. However, total suspended solids were below detection in all samples.

With respect to anions and nutrients, ammonia, chloride, nitrate, and nitrite were below the associated CCME-FAL guidelines. Fluoride concentrations exceeded the CCME-FAL guideline of 0.12 mg/L in both the Ho Hum TCA (all sample depths at station T-8), in Moose Bay (station T-10) and at reference sites (R-2 and R-3). Moose Bay fluoride concentrations at T-10 were consistent with referce stations (~0.15 mg/L), while the Ho Hum TCA was 0.683-0.802 mg/L and consistent with 2017 monitoring results. 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 fluorspar, fluorapalite, 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. Based on elevated fluoride concentrations in reference station samples, local mineralogy may have resulted in elevated fluoride concentrations within the Ho Hum drainage pathway. However, additional contributions are 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). Total and dissolved organic carbon concentrations were low across all sampling sites, ranging from 4-13 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 EQC (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 column. A YSI Instruments multimeter probe was used at station T-8 to a depth of 10m (cable limit). Clear temperature changes were evident at depth and were used to determine sampling depths within the epilimnion, metalimnion and hypolimnion.

# 6.3.3 Terra Mine – Total and Dissolved Metals

Total and dissolved metal samples were collected from Ho Hum TCA (station T-8 at three depths) and in Moose Bay (station T-10 at surface). 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. <u>All metal concentrations, including arsenic and copper, were below the EQGs provided for these stations.</u>

The 2018 samples from the Ho Hum TCA station T-8 exceeded arsenic and copper CCME-FAL

guidelines at all depths sampled. No other metal parameters exceeded these guideline values. Multi-year plots have been provided below for surface and depth samples at station T-8, for both arsenic (Figure 1) and for copper (Figure 2).



#### Figure 1 Arsenic Concentrations in Ho Hum TCA (Station T-8)

As evidenced in Figure 1, arsenic concentrations at Station T-8 are well below the Water Licence EQC (1,000  $\mu$ g/L), though above the CCME-FAL (5  $\mu$ g/L). Depth samples (approximately 10-13 m below surface) are in all years higher in arsenic concentration than the corresponding surface sample. A general decrease in arsenic concentration is shown since sampling began at the station in 2004. As was documented in previous years, arsenic is found to be largely in the dissolved phase (Appendix B, Table B-2).

Copper concentrations within the Ho Hum TCA as documented in Figure 2, show little difference between surface and depth samples. The 2018 concentrations are within the range of previous sampling events, though no trend in changing copper concentration over time is immediately apparent. All copper concentrations, including 2018, exceed the CCME-FAL (2  $\mu$ g/L); however, are well below the Water Licence EQC (20  $\mu$ g/L). Concentrations of copper are principally in the dissolved phase (Appendix B, Table B-2).



#### Figure 2 Copper Concentrations in Ho Hum TCA (Station T-8)

Sampling conducted downstream of the Ho Hum TCA was conducted within Moose Bay at Station T-10. <u>Sample results were below the Water Licence EQC and CCME-FAL for all metal parameters.</u>

#### 6.3.4 Terra Mine – Hydrocarbons

Based on known PHC contamination of soils (e.g. from drum storage areas and fuel handing activities), reports of hydrocarbon sheens from earlier sampling campaigns, and analytical requirements of the Water Licence SNP, stations T-8 (at 3 depths) and T-10 were sampled for PHCs F1-F4, BTEX, Oil and Grease and Volatile Organic Compounds (VOCs). Both stations were below detection limits for all parameters.

# 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/SRK 2008).

### 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).

The 2018 sampling stations at Northrim Mine are presented in Table 5 below and are in accordance with the PRMP (INAC 2018b). It is noted that reference stations R-2 and R-3 serve as applicable background stations for all Silver Bear Sites (per previous monitoring events).

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 requirement (S17L8- 002 (8C))
Camsell River	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 requirement (S17L8-002 (9D))
Reference Sampling	R-2	Open Water	Surface	Belachey Lake	x	x				Background Measurements
	R-3	Open Water	Surface	Tutcho Lake	x	x	x			Background Measurements

 Table 5
 Northrim Mine 2018 Sampling Stations

# 7.3 NORTHRIM MINE - 2018 MONITORING RESULTS

Sampling figures are provided in Appendix A, with Figure 1 documenting the location of Northrim Mine within the larger GBL Sites project area, and Figure 3 the location of the individual Northrim Mine Sampling Stations. Results of sample analysis are provided in Appendix B, Tables B1-B3. Field data and observations are tabled in Appendix C and site photographs in Appendix D.

# 7.3.1 Northrim Mine – Aquatic Observations

During the 2018 field campaign the Camsell River water levels were high and topped the dock wall at the Northrim Mine, and higher than observed in 2017 (INAC-CARD 2018a). Similarly, ground conditions on the trail to and Hermandy Lake were saturated, suggesting recent

precipitation of substantial volume.

### 7.3.2 Northrim Mine – General Chemistry

Both field and analytical results indicated neutral to slightly alkaline pH at the Hermandy Lake (NO-7) and Camsell River (NO-6) stations. This is consistent with reference stations (R-2 and R-3) 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 the river reference station (R-2). Total dissolved solids were low and total suspended solids were 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 both stations (0.137-0.159 mg/L). However, these results are generally consistent with reference stations and anthropogenic influence is not suspected.

Total and dissolved organic carbon concentrations were low in Camsell River sampling station NO-6, though higher in Hermandy Lake station NO-7. Sulphide concentrations were below detection limit for both samples and sulphate concentrations were at or below concentrations reported from reference stations (~15 mg/L).

#### 7.3.3 Northrim Mine – Total and Dissolved Metals

Copper concentrations in sample NO-7 (2.92  $\mu$ g/L) from Hermandy Lake exceeded the CCME-FAL guideline for copper (2  $\mu$ g/L). However, unlike results reported in 2017 (INAC-CARD 2018a), the Hermandy Lake sample did not exceed the CCME-FAL guideline for arsenic (though was 4.81  $\mu$ g/L and only marginally below the guideline value of 5  $\mu$ g/L). Multi-year copper results are provided in Figure 3 for Hermandy Lake station NO-7, the results of which show that the level of exceedance is relatively minor and the 2018 result is within the range of previous sampling events. As reported in Appendix B, Table B-2, copper concentrations are primarily within the dissolved phase.



#### Figure 3 Copper Concentrations in Hermandy Lake (Station NO-7)

Station NO-6 was sampled from the shore of the Camsell River, at the discharge point of the Hermandy Lake flow pathway. A single exceedance of CCME-FAL guideline values was reported for copper (guideline 2  $\mu$ g/L), with a reported concentration of 2.69  $\mu$ g/L. In 2017 the copper concentration of 0.90  $\mu$ g/L was reported in at station NO-6, well below the CCME-FAL (INAC-CARD 2018a). However, as evidenced in Figure 4 below, the 2018 result is within the range of historical copper concentrations from earlier sampling events. It is also noted that the 2018 copper concentrations in reference stations R-2 (0.96  $\mu$ g/L) and R-3 (1.41  $\mu$ g/L) were approximately 20-35% higher than were reported in 2017 (INAC-CARD 2018a). The relative increase in 2018 may be a natural artifact of the increased precipitation reported in 2018, or attributable to the high-water level of the Camsell River which forced collection of the shoreline sample landward and away from the active flow of the Camsell River. As with other samples, copper was found to be primarily in the dissolved phase (Appendix B, Table B-2).

All other total metal concentrations in 2018 Northrim Mine water samples were below the CCME-FAL guidelines.



#### Figure 4 Copper Concentrations in the Camsell River at Northrim Mine (Station NO-6)

#### 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, Hermandy Lake (station NO-7) and the Camsell River (station NO-6) were sampled for PHCs F1-F4, BTEX and VOCs. All 2018 water sample results were below detection limits for these parameters.

# 8 NOREX MINE – WATER QUALITY MONITORING

### 8.1 NOREX MINE – SITE SUMMARY

The development and operational history of the Norex Mine and associated Graham Vein Site is provided in the associated Remedial Action Plan (SENES/SRK 2008). 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 2008).

The current surface features at Norex include two portals, three ventilation raises, a waste rock pile of approximately 40,000 m<sup>3</sup> 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 m<sup>3</sup> of waste rock (SENES/SRK 2008).

#### 8.2 NOREX MINE – 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 2008).

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 2008).

The 2018 sampling stations at Norex Mine are presented in Table 6 below and are in accordance with the PRMP (INAC-CARD 2018b). It is noted that reference stations R-2 and R-3 serve as applicable background stations for all Silver Bear Sites (per previous monitoring events).

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 STATIION, Camsell River, at drainage from Norex	x	x	x	x	Y	Location where suspected Norex and Graham Vein drainage enters the Camsell River, SNP requirement S17L8- 002 (11F))
On-land Water	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))
Reference	R-2	Open Water	Surface	Belachey Lake	x	x				Background Measurements
Sampling	R-3	Open Water	Surface	Tutcho Lake	x	x	x			Background Measurements

Table 6 Norex Mine 2018 Sampling Stations

# 8.3 NOREX MINE - 2018 MONITORING RESULTS

Sampling figures are provided in Appendix A, with Figure A1 documenting the location of Norex Mine within the larger GBL Sites project area and Figure A3 the specific location of the sampling stations. Results of sample analysis are provided in Appendix B, Tables B1-B3. Field data and observations are tabled in Appendix C and site photographs in Appendix D.

# 8.3.1 Norex Mine – Aquatic Observations

During the 2018 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, station NX-3 had minimal water and consequently was sampled using a syringe. In

an unseasonably wet summer season, this highlights the variable nature of water flow through the Norex waste rock pile, at which water flow at other seep locations may be abundant (e.g. northern seeps at stations NX-1 and NX-2).

#### 8.3.2 Norex Mine – General Chemistry

Both field and analytical results indicated neutral to slightly alkaline pH at the Camsell River station (NX-12) and within pooled standing water at the toe of the waste rock pile (NX-3). This is consistent with reference stations and despite obvious iron staining in water flowing from the adit, there is no evidence of acidic pH in downstream seeps. Electrical conductivity was elevated above reference stations in waters at the toe of the waste rock slope (station NX-3). This corresponds with higher total dissolved solids, though total suspended solids were below detection.

The fluoride concentration of Camsell River sample NX-12 (0.162 mg/L) was above the CCME-FAL guideline of 0.120 mg/L; however, was approximately consistent with reference stations (~0.15 mg/L). In contrast, station NX-3 at the toe of the waste rock slope reported a fluoride concentration of 0.440 mg/L.

The sulphate and sulphide concentrations in the Camsell River were low and consistent with reference stations. At the waste rock seepage station NX-3, sulphate concentrations (91.8 mg/L) and sulphide concentrations (1.21 mg/L) were expectedly higher.

#### 8.3.3 Norex Mine – Total and Dissolved Metals

The 2018 samples from the Camsell River at station NX-12 (offshore of the discharge point of Norex Mine waters), were below CCME-FAL guidelines for all total metal parameters.

Consistent with earlier monitoring programs, elevated metals were identified in water discharging from the toe of the waste rock pile at station NX-3. While this shallow pooled water (~5 cm deep) is not aquatic habitat and CCME-FAL guidelines are therefore not applicable, using these guidelines as a screening tool identifies elevated concentrations of arsenic (26.7  $\mu$ g/L) and iron (1,240  $\mu$ g/L) in the 2018 sample. The reported copper concentration is notably below detection limit and consistent with 2017 findings (INAC-CARD 2018a).

While minor differences were observed, metal trends were generally consistent with those reported in earlier monitoring programs compiled by SLR (2017) and INAC-CARD (2018a).

#### 8.3.4 Norex Mine – Hydrocarbons

Based on findings of terrestrial PHC contamination reported on the waste rock pile and analytical requirements of the Water Licence SNP, both the Camsell River station (NX-12) and the waste rock drainage station (NX-3) were sampled for PHC F1-F4, BTEX and VOCs.

A single detectable result was reported for F2 fraction hydrocarbons in sample NX-3. Due to the shallow water at this station, the underlying peat rich soils 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 0.89 mg/L. This result is consistent with previous monitoring at station NX-3 (INAC-CARD 2018a). All other 2018 water sample results were below detection limits for PHC, BTEX and VOC parameters.

# 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 2008). 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 2008).

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 m<sup>3</sup> 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. 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 (INAC-WRD 2011).

The 2017 water quality sampling failed to identify any PHC related concerns associated with the adjacent mine workings and fuel handling. However, results of the 2017 sampling program revealed concentrations of cadmium and zinc in some Smallwood Lake samples which were higher than documented in previous years (INAC-CARD 2018a). While not prescribed within the PRMP, sampling of two previously established stations in Smallwood Lake was added to the 2018 monitoring program (i.e. responsive monitoring). A summary of the 2018 Smallwood Mine stations are provided in Table 7 below.

AREA	STATIO N	SAMPLE TYPE	DEPTH	GENERAL LOCATION	General Chemistry	Total Metals	Dissolved Metals	РНС, ВТЕХ	SNP Station	RATIONALE
Smallwood	SM-1	Shoreline	Surface	Smallwood Lake shoreline, below waste rock pile, southwest side	x	x	x			Downstream of waste rock pile, confirm 2017 metal findings
Lake	SM-6	Open Water	Surface (A) -2m	Smallwood Lake, Open water in north end	x	x				Offshore of waste rock pile, confirm 2017 metal findings
Reference Stations	R-2	Open Water	Surface	Belachey Lake	x	x				Background Measurements
	R-3	Open Water	Surface	Tutcho Lake	x	x	х			Background Measurements

Table 7 Smallwood Mine 2018 Sampling Stations

#### 9.3 SMALLWOOD MINE - 2018 MONITORING RESULTS

Sampling figures are provided in Appendix A, with Figure A3 documenting the location of the individual Smallwood Mine sampling stations. Results of sample analysis are provided in Appendix B, Tables B1-B3. 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 2018 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 stations SM-1 and SM-6 in Smallwood Lake, consistent with Silver Bear reference stations (R-2 and R-3). Water was considered to be soft and the electrical conductivity comparable to reference stations. Total suspended solids were below detection and total dissolved solids were low and consistent with reference stations.

With respect to anions and nutrients, ammonia, chloride, nitrate, and nitrite were all below the associated CCME-FAL guidelines. Fluoride concentrations exceeded the CCME-FAL guideline of 0.12 mg/L at all both SM-1 (0.274 mg/L) and SM-6 (0.273 mg/). These concentrations are higher than reported at reference stations (~ 0.150 mg/L) and may represent contribution from

waste rock or natural variation.

Sulphide concentrations were below detection limit for both samples and sulphate concentrations consistent with reference stations. Total and dissolved organic carbon concentrations were low at both stations.

#### 9.3.3 Smallwood Mine – Total and Dissolved Metals

Sample of station SM-1 at the shoreline of Smallwood Lake and adjacent to the waste rock pile, revealed a minor exceedance of the CCME-FAL copper guideline (2.05  $\mu$ g/L result and 2.0  $\mu$ g/L guideline value). However, at the offshore station SM-6, the copper concentration of 1.82  $\mu$ g/L was below the guideline. Similarly, the cadmium concentration of 0.107  $\mu$ g/L at shoreline station SM-1 marginally exceeded the CCME-FAL guideline of 0.09  $\mu$ g/L, and was below the guideline at offshore station SM-6 (0.0323  $\mu$ g/L). A similar decrease is noted for zinc; however, concentrations in both sample SM-1 (55.3  $\mu$ g/L) and SM-6 (20.7  $\mu$ g/L) exceed the CCME-FAL guideline of 7  $\mu$ g/L. It is noted that this zinc guideline value was reduced by CCME in 2018 from a previous value of 30  $\mu$ g/L. Sample SM-1 was also analyzed for dissolved metal concentrations. Dissolved metal results for copper (1.53  $\mu$ g/L) and cadmium (0.0687  $\mu$ g/L) would not exceed the CCME-FAL guideline, while the zinc concentration of 50.9  $\mu$ g/L would continue to exceed the guideline (7  $\mu$ g/L).

To better understand these findings, 2018 results have been plotted with previous findings from earlier sampling events. Plots of multi-year concentrations of copper (Figure 5), cadmium (Figure 6) and zinc (Figure 7), demonstrate that these metals are typically higher in concentration in shoreline samples SM-1 than off-shore samples SM-6. The figures also show that 2018 sample results for both copper and cadmium are within the range of historical results at these sample sites. Concentrations of zinc may be elevated in 2016, 2017 and 2018; however, are below the highest reported zinc concentration in 2007.

An important observation is the change of location for sample station SM-1. From 2005-2009, this station was accessed by boat and found at the toe of the waste rock pile (inaccessible by foot). However, due to a poorly labelled photograph within these reports, sampling from 2016-2018 was conducted further north at the dock area (previously assigned to station SM-5). This area is also adjacent to the waste rock pile and is expected to be the location of more substantial overland flow due to the compacted roadway serving as a local topographic low spot and directing water to discharge at the dock. Comparison of early SM-1 and SM-5 sampling data confirms this assumption and zinc concentrations were higher at the dock area (i.e. current station SM-1). Figure 7 utilizes data from this location for all sampling years (SM-5 for 2005-2009 and SM-1 for 2016-2018).







Figure 6 Cadmium Concentrations in Smallwood Lake (Stations SM-1 and SM-6)



Figure 7 Zinc Concentrations in Smallwood Lake (Stations SM-1 and SM-6)

# **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 2008). 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 2008).

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 m<sup>3</sup> and approximately 1,000 m<sup>3</sup> 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 have 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 2018 sampling stations at Contact Lake Mine are presented in Table 8 below and are in accordance with the PRMP (INAC 2018b).

AREA	STATION	SAMPLE TYPE	DEPTH	GENERAL LOCATION	General Chemistry	Total Metals	Dissolved Metals	РНС, ВТЕХ	Radionuclides	SNP	RATIONALE
Contact Lake	CL-26	Open Water	Surface	Contact Lake; offshore at outflow of stream from tailings pond	x	x	x	x	x	Y	Offshore from tailings pond discharge, SNP Station (S17L8-002 (13H))
Tailings Pond	CL-3	Shoreline	Surface	Tailings Pond; Outflow into stream flowing from pond	x	x	x	x	x	Y	Tailings pond monitoring, SNP Station (S17L8-002 (12G))
Reference	CL-8	Open Water	2 meters	Contact Lake; Background Station in far NW of Lake	x	x			x		Background conditions

#### Table 8 Contact Lake Mine 2018 Sampling Stations

#### 10.3 CONTACT LAKE MINE – 2018 MONITORING RESULTS

Sampling figures are provided in Appendix A, with Figure 1 documenting the location of Contact

Lake Mine within the larger GBL Sites project area, and Figure 4 the location of individual Contact Lake Mine sampling stations. Results of sample analysis are provided in Appendix B, Tables B1-B4. Field data and observations are tabled in Appendix C and site photographs in Appendix D.

### 10.3.1 Contact Lake Mine – Aquatic Observations

Ground conditions in 2018 were substantially more wet and saturated than in previous monitoring years. The shoreline station at the tailings pond was fully submerged and the field team was forced to collect the sample approximately 10-m back from the original sampling location due to high water levels.

#### 10.3.2 Contact Lake Mine – General Chemistry

Field and analytical results indicated neutral to slightly alkaline pH at the Tailings Pond station CL-3 and within Contact Lake at station CL-26, consistent with reference station CL-8. Water sampled from Contact Lake (CL-26 and CL-8) was classified as soft, in contrast to the Tailings Pond sample which was classified as hard water. The same general trend is noted for electrical conductivity which is low and at reference stations and Contact Lake (~45  $\mu$ S/cm) and elevated in waters within the Tailings Pond (214  $\mu$ S/cm). Corresponding to conductivity, total dissolved solids within the Tailings Pond was elevated (146 mg/L), relative to stations CL-26 and CL-8 within Contact Lake (30 mg/L). All samples reported total suspended solids below detection.

Ammonia, chloride, nitrate, and nitrite were all below the associated CCME-FAL guidelines in the Tailings Pond (CL-3) and in Contact Lake (CL-26 and reference station CL-8). Fluoride concentrations exceeded the CCME guideline of 0.12 mg/L in samples from the Tailings Pond (0.282 mg/L). However, at Contact Lake station CL-26, the fluoride concentration (0.106 mg/L) was consistent with background (0.104 mg/L) and below the CCME-FAL guideline. It is noted that 2017 fluoride results of reference station CL-RL-1B from Thompson Lake also exceeded the CCME-FAL guideline and reported a concentration of 0.209 mg/L (INAC-CARD 2018a). 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 in the Tailings Pond sample CL-3 (7.55 mg/L), than were reported in the Contact Lake sample CL-26 (1.16 mg/L) and reference station CL-8 (1.19 mg/L). Total and dissolved organic carbon concentrations were low at all stations (<10 mg/L).

#### 10.3.3 Contact Lake Mine – Total and Dissolved Metals

As documented during earlier sampling events, sample CL-3 from the Contact Lake Tailings Pond was elevated in metals. Arsenic concentrations of 12.5  $\mu$ g/L, copper concentrations of 14.8  $\mu$ g/L and uranium concentrations of 47.7  $\mu$ g/L exceeded the respective CCME-FAL guideline values of 5  $\mu$ g/L, 2.6  $\mu$ g/L and 15  $\mu$ g/L. These results were incorporated with multiyear results to identify any potential trends in these constituents and are plotted in Figure 8 for arsenic, Figure 9 for copper and Figure 10 for uranium.



Figure 8 Arsenic Concentrations in Contact Lake Mine Tailings Pond (Station CL-3)







#### Figure 10 Uranium Concentrations in Contact Lake Mine Tailings Pond (Station CL-3)

The multi-year plots identify higher arsenic and copper concentrations in CL-3 water samples in 2018 when compared to 2017, which may be attributable to the wet summer season as evidenced by saturated ground conditions surrounding the Tailings Pond. This may be resulting

in increased surface water flow from the upgradient waste rock and tailings area into the Tailings Pond. However, the 2018 concentrations of arsenic, copper and uranium at this station are within the range of previous sampling results since sampling began in 2006. Results of dissolved metal analysis of the 2018 CL-3 sample determined concentrations to be almost entirely in the dissolved phase for arsenic, copper and uranium.

Sampling was also conducted at station CL-26 in Contact Lake, offshore of the discharge point of the Tailings Pond drainage pathway. <u>All metal results were below CCME-FAL guidelines</u>, which is consistent with findings of previous sampling events.

#### 10.3.4 Contact Lake Mine – Hydrocarbons

Based on findings of terrestrial PHC contamination reported at the main mine site, stations CL-3 at the Tailings Pond and CL-26 within Contact Lake were sampled for PHC F1-F4, BTEX and VOCs. All 2018 sample results were below detection limits for these parameters and consistent with previous sampling events.

#### 10.3.5 Contact Lake Mine – 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.

Station CL-3 within the Tailings Pond reported a radium-226 concentration of 0.053 Bq/L, approximately an order of magnitude below the CGDWQ value of 0.5 Bq/L, and a lead-210 concentration below detection limits. At the discharge of mine water to Contact Lake (station CL-26) and at the reference station (CL-8), both radium-226 and lead-210 concentrations were below detection limit in 2018 samples. These findings were approximately consistent with 2017 sampling results (INAC-CARD 2018a).

## **11 CONCLUSIONS AND RECOMMENDATIONS**

#### **11.1 CONCLUSIONS**

The results of 2018 monitoring were generally consistent with findings from earlier aquatic assessment and monitoring campaigns. The principal conclusions of 2018 monitoring are summarized as follows:

- Terra Mine:
  - $\circ$  There were no exceedances of the Water Licence EQC at the sampling stations.
  - pH measurements were neutral to slightly alkaline in the Ho Hum TCA (T-8) and Moose Bay (T-10).
  - Elevated fluoride above CCME-FAL guidelines was reported at all sampling stations (including reference stations), with the greatest concentrations in the Ho Hum TCA (station T-8). The extent to which fluoride concentrations are due to anthropogenic activity is difficult to confirm without pre-mining data.
  - The Ho Hum TCA (station T-8) demonstrated arsenic and copper concentrations in exceedance of CCME-FAL guidelines due to the presence of tailings (submerged and shoreline) and waste rock. Multi-year analysis indicates greater arsenic concentrations in the depth samples relative to surface samples at station T-8, and an overall decreasing trend in arsenic concentration since sampling began. No clear spatial or temporal trend is identified for copper concentrations at this station. Moose Bay station T-10 was below CCME-FAL guidelines for all metals and is generally consistent with reference stations (R-2 and R-3).
  - All PHC, BTEX, Oil and Grease and VOC samples from the Tailings Pond (T-8) and Moose Bay (T-10) were below detection limits.
- Northrim Mine:
  - pH measurements were neutral to slightly alkaline in Hermandy Lake (NO-7) and the Camsell River (NO-6).
  - Fluoride concentrations exceeded the CCME-FAL guidelines but were consistent with reference station concentrations.
  - Concentrations of copper marginally exceeded CCME-FAL guidelines in the Hermandy Lake TCA (station NO-7) and was generally consistent with earlier sampling events. However, unlike 2017 the arsenic concentrations did not exceed CCME-FAL guidelines. At the discharge point of these waters into the Camsell River (station NO-6), a single minor exceedance of CCME-FAL guidelines was reported for copper. While higher than results reported from the 2016 and 2017 sampling events, the 2018 copper concentration at station NO-6

is within the range of previous sampling results (since 2003). The relative increase in 2018 may be attributable to the higher water level of the Camsell River, forcing sample collection shoreward to permit access (i.e. away from the main flow of the Camsell River).

- All PHC, BTEX and VOC samples from the Hermandy Lake and Camsell River stations were below detection limits.
- Norex Mine:
  - pH measurements were neutral to slightly alkaline in the seepage from the waste rock pile (NX-3) and the Camsell River (NX-12).
  - Fluoride concentration within the Camsell River (station NX-12) was above the CCME-FAL guideline but consistent with reference stations. Alternatively, NX-3 waste rock seepage water reported fluoride concentrations approximately three times the CCME-FAL.
  - While CCME-FAL guidelines are not applicable to the shallow seepage water at the toe of the waste rock slope (NX-3), use as a screening tool identifies elevated arsenic and iron in the 2018 sample. However, at the drainage point of Norex Mine water to the Camsell River at station NX-12, all metal results are below CCME-FAL guidelines and consistent with previous monitoring at the site.
  - Station 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, BTEX and VOC sample results were below detection limits both at the toe of the waste rock pile (NX-3) and within the Camsell River (NX-12).
- Smallwood Mine:
  - pH measurements were neutral to slightly alkaline in the Smallwood Lake near shore station SM-1 and far shore station SM-6.
  - Fluoride concentrations within Smallwood Lake exceeded CCME-FAL guidelines and were higher than reported at reference stations (though lower than in TCAs at the GBL Site). This may represent contribution from waste rock or a natural elevation in Smallwood Lake.
  - Metal concentrations were generally low within Smallwood Lake; however, minor copper and cadmium exceedances of CCME-FAL guidelines were reported in shoreline sample SM-1 (though not of offshore station SM-6). Due to the recent reduction in CCME-FAL guidelines for zinc (30 µg/L to 7 µg/L), both the near shore sample SM-1 and far shore sample SM-6 exceed guidelines by seven times and three times respectively. Examination of the multi-year dataset determined that these concentrations are within the previous range of results reported from within Smallwood Lake.

- All PHC, BTEX and VOC samples from Smallwood Lake were below detection limits.
- Contact Lake Mine:
  - pH measurements were neutral to slightly alkaline in the Tailings Pond sample (CL-3) and offshore of the mine discharge point into Contact Lake (CL-26).
  - Fluoride concentrations exceeded the CCME-FAL guideline in the sample from the Tailings Pond, though not in the Contact Lake sample or reference sample (CL-8).
  - Concentrations of arsenic, copper and uranium in sample CL-3 from the Tailings Pond exceeded the CCME-FAL guidelines. Concentrations of arsenic and copper were higher than reported in 2017 (potentially due to increased precipitation and interaction with mine materials, as evidenced by saturated ground conditions); however, were within the range of results since sampling began. Multi-year analysis of uranium concentrations in Tailings Pond sample CL-3 also indicated consistency with earlier sampling results. All metal results from Contact Lake (CL-26) and the reference station (CL-8) were below CCME-FAL guidelines.
  - Results of PHC, BTEX and VOC analysis were below detection limits for all parameters in both the Tailings Pond and Contact Lake samples.
  - Station CL-3 within the Tailings Pond reported a radium-226 concentration above detection but well below the CGDWQ value, and a lead-210 concentration below detection limits. At the discharge of mine water to Contact Lake (station CL-26) and the reference station (CL-8), both radium-226 and lead-210 concentrations were below detection limit in 2018 samples. These findings were consistent with 2017 sampling results.

The results of the 2018 Water Quality Monitoring Program fulfilled the requirements as outlined within the Pre-Remediation Monitoring Plan (INAC 2018b). Results were generally consistent with previous monitoring at the sites.

#### **11.2 RECOMMENDATIONS**

The reported copper concentrations in the Northrim Mine sample NO-6 from the Camsell River was higher than was documented in the 2017 sampling program and slightly above the CCME-FAL guideline. While this value is within the range of earlier sampling events at Northrim Mine and increasing copper concentrations were observed at reference stations, this result represents the only recent exceedance of CCME-FAL guidelines in a downstream receiving water body. For this reason, additional sampling is recommended at this station during the next

sampling event. An incremental two stations, one upstream and one downstream of NO-6, would confirm there is no increasing trend in copper discharges to the Camsell River at this location.

At the Contact Lake Mine, sampling of station CL-3 on the southern margin of the Tailings Pond is heavily affected by water level. Access requires traversing shallow creeks and saturated ground, and during years of increased precipitation (as was observed in 2018), the water level within the Tailings Pond can be significantly higher and prevent access to the station. It is recommended that consideration be given to requesting a change in SNP station to the northern shore of the Tailings Pond, at which steeper banks ensure the station may be reliably accessed.

Flow conditions at the toe of the Norex Mine waste rock pile are often different during each sampling year. While in some years the flow is directed westward toward seep NX-3 (the SNP station); in other years this station is near dry and the seeps on the northern toe of the waste rock pile (NX-1 and NX-2) have significant flow. It is recommended that flexibility be incorporated in the SNP program to enable field personnel to sample/assess where flow conditions are greatest.

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# **APPENDIX A – Figures**





Fig 4

**Silver Bear Sites** 

Northrim Norex Smallwood

Crown-Indigenous Relations and Northern Affairs Canada Relations Couronne-Autochtones et Affaires du Nord Canada





# Figure 4: GBL Sites **Contact Lake Mine 2018 Monitoring Stations**

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Date: 9/20/2018



# **APPENDIX B – Data Tables**

## TABLE B-1 General Chemistry

Site							Terra Mine			Northrim	Mine
Sample ID	Lowest			SNP Effluent Quality	T-8-A	T-DUP-1	Т-8-В	T-8-C	T-10	NO-7	NO-6
SNP #	Detection Limit	Units	CCME Criteria <sup>A</sup>	T-8 and	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7B)	S17L8-002 (8C)	S17L8-002 (9D)
Water Body				T-10	Ho Hum TCA	Ho Hum TCA	Ho Hum TCA	Ho Hum TCA	Moose Bay	Hermandy Lake	Camsell River
Date Sampled					29-Aug-2018	29-Aug-2018	29-Aug-2018	29-Aug-2018	29-Aug-2018	28-Aug-2018	28-Aug-2018
Physical Tests (Water)											
Conductivity	2.0	uS/cm			183	186	184	223	146	137	155
Hardness (as CaCO3)	0.50	mg/L			76.6	75.4	79.4	90.4	71.8	71.7	78.1
pH	0.10	pН	Between 6.5 and 9.0	Between 6.0 and 9.0	7.91	7.93	7.91	7.89	7.92	7.90	7.94
Total Suspended Solids	3.0	mg/L		30	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	10	mg/L			132	126	131	136	89	109	100
Turbidity	0.10	NTU			1.30	1.25	1.31	1.04	0.41	0.55	0.75
Anions and Nutrients (Water)											
Alkalinity, Total (as CaCO3)	1.0	mg/L			61.3	59.2	62.6	76.2	57.7	64.4	66.9
Ammonia, Total (as N)	0.0050	mg/L	0.017 to 190 <sup>C</sup>	10	0.0058	0.0051	0.0051	<0.0050	<0.0050	0.0071	<0.0050
Bromide (Br)	0.050	mg/L			< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	<0.050	< 0.050
Chloride (CI)	0.50	mg/L	120		9.97	9.98	10.0	13.1	2.40	<0.50	2.03
Fluoride (F)	0.020	mg/L	0.12		0.683	0.687	0.686	0.802	0.160	0.137	0.159
Nitrate (as N)	0.0050	mg/L	13	10	< 0.0050	< 0.0050	< 0.0050	0.0470	< 0.0050	<0.0050	< 0.0050
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
Phosphorus (P)-Total Dissolved	0.0020	mg/L			0.0054	0.0052	0.0054	0.0055	0.0026	0.0079	0.0032
Phosphorus (P)-Total	0.0020	mg/L			0.0105	0.0204	0.0121	0.0084	0.0045	0.0090	0.0053
Sulfate (SO4)	0.30	mg/L			15.4	15.4	15.4	17.9	14.3	8.16	13.6
Sulphide as S	0.018	mg/L			<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon (Water	.)										
Dissolved Organic Carbon	0.50	mg/L			13.0	11.5	11.8	10.9	4.61	14.9	5.68
Total Organic Carbon	0.50	mg/L			12.8	12.6	12.4	12.2	5.18	16.4	6.07

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

(Freshwater), summary table accessed November 2018

B Water Licence S17L8-002 Admin Amend October 30, 2017) C Tabled values converted from mg/L NH3 to mg/L total ammonia as N (x0.8224)

\* Isolated pooled water ~ 5cm deep. CCME-FAL Guidelines not applicable.

Exceedance of CCME

## TABLE B-1 General Chemistry

Site					Nore	( Mine	Smallwo	ood Mine	Silver Bear	r Reference
Sample ID	Lowest			SNP Effluent Quality	NX-3*	NX-12	SM-1	SM-6	R-2	R-3
SNP #	Detection Limit	Units	CCME Criteria <sup>A</sup>	T-8 and	S17L8-002 (10E)	S17L8-002 (11F)				
Water Body				T-10 <sup>®</sup>	On-Land	Camsell River	Smallwood Lake	Smallwood Lake	Belachey Lake	Tutcho Lake
Date Sampled					28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018	29-Aug-2018	29-Aug-2018
Physical Tests (Water)										
Conductivity	2.0	uS/cm			371	150	109	109	148	75.3
Hardness (as CaCO3)	0.50	mg/L			163	69.7	52	51	70	37.8
pH	0.10	pН	Between 6.5 and 9.0	Between 6.0 and 9.0	7.73	7.95	7.76	7.75	7.97	7.69
Total Suspended Solids	3.0	mg/L		30	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	10	mg/L			255	93	80	73	90	63
Turbidity	0.10	NTU			4.04	0.55	0.63	0.83	0.52	0.57
Anions and Nutrients (Water)										
Alkalinity, Total (as CaCO3)	1.0	mg/L			98.4	59.8	42.4	42.9	58.0	36.8
Ammonia, Total (as N)	0.0050	mg/L	0.017 to 190 <sup>C</sup>	10	0.0166	< 0.0050	0.0084	0.0051	<0.0050	<0.0050
Bromide (Br)	0.050	mg/L			< 0.050	< 0.050	< 0.050	< 0.050	<0.050	< 0.050
Chloride (CI)	0.50	mg/L	120		1.05	2.43	<0.50	<0.50	2.35	0.54
Fluoride (F)	0.020	mg/L	0.12		0.440	0.162	0.274	0.273	0.156	0.140
Nitrate (as N)	0.0050	mg/L	13	10	<0.0050	< 0.0050	<0.0050	<0.0050	<0.0050	< 0.0050
Nitrite (as N)	0.0010	mg/L	0.06	0.8	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	0.0020	mg/L			0.0099	0.0033	0.0030	0.0029	0.0027	0.0044
Phosphorus (P)-Total	0.0020	mg/L			0.0853	0.0038	0.0063	0.0041	0.0297	0.0090
Sulfate (SO4)	0.30	mg/L			91.8	14.9	14.1	13.1	14.6	2.47
Sulphide as S	0.018	mg/L			1.21	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon (Water	·)									
Dissolved Organic Carbon	0.50	mg/L			8.48	4.37	6.29	6.51	4.41	7.70
Total Organic Carbon	0.50	mg/L			9.26	5.04	6.76	6.83	4.8	8.46

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(Freshwater), summary table accessed November 2018

B Water Licence S17L8-002 Admin Amend October 30, 2017) C Tabled values converted from mg/L NH3 to mg/L total ammonia as N (x0.8224)

\* Isolated pooled water ~ 5cm deep. CCME-FAL Guidelines not applicable.

Exceedance of CCME

## TABLE B-1 General Chemistry

Site						Contact Lake	Mine	Contact Lake Reference	Field	Blank
Sample ID	Lowest			SNP Effluent Quality	CL-3	CL-26	CL-DUP-1	CL-8	SB-FIELD BLANK	CL-FIELD BLANK
SNP #	Detection Limit	Units	CCME Criteria <sup>A</sup>	T-8 and	S17L8-002 (12G)	S17L8-002 (13H)	S17L8-002 (13H)			
Water Body				T-10 <sup>°</sup>	Tailings Pond	Contact Lake	Contact Lake	Contact Lake	Blank	Blank
Date Sampled	1				28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018	29-Aug-2018	28-Aug-2018
Physical Tests (Water)										
Conductivity	2.0	uS/cm			214	45.6	44.5	44.9	<2.0	<2.0
Hardness (as CaCO3)	0.50	mg/L			108	21.5	21.1	21.2	<0.50	<0.50
pH	0.10	pН	Between 6.5 and 9.0	Between 6.0 and 9.0	8.16	7.47	7.50	7.46	5.44	5.38
Total Suspended Solids	3.0	mg/L		30	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	10	mg/L			146	30	30	33	<10	<10
Turbidity	0.10	NTU			0.28	0.18	0.21	0.19	<0.10	<0.10
Anions and Nutrients (Water)										
Alkalinity, Total (as CaCO3)	1.0	mg/L			112	23.2	21.2	22.8	<1.0	<1.0
Ammonia, Total (as N)	0.0050	mg/L	0.017 to 190 <sup>C</sup>	10	0.0083	0.0096	0.0053	<0.0050	<0.0050	<0.0050
Bromide (Br)	0.050	mg/L			< 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
Fluoride (F)	0.020	mg/L	0.12		0.282	0.104	0.106	0.106	<0.020	<0.020
Nitrate (as N)	0.0050	mg/L	13	10	< 0.0050	0.0281	0.0281	0.0300	< 0.0050	< 0.0050
Nitrite (as N)	0.0010	mg/L	0.06	0.8	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	0.0020	mg/L			0.0042	0.0020	<0.0020	0.0021	<0.0020	<0.0020
Phosphorus (P)-Total	0.0020	mg/L			0.0044	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Sulfate (SO4)	0.30	mg/L			7.55	1.16	1.20	1.19	< 0.30	<0.30
Sulphide as S	0.018	mg/L			<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon (Water	r)									
Dissolved Organic Carbon	0.50	mg/L			9.91	2.06	2.11	1.96	<0.50	<0.50
Total Organic Carbon	0.50	mg/L			10.7	2.37	2.37	2.27	<0.50	<0.50

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

(Freshwater), summary table accessed November 2018

B Water Licence S17L8-002 Admin Amend October 30, 2017) C Tabled values converted from mg/L NH3 to mg/L total ammonia as N (x0.8224)

\* Isolated pooled water ~ 5cm deep. CCME-FAL Guidelines not applicable.

Exceedance of CCME

Site							Terra Mine		
Sample ID	Lowest			SNP Effluent Quality	T-8-A	T-DUP-1	Т-8-В	T-8-C	T-10
SNP #	Detection	Units	CCME Criteria A	Criteria (EQC) for T-8 and T-10 <sup>B</sup>	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7B)
Water Body				unu 1-10	Ho Hum TCA	Ho Hum TCA	Ho Hum TCA	Ho Hum TCA	Moose Bay
Date Sampled					29-Aug-2018	29-Aug-2018	29-Aug-2018	29-Aug-2018	29-Aug-2018
Total Metals (Water) Aluminum (Al)-Total	3.0	ua/L	100 <sup>D</sup>	800	58.3	56.9	62.8	28	22
Antimony (Sb)-Total	0.10	ug/L	100		1.19	1.22	1.21	1.31	<0.10
Arsenic (As)-Total	0.10	ug/L	5	1000 at T-8 and 200 at T-10	56.6	60.1	56.5	77.4	0.34
Barium (Ba)-Total	0.10	ug/L		200 ut 1-10	15.4	16.9	15.8	18	10.8
Beryllium (Be)-Total Bismuth (Bi)-Total	0.020	ug/L ug/l			<0.020	<0.020	<0.020	<0.020	<0.020
Boron (B)-Total	10	ug/L	1,500		24	27	24	30	12
Cadmium (Cd)-Total Calcium (Ca)-Total	0.0050	ug/L ug/L	0.09		0.0078	0.0106 23500	0.0063	0.0091 28400	<0.0050 16100
Cesium (Cs)-Total	0.010	ug/L			0.03	0.031	0.032	0.041	<0.010
Chromium (Cr)-Total	0.10	ug/L	1 <sup>E</sup>		0.27	0.13	0.23	0.19	0.14
Copper (Cu)-Total	0.50	ug/L	2 to 4 <sup>F</sup>	20	7.99	8.96	8.13	8.28	0.89
Iron (Fe)-Total	10	ug/L	300		58	61	65	36	17
Lead (Pb)-Total	0.050	ug/L	1 to 7 <sup>F</sup>	20	0.112	0.101	0.118	0.061	< 0.050
Magnesium (Mg)-Total	100	ug/L			4500	4470	4410	5140	6660
Manganese (Mn)-Total Mercury (Hg)-Total	0.10	ug/L ug/l	0.026	+	2.98	3.2	3.25	9.36 <0.0050	1.19
Molybdenum (Mo)-Total	0.050	ug/L	73		2.38	2.47	2.43	2.82	0.28
Nickel (Ni)-Total	0.50	ug/L	25 to 150 <sup>F</sup>	100	3.93	4.07	3.88	4.44	<0.50
Potassium (K)-Total	100	ug/L ug/L			1860	1840	1860	2240	980
Selenium (Se)-Total	0.050	ug/L	1		<0.050	0.068	<0.050	<0.050	<0.050
Silver (Ag)-Total	0.010	ug/L ug/L	0.25	4	0.014	0.019	0.014	0.02	<0.010
Sodium (Na)-Total	50	ug/L			7080	7130	6960 71 5	8810	2530
Sulfur (S)-Total	500	ug/L ug/L			5290	5220	5170	6100	4810
Thallium (TI)-Total	0.010	ug/L	0.8		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium (Ti)-Total	0.30	ug/L ug/L			1.67	1.56	1.61	0.73	0.62
Uranium (U)-Total	0.010	ug/L	15		2.19	2.2	2.16	2.7	0.528
Zinc (Zn)-Total	3.0	ug/L ug/L	7	40	3.9	3.4	3.4	4.4	<3.0
Zirconium (Zr)-Total Dissolved Metals (Water)	0.30	ug/L			0.31	<0.30	<0.30	<0.30	<0.30
Aluminum (Al)-Dissolved	1.0	ug/L			20.3	19.2	19	7.1	4.6
Antimony (Sb)-Dissolved	0.10	ug/L			1.11	1.11	1.1	1.17	<0.10
Barium (Ba)-Dissolved	0.10	ug/L			16.1	15.5	16.3	17.9	11.4
Beryllium (Be)-Dissolved	0.020	ug/L			<0.020	<0.020	<0.020	< 0.020	< 0.020
Boron (B)-Dissolved	10	ug/L			23	23	23	28	11
Cadmium (Cd)-Dissolved	0.0050	ug/L			0.0066	0.0073	0.0058	0.0072	<0.0050
Cesium (Cs)-Dissolved	0.010	ug/L			0.025	0.025	0.025	0.037	<0.010
Chromium (Cr)-Dissolved	0.10	ug/L			<0.10	<0.10	<0.10	<0.10	<0.10
Copper (Cu)-Dissolved	0.20	ug/L			7.35	7.4	7.46	7.64	0.73
Iron (Fe)-Dissolved	10	ug/L ug/l			20	19 <0.050	21 <0.050	<10	<10
Lithium (Li)-Dissolved	1.0	ug/L			6.8	6.9	7.2	8.6	2.4
Magnesium (Mg)-Dissolved Manganese (Mn)-Dissolved	100 0.10	ug/L ug/L			4660	4490	4660	5210 1.33	7180 <0.10
Mercury (Hg)-Dissolved	0.0050	ug/L			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Molybdenum (Mo)-Dissolved Nickel (Ni)-Dissolved	0.050	ug/L ug/L			2.42 3.68	2.4 3.74	2.44 3.85	2.77 4.29	0.287
Phosphorus (P)-Dissolved	50	ug/L			<50	<50	<50	<50	<50
Selenium (K)-Dissolved	0.050	ug/L ug/L			<0.050	<0.050	0.054	<0.050	<0.050
Silicon (Si)-Dissolved	50	ug/L			904	914	930	1410	821
Sodium (Na)-Dissolved	50	ug/L ug/L			<0.010	6890	7130	<0.010 8610	2610
Strontium (Sr)-Dissolved	0.20	ug/L			76	73.3	76.7	91.1	60.7
Thallium (TI)-Dissolved	0.010	ug/L ug/L			< 0.010	<0.010	<0.010	<0.010	<0.010
Tin (Sn)-Dissolved	0.10	ug/L			<0.10	<0.10	<0.10	<0.10	<0.10
Uranium (U)-Dissolved	0.010	ug/L ug/L			2.13	2.15	2.19	2.66	0.55
Vanadium (V)-Dissolved	0.50	ug/L			<0.50	<0.50	<0.50	<0.50	<0.50
Zirconium (Zr)-Dissolved	0.30	ug/L		1	<0.30	<0.30	<0.30	<0.30	<0.30
A Canadian Council of Ministers of	Enivronment -	Water Qu	ality Guidelines for the	Protection of Aquatic					
Elle (resnivater), summary table ac B Water Licence S17L8-002 Admin D pH based guideline; all samples h E Hexavalent chromium guideline va F Hardness based guideline; guideli * Isolated pooled water ~ 5cm deep. Exceedance of CCME Exceedance of SNP EQC	Amend Octobe ave pH greater alue applied to t ne value calcul . CCME-FAL G	er 30, 20 than 6.5 otal chor ated from uidelines	17) mium result as conserv sample hardness to d not applicable.	rative measure etermine guideline					

Site			Northrim Mine		Norex Mine		Smallwo	od Mine		
Sample ID	Lowest			SNP Effluent Quality	NO-7	NO-6	NX-3 *	NX-12	SM-1	SM-6
SNP #	Detection	Units	CCME Criteria A	Criteria (EQC) for T-8	S17L8-002 (8C)	S17L8-002 (9D)	S17L8-002 (10E)	S17L8-002 (11F)		
Water Body	Linit			and 1-10	Hermandy Lake	Camsell River	On-Land	Camsell River	Smallwood	Smallwood
Date Sampled					28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018
Total Metals (Water)			-							
Aluminum (Al)-Total	3.0	ug/L	100 <sup>D</sup>	800	29.9	28.4	10	21.7	19	13.8
Anumony (Sb)-Total Arsenic (As)-Total	0.10	ug/L ua/L	5	1000 at T-8 and	4.81	0.89	26.7	0.2	0.56	0.49
Barium (Ba)-Total	0.10	ug/l		200 at 1-10	6.42	10.8	20.8	10.9	7 33	7
Beryllium (Be)-Total	0.020	ug/L			<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Bismuth (Bi)-Total	0.050	ug/L			<0.050	<0.050	<0.050	<0.050	< 0.050	<0.050
Boron (B)-Total	10	ug/L	1,500		<10	11	50	11	12	13
Calcium (Ca)-Total	50	ug/L ua/L	0.09		20700	18600	47900	16000	14000	13800
Cesium (Cs)-Total	0.010	ug/L			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chromium (Cr)-Total	0.10	ug/L	1 <sup>E</sup>		0.32	0.18	0.2	0.17	<0.10	<0.10
Cobalt (Co)-Total	0.10	ug/L	F		0.15	< 0.10	1.44	< 0.10	0.13	<0.10
Copper (Cu)-1otal	0.50	ug/L	2 to 4 '	20	2.92	2.69	<0.50	0.81	2.05	1.82
Lead (Pb)-Total	0,050	ug/L	1 to 7 <sup>F</sup>	20	0.275	0,097	0,126	<0.050	0.616	<0.050
Lithium (Li)-Total	1.0	ug/L			1.2	2.1	5.4	2.3	1.3	1.3
Magnesium (Mg)-Total	100	ug/L			4540	6700	8990	6710	4240	4040
Manganese (Mn)-Total	0.10	ug/L	0.026		7.28	2.05	98	0.97	18.7	14.1
Molybdenum (Mo)-Total	0.0050	ug/L ug/L	73		0.594	0.314	4.89	0.266	1.07	1.06
Nickel (Ni)-Total	0.50	ug/L	25 to 150 F	100	0.84	0.55	1.14	<0.50	<0.50	<0.50
Phosphorus (P)-Total	50	ug/L			<50	<50	<50	<50	<50	<50
Potassium (K)-Total	100	ug/L	1		530	960	1210	970	720	690
Silicon (Si)-Total	100	ug/L ug/L	I		870	930	3640	780	620	590
Silver (Ag)-Total	0.010	ug/L	0.25	4	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Sodium (Na)-Total	50	ug/L			1540	2550	10800	2510	2700	2590
Sulfur (S)-Total	0.20	ug/L ug/l			26.2	54.4 4610	144 26600	56.9	28.1	27.2
Thallium (TI)-Total	0.010	ug/L	0.8		<0.010	<0.010	< 0.010	< 0.010	< 0.010	<0.010
Tin (Sn)-Total	0.10	ug/L			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Litanium (1)-Total	0.30	ug/L	15		0.59	0.88	< 0.90	0.66	0.46	0.34
Vanadium (V)-Total	0.50	ug/L	15		<0.50	< 0.50	0.68	< 0.50	<0.50	<0.50
Zinc (Zn)-Total	3.0	ug/L	7	40	<3.0	4	4.1	<3.0	55.3	20.7
Zirconium (Zr)-Total	0.30	ug/L			<0.30	< 0.30	<0.30	< 0.30	<0.30	<0.30
Aluminum (Al)-Dissolved	1.0	ua/l			18.7	5.9	8.4	4 4	5.8	
Antimony (Sb)-Dissolved	0.10	ug/L			0.11	<0.10	0.36	<0.10	<0.10	
Arsenic (As)-Dissolved	0.10	ug/L			4.73	0.84	25.1	0.17	0.46	
Barium (Ba)-Dissolved	0.10	ug/L			6.55	11.5	21.8	11.3	6.68	
Bismuth (Bi)-Dissolved	0.050	ug/L			<0.050	<0.050	<0.050	<0.050	< 0.050	
Boron (B)-Dissolved	10	ug/L			<10	<10	47	11	10	
Cadmium (Cd)-Dissolved	0.0050	ug/L			<0.0050	0.0053	<0.0050 49600	<0.0050	0.0687	
Cesium (Cs)-Dissolved	0.010	ug/L			<0.010	<0.010	<0.010	<0.010	<0.010	
Chromium (Cr)-Dissolved	0.10	ug/L			<0.10	<0.10	<0.10	<0.10	<0.10	
Copper (Cu)-Dissolved	0.10	ug/L			<0.10 2 7	<0.10 2.45	1.35	<0.10	<0.10	
Iron (Fe)-Dissolved	10	ug/L			45	<10	921	<u>&lt;10</u>	<10	
Lead (Pb)-Dissolved	0.050	ug/L			0.138	<0.050	0.093	<0.050	<0.050	
Lithium (Li)-Dissolved	1.0	ug/L			1.2	2.1	5.5	2.3	1.2	
Manganese (Mn)-Dissolved	0.10	ug/L ug/L			3.59	0.95	110	<0.10	1.02	
Mercury (Hg)-Dissolved	0.0050	ug/L			<0.0050	<0.0050	<0.0050	<0.0050	< 0.0050	
Molybdenum (Mo)-Dissolved	0.050	ug/L			0.565	0.328	4.74	0.258	1.05	
Phosphorus (P)-Dissolved	0.50 50	ug/L ug/L			<50	<50	<50	<0.50	<0.50 <50	
Potassium (K)-Dissolved	100	ug/L			570	1040	1310	1040	720	
Selenium (Se)-Dissolved	0.050	ug/L			0.051	<0.050	< 0.050	<0.050	0.052	
Silicon (SI)-Dissolved Silver (Ad)-Dissolved	50	ug/L ug/l			949	957 <0.010	3900	837 <0.010	590 <0.010	
Sodium (Na)-Dissolved	50	ug/L			1490	2550	11000	2480	2620	
Strontium (Sr)-Dissolved	0.20	ug/L			28.1	60	151	61.6	27.7	
Sultur (S)-Dissolved	500	ug/L			3000	4440	26300	5030	4840	
Tin (Sn)-Dissolved	0.010	ug/L ug/L			<0.10	<0.010	<0.010	<0.10	<0.10	
Titanium (Ti)-Dissolved	0.30	ug/L			0.33	<0.30	0.57	<0.30	<0.30	
Uranium (U)-Dissolved	0.010	ug/L			0.184	0.509	0.262	0.565	0.297	
Zinc (Zn)-Dissolved	0.50	ug/L ug/l			1 7	3.9	0.53	<0.50	50.9	
Zirconium (Zr)-Dissolved	0.30	ug/L		1	<0.30	<0.30	<0.30	<0.30	<0.30	

 Zirconium (Zr)-Dissolved
 0.30
 ug/L

 A Canadian Council of Ministers of Enivromment - Watter Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed November 2018

 B Water Licence S17L8-002 Admin Amend October 30, 2017)

 D pH based guideline; all samples have pH greater than 6.5

 E Hexavalent chromium guideline value applied to total chormium result as conservative measure F Hardness based guideline; guideline value calculated from sample hardness to determine guideline ' Isolated pooled water ~ 5cm deep. CCME-FAL Guidelines not applicable.

 Exceedance of CCME

 Exceedance of SNP EQC

Site					Silver Bear Reference		C	1e	
Sample ID	Lowest			SNP Effluent Quality	R-2	R-3	CL-3	CL-26	CL-DUP-1
SNP #	Detection Limit	Units	CCME Criteria <sup>A</sup>	Criteria (EQC) for T-8 and T-10 <sup>B</sup>			S17L8-002 (12G)	S17L8-002 (13H)	S17L8-002 (13H)
Water Body				and 1-10	Belachey Lake	Tutcho Lake	Tailings Pond	Contact Lake	Contact Lake
Date Sampled					29-Aug-2018	29-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018
Total Metals (Water)									
Aluminum (AI)-Total	3.0	ug/L	100 <sup>D</sup>	800	19.4	9.2	9.3	<3.0	3.4
Antimony (Sb)-Total	0.10	ug/L			<0.10	<0.10	0.79	<0.10	<0.10
Arsenic (As)-Total	0.10	ug/L	5	1000 at T-8 and 200 at T-10	0.22	0.68	12.5	0.16	0.18
Barium (Ba)-Total	0.10	ug/L			11.7	5.92	21.9	3.58	3.93
Beryllium (Be)-Total	0.020	ug/L			<0.020	<0.020	<0.020	<0.020	<0.020
Boron (B)-Total	10	ug/L	1 500		<0.050 13	13	<0.050 31	<0.050	<10
Cadmium (Cd)-Total	0.0050	ug/L	0.09		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Calcium (Ca)-Total	50	ug/L			16200	9810	26300	4840	5060
Cesium (Cs)-Total	0.010	ug/L			<0.010	<0.010	<0.010	<0.010	<0.010
Chromium (Cr)-Total	0.10	ug/L	1 <sup>E</sup>		<0.10	<0.10	0.13	<0.10	<0.10
Cobalt (Co)-Total	0.10	ug/L			<0.10	<0.10	0.11	<0.10	<0.10
Copper (Cu)-Total	0.50	ug/L	2 to 4 <sup>F</sup>	20	0.96	1.41	14.8	0.73	0.84
Iron (Fe)-Total	10	ug/L	300		18	17	38	<10	<10
Lead (Pb)-Total	0.050	ug/L	1 to 7 <sup>F</sup>	20	<0.050	<0.050	<0.050	<0.050	<0.050
Lithium (Li)-Total	1.0	ug/L			2.4	1.1	2.3	<1.0	<1.0
Magnesium (Mg)-Total	100	ug/L			7160	2880	9260	1990	2180
Margung (Hg) Total	0.0050	ug/L	0.026		0.94	0.85	4/.8	0.68	U.74
Molybdenum (Mo)-Total	0.050	ug/L ug/l	73		0.261	0.229	0.0073	0.159	0.177
Nickel (Ni)-Total	0.50	ug/L	25 to 150 F	100	<0.50	<0.50	1 34	<0.50	<0.50
Phosphorus (P)-Total	50	ug/L	2010/100	100	<50	<50	<50	<50	<50
Potassium (K)-Total	100	ug/L			1030	710	1170	480	510
Selenium (Se)-Total	0.050	ug/L	1		< 0.050	0.065	< 0.050	< 0.050	< 0.050
Silicon (Si)-Total	100	ug/L			880	1010	2230	290	320
Silver (Ag)-Total	0.010	ug/L	0.25	4	<0.010	<0.010	0.08	<0.010	<0.010
Sodium (Na)-Total	50	ug/L			2680	1720	4170	942	985
Strontium (Sr)-Total	0.20	ug/L			59.6	21.5	66.5	10.8	10.9
Thallium (TI)-Total	0.010	ug/L	0.8		<0.010	<0.010	<0.010	<0.010	<0.010
Tin (Sn)-Total	0.10	ug/L	0.0		<0.10	<0.10	<0.10	<0.10	<0.10
Titanium (Ti)-Total	0.30	ug/L			0.58	< 0.30	< 0.30	< 0.30	< 0.30
Uranium (U)-Total	0.010	ug/L	15		0.561	0.173	47.7	0.169	0.183
Vanadium (V)-Total	0.50	ug/L			<0.50	<0.50	<0.50	<0.50	<0.50
Zinc (Zn)-Total	3.0	ug/L	7	40	<3.0	<3.0	<3.0	<3.0	<3.0
Zirconium (Zr)-Total	0.30	ug/L			< 0.30	<0.30	< 0.30	< 0.30	< 0.30
Aluminum (Al) Dissolved	1.0	110/				4.4	7.6	<1.0	<1.0
Antimony (Sb)-Dissolved	0.10	ug/L				4.4 <0.10	0.71	<0.10	<0.10
Arsenic (As)-Dissolved	0.10	ug/L				0.62	12.4	0.13	0.16
Barium (Ba)-Dissolved	0.10	ug/L				5.86	22.6	3.68	3.64
Beryllium (Be)-Dissolved	0.020	ug/L				<0.020	<0.020	<0.020	<0.020
Bismuth (Bi)-Dissolved	0.050	ug/L				<0.050	<0.050	<0.050	<0.050
Boron (B)-Dissolved	10	ug/L				<10	29	<10	<10
Calamium (Ca)-Dissolved	0.0050	ug/L				<0.0050	<0.0050	<0.0050	<0.0050
Cesium (Cs)-Dissolved	0 010	ug/L ug/l		+		<0.010	<0.010	4930	4040 <0.010
Chromium (Cr)-Dissolved	0.10	ug/L		1		<0.10	<0.10	<0.10	<0.10
Cobalt (Co)-Dissolved	0.10	ug/L				<0.10	<0.10	<0.10	<0.10
Copper (Cu)-Dissolved	0.20	ug/L				1.06	13.7	0.55	0.55
Iron (Fe)-Dissolved	10	ug/L				<10	23	<10	<10
Lead (Pb)-Dissolved	0.050	ug/L				< 0.050	<0.050	< 0.050	< 0.050
Litnium (LI)-Dissolved	1.0	ug/L				1.1	2.3	<1.0	<1.0
Magnesium (Mg)-Dissolved	0.10	ug/L				<0.10	9940 43.5	<0.10	<0.10
Manganese (Min) Dissolved	0.0050	ug/L				<0.0050	0.0054	<0.0050	<0.0050
Molybdenum (Mo)-Dissolved	0.050	ug/L				0.22	0.477	0.175	0.168
Nickel (Ni)-Dissolved	0.50	ug/L				<0.50	1.23	<0.50	<0.50
Phosphorus (P)-Dissolved	50	ug/L				<50	<50	<50	<50
Potassium (K)-Dissolved	100	ug/L				750	1220	500	510
Selenium (Se)-Dissolved	0.050	ug/L				<0.050	<0.050	<0.050	< 0.050
Silver (Ag)-Dissolved	0 010	ug/L		<u> </u>		980	2410	<0.010	2/6 <0.010
Sodium (Na)-Dissolved	50	ug/L		1		1660	4100	939	954
Strontium (Sr)-Dissolved	0.20	ug/L				22.8	70.8	11.2	11.1
Sulfur (S)-Dissolved	500	ug/L				740	2530	<500	<500
Thallium (TI)-Dissolved	0.010	ug/L				<0.010	<0.010	<0.010	<0.010
Tin (Sn)-Dissolved	0.10	ug/L				<0.10	<0.10	<0.10	<0.10
Titanium (Ti)-Dissolved	0.30	ug/L				< 0.30	< 0.30	< 0.30	< 0.30
Vanadium (V)-Dissolved	0.010	ug/L				0.165	4ð.6	0.164	0.16
Zinc (Zn)-Dissolved	1.50	ug/L		+		<1.0	<1.0	<1.0	<1.0
Zirconium (Zr)-Dissolved	0.30	ug/L				<0.30	<0.30	<0.30	<0.30

 Linc (Zn)-Dissolved
 1.0
 ug/L

 Zirconium (Zr)-Dissolved
 0.30
 ug/L

 A Canadian Council of Ministers of Enivronment - Water Quality Guidelines for the Protection of Aquatic
 Life (Freshwater), summary table accessed November 2018

 B Water Licence S17L8-002 Admin Amend October 30, 2017)
 D
 DH based guideline; all samples have pH greater than 6.5

 E Hexavalent chromium guideline value applied to total chormium result as conservative measure
 F Hardness based guideline; guideline value calculated from sample hardness to determine guideline

 \* Isolated pooled water ~ 5cm deep.
 CCME-FAL Guidelines not applicable.

 Exceedance of CCME
 Exceedance of SNP EQC

Site					Contact Lake Reference	Field	Blank
Sample ID	Lowest			SNP Effluent Quality	CL-8	SB-FIELD BLANK	CL-FIELD BLANK
SNP #	Detection Limit	Units	CCME Criteria <sup>A</sup>	Criteria (EQC) for T-8			
Water Body				and 1-10	Contact Lake	Blank	Blank
Date Sampled					28-Aug-2018	29-Aug-2018	28-Aug-2018
Total Metals (Water)			-				
Aluminum (Al)-Total	3.0	ug/L	100 <sup>D</sup>	800	<3.0	<3.0	<3.0
Antimony (Sb)-Total	0.10	ug/L		4000 at T 0 and	<0.10	<0.10	<0.10
Arsenic (As)-Total	0.10	ug/L	5	200 at T-10	0.17	<0.10	<0.10
Barium (Ba)-Total	0.10	ug/L		200 00 1 10	3.73	<0.10	<0.10
Beryllium (Be)-Total	0.020	ug/L			<0.020	<0.020	<0.020
Bismuth (Bi)-Total	0.050	ug/L	4.500		<0.050	< 0.050	< 0.050
Boron (B)-Total	10	ug/L	1,500		<10	<10	<10
Calcium (Ca)-Total	50	ug/L	0.09		5020	<50	<50
Cesium (Cs)-Total	0.010	ug/L			<0.010	< 0.010	<0.010
Chromium (Cr)-Total	0.10	ug/L	1 <sup>E</sup>		<0.10	<0.10	<0.10
Cobalt (Co)-Total	0.10	ug/L			<0.10	<0.10	<0.10
Copper (Cu)-Total	0.50	ug/L	2 to 4 <sup>F</sup>	20	0.8	<0.50	<0.50
Iron (Fe)-Total	10	ug/L	300		<10	<10	<10
Lead (Pb)-Total	0.050	ug/L	1 to 7 <sup>F</sup>	20	<0.050	<0.050	<0.050
Lithium (Li)-Total	1.0	ug/L			<1.0	<1.0	<1.0
Magnesium (Mg)-Total	100	ug/L			2090	<100	<100
Manganese (Minj-Total Mercury (Hg)-Total	0.10	ug/L	0.026		<0.72	<0.10	<0.10
Molybdenum (Mo)-Total	0.050	ug/L	73	1	0.169	<0.050	<0.050
Nickel (Ni)-Total	0.50	ug/L	25 to 150 <sup>F</sup>	100	<0.50	<0.50	<0.50
Phosphorus (P)-Total	50	ug/L			<50	<50	<50
Potassium (K)-Total	100	ug/L			490	<100	<100
Selenium (Se)-Total	0.050	ug/L	1		<0.050	<0.050	<0.050
Silicon (Si)-Total	100	ug/L	0.05	4	300	<100	<100
Silver (Ag)-Total	0.010	ug/L	0.25	4	<0.010	<0.010	<0.010
Strontium (Sr)-Total	0.20	ug/L			11.1	<0.20	<0.20
Sulfur (S)-Total	500	ug/L			<500	<500	<500
Thallium (TI)-Total	0.010	ug/L	0.8		<0.010	<0.010	<0.010
Tin (Sn)-Total	0.10	ug/L			<0.10	<0.10	<0.10
Titanium (Ti)-Total	0.30	ug/L	45		< 0.30	< 0.30	< 0.30
Vanadium (V)-Total	0.010	ug/L	15		<0.178	<0.010	<0.010
Zinc (Zn)-Total	3.0	ug/L ug/L	7	40	<3.0	<3.0	<3.0
Zirconium (Zr)-Total	0.30	ug/L			<0.30	< 0.30	< 0.30
Dissolved Metals (Water)							
Aluminum (AI)-Dissolved	1.0	ug/L				<1.0	<1.0
Antimony (Sb)-Dissolved	0.10	ug/L				< 0.10	<0.10
Arsenic (As)-Dissolved	0.10	ug/L				<0.10	<0.10
Bervllium (Be)-Dissolved	0.020	ug/L ug/L				<0.020	<0.020
Bismuth (Bi)-Dissolved	0.050	ug/L				< 0.050	< 0.050
Boron (B)-Dissolved	10	ug/L				<10	<10
Cadmium (Cd)-Dissolved	0.0050	ug/L				<0.0050	<0.0050
Calcium (Ca)-Dissolved	50	ug/L				<50	<50
Chromium (Cr)-Dissolved	0.010	ug/L				<0.010	<0.010
Cobalt (Co)-Dissolved	0.10	ug/L		1		<0.10	<0.10
Copper (Cu)-Dissolved	0.20	ug/L				<0.20	<0.20
Iron (Fe)-Dissolved	10	ug/L				<10	<10
Lead (Pb)-Dissolved	0.050	ug/L				< 0.050	< 0.050
Litnium (LI)-Dissolved	1.0	ug/L				<1.0	<1.0
Magnesian (Mg)-Dissolved	0.10	ug/L				<0.10	<0.10
Mercury (Hg)-Dissolved	0.0050	ug/L				< 0.0050	< 0.0050
Molybdenum (Mo)-Dissolved	0.050	ug/L				<0.050	<0.050
Nickel (Ni)-Dissolved	0.50	ug/L				<0.50	<0.50
Phosphorus (P)-Dissolved	50	ug/L				<50	<50
Selenium (Se)-Dissolved	0.050	ug/L				<0.050	<0.050
Silicon (Si)-Dissolved	50	ug/L				<50	<50
Silver (Ag)-Dissolved	0.010	ug/L				<0.010	<0.010
Sodium (Na)-Dissolved	50	ug/L				<50	<50
Strontium (Sr)-Dissolved	0.20	ug/L				< 0.20	< 0.20
Sultur (S)-Dissolved	500	ug/L	<u> </u>			<500	<500
Tin (Sn)-Dissolved	0.10	ug/L ug/l				<0.010	<0.010
Titanium (Ti)-Dissolved	0.30	ug/L				<0.30	<0.30
Uranium (U)-Dissolved	0.010	ug/L				<0.010	<0.010
Vanadium (V)-Dissolved	0.50	ug/L				<0.50	<0.50
Zinc (Zn)-Dissolved	1.0	ug/L				<1.0	<1.0

 Zirconium (Zr)-Dissolved
 0.30
 ug/L

 A Canadian Council of Ministers of Enivromment - Watter Quality Guidelines for the Protection of Aquatic Life (Freshwater), summary table accessed November 2018

 B Water Licence S17L8-002 Admin Amend October 30, 2017)

 D pH based guideline; all samples have pH greater than 6.5

 E Hexavalent chromium guideline value applied to total chormium result as conservative measure F Hardness based guideline; guideline value calculated from sample hardness to determine guideline ' Isolated pooled water ~ 5cm deep. CCME-FAL Guidelines not applicable.

 Exceedance of CCME

 Exceedance of SNP EQC

## **TABLE B-3 Hydrocarbons**

Site							Terra Mine			Northrim	Mine
Sample ID	Lowest	11	А	SNP Effluent Quality Criteria (EQC) for T-8	T-8-A	T-DUP-1	Т-8-В	T-8-C	T-10	NO-7	NO-6
SNP #	Limit	Units	CCME Criteria	and T-10 <sup>B</sup>	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7A)	S17L8-002 (7B)	S17L8-002 (8C)	S17L8-002 (9D)
Water Body					Ho Hum TCA	Ho Hum TCA	Ho Hum TCA	Ho Hum TCA	Moose Bay	Hermandy Lake	Camsell River
Date Sampled					29-Aug-2018	29-Aug-2018	29-Aug-2018	29-Aug-2018	29-Aug-2018	28-Aug-2018	28-Aug-2018
Aggregate Organics (Water)											
Oil and Grease	5.0	mg/L		5	<5.0	<5.0	<5.0	<5.0	<5.0		
Oil And Grease (Visible Sheen)		-		no	no	no	no	no	no		
Volatile Organic Compounds (Wa	ater)										
Benzene	0.00050	mg/L	0.37		<0.00050	< 0.00050	<0.00050	<0.00050	<0.00050	<0.00050	< 0.00050
Ethylbenzene	0.00050	mg/L	0.09		< 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
Styrene	0.00050	mg/L			< 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
ortho-Xylene	0.00050	mg/L			< 0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	< 0.00050
meta- & para-Xylene	0.00050	mg/L			< 0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	< 0.00050
Xylenes	0.00075	mg/L			<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
Hydrocarbons (Water)											
F1-BTEX	0.10	mg/L			<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
F3 (C16-C34)	0.30	mg/L			< 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
Volatile Hydrocarbons (VH6-10)	0.10	mg/L			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
VPH (C6-C10)	0.10	mg/L			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

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

Life (Freshwater), summary table accessed November 2018

B Water Licence S17L8-002 Admin Amend October 30, 2017)

\* Silica gel cleanup conducted \* Isolated pooled water ~ 5cm deep. Exceedance of CCME

Exceedance of SNP EQC

2018 GBL Water Quality Monitoring Report

## **TABLE B-3 Hydrocarbons**

Site					Nore	( Mine	C	ontact Lake Mi	ne	Field	Blank
Sample ID	Lowest	11	Α	SNP Effluent Quality Criteria (EQC) for T-8	NX-3 *	NX-12	CL-3	CL-26	CL-DUP-1	SB-FIELD BLANK	CL-FIELD BLANK
SNP #	Limit	Units	CCME Criteria	and T-10 <sup>B</sup>	S17L8-002 (10E)	S17L8-002 (11F)	S17L8-002 (12G)	S17L8-002 (13H)	S17L8-002 (13H)		
Water Body					On-Land	Camsell River	Tailings Pond	Contact Lake	Contact Lake	Blank	Blank
Date Sampled					28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018	29-Aug-2018	28-Aug-2018
Aggregate Organics (Water)											
Oil and Grease	5.0	mg/L		5						<5.0	
Oil And Grease (Visible Sheen)		-		no						no	
Volatile Organic Compounds (Wa	iter)										
Benzene	0.00050	mg/L	0.37		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	< 0.00050
Ethylbenzene	0.00050	mg/L	0.09		<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
Styrene	0.00050	mg/L			<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
ortho-Xylene	0.00050	mg/L			<0.00050	<0.00050	<0.00050	< 0.00050	<0.00050	<0.00050	<0.00050
meta- & para-Xylene	0.00050	mg/L			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Xylenes	0.00075	mg/L			<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
Hydrocarbons (Water)											
F1-BTEX	0.10	mg/L			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
F2 (C10-C16)	0.30	mg/L			0.89*	< 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
F4 (C34-C50)	0.30	mg/L			< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	<0.30	<0.30
Volatile Hydrocarbons (VH6-10)	0.10	mg/L			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
VPH (C6-C10)	0.10	mg/L			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

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

Life (Freshwater), summary table accessed November 2018

B Water Licence S17L8-002 Admin Amend October 30, 2017)

\* Silica gel cleanup conducted

\* Isolated pooled water ~ 5cm deep. Exceedance of CCME

### **TABLE B-4** Radionuclides

Site					С	ontact Lake Mir	ne	tact Lake Refer	ence
Sample ID	Lowest		Candian Drinking Water Quality	SNP Effluent Quality Criteria	CL-3	CL-26	CL-DUP-1	CL-8	CL-FIELD BLANK
SNP #	Detection Limit	Units	Guidelines <sup>A</sup>	(EQC) for T-8 and T-	S17L8-002 (12G)	S17L8-002 (13H)	S17L8-002 (13H)		
Water Body				10	Tailings Pond	Contact Lake	Contact Lake	Contact Lake	Blank
Date Sampled					28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018	28-Aug-2018
Radiological Parameters (Misc.)									
Pb-210	0.025	Bq/L	0.2		<0.027	<0.026	<0.025	<0.026	<0.026
Ra-226	0.0039	Bq/L	0.5		0.053	< 0.0044	<0.0042	< 0.0043	<0.0051

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

Parameters

B Water Licence S17L8-002 Admin Amend October 30, 2017)

Exceedance of CCME

Site					Те	erra Mine	
Sample ID			T-8-A	T-DUP-1			
OND #	Lowest	Units	S17L8-002	S17L8-002			
SNP #	Detection Limit	Onito	(7A)	(7A)	Scenario	Calculation	Acceptability
Water Body			Ho Hum TCA	Ho Hum TCA			
Date Sampled			29-Aug-2018	29-Aug-2018			
Physical Tests							
Conductivity	2.0	uS/cm	183	186	D	1.6%	Acceptable
Hardness (as CaCO3)	0.50	mg/L	76.6	75.4	D	1.6%	Acceptable
pH	0.10	pН	7.91	7.93	D	0.3%	Acceptable
Total Suspended Solids	3.0	mg/L	<3.0	<3.0	A	N/A	Acceptable
Total Dissolved Solids	10	mg/L	132	126	D	4.7%	Acceptable
Turbidity	0.10	NTU	1.30	1.25	D	3.9%	Acceptable
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	1.0	mg/L	61.3	59.2	D	3.5%	Acceptable
Ammonia, Total (as N)	0.0050	mg/L	0.0058	0.0051	D	12.8%	Acceptable
Bromide (Br)	0.050	mg/L	<0.050	<0.050	A	N/A	Acceptable
Chloride (Cl)	0.50	mg/L	9.97	9.98	D	0.1%	Acceptable
Fluoride (F)	0.020	mg/L	0.683	0.687	D	0.6%	Acceptable
Nitrate (as N)	0.0050	mg/L	<0.0050	<0.0050	A	N/A	Acceptable
Nitrite (as N)	0.0010	mg/L	<0.0010	<0.0010	A	N/A	Acceptable
Phosphorus (P)-Total Dissolved	0.0020	mg/L	0.0054	0.0052	D	3.8%	Acceptable
Phosphorus (P)-Total	0.0020	mg/L	0.0105	0.0204	D	64.1%	Not Acceptable
Sulfate (SO4)	0.30	mg/L	15.4	15.4	D	0.0%	Acceptable
Sulphide as S	0.018	mg/L	<0.018	<0.018	A	N/A	Acceptable
Organic / Inorganic Carbon							
Dissolved Organic Carbon	0.50	mg/L	13.0	11.5	D	12.2%	Acceptable
Total Organic Carbon	0.50	mg/L	12.8	12.6	D	1.6%	Acceptable

Site					Con	tact Lake Mine	
Sample ID	1		CL-26	CL-DUP-1			
	Lowest	Units	S17L8-002	S17L8-002			
SNP #	Detection Limit	onito	(13H)	(13H)	Scenario	Calculation	Acceptability
Water Body	1		Contact Lake	Contact Lake			
Date Sampled	1		28-Aug-2018	28-Aug-2018			
Physical Tests							
Conductivity	2.0	uS/cm	45.6	44.5	D	2.4%	Acceptable
Hardness (as CaCO3)	0.50	mg/L	21.5	21.1	D	1.9%	Acceptable
pH	0.10	pН	7.47	7.50	D	0.4%	Acceptable
Total Suspended Solids	3.0	mg/L	<3.0	<3.0	А	N/A	Acceptable
Total Dissolved Solids	10	mg/L	30	30	С	I Result B - Result A I < 2x DL	Acceptable
Turbidity	0.10	NTU	0.18	0.21	С	I Result B - Result A I < 2x DL	Acceptable
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	1.0	mg/L	23.2	21.2	А	N/A	Acceptable
Ammonia, Total (as N)	0.0050	mg/L	0.0096	0.0053	С	I Result B - Result A I < 2x DL	Acceptable
Bromide (Br)	0.050	mg/L	<0.050	<0.050	А	N/A	Acceptable
Chloride (CI)	0.50	mg/L	<0.50	<0.50	А	N/A	Acceptable
Fluoride (F)	0.020	mg/L	0.104	0.106	D	1.9%	Acceptable
Nitrate (as N)	0.0050	mg/L	0.0281	0.0281	D	0.0%	Acceptable
Nitrite (as N)	0.0010	mg/L	<0.0010	<0.0010	А	N/A	Acceptable
Phosphorus (P)-Total Dissolved	0.0020	mg/L	0.0020	<0.0020	В	Result B - (0.5xDL) < DL	Acceptable
Phosphorus (P)-Total	0.0020	mg/L	<0.0020	<0.0020	А	N/A	Acceptable
Sulfate (SO4)	0.30	mg/L	1.16	1.20	D	3.4%	Acceptable
Sulphide as S	0.018	mg/L	<0.018	<0.018	А	N/A	Acceptable
Organic / Inorganic Carbon							
Dissolved Organic Carbon	0.50	mg/L	2.06	2.11	C	I Result B - Result A I < 2x DL	Acceptable
Total Organic Carbon	0.50	mg/L	2.37	2.37	C	I Result B - Result A I < 2x DL	Acceptable

Site			Terra Mine						
Sample ID			T-8-A	T-DUP-1					
	Lowest	Units	S17L8-002	S17L8-002					
SNP #	Detection Limit	Onito	(7A)	(7A)	Scenario	Calculation	Acceptability		
Water Body			Ho Hum TCA	Ho Hum TCA					
Date Sampled			29-Aug-2018	29-Aug-2018					
Total Metals									
Aluminum (Al)-Total	3.0	ug/L	58.3	56.9	D	2.4%	Acceptable		
Antimony (Sb)-Total	0.10	ug/L	1.19	1.22	D	2.5%	Acceptable		
Arsenic (As)-Total	0.10	ug/L	56.6	60.1	D	6.0%	Acceptable		
Barium (Ba)-Total	0.10	ug/L	15.4	16.9	D	9.3%	Acceptable		
Beryllium (Be)-Total	0.020	ug/L	<0.020	<0.020	А	N/A	Acceptable		
Bismuth (Bi)-Total	0.050	ug/L	<0.050	<0.050	А	N/A	Acceptable		
Boron (B)-Total	10	ug/L	24	27	D	11.8%	Acceptable		
Cadmium (Cd)-Total	0.0050	ug/L	0.0078	0.0106	С	I Result B - Result A I < 2x DL	Acceptable		
Calcium (Ca)-Total	50	ug/L	22300	23500	D	5.2%	Acceptable		
Cesium (Cs)-Total	0.010	ug/L	0.03	0.031	D	3.3%	Acceptable		
Chromium (Cr)-Total	0.10	ug/L	0.27	0.13	С	I Result B - Result A I < 2x DL	Acceptable		
Cobalt (Co)-Total	0.10	ug/L	0.14	0.15	С	I Result B - Result A I < 2x DL	Acceptable		
Copper (Cu)-Total	0.50	ug/L	7.99	8.96	D	11.4%	Acceptable		
Iron (Fe)-Total	10	ug/L	58	61	D	5.0%	Acceptable		
Lead (Pb)-Total	0.050	ug/L	0.112	0.101	С	I Result B - Result A I < 2x DL	Acceptable		
Lithium (Li)-Total	1.0	ug/L	6.9	7.5	D	8.3%	Acceptable		
Magnesium (Mg)-Total	100	ug/L	4500	4470	D	0.7%	Acceptable		
Manganese (Mn)-Total	0.10	ug/L	2.98	3.2	D	7.1%	Acceptable		
Mercury (Hg)-Total	0.0050	ug/L	<0.0050	<0.0050	А	N/A	Acceptable		
Molybdenum (Mo)-Total	0.050	ug/L	2.38	2.47	С	I Result B - Result A I < 2x DL	Acceptable		
Nickel (Ni)-Total	0.50	ug/L	3.93	4.07	D	3.5%	Acceptable		
Phosphorus (P)-Total	50	ug/L	<50	<50	А	N/A	Acceptable		
Potassium (K)-Total	100	ug/L	1860	1840	D	1.1%	Acceptable		
Selenium (Se)-Total	0.050	ug/L	<0.050	0.068	В	Result B - (0.5xDL) < DL	Acceptable		
Silicon (Si)-Total	100	ug/L	940	1000	D	6.2%	Acceptable		
Silver (Ag)-Total	0.010	ug/L	0.014	0.019	С	I Result B - Result A I < 2x DL	Acceptable		
Sodium (Na)-Total	50	ug/L	7080	7130	D	0.7%	Acceptable		
Strontium (Sr)-Total	0.20	ug/L	70.5	72.9	D	3.3%	Acceptable		
Sulfur (S)-Total	500	ug/L	5290	5220	D	1.3%	Acceptable		
Thallium (TI)-Total	0.010	ug/L	<0.010	<0.010	A	N/A	Acceptable		
Tin (Sn)-Total	0.10	ug/L	<0.10	<0.10	A	N/A	Acceptable		
Titanium (Ti)-Total	0.30	ug/L	1.67	1.56	D	6.8%	Acceptable		
Uranium (U)-Total	0.010	ug/L	2.19	2.2	D	0.5%	Acceptable		
Vanadium (V)-Total	0.50	ug/L	<0.50	<0.50	A	N/A	Acceptable		
Zinc (Zn)-Total	3.0	ug/L	3.9	3.4	С	I Result B - Result A I < 2x DL	Acceptable		
Zirconium (Zr)-Total	0.30	ug/L	0.31	<0.30	В	Result B - (0.5xDL) < DL	Acceptable		

Site			Contact Lake Mine							
Sample ID			CL-26	CL-DUP-1						
	Lowest	Unite	S17L8-002	S17L8-002						
SNP #	Detection Limit	Onito	(13H)	(13H)	Scenario	Calculation	Acceptability			
Water Body			Contact Lake	Contact Lake						
Date Sampled			28-Aug-2018	28-Aug-2018						
Total Metals										
Aluminum (Al)-Total	3.0	ug/L	<3.0	3.4	В	Result B - (0.5xDL) < DL	Acceptable			
Antimony (Sb)-Total	0.10	ug/L	<0.10	<0.10	А	N/A	Acceptable			
Arsenic (As)-Total	0.10	ug/L	0.16	0.18	С	I Result B - Result A I < 2x DL	Acceptable			
Barium (Ba)-Total	0.10	ug/L	3.58	3.93	D	9.3%	Acceptable			
Beryllium (Be)-Total	0.020	ug/L	<0.020	< 0.020	А	N/A	Acceptable			
Bismuth (Bi)-Total	0.050	ug/L	<0.050	< 0.050	А	N/A	Acceptable			
Boron (B)-Total	10	ug/L	<10	<10	А	N/A	Acceptable			
Cadmium (Cd)-Total	0.0050	ug/L	<0.0050	< 0.0050	А	N/A	Acceptable			
Calcium (Ca)-Total	50	ug/L	4840	5060	D	4.4%	Acceptable			
Cesium (Cs)-Total	0.010	ug/L	<0.010	<0.010	А	N/A	Acceptable			
Chromium (Cr)-Total	0.10	ug/L	<0.10	<0.10	А	N/A	Acceptable			
Cobalt (Co)-Total	0.10	ug/L	<0.10	<0.10	А	N/A	Acceptable			
Copper (Cu)-Total	0.50	ug/L	0.73	0.84	С	I Result B - Result A I < 2x DL	Acceptable			
Iron (Fe)-Total	10	ug/L	<10	<10	А	N/A	Acceptable			
Lead (Pb)-Total	0.050	ug/L	<0.050	< 0.050	А	N/A	Acceptable			
Lithium (Li)-Total	1.0	ug/L	<1.0	<1.0	А	N/A	Acceptable			
Magnesium (Mg)-Total	100	ug/L	1990	2180	D	9.1%	Acceptable			
Manganese (Mn)-Total	0.10	ug/L	0.68	0.74	D	8.5%	Acceptable			
Mercury (Hg)-Total	0.0050	ug/L	<0.0050	<0.0050	А	N/A	Acceptable			
Molybdenum (Mo)-Total	0.050	ug/L	0.159	0.177	D	10.7%	Acceptable			
Nickel (Ni)-Total	0.50	ug/L	<0.50	<0.50	А	N/A	Acceptable			
Phosphorus (P)-Total	50	ug/L	<50	<50	А	N/A	Acceptable			
Potassium (K)-Total	100	ug/L	480	510	D	6.1%	Acceptable			
Selenium (Se)-Total	0.050	ug/L	<0.050	< 0.050	А	N/A	Acceptable			
Silicon (Si)-Total	100	ug/L	290	320	С	I Result B - Result A I < 2x DL	Acceptable			
Silver (Ag)-Total	0.010	ug/L	<0.010	<0.010	А	N/A	Acceptable			
Sodium (Na)-Total	50	ug/L	942	985	D	4.5%	Acceptable			
Strontium (Sr)-Total	0.20	ug/L	10.8	10.9	D	0.9%	Acceptable			
Sulfur (S)-Total	500	ug/L	<500	500	В	Result B - (0.5xDL) < DL	Acceptable			
Thallium (TI)-Total	0.010	ug/L	<0.010	<0.010	А	N/A	Acceptable			
Tin (Sn)-Total	0.10	ug/L	<0.10	<0.10	А	N/A	Acceptable			
Titanium (Ti)-Total	0.30	ug/L	<0.30	<0.30	А	N/A	Acceptable			
Uranium (U)-Total	0.010	ug/L	0.169	0.183	D	8.0%	Acceptable			
Vanadium (V)-Total	0.50	ug/L	<0.50	< 0.50	А	N/A	Acceptable			
Zinc (Zn)-Total	3.0	ug/L	<3.0	<3.0	A	N/A	Acceptable			
Zirconium (Zr)-Total	0.30	ug/L	< 0.30	< 0.30	A	N/A	Acceptable			

Site			Terra Mine					
Sample ID	1		T-8-A	T-DUP-1				
SND #	Lowest	Units	S17L8-002	S17L8-002				
5NP #	Detection Limit	enne	(7A)	(7A)	Scenario	Calculation	Acceptability	
Water Body			Ho Hum TCA	Ho Hum TCA				
Date Sampled			29-Aug-2018	29-Aug-2018				
Dissolved Metals								
Aluminum (AI)-Dissolved	1.0	ug/L	20.3	19.2	D	5.6%	Acceptable	
Antimony (Sb)-Dissolved	0.10	ug/L	1.11	1.11	D	0.0%	Acceptable	
Arsenic (As)-Dissolved	0.10	ug/L	50.1	49.4	D	1.4%	Acceptable	
Barium (Ba)-Dissolved	0.10	ug/L	16.1	15.5	D	3.8%	Acceptable	
Beryllium (Be)-Dissolved	0.020	ug/L	<0.020	<0.020	А	N/A	Acceptable	
Bismuth (Bi)-Dissolved	0.050	ug/L	<0.050	<0.050	Α	N/A	Acceptable	
Boron (B)-Dissolved	10	ug/L	23	23	С	I Result B - Result A I < 2x DL	Acceptable	
Cadmium (Cd)-Dissolved	0.0050	ug/L	0.0066	0.0073	С	I Result B - Result A I < 2x DL	Acceptable	
Calcium (Ca)-Dissolved	50	ug/L	23000	22800	D	0.9%	Acceptable	
Cesium (Cs)-Dissolved	0.010	ug/L	0.025	0.025	С	I Result B - Result A I < 2x DL	Acceptable	
Chromium (Cr)-Dissolved	0.10	ug/L	<0.10	<0.10	А	N/A	Acceptable	
Cobalt (Co)-Dissolved	0.10	ug/L	<0.10	<0.10	Α	N/A	Acceptable	
Copper (Cu)-Dissolved	0.20	ug/L	7.35	7.4	D	0.7%	Acceptable	
Iron (Fe)-Dissolved	10	ug/L	20	19	С	I Result B - Result A I < 2x DL	Acceptable	
Lead (Pb)-Dissolved	0.050	ug/L	<0.050	<0.050	A	N/A	Acceptable	
Lithium (Li)-Dissolved	1.0	ug/L	6.8	6.9	D	1.5%	Acceptable	
Magnesium (Mg)-Dissolved	100	ug/L	4660	4490	D	3.7%	Acceptable	
Manganese (Mn)-Dissolved	0.10	ug/L	0.26	0.26	С	I Result B - Result A I < 2x DL	Acceptable	
Mercury (Hg)-Dissolved	0.0050	ug/L	<0.0050	<0.0050	A	N/A	Acceptable	
Molybdenum (Mo)-Dissolved	0.050	ug/L	2.42	2.4	D	0.8%	Acceptable	
Nickel (Ni)-Dissolved	0.50	ug/L	3.68	3.74	D	1.6%	Acceptable	
Phosphorus (P)-Dissolved	50	ug/L	<50	<50	A	N/A	Acceptable	
Potassium (K)-Dissolved	100	ug/L	2090	2080	D	0.5%	Acceptable	
Selenium (Se)-Dissolved	0.050	ug/L	<0.050	<0.050	A	N/A	Acceptable	
Silicon (Si)-Dissolved	50	ug/L	904	914	D	1.1%	Acceptable	
Silver (Ag)-Dissolved	0.010	ug/L	<0.010	<0.010	A	N/A	Acceptable	
Sodium (Na)-Dissolved	50	ug/L	6980	6890	D	1.3%	Acceptable	
Strontium (Sr)-Dissolved	0.20	ug/L	76	73.3	D	3.6%	Acceptable	
Sulfur (S)-Dissolved	500	ug/L	5190	5210	D	0.4%	Acceptable	
Thallium (TI)-Dissolved	0.010	ug/L	<0.010	<0.010	A	N/A	Acceptable	
Tin (Sn)-Dissolved	0.10	ug/L	<0.10	<0.10	A	N/A	Acceptable	
Titanium (Ti)-Dissolved	0.30	ug/L	< 0.30	<0.30	A	N/A	Acceptable	
Uranium (U)-Dissolved	0.010	ug/L	2.13	2.15	D	0.9%	Acceptable	
Vanadium (V)-Dissolved	0.50	ug/L	<0.50	<0.50	A	N/A	Acceptable	
Zinc (Zn)-Dissolved	1.0	ug/L	3.3	2.5	С	I Result B - Result A I < 2x DL	Acceptable	
Zirconium (Zr)-Dissolved	0.30	ug/L	<0.30	<0.30	A	N/A	Acceptable	

Site			Contact Lake Mine							
Sample ID			CL-26	CL-DUP-1						
	Lowest	Unite	S17L8-002	S17L8-002						
SNP #	Detection Limit	Onits	(13H)	(13H)	Scenario	Calculation	Acceptability			
Water Body			Contact Lake	Contact Lake						
Date Sampled			28-Aug-2018	28-Aug-2018						
Dissolved Metals										
Aluminum (AI)-Dissolved	1.0	ug/L	<1.0	<1.0	А	N/A	Acceptable			
Antimony (Sb)-Dissolved	0.10	ug/L	<0.10	<0.10	А	N/A	Acceptable			
Arsenic (As)-Dissolved	0.10	ug/L	0.13	0.16	С	I Result B - Result A I < 2x DL	Acceptable			
Barium (Ba)-Dissolved	0.10	ug/L	3.68	3.64	D	1.1%	Acceptable			
Beryllium (Be)-Dissolved	0.020	ug/L	<0.020	< 0.020	А	N/A	Acceptable			
Bismuth (Bi)-Dissolved	0.050	ug/L	<0.050	< 0.050	А	N/A	Acceptable			
Boron (B)-Dissolved	10	ug/L	<10	<10	А	N/A	Acceptable			
Cadmium (Cd)-Dissolved	0.0050	ug/L	<0.0050	< 0.0050	А	N/A	Acceptable			
Calcium (Ca)-Dissolved	50	ug/L	4930	4840	D	1.8%	Acceptable			
Cesium (Cs)-Dissolved	0.010	ug/L	<0.010	<0.010	А	N/A	Acceptable			
Chromium (Cr)-Dissolved	0.10	ug/L	<0.10	<0.10	А	N/A	Acceptable			
Cobalt (Co)-Dissolved	0.10	ug/L	<0.10	<0.10	А	N/A	Acceptable			
Copper (Cu)-Dissolved	0.20	ug/L	0.55	0.55	С	I Result B - Result A I < 2x DL	Acceptable			
Iron (Fe)-Dissolved	10	ug/L	<10	<10	А	N/A	Acceptable			
Lead (Pb)-Dissolved	0.050	ug/L	<0.050	< 0.050	А	N/A	Acceptable			
Lithium (Li)-Dissolved	1.0	ug/L	<1.0	<1.0	А	N/A	Acceptable			
Magnesium (Mg)-Dissolved	100	ug/L	2230	2190	D	1.8%	Acceptable			
Manganese (Mn)-Dissolved	0.10	ug/L	<0.10	<0.10	А	N/A	Acceptable			
Mercury (Hg)-Dissolved	0.0050	ug/L	<0.0050	<0.0050	А	N/A	Acceptable			
Molybdenum (Mo)-Dissolved	0.050	ug/L	0.175	0.168	С	I Result B - Result A I < 2x DL	Acceptable			
Nickel (Ni)-Dissolved	0.50	ug/L	<0.50	<0.50	А	N/A	Acceptable			
Phosphorus (P)-Dissolved	50	ug/L	<50	<50	A	N/A	Acceptable			
Potassium (K)-Dissolved	100	ug/L	500	510	D	2.0%	Acceptable			
Selenium (Se)-Dissolved	0.050	ug/L	<0.050	<0.050	А	N/A	Acceptable			
Silicon (Si)-Dissolved	50	ug/L	274	276	D	0.7%	Acceptable			
Silver (Ag)-Dissolved	0.010	ug/L	<0.010	<0.010	A	N/A	Acceptable			
Sodium (Na)-Dissolved	50	ug/L	939	954	D	1.6%	Acceptable			
Strontium (Sr)-Dissolved	0.20	ug/L	11.2	11.1	D	0.9%	Acceptable			
Sulfur (S)-Dissolved	500	ug/L	<500	<500	А	N/A	Acceptable			
Thallium (TI)-Dissolved	0.010	ug/L	<0.010	<0.010	A	N/A	Acceptable			
Tin (Sn)-Dissolved	0.10	ug/L	<0.10	<0.10	А	N/A	Acceptable			
Titanium (Ti)-Dissolved	0.30	ug/L	<0.30	<0.30	А	N/A	Acceptable			
Uranium (U)-Dissolved	0.010	ug/L	0.164	0.16	D	2.5%	Acceptable			
Vanadium (V)-Dissolved	0.50	ug/L	<0.50	<0.50	A	N/A	Acceptable			
Zinc (Zn)-Dissolved	1.0	ug/L	<1.0	<1.0	A	N/A	Acceptable			
Zirconium (Zr)-Dissolved	0.30	ug/L	<0.30	<0.30	A	N/A	Acceptable			

Site		Terra Mine						
Sample ID			T-8-A	T-DUP-1				
	Lowest	Unite	S17L8-002	S17L8-002				
SNP #	Detection Limit	Onits	(7A)	(7A)	Scenario	Calculation	Acceptability	
Water Body			Ho Hum TCA	Ho Hum TCA				
Date Sampled			29-Aug-2018	29-Aug-2018				
Aggregate Organics								
Oil and Grease	5.0	mg/L	<5.0	<5.0	А	N/A	Acceptable	
Oil And Grease (Visible Sheen)		-	no	no	А	N/A	Acceptable	
Volatile Organic Compounds								
Benzene	0.00050	mg/L	<0.00050	< 0.00050	А	N/A	Acceptable	
Ethylbenzene	0.00050	mg/L	<0.00050	<0.00050	А	N/A	Acceptable	
Methyl t-butyl ether (MTBE)	0.00050	mg/L	<0.00050	<0.00050	А	N/A	Acceptable	
Styrene	0.00050	mg/L	<0.00050	<0.00050	А	N/A	Acceptable	
Toluene	0.00045	mg/L	<0.00045	<0.00045	А	N/A	Acceptable	
ortho-Xylene	0.00050	mg/L	<0.00050	<0.00050	А	N/A	Acceptable	
meta- & para-Xylene	0.00050	mg/L	<0.00050	<0.00050	А	N/A	Acceptable	
Xylenes	0.00075	mg/L	<0.00075	<0.00075	А	N/A	Acceptable	
F1 (C6-C10)	0.10	mg/L	<0.10	<0.10	А	N/A	Acceptable	
4-Bromofluorobenzene (SS)		%	99.1	102.6				
1,4-Difluorobenzene (SS)		%	100.7	100.4				
Hydrocarbons								
F1-BTEX	0.10	mg/L	<0.10	<0.10	А	N/A	Acceptable	
F2 (C10-C16)	0.30	mg/L	<0.30	<0.30	А	N/A	Acceptable	
F3 (C16-C34)	0.30	mg/L	<0.30	<0.30	А	N/A	Acceptable	
F4 (C34-C50)	0.30	mg/L	<0.30	<0.30	А	N/A	Acceptable	
Volatile Hydrocarbons (VH6-10)	0.10	mg/L	<0.10	<0.10	А	N/A	Acceptable	
VPH (C6-C10)	0.10	mg/L	<0.10	<0.10	А	N/A	Acceptable	
2-Bromobenzotrifluoride, F2-F4		%	98	91.2				
3,4-Dichlorotoluene (SS)		%	76.8	92.6				
Radiological Parameters								
Pb-210	0.025	Bq/L						
Ra-226	0.0039	Bq/L						

Site					Conta	act Lake Mine	
Sample ID	1		CL-26	CL-DUP-1			
	Lowest	Unite	S17L8-002	S17L8-002			
SNP#	Detection Limit	Onits	(13H)	(13H)	Scenario	Calculation	Acceptability
Water Body			Contact Lake	Contact Lake			
Date Sampled			28-Aug-2018	28-Aug-2018			
Aggregate Organics							
Oil and Grease	5.0	mg/L					
Oil And Grease (Visible Sheen)		-					
Volatile Organic Compounds							
Benzene	0.00050	mg/L	< 0.00050	<0.00050	А	N/A	Acceptable
Ethylbenzene	0.00050	mg/L	<0.00050	<0.00050	А	N/A	Acceptable
Methyl t-butyl ether (MTBE)	0.00050	mg/L	<0.00050	<0.00050	А	N/A	Acceptable
Styrene	0.00050	mg/L	<0.00050	<0.00050	А	N/A	Acceptable
Toluene	0.00045	mg/L	< 0.00045	<0.00045	А	N/A	Acceptable
ortho-Xylene	0.00050	mg/L	<0.00050	<0.00050	А	N/A	Acceptable
meta- & para-Xylene	0.00050	mg/L	<0.00050	<0.00050	А	N/A	Acceptable
Xylenes	0.00075	mg/L	<0.00075	<0.00075	А	N/A	Acceptable
F1 (C6-C10)	0.10	mg/L	<0.10	<0.10	А	N/A	Acceptable
4-Bromofluorobenzene (SS)		%	103.6	100.8			
1,4-Difluorobenzene (SS)		%	100	100.3			
Hydrocarbons							
F1-BTEX	0.10	mg/L	<0.10	<0.10	А	N/A	Acceptable
F2 (C10-C16)	0.30	mg/L	< 0.30	<0.30	А	N/A	Acceptable
F3 (C16-C34)	0.30	mg/L	<0.30	<0.30	А	N/A	Acceptable
F4 (C34-C50)	0.30	mg/L	< 0.30	<0.30	А	N/A	Acceptable
Volatile Hydrocarbons (VH6-10)	0.10	mg/L	<0.10	<0.10	А	N/A	Acceptable
VPH (C6-C10)	0.10	mg/L	<0.10	<0.10	А	N/A	Acceptable
2-Bromobenzotrifluoride, F2-F4		%	95.4	95.4			
3,4-Dichlorotoluene (SS)		%	108.6	85.7			
Radiological Parameters							
Pb-210	0.025	Bq/L	<0.026	<0.025	A	N/A	Acceptable
Ra-226	0.0039	Bq/L	< 0.0044	< 0.0042	A	N/A	Acceptable

# **APPENDIX C – Field Data and Observations**
#### 2018 Water Quality Monitoring Field Notes

SITE		Terra Mine		Terra Mine	Northrim Mine	Northrim Mine
STATION		Т-8		T-10	NO-7	NO-6
Date		29-Aug-18		29-Aug-18	28-Aug-19	28-Aug-19
Personnel		AT, JM, HK, CB		AT, JM, HK, CB	SY, AT	JM, CB, HK
Location Description		Ho Hum TCA - Mid L	ake	Middle of Moose Bay, mid way down airstrip	Hermandy Lake, south end, east shore	Within Camsell River, where Hermandy Lake outIflows
Latitude (Dec. Deg. N)		65.60387°		65.61036°	65.59757°	65.59551°
Longitude (Dec. Deg. W)		118.13012°		118.14873°	117.98439°	117.98116°
Sample Type		Open Water		Open Water	Shoreline	Shoreline
Access		Boat		Boat	Foot	Foot
Method		Van Dorn		Grab	Grab	Grab-Pole
Water Column Depth	16m		2m	0.3m	0.4m	
Sample Depth	1m	6m	13m	Surface	Surface	Surface
Parameters	General, T.Metals, D.Metals, PHC/BTEX, O&G	General, T.Metals, D.Metals, PHC/BTEX, O&G	General, T.Metals, D.Metals, PHC/BTEX, O&G	General, T.Metals, D.Metals, PHC/BTEX, O&G	General, T. Metals, D. Metals, PHC/BTEX	General, T. Metals, D. Metals, PHC/BTEX
рН	7.52	6.97	6.94	7.88	7.47	7.46
Conductivity (µS/cm)	157.9	163.2	157.7	128.8	123.8	143.9
Temperature (°C)	11.7	9.4	4.3	12.7	13.8	13
Dissolved Oxygen (mg/L)	10.3	5.29	4.43	10.44	9.9	10.41
Turbidity (NTU)	1.21	0.88	0.7	0.46	0.47	0.47
QA/QC Samples	T-DUP-1	None	None	None	None	None
Notes	Water level appears higher ithan in previous year. Light wind, no heavy wave action or visible turbidity (clear water column).			Wind from mouth of bay inwards, clear water, light wave action and vegetation in water.	Trail up to lake was very wet, yellow water column, no wave action.	Water level at least 15cm higher than previous year, abundant vegetation in groud ad in water column, no wind or wave action.

#### 2018 Water Quality Monitoring Field Notes

SITE	Norex Mine	Norex Mine	Smallwood Mine	Smallwood Mine	Silver Bear Reference	Silver Bear Refrence
STATION	NX-3	NX-12	SM-1	SM-6	R-2	R-3
Date	28-Aug-19	28-Aug-19	28-Aug-19	28-Aug-19	29-Aug-18	29-Aug-18
Personnel	AT, SY	SY, CB	ЈМ, СВ, НК	CB, SY	SY	SY
Location Description	West seep of waste rock pile	Camsell River, offshore of Norex outflow	Smallwood Lake, south end of roadway as it enters lake, ~20m south at toe of waste rock pile	Smallwood Lake, ~mid lake across from waste rock pile	Reference Station, Belachey Lake, upstream of rapids	Referece Station, Tutcho Lake, mid lake
Latitude (Dec. Deg. N)	65.589532°	65.59486°	65.58201°	65.58156°	65.63223°	65.59494°
Longitude (Dec. Deg. W)	117.96862°	117.97376°	117.94312°	117.94188°	117.91731°	118.15921°
Sample Type	On-land	Open Water	Shoreline	Open Water	Open Water	Open Water
Access	Foot	Float Plane	Foot	Float Plane	Float Plane	Float Plane
Method	Grab-Syringe	Grab	Grab	Van Dorn	Grab	Grab
Water Column Depth	0.06m	0.3	0.25m		N/A	N/A
Sample Depth	Surface	Surface	Surface	1m	Surface	Surface
Parameters	General, T. Metals, D. Metals, PHC/BTEX	General, T. Metals, D. Metals, PHC/BTEX	General, T. Metals, D. Metals	General, T. Metals	General, T.Metals	General, T.Metals, D.Metals
рН	6.87	7.79	7.43	7.67	7.84	7.68
Conductivity (µS/cm)	396	130.4	101.8	97.7	129.4	65.7
Temperature (°C)	6.2	12.2	13.3	12.5	12.2	12.1
Dissolved Oxygen (mg/L)	N/A	10.68	10.8	10.1	10.96	10.46
Turbidity (NTU)	N/A	0.58	0.37	0.4	0.5	0.76
QA/QC Samples	None	None	None	None	None	None
Notes	Stagnant water with no flow, bacterial sheen on surface, TDS=280ppm. Due to shallow depths, measurements collected with Oakton pen meter (no tubidity or dissolved oxygen).	Camsell River water level approximately 0.25m higher than previous years, field crew indicated rainy summer season, clear with vegetation, no wave action.	Water level similar as last year, clear water column with vegetation, orange staining on rocks.	Clear water collumn, no wave action.	Light wave action, clear water column and light rain.	Light rain, clear water column.

#### 2018 Water Quality Monitoring Field Notes

SITE	Contact Lake Mine	Contact Lake Mine	Contact Lake Reference
STATION	CL-3	CL-26	CL-8
Date	28-Aug-19	28-Aug-19	28-Aug-19
Personnel	SY,AT	СВ, ЈМ, НК	CB, SY
Location Description	Tailings Pond, south shore	Contact Lake, ~50m offshore of discharge point of stream from Tailings Pond	Reference Station, north end of Contact Lake
Latitude (Dec. Deg. N)	65.99091°	65.98978°	66.00485°
Longitude (Dec. Deg. W)	117.80110°	117.80171°	117.89067°
Sample Type	Shoreline	Open Water	Open Water
Access	Foot	Boat	Float Plane
Method	Grab-Pole	Grab	Grab
Water Column Depth	0.5m	11m	NA
Sample Depth	0.5m	Surface	Surface
Parameters	General, T. Metals, D. Metals, Rad., PHC/BTEX	General, T. Metals, D. Metals, PHC/BTEX Rads.	General, T. Metals, Rads.
рН	7.56	7.39	7.39
Conductivity (µS/cm)	175.6	38.2	38.1
Temperature (°C)	10.2	11.1	11
Dissolved Oxygen (mg/L)	10.28	10.8	10.99
Turbidity (NTU)	0	0.15	0.15
QA/QC Samples	None	CL-DUP-1	None
Notes	Calm water, indication of higher water levels, brown tint in water, sampled 10m from coordinates due to saturated ground conditions.	Audible water from stream, collected field blank on shore by SNP sign, water column clear, no wave action.	Clear water column, light wave action.

# **APPENDIX D – Photo Log**





Photo 1 Terra Mine - Station T-8: Ho Hum TCA, mid



Photo 2 Terra Mine- Station T-10: Moose Bay, middle, mid-way down airstrip





Photo 3 Silver Bear Reference - Station R-2: Reference Station, Belachey Lake, upstream of rapids



Photo 4 Silver Bear Reference - Station R-3: Reference Station, Tutcho Lake, mid-lake





Photo 5 Northrim Mine- Station NO-7: Hermandy Lake, south end, east shore



**Photo 6** Northrim Mine- Station NO-6: Camsell River, at point of discharge of Hermandy Lake drainage



Crown-Indigenous Relations Relations Couronne-Autochtones and Northern Affairs Canada et Affaires du Nord Canada



Photo 7 Norex Mine - Station NX-3: West seep of waste rock pile



Photo 8 Norex Mine- Station NX-12: Camsell River, offshore of outflow from Norex Mine



Crown-Indigenous Relations Relations Couronne-Autochtones and Northern Affairs Canada et Affaires du Nord Canada



Photo 9 Smallwood Mine- Station SM-1: Smallwood Lake, end of road at Smallwood waste rock pile



Photo 10 Smallwood Mine - Station SM-6: Smallwood Lake, offshore of waste rock pile



Photo 11 Contact Lake Mine- Station CL-3: Tailings pond, south end of pond



Photo 12 Contact Lake Mine- Station CL-26: Contact Lake, offshore of discharge from Tailings Pond



**Photo 14 Contact Lake Mine – Station CL-8:** Reference Station, north end of Contact Lake

# **APPENDIX E – Laboratory Certificates**



DXB PROJECT MANAGEMENT INC. ATTN: Dave Bynski 315 Montgomery Avenue Winnipeg MB R3L 1T6 Date Received:30-AUG-18Report Date:09-OCT-18 20:01 (MT)Version:FINAL

Client Phone: 204-795-5508

# **Certificate of Analysis**

#### Lab Work Order #: L2156175

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED GBL-2018

**Comments:** Addition of NO6 rerun for total metals. Addition of NO6 rerun for total and dissolved metals using general bottle.

Joanne Lee Account Manager

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		Sample ID Description Sampled Date Sampled Time Client ID	L2156175-9 WATER 28-AUG-18 11:00 CL-3	L2156175-10 WATER 28-AUG-18 11:00 CL-26	L2156175-13 WATER 28-AUG-18 11:00 CL-8	L2156175-15 WATER 28-AUG-18 11:00 CL-DUP-1	L2156175-17 WATER 28-AUG-18 11:00 CL-FIELD BLANK
Grouping	Analyte						
MISC.							
Radiological Parameters	Pb-210 (Bq/L)		<0.027	<0.026	<0.026	<0.025	<0.026
	Ra-226 (Bq/L)		0.053	<0.0044	<0.0043	<0.0042	<0.0051

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-1 WATER 29-AUG-18 11:00 T-8-A	L2156175-2 WATER 29-AUG-18 11:00 T-8-B	L2156175-3 WATER 29-AUG-18 11:00 T-8-C	L2156175-4 WATER 29-AUG-18 11:00 T-10	L2156175-5 WATER 28-AUG-18 11:00 NO-7
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	183	184	223	146	137
	Hardness (as CaCO3) (mg/L)	76.6	79.4	90.4	71.8	71.7
	рН (рН)	7.91	7.91	7.89	7.92	7.90
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	132	131	136	89	109
	Turbidity (NTU)	1.30	1.31	1.04	0.41	0.55
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	61.3	62.6	76.2	57.7	64.4
	Ammonia, Total (as N) (mg/L)	0.0058	0.0051	<0.0050	<0.0050	0.0071
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (CI) (mg/L)	9.97	10.0	13.1	2.40	<0.50
	Fluoride (F) (mg/L)	0.683	0.686	0.802	0.160	0.137
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.0470	<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)	0.0054	0.0054	0.0055	0.0026	0.0079
	Phosphorus (P)-Total (mg/L)	0.0105	0.0121	0.0084	0.0045	0.0090
	Sulfate (SO4) (mg/L)	15.4	15.4	17.9	14.3	8.16
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	13.0	11.8	10.9	4.61	14.9
	Total Organic Carbon (mg/L)	12.8	12.4	12.2	5.18	16.4
Total Metals	Aluminum (Al)-Total (ug/L)	58.3	62.8	28.0	22.0	29.9
	Antimony (Sb)-Total (ug/L)	1.19	1.21	1.31	<0.10	0.14
	Arsenic (As)-Total (ug/L)	56.6	56.5	77.4	0.34	4.81
	Barium (Ba)-Total (ug/L)	15.4	15.8	18.0	10.8	6.42
	Beryllium (Be)-Total (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Total (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Boron (B)-Total (ug/L)	24	24	30	12	<10
	Cadmium (Cd)-Total (ug/L)	0.0078	0.0063	0.0091	<0.0050	<0.0050
		22300	22900	28400	16100	20700
	Cesium (Cs)-Total (ug/L)	0.030	0.032	0.041	<0.010	<0.010
	Chromium (Cr)-Total (ug/L)	0.27	0.23	0.19	0.14	0.32
		0.14	0.15	0.11	<0.10	0.15
	Copper (Cu)- I otal (ug/L)	7.99	8.13	8.28	0.89	2.92
	iron (Fe)-iotai (ug/L)	58	65	36	17	63
	Lead (Pb)-Total (ug/L)	0.112	0.118	0.061	<0.050	0.275
		6.9	6.9	8.7	2.3	1.2
	Magnesium (Mg)-Total (ug/L)	4500	4410	5140	6660	4540

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-6 WATER 28-AUG-18 11:00 NO-6	L2156175-7 WATER 28-AUG-18 11:00 NX-12	L2156175-8 WATER 28-AUG-18 11:00 NX-3	L2156175-9 WATER 28-AUG-18 11:00 CL-3	L2156175-10 WATER 28-AUG-18 11:00 CL-26
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	155	150	371	214	45.6
	Hardness (as CaCO3) (mg/L)	78.1	69.7	163	108	21.5
	рН (рН)	7.94	7.95	7.73	8.16	7.47
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	100	93	255	146	30
	Turbidity (NTU)	0.75	0.55	4.04	0.28	0.18
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	66.9	59.8	98.4	112	23.2
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0166	0.0083	0.0096
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	2.03	2.43	1.05	<0.50	<0.50
	Fluoride (F) (mg/L)	0.159	0.162	0.440	0.282	0.104
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0281
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0032	0.0033	0.0099	0.0042	0.0020
	Phosphorus (P)-Total (mg/L)	0.0053	0.0038	0.0853	0.0044	<0.0020
	Sulfate (SO4) (mg/L)	13.6	14.9	91.8	7.55	1.16
	Sulphide as S (mg/L)	<0.018	<0.018	1.21	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	5.68	4.37	8.48	9.91	2.06
	Total Organic Carbon (mg/L)	6.07	5.04	9.26	10.7	2.37
Total Metals	Aluminum (Al)-Total (ug/L)	28.4	21.7	10.0	9.3	<3.0
	Antimony (Sb)-Total (ug/L)	<0.10	<0.10	0.37	0.79	<0.10
	Arsenic (As)-Total (ug/L)	0.89	0.20	26.7	12.5	0.16
	Barium (Ba)-Total (ug/L)	10.8	10.9	20.8	21.9	3.58
	Beryllium (Be)-Total (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Total (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Boron (B)-Total (ug/L)	11	11	50	31	<10
	Cadmium (Cd)-Total (ug/L)	0.0061	<0.0050	<0.0050	<0.0050	<0.0050
	Calcium (Ca)-Total (ug/L)	18600	16000	47900	26300	4840
	Cesium (Cs)-Total (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chromium (Cr)-Total (ug/L)	0.18	0.17	0.20	0.13	<0.10
	Cobalt (Co)-Total (ug/L)	<0.10	<0.10	1.44	0.11	<0.10
	Copper (Cu)-Total (ug/L)	2.69	0.81	<0.50	14.8	0.73
	Iron (Fe)-Iotal (ug/L)	28	21	1240	38	<10
	Lead (Pb)-Total (ug/L)	0.097	<0.050	0.126	<0.050	<0.050
	Lithium (Li)- I otal (ug/L)	2.1	2.3	5.4	2.3	<1.0
	Magnesium (Mg)-Total (ug/L)	6700	6710	8990	9260	1990

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-11 WATER 29-AUG-18 11:00 R-2	L2156175-12 WATER 29-AUG-18 11:00 R-3	L2156175-13 WATER 28-AUG-18 11:00 CL-8	L2156175-14 WATER 29-AUG-18 11:00 T-DUP-1	L2156175-15 WATER 28-AUG-18 11:00 CL-DUP-1
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	148	75.3	44.9	186	44.5
	Hardness (as CaCO3) (mg/L)	нтс 70.0	37.8	нтс 21.2	75.4	21.1
	рН (рН)	7.97	7.69	7.46	7.93	7.50
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	90	63	33	126	30
	Turbidity (NTU)	0.52	0.57	0.19	1.25	0.21
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	58.0	36.8	22.8	59.2	21.2
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	0.0051	0.0053
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	2.35	0.54	<0.50	9.98	<0.50
	Fluoride (F) (mg/L)	0.156	0.140	0.106	0.687	0.106
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.0300	<0.0050	0.0281
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0027	0.0044	0.0021	0.0052	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0297	0.0090	<0.0020	0.0204	<0.0020
	Sulfate (SO4) (mg/L)	14.6	2.47	1.19	15.4	1.20
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	<0.018
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	4.41	7.70	1.96	11.5	2.11
	Total Organic Carbon (mg/L)	4.80	8.46	2.27	12.6	2.37
Total Metals	Aluminum (Al)-Total (ug/L)	19.4	9.2	<3.0	56.9	3.4
	Antimony (Sb)-Total (ug/L)	<0.10	<0.10	<0.10	1.22	<0.10
	Arsenic (As)-Total (ug/L)	0.22	0.68	0.17	60.1	0.18
	Barium (Ba)-Total (ug/L)	11.7	5.92	3.73	16.9	3.93
	Beryllium (Be)-Total (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Total (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Boron (B)-Total (ug/L)	13	13	<10	27	<10
	Cadmium (Cd)-Total (ug/L)	<0.0050	<0.0050	<0.0050	0.0106	<0.0050
	Calcium (Ca)-Total (ug/L)	16200	9810	5020	23500	5060
	Cesium (Cs)-Total (ug/L)	<0.010	<0.010	<0.010	0.031	<0.010
	Chromium (Cr)-Total (ug/L)	<0.10	<0.10	<0.10	0.13	<0.10
	Cobalt (Co)-Total (ug/L)	<0.10	<0.10	<0.10	0.15	<0.10
	Copper (Cu)-Total (ug/L)	0.96	1.41	0.80	8.96	0.84
	Iron (Fe)-Total (ug/L)	18	17	<10	61	<10
	Lead (Pb)-Total (ug/L)	<0.050	<0.050	<0.050	0.101	<0.050
	Lithium (Li)-Total (ug/L)	2.4	1.1	<1.0	7.5	<1.0
	Magnesium (Mg)-Total (ug/L)	7160	2880	2090	4470	2180

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-16 WATER 29-AUG-18 11:00 SB-FIELD BLANK	L2156175-17 WATER 28-AUG-18 11:00 CL-FIELD BLANK	L2156175-18 WATER 28-AUG-18 11:00 SM-1	L2156175-19 WATER 28-AUG-18 11:00 SM-6	L2156175-22 WATER 28-AUG-18 11:00 NO-6 RERUN
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	<2.0	<2.0	109	109	
	Hardness (as CaCO3) (mg/L)	<0.50	<0.50	52.0	нтс 51.0	нтс 77.3
	рН (рН)	5.44	5.38	7.76	7.75	
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	
	Total Dissolved Solids (mg/L)	<10	<10	80	73	
	Turbidity (NTU)	<0.10	<0.10	0.63	0.83	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	<1.0	<1.0	42.4	42.9	
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0084	0.0051	
	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)	<0.020	<0.020	0.274	0.273	
	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	<0.0020	0.0030	0.0029	
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	0.0063	0.0041	
	Sulfate (SO4) (mg/L)	<0.30	<0.30	14.1	13.1	
	Sulphide as S (mg/L)	<0.018	<0.018	<0.018	<0.018	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50	<0.50	6.29	6.51	
	Total Organic Carbon (mg/L)	<0.50	<0.50	6.76	6.83	
Total Metals	Aluminum (Al)-Total (ug/L)	<3.0	<3.0	19.0	13.8	32.7
	Antimony (Sb)-Total (ug/L)	<0.10	<0.10	0.10	0.10	<0.10
	Arsenic (As)-Total (ug/L)	<0.10	<0.10	0.56	0.49	0.94
	Barium (Ba)-Total (ug/L)	<0.10	<0.10	7.33	7.00	11.4
	Beryllium (Be)-Total (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (BI)-Total (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Boron (B)-rotal (ug/L)	<10	<10	12	13	10
	Calcium (Co) Total (ug/L)	<0.0050	<0.0050	0.107	0.0323	0.0073
	Calcium (Ca) Total (ug/L)	<50	<50	14000	13800	19100
	Chromium (Cr) Total (ug/L)	<0.010	<0.010	<0.010	<0.010	
	Coholt (Co) Total ( $ug(L)$	<0.10	<0.10	<0.10	<0.10	0.16
		<0.10	<0.10	0.13	<0.10	<0.10
		<0.50	<0.50	2.05	1.82	2.78
		<10	<10	36	24	29
		<0.050	<0.050	0.616	<0.050	0.094
	Magnesium (Mg) Total (ug/L)	<1.0	<1.0	1.3	1.3	2.1
	waynesium (wy)-rotal (uy/L)	<100	<100	4240	4040	7210

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-23 WATER 28-AUG-18 11:00 NO-6 GENERAL		
Grouping	Analyte			
WATER				
Physical Tests	Conductivity (uS/cm)			
	Hardness (as CaCO3) (mg/L)			
	рН (рН)			
	Total Suspended Solids (mg/L)			
	Total Dissolved Solids (mg/L)			
	Turbidity (NTU)			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)			
	Ammonia, Total (as N) (mg/L)			
	Bromide (Br) (mg/L)			
	Chloride (Cl) (mg/L)			
	Fluoride (F) (mg/L)			
	Nitrate (as N) (mg/L)			
	Nitrite (as N) (mg/L)			
	Phosphorus (P)-Total Dissolved (mg/L)			
	Phosphorus (P)-Total (mg/L)			
	Sulfate (SO4) (mg/L)			
	Sulphide as S (mg/L)			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)			
	Total Organic Carbon (mg/L)			
Total Metals	Aluminum (Al)-Total (ug/L)	26.6		
	Antimony (Sb)-Total (ug/L)	<0.10		
	Arsenic (As)-Total (ug/L)	0.87		
	Barium (Ba)-Total (ug/L)	11.0		
	Beryllium (Be)-Total (ug/L)	<0.020		
	Bismuth (Bi)-Total (ug/L)	<0.050		
	Boron (B)-Total (ug/L)	11		
	Cadmium (Cd)-Total (ug/L)	0.0069		
	Calcium (Ca)-Total (ug/L)	18500		
	Cesium (Cs)-Total (ug/L)			
	Chromium (Cr)-Total (ug/L)	<0.10		
	Cobalt (Co)-Total (ug/L)	<0.10		
	Copper (Cu)-Total (ug/L)	2.43		
	Iron (Fe)-Total (ug/L)	24		
	Lead (Pb)-Total (ug/L)	0.074		
	Lithium (Li)-Total (ug/L)	2.4		
	Magnesium (Mg)-Total (ug/L)	6720		

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-1 WATER 29-AUG-18 11:00 T-8-A	L2156175-2 WATER 29-AUG-18 11:00 T-8-B	L2156175-3 WATER 29-AUG-18 11:00 T-8-C	L2156175-4 WATER 29-AUG-18 11:00 T-10	L2156175-5 WATER 28-AUG-18 11:00 NO-7
Grouping	Analyte					
WATER						
Total Metals	Manganese (Mn)-Total (ug/L)	2.98	3.25	9.36	1.19	7.28
	Mercury (Hg)-Total (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Molybdenum (Mo)-Total (ug/L)	2.38	2.43	2.82	0.280	0.594
	Nickel (Ni)-Total (ug/L)	3.93	3.88	4.44	<0.50	0.84
	Phosphorus (P)-Total (ug/L)	<50	<50	<50	<50	<50
	Potassium (K)-Total (ug/L)	1860	1860	2240	980	530
	Selenium (Se)-Total (ug/L)	<0.050	<0.050	<0.050	<0.050	0.063
	Silicon (Si)-Total (ug/L)	940	930	1330	810	870
	Silver (Ag)-Total (ug/L)	0.014	0.014	0.020	<0.010	<0.010
	Sodium (Na)-Total (ug/L)	7080	6960	8810	2530	1540
	Strontium (Sr)-Total (ug/L)	70.5	71.5	91.4	55.7	26.2
	Sulfur (S)-Total (ug/L)	5290	5170	6100	4810	2740
	Thallium (TI)-Total (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Tin (Sn)-Total (ug/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Titanium (Ti)-Total (ug/L)	1.67	1.61	0.73	0.62	0.59
	Uranium (U)-Total (ug/L)	2.19	2.16	2.70	0.528	0.189
	Vanadium (V)-Total (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Zinc (Zn)-Total (ug/L)	3.9	3.4	4.4	<3.0	<3.0
	Zirconium (Zr)-Total (ug/L)	0.31	<0.30	<0.30	<0.30	<0.30
Dissolved Metals	Dissolved Mercury Filtration Location	LAB	LAB	LAB	LAB	LAB
	Dissolved Metals Filtration Location	LAB	LAB	LAB	LAB	LAB
	Aluminum (Al)-Dissolved (ug/L)	20.3	19.0	7.1	4.6	18.7
	Antimony (Sb)-Dissolved (ug/L)	1.11	1.10	1.17	<0.10	0.11
	Arsenic (As)-Dissolved (ug/L)	50.1	50.1	78.6	0.28	4.73
	Barium (Ba)-Dissolved (ug/L)	16.1	16.3	17.9	11.4	6.55
	Beryllium (Be)-Dissolved (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Dissolved (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Boron (B)-Dissolved (ug/L)	23	23	28	11	<10
	Cadmium (Cd)-Dissolved (ug/L)	0.0066	0.0058	0.0072	<0.0050	<0.0050
	Calcium (Ca)-Dissolved (ug/L)	23000	24100	27600	16900	20700
	Cesium (Cs)-Dissolved (ug/L)	0.025	0.025	0.037	<0.010	<0.010
	Chromium (Cr)-Dissolved (ug/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cobalt (Co)-Dissolved (ug/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Copper (Cu)-Dissolved (ug/L)	7.35	7.46	7.64	0.73	2.70
	Iron (Fe)-Dissolved (ug/L)	20	21	<10	<10	45
	Lead (Pb)-Dissolved (ug/L)	<0.050	<0.050	<0.050	<0.050	0.138
	Lithium (Li)-Dissolved (ug/L)	6.8	7.2	8.6	2.4	1.2

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-6 WATER 28-AUG-18 11:00 NO-6	L2156175-7 WATER 28-AUG-18 11:00 NX-12	L2156175-8 WATER 28-AUG-18 11:00 NX-3	L2156175-9 WATER 28-AUG-18 11:00 CL-3	L2156175-10 WATER 28-AUG-18 11:00 CL-26
Grouping	Analyte					
WATER						
Total Metals	Manganese (Mn)-Total (ug/L)	2.05	0.97	98.0	47.8	0.68
	Mercury (Hg)-Total (ug/L)	<0.0050	<0.0050	<0.0050	0.0073	<0.0050
	Molybdenum (Mo)-Total (ug/L)	0.314	0.266	4.89	0.486	0.159
	Nickel (Ni)-Total (ug/L)	0.55	<0.50	1.14	1.34	<0.50
	Phosphorus (P)-Total (ug/L)	<50	<50	<50	<50	<50
	Potassium (K)-Total (ug/L)	960	970	1210	1170	480
	Selenium (Se)-Total (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Silicon (Si)-Total (ug/L)	930	780	3640	2230	290
	Silver (Ag)-Total (ug/L)	<0.010	<0.010	<0.010	0.080	<0.010
	Sodium (Na)-Total (ug/L)	2550	2510	10800	4170	942
	Strontium (Sr)-Total (ug/L)	54.4	56.9	144	66.5	10.8
	Sulfur (S)-Total (ug/L)	4610	5020	26600	2510	<500
	Thallium (TI)-Total (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Tin (Sn)-Total (ug/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Titanium (Ti)-Total (ug/L)	0.88	0.66	<0.90	<0.30	<0.30
	Uranium (U)-Total (ug/L)	0.520	0.542	0.296	47.7	0.169
	Vanadium (V)-Total (ug/L)	<0.50	<0.50	0.68	<0.50	<0.50
	Zinc (Zn)-Total (ug/L)	4.0	<3.0	4.1	<3.0	<3.0
	Zirconium (Zr)-Total (ug/L)	<0.30	<0.30	<0.30	<0.30	<0.30
Dissolved Metals	Dissolved Mercury Filtration Location	LAB	LAB	LAB	LAB	LAB
	Dissolved Metals Filtration Location	LAB	LAB	LAB	LAB	LAB
	Aluminum (Al)-Dissolved (ug/L)	5.9	4.4	8.4	7.6	<1.0
	Antimony (Sb)-Dissolved (ug/L)	<0.10	<0.10	0.36	0.71	<0.10
	Arsenic (As)-Dissolved (ug/L)	0.84	0.17	25.1	12.4	0.13
	Barium (Ba)-Dissolved (ug/L)	11.5	11.3	21.8	22.6	3.68
	Beryllium (Be)-Dissolved (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Dissolved (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Boron (B)-Dissolved (ug/L)	<10	11	47	29	<10
	Cadmium (Cd)-Dissolved (ug/L)	0.0053	<0.0050	<0.0050	<0.0050	<0.0050
	Calcium (Ca)-Dissolved (ug/L)	19400	16000	49600	27000	4930
	Cesium (Cs)-Dissolved (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chromium (Cr)-Dissolved (ug/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cobalt (Co)-Dissolved (ug/L)	<0.10	<0.10	1.35	<0.10	<0.10
	Copper (Cu)-Dissolved (ug/L)	2.45	0.65	<0.20	13.7	0.55
	Iron (Fe)-Dissolved (ug/L)	<10	<10	921	23	<10
	Lead (Pb)-Dissolved (ug/L)	<0.050	<0.050	0.093	<0.050	<0.050
	Lithium (Li)-Dissolved (ug/L)	2.1	2.3	5.5	2.3	<1.0

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-11 WATER 29-AUG-18 11:00 R-2	L2156175-12 WATER 29-AUG-18 11:00 R-3	L2156175-13 WATER 28-AUG-18 11:00 CL-8	L2156175-14 WATER 29-AUG-18 11:00 T-DUP-1	L2156175-15 WATER 28-AUG-18 11:00 CL-DUP-1
Grouping	Analyte					
WATER						
Total Metals	Manganese (Mn)-Total (ug/L)	0.94	0.85	0.72	3.20	0.74
	Mercury (Hg)-Total (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Molybdenum (Mo)-Total (ug/L)	0.261	0.229	0.169	2.47	0.177
	Nickel (Ni)-Total (ug/L)	<0.50	<0.50	<0.50	4.07	<0.50
	Phosphorus (P)-Total (ug/L)	<50	<50	<50	<50	<50
	Potassium (K)-Total (ug/L)	1030	710	490	1840	510
	Selenium (Se)-Total (ug/L)	<0.050	0.065	<0.050	0.068	<0.050
	Silicon (Si)-Total (ug/L)	880	1010	300	1000	320
	Silver (Ag)-Total (ug/L)	<0.010	<0.010	<0.010	0.019	<0.010
	Sodium (Na)-Total (ug/L)	2680	1720	936	7130	985
	Strontium (Sr)-Total (ug/L)	59.6	21.5	11.1	72.9	10.9
	Sulfur (S)-Total (ug/L)	5180	980	<500	5220	500
	Thallium (TI)-Total (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Tin (Sn)-Total (ug/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Titanium (Ti)-Total (ug/L)	0.58	<0.30	<0.30	1.56	<0.30
	Uranium (U)-Total (ug/L)	0.561	0.173	0.176	2.20	0.183
	Vanadium (V)-Total (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Zinc (Zn)-Total (ug/L)	<3.0	<3.0	<3.0	3.4	<3.0
	Zirconium (Zr)-Total (ug/L)	<0.30	<0.30	<0.30	<0.30	<0.30
Dissolved Metals	Dissolved Mercury Filtration Location		LAB		LAB	LAB
	Dissolved Metals Filtration Location		LAB		LAB	LAB
	Aluminum (Al)-Dissolved (ug/L)		4.4		19.2	<1.0
	Antimony (Sb)-Dissolved (ug/L)		<0.10		1.11	<0.10
	Arsenic (As)-Dissolved (ug/L)		0.62		49.4	0.16
	Barium (Ba)-Dissolved (ug/L)		5.86		15.5	3.64
	Beryllium (Be)-Dissolved (ug/L)		<0.020		<0.020	<0.020
	Bismuth (Bi)-Dissolved (ug/L)		<0.050		<0.050	<0.050
	Boron (B)-Dissolved (ug/L)		<10		23	<10
	Cadmium (Cd)-Dissolved (ug/L)		<0.0050		0.0073	<0.0050
	Calcium (Ca)-Dissolved (ug/L)		10000		22800	4840
	Cesium (Cs)-Dissolved (ug/L)		<0.010		0.025	<0.010
	Chromium (Cr)-Dissolved (ug/L)		<0.10		<0.10	<0.10
	Cobalt (Co)-Dissolved (ug/L)		<0.10		<0.10	<0.10
	Copper (Cu)-Dissolved (ug/L)		1.06		7.40	0.55
	Iron (Fe)-Dissolved (ug/L)		<10		19	<10
	Lead (Pb)-Dissolved (ug/L)		<0.050		<0.050	<0.050
	Lithium (Li)-Dissolved (ug/L)		1.1		6.9	<1.0

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-16 WATER 29-AUG-18 11:00 SB-FIELD BLANK	L2156175-17 WATER 28-AUG-18 11:00 CL-FIELD BLANK	L2156175-18 WATER 28-AUG-18 11:00 SM-1	L2156175-19 WATER 28-AUG-18 11:00 SM-6	L2156175-22 WATER 28-AUG-18 11:00 NO-6 RERUN
Grouping	Analyte					
WATER						
Total Metals	Manganese (Mn)-Total (ug/L)	<0.10	<0.10	18.7	14.1	2.15
	Mercury (Hg)-Total (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Molybdenum (Mo)-Total (ug/L)	<0.050	<0.050	1.07	1.06	0.344
	Nickel (Ni)-Total (ug/L)	<0.50	<0.50	<0.50	<0.50	0.60
	Phosphorus (P)-Total (ug/L)	<50	<50	<50	<50	<50
	Potassium (K)-Total (ug/L)	<100	<100	720	690	920
	Selenium (Se)-Total (ug/L)	<0.050	<0.050	0.098	0.078	<0.050
	Silicon (Si)-Total (ug/L)	<100	<100	620	590	1030
	Silver (Ag)-Total (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Sodium (Na)-Total (ug/L)	<50	<50	2700	2590	2400
	Strontium (Sr)-Total (ug/L)	<0.20	<0.20	28.1	27.2	54.4
	Sulfur (S)-Total (ug/L)	<500	<500	5150	4610	4650
	Thallium (TI)-Total (ug/L)	<0.010	<0.010	<0.010	<0.010	0.011
	Tin (Sn)-Total (ug/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Titanium (Ti)-Total (ug/L)	<0.30	<0.30	0.46	0.34	0.95
	Uranium (U)-Total (ug/L)	<0.010	<0.010	0.325	0.305	0.461
	Vanadium (V)-Total (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Zinc (Zn)-Total (ug/L)	<3.0	<3.0	55.3	20.7	4.0
	Zirconium (Zr)-Total (ug/L)	<0.30	<0.30	<0.30	<0.30	<0.30
Dissolved Metals	Dissolved Mercury Filtration Location	LAB	LAB	LAB		
	Dissolved Metals Filtration Location	LAB	LAB	LAB		
	Aluminum (Al)-Dissolved (ug/L)	<1.0	<1.0	5.8		
	Antimony (Sb)-Dissolved (ug/L)	<0.10	<0.10	<0.10		
	Arsenic (As)-Dissolved (ug/L)	<0.10	<0.10	0.46		
	Barium (Ba)-Dissolved (ug/L)	<0.10	<0.10	6.68		
	Beryllium (Be)-Dissolved (ug/L)	<0.020	<0.020	<0.020		
	Bismuth (Bi)-Dissolved (ug/L)	<0.050	<0.050	<0.050		
	Boron (B)-Dissolved (ug/L)	<10	<10	10		
	Cadmium (Cd)-Dissolved (ug/L)	<0.0050	<0.0050	0.0687		
	Calcium (Ca)-Dissolved (ug/L)	<50	<50	13800		
	Cesium (Cs)-Dissolved (ug/L)	<0.010	<0.010	<0.010		
	Chromium (Cr)-Dissolved (ug/L)	<0.10	<0.10	<0.10		
	Cobalt (Co)-Dissolved (ug/L)	<0.10	<0.10	<0.10		
	Copper (Cu)-Dissolved (ug/L)	<0.20	<0.20	1.53		
	Iron (Fe)-Dissolved (ug/L)	<10	<10	<10		
	Lead (Pb)-Dissolved (ug/L)	<0.050	<0.050	<0.050		
	Lithium (Li)-Dissolved (ug/L)	<1.0	<1.0	1.2		

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-23 WATER 28-AUG-18 11:00 NO-6 GENERAL			
Grouping	Analyte				
WATER					
Total Metals	Manganese (Mn)-Total (ug/L)	1.60			ĺ
	Mercury (Hg)-Total (ug/L)				ĺ
	Molybdenum (Mo)-Total (ug/L)	0.367			ĺ
	Nickel (Ni)-Total (ug/L)	0.51			ĺ
	Phosphorus (P)-Total (ug/L)	<50			ĺ
	Potassium (K)-Total (ug/L)	950			ĺ
	Selenium (Se)-Total (ug/L)	<0.050			ĺ
	Silicon (Si)-Total (ug/L)	950			ĺ
	Silver (Ag)-Total (ug/L)	<0.010			
	Sodium (Na)-Total (ug/L)	2340			ĺ
	Strontium (Sr)-Total (ug/L)	59.3			ĺ
	Sulfur (S)-Total (ug/L)	4800			ĺ
	Thallium (TI)-Total (ug/L)	<0.010			ĺ
	Tin (Sn)-Total (ug/L)	<0.10			ĺ
	Titanium (Ti)-Total (ug/L)	DLM <0.90			ĺ
	Uranium (U)-Total (ug/L)	0.476			ĺ
	Vanadium (V)-Total (ug/L)	<0.50			ĺ
	Zinc (Zn)-Total (ug/L)	4.8			ĺ
	Zirconium (Zr)-Total (ug/L)	<0.30			ĺ
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location				ĺ
	Dissolved Metals Filtration Location	LAB			ĺ
	Aluminum (Al)-Dissolved (ug/L)	4.7			ĺ
	Antimony (Sb)-Dissolved (ug/L)	<0.10			ĺ
	Arsenic (As)-Dissolved (ug/L)	0.88			ĺ
	Barium (Ba)-Dissolved (ug/L)	11.3			ĺ
	Beryllium (Be)-Dissolved (ug/L)	<0.020			ĺ
	Bismuth (Bi)-Dissolved (ug/L)	<0.050			ĺ
	Boron (B)-Dissolved (ug/L)	11			ĺ
	Cadmium (Cd)-Dissolved (ug/L)	<0.0050			ĺ
	Calcium (Ca)-Dissolved (ug/L)	21100			ĺ
	Cesium (Cs)-Dissolved (ug/L)				
	Chromium (Cr)-Dissolved (ug/L)	<0.10			
	Cobalt (Co)-Dissolved (ug/L)	<0.10			
	Copper (Cu)-Dissolved (ug/L)	2.54			
	Iron (Fe)-Dissolved (ug/L)	<10			
	Lead (Pb)-Dissolved (ug/L)	<0.050			
	Lithium (Li)-Dissolved (ug/L)	2.4			
		1		1	1

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-1 WATER 29-AUG-18 11:00 T-8-A	L2156175-2 WATER 29-AUG-18 11:00 T-8-B	L2156175-3 WATER 29-AUG-18 11:00 T-8-C	L2156175-4 WATER 29-AUG-18 11:00 T-10	L2156175-5 WATER 28-AUG-18 11:00 NO-7
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (ug/L)	4660	4660	5210	7180	4880
	Manganese (Mn)-Dissolved (ug/L)	0.26	0.27	1.33	<0.10	3.59
	Mercury (Hg)-Dissolved (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Molybdenum (Mo)-Dissolved (ug/L)	2.42	2.44	2.77	0.287	0.565
	Nickel (Ni)-Dissolved (ug/L)	3.68	3.85	4.29	<0.50	0.76
	Phosphorus (P)-Dissolved (ug/L)	<50	<50	<50	<50	<50
	Potassium (K)-Dissolved (ug/L)	2090	2130	2510	1070	570
	Selenium (Se)-Dissolved (ug/L)	<0.050	0.054	<0.050	<0.050	0.051
	Silicon (Si)-Dissolved (ug/L)	904	930	1410	821	949
	Silver (Ag)-Dissolved (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Sodium (Na)-Dissolved (ug/L)	6980	7130	8610	2610	1490
	Strontium (Sr)-Dissolved (ug/L)	76.0	76.7	91.1	60.7	28.1
	Sulfur (S)-Dissolved (ug/L)	5190	4970	6120	4660	3000
	Thallium (TI)-Dissolved (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Tin (Sn)-Dissolved (ug/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Titanium (Ti)-Dissolved (ug/L)	<0.30	<0.30	<0.30	<0.30	0.33
	Uranium (U)-Dissolved (ug/L)	2.13	2.19	2.66	0.550	0.184
	Vanadium (V)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Zinc (Zn)-Dissolved (ug/L)	3.3	2.8	3.8	<1.0	1.7
	Zirconium (Zr)-Dissolved (ug/L)	<0.30	<0.30	<0.30	<0.30	<0.30
Aggregate Organics	Oil and Grease (mg/L)	<5.0	<5.0	<5.0	<5.0	
	Oil And Grease (Visible Sheen)	no	no	no	no	
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Toluene (mg/L)	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
	ortho-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Xylenes (mg/L)	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
	F1 (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Surrogate: 4-Bromofluorobenzene (SS) (%)	99.1	102.4	100.7	98.3	102.5
	Surrogate: 1,4-Difluorobenzene (SS) (%)	100.7	101.2	99.5	93.7	98.1
Hydrocarbons	F1-BTEX (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	F2 (C10-C16) (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	F3 (C16-C34) (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-6 WATER 28-AUG-18 11:00 NO-6	L2156175-7 WATER 28-AUG-18 11:00 NX-12	L2156175-8 WATER 28-AUG-18 11:00 NX-3	L2156175-9 WATER 28-AUG-18 11:00 CL-3	L2156175-10 WATER 28-AUG-18 11:00 CL-26
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (ug/L)	7210	7190	9450	9940	2230
	Manganese (Mn)-Dissolved (ug/L)	0.95	<0.10	110	43.5	<0.10
	Mercury (Hg)-Dissolved (ug/L)	<0.0050	<0.0050	<0.0050	0.0054	<0.0050
	Molybdenum (Mo)-Dissolved (ug/L)	0.328	0.258	4.74	0.477	0.175
	Nickel (Ni)-Dissolved (ug/L)	<0.50	<0.50	1.03	1.23	<0.50
	Phosphorus (P)-Dissolved (ug/L)	<50	<50	<50	<50	<50
	Potassium (K)-Dissolved (ug/L)	1040	1040	1310	1220	500
	Selenium (Se)-Dissolved (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Silicon (Si)-Dissolved (ug/L)	957	837	3900	2410	274
	Silver (Ag)-Dissolved (ug/L)	<0.010	<0.010	<0.010	0.034	<0.010
	Sodium (Na)-Dissolved (ug/L)	2550	2480	11000	4100	939
	Strontium (Sr)-Dissolved (ug/L)	60.0	61.6	151	70.8	11.2
	Sulfur (S)-Dissolved (ug/L)	4440	5030	26300	2530	<500
	Thallium (TI)-Dissolved (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Tin (Sn)-Dissolved (ug/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Titanium (Ti)-Dissolved (ug/L)	<0.30	<0.30	0.57	<0.30	<0.30
	Uranium (U)-Dissolved (ug/L)	0.509	0.565	0.262	48.6	0.164
	Vanadium (V)-Dissolved (ug/L)	<0.50	<0.50	0.53	<0.50	<0.50
	Zinc (Zn)-Dissolved (ug/L)	3.9	<1.0	3.5	<1.0	<1.0
	Zirconium (Zr)-Dissolved (ug/L)	<0.30	<0.30	<0.30	<0.30	<0.30
Aggregate Organics	Oil and Grease (mg/L)					
	Oil And Grease (Visible Sheen)					
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Toluene (mg/L)	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
	ortho-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Xylenes (mg/L)	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
	F1 (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Surrogate: 4-Bromofluorobenzene (SS) (%)	101.0	100.5	102.0	103.2	103.6
	Surrogate: 1,4-Difluorobenzene (SS) (%)	97.1	100.7	99.5	95.8	100.0
Hydrocarbons	F1-BTEX (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	F2 (C10-C16) (mg/L)	<0.30	<0.30	1.16	<0.30	<0.30
	F3 (C16-C34) (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-11 WATER 29-AUG-18 11:00 R-2	L2156175-12 WATER 29-AUG-18 11:00 R-3	L2156175-13 WATER 28-AUG-18 11:00 CL-8	L2156175-14 WATER 29-AUG-18 11:00 T-DUP-1	L2156175-15 WATER 28-AUG-18 11:00 CL-DUP-1
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (ug/L)		3120		4490	2190
	Manganese (Mn)-Dissolved (ug/L)		<0.10		0.26	<0.10
	Mercury (Hg)-Dissolved (ug/L)		<0.0050		<0.0050	<0.0050
	Molybdenum (Mo)-Dissolved (ug/L)		0.220		2.40	0.168
	Nickel (Ni)-Dissolved (ug/L)		<0.50		3.74	<0.50
	Phosphorus (P)-Dissolved (ug/L)		<50		<50	<50
	Potassium (K)-Dissolved (ug/L)		750		2080	510
	Selenium (Se)-Dissolved (ug/L)		<0.050		<0.050	<0.050
	Silicon (Si)-Dissolved (ug/L)		980		914	276
	Silver (Ag)-Dissolved (ug/L)		<0.010		<0.010	<0.010
	Sodium (Na)-Dissolved (ug/L)		1660		6890	954
	Strontium (Sr)-Dissolved (ug/L)		22.8		73.3	11.1
	Sulfur (S)-Dissolved (ug/L)		740		5210	<500
	Thallium (TI)-Dissolved (ug/L)		<0.010		<0.010	<0.010
	Tin (Sn)-Dissolved (ug/L)		<0.10		<0.10	<0.10
	Titanium (Ti)-Dissolved (ug/L)		<0.30		<0.30	<0.30
	Uranium (U)-Dissolved (ug/L)		0.165		2.15	0.160
	Vanadium (V)-Dissolved (ug/L)		<0.50		<0.50	<0.50
	Zinc (Zn)-Dissolved (ug/L)		<1.0		2.5	<1.0
	Zirconium (Zr)-Dissolved (ug/L)		<0.30		<0.30	<0.30
Aggregate Organics	Oil and Grease (mg/L)				<5.0	
	Oil And Grease (Visible Sheen)				no	
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) (%)				102.6	100.8
	Surrogate: 1,4-Difluorobenzene (SS) (%)				100.4	100.3
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

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-16 WATER 29-AUG-18 11:00 SB-FIELD BLANK	L2156175-17 WATER 28-AUG-18 11:00 CL-FIELD BLANK	L2156175-18 WATER 28-AUG-18 11:00 SM-1	L2156175-19 WATER 28-AUG-18 11:00 SM-6	L2156175-22 WATER 28-AUG-18 11:00 NO-6 RERUN
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (ug/L)	<100	<100	4290		
	Manganese (Mn)-Dissolved (ug/L)	<0.10	<0.10	1.02		
	Mercury (Hg)-Dissolved (ug/L)	<0.0050	<0.0050	<0.0050		
	Molybdenum (Mo)-Dissolved (ug/L)	<0.050	<0.050	1.05		
	Nickel (Ni)-Dissolved (ug/L)	<0.50	<0.50	<0.50		
	Phosphorus (P)-Dissolved (ug/L)	<50	<50	<50		
	Potassium (K)-Dissolved (ug/L)	<100	<100	720		
	Selenium (Se)-Dissolved (ug/L)	<0.050	<0.050	0.052		
	Silicon (Si)-Dissolved (ug/L)	<50	<50	590		
	Silver (Ag)-Dissolved (ug/L)	<0.010	<0.010	<0.010		
	Sodium (Na)-Dissolved (ug/L)	<50	<50	2620		
	Strontium (Sr)-Dissolved (ug/L)	<0.20	<0.20	27.7		
	Sulfur (S)-Dissolved (ug/L)	<500	<500	4840		
	Thallium (TI)-Dissolved (ug/L)	<0.010	<0.010	<0.010		
	Tin (Sn)-Dissolved (ug/L)	<0.10	<0.10	<0.10		
	Titanium (Ti)-Dissolved (ug/L)	<0.30	<0.30	<0.30		
	Uranium (U)-Dissolved (ug/L)	<0.010	<0.010	0.297		
	Vanadium (V)-Dissolved (ug/L)	<0.50	<0.50	<0.50		
	Zinc (Zn)-Dissolved (ug/L)	<1.0	<1.0	50.9		
	Zirconium (Zr)-Dissolved (ug/L)	<0.30	<0.30	<0.30		
Aggregate Organics	Oil and Grease (mg/L)	<5.0				
	Oil And Grease (Visible Sheen)	no				
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) (%)	101.8	97.9			
	Surrogate: 1,4-Difluorobenzene (SS) (%)	99.3	99.5			
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			

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-23 WATER 28-AUG-18 11:00 NO-6 GENERAL		
Grouping	Analyte			
WATER				
Dissolved Metals	Magnesium (Mg)-Dissolved (ug/L)	7390		
	Manganese (Mn)-Dissolved (ug/L)	0.34		
	Mercury (Hg)-Dissolved (ug/L)			
	Molybdenum (Mo)-Dissolved (ug/L)	0.380		
	Nickel (Ni)-Dissolved (ug/L)	<0.50		
	Phosphorus (P)-Dissolved (ug/L)	<50		
	Potassium (K)-Dissolved (ug/L)	1100		
	Selenium (Se)-Dissolved (ug/L)	<0.050		
	Silicon (Si)-Dissolved (ug/L)	931		
	Silver (Ag)-Dissolved (ug/L)	<0.010		
	Sodium (Na)-Dissolved (ug/L)	2830		
	Strontium (Sr)-Dissolved (ug/L)	58.6		
	Sulfur (S)-Dissolved (ug/L)	4090		
	Thallium (TI)-Dissolved (ug/L)	<0.010		
	Tin (Sn)-Dissolved (ug/L)	<0.10		
	Titanium (Ti)-Dissolved (ug/L)	<0.30		
	Uranium (U)-Dissolved (ug/L)	0.507		
	Vanadium (V)-Dissolved (ug/L)	<0.50		
	Zinc (Zn)-Dissolved (ug/L)	4.0		
	Zirconium (Zr)-Dissolved (ug/L)	<0.30		
Aggregate Organics	Oil and Grease (mg/L)			
	Oil And Grease (Visible Sheen)			
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)			

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-1 WATER 29-AUG-18 11:00 T-8-A	L2156175-2 WATER 29-AUG-18 11:00 T-8-B	L2156175-3 WATER 29-AUG-18 11:00 T-8-C	L2156175-4 WATER 29-AUG-18 11:00 T-10	L2156175-5 WATER 28-AUG-18 11:00 NO-7
Grouping	Analyte					
WATER						
Hydrocarbons	F4 (C34-C50) (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Surrogate: 2-Bromobenzotrifluoride, F2-F4	98.0	90.8	95.5	93.2	93.1
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	76.8	92.6	87.2	78.5	99.5

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-6 WATER 28-AUG-18 11:00 NO-6	L2156175-7 WATER 28-AUG-18 11:00 NX-12	L2156175-8 WATER 28-AUG-18 11:00 NX-3	L2156175-9 WATER 28-AUG-18 11:00 CL-3	L2156175-10 WATER 28-AUG-18 11:00 CL-26
Grouping	Analyte					
WATER						
Hydrocarbons	F4 (C34-C50) (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Surrogate: 2-Bromobenzotrifluoride, F2-F4	95.9	85.0	102.6	92.2	95.4
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	112.1	109.2	96.1	100.7	108.6

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-11 WATER 29-AUG-18 11:00 R-2	L2156175-12 WATER 29-AUG-18 11:00 R-3	L2156175-13 WATER 28-AUG-18 11:00 CL-8	L2156175-14 WATER 29-AUG-18 11:00 T-DUP-1	L2156175-15 WATER 28-AUG-18 11:00 CL-DUP-1
Grouping	Analyte					
WATER						
Hydrocarbons	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
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)				91.2	95.4
	Surrogate: 3,4-Dichlorotoluene (SS) (%)				92.6	85.7

L2156175 CONTD.... PAGE 21 of 27 09-OCT-18 20:01 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-16 WATER 29-AUG-18 11:00 SB-FIELD BLANK	L2156175-17 WATER 28-AUG-18 11:00 CL-FIELD BLANK	L2156175-18 WATER 28-AUG-18 11:00 SM-1	L2156175-19 WATER 28-AUG-18 11:00 SM-6	L2156175-22 WATER 28-AUG-18 11:00 NO-6 RERUN
Grouping	Analyte					
WATER						
Hydrocarbons	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			
	Surrogate: 2-Bromobenzotrifluoride, F2-F4	87.7	92.2			
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	95.4	SURR- ND 65.6			

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	Sample ID Description Sampled Date Sampled Time Client ID	L2156175-23 WATER 28-AUG-18 11:00 NO-6 GENERAL		
Grouping	Analyte			
WATER				
Hydrocarbons	F4 (C34-C50) (mg/L)			
	Volatile Hydrocarbons (VH6-10) (mg/L)			
	VPH (C6-C10) (mg/L)			
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)			
	Surrogate: 3,4-Dichlorotoluene (SS) (%)			

#### **Reference Information**

Description

Qualifier

LPMB

#### **Qualifiers for Individual Samples Listed:**

Sample Number	Client Sample ID
L2156175-23	NO-6 GENERAL

Lab-Preserved for Total Metals. Sample received with pH > 2 and preserved at the lab. Total Metals results may be biased low.

#### **QC Samples with Qualifiers & Comments:**

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L2156175-17, -18, -19
Matrix Spike	Dissolved Organic Carbon	MS-B	L2156175-17, -18, -19
Matrix Spike	Dissolved Organic Carbon	MS-B	L2156175-1, -10, -11, -12, -13, -14, -15, -16, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L2156175-17, -18, -19
Matrix Spike	Total Organic Carbon	MS-B	L2156175-17, -18, -19
Matrix Spike	Total Organic Carbon	MS-B	L2156175-1, -10, -11, -12, -13, -14, -15, -16, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L2156175-1, -10, -12, -14, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2156175-23
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2156175-1, -10, -12, -14, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2156175-23
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2156175-1, -10, -12, -14, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2156175-23
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2156175-1, -10, -12, -14, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2156175-23
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2156175-1, -10, -12, -14, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2156175-23
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2156175-23
Matrix Spike	Antimony (Sb)-Total	MS-B	L2156175-23
Matrix Spike	Arsenic (As)-Total	MS-B	L2156175-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Arsenic (As)-Total	MS-B	L2156175-23
Matrix Spike	Barium (Ba)-Total	MS-B	L2156175-11, -12, -13, -14, -15, -16, -17, -18, -19
Matrix Spike	Barium (Ba)-Total	MS-B	L2156175-23
Matrix Spike	Boron (B)-Total	MS-B	L2156175-23
Matrix Spike	Calcium (Ca)-Total	MS-B	L2156175-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2156175-11, -12, -13, -14, -15, -16, -17, -18, -19
Matrix Spike	Calcium (Ca)-Total	MS-B	L2156175-23
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2156175-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2156175-11, -12, -13, -14, -15, -16, -17, -18, -19
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2156175-23
Matrix Spike	Manganese (Mn)-Total	MS-B	L2156175-11, -12, -13, -14, -15, -16, -17, -18, -19
Matrix Spike	Manganese (Mn)-Total	MS-B	L2156175-23
Matrix Spike	Potassium (K)-Total	MS-B	L2156175-23
Matrix Spike	Sodium (Na)-Total	MS-B	L2156175-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L2156175-11, -12, -13, -14, -15, -16, -17, -18, -19
Matrix Spike	Sodium (Na)-Total	MS-B	L2156175-23
Matrix Spike	Strontium (Sr)-Total	MS-B	L2156175-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2156175-11, -12, -13, -14, -15, -16, -17, -18, -19
Matrix Spike	Strontium (Sr)-Total	MS-B	L2156175-23
Matrix Spike	Sulfur (S)-Total	MS-B	L2156175-23
Matrix Spike	Phosphorus (P)-Total	MS-B	L2156175-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulphide as S	MS-B	L2156175-1, -11, -12, -14, -16, -2, -3, -4

**Qualifiers for Individual Parameters Listed:** 

#### **Reference Information**

Qualifier	Description	Description				
DLM	Detection L	imit Adjust	ed due to sample matrix effects (e.g. chemical interfere	nce, colour, turbidity).		
HTC	Hardness w	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).				
MS-B	Matrix Spike	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.				
RRV	Reported Result Verified By Repeat Analysis					
SURR-ND	Surrogate rounaffected.	ecovery ma	arginally exceeded ALS DQO. Reported non-detect res	ults for associated samples were deemed to be		
Fest Method F	References:					
ALS Test Code	)	Matrix	Test Description	Method Reference**		
ALK-TITR-VA		Water	Alkalinity Species by Titration	APHA 2320 Alkalinity		
This analysis pH 4.5 endpoi	is carried out u int. Bicarbonate	sing proce e, carbonat	dures adapted from APHA Method 2320 "Alkalinity". To te and hydroxide alkalinity are calculated from phenolph	tal alkalinity is determined by potentiometric titration to a thalein alkalinity and total alkalinity values.		
BE-D-L-CCMS	-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)		
Water sample	es are filtered (0	0.45 um), p	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 sample	es 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 anic	ons are analyze	ed by Ion C	hromatography with conductivity and/or UV detection.			
CARBONS-DO	C-VA	Water	Dissolved organic carbon by combustion	APHA 5310B		
This analysis determined by	is carried out u / filtering the sa	sing proce ample throu	dures adapted from APHA Method 5310 "Total Organic ugh a 0.45 micron membrane filter prior to analysis.	Carbon (TOC)". Dissolved carbon (DOC) fractions are		
CARBONS-TO	C-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)		
This analysis	is carried out u	sing proce	dures adapted from APHA Method 5310 "Total Organic	Carbon (TOC)".		
CL-IC-N-VA		Water	Chloride in Water by IC	EPA 300.1 (mod)		
Inorganic anic	ons are analyze	ed by Ion C	hromatography with conductivity and/or UV detection.			
EC-PCT-VA		Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.		
This analysis electrode.	is carried out u	sing proce	dures adapted from APHA Method 2510 "Conductivity".	Conductivity is determined using a conductivity		
EC-SCREEN-V	'A	Water	Conductivity Screen (Internal Use Only)	APHA 2510		
Qualitative an	alysis of condu	ctivity whe	re 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 anic	ons are analyze	ed by Ion C	hromatography with conductivity and/or UV detection.			
F1-BTX-CALC-	VA	Water	F1-Total BTX	CCME CWS PHC TIER 1 (2001)		
This analysis Council of Mir GC/FID. The I	is based on the histers of the Ei F1-BTEX result	e "Referenc nvironment t is calcula	ce Method for the Canada-Wide Standard for Petroleum t, December 2000." For F1 (C6-C10), the sample unde ted as follows:	Hydrocarbons in Soil - Tier 1 Method, Canadian rgoes a purge and trap extraction prior to analysis by		
F1-BTEX: F1	(C6-C10) minu	s 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 Council of Mir	is based on the histers of the Ei	e "Referend nvironment	ce Method for the Canada-Wide Standard for Petroleum t, December 2000." For F1 (C6-C10), the sample unde	h Hydrocarbons in Soil - Tier 1 Method, Canadian rgoes a headspace purge prior to analysis by GC/FID.		
F1 (C6-C10):	Sum of all hydi	rocarbons	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 extra Canada-Wide	cted from wate Standard for F	er using a h Petroleum H	exane micro-extraction technique. Instrumental analys Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001	is is by GC-FID, as per the Reference Method for the .		
HARDNESS-C	ALC-VA	Water	Hardness	APHA 2340B		
Hardness (als Dissolved Cal	o known as To cium and Magr	tal Hardne	ss) is calculated from the sum of Calcium and Magnesi ncentrations are preferentially used for the hardness cal	um concentrations, expressed in CaCO3 equivalents. culation.		
#### **Reference Information**

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered with stannous chloride, and	(0.45 um), pi I analyzed by	reserved with hydrochloric acid, then undergo a cold-ox CVAAS or CVAFS.	idation using bromine monochloride prior to reduction
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a	cold-oxidatior	n using bromine monochloride prior to reduction with sta	annous 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), pi	reserved with nitric acid, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulfu	ur): Sulfide ar	nd volatile sulfur species may not be recovered by this r	nethod.
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digeste	d with nitric a	and hydrochloric acids, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulfu	ur): Sulfide ar	nd volatile sulfur species may not be recovered by this r	nethod.
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out of Chemistry, "Flow-injectic al.	, on sulfuric a on analysis w	acid preserved samples, using procedures modified from th fluorescence detection for the determination of trace	n J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyz	zed by Ion Ch	nromatography 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 analyz	zed by Ion Ch	rromatography with conductivity and/or UV detection.	
OGG-SF-VA	Water	Oil & Grease by Gravimetric	BCMOE (2010), EPA1664A
The procedure involves an determine Oil and Grease.	extraction of	the entire water sample with hexane. This extract is th	en evaporated to dryness, and the residue weighed to
OGG-VISIBLE-SHEEN-VA	Water	Oil and Grease - Visible Sheen	AER D50
"Visible Sheen" refers to a (NAPL) on the surface of a available for this test. Field observation at the laborato	qualitative vis drilling waste dobservation ry. This is a	sual observation of the presence or absence of rainbow e (fluid portion, clear liquid portion, or total waste) or on s should also be recorded, because sample characteris non-accredited test.	sheen, iridescence, or non-aqueous phase liquid an aqueous sample. No hold time guidance is stics may change between sampling and time of
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
This analysis is carried out after persulphate digestion Samples with very high dis available for these types of	using proced of the sample solved solids samples.	lures adapted from APHA Method 4500-P "Phosphorus e. (i.e. seawaters, brackish waters) may produce a negat	". Total Phosphorus is determined colourimetrically ive bias by this method. Alternate methods are
Arsonic (5+) at playated la	vels is a nos	itive interference on colourimetric phosphate analysis	
	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
This analysis is carried out colourimetrically after persu Samples with very high dis available for these types of	using proced ulphate diges solved solids samples.	lures adapted from APHA Method 4500-P "Phosphorus tion of a sample that has been lab or field filtered throug (i.e. seawaters, brackish waters) may produce a negat	". Total Dissolved Phosphorus is determined gh a 0.45 micron membrane filter. ive bias by this method. Alternate methods are
Arsenic (5+), at elevated le	vels, is a pos	itive interference on colourimetric phosphate analysis.	
PB210L-FC	Misc.	Lead-210 by Liquid Scintillation	Refer to sublet facility report
Pb in soils and sediments i Pb is pre-concentrated by p 210Pb from potentially inte stripped from the resin with scintillation counter (LSC). sample by ICP-AES before	s solubilized bassing the s rfering radion hydrochloric Stable Pb, a and after ch	using nitric, hydrofluoric and hydrochloric acids. ample through a cation exchange column. A chromatog uclides. In nitric acid, Pb is retained on the resin while acid (HCI). The purified solution containing Pb is mixe idded into the samples at the beginning of the procedur emical separation.	graphic resin with a high affinity for Pb is used to isolate other unwanted sample constituents are not. Pb is ad with liquid scintillation cocktail and counted in a liquid e to monitor the chemical recovery, is measured in the
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.

#### **Reference Information**

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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 colourimetric method.	using proce	dures adapted from APHA Method 4500-S2 "Sulphide".	Sulphide is determined using the methlyene blue
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion C	hromatography with conductivity and/or UV detection.	
TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC
This analysis is carried out (TDS) are determined by fi	using proce Itering a sam	dures adapted from APHA Method 2540 "Solids". Solids ple through a glass fibre filter, TDS is determined by ev	s are determined gravimetrically. Total Dissolved Solids vaporating 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 Solids (TSS) are determine Samples containing very h methods are available for t	using proce ed by filtering igh dissolved hese types o	dures adapted from APHA Method 2540 "Solids". Solids a sample through a glass fibre filter, TSS is determine I solid content (i.e. seawaters, brackish waters) may pro f samples.	s are determined gravimetrically. Total Suspended d by drying the filter at 104 degrees celsius. oduce a positive bias by this method. Alternate analysis
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out	using proce	dures adapted from APHA Method 2130 "Turbidity". Tu	rbidity 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 add Compounds eluting betwee	ded reagents en n-hexane	<ul> <li>is heated in a sealed vial to equilibrium. The headspa and n-decane are measured and summed together using the second second second second second second second second second second second second second seco</li></ul>	ce from the vial is transfered into a gas chromatograph. ng 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 add Target compound concent	ded reagents rations are m	, is heated in a sealed vial to equilibrium. The headspa easured using mass spectrometry detection.	ce from the vial is transfered into a gas chromatograph.
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 VPH
VPHw measures Volatile F VH6-10, as per the BC Lab VPHw = VH6-10 minus Be	Petroleum Hy Manual VPI nzene, Tolue	drocarbons in water. Results are calculated by subtract H calculation procedure. ane, Ethylbenzene, Xylenes, and Styrene	ion of specific Monocyclic Aromatic Hydrocarbons from
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Calculation of Total Xylene	S		
Total Xylenes is the sum o The DL for Total Xylenes is	f the concent s set to a valu	rations of the ortho, meta, and para Xylene isomers. R ue no less than the square root of the sum of the square	esults below detection limit (DL) are treated as zero. es of the DLs of the individual Xylenes.
** ALS test methods may inco	orporate mod	lifications from specified reference methods to improve	performance.
The last two letters of the at	oove test cod	e(s) indicate the laboratory that performed analytical ar	alysis for that test. Refer to the list below:
Laboratory Definition Code	e Labora	atory Location	
FC	ALS EI	NVIRONMENTAL - FORT COLLINS, COLORADO, US/	4

ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

VA

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 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.



		Workorder:	L2156175	Re	eport Date:	09-OCT-18	Pag	je 1 of 30
Client: DXB PF 315 Mo Winnipe	ROJECT MANAGE ntgomery Avenue eg MB R3L 1T6	MENT INC.						
Contact: Dave By	/nski							
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-TITR-VA	Water							
Batch R419646	1							
WG2866325-3 CRM Alkalinity, Total (as Ca	CO3)	VA-ALK-TITR-	99.7		%		85-115	02-SEP-18
WG2866325-1 MB Alkalinity, Total (as Ca	CO3)		<1.0		mg/L		1	02-SEP-18
Batch R4198364	4							
WG2866323-3 CRM Alkalinity, Total (as Ca	CO3)	VA-ALK-TITR-	<b>CONTROL</b> 95.8		%		85-115	04-SEP-18
WG2866323-5 DUP Alkalinity, Total (as Ca	CO3)	<b>L2156175-14</b> 59.2	61.1		mg/L	3.2	20	04-SEP-18
WG2866323-1 MB Alkalinity, Total (as Ca	CO3)		<1.0		mg/L		1	04-SEP-18
BE-D-L-CCMS-VA	Water							
Batch R420000	8							
WG2866245-3 DUP Beryllium (Be)-Dissolve	ed	<b>L2156175-2</b> <0.000020	<0.000020	RPD-NA	mg/L	N/A	20	04-SEP-18
WG2866245-2 LCS Beryllium (Be)-Dissolve	ed		90.9		%		80-120	04-SEP-18
WG2866245-1 MB Beryllium (Be)-Dissolve	ed	LF	<0.000020		mg/L		0.00002	04-SEP-18
WG2866245-4 MS Beryllium (Be)-Dissolve	ed	L2156175-1	90.8		%		70-130	04-SEP-18
Batch R423560	7							
WG2883823-2 LCS Beryllium (Be)-Dissolv	ed		99.9		%		80 120	22 SED 19
WG2883823-1 MB		16	00.0		70		00-120	23-321-10
Beryllium (Be)-Dissolve	ed	LI	<0.000020		mg/L		0.00002	23-SEP-18
BE-T-L-CCMS-VA	Water							
Batch R419750	7							
WG2866071-3 DUP Beryllium (Be)-Total		<b>L2156175-2</b> <0.000020	<0.000020	RPD-NA	mg/L	N/A	20	02-SEP-18
WG2866071-2 LCS Beryllium (Be)-Total			94.9		%		80-120	02-SEP-18
WG2866071-1 MB Beryllium (Be)-Total			<0.000020		mg/L		0.00002	02-SEP-18
WG2866071-4 MS Beryllium (Be)-Total		L2156175-1	94.3		%		70-130	02-SEP-18



		Workorder:	L2156175	5 I	Report Date: 09-OCT-18		Page 2 of 30		
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
BE-T-L-CCMS-VA	Water								
Batch R4200693									
WG2866082-2 LCS Beryllium (Be)-Total			95.5		%		80-120	04-SEP-18	
WG2866082-1 MB Beryllium (Be)-Total			<0.000020	)	mg/L		0.00002	04-SEP-18	
Batch R4225549									
WG2881251-2 LCS Beryllium (Be)-Total			108.6		%		80-120	19-SEP-18	
WG2881251-1 MB									
Beryllium (Be)-Total			<0.000020	)	mg/L		0.00002	19-SEP-18	
Batch R4235372									
WG2883822-2 LCS Beryllium (Be)-Total			96.0		%		80-120	22-SEP-18	
WG2883822-1 MB Beryllium (Be)-Total			<0.000020	)	mg/L		0.00002	22-SEP-18	
BR-L-IC-N-VA	Water								
Batch R4203293									
WG2866329-3 DUP Bromide (Br)		<b>L2156175-12</b> <0.050	<0.050	RPD-N/	4 mg/L	N/A	20	04-SEP-18	
WG2866329-2 LCS Bromide (Br)			102.6		%		85-115	04-SEP-18	
WG2866333-2 LCS Bromide (Br)			99.2		%		85-115	04-SEP-18	
WG2866329-1 MB Bromide (Br)			<0.050		mg/L		0.05	04-SEP-18	
WG2866333-1 MB Bromide (Br)			<0.050		mg/L		0.05	04-SEP-18	
WG2866329-4 MS Bromide (Br)		L2156175-13	103.4		%		75-125	04-SEP-18	
CARBONS-DOC-VA	Water								
Batch R4198790									
WG2865907-9 DUP Dissolved Organic Carb	oon	<b>L2156175-17</b> <0.50	<0.50	RPD-N/	4 mg/L	N/A	20	01-SEP-18	
WG2865907-12 LCS Dissolved Organic Carb	oon		106.5		%		80-120	01-SEP-18	
WG2865907-4 LCS Dissolved Organic Carb	oon		100.4		%		80-120	01-SEP-18	
WG2865907-8 LCS Dissolved Organic Carb	oon		97.3		%		80-120	01-SEP-18	



	Workorder:	L215617	5 R	eport Date: (	)9-OCT-18	Pa	ge 3 of 30
Test Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CARBONS-DOC-VA Water							
Batch R4198790							
WG2865907-11 MB Dissolved Organic Carbon		<0.50		mg/L		0.5	01-SEP-18
WG2865907-3 MB Dissolved Organic Carbon		<0.50		mg/L		0.5	01-SEP-18
WG2865907-7 MB Dissolved Organic Carbon		<0.50		mg/L		0.5	01-SEP-18
WG2865907-10 MS Dissolved Organic Carbon	L2156175-18	N/A	MS-B	%		-	01-SEP-18
Batch R4199649							
WG2866212-1 DUP Dissolved Organic Carbon	<b>L2156175-1</b> 13.0	12.2		mg/L	6.1	20	01-SEP-18
WG2866212-5 DUP Dissolved Organic Carbon	<b>L2156175-9</b> 9.91	10.4		mg/L	5.0	20	01-SEP-18
WG2866212-4 LCS Dissolved Organic Carbon		99.5		%		80-120	01-SEP-18
WG2866212-8 LCS Dissolved Organic Carbon		97.9		%		80-120	01-SEP-18
WG2866212-3 MB Dissolved Organic Carbon		<0.50		mg/L		0.5	01-SEP-18
WG2866212-7 MB Dissolved Organic Carbon		<0.50		mg/L		0.5	01-SEP-18
WG2866212-2 MS Dissolved Organic Carbon	L2156175-2	N/A	MS-B	%		_	01-SEP-18
WG2866212-6 MS Dissolved Organic Carbon	L2156175-10	103.8		%		70-130	01-SEP-18
CARBONS-TOC-VA Water							
Batch B4198787							
WG2865906-10 DUP Total Organic Carbon	<b>L2156175-17</b> <0.50	<0.50	RPD-NA	mg/L	N/A	20	01-SEP-18
WG2865906-1 LCS Total Organic Carbon		98.4		%		80-120	01-SEP-18
WG2865906-13 LCS Total Organic Carbon		99.8		%		80-120	01-SEP-18
WG2865906-5 LCS Total Organic Carbon		99.9		%		80-120	01-SEP-18
WG2865906-9 LCS Total Organic Carbon		97.0		%		80-120	01-SEP-18
WG2865906-12 MB						-	· · -



		Workorder:	L215617	5 F	Report Date: 0	9-OCT-18	Pa	ge 4 of 30
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CARBONS-TOC-VA Batch R4198787	Water							
WG2865906-12 MB Total Organic Carbon			<0.50		mg/L		0.5	01-SEP-18
WG2865906-4 MB Total Organic Carbon			<0.50		mg/L		0.5	01-SEP-18
WG2865906-8 MB Total Organic Carbon			<0.50		mg/L		0.5	01-SEP-18
WG2865906-11 MS Total Organic Carbon		L2156175-18	N/A	MS-B	%		-	01-SEP-18
Batch R4199609								
WG2866211-2 DUP Total Organic Carbon		<b>L2156175-1</b> 12.8	12.7		mg/L	0.6	20	01-SEP-18
WG2866211-6 DUP Total Organic Carbon		<b>L2156175-9</b> 10.7	10.9		mg/L	1.8	20	01-SEP-18
WG2866211-1 LCS Total Organic Carbon			100.1		%		80-120	01-SEP-18
WG2866211-5 LCS Total Organic Carbon			100.0		%		80-120	01-SEP-18
WG2866211-9 LCS Total Organic Carbon			98.2		%		80-120	01-SEP-18
WG2866211-4 MB Total Organic Carbon			<0.50		mg/L		0.5	01-SEP-18
WG2866211-8 MB Total Organic Carbon			<0.50		mg/L		0.5	01-SEP-18
WG2866211-3 MS Total Organic Carbon		L2156175-2	N/A	MS-B	%		_	01-SFP-18
WG2866211-7 MS		L2156175-10		_				0.01.10
Total Organic Carbon			99.2		%		70-130	01-SEP-18
CL-IC-N-VA	Water							
Batch R4203293								
WG2866329-3 DUP Chloride (Cl)		<b>L2156175-12</b> 0.54	0.54		mg/L	0.1	20	04-SEP-18
WG2866329-2 LCS Chloride (Cl)			99.7		%		90-110	04-SEP-18
WG2866333-2 LCS Chloride (Cl)			99.6		%		90-110	04-SEP-18
WG2866329-1 MB Chloride (Cl)			<0.50		mg/L		0.5	04-SEP-18
WG2866333-1 MB								



			Workorder:	L2156175	5 I	Report Date: 09-C	)CT-18	Pag	e 5 of 30
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-VA Batch R4	203293	Water							
WG2866333-1 Chloride (Cl)	МВ			<0.50		mg/L		0.5	04-SEP-18
WG2866329-4 Chloride (Cl)	MS		L2156175-13	100.9		%		75-125	04-SEP-18
EC-PCT-VA		Water							
Batch R4	196461								
WG2866325-4 Conductivity	CRM		VA-EC-PCT-CO	0NTROL 100.7		%		90-110	02-SEP-18
WG2866325-1 Conductivity	MB			<2.0		uS/cm		2	02-SEP-18
Batch R4	198364								
WG2866323-4 Conductivity	CRM		VA-EC-PCT-CO	<b>DNTROL</b> 100.9		%		90-110	04-SEP-18
WG2866323-5 Conductivity	DUP		<b>L2156175-14</b> 186	187		uS/cm	0.5	10	04-SEP-18
WG2866323-1 Conductivity	MB			<2.0		uS/cm		2	04-SEP-18
F-IC-N-VA		Water							
Batch R4	203293								
WG2866329-3 Fluoride (F)	DUP		<b>L2156175-12</b> 0.140	0.140		mg/L	0.1	20	04-SEP-18
WG2866329-2 Fluoride (F)	LCS			101.0		%		90-110	04-SEP-18
WG2866333-2 Fluoride (F)	LCS			100.3		%		90-110	04-SEP-18
<b>WG2866329-1</b> Fluoride (F)	МВ			<0.020		mg/L		0.02	04-SEP-18
WG2866333-1 Fluoride (F)	MB			<0.020		mg/L		0.02	04-SEP-18
WG2866329-4 Fluoride (F)	MS		L2156175-13	102.4		%		75-125	04-SEP-18
F1-HSFID-VA		Water							
Batch R4	203069								
WG2867181-2 F1 (C6-C10)	LCS			78.2		%		70-130	05-SEP-18
<b>WG2867181-1</b> F1 (C6-C10)	МВ			<0.10		mg/L		0.1	05-SEP-18
		<b>M</b> /-/							

F2-F4-ME-FID-VA

Water



		Workorder:	L2156175	5	Report Date: 09-OCT-18		:T-18	Page 6 of 30	
Test	Matrix	Reference	Result	Qualifier	U	Jnits	RPD	Limit	Analyzed
F2-F4-ME-FID-VA	Water								
Batch R4204154									
WG2868623-2 LCS			<b>-</b>			.,			
F2 (C10-C16)			94.7		9	%		70-130	05-SEP-18
F3 (C16-C34)			94.4		9	%		70-130	05-SEP-18
F4 (C34-C50)			93.9		0	%		70-130	05-SEP-18
WG2868623-1 MB F2 (C10-C16)			<0.30		n	ng/L		0.3	05-SEP-18
F3 (C16-C34)			<0.30		n	ng/L		0.3	05-SEP-18
F4 (C34-C50)			<0.30		n	ng/L		0.3	05-SEP-18
Surrogate: 2-Bromoben:	zotrifluoride, F2-F	4	84.7		9	%		60-140	05-SEP-18
HG-D-CVAA-VA	Water								
Batch R4195991									
WG2865971-2 LCS									
Mercury (Hg)-Dissolved			95.8		9	%		80-120	01-SEP-18
WG2865971-1 MB		LF				_			
Mercury (Hg)-Dissolved			<0.000005	С	n	ng/L		0.000005	01-SEP-18
WG2865971-4 MS Mercury (Hg)-Dissolved		L2156175-1	96.3		9	%		70-130	01-SEP-18
Batch R4203031									
WG2868024-3 DUP		L2156175-9							
Mercury (Hg)-Dissolved		0.0000054	0.0000061		n	mg/L	11	20	05-SEP-18
WG2868024-2 LCS									
Mercury (Hg)-Dissolved			99.7		9	%		80-120	05-SEP-18
WG2868024-1 MB Mercury (Ha)-Dissolved		LF	<0.000005	C	n	ma/l		0 000005	05 SED 19
				-				0.000000	
HG-I-CVAA-VA	water								
Batch R4203542		1 24 564 75 9							
Mercury (Hg)-Total		<0.0000050	<0.000005	C RPD-	NA n	ng/L	N/A	20	06-SEP-18
WG2869027-5 DUP		L2156175-19							
Mercury (Hg)-Total		<0.000050	<0.000005	C RPD-	NA n	mg/L	N/A	20	06-SEP-18
WG2869027-2 LCS			100 6		o	<i></i>		00.400	
			100.0		/	70		00-120	UD-DEM-10
Mercury (Hg)-Total			<0.000005	C	n	ng/L		0.000005	06-SEP-18
WG2869027-4 MS		L2156175-7							
Mercury (Hg)-Total			85.9		9	%		70-130	06-SEP-18

MET-D-CCMS-VA

Water



		Workorder:	L2156175	Re	eport Date: (	ort Date: 09-OCT-18 Page 7 of 3			
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
MET-D-CCMS-VA	Water								
Batch R4200	008								
WG2866245-3 DI	JP	L2156175-2	0.0204		~~~/l	7.4	00		
Antimony (Sh) Diss	olved	0.0190	0.0204		mg/∟	7.1	20	04-SEP-18	
Antimony (Sb)-Diss	olved	0.00110	0.00108		mg/L	2.0	20	04-SEP-18	
Arsenic (As)-Disson	ved	0.0501	0.0504		mg/∟	0.6	20	04-SEP-18	
Barium (Ba)-Dissol	/ed	0.0163	0.0158		mg/L	3.0	20	04-SEP-18	
Bismuth (Bi)-Dissol	ved	<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-SEP-18	
Boron (B)-Dissolved	1 	0.023	0.023		mg/L	0.5	20	04-SEP-18	
Cadmium (Cd)-Diss	solved	0.0000058	0.0000052		mg/L	11	20	04-SEP-18	
Calcium (Ca)-Disso	lved	24.1	22.9		mg/L	5.0	20	04-SEP-18	
Cesium (Cs)-Dissol	ved	0.000025	0.000027		mg/L	4.9	20	04-SEP-18	
Chromium (Cr)-Dise	solved	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-SEP-18	
Cobalt (Co)-Dissolv	ed	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-SEP-18	
Copper (Cu)-Dissol	ved	0.00746	0.00734		mg/L	1.7	20	04-SEP-18	
Iron (Fe)-Dissolved		0.021	0.021		mg/L	0.8	20	04-SEP-18	
Lead (Pb)-Dissolved	d	<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-SEP-18	
Lithium (Li)-Dissolve	ed	0.0072	0.0070		mg/L	2.4	20	04-SEP-18	
Magnesium (Mg)-Di	issolved	4.66	4.66		mg/L	0.0	20	04-SEP-18	
Manganese (Mn)-D	issolved	0.00027	0.00033	J	mg/L	0.00007	0.0002	04-SEP-18	
Molybdenum (Mo)-[	Dissolved	0.00244	0.00243		mg/L	0.7	20	04-SEP-18	
Nickel (Ni)-Dissolve	d	0.00385	0.00383		mg/L	0.4	20	04-SEP-18	
Phosphorus (P)-Dis	solved	<0.050	<0.050	RPD-NA	mg/L	N/A	20	04-SEP-18	
Potassium (K)-Diss	olved	2.13	2.04		mg/L	4.3	20	04-SEP-18	
Selenium (Se)-Diss	olved	0.000054	<0.000050	RPD-NA	mg/L	N/A	20	04-SEP-18	
Silicon (Si)-Dissolve	ed	0.930	0.922		mg/L	0.8	20	04-SEP-18	
Silver (Ag)-Dissolve	d	<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	04-SEP-18	
Sodium (Na)-Dissol	ved	7.13	7.02		mg/L	1.6	20	04-SEP-18	
Strontium (Sr)-Disse	olved	0.0767	0.0731		mg/L	4.9	20	04-SEP-18	
Sulfur (S)-Dissolved	ł	4.97	5.14		mg/L	3.3	20	04-SEP-18	
Thallium (TI)-Dissol	ved	<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	04-SEP-18	
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-SEP-18	
Titanium (Ti)-Dissol	ved	<0.00030	0.00030	RPD-NA	mg/L	N/A	20	04-SEP-18	
Uranium (U)-Dissol	ved	0.00219	0.00213		mg/L	2.5	20	04-SEP-18	
Vanadium (V)-Disso	olved	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	04-SEP-18	
Zinc (Zn)-Dissolved		0.0028	0.0028		mg/L	1.2	20	04-SEP-18	
Zirconium (Zr)-Diss	olved	<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	04-SEP-18	



		Workorder	Workorder: L2156175			Report Date: 09-OCT-18		Page 8 of 30	
est Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed		
MET-D-CCMS-VA	Water								
Batch R4200	8000								
WG2866245-2 L	CS				04				
	solved		99.3		%		80-120	04-SEP-18	
Antimony (Sb)-Diss	solved		98.3		%		80-120	04-SEP-18	
Arsenic (As)-Dissol	ived		100.5		%		80-120	04-SEP-18	
Barium (Ba)-Dissol	ved		94.7		%		80-120	04-SEP-18	
Bismuth (Bi)-Dissol	lved		96.7		%		80-120	04-SEP-18	
Boron (B)-Dissolve	d		92.7		%		80-120	04-SEP-18	
Cadmium (Cd)-Dis	solved		87.5		%		80-120	04-SEP-18	
Calcium (Ca)-Disso	blved		91.3		%		80-120	04-SEP-18	
Cesium (Cs)-Disso	lved		94.6		%		80-120	04-SEP-18	
Chromium (Cr)-Dis	solved		97.1		%		80-120	04-SEP-18	
Cobalt (Co)-Dissolv	ved		90.1		%		80-120	04-SEP-18	
Copper (Cu)-Disso	lved		91.5		%		80-120	04-SEP-18	
Iron (Fe)-Dissolved	l		93.0		%		80-120	04-SEP-18	
Lead (Pb)-Dissolve	d		95.2		%		80-120	04-SEP-18	
Lithium (Li)-Dissolv	ved		89.5		%		80-120	04-SEP-18	
Magnesium (Mg)-D	lissolved		104.7		%		80-120	04-SEP-18	
Manganese (Mn)-D	Dissolved		96.3		%		80-120	04-SEP-18	
Molybdenum (Mo)-	Dissolved		100.8		%		80-120	04-SEP-18	
Nickel (Ni)-Dissolve	ed		95.3		%		80-120	04-SEP-18	
Phosphorus (P)-Dis	ssolved		108.6		%		70-130	04-SEP-18	
Potassium (K)-Diss	solved		106.1		%		80-120	04-SEP-18	
Selenium (Se)-Diss	solved		94.7		%		80-120	04-SEP-18	
Silicon (Si)-Dissolve	ed		108.9		%		60-140	04-SEP-18	
Silver (Ag)-Dissolve	ed		92.3		%		80-120	04-SEP-18	
Sodium (Na)-Disso	lved		94.3		%		80-120	04-SEP-18	
Strontium (Sr)-Diss	olved		95.6		%		80-120	04-SEP-18	
Sulfur (S)-Dissolve	d		103.3		%		80-120	04-SEP-18	
Thallium (TI)-Disso	lved		96.0		%		80-120	04-SEP-18	
Tin (Sn)-Dissolved			93.5		%		80-120	04-SEP-18	
Titanium (Ti)-Disso	lved		101.1		%		80-120	04-SEP-18	
Uranium (U)-Dissol	lved		93.0		%		80-120	04-SEP-18	
Vanadium (V)-Diss	olved		98.4		%		80-120	04-SEP-18	
Zinc (Zn)-Dissolved	ł		92.5		%		80-120	04-SEP-18	
Zirconium (Zr)-Diss	solved		98.7		%		80-120	04-SEP-18	



		Workorder	Workorder: L2156175			Report Date: 09-OCT-18		Page 9 of 30	
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
MET-D-CCMS-VA	Water								
Batch R4200	8000								
WG2866245-1 M	B	LF	0.0040						
	solved		<0.0010		mg/L		0.001	04-SEP-18	
Antimony (Sb)-Diss	solved		<0.00010		mg/L		0.0001	04-SEP-18	
Arsenic (As)-Dissol	lved		<0.00010		mg/L		0.0001	04-SEP-18	
Barium (Ba)-Dissol	ved		<0.00010		mg/L		0.0001	04-SEP-18	
Bismuth (Bi)-Dissol	lved		<0.00005	0	mg/L		0.00005	04-SEP-18	
Boron (B)-Dissolve	d		<0.010		mg/L		0.01	04-SEP-18	
Cadmium (Cd)-Diss	solved		<0.00000	50	mg/L		0.000005	04-SEP-18	
Calcium (Ca)-Disso	blved		<0.050		mg/L		0.05	04-SEP-18	
Cesium (Cs)-Disso	lved		<0.00001	0	mg/L		0.00001	04-SEP-18	
Chromium (Cr)-Dis	solved		<0.00010		mg/L		0.0001	04-SEP-18	
Cobalt (Co)-Dissolv	ved		<0.00010		mg/L		0.0001	04-SEP-18	
Copper (Cu)-Dissol	lved		<0.00020		mg/L		0.0002	04-SEP-18	
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	04-SEP-18	
Lead (Pb)-Dissolve	d		<0.00005	0	mg/L		0.00005	04-SEP-18	
Lithium (Li)-Dissolv	red		<0.0010		mg/L		0.001	04-SEP-18	
Magnesium (Mg)-D	lissolved		<0.0050		mg/L		0.005	04-SEP-18	
Manganese (Mn)-D	Dissolved		<0.00010		mg/L		0.0001	04-SEP-18	
Molybdenum (Mo)-l	Dissolved		<0.00005	0	mg/L		0.00005	04-SEP-18	
Nickel (Ni)-Dissolve	ed		<0.00050		mg/L		0.0005	04-SEP-18	
Phosphorus (P)-Dis	ssolved		<0.050		mg/L		0.05	04-SEP-18	
Potassium (K)-Diss	solved		<0.050		mg/L		0.05	04-SEP-18	
Selenium (Se)-Diss	solved		<0.00005	0	mg/L		0.00005	04-SEP-18	
Silicon (Si)-Dissolve	ed		<0.050		mg/L		0.05	04-SEP-18	
Silver (Ag)-Dissolve	ed		<0.00001	0	mg/L		0.00001	04-SEP-18	
Sodium (Na)-Disso	lved		<0.050		mg/L		0.05	04-SEP-18	
Strontium (Sr)-Diss	olved		<0.00020		mg/L		0.0002	04-SEP-18	
Sulfur (S)-Dissolved	d		<0.50		mg/L		0.5	04-SEP-18	
Thallium (TI)-Disso	lved		<0.00001	0	mg/L		0.00001	04-SEP-18	
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	04-SEP-18	
Titanium (Ti)-Disso	lved		<0.00030		mg/L		0.0003	04-SEP-18	
Uranium (U)-Dissol	lved		<0.00001	0	mg/L		0.00001	04-SEP-18	
Vanadium (V)-Diss	olved		<0.00050		mg/L		0.0005	04-SEP-18	
Zinc (Zn)-Dissolved	Ł		<0.0010		mg/L		0.001	04-SEP-18	
Zirconium (Zr)-Diss	solved		<0.00006	0	mg/L		0.00006	04-SEP-18	



		Workorder:	Workorder: L2156175			)9-OCT-18	Page 10 of 30		
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
MET-D-CCMS-VA	Water								
Batch R4200	8000								
WG2866245-4 M	IS solved	L2156175-1	07.0		0/				
Antimore (Al)-Diss			97.0		%		70-130	04-SEP-18	
Antimony (SD)-Diss	solved		95.4	140 D	%		70-130	04-SEP-18	
Arsenic (As)-Disso			N/A	M2-R	%		-	04-SEP-18	
Barium (Ba)-Dissoi	ived		91.9		%		70-130	04-SEP-18	
Bismuth (Bi)-Disso	lved		87.8		%		70-130	04-SEP-18	
Boron (B)-Dissolve	ed		90.3		%		70-130	04-SEP-18	
Cadmium (Cd)-Dis	solved		91.0		%		70-130	04-SEP-18	
Calcium (Ca)-Disso	olved		N/A	MS-B	%		-	04-SEP-18	
Cesium (Cs)-Disso	blved		95.8		%		70-130	04-SEP-18	
Chromium (Cr)-Dis	solved		97.3		%		70-130	04-SEP-18	
Cobalt (Co)-Dissolv	ved		90.5		%		70-130	04-SEP-18	
Copper (Cu)-Disso	lved		90.8		%		70-130	04-SEP-18	
Iron (Fe)-Dissolved	1		97.2		%		70-130	04-SEP-18	
Lead (Pb)-Dissolve	ed		93.0		%		70-130	04-SEP-18	
Lithium (Li)-Dissolv	ved		89.5		%		70-130	04-SEP-18	
Magnesium (Mg)-D	Dissolved		N/A	MS-B	%		-	04-SEP-18	
Manganese (Mn)-E	Dissolved		95.8		%		70-130	04-SEP-18	
Molybdenum (Mo)-	Dissolved		98.1		%		70-130	04-SEP-18	
Nickel (Ni)-Dissolve	ed		94.1		%		70-130	04-SEP-18	
Phosphorus (P)-Dis	ssolved		97.8		%		70-130	04-SEP-18	
Potassium (K)-Diss	solved		93.8		%		70-130	04-SEP-18	
Selenium (Se)-Diss	solved		99.4		%		70-130	04-SEP-18	
Silicon (Si)-Dissolv	red		106.4		%		70-130	04-SEP-18	
Silver (Ag)-Dissolve	ed		94.9		%		70-130	04-SEP-18	
Sodium (Na)-Disso	olved		N/A	MS-B	%		-	04-SEP-18	
Strontium (Sr)-Diss	solved		N/A	MS-B	%		-	04-SEP-18	
Sulfur (S)-Dissolve	d		107.5		%		70-130	04-SEP-18	
Thallium (TI)-Disso	lved		91.4		%		70-130	04-SEP-18	
Tin (Sn)-Dissolved			92.2		%		70-130	04-SEP-18	
Titanium (Ti)-Disso	blved		101.6		%		70-130	04-SEP-18	
Uranium (U)-Disso	lved		92.5		%		70-130	04-SEP-18	
Vanadium (V)-Diss	olved		105.3		%		70-130	04-SEP-18	
Zinc (Zn)-Dissolved	d		96.0		%		70-130	04-SEP-18	
Zirconium (Zr)-Dise	solved		101.9		%		70-130	04-SEP-18	



			Workorder: L2156175			Report Date: 09-OCT-18		Page 11 of 30	
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
MET-D-CCMS-VA	Water								
Batch R4235	607								
WG2883823-2 L(	CS		4077		0/				
Antimony (Sh) Diss			107.7		%		80-120	23-SEP-18	
Antimony (Sb)-Diss	solved		107.0		%		80-120	23-SEP-18	
Arsenic (As)-Dissoi	ved		106.1		%		80-120	23-SEP-18	
Barium (Ba)-Dissol	ved		106.4		%		80-120	23-SEP-18	
Bismuth (Bi)-Dissol	ved		106.3		%		80-120	23-SEP-18	
Boron (B)-Dissolve	d 		94.5		%		80-120	23-SEP-18	
Cadmium (Cd)-Dise	solved		106.7		%		80-120	23-SEP-18	
Calcium (Ca)-Disso	blved		101.2		%		80-120	23-SEP-18	
Chromium (Cr)-Dis	solved		110.0		%		80-120	23-SEP-18	
Cobalt (Co)-Dissolv	ved		106.1		%		80-120	23-SEP-18	
Copper (Cu)-Dissol	lved		105.7		%		80-120	23-SEP-18	
Iron (Fe)-Dissolved			93.6		%		80-120	23-SEP-18	
Lead (Pb)-Dissolve	d		101.4		%		80-120	23-SEP-18	
Lithium (Li)-Dissolv	red		100.5		%		80-120	23-SEP-18	
Magnesium (Mg)-D	lissolved		104.9		%		80-120	23-SEP-18	
Manganese (Mn)-D	lissolved		107.5		%		80-120	23-SEP-18	
Molybdenum (Mo)-l	Dissolved		104.3		%		80-120	23-SEP-18	
Nickel (Ni)-Dissolve	ed		108.2		%		80-120	23-SEP-18	
Phosphorus (P)-Dis	ssolved		103.4		%		70-130	23-SEP-18	
Potassium (K)-Diss	olved		104.6		%		80-120	23-SEP-18	
Selenium (Se)-Diss	solved		99.3		%		80-120	23-SEP-18	
Silicon (Si)-Dissolve	ed		98.6		%		60-140	23-SEP-18	
Silver (Ag)-Dissolve	ed		102.8		%		80-120	23-SEP-18	
Sodium (Na)-Disso	lved		108.5		%		80-120	23-SEP-18	
Strontium (Sr)-Diss	olved		98.5		%		80-120	23-SEP-18	
Sulfur (S)-Dissolved	d		88.9		%		80-120	23-SEP-18	
Thallium (TI)-Disso	lved		104.6		%		80-120	23-SEP-18	
Tin (Sn)-Dissolved			101.7		%		80-120	23-SEP-18	
Titanium (Ti)-Disso	lved		108.9		%		80-120	23-SEP-18	
Uranium (U)-Dissol	ved		100.6		%		80-120	23-SEP-18	
Vanadium (V)-Diss	olved		106.3		%		80-120	23-SEP-18	
Zinc (Zn)-Dissolved	ł		106.0		%		80-120	23-SEP-18	
Zirconium (Zr)-Diss	olved		93.4		%		80-120	23-SEP-18	
WG2883823-1 M	В	LF							



		Workorder	L215617	5	Report Date: (	)9-OCT-18	Pag	ge 12 of 30
Fest         MET-D-CCMS-VA         Batch       R4235607         WG2883823-1       MB         Aluminum (Al)-Dissolved         Antimony (Sb)-Dissolved         Barium (Ba)-Dissolved         Barium (Ba)-Dissolved         Barium (Ba)-Dissolved         Boron (B)-Dissolved         Cadmium (Cd)-Dissolved         Cadmium (Cd)-Dissolved         Calcium (Ca)-Dissolved         Cobalt (Co)-Dissolved         Cobalt (Co)-Dissolved         Lead (Pb)-Dissolved         Lead (Pb)-Dissolved         Lithium (Li)-Dissolved         Magnesium (Mg)-Dissol         Molybdenum (Mo)-Dissol         Molybdenum (Mo)-Dissolved         Phosphorus (P)-Dissolved         Selenium (Se)-Dissolved         Silicon (Si)-Dissolved         Silver (Ag)-Dissolved         Sodium (Na)-Dissolved         Sodium (Na)-Dissolved         Sulfur (S)-Dissolved         Sulfur (S)-Dissolved         Thallium (TI)-Dissolved         Thallium (TI)-Dissolved	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4235	607							
WG2883823-1 M	B	LF	0.0040		( <b>1</b>			
Aluminum (Al)-Diss	solved		<0.0010		mg/L		0.001	23-SEP-18
Antimony (Sb)-Diss	solved		<0.00010	)	mg/L		0.0001	23-SEP-18
Arsenic (As)-Dissol	ved		<0.00010	)	mg/L		0.0001	23-SEP-18
Barium (Ba)-Dissor	ved		<0.00010	)	mg/L		0.0001	23-SEP-18
Bismuth (Bi)-Dissol	ved		<0.00005	0	mg/L		0.00005	23-SEP-18
Boron (B)-Dissolve	d 		<0.010		mg/L		0.01	23-SEP-18
Cadmium (Cd)-Dise	solved		<0.00000	050	mg/L		0.000005	23-SEP-18
Calcium (Ca)-Disso	blved		<0.050		mg/L		0.05	23-SEP-18
Chromium (Cr)-Dis	solved		<0.00010	)	mg/L		0.0001	23-SEP-18
Cobalt (Co)-Dissolv	ved		<0.00010	)	mg/L		0.0001	23-SEP-18
Copper (Cu)-Dissol	lved		<0.00020	)	mg/L		0.0002	23-SEP-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-SEP-18
Lead (Pb)-Dissolve	d		<0.00005	50	mg/L		0.00005	23-SEP-18
Lithium (Li)-Dissolv	red		<0.0010		mg/L		0.001	23-SEP-18
Magnesium (Mg)-D	issolved		<0.0050		mg/L		0.005	23-SEP-18
Manganese (Mn)-D	lissolved		<0.00010	)	mg/L		0.0001	23-SEP-18
Molybdenum (Mo)-	Dissolved		<0.00005	50	mg/L		0.00005	23-SEP-18
Nickel (Ni)-Dissolve	ed		<0.00050	)	mg/L		0.0005	23-SEP-18
Phosphorus (P)-Dis	ssolved		<0.050		mg/L		0.05	23-SEP-18
Potassium (K)-Diss	olved		<0.050		mg/L		0.05	23-SEP-18
Selenium (Se)-Diss	solved		<0.00005	50	mg/L		0.00005	23-SEP-18
Silicon (Si)-Dissolve	ed		<0.050		mg/L		0.05	23-SEP-18
Silver (Ag)-Dissolve	ed		<0.00001	0	mg/L		0.00001	23-SEP-18
Sodium (Na)-Disso	lved		<0.050		mg/L		0.05	23-SEP-18
Strontium (Sr)-Diss	olved		<0.00020	)	mg/L		0.0002	23-SEP-18
Sulfur (S)-Dissolve	d		<0.50		mg/L		0.5	23-SEP-18
Thallium (TI)-Disso	lved		<0.00001	0	mg/L		0.00001	23-SEP-18
Tin (Sn)-Dissolved			<0.00010	)	mg/L		0.0001	23-SEP-18
Titanium (Ti)-Disso	lved		<0.00030	)	mg/L		0.0003	23-SEP-18
Uranium (U)-Dissol	ved		<0.00001	0	mg/L		0.00001	23-SEP-18
Vanadium (V)-Diss	olved		<0.00050	)	mg/L		0.0005	23-SEP-18
Zinc (Zn)-Dissolved	1		<0.0010		mg/L		0.001	23-SEP-18
Zirconium (Zr)-Diss	solved		<0.0006	60	mg/L		0.00006	23-SEP-18

MET-T-CCMS-VA

Water



Test     Matrix     Reference     Result     Qualifier     Units     RPD     Limit       MET-T-CCMS-VA     Water     Vater     Vate	Analyzed
MET-T-CCMS-VA Water	
Batch R4197507	
WG2866071-3 DUP L2156175-2	
Aluminum (Al)- I otal 0.0628 0.0621 mg/L 1.2 20	02-SEP-18
Antimony (Sb)-I otal 0.00121 0.00120 mg/L 1.1 20	02-SEP-18
Arsenic (As)-Total 0.0565 0.0566 mg/L 0.1 20	02-SEP-18
Barium (Ba)-Total 0.0158 0.0161 mg/L 2.2 20	02-SEP-18
Bismuth (Bi)-Total <0.000050 <0.000050 RPD-NA mg/L N/A 20	02-SEP-18
Boron (B)-Total 0.024 0.025 mg/L 3.3 20	02-SEP-18
Cadmium (Cd)-Total 0.0000063 0.0000070 mg/L 10 20	02-SEP-18
Calcium (Ca)-Total 22.9 23.2 mg/L 1.0 20	02-SEP-18
Cesium (Cs)-Total 0.000032 0.000033 mg/L 1.0 20	02-SEP-18
Chromium (Cr)-Total 0.00023 0.00020 mg/L 12 20	02-SEP-18
Cobalt (Co)-Total         0.00015         0.00015         mg/L         5.8         20	02-SEP-18
Copper (Cu)-Total 0.00813 0.00810 mg/L 0.4 20	02-SEP-18
Iron (Fe)-Total 0.065 0.064 mg/L 1.0 20	02-SEP-18
Lead (Pb)-Total 0.000118 0.000116 mg/L 1.6 20	02-SEP-18
Lithium (Li)-Total 0.0069 0.0071 mg/L 2.3 20	02-SEP-18
Magnesium (Mg)-Total 4.41 4.46 mg/L 1.2 20	02-SEP-18
Manganese (Mn)-Total 0.00325 0.00326 mg/L 0.4 20	02-SEP-18
Molybdenum (Mo)-Total 0.00243 0.00251 mg/L 3.3 20	02-SEP-18
Nickel (Ni)-Total 0.00388 0.00385 mg/L 1.0 20	02-SEP-18
Phosphorus (P)-Total <0.050 <0.050 RPD-NA mg/L N/A 20	02-SEP-18
Potassium (K)-Total 1.86 1.84 mg/L 1.0 20	02-SEP-18
Selenium (Se)-Total <0.000050 <0.000050 RPD-NA mg/L N/A 20	02-SEP-18
Silicon (Si)-Total 0.93 0.93 mg/L 0.7 20	02-SEP-18
Silver (Ag)-Total 0.000014 0.000014 mg/L 2.1 20	02-SEP-18
Sodium (Na)-Total 6.96 7.12 mg/L 2.2 20	02-SEP-18
Strontium (Sr)-Total 0.0715 0.0732 mg/L 2.3 20	02-SEP-18
Sulfur (S)-Total 5.17 5.23 mg/L 1.1 20	02-SEP-18
Thallium (TI)-Total <0.000010 <0.000010 RPD-NA mg/L N/A 20	02-SEP-18
Tin (Sn)-Total <0.00010 <0.00010 RPD-NA mg/L N/A 20	02-SEP-18
Titanium (Ti)-Total 0.00161 0.00167 mg/L 3.8 20	02-SEP-18
Uranium (U)-Total 0.00216 0.00216 mg/L 0.0 20	02-SFP-18
Vanadium (V)-Total <0.00050 <0.00050 RPD-NA mg/L N/A 20	02-SEP-18
Zinc (Zn)-Total 0.0034 0.0034 mg/L 0.6 20	02-SEP-18
Zirconium (Zr)-Total <0.00030 <0.00030 RPD-NA mg/L N/A 20	02-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4197507	,							
WG2866071-2 LCS								
Aluminum (Al)-Total			95.7		%		80-120	02-SEP-18
Antimony (Sb)-Total			101.2		%		80-120	02-SEP-18
Arsenic (As)-Total			96.1		%		80-120	02-SEP-18
Barium (Ba)-Total			93.8		%		80-120	02-SEP-18
Bismuth (Bi)-Total			95.2		%		80-120	02-SEP-18
Boron (B)-Total			94.8		%		80-120	02-SEP-18
Cadmium (Cd)-Total			95.3		%		80-120	02-SEP-18
Calcium (Ca)-Total			95.8		%		80-120	02-SEP-18
Cesium (Cs)-Total			99.3		%		80-120	02-SEP-18
Chromium (Cr)-Total			95.3		%		80-120	02-SEP-18
Cobalt (Co)-Total			95.9		%		80-120	02-SEP-18
Copper (Cu)-Total			92.9		%		80-120	02-SEP-18
Iron (Fe)-Total			98.2		%		80-120	02-SEP-18
Lead (Pb)-Total			98.7		%		80-120	02-SEP-18
Lithium (Li)-Total			94.2		%		80-120	02-SEP-18
Magnesium (Mg)-Total			99.9		%		80-120	02-SEP-18
Manganese (Mn)-Total			95.4		%		80-120	02-SEP-18
Molybdenum (Mo)-Tota	al		98.0		%		80-120	02-SEP-18
Nickel (Ni)-Total			94.1		%		80-120	02-SEP-18
Phosphorus (P)-Total			95.1		%		80-120	02-SEP-18
Potassium (K)-Total			97.9		%		80-120	02-SEP-18
Selenium (Se)-Total			94.8		%		80-120	02-SEP-18
Silicon (Si)-Total			93.5		%		80-120	02-SEP-18
Silver (Ag)-Total			96.2		%		80-120	02-SEP-18
Sodium (Na)-Total			100.2		%		80-120	02-SEP-18
Strontium (Sr)-Total			96.3		%		80-120	02-SEP-18
Sulfur (S)-Total			99.2		%		80-120	02-SEP-18
Thallium (TI)-Total			96.9		%		80-120	02-SEP-18
Tin (Sn)-Total			98.0		%		80-120	02-SEP-18
Titanium (Ti)-Total			93.9		%		80-120	02-SEP-18
Uranium (U)-Total			99.3		%		80-120	02-SEP-18
Vanadium (V)-Total			97.8		%		80-120	02-SEP-18
Zinc (Zn)-Total			85.2		%		80-120	02-SEP-18
Zirconium (Zr)-Total			100.6		%		80-120	02-SEP-18



		Workorder	L215617	5	Report Date: (	)9-OCT-18	Page 15 of 30		
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
MET-T-CCMS-VA	Water								
Batch R419750	07								
WG2866071-1 MB									
Aluminum (Al)-Total			<0.0030		mg/L		0.003	02-SEP-18	
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	02-SEP-18	
Arsenic (As)-Total			<0.00010		mg/L		0.0001	02-SEP-18	
Barium (Ba)-Total			<0.00010		mg/L		0.0001	02-SEP-18	
Bismuth (Bi)-Total			<0.00005	60	mg/L		0.00005	02-SEP-18	
Boron (B)-Total			<0.010		mg/L		0.01	02-SEP-18	
Cadmium (Cd)-Total			<0.00000	50	mg/L		0.000005	02-SEP-18	
Calcium (Ca)-Total			<0.050		mg/L		0.05	02-SEP-18	
Cesium (Cs)-Total			<0.00001	0	mg/L		0.00001	02-SEP-18	
Chromium (Cr)-Total			<0.00010	)	mg/L		0.0001	02-SEP-18	
Cobalt (Co)-Total			<0.00010	)	mg/L		0.0001	02-SEP-18	
Copper (Cu)-Total			<0.00050	)	mg/L		0.0005	02-SEP-18	
Iron (Fe)-Total			<0.010		mg/L		0.01	02-SEP-18	
Lead (Pb)-Total			<0.00005	60	mg/L		0.00005	02-SEP-18	
Lithium (Li)-Total			<0.0010		mg/L		0.001	02-SEP-18	
Magnesium (Mg)-Tota	al		<0.0050		mg/L		0.005	02-SEP-18	
Manganese (Mn)-Tot	al		<0.00010	)	mg/L		0.0001	02-SEP-18	
Molybdenum (Mo)-To	otal		<0.00005	0	mg/L		0.00005	02-SEP-18	
Nickel (Ni)-Total			<0.00050	)	mg/L		0.0005	02-SEP-18	
Phosphorus (P)-Total	I		<0.050		mg/L		0.05	02-SEP-18	
Potassium (K)-Total			<0.050		mg/L		0.05	02-SEP-18	
Selenium (Se)-Total			<0.00005	60	mg/L		0.00005	02-SEP-18	
Silicon (Si)-Total			<0.10		mg/L		0.1	02-SEP-18	
Silver (Ag)-Total			<0.00001	0	mg/L		0.00001	02-SEP-18	
Sodium (Na)-Total			<0.050		mg/L		0.05	02-SEP-18	
Strontium (Sr)-Total			<0.00020	)	mg/L		0.0002	02-SEP-18	
Sulfur (S)-Total			<0.50		mg/L		0.5	02-SEP-18	
Thallium (TI)-Total			<0.00001	0	mg/L		0.00001	02-SEP-18	
Tin (Sn)-Total			<0.00010	)	mg/L		0.0001	02-SEP-18	
Titanium (Ti)-Total			<0.00030	)	mg/L		0.0003	02-SEP-18	
Uranium (U)-Total			<0.00001	0	mg/L		0.00001	02-SEP-18	
Vanadium (V)-Total			<0.00050	)	mg/L		0.0005	02-SEP-18	
Zinc (Zn)-Total			<0.0030		mg/L		0.003	02-SEP-18	
Zirconium (Zr)-Total			<0.00006	0	mg/L		0.00006	02-SEP-18	



		Workorder: L2156175			Report Date: 09-OCT-18		Page 16 of 30	
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4197507	,							
WG2866071-4 MS		L2156175-1			<b>0</b> (			
Aluminum (Al)-Total			92.8		%		70-130	02-SEP-18
Antimony (Sb)-Total			101.7		%		70-130	02-SEP-18
Arsenic (As)- I otal			N/A	MS-B	%		-	02-SEP-18
Barium (Ba)- I otal			90.3		%		70-130	02-SEP-18
Bismuth (Bi)-Total			99.0		%		70-130	02-SEP-18
Boron (B)-Total			91.8		%		70-130	02-SEP-18
Cadmium (Cd)-Total			95.3		%		70-130	02-SEP-18
Calcium (Ca)-Total			N/A	MS-B	%		-	02-SEP-18
Cesium (Cs)-Total			99.1		%		70-130	02-SEP-18
Chromium (Cr)-Total			93.3		%		70-130	02-SEP-18
Cobalt (Co)-Total			95.5		%		70-130	02-SEP-18
Copper (Cu)-Total			91.0		%		70-130	02-SEP-18
Iron (Fe)-Total			94.2		%		70-130	02-SEP-18
Lead (Pb)-Total			99.1		%		70-130	02-SEP-18
Lithium (Li)-Total			92.1		%		70-130	02-SEP-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	02-SEP-18
Manganese (Mn)-Total			95.0		%		70-130	02-SEP-18
Molybdenum (Mo)-Tota	d		99.8		%		70-130	02-SEP-18
Nickel (Ni)-Total			93.5		%		70-130	02-SEP-18
Phosphorus (P)-Total			94.1		%		70-130	02-SEP-18
Potassium (K)-Total			91.3		%		70-130	02-SEP-18
Selenium (Se)-Total			96.7		%		70-130	02-SEP-18
Silicon (Si)-Total			90.6		%		70-130	02-SEP-18
Silver (Ag)-Total			101.5		%		70-130	02-SEP-18
Sodium (Na)-Total			N/A	MS-B	%		-	02-SEP-18
Strontium (Sr)-Total			N/A	MS-B	%		-	02-SEP-18
Sulfur (S)-Total			94.9		%		70-130	02-SEP-18
Thallium (TI)-Total			96.4		%		70-130	02-SEP-18
Tin (Sn)-Total			97.4		%		70-130	02-SEP-18
Titanium (Ti)-Total			95.3		%		70-130	02-SEP-18
Uranium (U)-Total			101.5		%		70-130	02-SEP-18
Vanadium (V)-Total			97.5		%		70-130	02-SEP-18
Zinc (Zn)-Total			84.2		%		70-130	02-SEP-18
Zirconium (Zr)-Total			102.2		%		70-130	02-SEP-18



		Workorder: L2156175			Report Date: 09-OCT-18		Page 17 of 30	
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R420069	3							
WG2866082-2 LCS								
Aluminum (Al)-Total			105.3		%		80-120	04-SEP-18
Antimony (Sb)-Total			102.7		%		80-120	04-SEP-18
Arsenic (As)- I otal			108.7		%		80-120	04-SEP-18
Barium (Ba)-Total			103.2		%		80-120	04-SEP-18
Bismuth (Bi)-Total			97.1		%		80-120	04-SEP-18
Boron (B)-Total			99.1		%		80-120	04-SEP-18
Cadmium (Cd)-Total			104.6		%		80-120	04-SEP-18
Calcium (Ca)-Total			98.1		%		80-120	04-SEP-18
Cesium (Cs)-Total			99.3		%		80-120	04-SEP-18
Chromium (Cr)-Total			104.2		%		80-120	04-SEP-18
Cobalt (Co)-Total			105.5		%		80-120	04-SEP-18
Copper (Cu)-Total			103.4		%		80-120	04-SEP-18
Iron (Fe)-Total			100.2		%		80-120	04-SEP-18
Lead (Pb)-Total			99.1		%		80-120	04-SEP-18
Lithium (Li)-Total			96.3		%		80-120	04-SEP-18
Magnesium (Mg)-Tota	I		105.0		%		80-120	04-SEP-18
Manganese (Mn)-Tota	I		102.8		%		80-120	04-SEP-18
Molybdenum (Mo)-Tot	al		105.1		%		80-120	04-SEP-18
Nickel (Ni)-Total			102.8		%		80-120	04-SEP-18
Phosphorus (P)-Total			102.8		%		80-120	04-SEP-18
Potassium (K)-Total			101.0		%		80-120	04-SEP-18
Selenium (Se)-Total			106.1		%		80-120	04-SEP-18
Silicon (Si)-Total			109.6		%		80-120	04-SEP-18
Silver (Ag)-Total			98.2		%		80-120	04-SEP-18
Sodium (Na)-Total			102.1		%		80-120	04-SEP-18
Strontium (Sr)-Total			99.8		%		80-120	04-SEP-18
Sulfur (S)-Total			103.3		%		80-120	04-SEP-18
Thallium (TI)-Total			95.7		%		80-120	04-SEP-18
Tin (Sn)-Total			103.1		%		80-120	04-SEP-18
Titanium (Ti)-Total			105.9		%		80-120	04-SEP-18
Uranium (U)-Total			103.3		%		80-120	04-SEP-18
Vanadium (V)-Total			104.8		%		80-120	04-SEP-18
Zinc (Zn)-Total			97.7		%		80-120	04-SEP-18
Zirconium (Zr)-Total			103.8		%		80-120	04-SEP-18



		Workorder	L215617	5	Report Date: (	)9-OCT-18	Page 18 of 30		
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
MET-T-CCMS-VA	Water								
Batch R42006	93								
WG2866082-1 MB									
Aluminum (Al)-Total			<0.0030		mg/L		0.003	04-SEP-18	
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	04-SEP-18	
Arsenic (As)-Total			<0.00010		mg/L		0.0001	04-SEP-18	
Barium (Ba)-Total			<0.00010		mg/L		0.0001	04-SEP-18	
Bismuth (Bi)-Total			<0.00005	0	mg/L		0.00005	04-SEP-18	
Boron (B)-Total			<0.010		mg/L		0.01	04-SEP-18	
Cadmium (Cd)-Total			<0.00000	50	mg/L		0.000005	04-SEP-18	
Calcium (Ca)-Total			<0.050		mg/L		0.05	04-SEP-18	
Cesium (Cs)-Total			<0.00001	0	mg/L		0.00001	04-SEP-18	
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	04-SEP-18	
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	04-SEP-18	
Copper (Cu)-Total			<0.00050		mg/L		0.0005	04-SEP-18	
Iron (Fe)-Total			<0.010		mg/L		0.01	04-SEP-18	
Lead (Pb)-Total			<0.00005	0	mg/L		0.00005	04-SEP-18	
Lithium (Li)-Total			<0.0010		mg/L		0.001	04-SEP-18	
Magnesium (Mg)-Tot	al		<0.0050		mg/L		0.005	04-SEP-18	
Manganese (Mn)-Tot	al		<0.00010		mg/L		0.0001	04-SEP-18	
Molybdenum (Mo)-To	otal		<0.00005	0	mg/L		0.00005	04-SEP-18	
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	04-SEP-18	
Phosphorus (P)-Tota	I		<0.050		mg/L		0.05	04-SEP-18	
Potassium (K)-Total			<0.050		mg/L		0.05	04-SEP-18	
Selenium (Se)-Total			<0.00005	0	mg/L		0.00005	04-SEP-18	
Silicon (Si)-Total			<0.10		mg/L		0.1	04-SEP-18	
Silver (Ag)-Total			<0.00001	0	mg/L		0.00001	04-SEP-18	
Sodium (Na)-Total			<0.050		mg/L		0.05	04-SEP-18	
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	04-SEP-18	
Sulfur (S)-Total			<0.50		mg/L		0.5	04-SEP-18	
Thallium (TI)-Total			<0.00001	0	mg/L		0.00001	04-SEP-18	
Tin (Sn)-Total			<0.00010		mg/L		0.0001	04-SEP-18	
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	04-SEP-18	
Uranium (U)-Total			<0.00001	0	mg/L		0.00001	04-SEP-18	
Vanadium (V)-Total			<0.00050		mg/L		0.0005	04-SEP-18	
Zinc (Zn)-Total			<0.0030		mg/L		0.003	04-SEP-18	
Zirconium (Zr)-Total			<0.00006	0	mg/L		0.00006	04-SEP-18	



		Workorder: L2156175			Report Date: 09-OCT-18		Page 19 of 30	
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4225549								
WG2881251-2 LCS					24			
Aluminum (Al)-Total			112.6		%		80-120	19-SEP-18
Antimony (Sb)-Total			113.4		%		80-120	19-SEP-18
Arsenic (As)- I otal			114.5		%		80-120	19-SEP-18
Barium (Ba)- I otal			116.0		%		80-120	19-SEP-18
Bismuth (Bi)-Total			108.1		%		80-120	19-SEP-18
Boron (B)-Total			99.4		%		80-120	19-SEP-18
Cadmium (Cd)-Total			113.2		%		80-120	19-SEP-18
Calcium (Ca)-Total			106.9		%		80-120	19-SEP-18
Chromium (Cr)-Total			106.9		%		80-120	19-SEP-18
Cobalt (Co)-Total			110.1		%		80-120	19-SEP-18
Copper (Cu)-Total			111.0		%		80-120	19-SEP-18
Iron (Fe)-Total			104.0		%		80-120	19-SEP-18
Lead (Pb)-Total			110.9		%		80-120	19-SEP-18
Lithium (Li)-Total			104.2		%		80-120	19-SEP-18
Magnesium (Mg)-Total			111.9		%		80-120	19-SEP-18
Manganese (Mn)-Total			115.5		%		80-120	19-SEP-18
Molybdenum (Mo)-Total			109.9		%		80-120	19-SEP-18
Nickel (Ni)-Total			112.1		%		80-120	19-SEP-18
Phosphorus (P)-Total			111.3		%		80-120	19-SEP-18
Potassium (K)-Total			107.8		%		80-120	19-SEP-18
Selenium (Se)-Total			112.7		%		80-120	19-SEP-18
Silicon (Si)-Total			113.5		%		80-120	19-SEP-18
Silver (Ag)-Total			109.9		%		80-120	19-SEP-18
Sodium (Na)-Total			112.3		%		80-120	19-SEP-18
Strontium (Sr)-Total			107.4		%		80-120	19-SEP-18
Sulfur (S)-Total			111.5		%		80-120	19-SEP-18
Thallium (TI)-Total			108.2		%		80-120	19-SEP-18
Tin (Sn)-Total			111.2		%		80-120	19-SEP-18
Titanium (Ti)-Total			109.9		%		80-120	19-SEP-18
Uranium (U)-Total			105.8		%		80-120	19-SEP-18
Vanadium (V)-Total			113.4		%		80-120	19-SEP-18
Zinc (Zn)-Total			110.7		%		80-120	19-SEP-18
Zirconium (Zr)-Total			100.2		%		80-120	19-SEP-18
WG2881251-1 MB								



Test		Workorder:	Workorder: L2156175		Report Date: 09-OCT-18		Page 20 of 30	
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4225549								
WG2881251-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	19-SEP-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	19-SEP-18
Arsenic (As)-Total			<0.00010		mg/L		0.0001	19-SEP-18
Barium (Ba)- I otal			<0.00010		mg/L		0.0001	19-SEP-18
Bismuth (Bi)-Total			<0.00005	0	mg/L		0.00005	19-SEP-18
Boron (B)-Total			<0.010		mg/L		0.01	19-SEP-18
Cadmium (Cd)-Total			<0.00000	50	mg/L		0.000005	19-SEP-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	19-SEP-18
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	19-SEP-18
Cobalt (Co)-Total			<0.00010	)	mg/L		0.0001	19-SEP-18
Copper (Cu)-Total			<0.00050		mg/L		0.0005	19-SEP-18
Iron (Fe)-Total			<0.010		mg/L		0.01	19-SEP-18
Lead (Pb)-Total			<0.00005	0	mg/L		0.00005	19-SEP-18
Lithium (Li)-Total			<0.0010		mg/L		0.001	19-SEP-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	19-SEP-18
Manganese (Mn)-Total			<0.00010	)	mg/L		0.0001	19-SEP-18
Molybdenum (Mo)-Total			<0.00005	0	mg/L		0.00005	19-SEP-18
Nickel (Ni)-Total			<0.00050	)	mg/L		0.0005	19-SEP-18
Phosphorus (P)-Total			<0.050		mg/L		0.05	19-SEP-18
Potassium (K)-Total			<0.050		mg/L		0.05	19-SEP-18
Selenium (Se)-Total			<0.00005	60	mg/L		0.00005	19-SEP-18
Silicon (Si)-Total			<0.10		mg/L		0.1	19-SEP-18
Silver (Ag)-Total			<0.00001	0	mg/L		0.00001	19-SEP-18
Sodium (Na)-Total			<0.050		mg/L		0.05	19-SEP-18
Strontium (Sr)-Total			<0.00020	)	mg/L		0.0002	19-SEP-18
Sulfur (S)-Total			<0.50		mg/L		0.5	19-SEP-18
Thallium (TI)-Total			<0.00001	0	mg/L		0.00001	19-SEP-18
Tin (Sn)-Total			<0.00010	)	mg/L		0.0001	19-SEP-18
Titanium (Ti)-Total			<0.00030	)	mg/L		0.0003	19-SEP-18
Uranium (U)-Total			<0.00001	0	mg/L		0.00001	19-SEP-18
Vanadium (V)-Total			<0.00050	)	mg/L		0.0005	19-SEP-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	19-SEP-18
Zirconium (Zr)-Total			<0.00006	60	mg/L		0.00006	19-SEP-18



		Workorder: L2156175			Report Date: 09-OCT-18		Page 21 of 30	
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4235372								
WG2883822-2 LCS					<u>.</u>			
Aluminum (Al)-Total			93.2		%		80-120	22-SEP-18
Antimony (Sb)-Total			98.1		%		80-120	22-SEP-18
Arsenic (As)-Total			94.6		%		80-120	22-SEP-18
Barium (Ba)- I otal			91.2		%		80-120	22-SEP-18
Bismuth (Bi)-Total			98.4		%		80-120	22-SEP-18
Boron (B)-Total			86.3		%		80-120	22-SEP-18
Cadmium (Cd)-Total			93.1		%		80-120	22-SEP-18
Calcium (Ca)-Total			93.1		%		80-120	22-SEP-18
Chromium (Cr)-Total			89.7		%		80-120	22-SEP-18
Cobalt (Co)-Total			92.1		%		80-120	22-SEP-18
Copper (Cu)-Total			92.9		%		80-120	22-SEP-18
Iron (Fe)-Total			88.1		%		80-120	22-SEP-18
Lead (Pb)-Total			91.9		%		80-120	22-SEP-18
Lithium (Li)-Total			96.5		%		80-120	22-SEP-18
Magnesium (Mg)-Total			91.5		%		80-120	22-SEP-18
Manganese (Mn)-Total			95.9		%		80-120	22-SEP-18
Molybdenum (Mo)-Total			97.2		%		80-120	22-SEP-18
Nickel (Ni)-Total			92.6		%		80-120	22-SEP-18
Phosphorus (P)-Total			115.2		%		80-120	22-SEP-18
Potassium (K)-Total			93.6		%		80-120	22-SEP-18
Selenium (Se)-Total			91.7		%		80-120	22-SEP-18
Silicon (Si)-Total			91.2		%		80-120	22-SEP-18
Silver (Ag)-Total			92.9		%		80-120	22-SEP-18
Sodium (Na)-Total			95.8		%		80-120	22-SEP-18
Strontium (Sr)-Total			90.8		%		80-120	22-SEP-18
Sulfur (S)-Total			97.6		%		80-120	22-SEP-18
Thallium (TI)-Total			94.1		%		80-120	22-SEP-18
Tin (Sn)-Total			93.8		%		80-120	22-SEP-18
Titanium (Ti)-Total			101.8		%		80-120	22-SEP-18
Uranium (U)-Total			89.4		%		80-120	22-SEP-18
Vanadium (V)-Total			95.1		%		80-120	22-SEP-18
Zinc (Zn)-Total			91.8		%		80-120	22-SEP-18
Zirconium (Zr)-Total			89.8		%		80-120	22-SEP-18
WG2883822-1 MB								



		Workorder	: L215617	'5	Report Date: (	)9-OCT-18	Pa	ge 22 of 30
est  AET-T-CCMS-VA Batch R4235372 WG2883822-1 MB Aluminum (Al)-Total Antimony (Sb)-Total Arsenic (As)-Total Barium (Ba)-Total Barium (Ba)-Total Bismuth (Bi)-Total Boron (B)-Total Cadmium (Cd)-Total Cadmium (Cd)-Total Calcium (Ca)-Total Cobalt (Co)-Total Cobalt (Co)-Total Cobalt (Co)-Total Cobalt (Co)-Total Cobalt (Co)-Total Lead (Pb)-Total Lead (Pb)-Total Lithium (Li)-Total Magnesium (Mg)-Total Manganese (Mn)-Total Nickel (Ni)-Total Phosphorus (P)-Total Phosphorus (P)-Total Silicon (Si)-Total Silicon (Si)-Total Silicon (Si)-Total Silver (Ag)-Total Sulfur (S)-Total Thallium (TI)-Total Tin (Sn)-Total Tin (Sn)-Total	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4235372								
WG2883822-1 MB								
Aluminum (Al)-Total			< 0.0030		mg/L		0.003	22-SEP-18
Antimony (Sb)- I otal			<0.00010	)	mg/L		0.0001	22-SEP-18
Arsenic (As)-Total			<0.00010	)	mg/L		0.0001	22-SEP-18
Barium (Ba)-Total			<0.00010	)	mg/L		0.0001	22-SEP-18
Bismuth (Bi)- I otal			<0.00005	50	mg/L		0.00005	22-SEP-18
Boron (B)- I otal			<0.010		mg/L		0.01	22-SEP-18
Cadmium (Cd)-Total			<0.00000	050	mg/L		0.000005	22-SEP-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	22-SEP-18
Chromium (Cr)-Total			<0.00010	)	mg/L		0.0001	22-SEP-18
Cobalt (Co)-Total			<0.00010	)	mg/L		0.0001	22-SEP-18
Copper (Cu)-Total			<0.00050	)	mg/L		0.0005	22-SEP-18
Iron (Fe)-Total			<0.010		mg/L		0.01	22-SEP-18
Lead (Pb)-Total			<0.00005	50	mg/L		0.00005	22-SEP-18
Lithium (Li)-Total			<0.0010		mg/L		0.001	22-SEP-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	22-SEP-18
Manganese (Mn)-Total			<0.00010	)	mg/L		0.0001	22-SEP-18
Molybdenum (Mo)-Tota	I		<0.00005	50	mg/L		0.00005	22-SEP-18
Nickel (Ni)-Total			<0.00050	)	mg/L		0.0005	22-SEP-18
Phosphorus (P)-Total			<0.050		mg/L		0.05	22-SEP-18
Potassium (K)-Total			<0.050		mg/L		0.05	22-SEP-18
Selenium (Se)-Total			<0.00005	50	mg/L		0.00005	22-SEP-18
Silicon (Si)-Total			<0.10		mg/L		0.1	22-SEP-18
Silver (Ag)-Total			<0.00001	10	mg/L		0.00001	22-SEP-18
Sodium (Na)-Total			<0.050		mg/L		0.05	22-SEP-18
Strontium (Sr)-Total			<0.00020	)	mg/L		0.0002	22-SEP-18
Sulfur (S)-Total			<0.50		mg/L		0.5	22-SEP-18
Thallium (TI)-Total			<0.00001	10	mg/L		0.00001	22-SEP-18
Tin (Sn)-Total			<0.00010	)	mg/L		0.0001	22-SEP-18
Titanium (Ti)-Total			<0.00030	)	mg/L		0.0003	22-SEP-18
Uranium (U)-Total			<0.00001	10	mg/L		0.00001	22-SEP-18
Vanadium (V)-Total			<0.00050	)	mg/L		0.0005	22-SEP-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	22-SEP-18
Zirconium (Zr)-Total			<0.0006	60	mg/L		0.00006	22-SEP-18

NH3-F-VA

Water



		Workorder:	L215617	5 Re	port Date:	09-OCT-18	Pa	ge 23 of 30
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-F-VA	Water							
Batch R4196454	1							
WG2866455-7 DUP Ammonia, Total (as N)		<b>L2156175-11</b> <0.0050	<0.0050	RPD-NA	mg/L	N/A	20	02-SEP-18
WG2866455-2 LCS Ammonia, Total (as N)			96.5		%		85-115	02-SEP-18
WG2866455-6 LCS Ammonia, Total (as N)			98.0		%		85-115	02-SEP-18
WG2866455-1 MB Ammonia, Total (as N)			<0.0050		mg/L		0.005	02-SEP-18
WG2866455-5 MB Ammonia, Total (as N)			<0.0050		mg/L		0.005	02-SEP-18
WG2866455-8 MS Ammonia, Total (as N)		L2156175-11	108.3		%		75-125	02-SEP-18
NO2-L-IC-N-VA	Water							
Batch R4203293	3							
WG2866329-3 DUP Nitrite (as N)		<b>L2156175-12</b> <0.0010	<0.0010	RPD-NA	mg/L	N/A	20	04-SEP-18
WG2866329-2 LCS Nitrite (as N)			101.2		%		90-110	04-SEP-18
WG2866333-2 LCS Nitrite (as N)			99.8		%		90-110	04-SEP-18
WG2866329-1 MB Nitrite (as N)			<0.0010		mg/L		0.001	04-SEP-18
WG2866333-1 MB Nitrite (as N)			<0.0010		mg/L		0.001	04-SEP-18
WG2866329-4 MS Nitrite (as N)		L2156175-13	100.9		%		75-125	04-SEP-18
NO3-L-IC-N-VA	Water							
Batch R420329	R							
WG2866329-3 DUP Nitrate (as N)		<b>L2156175-12</b> <0.0050	<0.0050	RPD-NA	mg/L	N/A	20	04-SEP-18
WG2866329-2 LCS Nitrate (as N)			99.6		%		90-110	04-SEP-18
WG2866333-2 LCS Nitrate (as N)			98.6		%		90-110	04-SEP-18
WG2866329-1 MB Nitrate (as N)			<0.0050		mg/L		0.005	04-SEP-18
WG2866333-1 MB Nitrate (as N)			<0.0050		mg/L		0.005	04-SEP-18



	Workorder:	L215617	5	Report Date: 09	9-OCT-18	Pa	ge 24 of 30
Test Matrix	x Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-VA Wate Batch R4203293 WG2866329-4 MS Nitrate (as N)	r L2156175-13	100.7		%		75-125	04-SEP-18
OGG-SF-VA Wate	r						
Batch R4207171 WG2870790-2 LCS Oil and Grease		92.2		%		70-130	07-SEP-18
WG2870790-1 MB Oil and Grease		<5.0		mg/L		5	07-SEP-18
OGG-VISIBLE-SHEEN-VA Wate Batch R4207171	r						
WG2870790-2 LCS Oil And Grease (Visible Sheen)		no					07-SEP-18
WG2870790-1 MB Oil And Grease (Visible Sheen)		no					07-SEP-18
P-T-PRES-COL-VA Wate	r						
Batch R4200627 WG2866457-2 CRM Phosphorus (P)-Total	VA-ERA-PO4	102.2		%		80-120	04-SEP-18
WG2866457-6 CRM Phosphorus (P)-Total	VA-ERA-PO4	96.9		%		80-120	04-SEP-18
WG2866457-7 DUP Phosphorus (P)-Total	<b>L2156175-18</b> 0.0063	0.0063		mg/L	0.2	20	04-SEP-18
WG2866457-1 MB Phosphorus (P)-Total		<0.0020		mg/L		0.002	04-SEP-18
WG2866457-5 MB Phosphorus (P)-Total		<0.0020		mg/L		0.002	04-SEP-18
WG2866457-8 MS Phosphorus (P)-Total	L2156175-19	92.0		%		70-130	04-SEP-18
P-TD-COL-VA Wate	r						
Batch R4196307 WG2866014-2 CRM Phosphorus (P)-Total Dissolve	VA-ERA-PO4	108.2		%		80-120	01-SEP-18
WG2866014-3 DUP Phosphorus (P)-Total Dissolve	<b>L2156175-19</b> d 0.0029	0.0022	J	mg/L	0.0007	0.004	01-SEP-18
WG2866014-1 MB Phosphorus (P)-Total Dissolve	d	<0.0020		mg/L		0.002	01-SEP-18

Water



			Workorder:	L2156175	5 Re	port Date: 09	-OCT-18	Pa	ge 25 of 30
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-PCT-VA Batch R41 WG2866325-2 pH	96461 CRM	Water	VA-PH7-BUF	7.02		рН		6.9-7.1	02-SEP-18
Batch R41 WG2866323-2 pH WG2866323-5	98364 CRM DUP		VA-PH7-BUF L2156175-14	7.01		рН		6.9-7.1	04-SEP-18
рН			7.93	7.97	J	рН	0.04	0.3	04-SEP-18
S2-T-COL-VA Batch R42 WG2868777-2 Sulphide as S	203941 DUP	Water	<b>L2156175-4</b> <0.018	<0.018	RPD-NA	mg/L	N/A	20	05-SEP-18
WG2868777-3 Sulphide as S	LCS			110.1		%		75-135	05-SEP-18
WG2868777-8 Sulphide as S	LCS			110.1		%		75-135	05-SEP-18
WG2868777-1 Sulphide as S	МВ			<0.018		mg/L		0.018	05-SEP-18
WG2868777-7 Sulphide as S	МВ			<0.018		mg/L		0.018	05-SEP-18
Batch R42	205318								
WG2869927-3 Sulphide as S	LCS			95.8		%		75-135	06-SEP-18
WG2869927-1 Sulphide as S	МВ			<0.018		mg/L		0.018	06-SEP-18
Batch R42	211106								
WG2872655-3 Sulphide as S	LCS			102.9		%		75-135	10-SEP-18
WG2872655-1 Sulphide as S	МВ			<0.018		mg/L		0.018	10-SEP-18
SO4-IC-N-VA		Water							
Batch R42	203293								
WG2866329-3 Sulfate (SO4)	DUP		<b>L2156175-12</b> 2.47	2.47		mg/L	0.0	20	04-SEP-18
WG2866329-2 Sulfate (SO4)	LCS			100.6		%		90-110	04-SEP-18
WG2866333-2 Sulfate (SO4)	LCS			100.5		%		90-110	04-SEP-18



		Workorder:	L2156175	Rep	oort Date: 09-OC	T-18	Page	e 26 of 30
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-VA Batch R4203293	Water							
<b>WG2866329-1 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	04-SEP-18
<b>WG2866333-1 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	04-SEP-18
WG2866329-4 MS Sulfate (SO4)		L2156175-13	101.3		%		75-125	04-SEP-18
TDS-VA	Water							
Batch R4198232								
WG2865990-2 LCS Total Dissolved Solids			94.5		%		85-115	01-SEP-18
WG2865990-1 MB Total Dissolved Solids			<10		mg/L		10	01-SEP-18
TSS-VA	Water							
Batch R4198308								
WG2865960-6 DUP Total Suspended Solids		<b>L2156175-8</b> <3.0	<3.0	RPD-NA	mg/L	N/A	20	01-SEP-18
WG2865960-2 LCS Total Suspended Solids			95.9		%		85-115	01-SEP-18
WG2865960-5 LCS Total Suspended Solids			98.3		%		85-115	01-SEP-18
WG2865960-1 MB Total Suspended Solids			<3.0		mg/L		3	01-SEP-18
WG2865960-4 MB Total Suspended Solids			<3.0		mg/L		3	01-SEP-18
TURBIDITY-VA	Water							
Batch R4195850								
WG2865749-2 CRM Turbidity		VA-FORM-40	104.0		%		85-115	31-AUG-18
WG2865749-5 CRM Turbidity		VA-FORM-40	103.8		%		85-115	31-AUG-18
WG2865749-3 DUP Turbidity		<b>L2156175-1</b> 1.30	1.28		NTU	1.6	15	31-AUG-18
WG2865749-1 MB Turbidity			<0.10		NTU		0.1	31-AUG-18
WG2865749-4 MB Turbidity			<0.10		NTU		0.1	31-AUG-18
VH-HSFID-VA	Water							



	Workorder	: L215617	5	Report Date: 0	9-OCT-18	Pa	ge 27 of 30
Test Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VH-HSFID-VA Water							
Batch R4203069							
WG2867181-2 LCS							
Volatile Hydrocarbons (VH6-10)		73.1		%		70-130	05-SEP-18
WG2867181-1 MB							
Volatile Hydrocarbons (VH6-10)		<0.10		mg/L		0.1	05-SEP-18
VOC7-HSMS-VA Water							
Batch R4198892							
WG2867181-2 LCS							
Benzene		79.2		%		70-130	04-SEP-18
Ethylbenzene		83.4		%		70-130	04-SEP-18
Methyl t-butyl ether (MTBE)		88.6		%		70-130	04-SEP-18
Styrene		87.3		%		70-130	04-SEP-18
Toluene		81.0		%		70-130	04-SEP-18
meta- & para-Xylene		83.2		%		70-130	04-SEP-18
ortho-Xylene		85.4		%		70-130	04-SEP-18
WG2867181-1 MB							
Benzene		<0.00050	1	mg/L		0.0005	04-SEP-18
Ethylbenzene		<0.00050	1	mg/L		0.0005	04-SEP-18
Methyl t-butyl ether (MTBE)		<0.00050	)	mg/L		0.0005	04-SEP-18
Styrene		<0.00050	1	mg/L		0.0005	04-SEP-18
Toluene		<0.00045	i	mg/L		0.00045	04-SEP-18
meta- & para-Xylene		<0.00050	)	mg/L		0.0005	04-SEP-18
ortho-Xylene		<0.00050	1	mg/L		0.0005	04-SEP-18

Workorder: L2156175

Report Date: 09-OCT-18

#### 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
J	Duplicate results and limits are expressed in terms of absolute difference.
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.

Workorder: L2156175

Report Date: 09-OCT-18

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests		• •					
pH by Meter (Automated)							
	1	29-AUG-18 11:00	02-SEP-18 10:04	0.25	95	hours	EHTR-FM
	2	29-AUG-18 11:00	02-SEP-18 10:04	0.25	95	hours	EHTR-FM
	3	29-AUG-18 11:00	02-SEP-18 10:04	0.25	95	hours	EHTR-FM
	4	29-AUG-18 11:00	02-SEP-18 10:04	0.25	95	hours	EHTR-FM
	5	28-AUG-18 11:00	02-SEP-18 10:04	0.25	119	hours	EHTR-FM
	6	28-AUG-18 11:00	02-SEP-18 10:04	0.25	119	hours	EHTR-FM
	7	28-AUG-18 11:00	02-SEP-18 10:04	0.25	119	hours	EHTR-FM
	8	28-AUG-18 11:00	02-SEP-18 10:04	0.25	119	hours	EHTR-FM
	9	28-AUG-18 11:00	02-SEP-18 10:04	0.25	119	hours	EHTR-FM
	10	28-AUG-18 11:00	02-SEP-18 10:04	0.25	119	hours	EHTR-FM
	11	29-AUG-18 11:00	02-SEP-18 10:04	0.25	95	hours	EHTR-FM
	12	29-AUG-18 11:00	02-SEP-18 10:04	0.25	95	hours	EHTR-FM
	13	28-AUG-18 11:00	02-SEP-18 10:04	0.25	119	hours	EHTR-FM
	14	29-AUG-18 11:00	04-SEP-18 08:46	0.25	142	hours	EHTR-FM
	15	28-AUG-18 11:00	04-SEP-18 08:46	0.25	166	hours	EHTR-FM
	16	29-AUG-18 11:00	04-SEP-18 08:46	0.25	142	hours	EHTR-FM
	17	28-AUG-18 11:00	04-SEP-18 08:46	0.25	166	hours	EHTR-FM
	18	28-AUG-18 11:00	04-SEP-18 08:46	0.25	166	hours	EHTR-FM
	19	28-AUG-18 11:00	04-SEP-18 08:46	0.25	166	hours	EHTR-FM
Anions and Nutrients							
Nitrate in Water by IC (Low	Level)						
	, 1	29-AUG-18 11:00	04-SEP-18 07:18	3	6	davs	EHT
	2	29-AUG-18 11:00	04-SEP-18 07:18	3	6	davs	EHT
	3	29-AUG-18 11:00	04-SEP-18 07:18	3	6	davs	EHT
	4	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT
	5	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	6	28-AUG-18 11:00	04-SEP-18 07:18	3	7	davs	EHTL
	7	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	8	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	9	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	10	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	11	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT
	12	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT
	13	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	14	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT
	15	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	16	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT
	17	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	18	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	19	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
Nitrite in Water by IC (Low	Level)						
	1	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT
	2	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT
	3	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT
	4	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT
	5	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	6	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	7	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	8	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	9	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	10	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	11	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT
	12	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT
	13	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	14	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT
	15	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	16	29-AUG-18 11:00	04-SEP-18 07:18	3	6	days	EHT

Workorder: L2156175

Report Date: 09-OCT-18

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Hold Time Exceedances:

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrite in Water by IC (Low	Level)						
• · ·	17	28-AUG-18 11:00	04-SEP-18 07:18	3	7	davs	EHTL
	18	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
	19	28-AUG-18 11:00	04-SEP-18 07:18	3	7	days	EHTL
Total Dissolved P in Water	by Colour						
	5	28-AUG-18 11:00	31-AUG-18 23:00	3	4	davs	EHTL
	6	28-AUG-18 11:00	31-AUG-18 23:00	3	4	days	EHTL
	7	28-AUG-18 11:00	31-AUG-18 23:00	3	4	days	EHTL
	8	28-AUG-18 11:00	31-AUG-18 23:00	3	4	days	EHTL
	9	28-AUG-18 11:00	31-AUG-18 23:00	3	4	days	EHTL
	10	28-AUG-18 11:00	31-AUG-18 23:00	3	4	days	EHTL
	13	28-AUG-18 11:00	31-AUG-18 23:00	3	4	days	EHTL
	15	28-AUG-18 11:00	31-AUG-18 23:00	3	4	days	EHTL
	17	28-AUG-18 11:00	31-AUG-18 23:00	3	4	days	EHTL
	18	28-AUG-18 11:00	31-AUG-18 23:00	3	4	days	EHTL
	19	28-AUG-18 11:00	31-AUG-18 23:00	3	4	days	EHTL
Total Sulphide by Colorime	etric						
	5	28-AUG-18 11:00	06-SEP-18 14:30	7	9	days	EHT
	6	28-AUG-18 11:00	06-SEP-18 14:30	7	9	days	EHT
	7	28-AUG-18 11:00	06-SEP-18 14:30	7	9	days	EHT
	8	28-AUG-18 11:00	10-SEP-18 12:15	7	13	days	EHT
	9	28-AUG-18 11:00	06-SEP-18 14:30	7	9	days	EHT
	10	28-AUG-18 11:00	06-SEP-18 14:30	7	9	days	EHT
	13	28-AUG-18 11:00	06-SEP-18 14:30	7	9	days	EHT
	15	28-AUG-18 11:00	06-SEP-18 14:30	7	9	days	EHT
	17	28-AUG-18 11:00	06-SEP-18 14:30	7	9	days	EHT
	18	28-AUG-18 11:00	06-SEP-18 14:30	7	9	days	EHT
	19	28-AUG-18 11:00	06-SEP-18 14:30	7	9	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 L2156175 were received on 30-AUG-18 11:50.

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 predetermined 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.

Ft. Collins, Colorado

LIMS Version: 6.879

Monday, October 08, 2018

Joanne Lee ALS Environmental 8081 Lougheed Hwy, Suite 100 Burnaby, BC V5A 1W9

Re: ALS Workorder: 1809090 Project Name: Project Number: L2156175

Dear Ms. Lee:

Five water samples were received from ALS Environmental, on 9/6/2018. The samples were scheduled for the following analyses:

Lead-210	
Total Radium	

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 Katie M. OBrien Project Manager

ADDRESS 225 Commerce Drive, Fort Collins, Colorado, USA 80524 | PHONE +1 970 490 1511 | FAX +1 970 490 1522 ALS GROUP USA, CORP. Part of the ALS Laboratory Group An ALS Limited Company 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				
Arizona (AZ)	AZ0742				
California (CA)	06251CA				
Colorado (CO)	CO01099				
Florida (FL)	E87914				
Idaho (ID)	CO01099				
Kansas (KS)	E-10381				
Kentucky (KY)	90137				
PJ-LA (DoD ELAP/ISO 170250)	95377				
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				



#### 1809090

#### Radium-226:

The samples were analyzed for the presence of <sup>226</sup>Ra according to the current revision of SOP 724.

All acceptance criteria were met.

#### Lead-210:

The samples were analyzed for the presence of <sup>210</sup>Pb according to the current revisions of SOP 704.

All acceptance criteria were met.
## Sample Number(s) Cross-Reference Table

OrderNum: 1809090 Client Name: ALS Environmental Client Project Name: Client Project Number: L2156175 Client PO Number: L2156175

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L2156175-9	1809090-1		WATER	28-Aug-18	
L2156175-10	1809090-2		WATER	28-Aug-18	
L2156175-13	1809090-3		WATER	28-Aug-18	
L2156175-15	1809090-4		WATER	28-Aug-18	
L2156175-17	1809090-5		WATER	28-Aug-18	



L2156175

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1809090

#### Subcontract Request Form

**Subcontract To:** 

**ALS ENVIRONMENTAL** 225 COMMERCE DRIVE FORT COLLINS, CO 80524

FORT COLLINS COLORADO, USA

NOTES: Please reference on final report and invoice: PO# L2156175 ALS requires QC data to be provided with your final results.

#### Please see enclosed 5 sample(s) in **10** Container(s)

SAMPLE NUMBER		DATE SAMPLED	Driority
	ANALYTICAL REQUIRED	DUE DATE	Flag
L2156175-9 CL-3		8/28/2018	
	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/2/2018	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/2/2018	
L2156175-10 CL-26		8/28/2018	
	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/2/2018	
-	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/2/2018	
L2156175-13 CL-8		8/28/2018	
	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/2/2018	
)	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/2/2018	
L2156175-15 CL-DVP-1		8/28/2018	
7	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/2/2018	
	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/2/2018	
L2156175-17 CL-FIELD B	LANK	8/28/2018	
$\mathbf{r}$	Lead-210 by Liquid Scintillation (PB210L-FC 14)	10/2/2018	
J	Radium-226 by Gas Flow Prop. (RA226-GFPC-FC 14)	10/2/2018	



L2156175 VANCOUVER

1 809090

#### **Subcontract Request Form**

#### Subcontract To:

#### ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE FORT COLLINS,CO 80524

Subcontract Info Analysis and rep	• Contact: orting info contact:	Walter L Joanne   8081 LC SUITE 1 BURNAE	.in (604) 253-4188 Lee DUGHEED HWY 00 BY,BC V5A 1W9	*NEW* Reporting Contacts: 1.Account Manager Listed Below 2.ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL) 3.ALSE.CASDG@ALSGlobal.com (EDD/Database Formats)		
		Phone:	(604) 253-4188	Email:joanne.lee@alsglobal.com		
Please email co	onfirmation of recei	ipt to:	joanne.lee@als	global.com		
Shipped By:	7	mel	Date Shipped:	Ser 0 4 2018		
Received By:	KELI-JEAN SNIT		Date Received:	9.10:18 1125		
Verified By:			Date Verified:			
			Temperature:			
Sample Integrity	Issues:					



L2156175

VANCOUVER

1809090

#### **Subcontract Request Form**

#### **Subcontract To:**

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#### ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE FORT COLLINS,CO 80524









#### Subcontract Request Form

#### **Subcontract To:**

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#### ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE FORT COLLINS,CO 80524

Subcontract Info (	Contact:	Walter Lin	(604) 253-4188	*NEW* Reporting Contacts:			
Analysis and repo	rting info contact:	Joanne Lee 8081 LOUG SUITE 100 BURNABY,	e GHEED HWY ) BC V5A 1W9	I.Account Manager Listed Below 2.ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL) 3.ALSE.CASDG@ALSGlobal.com (EDD/Database Forma			
		Phone: (	604) 253-4188	Email:joanne.lee@alsglobal.com			
Please email cor	nfirmation of rece	ipt to:	joanne.lee@als	global.com D91 11 / 23 (8			
Received By:	KELI-JEAN :	SMITH K	Date Received:	9.12-18 1030			
Verified By:			Date Verified:				
			Temperature:				

Sample Integrity Issues:



#### ALS Environmental - Fort Collins CONDITION OF SAMPLE UPON RECEIPT FORM

(ALS) Client: ALR RILL	MARV	Workorder No:	18	0900	90	
Project Manager:	D		Date:	9.0	0.18	
1. Are airbills / shipping documents present	and/or removable?	8		DROP OFF	YES	NO
<sup>2</sup> Are custody seals on <b>shipping</b> containers	intact?			MONE	YES	NO
3. Are custody seals on sample containers in	itact?			NONE	YES	NO
4 Is there a COC (chain-of-custody) present	?				YES	NO
<ul> <li>Is the COC in agreement with samples rec</li> <li>matrix, requested analyses, etc.)</li> </ul>	eived? (IDs, dates, ti	mes, # of samples, #	of conta	iners,	YES	NO
6. Are short-hold samples present?					YES	NO
7. Are all samples within holding times for the	he requested analyse	es?			YES	NO
8 Were all sample containers received intact	t? (not broken or le	aking)			YES	NO
9 Is there sufficient sample for the requested	l analyses?				YES	NO
10. Are all samples in the proper containers for	or the requested ana	lyses?			YES	NO
11. Are all aqueous samples preserved correct	ly, if required? (exc	luding volatiles)	12	N/A	YES	NO
12. Are all aqueous non-preserved samples pH	ł 4-9?			N/A	YES	NO
Are all samples requiring no headspace (V of bubbles > 6 mm (1/4 inch) diameter? (i	OC, GRO, RSK/M .e. size of green pea	EE, Rx CN/S, rador )	ı) free	N/A	YES	NO
14 Were the samples shipped on ice?					YES .	NO
<sup>15.</sup> Were cooler temperatures measured at 0.1	-6.0°C? IR gun used*:	#1 (#3)	#4	RAD	YES	NO
Cooler #:	$\underline{}$					
Temperature (°C):	5.5 15.8					
No. of custody seals on cooler:	00					
Acceptance External µR/hr reading:	10 10					
Background μR/hr reading:	10	$\overline{\mathbf{A}}$				
Were external $\mu$ R/hr readings $\leq$ two times background and	within DOT acceptance c	riteria? YES/NO/NA	(If no, see	Form 008.)		
Additional Information: Please provide details be	re for any NO responses	a gray shaded haves show		than issues a	notodi	2.10

Additional information: Please provide details here for any NO responses to gray-shaded boxes above, or any other issues noted:

5 for sample- 4 Client will subun -Missina 11 10m mossi puttle If applicable, was the client contacted? YES NO/NA Contact: Joanne lec 18 1250 917 Date/Time: 9 4 Project Manager Signature / Date: Form 201r26.xls \*IR Gun #1, VWR SN 170560549 (06/29/2018) \*IR Gun #3, VWR SN 170647571 Page 1 of \*IR Gun #4, Oakton, SN 2372220101-0002

ALS Env CONDITION OF S	vironmental - F SAMPLE UPO	ort Collins N RECEIPT FOR	м			
(ALS) Client: ALS		Workorder No:	1800	109-	D	
Project Manager:( <u>(M()</u>		Initials:/(	Date:	91	2.18	_
Are airbills / shipping documents present and/or i	removable?			DROP OFF	YES	) NO
Are custody seals on <b>shipping</b> containers intact?				NONE	YES	NO
Are custody seals on <b>sample</b> containers intact?				NONE	YES	NO
Is there a COC (chain-of-custody) present?			·····		YES	) NO
Is the COC in agreement with samples received? matrix, requested analyses, etc.)	(IDs, dates, tim	nes, # of samples, #	f of conta	iners,	YES	) no
Are short-hold samples present?	w				YES	(NO)
Are all samples within holding times for the requ	ested analyses	?			YES	NO
Were all sample containers received intact? (not	broken or leak	(ing)			VES	NO
Is there sufficient sample for the requested analys	ses?		······		YES	NO
Are all samples in the proper containers for the re	equested analy	ses?			YES	NO
Are all aqueous samples preserved correctly, if re	equired? (exclu	uding volatiles)		N/A	YES	NO
Are all aqueous non-preserved samples pH 4-9?				(N/A)	YES	NO
Are all samples requiring no headspace (VOC, G of bubbles $> 6 \text{ mm} (1/4 \text{ inch})$ diameter? (i.e. size	RO, RSK/ME of green pea)	E, Rx CN/S, rador	n) free	N/A)	YES	NO
Were the samples shipped on ice?					YES	NQ
Were cooler temperatures measured at 0.1-6.0°C?	? IR gun used*:	#1 (#3)	#4	RAD	YES	(NO
Temperature (°C): No. of custody seals on cooler: Acceptance Information Background µR/hr reading: Were external µR/hr readings ≤ two times background and within D	OT acceptance criti	eria? <b>YES NO / NA</b>	(If no, see	Form 008.)		
Iditional Information: Please provide details here for any Y · (S) IU (WMB DU	v NO responses to W DW	gray-shaded boxes abov	ve. or any o	ther issues	noted: ////////////////////////////////////	Kd_
applicable, was the client contacted? YES / NO / NA CONTACTER? YES / NO	ct: n #1, VWR SN 17 n #3, VWR SN 17 Oakton SN 227	- <u>4/14/13</u> 70560549 10647571		Date/Ti	me:	of

1809090



2. Place label in shipping pouch and affix it to your shipment. 1. Fold the printed page along the horizontal line.

CONSIGNEE COPY - PLEASE PLACE IN FRONT OF POUCH After printing this label:

MANDATORY LAW income and provide a style and and and a style and and and a style and and and a style operations and and a style operations and and a style operations and a style opera

Method in the control of the control

S. Ve makets constrained by not implied to incorrect declaration of cargo, improper or insufficient pecking, secting, marking or addressing of the shipmant, or for the acts or omissions of the including terms of our agreement. We won't be lable from (or the acts or omissions of the including terms of our agreement. We won't be lable from (or the acts or omissions of the including terms of our agreement. We won't be lable from (or the acts or omissions of the including terms of our agreement. We won't be lable from (or the acts or omissions of the including terms of our agreement. We won't be lable from (or the acts or omissions of the including terms of our agreement. We won't be lable for our or the acts or omissions of the including terms of the acts or omissions of the including terms of the acts of out to the acts of the including terms of the acts or omissions of the including terms of the acts of the including terms of the acts of the including terms of the acts of t

In this work of Lability. If not governed by the Warsaw Convention of the CMR as described above, our maximum liability for tors, damage or delay is Himided by this Air Warylill to US. \$100 per shorend or US. \$100 per shor HEA810

Portube and provide the without operations. You' and "federal Express Corporation, it's subsidiaries and brain may any and independent contractors. You' and You' refer to the shipper, it's employees, agains and the mapped contractor without and the provide of the shipper, it's employees, the many and the press subsidiary, branch or independent contractor without and the press format and the press and the

10 of 20



1. Fold the printed page slong the horizontal line.
2. Place label in shipping pouch and affix it to your shipment.

CONSIGNEE COPY - PLEASE PLACE IN FRONT OF POUCH





2. Place label in shipping pouch and affix it to your shipment.

I. Fold the printed page along the horizontal line.

CONSIGNEE COPY - PLEASE PLACE IN FRONT OF POUCH Hedal sint grinning reftA

nertio sealor. Unitentise to each an this way this is the place of destination. Unites other restriction of the second second and the second second second second second second second second second second

to the extent that it is not overinden. The investidity or unenticreablish of any provision shall not affect any other pail of this knowled to a poil of our agreement is a it is not overindent. The investide soft is well as any provision shall as a poil of our agreement is a it is a greement in a it is a contained on the face of the knowled as a poil of our agreement is a it is a greement in a it is a poil of the knowled as a poil of the knowled as a poil of the knowled as a poil of our agreement is a it is a face of the knowled as a poil of our agreement is a it is a poil of our agreement is a it is a poil of the knowled as a poil of our agreement is a it is a poil of the knowled as a poil of our agreement is a it is a poil of the knowled as a poil of the know USC Sec 401, 18 USC Sec. 1001, 50 USC app. 2410.

In GS 564 (c): If BUCS FC, DURANDEE YMA MARKANTIEE YMA MARKANTIE YMA YMA MARKANTIE YMA YMA MARKANTIE YMA YMA MAR with actual or appare M ON

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equivation focal cum NEOLIOE We won't finterest in interest in Labeling, if not governed by the Warsaw Convention of the CMR as described above, our maximum labeling to loss, damage or delay is limited by this Air waybill to U.S. \$100 per shorend or U.S. \$100 prevail prevail

Derivations: On the Ak Waybill Yae, 'Our', 'us' and 'and'rease compression, it's subsidiaries and brain taspective amplorees, significant contractions. You', 'us' and' 'Fed&r refer to bis stripper, it's employees, agains and the inspective amplores provided more use the stripper, it's employees, agains and the inspective amplores of the Ak Waybill Yae, 'Our', 'us' and 'Fed&r refer to bis stripper, it's employees, and the inspective amplores of the Ak Waybill in any type repression and the ak Waybill and is stripper, the amplore and the aktive outed of th

Client:	ALS Environmental					<b>Date:</b> 08-0	Dct-18
Project:	L2156175					Work Order: 1809	9090
Sample ID:	L2156175-9					Lab ID: 1809	9090-1
Legal Location:						Matrix: WA	TER
<b>Collection Date:</b>	8/28/2018				Perc	ent Moisture:	
Analyses		Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liq	uid Scintilation		SOP	704	Pre	p Date: <b>9/27/2018</b>	PrepBy: <b>KMR</b>
Pb-210		0.0062 (+/- 0.016)	U	0.027	BQ/I	NA	9/30/2018 03:02
Carr: LEAD		87.4		40-110	%REC	DL = NA	9/30/2018 03:02
Radium-226 by (	GFPC		SOP	724	Pre	p Date: <b>9/18/2018</b>	PrepBy: CMW
Ra-226		0.053 (+/- 0.015)		0.0039	BQ/I	NA	10/3/2018 08:35
Carr: BARIUM		96		40-110	%REC	DL = NA	10/3/2018 08:35

Client:	ALS Environmental					<b>Date:</b> 08-0	Oct-18
Project:	L2156175					Work Order: 1809	9090
Sample ID:	L2156175-10					Lab ID: 1809	9090-2
Legal Location:						Matrix: WA	TER
<b>Collection Date:</b>	8/28/2018				Perc	ent Moisture:	
Analyses		Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Lig	uid Scintilation		SOP	704	Pre	p Date: <b>9/27/2018</b>	PrepBy: <b>KMR</b>
Pb-210		-0.0097 (+/- 0.015)	U	0.026	BQ/I	NA	9/30/2018 04:45
Carr: LEAD		90.6		40-110	%REC	DL = NA	9/30/2018 04:45
Radium-226 by	GFPC		SOP	724	Pre	p Date: <b>9/18/2018</b>	PrepBy: CMW
Ra-226		0.0016 (+/- 0.0021)	U	0.0044	BQ/I	NA	10/3/2018 08:35
Carr: BARIUM		87.3		40-110	%REC	DL = NA	10/3/2018 08:35

Client:	ALS Environmental					<b>Date:</b> 08-0	Dct-18
Project:	L2156175					Work Order: 1809	9090
Sample ID:	L2156175-13					Lab ID: 1809	9090-3
Legal Location:						Matrix: WA	TER
<b>Collection Date:</b>	8/28/2018				Perc	ent Moisture:	
Analyses		Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liq	uid Scintilation		SOP	704	Pre	p Date: <b>9/27/2018</b>	PrepBy: <b>KMR</b>
Pb-210		-0.011 (+/- 0.015)	U	0.026	BQ/I	NA	9/30/2018 06:27
Carr: LEAD		89.2		40-110	%REC	DL = NA	9/30/2018 06:27
Radium-226 by	GFPC		SOP	724	Pre	p Date: <b>9/18/2018</b>	PrepBy: CMW
Ra-226		0.0010 (+/- 0.0019)	U	0.0043	BQ/I	NA	10/3/2018 08:35
Carr: BARIUM		82.1		40-110	%REC	DL = NA	10/3/2018 08:35

Client:	ALS Environmental					<b>Date:</b> 08-0	Dct-18
Project:	L2156175					Work Order: 1809	9090
Sample ID:	L2156175-15					Lab ID: 1809	9090-4
Legal Location:						Matrix: WA	TER
<b>Collection Date:</b>	8/28/2018				Perc	ent Moisture:	
Analyses		Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liq	uid Scintilation		SOP	704	Pre	p Date: <b>9/27/2018</b>	PrepBy: <b>KMR</b>
Pb-210		-0.00049 (+/- 0.015)	U	0.025	BQ/I	NA	9/30/2018 08:10
Carr: LEAD		92.6		40-110	%REC	DL = NA	9/30/2018 08:10
Radium-226 by	GFPC		SOP	724	Pre	p Date: <b>9/18/2018</b>	PrepBy: CMW
Ra-226		0.0017 (+/- 0.0021)	U	0.0042	BQ/I	NA	10/3/2018 08:35
Carr: BARIUM		80.3		40-110	%REC	DL = NA	10/3/2018 08:35

Client:	ALS Environmental					<b>Date:</b> 08	2-Oct-18
Project:	L2156175					Work Order: 18	09090
Sample ID:	L2156175-17					Lab ID: 18	09090-5
Legal Location:						Matrix: W	ATER
<b>Collection Date:</b>	8/28/2018				Perc	ent Moisture:	
Analyses		Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Lead-210 by Liq	uid Scintilation		SOP	704	Pre	p Date: <b>9/27/2018</b>	PrepBy: <b>KMR</b>
Pb-210		-0.0026 (+/- 0.015)	U	0.026	BQ/I	NA	9/30/2018 09:52
Carr: LEAD		89.6		40-110	%REC	DL = NA	9/30/2018 09:52
Radium-226 by	GFPC		SOP	724	Pre	p Date: <b>9/18/2018</b>	PrepBy: CMW
Ra-226		0.00080 (+/- 0.0022)	U	0.0051	BQ/I	NA	10/3/2018 08:35
Carr: BARIUM		80.2		40-110	%REC	DL = NA	10/3/2018 08:35

Client:	ALS Environmental					Date:	08-0ct-18	
Project:	L2156175					Work Order:	1809090	
Sample ID:	L2156175-17					Lab ID:	1809090-5	
Legal Location:						Matrix:	WATER	
Collection Date:	8/28/2018				Perc	ent Moisture:		
				Report		Dibation		
Analyses		Result	Qual	Limit	Units	Factor		Date Analyzed
Explanation of (	Qualifiers							
Radiochemistry:								
- "Report Limit" is the	MDC		ı	M3 - The reques	ted MDC was r	not met, but the rep	orted	
U or ND - Result is le	ess than the sample specific MDC			activity is g	reater than the	reported MDC.		
Y1 - Chemical Yield i	is in control at 100-110%. Quanti	tative yield is assumed.	۱	L - LCS Recover	y below lower o	control limit.		
Y2 - Chemical Yield	outside default limits.			H - LCS Recover	ry above upper	control limit.		
W - DER is greater the	han Warning Limit of 1.42		,	P - LCS, Matrix S	Popovoru outoi	within control limits	5.	
* - Aliquot Basis is 'A	s Received' while the Report Bas	is is 'Dry Weight'.	1	NC - Not Calcula	ated for duplica	to results less than	5 times MDC	
# - Aliquot Basis is 'E G - Sample density d	big weight while the Report Basis	ensity.	1	B - Analvte conce	entration great	er than MDC.		
D - DER is greater th	an Control Limit		l	B3 - Analyte cond	centration grea	ter than MDC but le	ess than Reques	ted
M - Requested MDC	not met.		I	MDC.	Ū.			
LT - Result is less the	an requested MDC but greater the	an achieved MDC.						
Inorganics:								
B - Result is less that	n the requested reporting limit bu	t greater than the instrun	nent metho	od detection limit	t (MDL).			
U or ND - Indicates th	hat the compound was analyzed f	or but not detected.		tonunoto moviha	a included in th	o porrotivo		
M - Duplicate injecti	ion precision was not met	sence of interference. A	An explana	alory note may be		e narrauve.		
N - Spiked sample re duplicate fail and the	covery not within control limits. A native sample concentration is le	A post spike is analyzed f less than four times the sp	for all ICP bike addec	analyses when the concentration.	he matrix spike	e and or spike		
Z - Spiked recovery n	ot within control limits. An explan	atory note may be includ	led in the r	narrative.				
* - Duplicate analysis	(relative percent difference) not	within control limits.						
S - SAR value is estin	mated as one or more analytes us	sed in the calculation we	re not dete	ected above the	detection limit.			
Organics:								
U or ND - Indicates the	hat the compound was analyzed f	or but not detected.						
B - Analyte is detecte	ed in the associated method blank	as well as in the sample	e. It indica	ates probable bla	ank contaminati	ion and warns the d	ata user.	
E - Analyte concentra	ation exceeds the upper level of the	e calibration range.	the instrum		testion limit (M			
<ul> <li>J - Estimated value.</li> <li>Δ - Δ tentatively ident</li> </ul>	the result is less than the report	dol-condensation produc	the instruct	ment method dei	lection limit (ivi	DL).		
X - The analyte was	diluted below an accurate quantita	ation level.						
* - The spike recover	y is equal to or outside the contro	I criteria used.						
+ - The relative perce	ent difference (RPD) equals or exe	ceeds the control criteria	l <b>.</b>					
G - A pattern resemb	ling gasoline was detected in this	sample.						
D - A pattern resemb	ling diesel was detected in this sa	ample.						
M - A pattern resemb	ling motor oil was detected in this	s sample.						
C - A pattern resemb	ling crude oil was detected in this	s sample.						
5 - A pattern resembl	ling JP-5 was detected in this san	npie. nple						
H - Indicates that the	fuel pattern was in the heavier er	nd of the retention time w	indow for	the analyte of int	terest.			
L - Indicates that the	fuel pattern was in the lighter end	of the retention time wir	ndow for th	ne analyte of inte	rest.			
Z - This flag indicates	s that a significant fraction of the	reported result did not re	semble th	e patterns of any	of the followin	ng petroleum hydrod	arbon products:	
- gasoline								
- diesel								
- mineral spirits								
- motor oil								
- Stoddard solvent								

Client:	ALS Environmental
Work Order:	1809090
Project:	L2156175

## **QC BATCH REPORT**

Batch ID: 1	FR180917-1-1	I	nstrument ID LB	4100-C		Method:	Radium-226	by GFP	C				
LCS	Sample ID:	TR180917-1					Units: <b>BQ/I</b>		Analys	is Date: 1	0/3/201	8 08:35	
Client ID:			Run II	D: TR180917-	1B			F	Prep Date: 9/18	/2018	DF	NA	
Analyte			Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226			1.97 (+/- 0.501)	0.0103	1.771		111	75-125					P,M3
Carr: BARI	IUM		15300		16230		94.4	40-110					
LCSD	Sample ID:	TR180917-1					Units: <b>BQ/I</b>		Analys	is Date: 1	0/3/201	8 08:35	
Client ID:			Run II	D: TR180917-	1B			F	Prep Date: 9/18	/2018	DF	NA	
Analyte			Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226			1.88 (+/- 0.478)	0.00951	1.771		106	75-125		1.97	0.1	2.1	Р
Carr: BARI	IUM		15500		16230		95.4	40-110		15300			
МВ	Sample ID:	TR180917-1					Units: <b>BQ/I</b>		Analys	is Date: 1	0/3/201	8 08:35	
Client ID:			Run II	D: TR180917-	1B			F	Prep Date: 9/18	/2018	DF	NA	
Analyte			Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226			0.0022 (+/- 0.0021)	0.004									U
Carr: BARI	IUM		15300		16230		94.4	40-110					
The follow	wing samples	were analyze	d in this batch:	18090	)90-1 )90-4	1809	090-2	180	9090-3				

### **QC BATCH REPORT**

Batch ID: Pb180927-1-2 Instrument ID LIQSCINT Lead-210 by Liquid Scintilatio Method: LCS Sample ID: Pb180927-1 Units: ug Analysis Date: 9/30/2018 15:00 Client ID: Run ID: PB180927-1B Prep Date: 9/27/2018 DF: NA SPK Ref DER Control Decision DER Value Limit Limit Level Ref ReportLimit SPK Val %REC DER Qual Analyte Result Carr: LEAD 757 856.6 88.3 40-110 Pb-210 1.60 (+/- 0.394) 105 0.0495 1.519 75-125 P,M3 LCSD Sample ID: Pb180927-1 Analysis Date: 9/30/2018 15:33 Units: ug Run ID: PB180927-1B Client ID: Prep Date: 9/27/2018 DF: NA SPK Ref Decision DER Control DER Value %REC Limit Level Ref DER Limit Qual ReportLimit SPK Val Analyte Result Carr: LEAD 797 862 92.5 40-110 757 1.53 (+/- 0.377) Pb-210 0.0473 1.519 101 75-125 1.6 0.1 2.1 P,M3 Sample ID: Pb180927-1 Units: ug Analysis Date: 9/30/2018 13:18 MB Client ID: Run ID: PB180927-1B Prep Date: 9/27/2018 DF: NA DER SPK Ref Control Decision DER Limit Value Level Ref SPK Val %REC Limit DER Qual Analyte Result ReportLimit 788 Carr: LEAD 916.7 40-110 86 -0.0061 (+/- 0.016) Pb-210 0.027 U The following samples were analyzed in this batch: 1809090-1 1809090-2 1809090-3 1809090-4 1809090-5

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L2156175-8
Client ID	NX-3
Matrix	WATER
Units	mg/L
Analyte	
F2 (C10-C16)	0.89
F3 (C16-C34)	<0.30
F4 (C34-C50)	<0.30

Sample ID	Method Blank
Client ID	WG2868623-1
Matrix	Water
Units	mg/L
Analyte	
F2 (C10-C16)	<0.30
F3 (C16-C34)	<0.30
F4 (C34-C50)	<0.30



nC10	n©16	nC34	nC50	
174°C	287°C	481°C	575°C	
346'F	549'F	898'F	1067'F	
- Gasoliw	e-> +	Motor	lis/ Lube Oils/ Grease-	

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.



nC10	n©16	nC34	nC50	
174°C	287°C	481°C	575°C	
346'F	549'F	898'F	1067'F	
- Gasoliw	e-> +	Motor	lis/ Lube Oils/ Grease-	

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nC10	n©16	nC34	nC50	
174°C	287°C	481°C	575°C	
346'F	549'F	898'F	1067'F	
-Gasolim	e	- Motor V	lis/ Lube Oils/ Grease-	

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nC10	nC16	nC34	nC50	
174°C	287°C	481°C	575°C	
346'F	549'F	898'F	1067'F	
-Gasolim	e	Motor	lis/ Lube Oils/ Grease-	

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

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#### Chain of Custody (COC) / Analytical Request Form



COC Number: 14 -

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4	T-10			29-AUG-18		vvater	V	V	4	4	4	V	V	4	V	4	V	-	-	14
5	NO-7			28-AUG-18		Water	V	V,	V,	V,	V	V	V	V	-	V	V	11		12
6	NO-6			28-AUG-18		Water	V	1	V	1	V	1	1	1		1	1	-	1211	12
7	NX-12			78-AUG-18		Water	1	1	1	1	1	1	0	1		1/	1			12
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Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy. 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



#### Chain of Custody (COC) / Analytical Request Form

#### Affix ALS barcode label here (lab use only)

COC Number: 14 -

Page 2 of 2

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11				AC DIV 16		Water		V/	-	1	1	1	4	1	V	V	V	-		17
ii	CC-DOF-1			28-1406-10	-	vvaler	V	V	V	V	V	V	V	1	/	V	VA	V	1	17
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18	5M -			28-AUG-18		Water	V	1	V	V	V	V	1	V						8
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ALS Canada Ltd. 8081 Lougheed Highway Burnaby, BC Canada V5A 1W9 <u>T</u> +1 604 253 4188 <u>E</u> +1 604 253 6700

March 7, 2019

DXB Projects 315 Montgomery Ave. Winnipeg, MB R3L 1T6

Dear Claire Brown,

## Re: ALS Corrective Action Report (CAR) #17276 - Hold Time Exceedances for DXB Project # GBL-2018 - ALS Work Order L2156175

ALS Vancouver received 19 water samples for the above mentioned DXB project on August 31, 2018. Unfortunately, several of the submitted samples were analysed past the recommended hold times for Nitrite (NO2), Nitrate (NO3), Total Dissolved Phosphate (TDP) and Total Sulphide.

Please see below for ALS' comments on the hold time exceedances flagged in this sample submission.

Under some circumstances, many test parameters can be altered between the time of sampling and the time of analysis due to bacterial action, chemical reaction, evaporative loss, or other processes.

A sample hold time is the recommended maximum time between sampling and analysis, and is often matched with a specified sample preservation practice (e.g. acidification or dechlorination). Maximum hold times are established in order to protect the integrity of test samples, and to reduce potential changes in the sample before analysis.

The hold time guidelines used by most laboratories in Canada are those established by organizations such as US EPA, Environment Canada, or the American Public Health Association (APHA). ALS adopted our recommended hold times after careful review of recent literature, including guidelines established by provincial jurisdictions (notably British Columbia and Ontario).

However, rigorous scientific studies are not always available to substantiate precise hold time recommendations for all test methods. Because of this, published hold time guidelines may sometimes be overly conservative. This problem has been recognized by the US EPA and was the impetus for a 2006 EPA study titled "Sample Holding Time Re-Evaluation". The EPA introduction to this project stated the following:

"While holding times may appear adequate to protect sample integrity and provide sufficient time for laboratory analysis, relevant data is sparse on individually defined holding times and, thus, some of the holding times appear to be arbitrary and/or politically driven. Holding times appear to be arbitrary when a single value is applied over a large general class of compounds (e.g., pesticides or polyaromatic hydrocarbons); when the holding time was originally "established" for aqueous media and then blindly applied to other media (e.g., sediments and tissues); or when a



contaminant is known to be chemically highly stable and will still be present in the sample even if the sample is not extracted in the regulatory time frame. For example, if PCBs significantly degraded after 7 days, then there would not be an environmental problem with PCBs today."

Another reason for conservatism in hold time guidelines is that a single hold time is normally applied to a broad spectrum of sample types, often with vastly different compositions and characteristics (e.g. drinking waters, groundwaters, or wastewaters). A hold time guideline that is appropriate for a wastewater with complex chemical and microbiological composition may be overly conservative for less complex samples. Thus, it is important to note that for many test parameters and for many sample types, no noticeable degradation or change to results will be observed long after the recommended hold time has passed.

Apart from microbiological test requirements pertaining to human health and drinking water, we are not aware of any Canadian regulatory agencies that normally reject or invalidate laboratory test results solely because of hold time exceedances, especially where the exceedance is marginal.

Because of the conservatism applied in the establishment of most hold time guidelines, one can generally assume that the integrity of samples tested *within* the recommended hold time will be reliable. Although analysis within the recommended hold time is of course advisable, and is always the objective of the laboratory, it is important to understand that sample integrity is not immediately compromised once the recommended hold time has elapsed.

When analytical hold times are exceeded, it is common practice to apply professional judgment to determine whether the results are useable and fit for purpose. Part of this assessment should include whether the sample was appropriately preserved, whether it was appropriately stored, and whether the magnitude of the hold time exceedance was substantial. In many cases, such results are simply flagged to indicate that their degree of uncertainty may be higher than usual. This is a common approach used under the US EPA Contract Laboratory Program and adopted by ALS.

For the submission referenced above (DXB Project # GBL-2018 - ALS Work Order L2156175), hold time exceedances were noted for Nitrate, Nitrite, Total Dissolved Phosphorus and Sulfide. It is our opinion that these hold time exceedances are unlikely to cause any appreciable impact to the quality of the results reported. Specific details are listed below:

- For Sulfide, the analytical method used and referenced by ALS, APHA Method 4500-S2 "Sulfide," indicates a maximum recommended hold time of 28 days. ALS uses the 7 day recommended hold time as this is what the BC Ministry of Environment had adopted, based on a USA regulatory limit. Because the APHA "recommended hold time" is 28 days, we are confident that data for these samples was unaffected and is scientifically defensible.
- For the Nitrite & Nitrate, the most common change that can occur in water samples over time is the oxidation of Nitrite to Nitrate by nitrifying bacteria. Only 4 of the submitted samples contained detectable Nitrate (3 samples & 1 duplicate) and none of the submitted samples contained any detectable Nitrite. The Nitrate & Nitrite samples were analysed 6 & 7 days after sampling and based on the concentration of Nitrate & Nitrite in the samples, and the type of samples submitted, we do not feel that these hold time exceedances would have had any significant impact on the results.



• For Total Dissolved Phosphorus (TDP), the samples were analyzed on day 3 of the 3 day hold time but late in the day (11:00 pm). The ALS database flags this as a hold time exceedance. This exceedance of the 3 day hold time by 12 hours is not expected to have any impact on the reported results.

Please note that DXB Consulting delivered these samples to ALS Yellowknife within 48 hours of sampling on August 30, 2018. Samples were then transported to ALS Vancouver by the following day (72 hours after sampling) on August 31, 2018.

ALS strives to provide our clients with the highest quality and most reliable test data possible. On behalf of ALS, we sincerely apologize for the inconvenience this issue has caused you and DXB Projects.

If you require any additional information, please do not hesitate to contact either myself or Jerry Holzbecher.

Sincerely,

Kathen Nom

Katherine B. Thomas, B.Sc. Operations Manager - Vancouver

Jerry Holzbecher, B.Sc. Client Services Manager - Vancouver