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Ennadai Lake Long Term Monitoring Event
Kivalliq Region, Nunavut

2018 Long Term Monitoring Report

CROWN-INDIGENOUS RELATIONS AND NORTHERN AFFAIRS CANADA
NUNAVUT REGIONAL OFFICE

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2018 LONG TERM MONITORING REPORT
ENNADAI LAKE LONG TERM MONITORING EVENT
KIVALLIQ REGION, NUNAVUT

SLR Project No.: 209.40585.00000

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EXECUTIVE SUMMARY

SLR Consulting (Canada) Ltd. (SLR) was retained by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) to complete the Year 3 Monitoring Program at Former Weather Station Ennadai Lake (herein referred to as "the site"), located in the Kivalliq Region of Nunavut. Ennadai Lake is located approximately 370 km west of Arviat, Nunavut and 500 km southwest of Rankin Inlet, Nunavut.

The objective of the long term monitoring event was to complete Year 3 monitoring activities as described in the *Ennadai Lake Long-Term Monitoring Plan,* INAC, 2016 (LTM Plan) which included the following:

- Monitor general site conditions (i.e., roads, buildings, etc.);
- Monitor the natural environment (i.e. wildlife);
- Perform a visual and geotechnical inspection of the Non-Hazardous Waste Landfill (NHWL) in accordance with the LTM Plan and Abandoned Military Site Remediation Protocol (AMSRP);
- Conduct a groundwater sampling program at the three monitoring wells surrounding the NHWL at Ennadai Lake;
- Collect soil samples at locations where new seepage or staining has been identified;
- Submit groundwater samples to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory for analysis; and
- Submit draft and final versions of the Ennadai Lake Long Term Monitoring (Year 3) Report to CIRNAC which include results compared to baseline data and applicable federal criteria.

Results of the 2018 Ennadai Lake site visit indicate that the NHWL is performing as designed and effectively containing the enclosed waste. Several areas of settlement were observed on the NHWL; however, these features appear to be of similar size, extent, and condition as observed in previous monitoring programs. The access road from the airstrip to the NHWL continues to erode and may pose access issues for vehicular traffic in the future. Several siksik burrows were observed along the access road. The NHWL cap appears to be flat and in good condition with no signs of settlement or ponding. No soil samples were collected during the 2018 monitoring event.

In addition to these physical observations, SLR collected groundwater samples from one of the monitoring wells that surrounds the NHWL, MWLF-3. The other two wells, MWLF-1 and MWLF-2 were either dry or frozen. Concentrations of PHCs, BTEX, and PCBs were below reportable detection limits. SLR also collected a duplicate sample and a field blank from this location.

Concentrations of several inorganic, total and dissolved metals parameters in each of the wells were greater than the FIGQG criteria. These exceedances should be closely monitored during the next site visit but are consistent with the results of previous monitoring programs. No upper limit of acceptability exceedances were reported for any parameters and the NHWL is considered to be performing in "acceptable" condition as determined by AMSRP guidelines.

The locks were replaced on all wells during the 2018 site visit and the keys remain in the possession of the CIRNAC representative.

Based on the results of the Year 3 LTM event at Ennadai Lake, SLR recommends continued monitoring of landfill features noted in above sections. Additionally, all parameters with reported

FIGQG exceedances should be monitored during future monitoring events to confirm or eliminate the possibility of increasing trends. It is recommended that monitoring continue as per the schedule set out in the Ennadai Lake LTM Plan. The next monitoring event, Year 5, is scheduled in 2020. No further action is recommended at this time.

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ACRONYMS AND ABBREVIATIONS

AMSRP	Abandoned Military Site Remediation Protocol
AST	Aboveground storage tank
ATV	All-terrain vehicle
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
CEQG	Canadian Environmental Quality Guidelines
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CSQG	Canadian Soil Quality Guidelines
CWS	Canada Wide Standard
ECCC	Environment and Climate Change Canada
FCSAP	Federal Contaminated Sites Action Plan
FIGQG	Federal Interim Groundwater Quality Guidelines
GIS	Geographic Information System
GPS	Global Positioning System
GW	Groundwater
HASP	Health and Safety Plan
LTM	Long-Term Monitoring
NHWL	Non-Hazardous Waste Landfill
PCBs	Polychlorinated Biphenyls
PHCs	Petroleum Hydrocarbons
PPM	Parts per Million
QAQC	Quality Assurance/Quality Control
RDL	Reportable Detection Limit
RPD	Relative Percent Difference

SLR	SLR Consulting (Canada) Ltd.
ULA	Upper Limit of Acceptability

1.0 INTRODUCTION

SLR Consulting (Canada) Ltd. (SLR) was retained by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) to complete the Year 3 Monitoring Program at the former weather station Ennadai Lake (herein referred to as "the site"), located in the Kivalliq Region of Nunavut. Nunavut. Ennadai Lake is located at approximately 61° 07' 51" N and 100° 53' 14" W and is approximately 370 km west of Arviat, Nunavut and 500 km southwest of Rankin Inlet, Nunavut.

1.1 Project Objectives

The objective of the long term monitoring event was to complete Year 3 monitoring activities as described in the *Ennadai Lake Long-Term Monitoring Plan,* INAC, 2016 (LTM Plan).

The program included visual monitoring of the non-hazardous waste landfill (NHWL), visual observation of general site conditions and the natural environment, and collection and analysis of groundwater samples. Analysis of field data and visual observations was conducted to satisfy the requirements of the Abandoned Military Site Remediation Protocol (INAC, 2009) and the site-specific Field Sampling and Quality Assurance/Quality Control Plan (SLR, 2018).

1.2 Scope of Work

The scope of work for the 2018 work program was carried out in accordance with SLR's standard field investigative procedures and is consistent with the previous year's monitoring. The final scope of work for the project included the following items:

- Prepare and submit a Logistics Plan detailing the work schedule;
- Prepare and submit a detailed Health and Safety Plan (HASP);
- Prepare and submit a Sampling and Quality Assurance/Quality Control Plan detailing the proposed scope of work to CIRNAC;
- Arrange for a wildlife monitor to be present during fieldwork and conduct interviews to understand land use and wildlife trends;
- Monitor general site conditions (i.e., roads, buildings, etc.);
- Monitor the natural environment (i.e. wildlife);
- Perform a visual and geotechnical inspection of the NHWL in accordance with the LTM Plan and AMSRP;
- Conduct a groundwater sampling program of the three monitoring wells surrounding the NHWL at Ennadai Lake;
- Collect soil samples at locations where new seepage or staining has been identified;
- Collect and analyse duplicate samples from at least 20% of samples;
- Submit groundwater samples to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory for analysis of parameters outlined in Section 5.4.
- Prepare field reports summarizing LTM activities undertaken within two weeks of fieldwork completion; and
- Submit draft and final versions of the Ennadai Lake Long Term Monitoring (Year 3) Report to CIRNAC.

Details regarding the specific methodology of each task are located in Section 4.0.

2.0 BACKGROUND INFORMATION

2.1 Site Description

Since the 1950s, the site has operated as a weather station. The site originally housed a Department of National Defense (DND) signals station and a manned Transport Canada weather station which was later transferred to Environment and Climate Change Canada (ECCC). ECCC currently operates an unmanned weather station near the site. The site was abandoned in the late 1980s / early 1990s and remediation activities took place between 2014 and 2015. Remediation included the construction of the NHWL, demolition and disposal of on-site structures, and clean-up of contaminated soils.

The NHWL was constructed at the site beginning in 2014 and is located 200 m west of the main site. The NHWL was designed to contain non-hazardous material only. The cell was approximately 15 m x 11.4 m (base interior) / 22 m x 18.4 m (interior top of berm) in size and has an estimated volume of 506 m^3. It consists of four perimeter berms constructed of granular material. The non-hazardous waste was placed in the landfill in layers consisting of 0.5 metre lifts of waste covered by 0.15 metres of granular fill. Once all the layers were completed a final cover consisting of a minimum of 1.0 metres of granular fill was used to cap the landfill. The NHWL contains the following:

- Tier I Contaminated soil (i.e. soil with lead concentration up to 500 parts per million (ppm) and polychlorinated-biphenyl (PCB) concentrations up to 5 ppm;
- Type A Petroleum Hydrocarbon (PHC) contaminated soil;
- Non-hazardous site debris, such as scrap metal and wood; and
- Asbestos containing materials (ACM).

The area is known to be used by hunters and fishermen. However, the presence of permafrost and shallow groundwater depth make it unlikely that groundwater would ever be used for drinking water in this area.

2.2 Baseline Soil and Groundwater Data

SLR reviewed the Ennadai Lake LTM Plan and AMSRP for mention of specific guidelines to use for comparison purposes. Federal guidelines were used where site-specific criteria were absent.

2.2.1 Groundwater

Historical baseline groundwater data was collected during remediation activities (Stantec, 2015). Results of this baseline monitoring are available in **Tables 1 and 2** at the end of this report. Arcadis conducted Year 1 of long-term monitoring at Ennadai Lake in 2016. Only one of three wells contained water (MWLF-3) and results of this data are presented in **Tables 3 to 6** at the end of this report.

Arcadis was unable to calculate upper limit of acceptability (ULA) criteria for baseline groundwater data due to the fact that it was so variable and sparse. As a result, SLR has used baseline and 2016 data to calculate ULAs for comparison with 2018 data.

2.2.2 Soil

Similar to groundwater, historical baseline soil data collected during site remediation activities is available in the Final Remediation Report (Stantec, 2015). No soil samples were collected during either Year 1 (2016) or Year 3 (2018) monitoring events.

2.3 Previous Monitoring Programs

The post construction landfill monitoring frequency follows the schedule recommended in the INAC AMSRP (2009). The three phases recommended by the protocol are:

- Phase I: Years 1, 3 and 5.
- Phase II (*if required*): Years 7, 10, 15 and 25.
- Phase III (*if required*): beyond 25 years.

To become familiar with the site, SLR reviewed the following reports pertaining to the site:

- *Long Term Monitoring, 2016, Ennadai Lake, Nunavut*, Final Report, dated February 3, 2017 by Arcadis Canada Inc.;
- *Ennadai Lake Long-Term Monitoring Plan,* dated January 22, 2016 by Indian and Northern Affairs Canada.;
- *Abandoned Military Site Remediation Protocol,* dated March 2009 by Indian and Northern Affairs Canada, Contaminated Sites Program.

The monitoring plan began at Ennadai Lake in 2016. **Tables 1 and 2** at the end of this report show baseline groundwater data from remediation activities in 2014 and **Tables 3 to 6** show groundwater data from Year 1 (2016) of the LTM Plan. Two of the three wells were either dry or frozen during the 2016 monitoring event. SLR completed Year 3 of the program in 2018.

3.0 REGULATORY GUIDELINES

3.1 Groundwater

3.1.1 Baseline Samples

In the absence of groundwater guidelines in the Ennadai Lake LTM Plan, analytical data for groundwater was compared to historical data according to the AMSRP guidance on post-construction monitoring. The AMSRP provides the following guidance for the assessment of analytical data in groundwater:

Table 3-1: AMSRP Groundwater Monitoring Guidance

Geochemical Assessment	Acceptable	Marginal	Significant	Unacceptable
Groundwater concentrations within average +/- three standard deviations or within analytical variability	Performing as expected			

Geochemical Assessment	Acceptable	Marginal	Significant	Unacceptable
Increasing trend in contaminant data over two or more successive monitoring events (variation in excess of average +/- three standard deviations or analytical variability		Low risk of failure		
Groundwater concentrations in excess of three times average baseline concentrations in more than one monitoring event			Moderate risk of failure	
Where applicable, surface water concentrations in excess of surface water quality guidelines for the protection of aquatic life				Failure
Required Actions	Monitor as per schedule	Increase monitoring frequency. Monitor surface water quality, if acceptable, in downgradient water bodies within 300 m	Assess causes of increasing contaminant concentrations. Evaluate whether remediation is required.	Assess cause of contaminant concentrations. Develop and implement a remedial plan.

In the previous LTM Report (Arcadis 2017), historical data presented in the Final Remediation Report (Stantec, 2015) was used to obtain mean and standard deviation of groundwater analytical results in order to establish statistical upper limits of acceptability. These limits are calculated as mean plus three standard deviations, and are used for comparison with analytical results from the 2016 field program. However because this was a very limited data, standard deviations for some parameters are quite high. As a result, Arcadis did not compare results to the calculated ULAs. It was stated that more results in subsequent years would create a more representative data set for ULA calculations.

For purposes of this 2018 LTM report, SLR used baseline data and results from 2016 to calculate ULA values for comparison with 2018 results. The results of the ULA calculation are available in **Tables 1 and 2** at the end of this report.

3.1.2 Federal Interim Groundwater Guidelines

In May 2010, Environment and Climate Change Canada (ECCC) under Federal Contaminated Sites Action Plan (FCSAP) released the *Federal Interim Groundwater Quality Guidelines* (FIGQG) for Federal Contaminated Sites. The guidelines were developed to assist federal custodians in assessing, remediating, and managing federally contaminated sites funded under the FCSAP. These guidelines are intended as an interim measure until Canadian Groundwater Quality Guidelines are available. The FIGQGs were most recently updated in June 2016.

The FIGQGs follow a tiered framework, consistent with the Canadian Soil Quality Guidelines (CSQGs) development through the CCME. The tiers are:

- **Tier 1:** direct application of the generic numerical guidelines; specifically, application of the lowest guideline for any pathway;
- **Tier 2:** allows for the development of site-specific remediation objectives through the consideration of site-specific conditions, by modifying (within limits) the numerical guidelines based on site specific conditions and focusing on exposure pathways and receptors that are applicable to the site; and
- **Tier 3:** use of site-specific risk assessment to develop Site-Specific Remediation Objectives.

With consideration to surrounding land use, Table 2 in the FIGQGs, Generic Guidelines for Residential/Parkland Land Uses, Tier 1 Lowest Guideline for coarse-grained soil (FIGQG, Table 2, and Tier 1) were referenced for comparison purposes in this study.

3.2 Soil

3.2.1 Baseline Samples

Historical baseline soil data collected during remediation activities is available in the Final Remediation Report (Stantec 2015). No soil samples were taken in either 2016 or 2018. Should future samples be collected at the site, the results should be compared to baseline data as described above.

3.2.2 CCME - Environmental Quality Guidelines

The following CCME guidelines should be referenced with respect to future soil analytical results at the site:

- *CSQGs for the Protection of Environmental and Human Health* (CCME, 1999, with updates) for residential/parkland use, including fact sheets for BTEX, non-potable water, coarse-grained soil.
- *Canada-Wide Standard (CWS) for Petroleum Hydrocarbons in Soil* (CCME, 2008a) – Tier 1 Residential/Parkland, coarse-grained soil, non-potable groundwater.

The rationale for choosing these particular criteria is based on the fact that the groundwater at Ennadai Lake is not used for drinking purposes (non-potable) and coarse-grain material was assumed based on field observations as well as for conservative reasons –criteria for coarse-grain soils are general more stringent than those applied to fine grain soils.

As described above, while no soil was sampled during the 2018 monitoring event, these guidelines should be used for the analysis of future analytical results.

4.0 INVESTIGATIVE METHODOLOGY

The visual inspection was carried out by Donovan Kitt, P.Eng. and the groundwater sampling was carried out by Dalen Peterson, B.Sc. CIRNAC representative Jean Allen was present during the sampling and inspection activities and the crew was accompanied by Jakob Voisey, CIRNAC summer student and resident of Rankin Inlet, who acted as the wildlife monitor. The site was accessed with a de Havilland Twin Otter operated by Summit Air. On the day of the site

visit, August 17, 2018, air temperature was 14 degrees Celsius and conditions were partly cloudy with a light breeze from the southwest.

A copy of the field notes is available in **Appendix B.**

4.1 Health and Safety Plan

Before commencement of the field activities, a detailed Health and Safety Plan (HASP) was created for Ennadai Lake that provided emergency contact information, emergency response plans, hazard identification, and hazard mitigation and prevention strategies.

The HASP was approved by SLR's internal Health and Safety Officer, Phil Folkersen, and by CIRNAC prior to field activities. The HASP was brought to site with field staff and its contents were discussed with wildlife monitor Jakob Voisey and Summit Air pilots before visiting the Ennadai Lake site. A copy of the HASP has been retained on file at SLR and at the CIRNAC Nunavut Regional Office.

4.2 Non-Hazardous Waste Landfill Monitoring

A visual inspection of the NHWL was conducted at the Ennadai Lake site. The objectives of the visual inspections of the NHWL included:

- Visual inspection of the landfill caps and observing for areas of settlement, erosion, frost action, sloughing and cracking, animal burrows, vegetation re-establishment and percentage of cover, vegetation stress, soil or water staining, odours, seepage points or ponded water, exposed debris, condition of monitoring instruments, the condition of the wells, and any other features that may affect the integrity of the landfills;
- Opportunistic observations of wildlife presence, signs and droppings;
- Photographic records noting the scale, and directional viewpoints to substantiate all recorded observations. Observations will be mapped and annotated to show the location and size with regards to the landfill; and
- Provide all AutoCAD / GIS files associated with the site.

4.3 Natural Environment Monitoring

Natural environment data was collected during the 2018 Ennadai Lake site visit. The specific data collected included:

- Wildlife sightings (species, number, gender, etc.).
- Evidence of recent wildlife presence (droppings, tracks, feathers, etc.).
- Wildlife activity (nesting, denning, migrations).
- Qualitative assessment of relative numbers.
- Revegetation of disturbed areas.

This information was collected with the assistance of the wildlife monitor Jakob Voisey who is familiar with the area.

4.4 Groundwater Sample Collection

Of the three existing monitoring wells (MWLF-1, MWLF-2, and MWLF-3), only MWLF-3 had water. MWLF-1 was dry and MWLF-2 was frozen. Historically, MWLF-1 and MWLF-2 have also

either been dry or frozen during the time of the site visit. Additionally, a field blank was collected during the site visit to Ennadai Lake.

Water level and depth of well was recorded to calculate approximate well volume. Monitoring wells were purged of three well volumes using a bailer prior to sampling where available and water was saved in case of the event of limited volumes and low recharge rates. Water quality parameters such as temperature, dissolved oxygen, conductivity, pH, redox, and turbidity were also recorded using an Aqua TROLL 600 Multiparameter Sonde.

Following purging, samples were collected using a peristaltic pump and dedicated, disposable, polyethylene tubing. A low-flow sampling methodology was employed. Water was pumped through a flow-through cell where water quality parameters were continually monitored. Once parameters have stabilized, sampling began. The following parameter stabilization guidelines were used:

- pH +/- 0.2 units
- Temperature +/- 0.1 degrees Celsius
- Conductivity +/- 3%
- Redox +/- 20 mV
- D/O +/- 0.2 mg/L
- Turbidity +/- 10%

Sampling equipment was cleaned thoroughly using a distilled water and Alconox solution between each sample. Samples were field filtered where applicable, using a 0.45-micron filter with the peristaltic pump.

Groundwater samples were submitted to Maxxam Analytics in Yellowknife, NT for analyses of PHC Fractions F1 and F2 (C_6-C_{16}), total metals, dissolved metals, PCBs, total suspended solids, total dissolved solids and routine parameters including major ions and hardness. Additional routine parameters including pH, conductivity, and turbidity were measured in-situ. Laboratory Certificates of Analysis are available in **Appendix C.**

Table 4-1 contains a summary of the groundwater analysis:

Table 4-1: Ennadai Lake Groundwater Sampling Plan

	Sampling Location	PHC F1 and F2 (C_6-C_{16})	Total Metals	Dissolved Metals	PCBs	Total Suspended Solids	Major Ions[1]	Routine Parameters[2]
Ennadai Lake	MWLF-1	X	X	X	X	X	X	X
	MWLF-2	X	X	X	X	X	X	X
	MWLF-3	X	X	X	X	X	X	X
	Duplicate	X	X	X	X	X	X	X

[1] Major ions including Calcium (Ca^{2+}), sodium (Na^{+}), magnesium (Mg^{2+}), potassium (K^{+}), strontium (Sr^{2+}), sulfate (SO_4^{2-}), chloride(Cl^{-}), bicarbonate (HCO_3^{-}), and hydroxide (OH^{-}).

[2] Routine Parameters including alkalinity, hardness, total dissolved solids, total suspended solids, pH, and conductivity.

In the absence of groundwater guidelines in the Ennadai Lake LTM Plan, analytical data for groundwater was compared to historical data, AMSRP guidance, and the *Federal Interim Groundwater Quality Guidelines* (FIGQG, June 2016), Table 2 *Generic Guidelines for Residential/Parkland Land Uses*, Tier 1 Lowest Guideline Values for coarse-grained soil.

4.5 Soil Sample Collection

Soil samples were to be collected in areas that exhibit new staining, odours or stressed vegetation, along with GPS coordinates and pictures. Samples were to be collected with a shovel which will be decontaminated with a laboratory-grade biodegradable cleaner (Alconox®) and rinsed between sampling locations. Soil samples were to be collected to a maximum depth of 30 cm and packed into glass jars with minimal to no headspace. Soil samples were to be placed on ice until laboratory analysis.

Based on the previous events, collection of soil samples was likely to be required however the crew was prepared to take samples if deemed necessary. Duplicate samples were to be taken for 20% of the total soil samples. All samples were to be analyzed for benzene, toluene, ethylbenxene and xylenes (BTEX), PHC F1 to F4 (C_6-C_{50}), PCBs, and CCME metals. Table 4-2 contains a summary of the soil analyses.

Table 4-2: Ennadai Lake Soil Sampling Plan

	BTEX	PHC F1–F4	PCBs	CCME Metals[1]
Sample X	X	X	X	X
Duplicate	X	X	X	X

[1] CCME Metals include arsenic, cadmium, chromium, cobalt, copper, lead, nickel, and zinc.

Due to no new areas of staining or settlement being observed at the site, no soil samples were taken during the 2018 monitoring event. However, should any future soil samples be taken at the site, results should be compared to previous soil sampling monitoring results, the AMSRP original DEW Line Clean-Up Criteria guidelines, CCME Environmental Quality Guidelines for the Protection of Environmental and Human Health for Parkland and Industrial Land Use sites, and the Canada Wide Standards for Petroleum Hydrocarbons.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

Field procedures were implemented to minimize the potential of cross contamination between sampling locations. Sample handling protocols were established to track and maintain the integrity of the samples. Field handling of samples was minimized by transferring samples directly into containers, when possible. Where handling is required, disposable nitrile gloves will be used at all times and changed between samples. All monitoring equipment was decontaminated prior to initial use and between each location. During groundwater sampling, disposable tubing was dedicated to the individual wells and during all sampling activities a new pair of disposable nitrile gloves was used between each sample.

Photographs were taken of all areas of interest and the scale, location, and directional view point was recorded.

5.1 Replicate Samples

A replicate sample is a sequential sample that is taken immediately following the collection of a regular sample. Replicate samples were collected for approximately 20 percent (%) of the samples collected as part of the QA/QC sampling program. This equates to one duplicate per five wells samples. Duplicates are a type of replicate sample (two of the same), and these samples provide a rough estimate of the overall variability of the field technique and laboratory analysis.

One replicate sample was taken during the 2018 monitoring event as only one well was sampled for groundwater. The sample was collected from MWLF-3 on August 17, 2018.

5.2 Field Blanks

Field blanks are used to evaluate for contamination resulting from the sampling technique and from exposure to the air environment of the sampling location.

For this water quality monitoring program, because there is little variability anticipated between sampling techniques used at the various sites or between their atmospheres, one field blank was collected for both the Ennadai Lake and CAM-D Simpson Lake sites.

The field blank sample was collected at the Ennadai Lake site on August 17th, 2018 at 15:20.

Deionised water was included in the bottle order from Maxxam Analytics for preparation of field blanks.

5.3 Travel Blanks

A travel blank is a sample of distilled “clean” water that is prepared by the laboratory performing the analysis. The travel blank is shipped to the site and remains sealed before being shipped back to the lab for analysis. A travel blank helps to identify the presence of container or preservative contamination, and is often used when the integrity of samples is of paramount concern (e.g., in legal matters). One trip blank was brought to both the Ennadai Lake and CAM-D Simpson Lake sites.

5.4 Laboratory

All surface water samples were analyzed by Maxxam Analytics. Maxxam is accredited by the Canadian Association for Laboratory Accreditation (CALA) for the parameters proposed for analysis, and uses recognized methods to conduct laboratory analyses. As conveyed by the laboratory, method blanks, certified reference materials, method spikes, duplicates, surrogates and laboratory control samples are routinely analysed as part of their QA/QC programs.

5.5 Relative Percent Difference

The relative percent difference (RPD – the absolute difference between the two values, divided by the mean) of duplicate analyses is used to evaluate the sample result variability. Where the

concentration of a parameter is less than five times the laboratory reportable detection limit (RDL), the results are less precise and the RPD is not calculated.

The Guidance manual for Environmental Site Characterization in Support of Human Health Risk Assessment, Volume I (CCME, 2016) recommends that RPDs for parameters of duplicate groundwater samples not exceed 40%. The guide also recommends that RPDs for laboratory duplicates not exceed 20%. Should either of these guidelines be exceeded, a potential problem may be indicated.

6.0 RESULTS

6.1 Location

The NHWL is located southwest of the airstrip and to the south of Ennadai Lake. The current weather station is located to the south of the NHWL. An access road runs from the southwest corner of the NHWL to the weather station. A map showing the location of the site is available on **Drawing 1** at the end of this report. The monitoring wells are located at the northeast, southeast, and southwest corners of the NHWL at the following coordinates:

Table 6-1: Ennadai Lake Monitoring Wells

Source Description	Latitude	Longitude
MWLF-1	61 7 56.64	-100 53 0.632
MWLF-2	61 7 56.68	-100 53 4.553
MWLF-3	61 7 58.02	-100 53 1.082

Monitoring of the landfill included visual observations to assess physical integrity including evidence of erosion, ponding, frost action, settlement, and lateral movement. Groundwater was thawed in one of the wells during the 2018 monitoring event and as a result, two (2) groundwater samples were collected (one monitoring well plus one duplicate).

6.2 Photographic Record

The photographic record of the NHWL and surrounding areas has been completed as per the scope of work **(Photos 1 to 48, Attached USB)**. Photographs referenced in the body of this document are included in **Appendix A.** The complete photographic record is provided in the attached USB drive.

6.3 Visual Monitoring

Visual monitoring of the NHWL, natural environment, and surrounding areas was undertaken at Ennadai Lake during the 2018 monitoring event. Checklists were utilized for NHWL and natural environment monitoring and interviews were conducted with local wildlife monitor, Jakob Voisey, to understand trends and changes over time.

6.3.1 Non-Hazardous Waste Landfill

The physical integrity of the NHWL was assessed by collecting visual evidence staining, seepage, erosion, frost action, settlement, and lateral movement. Features identified in previous

monitoring programs were assessed during the 2018 site visit for condition and stability. Additionally, any new features were noted for size and extent. The locations of historic features referred to in the sections below are available on **Drawing 2** at the end of this report. **Table 6-2** provides a summary of the NHWL features.

Table 6-2: Ennadai Lake NHWL Feature Summary

Feature Letter	Feature Type	Location	Extent	Description / Change Comments	Viewpoint #
A	Erosion	SE Corner of NHWL	<1%	Minor erosional channel, Not observed in 2018	27
B	Other	West berm	<1%	ATV tracks, Observed in 2018, of similar size and extent as 2016	6, 9
C	Settlement	NE corner of NHWL	<1%	Pothole, Observed in 2018, of similar size and extent as 2016, Does not appear to impact integrity of the landfill	25
D	Erosion	Access road between NHWL and Weather Station	<1%	Erosional channels, Observed in 2018, of similar size and extent as 2016	15, 45
E	Other	East berm, near SE Corner	<1%	ATV tracks, Observed in 2018, of similar size and extent as 2016	32
F	Other	North berm	<1%	ATV tracks, Observed in 2018, of similar size and extent as 2016	7, 37
G	Settlement	Cap of NHWL, near NE Corner	<1%	Pothole, Observed in 2018, of similar size and extent as 2016, Does not appear to impact integrity of the landfill	12

Staining

No new areas of staining were observed during the 2018 site visit. Additionally, no historical staining features have ever been noted at the Ennadai Lake NHWL. No soil samples were collected during the site visit.

Seepage Points

No areas of seepage or ponded water were observed on or surrounding the NHWL during the 2018 site visit.

Settlement

Historically, two areas of settlement were observed in the northeast corner of the NHWL (**Photo 43, Appendix A**). One was located on the cap (Feature G), and one was located at the toe of the berm (Feature C). The potholes were small in nature (< 0.5 m) and were not considered to impact the integrity of the landfill. These features were observed in 2018 but appear to be of similar size and extent as observed previously. These features should be monitored during future site visits but are not considered to be of concern at this time. No other areas of settlement were observed on the NHWL.

Erosion

Erosion was observed along the access road to the airstrip in 2018 (**Photo 18, Appendix A**). The road appears significantly washed out. This area of erosion does not appear to impact the integrity of the NHWL but could impact access to both the NHWL and the weather station.

Frost Action

No evidence of frost action or cracking on or surrounding the landfill was observed at the time of the 2018 site visit.

Evidence of Burrows

Several siksik burrows were observed on the access road to the NHWL at Ennadai Lake (**Photo 17, Appendix A**). No evidence of animal burrows was observed on the NHWL itself.

Re-establishment of Vegetation

It is estimated that less than 1% of the NHWL is covered with vegetation. Vegetation directly surrounding the NHWL is also sparse, with an estimated cover of less than 10%. Revegetation of the NHWL is expected to take a long time due to the coarse gravel cover and short growing season.

Debris

Some areas of exposed debris were observed near the airstrip. Debris included broken glass and metal (**Photo 48, Attached USB**). This debris does not appear to be related to the NHWL and is likely the result of human traffic in the area.

Discussion

All 2018 physical observations indicate that the NHWL is performing as designed and is containing the enclosed waste. The features noted above including minor settlement and road erosion do not appear to be affecting the physical integrity of the NHWL. Overall, the landfill appears to be in similar condition as noted in previous years. The cap of the landfill is flat, with no indication of settlement or erosion occurring.

Soil samples were not collected during the 2018 site visit due to no new areas of staining or other anomalies being observed.

It is recommended that monitoring continue as per the schedule set out in the LTM Plan (INAC, 2008). The next monitoring event is Year 5, scheduled in 2020.

6.3.2 Natural Environment

Information regarding the natural environment was gathered directly through site observations and through interviews with Jakob Voisey, resident of Rankin Inlet, Nunavut.

Prior to landing, eight caribou were identified south of the airstrip that ran off during the flyover. Numerous caribou tracks and scat were observed around the airstrip and NHWL, and the pilots identified bear scat west of the NHWL. Several siksik burrows were observed in the road between the NHWL and airstrip. Very minimal vegetation was present on the NHWL flanks and surrounding area. Prior to leaving site, four bull caribou and one cow caribou were spotted north of the airstrip (**Photo 2, Appendix A**).

It is estimated that less than 1 % of the NHWL is covered with vegetation. More vegetation is present further away from the toe of the NHWL.

6.3.3 Surrounding Areas

As proposed, a brief visual inspection of the areas surrounding the site was completed during the Year 3 monitoring event.

An area of significant erosion was noted on the access road from the airstrip to the NHWL (**Photo 18, Appendix A**). This feature was noted during the previous monitoring event. This erosion should be continually monitored as it may affect access to the NHWL and the weather station. All other areas surrounding the NHWL appear to be in stable and good condition.

6.4 Results – Groundwater

6.4.1 General

Of the three existing monitoring wells (MWLF-1, MWLF-2, and MWLF-3), only MWLF-3 had water. MWLF-1 was dry and MWLF-2 was frozen. An Aqua TROLL 600 Multiparameter Sonde was used to measure in-situ field parameters prior to purging three well volumes using a bailer. A sample and duplicate were collected using a peristaltic pump once parameters had stabilized. Note that of the six parameters monitored (pH, electrical conductivity, temperature, redox, dissolved oxygen, and turbidity), only turbidity did not meet SLR's stabilization criteria. A field blank (Dup-2) was collected from water supplied from Maxxam. All samples (including the trip blank) were submitted for analysis.

During the site visit, the lock on each of the monitoring wells was cut and replaced with a new lock. The keys to all wells at both sites are in possession of CIRNAC personnel.

Table 6-2 below provides a summary of water levels and samples collected from each well:

Table 6-3: Well Summary and Sample Details

Sample / Well ID	Start WL*	Well Depth*	Purged Amount	# Bottles Collected	Total Water Removed From Well	Notes
MWLF-1	dry	3.48 m	---	---	---	Well dry
MWLF-2	frozen	3.67 m	---	---	---	Ice identified on probe
MWLF-3	1.665	2.41 m	5 L	10	8.5 L	Turbidity did not stabilize, all bottles filled
DUP	---	---	---	10	2 L	All bottles filled
DUP 2 (Field Blank)	---	---	---	10	---	Field blank prepared with laboratory-supplied water
Trip Blank	---	---	---	10	---	Supplied by Maxxam

* From top of casing

6.4.2 Analytical

All PCB, BTEX, and PHC concentrations were below laboratory detection limits.

No ULA were calculated in the previous LTM Report (Arcadis, 2017) due to the sparsity and variability of the baseline data. It was recommended that ULAs be recalculated once more data has been acquired for the site.

SLR calculated ULAs based on the 2014 results of baseline monitoring and the results of Year 1 monitoring in 2016. Unfortunately, ULAs could not be calculated for all parameters due to continued lack of data or results below detection limit. High variability in parameter concentrations resulted in high standard deviations for some parameters such as aluminum. As a result, the calculated ULA is also high and may not accurately represent the criteria in which results should be compared to. This issue will be eliminated as data at the site is continually collected. The method in which the ULA was calculated is described in Section 3.1.1. No ULA exceedances were reported for any results of the 2018 monitoring event.

Due to the lack of baseline criteria for all parameters, results were also compared to the Federal Interim Groundwater Quality Guidelines, Table 2 Residential/ Parkland Use, Tier 1, Coarse-grained soils.

Several inorganic, total metals, and dissolved metals parameters exceeded criteria set out by the FIGQG. The exceedances are as follows:

Table 6-4: 2018 FIGQG Groundwater Exceedances at Ennadai Lake

Well ID	Parameter	FIGQG Criteria (µg/L)	Concentration (µg/L)
MWLF-3	pH	6.5-9.0	6.01
	Total Aluminum	5[1]	210
	Dissolved Aluminum	5[1]	170
	Total Cadmium	0.017	0.097
	Dissolved Cadmium	0.017	0.083
	Total Copper	2[2]	18
	Dissolved Copper	2[2]	16
	Total Silver	0.1	0.1
DUP	pH	6.5-9.0	6.24
	Total Aluminum	5[1]	200
	Dissolved Aluminum	5[1]	160
	Total Cadmium	0.017	0.11
	Dissolved Cadmium	0.017	0.082
	Total Copper	2[2]	19
	Dissolved Copper	2[2]	17
	Total Silver	0.1	0.11

[1] Calculated standard based on CCME Water Quality for the Protection of Aquatic Life guidelines – calculated using water pH as recommended by the FIGQG (2010).
[2] Calculated standard based on CCME Water Quality for the Protection of Aquatic Life guidelines – calculated using water hardness ($CaCO_3$) as recommended by the FIGQG (2010).

6.4.3 Comparison to Previous Monitoring Programs / Discussion

Where available, 2018 results were compared to ULA criteria as determined by the 2014 baseline data and Year 1 monitoring event data. The two years were used to calculate ULA criteria based on a recommendation by Arcadis in the 2017 LTM Report to create more robust guideline criteria. No ULA exceedances were reported for any parameters analyzed in 2018.

Parameters reporting FIGQG exceedances should be closely monitored in future sampling events to understand if there is an increasing contaminant trend at this site. Reported silver exceedances are not considered to be a concern as concentrations do not exceed five times the RDL. Exceedances with regards to aluminum, cadmium, and copper concentrations appear to be consistent with the results of previous monitoring programs. Currently, not enough data exists to correlate the FIGQG exceedances with the condition of the NHWL at the site.

Overall, the NHWL is considered to be performing as expected and in “acceptable” condition as defined by the AMSRP guidelines in **Table 3-1**. However, because ULA criteria were not calculated for all parameters, concentrations of metals should be closely monitored during future sampling events to understand if any concentrations are increasing over time. Additionally, while no longer baseline data, the results of 2018 data could be used alongside results of previous monitoring events to calculate ULA for the Year 5 monitoring event.

6.5 Results – Soil

6.5.1 General

Historically, soil samples were only collected during construction and remediation activities in 2014 and 2015. The soil analytical results from 2014 and 2015 are available in the final remediation report (Stantec 2015).

A review of images from the 2016 site visit, and communications with the CIRNAC representative suggest that the NHWL is in comparable shape to previous years and does not show any evidence of present or historic staining.

As a result, no soil samples were collected at Ennadai Lake during the 2018 sampling program.

6.6 QA/QC Results

6.6.1 Duplicate Samples – Relative Percent Difference

One (1) field duplicate sample was collected from MWLF-3 at Ennadai Lake and was analysed for general parameters, total metals, dissolved metals, and PHC, and PCBs. RPD values were calculated where analyte concentrations were greater than five times the reportable detection limit (RDL).

All results for PCBs and BTEX/Hydrocarbons were below the RDL (non-detect) for all parameters, therefore no RPD values were calculated.

No field duplicate pair exceeded the 40% RPD criterion for individual total metal, dissolved metal, or inorganic parameters or batch averages. As a result, all analyses fall within RPD quality targets.

A complete list of detection limits and RPD values for all parameters are available in **Tables 7 to 11** at the end of this report.

6.6.2 Field Blank

One (1) field blank was collected for both the Ennadai Lake and CAM-D Simpson Lake sites. The field blank was filled on August 17, 2018 at 15:20 at Ennadai Lake using laboratory supplied deionized water.

All field blank results were below the RDL (non-detect) for all parameters with the exception of total aluminum, total copper, and dissolved copper. However, none of these parameters reported concentrations above five times the reportable detection limit and are therefore not considered to be a QAQC concern.

Complete field blank results are available in **Tables 7 to 11** at the end of this report.

6.6.3 Trip Blank

One (1) trip blank was collected for both the Ennadai Lake and CAM-D Simpson Lake sites. The trip blank was filled with laboratory supplied water and sealed prior to trip commencement.

All trip blank results were below the RDL (non-detect) for all parameters.

Complete trip blank results are available in **Tables 7 to 11** at the end of this report.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Observations made during the 2018 Ennadai Lake site visit indicate that the NHWL is performing as designed and effectively containing the enclosed waste. Several areas of erosion and settlement were observed on and in the vicinity of the NHWL. However, these features appear to be of similar size, extent, and condition as observed in previous monitoring programs The NHWL cap appears to be flat and in good condition with no signs of settlement or ponding. No soil samples were collected during the 2018 monitoring event.

Assess to site was via charter aircraft provided by Summit Air. The access road to the NHWL was in overall good condition, with one area of significant erosion observed. Several siksik burrows were observed along the access road. The areas immediately surrounding the NHWL are generally void of vegetation but in stable condition.

In addition to these physical observations, SLR collected groundwater samples from one monitoring wells that surrounds the NHWL, MWLF-3. The other two wells, MWLF-1 and MWLF-2 were either dry or frozen. Concentrations of PHCs, BTEX, and PBCs were below reportable detection limits.

Concentrations of several inorganic, total and dissolved metals parameters in each of the wells were greater than the FIGQG criteria. These exceedances should be closely monitored during the next site visit but are consistent with the results of previous monitoring programs. No ULA exceedances were reported for any parameters and the NHWL is considered to be performing in “acceptable” condition as determined by AMSRP guidelines.

The locks were replaced on all wells during the 2018 site visit and the keys remain in the possession of the CIRNAC representative.

Based on the results of the Year 3 LTM event at Ennadai Lake, SLR recommends continued monitoring of landfill features noted in above sections. Additionally, all parameters with reported FIGQG exceedances should be continually monitored during future monitoring events to confirm or eliminate the possibility of increasing trends. It is recommended that monitoring continue as per the schedule set out in the Ennadai Lake LTM Plan. The next monitoring event, Year 5, is scheduled in 2020. No further action is recommended at this time.

8.0 LIMITATIONS

This report has been prepared and the work referred to in this report has been undertaken by SLR for Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) and completed in compliance with Contract Number 4500381248. Under the CIRNAC Standing Offer 4600000874, CIRNAC has the exclusive right to copy and redistribute this report.

This report has been prepared for specific application to this site and site conditions existing at the time work for the report was completed. Any conclusions or recommendations made in this report reflect SLR’s professional opinion based on limited investigations including: visual observation of the site, surface and subsurface investigation at discrete locations and depths, and laboratory analysis of specific chemical parameters. The results cannot be extended to previous or future site conditions, portions of the site that were unavailable for direct investigation, subsurface locations which were not investigated directly, or chemical parameters

and materials that were not addressed. Substances other than those addressed by the investigation may exist within the site; and substances addressed by the investigation may exist in areas of the site not investigated in concentrations that differ from those reported. SLR does not warranty information from third party sources used in the development of investigations and subsequent reporting.

Nothing in this report is intended to constitute or provide a legal opinion. SLR expresses no warranty to the accuracy of laboratory methodologies and analytical results. SLR makes no representation as to the requirements of compliance with environmental laws, rules, regulations or policies established by federal, provincial or local government bodies. Revisions to the regulatory standards referred to in this report may be expected over time. As a result, modifications to the findings, conclusions and recommendations in this report may be necessary.

CIRNAC may submit this report to the Nunavut Water Board and/or related Nunavut environmental regulatory authorities or persons for review and comment purposes.

9.0 REFERENCES

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TABLES

Crown-Indigenous Relations and Northern Affairs Canada
Contaminants and Remediation Division

Cape Christian Long Term Monitoring Event
Qikiqtaaluk Region, Nunavut
SLR Project No.: 209.40585.00000

Table 1 - Summary of Historic Groundwater Analytical Results - Metals

Parameter (mg/L) / Sample # / Date	MW13-2	LF3-WS-01	MW-LF3-WS-02	MWLF-3	DUP	ULA Calculation		
						Average	Standard Devidation	ULA[1] (mg/L)
Date	2014	2014	2014	2016	2016			
Total Aluminum (Al)	---	21.4	1.78	3.1	3.9	8.76	11.0	41.7
Dissolved Aluminum (Al)	---	---	---	0.1	0.092	0.10	NC	NC
Total Arsenic (As)	---	0.00381	0.0005	0.00094	0.0012	0.002	0.002	0.007
Dissolved Arsenic (As)	---	---	---	0.00044	0.00051	NC	NC	NC
Total Cadmium (Cd)	---	0.000113	0.000035	0.00015	0.00015	0.0001	0.0001	0.0003
Dissolved Cadmium (Cd)	---	---	---	0.00012	0.00012	NC	NC	NC
Total Cobalt (Co)	---	0.0122	0.00501	0.015	0.016	0.011	0.005	0.026
Dissolved Cobalt (Co)	---	---	---	0.014	0.013	NC	NC	NC
Total Chromium (Cr)	---	0.0321	0.00276	0.012	0.014	0.016	0.015	0.061
Dissolved Chromium (Cr)	---	---	---	<0.0010	<0.0010	NC	NC	NC
Total Copper (Cu)	---	0.0442	0.00605	0.015	0.016	0.022	0.020	0.082
Dissolved Copper (Cu)	---	---	---	0.0065	0.0059	NC	NC	NC
Total Iron	---	18.2	1.6	4.8	5.6	8.20	8.81	34.6
Dissolved Iron (Fe)	---	---	---	0.088	0.095	NC	NC	NC
Total Mercury	---	<0.00010	0.00004	0.000014	0.000014	0.00003	0.00002	0.0001
Dissolved Mercury (Hg)	---	---	---	0.0000067	0.0000067	NC	NC	NC
Total Nickel (Ni)	---	0.0247	0.00339	0.028	0.03	0.019	0.013	0.059
Dissolved Nickel (Ni)	---	---	---	0.022	0.02	NC	NC	NC
Total Lead (Pb)	---	0.0194	0.0023	0.0026	0.0033	0.008	0.010	0.037
Dissolved Lead (Pb)	---	---	---	<0.00020	<0.00020	NC	NC	NC
Total Silver	---	0.000208	<0.000020	<0.00010	0.00011	NC	NC	NC
Dissolved Silver (Ag)	---	---	---	<0.00010	<0.00010	NC	NC	NC
Total Zinc (Zn)	---	0.0373	0.0059	0.016	0.018	0.0197	0.016	0.068
Dissolved Zinc (Zn)	---	---	---	0.004	<0.0030	NC	NC	NC

Notes:

mg/L - milligrams per litre
< - less than analytical detection limit indicated
'---' - sample not analyzed for parameter indicated
ns - no standard listed
NC - Not calculated

1 - ULA is calculated as the average + 3x the standard devidation of a parameter. Note that the duplicate sample was not included in the ULA calculation

Table 2 - Summary of Historic Groundwater Analytical Results - PCBs, PHCs, and Inorganics

Parameter / Sample # / Date	MW13-2	LF3-WS-01	MW-LF3-WS-02	MWLF-3	DUP	ULA Calculation		
						Average	Standard Devidation	ULA[1] (mg/L)
	2014	2014	2014	2016	2016			
PCBs								
Total PCBs	---	---	---	<0.05	<0.05	NC	NC	NC
PHCs								
Benzene [µg/L]	<0.50	<0.50	<0.50	<0.40	<0.40	NC	NC	NC
Toluene [µg/L]	<0.50	<0.50	<0.50	<0.40	<0.40	NC	NC	NC
Ethyl-benzene [µg/L]	<0.50	<0.50	<0.50	<0.40	<0.40	NC	NC	NC
Total Xylene [µg/L]	<2	<2	<2	<0.80	<0.80	NC	NC	NC
F1 [µg/L]	<200	<200	<200	260	340	NC	NC	NC
F2 [mg/L]	<0.20	<0.20	<0.40	<0.10	<0.10	NC	NC	NC
F3 [mg/L]	<0.30	<0.30	---	<0.20	<0.20	NC	NC	NC
F4 [mg/L]	<0.30	<0.30	---	<0.20	<0.20	NC	NC	NC
Inorganics								
Colour	---	---	---	---	---	NC	NC	NC
Con-ductivity	23	99	79	330	320	132.75	135.4	538.9
Total Dissolved Solids	12.5	58.9	54.5	220	200	86.475	91.4	360.8
Fluoride (F-)	---	---	---	---	---	NC	NC	NC
Ortho-phosphate (P)	---	---	---	---	---	NC	NC	NC
pH	6.22	6.66	6.68	6.42	6.39	6.495	0.218	7.15
Total Suspended Solids	---	---	---	110	110	NC	NC	NC
Dissolved Sulphate (SO4)	<3.0	15	3.1	<1.0	<1.0	9.05	8.41	34.3
Dissolved Chloride (Cl)	9.2	4.8	9.8	4.2	4.2	7	2.91	15.7
Nitrite (N)	<0.050	0.06	0.089	<0.010	<0.010	0.0745	0.021	0.14
Nitrate (N)	<0.50	<0.50	<0.50	<0.010	<0.010	NC	NC	NC
Nitrate + Nitrite	<0.50	<0.50	<0.50	<0.020	<0.020	NC	NC	NC

Notes:

µg/L - micrograms per Litre
mg/L - milligrams per litre
< - less than analytical detection limit indicated
'---' - sample not analyzed for parameter indicated
ns - no standard listed
NC - Not calculated

1 - ULA is calculated as the average + 3x the standard devidation of a parameter. Note that the duplicate sample was not included in the ULA calculation

Table 3 - Summary of 2016 Groundwater Analytical Results - PHCs

PARAMETER / Sample ID / Date	FIGQGs[1]	Upper Limit of Acceptability[2]	RDL	MWLF-3		
				8/24/2016	8/24/2016	RPD
BTEX & F1 Hydrocarbons (µg/L)					Duplicate	
Benzene	140	NC	0.40	<0.40	<0.40	NC
Toluene	83	NC	0.40	<0.40	<0.40	NC
Ethylbenzene	11000	NC	0.40	<0.40	<0.40	NC
o-Xylene	ns	NC	0.40	<0.40	<0.40	NC
p+m-Xylene	ns	NC	0.80	<0.80	<0.80	NC
Total Xylenes	3900	NC	0.80	<0.80	<0.80	NC
F1 (C6-C10)	810	NC	100	260	340	NC
F1 (C6-C10) - BTEX	ns	NC	100	260	340	NC
F2-F4 Hydrocarbons (mg/L)						
F2 (C10-C16 Hydrocarbons)	1300	NC	0.10	<0.10	<0.10	NC
F3 (C16-C34 Hydrocarbons)	ns	NC	0.20	<0.20	<0.20	NC
F4 (C34-C50 Hydrocarbons)	ns	NC	0.20	<0.20	<0.20	NC
Reached Baseline at C50	ns	NC	N/A	Yes	Yes	NC

Notes:

µg/L - micrograms per litre
< - less than analytical detection limit indicated
'---' - sample not analyzed for parameter indicated
ns - no standard listed
NC - Not calculated. When there are only non-detect values, no standard deviation was calculated
RDL - Reporting Detection Limit
[1] Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1,
[2] Upper Limit of Acceptability is determined as described in Report Section 3.1. Upper limits of acceptability are calculated
[3] Calculated standard based on CCME Water Quality for the Protection of Aquatic Life guidelines - calculated using water hardness (CaCO3)

Bold & Red
Highlighted

RPD = abs (X1 - X2)/((X1 + X2)/2) * 100
X1 = Sample Parameter Value
X2 = Duplicate Parameter Value
N/A - No RPD calculated

Table 4 - Summary of 2016 Groundwater Analytical Results - PCBs

PARAMETER / Sample ID / Date	FIGQGs[1]	Upper Limit of Acceptability[2]	MWLF-3		
			8/24/2016	8/24/2016	RPD
PCBs (µg/L)				**Duplicate**	
Aroclor 1016	ns	NC	<0.05	<0.05	NC
Aroclor 1221	ns	NC	<0.05	<0.05	NC
Aroclor 1232	ns	NC	<0.05	<0.05	NC
Aroclor 1242	ns	NC	<0.05	<0.05	NC
Aroclor 1248	ns	NC	<0.05	<0.05	NC
Aroclor 1254	ns	NC	<0.05	<0.05	NC
Aroclor 1260	ns	NC	<0.05	<0.05	NC
Aroclor 1262	ns	NC	<0.05	<0.05	NC
Aroclor 1268	ns	NC	<0.05	<0.05	NC
Total PCB	ns	NC	<0.05	<0.05	NC

Notes:

µg/L - micrograms per litre
< - less than analytical detection limit indicated
'---' - sample not analyzed for parameter indicated
ns - no standard listed
NC - Not calculated. When there are only non-detect values, no standard deviation was calculated
RDL - Reporting Detection Limit
[1] Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1,
[2] Upper Limit of Acceptability is determined as described in Report Section 3.1. Upper limits of acceptability are
[3] Calculated standard based on CCME Water Quality for the Protection of Aquatic Life guidelines - calculated using water hardness (CaCO3)

Bold & Red
Highlighted

RPD = abs (X1 - X2)/((X1 + X2)/2) * 100
X1 = Sample Parameter Value
X2 = Duplicate Parameter Value
N/A - No RPD calculated

Table 5 - Summary of 2016 Groundwater Analytical Results - Metals

PARAMETER / Sample ID / Date		Guidelines			Lowest RDL	MWLF-3					
		FIGQGs[1]	Upper Limit of Acceptability[2]			8/24/2016	8/24/2016	RPD	8/24/2016	8/24/2016	RPD
Metals	Units	Total	Total	Dissolved		Total	Duplicate		Dissolved	Duplicate	
Aluminum (Al)	mg/L	0.1	NC	NC	0.003	**3.1**	**3.9**	23%	0.1	0.092	8%
Antimony (Sb)	mg/L	2.0	NC	NC	0.00060	<0.00060	<0.00060	NC	<0.00060	<0.00060	NC
Arsenic (As)	mg/L	0.005	NC	NC	0.0002	0.00094	0.0012	NC	0.00044	0.00051	NC
Barium (Ba)	mg/L	0.5	NC	NC	0.01	0.24	0.24	0%	0.22	0.22	0%
Beryllium (Be)	mg/L	0.0053	NC	NC	0.001	<0.0010	<0.0010	NC	<0.0010	<0.0010	NC
Boron (B)	mg/L	5	NC	NC	0.02	<0.020	<0.020	NC	<0.020	<0.020	NC
Cadmium	ug/L	0.017	NC	NC	0.02	**0.15**	**0.15**	0%	**0.12**	**0.12**	0%
Calcium (Ca)	mg/L	ns	NC	NC	0.3	37	37	0%	40	39	3%
Chromium (Cr)	mg/L	0.0089	NC	NC	0.0010	**0.012**	**0.014**	15%	<0.0010	<0.0010	NC
Chromium VI (6+)	mg/L	ns	NC	NC	0.0010	<0.0010	<0.0010	NC	NA	NA	NC
Cobalt (Co)	mg/L	ns	NC	NC	0.0003	0.015	0.016	6%	0.014	0.013	7%
Copper (Cu)	mg/L	0.002-0.004 [3]	NC	NC	0.0002	**0.015**	**0.016**	6%	**0.0065**	**0.0059**	10%
Iron (Fe)	mg/L	0.3	NC	NC	0.060	**4.8**	**5.6**	15%	0.088	0.095	NC
Lead (Pb)	mg/L	0.001-0.007 [3]	NC	NC	0.0002	0.0026	0.0033	24%	<0.00020	<0.00020	NC
Lithium (Li)	mg/L	ns	NC	NC	0.02	<0.020	<0.020	NC	<0.020	<0.020	NC
Magnesium (Mg)	mg/L	ns	NC	NC	0.2	17	17	0%	17	17	0%
Manganese (Mn)	mg/L	ns	NC	NC	0.004	1.4	1.4	0%	1.5	1.5	0%
Mercury (Hg)	ug/L	0.026	NC	NC	0.002	0.014	0.014	0%	0.0067	0.0067	NC
Molybdenum (Mo)	mg/L	0.073	NC	NC	0.0002	0.00093	0.00091	NC	0.00082	0.00075	NC
Nickel (Ni)	mg/L	0.025-0.15 [3]	NC	NC	0.0005	0.028	0.03	7%	0.022	0.02	10%
Phosphorus (P)	mg/L	ns	NC	NC	0.1	0.33	0.49	NC	<0.10	<0.10	NC
Potassium (K)	mg/L	ns	NC	NC	0.3	8.3	8.5	2%	8.3	8.1	2%
Selenium (Se)	mg/L	0.001	NC	NC	0.0002	0.00022	0.00035	NC	<0.00020	<0.00020	NC
Silicon (Si)	mg/L	ns	NC	NC	0.1	14	15	7%	9.1	9	1%
Silver (Ag)	mg/L	0.0001	NC	NC	0.0001	<0.00010	**0.00011**	NC	<0.00010	<0.00010	NC
Sodium (Na)	mg/L	ns	NC	NC	0.50	5.6	5.6	0%	6.2	6.0	3%
Strontium (Sr)	mg/L	ns	NC	NC	0.020	0.35	0.36	3%	0.38	0.38	0%
Sulphur (S)	mg/L	ns	NC	NC	0.20	0.53	0.56	NC	0.62	0.56	NC
Thallium (Tl)	mg/L	0.0008	NC	NC	0.0002	<0.00020	<0.00020	NC	<0.00020	<0.00020	NC
Tin (Sn)	mg/L	ns	NC	NC	0.0010	<0.0010	<0.0010	NC	<0.0010	<0.0010	NC
Titanium (Ti)	mg/L	0.1	NC	NC	0.0010	**0.34**	**0.4**	16%	0.0015	0.001	NC
Uranium (U)	mg/L	0.015	NC	NC	0.0001	0.0021	0.0022	5%	0.00084	0.00078	7%
Vanadium (V)	mg/L	ns	NC	NC	0.0010	0.0098	0.011	12%	<0.0010	<0.0010	NC
Zinc (Zn)	mg/L	0.01	NC	NC	0.0030	**0.016**	**0.018**	12%	0.004	<0.0030	NC

Notes:

µg/L - micrograms per litre
< - less than analytical detection limit indicated
'---' - sample not analyzed for parameter indicated
ns - no standard listed
NC - Not calculated. When there are only non-detect values, no standard deviation was calculated
RDL - Reporting Detection Limit
[1] Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use
[2] Upper Limit of Acceptability is determined as described in Report Section 3.1. Upper limits of acceptability are
[3] Calculated standard based on CCME Water Quality for the Protection of Aquatic Life guidelines - calculated using water hardness (CaCO3)

Bold & Red
Highlighted

RPD = abs (X1 - X2)/((X1 + X2)/2) * 100
X1 = Sample Parameter Value
X2 = Duplicate Parameter Value
N/A - No RPD calculated

Table 6 - Summary of 2016 Groundwater Analytical Results - Inorganics

PARAMETER / Sample ID / Date		FIGQGs[1]	Upper Limit of Acceptability[2]	RDL	MWLF-3		
					8/24/2016	8/24/2016	RPD
Calculated Parameters						Duplicate	
Anion Sum	meq/L	ns	NC	N/A	3.1	3	3%
Cation Sum	meq/L	ns	NC	N/A	3.9	3.9	0%
Hardness ($CaCO_3$)	mg/L	ns	NC	0.50	170	170	0%
Ion Balance	N/A	ns	NC	0.010	1.3	1.3	0%
Dissolved Nitrate (NO_3)	mg/L	13	NC	0.044	<0.044	<0.044	NC
Nitrate plus Nitrite (N)	mg/L	ns	NC	0.020	<0.020	<0.020	NC
Dissolved Nitrite (NO_2)	mg/L	0.06	NC	0.033	<0.033	<0.033	NC
Misc. Inorganics							
Conductivity	uS/cm	ns	NC	1.0	330	320	3%
pH	pH	6.5 to 9.0	NC	N/A	6.42	6.39	0%
Total Dissolved Solids	mg/L	ns	NC	50	220	200	NC
Total Suspended Solids	mg/L	ns	NC	1.0	110	110	0%
Anions							
Alkalinity (PP as $CaCO_3$)	mg/L	ns	NC	0.50	<0.50	<0.50	NC
Alkalinity (Total as $CaCO_3$)	mg/L	ns	NC	0.50	150	140	7%
Bicarbonate (HCO_3)	mg/L	ns	NC	0.50	180	180	0%
Carbonate (CO_3)	mg/L	ns	NC	0.50	<0.50	<0.50	NC
Hydroxide (OH)	mg/L	ns	NC	0.50	<0.50	<0.50	NC
Dissolved Sulphate (SO_4)	mg/L	ns	NC	1.0	<1.0	<1.0	NC
Dissolved Chloride (Cl)	mg/L	120	NC	1.0	4.2	4.2	NC
Nutrients							
Dissolved Nitrite (N)	mg/L	0.06	NC	0.010	<0.010	<0.010	NC
Dissolved Nitrate (N)	mg/L	13	NC	0.010	<0.010	<0.010	NC

Notes:

µg/L - micrograms per litre
< - less than analytical detection limit indicated
'---' - sample not analyzed for parameter indicated
ns - no standard listed
NC - Not calculated. When there are only non-detect values, no standard deviation was calculated
RDL - Reporting Detection Limit
[1] Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1, Freshwater life pathway for coarse grained soils.
[2] Upper Limit of Acceptability is determined as described in Report Section 3.1. Upper limits of acceptability are calculated using mean of baseline data +3 standard deviations.
[3] Calculated standard based on CCME Water Quality for the Protection of Aquatic Life guidelines - calculated using water hardness (CaCO3)

Bold & Red
Highlighted

RPD = abs (X1 - X2)/((X1 + X2)/2) * 100
X1 = Sample Parameter Value
X2 = Duplicate Parameter Value
N/A - No RPD calculated

Table 7: 2018 Groundwater Analytical Results and QAQC Data - PHCs

Sample ID	Units	RDL	Upper Limits of Acceptability [1]	FIGQG [2]	MWLF-3	DUP	RPD (%)	Field Blank (DUP 2)	Trip Blank
Type					GW	GW		DI Water	DI Water
Date					17-Aug-18	17-Aug-18		17-Aug-18	17-Aug-18
Time					14:35	14:35		15:20	--
Total Xylenes	µg/L	0.89	NC	3900	<0.89	<0.89	N/A	<0.89	<0.89
F1 (C6-C10)	µg/L	100	NC	810	<100	<100	N/A	<100	<100
F1 (C6-C10) - BTEX	µg/L	100	NC	ns	<100	<100	N/A	<100	<100
F2 (C10-C16 Hydrocarbons)	µg/L	100	NC	1300	<100	<100	N/A	<100	<100
						Batch Average	N/A		

Notes:

µg/L - micrograms per Litre
< - less than analytical detection limit indicated
'---' - sample not analyzed for parameter indicated
ns - no standard listed
NC - Not calculated
RDL - Reporting Detection Limit
1 - Upper Limit of Acceptability is determined as described in Report Section 3.1.1. Upper limits of acceptability are calculated using mean of baseline data (2014) +3 standard deviations.
2 - Federal Interim Groundwater Quality Guidelines, Table 2 Residential/Parkland Use, Tier 1, Coarse Grained Soils
3 - Calculated standard based on CCME Water Quality for the Protection of Aquatic Life guidelines - calculated using water hardness (CaCO3) or pH (aluminum only)

Bold & Red	FIGQG Exceedence
Bold & Red & Outlined	ULA Exceedance
Highlighted	DL > Criteria

RPD = abs (X1 - X2)/((X1 + X2)/2) * 100
X1 = Sample Parameter Value
X2 = Duplicate Parameter Value
N/A - No RPD calculated

Table 8: 2018 Groundwater Analytical Results and QAQC Data - Total Metals

Sample ID	Units	RDL	Upper Limits of Acceptability [1]	FIGQG [2]	MWLF-3	DUP	RPD (%)	Field Blank (DUP 2)	Trip Blank
Type					GW	GW		Water	Water
Date					17-Aug-18	17-Aug-18		17-Aug-18	17-Aug-18
Time					14:35	14:35		15:20	--
Total Aluminum (Al)	µg/L	3	41659	5	**210**	**200**	4.9	5.0	<3
Total Antimony (Sb)	µg/L	0.6	NC	2000	<0.6	<0.6	N/A	<0.6	<0.6
Total Arsenic (As)	µg/L	0.2	7.1	5	0.57	0.40	35.1	<0.2	<0.2
Total Barium (Ba)	µg/L	10	NC	500	120	120	0.0	<10	<10
Total Beryllium (Be)	µg/L	1	NC	5.3	<1	<1	N/A	<1	<1
Total Boron (B)	µg/L	20	NC	5000	<20	<20	N/A	<20	<20
Total Cadmium (Cd)	µg/L	0.02	0.28	0.017	**0.097**	**0.11**	12.6	<0.02	<0.02
Total Calcium (Ca)	µg/L	300	NC	ns	23,000	23,000	0.0	<300	<300
Total Chromium (Cr)	µg/L	1	60.6	8.9	2.4	2.3	4.3	<1	<1
Total Cobalt (Co)	µg/L	0.3	26.2	ns	14.0	14.0	0.0	<0.3	<0.3
Total Copper (Cu)	µg/L	0.2	81.6	2 [3]	**18.0**	**19.0**	5.4	0.29	<0.2
Total Iron (Fe)	µg/L	60	34620	300	130	120	8.0	<60	<60
Total Lead (Pb)	µg/L	0.2	37	2.6 [3]	<0.2	<0.2	N/A	<0.2	<0.2
Total Lithium (Li)	µg/L	20	NC	ns	<20	<20	N/A	<20	<20
Total Magnesium (Mg)	µg/L	200	NC	ns	7,800	7,900	1.3	<200	<200
Total Manganese (Mn)	µg/L	4	NC	ns	2,000	2,000	0.0	<4	<4
Total Molybdenum (Mo)	µg/L	0.2	NC	73	0.31	0.29	6.7	<0.2	<0.2
Total Nickel (Ni)	µg/L	0.5	59	85 [3]	27.0	27.0	0.0	<0.5	<0.5
Total Phosphorus (P)	µg/L	100	NC	ns	<100	<100	N/A	<100	<100
Total Potassium (K)	µg/L	300	NC	ns	4,300	4,300	0.0	<300	<300
Total Selenium (Se)	µg/L	0.2	NC	1	0.28	0.21	28.6	<0.2	<0.2
Total Silicon (Si)	µg/L	100	NC	ns	7,000	7,000	0.0	<100	<100
Total Silver (Ag)	µg/L	0.1	NC	0.1	**0.10**	**0.11**	9.5	<0.1	<0.1
Total Sodium (Na)	µg/L	500	NC	ns	1,200	1,200	0.0	<500	<500
Total Strontium (Sr)	µg/L	20	NC	ns	210	210	0.0	<20	<20
Total Sulphur (S)	µg/L	200	NC	ns	600	660	9.5	<200	<200
Total Thallium (Tl)	µg/L	0.2	NC	0.8	<0.2	<0.2	N/A	<0.2	<0.2
Total Tin (Sn)	µg/L	1	NC	ns	<1	<1	N/A	<1	<1
Total Titanium (Ti)	µg/L	1	NC	100	7.7	7.1	8.1	1.1	<1
Total Uranium (U)	µg/L	0.1	NC	15	1.2	1.2	0.0	<0.1	<0.1
Total Vanadium (V)	µg/L	1	NC	ns	1.3	1.3	0.0	<1	<1
Total Zinc (Zn)	µg/L	3	68	10	4.1	4.2	2.4	<3	<3
						Batch Average	5.7		

Notes:

µg/g - micrograms per gram
mg/L - milligrams per litre
< - less than analytical detection limit indicated
'---' - sample not analyzed for parameter indicated
ns - no standard listed
NC - Not calculated
RDL - Reporting Detection Limit
1 - Upper Limit of Acceptability is determined as described in Report Section 3.1.1. Upper limits of acceptability are calculated using mean of baseline data (2014) +3 standard deviations.
2 - Federal Interim Groundwater Quality Guidelines, Table 2 Residential/Parkland Use, Tier 1, Coarse Grained Soils
3 - Calculated standard based on CCME Water Quality for the Protection of Aquatic Life guidelines - calculated using water hardness (CaCO3) or pH (aluminum only)

Bold & Red FIGQG Exceedence
Bold & Red & Outlined ULA Exceedance
Highlighted DL > Criteria

RPD = abs (X1 - X2)/((X1 + X2)/2) * 100
X1 = Sample Parameter Value
X2 = Duplicate Parameter Value
N/A - No RPD calculated

Table 9: 2018 Groundwater Analytical Results and QAQC Data - Dissolved Metals

Sample ID	Units	RDL	Upper Limits of Acceptability [1]	FIGQG [2]	MWLF-3	DUP	RPD (%)	Field Blank (DUP 2)	Trip Blank
Type					GW	GW		Water	Water
Date					17-Aug-18	17-Aug-18		17-Aug-18	17-Aug-18
Time					14:35	14:35		15:20	--
Dissolved Aluminum (Al)	µg/L	3	NC	5	**170**	**160**	6.1	<3	<3
Dissolved Antimony (Sb)	µg/L	1	NC	2000	<0.6	<0.6	N/A	<0.6	<0.6
Dissolved Arsenic (As)	µg/L	0.2	NC	5	0.35	0.48	31.3	<0.2	<0.2
Dissolved Barium (Ba)	µg/L	10	NC	500	120	120	0.0	<10	<10
Dissolved Beryllium (Be)	µg/L	1	NC	5.3	<1	<1	N/A	<1	<1
Dissolved Boron (B)	µg/L	20	NC	5000	<20	<20	N/A	<20	<20
Dissolved Cadmium (Cd)	µg/L	0.02	NC	0.017	**0.083**	**0.082**	1.2	<0.02	<0.02
Dissolved Calcium (Ca)	µg/L	300	NC	ns	22000	22000	0.0	<300	<300
Dissolved Chromium (Cr)	µg/L	1	NC	8.9	1.8	1.9	5.4	<1	<1
Dissolved Cobalt (Co)	µg/L	0.3	NC	ns	13	14	7.4	<0.3	<0.3
Dissolved Copper (Cu)	µg/L	0.2	NC	2 [3]	**16**	**17**	6.1	0.23	<0.2
Dissolved Iron (Fe)	µg/L	60	NC	300	75	78	3.9	<60	<60
Dissolved Lead (Pb)	µg/L	0.2	NC	2.6 [3]	<0.2	<0.2	N/A	<0.2	<0.2
Dissolved Lithium (Li)	µg/L	20	NC	ns	<20	<20	N/A	<20	<20
Dissolved Magnesium (Mg)	µg/L	200	NC	ns	7700	7600	1.3	<200	<200
Dissolved Manganese (Mn)	µg/L	4	NC	ns	2000	2000	0.0	<4	<4
Dissolved Molybdenum (Mo)	µg/L	0.2	NC	73	0.22	0.22	0.0	<0.2	<0.2
Dissolved Nickel (Ni)	µg/L	1	NC	85 [3]	26	26	0.0	<0.5	<0.5
Dissolved Phosphorus	µg/L	100	NC	ns	<100	<100	N/A	<100	<100
Dissolved Potassium (K)	µg/L	300	NC	ns	4100	4100	0.0	<300	<300
Dissolved Selenium (Se)	µg/L	0.2	NC	1	0.23	0.22	4.4	<0.2	<0.2
Dissolved Silicon (Si)	µg/L	100	NC	ns	6900	6900	0.0	<100	<100
Dissolved Silver (Ag)	µg/L	0.1	NC	0.1	<0.1	<0.1	N/A	<0.1	<0.1
Dissolved Sodium (Na)	µg/L	500	NC	ns	1200	1200	0.0	<500	<500
Dissolved Strontium (Sr)	µg/L	20	NC	ns	210	210	0.0	<20	<20
Dissolved Sulphur	µg/L	200	NC	ns	630	620	1.6	<200	<200
Dissolved Thallium (Tl)	µg/L	0.2	NC	0.8	<0.2	<0.2	N/A	<0.2	<0.2
Dissolved Tin (Sn)	µg/L	1	NC	ns	<1	<1	N/A	<1	<1
Dissolved Titanium (Ti)	µg/L	1	NC	100	3.7	2.5	38.7	<1	<1
Dissolved Uranium (U)	µg/L	0.1	NC	15	1.1	0.99	10.5	<0.1	<0.1
Dissolved Vanadium (V)	µg/L	1	NC	ns	1.5	1.6	6.5	<1	<1
Dissolved Zinc (Zn)	µg/L	3	NC	10	<3	4.5	N/A	<3	<3
						Batch Average	5.7		

Notes:

µg/L - micrograms per Litre
< - less than analytical detection limit indicated
'---' - sample not analyzed for parameter indicated
ns - no standard listed
NC - Not calculated
RDL - Reporting Detection Limit
1 - Upper Limit of Acceptability is determined as described in Report Section 3.1.1. Upper limits of acceptability are calculated using mean of baseline data (2014) +3 standard deviations. Dissolved metal results are only avaiable for one sample in 2016 - as a result, ULA could not be calculated
2 - Federal Interim Groundwater Quality Guidelines, Table 2 Residential/Parkland Use, Tier 1, Coarse Grained Soils
3 - Calculated standard based on CCME Water Quality for the Protection of Aquatic Life guidelines - calculated using water hardness (CaCO3) or pH (aluminum only)

Bold & Red	FIGQG Exceedence
Bold & Red & Outlined	ULA Exceedance
Highlighted	DL > Criteria

RPD = abs (X1 - X2)/((X1 + X2)/2) * 100
X1 = Sample Parameter Value
X2 = Duplicate Parameter Value
N/A - No RPD calculated

Table 10: 2018 Groundwater Analytical Results and QAQC Data - Inorganics

Sample ID	Units	RDL	Upper Limits of Acceptability [1]	FIGQG [2]	MWLF-3	DUP	RPD (%)	Field Blank (DUP 2)	Trip Blank
Type					GW	GW		Water	Water
Date					17-Aug-18	17-Aug-18		17-Aug-18	17-Aug-18
Time					14:35	14:35		15:20	--
Calculated Parameters									
Anion Sum	meq/L	N/A	NC	ns	1.8	1.8	0.0	0	3.1
Cation Sum	meq/L	N/A	NC	ns	2	2	0.0	0.008	0
Hardness (CaCO3)	mg/L	0.50	NC	ns	87	86	1.2	<0.50	<0.50
Ion Balance (% Difference)	%	N/A	NC	13	3.2	3	6.5	NC	NC
Dissolved Nitrate (NO3)	mg/L	0.44	NC	ns	<0.44	<0.44	N/A	<0.044	<0.044
Nitrate plus Nitrite (N)	mg/L	0.14	NC	ns	<0.14	<0.14	N/A	<0.014	<0.014
Dissolved Nitrite (NO2)	mg/L	0.33	0.14	0.06	<0.33	<0.33	N/A	<0.033	<0.033
Calculated Total Dissolved Solids	mg/L	10	361	ns	93	92	1.1	<10	110
Misc. Inorganics									
Conductivity	uS/cm	2.0	539	ns	190	190	0.0	<2.0	290
pH	pH	N/A	5.84 - 7.15	6.5 - 9.0	**6.01**	**6.24**	3.8	5.07	8.02
Total Suspended Solids	mg/L	1.0	NC	ns	1.3	1.3	0.0	<1.0	<1.0
Anions									
Alkalinity (PP as CaCO3)	mg/L	1.0	NC	ns	<1.0	<1.0	N/A	<1.0	<1.0
Alkalinity (Total as CaCO3)	mg/L	1.0	NC	ns	91	90	1.1	<1.0	110
Bicarbonate (HCO3)	mg/L	1.0	NC	ns	110	110	0.0	<1.0	130
Carbonate (CO3)	mg/L	1.0	NC	ns	<1.0	<1.0	N/A	<1.0	<1.0
Hydroxide (OH)	mg/L	1.0	NC	ns	<1.0	<1.0	N/A	<1.0	<1.0
Dissolved Sulphate (SO4)	mg/L	1.0	34.3	100	<1.0	<1.0	N/A	<1.0	43
Dissolved Chloride (Cl)	mg/L	1.0	15.7	120	1.2	1.2	0.0	<1.0	4.2
Nutrients									
Dissolved Nitrite (N)	mg/L	0.10	0.14	0.06	<0.10 (1)	<0.10 (1)	N/A	<0.010	<0.010
Dissolved Nitrate (N)	mg/L	0.10	NC	13	<0.10 (1)	<0.10 (1)	N/A	<0.010	<0.010
						Batch Average	1.2		

Notes:

mS/cm - microsiemens per centimetre
mg/L - miligrams per litre
ns - no standard listed
< - less than analytical detection limit indicated
'---' - sample not analyzed for parameter indicated
NC - Not calculated
RDL - Reporting Detection Limit
1 - Upper Limit of Acceptability is determined as described in Report Section 3.1.1. Upper limits of acceptability are calculated using mean of baseline data (2014) +3 standard deviations.
2 - Federal Interim Groundwater Quality Guidelines, Table 2 Residential/Parkland Use, Tier 1, Coarse Grained Soils
3 - Calculated standard based on CCME Water Quality for the Protection of Aquatic Life guidelines - calculated using water hardness (CaCO3) or pH (aluminum only)

Bold & Red	FIGQG Exceedence
Bold & Red & Outlined	ULA Exceedance
Highlighted	DL > Criteria

RPD = abs (X1 - X2)/((X1 + X2)/2) * 100
X1 = Sample Parameter Value
X2 = Duplicate Parameter Value
N/A - No RPD calculated

Table 11: 2018 Groundwater Analytical Results and QAQC Data - PCBs

Sample ID	Units	RDL	Upper Limits of Acceptability [1]	FIGQG [2]	MWLF-3	DUP	RPD (%)	Field Blank (DUP 2)	Trip Blank
Type					GW	GW		Water	Water
Date					17-Aug-18	17-Aug-18		17-Aug-18	17-Aug-18
Time					14:35	14:35		15:20	--
Aroclor 1016	µg/L	0.05	NC	ns	<0.05	<0.05	N/A	<0.05	<0.05
Aroclor 1221	µg/L	0.05	NC	ns	<0.05	<0.05	N/A	<0.05	<0.05
Aroclor 1232	µg/L	0.05	NC	ns	<0.05	<0.05	N/A	<0.05	<0.05
Aroclor 1242	µg/L	0.05	NC	ns	<0.05	<0.05	N/A	<0.05	<0.05
Aroclor 1248	µg/L	0.05	NC	ns	<0.05	<0.05	N/A	<0.05	<0.05
Aroclor 1254	µg/L	0.05	NC	ns	<0.05	<0.05	N/A	<0.05	<0.05
Aroclor 1260	µg/L	0.05	NC	ns	<0.05	<0.05	N/A	<0.05	<0.05
Aroclor 1262	µg/L	0.05	NC	ns	<0.05	<0.05	N/A	<0.05	<0.05
Aroclor 1268	µg/L	0.05	NC	ns	<0.05	<0.05	N/A	<0.05	<0.05
Total PCB	µg/L	0.05	NC	ns	<0.05	<0.05	N/A	<0.05	<0.05
						Batch Average	N/A		

Notes:

µg/L - micrograms per litre
< - less than analytical detection limit indicated
'---' - sample not analyzed for parameter indicated
ns - no standard listed
NC - Not calculated. When there are only non-detect values, no standard deviation was calculated
RDL - Reporting Detection Limit
1 - Upper Limit of Acceptability is determined as described in Report Section 3.1.1. Upper limits of acceptability are calculated using mean of baseline data (2014) +3 standard deviations.
2 - Federal Interim Groundwater Quality Guidelines, Table 2 Residential/Parkland Use, Tier 1, Coarse Grained Soils
3 - Calculated standard based on CCME Water Quality for the Protection of Aquatic Life guidelines - calculated using water hardness (CaCO3) or pH (aluminum only)

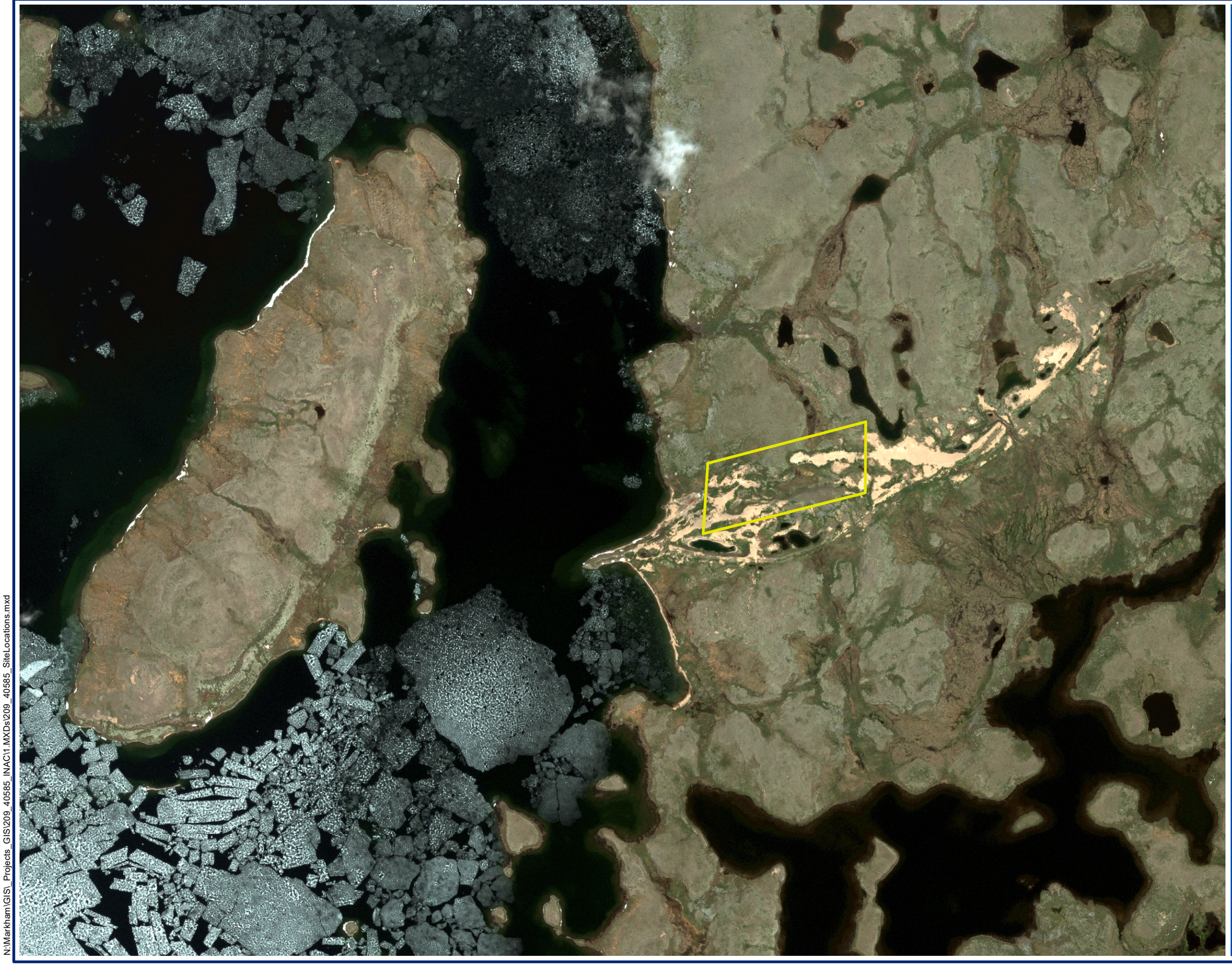
Bold & Red FIGQG Exceedence
Bold & Red & Outlined ULA Exceedance
Highlighted DL > Criteria

RPD = abs (X1 - X2)/((X1 + X2)/2) * 100
X1 = Sample Parameter Value
X2 = Duplicate Parameter Value
N/A - No RPD calculated

DRAWINGS

Crown-Indigenous Relations and Northern Affairs Canada
Contaminants and Remediation Division

Cape Christian Long Term Monitoring Event
Qikiqtaaluk Region, Nunavut
SLR Project No.: 209.40585.00000



LEGEND

Approximate Site Locations

0 0.125 0.25 0.5 Kilometers

SCALE: 1:15,000
WHEN PLOTTED CORRECTLY AT 11 x 17
Canada Lambert Conformal Conic

NOTES

This map is for conceptual purposes only and should not be used for navigational purposes.

Basedata:

CROWN INDIGENOUS RELATIONS AND NORTHEN AFFAIRS CANADA (CIRNAC)

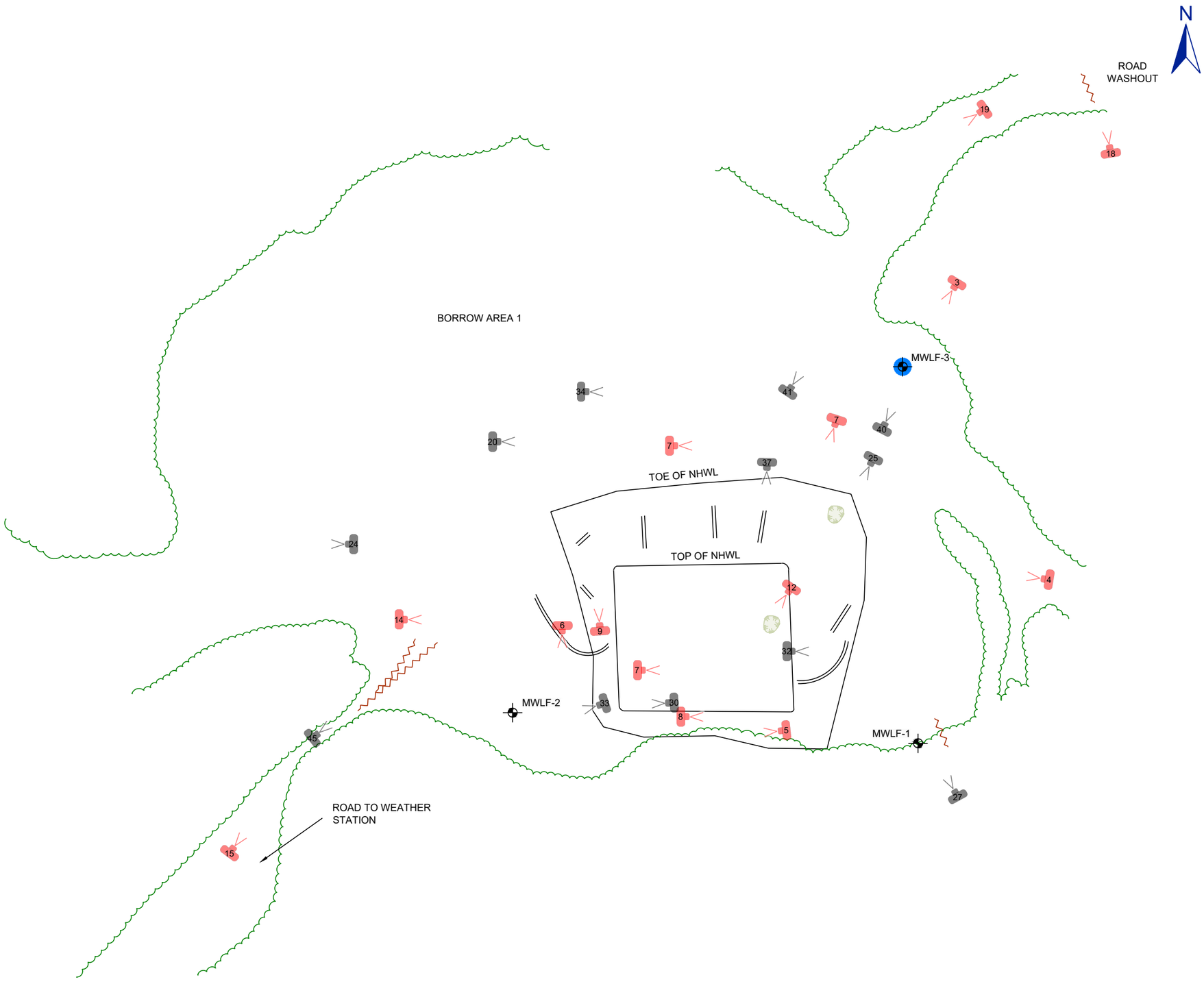
ENNADAI LAKE, FORMER WEATHER STATION, NUNAVUT

SITE LOCATION

December, 2018	Rev **0.0**	Drawing No. **1**
Project No. 209.40585.00000		

SLR global environmental solutions

N:\Markham\GIS_Projects_GIS\209_40585_INAC\1.MXDs\209_40585_SiteLocations.mxd



NOTES:
REFERENCED FROM ARCADIS FIGURE *PLAN OF THE NHWL* (NOVEMBER 2016).

LEGEND:

- SETTLEMENT OR DEPRESSION
- EROSION
- EDGE OF BRUSH
- ATV TRACKS
- MONITORING WELL (ARCADIS, 2016)
- MONITORING WELL SAMPLED IN 2018
- # VIEWPOINT PHOTOGRAPH INCLUDED IN APPENDIX A
- # VIEWPOINT PHOTOGRAPH INCLUDED IN ATTACHED USB

0 5 10 20 30 m

SCALE 1:600
WHEN PLOTTED CORRECTLY ON A 11 x 17 PAGE LAYOUT
NAD 1983 UTM Zone 14 V

THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.

CROWN-INDIGENOUS RELATIONS AND NORTHERN AFFAIRS CANADA (CIRNAC)
ENNADAI LAKE
NUNAVUT

ENNADAI LAKE LONG TERM MONITORING EVENT

ENNADAI LAKE NON-HAZARDOUS WASTE LANDFILL PLAN

Date: December 17, 2018
Project No. 209.40585.00000
Drawing No. 2

SLR global environmental solutions

Cadfile name: S_209-40585-00000-A4.dwg

APPENDIX A
Site Photographs

Crown-Indigenous Relations and Northern Affairs Canada
Contaminants and Remediation Division

Cape Christian Long Term Monitoring Event
Qikiqtaaluk Region, Nunavut
SLR Project No.: 209.40585.00000

Photograph 1. View of NHWL from Plane

Photograph 2. Caribou near plane

Photograph 3. NE Corner of NHWL, facing SW

Photograph 4. East edge of NHWL, Facing W

Photograph 5. South edge of NHWL, Facing W

Photograph 6. West edge of NHWL, facing S

Photograph 7. View along North edge, Facing E

Photograph 8. South edge of NHWL, Facing E

Photograph 9. Depression in Cap, Facing SW

Photograph 10. View along western edge, facing SW, weather station in background

Photograph 11. Northeast edge of NHWL, Facing S

Photograph 12. East edge of NHWL, Facing S, Weather station in background

Photograph 13. South edge from Cap, facing S

.

Photograph 14. West edge of NHWL, Facing E

Photograph 15. Road to NHWL from Weather Station, Facing NE

.

Photograph 16. View of NHWL from Weather Station, facing N

.

Photograph 17. Siksik burrows on access road, facing S

.

Photograph 18. Erosion along access road, facing S

Photograph 19. Road to landfill from airstrip, facing W

Photograph 20. Drums on airstrip, facing SW

APPENDIX B
Field Sheets and Notes

Crown-Indigenous Relations and Northern Affairs Canada
Contaminants and Remediation Division

Cape Christian Long Term Monitoring Event
Qikiqtaaluk Region, Nunavut
SLR Project No.: 209.40585.00000

Non-Hazardous Waste Landfill Visual Inspection

Project Number.: 209.40585.00000 Date: 08/17/2018

Project Name: INAC Nunavut 2018 Weather: 11°C, Partly cloudy, light wind from SW

Site: Ennadai Lake Field Staff: D. Kith, D. Peterson

Item	Presence / Absence (Y/N)	Extent (LxWxD)	Description	Coodinates	Other Notes (Photo reference etc)
Settlement	Y	2 on cap 1 near MWLF3	· Minor depressions on cap · settlement near MWLF3	Cap.	29, 30
Erosion	Y	Across road.	· Erosion accross road to airstrip.		38
Frost Action	N	N/A	N/A	N/A.	
Animal Burrows	Y	Across road	Siksik burrows on road to strip.	Road.	36, 37, 39
Vegetation	Y	Flanks.	<1% veg. on flanks <10% ~~along~~ around landfill.	N/A.	All photos of landfill.
Staining	N	N/A	N/A	N/A	
Vegetation Stress	N	N/A	N/A	N/A	
Seepage	N	N/A	N/A.	N/A.	
Exosed Debris	N		· glass/metal near strip + around toe		41
Condition of Monitoring Instruments	Great!				
Other					

Natural Environment Monitoring Checklist

Project Number.: 209.40585.00000

Project Name: INAC Nunavut 2018

Site: Ennadai Lake

Date: 08/17/2018

Weather: +14°C, partly cloudy, light wind from SW

Field Staff: D. Kith, D. Peterson.

Item	Presence / Absence (Y/N)	Extent (LxWxD)	Description	Other Notes (Photo reference etc)
Wildlife Sightings	Y	13 Caribou	· 8 near strip when landing · 4 near strip when leaving · 1 by plane when leaving.	Photo 43
Evidence of Wildlife	Y	· throughout site	· Caribou tracks + scat · Bear scat - · Siksik burrows on road	44.45
Wildlife Activity	Y	Burrowing on road.	· Siksik burrows on road.	44.45
Relatve Number	N/A	N/A	N/A	
Evidence of Revegetation	N	N/A.	<1% vegetation on flanks, <10% in surrounding area.	All photos of landfill.
Other:				
Other:				

Low-Flow Test Report:

Test Date / Time: 2018-08-17 12:49:54 PM
Project: Ennadai
Operator Name:

Location Name: MWLF-3 **Total Depth: 2.41 m** **Initial Depth to Water: 1.665 m**	**Flow Cell Volume: 130 ml** **Final Draw Down: 0.012 m**	**Instrument Used: Aqua TROLL 600** **Serial Number: 588344**

Test Notes:

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water
		+/- 0.2	+/- 0.1	+/- 3 %	+/- 0.2	+/- 10 %	+/- 20	+/- 5
2018-08-17 12:49 PM	00:00	5.80 pH	14.80 °C	160.22 µS/cm	5.01 mg/L	12.89 NTU	280.3 mV	166.50 cm
2018-08-17 12:50 PM	00:30	5.73 pH	12.62 °C	166.11 µS/cm	4.24 mg/L	12.57 NTU	279.8 mV	166.50 cm
2018-08-17 12:50 PM	01:00	5.79 pH	11.74 °C	169.24 µS/cm	3.68 mg/L	15.56 NTU	277.5 mV	166.50 cm
2018-08-17 12:51 PM	01:30	5.89 pH	11.49 °C	169.23 µS/cm	3.37 mg/L	10.00 NTU	271.2 mV	166.50 cm
2018-08-17 12:51 PM	02:00	5.98 pH	10.85 °C	172.56 µS/cm	3.25 mg/L	6.71 NTU	265.7 mV	167.60 cm
2018-08-17 12:52 PM	02:30	6.04 pH	10.49 °C	175.34 µS/cm	3.09 mg/L	7.40 NTU	262.3 mV	167.60 cm
2018-08-17 12:52 PM	03:00	6.11 pH	10.30 °C	175.84 µS/cm	2.96 mg/L	4.95 NTU	258.5 mV	167.60 cm
2018-08-17 12:53 PM	03:30	6.16 pH	9.96 °C	175.90 µS/cm	2.86 mg/L	6.23 NTU	255.1 mV	167.60 cm
2018-08-17 12:53 PM	04:00	6.17 pH	9.63 °C	177.29 µS/cm	2.82 mg/L	6.93 NTU	254.5 mV	167.70 cm
2018-08-17 12:54 PM	04:30	6.08 pH	9.58 °C	179.01 µS/cm	2.81 mg/L	7.63 NTU	258.8 mV	167.70 cm
2018-08-17 12:54 PM	05:00	5.94 pH	9.28 °C	179.11 µS/cm	2.83 mg/L	6.38 NTU	265.7 mV	167.70 cm
2018-08-17 12:55 PM	05:30	5.77 pH	9.12 °C	180.19 µS/cm	2.81 mg/L	5.25 NTU	272.9 mV	167.90 cm
2018-08-17 12:55 PM	06:00	5.69 pH	9.05 °C	179.44 µS/cm	2.76 mg/L	5.73 NTU	279.3 mV	167.90 cm
2018-08-17 12:56 PM	06:30	5.59 pH	9.06 °C	182.39 µS/cm	2.79 mg/L	7.58 NTU	284.3 mV	167.70 cm
2018-08-17 12:56 PM	07:00	5.50 pH	9.28 °C	182.87 µS/cm	2.76 mg/L	7.59 NTU	288.3 mV	167.70 cm
2018-08-17 12:57 PM	07:30	5.44 pH	9.43 °C	182.46 µS/cm	2.71 mg/L	8.49 NTU	291.3 mV	167.70 cm
2018-08-17 12:57 PM	08:00	5.42 pH	9.51 °C	182.01 µS/cm	2.72 mg/L	4.52 NTU	293.7 mV	167.90 cm
2018-08-17 12:58 PM	08:30	5.36 pH	9.40 °C	181.22 µS/cm	2.74 mg/L	3.60 NTU	296.5 mV	167.90 cm

2018-08-17 12:58 PM	09:00	5.35 pH	9.46 °C	181.11 µS/cm	2.73 mg/L	4.31 NTU	298.4 mV	167.90 cm
2018-08-17 12:59 PM	09:30	5.33 pH	9.46 °C	180.34 µS/cm	2.73 mg/L	4.40 NTU	299.3 mV	167.70 cm
2018-08-17 12:59 PM	10:00	5.34 pH	9.48 °C	180.69 µS/cm	2.76 mg/L	5.59 NTU	299.6 mV	167.70 cm
2018-08-17 1:00 PM	10:30	5.33 pH	9.44 °C	180.67 µS/cm	2.80 mg/L	4.36 NTU	298.7 mV	167.70 cm
2018-08-17 1:00 PM	11:00	5.30 pH	9.32 °C	181.44 µS/cm	2.80 mg/L	5.15 NTU	298.6 mV	167.70 cm
2018-08-17 1:01 PM	11:30	5.31 pH	9.29 °C	181.86 µS/cm	2.79 mg/L	4.94 NTU	298.2 mV	167.70 cm
2018-08-17 1:01 PM	12:00	5.31 pH	9.37 °C	182.03 µS/cm	2.77 mg/L	4.34 NTU	298.6 mV	167.70 cm

Samples

Sample ID:	Description:

CAM-D LTM 08/16/2018
@ 9:22 Left Gjoa Haven
- Pilots x2 (Summit)
- Jean Allen (INAC)
- Donovan Kitt (SLR)
- Daben Pekrson (SLR)
- Wildlife Monitor (JU)
@ 10:14 Touched down, 1°C Partly cloudy
@ 10:25 H+S meeting.
@ 11:00 Arrived @ MW2

MW2 - Frozen @ 1.293 mbtoc
- cut off Guard Lock
- Replaced w/ Master Lock.
- WGC, Heaved ~ 0.04 m

MW1 - Frozen @ 1.788 mbtoc
- cut Guard lock + replaced with Master Lock
- WGC, Heaved ~ 0.20 m

MW4 - Heaved 0.49 m
- frozen @ 1.725
- Cut Guard lock + replaced with Master Lock

MW3 - Heaved - 0.31 m.
- frozen @ 1.632
- Cut Guard lock + replaced with Master lock
- Well vented - J-plug off.

@ 13:00
- Measured cracking + erosion features on landfill.

- Took photos of landfill extents
- Collected SW sample from water near MW03 - w/ erosion channel leading up to it.
- Took photo of metal debris N. of landfill
- Photo of possible asbestoes tiles on road
- Photos of erosion on road
- Photos of burrowing near drum culvert by airstrip
- Packed up Twin
@ 15:49 - Touched off.

@ 16:30 touched down in Gjoa. Paid wildlife monitor. Refueled.
@ 16:53 touched off for Rankin Inlet.

@ 20:24 Touched down in Rankin.

* Runway @ CAM-D was in good condition.

Ennadai Lake 08/17/2018

@7:33 Ride arrived @ Hotel. Picked up pilots

@ 8:04 Arrived @ Airport. Grant Beadsall took another job & is unable to be wildlife monitor. Contacted Robert (backup monitor in Arviat) but he is on another job in Pond Inlet.
- Tried contacting the Hunter + Trapper Ass. in Rankin but no answer.
- Jacob (INAC) employee agreed to be the wildlife monitor. Discussed w/ Pilots + Jean and everyone is in agreement.

@8:46 - Touched off from Rankin
- Donavan Kitt (SLR)
- Dalen Peterson (SLR)
- Daly (Summit)
- Andy (Summit)
- Jean (INAC)
- Jacob (INAC)

- 8 caribou identified on initial fly over east of strip

@ 11:16 touched down

@ 11:32 Finished Hrs.

- MWLF-3 - WGC
  - monitored + purged (5L)
  - saved (2L in case of insufficient recharge)

- MWLF-2 - WGC
  - frozen

MWLF-1 - WGC
- dry.

- Completed geotech. inspection
  - No issues.
- Saw 3 bull caribou on way to strip.
- saw cow caribou north of strip.
- bull caribou came up to plane while we were completing field blank.
- field blank @ 15:16
- loaded plane
- touched off @ 15:42
- touched down @ 18:04.
> runway soft - pilot thinks it is attributed to wet year.

Rite in the Rain.

August 16, 2018

- Airport @ 9:00
  - ↳ Met Jennasie
  - ↳ Filled Water + Alconox Bottles
- Take off ~9:30
- Landed 10:15
  - ↳ Review HASP + Safety Kick off
  - ↳ Unload Gear
- Started Monitoring 11:20
  - ↳ MW2 Frozen @ 1.293 mbTOC
    - Replaced Lock - Minimal Heaving
    - Hex Oppm IBL Oppm
  - ↳ MW1 Frozen @ 1.748 mbTOC
    - Replaced Lock - Heaved Stick up 20 cm
    - Hex Oppm IBL Oppm
  - ↳ MW4 Frozen @ 1.725
    - Replaced Lock
    - Stick up Heaved out of Ground - Broken Reflector Marker
    - Hex Oppm IBL Oppm
  - ↳ MW3 Frozen @ 1.632 mbTOC
    - Replaced Lock
    - Heaved Stick up
    - Hex Oppm IBL Oppm
    - Vented. J-Plug Found Popped off in Stick-up

Rite in the Rain

↳ Landfill Inspection
- Measure/Note & Photo Features

↳ SW Sampling
pH: 8.11 Temp: 8.87 °C
ORP: 252.3mV EC: 266.07 µS/cm
DO: 12.39 mg/L Turb: 363.55 NTU
Time: 14:33
Took Dup of SW1 & Labelled SW2

↳ Fixed Reflector @ MW4
↳ Packed up @ Landfill
↳ Noted/GPSed/Photos of Road Erosion Leading To Runway
↳ Packed up & offsite @ 15:45
↳ Fly To Gjoa And Drop off Joanasie
↳ Fly To Rankin Inlet
↳ End 22:00 (21:00 Rankin)

August 17, 2018

- Shuttle @ 7:30
- Wildlife Monitor Took Another Job
  - ↳ Jacob (Summer Student) Resumed Roll
- Take off 8:45
- Ennadai Lake @ ~11:00
  - ↳ 7 Caribou on Runway
- Landed ~11:10
- Review H&S & Unpack 11:36
- Monitoring GW Wells
  - ↳ MWLF-3 → Good Condition
    - Hex: 0ppm IBL: 0ppm
    - Depth To H_2O: 1.659 mbTOC EOH: 2.41
    - Pre Purge
    - pH: 5.90 Temp: 6.02 EC: 102.75
    - ORP: 282.3 DO: 3.06 Turb 1.30
    - 3 Well Volumes ~ 5L
    - Purged: 5L

  - ↳ MWLF-2 → Good Condition
    - Hex: 0ppm IBL: 0ppm
    - EOH @ 3.67 mbTOC
    - Ice observed on Probe

Rite in the Rain

↳ MWLF-1 → Good Condition
Hex: 0ppm IBL: 0ppm
Depth To GW: —
EOH: 3.48 mbTOC
No Evidence of Ice on Probe

- Start Landfill Inspection 12:30
  ↳ Photos of Structure/~~Area~~/Features

- Sample MWLF-3
  ↳ Depth To GW: 1.665 mbTOC
  E.O.H. 32.41
  Start Pumping @ 13:49
  - Initial Drawdown To 1.682 mbTOC
  - Turned Down Pump
  - GW @ 1.676 @ 13:50

500mL in 2:20
500mL w 3:02 (5:22 Run)
500mL w 2:52 (8:14 Run)

1.676 @ 13:51
1.677 @ 13:53
1.679 @ 13:54
1.677 @ 13:55 Turned Pump Down
1.677 @ 13:56
1.679 @ 13:57
1.677 13:58
1.678 13:59
1.677 14:00

Aug 18, 2018

- Start 6:30 (Rankin)
- Shuttle to Airport
- Pick up Samples/Coolers
- Load Plane
- Take off @ 7:30
  - Re-Fuel in Baker Lake 8:30-9
  - Land 11:45
- Change Flights
- Submit Samples 12:20 - 13:00
- Ship Equip
- Return Coolers
- Drop Equip @ office
- Fly to Calgary (Flts delayed)
  - Depart 8:30 (9:30 Rankin)
- Hotel @ 11:45 (12:45 Rankin)

Aug 19, 2018

- Start ~~7:30~~ 8:00
- Fly to GP
- Unload @ office
- End 12:30

Pre Sample Parameters (All Stable Except Turbidity) on Tablet.

Sampled @ 14:02 - 14:35
MWLF-3 & Dup 10 Bottles Each

- Pack up Samples & Gear
- Walk To Runway
- Collect Field Blank @ 15:20 (10 Bottles)
- Load Plane
- Take off 15:45
  - Runway very soft. Had To back plane up to take off.
- Rankin Inlet Landed 17:30
- Samples into Cooler @ Airport
- Hotel @ 18:05

- eCOCs 7:30 - 8:45

Rite in the Rain

APPENDIX C
Laboratory Certificates of Analysis

Crown-Indigenous Relations and Northern Affairs Canada
Contaminants and Remediation Division

Cape Christian Long Term Monitoring Event
Qikiqtaaluk Region, Nunavut
SLR Project No.: 209.40585.00000

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 209.40585.00000
Site Location: Ennadai Lake
Your C.O.C. #: 8039

Attention: Donovan Kitt

SLR CONSULTING (CANADA) LTD.
200 10135-101AVE
GRANDE PRARIE , AB
CANADA

Report Date: 2018/08/25
Report #: R2609411
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B869984
Received: 2018/08/18, 13:26

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	3	N/A	2018/08/22	AB SOP-00005	SM 23 2320 B m
Alkalinity @25C (pp, total), CO3,HCO3,OH	1	N/A	2018/08/24	AB SOP-00005	SM 23 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	4	N/A	2018/08/22	AB SOP-00039	CCME CWS/EPA 8260d m
F1-BTEX	4	N/A	2018/08/23	AB SOP-00039	Auto Calc
Cadmium - low level CCME - Dissolved	4	N/A	2018/08/25	AB WI-00065	Auto Calc
Cadmium - low level CCME (Total)	4	N/A	2018/08/24	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	3	N/A	2018/08/22	AB SOP-00020	SM 22 4500-Cl-E m
Chloride by Automated Colourimetry	1	N/A	2018/08/24	AB SOP-00020	SM 22 4500-Cl-E m
Conductivity @25C	3	N/A	2018/08/22	AB SOP-00005	SM 23 2510 B m
Conductivity @25C	1	N/A	2018/08/24	AB SOP-00005	SM 23 2510 B m
CCME Hydrocarbons in Water (F2; C10-C16) (2)	4	2018/08/22	2018/08/22	AB SOP-00037 / AB SOP-00040	CCME PHC-CWS m
Hardness	4	N/A	2018/08/22	AB WI-00065	Auto Calc
Elements by ICP - Dissolved (3)	4	N/A	2018/08/22	AB SOP-00042	EPA 6010d R4 m
Elements by ICP - Total	4	2018/08/23	2018/08/23	AB SOP-00014 / AB SOP-00042	EPA 6010d R4 m
Elements by ICPMS - Dissolved (3)	4	N/A	2018/08/23	AB SOP-00043	EPA 6020b R2 m
Elements by ICPMS - Total	4	2018/08/23	2018/08/23	AB SOP-00014 / AB SOP-00043	EPA 6020b R2 m
Ion Balance	4	N/A	2018/08/22	AB WI-00065	Auto Calc
Sum of cations, anions	4	N/A	2018/08/22	AB WI-00065	Auto Calc
Nitrate and Nitrite	4	N/A	2018/08/22	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	4	N/A	2018/08/22	AB WI-00065	Auto Calc
Nitrogen (Nitrite - Nitrate) by IC	4	N/A	2018/08/21	AB SOP-00023	SM 23 4110 B m
Polychlorinated Biphenyls in Water (1)	4	2018/08/23	2018/08/24	CAL SOP-00149	EPA 8082A R1 m
Total PCBs in Water (1)	4	N/A	2018/08/24	CAL SOP-00149	Auto Calc
pH @25°C (4)	3	N/A	2018/08/22	AB SOP-00005	SM 23 4500 H+ B m
pH @25°C (4)	1	N/A	2018/08/24	AB SOP-00005	SM 23 4500 H+ B m
Sulphate by Automated Colourimetry	3	N/A	2018/08/22	AB SOP-00018	SM 22 4500-SO4 E m
Sulphate by Automated Colourimetry	1	N/A	2018/08/24	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Calculated)	2	N/A	2018/08/22	AB WI-00065	Auto Calc

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Your Project #: 209.40585.00000
Site Location: Ennadai Lake
Your C.O.C. #: 8039

Attention: Donovan Kitt

SLR CONSULTING (CANADA) LTD.
200 10135-101AVE
GRANDE PRARIE , AB
CANADA

Report Date: 2018/08/25
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Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B869984
Received: 2018/08/18, 13:26

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Dissolved Solids (Calculated)	2	N/A	2018/08/23	AB WI-00065	Auto Calc
Total Suspended Solids (NFR)	4	2018/08/22	2018/08/22	AB SOP-00061	SM 23 2540 D m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Calgary Environmental
(2) Silica gel clean up employed.
(3) Dissolved > Total Imbalance: Whenever applicable, Dissolved >Total for any parameter that falls within method uncertainty for duplicates is likely equivalent. If RPD is >20% samples were reanalyzed and confirmed.
(4) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Maxxam endeavours to analyze samples as soon as possible after receipt.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

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Site Location: Ennadai Lake
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Report Date: 2018/08/25
Report #: R2609411
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B869984
Received: 2018/08/18, 13:26

Encryption Key

Maxxam
25 Aug 2018 11:12:39

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Carmen McKay, Project Manager
Email: CMcKay@maxxam.ca
Phone# (403)219-3683
==========
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B869984
Report Date: 2018/08/25

SLR CONSULTING (CANADA) LTD.
Client Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampler Initials: DAP

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UC6471		UC6472			UC6473		UC6474		
Sampling Date		2018/08/17 14:35		2018/08/17 14:35			2018/08/17 15:20		2018/08/17		
COC Number		8039		8039			8039		8039		
	UNITS	**MWLF-3**	**QC Batch**	**DUP**	**RDL**	**QC Batch**	**DUP 2**	**QC Batch**	**Trip Blank**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	meq/L	1.8	9111314	1.8	N/A	9111314	0.0000	9111314	3.1	N/A	9111314
Cation Sum	meq/L	2.0	9111314	2.0	N/A	9111314	0.0080	9111314	0.000	N/A	9111314
Hardness (CaCO3)	mg/L	87	9111312	86	0.50	9111312	<0.50	9111312	<0.50	0.50	9111312
Ion Balance (% Difference)	%	3.2	9111313	3.0	N/A	9111313	NC	9111313	NC	N/A	9111313
Dissolved Nitrate (NO3)	mg/L	<0.44	9110786	<0.44	0.44	9110786	<0.044	9110786	<0.044	0.044	9110786
Nitrate plus Nitrite (N)	mg/L	<0.14	9110787	<0.14	0.14	9110787	<0.014	9110787	<0.014	0.014	9110787
Dissolved Nitrite (NO2)	mg/L	<0.33	9110786	<0.33	0.33	9110786	<0.033	9110786	<0.033	0.033	9110786
Calculated Total Dissolved Solids	mg/L	93	9111316	92	10	9111316	<10	9111316	110	10	9111316
Misc. Inorganics											
Conductivity	uS/cm	190	9112557	190	2.0	9113016	<2.0	9113069	290	2.0	9116060
pH	pH	6.01	9112551	6.24	N/A	9113014	5.07	9113067	8.02	N/A	9116054
Total Suspended Solids	mg/L	1.3	9112257	1.3	1.0	9112257	<1.0	9112257	<1.0	1.0	9112257
Low Level Elements											
Dissolved Cadmium (Cd)	ug/L	0.083	9111108	0.082	0.020	9111108	<0.020	9111108	<0.020	0.020	9111108
Total Cadmium (Cd)	ug/L	0.097	9112785	0.11	0.020	9112785	<0.020	9112785	<0.020	0.020	9112785
Anions											
Alkalinity (PP as CaCO3)	mg/L	<1.0	9112556	<1.0	1.0	9113015	<1.0	9113068	<1.0	1.0	9116059
Alkalinity (Total as CaCO3)	mg/L	91	9112556	90	1.0	9113015	<1.0	9113068	110	1.0	9116059
Bicarbonate (HCO3)	mg/L	110	9112556	110	1.0	9113015	<1.0	9113068	130	1.0	9116059
Carbonate (CO3)	mg/L	<1.0	9112556	<1.0	1.0	9113015	<1.0	9113068	<1.0	1.0	9116059
Hydroxide (OH)	mg/L	<1.0	9112556	<1.0	1.0	9113015	<1.0	9113068	<1.0	1.0	9116059
Dissolved Sulphate (SO4)	mg/L	<1.0	9112749	<1.0	1.0	9112749	<1.0	9112749	43	1.0	9115575
Dissolved Chloride (Cl)	mg/L	1.2	9112743	1.2	1.0	9112743	<1.0	9112743	4.2	1.0	9115574
Nutrients											
Dissolved Nitrite (N)	mg/L	<0.10 (1)	9110894	<0.10 (1)	0.10	9110894	<0.010	9110894	<0.010	0.010	9110894
Dissolved Nitrate (N)	mg/L	<0.10 (1)	9110894	<0.10 (1)	0.10	9110894	<0.010	9110894	<0.010	0.010	9110894

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to matrix interference.

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Maxxam Job #: B869984
Report Date: 2018/08/25

SLR CONSULTING (CANADA) LTD.
Client Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampler Initials: DAP

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		UC6471	UC6472	UC6473	UC6474		
Sampling Date		2018/08/17 14:35	2018/08/17 14:35	2018/08/17 15:20	2018/08/17		
COC Number		8039	8039	8039	8039		
	UNITS	**MWLF-3**	**DUP**	**DUP 2**	**Trip Blank**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	9112289
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	105	96	94	96		9112289
RDL = Reportable Detection Limit							

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SLR CONSULTING (CANADA) LTD.
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Site Location: Ennadai Lake
Sampler Initials: DAP

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		UC6471	UC6472	UC6473	UC6474		
Sampling Date		2018/08/17 14:35	2018/08/17 14:35	2018/08/17 15:20	2018/08/17		
COC Number		8039	8039	8039	8039		
	UNITS	**MWLF-3**	**DUP**	**DUP 2**	**Trip Blank**	**RDL**	**QC Batch**
Polychlorinated Biphenyls							
Aroclor 1016	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	9113827
Aroclor 1221	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	9113827
Aroclor 1232	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	9113827
Aroclor 1242	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	9113827
Aroclor 1248	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	9113827
Aroclor 1254	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	9113827
Aroclor 1260	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	9113827
Aroclor 1262	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	9113827
Aroclor 1268	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	9113827
Total PCB	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	9110350
Surrogate Recovery (%)							
NONACHLOROBIPHENYL (sur.)	%	101	127	130	99		9113827
RDL = Reportable Detection Limit							

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Maxxam Job #: B869984
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SLR CONSULTING (CANADA) LTD.
Client Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampler Initials: DAP

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UC6471	UC6472	UC6473	UC6474		
Sampling Date		2018/08/17 14:35	2018/08/17 14:35	2018/08/17 15:20	2018/08/17		
COC Number		8039	8039	8039	8039		
	UNITS	**MWLF-3**	**DUP**	**DUP 2**	**Trip Blank**	**RDL**	**QC Batch**
Elements							
Dissolved Aluminum (Al)	mg/L	0.17	0.16	<0.0030	<0.0030	0.0030	9113082
Total Aluminum (Al)	mg/L	0.21	0.20	0.0050	<0.0030	0.0030	9113843
Dissolved Antimony (Sb)	mg/L	<0.00060	<0.00060	<0.00060	<0.00060	0.00060	9113082
Total Antimony (Sb)	mg/L	<0.00060	<0.00060	<0.00060	<0.00060	0.00060	9113843
Dissolved Arsenic (As)	mg/L	0.00035	0.00048	<0.00020	<0.00020	0.00020	9113082
Total Arsenic (As)	mg/L	0.00057	0.00040	<0.00020	<0.00020	0.00020	9113843
Dissolved Barium (Ba)	mg/L	0.12	0.12	<0.010	<0.010	0.010	9112680
Total Barium (Ba)	mg/L	0.12	0.12	<0.010	<0.010	0.010	9113849
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	9113082
Total Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	9113843
Dissolved Boron (B)	mg/L	<0.020	<0.020	<0.020	<0.020	0.020	9112680
Total Boron (B)	mg/L	<0.020	<0.020	<0.020	<0.020	0.020	9113849
Dissolved Calcium (Ca)	mg/L	22	22	<0.30	<0.30	0.30	9112680
Total Calcium (Ca)	mg/L	23	23	<0.30	<0.30	0.30	9113849
Dissolved Chromium (Cr)	mg/L	0.0018	0.0019	<0.0010	<0.0010	0.0010	9113082
Total Chromium (Cr)	mg/L	0.0024	0.0023	<0.0010	<0.0010	0.0010	9113843
Dissolved Cobalt (Co)	mg/L	0.013	0.014	<0.00030	<0.00030	0.00030	9113082
Total Cobalt (Co)	mg/L	0.014	0.014	<0.00030	<0.00030	0.00030	9113843
Dissolved Copper (Cu)	mg/L	0.016	0.017	0.00023	<0.00020	0.00020	9113082
Total Copper (Cu)	mg/L	0.018	0.019	0.00029	<0.00020	0.00020	9113843
Dissolved Iron (Fe)	mg/L	0.075	0.078	<0.060	<0.060	0.060	9112680
Total Iron (Fe)	mg/L	0.13	0.12	<0.060	<0.060	0.060	9113849
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	9113082
Total Lead (Pb)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	9113843
Dissolved Lithium (Li)	mg/L	<0.020	<0.020	<0.020	<0.020	0.020	9112680
Total Lithium (Li)	mg/L	<0.020	<0.020	<0.020	<0.020	0.020	9113849
Dissolved Magnesium (Mg)	mg/L	7.7	7.6	<0.20	<0.20	0.20	9112680
Total Magnesium (Mg)	mg/L	7.8	7.9	<0.20	<0.20	0.20	9113849
Dissolved Manganese (Mn)	mg/L	2.0	2.0	<0.0040	<0.0040	0.0040	9112680
Total Manganese (Mn)	mg/L	2.0	2.0	<0.0040	<0.0040	0.0040	9113849
Dissolved Molybdenum (Mo)	mg/L	0.00022	0.00022	<0.00020	<0.00020	0.00020	9113082
RDL = Reportable Detection Limit							

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SLR CONSULTING (CANADA) LTD.
Client Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampler Initials: DAP

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UC6471	UC6472	UC6473	UC6474		
Sampling Date		2018/08/17 14:35	2018/08/17 14:35	2018/08/17 15:20	2018/08/17		
COC Number		8039	8039	8039	8039		
	UNITS	**MWLF-3**	**DUP**	**DUP 2**	**Trip Blank**	**RDL**	**QC Batch**
Total Molybdenum (Mo)	mg/L	0.00031	0.00029	<0.00020	<0.00020	0.00020	9113843
Dissolved Nickel (Ni)	mg/L	0.026	0.026	<0.00050	<0.00050	0.00050	9113082
Total Nickel (Ni)	mg/L	0.027	0.027	<0.00050	<0.00050	0.00050	9113843
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	9112680
Total Phosphorus (P)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	9113849
Dissolved Potassium (K)	mg/L	4.1	4.1	<0.30	<0.30	0.30	9112680
Total Potassium (K)	mg/L	4.3	4.3	<0.30	<0.30	0.30	9113849
Dissolved Selenium (Se)	mg/L	0.00023	0.00022	<0.00020	<0.00020	0.00020	9113082
Total Selenium (Se)	mg/L	0.00028	0.00021	<0.00020	<0.00020	0.00020	9113843
Dissolved Silicon (Si)	mg/L	6.9	6.9	<0.10	<0.10	0.10	9112680
Total Silicon (Si)	mg/L	7.0	7.0	<0.10	<0.10	0.10	9113849
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	9113082
Total Silver (Ag)	mg/L	0.00010	0.00011	<0.00010	<0.00010	0.00010	9113843
Dissolved Sodium (Na)	mg/L	1.2	1.2	<0.50	<0.50	0.50	9112680
Total Sodium (Na)	mg/L	1.2	1.2	<0.50	<0.50	0.50	9113849
Dissolved Strontium (Sr)	mg/L	0.21	0.21	<0.020	<0.020	0.020	9112680
Total Strontium (Sr)	mg/L	0.21	0.21	<0.020	<0.020	0.020	9113849
Dissolved Sulphur (S)	mg/L	0.63	0.62	<0.20	<0.20	0.20	9112680
Total Sulphur (S)	mg/L	0.60	0.66	<0.20	<0.20	0.20	9113849
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	9113082
Total Thallium (Tl)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	9113843
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	9113082
Total Tin (Sn)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	9113843
Dissolved Titanium (Ti)	mg/L	0.0037	0.0025	<0.0010	<0.0010	0.0010	9113082
Total Titanium (Ti)	mg/L	0.0077	0.0071	0.0011	<0.0010	0.0010	9113843
Dissolved Uranium (U)	mg/L	0.0011	0.00099	<0.00010	<0.00010	0.00010	9113082
Total Uranium (U)	mg/L	0.0012	0.0012	<0.00010	<0.00010	0.00010	9113843
Dissolved Vanadium (V)	mg/L	0.0015	0.0016	<0.0010	<0.0010	0.0010	9113082
Total Vanadium (V)	mg/L	0.0013	0.0013	<0.0010	<0.0010	0.0010	9113843
Dissolved Zinc (Zn)	mg/L	<0.0030	0.0045	<0.0030	<0.0030	0.0030	9113082
Total Zinc (Zn)	mg/L	0.0041	0.0042	<0.0030	<0.0030	0.0030	9113843
RDL = Reportable Detection Limit							

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SLR CONSULTING (CANADA) LTD.
Client Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampler Initials: DAP

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		UC6471		UC6472	UC6473	UC6474		
Sampling Date		2018/08/17 14:35		2018/08/17 14:35	2018/08/17 15:20	2018/08/17		
COC Number		8039		8039	8039	8039		
	UNITS	**MWLF-3**	**QC Batch**	**DUP**	**DUP 2**	**Trip Blank**	**RDL**	**QC Batch**
Volatiles								
Xylenes (Total)	mg/L	<0.00089	9109870	<0.00089	<0.00089	<0.00089	0.00089	9109870
F1 (C6-C10) - BTEX	mg/L	<0.10	9109870	<0.10	<0.10	<0.10	0.10	9109870
F1 (C6-C10)	mg/L	<0.10	9112505	<0.10	<0.10	<0.10	0.10	9110121
Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	101	9112505	99	117	100		9110121
4-Bromofluorobenzene (sur.)	%	102	9112505	101	102	103		9110121
D4-1,2-Dichloroethane (sur.)	%	132	9112505	125	140	122		9110121

RDL = Reportable Detection Limit

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SLR CONSULTING (CANADA) LTD.
Client Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampler Initials: DAP

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.7°C
Package 2	7.0°C
Package 3	6.3°C

As per client request 4 * Total Metals were completed, request received 08/22

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

SLR CONSULTING (CANADA) LTD.
Client Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampler Initials: DAP

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9110121	1,4-Difluorobenzene (sur.)	2018/08/22	98	50 - 140	96	50 - 140	105	%		
9110121	4-Bromofluorobenzene (sur.)	2018/08/22	101	50 - 140	98	50 - 140	104	%		
9110121	D4-1,2-Dichloroethane (sur.)	2018/08/22	119	50 - 140	136	50 - 140	129	%		
9112289	O-TERPHENYL (sur.)	2018/08/22	94	60 - 140	94	60 - 140	102	%		
9112505	1,4-Difluorobenzene (sur.)	2018/08/22	100	50 - 140	98	50 - 140	104	%		
9112505	4-Bromofluorobenzene (sur.)	2018/08/22	110	50 - 140	100	50 - 140	102	%		
9112505	D4-1,2-Dichloroethane (sur.)	2018/08/22	128	50 - 140	128	50 - 140	132	%		
9113827	NONACHLOROBIPHENYL (sur.)	2018/08/23	96	50 - 130	97	50 - 130	95	%		
9110121	F1 (C6-C10)	2018/08/22	71	60 - 140	119	60 - 140	<0.10	mg/L	NC	30
9110894	Dissolved Nitrate (N)	2018/08/21	101	80 - 120	101	80 - 120	<0.010	mg/L	NC	20
9110894	Dissolved Nitrite (N)	2018/08/21	101	80 - 120	101	80 - 120	<0.010	mg/L	NC	20
9112257	Total Suspended Solids	2018/08/22	100	80 - 120	97	80 - 120	<1.0	mg/L	NC	20
9112289	F2 (C10-C16 Hydrocarbons)	2018/08/22	86	60 - 140	89	60 - 140	<0.10	mg/L	NC	30
9112505	F1 (C6-C10)	2018/08/22	74	60 - 140	111	60 - 140	<0.10	mg/L	NC	30
9112551	pH	2018/08/22			100	97 - 103			0.91	N/A
9112556	Alkalinity (PP as CaCO3)	2018/08/22					<1.0	mg/L	7.4	20
9112556	Alkalinity (Total as CaCO3)	2018/08/22			102	80 - 120	<1.0	mg/L	0.37	20
9112556	Bicarbonate (HCO3)	2018/08/22					<1.0	mg/L	1.7	20
9112556	Carbonate (CO3)	2018/08/22					<1.0	mg/L	7.4	20
9112556	Hydroxide (OH)	2018/08/22					<1.0	mg/L	NC	20
9112557	Conductivity	2018/08/22			100	90 - 110	<2.0	uS/cm	0.60	10
9112680	Dissolved Barium (Ba)	2018/08/22	98	80 - 120	100	80 - 120	<0.010	mg/L	NC	20
9112680	Dissolved Boron (B)	2018/08/22	101	80 - 120	102	80 - 120	<0.020	mg/L	NC	20
9112680	Dissolved Calcium (Ca)	2018/08/22	95	80 - 120	97	80 - 120	<0.30	mg/L	0.10	20
9112680	Dissolved Iron (Fe)	2018/08/22	97	80 - 120	98	80 - 120	<0.060	mg/L	3.2	20
9112680	Dissolved Lithium (Li)	2018/08/22	97	80 - 120	99	80 - 120	<0.020	mg/L	NC	20
9112680	Dissolved Magnesium (Mg)	2018/08/22	100	80 - 120	101	80 - 120	<0.20	mg/L	0.0055	20
9112680	Dissolved Manganese (Mn)	2018/08/22	98	80 - 120	99	80 - 120	<0.0040	mg/L	NC	20
9112680	Dissolved Phosphorus (P)	2018/08/22	100	80 - 120	99	80 - 120	<0.10	mg/L	NC	20
9112680	Dissolved Potassium (K)	2018/08/22	100	80 - 120	101	80 - 120	<0.30	mg/L	0.57	20
9112680	Dissolved Silicon (Si)	2018/08/22	97	80 - 120	97	80 - 120	<0.10	mg/L	2.5	20

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QUALITY ASSURANCE REPORT(CONT'D)

SLR CONSULTING (CANADA) LTD.
Client Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampler Initials: DAP

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9112680	Dissolved Sodium (Na)	2018/08/22	97	80 - 120	100	80 - 120	<0.50	mg/L	0.62	20
9112680	Dissolved Strontium (Sr)	2018/08/22	96	80 - 120	99	80 - 120	<0.020	mg/L	0.30	20
9112680	Dissolved Sulphur (S)	2018/08/22					<0.20	mg/L	0.23	20
9112743	Dissolved Chloride (Cl)	2018/08/22	NC	80 - 120	105	80 - 120	<1.0	mg/L	0.55	20
9112749	Dissolved Sulphate (SO4)	2018/08/22	112	80 - 120	108	80 - 120	<1.0	mg/L	NC	20
9113014	pH	2018/08/22			100	97 - 103			0.028	N/A
9113015	Alkalinity (PP as CaCO3)	2018/08/22					<1.0	mg/L	NC	20
9113015	Alkalinity (Total as CaCO3)	2018/08/22			99	80 - 120	<1.0	mg/L	0.35	20
9113015	Bicarbonate (HCO3)	2018/08/22					<1.0	mg/L	0.35	20
9113015	Carbonate (CO3)	2018/08/22					<1.0	mg/L	NC	20
9113015	Hydroxide (OH)	2018/08/22					<1.0	mg/L	NC	20
9113016	Conductivity	2018/08/22			100	90 - 110	<2.0	uS/cm	0	10
9113067	pH	2018/08/22			101	97 - 103			0.047	N/A
9113068	Alkalinity (PP as CaCO3)	2018/08/22					<1.0	mg/L	NC	20
9113068	Alkalinity (Total as CaCO3)	2018/08/22			102	80 - 120	<1.0	mg/L	0.076	20
9113068	Bicarbonate (HCO3)	2018/08/22					<1.0	mg/L	0.076	20
9113068	Carbonate (CO3)	2018/08/22					<1.0	mg/L	NC	20
9113068	Hydroxide (OH)	2018/08/22					<1.0	mg/L	NC	20
9113069	Conductivity	2018/08/22			99	90 - 110	<2.0	uS/cm	0.37	10
9113082	Dissolved Aluminum (Al)	2018/08/23	NC	80 - 120	100	80 - 120	<0.0030	mg/L	0.27	20
9113082	Dissolved Antimony (Sb)	2018/08/23	88	80 - 120	88	80 - 120	<0.00060	mg/L	NC	20
9113082	Dissolved Arsenic (As)	2018/08/23	97	80 - 120	98	80 - 120	<0.00020	mg/L	NC	20
9113082	Dissolved Beryllium (Be)	2018/08/23	99	80 - 120	96	80 - 120	<0.0010	mg/L	NC	20
9113082	Dissolved Chromium (Cr)	2018/08/23	96	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20
9113082	Dissolved Cobalt (Co)	2018/08/23	95	80 - 120	96	80 - 120	<0.00030	mg/L	NC	20
9113082	Dissolved Copper (Cu)	2018/08/23	93	80 - 120	96	80 - 120	<0.00020	mg/L	0.95	20
9113082	Dissolved Lead (Pb)	2018/08/23	94	80 - 120	95	80 - 120	<0.00020	mg/L	NC	20
9113082	Dissolved Molybdenum (Mo)	2018/08/23	99	80 - 120	98	80 - 120	<0.00020	mg/L	2.1	20
9113082	Dissolved Nickel (Ni)	2018/08/23	94	80 - 120	95	80 - 120	<0.00050	mg/L	19	20
9113082	Dissolved Selenium (Se)	2018/08/23	99	80 - 120	99	80 - 120	<0.00020	mg/L	NC	20
9113082	Dissolved Silver (Ag)	2018/08/23	96	80 - 120	97	80 - 120	<0.00010	mg/L	NC	20

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Maxxam Job #: B869984
Report Date: 2018/08/25

QUALITY ASSURANCE REPORT(CONT'D)

SLR CONSULTING (CANADA) LTD.
Client Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampler Initials: DAP

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9113082	Dissolved Thallium (Tl)	2018/08/23	96	80 - 120	96	80 - 120	<0.00020	mg/L	NC	20
9113082	Dissolved Tin (Sn)	2018/08/23	98	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20
9113082	Dissolved Titanium (Ti)	2018/08/23	95	80 - 120	104	80 - 120	<0.0010	mg/L	NC	20
9113082	Dissolved Uranium (U)	2018/08/23	97	80 - 120	96	80 - 120	<0.00010	mg/L	0.11	20
9113082	Dissolved Vanadium (V)	2018/08/23	98	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20
9113082	Dissolved Zinc (Zn)	2018/08/23	92	80 - 120	97	80 - 120	<0.0030	mg/L	NC	20
9113827	Aroclor 1016	2018/08/23					<0.000050	mg/L	NC	30
9113827	Aroclor 1221	2018/08/23					<0.000050	mg/L	NC	30
9113827	Aroclor 1232	2018/08/23					<0.000050	mg/L	NC	30
9113827	Aroclor 1242	2018/08/23					<0.000050	mg/L	NC	30
9113827	Aroclor 1248	2018/08/23					<0.000050	mg/L	NC	30
9113827	Aroclor 1254	2018/08/23					<0.000050	mg/L	NC	30
9113827	Aroclor 1260	2018/08/23	87	50 - 130	95	50 - 130	<0.000050	mg/L	NC	30
9113827	Aroclor 1262	2018/08/23					<0.000050	mg/L	NC	30
9113827	Aroclor 1268	2018/08/23					<0.000050	mg/L	NC	30
9113843	Total Aluminum (Al)	2018/08/23	108	80 - 120	97	80 - 120	<0.0030	mg/L	6.3	20
9113843	Total Antimony (Sb)	2018/08/23	107	80 - 120	96	80 - 120	<0.00060	mg/L	2.4	20
9113843	Total Arsenic (As)	2018/08/23	103	80 - 120	98	80 - 120	<0.00020	mg/L	2.1	20
9113843	Total Beryllium (Be)	2018/08/23	103	80 - 120	96	80 - 120	<0.0010	mg/L	0.63	20
9113843	Total Chromium (Cr)	2018/08/23	102	80 - 120	100	80 - 120	<0.0010	mg/L	0.0056	20
9113843	Total Cobalt (Co)	2018/08/23	101	80 - 120	100	80 - 120	<0.00030	mg/L	0.32	20
9113843	Total Copper (Cu)	2018/08/23	99	80 - 120	100	80 - 120	<0.00020	mg/L	0.31	20
9113843	Total Lead (Pb)	2018/08/23	98	80 - 120	97	80 - 120	<0.00020	mg/L	1.0	20
9113843	Total Molybdenum (Mo)	2018/08/23	111	80 - 120	99	80 - 120	<0.00020	mg/L	3.4	20
9113843	Total Nickel (Ni)	2018/08/23	99	80 - 120	98	80 - 120	<0.00050	mg/L	0.31	20
9113843	Total Selenium (Se)	2018/08/23	99	80 - 120	98	80 - 120	<0.00020	mg/L	4.9	20
9113843	Total Silver (Ag)	2018/08/23	101	80 - 120	98	80 - 120	<0.00010	mg/L	5.9	20
9113843	Total Thallium (Tl)	2018/08/23	100	80 - 120	100	80 - 120	<0.00020	mg/L	NC	20
9113843	Total Tin (Sn)	2018/08/23	107	80 - 120	97	80 - 120	<0.0010	mg/L	3.2	20
9113843	Total Titanium (Ti)	2018/08/23	104	80 - 120	99	80 - 120	<0.0010	mg/L	5.3	20
9113843	Total Uranium (U)	2018/08/23	104	80 - 120	101	80 - 120	<0.00010	mg/L	2.1	20

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Maxxam Job #: B869984
Report Date: 2018/08/25

QUALITY ASSURANCE REPORT(CONT'D)

SLR CONSULTING (CANADA) LTD.
Client Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampler Initials: DAP

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9113843	Total Vanadium (V)	2018/08/23	105	80 - 120	100	80 - 120	<0.0010	mg/L	4.0	20
9113843	Total Zinc (Zn)	2018/08/23	101	80 - 120	98	80 - 120	<0.0030	mg/L	0.55	20
9113849	Total Barium (Ba)	2018/08/23	95	80 - 120	95	80 - 120	<0.010	mg/L	1.4	20
9113849	Total Boron (B)	2018/08/23	99	80 - 120	99	80 - 120	<0.020	mg/L	4.7	20
9113849	Total Calcium (Ca)	2018/08/23	NC	80 - 120	98	80 - 120	<0.30	mg/L	0.17	20
9113849	Total Iron (Fe)	2018/08/23	NC	80 - 120	97	80 - 120	<0.060	mg/L	2.6	20
9113849	Total Lithium (Li)	2018/08/23	94	80 - 120	94	80 - 120	<0.020	mg/L	3.7	20
9113849	Total Magnesium (Mg)	2018/08/23	98	80 - 120	98	80 - 120	<0.20	mg/L	0.33	20
9113849	Total Manganese (Mn)	2018/08/23	97	80 - 120	98	80 - 120	<0.0040	mg/L	0.31	20
9113849	Total Phosphorus (P)	2018/08/23	99	80 - 120	98	80 - 120	<0.10	mg/L	4.3	20
9113849	Total Potassium (K)	2018/08/23	98	80 - 120	98	80 - 120	<0.30	mg/L	3.5	20
9113849	Total Silicon (Si)	2018/08/23	101	80 - 120	99	80 - 120	<0.10	mg/L	4.1	20
9113849	Total Sodium (Na)	2018/08/23	NC	80 - 120	97	80 - 120	<0.50	mg/L	1.0	20
9113849	Total Strontium (Sr)	2018/08/23	94	80 - 120	95	80 - 120	<0.020	mg/L	1.0	20
9113849	Total Sulphur (S)	2018/08/23					<0.20	mg/L	0.53	20
9115574	Dissolved Chloride (Cl)	2018/08/24	NC	80 - 120	109	80 - 120	<1.0	mg/L	0.90	20
9115575	Dissolved Sulphate (SO4)	2018/08/24	NC	80 - 120	106	80 - 120	<1.0	mg/L	1.0	20
9116054	pH	2018/08/24			100	97 - 103			0.046	N/A
9116059	Alkalinity (PP as CaCO3)	2018/08/24					<1.0	mg/L	NC	20
9116059	Alkalinity (Total as CaCO3)	2018/08/24			101	80 - 120	<1.0	mg/L	0.59	20
9116059	Bicarbonate (HCO3)	2018/08/24					<1.0	mg/L	0.59	20
9116059	Carbonate (CO3)	2018/08/24					<1.0	mg/L	NC	20
9116059	Hydroxide (OH)	2018/08/24					<1.0	mg/L	NC	20

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Maxxam Job #: B869984
Report Date: 2018/08/25

QUALITY ASSURANCE REPORT(CONT'D)

SLR CONSULTING (CANADA) LTD.
Client Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampler Initials: DAP

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9116060	Conductivity	2018/08/24			100	90 - 110	<2.0	uS/cm	0.37	10

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B869984
Report Date: 2018/08/25

SLR CONSULTING (CANADA) LTD.
Client Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampler Initials: DAP

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Justin Geisel, B.Sc., Organics Supervisor

Poonam Sharma, cCT, Organics Supervisor

Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics

Winnie Au, B.Sc., QP, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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16003

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CUSTODY TRACKING FORM

eCOC Number
W8039

- Please use this form for custody tracking when submitting the work instructions via eCOC (Electronic Chain of Custody).
- Please ensure your form **has a barcode** or a **Maxxam eCOC confirmation number** in the top right hand side. This number links your electronic submission to your samples.
- This form should be **placed in the cooler with your samples.**

RELINQUISHED BY				RECEIVED BY			
Dalen Peterson		Date	2018/08/18	London McLean		Date	2018/08/19
		Time (24HR)	12:25			Time (24HR)	12:20
		Date	/ /			Date	/ /
		Time (24HR)	:			Time (24HR)	:
		Date	/ /			Date	/ /
		Time (24HR)	:			Time (24HR)	:

Unless otherwise agreed to, submissions and use of services are governed by Maxxam's standard terms and conditions which can be found at www.maxxam.ca/terms

TRIAGE INFORMATION

Sampled by *(print)*: Dalen Peterson / Donovan Kitt

Number of Coolers/Packages: 2

Rush ☐ Micro ☐ Immediate Test ☐ Food Residue ☐ Food Chemistry ☐

LABORATORY USE ONLY

Received At: MED2

Labeled By:

Verified By:

Lab Comments: RECEIVED IN YELLOWKNIFE
By: Jeffery.S
Ice-yes 2018-08-18 13:26
Sealed-yes
See temp Record
Temp: / /

Custody Seal		Cooling Media	Temperature °C		
Present (Y/N)	Intact (Y/N)	Present (Y/N)	1	2	3
See	ACTR				

Job B869984

Maxxam
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eCOC: W8039

Results Required By Date: 2018/08/31

Invoice Information

Attn: Donovan Kitt
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10015 102 ST.
GRAND PRAIRIE, AB
T8V 2V5 , CANADA
Email to:
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analytical@slrconsulting.com

Report Information

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CANADA
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Project Information

Quote #:
PO/AFE#:
Project #: 209.40585.00000
Site Location: Ennadai Lake
Sampled By: DAP

Analytical Summary

Client Sample ID	Sampling Date/Time	Matrix	Dissolved Metals	Major Ions	PCBs	PHC F1-F2 (C6-C16)	Routine Parameters	Total Metals	Total Suspended Solids
MWLF-3	2018/08/17 14:35	GROUND WATER	X	X	X	X	X	X	X
DUP	2018/08/17 14:35	GROUND WATER	X	X	X	X	X	X	X
DUP 2	2018/08/17 15:20	GROUND WATER	X	X	X	X	X	X	X
Trip Blank	2018/08/17	WATER	X	X	X	X	X	X	X

Submission Information

# of Samples: 4

SLR

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