AECOM

CAM-F Sarcpa Lake Long Term Monitoring

Year 15

Crown-Indigenous Relations and Northern Affairs Canada

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Executive Summary

CAM-F Sarcpa Lake is a former intermediate Distant Early Warning (DEW) Line site constructed by the Department of National Defence (DND) in 1957 and subsequently abandoned in 1963. It was converted to a scientific research station in 1997 under the Science Institute of the Northwest Territories and the Department of Indian Affairs and Northern Development (currently CIRNAC) and was operated seasonally until 1988. A remediation project was conducted at the Site between 2005 and 2008. The remediation involved the demolition and disposal of buildings, structures, and other debris, as well as the clean-up of hazardous materials. A Secure Soil Disposal Facility (SSDF) and Non-Hazardous Waste Landfill (NHWL) were constructed during remediation from July 2006 to September 2007.

The field program was completed on August 8 and 9, 2022, including visual inspection and sampling. A visual and environmental monitoring inspection was completed for the Site and documented via checklist along with a photographic record.

Groundwater samples collected from the landfills did exhibit some ULA exceedances, however they are not cause for concern at this time. At the NHWL, the exceedances were not successive with previous years, are not within the contaminants of concern (COCs) outlined in the Abandoned Military Sites Remediation Protocol (AMSRP), and appear anomalous to historical data. The SSDF exceedances were also not successive and appeared anomalous. Further monitoring is required to determine if any potential trends are established. In the Year 10 monitoring report, Arcadis recommended the discontinuation of PCB and PHC monitoring as they were not detected in the first ten years, as per the AMSRP (Arcadis, 2018). PCB and PHC analyses were not conducted during the 2022 Year 15 activities.

A surface water sample was collected off the south slope of the SSDF, however, there are no historical samples to compare against. A ULA exceedance of pH was the only parameter of note in the sample; further monitoring would be required to identify any trends if surface water continues to be present in future monitoring events.

Soil samples were collected for the first time since Year 4 and are the first samples collected after point sampling was discontinued. The four soil samples were collected along the south slope of the SSDF with results below Canadian Council of Ministers of the Environment (CCME) guidelines for metals, consistent with baseline data from 2007. Elevated levels of arsenic, cadmium, chromium, lead, and nickel were reported as compared to the post-construction samples collected by UMA at MW06-05 and MW06-06 (UMA/AECOM, 2008). The elevations ranged between 20% - 62% and further monitoring is required to determine potential trends as no previous monitoring results are available for comparison

Thermal data was collected from the thermistors located at the SSDF and processed off-site. As a whole, the thermal data indicates the SSDF contents have remained frozen since 2008 and there is no cause for concern at this time. Thermal data from VT-4 was corrupt and the data logger may require servicing if data issues are experienced again in the next monitoring event. Increased temperature variation displayed by VT-3 data is also recommended for further observation to determine whether additional servicing may be required or if a trend is developing.

Based on the results of the 2022 Year 15 activities, the remediation strategy for CAM-F appears to be meeting the objectives expected for this phase of the Long-Term Monitoring Plan (LTMP). The thermistor data indicates the SSDF contents remain frozen, and visual inspection of both landfills found them to be in acceptable condition overall as per AMSRP severity ratings. The settlement features observed at the landfills are presently not identified as a concern and appear to remain relatively consistent over time with minimal advancement.

Continuation of the monitoring schedule as written in the LTMP is recommended, with the next monitoring event being Year 20 in 2027.

Table of Contents

Figures

Tables

Appendices

Acronyms and Abbreviations

AECOM	AECOM Canada Ltd.
ALS	ALS Environmental Laboratories
AMSRP	Abandoned Military Site Remediation Protocol
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
CCUSBA	Communication Cable USB-A
COC	Contaminant of Concern
COM	Communication Channel for Data Loggers
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
DEW	Distant Early Warning
DND	Department of National Defense
DO	Dissolved Oxygen
HASP	Health and Safety Plan
HDPE	High Density Polyethylene
INAC	Indigenous and Northern Affairs Canada (*formerly Aboriginal Affairs and Northern Development Canada - AANDC*)
LDPE	Low Density Polyethylene
LTM	Long Term Monitoring
LTMP	Long Term Monitoring Plan
NHWL	Non-Hazardous Waste Landfill
ORP	Oxidative-Reduction Potential
PCBs	Polychlorinated Biphenyls
PHCs	Petroleum Hydrocarbons
POL	Petroleum, Oil, and Lubricants
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
QA/QC	Quality Assurance/Quality Control
RDL	Reportable Detection Limit
RPD	Relative Percent Difference
SSDF	Secure Soil Disposal Facility
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
ULA	Upper Limit of Acceptability
UTM	Universal Transverse Mercator

1. Introduction

AECOM Canada Ltd. (AECOM) was retained by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) to conduct the long-term monitoring (LTM) activities at former Distant Early Warning (DEW) Line site CAM-F Sarcpa Lake (herein referred to as the "Site"). CAM-F is located at 63º 33' 0" N, 88º 19' 0" W on the Melville Peninsula within the Baffin Region, approximately 85 kilometres (km) west of Hall Beach and 100 km southwest of Igloolik. This report outlines Year 15 of the monitoring program.

1.1 Objectives

The objective of the long-term monitoring event was to complete Year 15 monitoring activities as described in the *CAM-F Sarcpa Lake Long-Term Monitoring Plan* (INAC, 2017; LTMP). The program included visual monitoring of the non-hazardous waste landfill (NHWL) and secure soil disposal facility (SSDF), visual observation of general site conditions, collection and analysis of groundwater samples, collection of soil and/or surface water samples if identified, and collection of thermal monitoring data. Analysis of field data and visual observations was conducted to satisfy the requirements of the *Abandoned Military Site Remediation Protocol* (INAC, 2009; AMSRP).

1.2 Scope of Work

The scope of work for the 2022 long-term monitoring activities included the following:

- Prepare and submit a Logistics Plan detailing the work schedule.
- Prepare and submit a Work Plan detailing the work methodologies.
- Prepare and submit a detailed Health and Safety Plan (HASP).
- Mobilize to and from CAM-F Sarcpa Lake via chartered Twin Otter aircraft, with two field days on Site.
- Provision of a wildlife monitor (with firearm) from nearest community.
- Monitoring of general site conditions (i.e., access roads and airstrip, etc.) as outlined in Section 2 of the LTMP.
- Visual inspection of the NHWL and SSDF in accordance with Appendix D of the LTMP. Observations will be documented via a photographic record, visual monitoring checklist, and a site map.
- Purge monitoring wells, collect in-situ field parameters, and collect groundwater samples from three (3) monitoring wells around the NHWL and three (3) monitoring wells around the SSDF.
- Collect soil samples if seepage or staining is identified during visual inspection. Parameters to be analysed include: polychlorinated biphenyls (PCBs), petroleum hydrocarbons (PHCs), and metals (As, Cd, Co, Cr, Pb, Ni, and Zn).
- Download information from the four (4) data loggers installed at the SSDF.
- Replace data logger batteries and Guard locks.
- Collect and analyse blind duplicates from at least 20% of samples. Submit water samples to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory for analysis of total and dissolved metals, major ions, hardness, total dissolved solids, total suspended solids, pH, and conductivity.
- Prepare a field report summarizing LTM activities within two weeks of fieldwork completion.
- Submit draft and final versions of the CAM-F Long term Monitoring Report (Year 15) Report to CIRNAC.

This report presents the results of the monitoring event completed in August 2022. Sections 2 and 3 provide background information on the Site and reference guideline information, respectively. Details regarding specific methodologies of each monitoring task are included in Section 4, while monitoring results are presented in Section 5. Recommendations and conclusions are available in Section 6.

2. Background Information

2.1 Site Description

The Site is located approximately 85 km west of Hall Beach, 100 km southwest of Igloolik, and 510 km east of Gjoa Haven, Nunavut. Figure 1 in **Appendix A** shows the general site location. CAM-F is a former intermediate DEW Line site constructed by the Department of National Defence (DND) in 1957 and abandoned in 1963. It was converted to a scientific research station in 1997 under the Science Institute of the Northwest Territories and the Department of Indian Affairs and Northern Development (currently CIRNAC) and operated seasonally until 1988.

The CAM-F DEW Line site consisted of two main parts – the former station area and the former construction camp area at Sarcpa Lake. Before remediation was completed in 2008, the DEW Line former station area facilities included an airstrip, small module train, warehouse, garage, Quonset hut, Inuit house, two former landfill areas, and petroleum oil and lubricants (POL) storage facilities. The Site contained approximately 10,000 barrels of unknown contents, a radar tower that had been dismantled, various debris, and contaminated soil. Small volumes of miscellaneous waste and chemical residues also remained from the research facility.

The beach area at Sarcpa Lake included the former construction camp, the remnants of which consisted primarily of scattered barrels of unknown contents (in and around the lake), abandoned construction equipment, a small machine shop, and generator pad.

A remediation project was conducted at the Site between 2005 and 2008. The remediation involved the demolition and disposal of buildings, structures, and other debris, as well as the clean-up of hazardous materials. A SSDF and NHWL were constructed during remediation from July 2006 to September 2007 (Figures 2 and 3, respectively in **Appendix A**).

The SSDF was designed to contain Tier II and PHC contaminated soils. The design was based on the characteristics of the contaminants in the soil and the local geothermal and permafrost properties. The design uses permafrost as the primary containment barrier with both the contents and perimeter berms remaining in a frozen state. It was assumed that the SSDF would reach a frozen state within three to four years of construction, and ground temperature data loggers were installed at each of the four corners of the facility to monitor the freeze-back of the contents and berms. The thickness of the cover material was calculated to prevent the thaw of the contaminated soil even after 10 consecutive 1-in-100 warm years. In response to Arctic climate change studies, the initial design was modified in 2007 and an additional metre of cover was added, increasing the total cover material thickness to 3.0 m. The SSDF contains the following:

- Tier II contaminated soil (as defined by the DEW Line Cleanup Criteria, presented in INAC's AMSRP); and
- Soils impacted with benzene, toluene, ethylbenzene and xylenes (BTEX), and PHC Fractions F1 and F2.

The NHWL was designed to contain non-hazardous materials only. It was constructed on the natural ground surface with the organic matter stripped and consists of four perimeter berms constructed of granular material. The non-hazardous waste was reportedly placed in the landfill in layers consisting of 0.5 m lifts of waste, covered by 0.15 m of granular fill. The waste layers were compacted and a final cover consisting of a minimum of 1.0 m of granular fill was used to cap the landfill. The NHWL contains the following:

- Tier I contaminated soil (i.e., soil with lead content between 200 and 500 parts per million (ppm) and PCB content between 1 and 5 ppm);
- Soils impacted with PHC Fractions F3 and F4;
- Non-hazardous demolition debris, such as timbers, plywood, and sheet metal;
- Non-hazardous debris, such as scrap metal and wood;
- Non-hazardous debris/soil excavated from landfills;
- Creosote timbers; and
- Double bagged asbestos.

2.2 Previous Reports and Monitoring Programs

AECOM reviewed the following reports prior to the field program:

- *Long Term Monitoring 2017 CAM-F, Sarcpa Lake, Nunavut* (Arcadis, 2018)
- *CAM-F Sarcpa Lake Long-Term Monitoring Plan* (INAC, 2017)
- *Long Term Monitoring 2014, CAM-F Sarcpa Lake, Nunavut* (Franz Environmental Inc., 2015)
- *Abandoned Military Site Remediation Protocol* (AMSRP) (INAC, 2009)
- *Public Works and Government Services Canada CAM-F Sarcpa Lake 2007 Construction Clean-up Summary* (UMA/AECOM, 2008)

The requirements for long-term monitoring as dictated by the LTMP include:

- **Phase I:** Years 1, 2, 3, 4, 5
- **Phase II:** Years 7,10, 15, and 25
- **Phase III:** Beyond Year 25 if required.

The monitoring plan at CAM-F Sarcpa Lake began in 2008 and was scheduled every year for the first 5 years, decreasing frequency to Years 7, 10, 15, 20, and 25. The program will be reviewed at the end of Year 25 to assess the need for continued monitoring.

3. Reference Guidelines

Review of the CAM-F LTMP and AMSRP identified the applicable guidelines for use in the LTM program. The following sections describe the reference guidelines selected for each type of sample collected at the Site. In absence of criteria, samples collected will be compared to background samples.

3.1 Groundwater

Six monitoring wells, MW06-01 – MW06-06, were installed at the Site during the 2006-2007 remedial program: MW06-01 to MW06-03 around the NHWL, and MW06-04 to MW06-06 around the SSDF. Five groundwater samples were collected at the NHWL prior to the Year 10 monitoring event (three in Year 5 and two in Year 7) and two during the Year 10 event. Sample collection has not been problematic at the SSDF, and therefore numerous samples are available for comparison.

Due to the absence of appropriate groundwater criteria, the analytical data for groundwater are compared to available historical data from the Site. According to the AMSRP, if the analytical results are within the average +/- three standard deviations, the landfill is deemed acceptable and performing as expected. If the analytical results do not meet these criteria, further measures should be recommended ranging from increasing monitoring frequency to developing a new remedial plan.

As per the AMSRP, Upper Limits of Acceptability (ULAs) were calculated using the average + three (3) standard deviations of all available data from 2006 to 2014. ULAs were only calculated for a limited number of parameters since baseline data is sparse, and as concentrations for many parameters are below the detectable limit. Duplicates were omitted from the calculations as to not over-represent results from one well in the ULA calculation. Tables D5 to D8 in **Appendix D** summarize the available historical groundwater data and the calculated ULAs, where available.

For the 2017 Year 10 LTM report, Arcadis considered baseline data to be Year 5 and 7 so that ULA criteria could be calculated for total and dissolved metals and some inorganic parameters. There is currently insufficient historical or baseline data to calculate ULAs for the remaining parameters (e.g., PHCs and PCBs).

3.2 Surface Water

Due to the absence of appropriate surface water criteria, the analytical data for surface water should be compared to available historical data from the Site. According to the AMSRP, if the analytical results are within +/- three (3) standard deviations, the landfill is deemed acceptable and performing as expected. If the analytical results do not meet these criteria, further measures should be recommended ranging from increasing monitoring frequency to developing a new remedial plan.

No baseline surface water samples exist for the Site. Given the absence of appropriate reference guidelines or baseline reference data, the Canadian Council of Ministers of the Environment (CCME) guidelines for Protection of Aquatic Life are used purely as a point of reference and are not meant to be interpreted as criteria.

The CCME guidelines are a conservative reference as the closest permanent body of water is approximately 110 m and 260 m from the SSDF and NHWL, respectively. One surface water sample (SW1) was collected from ephemeral ponded water at the south toe of the SSDF during the 2022 monitoring event. The surface water sample collected in 2022 could be used as baseline if future samples are collected.

3.3 Soil

Baseline soil samples were collected during completion of the 2006 – 2007 remedial program and were analyzed for PHCs, PCBs, and metals; results of which can be found in Tables F1 to F3 in **Appendix F**. The results may be used to calculate ULAs and used as criteria per the AMSRP, however no soil samples have been collected since point sampling was discontinued in favor of soil sample collection based on physical evidence and observation of staining or seepage. No soil samples were collected in Years 5 and 10 since the point sampling method was discontinued and therefore no ULAs have been calculated.

4. 2022 Monitoring Program Methodologies

The Site investigation for the 2022 CAM-F long-term monitoring event was completed on August 8 and August 9, 2022 by AECOM personnel David Bugden and Alysha Selinger, accompanied by CIRNAC representative Melanie Netser, wildlife monitor Noah Alookie, and a field technician Max Dubeau with Nunatta Environmental. The Site was accessed by Twin-Otter aircraft provided by Kenn Borek Ltd. The team was to depart from Kugaaruk, but due to fuel shortages, departure was made from Gjoa Haven to the Site. A summary of the activities and field notes can be found in **Appendices C** through **G**.

4.1 Health and Safety Plan

In preparation for the field program, a site-specific HASP was produced and previously submitted to CIRNAC under a separate cover. The HASP identified risks and suspected hazards associated with work on the Site. It specifically addressed any known or suspected hazards and provided mitigative measures including protocols for COVID-19. Included in the HASP were emergency contacts and procedures for medical, mechanical, or weather emergencies. Prior to the start of work, a review of the HASP was completed with all personnel involved in the field program.

4.2 Geotechnical Monitoring and Visual Inspection

The physical integrity of the NHWL and SSDF were inspected at CAM-F during the 2022 long-term monitoring event. The purpose of the visual inspection was for evidence of the following:

- Erosion, ponding, frost action, settlement, and lateral movement;
- Animal burrows, vegetation, vegetation stresses; and
- Staining or seepage.

These features were documented by use of the visual monitoring checklist and through Site photographs. Site features documented in the previous monitoring event were specifically inspected for any observed changes, and new features observed during the 2022 visual monitoring were added to the documented features.

4.3 Groundwater Sampling Methodology

The following outlines the groundwater sampling methodology that was prepared for this program. Water level and depth to bottom were recorded, and an approximate well volume calculated. Samples were collected from five of the six groundwater wells using a peristaltic pump and dedicated disposable polyethylene tubing to purge and sample using low-flow methodology. The following recordings were taken prior to sampling; water level, total depth of water, height of well casing above surface (stick-up), presence of hydrocarbons, and hydrocarbon thickness (if appropriate). Prior to the collection of representative groundwater samples, the monitoring wells were purged until water quality parameters stabilized, including dissolved oxygen (DO), oxidative-reduction potential (ORP), temperature, pH, conductivity, and turbidity. All field parameters were recorded prior to sampling. Parameter readings during the purging process were recorded every 3-5 minutes, aiming for three consecutive readings within 5% prior to sampling. If stabilization could not be achieved before depletion of the water column, purging stopped, and sample collection began. Laboratory supplied containers were filled, packed in coolers, and shipped with ice to CALA accredited ALS Environmental Laboratories (ALS) depot in Edmonton, AB, for analysis.

Samples were analyzed for:

- Total and dissolved metals;
- Major ions, hardness, total dissolved solids, total suspended solids; and
- pH, conductivity.

It should be noted that based on the recommendations made in 2017, analytical testing for PCBs and PHCs were discontinued as of the Year 15 monitoring event based on non-detect results in the first 10 years (Arcadis, 2018).

4.4 Surface Water Sampling Methodology

Collection of the surface water sample included a syringe with a filter, where appropriate, into laboratory-supplied, clean sample bottles, and placement in insulated coolers (provided by ALS) to be maintained between 0 and 10 ºC during shipment to the laboratory under a chain of custody.

ALS analyzed the sample for:

- Total and dissolved metals; and
- Total suspended solids, total dissolved solids, and routine parameters including major ions and hardness.

4.5 Soil Sampling Methodology

Soil samples were collected by hand with a small trowel that was decontaminated with a laboratory-grade biodegradable cleaner (Alconox®) and rinsed between sampling locations. Soil samples were collected to a maximum depth of 30 cm and packed into laboratory supplied jars with minimal to no headspace. Samples were kept cool and packed on ice for shipment to ALS Laboratories.

The following parameters were analysed:

- PCBs;
- PHC Fractions F1-F4; and
- Metals.

4.6 Thermal Data Collection Methodology

The thermistor casings were visually inspected for their condition and any damage documented. The data loggers were then connected to a laptop and downloaded with Lakewood ProLog software using the designated CCUSBA Communication Cable and reset. Both the main battery and back-up 9-volt battery were replaced within each data logger. The data logger was then disconnected from the thermistor cable so manual readings could be taken as a backup in the event of malfunction. Once the data logger was reconnected, the cable was placed back in the casing with the data logger on top and locked.

The thermal data was then processed off-site to produce ground temperatures curves and rate plots for each thermistor, with clear indication of the 0°C isotherm. These graphs provide the basis for discussion of freeze back and active layer depth within the SSDF during the period of maximum thaw.

4.7 Quality Assurance and Quality Control

A Quality Assurance/Quality Control (QA/QC) program was followed during the monitoring event to verify sampling and analytical data collected are interpretable, defensible, and comparable. This involved following QA/QC measures in both the collection and analysis of environmental samples.

Quality Control (QC) measures used in the collection, preservation, shipment, and analysis of samples included the following:

- Sampling techniques were performed in accordance with standard written AECOM protocols.
- Thorough field notes taken during the site visit.
- All samples collected in laboratory provided sample containers and kept cool prior to shipment.
- Samples were to be assigned unique sample control numbers and transported under chain of custody procedures.
- The analytical laboratory chosen had proficiency certification issued by CALA.

Quality Assurance (QA) measures established for the investigation included collection of field duplicate samples at a rate of minimum 20%. A blind duplicate sample consists of a second aliquot of an individual sample that is submitted to the analytical laboratory under a separate label such that the analytical laboratory has no prior knowledge that it is a duplicate.

The relative percent difference (RPD) between duplicate results was to be used to assess overall sampling precision. The RPD is a measure of the variability between two duplicate analyses and is calculated by the following equation:

$$RPD = 100 \times ((2 \times (x_1 - x_2))/(x_1 + x_2))$$

Where x_1 is the primary results and x_2 is the blind duplicate result.

Acceptable RPD values vary on the analytical parameters, the sample matrix, and the concentrations of analytes in the sample. Acceptable RPD values are 35% for metals in soils, and 50% for organics in soils (namely PHCs and PCBs). Only when concentrations are at least 10 times the method detection limit are RPD calculations considered valid.

5. Results

Drawings, with inspection feature markups, are provided on figures in **Appendix A**. Photographs of the Site taken during the Site monitoring program are presented in **Appendix B**. The Visual Inspection Checklist can be found in **Appendix C**.

5.1 Non-Hazardous Waste Landfill

5.1.1 Geotechnical Monitoring and Visual Inspection

The following subsections describe the results of the geotechnical monitoring visual inspections completed at the landfill and immediate surrounding area.

5.1.1.1 Settlement

Areas of differential settlement were noted on top of the NHWL in a localized area in the west corner covering approximately 5% of the cover surface and extending 30 – 40 cm deep (see Photographs 4 and 5 in **Appendix B**). This settlement was previously noted in the Year 10 inspection. Settlement was also noted at the north and west corners of the NHWL and at the base of the south slope, which were also identified in previous years. Based on information presented in the previous monitoring reports, the settlement in these areas does not appear to have worsened (see Photographs 11, 14, and 16 respectively in **Appendix B**) since they were originally observed. An additional area of settlement was observed at the northeast slope (see Photograph 10 in **Appendix B**), which had not been previously noted.

Currently, the observed features do not compromise the performance of the NHWL. It should be noted that the west and east corners at the top of the landfill are higher than the north corner indicating poor grading, which may lead to increased sediment loading down the north corner during a high rainfall year (see Photographs 4, 2 and 3 respectively in **Appendix B**).

5.1.1.2 Erosion

Evidence of erosion is similar to observations in previous years. Coarse material was exposed on the NHWL surface and its slopes. Previous monitoring years noted minor evidence of erosion on slopes attributed to down-slope washing of fine-grained fill between coarse material. Erosion was observed at the new settlement area identified at the base of the northeast slope (see Photograph 10 in **Appendix B**).

5.1.1.3 Animal Presence

No evidence of wildlife activity was noted at the NHWL; no animals were sighted, nor burrows noted during the investigation.

5.1.1.4 Debris

No debris was observed on or within the vicinity of the NHWL.

5.1.1.5 Staining

No staining was observed.

5.1.1.6 Vegetations Stress

Sparse vegetation was noted on top and on the slopes of the NHWL.

5.1.1.7 Seepage and Ponding

Active seepage and ponding water was not observed at the time of assessment. Indicators of previous ponded water were observed off the west corner (see Photographs 13 and 14 in **Appendix B**), which was not actively observed in monitoring Years 5 and 10.

5.1.1.8 Monitoring Instruments

The monitoring wells on the perimeter of the NHWL, MW06-01, MW06-02 and MW06-03, were generally in good condition. Monitoring well MW06-01 was found without a lock and the well cap was missing. Well MW06-02 was locked, but missing the cap.

5.1.2 Groundwater Monitoring

There are six (6) groundwater monitoring wells, MW06-01 – MW06-06, at the Site. Three (3) are located around the NHWL, two of which were sampled during the 2022 long-term monitoring event. MW06-01 and MW06-02 were found without caps, MW06-01 was found with the casing open and PVC pipe exposed, and MW06-03 could only be sampled discretely due to a limited water column and minimal recharge. Well locations are provided in **Table 5-1** and shown in Figure 3 of **Appendix A**.

Table 5-1 CAM-F Sarcpa Lake Groundwater Well Locations at the NHWL

Well	Location	UTM83-17 Northing (m)	UTM83-17 Easting (m)	Gradient
MW06-01	NHWL	7606175.1	405570.2	Upgradient
MW06-02	NHWL	7606144.7	405679.4	Downgradient
MW06-03	NHWL	7606122.4	405663.3	Downgradient

The AMSRP suggests analytical results be compared to previous data, and if the groundwater concentrations are within range of the average +/- three standard deviations, the landfill is performing acceptably. The average + three standard deviations of all available historical data form the ULA, which is applied to the present data as reference criteria.

Field parameters for the groundwater monitoring wells are summarized in Table D1 of **Appendix D**. Analytical results from the Year 15 monitoring event can be found in Tables D2 – D4 of **Appendix D**. Analytical results for a suite of metals, general chemistry, and environmental parameters have been collected since 2006 to provide baseline water quality data that has been tabulated and presented in Tables D5 - D8 of **Appendix D** for trend evaluation.

Table 5-2 summarizes the exceedances of calculated ULAs for groundwater samples analyzed at the NHWL during the 2022 long-term monitoring event.

Table 5-2 Summary of ULA Exceedances in Groundwater at the NHWL

Parameter	Result	ULA	Note(s)
MW06-01			
General Chemistry			
pH	8.41	8.38	-
MW06-02			
Metals			
Aluminum, Total	2.68 mg/L	2.503 mg/L	-
Thallium, Total	0.000033 mg/L	0.000026 mg/L	-

ULA exceedances in monitoring wells MW06-01 and MW06-02 were not observed in successive sampling events (2017 and 2022), therefore the ULA exceedances reported in 2022 appear anomalous to historical data (see Table D6 in Appendix D for historical data). The Year 15 ULA metals exceedances are not within the contaminants of concern (COCs) outlined in the AMSRP and are not cause for concern at this time. Further monitoring is required to determine if a trend is present.

5.1.3 Surface Water Monitoring

Surface water ponding or seepage was not observed at the NHWL; this is consistent with baseline and previous monitoring events. No samples were collected during the 2022 long term monitoring event.

5.1.4 Soil Monitoring

No soil samples were collected at the time of the 2022 long term monitoring event as there was no evidence of seepage or staining.

5.1.5 Landfill Performance

The overall performance condition of the NHWL is rated as acceptable in 2022 based on the severity ratings presented in AMSRP Volume II (INAC, 2009). This is consistent with the previous condition documented in Year 10 (Arcadis, 2018). While a new settlement feature has been identified at the base of the NHWL, it along with the current features identified, does not appear to affect the stability or performance of the landfill. Generally consistent groundwater analysis below reference guidelines and lack of active surface water accumulation indicates little to no risk associated with contaminant migration from the landfill.

5.2 Secure Soil Disposal Facility

5.2.1 Geotechnical Monitoring and Visual Inspection

5.2.1.1 Settlement

Areas of settlement on the northwest corner, west and north slopes were previously reported in Year 10 and do not appear to have worsened (see Photographs 30, 31, and 44 respectively in **Appendix B**). An area of settlement was identified in the southwest corner, which was reported as ponded water in Year 10 (see Photograph 30 in **Appendix B**). This settlement area was dry at the time of the 2022 inspection. Settlement features noted do not pose a risk to the integrity of the SSDF.

5.2.1.2 Erosion

Areas of erosion were observed on the west, south, and east slopes and southwest corner, all of which were identified in previous monitoring years. Based on information presented in the previous monitoring reports, the areas with erosion do not appear to have worsened since they were originally observed (see Photographs 31, 34, 40 and 33 respectively in **Appendix B**). Erosion was newly identified on the northeast corner, east of the access ramp (see Photograph 41 in **Appendix B**).

Erosion channels at the base of the south slope identified in monitoring Years 5 and 10 appear to be of similar length and depth in 2022 (see Photographs 35 through 37 in **Appendix B**). Channels reported as dry in Years 5 and 10 were found with water in Year 15 and sampled for surface water and soil samples. Potholes reported in previous reports since 2008 were not observed in 2022. Overall, erosion appears to have marginally increased since Year 10.

5.2.1.3 Animal Presence

No evidence of wildlife activity was noted at the SSDF; no animals were sighted, nor burrows noted during the investigation.

5.2.1.4 Debris

A small pile of aluminum, wood, and rusted steel debris was observed off the west side of the SSDF. Given the contents of the SSDF, the debris pile is not likely associated with the landfill.

A hunting shelter is located west of the SSDF and south of the NHWL (see Figure 1 in **Appendix A**) with significant debris in the shelter and surrounding area, including; a burn barrel with scattered debris, fuel and oil cans near standing water, fuel and oil cans near the cabin, and spilled fuel and oil cans with various debris inside the shelter (see Photographs 18 through 22 in **Appendix B**). A propane tank was observed along the former road intersecting the airstrip (see Photograph 28 in **Appendix B**). Debris was previously reported in Year 10.

5.2.1.5 Staining

No staining was observed.

5.2.1.6 Vegetation Stress

No evidence of revegetation was noted.

5.2.1.7 Seepage and Ponding

Ponded water was observed at the base of the north slope, which was identified in Year 10 (see Photograph 42 in **Appendix B**). The ponded water previously reported in the southwest corner was not observed during the 2022 monitoring year; however, this area has been identified as a settlement area (see Photographs 38 and 39 in **Appendix B**). Newly identified ponded water was observed at the base of the southwest corner and south end of the east slope (see Photographs 32 and 39 respectively in **Appendix B**).

Seepage was observed at the base of the south slope at the previously reported erosion channels (see Photograph 37 in **Appendix B**). Surface water and soil samples were collected, results of which are discussed in **Sections 5.2.4** and **5.2.5** respectively.

5.2.1.8 Monitoring Instruments

The monitoring wells on the perimeter of the SSDF, (MW06-04, MW06-05 and MW06-06), were generally in good condition. Thermistor casings installed in the landfill were also in good condition.

5.2.2 Thermal Monitoring

The SSDF was constructed to contain Tier II and PHC F1-F2 contaminated soil. The design of the SSDF utilizes low permeability berms constructed of near-saturated engineered fill. A geosynthetic liner system composed of high-density polyethylene (HDPE) was placed on the base and inside slopes of the facility. Following placement of landfill contents, the cell was capped with a synthetic liner system overlain by granular cover. The SSDF design comprises a dual containment system. The primary containment is intended to be permafrost; a sufficient thickness of granular fill is placed over the surface and berms of the final landfill to promote freeze-back of the landfill contents and the low-permeability saturated berms. The geosynthetic liner system is intended as secondary containment over the long term, also providing primary containment until freeze-back conditions are obtained at the landfill. Four thermistors were installed in 2007, one in each corner of the SSDF: VT-1 and VT-4 installed to a depth of 4.8 m on the south side, and VT-2 and VT-3 to a depth of 6.9 m on the north side (see Figure 2 in **Appendix A**).

5.2.2.1 Thermal Inspection and Data Collection

The thermistor casings were found to be in good physical condition with no damage or disturbance to note. Ground temperature data was retrieved by AECOM personnel during the 2022 field program. On August 8, 2022, data was successfully retrieved from VT-1, VT-2, and VT-3, with a partial download of VT-4. During the download of VT-4 two errors were incurred which included the following messages:

- “There was an error trying to read the data logger header. Please check that: (1) your data logger is plugged in, (2) your communication options are correct. Would you like to review your project options now?”
    - In review of the project options, the COM port was locked to COM3 and could not be adjusted. The data logger connection was also adjusted multiple times. This error could not be resolved.
- “There was an error trying to obtain current sensor readings from your data logger. Both banks of the multiplexor could not be read. This can happen if the multiplexor is enabled in the data logger’s configuration, but a multiplexor card is not attached to the data logger. Do you want to proceed with the download despite this error?”
    - A complete memory transfer could not be performed. A partial download was obtained after proceeding; however, the data was identified to be corrupt.

An in-situ manual reading was taken at each thermistor location following the initial data downloads. New main batteries and back-up 9-volt batteries were installed in all four data loggers; however, the batteries will require replacement in 2024, before the next monitoring event scheduled for 2027.

5.2.2.2 Thermal Data Evaluation

Four thermistors were installed within the SSDF to document the active layer depth fluctuation over time. During the site visit, temperature measurements, recorded in degree Celsius (ºC) from February 8, 2020, to August 8, 2022, were downloaded from the thermistors. The data was processed to analyze annual temperature patterns and trends over time. Rate Plots, Figures G-1 through G-3 in **Appendix G**, present the temperature fluctuation recorded for each thermistor bead at thermistor locations VT-1 to VT-3. The Ground Temperature Curves, Figures G-4 through G-6 in

Appendix G, depict the temperature depth profiles mid-month over the last two years. Due to corruption of VT-4 data, neither a Rate Plot nor Ground Temperature Curve could be plotted.

The maximum active layer depths recorded during monitoring events were compared to the cover thickness and top of liner to confirm that the thermal containment design is performing as intended. These depths are included on the Ground Temperature Curves to visualize the thermal conditions with respect to the various landfill layers (see **Appendix G**). Interpolation of the results in **Appendix G** allowed for determination of the per annum maximum thaw at each thermistor location. As shown in **Table 5-3**, between 2008 and 2022 the maximum active layer depth has generally decreased, although not consistently. The SSDF cover design incorporated some variability for active layer thickness (including climate change implications) in derivation of the cover thickness design. Therefore, the key information shown in **Table 5-3** is that the landfill contents have been consistently frozen since 2008, with the maximum active layer depth limited to within the surface cover. This is consistent with design predictions and monitoring results from other sites which have freeze-back occurring within 2-5 years following construction.

Table 5-3 Maximum Thaw Depth by Year (shown in metres below ground surface)

Year	VT-1	VT-2	VT-3	VT-4
	Top of Key Trench	Middle of Key Trench	Middle of Key Trench	Top of Key Trench
	Depth to Liner from Cover Surface is 2.7 m [a]			
2008 – Year 1 of LTM	2.29	2.33	2.49	2.12
2009 – Year 2 of LTM	1.84	2.23	2.37	2.23
2010 – Year 3 of LTM	1.79	2.26	2.39	2.27
2011 – Year 4 of LTM	1.77	2.15	2.30	2.19
2012 – Year 5 of LTM	1.44	1.89	- [b]	1.97
2013	1.52	1.86	- [b]	1.89
2014	1.43	1.76	- [b]	1.89
2015	1.29	1.71	1.72	1.68
2016	1.60	1.93	2.07	2.01
2017 – Year 10 of LTM	1.43	1.75	1.82	1.82
2018	- [c]	- [c]	- [c]	- [c]
2019	- [c]	- [c]	- [c]	- [c]
2020	1.62	2.04	2.20	- [d]
2021	1.36	1.69	1.64	- [d]
2022 – Year 15 of LTM	1.22	1.29	- [e]	- [d]

[a] *– Based on Ground Temperature Cable Installation Report (UMA/AECOM, 2008)*

[b] *– Insufficient data to calculate depth.*

[c] *– Data gap between end of Year 10 reporting and current data download; memory reached capacity and overwrote oldest data.*

[d] *– Data corrupt, unable to be processed.*

[e] *– Data collected prior to thaw.*

Figures 1 to **3**, below, are a simplification of the Ground Temperature Curves in **Appendix G,** providing the maximum freeze (depicted with annual data from January 15) and maximum thaw (August 15 annually) with respect to the landfill cover surface, top of liner, and 0˚C isotherm. The range of temperature variability narrows from approximately 10-degrees at the top of the liner, to approximately 2-degrees at the end of the strings for thermistors VT-1 and VT-2. The temperature is more variable in the VT-3 data (see **Figure 3** below) which appears anomalous compared to VT-1, VT-2, and historical data. Despite the increased variability, the landfill contents still appear to remain frozen, indicating the containment method is performing as designed. Intersection of the curves with the 0ºC isotherm provides the maximum thaw depth presented in **Table 5-3** and informs the active layer depth. The active layer remains above the liner at all thermistor locations and shows the SSDF has been frozen continuously since 2008.

Manual in-situ readings for thermistor VT-4 appear to be consistent with VT-3 (see **Appendix H**). If data corruption is experienced during the next monitoring event at VT-4, it may indicate an issue with the data logger and maintenance may be required.

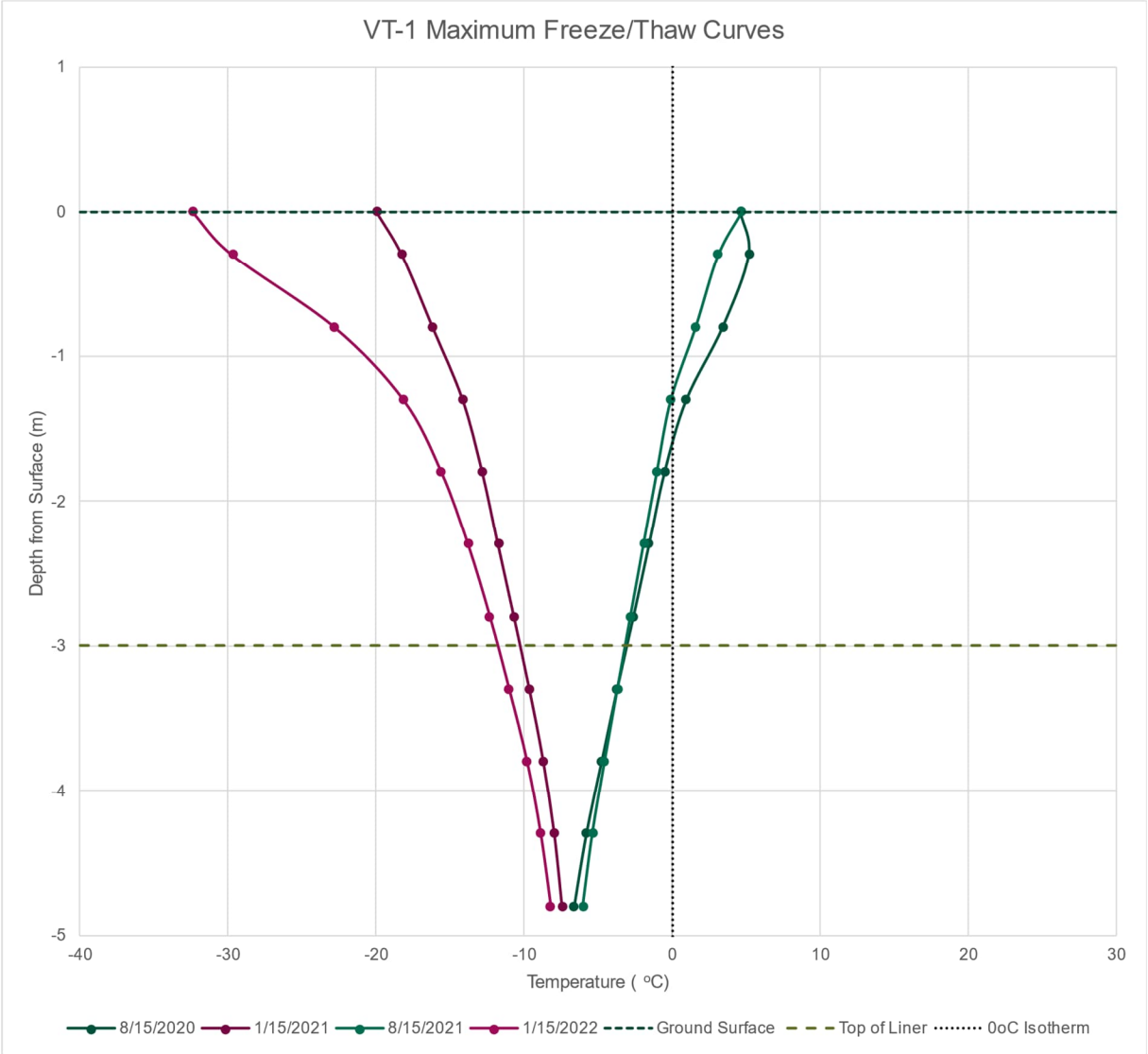

Figure 1. VT-1 Maximum Freeze and Thaw Curves

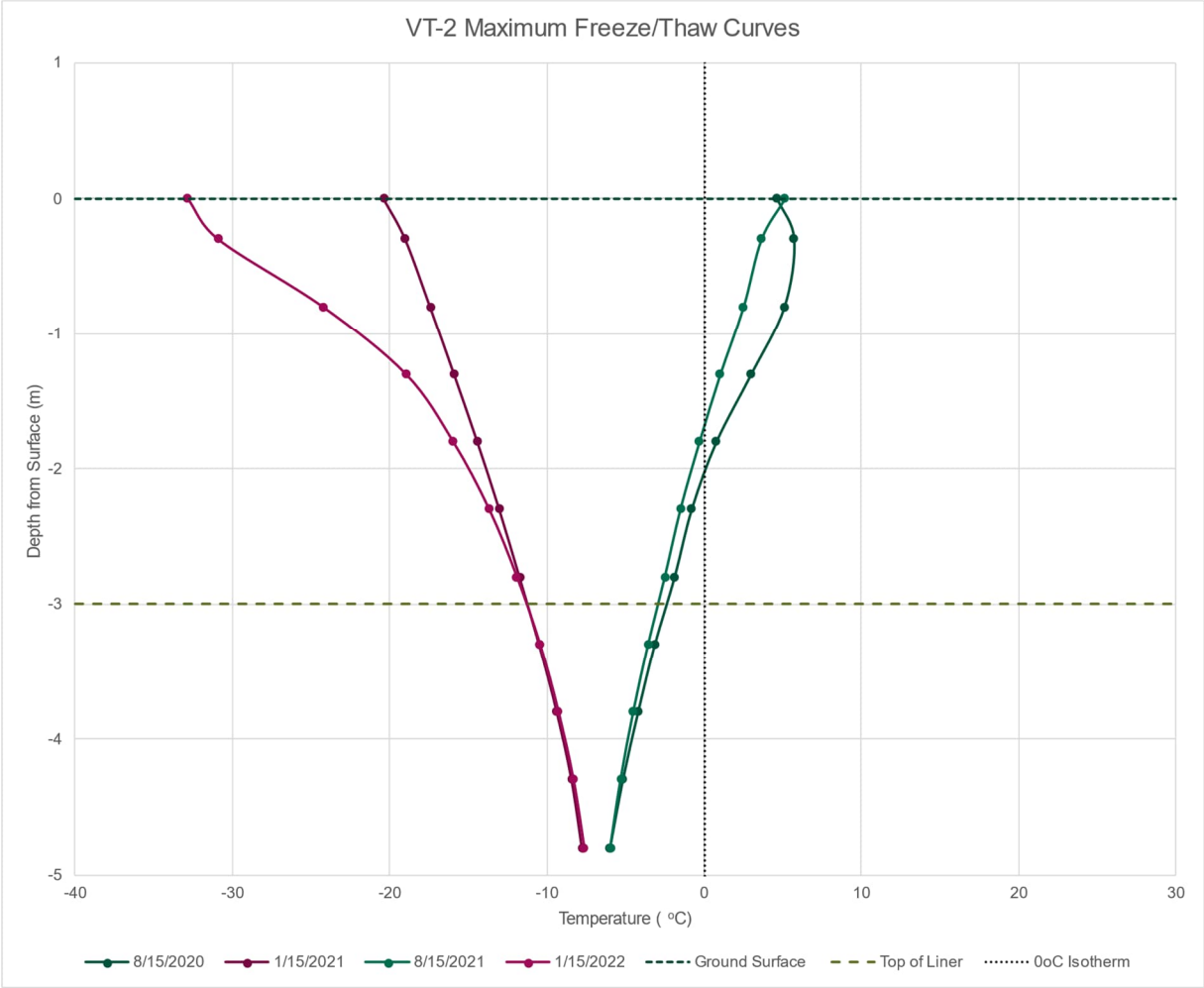

Figure 2. VT-2 Maximum Freeze and Thaw Curves

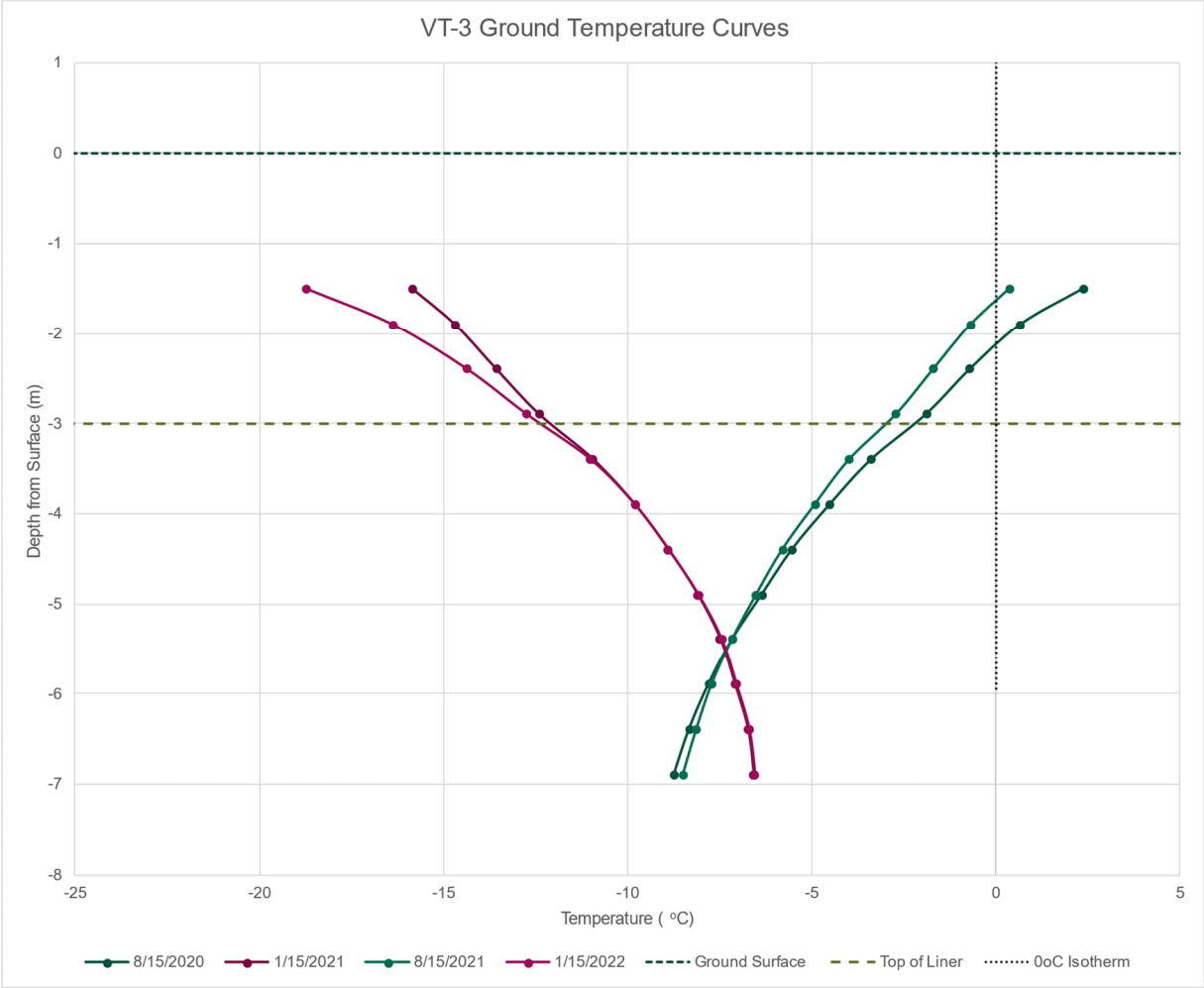

Figure 3. VT-3 Maximum Freeze and Thaw Curves

5.2.3 Groundwater Monitoring

There are six (6) groundwater monitoring wells, MW06-01 – MW06-06, at the Site. Three (3) are located around the SSDF, all of which were sampled during the 2022 long-term monitoring event. Monitoring wells MW06-04, MW06-05, and MW06-06 were in good condition at the time of assessment. Well locations are provided in **Table 5-4** and shown in Figure 2 of **Appendix A**.

Table 5-4 CAM-F Sarcpa Lake Groundwater Well Locations at the SSDF

Well	Location	UTM83-17 Northing (m)	UTM83-17 Easting (m)	Gradient
MW06-04	SSDF	7605609.5	405939.9	Upgradient
MW06-05	SSDF	7605492.1	405907.3	Downgradient
MW06-06	SSDF	7605503.1	405877.6	Downgradient

Table 5-5 summarizes the exceedances of calculated ULAs for groundwater samples analyzed at the SSDF during the 2022 long-term monitoring event.

Table 5-5 Summary of ULA Exceedances in Groundwater at the SSDF

Parameter	Result	ULA	Note(s)
MW06-06			
General Chemistry			
pH	8.39	8.38	-
MW06-04 – DUP			
General Chemistry			
pH	8.41	8.38	-

ULA exceedances in MW06-04 – DUP and MW06-06 for pH were not observed in successive sampling events (2017 and 2022), therefore the ULA exceedances reported in 2022 appear anomalous to historical data (see Table D-6 in **Appendix D**). Further monitoring is required to determine potential trends.

5.2.4 Surface Water Monitoring

Analytical results of the surface water sample SW1 are presented in Tables E-1 and E-2 in **Appendix E**.

There are no historical samples to compare the above data. Further monitoring may show trends if surface water continues to be present in future monitoring years.

5.2.5 Soil Monitoring

In 2022, four soil samples were collected from areas where surface seepage was observed. Samples were collected from the toe of the SSDF at the southwest, south, and east slopes near monitoring wells MW06-5 and MW06-6. Soil sample SS3-Southside was collected at the same location as surface water sample SW1. The sampling locations are visible on Figure 2 of **Appendix A**.

Analytical results show all soil samples are below AMSRP DEW Line Cleanup Criteria (DCC) for metals. Results from PCBs, PHCs and volatiles are below reportable detection limits, which is consistent with baseline data from 2007. Tables F-1 to F-3 in **Appendix F** summarize the analytical results of the 2022 monitoring event and baseline data is provided in Table F-4 of **Appendix F**.

Soil samples were not collected in monitoring Years 5 and 10 after the point sampling method was discontinued. Comparison of baseline soil data collected at MW06-05 and MW06-06 by UMA post landfill construction in 2007 indicates elevated levels of arsenic, cadmium, chromium, lead, and nickel between 20% and 62% for concentrations above the RDL. As there are no previous monitoring years to compare results to, further monitoring is required to determine potential trends.

5.2.6 Landfill Performance

The overall performance condition of the SSDF is considered acceptable in 2022 based on the severity ratings presented in AMSRP Volume II (INAC, 2009). This is consistent with the condition documented in the Year 10 inspection (Arcadis, 2018). While some features are newly identified, the erosion at the base and new cracking at the access ramp does not appear to be affecting the stability or performance of the landfill and the landfill surface did not show any evidence of settlement or erosion. The thermal data demonstrate that permafrost containment of the SSDF soil has been in place since 2008. This data combined with generally consistent groundwater analysis below reference guidelines, and surface analyses below reference guidelines, indicates little to no risk associated with contaminant migration from the landfill. Soil analysis does not necessarily indicate contaminant migration as further monitoring will determine if a trend is present, therefore it is not a concern at this time.

5.3 QA/QC Discussion

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 was required, disposable nitrile gloves were used at all times and changed between samples. All monitoring equipment was decontaminated prior to initial use and between each sample location. During groundwater sampling, disposable low-density polyethylene (LDPE) and master flex 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; location and directional viewpoint were recorded.

5.3.1 Duplicate Samples

A duplicate sample is a sequential sample taken immediately following the collection of a regular sample. The duplicate samples were collected for 20% of the samples collected as part of the QA/QC sampling program. This equates to one duplicate per ten wells sampled. Duplicate samples provide a rough estimate of the overall variability of the field technique and laboratory analysis.

5.3.2 Relative Percent Difference

The RPD is the absolute difference between the duplicate analysis values, divided by the mean and 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 such as compromised sample collection, equipment malfunction, or handling errors.

5.3.3 Analytical QA/QC

Both samples were analyzed by ALS Environmental Laboratories, which is CALA accredited 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 analyzed as part of their QA/QC programs. Analytical QA/QC was completed by ALS laboratories by way of analytical method blanks, analytical control spikes and analytical duplicates.

Hold times for pH, total suspended solids (TSS), total dissolved solids (TDS), alkalinity, nitrate, and nitrite were exceeded in water samples and PHCs were exceeded for soil samples. The hold time exceedances were in part due to the logistical constraints of shipping from the Site to the southern ALS laboratory in Edmonton, Alberta for analysis. As stated in ALS laboratories guidance document “Hold Times: General Information of Exceedances (2017), hold times are established and intended as best-practice to protect the integrity of the test samples and minimize the potential for significant changes to samples prior to analysis” (ALS, 2017). If exceeded, it is common practice to apply professional judgement to assess whether the results may still be useable and fit-for-purpose. It was expected that the hold time for pH would exceed, and as a standard procedure, field measurements were collected to represent conditions at the time of sampling (**Appendix D**). Based on recommendations from ALS, test results with hold time exceedances less than 50% of the recommended hold time may be considered valid and defensible, with the caveat that the measurement uncertainty associated with those tests may be higher than usual. This would be applicable to PHCs which were 13% over their recommended hold time and alkalinity which was up to 29% over its recommended hold time.

For significant hold time exceedances such as samples for TDS, TSS, nitrate, and nitrite, the environmental stability characteristics for the specific sample should be considered prior to determining whether the test results are fit-for-purpose. ALS recommends that the consistency with historical or expected results or with available test results from related or similar samples be considered. Results for TSS increased from previous years but did not exceed reference guidelines. Results for TDS and nitrate were generally consistent or below historic concentrations and did not exceed criteria. Nitrite concentrations remain below reportable detection limits which are consistent with previous reporting years.

Logistical challenges are expected working in remote locations, and some hold time exceedances were anticipated. For future monitoring programs, implementing methods to expedite sample delivery would help to reduce uncertainty related to the results.

The complete analytical quality control report can be found as part of the certificate of analyses in **Appendix I**.

6. Conclusion and Recommendations

Based on the results of the 2022 Year 15 activities, the remediation strategy for CAM-F appears to be meeting the objectives expected for this phase of the LTMP. The thermistor data indicates the SSDF contents remain frozen, and visual inspection of both landfills found them to be in acceptable condition overall. The settlement features observed at the landfills are presently not identified as a concern and appear to remain relatively consistent over time with minimal advancement. Continuation of the monitoring schedule as written in the LTMP is recommended.

Thermal data from VT-4 was corrupt and the data logger may require servicing if data issues are experienced again in the next monitoring event. The increased temperature variation displayed by VT-3 data is also recommended for further observation to determine whether additional servicing may be required or if a trend is developing. As a whole, the thermal data indicates the SSDF contents have remained frozen since 2008 and there is no cause for concern at this time. New batteries were installed in all four data loggers; however, the batteries will require replacement in 2024, before the next monitoring event scheduled for 2027. It is recommended that the frequency of the data logger recording be reduced to once daily readings during the 2027 Year 20 monitoring event to preserve memory over the 5-year period before Year 25 activities.

Groundwater samples collected from the landfills did exhibit some ULA exceedances, however they are not cause for concern at this time. At the NHWL, the exceedances were not successive with previous years, are not within the COCs outlined in the AMSRP, and appear anomalous to historical data. The SSDF exceedances were also not successive and appeared anomalous. Further monitoring is required to determine if any potential trends are established. In the Year 10 monitoring report, Arcadis recommended the discontinuation of PCB and PHC monitoring as they were not detected in the first ten years, as per the AMSRP (Arcadis, 2018). PCB and PHC analyses were not conducted during the 2022 Year 15 activities.

A surface water sample was collected off the south slope of the SSDF, however, there are no historical samples to compare against. Further monitoring would be required to identify any trends if surface water continues to be present in future monitoring events.

Soil samples were collected for the first time since Year 4 and are the first samples collected after point sampling was discontinued. The four soil samples were collected along the south slope of the SSDF with results below CCME guidelines for metals, consistent with baseline data from 2007. Elevated levels of arsenic, cadmium, chromium, lead, and nickel were reported as compared to the post-construction samples collected by UMA at MW06-05 and MW06-06 (UMA/AECOM, 2008). The elevations ranged between 20% - 62% and further monitoring is required to determine potential trends as no previous monitoring results are available for comparison.

Thermistors and groundwater wells were locked with Guard Key 111 and additional key sets were left with a CIRNAC representative. It is recommended keys are provided for the next monitoring event to avoid cutting and replacement of locks on site. Further, it is recommended additional locks are brought to site during future visits in the event locks are found missing or damaged.

7. References

Arcadis Canada Inc. (Arcadis). 2018. Long Term Monitoring 2017 CAM-F, Sarcpa Lake, Nunavut. Prepared for Indigenous and Northern Affairs Canada (INAC). January 25, 2018.

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CCME. 2007. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health.

Indigenous and Northern Affairs Canada (INAC). 2017. CAM-F Sarcpa Lake Long-Term Monitoring Plan. Revised March 2, 2017.

INAC. 2009. Abandoned Military Site Remediation Protocol (AMSRP).

UMA Engineering Ltd. (UMA/AECOM). 2008. CAM-F 2007 Construction Clean-Up Summary. Prepared for Public Works and Government Services Canada. February 2008.

Appendix A

Drawings

SITE LOCATION PLAN
N.T.S.

LEGEND

- PONDED WATER
- EXISTING CULVERT
- DEBRIS PILE

NOTES:
1. ALL COORDINATES ARE REFERENCED TO NAD83 UTM ZONE 17.
2. IMAGERY FROM ARCGIS DATAMAP.

0 125 250 m

1:5000

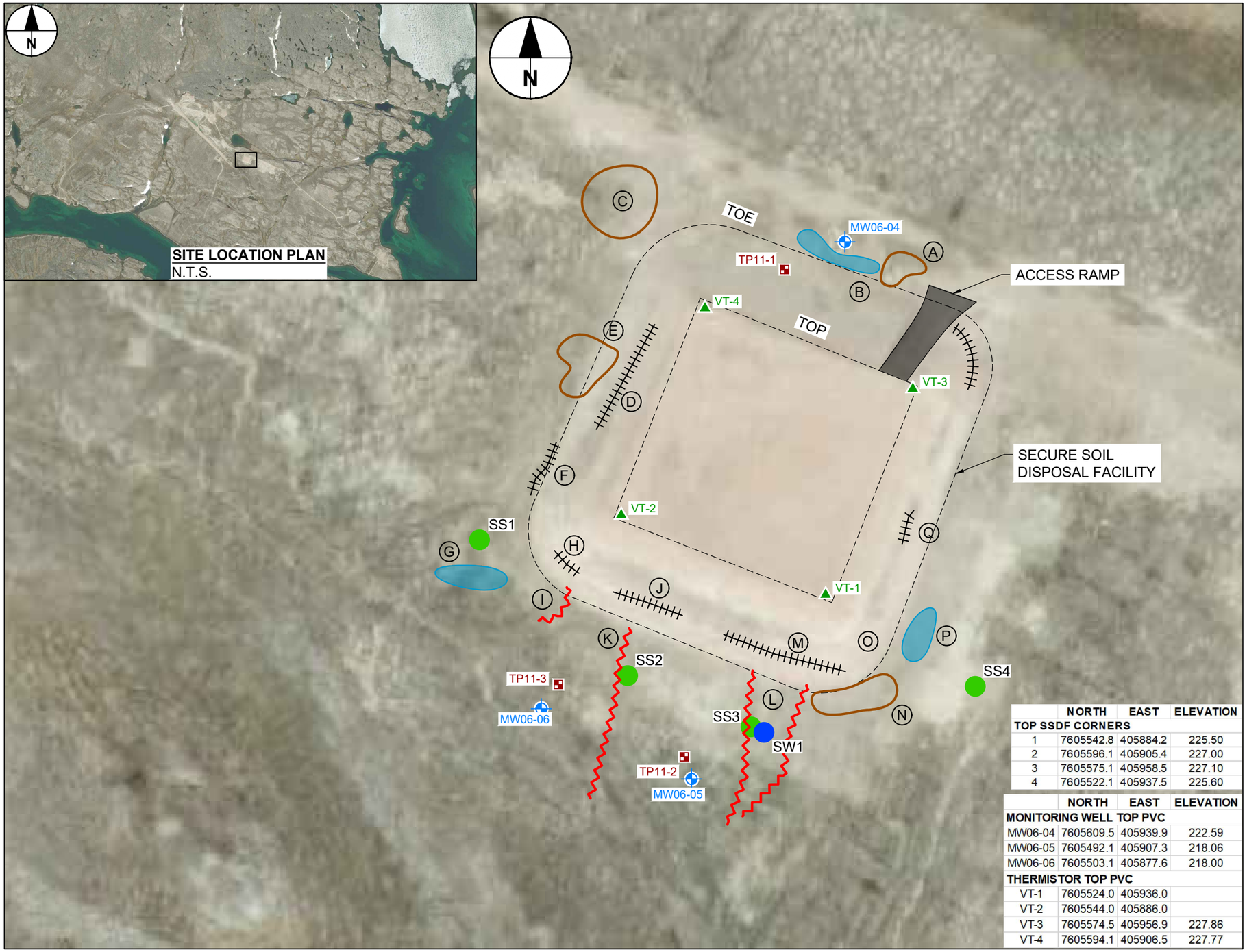
Issue Status: FINAL

2022 Nunavut Sites Long-Term Monitoring
CAM-F Sarcpa Lake (Year 15)
Crown-Indigenous Relations and Northern Affairs Canada
Project No.: 60686962 Date: 2023-01-11

CAM-F SARCPA LAKE
LOCATION PLAN

AECOM

Figure 1



	NORTH	EAST	ELEVATION
TOP SSDF CORNERS			
1	7605542.8	405884.2	225.50
2	7605596.1	405905.4	227.00
3	7605575.1	405958.5	227.10
4	7605522.1	405937.5	225.60

	NORTH	EAST	ELEVATION
MONITORING WELL TOP PVC			
MW06-04	7605609.5	405939.9	222.59
MW06-05	7605492.1	405907.3	218.06
MW06-06	7605503.1	405877.6	218.00
THERMISTOR TOP PVC			
VT-1	7605524.0	405936.0	
VT-2	7605544.0	405886.0	
VT-3	7605574.5	405956.9	227.86
VT-4	7605594.1	405906.5	227.77

LEGEND

- TP — TEST PIT LOCATIONS
- MW — MONITORING WELL
- VT — THERMISTOR
- EROSION
- CRACKING
- SETTLEMENT
- Ⓐ — FEATURE LETTER
- PONDED WATER
- SOIL SAMPLE
- SURFACE WATER SAMPLE

NOTES:
1. ALL COORDINATES ARE REFERENCED TO NAD83 UTM ZONE 17.
2. IMAGERY FROM ARCGIS DATAMAP.

0 25 50 m

1:1000

Issue Status: FINAL

2022 Nunavut Sites Long-Term Monitoring
CAM-F Sarcpa Lake (Year 15)
Crown-Indigenous Relations and Northern Affairs Canada
Project No.: 60686962 Date: 2023-01-11

SECURE SOIL DISPOSAL FACILITY
VISUAL INSPECTION

AECOM

Figure 2

SITE LOCATION PLAN
N.T.S.

N

NON-HAZARDOUS WASTE LANDFILL

TOE

TOP

MW06-01

MW06-02

MW06-03

Ⓐ

Ⓑ

Ⓒ

Ⓓ

Ⓔ

Ⓕ

LEGEND

- MW — MONITORING WELL
- SETTLEMENT
- Ⓐ — FEATURE LETTER
- POOR GRADING

	NORTH	EAST	ELEVATION
TOP NHWL CORNERS			
1	7606158.2	405587.0	243.80
2	7606195.0	405624.0	244.70
3	7606157.5	405661.3	242.20
4	7606121.6	405623.7	243.90

	NORTH	EAST	ELEVATION
MONITORING WELL TOP PVC			
MW06-01	7606175.1	405570.2	241.45
MW06-02	7606144.7	405679.4	238.49
MW06-03	7606122.4	405663.3	240.58

NOTES:
1. ALL COORDINATES ARE REFERENCED TO NAD83 UTM ZONE 17.
2. IMAGERY FROM ARCGIS DATAMAP.

0 18.75 37.5 m

1:750

Issue Status: FINAL

2022 Nunavut Sites Long-Term Monitoring
CAM-F Sarcpa Lake (Year 15)
Crown-Indigenous Relations and Northern Affairs Canada
Project No.: 60686962 Date: 2023-01-11

NON-HAZARDOUS WASTE WASTE LANDFILL
VISUAL INSPECTION

AECOM

Figure 3

Appendix B

Photographic Record

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
1	8/9/2022

Direction Photo Taken

Northwest

Area

NHWL

Description

Top of NHWL cover. Coarse material throughout with sparse vegetation.

Photo No.	Date
2	8/9/2022

Direction Photo Taken

Southeast

Area

NHWL

Description

Top of NHWL cover, east corner is high.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
3	8/9/2022

Direction Photo Taken

North

Area

NHWL

Description

Sloping in NHWL cover. High west corner, lower north corner.

Photo No.	Date
4	8/9/2022

Direction Photo Taken

N/A

Area

NHWL

Description

Settlement on NHWL cover near west corner (circled).

See Feature B of Appendix A Figure 3.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
5	8/9/2022

Direction Photo Taken

Northwest

Area

NHWL

Description

Settlement on northwest side of NHWL cover.

See Feature A in Appendix A Figure 3.

Photo No.	Date
6	8/9/2022

Direction Photo Taken

North

Area

NHWL

Description

South corner of NHWL in good condition.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
7	8/9/2022

Direction Photo Taken: South

Area: NHWL

Description: Southeast slope of NHWL in good condition.

Photo No.	Date
8	8/9/2022

Direction Photo Taken: North

Area: NHWL

Description: Southeast slope of NHWL in good condition.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
9	8/9/2022

Direction Photo Taken

West

Area

NHWL

Description

East corner of NHWL in good condition.

Photo No.	Date
10	8/9/2022

Direction Photo Taken

N/A

Area

NHWL

Description

Settlement and erosion at base of northeast slope of NHWL.

See Feature F in Appendix A Figure 3.

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
11	8/9/2022

Direction Photo Taken: East

Area: NHWL

Description: North corner of NHWL in good condition.

Photo No.	Date
12	8/9/2022

Direction Photo Taken: Northeast

Area: NHWL

Description: Northwest slope of NHWL in good condition.

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
13	8/9/2022

Direction Photo Taken: East

Area: NHWL

Description: West corner of NHWL, visual evidence of ponding at base (see Photo 14).

Photo No.	Date
14	8/9/2022

Direction Photo Taken: West

Area: NHWL

Description: Visual evidence of ponding off west corner of NHWL (circled).

See Feature C of Appendix A Figure 3.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
15	8/9/2022

Direction Photo Taken

North

Area

NHWL

Description

Southwest slope of NHWL in good condition.

Photo No.	Date
16	8/9/2022

Direction Photo Taken

N/A

Area

NHWL

Description

Area of settlement at base of NWHL, on west side of south corner.

See Feature D of Appendix A Figure 3.

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
17	8/9/2022

Direction Photo Taken: Southeast

Area: Hunting Cabin

Description: Site condition: Hunting Cabin located northeast of SSDF. Structurally in good condition, garbage and waste debris present in surrounding area.

Photo No.	Date
18	8/9/2022

Direction Photo Taken: N/A

Area: Hunting Cabin

Description: Site condition: Fuel and oil cans scattered throughout, most empty but some with remaining contents.

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
19	8/9/2022

Direction Photo Taken

Southeast

Area

Hunting Cabin

Description

Site condition: Debris, fuel and oil cans scattered throughout.

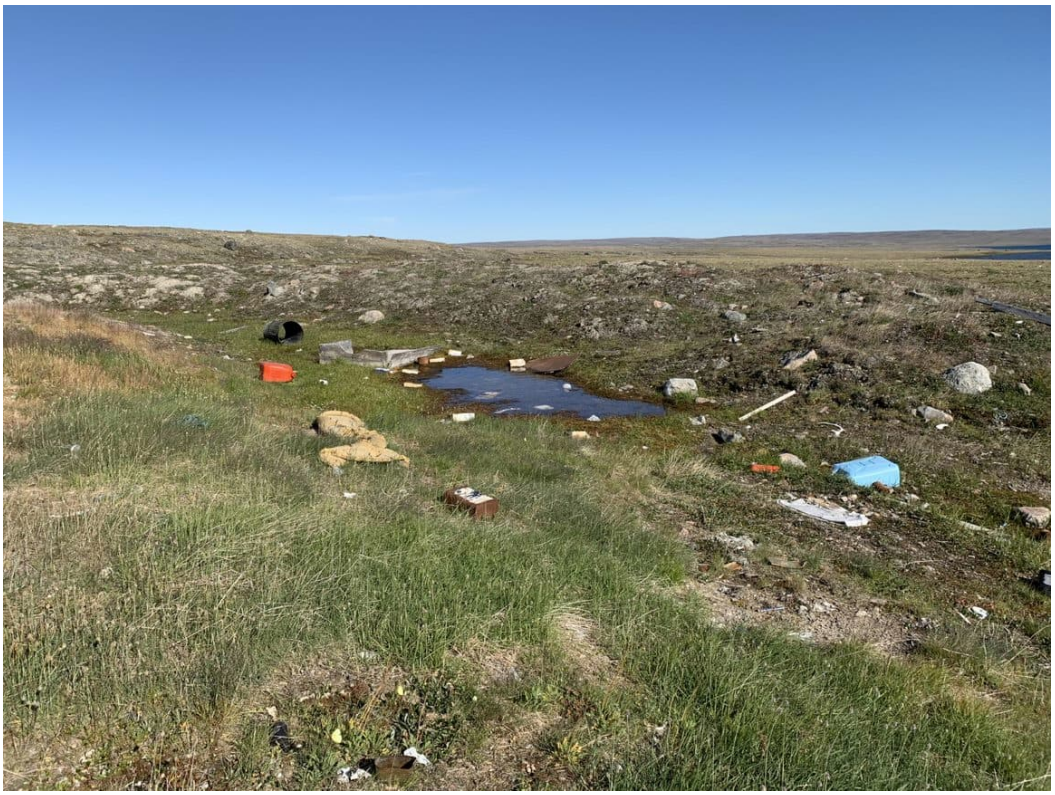


Photo No.	Date
20	8/9/2022

Direction Photo Taken

Southwest

Area

Near Hunting Cabin

Description

Site condition: Burn barrel located southwest of cabin, scattered waste throughout area.

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
21	8/9/2022

Direction Photo Taken

N/A

Area

Hunting Cabin

Description

Site condition: Spilled fuel cans inside structure. Waste batteries observed in bunk room (not pictured).

Photo No.	Date
22	8/9/2022

Direction Photo Taken

N/A

Area

Hunting Cabin

Description

Site condition: Scattered debris in shelter.

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
23	8/9/2022

Direction Photo Taken

Southwest

Area

Southwest of NHWL

Description

Site condition: Concrete foundations located northwest of Hunting Cabin and southwest of NHWL.

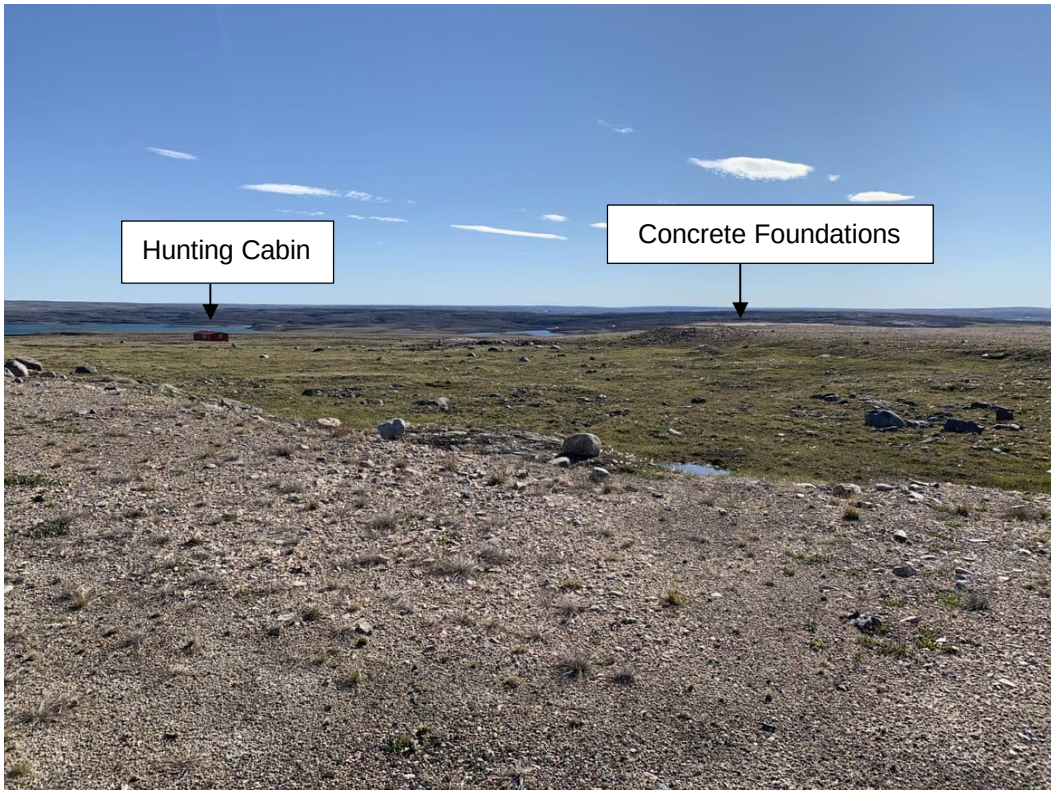


Photo No.	Date
24	8/9/2022

Direction Photo Taken

East

Area

Southwest of NHWL

Description

Site condition: Concrete foundation (1 of 2).

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
25	8/9/2022

Direction Photo Taken: South

Area: Southwest of NHWL

Description: Site condition: Concrete foundation (2 of 2).

Photo No.	Date
26	8/9/2022

Direction Photo Taken: South

Area: Southwest of NHWL

Description: Site condition: Southeast portion of second concrete foundation.

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
27	8/9/2022

Direction Photo Taken

Southwest

Area

Southwest of NHWL

Description

Site condition: Southwest portion of second concrete foundation.

Photo No.	Date
28	8/9/2022

Direction Photo Taken

South

Area

Near Airstrip

Description

Site condition: Scattered garbage and metal debris along Former Road at intersection with Airstrip. Large propane canister (circled) appeared to be empty.

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
29	8/9/2022

Direction Photo Taken: South

Area: SSDF

Description: Northwest corner of SSDF. See Photo 30 for area of settlement with evidence of former ponded water off northwest corner.

Photo No.	Date
30	8/9/2022

Direction Photo Taken: Northwest

Area: SSDF

Description: Evidence of former ponding and settlement off northwest corner of SSDF.

See Feature C in Appendix A Figure 2.

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
31	8/9/2022

Direction Photo Taken: Southeast

Area: SSDF

Description:

West Slope of SSDF. Horizontal cracking present along slope (circled) and settlement at toe (boxed).

See Features D & E in Appendix A Figure 2.

Photo No.	Date
32	8/9/2022

Direction Photo Taken: South

Area: SSDF

Description:

Ponded water off southwest corner of SSDF.

See Feature G in Appendix A Figure 2.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
33	8/9/2022

Direction Photo Taken

Northeast

Area

SSDF

Description

Southwest corner of SSDF. Evidence of surface water draining from toe of slope (circled); insufficient quantity to sample surface water.

Soil sample SS1 collected.

Photo No.	Date
34	8/9/2022

Direction Photo Taken

North

Area

SSDF

Description

Horizontal cracking along south slope of SSDF.

See Features H & J in Appendix A Figure 2.

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
35	8/9/2022

Direction Photo Taken: North

Area: SSDF

Description:

Active erosion channel off south slope of SSDF.

Soil sample SS2 collected.

See Feature K in Appendix A Figure 2.

Photo No.	Date
36	8/9/2022

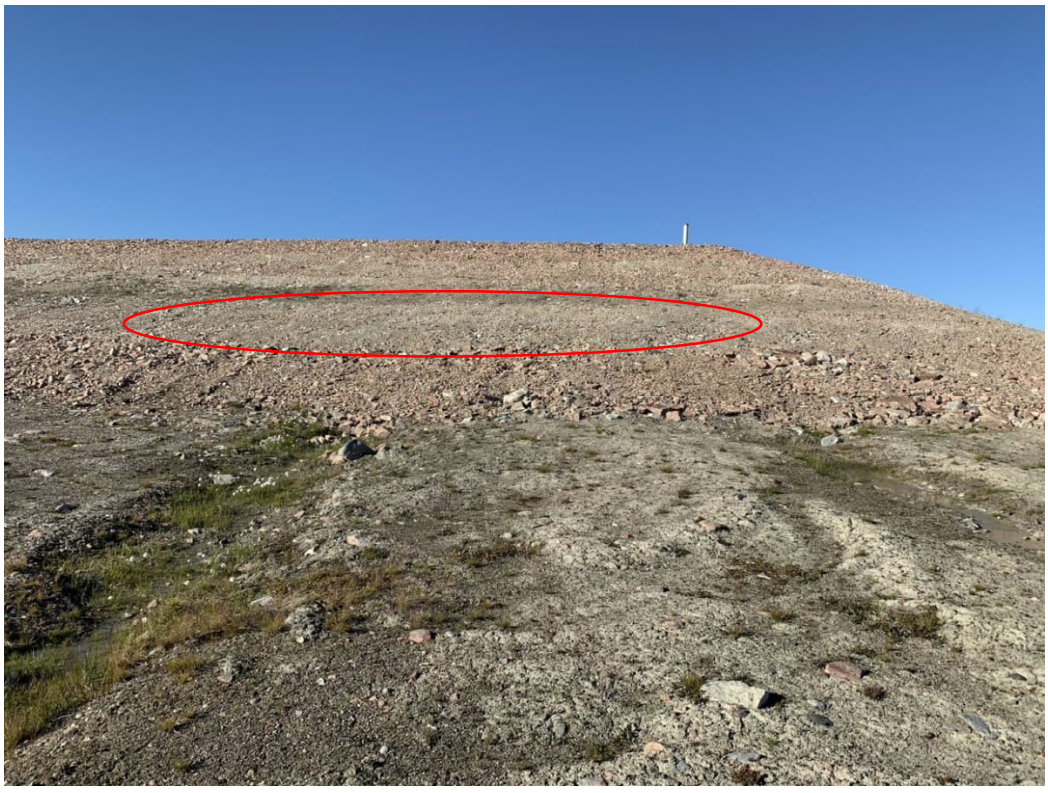
Direction Photo Taken: Northeast

Area: SSDF

Description:

Active erosion channels off the south slope of SSDF (continued in Photo 37). Horizontal cracking in slope (circled).

See Features L & M in Appendix A Figure 2.



Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
37	8/9/2022

Direction Photo Taken

South

Area

SSDF

Description

Continuation of erosion channel in Photo 36.

Soil sample SS3 collected.

Surface water sample SW1 collected.

See Feature L in Appendix A Figure 2.

Photo No.	Date
38	8/9/2022

Direction Photo Taken

North

Area

SSDF

Description

Southeast corner of SSDF with evidence of previously ponded water.

See Feature N in Appendix A Figure 2.

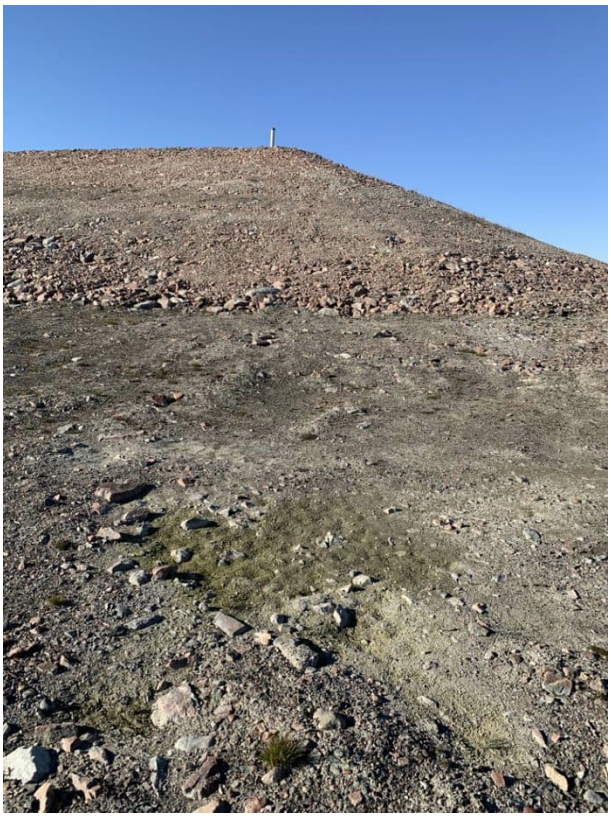


Photo No.	Date
39	8/9/2022

Direction Photo Taken: North

Area: SSDF

Description:

Ponded water at south end of east SSDF slope.

Soil sample SS4 collected.

See Feature P in Appendix A Figure 2.

Photo No.	Date
40	8/9/2022

Direction Photo Taken: Northwest

Area: SSDF

Description:

Cracking on east slope of SSDF (circled).

See Feature Q in Appendix A Figure 2.

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
41	8/9/2022

Direction Photo Taken

Southwest

Area

SSDF

Description

Northeast corner of SSDF; east side of ramp access on north side. Horizontal cracking at base of corner.

Photo No.	Date
42	8/9/2022

Direction Photo Taken

Northwest

Area

SSDF

Description

Ponded water on north side of SSDF.

See Feature B in Appendix A Figure 2.

MW06-04 (circled).

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
43	8/9/2022

Direction Photo Taken

Southeast

Area

SSDF

Description

West side of ramp access to SSDF in good condition.

Photo No.	Date
44	8/9/2022

Direction Photo Taken

N/A

Area

SSDF

Description

Settlement area east of MW06-04.

See Feature A in Appendix A Figure 2.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
45	8/9/2022

Direction Photo Taken

South

Area

SSDF

Description

North slope of SSDF in good condition.

Photo No.	Date
46	8/9/2022

Direction Photo Taken

North

Area

Near SSDF

Description

Empty abandoned drum on shore of lake northwest of SSDF.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
47	8/9/2022

Direction Photo Taken

Northeast

Area

Near SSDF

Description

Debris pile with aluminum, wood, and rusted steel off west side of SSDF.

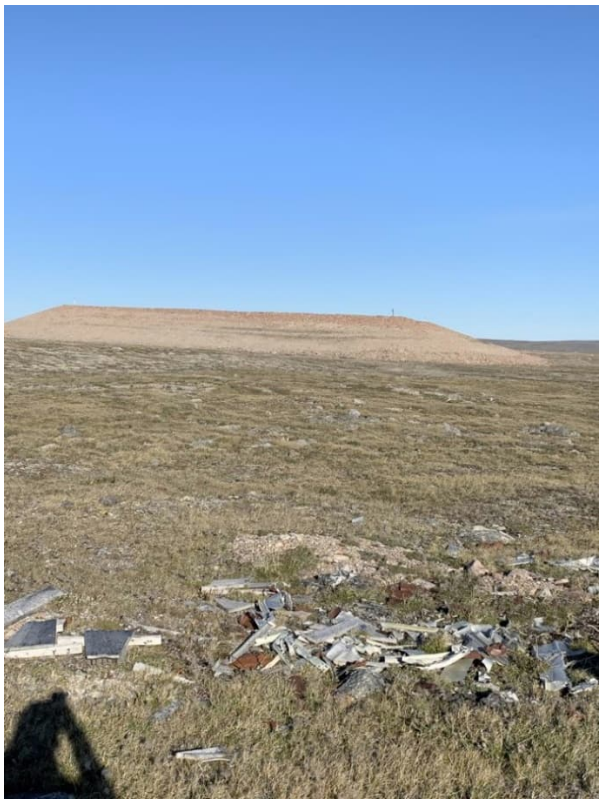


Photo No.	Date
48	8/8/2022

Direction Photo Taken

South

Area

Sampling

Description

Collecting soil sample SS2 on south side of SSDF.

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-F Long-Term Monitoring – Year 15	Sarcpa Lake, NU	60686962

Photo No.	Date
49	8/8/2022

Direction Photo Taken

South

Area

Sampling

Description

Groundwater sampling at MW06-05 off south slope of SSDF.

Appendix C

Monitoring Checklist and Daily Field Report

VISUAL MONITORING CHECKLIST

Date:	**August 9, 2022**
Landfill:	SSDF and NHWL

1. Erosion	**Answer**
a) Is erosion occurring on the surface or berms of the landfill?	No
i) Are there preferred drainage channels?	No
ii) Is there sloughing of material?	No
b) What is the extent of the erosion? (percentage of surface area)	-
i) Is it localized or continuous?	-
c) Where is the erosion occurring? (i.e. along the toe, on the surface, through the berms)	
d) Explanation: (i.e. evidence of significant surface water run-off, poor material)	

2. Settlement	**Answer**
a) Is there differential settlement occurring on the surface?	Yes
i) Are there low areas or depressions?	Yes
ii) Are voids forming?	No
b) What is the extent of the settlement? (percentage of surface area)	5%
i) Is it localized or continuous?	Localized
ii) How deep is it?	30-40 cm
c) Where is the settlement occurring? (i.e. near berms, near the centre of the facility) • Top Surface	
d) Explanation: (i.e. evidence of significant surface infiltration, water ponding, snow drifting)	

3. Frost Action	**Answer**
a) Is there frost action/damage to the landfill?	No
i) Is there exposed debris due to uplift?	No
ii) Is there tension cracking along the berms?	No
iii) Is there sorting of granular fill?	Some coarse material
b) What is the extent of the frost action? (percentage of surface area)	-
i) Is it localized or continuous?	-
c) Where is the heaving/cracking occurring? (i.e. along the toe, on the surface, through the berms) • No	
d) Explanation: (i.e. poor material, poor compaction, high water/silt content in cover material) • Some coarse material in berms and on surface	

4. Monitoring Instruments
a) What is the condition of the monitoring wells and thermistor strings (if applicable)? • Monitoring wells in good condition • Thermistors in good condition

5. Sketch

6. General Comments
• Hunting Cabin structurally in good condition, however interior and surrounding area in disarray with excess garbage, evidence of misuse, and damage. • Airstrip in good condition. • Abandoned drum near surface water body northwest of SSDF.

Groundwater Sampling
Field Data

CAM-F
Year 15 2022

AECOM

Aquatics Monitoring								
Time	**Temperature (°C)**	**Conductivity (µs/cm[c])**	**pH**	**ORP**	**NTU**	**ODO (mg/L)**	**Water Level (m)**	**Notes**
MW06-01								
11:51	6.34	775	6.39	190.4	5.5	4.79	2.11	Well found without a lock and no cap
11:54	4.78	711	7.05	171.3	3.7	5.72	2.1	
MW06-02								
12:24	6.21	462	7.76	162	17.1	8.17	2.015	Well locked but no cap
12:26	5.35	446	7.52	161.6	35.9	7.67	2.04	
12:27	-	-	-	-	-	-	2.07	
MW06-03								
12:41	14	319	7.82	165.8	1162.2	9.84	2.77	Pump unable to pull up much water, unable to
12:43	12.51	33	8.03	152.2	1141.5	10.88	-	use flow-through cell, therefore discrete reading
MW06-04								
12:31	6.39	922	7.13	181	36.5	5.96	0.99	
12:34	6.3	888	7.23	173.2	23.9	6.01	1.045	
12:37	5.92	902	7.32	168	14.5	5.93	1.085	
12:40	5.7	902	7.33	165.1	9.7	5.79	1.07	
12:43	6.67	870	7.35	163	10.1	6.05	1.09	-
12:46	6.34	858	7.39	161.2	10.2	6.27	1.1	
12:49	5.9	901	7.37	160.5	5.5	6.02	1.1	
12:52	5.76	932	7.38	159.4	5.2	5.78	1.12	
MW06-05								
3:25	6.2	1534	8.3	130.6	0.2	3.27	1.5	
3:30	5.94	1485	8.12	131.2	-1.6	4.62	1.55	
3:35	5.62	1504	7.94	127.3	-3.2	5.33	1.59	
3:40	5.84	1525	7.88	122	-2.3	5.77	1.62	
3:45	5.51	1546	7.83	117.8	-3.3	5.94	1.64	-
3:50	5.39	1553	7.79	114.9	-2.9	6.22	1.66	
3:55	5.31	1562	7.76	112.3	-1.8	6.34	1.67	
4:00	5.15	1561	7.74	110.9	-2.2	6.45	1.685	
4:05	5.17	1560	7.73	109.9	-2.9	6.45	1.69	
MW06-06								
4:30	6.2	1130	7.57	123.7	-1.6	4.9	1.8	Well started to go dry, let recover before
4:34	6.98	1222	7.63	121.1	-0.6	3.09	-	sampling, used 7 puck filters (silty)

Notes:
ORP - Oxidative-Reduction Potential
NTU - Nephelometric Turbidity Units
ODO - Optical Dissolved Oxygen
Stick Up - Height of well casing from ground surface to top of casing

Depth to Water (m)	Depth to Bottom (m)	Stick Up (m)
MW06-01		
2.015	2.17	0.635
MW06-02		
1.995	2.07	0.76
MW06-03		
2.75	2.79	0.68
MW06-04		
0.78	1.74	0.47
MW06-05		
1.36	2.08	0.71
MW06-06		
1.365	2.005	0.77

Soil and Surface Water Sampling Field Data

CAM-F

Year 15 2022

Sampling		
Sample ID	**Location**	**Notes**
Soil Sample		
SS1-SW Corner	SSDF	Grey sandy silt
		No odours
		Small amount of clear water on top (not enough to sample)
SS2-South Side	SSDF	Grey sandy silt
		No odours
		Some clear water on top (not enough to sample)
SS3-South Side	SSDF	Grey sndy silt
		Slightly swampy odour
		Clear water on top
		Sampled at SW1-South Side
SS4-East Side	SSDF	Grey sandy silt, some gravel
		Swampy odour
		Some algea odour
Surface Water Sample		
SW1-South Side	SSDF	Clear
		Slight flow
		Sampled at SS3-South Side

Project Daily Report			
Client:	CIRNAC	**Date:**	8-Aug-22
Project:	Nunavut Sites LTM	**Weather:**	10°C strong winds on site
Project No.:	60686962		
Location:	Gjoa Haven / CAM-F	**Number of Personnel On-Site :**	7
Departure Time:	9:30 AM MST	**Return Time:**	6:00 PM MST

Company			Total # Workers
AECOM	David Bugden	Alysha Selinger	2
CIRNAC	Melanie Netser		1
Nunatta	Max Dubeau	Noah Alookie	2
Kenn Borek	Brian Good	Travis Fawcett	2
Total			**7**

Health and Safety

Observations/Near Misses/Incidents/H&S Issues

Strong, consistent winds prevailed on site for the duration of field activities. Additional precautions were used when setting up equipment on site to prevent tipping, flying, or damage to equipment. Work was done back-to-the-wind when possible.

Technical Scope

Geotechnical Inspection

The geotechnical inspection will be completed tomorrow.

Aquatic Monitoring

The three wells surrounding the secure soil disposal area were low-flow sampled. Well MW-6 went dry and required a recharge period before all samples could be collected.

Temperature Monitoring

Data was successfully downloaded from 3 of the 4 thermistors and the batteries were replaced. Thermistor VT-02 provided an error message re:multiplexors. The field team attemped a Complete Memory Transfer but the drop down option was unavailable. The team will re-attempt data collection from VT-02 tomorow after additional research/investigation into the error. Batteries for VT-02 have not been replaced yet.

Communications or Deviation from Work Plan

A drum and broken BBQ with a propane tank were identified on site and will be investigated tomorrow during the geotechnical inspection. The cabin will also be assessed tomorrow.

Other:

Historically, fog has been a concern at the site. No fog was observed today.

Project Daily Photo Record

Photograph 1: Downloading Thermistor Data

Photograph 2: Taking Low-Flow Stabilization Readings

AECOM

Project Daily Report			
Client:	CIRNAC	**Date:**	9-Aug-22
Project:	Nunavut Sites LTM	**Weather:**	13°C steady winds on site
Project No.:	60686962		
Location:	Gjoa Haven / CAM-F	**Number of Personnel On-Site :**	7
Departure Time:	9:30 AM MST	**Return Time:**	8:15 PM MST

Company			Total # Workers
AECOM	David Bugden	Alysha Selinger	2
CIRNAC	Melanie Netser		1
Nunatta	Max Dubeau	Noah Alookie	2
Kenn Borek	Brian Good	Travis Fawcett	2
Total			**7**

Health and Safety

Observations/Near Misses/Incidents/H&S Issues

Field activities were split between two areas on site, therefore communication between the field team and pilots was key to keep everyone safe and accounted for. All work was done in minimum of 2-person teams.

Technical Scope

Geotechnical Inspection

The geotechnical inspection was completed for the NHWL and Secure Soil Disposal Facility (SSDF). The condition was consistent with the previous assessment and no new deficiencies were identified. A total of four soil samples were taken along the West, South, and East sides of the SSDF in areas where seepage appeared to be occuring from the toe of the cell. A surface water sample was also collected on the South side of the SSDF.

Aquatic Monitoring

The wells surrounding the NHWL were low-flow sampled. MW-1 and MW-2 were found without caps, and MW-1 was also found with the casing open. Well MW-3 only had 6 cm of water prior to any low-flow pumping, and did not have enough water to filll the flow-through cell. Despite several re-charge periods, there was not sufficient water quantity to sample at MW-3.

Temperature Monitoring

The Complete Memory Transfer for VT-02 (or VT-04 - see note in next section) encountered an error and failed. The file was saved, but the graph presented after the download did not appear to be accurate. A static reading was taken with the splitter box. Batteries for VT-02 have been replaced.

Communications or Deviation from Work Plan

A drum and broken BBQ with a propane tank were investigated during the geotechnical inspection, both were found to be empty. The cabin was also assessed as part of the inspeciton. Structurally, the cabin was in good condition, however, the interior and surrounding exterior area were scattered with various garbage and debris including old oil cans, batteries, furniture, and metal. A burn barrel was found approx. 20 m south of the cabin.

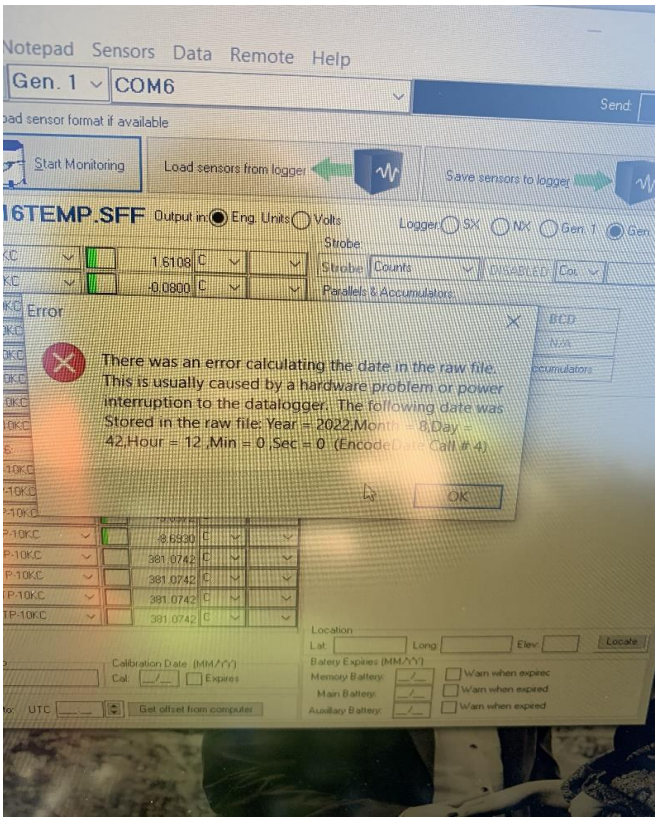
It appears the thermistor ID names may not match the order they were presented in the previous LTM figure. Futher desktop investigation will be required to confirm the appropriate labelling.

Other:

Historically, fog has been a concern at the site. No fog was observed today.

Project Daily Photo Record

Photograph 1: Soil Sampling at the Secure Soil Disposal Facility (SSDF)



Photograph 2: Thermistor Error Message during Complete Memory Transfer Attempt

Photograph 3: Cabin Condition

Appendix D

Groundwater Tables

TABLE D-1

CAM-F
Year 15 2022

In-Situ Field Parameters from Groundwater Monitoring Wells

Parameter	Units	MW06-01	MW06-02	MW06-03	MW06-04	MW06-05	MW06-06
		9-Aug-2022	9-Aug-2022	9-Aug-2022	8-Aug-2022	8-Aug-2022	8-Aug-2022
Field Parameters		Year 15	Year 15	Year 15	Year 15	Year 15	Year 15
Depth to Water	m	2.015	1.995	2.75	0.78	1.36	1.365
Depth to Bottom	m	2.17	2.07	2.79	1.74	2.08	2.005
Stick up	m	0.635	0.76	0.68	0.47	0.71	0.77
Temperature	ºC	4.78	5.35	12.51	5.76	5.17	6.98
Conductivity	µS/cm	711	446	33	932	1560	1222
pH	-	7.05	7.52	8.03	7.38	7.73	7.63
ORP	mV	171.3	161.6	152.2	159.4	109.9	121.1
Turbidity	NTU	3.7	35.9	1141.5	5.2	-2.9	-0.6
Dissolved Oxygen	mg/L	5.72	7.67	10.88	5.78	6.45	3.09
Water Level	m	2.1	2.07	2.77	1.12	1.69	1.8

Notes:

MW06-01 found with no well cap or lock.

MW06-03 data collected using discrete readings, instead of flow cell, due to lack of water.

TABLE D-2

CAM-F

Year 15 2022

General Chemistry of Groundwater Monitoring Wells

Parameter	Units	Lowest Detection Limit	Reference Criteria - ULA	MW06-01	MW06-02	MW06-04	MW06-04 - DUP	MW06-05	MW06-06
				9-Aug-2022	9-Aug-2022	8-Aug-2022	8-Aug-2022	8-Aug-2022	8-Aug-2022
General Chemistry				Year 15	Year 15	Year 15	Year 15	Year 15	Year 15
Physical Tests									
Conductivity	µS/cm	2.0	4320	745	399	964	1030	1480	1060
Hardness (as CaCO3), dissolved	mg/L	0.50	1326	407	197	509	493	847	605
pH	pH units	0.10	8.38	8.41	8.38	8.38	8.41	8.37	8.39
Total Suspended Solids (TSS)	mg/L	3.0	167	104	60	<3.0	4.4	<3.0	58.4
Total Dissolved Solids (TDS)	mg/L	10	1996	446	268	704	622	1180	824
Total Dissolved Solids (TDS), calculated	mg/L	1.0	-	476	244	658	691	1100	760
Anions and Nutrients									
Chloride	mg/L	0.50	63.57	10.5	1.84	8.73	9.58	34.7	17.6
Fluoride	mg/L	0.020	1.116	0.595	0.151	0.469	0.481	0.554	0.601
Nitrate (as N)	mg/L	0.020	17.41	1.63	1.78	0.663	0.59	0.534	0.328
Nitrate + Nitrite (as N)	mg/L	0.0500	-	1.63	1.78	0.663	0.59	0.534	0.328
Nitrite (as N)	mg/L	0.010	0.029	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Sulfate (as SO4)	mg/L	0.30	1060	93.4	20.1	225	274	616	381
Alkalinity									
Bicarbonate (as HCO3)	mg/L	1.0	-	399	244	416	393	268	262
Carbonate (as CO3)	mg/L	1.0	-	7.8	3.4	6.8	8.2	4	4.8
Hydroxide (as OH)	mg/L	1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total (as CaCO3)	mg/L	2.0	-	340	206	353	336	226	223
Ion Balance									
Anion Sum	meq/L	0.10	-	9.18	4.72	12	12.8	18.4	12.9
Cation Sum	meq/L	0.10	-	9.04	4.50	12.10	11.80	18.90	13.70
Ion Balance (APHA)	%	0.010	-	0.768	2.39	0.415	4.06	1.34	3.01
Ion Balance (cations/anions)	%	0.010	-	98.50	95.30	101.00	92.20	103.00	106.00

Notes:

Reference Criteria: Site-specific Upper Limit of Acceptability (ULA)

ULA - Upper Limit of Acceptability; calculated using the average + three (3) standard deviations of all available data. Only calculated for parameters with three or more data points of detectable concentrations.

Exceeds Reference Criteria
Detection Limit Exceeds Reference Criteria

TABLE D-3

CAM-F
Year 15 2022

AECOM

Total and Dissolved Metals of Groundwater Wells

Parameter	Units	Lowest Detection Limit	Reference Criteria - ULA	MW06-01	MW06-02	MW06-04	MW06-04 - DUP	MW06-05	MW06-06
				9-Aug-2022	9-Aug-2022	8-Aug-2022	8-Aug-2022	8-Aug-2022	8-Aug-2022
Metals				Year 15	Year 15	Year 15	Year 15	Year 15	Year 15
Total Metals									
Aluminum, Total	mg/L	0.003	2.503	0.557	2.68	0.135	0.13	0.0099	1.58
Antimony, Total	mg/L	0.0001	0.00079	<0.00010	0.00024	0.00016	0.00016	<0.00010	<0.00010
Arsenic, Total	mg/L	0.0001	0.00241	0.00048	0.00071	0.0003	0.0003	0.00041	0.00056
Barium, Total	mg/L	0.0001	0.0744	0.016	0.048	0.0144	0.0146	0.0215	0.0176
Beryllium, Total	mg/L	0.00002	0.002044	<0.000020	0.000159	<0.000020	<0.000020	<0.000020	0.000092
Bismuth, Total	mg/L	0.00005	-	<0.000050	0.000067	<0.000050	<0.000050	<0.000050	<0.000050
Boron, Total	mg/L	0.01	1.189	0.045	0.472	0.064	0.062	0.066	0.062
Cadmium, Total	mg/L	0.000005	0.0004549	0.0000184	0.000028	0.0000383	0.0000166	0.0000117	0.0000238
Calcium, Total	mg/L	0.05	200.3	64.3	56.2	63.4	62.7	92.2	78.2
Cesium, Total	mg/L	0.00001	-	0.000038	0.000236	0.000022	0.000019	0.000021	0.000103
Chromium, Total	mg/L	0.0005	0.08020	0.00911	0.00552	0.00072	0.00067	<0.00050	0.00851
Cobalt, Total	mg/L	0.0001	0.29765	0.07	0.00165	0.00089	0.00087	0.00032	0.00071
Copper, Total	mg/L	0.0005	0.0503	0.0163	0.0154	0.00581	0.00586	0.00286	0.00543
Iron, Total	mg/L	0.01	4.048	0.653	2.65	0.198	0.195	0.023	0.946
Lead, Total	mg/L	0.00005	0.007141	0.000354	0.00304	0.000126	0.000136	<0.000050	0.00191
Lithium, Total	mg/L	0.001	0.1038	0.0342	0.0088	0.0538	0.054	0.0716	0.0769
Magnesium, Total	mg/L	0.005	190.2	52.4	16.2	72.1	70.1	142	99.9
Manganese, Total	mg/L	0.0001	0.1233	0.0372	0.057	0.0245	0.0239	0.0105	0.0373
Molybdenum, Total	mg/L	0.00005	0.019833	0.00291	0.00103	0.00896	0.00872	0.00559	0.00964
Nickel, Total	mg/L	0.0005	0.0777	0.0188	0.00648	0.0046	0.00456	0.00306	0.00847
Phosphorus, Total	mg/L	0.05	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium, Total	mg/L	0.05	13.03	8.26	4.78	9.14	9.3	11.1	9.76
Rubidium, Total	mg/L	0.0002	-	0.00202	0.00572	0.00154	0.00152	0.0011	0.00221
Selenium, Total	mg/L	0.00005	0.003212	0.000248	0.000089	0.000434	0.000414	0.000124	0.0012
Silicon, Total	mg/L	0.1	9.07	3.77	7.79	3.08	3.12	2.86	6.14
Silver, Total	mg/L	0.00001	0.002289	0.000217	0.000092	0.000038	0.000044	<0.000010	0.000093
Sodium, Total	mg/L	0.05	325.1	14.6	9.79	35.4	35.2	39.8	29.2
Strontium, Total	mg/L	0.0002	0.585	0.238	0.0743	0.232	0.226	0.416	0.323
Sulfur, Total	mg/L	0.5	368.5	29.6	7.94	67.8	68	222	150
Tellurium, Total	mg/L	0.0002	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium, Total	mg/L	0.00001	0.000026	0.000011	0.000033	0.000025	0.000012	0.000011	0.000022
Thorium, Total	mg/L	0.0001	-	0.0002	0.0018	0.00034	0.00024	0.00013	0.00135
Tin, Total	mg/L	0.0001	-	0.00012	0.00018	<0.00010	<0.00010	<0.00010	0.00012
Titanium, Total	mg/L	0.0003	0.1821	0.0405	0.0845	0.00726	0.00727	<0.00030	0.0331
Tungsten, Total	mg/L	0.0001	-	0.114	0.028	0.254	0.259	0.0402	0.117
Uranium, Total	mg/L	0.00001	0.3103	0.0751	0.00884	0.0632	0.0637	0.218	0.164
Vanadium, Total	mg/L	0.0005	0.00851	0.00209	0.00399	0.00094	0.00094	0.00074	0.002
Zinc, Total	mg/L	0.003	3.558	0.171	0.427	0.0277	0.0212	0.0126	0.352
Zirconium, Total	mg/L	0.0002	-	0.00057	0.00058	0.00028	0.00028	0.00036	0.00095

TABLE D-3

CAM-F
Year 15 2022

AECOM

Total and Dissolved Metals of Groundwater Wells

Parameter	Units	Lowest Detection Limit	Reference Criteria - ULA	MW06-01	MW06-02	MW06-04	MW06-04 - DUP	MW06-05	MW06-06
				9-Aug-2022	9-Aug-2022	8-Aug-2022	8-Aug-2022	8-Aug-2022	8-Aug-2022
Metals				Year 15	Year 15	Year 15	Year 15	Year 15	Year 15
Dissolved Metals									
Aluminum, Dissolved	mg/L	0.001	0.0229	0.0082	0.014	0.0027	0.0034	0.0062	0.0053
Antimony, Dissolved	mg/L	0.0001	0.00051	<0.00010	0.00026	0.00017	0.00015	<0.00010	<0.00010
Arsenic, Dissolved	mg/L	0.0001	0.00091	0.00025	0.00016	0.00019	0.0002	0.00034	0.00027
Barium, Dissolved	mg/L	0.0001	0.0593	0.0126	0.0329	0.0142	0.0141	0.0223	0.0128
Beryllium, Dissolved	mg/L	0.00002	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth, Dissolved	mg/L	0.00005	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron, Dissolved	mg/L	0.01	1.29	0.05	0.477	0.07	0.068	0.07	0.06
Cadmium, Dissolved	mg/L	0.000005	0.000533	0.0000133	0.0000098	0.000013	0.0000168	0.0000104	0.0000115
Calcium, Dissolved	mg/L	0.05	199.9	71.4	54.6	75.1	69.6	105	79.2
Cesium, Dissolved	mg/L	0.00001	-	<0.000010	<0.000010	0.00001	<0.000010	0.000023	0.000015
Chromium, Dissolved	mg/L	0.0005	0.01150	<0.00050	0.00138	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt, Dissolved	mg/L	0.0001	0.3085	0.0507	0.00036	0.00091	0.00086	0.00032	0.0003
Copper, Dissolved	mg/L	0.0002	0.02216	0.00683	0.00868	0.00462	0.00528	0.00278	0.00212
Iron, Dissolved	mg/L	0.03	0.014	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead, Dissolved	mg/L	0.00005	7.551345	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000091
Lithium, Dissolved	mg/L	0.001	0.1069	0.0392	0.0057	0.0629	0.0591	0.0818	0.0741
Magnesium, Dissolved	mg/L	0.005	200.5	55.6	14.8	78.1	77.5	142	99
Manganese, Dissolved	mg/L	0.005	0.1003	0.0188	<0.00500	0.0265	0.0257	0.0111	0.0227
Molybdenum, Dissolved	mg/L	0.00005	0.01959	0.00298	0.00104	0.00956	0.00886	0.00593	0.00898
Nickel, Dissolved	mg/L	0.0005	0.0453	0.0084	0.00236	0.00455	0.00443	0.00305	0.00234
Phosphorus, Dissolved	mg/L	0.05	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium, Dissolved	mg/L	0.05	13.81	8.74	4.42	9.97	9.83	11.4	9.99
Rubidium, Dissolved	mg/L	0.0002	-	0.0011	0.0007	0.00131	0.00126	0.0011	0.00057
Selenium, Dissolved	mg/L	0.00005	0.00297	0.00029	0.000085	0.000392	0.000469	0.000182	0.00106
Silicon, Dissolved	mg/L	0.05	3.53	3.19	2.23	2.73	2.7	2.82	2.68
Silver, Dissolved	mg/L	0.00001	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, Dissolved	mg/L	0.05	84.9	15.6	10.2	38.9	38.5	39.9	30.1
Strontium, Dissolved	mg/L	0.0002	0.609	0.256	0.068	0.257	0.244	0.438	0.304
Sulfur, Dissolved	mg/L	0.5	366.0	31.2	7.76	82.4	82.8	222	156
Tellurium, Dissolved	mg/L	0.0002	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium, Dissolved	mg/L	0.00001	0.00003	<0.000010	<0.000010	0.000013	0.00001	0.000014	<0.000010
Thorium, Dissolved	mg/L	0.0001	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin, Dissolved	mg/L	0.0001	0.01463	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium, Dissolved	mg/L	0.0003	-	<0.00030	0.0004	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten, Dissolved	mg/L	0.0001	-	0.105	0.0375	0.288	0.269	0.0462	0.0942
Uranium, Dissolved	mg/L	0.00001	0.3244	0.0795	0.00684	0.0716	0.0659	0.234	0.141
Vanadium, Dissolved	mg/L	0.0005	0.00073	0.00051	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc, Dissolved	mg/L	0.001	3.4562	0.0844	0.0629	0.0157	0.016	0.0122	0.144
Zirconium, Dissolved	mg/L	0.0002	-	0.00037	0.00046	0.00022	0.00021	0.0004	<0.00020

Notes

Reference Criteria: Site-specific Upper Limit of Acceptability (ULA)

ULA - Upper Limit of Acceptability; calculated using the average + three (3) standard deviations of all available data. Only calculated for parameters with three or more data points of detectable concentrations.

Exceeds Reference Criteria
Detection Limit Exceeds Reference Criteria

TABLE D-4

CAM-F

Year 15 2022

QA/QC of Groundwater Wells

Parameter	Units	Lowest Detection Limit	MW06-04	MW06-04 - DUP	RPD
			9-Aug-2022	9-Aug-2022	
QA/QC			Year 15	Year 15	
General Chemistry					
Physical Tests					
Conductivity	µS/cm	2	964	1030	6.62%
Hardness (as CaCO3), dissolved	mg/L	0.5	509	493	3.19%
pH	pH units	0.1	8.38	8.41	0.36%
Total Suspended Solids (TSS)	mg/L	3	<3.0	4.4	37.84%
Total Dissolved Solids (TDS)	mg/L	10	704	622	12.37%
Total Dissolved Solids (TDS), calculated	mg/L	1	658	691	4.89%
Anions and Nutrients					
Chloride	mg/L	0.5	8.73	9.58	9.28%
Fluoride	mg/L	0.02	0.469	0.481	2.53%
Nitrate (as N)	mg/L	0.02	0.663	0.59	11.65%
Nitrate + Nitrite (as N)	mg/L	0.05	0.663	0.59	11.65%
Nitrite (as N)	mg/L	0.01	<0.010	<0.010	0.00%
Sulfate (as SO4)	mg/L	0.3	225	274	19.64%
Alkalinity					
Bicarbonate (as HCO3)	mg/L	1	416	393	5.69%
Carbonate (as CO3)	mg/L	1	6.8	8.2	18.67%
Hydroxide (as OH)	mg/L	1	<1.0	<1.0	0.00%
Total (as CaCO3)	mg/L	2	353	336	4.93%
Ion Balance					
Anion Sum	meq/L	0.1	12	12.8	6.45%
Cation Sum	meq/L	0.1	12.10	11.80	2.51%
Ion Balance (APHA)	%	0.01	0.415	4.06	162.91%
Ion Balance (cations/anions)	%	0.01	101.00	92.20	9.11%

TABLE D-4

CAM-F

Year 15 2022

QA/QC of Groundwater Wells

Parameter	Units	Lowest Detection Limit	MW06-04	MW06-04 - DUP	RPD
			9-Aug-2022	9-Aug-2022	
QA/QC			Year 15	Year 15	
Metals					
Total Metals					
Aluminum, Total	mg/L	0.003	0.135	0.13	3.77%
Antimony, Total	mg/L	0.0001	0.00016	0.00016	0.00%
Arsenic, Total	mg/L	0.0001	0.0003	0.0003	0.00%
Barium, Total	mg/L	0.0001	0.0144	0.0146	1.38%
Beryllium, Total	mg/L	0.00002	<0.000020	<0.000020	0.00%
Bismuth, Total	mg/L	0.00005	<0.000050	<0.000050	0.00%
Boron, Total	mg/L	0.01	0.064	0.062	3.17%
Cadmium, Total	mg/L	0.000005	0.0000383	0.0000166	79.05%
Calcium, Total	mg/L	0.05	63.4	62.7	1.11%
Cesium, Total	mg/L	0.00001	0.000022	0.000019	14.63%
Chromium, Total	mg/L	0.0005	0.00072	0.00067	7.19%
Cobalt, Total	mg/L	0.0001	0.00089	0.00087	2.27%
Copper, Total	mg/L	0.0005	0.00581	0.00586	0.86%
Iron, Total	mg/L	0.01	0.198	0.195	1.53%
Lead, Total	mg/L	0.00005	0.000126	0.000136	7.63%
Lithium, Total	mg/L	0.001	0.0538	0.054	0.37%
Magnesium, Total	mg/L	0.005	72.1	70.1	2.81%
Manganese, Total	mg/L	0.0001	0.0245	0.0239	2.48%
Molybdenum, Total	mg/L	0.00005	0.00896	0.00872	2.71%
Nickel, Total	mg/L	0.0005	0.0046	0.00456	0.87%
Phosphorus, Total	mg/L	0.05	<0.050	<0.050	0.00%
Potassium, Total	mg/L	0.05	9.14	9.3	1.74%
Rubidium, Total	mg/L	0.0002	0.00154	0.00152	1.31%
Selenium, Total	mg/L	0.00005	0.000434	0.000414	4.72%
Silicon, Total	mg/L	0.1	3.08	3.12	1.29%
Silver, Total	mg/L	0.00001	0.000038	0.000044	14.63%
Sodium, Total	mg/L	0.05	35.4	35.2	0.57%
Strontium, Total	mg/L	0.0002	0.232	0.226	2.62%
Sulfur, Total	mg/L	0.5	67.8	68	0.29%
Tellurium, Total	mg/L	0.0002	<0.00020	<0.00020	0.00%
Thallium, Total	mg/L	0.00001	0.000025	0.000012	70.27%
Thorium, Total	mg/L	0.0001	0.00034	0.00024	34.48%
Tin, Total	mg/L	0.0001	<0.00010	<0.00010	0.00%
Titanium, Total	mg/L	0.0003	0.00726	0.00727	0.14%
Tungsten, Total	mg/L	0.0001	0.254	0.259	1.95%
Uranium, Total	mg/L	0.00001	0.0632	0.0637	0.79%
Vanadium, Total	mg/L	0.0005	0.00094	0.00094	0.00%
Zinc, Total	mg/L	0.003	0.0277	0.0212	26.58%
Zirconium, Total	mg/L	0.0002	0.00028	0.00028	0.00%

TABLE D-4

CAM-F

Year 15 2022

QA/QC of Groundwater Wells

Parameter	Units	Lowest Detection Limit	MW06-04	MW06-04 - DUP	RPD
			9-Aug-2022	9-Aug-2022	
QA/QC			Year 15	Year 15	
Dissolved Metals					
Aluminum, Dissolved	mg/L	0.001	0.0027	0.0034	22.95%
Antimony, Dissolved	mg/L	0.0001	0.00017	0.00015	12.50%
Arsenic, Dissolved	mg/L	0.0001	0.00019	0.0002	5.13%
Barium, Dissolved	mg/L	0.0001	0.0142	0.0141	0.71%
Beryllium, Dissolved	mg/L	0.00002	<0.000020	<0.000020	0.00%
Bismuth, Dissolved	mg/L	0.00005	<0.000050	<0.000050	0.00%
Boron, Dissolved	mg/L	0.01	0.07	0.068	2.90%
Cadmium, Dissolved	mg/L	0.000005	0.000013	0.0000168	25.50%
Calcium, Dissolved	mg/L	0.05	75.1	69.6	7.60%
Cesium, Dissolved	mg/L	0.00001	0.00001	<0.000010	0.00%
Chromium, Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.00%
Cobalt, Dissolved	mg/L	0.0001	0.00091	0.00086	5.65%
Copper, Dissolved	mg/L	0.0002	0.00462	0.00528	13.33%
Iron, Dissolved	mg/L	0.03	<0.030	<0.030	0.00%
Lead, Dissolved	mg/L	0.00005	<0.000050	<0.000050	0.00%
Lithium, Dissolved	mg/L	0.001	0.0629	0.0591	6.23%
Magnesium, Dissolved	mg/L	0.005	78.1	77.5	0.77%
Manganese, Dissolved	mg/L	0.005	0.0265	0.0257	3.07%
Molybdenum, Dissolved	mg/L	0.00005	0.00956	0.00886	7.60%
Nickel, Dissolved	mg/L	0.0005	0.00455	0.00443	2.67%
Phosphorus, Dissolved	mg/L	0.05	<0.050	<0.050	0.00%
Potassium, Dissolved	mg/L	0.05	9.97	9.83	1.41%
Rubidium, Dissolved	mg/L	0.0002	0.00131	0.00126	3.89%
Selenium, Dissolved	mg/L	0.00005	0.000392	0.000469	17.89%
Silicon, Dissolved	mg/L	0.05	2.73	2.7	1.10%
Silver, Dissolved	mg/L	0.00001	<0.000010	<0.000010	0.00%
Sodium, Dissolved	mg/L	0.05	38.9	38.5	1.03%
Strontium, Dissolved	mg/L	0.0002	0.257	0.244	5.19%
Sulfur, Dissolved	mg/L	0.5	82.4	82.8	0.48%
Tellurium, Dissolved	mg/L	0.0002	<0.00020	<0.00020	0.00%
Thallium, Dissolved	mg/L	0.00001	0.000013	0.00001	26.09%
Thorium, Dissolved	mg/L	0.0001	<0.00010	<0.00010	0.00%
Tin, Dissolved	mg/L	0.0001	<0.00010	<0.00010	0.00%
Titanium, Dissolved	mg/L	0.0003	<0.00030	<0.00030	0.00%
Tungsten, Dissolved	mg/L	0.0001	0.288	0.269	6.82%
Uranium, Dissolved	mg/L	0.00001	0.0716	0.0659	8.29%
Vanadium, Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.00%
Zinc, Dissolved	mg/L	0.001	0.0157	0.016	1.89%
Zirconium, Dissolved	mg/L	0.0002	0.00022	0.00021	4.65%
Notes: RPD - Relative Percent Difference					

RPD > 50%

TABLE D-5

CAM-F
Year 15 2022

Historical General Chemistry of Groundwater Wells

Parameter	Units	Lowest Detection Limit	MW06-01	MW06-01	MW06-01 Duplicate	MW06-02	MW06-02	MW06-02	MW06-03	MW06-03
			Franz	Arcadis	Arcadis	Franz	Franz	Arcadis	Franz	Arcadis
			2012	2017	2017	2012	2014	2017	2012	2017
Historical General Chemistry										
Conductivity	µS/cm	2	670	620	610	480	660	580	270	270
pH	pH units	0.1	8.14	8.08	8.05	8.07	8.14	7.95	8.1	8.39
Colour	-	3	<2	3	2	5	8	6	42	29
Hardness (as CaCO3)	mg/L	0.5	240	235	225	230	-	269	130	-
Total Suspended Solids	mg/L	3	<10	<10	<10	<10	80	21	100	-
Total Dissolved Solids	mg/L	13	398	372	370	284	386	360	222	-
Chloride (Cl)	mg/L	0.5	10	8.7	9.3	12	8	5.4	<1	-
Fluoride (F)	mg/L	0.02	0.52	0.57	0.51	0.16	0.17	0.15	0.12	-
Nitrate (as N)	mg/L	0.005	10	11.6	13.7	7.2	2.94	2.68	<0.10	-
Nitrite (as N)	mg/L	0.001	0.02	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	-
Sulfate (SO4)	mg/L	0.3	88	41	41	230	-	269	130	-

Exceeds Criteria
Detection Limit Exceeds Reference Criteria

TABLE D-5

Historical General Chemistry of Groundwater Wells

Parameter	Units	Lowest Detection Limit	MW06-04	MW06-04	MW06-04	MW06-04	MW06-04	MW06-04	MW06-04	MW06-04	MW06-04	MW06-04	MW06-04 Duplicate
			UMA	UMA	Franz	Franz	Franz	Franz	Franz	Franz	Franz	Arcadis	Arcadis
			2006	2008	2009	2010	2010	2011	2011	2012	2014	2017	2017
Historical General Chemistry													
Conductivity	µS/cm	2	3110	630	3740	1980	1950	4020	3930	1400	810	1500	1400
pH	pH units	0.1	7.9	8.2	7.8	8	8	7.86	7.97	7.95	8.09	7.92	7.97
Colour	-	3	-	>70	4	4	3	3	4	4	4	<2	3
Hardness (as CaCO3)	mg/L	0.5	-	-	-	-	-	-	-	600	-	635	653
Total Suspended Solids	mg/L	3	-	-	-	-	-	-	-	<10	<10	<10	<10
Total Dissolved Solids	mg/L	13	-	-	-	-	-	-	-	1060	578	1000	996
Chloride (Cl)	mg/L	0.5	-	-	-	-	-	-	-	28	12	21	20
Fluoride (F)	mg/L	0.02	-	-	-	-	-	-	-	0.34	0.53	0.78	0.61
Nitrate (as N)	mg/L	0.005	-	-	-	-	-	-	-	3.8	3.43	1.54	1.61
Nitrite (as N)	mg/L	0.001	-	-	-	-	-	-	-	0.014	<0.010	<0.010	<0.010
Sulfate (SO4)	mg/L	0.3	-	-	-	-	-	-	-	540	210	520	470

Exceeds Criteria
Detection Limit Exceeds Reference Criteria

TABLE D-5

Historical General Chemistry of Groundwater Wells

Parameter	Units	Lowest Detection Limit	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05
			UMA	UMA	UMA	Franz	Franz	Franz	Franz	Franz	Arcadis
			2006	2008	2008	2009	2010	2011	2012	2012	2017
Historical General Chemistry											
Conductivity	µS/cm	2	847	1010	1000	1520	1650	1500	1600	1600	1800
pH	pH units	0.1	7.8	8.1	8.1	7.8	8	7.95	7.9	7.9	7.94
Colour	-	3	-	60	60	3	2	4	<2	4	3
Hardness (as CaCO3)	mg/L	0.5	-	-	-	-	-	-	-	880	942
Total Suspended Solids	mg/L	3	-	-	-	-	-	-	-	<10	<10
Total Dissolved Solids	mg/L	13	-	-	-	-	-	-	-	1330	1410
Chloride (Cl)	mg/L	0.5	-	-	-	-	-	-	-	47	48
Fluoride (F)	mg/L	0.02	-	-	-	-	-	-	-	0.33	0.7
Nitrate (as N)	mg/L	0.005	-	-	-	-	-	-	-	1.3	1.12
Nitrite (as N)	mg/L	0.001	-	-	-	-	-	-	-	<0.010	<0.010
Sulfate (SO4)	mg/L	0.3	-	-	-	-	-	-	-	640	710

Exceeds Criteria
Detection Limit Exceeds Reference Criteria

TABLE D-5

Historical General Chemistry of Groundwater Wells

Parameter	Units	Lowest Detection Limit	MW06-06	MW06-06	MW06-06	MW06-06	MW06-06	MW06-06	MW06-06	MW06-06	Average	Standard Deviation	ULA
			UMA	UMA	Franz	Franz	Franz	Franz	Franz	Arcadis			
			2006	2008	2009	2009	2010	2011	2012	2017			
Historical General Chemistry													
Conductivity	µS/cm	2	2260	1060	1530	1650	1510	1440	1200	1500	1481	946	4320
pH	pH units	0.1	8.1	8	8.1	7.9	8	8.19	7.89	7.9	8.00	0.13	8.38
Colour	-	3	-	>70	3	5	< 2	3	5	3	10	17	61
Hardness (as CaCO3)	mg/L	0.5	-	-	-	-	-	-	580	746	490	279	1326
Total Suspended Solids	mg/L	3	-	-	-	-	-	-	14	20	47	40	167
Total Dissolved Solids	mg/L	13	-	-	-	-	-	-	900	1270	729	422	1996
Chloride (Cl)	mg/L	0.5	-	-	-	-	-	-	30	32	21	14	64
Fluoride (F)	mg/L	0.02	-	-	-	-	-	-	0.39	0.75	0.44	0.22	1.12
Nitrate (as N)	mg/L	0.005	-	-	-	-	-	-	2.8	0.51	4.59	4.27	17.41
Nitrite (as N)	mg/L	0.001	-	-	-	-	-	-	<0.010	<0.010	0.015	0.0046	0.0287
Sulfate (SO4)	mg/L	0.3	-	-	-	-	-	-	380	640	351	236	1060
			Notes: ULA - Upper Limit of Acceptability; calculated using the average + three (3) standard deviations of all available data. Only calculated for parameters with three or more data points of detectable concentrations.										

Exceeds Criteria
Detection Limit Exceeds Reference Criteria

TABLE D-6

Historical Metals Concentrations of Groundwater Wells

CAM-F
Year 15 2022

AECOM

Parameter	Units	Lowest Detection Limit	MW06-01	MW06-01	MW06-01 Duplicate	MW06-02	MW06-02	MW06-02	MW06-03	MW06-03	MW06-03	MW06-04	MW06-04	MW06-04	MW06-04	MW06-04 Duplicate	MW06-04	MW06-04 AH1	MW06-04	MW06-04	MW06-04 Duplicate	MW06-04	MW06-04 Duplicate
			Franz	Arcadis	Arcadis	Franz	Franz	Arcadis	Franz	Franz	Arcadis	UMA	UMA	Franz	Franz	Franz	Franz	Franz	Franz	Franz	Franz	Arcadis	Arcadis
Historical Metals			2012	2017	2017	2012	2014	2017	2012	2014	2017	2006	2008	2009	2010	2010	2011	2011	2012	2014	2014	2017	2017
Total Metals																							
Aluminum, Total	mg/L	0.0005	0.011	0.0308	0.0209	0.092	1.1	1.14	1.3	2.5	0.00411								0.017	0.02		0.0146	0.0113
Antimony, Total	mg/L	0.00002	<0.0006	0.000108	0.000108	0.00066	<0.0006	0.000313	<0.0006	<0.0006	0.000302								<0.0006	<0.0006		0.000207	0.000199
Arsenic (As)-Total	mg/L	0.00002	0.00034	0.000289	0.000286	0.00023	0.00041	0.000222	0.00061	0.00094	0.000215		0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	0.00024	<0.0002	<0.0002	0.000177	0.000184
Barium, Total	mg/L	0.00002	0.025	0.0244	0.0248	0.035	0.057	0.0469	0.043	0.058	0.0215								<0.01	<0.01		0.0132	0.0135
Beryllium, Total	mg/L	0.00001	<0.001	<0.000010	<0.000010	<0.001	<0.001	0.000031	<0.001	<0.001	<0.00001								<0.001	0.001		<0.00001	<0.00001
Boron, Total	mg/L	0.01	<0.020	0.016	0.016	0.086	0.94	1	<0.002	0.025	<0.01								0.034	0.022		0.07	0.072
Cadmium (Cd)-Total	mg/L	0.000005	0.0000099	<0.0000050	<0.0000050	0.00001	<0.00002	0.000019	0.000039	0.00025	0.000006		0.000163	<0.0001	<0.00005	<0.00005	<0.0001	<0.0001	0.000017	<0.00002	0.000027	0.00002	0.000017
Calcium, Total	mg/L	0.05	60	55	55.1	68	110	82.9	37	65	30.6								120	64		87.3	89.1
Chromium (Cr)-Total	mg/L	0.0001	<0.001	0.00025	0.00022	0.0035	0.0064	0.0111	0.003	0.025	0.0002		0.019	<0.005	<0.0025	<0.0025	<0.005	<0.005	<0.001	<0.001	<0.001	0.00012	<0.0001
Cobalt (Co)-Dissolved	mg/L	0.000005	0.22	0.363	0.349	<0.0003	0.0013	0.000141	0.0016	0.0035	0.000267		0.003	0.0025	0.00077	0.00082	0.0021	0.0024	0.0008	0.0006	0.00061	0.00125	0.00127
Copper (Cu)-Total	mg/L	0.00005	0.0074	0.0107	0.0104	0.004	0.0098	0.00402	0.037	0.038	0.0166		0.032	0.007	0.0059	0.0063	0.004	0.004	0.0067	0.0024	0.0021	0.00474	0.00474
Iron, Total	mg/L	0.001	<0.0006	0.026	0.0255	0.072	1.4	0.402	1.2	4.1	0.0074								<0.06	<0.06		0.0177	0.0126
Lead (Pb)-Total	mg/L	0.000005	<0.0002	0.000018	0.000023	<0.0002	0.00089	0.00042	0.0022	0.0045	0.000057	<0.0005	<0.001	<0.0005	<0.000025	<0.00025	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	0.00002	0.000018
Lithium, Total	mg/L	0.0005	<0.020	0.0224	0.0228	<0.0020	<0.02	0.00685	<0.02	<0.02	0.0041								0.04	0.035		0.0641	0.066
Magnesium, Total	mg/L	0.05	21	21.5	21.7	13	24	17.1	9.3	21	10.7								74	48		101	104
Manganese, Total	mg/L	0.00005	0.076	0.0686	0.0666	<0.004	0.028	0.00406	0.023	0.1	0.00341								0.018	0.024		0.0475	0.0499
Mercury (Hg)-Total	mg/L	0.00001											<0.000025	<0.0001									
Molybdenum, Total	mg/L	0.00005	0.011	0.00886	0.009	0.0013	0.0011	0.00108	0.00072	0.0025	0.00134								0.0095	0.011		0.013	0.0132
Nickel (Ni)-Total	mg/L	0.00002	0.025	0.0241	0.0233	0.0012	0.0076	0.0019	0.012	0.032	0.00546	0.004	<0.003	0.009	0.0044	0.0047	0.016	0.017	0.0039	0.0039	0.0038	0.0068	0.00715
Phosphorus, Total	mg/L	0.1	<0.1			<0.1	<0.1	0	<0.1	0.21	0								<0.1	<0.1			
Potassium, Total	mg/L	0.05	7	7.99	7.73	3.8	6.2	4.5	4.8	7.4	4.64								6.7	6.1		10.2	10.2
Selenium, Total	mg/L	0.00004	0.0004	0.000145	0.000128	<0.0002	<0.0002	0.000095	<0.0002	0.00023	0.000145								0.0005	0.00041		0.000521	0.000513
Silicon, Total	mg/L	0.05	1.9	2.43	2.44	2.4	5.2	5.91	5.4	9	2.68								2.3	2.1		2.45	2.34
Silver, Total	mg/L	0.000005	<0.00010	0.000018	0.000011	<0.0001	0.00044	0.000032	0.00065	0.0023	0.000018								<0.0001	<0.0001		0.00001	0.000011
Sodium, Total	mg/L	0.05	41	29.5	28.6	8	14	13.5	7.8	7.2	8.89								68	47		51.7	51.8
Strontium, Total	mg/L	0.00005	0.093	0.0894	0.0894	0.063	0.12	0.0913	0.06	0.18	0.092								0.3	0.18		0.324	0.343
Sulfur, Total	mg/L	3	26	13.6	13.4	11	11	10	1	2.4	<3								170	77		161	163
Thallium, Total	mg/L	0.000002	<0.0002	0.000005	0.000006	<0.0002	<0.0002	0.000004	<0.0002	<0.0002	0.000006								<0.0002	<0.0002		0.000012	0.000012
Tin, Total	mg/L	0.0002	<0.001	<0.0002	<0.0002	<0.0001	<0.001	<0.0002	<0.001	<0.001	<0.0002								<0.001	<0.001		<0.0002	<0.0002
Titanium, Total	mg/L	0.0005	<0.001	0.00103	0.00117	0.0036	0.064	0.0123	0.043	0.17	<0.0005								<0.001	<0.001		0.00056	0.0006
Uranium, Total	mg/L	0.000002	0.0053	0.00758	0.00786	0.005	0.011	0.00998	0.0024	0.011	0.00572								0.077	0.086		0.154	0.142
Vanadium, Total	mg/L	0.0002	<0.001	<0.00020	<0.00020	<0.0001	0.0028	0.0006	0.0021	0.006	0.00053								<0.001	<0.001		<0.0002	<0.0002
Zinc (Zn)-Total	mg/L	0.0001	0.3	0.484	0.483	0.17	0.053	0.159	0.16	0.41	0.103	<0.005	0.05	0.024	0.0099	0.0101	0.007	0.008	0.034	0.011	0.011	0.0226	0.0208
Dissolved Metals																							
Aluminum, Dissolved	mg/L	0.0005	0.0043	0.00185	0.00197	0.0035	0.019	0.00434	0.018	0.0089	0.00563								0.014	0.007		0.00379	0.00378
Antimony, Dissolved	mg/L	0.00002	<0.0006	0.000108	0.000111	<0.0006	<0.0006	0.000326	<0.0006	<0.0006	0.00033								<0.0006	<0.0006		0.000202	0.000213
Arsenic (As)-Dissolved	mg/L	0.00002	0.00033	0.0003	0.000326	<0.0002	<0.0002	0.000203	0.00021	0.0003	0.000262	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	0.000177	0.000166
Barium, Dissolved	mg/L	0.00002	0.026	0.0248	0.0239	0.035	0.048	0.0455	0.031	0.026	0.0256								<0.01	<0.01		0.0133	0.0133
Beryllium, Dissolved	mg/L	0.00001	<0.001	<0.00001	<0.00001	<0.001	<0.001	<0.00001	<0.001	<0.001	<0.00001								<0.001	<0.001		<0.00001	<0.00001
Boron, Dissolved	mg/L	0.01	<0.02	0.015	0.015	0.087	0.87	0.996	<0.02	<0.02	<0.01								0.032	<0.02		0.065	0.068
Cadmium (Cd)-Dissolved	mg/L	0.000005	0.0000078	0.000005	0.000005	0.000012	<0.00002	0.000024	0.000016	0.000038	0.000019	<0.0001	<0.000025	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000027	0.000021	0.000021	0.000014	0.000017
Calcium, Dissolved	mg/L	0.05	60	57.6	55.4	69	110	80.5	37	44	33.1								120	65		87.4	88.2
Chromium (Cr)-Dissolved	mg/L	0.0001	<0.001	0.00019	0.00017	0.0032	0.0021	0.00908	<0.001	<0.001	0.00019	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	0.00011	<0.0001
Cobalt (Co)-Dissolved	mg/L	0.000005	0.21	0.365	0.358	<0.0003	0.00061	0.000067	0.00057	0.00091	0.000234	0.001	0.001	0.0021	0.0008	0.0006	0.0021	0.0019	0.00075	0.0005		0.0012	0.00116
Copper (Cu)-Dissolved	mg/L	0.00005	0.007	0.00985	0.00957	0.0039	0.011	0.0045	0.024	0.018	0.0185	0.002	0.008	0.001	0.006	0.007	<0.001	<0.001	0.0069	0.0053		0.00464	0.00447
Iron, Dissolved	mg/L	0.001	<0.06	<0.001	0.0025	<0.0006	<0.06	0.0078	<0.0006	<0.0006	0.009								<0.0006	<0.0006		<0.001	<0.001
Lead (Pb)-Dissolved	mg/L	0.000005	<0.0002	<0.0000050	<0.0000050	<0.0002	<0.0002	0.00008	<0.0002	<0.00002	0.000085		3.71	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0000050	<0.0000050
Lithium, Dissolved	mg/L	0.0005	<0.02	0.0223	0.0216	<0.02	<0.02	0.00669	<0.02	<0.02	0.00424								0.04	0.031		0.0615	0.0605
Magnesium, Dissolved	mg/L	0.05	21	22.2	21.1	13	22	16.5	9.1	14	9.84								75	48		103	98.4
Manganese, Dissolved	mg/L	0.00005	0.077	0.0652	0.0636	<0.004	0.0043	0.000966	0.0066	0.018	0.00412								0.018	0.023		0.0455	0.0436
Mercury (Hg)-Dissolved	mg/L	0.00001											<0.000025										
Molybdenum, Dissolved	mg/L	0.00005	0.01	0.00862	0.00884	0.0012	0.001	0.0011	0.00047	0.0018	0.00133								0.0092	0.0097		0.0132	0.013
Nickel (Ni)-Dissolved	mg/L	0.00002	0.024	0.023	0.0228	0.00099	0.0037	0.00103	0.0064	0.0083	0.00458		0.04	0.008	0.004	0.004	0.015	0.014	0.0039	0.0032	0.0033	0.00647	0.00631
Phosphorus, Dissolved	mg/L	0.1	<0.1			<0.1	<0.1		<0.1	<0.1									<0.1	<0.1			
Potassium, Dissolved	mg/L	0.05	6.9	8.29	7.81	3.9	5.9	4.66	4.4	6	4.67								6.9	5.9		10.6	10.4
Selenium, Dissolved	mg/L	0.00004	0.0003	0.000136	0.000144	<0.0002	<0.0002	0.000095	<0.0002	0.0002	0.000154								0.00052	0.00041		0.000535	0.000549
Silicon, Dissolved	mg/L	0.05	1.9	2.36	2.38	2.2	2.9	2.97	2.2	3.1	2.6								2.4	2		2.44	2.33
Silver, Dissolved	mg/L	0.000005	<0.0001	<0.000005	<0.000005	<0.0001	<0.0001	<0.000005	<0.0001	<0.0001	0.000015								<0.0001	<0.0001		<0.000005	<0.000005
Sodium, Dissolved	mg/L	0.05	40	27.9	27.6	8	14	13.4	5.4	6	8.88								69	41		53.2	51.6
Strontium, Dissolved	mg/L	0.00005	0.092	0.0937	0.0891	0.064	0.11	0.0896	0.062	0.13	0.0862								0.3	0.17		0.329	0.324
Sulfur, Dissolved	mg/L	3	26	12.6	13.2	12	11	10.3	0.87	2	<3								180	74		149	145
Thallium, Dissolved	mg/L	0.000002	<0.0002	0.000006	0.000005	<0.0002	<0.0002	0.000002	<0.0002	<0.0002	0.000006								<0.0002	<0.0002		0.000011	0.000011
Tin, Dissolved	mg/L	0.0002	<0.001	<0.0002	<0.0002	<0.001	<0.001	0.00443	<0.001	<0.001	0.00842								<0.001	<0.01		<0.0002	<0.0002
Titanium, Dissolved	mg/L	0.0005	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.0005	<0.001	<0.002	0.00052								<0.001	<0.001		<0.0005	<0.0005
Uranium, Dissolved	mg/L	0.000002	0.005	0.00734	0.00725	0.0047	0.0099	0.00965	0.0015	0.0085	0.0059								0.072	0.083		0.148	0.142
Vanadium, Dissolved	mg/L	0.0002	<0.001	<0.0002	<0.0002	<0.001	<0.001	0.00034	<0.001	<0.001	0.00051								<0.001	<0.001		<0.0002	<0.0002
Zinc (Zn)-Dissolved	mg/L	0.0001	0.27	0.546	0.525	0.14	0.025	0.106	0.043	0.11	0.125		0.234	0.06	0.01	0.009	<0.005	<0.005	0.033	0.0092	<0.003	0.0221	0.0218

Exceeds Reference Criteria

Detection Limit Exceeds Reference Criteria

TABLE D-6

Historical Metals Concentrations of Groundwater Wells

Parameter	Units	Lowest Detection Limit	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05 Duplicate	MW06-05	MW06-06	MW06-06	MW06-06	MW06-06	MW06-06 Duplicate	MW06-06	MW06-06	MW06-06	MW06-06	Average	Standard Deviation	ULA
			UMA	UMA	UMA	UMA	Franz	Franz	Franz	Franz	Franz	Arcadis	UMA	UMA	UMA	Franz	Franz	Franz	Franz	Franz	Arcadis			
Historical Metals			2006	2007	2008	2008	2009	2010	2011	2012	2012	2017	2006	2007	2008	2009	2009	2010	2011	2012	2017			
Total Metals																								
Aluminum, Total	mg/L	0.0005								0.011		0.00606								0.15	0.164	0.388	0.705	2.503
Antimony, Total	mg/L	0.00002								<0.0006		0.000054								<0.0006	0.000062	0.000224	0.000189	0.000792
Arsenic (As)-Total	mg/L	0.00002		<0.001	0.002	0.002	<0.001	0.0005	<0.001	0.00037	0.00037	0.000349		<0.001	0.002	0.001	<0.001	<0.0005	0.001	0.0003	0.000289	0.000638	0.000590	0.002409
Barium, Total	mg/L	0.00002								0.039		0.0313								0.032	0.025	0.033	0.014	0.074
Beryllium, Total	mg/L	0.00001								<0.001		<0.00001								<0.001	0.00001	0.00035	0.00057	0.00204
Boron, Total	mg/L	0.01								0.022		0.047								0.021	0.05	0.173	0.339	1.189
Cadmium (Cd)-Total	mg/L	0.000005		<0.001	0.000261	0.000307	<0.0001	0.00011	<0.0001	0.000037	0.000044	0.000022		<0.001	0.000453	0.0001	<0.0001	0.00009	<0.0001	0.000011	0.00003	0.00009	0.00012	0.00045
Calcium, Total	mg/L	0.05								180		130								120	104	86	38	200
Chromium (Cr)-Total	mg/L	0.0001		0.006	0.011	0.016	<0.005	<0.0025	<0.005	<0.001	<0.001	0.00013		0.025	0.097	0.021	0.011	<0.0025	0.034	<0.001	0.00138	0.01457	0.02188	0.08020
Cobalt (Co)-Dissolved	mg/L	0.000005		0.002	0.003	0.002	0.0015	0.00102	<0.0005	0.00075	0.00067	0.000507		0.002	0.006	0.0023	0.0023	0.0009	0.004	0.00039	0.000422	0.028134	0.089837	0.297645
Copper (Cu)-Total	mg/L	0.00005		0.006	0.012	0.016	0.009	0.0072	0.008	0.0073	0.0068	0.00409		0.013	0.046	0.021	0.012	0.0078	0.054	0.0063	0.00464	0.01240	0.01263	0.05028
Iron, Total	mg/L	0.001								<0.06		0.0018								0.17	0.183	0.586	1.154	4.048
Lead (Pb)-Total	mg/L	0.000005	<0.0005		<0.001	<0.001	<0.0005	0.00037	<0.0005	<0.0002	<0.0002	0.000011	<0.0005		<0.001	<0.0005	<0.0005	0.00037	0.0066	<0.0002	0.000187	0.00112	0.00201	0.00714
Lithium, Total	mg/L	0.0005								0.034		0.0649								0.037	0.0596	0.0381	0.0219	0.1038
Magnesium, Total	mg/L	0.05								100		150								68	118	54	45	190
Manganese, Total	mg/L	0.00005								0.0059		0.0104								0.02	0.0177	0.0352	0.0294	0.1233
Mercury (Hg)-Total	mg/L	0.00001			<0.000025	<0.000025	<0.0001								<0.000025	<0.0001	<0.0001					-	-	-
Molybdenum, Total	mg/L	0.00005								0.0027		0.00497								0.0052	0.00862	0.0062	0.0046	0.0198
Nickel (Ni)-Total	mg/L	0.00002	0.015		0.006	0.006	0.009	0.007	0.005	0.0042	0.0043	0.00424	0.003		0.008	0.005	0.006	0.0388	0.13	0.0064	0.00542	0.01288	0.02161	0.07771
Phosphorus, Total	mg/L	0.1								<0.1		0								<0.1		0.21	-	-
Potassium, Total	mg/L	0.05								6.7		9.56								8.6	8.68	7.11	1.98	13.03
Selenium, Total	mg/L	0.00004								0.00044		0.000485								0.0014	0.0034	0.0006	0.0009	0.0032
Silicon, Total	mg/L	0.05								2.9		2.62								3.3	2.68	3.41	1.88	9.07
Silver, Total	mg/L	0.000005								<0.0001		0.000018								0.00012	0.000021	0.00030	0.00066	0.00229
Sodium, Total	mg/L	0.05								31		398.6								25	30.7	50.7	91.5	325.1
Strontium, Total	mg/L	0.00005								0.34		0.47								0.22	0.342	0.200	0.128	0.585
Sulfur, Total	mg/L	3								220		258								130	206	92	92	368
Thallium, Total	mg/L	0.000002								<0.0002		0.000021								<0.0002	0.000008	0.000009	0.000006	0.000026
Tin, Total	mg/L	0.0002								<0.001		<0.0002								<0.001	0.0002	0.0002	-	-
Titanium, Total	mg/L	0.0005								<0.001		<0.0005								0.0081	0.0086	0.0285	0.0512	0.1821
Uranium, Total	mg/L	0.000002								0.15		0.256								0.094	0.181	0.071	0.080	0.310
Vanadium, Total	mg/L	0.0002								<0.001		<0.0002								<0.001	0.00055	0.00210	0.00214	0.00851
Zinc (Zn)-Total	mg/L	0.0001	0.047		0.347	0.04	0.018	0.0635	0.048	0.032	0.032	0.04	0.009		6.65	0.12	0.17	0.0969	0.67	0.26	0.157	0.306	1.084	3.558
Dissolved Metals																								
Aluminum, Dissolved	mg/L	0.0005								0.007		0.00783								0.01	0.00651	0.00749	0.00515	0.02294
Antimony, Dissolved	mg/L	0.00002								<0.0006		0.000057								<0.0006	0.000058	0.000176	0.000110	0.000507
Arsenic (As)-Dissolved	mg/L	0.00002	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.00032	0.0003	0.000364	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.00024	0.000257	0.000317	0.000198	0.000911
Barium, Dissolved	mg/L	0.00002								0.04		0.0317								0.031	0.0232	0.0292	0.0100	0.0593
Beryllium, Dissolved	mg/L	0.00001								<0.001		<0.00001								<0.001	<0.00001	-	-	-
Boron, Dissolved	mg/L	0.01								0.023		0.051								<0.02	0.055	0.207	0.361	1.289
Cadmium (Cd)-Dissolved	mg/L	0.000005	0.0001		<0.000025	<0.000025	<0.0001	0.0001	0.0003	0.000049	0.000044	0.000026	<0.0001		<0.000025	<0.0001	<0.0001	0.0007	<0.0001	0.000016	0.000022	0.000072	0.000154	0.000533
Calcium, Dissolved	mg/L	0.05								180		126								120	102	84	38	200
Chromium (Cr)-Dissolved	mg/L	0.0001	<0.005		<0.001	<0.001	<0.005	<0.005	<0.005	<0.001	<0.001	0.00014	<0.005		<0.001	<0.005	<0.005	0.006	<0.005	<0.001	0.00014	0.00213	0.00312	0.01150
Cobalt (Co)-Dissolved	mg/L	0.000005	0.0017		0.002	0.002	0.0012	0.0007	<0.0005	0.00074	0.0008	0.000496	<0.0005		0.001	0.0005	0.0006	0.0007	0.0006	<0.0003	0.000311	0.029147	0.093121	0.308511
Copper (Cu)-Dissolved	mg/L	0.00005	0.008		0.012	0.01	0.006	0.007	0.009	0.0077	0.0064	0.00443	0.004		0.013	0.003	0.005	0.008	0.003	0.0056	0.00346	0.00763	0.00484	0.02216
Iron, Dissolved	mg/L	0.001								<0.0006		0.0069								<0.0006	0.0033	0.0059	0.0029	0.0145
Lead (Pb)-Dissolved	mg/L	0.000005		0.001	0.807	1.1	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	0.000064		0.001	7.39	0.0033	0.0025	<0.0005	<0.0005	<0.0002	0.000063	1.00125	2.18337	7.55134
Lithium, Dissolved	mg/L	0.0005								0.031		0.0693								0.036	0.0704	0.0379	0.0230	0.1069
Magnesium, Dissolved	mg/L	0.05								100		155								68	140	55	48	200
Manganese, Dissolved	mg/L	0.00005								0.0057		0.0114								0.017	0.0152	0.0262	0.0247	0.1003
Mercury (Hg)-Dissolved	mg/L	0.00001			<0.000025	<0.000025									<0.000025							-	-	-
Molybdenum, Dissolved	mg/L	0.00005								0.0028		0.00549								0.0049	0.0101	0.0060	0.0045	0.0196
Nickel (Ni)-Dissolved	mg/L	0.00002		0.009	0.02	0.02	0.018	0.007	0.004	0.0044	0.0044	0.00384		0.022	0.03	0.02	0.013	0.049	0.01	0.0063	0.00427	0.01211	0.01107	0.04533
Phosphorus, Dissolved	mg/L	0.1								<0.1										<0.1		-	-	-
Potassium, Dissolved	mg/L	0.05								6.8		10.2								8.5	9.97	7.16	2.21	13.81
Selenium, Dissolved	mg/L	0.00004								0.00049		0.00046								0.0013	0.00313	0.00060	0.00079	0.00297
Silicon, Dissolved	mg/L	0.05								3		2.6								2.6	2.31	2.49	0.35	3.53
Silver, Dissolved	mg/L	0.000005								<0.0001		<0.000005								<0.0001	<0.000005	0.000015	-	-
Sodium, Dissolved	mg/L	0.05								31		40.7								25	32.6	29.1	18.6	84.9
Strontium, Dissolved	mg/L	0.00005								0.34		0.493								0.22	0.395	0.199	0.136	0.609
Sulfur, Dissolved	mg/L	3								220		248								130	222	91	92	366
Thallium, Dissolved	mg/L	0.000002								<0.0002		0.000023								<0.0002	0.000005	0.000009	0.000007	0.000028
Tin, Dissolved	mg/L	0.0002								<0.001		0.00091								<0.001	0.00049	0.00356	0.00369	0.01463
Titanium, Dissolved	mg/L	0.0005								<0.001		<0.0005								<0.001	<0.0005	0.00052	-	-
Uranium, Dissolved	mg/L	0.000002								0.15		0.267								0.089	0.212	0.072	0.084	0.324
Vanadium, Dissolved	mg/L	0.0002								<0.001		<0.0002								<0.001	0.00029	0.00038	0.00012	0.00073
Zinc (Zn)-Dissolved	mg/L	0.0001		0.03	0.043	0.063	0.009	0.073	0.064	0.035	0.029	0.0431		0.17	6.21	0.33	0.17	0.07	0.052	0.24	0.123	0.295	1.054	3.456

Notes:
ULA - Upper Limit of Acceptability; calculated using the average + three (3) standard deviations of all available data. Only calculated for parameters with three or more data points of detectable concentrations.

Exceeds Reference Criteria

Detection Limit Exceeds Reference Criteria

TABLE D-7

Historical PHC Concentrations of Groundwater Wells

CAM-F
Year 15 2022

AECOM

Parameter	Units	Lowest Detection Limit	MW06-01	MW06-01	MW06-01 Duplicate	MW06-02	MW06-02	MW06-02	MW06-03	MW06-03	MW06-03	MW06-04	MW06-04	MW06-04	MW06-04 Duplicate	MW06-04	MW06-04 AH1	MW06-04	MW06-04	MW06-04 Duplicate	MW06-04	MW06-04 Duplicate
			Franz	Arcadis	Arcadis	Franz	Franz	Arcadis	Franz	Franz	Arcadis	UMA	Franz	Franz	Franz	Franz	Franz	Franz	Franz	Franz	Arcadis	Arcadis
			2012	2017	2017	2012	2014	2017	2012	2014	2017	2008	2009	2010	2010	2011	2011	2012	2014	2014	2017	2017
Historical PHCs and VOCs																						
FI (C6-C10)	mg/L	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.1	<0.1	<0.1	<0.1	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
F2 (C10-C16)	mg/L	0.3	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
F3 (C16-C34)	mg/L	0.6	<0.1	<0.1	<0.6	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
F4 (C34-C50)	mg/L	0.6	<0.1	<0.1	<0.6	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzene	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Ethylbenzene	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Toluene	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Xylenes	mg/L	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004		<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004

Exceeds Criteria
Detection Limit Exceeds Criteria

TABLE D-7

Historical PHC Concentrations of Groundwater Wells

Parameter	Units	Lowest Detection Limit	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05 Duplicate	MW06-05	MW06-06	MW06-06	MW06-06	MW06-06 Duplicate	MW06-06	MW06-06	MW06-06	MW06-06	Average	Standard Deviation	ULA
			UMA	UMA	UMA	Franz	Franz	Franz	Franz	Franz	Arcadis	UMA	UMA	Franz	Franz	Franz	Franz	Franz	Arcadis			
			2007	2008	2008	2009	2010	2011	2012	2012	2017	2007	2008	2009	2009	2010	2011	2012	2017			
Historical PHCs and VOCs																						
FI (C6-C10)	mg/L	0.025	<0.025	<0.1	<0.1	<0.1	<0.1	<0.025	<0.025	<0.025	<0.025	<0.025	0.2	<0.1	<0.1	<0.1	<0.025	<0.025	<0.025	NC	NC	NC
F2 (C10-C16)	mg/L	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NC	NC	NC
F3 (C16-C34)	mg/L	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NC	NC	NC
F4 (C34-C50)	mg/L	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NC	NC	NC
Benzene	mg/L	0.0002				<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	All <RDL	All <RDL	All <RDL
Ethylbenzene	mg/L	0.0002				<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	All <RDL	All <RDL	All <RDL
Toluene	mg/L	0.0002				<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	All <RDL	All <RDL	All <RDL
Xylenes	mg/L	0.0004				<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004			<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	All <RDL	All <RDL	All <RDL

Note:
ULA - Upper Limit of Acceptability; calculated using the average + three (3) standard deviations of all available data. Only calculated for parameters with three or more data points of detectable concentrations.
NC - Not calculated
RDL - Refers to laboratory detection limit. 2017 RDL used.

Exceeds Criteria
Detection Limit Exceeds Criteria

TABLE D-8

Historical PCB Concentrations of Groundwater Wells

CAM-F
Year 15 2022

AECOM

Parameter	Units	Lowest Detection Limit	MW06-01	MW06-01	MW06-01 Duplicate	MW06-02	MW06-02	MW06-02	MW06-03	MW06-03	MW06-03	MW06-04	MW06-04	MW06-04	MW06-04	MW06-04 Duplicate	MW06-04	MW06-04 AH1	MW06-04	MW06-04	MW06-04 Duplicate	MW06-04	MW06-04 Duplicate
			Franz	Arcadis	Arcadis	Franz	Franz	Arcadis	Franz	Franz	Arcadis	UMA	UMA	Franz	Franz	Franz	Franz	Franz	Franz	Franz	Franz	Arcadis	Arcadis
			2012	2017	2017	2012	2014	2017	2012	2014	2017	2006	2008	2009	2010	2010	2011	2011	2012	2014	2014	2017	2017
Historical PCBs																							
Aroclor 1016	mg/L	<0.00005	<0.00005	-	-	<0.00005	<0.00005	-	<0.00005	-	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	-	-
Aroclor 1221	mg/L	<0.00005	<0.00005	-	-	<0.00005	<0.00005	-	<0.00005	-	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	-	-
Aroclor 1232	mg/L	<0.00005	<0.00005	-	-	<0.00005	<0.00005	-	<0.00005	-	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	-	-
Aroclor 1242	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	<0.00005	<0.00005
Aroclor 1248	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	<0.00005	<0.00005
Aroclor 1254	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	<0.00005	<0.00005
Aroclor 1260	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	<0.00005	<0.00005
Aroclor 1262	mg/L	<0.00005	<0.00005	-	-	<0.00005	<0.00005	-	<0.00005	-	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	-	-
Aroclor 1268	mg/L	<0.00005	<0.00005	-	-	<0.00005	<0.00005	-	<0.00005	-	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	-	-
Total PCBs	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005

Exceeds Criteria

Detection Limit Exceeds Reference Criteria

TABLE D-8

Historical PCB Concentrations of Groundwater Wells

Parameter	Units	Lowest Detection Limit	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05	MW06-05 Duplicate	MW06-05	MW06-06	MW06-06	MW06-06	MW06-06	MW06-06 Duplicate	MW06-06	MW06-06	MW06-06	MW06-06	Average	Standard Deviation	ULA
			UMA	UMA	UMA	UMA	Franz	Franz	Franz	Franz	Franz	Arcadis	UMA	UMA	UMA	Franz	Franz	Franz	Franz	Franz	Arcadis			
			2006	2007	2008	2008	2009	2010	2011	2012	2012	2017	2006	2007	2008	2009	2009	2010	2011	2012	2017			
Historical PCBs																								
Aroclor 1016	mg/L	<0.00005	-	-	-	-	-	-	-	-	<0.00005	-	-	-	-	-	-	-	-	<0.00005	-	All <RDL	All <RDL	All <RDL
Aroclor 1221	mg/L	<0.00005	-	-	-	-	-	-	-	-	<0.00005	-	-	-	-	-	-	-	-	<0.00005	-	All <RDL	All <RDL	All <RDL
Aroclor 1232	mg/L	<0.00005	-	-	-	-	-	-	-	-	<0.00005	-	-	-	-	-	-	-	-	<0.00005	-	All <RDL	All <RDL	All <RDL
Aroclor 1242	mg/L	<0.00005	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	-	-	-	-	-	-	<0.00005	<0.00005	All <RDL	All <RDL	All <RDL
Aroclor 1248	mg/L	<0.00005	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	-	-	-	-	-	-	<0.00005	<0.00005	All <RDL	All <RDL	All <RDL
Aroclor 1254	mg/L	<0.00005	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	-	-	-	-	-	-	<0.00005	<0.00005	All <RDL	All <RDL	All <RDL
Aroclor 1260	mg/L	<0.00005	-	-	-	-	-	-	-	-	<0.00005	<0.00005	-	-	-	-	-	-	-	<0.00005	<0.00005	All <RDL	All <RDL	All <RDL
Aroclor 1262	mg/L	<0.00005	-	-	-	-	-	-	-	-	<0.00005	-	-	-	-	-	-	-	-	<0.00005	-	All <RDL	All <RDL	All <RDL
Aroclor 1268	mg/L	<0.00005	-	-	-	-	-	-	-	-	<0.00005	-	-	-	-	-	-	-	-	<0.00005	-	All <RDL	All <RDL	All <RDL
Total PCBs	mg/L	<0.00005	<0.00005	<0.0001	<0.00001	<0.00001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0001	<0.00001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	All <RDL	All <RDL	All <RDL

Note:
ULA - Upper Limit of Acceptability; calculated using the average + three (3) standard deviations of all available data. Only calculated for parameters with three or more data points of detectable concentrations.
RDL - Refers to laboratory detection limit. 2017 RDL used.

Exceeds Criteria

Detection Limit Exceeds Reference Criteria

Appendix E

Surface Water Tables

TABLE E-1

CAM-F
Year 15 2022

General Chemistry of Surface Water

Parameter	Units	Lowest Detection Limit	CCME [1]	SW1-SOUTH SIDE
				9-Aug-2022
General Chemistry				Year 15
Physical Tests				
Conductivity	µS/cm	2.0	-	481
Hardness (as CaCO3), dissolved	mg/L	0.50	-	259
pH	pH units	0.10	-	8.52
Total Suspended Solids (TSS)	mg/L	3.0	-	<3.0
Total Dissolved Solids (TDS)	mg/L	10	-	314
Total Dissolved Solids (TDS), calculated	mg/L	1.0	-	298
Anions and Nutrients				
Chloride	mg/L	0.50	120.00	1.07
Fluoride	mg/L	0.020	120.00	0.05
Nitrate (as N)	mg/L	0.020	13.00	1.43
Nitrate + Nitrite (as N)	mg/L	0.0500	-	1.43
Nitrite (as N)	mg/L	0.010	60 NO_2-N	<0.010
Sulfate (as SO4)	mg/L	0.30	-	31
Alkalinity				
Bicarbonate (as HCO3)	mg/L	1.0	-	286
Carbonate (as CO3)	mg/L	1.0	-	9.2
Hydroxide (as OH)	mg/L	1.0	-	<1.0
Total (as CaCO3)	mg/L	2.0	-	250
Ion Balance				
Anion Sum	meq/L	0.10	-	5.78
Cation Sum	meq/L	0.10	-	5.56
Ion Balance (APHA)	%	0.010	-	1.94
Ion Balance (cations/anions)	%	0.010	-	96.20

Notes:

[1] Canadian Council of Ministers of the Environment (CCME). 1987-2018. Water Quality Guidelines for the Protection of Aquatic Life, Freshwater, Long Term.

Exceeds CCME Criteria
Detection Limit Exceeds CCME Criteria

TABLE E-2

CAM-F
Year 15 2022

Metals Concentrations of Surface Water As Per AMSRP

Parameter	Units	Lowest Detection Limit	CCME [1]	SW1-SOUTH SIDE
				9-Aug-2022
Metals				Year 15
Total Metals				
Arsenic, Total	mg/L	0.0001	0.005	0.00027
Cadmium, Total	mg/L	0.000005	0.00035	0.0000102
Chromium, Total	mg/L	0.0005	-	<0.00050
Cobalt, Total	mg/L	0.0001	-	<0.00010
Copper, Total	mg/L	0.0005	0.0040	0.00166
Lead, Total	mg/L	0.00005	0.0070	0.000086
Nickel, Total	mg/L	0.0005	0.15	0.00065
Zinc, Total	mg/L	0.003	-	<0.0030
Dissolved Metals				
Arsenic, Dissolved	mg/L	0.0001	0.005	0.00021
Cadmium, Dissolved	mg/L	0.000005	0.00035	<0.0000050
Chromium, Dissolved	mg/L	0.0005	-	<0.00050
Cobalt, Dissolved	mg/L	0.0001	-	<0.00010
Copper, Dissolved	mg/L	0.0002	0.0040	0.0027
Lead, Dissolved	mg/L	0.00005	0.0070	<0.000050
Nickel, Dissolved	mg/L	0.0005	0.15	0.00057
Zinc, Dissolved	mg/L	0.001	-	<0.0010

Notes

[1] Canadian Council of Ministers of the Environment (CCME). 1987-2018. Water Quality Guidelines for the Protection of Aquatic Life, Freshwater, Long Term.

Exceeds CCME Criteria
Detection Limit Exceeds CCME Criteria

Appendix F

Soil Sample Tables

TABLE F-1

Metals Concentration in Soil Samples as per AMSRP

CAM-F
Year 15 2022

Parameter	Units	RDL	DCC Tier I	DCC Tier II	SS1- SW Corner	SS2 - Southside	SS3 - Southside	SS4 - Eastside	Average	Standard Deviation	ULA
					AECOM	AECOM	AECOM	AECOM			
					9-Aug-22	9-Aug-22	9-Aug-22	9-Aug-22			
Metals											
Arsenic	mg/kg	0.1		30	1.36	0.94	1.1	1.3	NC	NC	NC
Cadmium	mg/kg	0.02		5	0.053	0.028	0.039	0.041	NC	NC	NC
Chromium	mg/kg	0.5		250	32.6	28.4	30.2	37.5	NC	NC	NC
Cobalt	mg/kg	0.1		50	6.51	5	5.85	5.66	NC	NC	NC
Copper	mg/kg	0.5		100	15.8	11	14.7	13.3	NC	NC	NC
Lead	mg/kg	0.5	200	500	12.5	5.66	8.18	7.58	NC	NC	NC
Mercury	mg/kg	0.005		2	0.0056	<0.0050	0.0051	<0.0050	NC	NC	NC
Nickel	mg/kg	0.5		100	19	16.3	18.2	20.6	NC	NC	NC
Zinc	mg/kg	2		500	39.9	28.8	34.5	34.2	NC	NC	NC

Notes:

DCC - DEW Line Cleanup Criteria; specified in the Long-Term Monitoring Plan (LTMP; INAC, 2018) as per Abandoned Military Sites Remediation Protocol (AMSRP; INAC, 2009)

NC - Not calculated

RDL - Refers to laboratory detection limit. 2017 RDL used.

ULA - Upper Limit of Acceptability; calculated using the average + three (3) standard deviations of all available data. Only calculated for parameters with three or more data points of detectable concentrations.

TABLE F-2

CAM-F
Year 15 2022

PCB Concentrations in Soil Samples as per AMSRP

Parameter	Units	RDL	DCC Tier I	DCC Tier II	SS1- SW Corner	SS2 - Southside	SS3 - Southside	SS4 - Eastside	Average	Standard Deviation	ULA
					AECOM	AECOM	AECOM	AECOM			
					9-Aug-22	9-Aug-22	9-Aug-22	9-Aug-22			
PCBs											
Polychlorinated Biphenyls [PCBs], Total	mg/kg	0.01	1.0	5.0	<0.010	<0.010	<0.010	<0.010	All <RDL	All <RDL	All <RDL

Notes:

DCC - DEW Line Cleanup Criteria; specified in the Long-Term Monitoring Plan (LTMP; INAC, 2018) as per Abandoned Military Sites Remediation Protocol (AMSRP; INAC, 2009)
RDL - Refers to laboratory detection limit. 2017 RDL used.

ULA - Upper Limits of Acceptability, calculated using the average + three (3) standard deviations of all available data & only calculated for parameters that had

TABLE F-3

CAM-F
Year 15 2022

PHC Concentrations in Soil Samples as Per AMSRP

Parameter	Units	RDL	DCC PHC Guidelines	SS1- SW Corner	SS2 - Southside	SS3 - Southside	SS4 - Eastside	Average	Standard Deviation	ULA
				AECOM	AECOM	AECOM	AECOM			
				9-Aug-22	9-Aug-22	9-Aug-22	9-Aug-22			
PHCs										
F1 (C6-C10)	mg/kg	5	1290	<5.0	<5.0	<5.0	<5.0	All <RDL	All <RDL	All <RDL
F2 (C10-C16)	mg/kg	25	330	<25	<25	<25	<25	All <RDL	All <RDL	All <RDL
F3 (C16-C34)	mg/kg	50	-	<50	<50	<50	<50	All <RDL	All <RDL	All <RDL
F4 (C34-C50)	mg/kg	50	-	<50	<50	<50	<50	All <RDL	All <RDL	All <RDL

Notes:

DCC - DEW Line Cleanup Criteria; specified in the Long-Term Monitoring Plan (LTMP; INAC, 2018) as per Abandoned Military Sites Remediation Protocol (AMSRP; INAC, 2009)

RDL - Refers to laboratory detection limit. 2017 RDL used.

ULA - Upper Limits of Acceptability, calculated using the average + three (3) standard deviations of all available data & only calculated for parameters that had

TABLE F-4

CAM-F
Year 15 2022

Baseline Analytical Results From Landfill Monitoring Samples

Sample #	Area	Field Dup TN	Sample Matrix	Depth (m)	Date Collected	Metals								PCB				F1-F4 PHC			
						Total As (ppm)	Total Cd (ppm)	Total Cr (ppm)	Total Co (ppm)	Total Cu (ppm)	Total Pb (ppm)	Total Ni (ppm)	Total Zn (ppm)	Aroclor 1248 (ppm)	Aroclor 1254 (ppm)	Aroclor 1260 (ppm)	PCB Total (ppm)	F1 (C6-C10)	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)
Soil and Paint CEPA Criteria																	50				
Soil Tier II Criteria [a]						30	5	250	50	100	500	100	500				5 to 50	260	900	800	5600
Soil Tier I Criteria [a]											200						1 to 5				
Units: mg/kg																					
941	NHWL - MW-2	no dup	soil	0	Sep-09	<0.7	<0.9	15	4	12	<10	11	31	<0.1	<0.1	<0.1	<0.1	<10	<20	48	<20
942	NHWL - MW-2		soil	0.3	Sep-09	0.8	<0.9	22	5	15	<10	15	33	<0.1	<0.1	<0.1	<0.1	<10	<20	<20	<20
943	NHWL - MW-3		soil	0	Sep-09	<0.7	<0.9	18	5	16	<10	12	33	<0.1	<0.1	<0.1	<0.1	<10	<20	<20	<20
944	NHWL - MW-3		soil	0.2	Sep-09	<0.7	<0.9	20	7	16	<10	16	50	<0.1	<0.1	<0.1	<0.1	<10	<20	<20	<20
945	NHWL -MW-1		soil	0	Sep-09	<0.7	<0.9	20	4	11	<10	12	30	<0.1	<0.1	<0.1	<0.1	<10	<20	<20	<20
946	NHWL - MW-1		soil	0.3	Sep-09	<0.7	<0.9	16	4	11	<10	10	23	<0.1	<0.1	<0.1	<0.1	<10	<20	28	<20
947	SSDF MW-6		soil	0	Sep-09	<0.7	<0.9	17	4	9	<10	11	29	<0.1	<0.1	<0.1	<0.1	<10	<20	<20	<20
948	SSDF MW-6		soil	0.3	Sep-09	<0.7	<0.9	19	5	14	<10	14	33	<0.1	<0.1	<0.1	<0.1	<10	<20	<20	<20
949	SSDF MW-5		soil	0	Sep-09	<0.7	<0.9	19	4	12	<10	13	33	<0.1	<0.1	<0.1	<0.1	<10	<20	<20	<20
950	SSDF MW-5	951	soil	0.3	Sep-09	<0.7	<0.9	17	4	11	<10	12	29	<0.1	<0.1	<0.1	<0.1	<10	<20	<20	<20
951	SSDF MW-5	950	soil	0.3	Sep-09	<0.7	<0.9	18	4	13	<10	13	31	<0.1	<0.1	<0.1	<0.1	<10	<20	<20	<20
952	SSDF MW-4		soil	0	Sep-16	<0.7	<0.9	17	4	10	<10	12	28	<0.1	<0.1	<0.1	<0.1	<10	<20	<20	<20
953	SSDF MW-4		soil	0.3	Sep-16	<0.7	<0.9	18	4	12	<10	13	29	<0.1	<0.1	<0.1	<0.1	<10	<20	<20	<20

Note:

Analytical results for landfill monitoring samples collected by UMA during construction clean-up in 2007.

Samples collected at installed groundwater monitoring wells

[a] - Specified in the Long-Term Monitoring Plan (LTMP; INAC, 2018) as per Abandoned Military Sites Remediation Protocol (AMSRP; INAC, 2009)

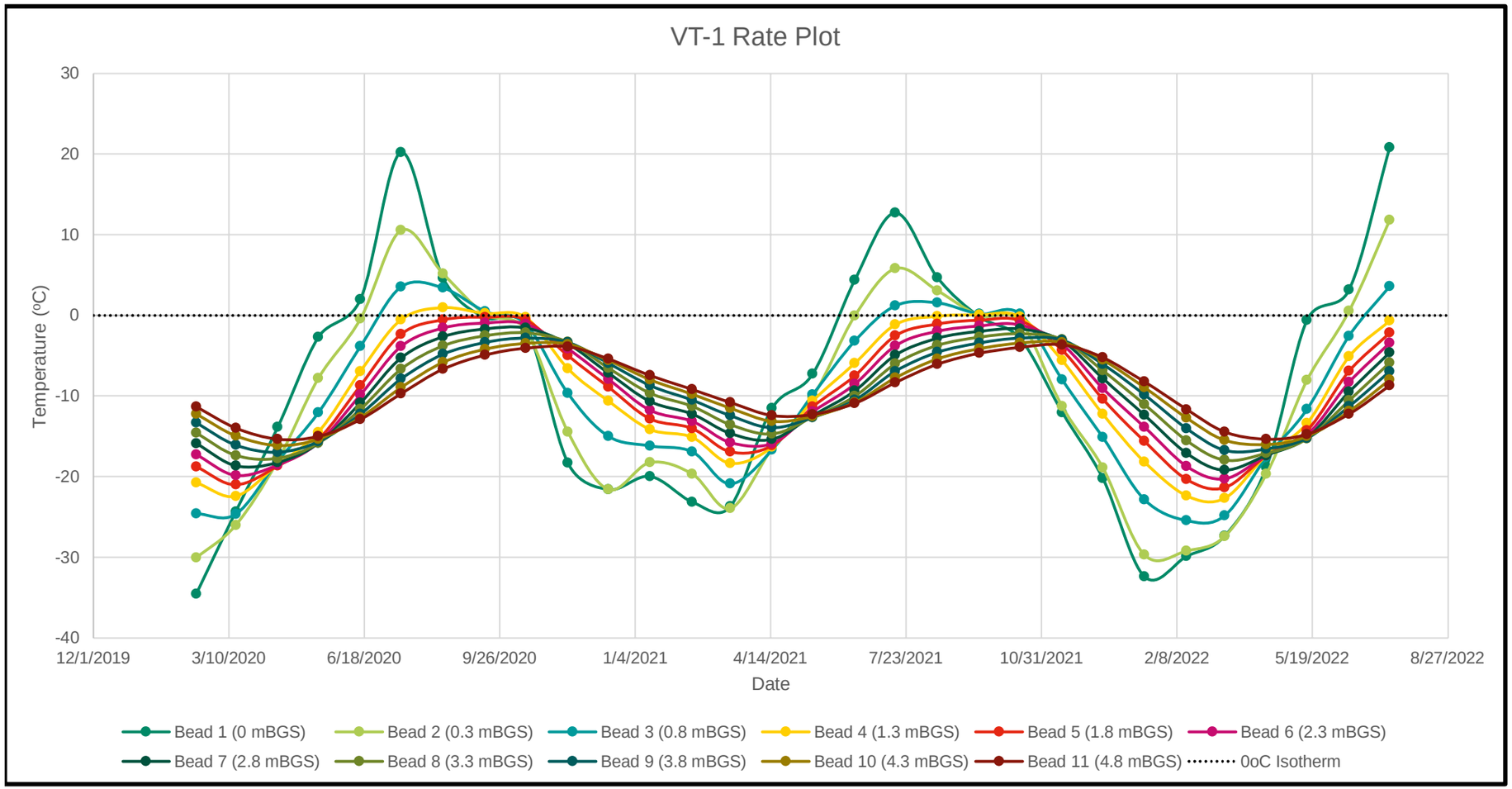
Appendix G

Thermal Monitoring Graphs

FIGURE G-1

CAM-F
Year 15 2022

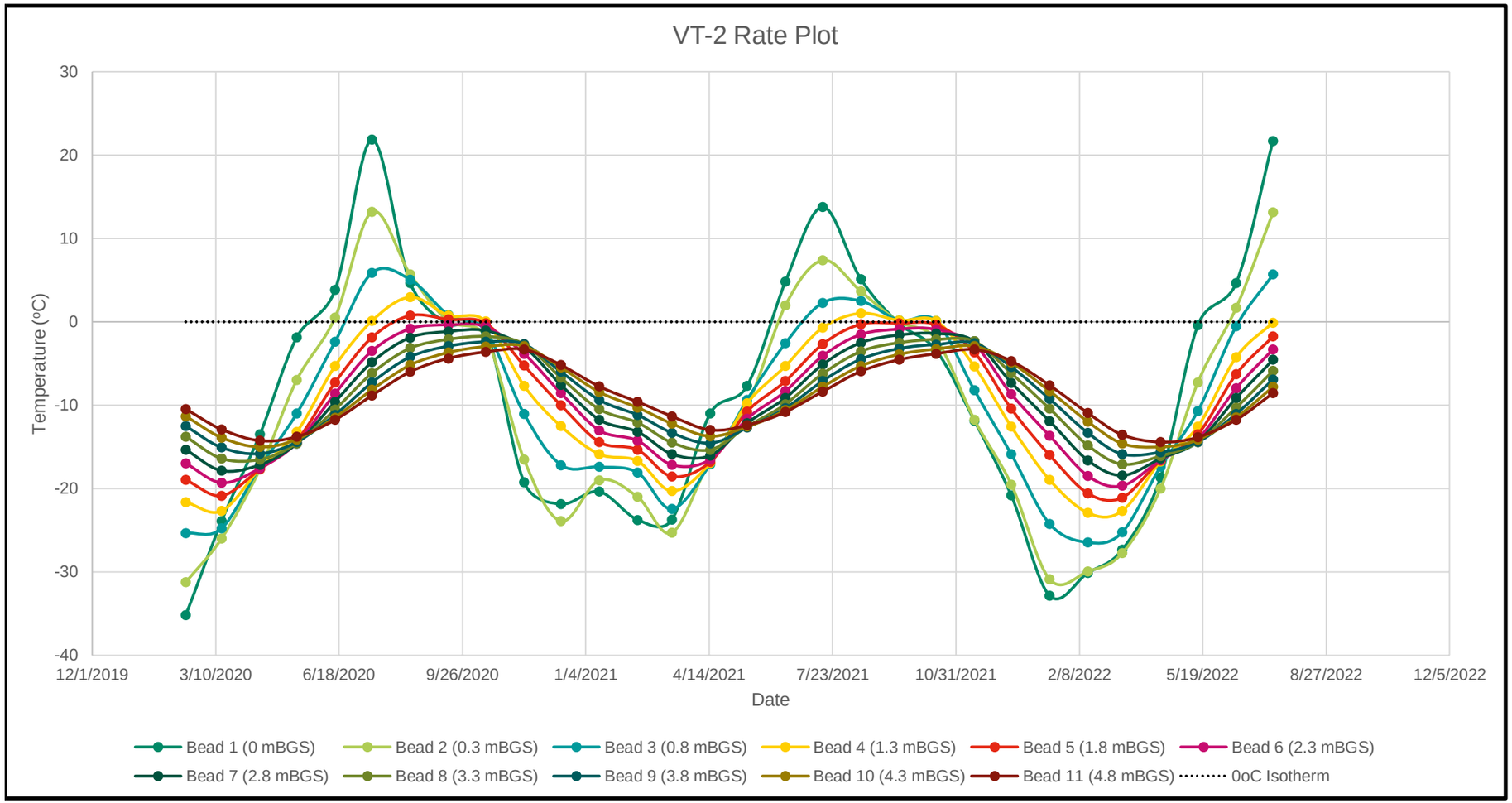
AECOM



Notes:
mBGS = Metres Below Ground Surface

FIGURE G-2

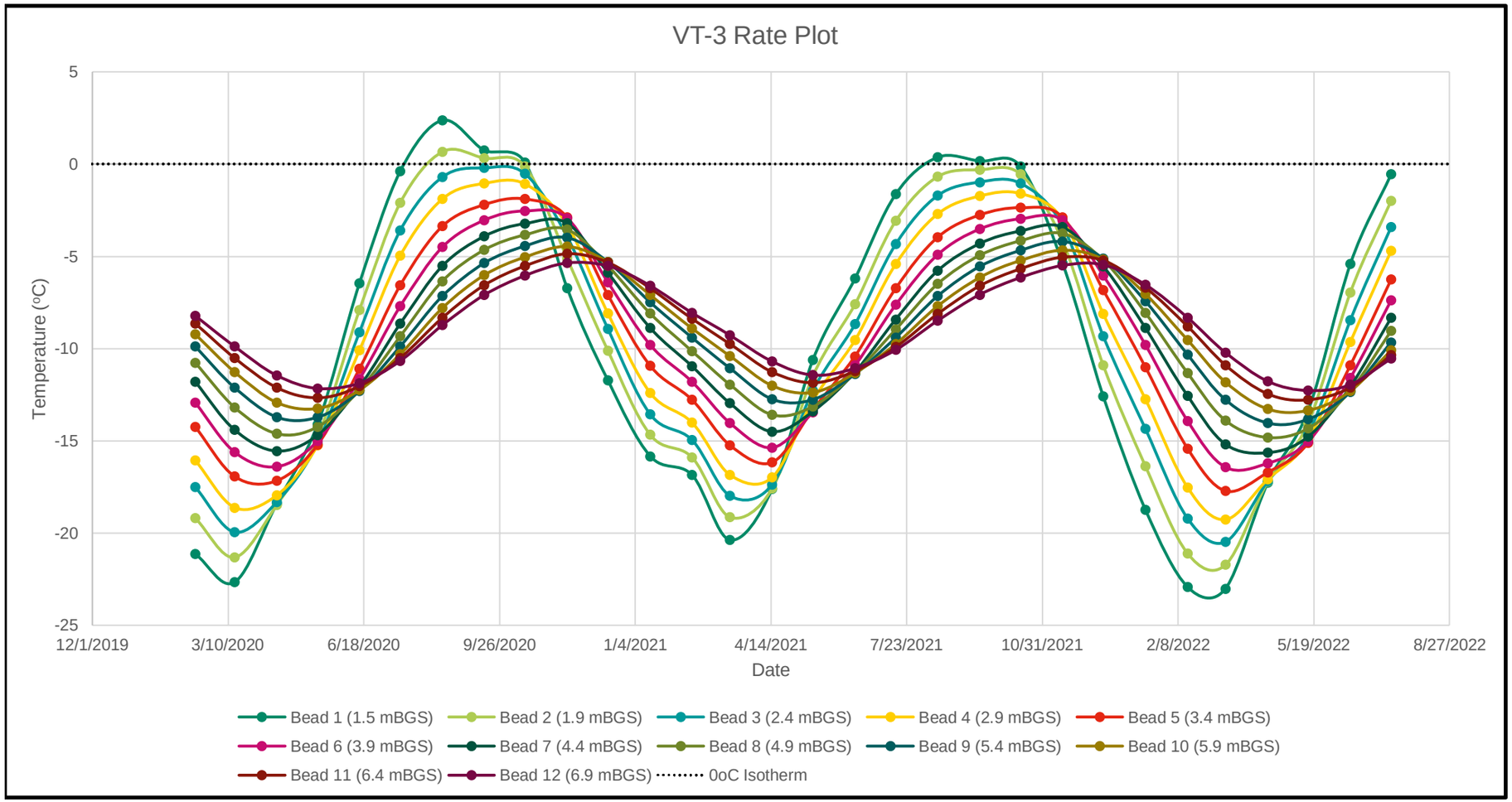
CAM-F
Year 15 2022



Notes:
mBGS = Metres Below Ground Surface

FIGURE G-3

CAM-F
Year 15 2022



Notes:
mBGS = Metres Below Ground Surface

FIGURE G-4

CAM-F
Year 15 2022

AECOM

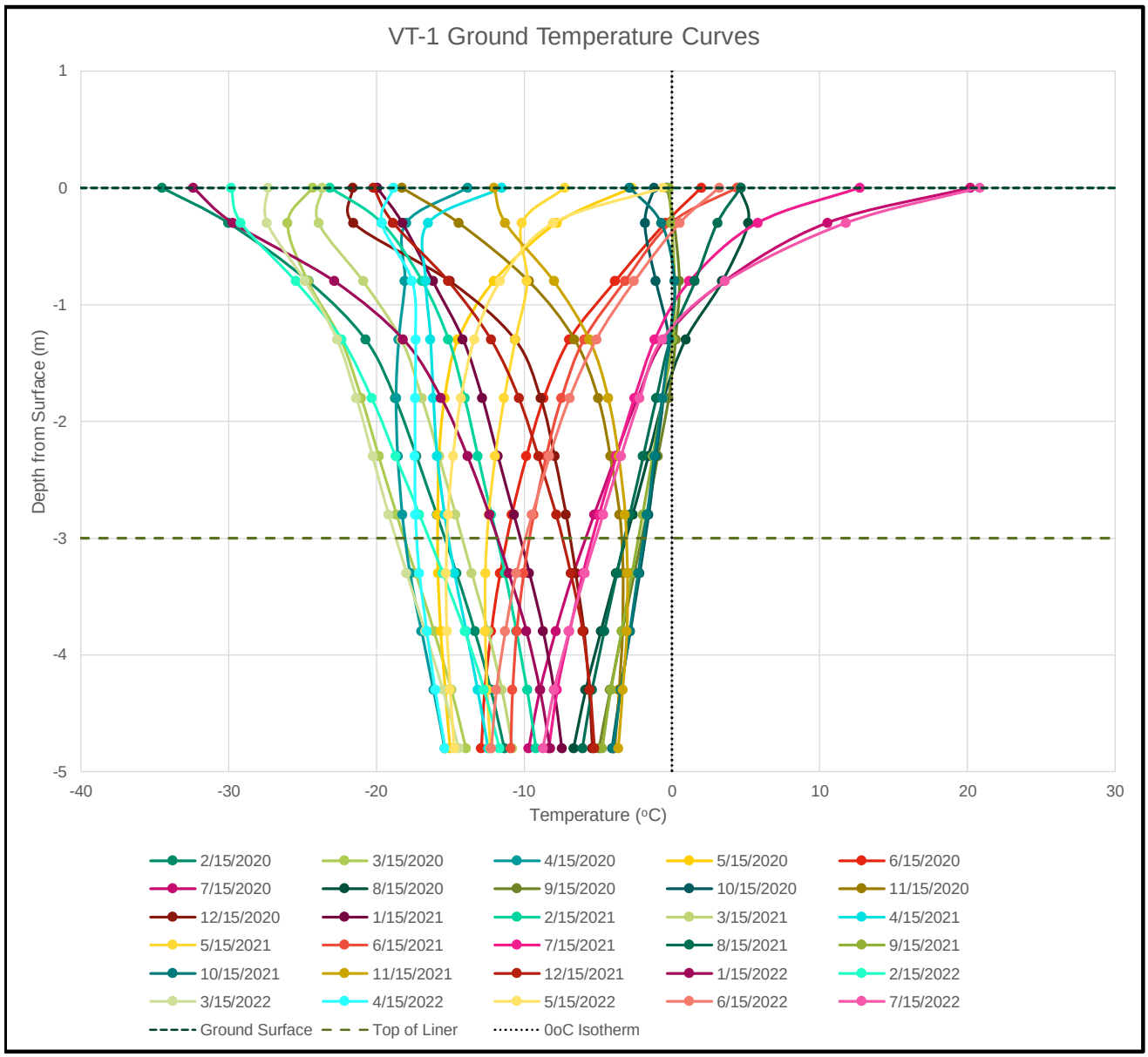


FIGURE G-5

CAM-F
Year 15 2022

AECOM

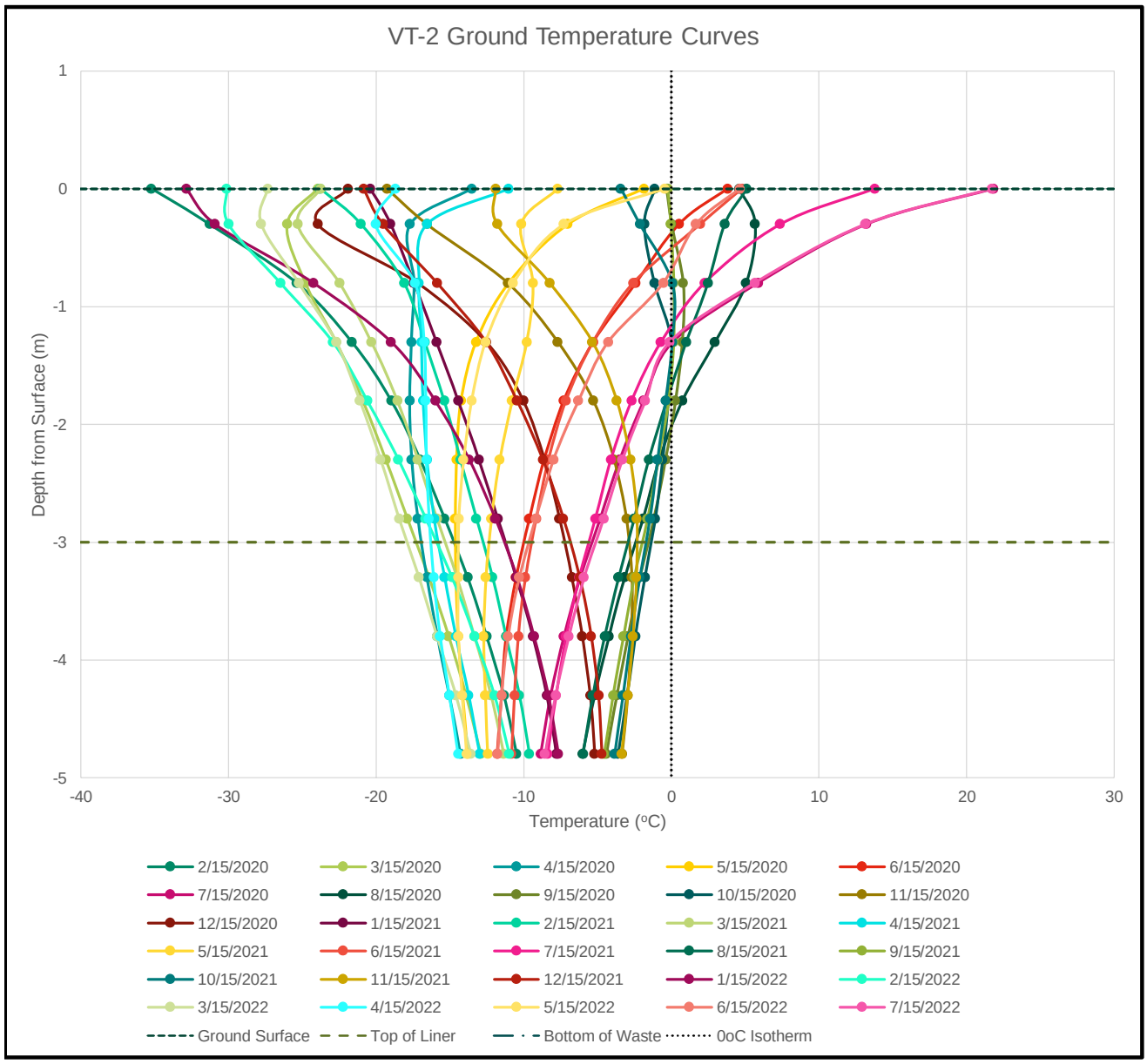
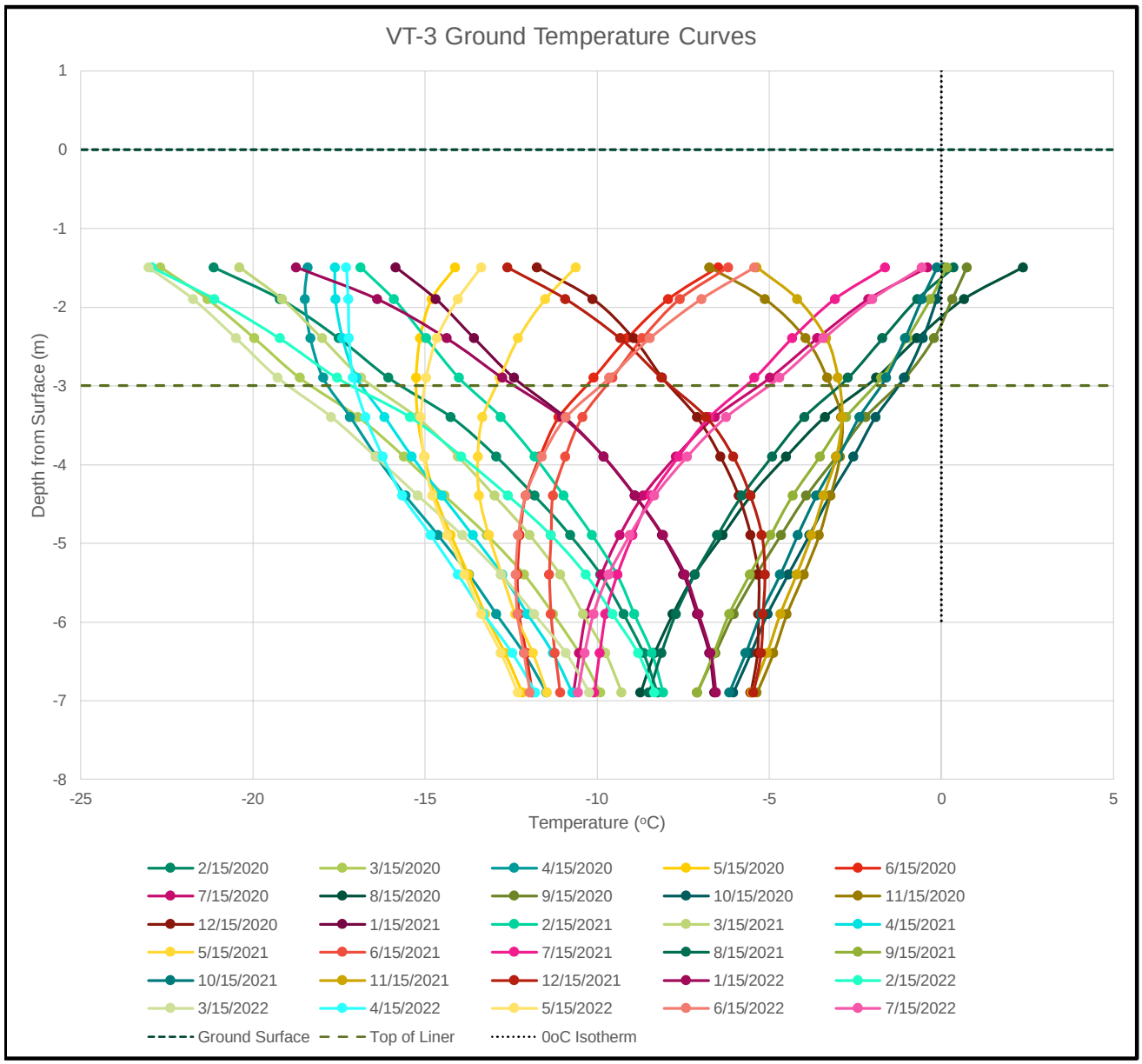


FIGURE G-6

CAM-F
Year 15 2022

AECOM



Appendix H

Thermal Data

Raw data available on USB.

Thermal Monitoring
Field Data

CAM-F

Year 15 2022

AECOM

Thermal Monitoring			
Channel	**Resistance (kΩ)**	**Temperature (°C)**	**Notes**
VT-01			
1	7.919	14.77	
2	10.62	8.63	
3	13.31	4.04	
4	15.97	0.43	
5	17.01	-0.80	
6	17.8	-1.69	
7	18.66	-2.60	
8	20.2	-4.12	
9	21.31	-5.13	
10	22.42	-6.09	
11	23.35	-6.86	
12	Over Limit	-	
13	Over Limit	-	
14	Over Limit	-	
15	Over Limit	-	
16	Over Limit	-	
VT-02			
1	7.421	16.16	
2	10.04	9.79	
3	12.46	5.37	
4	14.56	2.25	
5	16.29	0.04	
6	17.2	-1.02	
7	18.44	-2.37	
8	19.84	-3.77	
9	20.99	-4.85	
10	22.02	-5.75	
11	22.97	-6.55	
12	Over Limit	-	
13	Over Limit	-	
14	Over Limit	-	
15	Over Limit	-	
16	Over Limit	-	

Thermal Monitoring			
Channel	**Resistance (kΩ)**	**Temperature (°C)**	**Notes**
VT-03			
1	15.04	1.61	
2	16.29	0.04	
3	17.2	-1.02	
4	18.23	-2.15	
5	19.87	-3.80	
6	21.33	-5.15	
7	22.52	-6.18	
8	23.51	-6.98	
9	24.49	-7.75	
10	25.32	-8.37	
11	25.94	-8.81	
12	26.54	-9.24	
13	Over Limit	-	
14	Over Limit	-	
15	Over Limit	-	
16	Over Limit	-	
VT-04			
1	15.14	1.48	Unable to download data or perform a complete memory transfer. Batteries changed.
2	16.27	0.06	
3	17.19	-1.01	
4	18.2	-2.12	
5	19.6	-3.54	
6	20.93	-4.79	
7	22.26	-5.96	
8	23.4	-6.90	
9	24.41	-7.69	
10	25.31	-8.36	
11	26.58	-9.26	
12	26.02	-8.87	
13	Over Limit	-	
14	Over Limit	-	
15	Over Limit	-	
16	Over Limit	-	

Appendix I

Laboratory Certificates of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EO2206880**	Page	: 1 of 13
Client	: **AECOM Canada Ltd.**	Laboratory	: Edmonton - Environmental
Contact	: Jessica Stepney	Account Manager	: Pamela Toledo
Address	: 101 - 18817 Stony Plain Rd. NW Edmonton AB Canada T5S 0C2	Address	: 9450 - 17 Avenue NW Edmonton AB Canada T6N 1M9
Telephone	: 780-486-5921	Telephone	: +1 780 413 5227
Project	: 60686962	Date Samples Received	: 24-Aug-2022 14:22
PO	: ----	Date Analysis Commenced	: 24-Aug-2022
C-O-C number	: 20-1009581	Issue Date	: 01-Sep-2022 12:21
Sampler	: ----		
Site	: 2022 Price List - Prairies		
Quote number	: 2022 Price List - Prairies		
No. of samples received	: 11		
No. of samples analysed	: 11		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Alex Drake	Lab Analyst	Inorganics, Edmonton, Alberta
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Daniel Nguyen	Lab Assistant	Inorganics, Edmonton, Alberta
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Joan Wu	Lab Analyst	Metals, Edmonton, Alberta
Kari Mulroy	Lab Supervisor - Environmental	Organics, Edmonton, Alberta
Remy Gatabazi	Lab Analyst	Organics, Edmonton, Alberta
Sobhithan Pillay		Inorganics, Edmonton, Alberta

General Comments

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

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

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

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

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DTC	*Dissolved concentration exceeds total. Results were confirmed by re-analysis.*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS1-SW CORNER	SS2-SOUTHSIDE	SS3-SOUTHSIDE	SS4-EASTSIDE	----
					Client sampling date / time	09-Aug-2022 16:15	09-Aug-2022 16:30	09-Aug-2022 16:45	09-Aug-2022 17:00	----
						EO2206880-008	EO2206880-009	EO2206880-010	EO2206880-011	--------
						Result	Result	Result	Result	----
Physical Tests										
moisture	----	E144	0.25	%		35.0	23.7	28.2	41.9	----
pH (1:2 soil:water)	----	E108	0.10	pH units		8.58	8.58	8.61	8.55	----
Metals										
aluminum	7429-90-5	E440	50	mg/kg		13000	8220	11000	9820	----
antimony	7440-36-0	E440	0.10	mg/kg		<0.10	<0.10	<0.10	<0.10	----
arsenic	7440-38-2	E440	0.10	mg/kg		1.36	0.94	1.10	1.30	----
barium	7440-39-3	E440	0.50	mg/kg		45.9	34.6	42.4	41.9	----
beryllium	7440-41-7	E440	0.10	mg/kg		0.58	0.29	0.44	0.36	----
bismuth	7440-69-9	E440	0.20	mg/kg		<0.20	<0.20	<0.20	<0.20	----
boron	7440-42-8	E440	5.0	mg/kg		8.4	5.7	6.7	6.6	----
cadmium	7440-43-9	E440	0.020	mg/kg		0.053	0.028	0.039	0.041	----
calcium	7440-70-2	E440	50	mg/kg		42200	42600	37400	66800	----
chromium	7440-47-3	E440	0.50	mg/kg		32.6	28.4	30.2	37.5	----
cobalt	7440-48-4	E440	0.10	mg/kg		6.51	5.00	5.85	5.66	----
copper	7440-50-8	E440	0.50	mg/kg		15.8	11.0	14.7	13.3	----
iron	7439-89-6	E440	50	mg/kg		17200	13000	15300	15600	----
lead	7439-92-1	E440	0.50	mg/kg		12.5	5.66	8.18	7.58	----
lithium	7439-93-2	E440	2.0	mg/kg		25.5	15.8	21.6	19.3	----
magnesium	7439-95-4	E440	20	mg/kg		15800	12200	13300	13300	----
manganese	7439-96-5	E440	1.0	mg/kg		264	203	228	239	----
mercury	7439-97-6	E510	0.0050	mg/kg		0.0056	<0.0050	0.0051	<0.0050	----
molybdenum	7439-98-7	E440	0.10	mg/kg		0.34	0.25	0.26	0.40	----
nickel	7440-02-0	E440	0.50	mg/kg		19.0	16.3	18.2	20.6	----
phosphorus	7723-14-0	E440	50	mg/kg		357	359	331	360	----
potassium	7440-09-7	E440	100	mg/kg		2680	2000	2430	2340	----
selenium	7782-49-2	E440	0.20	mg/kg		<0.20	<0.20	<0.20	<0.20	----
silver	7440-22-4	E440	0.10	mg/kg		<0.10	<0.10	<0.10	<0.10	----
sodium	7440-23-5	E440	50	mg/kg		244	170	214	241	----
strontium	7440-24-6	E440	0.50	mg/kg		30.9	29.6	27.0	42.8	----
sulfur	7704-34-9	E440	1000	mg/kg		<1000	<1000	<1000	<1000	----

Analytical Results

Sub-Matrix: Soil (Matrix: Soil/Solid)					Client sample ID	SS1-SW CORNER	SS2-SOUTHSIDE	SS3-SOUTHSIDE	SS4-EASTSIDE	----
					Client sampling date / time	09-Aug-2022 16:15	09-Aug-2022 16:30	09-Aug-2022 16:45	09-Aug-2022 17:00	----
Analyte	CAS Number	Method	LOR	Unit		EO2206880-008	EO2206880-009	EO2206880-010	EO2206880-011	--------
						Result	Result	Result	Result	----
Metals										
thallium	7440-28-0	E440	0.050	mg/kg		0.139	0.093	0.120	0.116	----
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	----
titanium	7440-32-6	E440	1.0	mg/kg		709	644	695	728	----
tungsten	7440-33-7	E440	0.50	mg/kg		<0.50	<0.50	<0.50	<0.50	----
uranium	7440-61-1	E440	0.050	mg/kg		2.64	1.82	2.64	2.19	----
vanadium	7440-62-2	E440	0.20	mg/kg		25.0	19.4	23.0	22.2	----
zinc	7440-66-6	E440	2.0	mg/kg		39.9	28.8	34.5	34.2	----
zirconium	7440-67-7	E440	1.0	mg/kg		6.4	5.2	5.4	5.4	----
Volatile Organic Compounds [BTEXS+MTBE]										
benzene	71-43-2	E611A	0.0050	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	----
ethylbenzene	100-41-4	E611A	0.015	mg/kg		<0.015	<0.015	<0.015	<0.015	----
toluene	108-88-3	E611A	0.050	mg/kg		<0.050	<0.050	<0.050	<0.050	----
xylene, m+p-	179601-23-1	E611A	0.050	mg/kg		<0.050	<0.050	<0.050	<0.050	----
xylene, o-	95-47-6	E611A	0.050	mg/kg		<0.050	<0.050	<0.050	<0.050	----
xylenes, total	1330-20-7	E611A	0.075	mg/kg		<0.075	<0.075	<0.075	<0.075	----
BTEX, total	----	E611A	0.10	mg/kg		<0.10	<0.10	<0.10	<0.10	----
Volatile Organic Compounds Surrogates										
bromofluorobenzene, 4-	460-00-4	E611A	0.10	%		80.5	119	90.8	75.1	----
difluorobenzene, 1,4-	540-36-3	E611A	0.10	%		87.2	129	94.0	82.8	----
Hydrocarbons										
F1 (C6-C10)	----	E581.F1	5.0	mg/kg		<5.0	<5.0	<5.0	<5.0	----
F1-BTEX	----	EC580	5.0	mg/kg		<5.0	<5.0	<5.0	<5.0	----
F2 (C10-C16)	----	E601.SG	25	mg/kg		<25	<25	<25	<25	----
F3 (C16-C34)	----	E601.SG	50	mg/kg		<50	<50	<50	<50	----
F4 (C34-C50)	----	E601.SG	50	mg/kg		<50	<50	<50	<50	----
chromatogram to baseline at nC50	n/a	E601.SG	-	-		Yes	Yes	Yes	Yes	----
hydrocarbons, total (C6-C50)	----	EC581	80	mg/kg		<80	<80	<80	<80	----
Hydrocarbons Surrogates										
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601.SG	1.0	%		80.6	83.2	82.7	81.4	----
dichlorotoluene, 3,4-	97-75-0	E581.F1	1.0	%		84.4	86.5	95.8	70.8	----
Polychlorinated Biphenyls										

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: SS1-SW CORNER	SS2-SOUTHSIDE	SS3-SOUTHSIDE	SS4-EASTSIDE	----
					Client sampling date / time: 09-Aug-2022 16:15	09-Aug-2022 16:30	09-Aug-2022 16:45	09-Aug-2022 17:00	----
					EO2206880-008	EO2206880-009	EO2206880-010	EO2206880-011	--------
					Result	Result	Result	Result	----
Polychlorinated Biphenyls									
Aroclor 1016	12674-11-2	E685	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	----
Aroclor 1221	11104-28-2	E685	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	----
Aroclor 1232	11141-16-5	E685	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	----
Aroclor 1242	53469-21-9	E685	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	----
Aroclor 1248	12672-29-6	E685	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	----
Aroclor 1254	11097-69-1	E685	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	----
Aroclor 1260	11096-82-5	E685	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	----
Aroclor 1262	37324-23-5	E685	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	----
Aroclor 1268	11100-14-4	E685	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	----
polychlorinated biphenyls [PCBs], total	----	E685	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	----
Polychlorinated Biphenyls Surrogates									
decachlorobiphenyl	2051-24-3	E685	0.01	%	66.0	69.0	69.0	74.5	----

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

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW-1	MW-2	MW-4	MW-5	MW-6
					Client sampling date / time	09-Aug-2022 14:00	09-Aug-2022 14:45	08-Aug-2022 13:00	08-Aug-2022 13:45	08-Aug-2022 14:30
						EO2206880-001	EO2206880-002	EO2206880-003	EO2206880-004	EO2206880-005
						Result	Result	Result	Result	Result
Physical Tests										
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		407	197	509	847	605
solids, total dissolved [TDS]	----	E162	10	mg/L		446	268	704	1180	824
solids, total suspended [TSS]	----	E160	3.0	mg/L		104	60.0	<3.0	<3.0	58.4
conductivity	----	E100	2.0	µS/cm		745	399	964	1480	1060
pH	----	E108	0.10	pH units		8.41	8.38	8.38	8.37	8.39
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L		399	244	416	268	262
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L		7.8	3.4	6.8	4.0	4.8
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	2.0	mg/L		340	206	353	226	223
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		476	244	658	1100	760
Anions and Nutrients										
chloride	16887-00-6	E235.Cl	0.50	mg/L		10.5	1.84	8.73	34.7	17.6
fluoride	16984-48-8	E235.F	0.020	mg/L		0.595	0.151	0.469	0.554	0.601
nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L		1.63	1.78	0.663	0.534	0.328
nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		93.4	20.1	225	616	381
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		1.63	1.78	0.663	0.534	0.328
Ion Balance										
anion sum	----	EC101	0.10	meq/L		9.18	4.72	12.0	18.4	12.9
cation sum	----	EC101	0.10	meq/L		9.04	4.50	12.1	18.9	13.7
ion balance (APHA)	----	EC101	0.010	%		0.768	2.39	0.415	1.34	3.01
ion balance (cations/anions)	----	EC101	0.010	%		98.5	95.3	101	103	106
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.557	2.68	0.135	0.0099	1.58
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	0.00024	0.00016	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00048	0.00071	0.00030	0.00041	0.00056
barium, total	7440-39-3	E420	0.00010	mg/L		0.0160	0.0480	0.0144	0.0215	0.0176
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	0.000159	<0.000020	<0.000020	0.000092
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	0.000067	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		0.045	0.472	0.064	0.066	0.062
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000184	0.0000280	0.0000383	0.0000117	0.0000238

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW-1	MW-2	MW-4	MW-5	MW-6
					Client sampling date / time	09-Aug-2022 14:00	09-Aug-2022 14:45	08-Aug-2022 13:00	08-Aug-2022 13:45	08-Aug-2022 14:30
						EO2206880-001	EO2206880-002	EO2206880-003	EO2206880-004	EO2206880-005
						Result	Result	Result	Result	Result
Total Metals										
calcium, total	7440-70-2	E420	0.050	mg/L		64.3	56.2	63.4	92.2	78.2
cesium, total	7440-46-2	E420	0.000010	mg/L		0.000038	0.000236	0.000022	0.000021	0.000103
chromium, total	7440-47-3	E420	0.00050	mg/L		0.00911	0.00552	0.00072	<0.00050	0.00851
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.0700	0.00165	0.00089	0.00032	0.00071
copper, total	7440-50-8	E420	0.00050	mg/L		0.0163	0.0154	0.00581	0.00286	0.00543
iron, total	7439-89-6	E420	0.010	mg/L		0.653	2.65	0.198	0.023	0.946
lead, total	7439-92-1	E420	0.000050	mg/L		0.000354	0.00304	0.000126	<0.000050	0.00191
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0342	0.0088	0.0538	0.0716	0.0769
magnesium, total	7439-95-4	E420	0.0050	mg/L		52.4	16.2	72.1	142	99.9
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0372	0.0570	0.0245	0.0105	0.0373
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00291	0.00103	0.00896	0.00559	0.00964
nickel, total	7440-02-0	E420	0.00050	mg/L		0.0188	0.00648	0.00460	0.00306	0.00847
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.050	mg/L		8.26	4.78	9.14	11.1	9.76
rubidium, total	7440-17-7	E420	0.00020	mg/L		0.00202	0.00572	0.00154	0.00110	0.00221
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000248	0.000089	0.000434	0.000124	0.00120
silicon, total	7440-21-3	E420	0.10	mg/L		3.77	7.79	3.08	2.86	6.14
silver, total	7440-22-4	E420	0.000010	mg/L		0.000217	0.000092	0.000038	<0.000010	0.000093
sodium, total	7440-23-5	E420	0.050	mg/L		14.6	9.79	35.4	39.8	29.2
strontium, total	7440-24-6	E420	0.00020	mg/L		0.238	0.0743	0.232	0.416	0.323
sulfur, total	7704-34-9	E420	0.50	mg/L		29.6	7.94	67.8	222	150
tellurium, total	13494-80-9	E420	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, total	7440-28-0	E420	0.000010	mg/L		0.000011	0.000033	0.000025	0.000011	0.000022
thorium, total	7440-29-1	E420	0.00010	mg/L		0.00020	0.00180	0.00034	0.00013	0.00135
tin, total	7440-31-5	E420	0.00010	mg/L		0.00012	0.00018	<0.00010	<0.00010	0.00012
titanium, total	7440-32-6	E420	0.00030	mg/L		0.0405	0.0845	0.00726	<0.00030	0.0331
tungsten, total	7440-33-7	E420	0.00010	mg/L		0.114	0.0280	0.254	0.0402	0.117
uranium, total	7440-61-1	E420	0.000010	mg/L		0.0751	0.00884	0.0632	0.218	0.164
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00209	0.00399	0.00094	0.00074	0.00200
zinc, total	7440-66-6	E420	0.0030	mg/L		0.171	0.427	0.0277	0.0126	0.352
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00057	0.00058	0.00028	0.00036	0.00095

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW-1	MW-2	MW-4	MW-5	MW-6
					Client sampling date / time	09-Aug-2022 14:00	09-Aug-2022 14:45	08-Aug-2022 13:00	08-Aug-2022 13:45	08-Aug-2022 14:30
						EO2206880-001	EO2206880-002	EO2206880-003	EO2206880-004	EO2206880-005
						Result	Result	Result	Result	Result
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0082	0.0140	0.0027	0.0062	0.0053
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	0.00026	0.00017	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00025	0.00016	0.00019	0.00034	0.00027
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0126	0.0329	0.0142	0.0223	0.0128
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.050	0.477	0.070	0.070	0.060
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000133	0.0000098	0.0000130	0.0000104	0.0000115
calcium, dissolved	7440-70-2	E421	0.050	mg/L		71.4	54.6	75.1	105	79.2
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		<0.000010	<0.000010	0.000010	0.000023	0.000015
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	0.00138	<0.00050	<0.00050	<0.00050
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.0507	0.00036	0.00091	0.00032	0.00030
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00683	0.00868	0.00462	0.00278	0.00212
iron, dissolved	7439-89-6	E421	0.030	mg/L		<0.030	<0.030	<0.030	<0.030	<0.030
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	0.000091
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0392	0.0057	0.0629	0.0818	0.0741
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		55.6	14.8	78.1	142	99.0
manganese, dissolved	7439-96-5	E421	0.00500	mg/L		0.0188	<0.00500	0.0265	0.0111	0.0227
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00298	0.00104	0.00956	0.00593	0.00898
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00840	0.00236	0.00455	0.00305	0.00234
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.050	mg/L		8.74	4.42	9.97	11.4	9.99
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00110	0.00070	0.00131	0.00110	0.00057
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000290	0.000085	0.000392	0.000182	0.00106
silicon, dissolved	7440-21-3	E421	0.050	mg/L		3.19	2.23	2.73	2.82	2.68
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		15.6	10.2	38.9	39.9	30.1
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.256	0.0680	0.257	0.438	0.304
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		31.2	7.76	82.4	222	156
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	0.000013	0.000014	<0.000010

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW-1	MW-2	MW-4	MW-5	MW-6
					Client sampling date / time	09-Aug-2022 14:00	09-Aug-2022 14:45	08-Aug-2022 13:00	08-Aug-2022 13:45	08-Aug-2022 14:30
						EO2206880-001	EO2206880-002	EO2206880-003	EO2206880-004	EO2206880-005
						Result	Result	Result	Result	Result
Dissolved Metals										
thorium, dissolved	7440-29-1	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	0.00040	<0.00030	<0.00030	<0.00030
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L		0.105	0.0375	0.288	0.0462	0.0942
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.0795	0.00684	0.0716	0.234	0.141
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00051	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0844	0.0629	0.0157	0.0122	0.144
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00037	0.00046	0.00022	0.00040	<0.00020
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

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

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: QA/QC	SW1-SOUTH SIDE	----	----	----
					Client sampling date / time: 08-Aug-2022	09-Aug-2022 16:00	----	----	----
					EO2206880-006	EO2206880-007	--------	--------	--------
					Result	Result	----	----	----
Physical Tests									
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	493	259	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	622	314	----	----	----
solids, total suspended [TSS]	----	E160	3.0	mg/L	4.4	<3.0	----	----	----
conductivity	----	E100	2.0	µS/cm	1030	481	----	----	----
pH	----	E108	0.10	pH units	8.41	8.52	----	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	393	286	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	8.2	9.2	----	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	336	250	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L	691	298	----	----	----
Anions and Nutrients									
chloride	16887-00-6	E235.Cl	0.50	mg/L	9.58	1.07	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.481	0.050	----	----	----
nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	0.590	1.43	----	----	----
nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	274	31.0	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L	0.590	1.43	----	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	12.8	5.78	----	----	----
cation sum	----	EC101	0.10	meq/L	11.8	5.56	----	----	----
ion balance (APHA)	----	EC101	0.010	%	4.06	1.94	----	----	----
ion balance (cations/anions)	----	EC101	0.010	%	92.2	96.2	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.130	0.0815	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00016	<0.00010	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00030	0.00027	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0146	0.0181	----	----	----
beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	0.062	<0.010	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000166	0.0000102	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: QA/QC	SW1-SOUTH SIDE	----	----	----
					Client sampling date / time: 08-Aug-2022	09-Aug-2022 16:00	----	----	----
					EO2206880-006	EO2206880-007	--------	--------	--------
					Result	Result	----	----	----
Total Metals									
calcium, total	7440-70-2	E420	0.050	mg/L	62.7	65.1	----	----	----
cesium, total	7440-46-2	E420	0.000010	mg/L	0.000019	0.000010	----	----	----
chromium, total	7440-47-3	E420	0.00050	mg/L	0.00067	<0.00050	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00087	<0.00010	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	0.00586	0.00166 RRV	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	0.195	0.090	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	0.000136	0.000086	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0540	0.0044	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	70.1	20.0	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.0239	0.00207	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00872	0.00780	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00456	0.00065	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	9.30	2.51	----	----	----
rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00152	0.00035	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L	0.000414	0.000120	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	3.12	3.52	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	0.000044	<0.000010	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L	35.2	7.60	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L	0.226	0.0689	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	68.0	11.4	----	----	----
tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	0.000012	<0.000010	----	----	----
thorium, total	7440-29-1	E420	0.00010	mg/L	0.00024	<0.00010	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	0.00727	0.00410	----	----	----
tungsten, total	7440-33-7	E420	0.00010	mg/L	0.259	0.00045	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.0637	0.0378	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00094	0.00102	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	0.0212	<0.0030	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L	0.00028	0.00053	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	QA/QC	SW1-SOUTH SIDE	----	----	----
					Client sampling date / time	08-Aug-2022	09-Aug-2022 16:00	----	----	----
						EO2206880-006	EO2206880-007	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0034	0.0036	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00015	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00020	0.00021	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0141	0.0188	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.068	0.010	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000168	<0.0000050	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		69.6	70.1	----	----	----
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	<0.00050	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00086	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00528	0.00270 DTC	----	----	----
iron, dissolved	7439-89-6	E421	0.030	mg/L		<0.030	<0.030	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0591	0.0041	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		77.5	20.3	----	----	----
manganese, dissolved	7439-96-5	E421	0.00500	mg/L		0.0257	<0.00500	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00886	0.00773	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00443	0.00057	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		9.83	2.53	----	----	----
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00126	<0.00020	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000469	0.000146	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.70	3.37	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		38.5	7.64	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.244	0.0713	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		82.8	11.0	----	----	----
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		0.000010	<0.000010	----	----	----

Analytical Results

Sub-Matrix: **Water** (Matrix: **Water**)					Client sample ID	QA/QC	SW1-SOUTH SIDE	----	----	----
					Client sampling date / time	08-Aug-2022	09-Aug-2022 16:00	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**EO2206880-006**	**EO2206880-007**	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
thorium, dissolved	7440-29-1	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	----	----	----
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L		0.269	<0.00010	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.0659	0.0342	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0160	<0.0010	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00021	0.00077	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **EO2206880**	Page	: 1 of 22
Client	: **AECOM Canada Ltd.**	Laboratory	: Edmonton - Environmental
Contact	: Jessica Stepney	Account Manager	: Pamela Toledo
Address	: 101 - 18817 Stony Plain Rd. NW Edmonton AB Canada T5S 0C2	Address	: 9450 - 17 Avenue NW Edmonton, Alberta Canada T6N 1M9
Telephone	: 780-486-5921	Telephone	: +1 780 413 5227
Project	: 60686962	Date Samples Received	: 24-Aug-2022 14:22
PO	: ----	Issue Date	: 01-Sep-2022 12:22
C-O-C number	: 20-1009581		
Sampler	: ----		
Site	: 2022 Price List - Prairies		
Quote number	: 2022 Price List - Prairies		
No. of samples received	: 11		
No. of samples analysed	: 11		

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

Key

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

Workorder Comments

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

Summary of Outliers

Outliers : Quality Control Samples

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

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Soil/Solid**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial SS1-SW CORNER	E581.F1	09-Aug-2022	26-Aug-2022	----	----		28-Aug-2022	40 days	19 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial SS2-SOUTHSIDE	E581.F1	09-Aug-2022	26-Aug-2022	----	----		28-Aug-2022	40 days	19 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial SS3-SOUTHSIDE	E581.F1	09-Aug-2022	26-Aug-2022	----	----		28-Aug-2022	40 days	19 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial SS4-EASTSIDE	E581.F1	09-Aug-2022	26-Aug-2022	----	----		28-Aug-2022	40 days	19 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID										
Glass soil jar/Teflon lined cap SS1-SW CORNER	E601.SG	09-Aug-2022	25-Aug-2022	14 days	16 days	× EHTR	26-Aug-2022	40 days	1 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID										
Glass soil jar/Teflon lined cap SS2-SOUTHSIDE	E601.SG	09-Aug-2022	25-Aug-2022	14 days	16 days	× EHTR	26-Aug-2022	40 days	1 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID										
Glass soil jar/Teflon lined cap SS3-SOUTHSIDE	E601.SG	09-Aug-2022	25-Aug-2022	14 days	16 days	× EHTR	26-Aug-2022	40 days	1 days	✓

Matrix: **Soil/Solid**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID										
Glass soil jar/Teflon lined cap										
SS4-EASTSIDE	E601.SG	09-Aug-2022	25-Aug-2022	14 days	16 days	× EHTR	26-Aug-2022	40 days	1 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
SS1-SW CORNER	E510	09-Aug-2022	31-Aug-2022	----	----		01-Sep-2022	28 days	23 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
SS2-SOUTHSIDE	E510	09-Aug-2022	31-Aug-2022	----	----		01-Sep-2022	28 days	23 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
SS3-SOUTHSIDE	E510	09-Aug-2022	31-Aug-2022	----	----		01-Sep-2022	28 days	23 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
SS4-EASTSIDE	E510	09-Aug-2022	31-Aug-2022	----	----		01-Sep-2022	28 days	23 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
SS1-SW CORNER	E440	09-Aug-2022	31-Aug-2022	----	----		31-Aug-2022	180 days	22 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
SS2-SOUTHSIDE	E440	09-Aug-2022	31-Aug-2022	----	----		31-Aug-2022	180 days	22 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
SS3-SOUTHSIDE	E440	09-Aug-2022	31-Aug-2022	----	----		31-Aug-2022	180 days	22 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
SS4-EASTSIDE	E440	09-Aug-2022	31-Aug-2022	----	----		31-Aug-2022	180 days	22 days	✓

Matrix: **Soil/Solid**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
SS1-SW CORNER	E144	09-Aug-2022	----	----	----		25-Aug-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
SS2-SOUTHSIDE	E144	09-Aug-2022	----	----	----		25-Aug-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
SS3-SOUTHSIDE	E144	09-Aug-2022	----	----	----		25-Aug-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
SS4-EASTSIDE	E144	09-Aug-2022	----	----	----		25-Aug-2022	----	----	
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
SS1-SW CORNER	E108	09-Aug-2022	31-Aug-2022	----	----		31-Aug-2022	30 days	22 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
SS2-SOUTHSIDE	E108	09-Aug-2022	31-Aug-2022	----	----		31-Aug-2022	30 days	22 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
SS3-SOUTHSIDE	E108	09-Aug-2022	31-Aug-2022	----	----		31-Aug-2022	30 days	22 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
SS4-EASTSIDE	E108	09-Aug-2022	31-Aug-2022	----	----		31-Aug-2022	30 days	22 days	✓
Polychlorinated Biphenyls : PCB Aroclors by GC-ECD										
Glass soil jar/Teflon lined cap										
SS1-SW CORNER	E685	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	40 days	0 days	✓

Matrix: **Soil/Solid**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Polychlorinated Biphenyls : PCB Aroclors by GC-ECD										
Glass soil jar/Teflon lined cap										
SS2-SOUTHSIDE	E685	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	40 days	0 days	✓
Polychlorinated Biphenyls : PCB Aroclors by GC-ECD										
Glass soil jar/Teflon lined cap										
SS3-SOUTHSIDE	E685	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	40 days	0 days	✓
Polychlorinated Biphenyls : PCB Aroclors by GC-ECD										
Glass soil jar/Teflon lined cap										
SS4-EASTSIDE	E685	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	40 days	0 days	✓
Volatile Organic Compounds [BTEXS+MTBE] : BTEX by Headspace GC-MS										
Glass soil methanol vial										
SS1-SW CORNER	E611A	09-Aug-2022	26-Aug-2022	----	----		28-Aug-2022	40 days	19 days	✓
Volatile Organic Compounds [BTEXS+MTBE] : BTEX by Headspace GC-MS										
Glass soil methanol vial										
SS2-SOUTHSIDE	E611A	09-Aug-2022	26-Aug-2022	----	----		28-Aug-2022	40 days	19 days	✓
Volatile Organic Compounds [BTEXS+MTBE] : BTEX by Headspace GC-MS										
Glass soil methanol vial										
SS3-SOUTHSIDE	E611A	09-Aug-2022	26-Aug-2022	----	----		28-Aug-2022	40 days	19 days	✓
Volatile Organic Compounds [BTEXS+MTBE] : BTEX by Headspace GC-MS										
Glass soil methanol vial										
SS4-EASTSIDE	E611A	09-Aug-2022	26-Aug-2022	----	----		28-Aug-2022	40 days	19 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC										
HDPE										
MW-1	E235.Cl	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	16 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC										
HDPE MW-2	E235.Cl	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	16 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE SW1-SOUTH SIDE	E235.Cl	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	16 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE MW-4	E235.Cl	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE MW-5	E235.Cl	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE MW-6	E235.Cl	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE QA/QC	E235.Cl	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW-1	E235.F	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	16 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW-2	E235.F	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	16 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE SW1-SOUTH SIDE	E235.F	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	16 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW-4	E235.F	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW-5	E235.F	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW-6	E235.F	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE QA/QC	E235.F	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE MW-1	E235.NO3	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	16 days	✖ EHTR-FM
Anions and Nutrients : Nitrate in Water by IC										
HDPE MW-2	E235.NO3	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	16 days	✖ EHTR-FM
Anions and Nutrients : Nitrate in Water by IC										
HDPE SW1-SOUTH SIDE	E235.NO3	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	16 days	✖ EHTR-FM
Anions and Nutrients : Nitrate in Water by IC										
HDPE MW-4	E235.NO3	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	17 days	✖ EHTR-FM
Anions and Nutrients : Nitrate in Water by IC										
HDPE MW-5	E235.NO3	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	17 days	✖ EHTR-FM

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC										
HDPE MW-6	E235.NO3	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	17 days	× EHTR-FM
Anions and Nutrients : Nitrate in Water by IC										
HDPE QA/QC	E235.NO3	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	17 days	× EHTR-FM
Anions and Nutrients : Nitrite in Water by IC										
HDPE MW-1	E235.NO2	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	16 days	× EHTR-FM
Anions and Nutrients : Nitrite in Water by IC										
HDPE MW-2	E235.NO2	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	16 days	× EHTR-FM
Anions and Nutrients : Nitrite in Water by IC										
HDPE SW1-SOUTH SIDE	E235.NO2	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	16 days	× EHTR-FM
Anions and Nutrients : Nitrite in Water by IC										
HDPE MW-4	E235.NO2	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	17 days	× EHTR-FM
Anions and Nutrients : Nitrite in Water by IC										
HDPE MW-5	E235.NO2	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	17 days	× EHTR-FM
Anions and Nutrients : Nitrite in Water by IC										
HDPE MW-6	E235.NO2	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	17 days	× EHTR-FM
Anions and Nutrients : Nitrite in Water by IC										
HDPE QA/QC	E235.NO2	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	3 days	17 days	× EHTR-FM

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW-1	E235.SO4	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	16 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW-2	E235.SO4	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	16 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE SW1-SOUTH SIDE	E235.SO4	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	16 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW-4	E235.SO4	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW-5	E235.SO4	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW-6	E235.SO4	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE QA/QC	E235.SO4	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW-1	E421	09-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	19 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW-2	E421	09-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	19 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SW1-SOUTH SIDE	E421	09-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	19 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW-4	E421	08-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	20 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW-5	E421	08-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	20 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW-6	E421	08-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	20 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) QA/QC	E421	08-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	21 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW-1	E290	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	14 days	16 days	× EHTR-FM
Physical Tests : Alkalinity Species by Titration										
HDPE MW-2	E290	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	14 days	16 days	× EHTR-FM
Physical Tests : Alkalinity Species by Titration										
HDPE SW1-SOUTH SIDE	E290	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	14 days	16 days	× EHTR-FM
Physical Tests : Alkalinity Species by Titration										
HDPE MW-4	E290	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	14 days	17 days	× EHTR-FM

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MW-5	E290	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	14 days	17 days	× EHTR-FM
Physical Tests : Alkalinity Species by Titration										
HDPE MW-6	E290	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	14 days	17 days	× EHTR-FM
Physical Tests : Alkalinity Species by Titration										
HDPE QA/QC	E290	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	14 days	18 days	× EHTR-FM
Physical Tests : Conductivity in Water										
HDPE MW-1	E100	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	16 days	✓
Physical Tests : Conductivity in Water										
HDPE MW-2	E100	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	16 days	✓
Physical Tests : Conductivity in Water										
HDPE SW1-SOUTH SIDE	E100	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	16 days	✓
Physical Tests : Conductivity in Water										
HDPE MW-4	E100	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Physical Tests : Conductivity in Water										
HDPE MW-5	E100	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓
Physical Tests : Conductivity in Water										
HDPE MW-6	E100	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	17 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE QA/QC	E100	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	28 days	18 days	✓
Physical Tests : pH by Meter										
HDPE MW-1	E108	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	0.25 hrs	0.97 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW-2	E108	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	0.25 hrs	0.97 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW-4	E108	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	0.25 hrs	0.97 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW-5	E108	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	0.25 hrs	0.97 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW-6	E108	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	0.25 hrs	0.97 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE QA/QC	E108	08-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	0.25 hrs	0.97 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SW1-SOUTH SIDE	E108	09-Aug-2022	25-Aug-2022	----	----		25-Aug-2022	0.25 hrs	0.97 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE MW-1	E162	09-Aug-2022	----	----	----		25-Aug-2022	7 days	16 days	× EHTR

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry										
HDPE MW-2	E162	09-Aug-2022	----	----	----		25-Aug-2022	7 days	16 days	× EHTR
Physical Tests : TDS by Gravimetry										
HDPE SW1-SOUTH SIDE	E162	09-Aug-2022	----	----	----		25-Aug-2022	7 days	16 days	× EHTR
Physical Tests : TDS by Gravimetry										
HDPE MW-4	E162	08-Aug-2022	----	----	----		25-Aug-2022	7 days	17 days	× EHTR
Physical Tests : TDS by Gravimetry										
HDPE MW-5	E162	08-Aug-2022	----	----	----		25-Aug-2022	7 days	17 days	× EHTR
Physical Tests : TDS by Gravimetry										
HDPE MW-6	E162	08-Aug-2022	----	----	----		25-Aug-2022	7 days	17 days	× EHTR
Physical Tests : TDS by Gravimetry										
HDPE QA/QC	E162	08-Aug-2022	----	----	----		25-Aug-2022	7 days	18 days	× EHTR
Physical Tests : TSS by Gravimetry										
HDPE MW-1	E160	09-Aug-2022	----	----	----		24-Aug-2022	7 days	15 days	× EHTR
Physical Tests : TSS by Gravimetry										
HDPE MW-2	E160	09-Aug-2022	----	----	----		24-Aug-2022	7 days	15 days	× EHTR
Physical Tests : TSS by Gravimetry										
HDPE SW1-SOUTH SIDE	E160	09-Aug-2022	----	----	----		24-Aug-2022	7 days	15 days	× EHTR

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE MW-4	E160	08-Aug-2022	----	----	----		24-Aug-2022	7 days	16 days	× EHTR
Physical Tests : TSS by Gravimetry										
HDPE MW-5	E160	08-Aug-2022	----	----	----		24-Aug-2022	7 days	16 days	× EHTR
Physical Tests : TSS by Gravimetry										
HDPE MW-6	E160	08-Aug-2022	----	----	----		24-Aug-2022	7 days	16 days	× EHTR
Physical Tests : TSS by Gravimetry										
HDPE QA/QC	E160	08-Aug-2022	----	----	----		24-Aug-2022	7 days	17 days	× EHTR
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MW-1	E420	09-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	19 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MW-2	E420	09-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	19 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) SW1-SOUTH SIDE	E420	09-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	19 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MW-4	E420	08-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	20 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MW-5	E420	08-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	20 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
MW-6	E420	08-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	20 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
QA/QC	E420	08-Aug-2022	28-Aug-2022	----	----		28-Aug-2022	180 days	20 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Soil/Solid**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
BTEX by Headspace GC-MS	E611A	620592	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	620593	1	20	5.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID	E601.SG	618574	1	20	5.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	626970	1	6	16.6	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	626971	1	8	12.5	5.0	✓
Moisture Content by Gravimetry	E144	619151	1	20	5.0	5.0	✓
PCB Aroclors by GC-ECD	E685	618228	1	14	7.1	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	626959	1	7	14.2	5.0	✓
Laboratory Control Samples (LCS)							
BTEX by Headspace GC-MS	E611A	620592	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	620593	1	20	5.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID	E601.SG	618574	2	20	10.0	10.0	✓
Mercury in Soil/Solid by CVAAS	E510	626970	2	6	33.3	10.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	626971	2	8	25.0	10.0	✓
Moisture Content by Gravimetry	E144	619151	1	20	5.0	5.0	✓
PCB Aroclors by GC-ECD	E685	618228	1	14	7.1	10.0	×
pH by Meter (1:2 Soil:Water Extraction)	E108	626959	2	7	28.5	10.0	✓
Method Blanks (MB)							
BTEX by Headspace GC-MS	E611A	620592	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	620593	1	20	5.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID	E601.SG	618574	1	20	5.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	626970	1	6	16.6	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	626971	1	8	12.5	5.0	✓
Moisture Content by Gravimetry	E144	619151	1	20	5.0	5.0	✓
PCB Aroclors by GC-ECD	E685	618228	1	14	7.1	5.0	✓
Matrix Spikes (MS)							
BTEX by Headspace GC-MS	E611A	620592	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	619129	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	618370	1	20	5.0	5.0	✓
Conductivity in Water	E100	619128	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	622435	1	18	5.5	5.0	✓
Fluoride in Water by IC	E235.F	618369	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP) - Continued							
Nitrate in Water by IC	E235.NO3	618366	1	20	5.0	5.0	✓
Nitrite in Water by IC	E235.NO2	618367	1	20	5.0	5.0	✓
pH by Meter	E108	619127	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	618368	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	618288	2	40	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	622254	1	20	5.0	5.0	✓
TSS by Gravimetry	E160	617357	1	13	7.6	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	619129	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	618370	1	20	5.0	5.0	✓
Conductivity in Water	E100	619128	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	622435	1	18	5.5	5.0	✓
Fluoride in Water by IC	E235.F	618369	1	20	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	618366	1	20	5.0	5.0	✓
Nitrite in Water by IC	E235.NO2	618367	1	20	5.0	5.0	✓
pH by Meter	E108	619127	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	618368	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	618288	2	40	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	622254	1	20	5.0	5.0	✓
TSS by Gravimetry	E160	617357	1	13	7.6	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	619129	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	618370	1	20	5.0	5.0	✓
Conductivity in Water	E100	619128	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	622435	1	18	5.5	5.0	✓
Fluoride in Water by IC	E235.F	618369	1	20	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	618366	1	20	5.0	5.0	✓
Nitrite in Water by IC	E235.NO2	618367	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	618368	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	618288	2	40	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	622254	1	20	5.0	5.0	✓
TSS by Gravimetry	E160	617357	1	13	7.6	5.0	✓
Matrix Spikes (MS)							
Chloride in Water by IC	E235.Cl	618370	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	622435	1	18	5.5	5.0	✓
Fluoride in Water by IC	E235.F	618369	1	20	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	618366	1	20	5.0	5.0	✓
Nitrite in Water by IC	E235.NO2	618367	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	618368	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	622254	1	20	5.0	5.0	✓

Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:Water Extraction)	E108 Edmonton - Environmental	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at <60 ºC) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH probe.
Moisture Content by Gravimetry	E144 Edmonton - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Metals in Soil/Solid by CRC ICPMS	E440 Edmonton - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.
Mercury in Soil/Solid by CVAAS	E510 Edmonton - Environmental	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl, followed by CVAAS analysis.
CCME PHC - F1 by Headspace GC-FID	E581.F1 Edmonton - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	CCME Fraction 1 (F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
CCME PHCs - F2-F4 by GC-FID	E601.SG Edmonton - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Sample extracts are subjected to in-situ silica gel treatment prior to analysis by GC-FID for CCME hydrocarbon fractions (F2-F4).
BTEX by Headspace GC-MS	E611A Edmonton - Environmental	Soil/Solid	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PCB Aroclors by GC-ECD	E685 Edmonton - Environmental	Soil/Solid	EPA 8082A (mod)	PCB Aroclors are analyzed by GC-ECD

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
F1-BTEX	EC580 Edmonton - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).
Sum F1 to F4 (C6-C50)	EC581 Edmonton - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Hydrocarbons, total (C6-C50) is the sum of CCME Fractions F1(C6-C10), F2(C10-C16), F3(C16-C34), and F4(C34-C50). F4G-sg is not used within this calculation due to overlap with other fractions.
Conductivity in Water	E100 Edmonton - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Edmonton - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160 Edmonton - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Edmonton - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Chloride in Water by IC	E235.Cl Edmonton - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Edmonton - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC	E235.NO2 Edmonton - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC	E235.NO3 Edmonton - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Edmonton - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Edmonton - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Total Metals in Water by CRC ICPMS	E420 Edmonton - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Metals in Water by CRC ICPMS	E421 Edmonton - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Hardness (Calculated)	EC100 Edmonton - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Edmonton - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Edmonton - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Edmonton - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 Edmonton - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Digestion for Metals and Mercury	EP440 Edmonton - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.
VOCs Methanol Extraction for Headspace Analysis	EP581 Edmonton - Environmental	Soil/Solid	EPA 5035A (mod)	VOCs in samples are extracted with methanol. Extracts are then prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
PHCs and PAHs Hexane-Acetone Tumbler Extraction	EP601 Edmonton - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1 (mod)	Samples are subsampled and Petroleum Hydrocarbons (PHC) and PAHs are extracted with 1:1 hexane:acetone using a rotary extractor.
PCB Aroclors Extraction	EP685 Edmonton - Environmental	Soil/Solid	EPA 3570/3550C (mod)	Samples are subsampled and PCBs are extracted with solvents using a mechanical shaking extractor.Water is added to the extract and the resulting hexane extract undergoes one or more of the following clean-up procedures (if required): florisil clean-up, silica gel clean-up, sulphur clean-up and/or sulphuric acid clean-up.
Dissolved Metals Water Filtration	EP421 Edmonton - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EO2206880**	Page	: 1 of 22
Client	: AECOM Canada Ltd.	Laboratory	: Edmonton - Environmental
Contact	: Jessica Stepney	Account Manager	: Pamela Toledo
Address	: 101 - 18817 Stony Plain Rd. NW Edmonton AB Canada T5S 0C2	Address	: 9450 - 17 Avenue NW Edmonton, Alberta Canada T6N 1M9
Telephone	: 780-486-5921	Telephone	: +1 780 413 5227
Project	: 60686962	Date Samples Received	: 24-Aug-2022 14:22
PO	: ----	Date Analysis Commenced	: 24-Aug-2022
C-O-C number	: 20-1009581	Issue Date	: 01-Sep-2022 12:22
Sampler	: ----		
Site	: 2022 Price List - Prairies		
Quote number	: 2022 Price List - Prairies		
No. of samples received	: 11		
No. of samples analysed	: 11		

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Alex Drake	Lab Analyst	Edmonton Inorganics, Edmonton, Alberta
Austin Wasylyshyn	Lab Analyst	Edmonton Metals, Edmonton, Alberta
Daniel Nguyen	Lab Assistant	Edmonton Inorganics, Edmonton, Alberta
Fahad Husain	Lab Assistant	Edmonton Inorganics, Edmonton, Alberta
Geoff Berg	Lab Analyst	Edmonton Organics, Edmonton, Alberta
Jessica Maitland	Lab Assistant	Edmonton Inorganics, Edmonton, Alberta
Joan Wu	Lab Analyst	Edmonton Metals, Edmonton, Alberta
Kari Mulroy	Lab Supervisor - Environmental	Edmonton Organics, Edmonton, Alberta
Remy Gatabazi	Lab Analyst	Edmonton Organics, Edmonton, Alberta
Sobhithan Pillay		Edmonton Inorganics, Edmonton, Alberta

General Comments

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

Key :

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

Workorder Comments

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 619151)											
EO2206856-006	Anonymous	moisture	----	E144	0.25	%	21.4	21.3	0.379%	20%	----
Physical Tests (QC Lot: 626959)											
EO2206880-008	SS1-SW CORNER	pH (1:2 soil:water)	----	E108	0.10	pH units	8.58	8.61	0.349%	3%	----
Metals (QC Lot: 626970)											
EO2206454-003	Anonymous	mercury	7439-97-6	E510	0.0050	mg/kg	0.0283	0.0262	7.72%	40%	----
Metals (QC Lot: 626971)											
EO2206454-003	Anonymous	aluminum	7429-90-5	E440	50	mg/kg	10200	9760	4.69%	40%	----
		antimony	7440-36-0	E440	0.10	mg/kg	0.40	0.38	0.02	Diff <2x LOR	----
		arsenic	7440-38-2	E440	0.10	mg/kg	5.84	5.58	4.52%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	204	198	3.27%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.51	0.48	0.02	Diff <2x LOR	----
		bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		boron	7440-42-8	E440	5.0	mg/kg	10.0	10.0	0.08	Diff <2x LOR	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.208	0.192	8.01%	30%	----
		calcium	7440-70-2	E440	50	mg/kg	16200	15500	4.86%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	23.1	26.4	13.5%	30%	----
		cobalt	7440-48-4	E440	0.10	mg/kg	7.36	7.00	5.01%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	15.1	14.3	5.29%	30%	----
		iron	7439-89-6	E440	50	mg/kg	15800	14900	5.82%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	7.38	6.92	6.45%	40%	----
		lithium	7439-93-2	E440	2.0	mg/kg	12.0	11.4	0.6	Diff <2x LOR	----
		magnesium	7439-95-4	E440	20	mg/kg	6980	6490	7.21%	30%	----
		manganese	7439-96-5	E440	1.0	mg/kg	281	267	5.23%	30%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	1.13	1.53	30.3%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	20.1	19.1	4.88%	30%	----
		phosphorus	7723-14-0	E440	50	mg/kg	450	418	7.41%	30%	----
		potassium	7440-09-7	E440	100	mg/kg	1600	1530	4.57%	40%	----
		selenium	7782-49-2	E440	0.20	mg/kg	0.21	0.21	0.003	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
		sodium	7440-23-5	E440	50	mg/kg	641	617	3.82%	40%	----
		strontium	7440-24-6	E440	0.50	mg/kg	50.1	48.4	3.54%	40%	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Metals (QC Lot: 626971) - continued											
EO2206454-003	Anonymous	sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	----
		thallium	7440-28-0	E440	0.050	mg/kg	0.176	0.163	0.013	Diff <2x LOR	----
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		titanium	7440-32-6	E440	1.0	mg/kg	111	107	3.62%	40%	----
		tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	----
		uranium	7440-61-1	E440	0.050	mg/kg	1.06	0.998	5.78%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	30.7	29.8	2.93%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	48.4	46.3	4.44%	30%	----
		zirconium	7440-67-7	E440	1.0	mg/kg	6.5	6.6	0.1	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 620592)											
EO2206856-001	Anonymous	benzene	71-43-2	E611A	0.0050	mg/kg	<0.0050	<0.0050	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015	<0.015	0	Diff <2x LOR	----
		toluene	108-88-3	E611A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611A	0.030	mg/kg	<0.030	<0.030	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611A	0.030	mg/kg	<0.030	<0.030	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 618574)											
EO2206711-007	Anonymous	F2 (C10-C16)	----	E601.SG	25	mg/kg	40	42	1	Diff <2x LOR	----
		F3 (C16-C34)	----	E601.SG	50	mg/kg	154	118	35	Diff <2x LOR	----
		F4 (C34-C50)	----	E601.SG	50	mg/kg	<50	<50	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 620593)											
EO2206856-001	Anonymous	F1 (C6-C10)	----	E581.F1	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	----
Polychlorinated Biphenyls (QC Lot: 618228)											
EO2206880-008	SS1-SW CORNER	Aroclor 1016	12674-11-2	E685	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		Aroclor 1221	11104-28-2	E685	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		Aroclor 1232	11141-16-5	E685	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		Aroclor 1242	53469-21-9	E685	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		Aroclor 1248	12672-29-6	E685	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		Aroclor 1254	11097-69-1	E685	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		Aroclor 1260	11096-82-5	E685	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		Aroclor 1262	37324-23-5	E685	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		Aroclor 1268	11100-14-4	E685	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 617357)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 617357) - continued											
--------		solids, total suspended [TSS]	----	E160	3.0	mg/L	----	16.4	0.6	Diff <2x LOR	----
Physical Tests (QC Lot: 618288)											
EO2206850-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	1660	1660	0.0301%	20%	----
Physical Tests (QC Lot: 618710)											
EO2206880-005	MW-6	solids, total dissolved [TDS]	----	E162	20	mg/L	824	786	4.78%	20%	----
Physical Tests (QC Lot: 619127)											
EO2206882-010	Anonymous	pH	----	E108	0.10	pH units	8.18	8.20	0.244%	3%	----
Physical Tests (QC Lot: 619128)											
EO2206882-010	Anonymous	conductivity	----	E100	2.0	µS/cm	1140	1140	0.351%	10%	----
Physical Tests (QC Lot: 619129)											
EO2206882-010	Anonymous	alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	345	350	1.30%	20%	----
Anions and Nutrients (QC Lot: 618366)											
EO2206880-007	SW1-SOUTH SIDE	nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	1.43	1.41	1.60%	20%	----
Anions and Nutrients (QC Lot: 618367)											
EO2206880-007	SW1-SOUTH SIDE	nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 618368)											
EO2206880-007	SW1-SOUTH SIDE	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	31.0	30.3	2.30%	20%	----
Anions and Nutrients (QC Lot: 618369)											
EO2206880-007	SW1-SOUTH SIDE	fluoride	16984-48-8	E235.F	0.020	mg/L	0.050	0.045	0.005	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 618370)											
EO2206880-007	SW1-SOUTH SIDE	chloride	16887-00-6	E235.Cl	0.50	mg/L	1.07	1.05	0.01	Diff <2x LOR	----
Total Metals (QC Lot: 622254)											
EO2206850-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.243	0.276	12.5%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00036	0.00035	0.00001	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00107	0.00112	4.40%	20%	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.107	0.105	2.03%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	0.000064	0.000039	0.000026	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.243	0.259	6.32%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	217	216	0.120%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	0.000039	0.000043	0.000005	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	0.00091	0.00089	0.00002	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00026	0.00027	0.000002	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.0102	0.0103	1.32%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.338	0.374	10.1%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 622254) - continued											
EO2206850-001	Anonymous	lead, total	7439-92-1	E420	0.000050	mg/L	0.000449	0.000443	0.000006	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.213	0.220	2.96%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	146	150	2.66%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0275	0.0277	0.711%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00252	0.00258	2.23%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00449	0.00456	0.00007	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	0.108	0.106	0.002	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	6.12	6.19	1.11%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00198	0.00218	9.69%	20%	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.0121	0.0119	1.90%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	9.12	9.14	0.233%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	0.000020	0.000019	0.000001	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	91.8	91.4	0.381%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	1.39	1.39	0.144%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	217	212	2.40%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	0.00029	0.00020	0.00009	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00734	0.00751	2.29%	20%	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.0437	0.0445	1.62%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00164	0.00175	0.00011	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.408	0.376	8.08%	20%	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	0.00086	0.00078	0.00007	Diff <2x LOR	----
Dissolved Metals (QC Lot: 622435)											
EO2206880-001	MW-1	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0082	0.0079	0.0003	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00025	0.00026	0.000009	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0126	0.0128	1.41%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.050	0.047	0.003	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000133	0.0000169	0.0000036	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	71.4	68.4	4.28%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 622435) - continued											
EO2206880-001	MW-1	chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.0507	0.0501	1.13%	20%	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00683	0.00691	1.14%	20%	----
		iron, dissolved	7439-89-6	E421	0.030	mg/L	<0.030	<0.030	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0392	0.0373	5.02%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	55.6	55.9	0.615%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00500	mg/L	0.0188	0.0185	0.00030	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00298	0.00283	5.15%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00840	0.00829	1.36%	20%	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	8.74	8.73	0.126%	20%	----
		rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00110	0.00123	0.00012	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000290	0.000352	0.000062	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.19	3.19	0.247%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	15.6	15.2	3.05%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.256	0.248	2.81%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	31.2	31.1	0.130%	20%	----
		tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	0.105	0.0942	10.8%	20%	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.0795	0.0699	12.8%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00051	<0.00050	0.000007	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0844	0.0848	0.422%	20%	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	0.00037	0.00036	0.00002	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 619151)						
moisture	----	E144	0.25	%	<0.25	----
Metals (QCLot: 626970)						
mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	----
Metals (QCLot: 626971)						
aluminum	7429-90-5	E440	50	mg/kg	<50	----
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	----
boron	7440-42-8	E440	5	mg/kg	<5.0	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
calcium	7440-70-2	E440	50	mg/kg	<50	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
iron	7439-89-6	E440	50	mg/kg	<50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
lithium	7439-93-2	E440	2	mg/kg	<2.0	----
magnesium	7439-95-4	E440	20	mg/kg	<20	----
manganese	7439-96-5	E440	1	mg/kg	<1.0	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
phosphorus	7723-14-0	E440	50	mg/kg	<50	----
potassium	7440-09-7	E440	100	mg/kg	<100	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
sodium	7440-23-5	E440	50	mg/kg	<50	----
strontium	7440-24-6	E440	0.5	mg/kg	<0.50	----
sulfur	7704-34-9	E440	1000	mg/kg	<1000	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
tin	7440-31-5	E440	2	mg/kg	<2.0	----
titanium	7440-32-6	E440	1	mg/kg	<1.0	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 626971) - continued						
tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----
zirconium	7440-67-7	E440	1	mg/kg	<1.0	----
Volatile Organic Compounds (QCLot: 620592)						
benzene	71-43-2	E611A	0.005	mg/kg	<0.0050	----
ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015	----
toluene	108-88-3	E611A	0.05	mg/kg	<0.050	----
xylene, m+p-	179601-23-1	E611A	0.03	mg/kg	<0.030	----
xylene, o-	95-47-6	E611A	0.03	mg/kg	<0.030	----
Hydrocarbons (QCLot: 618574)						
F2 (C10-C16)	----	E601.SG	25	mg/kg	<25	----
F3 (C16-C34)	----	E601.SG	50	mg/kg	<50	----
F4 (C34-C50)	----	E601.SG	50	mg/kg	<50	----
Hydrocarbons (QCLot: 620593)						
F1 (C6-C10)	----	E581.F1	5	mg/kg	<5.0	----
Polychlorinated Biphenyls (QCLot: 618228)						
Aroclor 1016	12674-11-2	E685	0.01	mg/kg	<0.010	----
Aroclor 1221	11104-28-2	E685	0.01	mg/kg	<0.010	----
Aroclor 1232	11141-16-5	E685	0.01	mg/kg	<0.010	----
Aroclor 1242	53469-21-9	E685	0.01	mg/kg	<0.010	----
Aroclor 1248	12672-29-6	E685	0.01	mg/kg	<0.010	----
Aroclor 1254	11097-69-1	E685	0.01	mg/kg	<0.010	----
Aroclor 1260	11096-82-5	E685	0.01	mg/kg	<0.010	----
Aroclor 1262	37324-23-5	E685	0.01	mg/kg	<0.010	----
Aroclor 1268	11100-14-4	E685	0.01	mg/kg	<0.010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 617357)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 618288)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 618710)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 619128)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 619128) - continued						
conductivity	----	E100	1	µS/cm	1.0	----
Physical Tests (QCLot: 619129)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Anions and Nutrients (QCLot: 618366)						
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 618367)						
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 618368)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 618369)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 618370)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Total Metals (QCLot: 622254)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 622254) - continued						
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 622435)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 622435) - continued						
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 619151)									
moisture	----	E144	0.25	%	50 %	99.8	90.0	110	----
Physical Tests (QCLot: 626959)									
pH (1:2 soil:water)	----	E108	----	pH units	6 pH units	100	97.0	103	----
Metals (QCLot: 626970)									
mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	101	70.0	130	----
Metals (QCLot: 626971)									
aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	95.4	80.0	120	----
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	105	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	88.9	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	93.1	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	97.7	80.0	120	----
bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	106	80.0	120	----
boron	7440-42-8	E440	5	mg/kg	100 mg/kg	93.2	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	95.2	80.0	120	----
calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	102	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	93.0	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	92.2	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	92.8	80.0	120	----
iron	7439-89-6	E440	50	mg/kg	100 mg/kg	88.2	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	97.4	80.0	120	----
lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	100	80.0	120	----
magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	91.2	80.0	120	----
manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	93.7	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	95.7	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	91.8	80.0	120	----
phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	89.6	80.0	120	----
potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	91.8	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	91.7	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	103	80.0	120	----
sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	96.3	80.0	120	----
strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	100	80.0	120	----
sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	93.6	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	93.8	80.0	120	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Metals (QCLot: 626971) - continued									
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	90.3	80.0	120	----
titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	89.3	80.0	120	----
tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	95.0	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	100	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	96.3	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	84.7	80.0	120	----
zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	89.1	80.0	120	----
Volatile Organic Compounds (QCLot: 620592)									
benzene	71-43-2	E611A	0.005	mg/kg	2.5 mg/kg	101	70.0	130	----
ethylbenzene	100-41-4	E611A	0.015	mg/kg	2.5 mg/kg	96.9	70.0	130	----
toluene	108-88-3	E611A	0.05	mg/kg	2.5 mg/kg	89.7	70.0	130	----
xylene, m+p-	179601-23-1	E611A	0.03	mg/kg	5 mg/kg	107	70.0	130	----
xylene, o-	95-47-6	E611A	0.03	mg/kg	2.5 mg/kg	94.6	70.0	130	----
Hydrocarbons (QCLot: 618574)									
F2 (C10-C16)	----	E601.SG	25	mg/kg	576 mg/kg	116	70.0	130	----
F3 (C16-C34)	----	E601.SG	50	mg/kg	1184 mg/kg	97.1	70.0	130	----
F4 (C34-C50)	----	E601.SG	50	mg/kg	904 mg/kg	103	70.0	130	----
Hydrocarbons (QCLot: 620593)									
F1 (C6-C10)	----	E581.F1	5	mg/kg	86 mg/kg	87.9	70.0	130	----
Polychlorinated Biphenyls (QCLot: 618228)									
Aroclor 1260	11096-82-5	E685	0.01	mg/kg	0.5 mg/kg	69.3	65.0	130	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Physical Tests (QCLot: 617357)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	93.2	85.0	115	----
Physical Tests (QCLot: 618288)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	96.8	85.0	115	----
Physical Tests (QCLot: 618710)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	101	85.0	115	----
Physical Tests (QCLot: 619127)									
pH	----	E108	----	pH units	6 pH units	102	97.0	103	----
Physical Tests (QCLot: 619128)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 619128) - continued									
conductivity	----	E100	1	µS/cm	1412 µS/cm	97.0	90.0	110	----
Physical Tests (QCLot: 619129)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	107	85.0	115	----
Anions and Nutrients (QCLot: 618366)									
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 618367)									
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	97.8	90.0	110	----
Anions and Nutrients (QCLot: 618368)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 618369)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 618370)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	102	90.0	110	----
Total Metals (QCLot: 622254)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	110	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	95.4	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	107	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	98.8	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	89.1	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	95.8	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	104	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	98.3	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	108	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	107	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	96.9	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	93.7	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	102	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	107	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	99.1	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	109	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 622254) - continued									
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	109	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	109	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	101	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	104	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	91.1	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	107	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	96.4	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	108	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	95.1	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	93.9	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	84.5	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	96.0	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	107	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	97.2	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	90.9	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	101	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	90.1	80.0	120	----
Dissolved Metals (QCLot: 622435)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	106	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	94.3	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	99.9	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	95.2	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	89.5	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	96.5	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	96.9	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	94.1	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	95.4	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	102	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.4	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	99.3	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	94.3	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	91.6	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	99.0	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.1	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	98.2	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 622435) - continued									
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	94.7	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	99.4	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	110	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	105	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	95.3	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	97.0	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	86.1	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	101	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	94.0	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	104	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	92.9	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	91.8	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	86.4	80.0	120	----
tin, dissolved	7440-31-5	E421	----	mg/L	0.5 mg/L	92.8	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	101	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	93.2	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	89.2	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	99.8	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	98.0	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	85.0	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Volatile Organic Compounds (QCLot: 620592)										
EO2206856-002	Anonymous	benzene	71-43-2	E611A	1.86 mg/kg	2.5 mg/kg	107	60.0	140	----
		ethylbenzene	100-41-4	E611A	2.14 mg/kg	2.5 mg/kg	123	60.0	140	----
		toluene	108-88-3	E611A	1.95 mg/kg	2.5 mg/kg	112	60.0	140	----
		xylene, m+p-	179601-23-1	E611A	4.26 mg/kg	5 mg/kg	122	60.0	140	----
		xylene, o-	95-47-6	E611A	2.18 mg/kg	2.5 mg/kg	125	60.0	140	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 618366)										
EO2206880-007	SW1-SOUTH SIDE	nitrate (as N)	14797-55-8	E235.NO3	2.54 mg/L	2.5 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 618367)										
EO2206880-007	SW1-SOUTH SIDE	nitrite (as N)	14797-65-0	E235.NO2	0.521 mg/L	0.5 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 618368)										
EO2206880-007	SW1-SOUTH SIDE	sulfate (as SO4)	14808-79-8	E235.SO4	103 mg/L	100 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 618369)										
EO2206880-007	SW1-SOUTH SIDE	fluoride	16984-48-8	E235.F	0.978 mg/L	1 mg/L	97.8	75.0	125	----
Anions and Nutrients (QCLot: 618370)										
EO2206880-007	SW1-SOUTH SIDE	chloride	16887-00-6	E235.Cl	108 mg/L	100 mg/L	108	75.0	125	----
Total Metals (QCLot: 622254)										
EO2206850-002	Anonymous	aluminum, total	7429-90-5	E420	ND mg/L	0.2 mg/L	ND	70.0	130	----
		antimony, total	7440-36-0	E420	0.0187 mg/L	0.02 mg/L	93.7	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0421 mg/L	0.04 mg/L	105	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00852 mg/L	0.01 mg/L	85.2	70.0	130	----
		boron, total	7440-42-8	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00382 mg/L	0.004 mg/L	95.5	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00943 mg/L	0.01 mg/L	94.3	70.0	130	----
		chromium, total	7440-47-3	E420	0.0388 mg/L	0.04 mg/L	97.1	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 622254) - continued										
EO2206850-002	Anonymous	cobalt, total	7440-48-4	E420	0.0182 mg/L	0.02 mg/L	90.9	70.0	130	----
		copper, total	7440-50-8	E420	0.0182 mg/L	0.02 mg/L	91.1	70.0	130	----
		iron, total	7439-89-6	E420	1.98 mg/L	2 mg/L	98.8	70.0	130	----
		lead, total	7439-92-1	E420	0.0166 mg/L	0.02 mg/L	83.1	70.0	130	----
		lithium, total	7439-93-2	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		nickel, total	7440-02-0	E420	0.0355 mg/L	0.04 mg/L	88.7	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.00 mg/L	10 mg/L	100.0	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0196 mg/L	0.02 mg/L	98.1	70.0	130	----
		selenium, total	7782-49-2	E420	0.0381 mg/L	0.04 mg/L	95.2	70.0	130	----
		silicon, total	7440-21-3	E420	ND mg/L	10 mg/L	ND	70.0	130	----
		silver, total	7440-22-4	E420	0.00380 mg/L	0.004 mg/L	95.0	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0360 mg/L	0.04 mg/L	90.0	70.0	130	----
		thallium, total	7440-28-0	E420	0.00340 mg/L	0.004 mg/L	85.0	70.0	130	----
		thorium, total	7440-29-1	E420	0.0166 mg/L	0.02 mg/L	82.8	70.0	130	----
		tin, total	7440-31-5	E420	0.0188 mg/L	0.02 mg/L	93.9	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0182 mg/L	0.02 mg/L	91.1	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0966 mg/L	0.1 mg/L	96.6	70.0	130	----
		zinc, total	7440-66-6	E420	0.332 mg/L	0.4 mg/L	83.0	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0366 mg/L	0.04 mg/L	91.5	70.0	130	----
Dissolved Metals (QCLot: 622435)										
EO2206880-002	MW-2	aluminum, dissolved	7429-90-5	E421	0.205 mg/L	0.2 mg/L	102	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0197 mg/L	0.02 mg/L	98.4	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0413 mg/L	0.04 mg/L	103	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00713 mg/L	0.01 mg/L	71.3	70.0	130	----
		boron, dissolved	7440-42-8	E421	ND mg/L	0.1 mg/L	ND	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00400 mg/L	0.004 mg/L	100.0	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 622435) - continued										
EO2206880-002	MW-2	calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.00975 mg/L	0.01 mg/L	97.5	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0394 mg/L	0.04 mg/L	98.5	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0192 mg/L	0.02 mg/L	95.8	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.88 mg/L	2 mg/L	93.8	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0183 mg/L	0.02 mg/L	91.4	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0999 mg/L	0.1 mg/L	99.9	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0194 mg/L	0.02 mg/L	96.9	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0191 mg/L	0.02 mg/L	95.3	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0385 mg/L	0.04 mg/L	96.3	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.5 mg/L	10 mg/L	105	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0210 mg/L	0.02 mg/L	105	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0418 mg/L	0.04 mg/L	104	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.95 mg/L	10 mg/L	89.5	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00394 mg/L	0.004 mg/L	98.6	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	19.1 mg/L	20 mg/L	95.4	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0386 mg/L	0.04 mg/L	96.6	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00376 mg/L	0.004 mg/L	93.9	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0197 mg/L	0.02 mg/L	98.5	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0192 mg/L	0.02 mg/L	96.2	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0396 mg/L	0.04 mg/L	99.0	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		uranium, dissolved	7440-61-1	E421	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0987 mg/L	0.1 mg/L	98.7	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.365 mg/L	0.4 mg/L	91.3	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0396 mg/L	0.04 mg/L	99.0	70.0	130	----

Reference Material (RM) Report

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

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests (QCLot: 626959)									
	RM	pH (1:2 soil:water)	----	E108	8.07 pH units	97.8	96.0	104	----
Metals (QCLot: 626970)									
	RM	mercury	7439-97-6	E510	0.059 mg/kg	94.8	70.0	130	----
Metals (QCLot: 626971)									
	RM	aluminum	7429-90-5	E440	9817 mg/kg	95.7	70.0	130	----
	RM	antimony	7440-36-0	E440	3.99 mg/kg	110	70.0	130	----
	RM	arsenic	7440-38-2	E440	3.73 mg/kg	91.1	70.0	130	----
	RM	barium	7440-39-3	E440	105 mg/kg	96.3	70.0	130	----
	RM	beryllium	7440-41-7	E440	0.349 mg/kg	97.4	70.0	130	----
	RM	boron	7440-42-8	E440	8.5 mg/kg	107	40.0	160	----
	RM	cadmium	7440-43-9	E440	0.91 mg/kg	92.8	70.0	130	----
	RM	calcium	7440-70-2	E440	31082 mg/kg	95.1	70.0	130	----
	RM	chromium	7440-47-3	E440	101 mg/kg	93.4	70.0	130	----
	RM	cobalt	7440-48-4	E440	6.9 mg/kg	94.3	70.0	130	----
	RM	copper	7440-50-8	E440	123 mg/kg	93.4	70.0	130	----
	RM	iron	7439-89-6	E440	23558 mg/kg	87.4	70.0	130	----
	RM	lead	7439-92-1	E440	267 mg/kg	87.8	70.0	130	----
	RM	lithium	7439-93-2	E440	9.5 mg/kg	97.3	70.0	130	----
	RM	magnesium	7439-95-4	E440	5509 mg/kg	89.5	70.0	130	----
	RM	manganese	7439-96-5	E440	269 mg/kg	92.1	70.0	130	----
	RM	molybdenum	7439-98-7	E440	1.03 mg/kg	93.6	70.0	130	----
	RM	nickel	7440-02-0	E440	26.7 mg/kg	93.8	70.0	130	----
	RM	phosphorus	7723-14-0	E440	752 mg/kg	87.6	70.0	130	----
	RM	potassium	7440-09-7	E440	1587 mg/kg	100	70.0	130	----
	RM	silver	7440-22-4	E440	4.06 mg/kg	87.8	50.0	150	----
	RM	sodium	7440-23-5	E440	797 mg/kg	103	70.0	130	----
	RM	strontium	7440-24-6	E440	86.1 mg/kg	96.6	70.0	130	----
	RM	thallium	7440-28-0	E440	0.0786 mg/kg	115	40.0	160	----
	RM	tin	7440-31-5	E440	10.6 mg/kg	94.8	70.0	130	----

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 626971) - continued									
	RM	titanium	7440-32-6	E440	839 mg/kg	98.4	70.0	130	----
	RM	uranium	7440-61-1	E440	0.52 mg/kg	90.7	70.0	130	----
	RM	vanadium	7440-62-2	E440	32.7 mg/kg	95.0	70.0	130	----
	RM	zinc	7440-66-6	E440	297 mg/kg	82.4	70.0	130	----
	RM	zirconium	7440-67-7	E440	5.73 mg/kg	85.3	70.0	130	----
Hydrocarbons (QCLot: 618574)									
	RM	F2 (C10-C16)	----	E601.SG	4316 mg/kg	99.4	70.0	130	----
	RM	F3 (C16-C34)	----	E601.SG	12844 mg/kg	96.2	70.0	130	----
	RM	F4 (C34-C50)	----	E601.SG	1156 mg/kg	112	70.0	130	----

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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

COC Number: 20 - 1009581

Page of

Report To — Contact and company name below will appear on the final report

Company:	Aecom Canada Ltd
Contact:	Jessica Stepney
Phone:	1-780-298-6562
Company address below will appear on the final report	
Street:	101, 18817 Stoney plain Rd
City/Province:	Edmonton, AB
Postal Code:	T5S 0C2
Invoice To — Same as Report To	☒ YES ☐ NO
Copy of Invoice with Report	☐ YES ☐ NO
Company:	
Contact:	

Project Information

ALS Account # / Quote #:	
Job #:	Q89810
PO / AFE:	60686962
LSD:	

ALS Lab Work Order # (ALS use only): E02206880

Reports / Recipients

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

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

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

Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Jessica.Stepney@Aecom.Com

Email 2: Alysha.Selinger@Aecom.Com

Email 3: Rory.McNeil@Aecom.Com

Invoice Recipients

Select Invoice Distribution: ☒ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Jessica.Stepney@Aecom.Com

Email 2: CAN.SSC...

Oil and Gas Required Fields (client use)

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

Turnaround Time (TAT) Requested

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

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

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

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

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

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests

AFFIX ALS BARCODE LABEL HERE (ALS use only)

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

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

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

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Total Metals (P)	Dissolved Metals (F/P)	PHC: F1-F4(+BTEX) (P)	Major Anions	TDS	TSS	PCB	Metals (Soil)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
1	MW-1	Aug 9/22	14:00	GW		✓	✓		✓	✓	✓					
2	MW-2	"	14:45			✓	✓		✓	✓	✓					
3	MW-4	Aug 8/22	13:00			✓	✓		✓	✓	✓					
4	MW-5		13:45			✓	✓		✓	✓	✓					
5	MW-6		14:30			✓	✓		✓	✓	✓					
6	QA/QC					✓	✓		✓	✓	✓					
7	SW1 - South side	Aug 9/22	16:00	SW		✓	✓		✓	✓	✓					
8	SS1 - SW Corner		16:15	Soil				✓				✓	✓			
9	SS2 - South side		16:30					✓				✓	✓			
10	SS3 - South side		16:45					✓				✓	✓			
11	SS4 - East Side		17:00					✓				✓	✓			

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

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

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

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

CCME Guidelines

CAM F

~~Surface Water Guidelines~~

Along with Aecom PM

SAMPLE RECEIPT

Cooling Method: ☐ NONE ☐ ICE ☐ ICE P

Submission Comments identified on Sample Receipt

Cooler Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C: 9.0

SHIPMENT RELEASE (client use)

Released by: [signature] Date: Aug 10/22 Time:

INITIAL SHIPMENT RECEPTION (ALS use only)

Received by: [initials] Date: Aug 24, 22 Time:

FINAL SHIPMENT

Received by: Date:

Environmental Division
Edmonton
Work Order Reference
EO2206880

Telephone : +1 780 413 5227

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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

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

FRONT

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