AECOM

CAM-D Simpson Lake Long-Term Monitoring Report

Year 11

Project number: 60686962

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

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Executive Summary

The CAM-D Site is a former intermediate Distant Early Warning (DEW) Line site constructed in 1957 by the Department of National Defence (DND). The Site was taken out of service in 1963, and custody of the Site was assumed by Indigenous and Northern Affairs Canada (INAC) in 1965. Remediation, including construction of the Non-Hazardous Waste Landfill (NHWL), took place between 2008 and 2011. All non-hazardous waste was placed in the NHWL, and four (4) monitoring wells were installed around the landfill perimeter. Between 1992 and 1995, the DND constructed an unmanned Short-Range Radar (SRR) facility approximately 1 km east of the Site; this facility is still in operation and not part of the long-term monitoring activities.

This Year 11 monitoring event is the result of a recommendation for increased monitoring frequency by Arcadis after Year 5 activities, adjusting the *CAM-D (Simpson Lake) Long-Term Monitoring Plan* (INAC, 2010; LTMP) schedule from Year 5, Year 7, Year 10 to Year 5, Year 7, Year 9, and Year 11. The Year 11 field program was conducted August 6, 2022, and included visual monitoring of the NHWL, visual inspection of general site conditions, collection and analysis of groundwater samples, and surface water or soil samples, if identified. The visual and environmental monitoring inspection was documented via checklist along with a photographic record.

The Site was accessed via Twin Otter aircraft, with take off and landing on the site airstrip. The Kenn Borek staff considered the airstrip in good condition with exception to the taxiway that was in marginal to poor condition. The access road from the airstrip to the NHWL was considered in poor condition given development of sinkholes and erosion features throughout the length of the road.

The overall performance condition of the NHWL is rated as marginal in 2022 based on the severity ratings presented in Abandoned Military Sites Remediation Protocol Volume II (INAC, 2009; AMSRP). New settlement features were identified in three of the four landfill corners, and erosion features on the southeast slope appear to have increased in size and number from the previous monitoring event; however, it is difficult to assess the extent of the previously reported features based on the information and photographs presented in the Year 9 report. Additional monitoring is recommended.

Active layer groundwater was present during the Year 11 monitoring event and all four monitoring wells were sampled during the inspection. Groundwater samples collected from the landfill exhibited some ULA exceedances, however they are not cause for concern at this time. At the NHWL, the metals exceedances were not successive with previous years, nor within the contaminants of concern outlined in the AMSRP, and therefore appear anomalous to historical data. Nitrate ULA exceedances were successive with Year 9 results for MW02 and MW03, therefore further consideration and increased monitoring is recommended as per the AMSRP. This exceedance further supports the recommendation for an additional monitoring event. Field observations identified the presence of seasonal water ponding around the perimeter of the landfill cell, which appears to vary in location compared to previous monitoring events. The nearest permanent surface water body is approximately 1750 m away from the NHWL, therefore the mobility risk for the exceeded parameters is considered to be limited. No seepage or staining was identified on site; therefore, no soil or surface water samples were collected during the Year 11 event.

Based on the results of the 2022 Year 11 activities, the remediation strategy for CAM-D appears to be meeting the objectives expected for this phase of the LTMP. Geotechnical monitoring and visual inspection rate the NHWL as marginal per the AMSRP Volume II, consistent with the Year 9 results. Several areas of settlement and erosion were newly identified in the 2022 monitoring event with increased degradation of previously identified settlement areas and erosion on the southeast slope. Erosion channels on the northwest and northeast slopes indicate some fine granular material washout, which may compromise the structural integrity of the cell over time, however the channels appear to be self-armouring. The development of new erosion channels on the northwest slope also depicts self-armouring behaviour. Based on the Year 11 condition, it appears that the features are becoming self-armouring and may be stabilizing in their slumped condition; this could be confirmed with collection of survey data and specialized inspection in future monitoring events. The present landfill condition does not compromise containment given the scale of the features (less than 30 cm deep) relative to the berm width (approx. 14 m at base tapering to approx. 3 m at top) and cover thickness (minimum 1 m). Overall, the continued degradation of the landfill features and marginal condition rating result in recommendation for continuation of the increased monitoring frequency initially recommended in Year 5. Further, it is recommended that the next investigation is conducted by a geotechnical engineer with permafrost training and northern geotechnical experience. Utilization of a surveyor for explicit documentation of settlement and

erosion features is also recommended to increase the degree of monitoring of the site features and provide data to support whether the features are self-stabilizing.

AECOM recommends Year 13 monitoring in 2024 prior to the scheduled LTMP Year 15 event in 2026, at which point the LTMP schedule should be revisited. Prior to adjusting the remedial strategy (as stated in the AMSRP), additional monitoring events are needed. Further monitoring is required to determine if any potential groundwater trends are established and if there is continued degradation or signs of self-stabilization within the landfill features; inclusion of a Year 13 monitoring event will provide data which will allow for three or more data points to be interpreted in Year 15 as per the AMSRP trend definition.

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Acronyms and Abbreviations

AECOM	AECOM Canada Ltd.
ALS	ALS Environmental Laboratories
AMSRP	Abandoned Military Site Remediation Protocol
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
COC	Contaminant of Concern
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
INAC	Indigenous and Northern Affairs Canada *(subsequently Aboriginal Affairs and Northern Development Canada – AANDC, and now CIRNAC)*
LDPE	Low Density Polyethylene
LTM	Long Term Monitoring
LTMP	Long Term Monitoring Plan
NHWL	Non-Hazardous Waste Landfill
ORP	Oxidative-Reduction Potential
PAHs	Poly-Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PHCs	Petroleum Hydrocarbons
POL	Petroleum, Oil, and Lubricants
QA	Quality Assurance
QC	Quality Control
QA/QC	Quality Assurance/Quality Control
RDL	Reportable Detection Limit
RPD	Relative Percent Difference
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 long-term monitoring (LTM) activities at the former CAM-D Simpson Lake Distant Early Warning (DEW) Line site (referred to as "the Site"). CAM-D is located at 68° 35' N and 91° 57' W in the Kivalliq Region of Nunavut, 100 km east of Gjoa Haven and 80 km west of Kugaaruk. This report describes the monitoring activities completed at the site for Year 11 of the monitoring program.

1.1 Objectives

The objective of the long-term monitoring event was to complete Year 11 monitoring activities as described in the *CAM-D Simpson Lake Long-Term Monitoring Plan* (INAC, 2010; LTMP). Year 11 monitoring was added to the LTMP schedule based on the results of the Year 5 inspection, recommending continuation of a biannual frequency up to and including Year 11 in 2022 (Arcadis, 2017). The program included visual monitoring of the non-hazardous waste landfill (NHWL), visual observation of general site conditions and natural environment, collection and analysis of groundwater samples, and collection of surface water and/or soil samples, if identified. Analysis of field data and visual observations was completed to satisfy the requirements of the *Abandoned Military Site Remediation Protocol* (INAC, 2009; AMSRP).

The Phase II monitoring schedule of the LTMP was increased to include monitoring in Year 11, as recommended by Arcadis Canada Inc. (Arcadis) in the 2016 LTM report, and again by SLR Consulting Ltd. (SLR) in the 2018 LTM report.

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).
- Mobilization to and from CAM-D Simpson Lake via chartered Twin Otter aircraft with one field day on Site.
- Arrangement for a wildlife monitor (with firearm).
- Monitoring of general site conditions (i.e., access roads, airstrip, etc.) and natural environment as outlined in Section 2.1 of the LTMP.
- Visual inspection of the NHWL in accordance with Appendix C of the LTMP. Observations will be documented via a photographic record, visual monitoring checklist, and a site map.
- Purging of monitoring wells, collection of in-situ field parameters, and collection of groundwater samples from the four (4) monitoring wells around the NHWL.
- Collection of 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).
- Collection and analysis of blind duplicates from at least 20% of samples.
- Submit water samples to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory for analysis of PHC Fractions F1 and F2, total and dissolved metals, major ions, hardness, total dissolved solids, total suspended solids, pH, conductivity, and PCBs.
- Prepare a field report summarizing LTM activities undertaken within two weeks of fieldwork completion.
- Submit draft and final versions of the *CAM-D Simpson Lake Long-Term Monitoring (Year 11) 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 the 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 80 kilometres (km) west of Kugaaruk,120 km southeast of Taloyoak, and 160 km east of Gjoa Haven, Nunavut. Figure 1 in **Appendix A** shows the general site location. CAM-D was an intermediate DEW Line site constructed in 1957 by the Department of National Defence (DND). The Site was taken out of service in 1963, and custody of the Site was assumed by Indigenous and Northern Affairs Canada (INAC) in 1965.

During operations, the site consisted of a module train, warehouse, garage, Inuit house, petroleum, oil, and lubricant (POL) tanks, Quonset huts, storage pads, radar tower, and a 750 m airstrip. At the time of the 1994 assessment, only the garage and a POL pumphouse were still standing, all other buildings had been demolished or collapsed. Between 1992 and 1995, the DND constructed an unmanned Short-Range Radar (SRR) facility approximately 1km east of the site (see Figure 1 in **Appendix A**). This facility is still in operation and not part of the LTM activities.

Approximately 371 m^3 of soils with concentrations of metals, PCBs, PHCs, and/or polycyclic-aromatic hydrocarbons (PAHs) exceeding AMSRP criteria were identified on Site. The contaminated soils that were classified as Tier I contaminated soil were used as intermediate fill in the NHWL and Tier II contaminated soil was shipped off site for disposal. Approximately 58 m^3 of hazardous materials were identified and shipped off site for disposal.

Remediation, including the construction of the NHWL, took place between 2008 and 2011. All non-hazardous waste was placed in the NHWL, which is comprised of four (4) perimeter berms constructed of granular material. The waste was placed in the landfill in 0.5 m lifts and covered by 0.15 m of fill. The final cover consisted of a minimum 1.0 m granular fill cap. A total of 745 m^3 of non-hazardous waste was identified and disposed of on site in the NHWL. Four (4) monitoring wells were installed around the surrounding perimeter of the landfill. The NHWL and monitoring wells are shown in Figure 2 of **Appendix A**.

The NHWL contains the following:

- Tier I contaminated soil (i.e. soil with lead concentration up to 500 parts per million (ppm) and PCB concentrations up to 5 ppm);
- PHC Fractions F3 and F4 contaminated soil;
- Non-hazardous demolition debris such as timbers, plywood, and sheet metal;
- Non-hazardous site 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:

- *CAM-D (Simpson Lake) Long-Term Monitoring Plan* (INAC, 2010)
- *2018 Long-Term Monitoring Report – Year 7* (SLR, 2018)
- *2020 Long-Term Monitoring Report – Year 9* (BluMetric, 2020)
- *Abandoned Military Site Remediation Protocol (AMSRP)* (INAC, 2009)

A post construction landfill monitoring schedule is proposed in the AMSRP as follows:

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

The monitoring plan at CAM-D Simpson Lake began in 2012 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.

Additional monitoring at an increased frequency was recommended by Arcadis after Year 5 of the LTMP due to identification of cracking and erosion features at the NHWL. The recommendation based on the 2016 LTM report findings was to increase the Phase II monitoring schedule to include Year 9 (2020) and Year 11 (2022) (Arcadis, 2017).

3 Reference Guidelines

Review of the CAM-D 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.

3.1 Groundwater

In 2010, four monitoring wells, MW01 – MW04, were installed around the NHWL. No groundwater data is available from the year of installation. Groundwater samples were collected from monitoring wells in 2012, 2014, 2016, and 2020 which represent Years 1, 3, 5, and 9 of the LTMP. It should be noted that groundwater data was not collected from MW02 in 2016, and all 4 monitoring wells were not sampled in 2018 as they were identified to be frozen at the time of the 2018 inspection.

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 are recommended ranging from increased monitoring frequency to development of 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 2012 to 2020. 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 D-7 to D-9 in **Appendix D** summarize the available historical groundwater data and the calculated ULAs (where available).

For purposes of the 2016 Year 5 LTM Report, Arcadis considered baseline data to be 2012 and 2014 so that ULA criteria could be calculated for all 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 is 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 are recommended ranging from increased monitoring frequency to development of a new remedial plan.

Two samples of ponded water were collected in 2018 at the request of the CIRNAC representative and will be used to compare future surface water samples. 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 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 1750 m from the NHWL.

3.3 Soil

Soil samples were collected prior to remediation in 2012 by Franz Environmental Inc. and were analyzed for PHCs, PCBs, and metals. The results can be used to calculate ULAs and applied as criteria per the AMSRP as no soil samples were collected during remediation at the Site. As a result, the 2012 analytical results are considered to be baseline.

4 2022 Monitoring Program Methodologies

The site investigation for the 2022 CAM-D Long-Term Monitoring Program was completed August 6, 2022, by AECOM personnel David Bugden and Alysha Selinger, accompanied by CIRNAC representative Melanie Netser, wildlife monitor Noah Alookie (a resident of Iqaluit), and a field technician Max Dubeau from Nunatta Environmental. The site was accessed by a Twin Otter aircraft, chartered by Kenn Borek Air mobilizing from Kugluktuk, NU. Logistics for the site visit were modified from the original Logistics Plan, provided under a separate cover, due to fuel limitations and accommodation availability. A summary of the activities and field notes can be found in **Appendix C**.

4.1 Health and Safety Plan

In preparation for the field program, a site-specific HASP was produced and submitted to CIRNAC previously 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 was inspected at the CAM-D site during the 2022 long-term monitoring event. The visual inspection looked for evidence of:

- 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 figure markup.

4.3 Natural Environment Monitoring

Natural environment data was collected during the 2022 long term monitoring event. The specific observations included:

- Wildlife sightings (species, number, gender, juveniles);
- Evidence of recent presence of wildlife (droppings, tracks, feathers/fur, carcass remains, etc.);
- Wildlife activity (summering/nesting/denning, migratory/passing through); and
- Qualitative assessment of relative numbers versus previous years (more, same, less).

Additional observations or information were not collected from local residents due to logistical restraints that caused the field team to stage from Kugluktuk in place of Kugaaruk.

4.4 Groundwater Sampling Methodology

The following outlines the methodology prepared for this program. Water level and depth to bottom of casing were recorded, and an approximate well volume calculated. Samples were collected from all four 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;

- Stick-up (height of well casing above surface); and
- Presence of hydrocarbons.

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 ALS Laboratories (ALS) depot in Edmonton for analysis.

ALS is a CALA accredited laboratory, where samples were analyzed for:

- PHC Fractions F1 – F4;
- PCBs;
- Total and dissolved metals;
- Major ions, hardness, total dissolved solids, total suspended solids; and
- pH, conductivity.

4.5 Surface Water Sampling Methodology

The following outlines the methodology prepared for this program in the event surface water was identified on site.

Following the collection of each water sample, temperature, pH, dissolved oxygen, and conductivity were to be recorded using a YSI 6920 V2 probe. Observations such as turbidity, evidence of groundwater indicators (surface sheen, vegetation), presence or evidence of aquatic life, and human and/or animal presence on site were also to be noted.

All collected surface water samples were to be placed in appropriate laboratory-supplied clean sample bottles, placed in insulated coolers (provided by ALS Laboratory) to be maintained between 0 and 10ºC, and shipped to the laboratory under a Chain of Custody. Global Positioning System (GPS) UTM coordinates were to be documented for surface water sampling locations.

Samples were to be analyzed by a CALA accredited laboratory for:

- PHC Fractions F1 and F2 (C6-C16);
- Total and dissolved metals;
- PCBs; and
- Total suspended solids, total dissolved solids, and routine parameters including major ions and hardness.

4.6 Soil Sampling Methodology

In the event visual inspection identified the need for soil sample collection, samples were to be collected with a small trowel decontaminated with a laboratory-grade biodegradable cleaner (Alconox®) and rinsed between sampling locations. Soil samples were to be collected to a maximum depth of 30cm and packed into laboratory supplied jars with minimal to no headspace. Samples were to be kept cool and packed on ice for shipment to the receiving laboratory.

The following parameters were to be analysed by a CALA accredited laboratory:

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

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 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 at least 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. For metals in soils acceptable RPD values are 35%, and 50% for organics in soils (PHCs and PCBs). Only when concentrations are at least 10 times the method detection limit are RPD calculations considered valid.

5 Results

This section presents a summary of the analytical results and observations collected during the 2022 Year 11 monitoring activities. Site figures presenting the inspection observations are available in **Appendix A**. Photographs of the Site taken during the Site monitoring program are presented in **Appendix B**. The Visual Inspection and Natural Environment Checklists can be found in **Appendix C**.

5.1 Natural Environment

Observations of the natural environment showed numerous caribou tracks and some goose tracks at the base of the landfill and across the Site (see caribou tracks in Photographs 15 and 19 in **Appendix B**). An animal burrow was identified on the northwest corner of the landfill (see Figure 2 in **Appendix A** and Photograph 12 in **Appendix B**). There were no wildlife sightings at the time of assessment. Some sparse vegetation was observed on the NHWL slopes and cover. The complete Natural Environment Checklist is available in **Appendix C**.

5.2 Non-Hazardous Waste Landfill

5.2.1 Geotechnical Monitoring and Visual Inspection

The following subsections describe the results of the geotechnical monitoring and visual inspection completed at the landfill and immediate surrounding area. Photographic reference for each subsection is provided in the Visual Inspection Checklist in **Appendix C**.

5.2.1.1 Settlement

Areas of settlement and cracking were noted across all berm slopes and the north corner as previously identified in Years 7 and 9. Newly identified areas of settlement in the west, south, and east corners of the cell (see Photographs 4, 7, and 12 in **Appendix B**) and vertical settling on the southeast slope (see Photograph 6 in **Appendix B**) were added to the figure markup in Year 11 (see Figure 2 in **Appendix A**). Areas previously identified with settlement did not appear to have significantly changed since the monitoring inspection in Year 9 (based on Site photographs in the 2020 BluMetric report; BluMetric, 2021), except for an area on the southeast portion of the containment berm that further developed (see Photographs 5 and 6 in **Appendix B**).

Areas with settlement were identified on the south corner of the cell including vertical cracking at the base (see Photograph 7 in **Appendix B**). Horizontal cracking was observed extending around the east and west corners of the cell with localized settlement areas (see Photographs 4 and 12 respectively in **Appendix B**). Settlement and cracking on the southeast slope of the berm appeared worse in Year 11 with newly identified vertical cracks across the slope intersecting the horizontal crack (see Photograph 6 in **Appendix B**).

5.2.1.2 Erosion

Evidence of erosion was observed to be similar to observations in previous years. Identified flow paths for run-off were observed with exposed coarse granular material and minimal fines on the northwest and northeast slopes where the erosion channels are most prominent (see Photographs 16 to 18 in **Appendix B**). The erosion channels appear to be self-armouring.

5.2.1.3 Animal Presence

Evidence of wildlife activity was identified around the base of the cell with numerous caribou tracks and a newly identified animal burrow on the northwest corner (see Photograph 12 in **Appendix B**). Two burrows identified on the access road in Year 9 were not observed in Year 11.

5.2.1.4 Debris

Pieces of scrap steel angles and cable were observed on the ground surface on the northwest side of the cell but were not observed to be originating from the NHWL (see Photograph 14 in **Appendix B**). Wire and miscellaneous debris identified in the Year 7 report were not observed in either Year 9 or Year 11.

5.2.1.5 Staining

During the inspection, no observations of staining were observed.

5.2.1.6 Vegetation Stress

Sparse vegetation was noted on top of the NHWL cell and around the berms.

5.2.1.7 Seepage and Ponding

Several areas of surface ponding were observed around the base of the landfill along the east and west corners, with significant ponding at the base of the southwest berm (see Photograph 8 in **Appendix B**). The ponds did not appear to be the result of seepage from the landfill and were therefore not sampled. Previous reports indicated poor drainage around the Site, and presence of ephemeral ponded water, which is consistent with the Year 11 observations.

5.2.1.8 Monitoring Instruments

All four monitoring wells around the NHWL – MW01, MW02, MW03, and MW04 – were generally found in good condition. Some settling was observed at the base of the well stickup at MW02 and MW03 that does not appear to be affecting the function of the monitoring wells. The Year 9 report indicated heaving at MW04, however the casing did not appear raised during the Year 11 inspection; spalling and cracking in the concrete around the base was observed (see Photograph 24 in **Appendix B**). The function of MW04 does not appear to be impaired.

5.2.2 Groundwater Monitoring

During the inspection, all four groundwater monitoring wells located around the NHWL were inspected. At the time of assessment, the well locks were removed and replaced with Guard 111 keys; a spare set of keys was provided to the CIRNAC representative. All the metal well casings appeared in good condition. Active layer groundwater was present during the 2022 monitoring event and as a result, all monitoring wells were sampled during the inspection. For QA/QC purposes, a blind field duplicate was also collected from MW01. During the sampling program, slow water recharge was noted in all wells, and sampling required several recharges. Well locations are provided in **Table 5-1** and shown in Figure 2 in **Appendix A**.

Table 5-1 CAM-D Simpson Lake Groundwater Well Locations

Well	UTM83-15 Northing (m)	UTM83-15 Easting (m)
MW01	7609340	541517
MW02	7609426	541523
MW03	7609409	541474
MW04	7609348	541454

The AMSRP suggests analytical results be compared to previous data, and if 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 measured parameters (pH, conductivity, temperature, ORP, turbidity, DO, and water level) for the groundwater monitoring wells are summarized in Table D-1 of **Appendix D**. Analytical results from the Year 11 monitoring event are presented in Tables D-2 – D-6 in **Appendix D**. Tabulation of all historical groundwater results collected since 2012 are presented in Tables D-7 – D-9 in **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	Results	ULA
MW02		
General Chemistry		
Nitrate (as N)	2.48 mg/L	1.41 mg/L
Metals		
Calcium, total	151 mg/L	136 mg/L
Calcium, dissolved	144 mg/L	139.5 mg/L
MW03		
General Chemistry		
Nitrate (as N)	2.14 mg/L	1.41 mg/L

ULA metals exceedances for Calcium in monitoring wells MW02 and MW03 were not observed in successive sampling events (2018 and 2020), therefore the ULA exceedances reported in 2022 appear anomalous to historical data (see Table D-8 in **Appendix D** for historical data). The Year 11 ULA metal 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. The previous ULA exceedance in Year 9 was limited to Aluminum in MW01, which was not observed in Year 11.

BluMetric identified nitrate ULA exceedances in Year 9 at all four wells, making the above results for MW02 and MW03 in Year 11 successive. As per the AMSRP, successive monitoring events with ULA exceedances require further consideration and increased monitoring. Further discussion of the nitrate exceedance is provided in **Section 5.4.3** pertaining to analytical QA/QC.

All PCB and PHC concentrations were below laboratory detection limits, consistent with previous monitoring years.

5.2.3 Surface Water Monitoring

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

5.2.4 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.

5.2.5 Landfill Performance

The overall performance condition of the NHWL is rated as marginal in 2022 based on the severity ratings presented in AMSRP Volume II (INAC, 2009). This is consistent with the previous condition documented in Year 9 (BluMetric, 2021). New settlement features were identified in three of the four landfill corners, and erosion features on the southeast slope appear to have increased in size and number from the previous monitoring event; however, it is difficult to assess the extent of the previously reported features based on the information and photographs presented in the Year 9 report. Tension cracks in landfill berms are most likely caused by a bearing failure in the underlying native soils that occurs when the active layer is thawed. The general CAM-D area is quite flat and poorly drained, as is evident from the observed topography and the presence of numerous small surface water bodies in the area. When the active layer under the landfill berms is thawed, the surcharge loading from the overlying berms on the thawed, native active layer has resulted in settlement and the development of tensions cracks in the landfill berms. The condition of the southeast slope may be a result of these geotechnical processes. Given the size and extent of the features relative to the berm width and cover thickness, the NHWL containment is currently not compromised; however, continual degradation of the berms may lead to future failure and increased monitoring is required.

5.3 Site Condition

The Site access road from the airstrip to the NHWL was considered in poor condition given development of sinkholes and erosion features throughout the length of the road. Two sinkholes were noted along the access road, the largest above a culvert (see Photograph 22 in **Appendix B**). The access road near the landfill area was observed to be in good condition. The Kenn Borek staff considered the airstrip in good condition with exception to the taxiway that was in marginal to poor condition. Inspection observations are presented in the Visual Monitoring Checklist in **Appendix C**; access road conditions are shown in Photographs 20 – 22 in **Appendix B**.

5.4 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.

5.4.1 Duplicate Samples

A duplicate sample is a sequential sample taken immediately following the collection of a regular sample. Duplicate samples were collected for 25 percent (%) of the samples collected as part of the QA/QC sampling program. This equates to one duplicate per four wells sampled. Duplicate samples provide a rough estimate of the overall variability of the field technique and laboratory analysis.

5.4.2 Relative Percent Difference

The relative percent difference (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.

5.4.3 Analytical QA/QC

Samples were analyzed by ALS Environmental Laboratories which is accredited by CALA for the parameters proposed for analysis and uses recognized methods to conduct laboratory analyses. As conveyed by the laboratory, method blanks, certified reference materials, method spikes, duplicates, surrogates, and laboratory control samples are routinely analyzed as part of their QA/QC programs. Analytical QA/QC was completed by ALS by way of analytical method blanks, analytical control spikes and analytical duplicates.

Hold times for pH, nitrate, and nitrite were exceeded in water samples. The hold time exceedances were due to the logistical challenges and constraints of shipping samples from the site to ALS Laboratories in Edmonton, AB, 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 (see Table D-10 in **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 all parameters with hold time exceedances for the 2022 sample analyses.

For significant hold time exceedances such as samples for nitrate, 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 consistency with historical, expected, or available test results from related or similar samples be considered. Results for nitrate were higher (same order of magnitude) than in previous years but are not the first occurrence of elevated values. Given the logistical constraints that apply to all site visits, the hold time exceedance is not atypical and was experienced in previous monitoring events. For these reasons, the 2022 data for nitrate is considered fit for purpose.

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 E**.

6 Conclusion & Recommendations

Based on the results of the 2022 Year 11 activities, the remediation strategy for CAM-D appears to be meeting the objectives expected for this phase of the LTMP. Geotechnical monitoring and visual inspection rate the NHWL as marginal per the severity ratings presented in the AMSRP Volume II, consistent with the Year 9 results. Several areas of settlement and erosion were newly identified in the 2022 monitoring event with increased degradation of previously identified settlement areas and erosion on the southeast slope. Erosion channels on the northwest and northeast slopes indicate some fine granular material washout, which may compromise the structural integrity of the cell over time, however the channels appear to be self-armouring. The development of new erosion channels on the northwest slope also depicts self-armouring behaviour. The present landfill condition does not compromise containment given the scale of the features (estimated to be less than 30 cm deep) relative to the berm width (approx. 14 m at base tapering to approx. 3 m at top) and cover thickness (minimum 1 m). The continued degradation of the landfill features and marginal condition rating result in recommendation for continuation of the increased monitoring frequency initially recommended in Year 5 by Arcadis (Arcadis, 2017). AECOM recommends Year 13 monitoring in 2024 prior to the scheduled Year 15 event in 2026, at which point the schedule should be revisited.

It is recommended that the Year 13 inspection is conducted by a geotechnical engineer with permafrost training and northern geotechnical experience. Utilization of a surveyor for explicit documentation of settlement and erosion features is also recommended to increase the degree of monitoring of the site features. Based on the Year 11 condition, it appears that the features are becoming self-armouring and may be stabilizing in their slumped condition; this could be confirmed with collection of survey data and specialized inspection in future monitoring events.

Groundwater samples collected from the landfill exhibited some ULA exceedances, however they are not cause for concern at this time. At the NHWL, the metals exceedances were not successive with previous years, are not within the contaminants of concern outlined in the AMSRP, therefore appearing anomalous to historical data. Nitrate ULA exceedances were successive for MW02 and MW03 with Year 9 results, therefore further consideration and increased monitoring is recommended as per the AMSRP. This exceedance further supports the recommendation for an additional monitoring event in Year 13 prior to schedule reconsideration in Year 15. Field observations identified presence of seasonal water ponding around the perimeter of the landfill cell, which appear to vary in location compared to previous monitoring events. The nearest permanent surface water body is approximately 1750 m away from the NHWL, therefore the mobility risk for the exceeded parameters is considered to be limited. Prior to adjusting the remedial strategy (as stated in the AMSRP), additional monitoring events are needed. Further monitoring is required to determine if any potential trends are established; inclusion of Year 13 data will allow for three or more data points to be interpreted in Year 15. At this time it is also recommended to maintain PHCs and PCBs on the parameter list for the Site. Despite historical non-detect results, until the landfill subsidence stabilizes or remedial actions are required, continued monitoring for three (3) additional monitoring events will support identification of any potential contaminant migration.

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.

The Site was accessed via Twin Otter aircraft. Airline charter staff deemed the airstrip to be in good condition, but noted the taxiways were in marginal to poor condition. It is recommended that the airstrip condition is observed during future monitoring events to continue safe site access.

7 References

Arcadis Canada Inc. (Arcadis). 2017. Long Term Monitoring – 2016. February 3, 2017.

BluMetric Environmental Inc. (BluMetric). 2020. 2020 Long Term Monitoring Report. March 12, 2021.

Indigenous and Northern Affairs Canada (INAC). 2010. CAM-D Simpson Lake LTM Plan. February 22, 2010.

INAC. 2009. Abandoned Military Site Remediation Protocol (AMSRP). Contaminated Sites Program. December 2009.

SLR Consulting Ltd. (SLR). 2018. 2018 Long Term Monitoring Report. December 18, 2018.

Appendix A

Figures

NOTES:
1. ALL COORDINATES ARE REFERENCED TO NAD83 UTM ZONE 15.
2. IMAGERY FROM ARCGIS DATAMAP.

Issue Status: FINAL

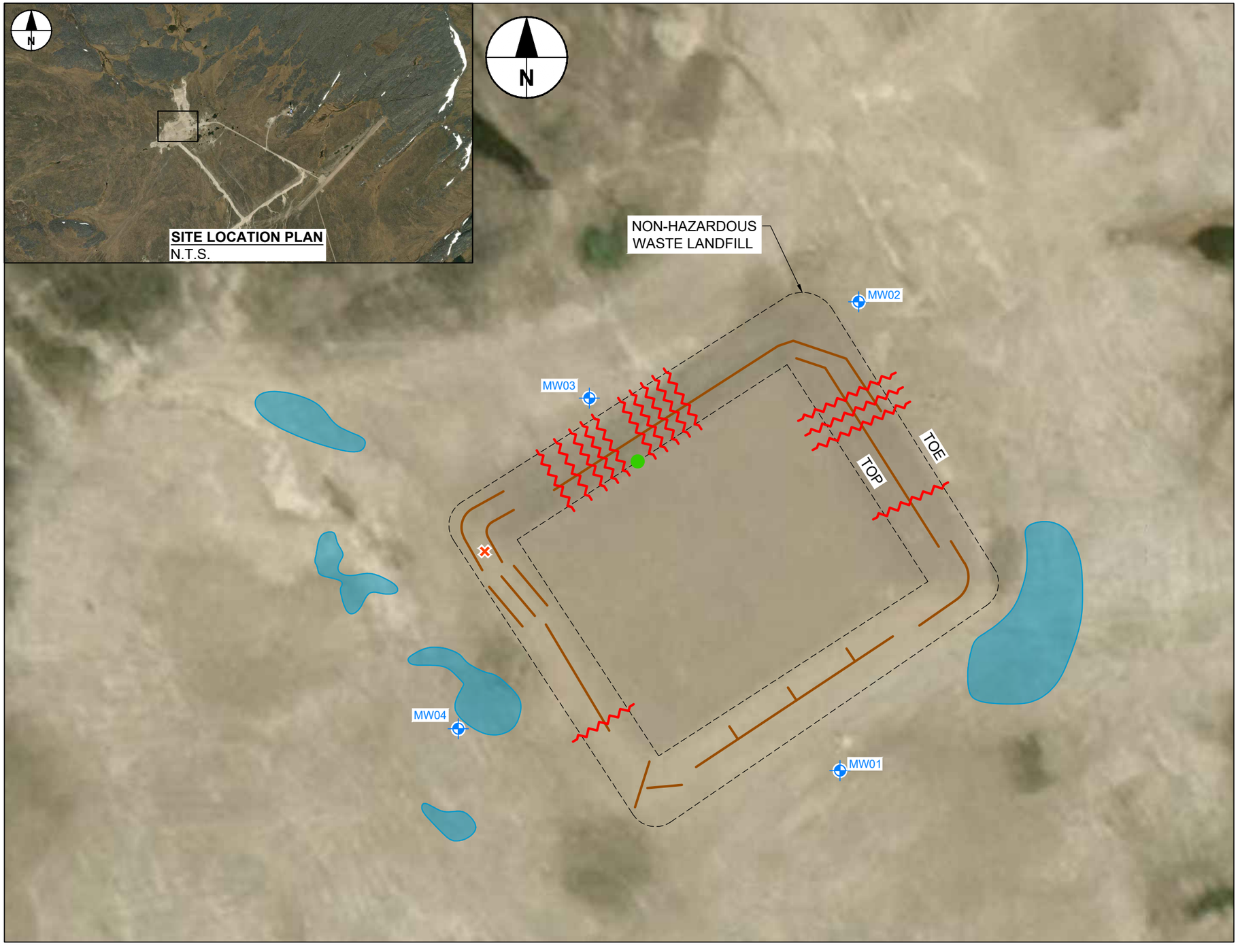
2022 Nunavut Sites Long-Term Monitoring
CAM-D Simpson Lake (Year 11)
Crown-Indigenous Relations and Northern Affairs Canada
Project No.: 60686962 Date: 2023-03-09

CAM-D SITE PLAN

AECOM

Figure 1

SITE LOCATION PLAN
N.T.S.



LEGEND

- ANIMAL BURROW
- MW — MONITORING WELL
- EROSION
- SETTLEMENT
- PONDED WATER
- DEBRIS

NOTES:
1. ALL COORDINATES ARE REFERENCED TO NAD83 UTM ZONE 15.
2. IMAGERY FROM ARCGIS DATAMAP.

0 18.75 37.5 m

1:750

Issue Status: FINAL

2022 Nunavut Sites Long-Term Monitoring
CAM-D Simpson Lake (Year 11)
Crown-Indigenous Relations and Northern Affairs Canada
Project No.: 60686962 Date: 2023-03-09

NON-HAZARDOUS WASTE LANDFILL
VISUAL INSPECTION

AECOM

Figure 2

Appendix B

Photographic Record

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
1	8/6/2022

Direction Photo Taken: East/Southeast

Area: NHWL

Description: Aerial view of site.

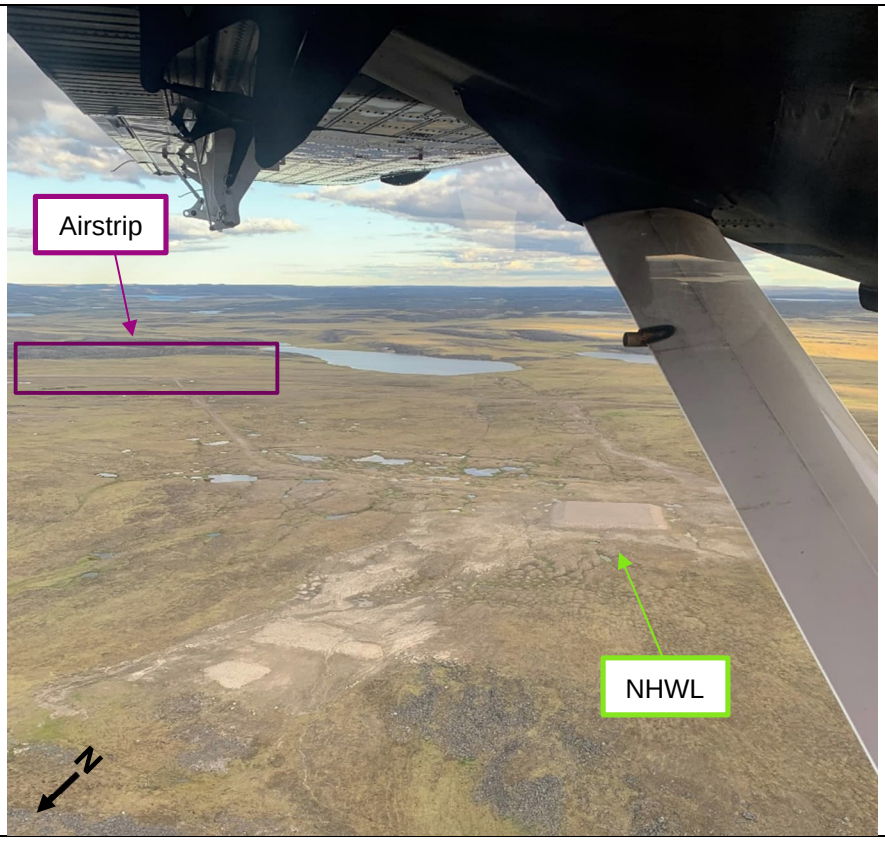
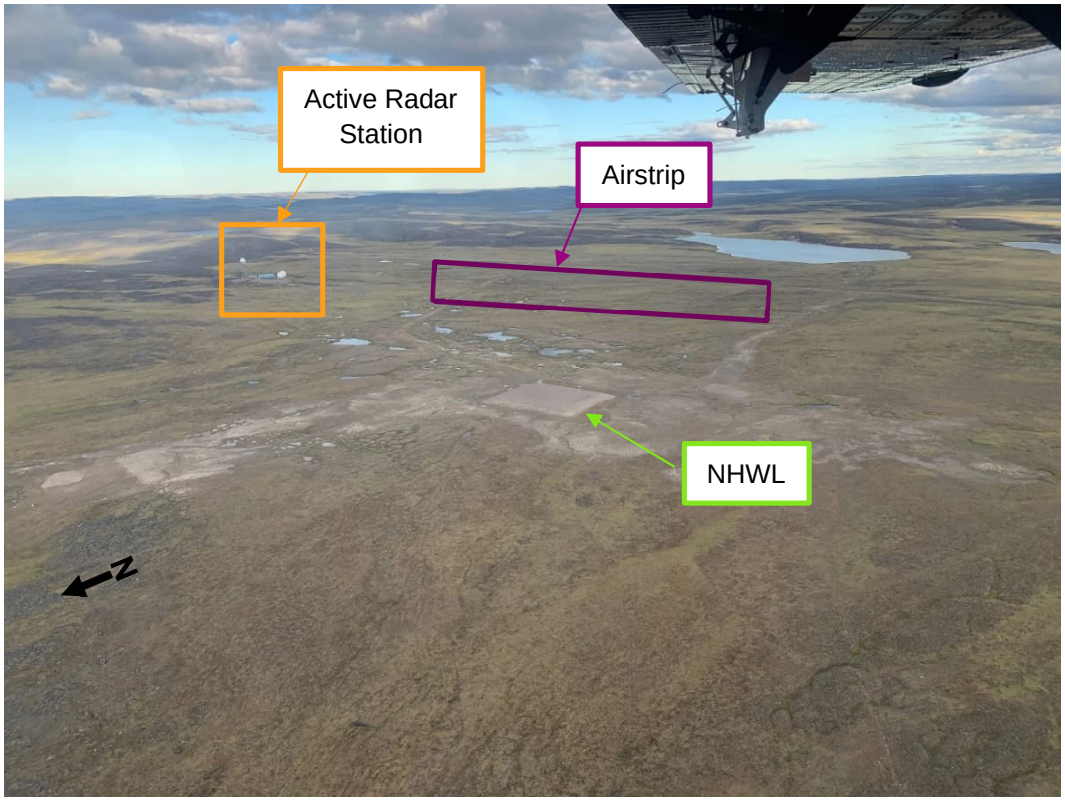


Photo No.	Date
2	8/6/2022

Direction Photo Taken: Southeast

Area: NHWL

Description: Wide aerial view of site.



AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
3	8/6/2022

Direction Photo Taken: West

Area: NHWL

Description: Top of NHWL cell in good condition. Sparse tufts of vegetation.

Photo No.	Date
4	8/6/2022

Direction Photo Taken: West

Area: NHWL

Description: East corner of landfill. Settlement crack around corner (circled). Ponding water at based of landfill around corner. MW01 visible in back left of photo (boxed).

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
5	8/6/2022

Direction Photo Taken: Northeast

Area: NHWL

Description: East portion of southeast slope of landfill. Horizontal settlement around corner (circled) and along top of slope (boxed). Some ponding at base of slope.

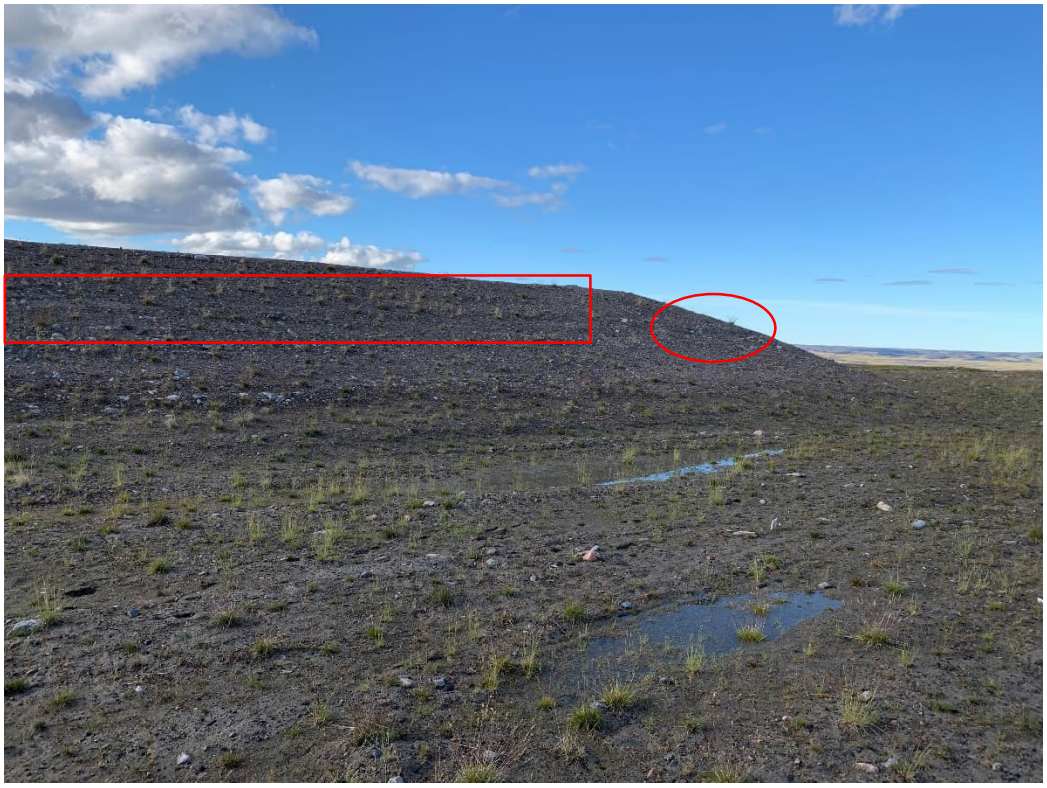
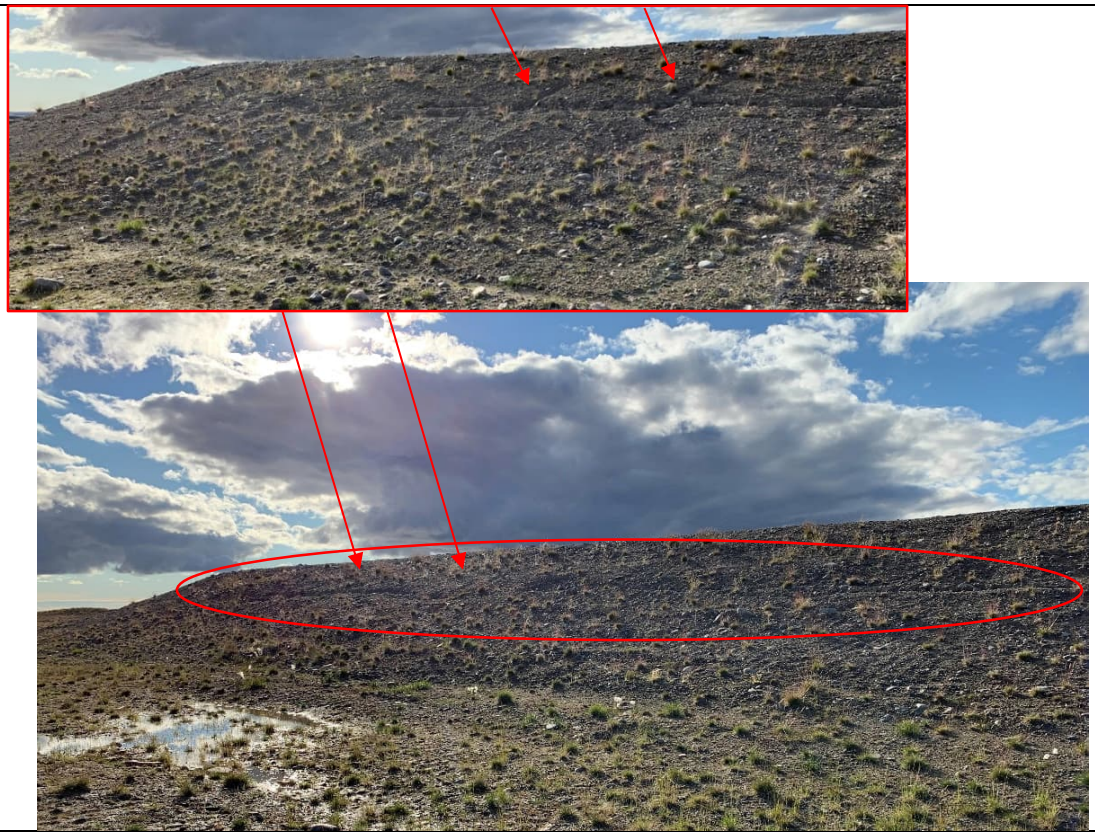


Photo No.	Date
6	8/6/2022

Direction Photo Taken: West

Area: NHWL

Description: Southeast landfill slope. Evidence of horizonal settlement along top of slope (circled) and intersecting vertical cracks (arrows and call-out). Some ponding at base of slope. MW01 located just to the left of photo.



AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
7	8/6/2022

Direction Photo Taken

North

Area

NHWL

Description

South corner of landfill. Erosion and settlement cracks extending down from top of landfill (circled).

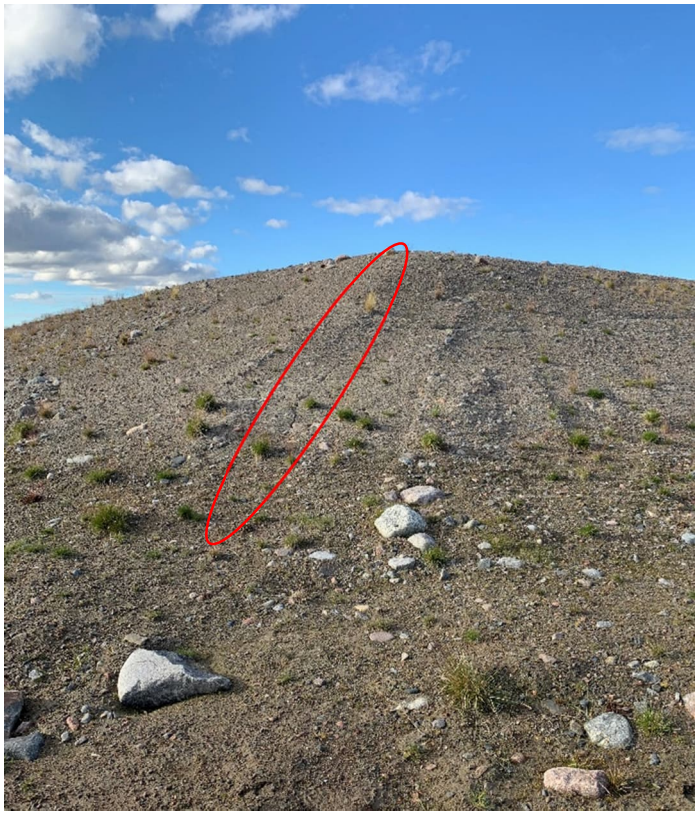


Photo No.	Date
8	8/6/2022

Direction Photo Taken

Northwest

Area

NHWL

Description

Ponded water around MW04 off southwest side of landfill.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
9	8/6/2022

Direction Photo Taken: Northeast

Area: NHWL

Description: Southwest slope of landfill. Erosion channel (circled) and horizontal settlement on slope (see Photo 10).

Photo No.	Date
10	8/6/2022

Direction Photo Taken: Northwest

Area: NWHL

Description: Settlement on southwest slope viewed from top of cell.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
11	8/6/2022

Direction Photo Taken

West

Area

NHWL

Description

Erosion on southwest slope near MW04 viewed from top of cell.

Photo No.	Date
12	8/6/2022

Direction Photo Taken

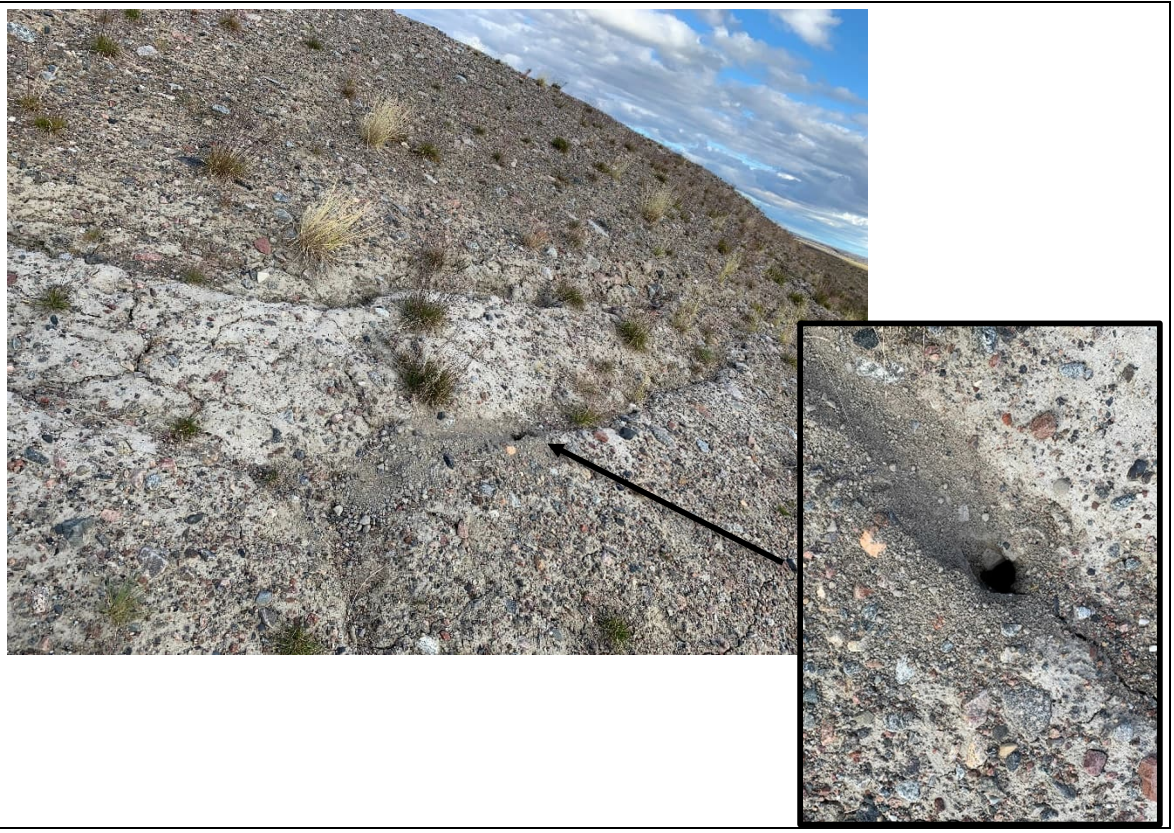
Southeast

Area

NHWL

Description

Cracking continues around west corner in parallel bands. Animal burrow on west landfill corner (call-out).



AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
13	8/6/2022

Direction Photo Taken: Northeast

Area: NHWL

Description: Northwest slope of landfill. Settlement noted near top of slope continuing for most of slope length (circled). MW03 visible (boxed).

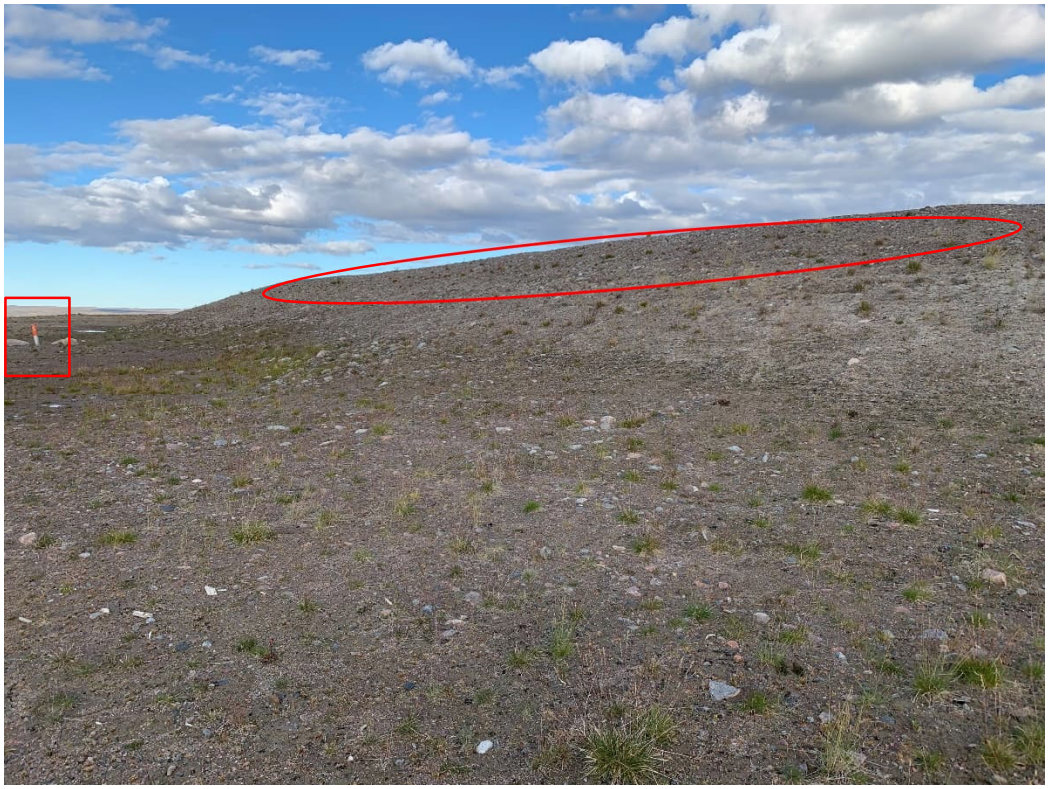


Photo No.	Date
14	8/6/2022

Direction Photo Taken: N/A

Area: NHWL

Description: Debris on northwest slope near MW03.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
15	8/6/2022

Direction Photo Taken: South

Area: NHWL

Description:

North corner of cell. Evidence of cracking and settlement around corner (circled). Erosion rills visible right of the circled settlement area. Some ponded water at base. MW02 visible in background (boxed). Caribou tracks visible around cell.

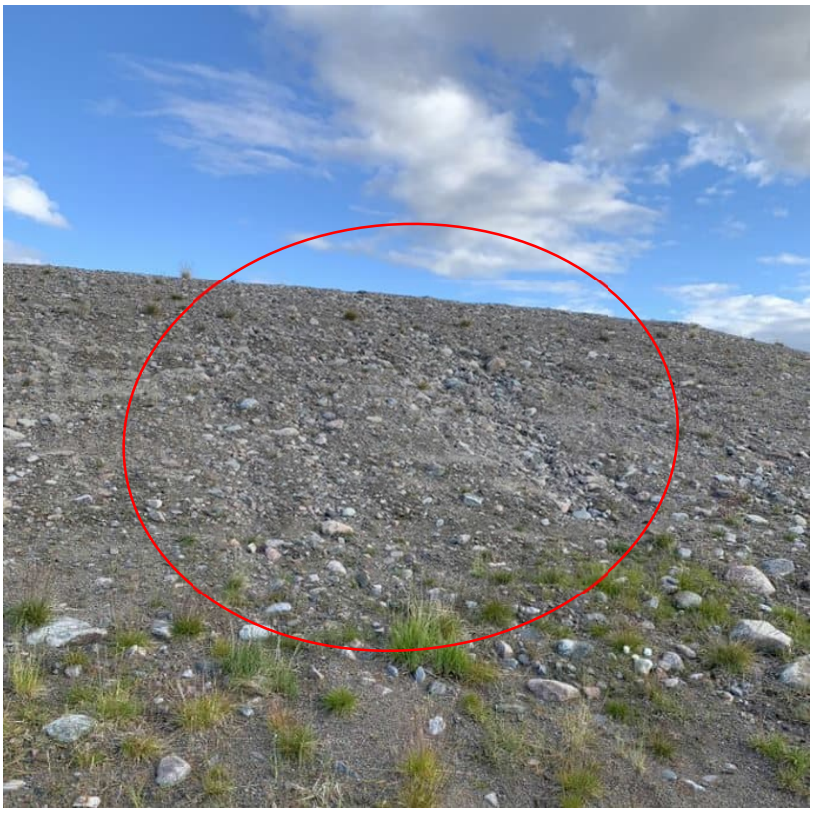
Photo No.	Date
16	8/6/2022

Direction Photo Taken: Southeast

Area: NHWL

Description:

Northeast slope of landfill. Flow path down from top of cell (circled) with exposed coarse granular material and minimal fines.



AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
17	8/6/2022

Direction Photo Taken

Southwest

Area

NHWL

Description

Erosion channels on northeast slope showing coase granular material and minimal fines.

Photo No.	Date
18	8/6/2022

Direction Photo Taken

South

Area

NHWL

Description

Northeast slope of cell. Evidence of horizontal settlement sloughing (circled) and an erosion channel (boxed) exposing coarse material. Runoff channel from top of cell observed.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
19	8/6/2022

Direction Photo Taken

NA

Area

NHWL

Description

Caribou tracks at base of landfill along northeast slope.

Photo No.	Date
20	8/6/2022

Direction Photo Taken

Southeast

Area

Site Access

Description

Access road from site to airstrip. Signs of erosion and settlement throughout.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
21	8/6/2022

Direction Photo Taken

NA

Area

Site Condition

Description

Sinkhole observed in access road. Sparse vegetation present.

Photo No.	Date
22	8/6/2022

Direction Photo Taken

N/A

Area

Site Condition

Description

Culvert on access road with evidence of erosion and sinkhole.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
23	8/6/2022

Direction Photo Taken

North

Area

Site Condition

Description

MW01 in good condition. North Warning Radar Tower visible in background.

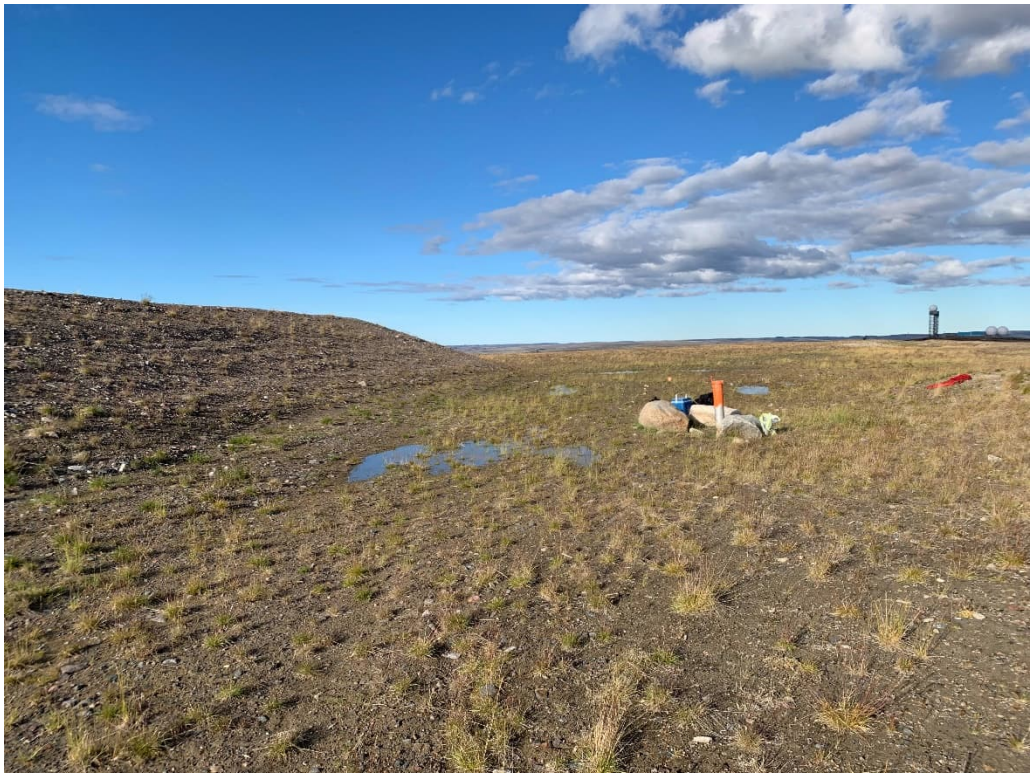


Photo No.	Date
24	8/6/2022

Direction Photo Taken

NA

Area

Site Condition

Description

Cracking and spalling around base of MW04. Ponded water in proximity.

AECOM

PHOTOGRAPHIC LOG

Site Name:	Site Location	Project No.
CAM-D Long-Term Monitoring – Year 11	Simpson Lake, NU	60686962

Photo No.	Date
25	8/6/2022

Direction Photo Taken

N/A

Area

Site Condition

Description

MW03 in good condition.

Appendix C

Monitoring Checklists and Daily Field Report

VISUAL MONITORING CHECKLIST

ITEM	PRESENCE / ABSENCE	EXTENT	DESCRIPTION / PHOTOGRAPHIC REFERENCE
Settlement	Yes	Some Settling and cracking in edges of cell	Photographs 5 - 7, 9, 10, 13, and 15 in Appendix B.
Erosion	Yes	Some eroding flow from top of cell	Photographs 6, 7, 9, 11, and 16 - 18 in Appendix B.
Frost Action	No	Top of cell looks good	-
Animal Burrows	Yes	NW corner, small burrow hole.	Photograph 12 in Appendix B.
Vegetation	Yes	Sparse vegetation in cell	Photograph 3 in Appendix B.
Staining	No	-	-
Vegetation Stress	No	-	-
Seepage Points	No	-	-
Exposed Debris	Yes	Piece of steel cable. Piece of T Bar angle. North side of cell.	Photograph 14 in Appendix B.
Condition of Monitoring Instruments	-	Wells in good condition. Some settling under well stickup (3,2). Locks were cut off and replaced with Guard 111 keys.	Photographs 23 - 25 in Appendix B.
Other Features of Note	-	Some ponded water around Site at base of cell. Roadway at Site in good condition. Road from runway to cell culvert is washing out. Some erosion. Poor condition.	Photographs 4, 5, 8, 11, and 20 - 22 respectively in Appendix B.

NATURAL ENVIRONMENT CHECKLIST

ITEM	PRESENCE / ABSENCE	EXTENT	DESCRIPTION / PHOTOGRAPHIC REFERENCE
Wildlife Sightings	No	-	-
Evidence of Wildlife	Yes	One animal burrow. Lots of caribou tracks. Some goose tracks.	Photographs 12, 15 and 19 in Appendix B.
Wildlife Activity	No	-	-
Relative Number	-	-	-
Evidence of Revegetation	Yes	Some sparse vegetation in cell	-

AECOM

Project Daily Report			
Client:	CIRNAC	**Date:**	6-Aug-22
Project:	Nunavut Sites LTM	**Weather:**	14°C mostly sunny
Project No.:	60686962		
Location:	Kugluktuk / Gjoa Haven / CAM-D	**Number of Personnel On-Site :**	7
Departure Time:	9:00 AM MST	**Return Time:**	8:30 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

Two sinkholes were found on the road leading up to site from the airstrip. Sinkholes were identified to the team once spotted to avoid and watch footing.

Technical Scope

Geotechnical Inspection

Visual inspection of landfill cell. Signs of erosion and sloughing were marked on the previous LTM figure. The marked feature areas were still present on site. Both horizontal and vertical cracks were also present along with overlfow drainage channels coming down from the top of the cell, primarily on the north side near MW#3. Top of the cell was in good condition. Some ponded water along the outside of the cell (did not appear to be leachate).

Aquatic Monitoring

Low-flow sampled four (4) wells. Wells seemed to have a slower recharge rate compared to other sites, needed to turn the pump off and wait for recharge a couple times.

Temperature Monitoring

N/A

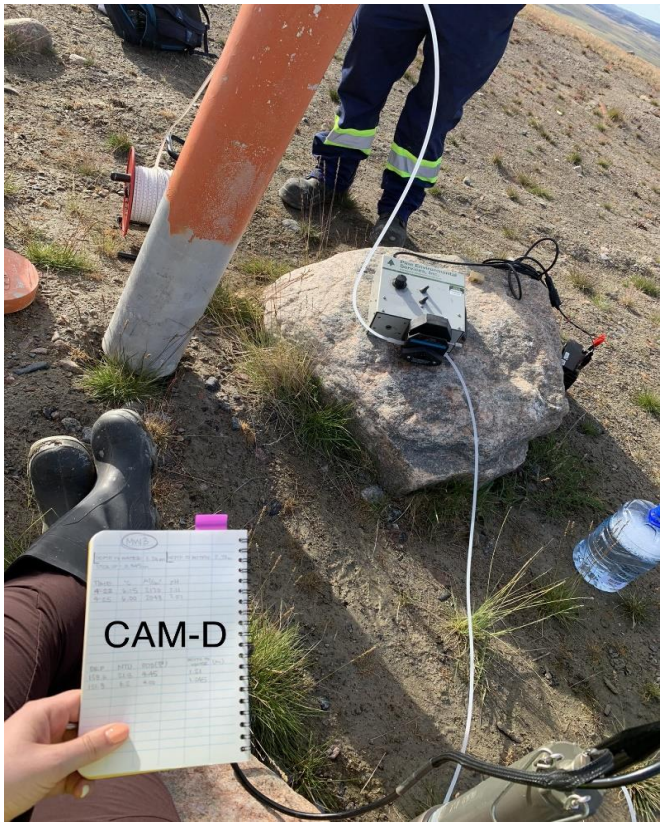
Communications or Deviation from Work Plan

Refuelled in Gjoa Haven prior to arriving on site.

Other:

Pilots found the aristrip to be in good condition, but said the taxiways were in poorer conditon.

Project Daily Photo Record



Photograph 1: Low-Flow Sampling at MW#4

Photograph 2: Sinkhole on Road between Airstrip and Site

CAM - D

AUG. 6, 2022

Rite in the Rain

MW#1

(m)	DEPTH TO WATER	DEPTH TO BOTTOM	STICK UP
	0.730	2.130	0.670

TIME	°C	µS/cm	pH
2:41	6.13	2556	6.80
2:44	6.10	2433	7.25
2:47	6.79	2385	7.34
2:50	6.93	2349	7.40
2:53	6.73	2315	7.39
2:56	6.37	2322	7.38
2:59	5.81	2372	7.39

ORP	NTU	ODO (mg/L)	WATER LEVEL (m)
168.5	2.7	3.42	1.01
147.9	3.6	2.46	1.01
139.6	14.6	2.84	1.02
136.0	14.0	3.34	1.27
134.0	7.6	3.33	1.335
132.7	5.7	3.43	1.39
131.8	4.6	3.59	1.55

MW4

(m)

DEPTH TO WATER	1.05
DEPTH TO BOTTOM	2.43
STICK UP	0.88

TIME	°C	mS/cm	pH	DRP	NTU	ODO (mg/L)
3:38	6.70	1377	7.61	128.9	1.8	2.15
3:41	6.36	1291	7.63	118.5	3.9	1.37
3:44	6.48	1250	7.62	109.5	3.4	1.15
3:47	6.38	1234	7.60	103.6	3.0	1.06
3:50	6.19	1228	7.60	100.2	20.3	1.00
3:53	6.12	1225	7.58	97.3	16.3	0.96
3:56	6.37	1216	7.55	92.3	8.9	0.93
3:59	6.57	1217	7.52	86.8	-6.7	0.89

DEPTH TO WATER (m)
1.16
1.20
1.20
1.215
1.220
1.233
1.242

MW3

DEPTH TO WATER: 1.06 m | DEPTH TO BOTTOM: 2.38 m

STICK UP = 0.845 m

TIME	°C	µS/cm	pH	ORP	NTU	ODO (%)	DEPTH TO WATER (m)
4:22	6.15	2170	7.11	138.6	21.8	4.45	1.21
4:25	6.00	2048	7.07	131.8	6.2	4.00	1.245
4:28	5.79	2023	7.06	130.6	10.5	3.89	1.28
4:31	5.86	1957	7.05	130.3	7.4	3.89	1.315
4:34	6.08	1912	7.06	130.9	5.5	4.01	1.34
4:37	6.29	1876	7.00	132.1	4.1	4.26	1.385
4:40	6.16	1868	7.00	133.2	2.9	4.40	
4:43	6.21	1847	6.97	134.7	2.3	4.55	1.43
4:46	6.18	1827	6.94	136.2	2.4	4.65	1.46

MW2

DEPTH TO WATER: 1.32m | DEPTH TO BOTTOM: 1.855m
STICK UP: 0.48m

TIME	°C	MS/cm^c	pH
5:08	3.46	1387	6.88
5:11	3.13	1368	6.88
5:14	3.24	1360	6.87
5:17	3.42	1365	6.87

ORP	NTU	ODO ($\frac{mg}{L}$)	DEPTH TO WATER (m)
146.2	2.8	3.45	1.44
142.7	1.7	3.97	1.51
141.4	1.2	4.67	1.545
141.7	0.9	5.16	1.58

NO

DATE Aug 6/22 PAGE

Lft Kugluktuk @ 9:30
(fuel up plane first stop)

2stop in Gjoa Haven @ 12:30
for fuel.

@ CAM-0 @ 13:52

Sampled 4 wells. MW1 = Deep

Alysha has Notes
See Data sheet checklist in Binder
Some Cracks & cracking on side of
cell, top of cell looks good.

lots of caribou tracks
1 Burrow small hole on cell.

Road from Airstrip to cell
Rough conditions Erosion.

Runway in good conditions

PARTY CHIEF / CHEF D'ÉQUIPE

CONDITIONS Sun +17 @ 9:30 Kugluktuk

NO

DATE Aug 6/22 PAGE

Back at plane @ 6:30

.5hr flight to GJoa Haven.

Difficulty getting our place to stay, No Contact.

contacted CAP located Rental and House.

No meals from Hotel.

PARTY CHIEF / CHEF D'ÉQUIPE

CONDITIONS

Appendix D

Groundwater Tables

TABLE D-1

CAM-D
Year 11 2022

In-situ Field Parameters from Groundwater Monitoring Wells

Parameter	Units	MW01	MW02	MW03	MW04
		6-Aug-22	6-Aug-22	6-Aug-22	6-Aug-22
Field Parameters		Year 11	Year 11	Year 11	Year 11
Depth to Water	mTOC	0.73	1.32	1.06	1.05
Depth to Bottom	mTOC	2.130	1.855	2.380	2.430
Stick Up	mTOC	0.670	0.480	0.845	0.880
Temperature	°C	5.81	3.42	6.18	6.57
Conductivity	µS/cm	2372	1365	1827	1217
pH	-	7.39	6.87	6.94	7.52
ORP	mV	131.8	141.7	136.2	86.8
NTU	NTU	4.6	0.9	2.4	-6.7
Dissolved Oxygen	mg/L	3.59	5.16	4.65	0.89
Water Level	mTOC	1.550	1.580	1.460	1.242

Notes:
Depth to Water - Depth from top of casing to top of water surface
Depth to Bottom - Depth from top of casing to bottom of well
Stick Up - Height of well casing from ground surface to top of casing
ORP - Oxidative-Reduction Potential
NTU - Nephelometric Turbidity Units
ODO - Optical Dissolved Oxygen
mTOC - Distance (metres) from top of casing (TOC) down into well

TABLE D-2

CAM-D

Year 11 2022

General Chemistry of Groundwater Monitoring Wells

Parameter	Units	RDL	Reference Criteria (ULA)	MW01	MW01 - DUP	MW02	MW03	MW04
				06-Aug-2022	06-Aug-2022	06-Aug-2022	06-Aug-2022	06-Aug-2022
General Chemistry				Year 11	Year 11	Year 11	Year 11	Year 11
Physical Tests								
Conductivity	µS/cm	2	5527	2300	2360	1310	1660	1150
Hardness (as CaCO3), dissolved	mg/L	0.5	949	406	381	736	553	238
pH	pH units	0.1	8.64	7.91	7.97	7.27	7.49	7.88
Total Suspended Solids (TSS)	mg/L	3	68.9	22.8	11.0	<3.0	3.4	<3.0
Total Dissolved Solids (TDS)	mg/L	10	4050	1620	1700	960	1110	710
Total Dissolved Solids (TDS), calculated	mg/L	1	-	1640	1660	843	1120	706
Anions and Nutrients								
Chloride	mg/L	0.5	277	114	114	110	147	135
Fluoride	mg/L	0.02	1.77	0.599	0.586	0.341	0.524	0.835
Nitrate (as N)	mg/L	0.02	1.41	0.223	0.207	2.48	2.14	0.023
Nitrate + Nitrite (as N)	mg/L	0.05	-	0.223	0.207	2.51	2.14	<0.0500
Nitrite (as N)	mg/L	0.01	12.28	<0.010	<0.010	0.030	<0.010	<0.010
Sulphate (as SO4)	mg/L	0.3	2268	679	690	178	351	204
Alkalinity								
Bicarbonate (as HCO3)	mg/L	1	-	479	483	530	438	218
Carbonate (as CO3)	mg/L	1	-	<1.0	<1.0	<1.0	<1.0	<1.0
Hydroxide (as OH)	mg/L	1	-	<1.0	<1.0	<1.0	<1.0	<1.0
Total (as CaCO3)	mg/L	2	-	393	396	434	359	178
Ion Balance								
Anion Sum	meq/L	0.1	-	25.2	25.5	15.7	18.8	11.6
Cation Sum	meq/L	0.1	-	28.2	28.4	16.2	19.9	12.2
Ion Balance (APHA)	%	0.01	-	5.62	5.38	1.57	2.84	2.52
Ion Balance (cations/anions)	%	0.01	-	112	111	103	106	105

Notes:

Reference criteria - Site-specific Upper Limit of Acceptability (ULA)

ULA - Upper Limit of Acceptability; calculated using the average + three times (x3) standard deviations of all available data & only calculated for parameters that had three or more data points with detectable concentrations.

RDL - Reported Detection Limit, which may vary between sample locations and events

Exceeds Reference Criteria
Detection Limit Exceeds Reference Criteria

TABLE D-3

CAM-D

Year 11 2022

Total and Dissolved Metals of Groundwater Wells

Parameter	Units	RDL	Reference Criteria (ULA)	MW01	MW01 - DUP	MW02	MW03	MW04
				06-Aug-2022	06-Aug-2022	06-Aug-2022	06-Aug-2022	06-Aug-2022
Metals				Year 11	Year 11	Year 11	Year 11	Year 11
Total Metals								
Aluminum, total	mg/L	0.003	7.22	0.35	0.335	0.0214	0.0998	0.392
Antimony, total	mg/L	0.0001	0.0025	0.00079	0.00082	0.00043	0.00034	0.00025
Arsenic, total	mg/L	0.0001	0.0051	0.00141	0.00138	0.00046	0.00087	0.00159
Barium, total	mg/L	0.0001	0.0659	0.0119	0.0122	0.038	0.034	0.0257
Beryllium, total	mg/L	0.00002	-	0.00005	0.000063	0.00003	0.000043	0.000036
Bismuth, total	mg/L	0.00005	-	0.000158	0.00016	<0.000050	<0.000050	<0.000050
Boron, total	mg/L	0.01	0.108	0.065	0.066	0.034	0.052	0.06
Cadmium, total	mg/L	0.000005	0.0010	0.0000504	0.0000508	0.0000511	0.0000582	0.0000582
Calcium, total	mg/L	0.05	136	64.5	64.8	151	96.6	41.5
Cesium, total	mg/L	0.00001	0.000211	0.000065	0.000068	0.000011	0.000019	0.000052
Chromium, total	mg/L	0.0005	0.00685	0.00231	0.00214	<0.00050	0.00056	0.00082
Cobalt, total	mg/L	0.0001	0.0018	0.00024	0.00024	0.0008	0.00012	0.00019
Copper, total	mg/L	0.0005	0.0537	0.00923	0.00908	0.0095	0.0102	0.00462
Iron, total	mg/L	0.01	5.62	0.259	0.246	0.039	0.06	0.266
Lead, total	mg/L	0.00005	0.00423	0.000364	0.00035	0.000319	0.000282	0.00018
Lithium, total	mg/L	0.001	0.204	0.104	0.106	0.0175	0.0484	0.0218
Magnesium, total	mg/L	0.005	143.9	61.6	63.1	95	79.3	34.6
Manganese, total	mg/L	0.0001	0.856	0.0178	0.0179	0.806	0.0093	0.0502
Molybdenum, total	mg/L	0.00005	0.108	0.0348	0.0362	0.00591	0.00961	0.0291
Nickel, total	mg/L	0.0005	0.0475	0.0142	0.0144	0.0034	0.00337	0.00176
Phosphorus, total	mg/L	0.05	-	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium, total	mg/L	0.05	43.7	21.4	21.8	9.45	22.5	22.8
Rubidium, total	mg/L	0.0002	0.0094	0.00515	0.00532	0.00116	0.00196	0.00422
Selenium, total	mg/L	0.00005	0.0063	0.00104	0.00099	0.000248	0.000261	0.000335
Silicon, total	mg/L	0.1	9.15	4.98	4.98	3.36	3.93	2.46
Silver, total	mg/L	0.00001	-	0.00001	<0.000010	0.00001	<0.000010	<0.000010
Sodium, total	mg/L	0.05	1155	414	425	28.1	189	159
Strontium, total	mg/L	0.0002	0.915	0.477	0.48	0.448	0.471	0.267
Sulfur, total	mg/L	0.5	774	300	313	69.1	139	77.4
Tellurium, total	mg/L	0.0002	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium, total	mg/L	0.00001	0.0001	0.00007	0.000064	<0.000010	0.000045	0.000071
Thorium, total	mg/L	0.0001	0.0011	0.00029	0.00024	<0.00010	<0.00010	0.00022
Tin, total	mg/L	0.0001	-	0.00011	0.00011	<0.00010	<0.00010	<0.00010
Titanium, total	mg/L	0.0003	0.362	0.0134	0.0127	0.00115	0.0028	0.0164
Tungsten, total	mg/L	0.0001	0.0034	0.00092	0.00094	<0.00010	0.00018	0.00083
Uranium, total	mg/L	0.00001	0.4067	0.161	0.162	0.108	0.0706	0.047
Vanadium, total	mg/L	0.0005	0.01270	0.00112	0.00108	0.00065	0.00079	0.00139
Zinc, total	mg/L	0.003	0.0172	0.0033	<0.0030	<0.0030	0.004	<0.0030
Zirconium, total	mg/L	0.0002	0.00269	0.00077	0.00072	0.00111	0.00062	0.00048

TABLE D-3

CAM-D

Year 11 2022

Total and Dissolved Metals of Groundwater Wells

Parameter	Units	RDL	Reference Criteria (ULA)	MW01	MW01 - DUP	MW02	MW03	MW04
				06-Aug-2022	06-Aug-2022	06-Aug-2022	06-Aug-2022	06-Aug-2022
Metals				Year 11	Year 11	Year 11	Year 11	Year 11
Dissolved Metals								
Aluminum, Dissolved	mg/L	0.001	3.02	0.0086	0.0061	0.0075	0.0067	0.023
Antimony, Dissolved	mg/L	0.0001	0.00236	0.00089	0.00095	0.00043	0.00034	0.00022
Arsenic, Dissolved	mg/L	0.0001	0.00458	0.00143	0.00125	0.00049	0.00092	0.00157
Barium, Dissolved	mg/L	0.0001	0.0554	0.0118	0.0115	0.0402	0.0347	0.0247
Beryllium, Dissolved	mg/L	0.00002	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth, Dissolved	mg/L	0.00005	-	0.000189	0.000207	<0.000050	<0.000050	<0.000050
Boron, Dissolved	mg/L	0.01	0.106	0.074	0.073	0.034	0.057	0.062
Cadmium, Dissolved	mg/L	0.000005	0.000237	0.0000364	0.0000335	0.0000421	0.0000332	0.0000432
Calcium, Dissolved	mg/L	0.05	139.5	63.1	60.4	144	96.5	41.1
Cesium, Dissolved	mg/L	0.00001	0.000309	0.000037	0.000033	<0.000010	0.00001	<0.000010
Chromium, Dissolved	mg/L	0.0005	0.00473	0.00055	0.0006	<0.00050	<0.00050	<0.00050
Cobalt, Dissolved	mg/L	0.0001	0.00106	0.00018	0.0002	0.00076	<0.00010	<0.00010
Copper, Dissolved	mg/L	0.0002	0.04381	0.00835	0.00862	0.00947	0.0102	0.00388
Iron, Dissolved	mg/L	0.03	2.24	<0.030	<0.030	<0.030	<0.030	<0.030
Lead, Dissolved	mg/L	0.00005	0.0040	0.00008	0.000094	0.000085	0.000156	<0.000050
Lithium, Dissolved	mg/L	0.001	0.2012	0.1	0.1	0.0172	0.0473	0.0214
Magnesium, Dissolved	mg/L	0.005	148.0	60.4	56	91.4	75.7	32.9
Manganese, Dissolved	mg/L	0.005	0.825	0.0295	0.029	0.725	0.00868	0.0311
Molybdenum, Dissolved	mg/L	0.00005	0.1073	0.0356	0.0362	0.0055	0.00922	0.0271
Nickel, Dissolved	mg/L	0.0005	0.03839	0.0131	0.0141	0.00355	0.00372	0.00185
Phosphorus, Dissolved	mg/L	0.05	-	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium, Dissolved	mg/L	0.05	43.4	23.1	21.6	9.25	23.4	23.5
Rubidium, Dissolved	mg/L	0.0002	0.01177	0.00515	0.00484	0.00122	0.00192	0.00347
Selenium, Dissolved	mg/L	0.00005	0.00725	0.00121	0.00122	0.000268	0.000233	0.000312
Silicon, Dissolved	mg/L	0.05	8.37	3.99	4.33	3.19	3.52	1.69
Silver, Dissolved	mg/L	0.00001	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, Dissolved	mg/L	0.05	1166	448	464	29.3	190	157
Strontium, Dissolved	mg/L	0.0002	0.980	0.458	0.436	0.41	0.445	0.248
Sulfur, Dissolved	mg/L	0.5	787.7	260	273	66	133	76.3
Tellurium, Dissolved	mg/L	0.0002	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium, Dissolved	mg/L	0.00001	0.00016	0.000063	0.000058	<0.000010	0.000034	0.000055
Thorium, Dissolved	mg/L	0.0001	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin, Dissolved	mg/L	0.0001	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium, Dissolved	mg/L	0.0003	0.1485	<0.00030	0.00031	0.00061	<0.00030	<0.00030
Tungsten, Dissolved	mg/L	0.0001	0.00995	0.00108	0.00103	<0.00010	0.00018	0.00076
Uranium, Dissolved	mg/L	0.00001	0.3939	0.158	0.145	0.0982	0.0625	0.0417
Vanadium, Dissolved	mg/L	0.0005	-	0.00072	0.00072	<0.00050	0.0005	0.00068
Zinc, Dissolved	mg/L	0.001	0.0153	<0.0010	<0.0010	<0.0010	0.0023	<0.0010
Zirconium, Dissolved	mg/L	0.00020	0.00313	0.00037	0.00031	0.00104	0.00059	<0.00020

Notes:

Reference criteria - Site-specific Upper Limit of Acceptability (ULA)

ULA - Upper Limit of Acceptability; calculated using the average + three times (x3) standard deviations of all available data & only calculated for parameters that had three or more data points with detectable concentrations.

RDL - Reported Detection Limit, which may vary between sample locations and events

Exceeds Reference Criteria
Detection Limit Exceeds Reference Criteria

TABLE D-4

CAM-D

Year 11 2022

Petroleum Hydrocarbons of Groundwater Wells

Parameter	Units	RDL	Reference Criteria (ULA)	MW01	MW01 - DUP	MW02	MW03	MW04
				06-Aug-2022	06-Aug-2022	06-Aug-2022	06-Aug-2022	06-Aug-2022
Petroleum Hydrocarbons (PHCs)				Year 11	Year 11	Year 11	Year 11	Year 11
Volatile Organic Compounds (VOCs) - BTEX								
Benzene	µg/L	0.50	All < RDL	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	µg/L	0.50	All < RDL	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.50	All < RDL	<0.50	<0.50	<0.50	<0.50	<0.50
Xylene, m+p-	µg/L	0.50	All < RDL	<0.50	<0.50	<0.50	<0.50	<0.50
Xylene, o-	µg/L	0.50	All < RDL	<0.50	<0.50	<0.50	<0.50	<0.50
Xylenes, total	µg/L	0.75	All < RDL	<0.75	<0.75	<0.75	<0.75	<0.75
BTEX, total	µg/L	1.2	All < RDL	<1.2	<1.2	<1.2	<1.2	<1.2
Hydrocarbons								
F1 (C6-C10)	µg/L	100	All < RDL	<100	<100	<100	<100	<100
F1-BTEX	µg/L	100	All < RDL	<100	<100	<100	<100	<100
F2 (C10-C16)	µg/L	100	All < RDL	<100	<100	<100	<100	<100
F3 (C16-C34)	µg/L	250	All < RDL	<250	<250	<250	<250	<250
F4 (C34-C50)	µg/L	250	All < RDL	<250	<250	<250	<250	<250
Hydrocarbons, total (C6-C50)	µg/L	400	All < RDL	<400	<400	<400	<400	<400

Notes:

Reference criteria - Site-specific Upper Limit of Acceptability (ULA)

ULA - Upper Limit of Acceptability; calculated using the average + three times (x3) standard deviations of all available data & only calculated for parameters that had three or more data points with detectable concentrations.

RDL - Reported Detection Limit, which may vary between sample locations and events

Exceeds Reference Criteria

TABLE D-5

CAM-D

Year 11 2022

Polychlorinated Biphenyls of Groundwater Wells

Parameter	Units	RDL	Reference Criteria (ULA)	MW01	MW01 - DUP	MW02	MW03	MW04
				06-Aug-2022	06-Aug-2022	06-Aug-2022	06-Aug-2022	06-Aug-2022
Polychlorinated Biphenyls (PCBs)				Year 11	Year 11	Year 11	Year 11	Year 11
PCBs								
Aroclor 1016	µg/L	1.0	all < RDL	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1221	µg/L	1.0	all < RDL	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1232	µg/L	1.0	all < RDL	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1242	µg/L	1.0	all < RDL	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1248	µg/L	1.0	all < RDL	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1254	µg/L	1.0	all < RDL	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1260	µg/L	1.0	all < RDL	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1262	µg/L	1.0	all < RDL	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1268	µg/L	1.0	all < RDL	<1.0	<1.0	<1.0	<1.0	<1.0
Total PCBs	µg/L	1.0	all < RDL	<1.0	<1.0	<1.0	<1.0	<1.0

Notes:

Reference criteria - Site-specific Upper Limit of Acceptability (ULA)

ULA - Upper Limit of Acceptability; calculated using the average + three times (x3) standard deviations of all available data & only calculated for parameters that had three or more data points with detectable concentrations.

RDL - Reported Detection Limit, which may vary between sample locations and events

Exceeds Reference Criteria

TABLE D-6

CAM-D

Year 11 2022

QA/QC of Groundwater Wells

Parameter	Units	RDL	MW01	MW01-DUP	RPD
			06-Aug-2022	06-Aug-2022	
QA/QC			Year 11	Year 11	
General Chemistry					
Physical Tests					
Conductivity	µS/cm	2.0	2300	2360	2.58%
Hardness (as CaCO3), dissolved	mg/L	0.50	406	381	6.35%
pH	pH units	0.10	7.91	7.97	0.76%
Total Suspended Solids (TSS)	mg/L	3.0	22.8	11.0	69.82%
Total Dissolved Solids (TDS)	mg/L	10	1620	1700	4.82%
Total Dissolved Solids (TDS), calculated	mg/L	1.0	1640	1660	1.21%
Anions and Nutrients					
Chloride	mg/L	0.50	114	114	0.00%
Fluoride	mg/L	0.020	0.599	0.586	2.19%
Nitrate (as N)	mg/L	0.020	0.223	0.207	7.44%
Nitrate + Nitrite (as N)	mg/L	0.0500	0.223	0.207	7.44%
Nitrite (as N)	mg/L	0.010	<0.010	<0.010	N/A
Sulfate (as SO4)	mg/L	0.30	679	690	1.61%
Alkalinity					
Bicarbonate (as HCO3)	mg/L	1.0	479	483	0.83%
Carbonate (as CO3)	mg/L	1.0	<1.0	<1.0	N/A
Hydroxide (as OH)	mg/L	1.0	<1.0	<1.0	N/A
Total (as CaCO3)	mg/L	2.0	393	396	0.76%
Ion Balance					
Anion sum	meq/L	0.10	25.2	25.5	1.18%
Cation sum	meq/L	0.10	28.2	28.4	0.71%
Ion balance (APHA)	%	0.010	5.62	5.38	4.36%
Ion balance (cations/anions)	%	0.010	112	111	0.90%

TABLE D-6

CAM-D

Year 11 2022

QA/QC of Groundwater Wells

Parameter	Units	RDL	MW01	MW01-DUP	RPD
			06-Aug-2022	06-Aug-2022	
QA/QC			Year 11	Year 11	
Metals					
Total Metals					
Aluminum, total	mg/L	0.0030	0.350	0.335	4.38%
Antimony, total	mg/L	0.00010	0.00079	0.00082	3.73%
Arsenic, total	mg/L	0.00010	0.00141	0.00138	2.15%
Barium, total	mg/L	0.00010	0.0119	0.0122	2.49%
Beryllium, total	mg/L	0.000020	0.000050	0.000063	23.01%
Bismuth, total	mg/L	0.000050	0.000158	0.000160	1.26%
Boron, total	mg/L	0.010	0.065	0.066	1.53%
Cadmium, total	mg/L	0.0000050	0.0000504	0.0000508	0.79%
Calcium, total	mg/L	0.050	64.5	64.8	0.46%
Cesium, total	mg/L	0.000010	0.000065	0.000068	4.51%
Chromium, total	mg/L	0.00050	0.00231	0.00214	7.64%
Cobalt, total	mg/L	0.00010	0.00024	0.00024	0.00%
Copper, total	mg/L	0.00050	0.00923	0.00908	1.64%
Iron, total	mg/L	0.010	0.259	0.246	5.15%
Lead, total	mg/L	0.000050	0.000364	0.000350	3.92%
Lithium, total	mg/L	0.0010	0.104	0.106	1.90%
Magnesium, total	mg/L	0.0050	61.6	63.1	2.41%
Manganese, total	mg/L	0.00010	0.0178	0.0179	0.56%
Molybdenum, total	mg/L	0.000050	0.0348	0.0362	3.94%
Nickel, total	mg/L	0.00050	0.0142	0.0144	1.40%
Phosphorus, total	mg/L	0.050	<0.050	<0.050	N/A
Potassium, total	mg/L	0.050	21.4	21.8	1.85%
Rubidium, total	mg/L	0.00020	0.00515	0.00532	3.25%
Selenium, total	mg/L	0.000050	0.00104	0.000990	4.93%
Silicon, total	mg/L	0.10	4.98	4.98	0.00%
Silver, total	mg/L	0.000010	0.000010	<0.000010	N/A
Sodium, total	mg/L	0.050	414	425	2.62%
Strontium, total	mg/L	0.00020	0.477	0.480	0.63%
Sulfur, total	mg/L	0.50	300	313	4.24%
Tellurium, total	mg/L	0.00020	<0.00020	<0.00020	N/A
Thallium, total	mg/L	0.000010	0.000070	0.000064	8.96%
Thorium, total	mg/L	0.00010	0.00029	0.00024	18.87%
Tin, total	mg/L	0.00010	0.00011	0.00011	0.00%
Titanium, total	mg/L	0.00030	0.0134	0.0127	5.36%
Tungsten, total	mg/L	0.00010	0.00092	0.00094	2.15%
Uranium, total	mg/L	0.000010	0.161	0.162	0.62%
Vanadium, total	mg/L	0.00050	0.00112	0.00108	3.64%
Zinc, total	mg/L	0.0030	0.0033	<0.0030	9.52%
Zirconium, total	mg/L	0.00020	0.00077	0.00072	6.71%

TABLE D-6

CAM-D

Year 11 2022

QA/QC of Groundwater Wells

Parameter	Units	RDL	MW01	MW01-DUP	RPD
			06-Aug-2022	06-Aug-2022	
QA/QC			Year 11	Year 11	
Dissolved Metals					
Aluminum, total	mg/L	0.0010	0.0086	0.0061	34.01%
Antimony, total	mg/L	0.00010	0.00089	0.00095	6.52%
Arsenic, total	mg/L	0.00010	0.00143	0.00125	13.43%
Barium, total	mg/L	0.00010	0.0118	0.0115	2.58%
Beryllium, total	mg/L	0.000020	<0.000020	<0.000020	N/A
Bismuth, total	mg/L	0.000050	0.000189	0.000207	9.09%
Boron, total	mg/L	0.010	0.074	0.073	1.36%
Cadmium, total	mg/L	0.0000050	0.0000364	0.0000335	8.30%
Calcium, total	mg/L	0.050	63.1	60.4	4.37%
Cesium, total	mg/L	0.000010	0.000037	0.000033	11.43%
Chromium, total	mg/L	0.00050	0.00055	0.00060	8.70%
Cobalt, total	mg/L	0.00010	0.00018	0.00020	10.53%
Copper, total	mg/L	0.00020	0.00835	0.00862	3.18%
Iron, total	mg/L	0.030	<0.030	<0.030	N/A
Lead, total	mg/L	0.000050	0.000080	0.000094	16.09%
Lithium, total	mg/L	0.0010	0.100	0.100	0.00%
Magnesium, total	mg/L	0.0050	60.4	56.0	7.56%
Manganese, total	mg/L	0.00500	0.0295	0.0290	1.71%
Molybdenum, total	mg/L	0.000050	0.0356	0.0362	1.67%
Nickel, total	mg/L	0.00050	0.0131	0.0141	7.35%
Phosphorus, total	mg/L	0.050	<0.050	<0.050	N/A
Potassium, total	mg/L	0.050	23.1	21.6	6.71%
Rubidium, total	mg/L	0.00020	0.00515	0.00484	6.21%
Selenium, total	mg/L	0.000050	0.00121	0.00122	0.82%
Silicon, total	mg/L	0.050	3.99	4.33	8.17%
Silver, total	mg/L	0.000010	<0.000010	<0.000010	NA
Sodium, total	mg/L	0.050	448	464	3.51%
Strontium, total	mg/L	0.00020	0.458	0.436	4.92%
Sulfur, total	mg/L	0.50	260	273	4.88%
Tellurium, total	mg/L	0.00020	<0.00020	<0.00020	N/A
Thallium, total	mg/L	0.000010	0.000063	0.000058	8.26%
Thorium, total	mg/L	0.00010	<0.00010	<0.00010	N/A
Tin, total	mg/L	0.00010	<0.00010	<0.00010	N/A
Titanium, total	mg/L	0.00030	<0.00030	0.00031	3.28%
Tungsten, total	mg/L	0.00010	0.00108	0.00103	4.74%
Uranium, total	mg/L	0.000010	0.158	0.145	8.58%
Vanadium, total	mg/L	0.00050	0.00072	0.00072	0.00%
Zinc, total	mg/L	0.0010	<0.0010	<0.0010	N/A
Zirconium, total	mg/L	0.00020	0.00037	0.00031	17.65%

TABLE D-6

CAM-D

Year 11 2022

QA/QC of Groundwater Wells

Parameter	Units	RDL	MW01	MW01-DUP	RPD
			06-Aug-2022	06-Aug-2022	
QA/QC			Year 11	Year 11	
PHCs					
Volatile Organic Compounds (VOCs) - BTEX					
Benzene	µg/L	0.50	<0.50	<0.50	N/A
Ethylbenzene	µg/L	0.50	<0.50	<0.50	N/A
Toluene	µg/L	0.50	<0.50	<0.50	N/A
Xylene, m+p-	µg/L	0.50	<0.50	<0.50	N/A
Xylene, o-	µg/L	0.50	<0.50	<0.50	N/A
Xylenes, total	µg/L	0.75	<0.75	<0.75	N/A
BTEX, total	µg/L	1.2	<1.2	<1.2	N/A
Hydrocarbons					
F1 (C6-C10)	µg/L	100	<100	<100	N/A
F2 (C10-C16)	µg/L	100	<100	<100	N/A
F3 (C16-C34)	µg/L	250	<250	<250	N/A
F4 (C34-C50)	µg/L	250	<250	<250	N/A
F1-BTEX	µg/L	100	<100	<100	N/A
Hydrocarbons, total (C6-C50)	µg/L	400	<400	<400	N/A
PCBs					
Aroclor 1016	µg/L	1.0	<1.0	<1.0	N/A
Aroclor 1221	µg/L	1.0	<1.0	<1.0	N/A
Aroclor 1232	µg/L	1.0	<1.0	<1.0	N/A
Aroclor 1242	µg/L	1.0	<1.0	<1.0	N/A
Aroclor 1248	µg/L	1.0	<1.0	<1.0	N/A
Aroclor 1254	µg/L	1.0	<1.0	<1.0	N/A
Aroclor 1260	µg/L	1.0	<1.0	<1.0	N/A
Aroclor 1262	µg/L	1.0	<1.0	<1.0	N/A
Aroclor 1268	µg/L	1.0	<1.0	<1.0	N/A
Polychlorinated Biphenyls (PCBs), total	µg/L	1.0	<1.0	<1.0	N/A

Notes:
RDL - Reported Detection Limit
RPD - Relative Percent Difference

RPD > 50%

TABLE D-7

Historical General Chemistry of Groundwater Wells

CAM-D
Year 11 2022

AECOM

Parameter	Units	RDL	MW01 - 2012	MW01 - 2014	MW01 - 2016	MW01 - 2020	MW02 - 2014	MW02 - 2016	MW02 - 2020	MW03 - 2012	MW03 - 2014	MW03 - 2016	MW03 - 2020	MW04 - 2012	MW04 - 2014	MW04 - 2016	MW04 - 2020	Average	Standard Deviation	ULA
			Franz	Franz	Arcadis	BluMetric	Franz	Arcadis	BluMetric	Franz	Franz	Arcadis	BluMetric	Franz	Franz	Arcadis	BluMetric			
			8-Jul-12	23-Aug-14	20-Aug-16	28-Aug-20	23-Aug-14	19- Aug-16	28-Aug-20	7-Aug-12	23-Aug-14	19-Aug-16	28-Aug-20	7-Aug-12	23-Aug-14	19-Aug-16	28-Aug-20			
Historical General Chemistry																				
Conductivity	uS/cm	2	3000	4600	4400	2830	1200	1400	1110	2100	2000	1800	1930	1300	1500	990	1170	2089	1146	5527
Hardness (as CaCO3)	mg/L	0.5	630		430	408		640	523	560		410	608	380		110	243	449	167	949
pH	-	0.1	7.98	8.16	7.96	8.1	7.91	7.6	7.59	7.85	7.93	7.86	7.83	7.43	7.9	8.47	7.87	7.90	0.25	8.64
Total Suspended Solids	mg/L	3	<10	14	8	6.9	<10	4	<3.0	15	<10	21	13.1	<10	<10	61	16.5	17.7	17.1	68.9
Total Dissolved Solids	mg/L	13	2210	3420	3100	1980	802	870	743	1410	1350	1200	1230	888	956	590	719	1431	873	4050
Bromide (Br)	mg/L	0.05				<1.0			<0.25				0.75				0.3	-	-	-
Chloride (Cl)	mg/L	0.5	160	140	110	119	44	65	52.5	170	180	190	200	59	120	130	90.9	122	52	277
Fluoride (F)	mg/L	0.02	1.07	0.7	0.64	0.86	0.41	0.93	0.72	1.29	0.67	1.4	0.79	0.31	0.34	1.1	0.5	0.78	0.33	1.77
Nitrate (as N)	mg/L	0.005	0.1	0.021	<0.010	0.44	<0.010	<0.010	1.31	0.054	0.036	0.054	0.221	<0.010	0.014	0.077	0.455	0.253	0.385	1.41
Nitrite (as N)	mg/L	0.001	0.48	0.31	1.3	<0.020	11.9	0.24	<0.0050	0.57	3.13	0.31	<0.010	0.44	2.51	0.33	<0.0050	1.96	3.44	12.28
Sulfate (SO4)	mg/L	0.3	1100	1700	1900	1020	190	310	248	550	430	420	422	390	380	190	275	635	544	2268

Notes:

RDL - Refers to laboratory detection limit.

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.

No groundwater data is available for 2018, all monitoring wells were frozen.

Exceedes Reference Criteria
Detection Limit Exceeds Reference Criteria

TABLE D-8

Historical Metals Concentrations of Groundwater Wells

CAM-D
Year 11 2022

AECOM

Parameter	Units	RDL	MW01 - 2012	MW01 - 2014	MW01 - 2016	MW01 - 2020	MW02 - 2014	MW02-2016	MW02 - 2020	MW03-2012	MW03-2014	MW03-2016	MW03 - 2020	MW04-2012	MW04-2014	MW04-2016	MW04 - 2020	Average	Standard Deviation	ULA
Metals			Franz	Franz	Arcadis	BluMetric	Franz	Arcadis	BluMetric	Franz	Franz	Arcadis	BluMetric	Franz	Franz	Arcadis	BluMetric			
			8-Jul-12	23-Aug-14	20-Aug-16	28-Aug-20	23-Aug-14	19-Aug-16	28-Aug-20	7-Aug-12	23-Aug-14	19-Aug-16	28-Aug-20	7-Aug-12	23-Aug-14	19-Aug-16	28-Aug-20			
Total Metals																				
Aluminum, total	mg/L	0.003			0.022	0.155		0.063	0.0183			1.2	0.187			5.9	1.73	1.16	2.02	7.22
Antimony, total	mg/L	0.0001			0.0016	0.00106		<0.000060	0.00031			<0.00060	0.00026			<0.00060	0.0004	0.0007	0.0006	0.0025
Arsenic, total	mg/L	0.0001	0.0037	0.0042	0.0026	0.00202	0.00052	0.00041	0.00041	0.0016	0.0011	0.0017	0.00094	0.00044	0.00072	0.0016	0.00073	0.0015	0.0012	0.0051
Barium, total	mg/L	0.0001			0.011	0.013		0.011	0.0263			0.039	0.0288			0.039	0.0421	0.0263	0.0132	0.0659
Beryllium, total	mg/L	0.0001			<0.0010	<0.00010		<0.0010	<0.00010			<0.0010	<0.00010			<0.0010	<0.00010	-	-	-
Bismuth, total	mg/L	0.00005				0.000239			<0.000050				<0.000050				<0.000050	-	-	-
Boron, total	mg/L	0.01			0.073	0.06		0.049	0.036			0.067	0.071			0.063	0.064	0.063	0.015	0.108
Cadmium, total	mg/L	0.000005	0.00018	0.00023	0.000043	0.000126	0.00003	0.000026	0.0000284	0.0011	0.000053	<0.000020	0.000151	0.000075	0.000024	<0.000020	0.0000549	0.0002	0.0003	0.0010
Calcium, total	mg/L	0.05			67	58.6		96	83			65	90.9			26	52.6	66.8	22.9	136
Cesium, total	mg/L	0.00001				0.000051			<0.000010				0.000023				0.000118	0.000067	0.000048	0.000211
Chromium, total	mg/L	0.0001	0.0018	0.0029	0.0011	0.00221	0.0011	<0.0010	0.00035	<0.001	0.0012	0.0029	0.00163	<0.001	0.0011	0.0065	0.00216	0.00208	0.00159	0.00685
Cobalt, total	mg/L	0.0001	0.00044	0.0012	0.00063	0.00039	0.00044	0.00089	0.00027	0.00044	0.00052	0.001	0.0003	0.0005	<0.00020	0.0015	0.00034	0.00063	0.00037	0.0018
Copper, total	mg/L	0.0005	0.012	0.038	0.02	0.0107	0.032	0.008	0.0103	0.046	0.017	0.0071	0.0112	0.024	0.013	0.013	0.00819	0.0180	0.0119	0.0537
Iron, total	mg/L	0.01			<0.060	0.117		0.1	0.014	NA	NA	2	0.123			4.1	0.853	1.04	1.52	5.62
Lead, total	mg/L	0.00005	0.0031	0.0029	0.00076	0.0002057	0.00073	0.0027	0.0003337	0.001	0.0004	0.00383	0.000266	<0.0002	<0.00020	0.00092	0.000424	0.00114	0.00103	0.00423
Lithium, total	mg/L	0.001			0.15	0.107		0.051	0.0252			0.078	0.083			0.029	0.0141	0.0684	0.0453	0.204
Magnesium, total	mg/L	0.005			65	53.9		99	71.4			72	86			15	33.6	62.0	27.3	143.9
Manganese, total	mg/L	0.0001			0.078	0.0872		0.73	0.117			0.11	0.084			0.075	0.0205	0.163	0.231	0.854
Mercury, total	mg/L	0.000005			0.0000029	<0.0000050		0.0000028	<0.0000050			0.0000024	<0.0000050			<0.0000020	<0.0000050	0.0000027	0.0000003	0.0000035
Molybdenum, total	mg/L	0.00005			0.085	0.0451		0.0093	0.00938			0.036	0.0222			0.0062	0.0162	0.0286	0.0266	0.108
Nickel, total	mg/L	0.0005	0.001	0.045	0.03	0.0159	0.0058	0.0031	0.00449	0.0036	0.018	0.012	0.00481	0.0075	0.0038	0.0037	0.00353	0.0108	0.0122	0.0475
Phosphorus, total	mg/L	0.05			<0.10	<0.050		<0.10	<0.050			<0.10	<0.050			<0.10	<0.050	-	-	-
Potassium, total	mg/L	0.05			18	20.6		9.5	9.14			29	30.6			23	20.2	20.0	7.9	43.7
Rubidium, total	mg/L	0.0002			-	0.00502		-	0.00136			-	0.00344			-	0.0055	0.0038	0.0019	0.0094
Selenium, total	mg/L	0.00005			0.0049	0.00156		<0.00020	0.000216			0.00039	0.00021			0.00036	0.000145	0.0011	0.0017	0.0063
Silicon, total	mg/L	0.1			4.9	4.84		2.8	3.71			4.5	3.51			7.6	5.68	4.69	1.49	9.15
Silver, total	mg/L	0.00001			<0.00010	<0.000010		<0.00010	<0.000010			<0.00010	<0.000010			<0.00010	<0.000011	-	-	-
Sodium, total	mg/L	0.05			910	511		51	66.6			230	205			140	168	285	290	1155
Strontium, total	mg/L	0.0002			0.71	0.494		0.41	0.328			0.41	0.536			0.18	0.265	0.417	0.166	0.915
Sulfur, total	mg/L	0.5			620	350		110	92.4			150	161			61	106	206	189	774
Tellurium, total	mg/L	0.0002				<0.00020			<0.00020				<0.00020				<0.00020	-	-	-
Thallium, total	mg/L	0.00001			<0.00020	0.000068		<0.00020	0.000013			<0.00020	0.000081			<0.00020	0.000061	0.0001	0.0000	0.0001
Thorium, total	mg/L	0.0001				0.0001			<0.00010				0.00012				0.0006	0.0003	0.0003	0.0011
Tin, total	mg/L	0.0001			<0.0010	0.00019		<0.0010	<0.00010			<0.0010	<0.00010			<0.0010	0.00011	-	-	-
Titanium, total	mg/L	0.0002			0.0014	0.00609		0.0052	0.00067			0.11	<0.0054			0.27	0.0524	0.0637	0.0995	0.362
Tungsten, total	mg/L	0.0001				0.00188			<0.00010				0.00035				0.00071	0.0010	0.00080	0.0034
Uranium, total	mg/L	0.00001			0.27	0.214		0.19	0.0958			0.074	0.0756			0.0048	0.0155	0.1175	0.0964	0.4057
Vanadium, total	mg/L	0.0005			0.001	0.00082		<0.0010	<0.00050			0.0047	0.00097			0.0089	0.00237	0.00313	0.00319	0.01270
Zinc, total	mg/L	0.003	0.012	0.014	0.0052	0.0062	0.0059	<0.0030	<0.0030	0.011	0.007	0.0089	0.0085	0.0056	0.0039	0.011	0.0071	0.0080	0.0030	0.0172
Zirconium, total	mg/L	0.0002				0.00047			0.00061				0.00061				0.00177	0.00087	0.00061	0.00259

TABLE D-8

Historical Metals Concentrations of Groundwater Wells

CAM-D
Year 11 2022

AECOM

Parameter	Units	RDL	MW01 - 2012	MW01 - 2014	MW01 - 2016	MW01 - 2020	MW02 - 2014	MW02-2016	MW02 - 2020	MW03-2012	MW03-2014	MW03-2016	MW03 - 2020	MW04-2012	MW04-2014	MW04-2016	MW04 - 2020	Average	Standard Deviation	ULA
			Franz	Franz	Arcadis	BluMetric	Franz	Arcadis	BluMetric	Franz	Franz	Arcadis	BluMetric	Franz	Franz	Arcadis	BluMetric			
Metals			8-Jul-12	23-Aug-14	20-Aug-16	28-Aug-20	23-Aug-14	19-Aug-16	28-Aug-20	7-Aug-12	23-Aug-14	19-Aug-16	28-Aug-20	7-Aug-12	23-Aug-14	19-Aug-16	28-Aug-20			
Dissolved Metals																				
Aluminum, total	mg/L	0.001			0.0079	0.0903		0.0061	0.0238			0.023	0.176			0.83	2.46	0.45	0.86	3.02
Antimony, total	mg/L	0.0001			0.0014	0.00124		<0.00060	0.00034			<0.00060	0.00028			<0.00060	0.00037	0.00073	0.00055	0.00236
Arsenic, total	mg/L	0.0001	0.0039	0.0031	0.0026	0.00158	0.00035	0.00029	0.00045	0.0016	0.00082	0.0013	0.00091	0.00045	0.00055	0.0013	0.00075	0.00133	0.00108	0.00458
Barium, total	mg/L	0.0001			<0.010	0.0119		<0.010	0.0257			0.029	0.0268			0.014	0.0398	0.0245	0.0103	0.0554
Beryllium, total	mg/L	0.0001			<0.0010	<0.00020		<0.0010	<0.00010			<0.0010	<0.00010			<0.0010	<0.00010	-	-	-
Bismuth, total	mg/L	0.00005				0.00031			<0.000050				<0.000050				<0.000050	-	-	-
Boron, total	mg/L	0.01			0.073	0.068		0.047	0.033			0.063	0.071			0.058	0.078	0.061	0.015	0.106
Cadmium, total	mg/L	0.000005	0.00013	0.00017	0.000051	<0.000075	0.000026	<0.000020	0.0000268	0.000061	0.000046	<0.000020	0.000153	0.000042	0.00000055	<0.000020	0.0000706	0.000071	0.0000056	0.000237
Calcium, total	mg/L	0.05			66	79.3		93	85.5			55	94			24	49.2	67.1	24.1	139.5
Cesium, total	mg/L	0.00001				0.000061			0.000012				0.000037				0.000186	0.000072	0.000079	0.000309
Chromium, total	mg/L	0.0001	0.0016	<0.001	<0.0010	0.00103	<0.0010	<0.0010	0.00035	<0.001	<0.0010	<0.0010	0.00123	<0.001	<0.0010	<0.0010	0.00224	0.00149	0.00108	0.00473
Cobalt, total	mg/L	0.0001	0.00042	0.0008	0.00059	0.00041	0.00031	0.00085	0.00026	<0.0003	0.00042	0.00031	0.00024	0.00041	<0.00030	<0.00030	0.00057	0.00047	0.00020	0.00106
Copper, total	mg/L	0.0002	0.011	0.027	0.012	0.0168	0.02	0.0076	0.0107	0.041	0.01	0.004	0.0118	0.021	0.0069	0.0029	0.00983	0.01417	0.00988	0.04381
Iron, total	mg/L	0.01			<0.060	0.097		<0.060	0.017			0.12	0.113			<0.060	1.48	0.37	0.62	2.24
Lead, total	mg/L	0.00005	0.0029	0.002	0.00078	0.00056	<0.00020	<0.00020	0.000329	0.00055	<0.00020	<0.00020	0.000493	<0.0002	<0.00020	<0.00020	<0.00020	0.0011	0.0010	0.0040
Lithium, total	mg/L	0.001			0.14	0.108		0.047	0.0379			0.068	0.0858			<0.020	0.0147	0.0716	0.0432	0.2012
Magnesium, total	mg/L	0.005			64	56.4		98	75.1			66	90.6			13	29.1	61.5	28.8	148.0
Manganese, total	mg/L	0.0001			0.072	0.0537		0.7	0.117			0.075	0.0866			0.015	0.0313	0.144	0.227	0.825
Mercury, total	mg/L	0.000005			<0.00000020	<0.0000050		<0.00000020	<0.0000050			<0.00000020	<0.0000050			<0.00000020	<0.0000050	-	-	-
Molybdenum, total	mg/L	0.000005			0.083	0.0485		0.0093	0.00637			0.033	0.022			0.0083	0.0157	0.0283	0.0264	0.1073
Nickel, total	mg/L	0.0005	0.0094	0.033	0.026	0.0203	0.0039	0.0028	0.0046	0.0031	0.014	0.0088	0.00491	0.0066	0.0025	0.00055	0.00519	0.00971	0.00266	0.03839
Phosphorus, total	mg/L	0.05			<0.10	<0.10		<0.10	<0.050			<0.10	<0.050			<0.10	<0.050	-	-	-
Potassium, total	mg/L	0.5			18	20.2		9	10.2			26	33.8			19	19	19.4	8.0	43.4
Rubidium, total	mg/L	0.0002				0.00582			0.0016				0.00394				0.00708	0.00459	0.00240	0.01177
Selenium, total	mg/L	0.00005			0.006	0.00183		0.0003	0.000197			0.00051	0.000219			0.0004	0.00012	0.00120	0.00202	0.00725
Silicon, total	mg/L	0.05			4.6	4.78		2.6	3.74			2.4	3.5			0.83	5.95	3.55	1.61	8.37
Silver, total	mg/L	0.00001			<0.00010	<0.00020		<0.00010	<0.000010			<0.00010	0.00001			<0.00010	<0.000010	-	-	-
Sodium, total	mg/L	0.05			860	625		48	77.3			210	222			130	160	292	291	1166
Strontium, total	mg/L	0.0002			0.68	0.574		0.39	0.356			0.37	0.622			0.16	0.238	0.424	0.185	0.980
Sulfur, total	mg/L	0.5			590	426		100	88.7			130	157			61	97.7	206.6	183.7	787.7
Tellurium, total	mg/L	0.0002				<0.00040			<0.00020				<0.00020				<0.00020	-	-	-
Thallium, total	mg/L	0.000001			<0.00020	0.000056		<0.00020	0.000011			<0.00020	0.000094			<0.00020	0.000071	0.00006	0.00004	0.00016
Thorium, total	mg/L	0.0001				<0.00020			<0.00010				<0.00010				0.00066	-	-	-
Tin, total	mg/L	0.0001			<0.0010	<0.00020		<0.0010	<0.00010			<0.0010	<0.00010			<0.0010	0.0001	-	-	-
Titanium, total	mg/L	0.0003			<0.0010	0.00464		<0.0010	0.00106			<0.0010	0.00586			<0.0010	0.0864	0.0245	0.0413	0.1485
Tungsten, total	mg/L	0.0001				0.00509			<0.00010				0.00039				0.00058	0.00205	0.00263	0.00995
Uranium, total	mg/L	0.00001			0.27	0.186		0.19	0.103			0.064	0.0865			0.0047	0.0141	0.1148	0.0930	0.3939
Vanadium, total	mg/L	0.0005			<0.0010	<0.0010		<0.0010	<0.00050			<0.0010	0.00087			<0.0010	0.0031	-	-	-
Zinc, total	mg/L	0.01	0.0097	0.0092	0.0034	0.0035	0.0065	<0.0030	0.0039	0.008	0.0006	0.0034	0.0103	0.0033	0.0046	<0.0030	0.0085	0.0059	0.0032	0.0153
Zirconium, total	mg/L	0.0002				<0.00040			0.00059				0.00056				0.00181	0.00099	0.00071	0.00313

Notes:

RDL - Refers to laboratory detection limit.

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.

No groundwater data is available for 2018, all monitoring wells were frozen.

Exceedes Reference Criteria

Detection Limit Exceeds Reference Criteria

TABLE D-9

Historical PHC Concentrations of Groundwater Wells

CAM-D
Year 11 2022

AECOM

Parameter	Units	RDL	MW01 - 2012	MW01 - 2014	MW01 - 2016	MW01 - 2020	MW02 - 2014	MW02 - 2016	MW02 - 2020	MW03 - 2012	MW03 - 2014	MW03 - 2016	MW03 - 2020	MW04 - 2012	MW04 - 2014	MW04 - 2016	MW04 - 2020	ULA
			Franz	Franz	Arcadis	BluMetric	Franz	Arcadis	BluMetric	Franz	Franz	Arcadis	BluMetric	Franz	Franz	Arcadis	BluMetric	
			8-Jul-12	23-Aug-14	20-Aug-16	28-Aug-20	23-Aug-14	19- Aug-16	28-Aug-20	7-Aug-12	23-Aug-14	19-Aug-16	28-Aug-20	7-Aug-12	23-Aug-14	19-Aug-16	28-Aug-20	
Historical PHCs and VOCs																		
F1 (C6-C10)	mg/L	0.1	<0.025	<0.025	<0.10	<0.10	<0.025	<0.10	<0.10	<0.025	<0.025	<0.10	<0.10	<0.025	<0.025	<0.10	<0.10	All < RDL
F1-BTEX	mg/L	0.1	<0.025	<0.025	<0.10	<0.10	<0.025	<0.10	<0.10	<0.025	<0.025	<0.10	<0.10	<0.025	<0.025	<0.10	<0.10	All < RDL
F2 (C10-C16)	mg/L	0.3	<100	<100	<0.10	<0.30	-	<0.10	<0.30	<100	<100	<0.10	<0.30	<100	<100	<0.10	<0.30	All < RDL
F3 (C16-C34)	mg/L	0.3	<100	<200	<0.20	<0.30	-	<0.20	<0.30	<100	<200	<0.20	<0.30	<100	<200	<0.20	<0.30	All < RDL
F4 (C34-C50)	mg/L	0.3	<100	<200	<0.20	<0.30	-	<0.20	<0.30	<100	<200	<0.20	<0.30	<100	<200	<0.20	<0.30	All < RDL
Benzene	mg/L	0.0005	<0.00020	<0.00020	<0.00040	<0.00050	<0.00020	<0.00040	<0.00050	<0.00020	<0.00020	<0.00040	<0.00050	<0.00020	<0.00020	<0.00040	<0.00050	All < RDL
Ethylbenzene	mg/L	0.0005	<0.00020	<0.00020	<0.00040	<0.00050	<0.00020	<0.00040	<0.00050	<0.00020	<0.00020	<0.00040	<0.00050	<0.00020	<0.00020	<0.00040	<0.00050	All < RDL
Methyl t-butyl ether (MTBE)	mg/L	0.0005	-	-	-	<0.00050	-	-	<0.00050	-	-	-	<0.00050	-	-	-	<0.00050	All < RDL
Styrene	mg/L	0.0005	-	-	-	<0.00050	-	-	<0.00050	-	-	-	<0.00050	-	-	-	<0.00050	All < RDL
Toluene	mg/L	0.00045	<0.00020	<0.00020	<0.00040	<0.00045	<0.00020	<0.00040	<0.00045	<0.00020	<0.00020	<0.00040	<0.00045	<0.00020	<0.00020	<0.00040	<0.00045	All < RDL
ortho-Xylene	mg/L	0.0005	<0.00020	<0.00020	<0.00040	<0.00050	<0.00020	<0.00040	<0.00050	<0.00020	<0.00020	<0.00040	<0.00050	<0.00020	<0.00020	<0.00040	<0.00050	All < RDL
meta- & para-Xylene	mg/L	0.0005	<0.00040	<0.00040	<0.00080	<0.00050	<0.00040	<0.00080	<0.00050	<0.00040	<0.00040	<0.00080	<0.00050	<0.00040	<0.00040	<0.00080	<0.00050	All < RDL
Xylenes	mg/L	0.00075	<0.00040	<0.00040	<0.00080	<0.00075	<0.00040	<0.00080	<0.00075	<0.00040	<0.00040	<0.00080	<0.00075	<0.00040	<0.00040	<0.00080	<0.00075	All < RDL

Notes:

RDL - Refers to laboratory detection limit.

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.

No groundwater data is available for 2018, all monitoring wells were frozen.

Exceedes Reference Criteria

Detection Limit Exceeds Reference Criteria

TABLE D-10

CAM-D
Year 11 2022

AECOM

Groundwater Sampling Field Data

Aquatics Monitoring							
Time	**Temperature (°C)**	**Conductivity (µS/cm)**	**pH**	**ORP (mV)**	**NTU**	**ODO (mg/L)**	**Water Level (mTOC)**
MW01							
2:41	6.13	2556	6.80	168.5	2.7	3.42	1.010
2:44	6.10	2433	7.25	147.9	3.6	2.46	1.010
2:47	6.79	2385	7.34	139.6	14.6	2.84	1.020
2:50	6.93	2349	7.40	136	14	3.34	1.270
2:53	6.73	2315	7.39	134	7.6	3.33	1.335
2:56	6.37	2322	7.38	132.7	5.7	3.43	1.390
2:59	5.81	2372	7.39	131.8	4.6	3.59	1.550
MW02							
5:08	3.46	1387	6.88	146.2	2.8	3.45	1.440
5:11	3.13	1368	6.88	142.7	1.7	3.97	1.510
5:14	3.24	1360	6.87	141.4	1.2	4.67	1.545
5:17	3.42	1365	6.87	141.7	0.9	5.16	1.580
MW03							
4:22	6.15	2170	7.11	138.6	21.8	4.45	1.210
4:25	6.00	2048	7.07	131.8	6.2	4.00	1.245
4:28	5.79	2023	7.06	130.6	10.5	3.89	1.280
4:31	5.86	1957	7.05	130.3	7.4	3.89	1.315
4:34	6.08	1912	7.06	130.9	5.5	4.01	1.340
4:37	6.29	1876	7.00	132.1	4.1	4.26	1.385
4:40	6.16	1868	7.00	133.2	2.9	4.40	-
4:43	6.21	1847	6.97	134.7	2.3	4.55	1.430
4:46	6.18	1827	6.94	136.2	2.4	4.65	1.460
MW04							
3:38	6.70	1377	7.61	128.9	1.8	2.15	-
3:41	6.36	1291	7.63	118.5	3.9	1.37	1.160
3:44	6.48	1250	7.62	109.5	3.4	1.15	1.200
3:47	6.38	1234	7.60	103.6	3.0	1.06	1.200
3:50	6.19	1228	7.60	100.2	20.3	1.00	1.215
3:53	6.12	1225	7.58	97.3	16.3	0.96	1.220
3:56	6.37	1216	7.55	92.3	8.9	0.93	1.233
3:59	6.57	1217	7.52	86.8	-6.7	0.89	1.242

Notes:
ORP - Oxidative-Reduction Potential
NTU - Nephelometric Turbidity Units
ODO - Optical Dissolved Oxygen
mTOC - Distance (metres) from top of casing (TOC) down into well

Depth to Water (mTOC)	**Depth to Bottom (mTOC)**	**Stick Up (mTOC)**
MW01		
0.73	2.130	0.670
MW02		
1.32	1.855	0.480
MW03		
1.06	2.380	0.845
MW04		
1.05	2.430	0.880

Notes:
mTOC - Distance (metres) from top of casing (TOC) down into well
Depth to Water - Depth from top of casing to top of water surface
Depth to Bottom - Depth from top of casing to bottom of well
Stick Up - Height of well casing from ground surface to top of casing

Appendix E

Laboratory Certificate of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EO2206346**	Page	: 1 of 7
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	: 10-Aug-2022 17:56
PO	: ----	Date Analysis Commenced	: 11-Aug-2022
C-O-C number	: 20-1009579	Issue Date	: 19-Aug-2022 08:38
Sampler	: ----		
Site	: CAM-D		
Quote number	: 2022 Price List - Prairies		
No. of samples received	: 5		
No. of samples analysed	: 5		

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
Austin Wasylyshyn	Lab Analyst	Metals, Edmonton, Alberta
Dan Nguyen	Team Leader - Inorganics	Inorganics, Edmonton, Alberta
Daniel Nguyen	Lab Assistant	Inorganics, Edmonton, Alberta
Janice Leung	Supervisor - Organics Instrumentation	Organics, Burnaby, British Columbia
Jessica Maitland	Lab Assistant	Inorganics, Edmonton, Alberta
Kari Mulroy	Lab Supervisor - Environmental	Organics, Edmonton, Alberta
Remy Gatabazi	Lab Analyst	Organics, Edmonton, Alberta
Sobhithan Pillay		Inorganics, Edmonton, Alberta
Yan Zhang	Lab Analyst	Organics, 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
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
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: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW01	MW02	MW03	MW04	QA/QC
					Client sampling date / time	06-Aug-2022 14:30	06-Aug-2022 17:30	06-Aug-2022 16:30	06-Aug-2022 15:30	06-Aug-2022
						EO2206346-001	EO2206346-002	EO2206346-003	EO2206346-004	EO2206346-005
						Result	Result	Result	Result	Result
Physical Tests										
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		406	736	553	238	381
solids, total dissolved [TDS]	----	E162	10	mg/L		1620	960	1110	710	1700
solids, total suspended [TSS]	----	E160	3.0	mg/L		22.8	<3.0	3.4	<3.0	11.0 RRV
conductivity	----	E100	2.0	µS/cm		2300	1310	1660	1150	2360
pH	----	E108	0.10	pH units		7.91	7.27	7.49	7.88	7.97
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L		479	530	438	218	483
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
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		393	434	359	178	396
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		1640	843	1120	706	1660
Anions and Nutrients										
chloride	16887-00-6	E235.Cl	0.50	mg/L		114	110	147	135	114
fluoride	16984-48-8	E235.F	0.020	mg/L		0.599	0.341	0.524	0.835	0.586
nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L		0.223	2.48	2.14	0.023	0.207
nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L		<0.010	0.030	<0.010	<0.010	<0.010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		679	178	351	204	690
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.223	2.51	2.14	<0.0500	0.207
Ion Balance										
anion sum	----	EC101	0.10	meq/L		25.2	15.7	18.8	11.6	25.5
cation sum	----	EC101	0.10	meq/L		28.2	16.2	19.9	12.2	28.4
ion balance (APHA)	----	EC101	0.010	%		5.62	1.57	2.84	2.52	5.38
ion balance (cations/anions)	----	EC101	0.010	%		112	103	106	105	111
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.350	0.0214	0.0998	0.392	0.335
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00079	0.00043	0.00034	0.00025	0.00082
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00141	0.00046	0.00087	0.00159	0.00138
barium, total	7440-39-3	E420	0.00010	mg/L		0.0119	0.0380	0.0340	0.0257	0.0122
beryllium, total	7440-41-7	E420	0.000020	mg/L		0.000050	0.000030	0.000043	0.000036	0.000063
bismuth, total	7440-69-9	E420	0.000050	mg/L		0.000158	<0.000050	<0.000050	<0.000050	0.000160
boron, total	7440-42-8	E420	0.010	mg/L		0.065	0.034	0.052	0.060	0.066

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW01	MW02	MW03	MW04	QA/QC
					Client sampling date / time	06-Aug-2022 14:30	06-Aug-2022 17:30	06-Aug-2022 16:30	06-Aug-2022 15:30	06-Aug-2022
						EO2206346-001	EO2206346-002	EO2206346-003	EO2206346-004	EO2206346-005
						Result	Result	Result	Result	Result
Total Metals										
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000504	0.0000511	0.0000582	0.0000582	0.0000508
calcium, total	7440-70-2	E420	0.050	mg/L		64.5	151	96.6	41.5	64.8
cesium, total	7440-46-2	E420	0.000010	mg/L		0.000065	0.000011	0.000019	0.000052	0.000068
chromium, total	7440-47-3	E420	0.00050	mg/L		0.00231	<0.00050	0.00056	0.00082	0.00214
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00024	0.00080	0.00012	0.00019	0.00024
copper, total	7440-50-8	E420	0.00050	mg/L		0.00923	0.00950	0.0102	0.00462	0.00908
iron, total	7439-89-6	E420	0.010	mg/L		0.259	0.039	0.060	0.266	0.246
lead, total	7439-92-1	E420	0.000050	mg/L		0.000364	0.000319	0.000282	0.000180	0.000350
lithium, total	7439-93-2	E420	0.0010	mg/L		0.104	0.0175	0.0484	0.0218	0.106
magnesium, total	7439-95-4	E420	0.0050	mg/L		61.6	95.0	79.3	34.6	63.1
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0178 RRV	0.806	0.00930	0.0502	0.0179 RRV
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.0348	0.00591	0.00961	0.0291	0.0362
nickel, total	7440-02-0	E420	0.00050	mg/L		0.0142	0.00340	0.00337	0.00176	0.0144
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		21.4	9.45	22.5	22.8	21.8
rubidium, total	7440-17-7	E420	0.00020	mg/L		0.00515	0.00116	0.00196	0.00422	0.00532
selenium, total	7782-49-2	E420	0.000050	mg/L		0.00104	0.000248	0.000261	0.000335	0.000990
silicon, total	7440-21-3	E420	0.10	mg/L		4.98	3.36	3.93	2.46	4.98
silver, total	7440-22-4	E420	0.000010	mg/L		0.000010	0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		414	28.1	189	159	425
strontium, total	7440-24-6	E420	0.00020	mg/L		0.477	0.448	0.471	0.267	0.480
sulfur, total	7704-34-9	E420	0.50	mg/L		300	69.1	139	77.4	313
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		0.000070	<0.000010	0.000045	0.000071	0.000064
thorium, total	7440-29-1	E420	0.00010	mg/L		0.00029	<0.00010	<0.00010	0.00022	0.00024
tin, total	7440-31-5	E420	0.00010	mg/L		0.00011	<0.00010	<0.00010	<0.00010	0.00011
titanium, total	7440-32-6	E420	0.00030	mg/L		0.0134	0.00115	0.00280	0.0164	0.0127
tungsten, total	7440-33-7	E420	0.00010	mg/L		0.00092	<0.00010	0.00018	0.00083	0.00094
uranium, total	7440-61-1	E420	0.000010	mg/L		0.161	0.108	0.0706	0.0470	0.162
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00112	0.00065	0.00079	0.00139	0.00108
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0033	<0.0030	0.0040	<0.0030	<0.0030

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW01	MW02	MW03	MW04	QA/QC
					Client sampling date / time	06-Aug-2022 14:30	06-Aug-2022 17:30	06-Aug-2022 16:30	06-Aug-2022 15:30	06-Aug-2022
						EO2206346-001	EO2206346-002	EO2206346-003	EO2206346-004	EO2206346-005
						Result	Result	Result	Result	Result
Total Metals										
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00077	0.00111	0.00062	0.00048	0.00072
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0086	0.0075	0.0067	0.0230	0.0061
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00089	0.00043	0.00034	0.00022	0.00095
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00143	0.00049	0.00092	0.00157	0.00125
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0118	0.0402	0.0347	0.0247	0.0115
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		0.000189	<0.000050	<0.000050	<0.000050	0.000207
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.074	0.034	0.057	0.062	0.073
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000364	0.0000421	0.0000332	0.0000432	0.0000335
calcium, dissolved	7440-70-2	E421	0.050	mg/L		63.1	144	96.5	41.1	60.4
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		0.000037	<0.000010	0.000010	<0.000010	0.000033
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		0.00055	<0.00050	<0.00050	<0.00050	0.00060
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00018	0.00076	<0.00010	<0.00010	0.00020
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00835	0.00947	0.0102	0.00388	0.00862
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		0.000080	0.000085	0.000156	<0.000050	0.000094
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.100	0.0172	0.0473	0.0214	0.100
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		60.4	91.4	75.7	32.9	56.0
manganese, dissolved	7439-96-5	E421	0.00500	mg/L		0.0295 DTC	0.725	0.00868	0.0311	0.0290 DTC
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0356	0.00550	0.00922	0.0271	0.0362
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.0131	0.00355	0.00372	0.00185	0.0141
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		23.1	9.25	23.4	23.5	21.6
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00515	0.00122	0.00192	0.00347	0.00484
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00121	0.000268	0.000233	0.000312	0.00122
silicon, dissolved	7440-21-3	E421	0.050	mg/L		3.99	3.19	3.52	1.69	4.33
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		448	29.3	190	157	464
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.458	0.410	0.445	0.248	0.436
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		260	66.0	133	76.3	273

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW01	MW02	MW03	MW04	QA/QC
					Client sampling date / time	06-Aug-2022 14:30	06-Aug-2022 17:30	06-Aug-2022 16:30	06-Aug-2022 15:30	06-Aug-2022
						EO2206346-001	EO2206346-002	EO2206346-003	EO2206346-004	EO2206346-005
						Result	Result	Result	Result	Result
Dissolved Metals										
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		0.000063	<0.000010	0.000034	0.000055	0.000058
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	0.00061	<0.00030	<0.00030	0.00031
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L		0.00108	<0.00010	0.00018	0.00076	0.00103
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.158	0.0982	0.0625	0.0417	0.145
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00072	<0.00050	0.00050	0.00068	0.00072
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	0.0023	<0.0010	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00037	0.00104	0.00059	<0.00020	0.00031
dissolved metals filtration location	----	EP421	-	-		Laboratory	Laboratory	Laboratory	Laboratory	Laboratory
Volatile Organic Compounds [BTEXS+MTBE]										
benzene	71-43-2	E611A	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
ethylbenzene	100-41-4	E611A	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
toluene	108-88-3	E611A	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
xylene, m+p-	179601-23-1	E611A	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
xylene, o-	95-47-6	E611A	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
xylenes, total	1330-20-7	E611A	0.75	µg/L		<0.75	<0.75	<0.75	<0.75	<0.75
BTEX, total	----	E611A	1.2	µg/L		<1.2	<1.2	<1.2	<1.2	<1.2
Volatile Organic Compounds Surrogates										
bromofluorobenzene, 4-	460-00-4	E611A	1.0	%		81.9	81.1	80.7	80.2	81.9
difluorobenzene, 1,4-	540-36-3	E611A	1.0	%		96.1	95.0	101	108	89.8
Hydrocarbons										
F1 (C6-C10)	----	E581.F1	100	µg/L		<100	<100	<100	<100	<100
F1-BTEX	----	EC580	100	µg/L		<100	<100	<100	<100	<100
F2 (C10-C16)	----	E601	100	µg/L		<100	<100	<100	<100	<100
F3 (C16-C34)	----	E601	250	µg/L		<250	<250	<250	<250	<250
F4 (C34-C50)	----	E601	250	µg/L		<250	<250	<250	<250	<250
hydrocarbons, total (C6-C50)	----	EC581	400	µg/L		<400	<400	<400	<400	<400
Hydrocarbons Surrogates										
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601	1.0	%		99.4	98.8	98.6	99.1	97.9

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: MW01	MW02	MW03	MW04	QA/QC
					Client sampling date / time: 06-Aug-2022 14:30	06-Aug-2022 17:30	06-Aug-2022 16:30	06-Aug-2022 15:30	06-Aug-2022
					EO2206346-001	**EO2206346-002**	**EO2206346-003**	**EO2206346-004**	**EO2206346-005**
					Result	Result	Result	Result	Result
Hydrocarbons Surrogates									
dichlorotoluene, 3,4-	97-75-0	E581.F1	1.0	%	100	96.1	95.4	92.9	102
Polychlorinated Biphenyls									
Aroclor 1016	12674-11-2	E685	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1221	11104-28-2	E685	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1232	11141-16-5	E685	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1242	53469-21-9	E685	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1248	12672-29-6	E685	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1254	11097-69-1	E685	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1260	11096-82-5	E685	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1262	37324-23-5	E685	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1268	11100-14-4	E685	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
polychlorinated biphenyls [PCBs], total	----	E685	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Polychlorinated Biphenyls Surrogates									
decachlorobiphenyl	2051-24-3	E685	1.0	%	85.7	91.7	83.7	89.9	86.0

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **EO2206346**	Page	: 1 of 17
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	: 10-Aug-2022 17:56
PO	: ----	Issue Date	: 19-Aug-2022 08:38
C-O-C number	: 20-1009579		
Sampler	: ----		
Site	: CAM-D		
Quote number	: 2022 Price List - Prairies		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **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										
MW01	E235.Cl	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
MW02	E235.Cl	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
MW03	E235.Cl	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
MW04	E235.Cl	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
QA/QC	E235.Cl	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	6 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
MW01	E235.F	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
MW02	E235.F	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 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 MW03	E235.F	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW04	E235.F	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE QA/QC	E235.F	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	6 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE MW01	E235.NO3	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	3 days	5 days	× EHTR-FM
Anions and Nutrients : Nitrate in Water by IC										
HDPE MW02	E235.NO3	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	3 days	5 days	× EHTR-FM
Anions and Nutrients : Nitrate in Water by IC										
HDPE MW03	E235.NO3	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	3 days	5 days	× EHTR-FM
Anions and Nutrients : Nitrate in Water by IC										
HDPE MW04	E235.NO3	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	3 days	5 days	× EHTR-FM
Anions and Nutrients : Nitrate in Water by IC										
HDPE QA/QC	E235.NO3	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	3 days	6 days	× EHTR-FM
Anions and Nutrients : Nitrite in Water by IC										
HDPE MW01	E235.NO2	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	3 days	5 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 : Nitrite in Water by IC										
HDPE MW02	E235.NO2	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	3 days	5 days	× EHTR-FM
Anions and Nutrients : Nitrite in Water by IC										
HDPE MW03	E235.NO2	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	3 days	5 days	× EHTR-FM
Anions and Nutrients : Nitrite in Water by IC										
HDPE MW04	E235.NO2	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	3 days	5 days	× EHTR-FM
Anions and Nutrients : Nitrite in Water by IC										
HDPE QA/QC	E235.NO2	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	3 days	6 days	× EHTR-FM
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW01	E235.SO4	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW02	E235.SO4	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW03	E235.SO4	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW04	E235.SO4	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE QA/QC	E235.SO4	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	6 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) MW01	E421	06-Aug-2022	15-Aug-2022	----	----		15-Aug-2022	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW02	E421	06-Aug-2022	15-Aug-2022	----	----		15-Aug-2022	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW03	E421	06-Aug-2022	15-Aug-2022	----	----		15-Aug-2022	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW04	E421	06-Aug-2022	15-Aug-2022	----	----		15-Aug-2022	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) QA/QC	E421	06-Aug-2022	15-Aug-2022	----	----		15-Aug-2022	180 days	9 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MW01	E581.F1	06-Aug-2022	12-Aug-2022	----	----		12-Aug-2022	14 days	6 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MW02	E581.F1	06-Aug-2022	12-Aug-2022	----	----		12-Aug-2022	14 days	6 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MW03	E581.F1	06-Aug-2022	12-Aug-2022	----	----		12-Aug-2022	14 days	6 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MW04	E581.F1	06-Aug-2022	12-Aug-2022	----	----		12-Aug-2022	14 days	6 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
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) QA/QC	E581.F1	06-Aug-2022	12-Aug-2022	----	----		12-Aug-2022	14 days	7 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MW01	E601	06-Aug-2022	11-Aug-2022	14 days	5 days	✓	11-Aug-2022	40 days	0 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MW02	E601	06-Aug-2022	11-Aug-2022	14 days	5 days	✓	11-Aug-2022	40 days	0 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MW03	E601	06-Aug-2022	11-Aug-2022	14 days	5 days	✓	11-Aug-2022	40 days	0 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MW04	E601	06-Aug-2022	11-Aug-2022	14 days	5 days	✓	11-Aug-2022	40 days	0 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) QA/QC	E601	06-Aug-2022	11-Aug-2022	14 days	5 days	✓	11-Aug-2022	40 days	0 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW01	E290	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW02	E290	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW03	E290	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	14 days	5 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 : Alkalinity Species by Titration										
HDPE MW04	E290	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE QA/QC	E290	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	14 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE MW01	E100	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW02	E100	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW03	E100	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW04	E100	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE QA/QC	E100	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	28 days	6 days	✓
Physical Tests : pH by Meter										
HDPE MW01	E108	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	0.25 hrs	3.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW02	E108	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	0.25 hrs	3.25 hrs	× 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 : pH by Meter										
HDPE MW03	E108	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	0.25 hrs	3.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE QA/QC	E108	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	0.25 hrs	3.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW04	E108	06-Aug-2022	11-Aug-2022	----	----		11-Aug-2022	0.25 hrs	3.63 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE MW01	E162	06-Aug-2022	----	----	----		11-Aug-2022	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW02	E162	06-Aug-2022	----	----	----		11-Aug-2022	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW03	E162	06-Aug-2022	----	----	----		11-Aug-2022	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW04	E162	06-Aug-2022	----	----	----		11-Aug-2022	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE QA/QC	E162	06-Aug-2022	----	----	----		11-Aug-2022	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW01	E160	06-Aug-2022	----	----	----		11-Aug-2022	7 days	5 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 : TSS by Gravimetry										
HDPE										
MW02	E160	06-Aug-2022	----	----	----		11-Aug-2022	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE										
MW03	E160	06-Aug-2022	----	----	----		11-Aug-2022	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE										
MW04	E160	06-Aug-2022	----	----	----		11-Aug-2022	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE										
QA/QC	E160	06-Aug-2022	----	----	----		11-Aug-2022	7 days	5 days	✓
Polychlorinated Biphenyls : PCB Aroclors by GC-ECD										
Amber glass/Teflon lined cap										
MW01	E685	06-Aug-2022	17-Aug-2022	----	----		18-Aug-2022	40 days	1 days	✓
Polychlorinated Biphenyls : PCB Aroclors by GC-ECD										
Amber glass/Teflon lined cap										
MW02	E685	06-Aug-2022	17-Aug-2022	----	----		18-Aug-2022	40 days	1 days	✓
Polychlorinated Biphenyls : PCB Aroclors by GC-ECD										
Amber glass/Teflon lined cap										
MW03	E685	06-Aug-2022	17-Aug-2022	----	----		18-Aug-2022	40 days	1 days	✓
Polychlorinated Biphenyls : PCB Aroclors by GC-ECD										
Amber glass/Teflon lined cap										
MW04	E685	06-Aug-2022	17-Aug-2022	----	----		18-Aug-2022	40 days	1 days	✓
Polychlorinated Biphenyls : PCB Aroclors by GC-ECD										
Amber glass/Teflon lined cap										
QA/QC	E685	06-Aug-2022	17-Aug-2022	----	----		18-Aug-2022	40 days	1 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) MW01	E420	06-Aug-2022	16-Aug-2022	----	----		16-Aug-2022	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MW02	E420	06-Aug-2022	16-Aug-2022	----	----		16-Aug-2022	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MW03	E420	06-Aug-2022	16-Aug-2022	----	----		16-Aug-2022	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MW04	E420	06-Aug-2022	16-Aug-2022	----	----		16-Aug-2022	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) QA/QC	E420	06-Aug-2022	16-Aug-2022	----	----		16-Aug-2022	180 days	11 days	✓
Volatile Organic Compounds [BTEXS+MTBE] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MW01	E611A	06-Aug-2022	12-Aug-2022	----	----		12-Aug-2022	14 days	6 days	✓
Volatile Organic Compounds [BTEXS+MTBE] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MW02	E611A	06-Aug-2022	12-Aug-2022	----	----		12-Aug-2022	14 days	6 days	✓
Volatile Organic Compounds [BTEXS+MTBE] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MW03	E611A	06-Aug-2022	12-Aug-2022	----	----		12-Aug-2022	14 days	6 days	✓
Volatile Organic Compounds [BTEXS+MTBE] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MW04	E611A	06-Aug-2022	12-Aug-2022	----	----		12-Aug-2022	14 days	6 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		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Volatile Organic Compounds [BTEXS+MTBE] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate)										
QA/QC	E611A	06-Aug-2022	12-Aug-2022	----	----		12-Aug-2022	14 days	7 days	✓

Legend & Qualifier Definitions

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

Quality Control Parameter Frequency Compliance

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

Matrix: **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	598215	1	14	7.1	5.0	✓
BTEX by Headspace GC-MS	E611A	599507	1	19	5.2	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	599506	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	598237	1	19	5.2	5.0	✓
Conductivity in Water	E100	598214	1	18	5.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	602827	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	598234	1	16	6.2	5.0	✓
Nitrate in Water by IC	E235.NO3	598238	1	17	5.8	5.0	✓
Nitrite in Water by IC	E235.NO2	598235	1	17	5.8	5.0	✓
pH by Meter	E108	598213	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	598236	1	19	5.2	5.0	✓
TDS by Gravimetry	E162	598243	3	53	5.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	604213	1	20	5.0	5.0	✓
TSS by Gravimetry	E160	598070	2	39	5.1	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	598215	1	14	7.1	5.0	✓
BTEX by Headspace GC-MS	E611A	599507	1	19	5.2	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	599506	1	19	5.2	5.0	✓
CCME PHCs - F2-F4 by GC-FID	E601	597880	1	10	10.0	5.0	✓
Chloride in Water by IC	E235.Cl	598237	1	19	5.2	5.0	✓
Conductivity in Water	E100	598214	1	18	5.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	602827	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	598234	1	16	6.2	5.0	✓
Nitrate in Water by IC	E235.NO3	598238	1	17	5.8	5.0	✓
Nitrite in Water by IC	E235.NO2	598235	1	17	5.8	5.0	✓
PCB Aroclors by GC-ECD	E685	606598	1	13	7.6	5.0	✓
pH by Meter	E108	598213	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	598236	1	19	5.2	5.0	✓
TDS by Gravimetry	E162	598243	3	53	5.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	604213	1	20	5.0	5.0	✓
TSS by Gravimetry	E160	598070	2	39	5.1	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	598215	1	14	7.1	5.0	✓
BTEX by Headspace GC-MS	E611A	599507	1	19	5.2	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	599506	1	19	5.2	5.0	✓
CCME PHCs - F2-F4 by GC-FID	E601	597880	1	10	10.0	5.0	✓
Chloride in Water by IC	E235.Cl	598237	1	19	5.2	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*
Method Blanks (MB) - Continued							
Conductivity in Water	E100	598214	1	18	5.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	602827	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	598234	1	16	6.2	5.0	✓
Nitrate in Water by IC	E235.NO3	598238	1	17	5.8	5.0	✓
Nitrite in Water by IC	E235.NO2	598235	1	17	5.8	5.0	✓
PCB Aroclors by GC-ECD	E685	606598	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	598236	1	19	5.2	5.0	✓
TDS by Gravimetry	E162	598243	3	53	5.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	604213	1	20	5.0	5.0	✓
TSS by Gravimetry	E160	598070	2	39	5.1	5.0	✓
Matrix Spikes (MS)							
BTEX by Headspace GC-MS	E611A	599507	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	598237	1	19	5.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	602827	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	598234	1	16	6.2	5.0	✓
Nitrate in Water by IC	E235.NO3	598238	1	17	5.8	5.0	✓
Nitrite in Water by IC	E235.NO2	598235	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	598236	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	604213	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
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.
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.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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.
CCME PHC - F1 by Headspace GC-FID	E581.F1 Edmonton - Environmental	Water	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 Edmonton - Environmental	Water	CCME PHC in Soil - Tier 1	Sample extracts are analyzed by GC-FID for CCME hydrocarbon fractions (F2-F4).
BTEX by Headspace GC-MS	E611A Edmonton - Environmental	Water	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 Vancouver - Environmental	Water	EPA 8082A (mod)	PCB Aroclors are analyzed by GC-ECD
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 $CaCO_3$ 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).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
F1-BTEX	EC580 Edmonton - Environmental	Water	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	Water	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.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Edmonton - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
VOCs Preparation for Headspace Analysis	EP581 Edmonton - Environmental	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
PHCs and PAHs Hexane Extraction	EP601 Edmonton - Environmental	Water	EPA 3511 (mod)	Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction.
PCB Aroclors Extraction	EP685 Vancouver - Environmental	Water	EPA 3510C (mod)	PCBs are extracted using an organic solvent liquid-liquid extraction.The 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.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EO2206346**	Page	: 1 of 18
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	: 10-Aug-2022 17:56
PO	: ----	Date Analysis Commenced	: 11-Aug-2022
C-O-C number	: 20-1009579	Issue Date	: 19-Aug-2022 08:38
Sampler	: ----		
Site	: CAM-D		
Quote number	: 2022 Price List - Prairies		
No. of samples received	: 5		
No. of samples analysed	: 5		

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
- 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
Dan Nguyen	Team Leader - Inorganics	Edmonton Inorganics, Edmonton, Alberta
Daniel Nguyen	Lab Assistant	Edmonton Inorganics, Edmonton, Alberta
Janice Leung	Supervisor - Organics Instrumentation	Vancouver Organics, Burnaby, British Columbia
Jessica Maitland	Lab Assistant	Edmonton Inorganics, 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
Yan Zhang	Lab Analyst	Edmonton Organics, 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: **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: 598070)											
EO2206342-001	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 598213)											
EO2206342-002	Anonymous	pH	----	E108	0.10	pH units	8.13	8.12	0.123%	3%	----
Physical Tests (QC Lot: 598214)											
EO2206342-002	Anonymous	conductivity	----	E100	2.0	µS/cm	281	281	0.00%	10%	----
Physical Tests (QC Lot: 598215)											
EO2206342-002	Anonymous	alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	132	130	1.91%	20%	----
Physical Tests (QC Lot: 598243)											
EO2206296-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	564	576	2.11%	20%	----
Physical Tests (QC Lot: 598253)											
EO2206346-004	MW04	solids, total dissolved [TDS]	----	E162	20	mg/L	710	704	0.707%	20%	----
Physical Tests (QC Lot: 600526)											
EO2206338-001	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	94.2	91.0	3.46%	20%	----
Physical Tests (QC Lot: 600896)											
EO2206342-003	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	226	228	0.879%	20%	----
Anions and Nutrients (QC Lot: 598234)											
EO2206346-005	QA/QC	fluoride	16984-48-8	E235.F	0.020	mg/L	0.586	0.617	5.15%	20%	----
Anions and Nutrients (QC Lot: 598235)											
EO2206346-005	QA/QC	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: 598236)											
EO2206346-005	QA/QC	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	690	694	0.612%	20%	----
Anions and Nutrients (QC Lot: 598237)											
EO2206346-005	QA/QC	chloride	16887-00-6	E235.Cl	0.50	mg/L	114	112	1.27%	20%	----
Anions and Nutrients (QC Lot: 598238)											
EO2206346-005	QA/QC	nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	0.207	0.207	0.145%	20%	----
Total Metals (QC Lot: 604213)											
EO2206342-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0100	0.0103	0.0003	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00026	0.00026	0.000009	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00021	0.00020	0.000007	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0208	0.0208	0.248%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	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*
Total Metals (QC Lot: 604213) - continued											
EO2206342-001	Anonymous	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	0.014	0.015	0.0006	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000050	0.0000060	0.0000010	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	55.1	53.1	3.74%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00081	0.00080	0.00001	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.025	0.025	0.0005	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000147	0.000145	0.000003	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	35.5	35.7	0.459%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00074	0.00077	0.00004	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000632	0.000656	3.65%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00065	0.00083	0.00018	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	0.777	0.778	0.136%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000147	0.000158	0.000011	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	1.04	1.05	1.20%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	4.27	4.36	2.02%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.0292	0.0299	2.36%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	10.3	10.7	3.34%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000084	0.000075	0.000009	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	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	<0.00030	<0.00030	0	Diff <2x LOR	----
		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	0.00221	0.00218	1.26%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 602827)											

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: 602827) - continued											
EO2206332-009	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.388	0.388	0.0201%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00017	0.00015	0.00002	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00070	0.00070	0.0000003	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0555	0.0570	2.70%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	0.000038	0.000030	0.000008	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	0.023	0.023	0.0006	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000380	0.0000339	0.0000041	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	19.4	18.9	2.55%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	0.00088	0.00091	0.00002	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.0121	0.0122	0.852%	20%	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00437	0.00443	1.48%	20%	----
		iron, dissolved	7439-89-6	E421	0.030	mg/L	0.605	0.614	1.46%	20%	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000308	0.000317	0.000009	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	3.90	3.93	0.728%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00500	mg/L	1.02	1.01	0.184%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000332	0.000332	0.00000006	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00474	0.00483	0.00009	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	0.210	0.203	0.006	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	10.8	10.7	0.654%	20%	----
		rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00262	0.00255	2.88%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000459	0.000500	0.000041	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.01	4.11	2.44%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	0.000014	0.000012	0.000001	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	3.47	3.45	0.705%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0440	0.0452	2.83%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	2.29	2.28	0.01	Diff <2x LOR	----
		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	0.00044	0.00044	0.000002	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	0.00900	0.00869	3.47%	20%	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	0.0300	0.0311	3.75%	20%	----
		tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	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: 602827) - continued											
EO2206332-009	Anonymous	uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000118	0.000119	0.757%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00186	0.00198	0.00012	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0034	0.0033	0.0001	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	0.00251	0.00250	0.592%	20%	----
Volatile Organic Compounds (QC Lot: 599507)											
EO2206342-001	Anonymous	benzene	71-43-2	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		toluene	108-88-3	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 599506)											
EO2206342-001	Anonymous	F1 (C6-C10)	----	E581.F1	100	µg/L	<100	<100	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 598070)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 598214)						
conductivity	----	E100	1	µS/cm	1.3	----
Physical Tests (QCLot: 598215)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 598243)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 598253)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 600526)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 600896)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 598234)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 598235)						
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 598236)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 598237)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 598238)						
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Total Metals (QCLot: 604213)						
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 604213) - continued						
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	----
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: 602827)						
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 602827) - continued						
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	----
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	----
Volatile Organic Compounds (QCLot: 599507)						
benzene	71-43-2	E611A	0.5	µg/L	<0.50	----
BTEX, total	----	E611A	1	µg/L	<1.0	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Volatile Organic Compounds (QCLot: 599507) - continued						
ethylbenzene	100-41-4	E611A	0.5	µg/L	<0.50	----
toluene	108-88-3	E611A	0.5	µg/L	<0.50	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	<0.40	----
xylene, o-	95-47-6	E611A	0.3	µg/L	<0.30	----
Hydrocarbons (QCLot: 597880)						
F2 (C10-C16)	----	E601	100	µg/L	<100	----
F3 (C16-C34)	----	E601	250	µg/L	<250	----
F4 (C34-C50)	----	E601	250	µg/L	<250	----
Hydrocarbons (QCLot: 599506)						
F1 (C6-C10)	----	E581.F1	100	µg/L	<100	----
Polychlorinated Biphenyls (QCLot: 606598)						
Aroclor 1016	12674-11-2	E685	1	µg/L	<1.0	----
Aroclor 1221	11104-28-2	E685	1	µg/L	<1.0	----
Aroclor 1232	11141-16-5	E685	1	µg/L	<1.0	----
Aroclor 1242	53469-21-9	E685	1	µg/L	<1.0	----
Aroclor 1248	12672-29-6	E685	1	µg/L	<1.0	----
Aroclor 1254	11097-69-1	E685	1	µg/L	<1.0	----
Aroclor 1260	11096-82-5	E685	1	µg/L	<1.0	----
Aroclor 1262	37324-23-5	E685	1	µg/L	<1.0	----
Aroclor 1268	11100-14-4	E685	1	µg/L	<1.0	----

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: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 598070)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	108	85.0	115	----
Physical Tests (QCLot: 598213)									
pH	----	E108	----	pH units	6 pH units	102	97.0	103	----
Physical Tests (QCLot: 598214)									
conductivity	----	E100	1	µS/cm	1412 µS/cm	102	90.0	110	----
Physical Tests (QCLot: 598215)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	100	85.0	115	----
Physical Tests (QCLot: 598243)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	97.9	85.0	115	----
Physical Tests (QCLot: 598253)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	103	85.0	115	----
Physical Tests (QCLot: 600526)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	102	85.0	115	----
Physical Tests (QCLot: 600896)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 598234)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 598235)									
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	92.9	90.0	110	----
Anions and Nutrients (QCLot: 598236)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	91.8	90.0	110	----
Anions and Nutrients (QCLot: 598237)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	94.2	90.0	110	----
Anions and Nutrients (QCLot: 598238)									
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	94.8	90.0	110	----
Total Metals (QCLot: 604213)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	105	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	101	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	102	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	108	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	103	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: 604213) - continued									
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	103	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	103	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	101	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	103	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	104	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	97.2	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	106	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	108	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	100	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	110	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	106	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	99.4	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	97.4	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	95.8	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	102	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	94.4	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	94.4	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	99.6	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	95.3	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	97.5	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	103	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	103	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	99.1	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	95.9	80.0	120	----
Dissolved Metals (QCLot: 602827)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	107	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	101	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	103	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: 602827) - continued									
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	107	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	96.6	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	91.1	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	99.1	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	102	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	105	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	99.2	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	106	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	94.6	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	100	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	101	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	98.4	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	99.7	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	107	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	103	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	103	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	86.8	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	99.9	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	92.1	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	105	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	94.0	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	86.2	80.0	120	----
tin, dissolved	7440-31-5	E421	----	mg/L	0.5 mg/L	99.0	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	102	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	94.9	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	94.0	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	96.2	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	93.9	80.0	120	----
Volatile Organic Compounds (QCLot: 599507)									

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Volatile Organic Compounds (QCLot: 599507) - continued									
benzene	71-43-2	E611A	0.5	µg/L	100 µg/L	87.1	70.0	130	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	100 µg/L	101	70.0	130	----
toluene	108-88-3	E611A	0.5	µg/L	100 µg/L	81.1	70.0	130	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	200 µg/L	107	70.0	130	----
xylene, o-	95-47-6	E611A	0.3	µg/L	100 µg/L	101	70.0	130	----
Hydrocarbons (QCLot: 597880)									
F2 (C10-C16)	----	E601	100	µg/L	3260 µg/L	105	70.0	130	----
F3 (C16-C34)	----	E601	250	µg/L	6340 µg/L	108	70.0	130	----
F4 (C34-C50)	----	E601	250	µg/L	4970 µg/L	111	70.0	130	----
Hydrocarbons (QCLot: 599506)									
F1 (C6-C10)	----	E581.F1	100	µg/L	2750 µg/L	86.8	70.0	130	----
Polychlorinated Biphenyls (QCLot: 606598)									
Aroclor 1260	11096-82-5	E685	1	µg/L	5 µg/L	115	65.0	130	----

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: **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: 598234)										
EO2206346-005	QA/QC	fluoride	16984-48-8	E235.F	0.984 mg/L	1 mg/L	98.4	75.0	125	----
Anions and Nutrients (QCLot: 598235)										
EO2206346-005	QA/QC	nitrite (as N)	14797-65-0	E235.NO2	0.469 mg/L	0.5 mg/L	93.8	75.0	125	----
Anions and Nutrients (QCLot: 598236)										
EO2206346-005	QA/QC	sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	100 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 598237)										
EO2206346-005	QA/QC	chloride	16887-00-6	E235.Cl	ND mg/L	100 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 598238)										
EO2206346-005	QA/QC	nitrate (as N)	14797-55-8	E235.NO3	2.46 mg/L	2.5 mg/L	98.6	75.0	125	----
Total Metals (QCLot: 604213)										
EO2206342-002	Anonymous	aluminum, total	7429-90-5	E420	0.192 mg/L	0.2 mg/L	96.0	70.0	130	----
		antimony, total	7440-36-0	E420	0.0196 mg/L	0.02 mg/L	98.0	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0200 mg/L	0.02 mg/L	99.9	70.0	130	----
		barium, total	7440-39-3	E420	0.0199 mg/L	0.02 mg/L	99.5	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00974 mg/L	0.01 mg/L	97.4	70.0	130	----
		boron, total	7440-42-8	E420	0.100 mg/L	0.1 mg/L	100	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00409 mg/L	0.004 mg/L	102	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	0.0100 mg/L	0.01 mg/L	100	70.0	130	----
		chromium, total	7440-47-3	E420	0.0399 mg/L	0.04 mg/L	99.8	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0197 mg/L	0.02 mg/L	98.3	70.0	130	----
		copper, total	7440-50-8	E420	0.0194 mg/L	0.02 mg/L	97.3	70.0	130	----
		iron, total	7439-89-6	E420	1.97 mg/L	2 mg/L	98.5	70.0	130	----
		lead, total	7439-92-1	E420	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		lithium, total	7439-93-2	E420	0.104 mg/L	0.1 mg/L	104	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	0.0199 mg/L	0.02 mg/L	99.3	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		nickel, total	7440-02-0	E420	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.4 mg/L	10 mg/L	104	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: 604213) - continued										
EO2206342-002	Anonymous	potassium, total	7440-09-7	E420	3.98 mg/L	4 mg/L	99.4	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0198 mg/L	0.02 mg/L	99.0	70.0	130	----
		selenium, total	7782-49-2	E420	0.0400 mg/L	0.04 mg/L	100	70.0	130	----
		silicon, total	7440-21-3	E420	9.48 mg/L	10 mg/L	94.8	70.0	130	----
		silver, total	7440-22-4	E420	0.00409 mg/L	0.004 mg/L	102	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	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		sulfur, total	7704-34-9	E420	19.1 mg/L	20 mg/L	95.6	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0380 mg/L	0.04 mg/L	94.9	70.0	130	----
		thallium, total	7440-28-0	E420	0.00388 mg/L	0.004 mg/L	96.9	70.0	130	----
		thorium, total	7440-29-1	E420	0.0162 mg/L	0.02 mg/L	80.9	70.0	130	----
		tin, total	7440-31-5	E420	0.0196 mg/L	0.02 mg/L	98.3	70.0	130	----
		titanium, total	7440-32-6	E420	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		uranium, total	7440-61-1	E420	0.00403 mg/L	0.004 mg/L	101	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0990 mg/L	0.1 mg/L	99.0	70.0	130	----
		zinc, total	7440-66-6	E420	0.363 mg/L	0.4 mg/L	90.8	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0430 mg/L	0.04 mg/L	107	70.0	130	----
Dissolved Metals (QCLot: 602827)										
EO2206332-010	Anonymous	aluminum, dissolved	7429-90-5	E421	0.213 mg/L	0.2 mg/L	106	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0200 mg/L	0.02 mg/L	99.9	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0211 mg/L	0.02 mg/L	106	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	0.0394 mg/L	0.04 mg/L	98.6	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00861 mg/L	0.01 mg/L	86.1	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.110 mg/L	0.1 mg/L	110	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00409 mg/L	0.004 mg/L	102	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.00984 mg/L	0.01 mg/L	98.4	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0388 mg/L	0.04 mg/L	97.1	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0197 mg/L	0.02 mg/L	98.5	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0197 mg/L	0.02 mg/L	98.3	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.93 mg/L	2 mg/L	96.5	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0176 mg/L	0.02 mg/L	87.9	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0998 mg/L	0.1 mg/L	99.8	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	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: 602827) - continued										
EO2206332-010	Anonymous	manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0387 mg/L	0.04 mg/L	96.6	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.4 mg/L	10 mg/L	104	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.78 mg/L	4 mg/L	94.5	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0198 mg/L	0.02 mg/L	99.2	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0463 mg/L	0.04 mg/L	116	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.62 mg/L	10 mg/L	86.2	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00367 mg/L	0.004 mg/L	91.7	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	19.6 mg/L	20 mg/L	97.9	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0420 mg/L	0.04 mg/L	105	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00362 mg/L	0.004 mg/L	90.6	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0177 mg/L	0.02 mg/L	88.6	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0195 mg/L	0.02 mg/L	97.4	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0403 mg/L	0.04 mg/L	101	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0182 mg/L	0.02 mg/L	90.8	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	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.356 mg/L	0.4 mg/L	89.0	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0387 mg/L	0.04 mg/L	96.7	70.0	130	----
Volatile Organic Compounds (QCLot: 599507)										
EO2206342-002	Anonymous	benzene	71-43-2	E611A	92.7 µg/L	100 µg/L	92.7	50.0	140	----
		ethylbenzene	100-41-4	E611A	87.4 µg/L	100 µg/L	87.4	50.0	140	----
		toluene	108-88-3	E611A	72.8 µg/L	100 µg/L	72.8	50.0	140	----
		xylene, m+p-	179601-23-1	E611A	201 µg/L	200 µg/L	100	50.0	140	----
		xylene, o-	95-47-6	E611A	90.9 µg/L	100 µg/L	90.9	50.0	140	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 - 1009579

Canada Toll Free: 1 800 668 9878

Page 1 of 1

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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 Stony Plain Road
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:	

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.Solinger@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: CANSSC.E-billing@Aecom.Com

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

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

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

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Project Information

ALS Account # / Quote #:	Q89810
Job #:	60686962
PO / AFE:	
LSD:	
ALS Lab Work Order # (ALS use only):	EO2206346

Oil and Gas Required Fields (client use)

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

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	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	MW01	06-Aug-22	14:30	GW	10	X	X	X	X	X	X	X			
	MW02	06-Aug-22	17:30	GW	10	X	X	X	X	X	X	X			
	MW03	06-Aug-22	16:30	GW	10	X	X	X	X	X	X	X			
	MW04	06-Aug-22	15:30	GW	10	X	X	X	X	X	X	X			
	QA/QC	06-Aug-22	—	GW	10	X	X	X	X	X	X	X			

Environmental Division
Edmonton
Work Order Reference
EO2206346

Telephone : +1 780 413 5227

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

Site: CAM-D

SAMPLE RECEIPT DETA

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS

Submission Comments identified on Sample Receipt Notif

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

INITIAL COOLER TEMPERATURES °C: 10.3

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date: Aug 7/22	Time:	Received by:	Date: Aug 10	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

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

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

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