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Public Services and Procurement Canada

2017 ENVIRONMENTAL MONITORING PROGRAM - CAMBRIDGE BAY AIRPORT APRON LTU

Cambridge Bay Airport, NU

February 22, 2018

2017 ENVIRONMENTAL MONITORING PROGRAM - APRON LTU

CAMBRIDGE BAY AIRPORT, NU

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ACRONYMS AND ABBREVIATIONS

Arcadis	Arcadis Canada Inc.
BTEX	Benzene, Toluene, Ethyl Benzene and Xylenes
CCME	Canadian Council of Ministers of the Environment
CCME FWAL	Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life
COC	Contaminant of Concern
DWSV	Drinking Water Screening Value
ESA	Environmental Site Assessment
FCSAP	Federal Contaminated Sites Action Plan
FIGQG	Federal Interim Groundwater Quality Guidelines
FTA	Fire Training Area
HC	Health Canada
km	kilometre(s)
kg	kilogram
l	litre(s)
LTU	Land Treatment Unit
m	metre(s)
m asl	metre(s) above sea level
m bgs	metre(s) below ground surface
NWB	Nunavut Water Board
OVM	Organic Vapour Measurement
PAH	Polycyclic Aromatic Hydrocarbon
PFAS	Poly-and-perfluoroalkyl Substances
PHC	Petroleum Hydrocarbon
ppm	parts per million
PSPC	Public Services and Procurement Canada
PWGSC	Public Works and Government Services Canada
RDL	Reportable Detection Limit
TC	Transport Canada
TOR	Terms of Reference

EXECUTIVE SUMMARY

Arcadis Canada Inc. (Arcadis) was retained by Public Services and Procurement Canada (PSPC) [formerly Public Works and Government Services Canada (PWGSC)] on behalf of Transport Canada (TC) to conduct an Environmental Monitoring Program at the Cambridge Bay Airport Apron Land Treatment Unit (LTU) and Excavation Area in Cambridge Bay, Nunavut. The 2017 field activities were completed from July 24 to August 10, 2017.

The Apron LTU was constructed in 2013 to treat petroleum hydrocarbon (PHC) impacted soil excavated from an area located near the Cambridge Bay Airport terminal, referred to as the Apron Excavation Area. The impacted soil occupies approximately 95% of the LTU. The remaining 5% of the LTU has been left empty to provide space for water storage around the sump located in the LTU's southwest corner.

The 2017 Environmental Monitoring Program included:

1. A groundwater and soil monitoring program that met the requirements of the Nunavut Water Board (NWB) License 1BR-FTA1217. This included modifying the soil sampling requirements to a single sampling event at the Apron LTU, as no active soil treatment is currently occurring at the site. Soil (7 samples), sump water (1 samples), and groundwater (4 samples) samples were collected and submitted for analysis;
2. The repair of damaged monitoring wells;
3. A Class A cost estimate for future proposed work (under separate cover); and,
4. The comparison of historical and current monitoring data from the various sampled media to assess for natural attenuation, and the integrity of the LTU.

Sump Water Monitoring Results

Analytical results for the 2017 sump water sample met the NWB Licence requirements for pH, oil-and-grease, dissolved lead, total zinc, benzene-toluene-ethylbenzene-and-xylenes (BTEX), and PHC fraction F1. Reported concentrations of oil-and-grease, dissolved lead, total zinc, BTEX, and PHC F1 were either below laboratory Reportable Detection Limits (RDLs) or were 2x below the applicable NWB Licence requirement. No exceedances of the NWB Licence requirements have ever been detected in the Apron LTU's sump water to date.

The 2017 sump water sample was also analyzed for poly-and-perfluoroalkyl substances (PFASs). Detectable levels of select PFAS were found in both the soil and sump water samples above Health Canada's Drinking Water Screening Values (DWSVs); however, no exceedances of existing federal guidelines for aquatic receptors were reported. Arcadis recommends that sump water should not be discharged to the ground surface outside the Apron LTU during future site activities until the risks associated with the PFAS impacts have been assessed.

Groundwater Monitoring Results

At the time of the 2017 field program, groundwater was observed to be frozen in four of the five monitoring wells surrounding the Apron LTU. In addition, monitoring well MW13-6, installed in the Apron Excavated Area, could not be located by Arcadis in 2017. This monitoring well has been buried under compacted granular material that resides in an active portion of the Airport's apron. As such, groundwater could only be collected from four of the nine monitoring wells (MW13-1, MW13-7, MW13-8 and MW13-9).

The 2017 groundwater analytical results were consistent with 2014, 2015 and 2016 analytical results. No increasing or decreasing trends in the groundwater parameters analyzed can be established. Concentrations of BTEX, PHCs and PAHs in all 2017 groundwater samples were below applicable Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME FWAL) and below laboratory RDLs. Exceedances of dissolved iron, dissolved chloride and phenols were detected in the groundwater sample collected from monitoring well MW13-1. In addition, exceedances of various metals/inorganics (including dissolved copper, dissolved iron, dissolved uranium, dissolved zinc, dissolved chloride and phenols) were detected in the groundwater samples collected from monitoring wells MW13-7, MW13-8 and MW13-9. The elevated dissolved metal concentrations are likely a result of naturally elevated background concentrations while the phenol exceedances are likely anthropogenic elevated concentrations. The 2017 dissolved chloride concentrations in the groundwater samples collected from monitoring wells MW13-7 and MW13-9 were between 9x and 68x the CCME FWAL. These are the highest dissolved chloride exceedance factors reported for the four monitoring wells located around the Apron excavation area since 2014. The dissolved chloride exceedances are likely due to road salt application practices used by the Cambridge Bay Airport.

Overall, the results from the 2017 Environmental Monitoring Program do not suggest that the integrity of the Apron LTU's liner and berms has been compromised.

Soil Petroleum Hydrocarbon Remediation Results

Arcadis collected seven soil samples (including one duplicate sample) from the Apron LTU during the 2017 field program. Samples were collected from the top 0.35 metres (m) of soil in the Apron LTU after the 2017 tilling activities (Refer to the 2017 Remedial Activities Program report (Arcadis, 2017) for more details regarding the 2017 tilling activities). Select soil samples were submitted for laboratory analysis of BTEX, PHCs and nutrient indicators. The soil analytical results were compared to the CCME FWAL guidelines and NWB License remediation requirements.

Exceedances of select BTEX and PHCs parameters were reported the soil samples above the CCME FWAL guidelines and NWB License remediation requirements. All 2017 soil samples reported BTEX concentrations below the NWB License remediation requirements; however, concentration of benzene and ethylbenzene in one soil sample were reported above applicable CCME FWAL guidelines. Concentrations of PHC fractions F1, F2 and F3 above both the CCME FWAL guidelines and NWB License remediation requirements were reported in 2017. Average hydrocarbon concentrations detected in the upper 0.35 m of soil in the Apron LTU in 2017 were comparable to 2016 PHC averages. The hydrocarbon concentrations in the Apron LTU's soil below 0.35 m depth have not been assessed to date.

The average nitrogen concentration in the upper 0.35 m of soil in the Apron LTU is above the estimated effective nitrogen range to for PHC biodegradation. Conversely, the average phosphorous concentration

is close to the lower limit of the estimated effective phosphorous range. Arcadis recommends no additional nutrients be added to the Apron LTU until average phosphorous concentrations drop below the lower limit of the estimated effective phosphorous range.

Monitoring Well Condition Assessment

Arcadis assessed the condition of the casing, riser and well cap of all monitoring wells around the Apron LTU and Excavation Area during the 2017 field program. Arcadis made repairs to two monitoring wells, MW13-7 and MW13-9. The well casing on monitoring well MW13-7 was reset to allow the well to be opened. The riser on MW13-9 was extended to prevent surface water from submerging the well during periods of wet conditions. All remaining monitoring wells were in good condition with the exception of monitoring well M13-8. The riser on monitoring well M13-8 was cracked; however, Arcadis did not have the materials necessary to repair the well during the 2017 field program.

Recommendations

Arcadis recommends that the following future work be completed at the Apron LTU:

1. To continue to be in compliance with the NWB License requirements and identified chemicals of concern, a groundwater monitoring program must be completed at the Apron LTU and Excavation Area to assess the parameters set out in the license. Attempts should be made to sample the monitoring wells during freshet conditions and during warmest weeks at Cambridge Bay, when liquid groundwater conditions are more probable and when groundwater levels are presumed to be at their highest to further evaluate groundwater trends. Based on temperature statistics obtained from ECCC, this sampling time period would occur in mid-July.

2. Once active treatment re-commences, Arcadis recommends that the number of soil samples submitted for laboratory analysis from the upper 0.35 m bgs of the soil in the Apron LTU be increased to 15 samples to better assess the effectiveness of PHC degradation. In addition, Arcadis recommends 15 additional soil samples be submitted for laboratory analysis from the soil located below 0.35 m bgs. Select soil samples should be analyzed for moisture, pH, bulk density, BTEX, and PHC Fractions F1 to F4.

3. Arcadis recommends that the riser on monitoring well MW13-8 be repaired. We recommend that a new J-plug style well cap be installed on monitoring well MW13-7 during the site's next scheduled monitoring program.

1 INTRODUCTION

Arcadis Canada Inc. (Arcadis) was retained by Public Services and Procurement Canada (PSPC) [formerly Public Works and Government Services Canada (PWGSC)] on behalf of Transport Canada (TC) to conduct an environmental monitoring program at the Cambridge Bay Airport Apron Land Treatment Unit (LTU) and excavation area in Cambridge Bay, Nunavut.

This report is submitted under Northern Standing Offer Contract Number EW699-141143/001/NCS and conducted in accordance with the Terms of Reference (TOR) Amendment entitled, "*Apron and Fire Training Area Site Remedial Activities Supervision and Environmental Monitoring Program, Cambridge Bay Airport, Victoria Island, Nunavut"* and the Arcadis proposal entitled, "*Fire Training Area (FTA) LTU, Site Remedial Activities Supervision and Environmental Monitoring Program, Cambridge Bay Airport, Victoria Island, Nunavut"* dated, July 13, 2017. Throughout this report the Apron LTU and Excavation Area will be referred to as "the site".

1.1 Project Objectives

The objectives of the 2017 Environmental Monitoring Program were to:

1. Complete an environmental monitoring program that meets the Nunavut Water Board (NWB) License 1BR-FTA1217 requirements. This included modifying the soil sampling requirements to a single sampling event at the LTU, as no active soil treatment is currently occurring at the site;
2. Complete a groundwater monitoring program at the Apron LTU (five monitoring wells) and Apron Excavated Area (four monitoring wells), in accordance with Part J, Item 7 of NWB license 1BR-FTA1217;
3. Repair damaged monitoring wells, if required and/or feasible;
4. Submit soil, sump water and groundwater samples for laboratory analysis and analyze data;
5. Provide a Class A cost estimate for future proposed work, if warranted; and,
6. Prepare draft and final reports of the above investigations.

2 BACKGROUND INFORMATION

As part of the airport operations transfer agreement between TC and the Government of Nunavut (GN), two areas of environmental concern (AECs) were identified for remediation at the Cambridge Bay Airport:

- AEC 1: an area on the apron near the airport terminal where airplanes refueled, hereafter referred to as the Apron Excavation Area, and
- AEC 2: a fire training area (FTA) located at the northwest end of the airport runway, hereafter referred to as the FTA Excavation Area.

The location of the Apron and FTA Excavation Areas are shown in **Figure 1** located at the end of this report. Previous investigation confirmed petroleum hydrocarbon (PHC) impacted soil and dissolved metal impacted groundwater in both AECs. To address these impacts, TC developed remedial action plans for both AECs that involved the excavation of impacted soil and its placement into two separate LTUs located near the northwest end of the airport's runway.

TC obtained an operating license for both LTUs (IBR-FTA1217/TC) through the Nunavut Water Board (NWB) in 2011.

2.1 Apron LTU and Excavation Area History

In 2013, a 55 metre (m) x 148 m LTU was constructed by GPEC International on airport land near the northwest end of the airport's runway, hereafter referred to as the Apron LTU (see **Figure 1**). The Apron LTU consists of berm walls and high-density polyethylene geomembrane liner. The berm walls were constructed to a height of approximately 0.5 m above the existing ground surface. The base of the Apron LTU was graded to direct captured water towards a single sump located in its southwest corner. A layer of granular material was spread and compacted over the geomembrane liner (excluding the portion of the geomembrane liner that extends over the berm walls). Five groundwater monitoring wells (MW13-1 to MW13-5) were installed around the Apron LTU. Monitoring well locations around the Apron LTU are shown in **Figure 2**.

Approximately 3,500 cubic metres (m^3) of impacted soil was transferred from the Apron Excavation Area to the Apron LTU following its construction. Additionally, a total of 165 m^3 of concrete debris (large pieces greater than 0.3 m in diameter) was removed from the Apron Excavation Area and placed adjacent and outside of the Apron LTU (see **Figure 2**). Four groundwater monitoring wells (MW13-6 to MW13-9) were installed around the Apron Excavated Area. Monitoring well locations around the Apron Excavated Area are shown in **Figure 3.**

In 2014, during construction of a second LTU to address the identified impacted soils in AEC 2, the remediation contractor discovered crushed drums and metal cylinders in the construction area. To minimize construction delays, 560 m^3 of impacted soil surrounding the drums and cylinders was placed in the Apron LTU. Based on observations in the field, the remedial oversight contractor assessed contaminants of concern as metals and PHCs. The soil was tested for metals, benzene, toluene, ethylbenzene, and xylenes (BTEX), and PHC fractions F1 through F4.

In 2014 and 2015, monitoring and sampling programs were conducted at the Apron LTU and excavation area by Dillon Consulting Limited (Dillon) to fulfill NWB Licence requirements. The programs included overseeing the discharge of water from the Apron LTU sump to an area of ground approximately 100 m to the west of the LTU after chemical analysis demonstrated that the sump water met licence discharge criteria. Dillion's activities in 2015 also included the supervision of a soil amendment program at the Apron LTU. The soil amendment program consisted of the addition of fertilizer to stimulates microbial growth in the LTU's soil and of soil aeration achieved through the tilling of the LTU's soil with a harrow.

In 2016, Arcadis supervised remedial activities and conducted an environmental monitoring program at the Apron LTU and Excavation Area. The remedial activities included recirculating water from around the Apron LTU's sump onto the soil in the LTU for water management purposes and to aide with PHC degradation. As part of the environmental monitoring program, soil and sump water samples were collected from the Apron LTU and analyzed for poly-and-perfluoroalkyl substances (PFASs). PFASs are a group of emerging contaminants and are found in fire treatment foams (HC, 2016). Detectable levels of PFASs were found in both the soil and sump water samples; however, no exceedances of existing federal guidelines were detected. The PFAS contamination in the Apron LTU soil and sump water is suspected to be caused by PFAS contaminated material associated with the drums and cylinders that were placed in the Apron LTU. As a result of the confirmed presence of PFAS contamination in the Apron LTU, TC has taken the position to suspend future active treatment of the soil in the Apron LTU until a national strategy has been determined.

3 ENVIRONMENTAL QUALITY GUIDELINES

Analytical results for the soil samples collected were evaluated against the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines, specifically the Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CSQGs) and the Canada-Wide Standards for Petroleum Hydrocarbons in Soil (CWS-PHC) for commercial/industrial land use and fine grain size. Soils were also compared against the Nunavut Water Board Licence No. 1BR-FTA1217, Part J, Remediation Requirements.

As per the NWB Licence, groundwater analytical results, as well as analytical results for surface water samples collected from the two LTU sumps, were evaluated against the Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (freshwater and marine), hereafter referred to as CCME FWAL. Canadian water quality guidelines are intended to protect freshwater and marine life from anthropogenic stressors such as chemical inputs or changes to physical conditions. Surface water samples collected from the sumps were also evaluated against the NWB Licence, Part D, Effluent Quality Limits.

The following summarizes the site conditions in support of the guidelines selected:

- Grain size analysis of soils samples collected by Dillon in 2014 and 2015 indicate that the soil at the site is fine grained (based on the predominant soil texture);
- The FTA LTU and excavation area are on airport land that has been classified as commercial;
- Groundwater is not used as a source of potable water on-site or in the area. The Hamlet of Cambridge Bay obtains potable water from a surface water body located over four kilometres northeast of the site;
- Freshwater waterbodies are located north and northwest of the FTA LTU and excavation area (within 300 m). The marine waterbody of Cambridge Bay is located to the south of both the Apron LTU and excavation area (within 200 and 100 m respectively); and,
- Groundwater elevations measured in monitoring wells within around the FTA LTU suggest groundwater flows south towards the Cambridge Bay waterbody.

Perfluorooctane sulfonate (PFOS) and other PFASs are anthropogenic chemicals that have been introduced to the environment through their broad application including manufacturing products and consumer products. Based on risk assessment activities under the Canadian Environmental Protection Act, 1999, it was concluded that PFOS and its associated salts and precursors may be entering the environment in concentrations that may have an immediate or long-term harmful effect on the environment or biological diversity. Historically, PFOS and other PFASs were used in aqueous film forming foams which were typically used during fire fighting training activities.

There are currently no Canadian environmental quality guidelines for PFAS. The United States Environmental Protection Agency has developed health advisories for Perfloro-n-Octanoic Acid (PFOA) and PFOS, but these are not legally enforced standards and are subject to change as new information becomes available. In the absence of definitive guidelines, Health Canada (HC) and Environment Canada (EC) have taken steps to develop PFAS screening values, until such time that environmental quality guidelines are developed.

HC has derived drinking water screening values (DWSVs) for PFAS, as well as soil screening values (SSV) for PFOS and PFOA. Screening values are developed at the request of a federal department in the event of a spill, leak or other unforeseen event and are based on readily-available scientific studies. They have not been subjected to as thorough a review as actual guideline values. They are designed for the protection of human health through direct exposure through drinking water. It should be noted these drinking water screening values have not considered other exposure pathways such as the protection from consumption of fish or irrigation of food crops.

In 2013, EC developed draft ecological receptor Federal Environmental Quality Guidelines (FEQGs) for PFOS. They were revised in 2015 but have not been finalized. These FEQGs are summarized in Table 3-1. The values are based on laboratory toxicity studies. If concentrations are detected above these values in the environment, EC presumes that adverse effects may occur.

Table 3-1: Draft FEQG for PFOS in the Environment in Canada from ECCC (2013)

Water (µg/L)	Fish Tissue (ng/g wet weight)	Wildlife Diet (ng/g wet weight food)		Bird Egg (ng/g wet weight)
		Mammalian	Avian	
6	8,300	4.6	8.2	1,900

For the purposes of the PFAS assessments at LTUs on TC properties, the more applicable of either the Health Canada screening values or the FEQGs should be used for the human health evaluation (e.g. based on land use scenarios and lowest applicable screening values). In October 2015, the National Guidelines and Standards Office, Environment Canada, issued Version 1.3 of the Director General-approved Federal Soil Quality Guidelines (FSQGs) for PFOS available to the Federal Contaminated Sites Action Plan (FCSAP).

Analytical results for surface water samples collected by Arcadis in 2016 and 2017 were compared to the HC drinking water screening values and the draft FEQGs for PFOS.

4 PROGRAM METHODOLOGY

The following sections outline the scope of work and methodology implemented during 2017 Environmental Monitoring Program. The field activities were completed between July 24 and August 10, 2017.

4.1 Site Specific Health and Safety Plan

Arcadis prepared a site-specific health and safety plan (HASP) prior to the field activities. The HASP included the documentation of all foreseeable work hazards and mitigative actions. It also contained a listing of emergency contact numbers and provided protocols to follow in the event of an incident. Arcadis ensured that the HASP was communicated to all site personnel ensuring that they were aware of all contaminants of concern, associated precautions, and required personal protective equipment.

A health and safety kick-off meeting and daily tailgate meetings, including task specific job safety analyses, were conducted to inform on-site personnel of the potential risks and appropriate safety controls. The HASP has been retained on file by Arcadis.

4.2 Nunavut Water Board Licence Requirements

In accordance with the NWB Licence (1BR-FTA1217), the sampling plan developed by Arcadis and implemented during the 2017 site visit was reviewed by Maxxam Analytics Inc. (Maxxam). Maxxam is certified by the Canadian Association for Laboratory Accreditation Inc. (CALA). **Appendix A** contains the letter from Maxxam in response to their review of Arcadis's 2017 sampling plan.

4.2.1 Sump Water Sampling

Arcadis collected a grab sample (APRONSUMP) from the surface water around the Apron LTU sump on July 25, 2017. In accordance with the NWB Licence, Part D, Number 4, the sample was submitted for the following analyses: pH, oil and grease, dissolved lead, total zinc, dissolved lead, and benzene, toluene, ethylbenzene and xylene (BTEX), and petroleum hydrocarbon fraction F1 (PHC F1).

All sump water sample containers were placed in a cooler with ice immediately after they were collected and then stored in a refrigerator prior to their shipment. Sump water samples were shipped in coolers with ice packs to the Maxxam depot in Yellowknife, NT, on July 26, 2017. Analysis of the samples was completed by the Maxxam laboratory in Edmonton, AB. Copies of the Certificate of Analysis laboratory reports are attached in **Appendix B**.

4.2.2 Soil Sampling

Arcadis conducted Apron LTU soil sampling in accordance with the NWB Licence requirements. All soil samples were analyzed for BTEX and PHC Fractions F1 to F4. A total of six soil samples (APRON1701 to APRON1706) and one duplicate sample (APRONDUP01) were collected on August 5, 2017. Soil samples were collected after the 2017 tilling activities. Refer to the 2017 Remedial Activities Program report (Arcadis, 2017) for more details regarding the 2017 tilling activities.

Sample locations were chosen by dividing the Apron LTU into six sections of approximately equal areal extent (approximately 45 metre by 25 metre areas), as shown in **Figure 4**. Samples were collected in each area at a depth of approximately 0.35 metres below ground surface (m bgs).

All sampling equipment was decontaminated between each sample location with Alconox and distilled water. A new pair of nitrile gloves were worn prior to the collection of each sample. LTU field conditions and soil descriptions, including approximate grain size, colour, moisture content, and nature and extent of apparent contamination, were documented for each soil sampling location. The GPS coordinates of each soil sample were also collected using a Garmin eTrex 10, with an accuracy of 3 metres.

All soil sample containers were placed in a cooler with ice immediately after they were collected and then stored in a refrigerator prior to shipment. The samples were shipped in coolers with ice packs to the Maxxam depot in Yellowknife, NWT on August 8, 2017. Analysis of the soil samples was completed by the Maxxam laboratory in Edmonton, AB. Copies of the Certificate of Analysis laboratory reports are attached in **Appendix B**.

4.2.3 Groundwater Monitoring and Sampling at the Apron LTU and Excavation Area

Arcadis conducted groundwater monitoring and sampling during the 2017 field program at the Apron LTU and the Apron excavation area. Nine groundwater monitoring wells are located at the site: five wells (MW13-1 to MW13-5) located around the Apron LTU and four wells around the Apron Excavation Area (MW13-6 to MW13-9). Monitoring well locations for the Apron LTU and Excavation Area are shown on **Figure 2** and **Figure 3,** respectively.

Arcadis collected groundwater samples from all wells with a sufficient volume of water present. One blind duplicate sample was also collected. Before sample collection, a minimum of three well volumes were purged. Purge water was disposed of into the Apron LTU. Groundwater could only be collected from four of the nine monitoring wells (MW13-1, MW13-7, MW13-8 and MW13-9). The groundwater in monitoring wells MW13-2, MW13-3, MW13-4 and MW13-5 was frozen. Monitoring well MW13-6 could not be located by Arcadis as it was installed on the north side of the Apron Excavation area in an active portion of the airport's gravel apron and is suspected of being buried under the compacted granular material. Monitoring results are presented in **Table 1**.

Sampling and purging was conducted using low-flow sampling techniques via a peristaltic pump and dedicated tubing. Volatile organic compound levels inside each monitoring well were measured with a MiniRae 3000 immediately after removing the well cap. Physical chemistry parameters including pH, oxidation-reduction potential, conductivity, turbidity, dissolved oxygen, total dissolved solids and temperature were monitored using a calibrated Horiba U-52. Water level drawdown was monitored using a Heron oil/water interface probe. Where the recharge was not sufficient to conduct low flow sampling techniques, the well was purged dry three times before sampling. All sampling equipment was decontaminated between sample locations with Alconox and distilled water. A new pair of nitrile gloves were worn for each sample.

In accordance with the NWB Licence requirements, Part J, Number 7, the groundwater samples were submitted for BTEX, PHC F1-F4, polycyclic aromatic hydrocarbons (PAHs), total alkalinity, nitrate-nitrite,

ammonia nitrogen, oil and grease, total phenols, calcium, magnesium, sodium, potassium, chloride, sulphate, dissolved metals, total suspended solids and total dissolved solids analysis. Copies of the Certificate of Analysis laboratory reports are attached in **Appendix B.**

All groundwater sample bottles were placed in a cooler with ice packs immediately after they were collected. The groundwater samples were then stored in a refrigerator prior to their shipment. Groundwater samples were shipped in coolers with ice packs to the Maxxam depot in Yellowknife, NWT. Analysis of the groundwater samples was completed at the Maxxam laboratory in Edmonton, AB. The GPS coordinates of the location of each monitoring well were collected using a Garmin eTrex 10 (accurate to 3 metres).

4.3 Soil Amendment Sampling

Arcadis collected four soil samples (APRON1701, APRON1703, APRON1704 and APRON1706) on August 5, 2017 as part of soil amendment sampling program for the Apron LTU. These four soil samples, plus one duplicate sample (APRONDUP01), were submitted for total iron, total potassium, available phosphorus and total nitrogen analysis. These analytical parameters were required to gauge the requirement of subsequent soil amendment applications. Samples were collected following the procedure outlined Section 4.2.2.

4.4 Per- and Polyfluoroalkyl Substance (PFAS) Sampling

Arcadis collected one grab sample from the water within the Apron LTU sump (APRONSUMP) on July 25, 2017 for PFAS analysis.

The sampling procedure adhered to TC's February 2016 PFAS Field Sampling Guidance Document. Arcadis applied the following procedure to reduce the potential PFAS contamination during sampling:

- A pencil was used to label sample containers;
- Each sample container was transported in an individual-sealable plastic bag;
- All samples were kept in their own cooler separate from other sample containers;
- Field notes were taken on non-waterproof paper on an aluminum clip board with a pencil;
- A new pair of nitrile gloves were worn prior to obtaining each sample;
- 100% cotton clothes were worn during sampling (the items were put through a wash cycle without detergent, air dried, and stored in a cotton pillow case);
- A pillow case was used on the driver's seat of the truck used to transport samples; and,
- Steel-toed boots were worn but contact with any soil to be collected for PFAS sampling was prevented.

The PFAS analysis was completed by the Maxxam laboratory in Mississauga, ON.

5 QUALITY ASSURANCE AND QUALITY CONTROL

To assess the reliability of the laboratory analytical data, one duplicate sample was taken for approximately every ten samples collected. Arcadis generated the duplicate soil samples by alternately placing approximately 10% of the sample volume into the primary sample container and then placing the same amount into the duplicate container. Arcadis continued placing aliquots of approximately 10% of the container volume into each container until both containers were filled. Parent and duplicate samples collected for BTEX/F1 analysis were collected side by side by inserting a plunger into an undisturbed area of the soil column and placing the soil from the plunger in their respective methanol vials. A trip blank and field blank were collected during the groundwater sampling program. Duplicate groundwater samples were collected by filling the duplicate sample bottles immediately after the primary sample was collected.

Analytical data quality was assessed by submission of the following soil and groundwater samples:

- Soil sample APRON1704 (primary) and APRONDUP01 (duplicate) were analyzed for BTEX and PHC fractions F1-F4;
- Groundwater sample MW13-7 (primary) and APRONDUP01 (duplicate) were analyzed for PHC fractions F1-F4, BTEX, PAHs, total alkalinity, nitrate-nitrite, ammonia nitrogen, oil and grease, total phenols, calcium, magnesium, sodium, potassium, chloride, sulphate, dissolved metals, total suspended solids and total dissolved solids analysis; and,
- The groundwater Trip Blank and Field Blank were analyzed for BTEX and PHC fractions F1-F4.

For each set of duplicates, the relative percent difference (RPD) was calculated using the following formula:

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

where, X_1 and X_2 are the duplicate concentrations and $X_{average}$ is the mean of these two values. Results for duplicate analyses of field duplicate samples were considered acceptable where RPD values were <50% for soil duplicate analyses and <50% for water duplicate analyses, consistent with common industry practices.

RPDs can be calculated only when the compound is detected in both the original and the duplicate sample at a concentration above the method detection limit. Alternative criteria are used to evaluate duplicate pairs where one or both of the results is less than five times the detection or quantitation limit, or where one or both of the results is less than the detection or quantitation limit (i.e., nd or ‘not-detected’).

6 ENVIRONMENTAL MONITORING PROGRAM RESULTS

The following sections summarizes the analytical results for all samples collected during the 2017 Environmental Monitoring Program.

6.1 Nunavut Water Board Licence Requirements Sampling Results

6.1.1 Sump Water Analytical Results

Arcadis collected a grab sample (APRONSUMP) from the standing water around the Apron LTU sump in 2017. Sump water sample APRONSUMP met all applicable NWB Licence requirements and CCME FWALs for oil and grease, dissolved lead, total zinc, BTEX and PHC F1. Notably, concentrations of oil and grease, total zinc, BTEX and PHC F1 in sump water sample APRONSUMP were below the laboratory's reportable detection limits (RDLs) and the concentration of Dissolved Lead was only 2 times above the RDL (and 2 times below the CCME FWAL).

The Sump Water analytical results are presented in **Table 6**. Laboratory certificate of analysis including lab QA/QC results are included in **Appendix B**.

6.1.2 Soil Analytical Results

A total of seven soil samples (including one duplicate sample) were collected from the Apron LTU and submitted for the laboratory analysis of BTEX and PHCs. The soil samples were identified as: APRON1701, APRON1702, APRON1703, APRON1704, APRON1705, APRON1706 and APRONDUP01. Soil samples results were compared to both CCME FWAL guidelines and NWB License remediation requirements.

BTEX and PHC F1 concentrations in all soil samples were below the laboratory RDLs with the exception of soil sample APRON1704 and its duplicate (APRONDUP01). Soil sample APRON1704 and its duplicate had concentrations of benzene and ethylbenzene above the applicable CCME guidelines. Exceedances of benzene and ethylbenzene in sample APRON1704 were 1.3 and 17.1 times above the applicable CCME guidelines, respectively. In addition, concentrations of PHC F1 in sample APRON1704 and its duplicate exceeded both the applicable NWB License requirements and CCME guidelines. The PHC F1 exceedance factor for sample APRON1704 was around 2.6 times for both criteria.

Concentrations of PHC F2 were well below applicable CCME guideline and NWB License requirements for all soil samples except soil sample APRON1704 and its duplicate. PHC F2 concentrations in sample APRON1704 and its duplicate were close to 2 times in exceedance factor for both criteria.

Exceedances of PHC F3 were reported in one of the seven soil samples. Soil sample APRON1705 had a concentration of PHC F3 1.1 times the applicable CCME guideline and NWB License requirements. Soil sample APRON1702 and APRON1703 had a concentration of PHC F3 close to exceeding both criteria. Remaining soil samples APRON1701, APRON1704 and APRON1706 had PHC F3 concentrations at least 3 times below both the applicable CCME guideline and NWB License requirements.

Concentrations of PHC F4 in all seven soil samples were below applicable CCME guideline and NWB License requirements. Soil samples APRON1701 and APRON1704 had PHC F4 concentrations below the laboratory RDL. The remaining soil samples had PHC F4 concentrations at least 1.2 times below both applicable criteria.

The soil analytical results for PHCs are presented in **Table 8**. Soil exceedances are shown on **Figure 4**. Laboratory certificate of analysis including lab QA/QC results are included in **Appendix B**.

6.1.3 Groundwater Analytical Results

Groundwater samples were collected from four monitoring wells (MW13-1, MW13-7, MW13-8 and MW13-9), one located adjacent to the Apron LTU (MW13-1) and three located in the excavation area (W13-7, MW13-8 and MW13-9). The analytical results for the groundwater samples were compared to the CCME FWAL guidelines.

The concentration of BTEX, PHCs and PAHs in all 2017 groundwater samples were below applicable CCME FWAL guidelines and laboratory RDLs. However, concentrations of select dissolved metal parameters, dissolved chloride and phenols above the CCME FWAL guidelines were reported for some of the analyzed groundwater samples.

The following exceedances were detected in monitoring well MW13-1 located immediately adjacent to the west side of the Apron LTU in 2017:

- Dissolved iron concentration was 19 times greater than the CCME guideline of 0.3 mg/L;
- Dissolved chloride concentration was 4 times greater than the CCME guideline of 120 mg/L; and
- Phenols concentration was 3 times greater than the CCME guideline of 0.004 mg/L.

The following exceedances were detected in the monitoring wells located around the Apron excavation area in 2017:

- Dissolved uranium concentrations reported in groundwater samples MW13-7, MW13-8 and MW13-9 range between 1.1 and 3 times the applicable CCME guideline of 0.015 mg/L;
- Dissolved iron concentrations in groundwater samples MW13-7 and MW13-9 range between 4 and 25 times the CCME guideline of 0.3 mg/L;
- Dissolved copper concentration in groundwater sample MW13-7 was 2.5 times the applicable CCME guideline of 0.004 mg/L;
- Dissolved zinc concentration in groundwater sample MW13-7 was 1.1 times the CCME guidelines of 0.03 mg/L;
- Dissolved chloride concentrations in groundwater samples MW13-7 and MW13-9 range between 9 and 68 times the CCME guideline of 120 mg/L; and,
- Phenols concentrations in groundwater samples MW13-1, MW13-7 and MW13-8 range between 2 and 9 times the CCME guideline of 0.004 mg/L.

The groundwater analytical results are presented in **Tables 2 to 5.** Groundwater **e**xceedances for the Apron LTU and excavation area are shown on **Figure 4** and **Figure 5** respectively. Laboratory certificate of analysis including lab QA/QC results are included in **Appendix B**.

6.2 Per- and Polyfluoroalkyl Substance (PFAS) Sampling Results

One grab sample (APRONSUMP) was collected from the water around the Apron LTU sump during the 2017 field program and submitted for the laboratory analysis of PFASs. The analytical results for APRONSUMP were compared to applicable HS DWSV and FEQGs. The following three PFAS exceedances were detected:

- Perfluoroheptanoic Acid (PFHpA) concentration in sump sample APRONSUMP was 1.2 the HS DWSV of 0.2 µg/L;
- Perfluorohexanoic Acid (PFHxA) concentration in sump sample APRONSUMP was 1.7 times the of HS DWSV of 0.2 µg/L; and
- Perfluoropentanoic Acid (PFPeA) concentration in sump sample APRONSUMP were 2.5 times the of HS DWSV of 0.2 µg/L;

No exceedances of FEQGs were reported.

The Sump Water PFAS analytical results are presented in **Table 7**. PFAS exceedances are shown on **Figure 3**. Laboratory certificate of analysis including lab QA/QC results are included in **Appendix B**.

7 QUALITY ASSURANCE AND QUALITY CONTROL

Arcadis quantitatively assessed the analytical quality of the data through calculating the relative percent difference (RPD) between each sample and its duplicate. A summary of the analytical results for the original and duplicate samples, along with the calculated RPDs, are included in the analytical results.

7.1 Soil and Groundwater Duplicates

The calculated RPDs for soil and groundwater duplicates sample APRON1704 (primary) and APRONDUP01 (duplicate) were at a maximum of 26% which meets the 50% alert level. In addition, internal laboratory quality control for analyses meets acceptability criteria; therefore, based on both laboratory and field QA/QC results, Arcadis deems the data as reliable for its intended use. Laboratory QA/QC results are included in the laboratory certificates of analyses provided in **Appendix B**.

7.2 Groundwater Duplicates

The calculated RPDs for groundwater sample MW13-7 (primary) and APRONDUP01 (duplicate) were all below 34% and deemed acceptable by Arcadis. In addition, internal laboratory quality control for analyses meets acceptability criteria; therefore, based on both laboratory and field QA/QC results, Arcadis deems the data as reliable for its intended use. Laboratory QA/QC results are included in the laboratory certificates of analyses provided in **Appendix B**.

7.3 Trip blank and Field blank

Both the trip blank and a field blank reported non-detect concentrations for BTEX and PHC F1. These results suggest no cross-contamination occurred between samples during their transportation. Furthermore, the field blank results suggest ambient conditions at the site have not impacted sample results. The trip blank and field blank analytical results are presented in **Table 2.**

8 DISCUSSION AND RECOMMENDATIONS

8.1 Monitoring Well Condition

Arcadis made repairs to monitoring wells MW13-7 and MW13-9 during the 2017 Environmental Monitoring Program. Monitoring well MW13-7 is located on the east side of the Apron excavation area along the edge of an access road associated with the Cambridge Bay airport. This access road is maintained year-round and routinely used by heavy equipment. The flush mount casing for monitoring well MW13-7 was reset to allow for the removal of the well cap (refer to Photos 1 and 2 in **Appendix C**). Monitoring well MW13-9 is situated south of the Apron excavation area in a low-lying area prone to drainage issues. Arcadis extended the well riser on monitoring well MW13-9 by 0.55 m to prevent the top of monitoring well MW13-9 from being routinely submerged (refer to Photos 3 in **Appendix C**).

Arcadis assessed the condition of the casing, riser and well cap on all monitoring wells around the Apron LTU and excavation area. Table 8-1 provides a summary of well conditions observed in 2017.

Table 8-1. FTA LTU and Excavation Area Monitoring Well Condition

Well ID	Well Condition	Comment
MW13-1	No repairs required	No lock on well casing
MW13-2	No repairs required	No lock on well casing. Well riser is loose.
MW13-3	No repairs required	No lock on well casing
MW13-4	No repairs required	No lock on well casing
MW13-5	No repairs required	No lock on well casing
MW13-6	Unknown	Well could not be located
MW13-7	No repairs required	Well requires a new J-plug style well cap
MW13-8	Well riser is cracked, refer to Photo 4 in **Appendix C**.	Well requires a new 2-inch diameter PVC coupling and riser extension.
MW13-9	No repairs required	Well has no monument casing or lock (refer to Photo 3 in **Appendix C**)

Arcadis recommends that the riser on monitoring well MW13-8 be repaired and that a new J-plug style well cap be installed on monitoring well MW13-7 during the site's next scheduled monitoring program.

8.2 Groundwater Conditions

The groundwater in four of the five wells surrounding the Apron LTU was frozen during the 2017 field program. As such, the shallow horizontal groundwater flow direction under the Apron LTU could not be accurately calculated. Historically, the interpreted shallow horizontal groundwater flow beneath the Apron LTU was to the southwest. Groundwater monitoring results for the monitoring wells associated with the Apron LTU are shown in **Figure 2**.

Groundwater elevations measured in the monitoring wells surrounding the Apron excavation area ranged between 16.54 to 18.75 metres above mean sea level (m amsl). The interpreted shallow horizontal groundwater flow direction is towards the southeast at the Apron excavation area. Groundwater monitoring results for the Apron excavation area are shown in **Figure 3**.

No measurable thickness of light non-aqueous phase liquid (LNAPL) was identified in any of the monitoring wells and no sheens were observed on purged groundwater or groundwater samples after collection.

8.3 Hydrocarbon Degradation Assessment

Average hydrocarbon concentrations detected in the upper 0.35 m of soil in the Apron LTU in 2017 were comparable to 2016 PHC averages. Since 2015, the average concentration of PHC F1 and F2 in the Apron LTU's soil has dropped by more than 50%. Average PHC F2 and F3 concentrations have remained relatively constant between 2015 and 2017. Table 8-2 shows the average concentrations of PHC fraction F1 to F4 in the Apron LTU soil between 2015 and 2017.

Table 8-2: Average Soil Hydrocarbon Concentrations for the Apron LTU

Petroleum Hydrocarbons	NWB License Requirements - Commercial (mg/kg)	2015 Average Concentration (mg/kg)	2016 Average Concentration (mg/kg)	2017 Average Concentration (mg/kg)
F1 (C6 to C10)	300	1,062	33	245
F1 (C6 to C10 minus BTEX)	300	1,062	33	242
F2 (C10 to C16)	300	1,223	109	161
F3 (C16 to C34)	1,700	860	866	773
F4 (C34 to C50)	1,700	389	528	512

Notes:
(1) One half the detection limit was used for calculations when results were below RDLs.
(2) The PHC averages for 2016 are based on analytical results from soil samples collected pre-and-post Apron LTU tilling activities.
(3) PHC averages represent soil concentration in the Apron LTU between 0.0 and 0.35 m bgs (PHC concentrations below 0.35 m bgs have not been assessed)

The PHC F1 averages in 2017 are elevated above 2016 PHC F1 averages due to the analytical results from soil sample APRON1704. Soil sample APRON1704 was collected from a pocket of soil showing signs of hydrocarbon impacts (refer to Photo 5 and 6 in **Appendix C**). This pocket of hydrocarbon impacted soil was identified approximately 0.6 m bgs during the soil excavation activities (conducted for

water management purposes) around the Apron Sump. For more details regarding the 2017 soil excavation activities in the Apron LTU refer to the 2017 Remedial Activities Program report (Arcadis, 2017). Arcadis observed multiple pockets of soil with hydrocarbon staining within the excavation area around the Apron LTU's sump. The location and extent of the excavation area is shown in **Figure 2**.

The moisture content detected in the upper 0.35 m of soil in the Apron LTU in 2017 ranged between 9.4% and 12%. These levels are below the lower limit of moisture content of 20% typically required to support healthy microbial populations (USEPA, 1994). The optimal moisture content for PHC biodegradation ranges between 40% and 80% (GC, 2006). Arcadis recommends the continued practice of sump water recirculation to elevate soil moisture levels and help promote microbial growth in the Apron LTU's soil.

Nitrogen and phosphorus are essential for promoting the microbial activities needed for hydrocarbon degradation; however, excessive concentrations of these nutrients have been found to decrease the biodegradation rate (USEPA ,1994). Federal guidelines for landfarming petroleum contaminated hydrocarbon soil recommends the carbon- to-nitrogen-to- phosphorus ratio remain between 100:10:1 and 100:1:0.5 to encourage effective biodegradation. Table 8-3 shows average nitrogen and phosphorus concentration in the Apron LTU's soil along with the estimated effective nutrient ranges.

Table 8-3: Average Nutrient Concentrations for the Apron LTU's soil

Petroleum Hydrocarbons	Effective Nutrient Range for Apron LTU	2016 Average Concentration	2017 Average Concentration
Nitrogen (mg/kg)	160 - 16	860	780
Phosphorus (mg/kg)	16 - 6	7.5	7.2

Note:
(1) Carbon content used to derive the effective nutrient ranges for the Apron LTU was based on the average total petroleum concentration in the Apron LTU in 2017.
(2) The effective nutrient range is based on the Federal Guidelines for Landfarming Petroleum Contaminated Hydrocarbon (GC, 2006) and does not consider site-specific climatic conditions.

The average nitrogen concentration in the upper 0.35 m of soil in the Apron LTU is above the estimated effective nitrogen range. Conversely, the average phosphorous concentration is close to the lower limit of the estimated effective phosphorous range. Arcadis recommends no additional nutrients be added to the Apron LTU until average phosphorous concentrations drop below the lower limit of the estimated effective phosphorous range. Nutrient concentration should continue to be monitored during future monitoring programs.

Due to the heterogenous nature of the hydrocarbon impacts in the Apron LTU, Arcadis recommends the number of soil samples submitted for laboratory analysis from the upper 0.35 m bgs of the soil in the Apron LTU be increased to 15 samples to better assess the effectiveness of hydrocarbon degradation. In addition, Arcadis recommends 15 additional soil samples from the soil located below 0.35 m bgs be submitted for laboratory analysis. Select soil samples should be analyzed for nutrients, moisture, pH, bulk density, BTEX, and PHC Fractions F1 to F4.

8.4 Groundwater Contaminant Assessment

The 2017 groundwater analytical results are comparable to the 2014, 2015 and 2016 analytical results. The same groundwater parameters (i.e., dissolved copper, dissolved iron, dissolved uranium, dissolved zinc, dissolved chloride and phenols) have consistently been reported above the CCME FWAL guidelines since 2014. BTEX, PHC F1 - F4 and PAHs groundwater concentrations have consistently been reported as non-detect or well below the CWS-PHCs standards and the CCME FWAL guidelines.

No increasing or decreasing trends in the groundwater parameters analyzed can be established. The magnitude of the reported dissolved metal and phenol exceedances have remained relatively consistent between 2014 and 2017. The dissolved metals are likely a result of naturally elevated background concentrations while phenol exceedances in groundwater at the site are likely a result of anthropogenic concentrations. The 2017 dissolved chloride exceedances in monitoring wells MW13-7 and MW13-9 range between 9 and 68 times the applicable CCME guideline. These are the highest dissolved chloride exceedance factors reported for the four wells located around the Apron excavation area since 2014. The dissolved chloride exceedances may be due to road salt application practices used by the Cambridge Bay Airport.

Overall, 2017 analytical results do not suggest that the integrity of the Apron LTU's liner and berms has been compromised. No increasing or decreasing trends in the groundwater parameters analyzed can be established.

8.5 Sump Water Assessment

Analytical results for surface water sample APRONSUMP confirmed that the surface water around the Apron LTU's sump met the NWB Licence requirements for pH, oil and grease, dissolved lead, total zinc and BTEX. PFAS analytical results for surface water sample APRONSUMP indicated concentrations of PFHxA, PFHpA and PFPeA above the HC DWSV; however, the concentration of PFOS detected in surface water sample APRONSUMP was below the FEQC for aquatic receptors. Arcadis recommends that sump water not be discharged to the ground surface outside the Apron LTU until the risk associated with the PFAS impacts are assessed.

8.6 Recommendations

Arcadis recommends the following future work at the Apron LTU and Apron Excavation Area:

1. To continue to be in compliance with the NWB License requirements and identified chemicals of concern, a groundwater monitoring program must be completed at the Apron LTU and Excavation Area to assess the parameters set out in the license. Attempts should be made to sample the monitoring wells during freshet conditions and during warmest weeks at Cambridge Bay, when liquid groundwater conditions are more probable and when groundwater levels are presumed to be at their highest to further evaluate groundwater trends. Based on temperature statistics obtained from ECCC, this sampling time period would occur in mid-July.

2. Due to the heterogenous nature of the PHC impacts in the Apron LTU soil, Arcadis recommends that the number of soil samples submitted for laboratory analysis from the upper 0.35 m bgs of the soil in the Apron LTU be increased to 15 samples to better assess the effectiveness of PHC degradation. In addition, Arcadis recommends 15 additional soil samples be submitted for laboratory analysis from the soil located below 0.35 m bgs. Select soil samples should be analyzed for moisture, pH, bulk density, BTEX, and PHC Fractions F1 to F4.

3. Arcadis recommends that the riser on monitoring well MW13-8 be repaired. We recommend that a new J-plug style well cap be installed on monitoring well MW13-7 during the site's next scheduled monitoring program.

9 LIMITATIONS

This report has been prepared and the work referred to in this report has been undertaken by Arcadis Canada Inc. (Arcadis) for Public Services and Procurement Canada [(PSPC) formerly Public Works and Government Services Canada (PWGSC)] and Transport Canada (TC). It is intended for the sole and exclusive use of PSPC/TC. Any use, reliance on or decision made by any other person other than PSPC/TC based on this report is the sole responsibility of such other person. PSPC, TC and Arcadis make no representation or warranty to any other person with regard to this report and the work referred to in this report and they accept no duty of care to any other person or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred by any other person as a result of the use of, reliance on, any decision made or any action taken based on this report or the work referred to in this report.

This report has been prepared in accordance with generally accepted engineering and environmental practices for the exclusive use of PSPC/TC. This report is based on the historical information provided and information obtained during this work program.

Third party information reviewed and used to compile the data and conclusions contained in this report is assumed to be complete and correct. Arcadis used this information in good faith and will not accept any responsibility for deficiencies, misinterpretation or incompleteness of the information contained in documents prepared by third parties.

The investigation undertaken by Arcadis with respect to this report and any conclusions or recommendations made in this report reflect Arcadis' judgment based on the site conditions observed at the time of the site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. This report has been prepared for specific application to the site and it is based, in part, upon visual observation of the site, subsurface investigation at discrete locations and depths, and specific analysis of specific chemical parameters and materials during a specific time interval, all as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, portions of the site which were unavailable for direct investigation, subsurface locations which were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Substances other than those addressed by the investigation described in this report may exist within the site, substances addressed by the investigation may exist in areas of the site not investigated and concentrations of substances addressed which are different than those reported may exist in areas other than the locations from which samples were taken. Notwithstanding these limitations, this report is believed to provide a reasonable representation of activities completed and site conditions as of July and August 2017.

If site conditions or applicable standards change or if any additional information becomes available at a future date, modifications to the findings, conclusions and recommendations in this report may be necessary.

Other than by PSPC/TC, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of Arcadis. Nothing in this report is intended to constitute or provide a legal opinion.

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TABLES

Table 1
Groundwater Monitoring Results

Monitoring Well	GPS Coordinates NAD83 (1)	Well Top Elevation (m amsl)	Water Level (m btc)			Bottom of Well (m btc)			Groudwater Elevation (m amsl)	Well Observations / Condition	OVM (3) (ppm)	Temperature (deg. Celsius)			pH			Redox Potential (mV)			Elec. Conductivity (µS/cm)			Turbidity (NTU)		Dissolved Oxygen (mg/L)			TDS (g/L)	
Monitoring Company		Dillon (2014)	Arcadis (2017)	Arcadis (2016)	Dillon (2015)	Arcadis (2017)	Arcadis (2016)	Dillon (2015)	Arcadis (2017)	Arcadis (2017)	Arcadis (2017)	Arcadis (2017)	Arcadis (2016)	Dillon (2015)	Arcadis (2017)	Arcadis (2016)	Dillon (2015)	Arcadis (2017)	Arcadis (2016)	Dillon (2015)	Arcadis (2017)	Arcadis (2016)	Dillon (2015)	Arcadis (2017)	Dillon (2015)	Arcadis (2017)	Arcadis (2016)	Dillon (2015)	Arcadis (2017)	Dillon (2015)
Apron Excavation Area Monitoring Wells																														
MW13-1	N 69.11184 W 105.16721	26.52	1.995	1.909	0.75	2.214	2.155	2.09	24.53	No Issues	ND	9.05	-	9.85	7.52	-	8.02	-42	-	68	4,500	-	2,880	12.8	2.9	0.08	-	1.64	2.83	1.84
MW13-2	N 69.11172 W 105.16409	28.61	Frozen	Frozen	1.011	2.018 (5)	2.002 (5)	2.07	-	Well riser is loose; however, no immediate repair is required	ND	-	-	5.91	-	-	7.85	-	-	255	-	-	4,394	-	1000	-	-	15.83	-	3.14
MW13-3	N 69.11142 W 105.16344	28.19	Frozen	1.916	0.831	2.115 (5)	2.123	2.43	-	No Issues	1.7	-	-	7.12	-	-	7.87	-	-	27	-	-	1,060	-	10.1	-	-	12.8	-	6.52
MW13-4	N 69.11118 W 105.16556	27.22	Frozen	Frozen	0.585	3.312 (5)	2.257 (5)	3.03	-	No Issues	ND	-	-	6.36	-	-	8.21	-	-	227	-	-	2,350	-	18.3	-	-	8.61	-	1.5
MW13-5	N 69.11012 W 105.16586	12.11	Frozen	2.145	1.103	2.279 (5)	2.204	2.222	-	No Issues	ND	-	4.15	9.27	-	7.18	8.51	-	58.9	253	-	3,115	900	-	8.5	-	9.33	13.87	-	0.59
Apron LTU Monitoring Wells																														
MW13-6	N 69.10622 W 105.11968	20.17	-	-	-	-	-	-	n/a	Unable to locate well	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-7	N 69.10608 W 105.11943	18.08	0.649	0.408	0	1.345	1.272	1.25	17.43	No Issues	ND	4.39	6.7	7.85	7.73	7.05	8.3	22	68.3	150	6,100	2,392	2,890	29	81.5	0.69	0.94	3.78	3.47	1.85
MW13-8	N 69.10599 W 105.12091	19.88	1.126	0.975	0.75	1.295	1.273	1.16	18.75	Top of well riser is cracked.	ND	7.49	3.6	5.72	7.07	7.06	8.22	109	26.1	231	1,870	1,872	450	12	395	1.69	0.94	8.67	1.24	0.29
MW13-9	N 69.10570 W 105.12053	17.41	0.867	Submerged	Submerged	1.762	-	-	16.54	Flush mount casing was removed and well riser was extended by 0.55 m in 2017.	ND	10.01	-	10.5	7.27	-	7.87	-21	-	28	27,000	-	10,400	13	16.3	0.08	-	15.86	16	4.1

Notes:

(1) North America Datum 1983

(3) Organic vapour measurement (OVM) was collected using a MiniRae3000 (parameter recorded: IBL)

(4) Total Dissolved Solids (TDS)

(5) Depth to Ice

ND non detect

Where low flow sampling methods where employed, field parameters were collected.

Units:

L litres

m amsl metres above mean sea level

m btc metres below top of casing

mg/L milligram per litre

mV millivolts

ppm parts per million

Table 2
Groundwater Analytical Results
Petroleum Hydrocarbons (PHCs)

Monitoring Well [2]				MW13-1				MW13-2		MW13-3			MW13-4	MW13-5			MW13-7						MW13-8							MW13-9					
Sample Date				2014-09-16	2015-07-26	2016-08-01	2017-07-30	2014-09-16	2015-07-26	2014-09-17	2015-07-26	2016-08-02	2015-07-26	2014-09-17	2015-07-26	2016-08-02	2014-09-23	2015-07-26	2016-08-03	2017-08-06	2017-08-06		2014-09-22	2015-07-26		2016-08-03	2016-08-03		2017-08-08	2015-07-26	2017-08-06	2016-08-03	2016-08-03	2017-08-09	2017-08-09
Sample ID	Units	RDL	CCME[1]	MW13-1	MW13-1	MW13-1	MW13-1	MW13-2	MW13-2	MW13-3	MW13-3	MW13-3	MW13-4	MW13-5	MW13-5	MW13-5	MW13-7	MW13-7	MW13-7	MW13-7	APRONDUP01 (Duplicate of MW13-7)	RPD (%)	MW13-8	MW13-8	RDL	MW13-8	DUP01 (Duplicate of MW13-8)	RPD (%)	MW13-8	MW13-9	MW13-9	TRIP BLANK	FIELD BLANK	TRIP BLANK	FIELD BLANK
Sampling Company				Dillon	Dillon	Arcadis	Arcadis	Dillon	Dillon	Dillon	Dillon	Arcadis	Dillon	Dillon	Dillon	Arcadis	Dillon	Dillon	Arcadis	Arcadis	Arcadis		Dillon	Dillon		Arcadis	Arcadis		Arcadis	Dillon	Arcadis	Arcadis	Arcadis	Arcadis	Arcadis
Laboratory				Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam		Maxxam	Maxxam		Maxxam	Maxxam		Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Volatiles																																			
Benzene	µg/L	0.40	370 / 110	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	1.4	<0.90	0.59	<0.40	<0.40	nc	<0.40	<0.40	0.4	<0.40	<0.40	nc	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Toluene	µg/L	0.40	2 / 115	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	nc	<0.40	<0.40	0.40	<0.40	<0.40	nc	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	µg/L	0.40	90 / 25	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	nc	<0.40	<0.40	0.40	<0.40	<0.40	nc	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
m & p-Xylene	µg/L	0.80	n/v	-	-	-	<0.80	<0.80	-	-	-	<0.80	-	-	-	<0.80	-	-	<0.80	<0.80	<0.80	nc	-	-	-	0.80	<0.80	nc	<0.80	-	<0.80	<0.80	<0.80	<0.80	<0.80
o-Xylene	µg/L	0.40	n/v	-	-	-	<0.40	<0.40	-	-	-	0.54	-	-	-	<0.40	-	-	<0.40	<0.40	<0.40	nc	-	-	-	0.40	<0.40	nc	<0.40	-	<0.40	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	µg/L	0.80	n/v	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	3.4	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	nc	<0.80	<0.80	0.80	<0.80	<0.80	nc	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
F1 (C6-C10) - BTEX	µg/L	100	n/v	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	nc	<100	<100	100	<100	<100	nc	<100	<100	<100	<100	<100	<100	<100
F1 (C6-C10)	µg/L	100	n/v	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	nc	<100	<100	100	<100	<100	nc	<100	<100	<100	<100	<100	<100	<100
Petroleum Hydrocarbons																																			
F2 (C10-C16 Hydrocarbons)	µg/L	100	n/v	<100	<100	<100	<100	120	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	nc	<270	<100	270	<100	<100	nc	<100	<100	<100	<100	<100	-	-
F3 (C16-C34 Hydrocarbons)	µg/L	200	n/v	<200	<200	<200	<100	430	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	110	110	0%	810	<200	200	<200	<200	nc	<100	<200	<100	<200	<200	-	-
F4 (C34-C50 Hydrocarbons)	µg/L	200	n/v	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	nc	<530	<200	530	<200	<200	nc	<200	<200	<200	<200	<200	-	-

Notes:

[1] CCME Water Quality Guidelines for the Protection of Aquatic Life (Freshwater/Marine)

[2] Monitoring well coordinates are located in Table 1

6.5 **Concentration exceeds the CCME guideline**

* Standard dependent on pH

** Standard dependent on hardness

n/v No standard / guideline value

\- Parameter not analyzed / not available

n/a Not applicable

RPD Relative Percent Difference

ITALICS RPD alert limit exceeded

RDL Reportable Detection Limit

nc Not calculable

Table 3
Groundwater Analytical Results
Polycyclic Aromatic Hydrocarbons (PAHs)

Monitoring Well [2]				MW13-1				MW13-2	MW13-3			MW 3-4	MW13-5			MW13-7						MW13-8					MW 13-9	
Sample Date				2014-09-16	2015-07-26	2017-07-30	2016-08-01	2015-07-26	2014-09-17	2015-07-26	2016-08-02	2015-07-26	2014-09-17	2015-07-26	2016-08-02	2014-09-23	2015-07-26	2016-08-03	2017-08-06	2017-08-06		2015-07-26	2016-08-03	2016-08-03		2017-08-08	2015-07-26	2017-08-06
Sample ID	Units	RDL	CCME[1]	MW13-1	MW13-1	MW13-1	MW13-1	MW13-2	MW13-3	MW13-3	MW13-3	MW13-4	MW13-5	MW13-5	MW13-5	MW13-7	MW13-7	MW13-7	MW13-7	APRON DUP01 (Duplicate of MW13-7)	RPD (%)	MW 13-8	MW 13-8	DUP01 (Duplicate of MW 13-8)	RPD (%)	MW 13-8	MW 13-9	MW 13-9
Sampling Company				Dillon	Dillon	Arcadis	Arcadis	Dillon	Dillon	Dillon	Arcadis	Dillon	Dillon	Dillon	Arcadis	Dillon	Dillon	Arcadis	Arcadis	Arcadis		Dillon	Arcadis	Arcadis		Arcadis	Dillon	Arcadis
Laboratory				Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam		Maxxam	Maxxam	Maxxam		Maxxam	Maxxam	Maxxam
Polycyclic Aromatics																												
Benzo[a]pyrene equivalency	µg/L	0.010	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	nc	<0.010	<0.010	<0.010	nc	<0.010	<0.010	<0.010
Acenaphthene	µg/L	0.10	5.8	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<0.10
Acenaphthylene	µg/L	0.10	n/v	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<0.10
Acridine	µg/L	0.20	4.4	<0.20	<0.20	<0.20	<0.050	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.05	<0.05	nc	<0.20	<0.20	<0.050	nc	<0.20	<0.20	<0.05
Anthracene	µg/L	0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	nc	<0.010	<0.010	<0.010	nc	<0.010	<0.010	<0.010
Benzo(a)anthracene	µg/L	0.0085	0.018	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085
Benzo(b&j)fluoranthene	µg/L	0.0085	n/v	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085
Benzo(k)fluoranthene	µg/L	0.0085	n/v	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085
Benzo(g,h,i)perylene	µg/L	0.0085	n/v	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085
Benzo(c)phenanthrene	µg/L	0.050	n/v	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050
Benzo(a)pyrene	µg/L	0.0075	0.015	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	nc	<0.0075	<0.0075	<0.0075	nc	<0.0075	<0.0075	<0.0075
Benzo[e]pyrene	µg/L	0.050	n/v	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050
Chrysene	µg/L	0.0085	n/v	<0.0085	<0.0085	<0.22	<0.0085	<0.0085	<0.0085	<0.0085	<0.22	<0.0085	<0.0085	<0.0085	<0.22	<0.0085	<0.0085	<0.22	<0.0085	<0.0085	nc	<0.0085	<0.22	<0.0085	nc	<0.0085	<0.0085	<0.0085
Dibenz(a,h)anthracene	µg/L	0.0075	n/v	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	nc	<0.0075	<0.0075	<0.0075	nc	<0.0075	<0.0075	<0.0075
Fluoranthene	µg/L	0.010	0.04	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	nc	<0.010	<0.010	<0.010	nc	<0.010	<0.010	<0.010
Fluorene	µg/L	0.050	3	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050
Indeno(1,2,3-cd)pyrene	µg/L	0.0085	n/v	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085
2-Methylnaphthalene	µg/L	0.10	n/v	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<0.10
Naphthalene	µg/L	0.10	1.1/1.4	<0.10	<0.10	<0.10	<0.10	<0.10	0.23	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<0.10
Phenanthrene	µg/L	0.050	0.4	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050
Perylene	µg/L	0.050	n/v	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050
Pyrene	µg/L	0.020	0.025	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	nc	<0.020	<0.020	<0.020	nc	<0.020	<0.020	<0.020
Quinoline	µg/L	0.20	3.4	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	nc	<0.20	<0.20	<0.20	nc	<0.20	<0.20	<0.20

Notes:

1	CCME Water Quality Guidelines for the Protection of Aquatic Life (Freshwater/Marine)
2	Monitoring well coordinates are located in Table 1
6.5	**Concentration exceeds the CCME guideline**
*	Standard dependent on pH
**	Standard dependent on hardness
n/v	No standard / guideline value
-	Parameter not analyzed / not available
n/a	Not applicable
RPD	Relative Percent Difference
ITALICS	RPD alert limit exceeded
RDL	Reportable Detection Limit
nc	Not calculable

Table 4
Groundwater Analytical Results
Inorganic Parameters

Monitoring Well [2]				MW13-1				MW13-2	MW13-3			MW13-4	MW13-5			MW13-7						MW13-8					MW 13-9	
Sample Date				2014-09-16	2015-07-26	2016-08-01	2017-07-30	2015-07-26	2014-09-17	2015-07-26	2016-08-02	2015-07-26	2014-09-17	2015-07-26	2016-08-02	2014-09-23	2015-07-26	2016-08-03	2017-08-06	2017-08-06		2015-07-26	2016-08-03	2016-08-03		2017-08-08	2015-07-26	2017-08-06
Sample ID	Units	RDL	CCME[1]	MW13-1	MW13-1	MW13-1	MW13-1	MW13-2	MW13-3	MW13-3	MW13-3	MW13-4	MW13-5	MW13-5	MW13-5	MW13-7	MW13-7	MW13-7	MW13-7	APRON DUP01 (Duplicate of MW13-7)	RPD (%)	MW 13-8	MW 13-8	DUP01 (Duplicate of MW13-8)	RPD (%)	MW 13-8	MW 13-9	MW 13-9
Sampling Company				Dillon	Dillon	Arcadis	Arcadis	Dillon	Dillon	Dillon	Arcadis	Dillon	Dillon	Dillon	Arcadis	Dillon	Dillon	Arcadis	Arcadis	Arcadis		Dillon	Arcadis	Arcadis		Arcadis	Dillon	Arcadis
Laboratory				Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam		Maxxam	Maxxam	Maxxam		Maxxam	Maxxam	Maxxam
Misc. Inorganics																												
Dissolved Cadmium (Cd)	mg/L	0.000020	0.001(short), 0.00009(long)/ 0.00012(long)	**<200**	**<0.020**	<0.000020	<0.000020	**<0.020**	**<200**	**<0.020**	<0.000020	**<0.020**	**<20**	**0.026**	<0.000020	**<100**	**0.05**	0.00021	0.00021	0.00022	5%	**0.03**	<0.000020	0.00002	nc	0.00002	**<0.020**	0.000039
Dissolved Calcium (Ca)	mg/L	0.30	n/v	-	130	270	250	32	-	-	140	100 (3)	-	94 (3)	86	-	180 (3)	-	330	330	0%	76	-	-	nc		-	460
Dissolved Magnesium (Mg)	mg/L	0.20	n/v	-	110	190	190	44	-	-	150	100		62 (3)	63	-	110 (3)	-	240	240	0%	52	-	-	nc		-	1100
Dissolved Aluminum (Al)	mg/L	0.0030	1*	0.05	0.0047	0.0059	0.0062	0.015	<0.030	<0.0030	0.0038	0.0091	0.041	0.0043	0.0057	<0.015	0.0099	0.0065	0.015	0.014	7%	0.0060	0.0054	0.0057	nc	0.0037	<0.0030	0.031
Dissolved Antimony (Sb)	mg/L	0.00060	n/v	<0.0060	<0.00060	<0.00060	<0.00060	<0.00060	<0.0060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.0030	<0.00060	<0.00060	<0.00060	<0.00060	nc	<0.00060	<0.00060	<0.00060	nc	<0.00060	<0.00060	<0.00060
Dissolved Arsenic (As)	mg/L	0.00020	0.005/0.0125	0.0041	0.0039	0.0028	0.0051	0.0023	<0.0020	0.0011	0.00088	0.00040	0.0014	0.0020	0.0022	<0.0010	0.00045	0.00068	0.0014	0.0015	7%	0.00068	0.0017	0.0019	11%	0.00075	0.00053	0.0025
Dissolved Barium (Ba)	mg/L	0.010	n/v	0.038	0.027	0.041	0.029	0.025	<0.10	0.015	0.014	0.044	0.025	0.035	0.019	0.048	0.036	0.038	0.036	0.036	0%	0.038	0.033	0.034	nc	0.037	0.053	<0.10
Dissolved Beryllium (Be)	mg/L	0.0010	n/v	<0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	nc	<0.0010	<0.0010	<0.0010	nc	<0.0010	<0.0010	<0.0010
Dissolved Boron (B)	mg/L	0.020	29(short), 1.5(long)	0.51	0.23	0.72	0.7	0.11	**4**	1.4	**3.1**	0.12	0.12	0.11	0.25	0.27	0.34	0.36	0.38	0.38	0%	0.23	0.26	0.27	4%	0.29	0.44	2.4
Dissolved Calcium (Ca)	mg/L	0.30	n/v	260	130	270	250	32	330	77	110	100 (3)	96	94 (3)	82	240	180 (3)	280	330	330	0%	76	300	300	0%	290	200	460
Total Calcium (Ca)	mg/L	0.30	n/v	-	170	290	280	140	-	-	140	99	-	93	85	-	160	280	250	280	11%	87	310	310	0%	260	-	280
Dissolved Chromium (Cr)	mg/L	0.0010	0.001/0.0015	<0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	nc	<0.0010	<0.0010	<0.0010	nc	<0.0010	<0.0010	<0.0010
Dissolved Cobalt (Co)	mg/L	0.00030	n/v	0.0084	0.0073	0.0066	0.0088	0.0024	0.051	0.0012	0.010	<0.00030	0.0052	0.0057	0.0095	0.012	0.0034 (3)	0.0056	0.015	0.014	7%	0.0023	0.013	0.013	0%	0.0069	0.0024	0.018
Dissolved Copper (Cu)	mg/L	0.0002	0.004**	0.003	0.0014	0.0016	0.00094	**0.0065**	0.0037	0.00078	0.00072	**0.0049**	0.0025	0.0018	0.00078	0.003	**0.0071**	**0.0068**	**0.010**	**0.011**	10%	0.0034	0.0036	0.004	11%	0.0029	0.00095	0.00035
Dissolved Iron (Fe)	mg/L	0.060	0.3	**2.6**	**1.1**	**2.2**	**5.8**	0.087	<0.60	<0.060	**0.65**	0.19	**0.46**	0.15	**0.60**	0.1	0.20	0.14	**1.5**	**1.4**	7%	0.095	**3**	**3.1**	3%	0.71	<0.060	**7.4**
Dissolved Lead (Pb)	mg/L	0.00020	0.007**	<0.0020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.00020	<0.00020	0.00037	0.00052	34%	<0.00020	<0.00020	<0.00020	nc	<0.00020	<0.00020	<0.00020
Dissolved Lithium (Li)	mg/L	0.020	n/v	0.053	<0.020	0.059	0.064	0.024	<0.20	0.04	0.076	<0.020	<0.020	<0.020	<0.020	0.041	0.024	0.044	0.058	0.058	0%	<0.020	0.035	0.036	nc	0.028	<0.020	0.23
Dissolved Magnesium (Mg)	mg/L	0.20	n/v	210	110	200	190	44	710	74	150	100	67	62 (3)	61	170	110 (3)	180	240	240	0%	52	230	230	0%	170	91	1100
Total Magnesium (Mg)	mg/L	0.20	n/v	-	140	200	190	96	-	-	150	100		61	61	-	100	180	210	230	9%	61	230	230	0%	160	-	1100
Dissolved Manganese (Mn)	mg/L	0.0040	n/v	1.5	0.8	0.94	0.82	<0.0040	0.57	0.21	0.14	<0.0040	0.65	0.48	0.71	2.2	0.93 (4)	1.4	1.7	1.7	0%	0.15	0.76	0.76	0%	0.47	0.29	0.48
Dissolved Molybdenum (Mo)	mg/L	0.00020	0.1	0.0066	0.0068	0.0046	0.0038	0.021	0.02	0.032	0.0093	0.0014	0.0026	0.0021	0.0043	0.0073	0.0066	0.0058	0.0069	0.0068	1%	0.0086	0.0074	0.0076	3%	0.0051	0.0035	0.0029
Dissolved Nickel (Ni)	mg/L	0.00050	0.15**	0.0083	0.0071	0.0056	0.0095	0.011	0.13	0.01	**0.26**	0.0031	0.0064	0.0055	0.038	0.011	0.0078	0.011	0.016	0.016	0%	0.0038	0.011	0.011	0%	0.0081	0.0035	0.028
Dissolved Phosphorus (P)	mg/L	0.10	n/v	0.12	<0.10	<0.10	<0.10	<0.10	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	9.9	11	11%	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<1.0
Dissolved Potassium (K)	mg/L	0.30	n/v	48	21	47	53	15	220	45	100 (1)	12	7.5	6.7	12	20	18 (3)	23	27	27	0%	13	24	24	0%	20	15	150
Total Potassium (K)	mg/L	0.30	n/v	-	28	50	54	24	-	-	88	12	-	7	13	-	17	24	25	28	11%	16	25	25	0%	20	-	150
Dissolved Selenium (Se)	mg/L	0.00020	0.001	<0.0020	0.0007	0.00021	0.00053	0.00057	<0.0020	0.0004	<0.00020	0.00035 (1)	0.00037	0.00034 (1)	0.00031	<0.0010	0.00042 (1)	0.00023	0.00042	0.00042	0%	0.00024	<0.00020	<0.00020	nc	0.00021	0.00067	0.00074
Dissolved Silicon (Si)	mg/L	0.10	n/v	5.9	6.1	6.1	7	6.4	3	2	2.4	3.3	6.3	6.0	5.9	5.8	4.4	5.5	6.2	6.1	2%	2.1	4.9	4.8	2%	4.1	2.1	6.3
Dissolved Silver (Ag)	mg/L	0.00010	0.00025 / 0.0075	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00010	<0.00010	<0.00010	0.00013	nc	<0.00010	<0.00010	<0.00010	nc	<0.00010	<0.00010	0.0001
Dissolved Sodium (Na)	mg/L	0.50	n/v	540 (1)	130	290	600	300	3600	840	1500 (2)	140	180	150	190	270	130 (3)	250	590	600	2%	27	90	90	0%	69	63	4000
Total Sodium (Na)	mg/L	0.50	n/v	-	240	320	580	350	-	-	1200 (3)	140	-	150	200	-	120	260	930	980	5%	28	93	91	2%	65	-	930
Dissolved Strontium (Sr)	mg/L	0.020	n/v	0.55	0.26	0.50	0.61	0.43	2.8	0.38	0.74	0.16 (3)	0.089	0.080	0.11	0.52	0.37 (3)	0.46	0.59	0.6	2%	0.14	0.31	0.31	0%	0.39	0.31	2.5
Dissolved Sulphur (S)	mg/L	0.20	n/v	360	100	360	450	31	1300	240	390	51	130	120	120	210	170	280	330	330	0%	66	330	330	0%	320	170	930
Dissolved Thallium (Tl)	mg/L	0.00020	0.0008	<0.0020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	nc	<0.00020	<0.00020	<0.00020	nc	<0.00020	<0.00020	<0.00020
Dissolved Tin (Sn)	mg/L	0.0010	n/v	<0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	nc	<0.0010	<0.0010	<0.0010	nc	<0.0010	<0.0010	<0.0010
Dissolved Titanium (Ti)	mg/L	0.0010	n/v	<0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.010	<0.0010	<0.0010	0.0019	0.0023	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	0.0014	0.0014	0%	<0.0010	<0.0010	<0.0010	nc	<0.0010	<0.0010	<0.0010
Dissolved Uranium (U)	mg/L	0.00010	0.033(short), 0.015(long)	**0.02**	**0.016**	**0.018**	0.014	**0.032**	**0.063**	0.0091	0.015	0.0077	0.0048	0.0038	0.0052	**0.036**	0.011	**0.021**	**0.043**	**0.043**	0%	0.012	**0.028**	**0.028**	0%	**0.017**	0.0074	**0.047**
Dissolved Vanadium (V)	mg/L	0.0010	n/v	<0.010	<0.0010	<0.0010	0.0013	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	nc	<0.0010	<0.0010	0.0011	nc	0.0011	<0.0010	<0.0010
Dissolved Zinc (Zn)	mg/L	0.0030	0.030	<0.030	<0.0030	<0.0030	<0.0030	0.023	<0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	**0.055**	**0.10**	**0.058**	**0.034**	**0.037**	8%	<0.0030	<0.0030	<0.0030	nc	<0.0030	<0.0030	<0.0030

Notes:

[1] CCME Water Quality Guidelines for the Protection of Aquatic Life (Freshwater/Marine)

[2] Monitoring well coordinates are located in Table 1

6.5 **Concentration exceeds the CCME guideline**

BOLD **Dillon detection limit (historical data) was higher than the aplicable guideline.**

* standard dependent on pH

** standard dependent on hardness

n/v No standard/guideline value.

\- Parameter not analyzed / not available.

n/a Not applicable.

RPD Relative Percent Difference

ITALICS RPD alert limit exceeded

RDL Reportable Detection Limit

nc Not calculable

(1) Detection limits raised due to dilution to bring analyte within the calibrated range

(2) Detection limits raised due to matrix interference

(3) Detection limit raised based on sample volume used for analysis

Table 5
Groundwater Analytical Results
Miscellaneous Parameters

Monitoring Well [2]				MW13-1				MW13-2	MW13-3			MW13-4	MW13-5			MW13-7						MW13-8					MW13-9	
Sample Date				2014-09-16	2015-07-26	2016-08-01	2017-07-30	2015-07-26	2014-09-17	2015-07-26	2016-08-02	2015-07-26	2014-09-17	2015-07-26	2016-08-02	2014-09-23	2015-07-26	2016-08-03	2017-08-06	2017-08-06		2015-07-26	2016-08-03	2016-08-03		2017-08-08	2015-07-26	2017-08-06
Sample ID	Units	RDL	CCME[1]	MW13-1	MW13-1	MW13-1	MW13-1	MW13-2	MW13-3	MW13-3	MW13-3	MW13-4	MW13-5	MW13-5	MW13-5	MW13-7	MW13-7	MW13-7	MW13-7	APRON DUP01 (Duplicate of MW13-7)	RPD (%)	MW13-8	MW13-8	DUP01 (Duplicate of MW13-8)	RPD (%)	MW13-8	MW13-9	MW13-9
Sampling Company				Dillon	Dillon	Arcadis	Arcadis	Dillon	Dillon	Dillon	Arcadis	Dillon	Dillon	Dillon	Arcadis	Dillon	Dillon	Arcadis	Arcadis	Arcadis		Dillon	Arcadis	Arcadis		Arcadis	Dillon	Dillon
Laboratory				Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam		Maxxam	Maxxam	Maxxam		Maxxam	Maxxam	Maxxam
Calculated Parameters																												
Hardness (CaCO3)	mg/L	0.50	n/v	1500.00	790	1500	1460	260	3700	500	970	670	510	490	470	1300	890	1400	1490	1650	10%	400	1700	1700	0%	1320	880	5500
Dissolved Nitrate (NO3)	mg/L	0.044	550(short), 13(long)/ 1500(short), 200(long)	<0.044	<0.044	0.41	0.25	1.1	<0.22	<0.044	<0.044	**17**	<0.044	<0.044	<0.044	<0.044	12	6.6	0.44	0.43	2%	1.4	**24**	**24**	0%	**48**	9.6	<0.044
Nitrate plus Nitrite (N)	mg/L	0.020	n/v	<0.010	<0.020	0.11	0.06	0.40	<0.050	<0.020	<0.020	3.9	<0.010	<0.020	<0.020	<0.010	2.7	1.5	0.13	0.12	8%	0.35	5.4	5.5	2%	11	2.4	<0.14
Dissolved Nitrite (NO2)	mg/L	0.033	0.1	<0.033	<0.33	0.063	<0.033	0.51	<0.16	<0.033	<0.033	0.092	<0.033	<0.033	<0.033	<0.033	0.044	<0.033	0.095	0.08	22%	0.12	**0.22**	**0.22**	0%	0.07	0.79	<0.33
Misc. Inorganics																												
pH	pH	N/A	6.5-9.0	7.77	7.66	7.70	7.52	8.88	7.81	7.82	7.87	7.95	7.92	7.55	7.76	7.49	7.39	7.62	7.73	7.81	1%	7.75	7.53	7.52	0%	7.49	8.05	7.27
Total Dissolved Solids	mg/L	10	n/v	4300	1200	2600	3400	1100	9400	2900	4400	1000	1000	990	1100	2000	1400	2500	4100	3900	5%	520	2400	2400	0%	2000	1200	20000
Total Suspended Solids	mg/L	1.0	background dependant	-	-	15	31	-	-	-	3.3	-	-	-	44	31	-	5.3	<1.0	<1.0	nc	-	4.7	8	nc	1.3	-	27
Anions																												
Alkalinity (PP as CaCO3)	mg/L	0.50	n/v	<0.50	<0.50	<0.50	<0.50	25	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	nc	<0.50	<0.50	<0.50	nc	<0.50	<0.50	<0.50
Alkalinity (Total as CaCO3)	mg/L	0.50	n/v	560	540	510	500	370	290	220	360	620	280	280	290	430	270	350	930	890	4%	210	610	640	5%	390	230	650
Bicarbonate (HCO3)	mg/L	0.50	n/v	680	650	620	610	390	360	270	440	760	340	350	350	520	320	430	1100	1100	0%	260	750	780	4%	480	280	790
Carbonate (CO3)	mg/L	0.50	n/v	<0.50	<0.50	<0.50	<0.50	30	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	nc	<0.50	<0.50	<0.50	nc	<0.50	<0.50	<0.50
Hydroxide (OH)	mg/L	0.50	n/v	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	nc	<0.50	<0.50	<0.50	nc	<0.50	<0.50	<0.50
Dissolved Sulphate (SO4)	mg/L	5.0	n/v	1600 (1)	340	1100	1400	110	1700 (1)	740	1100	170	370 (1)	390	330	520 (1)	580	860	860	860	0%	200	1000	950	5%	890	580	2700
Dissolved Chloride (Cl)	mg/L	1.0	640(short), 120(long)	**1300 (1)**	**170**	**370**	**470**	**330**	**2700 (1)**	**1000**	**1400**	110	**160**	110	**170**	**490 (1)**	**200**	**530**	**1100**	**1100**	0%	25	**140**	**140**	0%	92	84	**8200**
Nutrients																												
Total Ammonia (N)	mg/L	0.25	temp and pH dependant	0.68	0.71	1.4	1.9	1.2	1.1	1	0.61	0.13	<0.050	0.32	0.42	1.5	0.46	0.77	1.6	1.7	6%	1.1	6.3	6.2	2%	1.1	4.2	1.8
Dissolved Nitrite (N)	mg/L	0.010	0.197	<0.010	<0.10	0.019	<0.010	0.15	<0.050 (2)	<0.010	<0.010	0.028	<0.010	<0.010	<0.010	<0.010	0.014	<0.010	0.029	0.023	23%	0.037	0.068	0.067	1%	0.021	**0.24**	<0.10
Dissolved Nitrate (N)	mg/L	0.010	n/v	<0.010	<0.10	0.094	0.057	0.25	<0.050 (2)	<0.010	<0.010	3.9	<0.010	<0.010	<0.010	<0.010	2.7	1.5	0.1	0.096	4%	0.31	5.4	5.4	0%	11	2.2	<0.10
Misc. Organics																												
Extractable (n-Hex.) Oil and grease	mg/L	2.0	n/v	<4.2 (3)	<2.0	4.0	2.0	<2.0	<4.2 (3)	<2.0	4.0	<2.0	-	<2.0	8.0	<2.0	<2.0	3.0	3.0	<2.0	nc	<2.0	3	3	nc	2	<2.0	<2.0
Phenols	mg/L	0.0020	0.004	**0.041**	**0.033**	**0.013**	**0.012**	**0.010**	**0.020 (2)**	**0.016**	**0.021**	<0.0020	**0.0078**	0.0025	**0.091**	**0.0077**	<0.0020	**0.0080**	**0.035**	**0.029**	19%	0.0032	**0.019**	**0.020**	5%	**0.0045**	0.0034	0.1

Notes:

1	CCME Water Quality Guidelines for the Protection of Aquatic Life, (Freshwater/Marine)
2	Monitoring well coordinates are located in Table 1
6.5	**Concentration exceeds the CCME guideline**
*	standard dependent on pH
**	standard dependent on hardness
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
n/a	Not applicable.
RPD	Relative Percent Difference
ITALICS	RPD alert limit exceeded
RDL	Reportable Detection Limit
nc	Not calculable
(1)	Detection limits raised due to dilution to bring analyte within the calibrated range
(2)	Detection limits raised due to matrix interference
(3)	Detection limit raised based on sample volume used for analysis

Table 6
Sump Water Analytical Results
Metals and Volatile Parameters

Sample Date					2015-08-12	2015-08-27	2015-07-15	2016-07-26	2017-07-25
Sample ID	**Units**	**RDL**	**CCME[1]**	**NWB License[2]**	**Sump Water**	**Sump Water 2**	**APRON LTU - EFFLUENT**	**APRONSUMP**	**APRON SUMP**
Sampling Company					Dillon	Dillon	Dillon	Arcadis	Arcadis
Laboratory					Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Misc. Inorganics									
pH	-	-	6.5 to 9.0	6 to 9	8.23	8.37	8.25	8.00	8.25
Misc. Organics									
Oil and Grease	mg/L	2.0	n/v	5.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Metals									
Total Aluminum (Al)	mg/L	0.0030	0.1*	n/v	-	-	-	**0.95**	-
Total Antimony (Sb)	mg/L	0.00060	n/v	n/v	-	-	-	<0.00060	-
Total Arsenic (As)	mg/L	0.00020	0.005/0.0125	n/v	-	-	-	0.0029	-
Total Beryllium (Be)	mg/L	0.0010	n/v	n/v	-	-	-	<0.0010	-
Total Cadmium (Cd)	mg/L	0.000020	0.001(short), 0.00009(long) / 0.00012	n/v	-	-	-	<0.000020	-
Total Chromium (Cr)	mg/L	0.0010	0.001/0.0015	n/v	-	-	-	**0.0017**	-
Total Cobalt (Co)	mg/L	0.00030	n/v	n/v	-	-	-	0.0023	-
Total Copper (Cu)	mg/L	0.00020	0.002**	n/v	-	-	-	0.012	-
Total Lead (Pb)	mg/L	0.00020	0.001**	n/v	-	-	-	0.00068	-
Total Molybdenum (Mo)	mg/L	0.00020	0.073	n/v	-	-	-	0.022	-
Total Nickel (Ni)	mg/L	0.00050	0.025**	n/v	-	-	-	0.0073	-
Total Selenium (Se)	mg/L	0.00020	0.001	n/v	-	-	-	0.00045	-
Total Silver (Ag)	mg/L	0.00010	0.00025 /0.0075	n/v	-	-	-	<0.00010	-
Total Thallium (Tl)	mg/L	0.00020	0.0008	n/v	-	-	-	<0.00020	-
Total Tin (Sn)	mg/L	0.0010	n/v	n/v	-	-	-	<0.0010	-
Total Titanium (Ti)	mg/L	0.0010	n/v	n/v	-	-	-	0.038	-
Total Uranium (U)	mg/L	0.00010	0.033(short), 0.015 (long)	n/v	-	-	-	0.015	-
Total Vanadium (V)	mg/L	0.0010	n/v	n/v	-	-	-	0.0049	-
Total Zinc (Zn)	mg/L	0.0030	0.030	0.5	-	-	-	<0.0030	<0.0030
Dissolved Metals									
Dissolved Aluminum (Al)	mg/L	0.0030	0.1*	3.1	0.0053	<0.040	0.014	-	-
Dissolved Antimony (Sb)	mg/L	0.00060	n/v	n/v	<0.00060	<0.00060	<0.00060	-	-
Dissolved Arsenic (As)	mg/L	0.00020	0.005/0.0125	n/v	0.00091	0.002	0.00056	-	-
Dissolved Barium (Ba)	mg/L		n/v	n/v	0.057	0.061	0.035	-	-
Dissolved Beryllium (Be)	mg/L	0.00100	n/v	n/v	<0.0010	<0.0010	<0.0010	-	-
Dissolved Boron (B)	mg/L		29 (short), 1.5 (long)	n/v	0.51	0.56	0.38	-	-
Dissolved Cadmium (Cd)	mg/L	0.00002	0.001(short), 0.00009(long) /0.00012	n/v	<0.000020	<0.000020	<0.000020	-	-
Dissolved Calcium (Ca)	mg/L		n/v	n/v	170	200	130	-	-
Dissolved Chromium (Cr)	mg/L	0.00100	0.001/0.0015	n/v	<0.0010	<0.010	<0.0010	-	-
Dissolved Cobalt (Co)	mg/L	0.00030	n/v	n/v	0.001	0.00086	0.00050	-	-
Dissolved Copper (Cu)	mg/L	0.00020	0.002-0.004**	n/v	0.0039	0.0047	0.0026	-	-
Dissolved Iron (Fe)	mg/L		300.0	n/v	<0.060	<0.060	0.074	-	-
Dissolved Lead (Pb)	mg/L	0.00020	0.001-0.007**	0.001	<0.00020	<0.00020	<0.00020	<0.00020	0.00046
Dissolved Lithium (Li)	mg/L	0.02	n/v	n/v	0.029	0.029	<0.020	-	-
Dissolved Magnesium (Mg)	mg/L		n/v	n/v	91	100	62	-	-
Dissolved Manganese (Mn)	mg/L		n/v	n/v	0.0082	0.018	0.014	-	-
Dissolved Molybdenum (Mo)	mg/L	0.00020	0.073	n/v	0.011	0.012	0.0064	-	-
Dissolved Nickel (Ni)	mg/L	0.00050	0.025-0.15**	n/v	0.0035	0.0037	0.0038	-	-
Dissolved Phosphorus (P)	mg/L	0.1	0.1	n/v	<0.10	<0.10	<0.10	-	-
Dissolved Potassium (K)	mg/L		n/v	n/v	20	21	12	-	-
Dissolved Selenium (Se)	mg/L	0.0002	0.001	n/v	0.00038	0.00038	<0.00020	-	-
Dissolved Silicon (Si)	mg/L		n/v	n/v	1.4	1.1	0.39	-	-
Dissolved Silver (Ag)	mg/L	0.0001	0.00025	n/v	<0.00010	<0.00010	<0.00010	-	-
Dissolved Sodium (Na)	mg/L		n/v	n/v	84	81	44	-	-
Dissolved Strontium (Sr)	mg/L		n/v	n/v	0.45	0.5	0.33	-	-
Dissolved Sulphur (S)	mg/L		n/v	n/v	190	210	130	-	-
Dissolved Thallium (Tl)	mg/L	0.0002	0.00080	n/v	<0.00020	<0.00020	<0.00020	-	-
Dissolved Tin (Sn)	mg/L	0.001	n/v	n/v	<0.0010	<0.0010	<0.0010	-	-
Dissolved Titanium (Ti)	mg/L	0.001	n/v	n/v	<0.0010	<0.0010	<0.0010	-	-
Dissolved Uranium (U)	mg/L	0.00010	0.033(short), 0.015 (long)	n/v	0.02	0.023	0.014	-	-
Dissolved Vanadium (V)	mg/L	0.001	n/v	n/v	<0.0010	<0.0010	<0.0010	-	-
Dissolved Zinc (Zn)	mg/L	0.003	0.001**	0.5	<0.0030	<0.0030	<0.0030	-	-
Volatiles									
Benzene	µg/L	0.40	370/110	370	<0.40	<0.40	<0.40	<0.40	<0.40
Toluene	µg/L	0.40	2/115	2	<0.40	1.5	<0.40	<0.40	<0.40
Ethylbenzene	µg/L	0.40	90/25	90	<0.40	0.58	<0.40	<0.40	<0.40
m & p-Xylene	µg/L	0.80	n/v	n/v	-	-	-	<0.80	<0.80
o-Xylene	µg/L	0.40	n/v	n/v	-	-	-	<0.40	<0.40
Xylenes (Total)	µg/L	0.80	n/v	n/v	<0.8	3.3	<0.80	<0.80	<0.80
F1 (C6-C10) - BTEX	µg/L	100	n/v	n/v	<100	<100	<100	<100	<100
F1 (C6-C10)	µg/L	100	n/v	n/v	<100	<100	<100	<100	<100

Notes:

[1]	CCME Water Quality Guidelines for the Protection of Aquatic Life, (Freshwater/Marine) for long term exposure.
[2]	NWB License (1BR-FTA1217) effluent quality guidelines
6.5	**Concentration exceeds the CCME guideline**
	Concentration exceeds the NWB License guideline
*	standard dependent on pH
**	standard dependent on hardness
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
n/a	Not applicable.
RDL	Reportable Detection Limit

Table 7
Sump Water Analytical Results
Poly-and-Perfluoroalkyl Substances (PFASs)

Sample Date					2016-07-26	2017-07-25
Sample ID	Units	RDL	Drinking Water Screening Values[1]	FEQGs for PFOS[2]	APRONSUMP	APRONSUMP
Sampling Company					Arcadis	Arcadis
Laboratory					Maxxam	Maxxam
Perfluorinated Compounds						
Perfluorobutane Sulfonate (PFBS)	µg/L	0.020	15	n/v	0.024	0.028
Perfluorobutanoic acid	µg/L	0.020	n/v	n/v	0.095	0.11
Perfluorodecane Sulfonate	µg/L	0.020	n/v	n/v	<0.020	<0.020
Perfluorodecanoic Acid (PFDA)	µg/L	0.020	n/v	n/v	<0.020	<0.020
Perfluorododecanoic Acid (PFDoA)	µg/L	0.020	n/v	n/v	<0.020	<0.020
Perfluoroheptane sulfonate	µg/L	0.020	n/v	n/v	<0.020	<0.020
Perfluoroheptanoic Acid (PFHpA)	µg/L	0.020	0.2	n/v	0.16	**0.23**
Perfluorohexane Sulfonate (PFHxS)	µg/L	0.020	0.6	n/v	0.20	0.2
Perfluorohexanoic Acid (PFHxA)	µg/L	0.020	0.2	n/v	**0.27**	**0.34**
Perfluoro-n-Octanoic Acid (PFOA)	µg/L	0.020	0.2	n/v	0.078	0.050
Perfluorononanoic Acid (PFNA)	µg/L	0.020	0.2	n/v	<0.020	<0.020
Perfluorooctane Sulfonamide (PFOSA)	µg/L	0.020	n/v	n/v	<0.020	<0.020
Perfluorooctane Sulfonate (PFOS)	µg/L	0.020	0.6	6	0.076	<0.020
Perfluoropentanoic Acid (PFPeA)	µg/L	0.020	0.2	n/v	**0.34**	**0.49**
Perfluorotetradecanoic Acid	µg/L	0.020	n/v	n/v	<0.020	<0.020
Perfluorotridecanoic Acid	µg/L	0.020	n/v	n/v	<0.020	<0.020
Perfluoroundecanoic Acid (PFUnA)	µg/L	0.020	n/v	n/v	<0.020	<0.020

Notes:

1 Health Canada (HC) Summary of Drinking Water Screening Values for PFOS and PFOA. 2016.

2 Environment Canada (EC) Draft Federal Environmental Quality Guidelines for PFOS. 2013.

6.5 **Concentration exceeds the HC guideline**

n/v No standard/guideline value.

\- Parameter not analyzed / not available.

n/a Not applicable.

RDL Reportable Detection Limit

Table 8
Soil Analytical Results
Petroleum Hydrocarbons (PHCs)

Sample Date							2017-08-05	2017-08-05	2017-08-05	2017-08-05	2017-08-05		2017-08-05	2017-08-05
Sample ID	**Units**	**RDL**	**CCME CWS[1]**	**CCME CSQG[2]**	**NWB License (Commercial)[3]**	**NWB License (Industrial)[4]**	**APRON 1701**	**APRON 1702**	**APRON 1703**	**APRON 1704**	**APRONDUP01** (Duplicate of APRON 1704)	**RPD (%)**	**APRON 1705**	**APRON 1706**
Coordinates NAD83 (UTM Zone 13W)							493369 E 7666860 N	493425 E 7666833 N	493472 E 7666815 N	493360 E 7666834 N	493360 E 7666834 N		493416 E 7666814 N	493466 E 7666794 N
Sampling Company							Arcadis	Arcadis	Arcadis	Arcadis	Arcadis		Arcadis	Arcadis
Laboratory							Maxxam	Maxxam	Maxxam	Maxxam	Maxxam		Maxxam	Maxxam
Physical Properties														
Moisture	%	0.30	n/v	n/v	n/v	n/v	12	9.4	8.6	11	11	0%	9.8	9.7
Petroleum Hydrocarbons														
F2 (C10-C16 Hydrocarbons)	mg/kg	10	260	n/v	300	2800	36	21	23	**440**	**490**	11%	17	100
F3 (C16-C34 Hydrocarbons)	mg/kg	50	1700	n/v	1700	3300	<50	1500	1300	71	92	26%	**1900**	520
F4 (C34-C50 Hydrocarbons)	mg/kg	50	3300	n/v	1700	3300	<50	1000	840	<50	<50	nc	1400	270
Reached Baseline at C50	-	-	n/v	n/v	n/v	n/v	Yes	Yes	Yes	Yes	Yes	nc	Yes	Yes
Volatiles														
Benzene	mg/kg	0.0050	n/v	0.030	5	5	<0.0050	<0.0050	<0.0050	**0.038**	**0.045**	17%	<0.0050	<0.0050
Toluene	mg/kg	0.020	n/v	0.37	0.8	0.8	<0.020	<0.020	<0.020	<0.020	<0.020	nc	<0.020	<0.020
Ethylbenzene	mg/kg	0.010	n/v	0.082	20	20	<0.010	<0.010	<0.010	**1.4**	**1.6**	13%	<0.010	<0.010
Xylenes (Total)	mg/kg	0.040	n/v	11	17	20	<0.040	<0.040	<0.040	5.9	6.6	11%	<0.040	<0.040
m & p-Xylene	mg/kg	0.040	n/v	n/v	n/v	n/v	<0.040	<0.040	<0.040	3.3	3.7	11%	<0.040	<0.040
o-Xylene	mg/kg	0.020	n/v	n/v	n/v	n/v	<0.020	<0.020	<0.020	2.6	2.9	11%	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	12	320	n/v	300	2800	<10	<10	<10	**830**	**840**	1%	<10	<10
F1 (C6-C10)	mg/kg	12	320	n/v	300	2800	<10	<10	<10	**840**	**850**	1%	<10	<10
Nutrients														
Available (Mod Kel) Phosphorus (P)	mg/kg	4.0	n/v	n/v	n/v	n/v	<4.0	-	10	<4.0	<4.0	nc	-	20
Available (Mod Kel) Potassium (K)	mg/kg	4.0	n/v	n/v	n/v	n/v	-	-	-	-	-	-	-	-
Nitrogen	%	0.050	n/v	n/v	n/v	n/v	0.029	-	0.12	0.067	0.075	11%	-	0.10
Nutrients														
Total Iron (Fe)	mg/kg	4.0	n/v	n/v	n/v	n/v	7900	-	9900	9200	9400	2%	-	9700
Total Potassium (K)	mg/kg	4.0	n/v	n/v	n/v	n/v	1400	-	1700	1600	1600	0%	-	1600

Notes:

1	Canadian-Wide Standards for Petroleum Hydrocarbons in Soil, January 2008, Tier 1, Ecological Soil Contact, Commercial/Industrial, coarse-grained soils, Table 3 Surface soils
2	Canadian Environmental Quality Guidelines, CCME Soil Quality Guidelines for the Protection of Environmental and Human Health, 2004, Commercial, coarse-grained, surface soil
3	NWB License (1BR-FTA1217) Remediation Requirements, commercial land use, coarse-grained soils
4	NWB License (1BR-FTA1217) Remediation Requirements, industrial land use, coarse-grained soils
6.5	**Concentration exceeds the CCME guideline**
	Concentration exceeds the NWB License guideline
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
n/a	Not applicable.
RPD	Relative Percent Difference
ITALICS	RPD alert limit exceeded
RDL	Reportable Detection Limit
nc	Not calculable

FIGURES

Legend

Approximate Boundaries of Site

Metres
250 0 250 500
1:15000

Title: **SITE LOCATION**

Project: **2017 ENVIRONMENTAL MONITORING PROGRAM AT CAMBRIDGE BAY AIRPORT APRON LTU**

Client: **PWGSC/TC**

ARCADIS

Date: **NOVEMBER 2017**

FIGURE 1

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updated on:30-Nov-17 by dlogan

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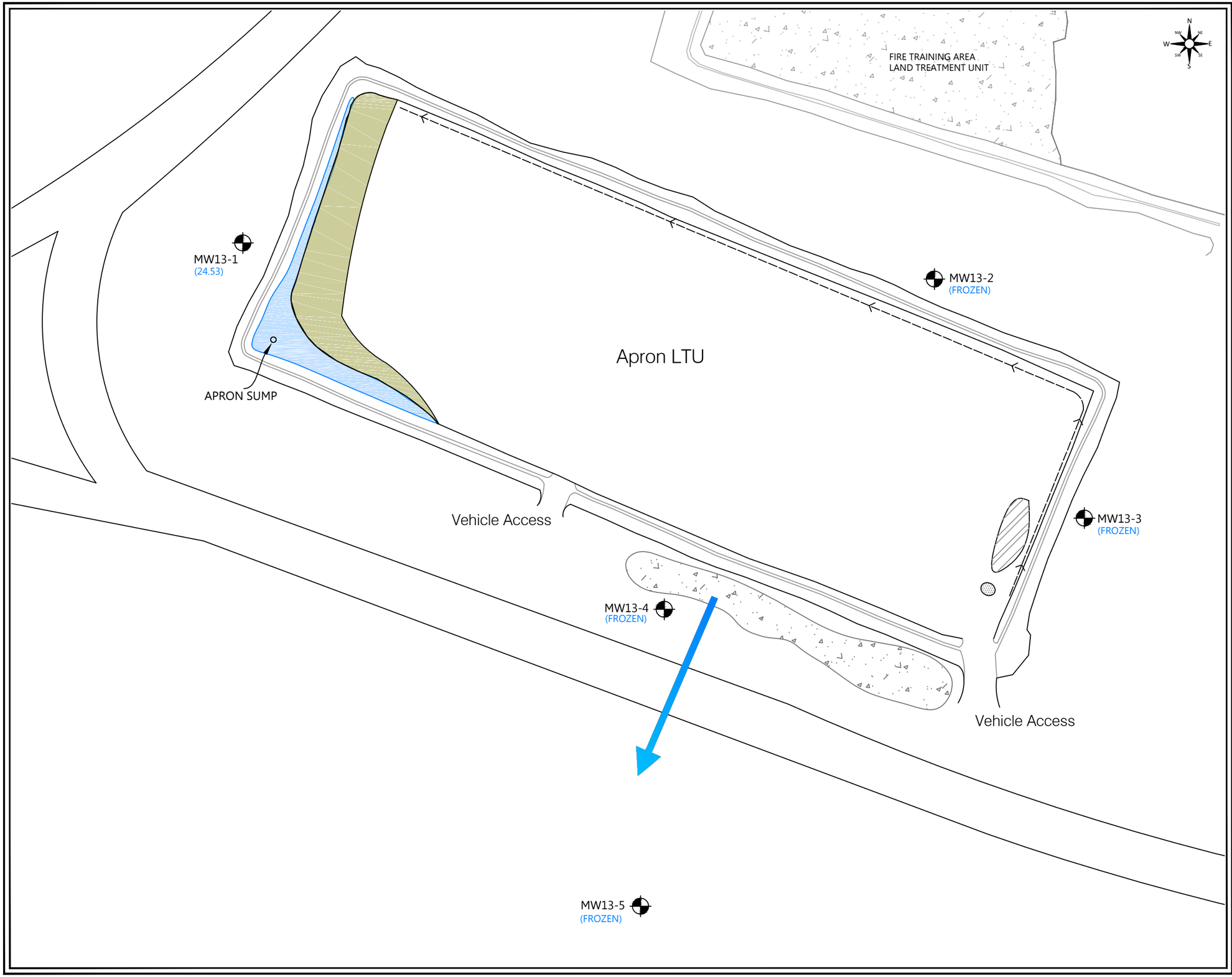

LEGEND

- LTU Bottom of Berm
- LTU Top of Berm
- Drainage Swale
- Tilled Area
- Scrap Metal Pile
- Boulders and Concrete Debris Pile
- Contaminated Area
- Concrete Debris
- Water
- Monitoring Well
- Test Pit Location
- Extent of Apron Soil Excavation in 2017
- (18.75) Measured Ground Water Elevation (m asl) by Arcadis in 2017
- Estimated Groundwater Flow Direction in 2016

Metres
10 0 10 20
1:675

Title:
2017 GROUNDWATER MONITORING APRON LTU

Project:
2017 ENVIRONMENTAL MONITORING PROGRAM AT CAMBRIDGE BAY AIRPORT APRON LTU

Client:
PWGSC/TC

ARCADIS

Date:
NOVEMBER 2017

FIGURE 2

last saved 30-Nov-17 by dlogan

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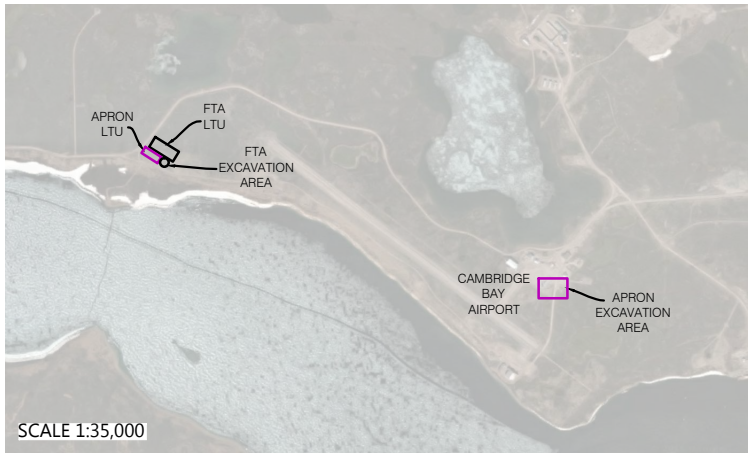

FORMER FUEL TRANSFER BUILDING
MW13-6 *
AIRPORT LIGHT (TYP.)
AIRPORT ELECTRICAL SERVICES (TYP.)
FORMER FUEL LINES
FUEL LINES
INACTIVE AIRPORT TANK FARM
FUEL LINE CAPPED - AUGUST 2013
MW13-7 (17.43)
STEEL POST
AIRPORT APRON
(18.75) MW13-8
GEOMEMBRANE BARRIER
ACCESS ROAD
MW13-9 (16.54)
BOULDER
CULVERT

N NW NE W E SW SE S

Legend

- Approximate Boundaries of Site
- Limits of Remedial Excavation (October, 2013)
- Marsh Area
- Monitoring Well
- (18.75) Measured Ground Water Elevation (m asl) by Arcadis in 2016
- Estimated Groundwater Flow Direction in 2017

Notes:
* - MW 13-6 has been buried beneath an active portion of the airport's gravel apron and could not be located during the 2017 monitoring program by Arcadis

Metres
7.5 0 7.5 15
1:600

Title: **2017 GROUNDWATER MONITORING - APRON EXCAVATION AREA**

Project: **2017 ENVIRONMENTAL MONITORING PROGRAM AT CAMBRIDGE BAY AIRPORT APRON LTU**

Client: **PWGSC/TC**

ARCADIS

Date: **NOVEMBER 2017**

FIGURE 3

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updated on:30-Nov-17 by dlogan

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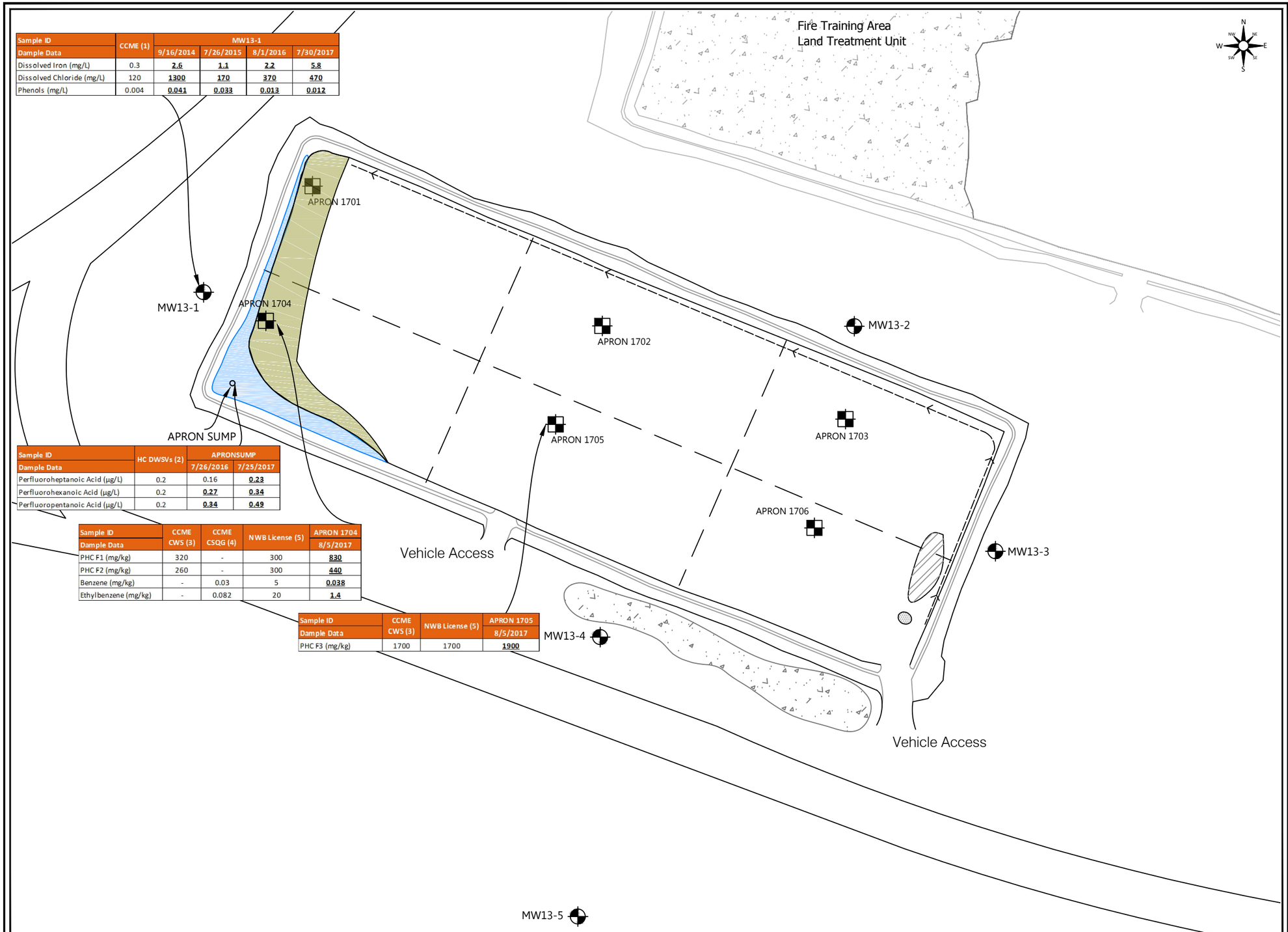
Sample ID	CCME (1)	MW13-1			
Dample Data		9/16/2014	7/26/2015	8/1/2016	7/30/2017
Dissolved Iron (mg/L)	0.3	**2.6**	**1.1**	**2.2**	**5.8**
Dissolved Chloride (mg/L)	120	**1300**	**170**	**370**	**470**
Phenols (mg/L)	0.004	**0.041**	**0.033**	**0.013**	**0.012**

Sample ID	HC DWSVs (2)	APRONSUMP	
Dample Data		7/26/2016	7/25/2017
Perfluoroheptanoic Acid (µg/L)	0.2	0.16	**0.23**
Perfluorohexanoic Acid (µg/L)	0.2	**0.27**	**0.34**
Perfluoropentanoic Acid (µg/L)	0.2	**0.34**	**0.49**

Sample ID	CCME CWS (3)	CCME CSQG (4)	NWB License (5)	APRON 1704
Dample Data				8/5/2017
PHC F1 (mg/kg)	320	-	300	**830**
PHC F2 (mg/kg)	260	-	300	**440**
Benzene (mg/kg)	-	0.03	5	**0.038**
Ethylbenzene (mg/kg)	-	0.082	20	**1.4**

Sample ID	CCME CWS (3)	NWB License (5)	APRON 1705
Dample Data			8/5/2017
PHC F3 (mg/kg)	1700	1700	**1900**



LEGEND

- LTU Bottom of Berm
- LTU Top of Berm
- Drainage Swale
- Tilled Area
- Boulders and Concrete Debris
- Contaminated Area
- Concrete Debris
- Water
- Extent of Apron Soil Excavation in 2017
- Monitoring Well
- Test Pit Location

NOTES:

(1) CCME Water Quality Guidelines for the Protection of Aquatic Life (Freshwater/Marine)

(2) Health Canada (HC) Summary of Drinking Water Screening Values for PFOS and PFOA. 2016.

(3) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil, January 2008, Tier 1, Ecological Soil Contact, Commercial/Industrial, coarse-grained soils, Table 3 Surface soils

(4) Canadian Environmental Quality Guidelines, CCME Soil Quality Guidelines for the Protection of Environmental and Human Health, 2004, Commercial, coarse-grained, surface soil

(5) NWB License (1BR-FTA1217) Remediation Requirements, commercial land use, coarse-grained soils

Metres
10 0 10 20
1:750

Title: **APRON LTU - SOIL, SUMP WATER AND GROUNDWATER EXCEEDANCES**

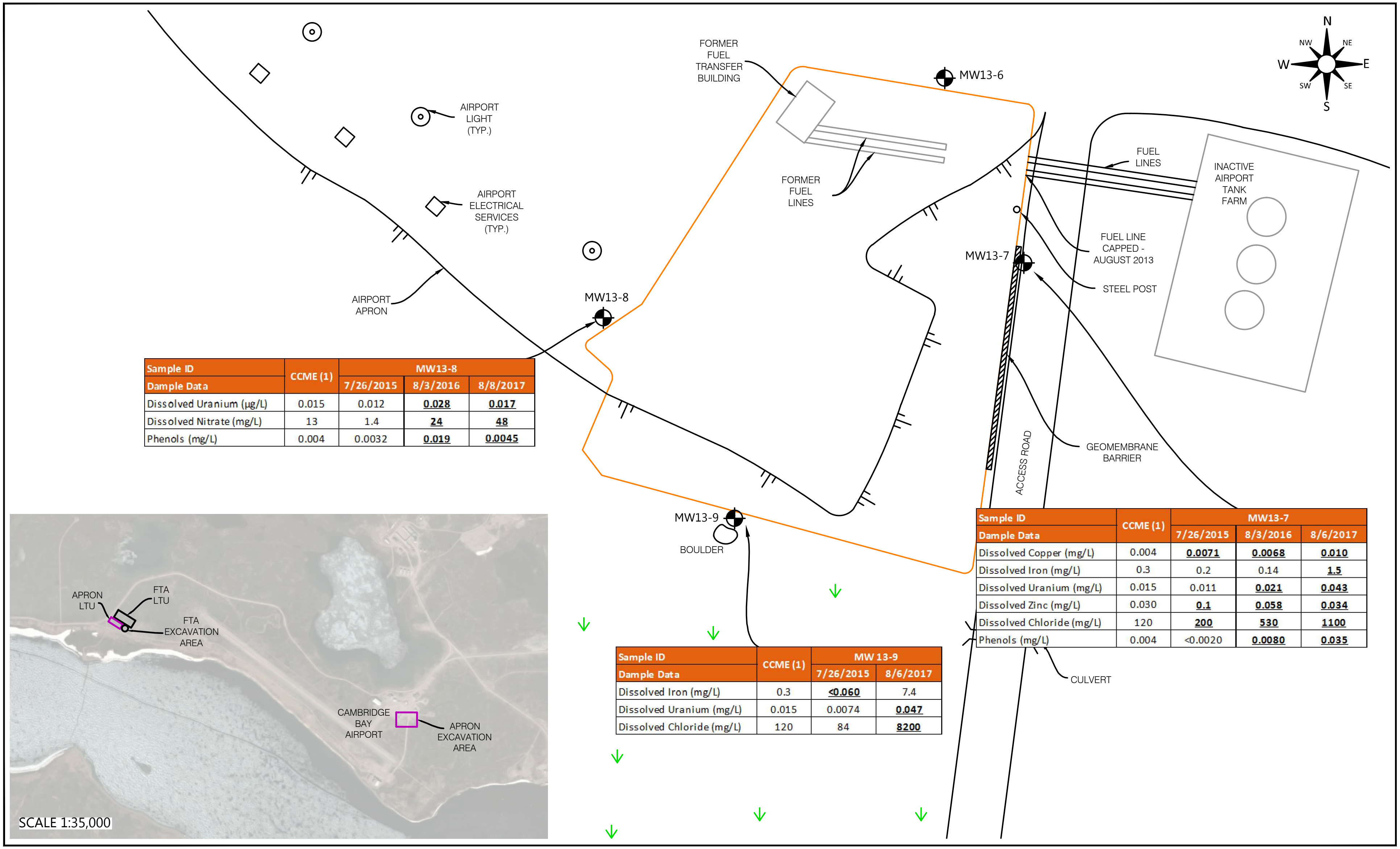
Project: **2017 ENVIRONMENTAL MONITORING PROGRAM AT CAMBRIDGE BAY AIRPORT APRON LTU**

Client: **PWGSC/TC**

ARCADIS

Date: **NOVEMBER 2017**

FIGURE 4



Sample ID	CCME (1)	MW13-8		
Dample Data		7/26/2015	8/3/2016	8/8/2017
Dissolved Uranium (µg/L)	0.015	0.012	**0.028**	**0.017**
Dissolved Nitrate (mg/L)	13	1.4	**24**	**48**
Phenols (mg/L)	0.004	0.0032	**0.019**	**0.0045**

Sample ID	CCME (1)	MW13-7		
Dample Data		7/26/2015	8/3/2016	8/6/2017
Dissolved Copper (mg/L)	0.004	**0.0071**	**0.0068**	**0.010**
Dissolved Iron (mg/L)	0.3	0.2	0.14	**1.5**
Dissolved Uranium (mg/L)	0.015	0.011	**0.021**	**0.043**
Dissolved Zinc (mg/L)	0.030	**0.1**	**0.058**	**0.034**
Dissolved Chloride (mg/L)	120	**200**	**530**	**1100**
Phenols (mg/L)	0.004	<0.0020	**0.0080**	**0.035**

Sample ID	CCME (1)	MW 13-9	
Dample Data		7/26/2015	8/6/2017
Dissolved Iron (mg/L)	0.3	**<0.060**	7.4
Dissolved Uranium (mg/L)	0.015	0.0074	**0.047**
Dissolved Chloride (mg/L)	120	84	**8200**

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Legend

Limits of Remedial Excavation (October, 2013)

Marsh Area

Monitoring Well

NOTES:

(1) CCME Water Quality Guidelines for the Protection of Aquatic Life (Freshwater/Marine)

(2) Health Canada (HC) Summary of Drinking Water Screening Values for PFOS and PFOA. 2016.

(3) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil, January 2008, Tier 1, Ecological Soil Contact, Commercial/Industrial, coarse-grained soils, Table 3 Surface soils

(4) Canadian Environmental Quality Guidelines, CCME Soil Quality Guidelines for the Protection of Environmental and Human Health, 2004, Commercial, coarse-grained, surface soil

(5) NWB License (1BR-FTA1217) Remediation Requirements, commercial land use, coarse-grained soils

Metres 7.5 0 7.5 15
1:600

Title: **APRON EXCAVATION AREA - GROUNDWATER EXCEEDANCES**

Project: **2017 ENVIRONMENTAL MONITORING PROGRAM AT CAMBRIDGE BAY AIRPORT APRON LTU**

Client: **PWGSC/TC**

ARCADIS

Date: **NOVEMBER 2017**

FIGURE 5

updated on:30-Nov-17 by dlogan

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APPENDIX A

Laboratory Response to Sampling and Quality Control Protocols

maxxam.ca

MAXXAM ANALYTICS
6740 Campobello Rd
Mississauga, ON L5N 2L8

Office 905 817 5700
Toll Free 800 563 6266
Fax 905 817 5777

July 20, 2017

Maurenia Lynds
Arcadis Canada Inc.
329 Churchill Ave N.
Ottawa, ON K1Z 5B8

RE: Cambridge Bay – Apron LTU Sampling Plans (as provided by Arcadis Canada Inc.)

Dear Maurenia;

We have completed a thorough review of the sampling plan you've provided in support of your project listed above.

While Maxxam cannot provide approval for field sampling plans, we can comment that the indicated planned frequency of field QC samples, as applicable to soil and groundwater related parameters in general, is in line with the frequency of analysis of QC samples (for soil and groundwater analyses) in our laboratories.

Should you require anything further please feel free to contact me at your convenience.

Sincerely,

Maxxam Analytics International Corporation
Susan Bigg, Certified Auditor
Senior QA Manager, Ontario and Manitoba

APPENDIX B

Certificates of Analysis

Your Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Your C.O.C. #: M07081

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/17
Report #: R2429732
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768254
Received: 2017/08/11, 10:03

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS/FID	1	N/A	2017/08/14	AB SOP-00039	CCME CWS/EPA 8260c m
BTEX/F1 in Water by HS GC/MS/FID	1	N/A	2017/08/16	AB SOP-00039	CCME CWS/EPA 8260c m
CCME Hydrocarbons (F2-F4 in water) (1)	1	2017/08/16	2017/08/16	AB SOP-00037	CCME PHC-CWS m

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Silica gel clean up employed.

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

Your Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Your C.O.C. #: M07081

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/17
Report #: R2429732
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768254
Received: 2017/08/11, 10:03

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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

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

Maxxam Job #: B768254
Report Date: 2017/08/17

ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Sampler Initials: EH

AT1 BTEX AND F1-F4 IN WATER (WATER)

Maxxam ID		RS5338		
Sampling Date		2017/08/09 15:15		
COC Number		M07081		
	UNITS	FIELD BLANK	RDL	QC Batch
Ext. Pet. Hydrocarbon				
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	0.10	8724895
F3 (C16-C34 Hydrocarbons)	mg/L	<0.10	0.10	8724895
F4 (C34-C50 Hydrocarbons)	mg/L	<0.20	0.20	8724895
Volatiles				
Benzene	ug/L	<0.40	0.40	8724271
Toluene	ug/L	<0.40	0.40	8724271
Ethylbenzene	ug/L	<0.40	0.40	8724271
m & p-Xylene	ug/L	<0.80	0.80	8724271
o-Xylene	ug/L	<0.40	0.40	8724271
Xylenes (Total)	ug/L	<0.80	0.80	8724271
F1 (C6-C10) - BTEX	ug/L	<100	100	8724271
F1 (C6-C10)	ug/L	<100	100	8724271
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	96	N/A	8724271
4-Bromofluorobenzene (sur.)	%	101	N/A	8724271
D4-1,2-Dichloroethane (sur.)	%	99	N/A	8724271
O-TERPHENYL (sur.)	%	108	N/A	8724895

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B768254
Report Date: 2017/08/17

ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Sampler Initials: EH

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		RS5337		
Sampling Date		2017/08/09		
COC Number		M07081		
	UNITS	TRIP BLANK	RDL	QC Batch
Volatiles				
Benzene	ug/L	<0.40	0.40	8725667
Toluene	ug/L	<0.40	0.40	8725667
Ethylbenzene	ug/L	<0.40	0.40	8725667
m & p-Xylene	ug/L	<0.80	0.80	8725667
o-Xylene	ug/L	<0.40	0.40	8725667
Xylenes (Total)	ug/L	<0.80	0.80	8725667
F1 (C6-C10) - BTEX	ug/L	<100	100	8725667
F1 (C6-C10)	ug/L	<100	100	8725667
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	104	N/A	8725667
4-Bromofluorobenzene (sur.)	%	98	N/A	8725667
D4-1,2-Dichloroethane (sur.)	%	99	N/A	8725667

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B768254
Report Date: 2017/08/17

ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	6.7°C
Package 2	5.3°C

Results relate only to the items tested.

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Maxxam Job #: B768254
Report Date: 2017/08/17

QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8724271	1,4-Difluorobenzene (sur.)	2017/08/13	98	70 - 130	99	70 - 130	104	%		
8724271	4-Bromofluorobenzene (sur.)	2017/08/13	100	70 - 130	100	70 - 130	102	%		
8724271	D4-1,2-Dichloroethane (sur.)	2017/08/13	111	70 - 130	106	70 - 130	102	%		
8724895	O-TERPHENYL (sur.)	2017/08/15	95	60 - 130	103	60 - 130	98	%		
8725667	1,4-Difluorobenzene (sur.)	2017/08/14	98	70 - 130	98	70 - 130	98	%		
8725667	4-Bromofluorobenzene (sur.)	2017/08/14	103	70 - 130	102	70 - 130	101	%		
8725667	D4-1,2-Dichloroethane (sur.)	2017/08/14	101	70 - 130	100	70 - 130	98	%		
8724271	Benzene	2017/08/12	107	70 - 130	108	70 - 130	<0.40	ug/L	NC	30
8724271	Ethylbenzene	2017/08/12	102	70 - 130	108	70 - 130	<0.40	ug/L	NC	30
8724271	F1 (C6-C10) - BTEX	2017/08/12					<100	ug/L	NC	30
8724271	F1 (C6-C10)	2017/08/12	76	70 - 130	90	70 - 130	<100	ug/L	NC	30
8724271	m & p-Xylene	2017/08/12	102	70 - 130	108	70 - 130	<0.80	ug/L	NC	30
8724271	o-Xylene	2017/08/12	98	70 - 130	102	70 - 130	<0.40	ug/L	NC	30
8724271	Toluene	2017/08/12	98	70 - 130	100	70 - 130	<0.40	ug/L	NC	30
8724271	Xylenes (Total)	2017/08/12					<0.80	ug/L	NC	30
8724895	F2 (C10-C16 Hydrocarbons)	2017/08/15	107	60 - 130	117	70 - 130	<0.10	mg/L	NC	30
8724895	F3 (C16-C34 Hydrocarbons)	2017/08/15	101	60 - 130	112	70 - 130	<0.10	mg/L	7.4	30
8724895	F4 (C34-C50 Hydrocarbons)	2017/08/15	96	60 - 130	106	70 - 130	<0.20	mg/L	NC	30
8725667	Benzene	2017/08/14	100	70 - 130	95	70 - 130	<0.40	ug/L	2.2	30
8725667	Ethylbenzene	2017/08/14	105	70 - 130	102	70 - 130	<0.40	ug/L	1.0	30
8725667	F1 (C6-C10) - BTEX	2017/08/14					<100	ug/L	NC	30
8725667	F1 (C6-C10)	2017/08/14	81	70 - 130	112	70 - 130	<100	ug/L	0.49	30
8725667	m & p-Xylene	2017/08/14	106	70 - 130	101	70 - 130	<0.80	ug/L	2.7	30
8725667	o-Xylene	2017/08/14	103	70 - 130	98	70 - 130	<0.40	ug/L	1.5	30
8725667	Toluene	2017/08/14	96	70 - 130	90	70 - 130	<0.40	ug/L	2.6	30

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Maxxam Job #: B768254
Report Date: 2017/08/17

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8725667	Xylenes (Total)	2017/08/14					<0.80	ug/L	1.7	30

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

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

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

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

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

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

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Maxxam Job #: B768254
Report Date: 2017/08/17

ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Sampler Initials: EH

VALIDATION SIGNATURE PAGE

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

Justin Geisel, B.Sc., Organics Supervisor

Poonam Sharma, cCT, Organics Supervisor

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

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Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 017081

Page 1 of 1

Report Information

Company: ARCADIS CANADA INC.
Contact: MAURENIA LYNDS
Phone: 613 721 0555
Email: MAURENIA.LYNDS@ARCADIS.COM
Sampled by: ELLIOTT HOLDEN

Comments

QUOTE: B50993
PROJECT: 102089-002
SITE: CAM BAY FTA LTU AND APRON LTU

Same as CoC

Project/LSD

Special Instructions

PLEASE PUT PROJECT # 102089-002 AND 102089-003 ON COC.

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 & VOC ☐	~~BTEX F1-F2~~ PHC F2-F4	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	HOLD - DO NOT ANALYZE
11	TRIP BLANK		2017		W	2	X										
12	FIELD BLANK		2017/08/09	15:15	W	4	X	X										
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

2.2.2 ice/seal yes

RECEIVED IN YELLOWKNIFE
By: [signature]
2017 -08- 11 16:03

Temp: 6 7 / 7 5 / 7 4 ices yes

Please indicate Filtered, Preserved or Both (F, P, F/P)

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
ELLIOTT HOLDEN	2017/08/10	10:00	Jenna Walter	20170812	1224	B768254

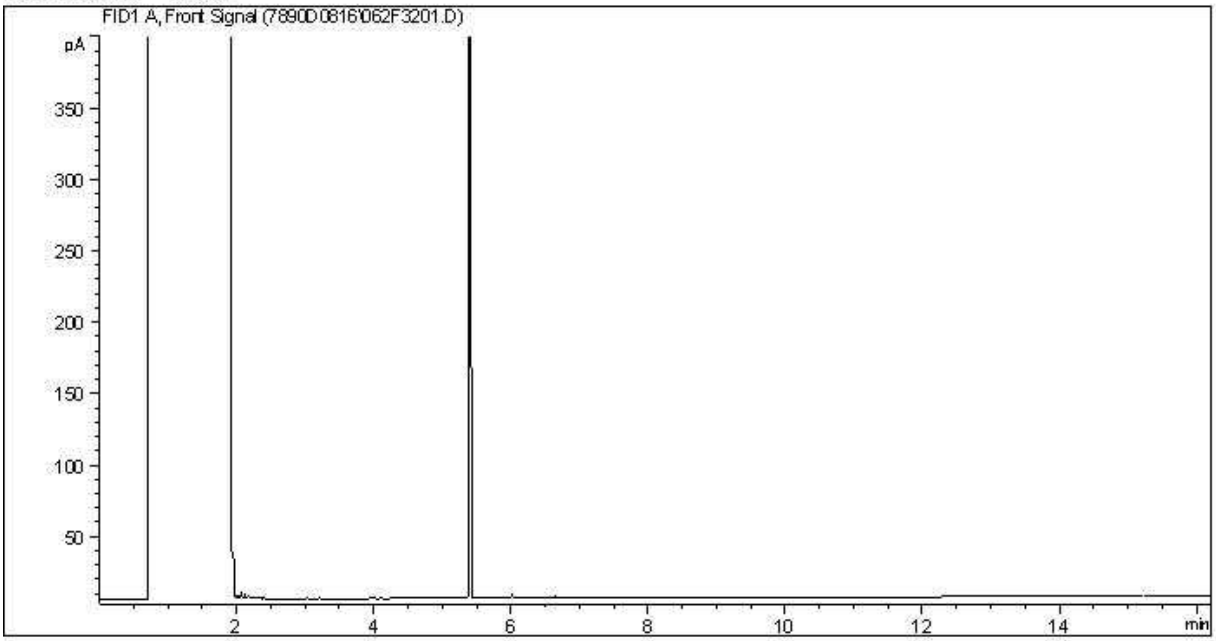
AB FCD-00331/6

Maxxam Job #: B768254
Report Date: 2017/08/17
Maxxam Sample: RS5338

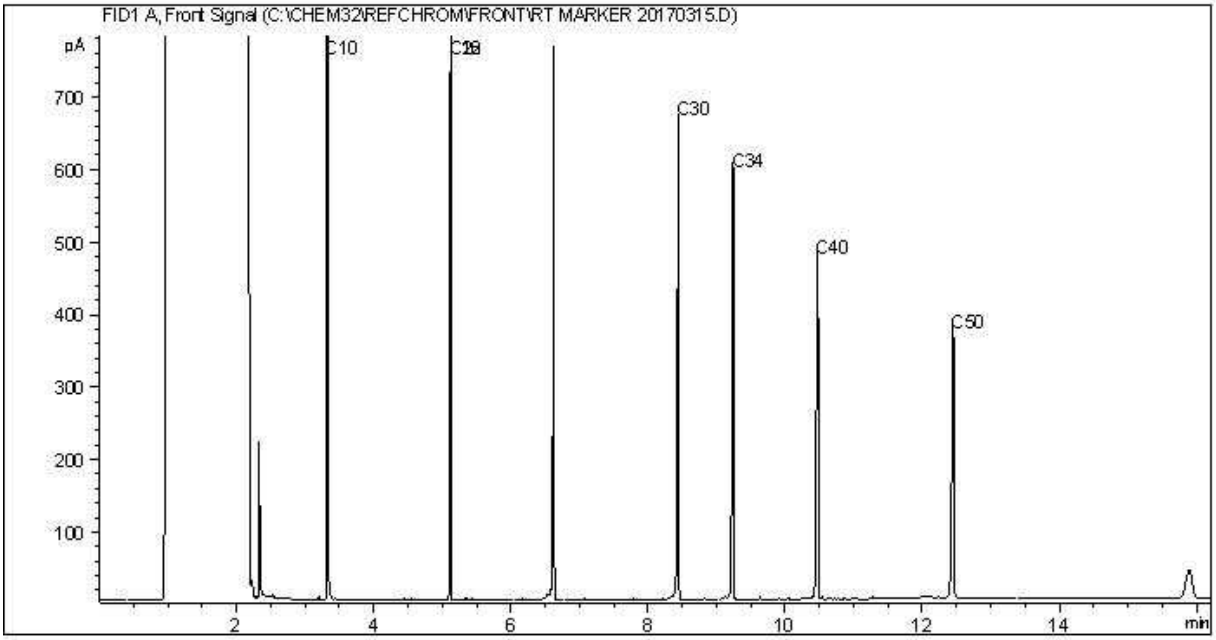
ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Reference: CAMBAY FTA LTU AND APRON LTU
Client ID: FIELD BLANK

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890D



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 102089-003
Site Location: CAM BAY APRON LTU
Your C.O.C. #: M057442

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/09
Report #: R2425789
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B764583
Received: 2017/08/01, 09:48

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	1	N/A	2017/08/03	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	1	N/A	2017/08/04	AB SOP-00039	CCME CWS/EPA 8260C m
Cadmium - low level CCME - Dissolved	1	N/A	2017/08/08	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	1	N/A	2017/08/03	AB SOP-00020	SM 22 4500-Cl E m
Conductivity @25C	1	N/A	2017/08/03	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons (F2-F4 in water) (1)	1	2017/08/03	2017/08/03	AB SOP-00037 / AB SOP-00040	CCME PHC-CWS m
Hardness	1	N/A	2017/08/04	AB WI-00065	Auto Calc
Hardness Total (calculated as CaCO3)	1	N/A	2017/08/05	AB WI-00065	Auto Calc
Elements by ICP - Dissolved (2)	1	N/A	2017/08/04	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	1	2017/08/03	2017/08/09	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Dissolved (2)	1	N/A	2017/08/05	AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	1	N/A	2017/08/03	AB WI-00065	Auto Calc
Sum of cations, anions	1	N/A	2017/08/04	AB WI-00065	Auto Calc
Ammonia-N (Total)	1	N/A	2017/08/03	AB SOP-00007	EPA 350.1 R2.0 m
Nitrate and Nitrite	1	N/A	2017/08/04	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	1	N/A	2017/08/04	AB WI-00065	Auto Calc
Nitrogen (Nitrite - Nitrate) by IC	1	N/A	2017/08/04	AB SOP-00023	SM 22 4110 B m
Oil and Grease (Gravimetric, n-Hexane)	1	2017/08/04	2017/08/04	EENVSOP-00093	SM 22 5520 B m
Benzo[a]pyrene Equivalency (3)	1	N/A	2017/08/08	AB SOP-00003	Auto Calc
PAH in Water by GC/MS	1	2017/08/02	2017/08/05	AB SOP-00037 / AB SOP-00003	EPA 3510C/8270D m
pH @25°C (4)	1	N/A	2017/08/03	AB SOP-00005	SM 22 4500 H+ B m
Phenols (4-AAP)	1	N/A	2017/08/09	EENVSOP-00061	MMCW 154 1996 m
Sulphate by Automated Colourimetry	1	N/A	2017/08/03	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Filt. Residue)	1	2017/08/04	2017/08/08	AB SOP-00065	SM 22 2540 C m
Total Dissolved Solids (Calculated)	1	N/A	2017/08/04	AB WI-00065	Auto Calc
Total Suspended Solids (NFR)	1	2017/08/03	2017/08/04	AB SOP-00061	SM 22 2540 D m

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

Your Project #: 102089-003
Site Location: CAM BAY APRON LTU
Your C.O.C. #: M057442

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/09
Report #: R2425789
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B764583
Received: 2017/08/01, 09:48

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

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

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

(1) Silica gel clean up employed.
(2) Dissolved > Total Imbalance: Whenever applicable, Dissolved >Total for any parameter that falls within method uncertainty for duplicates is likely equivalent. If RPD is >20% samples were reanalyzed and confirmed.
(3) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.
(4) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Maxxam endeavours to analyze samples as soon as possible after receipt.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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

Maxxam Job #: B764583
Report Date: 2017/08/09

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

AT1 BTEX AND F1-F4 IN WATER (WATER)

Maxxam ID		RQ5164	RQ5164		
Sampling Date		2017/07/30 09:00	2017/07/30 09:00		
COC Number		M057442	M057442		
	UNITS	MW13-1	MW13-1 Lab-Dup	RDL	QC Batch
Ext. Pet. Hydrocarbon					
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	N/A	0.10	8711925
F3 (C16-C34 Hydrocarbons)	mg/L	<0.10	N/A	0.10	8711925
F4 (C34-C50 Hydrocarbons)	mg/L	<0.20	N/A	0.20	8711925
Volatiles					
Benzene	ug/L	<0.40	<0.40	0.40	8717279
Toluene	ug/L	<0.40	<0.40	0.40	8717279
Ethylbenzene	ug/L	<0.40	<0.40	0.40	8717279
m & p-Xylene	ug/L	<0.80	<0.80	0.80	8717279
o-Xylene	ug/L	<0.40	<0.40	0.40	8717279
Xylenes (Total)	ug/L	<0.80	<0.80	0.80	8717279
F1 (C6-C10) - BTEX	ug/L	<100	<100	100	8717279
F1 (C6-C10)	ug/L	<100	<100	100	8717279
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	101	102	N/A	8717279
4-Bromofluorobenzene (sur.)	%	102	103	N/A	8717279
D4-1,2-Dichloroethane (sur.)	%	110	108	N/A	8717279
O-TERPHENYL (sur.)	%	96	N/A	N/A	8711925

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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

Maxxam Job #: B764583
Report Date: 2017/08/09

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		RQ5164		
Sampling Date		2017/07/30 09:00		
COC Number		M057442		
	UNITS	MW13-1	RDL	QC Batch
Calculated Parameters				
Anion Sum	meq/L	52	N/A	8713886
Cation Sum	meq/L	56	N/A	8713886
Hardness (CaCO3)	mg/L	1400	0.50	8713884
Ion Balance (% Difference)	%	3.3	N/A	8713885
Dissolved Nitrate (NO3)	mg/L	0.25	0.044	8714049
Nitrate plus Nitrite (N)	mg/L	0.057	0.014	8714050
Dissolved Nitrite (NO2)	mg/L	<0.033	0.033	8714049
Calculated Total Dissolved Solids	mg/L	3300	10	8713889
Misc. Inorganics				
Conductivity	uS/cm	4500	1.0	8715229
pH	pH	7.52	N/A	8715217
Low Level Elements				
Dissolved Cadmium (Cd)	ug/L	<0.020	0.020	8714267
Anions				
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.50	8715225
Alkalinity (Total as CaCO3)	mg/L	500	0.50	8715225
Bicarbonate (HCO3)	mg/L	610	0.50	8715225
Carbonate (CO3)	mg/L	<0.50	0.50	8715225
Hydroxide (OH)	mg/L	<0.50	0.50	8715225
Dissolved Sulphate (SO4)	mg/L	1400 (1)	10	8715606
Dissolved Chloride (Cl)	mg/L	470 (1)	5.0	8715576
Nutrients				
Dissolved Nitrite (N)	mg/L	<0.010	0.010	8714779
Dissolved Nitrate (N)	mg/L	0.057	0.010	8714779
Elements				
Dissolved Aluminum (Al)	mg/L	0.0062	0.0030	8718222
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	8718222
Dissolved Arsenic (As)	mg/L	0.0051	0.00020	8718222
Dissolved Barium (Ba)	mg/L	0.029	0.010	8716686

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B764583
Report Date: 2017/08/09

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		RQ5164		
Sampling Date		2017/07/30 09:00		
COC Number		M057442		
	UNITS	MW13-1	RDL	QC Batch
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	8718222
Dissolved Boron (B)	mg/L	0.70	0.020	8716686
Dissolved Calcium (Ca)	mg/L	250	0.30	8716686
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	8718222
Dissolved Cobalt (Co)	mg/L	0.0088	0.00030	8718222
Dissolved Copper (Cu)	mg/L	0.00094	0.00020	8718222
Dissolved Iron (Fe)	mg/L	5.8	0.060	8716686
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	8718222
Dissolved Lithium (Li)	mg/L	0.064	0.020	8716686
Dissolved Magnesium (Mg)	mg/L	190	0.20	8716686
Dissolved Manganese (Mn)	mg/L	0.82	0.0040	8716686
Dissolved Molybdenum (Mo)	mg/L	0.0038	0.00020	8718222
Dissolved Nickel (Ni)	mg/L	0.0095	0.00050	8718222
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	8716686
Dissolved Potassium (K)	mg/L	53	0.30	8716686
Dissolved Selenium (Se)	mg/L	0.00053	0.00020	8718222
Dissolved Silicon (Si)	mg/L	7.0	0.10	8716686
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	8718222
Dissolved Sodium (Na)	mg/L	600 (1)	5.0	8716686
Dissolved Strontium (Sr)	mg/L	0.61	0.020	8716686
Dissolved Sulphur (S)	mg/L	450	0.20	8716686
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	8718222
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	8718222
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	8718222
Dissolved Uranium (U)	mg/L	0.014	0.00010	8718222
Dissolved Vanadium (V)	mg/L	0.0013	0.0010	8718222
Dissolved Zinc (Zn)	mg/L	<0.0030	0.0030	8718222

RDL = Reportable Detection Limit

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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Maxxam Job #: B764583
Report Date: 2017/08/09

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		RQ5164		
Sampling Date		2017/07/30 09:00		
COC Number		M057442		
	UNITS	MW13-1	RDL	QC Batch
Calculated Parameters				
Total Hardness (CaCO3)	mg/L	1460	0.50	8714574
Misc. Inorganics				
Total Dissolved Solids	mg/L	3400 (1)	25	8716525
Total Suspended Solids	mg/L	31	1.0	8715288
Nutrients				
Total Ammonia (N)	mg/L	1.9	0.015	8715966
Misc. Organics				
Extractable (n-Hex.) Oil and grease	mg/L	2.0	2.0	8716875
Phenols	mg/L	0.012	0.0020	8720589

RDL = Reportable Detection Limit
(1) Detection limit raised based on sample volume used for analysis.

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SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		RQ5164		
Sampling Date		2017/07/30 09:00		
COC Number		M057442		
	UNITS	MW13-1	RDL	QC Batch
Polycyclic Aromatics				
Benzo[a]pyrene equivalency	ug/L	<0.010	0.010	8714517
Acenaphthene	ug/L	<0.10	0.10	8709927
Acenaphthylene	ug/L	<0.10	0.10	8709927
Acridine	ug/L	<0.050	0.050	8709927
Anthracene	ug/L	<0.010	0.010	8709927
Benzo(a)anthracene	ug/L	<0.0085	0.0085	8709927
Benzo(b&j)fluoranthene	ug/L	<0.0085	0.0085	8709927
Benzo(k)fluoranthene	ug/L	<0.0085	0.0085	8709927
Benzo(g,h,i)perylene	ug/L	<0.0085	0.0085	8709927
Benzo(c)phenanthrene	ug/L	<0.050	0.050	8709927
Benzo(a)pyrene	ug/L	<0.0075	0.0075	8709927
Benzo[e]pyrene	ug/L	<0.050	0.050	8709927
Chrysene	ug/L	<0.0085	0.0085	8709927
Dibenz(a,h)anthracene	ug/L	<0.0075	0.0075	8709927
Fluoranthene	ug/L	<0.010	0.010	8709927
Fluorene	ug/L	<0.050	0.050	8709927
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	0.0085	8709927
2-Methylnaphthalene	ug/L	<0.10	0.10	8709927
Naphthalene	ug/L	<0.10	0.10	8709927
Phenanthrene	ug/L	<0.050	0.050	8709927
Perylene	ug/L	<0.050	0.050	8709927
Pyrene	ug/L	<0.020	0.020	8709927
Quinoline	ug/L	<0.20	0.20	8709927
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	107	N/A	8709927
D8-ACENAPHTHYLENE (sur.)	%	101	N/A	8709927
D8-NAPHTHALENE (sur.)	%	90	N/A	8709927
TERPHENYL-D14 (sur.)	%	87	N/A	8709927

RDL = Reportable Detection Limit
N/A = Not Applicable

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		RQ5164		
Sampling Date		2017/07/30 09:00		
COC Number		M057442		
	UNITS	MW13-1	RDL	QC Batch
Elements				
Total Calcium (Ca)	mg/L	280	0.30	8715238
Total Magnesium (Mg)	mg/L	190	0.20	8715238
Total Potassium (K)	mg/L	54	0.30	8715238
Total Sodium (Na)	mg/L	580 (1)	5.0	8715238

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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GENERAL COMMENTS

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

Package 1	1.3°C
Package 2	0.7°C

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8709927	D10-ANTHRACENE (sur.)	2017/07/29	98	50 - 130	104	50 - 130	105	%		
8709927	D8-ACENAPHTHYLENE (sur.)	2017/07/29	93	50 - 130	96	50 - 130	98	%		
8709927	D8-NAPHTHALENE (sur.)	2017/07/29	91	50 - 130	94	50 - 130	96	%		
8709927	TERPHENYL-D14 (sur.)	2017/07/29	80	50 - 130	123	50 - 130	122	%		
8711925	O-TERPHENYL (sur.)	2017/08/01	96	60 - 130	93	60 - 130	103	%		
8717279	1,4-Difluorobenzene (sur.)	2017/08/04	97	70 - 130	97	70 - 130	101	%		
8717279	4-Bromofluorobenzene (sur.)	2017/08/04	103	70 - 130	101	70 - 130	103	%		
8717279	D4-1,2-Dichloroethane (sur.)	2017/08/04	108	70 - 130	104	70 - 130	108	%		
8709927	2-Methylnaphthalene	2017/07/29	87	50 - 130	91	50 - 130	<0.10	ug/L	NC	30
8709927	Acenaphthene	2017/07/29	85	50 - 130	88	50 - 130	<0.10	ug/L	NC	30
8709927	Acenaphthylene	2017/07/29	87	50 - 130	90	50 - 130	<0.10	ug/L	NC	30
8709927	Acridine	2017/07/29	96	50 - 130	97	50 - 130	<0.050	ug/L	NC	30
8709927	Anthracene	2017/07/29	83	50 - 130	93	50 - 130	<0.010	ug/L	NC	30
8709927	Benzo(a)anthracene	2017/07/29	81	50 - 130	120	50 - 130	<0.0085	ug/L	NC	30
8709927	Benzo(a)pyrene	2017/07/29	63	50 - 130	111	50 - 130	<0.0075	ug/L	NC	30
8709927	Benzo(b&j)fluoranthene	2017/07/29	66	50 - 130	121	50 - 130	<0.0085	ug/L	NC	30
8709927	Benzo(c)phenanthrene	2017/07/29	100	50 - 130	118	50 - 130	<0.050	ug/L	NC	30
8709927	Benzo(g,h,i)perylene	2017/07/29	62	50 - 130	129	50 - 130	<0.0085	ug/L	NC	30
8709927	Benzo(k)fluoranthene	2017/07/29	64	50 - 130	114	50 - 130	<0.0085	ug/L	NC	30
8709927	Benzo[e]pyrene	2017/07/29	67	50 - 130	123	50 - 130	<0.050	ug/L	NC	30
8709927	Chrysene	2017/07/29	70	50 - 130	113	50 - 130	<0.0085	ug/L	NC	30
8709927	Dibenz(a,h)anthracene	2017/07/29	59	50 - 130	128	50 - 130	<0.0075	ug/L	NC	30
8709927	Fluoranthene	2017/07/29	89	50 - 130	100	50 - 130	<0.010	ug/L	NC	30
8709927	Fluorene	2017/07/29	88	50 - 130	89	50 - 130	<0.050	ug/L	NC	30
8709927	Indeno(1,2,3-cd)pyrene	2017/07/29	59	50 - 130	129	50 - 130	<0.0085	ug/L	NC	30
8709927	Naphthalene	2017/07/29	80	50 - 130	83	50 - 130	<0.10	ug/L	NC	30
8709927	Perylene	2017/07/29	58	50 - 130	117	50 - 130	<0.050	ug/L	NC	30
8709927	Phenanthrene	2017/07/29	86	50 - 130	91	50 - 130	<0.050	ug/L	NC	30
8709927	Pyrene	2017/07/29	86	50 - 130	99	50 - 130	<0.020	ug/L	NC	30
8709927	Quinoline	2017/07/29	102	50 - 130	108	50 - 130	<0.20	ug/L	NC	30
8711925	F2 (C10-C16 Hydrocarbons)	2017/08/01	123	60 - 130	109	70 - 130	<0.10	mg/L	NC	30

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QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8711925	F3 (C16-C34 Hydrocarbons)	2017/08/01	102	60 - 130	103	70 - 130	<0.10	mg/L	72 (1)	30
8711925	F4 (C34-C50 Hydrocarbons)	2017/08/01	100	60 - 130	99	70 - 130	<0.20	mg/L	NC	30
8714779	Dissolved Nitrate (N)	2017/08/03	103	80 - 120	103	80 - 120	<0.010	mg/L	0.67	20
8714779	Dissolved Nitrite (N)	2017/08/03	103	80 - 120	101	80 - 120	<0.010	mg/L	NC	20
8715217	pH	2017/08/03			100	97 - 103			0.66	N/A
8715225	Alkalinity (PP as CaCO3)	2017/08/03					<0.50	mg/L	NC	20
8715225	Alkalinity (Total as CaCO3)	2017/08/03			103	80 - 120	<0.50	mg/L	8.5	20
8715225	Bicarbonate (HCO3)	2017/08/03					<0.50	mg/L	8.5	20
8715225	Carbonate (CO3)	2017/08/03					<0.50	mg/L	NC	20
8715225	Hydroxide (OH)	2017/08/03					<0.50	mg/L	NC	20
8715229	Conductivity	2017/08/03			100	90 - 110	<1.0	uS/cm	1.3	10
8715238	Total Calcium (Ca)	2017/08/04	98	80 - 120	101	80 - 120	<0.30	mg/L	1.9	20
8715238	Total Magnesium (Mg)	2017/08/04	101	80 - 120	103	80 - 120	<0.20	mg/L	1.4	20
8715238	Total Potassium (K)	2017/08/04	103	80 - 120	104	80 - 120	<0.30	mg/L	2.7	20
8715238	Total Sodium (Na)	2017/08/04	101	80 - 120	103	80 - 120	<0.50	mg/L	1.2	20
8715288	Total Suspended Solids	2017/08/04	107	80 - 120	109	80 - 120	<1.0	mg/L	0	20
8715576	Dissolved Chloride (Cl)	2017/08/03	NC	80 - 120	101	80 - 120	<1.0	mg/L	2.5	20
8715606	Dissolved Sulphate (SO4)	2017/08/03	NC	80 - 120	103	80 - 120	<1.0	mg/L	0.24	20
8715966	Total Ammonia (N)	2017/08/03	100	80 - 120	102	80 - 120	<0.015	mg/L	3.3	20
8716525	Total Dissolved Solids	2017/08/08	98	80 - 120	100	80 - 120	<10	mg/L	1.1	20
8716686	Dissolved Barium (Ba)	2017/08/04	96	80 - 120	99	80 - 120	<0.010	mg/L	0.45	20
8716686	Dissolved Boron (B)	2017/08/04	100	80 - 120	102	80 - 120	<0.020	mg/L	0.75	20
8716686	Dissolved Calcium (Ca)	2017/08/04	NC	80 - 120	100	80 - 120	<0.30	mg/L	0.26	20
8716686	Dissolved Iron (Fe)	2017/08/04	101	80 - 120	105	80 - 120	<0.060	mg/L	NC	20
8716686	Dissolved Lithium (Li)	2017/08/04	98	80 - 120	100	80 - 120	<0.020	mg/L	1.3	20
8716686	Dissolved Magnesium (Mg)	2017/08/04	96	80 - 120	103	80 - 120	<0.20	mg/L	0.28	20
8716686	Dissolved Manganese (Mn)	2017/08/04	93	80 - 120	99	80 - 120	<0.0040	mg/L	0.17	20
8716686	Dissolved Phosphorus (P)	2017/08/04	101	80 - 120	97	80 - 120	<0.10	mg/L	NC	20
8716686	Dissolved Potassium (K)	2017/08/04	101	80 - 120	104	80 - 120	<0.30	mg/L	1.8	20
8716686	Dissolved Silicon (Si)	2017/08/04	100	80 - 120	106	80 - 120	<0.10	mg/L	0.20	20
8716686	Dissolved Sodium (Na)	2017/08/04	98	80 - 120	103	80 - 120	<0.50	mg/L	0.25	20

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QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8716686	Dissolved Strontium (Sr)	2017/08/04	92	80 - 120	98	80 - 120	<0.020	mg/L	0.32	20
8716686	Dissolved Sulphur (S)	2017/08/04					<0.20	mg/L	0.63	20
8716875	Extractable (n-Hex.) Oil and grease	2017/08/04			106	70 - 130	<2.0	mg/L		
8717279	Benzene	2017/08/04	102	70 - 130	98	70 - 130	<0.40	ug/L	NC	30
8717279	Ethylbenzene	2017/08/04	101	70 - 130	97	70 - 130	<0.40	ug/L	NC	30
8717279	F1 (C6-C10) - BTEX	2017/08/04					<100	ug/L	NC	30
8717279	F1 (C6-C10)	2017/08/04	74	70 - 130	102	70 - 130	<100	ug/L	NC	30
8717279	m & p-Xylene	2017/08/04	100	70 - 130	97	70 - 130	<0.80	ug/L	NC	30
8717279	o-Xylene	2017/08/04	100	70 - 130	96	70 - 130	<0.40	ug/L	NC	30
8717279	Toluene	2017/08/04	94	70 - 130	90	70 - 130	<0.40	ug/L	NC	30
8717279	Xylenes (Total)	2017/08/04					<0.80	ug/L	NC	30
8718222	Dissolved Aluminum (Al)	2017/08/05	102	80 - 120	100	80 - 120	<0.0030	mg/L	NC	20
8718222	Dissolved Antimony (Sb)	2017/08/05	100	80 - 120	96	80 - 120	<0.00060	mg/L	NC	20
8718222	Dissolved Arsenic (As)	2017/08/05	97	80 - 120	102	80 - 120	<0.00020	mg/L	4.1	20
8718222	Dissolved Beryllium (Be)	2017/08/05	99	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20
8718222	Dissolved Chromium (Cr)	2017/08/05	97	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20
8718222	Dissolved Cobalt (Co)	2017/08/05	95	80 - 120	101	80 - 120	<0.00030	mg/L	NC	20
8718222	Dissolved Copper (Cu)	2017/08/05	92	80 - 120	100	80 - 120	<0.00020	mg/L	NC	20
8718222	Dissolved Lead (Pb)	2017/08/05	91	80 - 120	97	80 - 120	<0.00020	mg/L	NC	20
8718222	Dissolved Molybdenum (Mo)	2017/08/05	103	80 - 120	100	80 - 120	<0.00020	mg/L	4.3	20
8718222	Dissolved Nickel (Ni)	2017/08/05	95	80 - 120	101	80 - 120	<0.00050	mg/L	NC	20
8718222	Dissolved Selenium (Se)	2017/08/05	99	80 - 120	100	80 - 120	<0.00020	mg/L	0.48	20
8718222	Dissolved Silver (Ag)	2017/08/05	99	80 - 120	101	80 - 120	<0.00010	mg/L	NC	20
8718222	Dissolved Thallium (Tl)	2017/08/05	91	80 - 120	99	80 - 120	<0.00020	mg/L	NC	20
8718222	Dissolved Tin (Sn)	2017/08/05	98	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20
8718222	Dissolved Titanium (Ti)	2017/08/05	98	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20
8718222	Dissolved Uranium (U)	2017/08/05	98	80 - 120	99	80 - 120	<0.00010	mg/L	14	20
8718222	Dissolved Vanadium (V)	2017/08/05	99	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20
8718222	Dissolved Zinc (Zn)	2017/08/05	98	80 - 120	102	80 - 120	<0.0030	mg/L	NC	20

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QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8720589	Phenols	2017/08/09	103	80 - 120	94	80 - 120	<0.0020	mg/L	NC	20

N/A = Not Applicable

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

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

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

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

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

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

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

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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ARCADIS Canada
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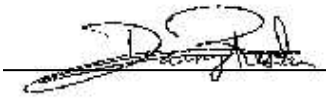
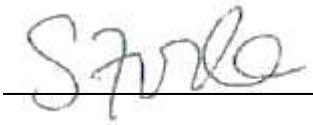
VALIDATION SIGNATURE PAGE

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



Daniel Reslan, cCT, QP, Organics Supervisor

Justin Geisel, B.Sc., Organics Supervisor



Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

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

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CHAIN OF CUSTODY RECORD

M 057442

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Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: #28344 PRIVATE CLIENTS	Company: ARCADIS CANADA INC.	Quotation #: B50993	☒ 5 - 7 Days Regular (Most analyses)
Contact Name: NATALIE ROBINSON	Contact Name: MAURENIA LYNDS	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 1650, 635-8th AVE. SW CALGARY, AB T2P 3M3	Address: 329 CHURCHILL AVE N OTTAWA ON K1Z 5B8	Project #: 102089-003	Rush TAT (Surcharges will be applied): ☐ Same Day ☐ 2 Days ☐ 1 Day ☐ 3-4 Days
Phone: 403-292-6882	Phone: 613 721 0555	Site Location: CAM BAT APRON LTU	
Email: NATALIE.ROBINSON@	Email: MAURENIA.LYNDS@	Site #:	Date Required:
Copies: PWGSC-TPSGC.GC.CA	Copies: ARCADIS.COM	Sampled By: E HOLDEN	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID	Temp
Seal Present	✓			
Seal Intact	✓			
Cooling Media	✓			1 1 1
Seal Present	✓			
Seal Intact	✓			
Cooling Media	✓			7 0 1
Seal Present				
Seal Intact				
Cooling Media				

Depot Reception
RECEIVED IN YELLOWKNIFE
By: ALYSIA HUEBERT
2017 -08- 01 09:48
ice/seal yes all
0 2 2
Temp: 0 1 1 1

Analysis Requested

Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2/F4	BTEX F1-F4	Routine Water (1)	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	~~Salinity~~ 4 Nitrate-Nitrite	~~Sieve (75 micron)~~ Oil & Grease	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	Ammonia-Nitrogen	TOTAL PHENOLS	Ca, Mg, Na, K	Chloride/Sulphate	Dissolved Metals	PAHs	TSS AND TDS			HOLD - DO NOT ANALYZE
1 MW13-1		2017/07/30	9:00	GW	11		X		X			X	X			X	X	X	X	X	X	X			
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
Please indicate Filtered, Preserved or Both (F, P, F/P)																			F/P						

Regulatory Criteria

☐ AT1
☐ CCME
☐ Drinking Water
☐ D50 (Drilling Waste)
☐ Saskatchewan
☐ Other:

Special Instructions

(1) pH, conductivity total hardness, total Alkalinity

(2) TRACE SEDIMENT IN SAMPLE

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
ELLIOTT HOLDEN	2017/07/31	10:00	Danielle Boisvert	2017/08/02	09:52	B764583

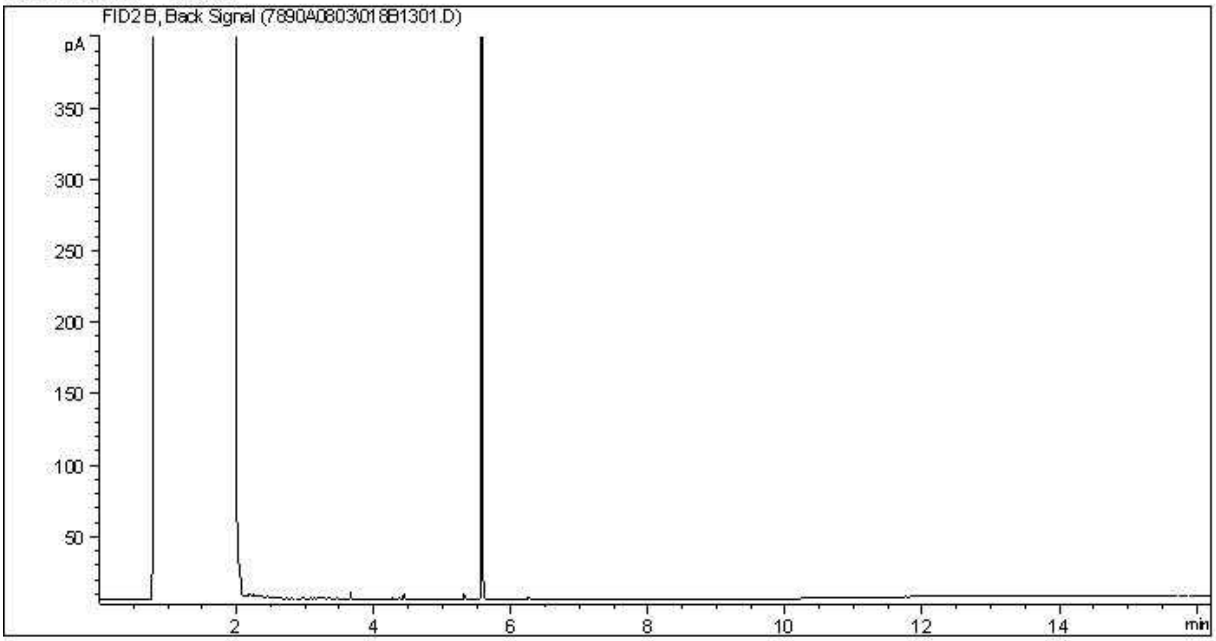
AB FCD-00331/7

Maxxam Job #: B764583
Report Date: 2017/08/09
Maxxam Sample: RQ5164

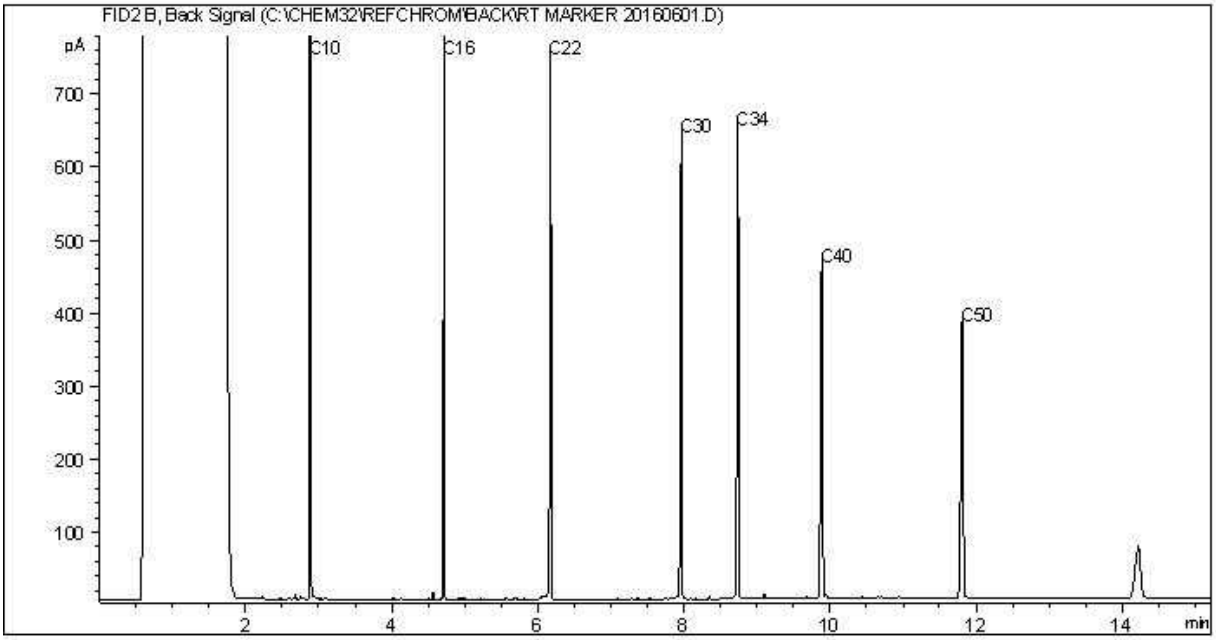
ARCADIS Canada
Client Project #: 102089-003
Site Reference: CAM BAY APRON LTU
Client ID: MW13-1

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890A



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 102089-003
Site Location: CAM BAY APRON LTU
Your C.O.C. #: M017073

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/21
Report #: R2431620
Version: 2 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768021
Received: 2017/08/10, 10:00

Sample Matrix: GROUND WATER
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	3	N/A	2017/08/13	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	3	N/A	2017/08/14	AB SOP-00039	CCME CWS/EPA 8260c m
Cadmium - low level CCME - Dissolved	3	N/A	2017/08/14	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	3	N/A	2017/08/14	AB SOP-00020	SM 22 4500-Cl-E m
Conductivity @25C	3	N/A	2017/08/13	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons (F2-F4 in water) (1)	2	2017/08/15	2017/08/15	AB SOP-00037	CCME PHC-CWS m
CCME Hydrocarbons (F2-F4 in water) (1)	1	2017/08/15	2017/08/16	AB SOP-00037	CCME PHC-CWS m
Hardness	3	N/A	2017/08/17	AB WI-00065	Auto Calc
Hardness Total (calculated as CaCO3)	3	N/A	2017/08/18	AB WI-00065	Auto Calc
Elements by ICP - Dissolved (2)	3	N/A	2017/08/17	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	1	2017/08/18	2017/08/18	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	2	2017/08/20	2017/08/20	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Dissolved (2)	3	N/A	2017/08/13	AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	3	N/A	2017/08/13	AB WI-00065	Auto Calc
Sum of cations, anions	3	N/A	2017/08/17	AB WI-00065	Auto Calc
Ammonia-N (Total)	3	N/A	2017/08/15	AB SOP-00007	EPA 350.1 R2.0 m
Nitrate and Nitrite	3	N/A	2017/08/13	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	3	N/A	2017/08/13	AB WI-00065	Auto Calc
Nitrogen (Nitrite - Nitrate) by IC	3	N/A	2017/08/12	AB SOP-00023	SM 22 4110 B m
Oil and Grease (Gravimetric, n-Hexane)	3	2017/08/14	2017/08/14	EENVSOP-00093	SM 22 5520 B m
Benzo[a]pyrene Equivalency (3)	3	N/A	2017/08/17	AB SOP-00003	Auto Calc
PAH in Water by GC/MS	3	2017/08/13	2017/08/16	AB SOP-00037 / AB SOP-00003	EPA 3510C/8270D m
pH @25°C (4)	3	N/A	2017/08/13	AB SOP-00005	SM 22 4500 H+ B m
Phenols (4-AAP)	3	N/A	2017/08/17	EENVSOP-00061	MMCW 154 1996 m
Sulphate by Automated Colourimetry	3	N/A	2017/08/14	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Filt. Residue)	2	2017/08/13	2017/08/13	AB SOP-00065	SM 22 2540 C m
Total Dissolved Solids (Filt. Residue)	1	2017/08/18	2017/08/21	AB SOP-00065	SM 22 2540 C m

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

Your Project #: 102089-003
Site Location: CAM BAY APRON LTU
Your C.O.C. #: M017073

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/21
Report #: R2431620
Version: 2 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768021
Received: 2017/08/10, 10:00

Sample Matrix: GROUND WATER
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Dissolved Solids (Calculated)	3	N/A	2017/08/17	AB WI-00065	Auto Calc
Total Suspended Solids (NFR)	3	2017/08/13	2017/08/13	AB SOP-00061	SM 22 2540 D m

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Silica gel clean up employed.
(2) Dissolved > Total Imbalance: Whenever applicable, Dissolved >Total for any parameter that falls within method uncertainty for duplicates is likely equivalent. If RPD is >20% samples were reanalyzed and confirmed.
(3) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.
(4) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Maxxam endeavours to analyze samples as soon as possible after receipt.

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Your Project #: 102089-003
Site Location: CAM BAY APRON LTU
Your C.O.C. #: M017073

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
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CANADA K1Z 5B8

Report Date: 2017/08/21
Report #: R2431620
Version: 2 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768021
Received: 2017/08/10, 10:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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

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

Maxxam Job #: B768021
Report Date: 2017/08/21

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

AT1 BTEX AND F1-F4 IN WATER (GROUND WATER)

Maxxam ID		RS3939	RS3939	RS3940	RS3941		
Sampling Date		2017/08/06 10:00	2017/08/06 10:00	2017/08/06 09:00	2017/08/06		
COC Number		M017073	M017073	M017073	M017073		
	UNITS	MW13-7	MW13-7 Lab-Dup	MW13-9	APRON DUP01	RDL	QC Batch
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	8724895
F3 (C16-C34 Hydrocarbons)	mg/L	0.11	<0.10	<0.10	0.11	0.10	8724895
F4 (C34-C50 Hydrocarbons)	mg/L	<0.20	<0.20	<0.20	<0.20	0.20	8724895
Volatiles							
Benzene	ug/L	<0.40	N/A	<0.40	<0.40	0.40	8724922
Toluene	ug/L	<0.40	N/A	<0.40	<0.40	0.40	8724922
Ethylbenzene	ug/L	<0.40	N/A	<0.40	<0.40	0.40	8724922
m & p-Xylene	ug/L	<0.80	N/A	<0.80	<0.80	0.80	8724922
o-Xylene	ug/L	<0.40	N/A	<0.40	<0.40	0.40	8724922
Xylenes (Total)	ug/L	<0.80	N/A	<0.80	<0.80	0.80	8724922
F1 (C6-C10) - BTEX	ug/L	<100	N/A	<100	<100	100	8724922
F1 (C6-C10)	ug/L	<100	N/A	<100	<100	100	8724922
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	102	N/A	102	101	N/A	8724922
4-Bromofluorobenzene (sur.)	%	102	N/A	102	101	N/A	8724922
D4-1,2-Dichloroethane (sur.)	%	109	N/A	109	113	N/A	8724922
O-TERPHENYL (sur.)	%	117	102	98	114	N/A	8724895

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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

Maxxam Job #: B768021
Report Date: 2017/08/21

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

ROUTINE WATER & DISS. REGULATED METALS (GROUND WATER)

Maxxam ID		RS3939	RS3939		RS3940		RS3941		
Sampling Date		2017/08/06 10:00	2017/08/06 10:00		2017/08/06 09:00		2017/08/06		
COC Number		M017073	M017073		M017073		M017073		
	UNITS	MW13-7	MW13-7 Lab-Dup	RDL	MW13-9	RDL	APRON DUP01	RDL	QC Batch
Calculated Parameters									
Anion Sum	meq/L	68	N/A	N/A	300	N/A	68	N/A	8724236
Cation Sum	meq/L	63	N/A	N/A	290	N/A	63	N/A	8724236
Hardness (CaCO3)	mg/L	1800	N/A	0.50	5500	0.50	1800	0.50	8724234
Ion Balance (% Difference)	%	3.6	N/A	N/A	2.2	N/A	4.1	N/A	8724235
Dissolved Nitrate (NO3)	mg/L	0.44	N/A	0.044	<0.44	0.44	0.43	0.044	8724435
Nitrate plus Nitrite (N)	mg/L	0.13	N/A	0.014	<0.14	0.14	0.12	0.014	8724436
Dissolved Nitrite (NO2)	mg/L	0.095	N/A	0.033	<0.33	0.33	0.076	0.033	8724435
Calculated Total Dissolved Solids	mg/L	3700	N/A	10	17000	10	3700	10	8724238
Misc. Inorganics									
Conductivity	uS/cm	6100	6100	1.0	27000	1.0	6100	1.0	8724961
pH	pH	7.73	7.75	N/A	7.27	N/A	7.81	N/A	8724959
Low Level Elements									
Dissolved Cadmium (Cd)	ug/L	0.21	N/A	0.020	0.039	0.020	0.22	0.020	8724430
Anions									
Alkalinity (PP as CaCO3)	mg/L	<0.50	<0.50	0.50	<0.50	0.50	<0.50	0.50	8724960
Alkalinity (Total as CaCO3)	mg/L	930	920	0.50	650	0.50	890	0.50	8724960
Bicarbonate (HCO3)	mg/L	1100	1100	0.50	790	0.50	1100	0.50	8724960
Carbonate (CO3)	mg/L	<0.50	<0.50	0.50	<0.50	0.50	<0.50	0.50	8724960
Hydroxide (OH)	mg/L	<0.50	<0.50	0.50	<0.50	0.50	<0.50	0.50	8724960
Dissolved Sulphate (SO4)	mg/L	860 (1)	N/A	5.0	2700 (1)	20	860 (1)	5.0	8724981
Dissolved Chloride (Cl)	mg/L	1100 (1)	N/A	10	8200 (1)	50	1100 (1)	10	8724975
Nutrients									
Dissolved Nitrite (N)	mg/L	0.029	N/A	0.010	<0.10 (2)	0.10	0.023	0.010	8724652
Dissolved Nitrate (N)	mg/L	0.10	N/A	0.010	<0.10 (2)	0.10	0.096	0.010	8724652
Elements									
Dissolved Aluminum (Al)	mg/L	0.015	N/A	0.0030	0.0031	0.0030	0.014	0.0030	8724712
Dissolved Antimony (Sb)	mg/L	<0.00060	N/A	0.00060	<0.00060	0.00060	<0.00060	0.00060	8724712
Dissolved Arsenic (As)	mg/L	0.0014	N/A	0.00020	0.0025	0.00020	0.0015	0.00020	8724712

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to matrix interference.

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

Maxxam Job #: B768021
Report Date: 2017/08/21

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

ROUTINE WATER & DISS. REGULATED METALS (GROUND WATER)

Maxxam ID		RS3939	RS3939		RS3940		RS3941		
Sampling Date		2017/08/06 10:00	2017/08/06 10:00		2017/08/06 09:00		2017/08/06		
COC Number		M017073	M017073		M017073		M017073		
	UNITS	MW13-7	MW13-7 Lab-Dup	RDL	MW13-9	RDL	APRON DUP01	RDL	QC Batch
Dissolved Barium (Ba)	mg/L	0.036	N/A	0.010	<0.10	0.10	0.036	0.010	8729320
Dissolved Beryllium (Be)	mg/L	<0.0010	N/A	0.0010	<0.0010	0.0010	<0.0010	0.0010	8724712
Dissolved Boron (B)	mg/L	0.38	N/A	0.020	2.4	0.20	0.38	0.020	8729320
Dissolved Calcium (Ca)	mg/L	330	N/A	0.30	460	3.0	330	0.30	8729320
Dissolved Chromium (Cr)	mg/L	<0.0010	N/A	0.0010	<0.0010	0.0010	<0.0010	0.0010	8724712
Dissolved Cobalt (Co)	mg/L	0.015	N/A	0.00030	0.018	0.00030	0.014	0.00030	8724712
Dissolved Copper (Cu)	mg/L	0.010	N/A	0.00020	0.00035	0.00020	0.011	0.00020	8724712
Dissolved Iron (Fe)	mg/L	1.5	N/A	0.060	7.4	0.60	1.4	0.060	8729320
Dissolved Lead (Pb)	mg/L	0.00027	N/A	0.00020	<0.00020	0.00020	0.00052	0.00020	8724712
Dissolved Lithium (Li)	mg/L	0.058	N/A	0.020	0.23	0.20	0.058	0.020	8729320
Dissolved Magnesium (Mg)	mg/L	240	N/A	0.20	1100	2.0	240	0.20	8729320
Dissolved Manganese (Mn)	mg/L	1.7	N/A	0.0040	0.48	0.040	1.7	0.0040	8729320
Dissolved Molybdenum (Mo)	mg/L	0.0069	N/A	0.00020	0.0029	0.00020	0.0068	0.00020	8724712
Dissolved Nickel (Ni)	mg/L	0.016	N/A	0.00050	0.028	0.00050	0.016	0.00050	8724712
Dissolved Phosphorus (P)	mg/L	9.9	N/A	0.10	<1.0	1.0	11	0.10	8729320
Dissolved Potassium (K)	mg/L	27	N/A	0.30	150	3.0	27	0.30	8729320
Dissolved Selenium (Se)	mg/L	0.00042	N/A	0.00020	0.00074	0.00020	0.00042	0.00020	8724712
Dissolved Silicon (Si)	mg/L	6.2	N/A	0.10	6.3	1.0	6.1	0.10	8729320
Dissolved Silver (Ag)	mg/L	<0.00010	N/A	0.00010	0.00010	0.00010	0.00013	0.00010	8724712
Dissolved Sodium (Na)	mg/L	590 (1)	N/A	5.0	4000	5.0	600 (1)	5.0	8729320
Dissolved Strontium (Sr)	mg/L	0.59	N/A	0.020	2.5	0.20	0.60	0.020	8729320
Dissolved Sulphur (S)	mg/L	330	N/A	0.20	930	2.0	330	0.20	8729320
Dissolved Thallium (Tl)	mg/L	<0.00020	N/A	0.00020	<0.00020	0.00020	<0.00020	0.00020	8724712
Dissolved Tin (Sn)	mg/L	<0.0010	N/A	0.0010	<0.0010	0.0010	<0.0010	0.0010	8724712
Dissolved Titanium (Ti)	mg/L	0.0014	N/A	0.0010	<0.0010	0.0010	0.0012	0.0010	8724712
Dissolved Uranium (U)	mg/L	0.043	N/A	0.00010	0.047	0.00010	0.043	0.00010	8724712
Dissolved Vanadium (V)	mg/L	<0.0010	N/A	0.0010	<0.0010	0.0010	<0.0010	0.0010	8724712
Dissolved Zinc (Zn)	mg/L	0.034	N/A	0.0030	<0.0030	0.0030	0.037	0.0030	8724712

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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

Maxxam Job #: B768021
Report Date: 2017/08/21

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF GROUND WATER

Maxxam ID		RS3939		RS3940			RS3941		
Sampling Date		2017/08/06 10:00		2017/08/06 09:00			2017/08/06		
COC Number		M017073		M017073			M017073		
	UNITS	MW13-7	RDL	MW13-9	RDL	QC Batch	APRON DUP01	RDL	QC Batch
Calculated Parameters									
Total Hardness (CaCO3)	mg/L	1490	0.50	5730	0.50	8729643	1650	0.50	8729643
Misc. Inorganics									
Total Dissolved Solids	mg/L	4100 (1)	50	20000 (1)	50	8725360	3900 (2)	250	8731475
Total Suspended Solids	mg/L	<1.0	1.0	27	1.0	8725520	<1.0	1.0	8725520
Nutrients									
Total Ammonia (N)	mg/L	1.6	0.015	1.8 (3)	0.030	8725834	1.7	0.015	8725834
Misc. Organics									
Extractable (n-Hex.) Oil and grease	mg/L	3.0	2.0	<2.0	2.0	8725530	<2.0	2.0	8725530
Phenols	mg/L	0.035	0.0020	0.10 (4)	0.020	8729852	0.029	0.0020	8729852

RDL = Reportable Detection Limit

(1) Detection limit raised based on sample volume used for analysis.

(2) Detection limit raised based on sample volume used for analysis. Sample was originally processed within hold time. Data quality required investigation. Re-analysis was completed past recommended hold time.

(3) Detection limits raised due to matrix interference.

(4) Detection limits raised due to dilution to bring analyte within the calibrated range.

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Report Date: 2017/08/21

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

SEMIVOLATILE ORGANICS BY GC-MS (GROUND WATER)

Maxxam ID		RS3939	RS3939	RS3940	RS3941		
Sampling Date		2017/08/06 10:00	2017/08/06 10:00	2017/08/06 09:00	2017/08/06		
COC Number		M017073	M017073	M017073	M017073		
	UNITS	MW13-7	MW13-7 Lab-Dup	MW13-9	APRON DUP01	RDL	QC Batch
Polycyclic Aromatics							
Benzo[a]pyrene equivalency	ug/L	<0.010	N/A	<0.010	<0.010	0.010	8724500
Acenaphthene	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	8724898
Acenaphthylene	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	8724898
Acridine	ug/L	<0.050	<0.050	<0.050	<0.050	0.050	8724898
Anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	0.010	8724898
Benzo(a)anthracene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	8724898
Benzo(b&j)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	8724898
Benzo(k)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	8724898
Benzo(g,h,i)perylene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	8724898
Benzo(c)phenanthrene	ug/L	<0.050	<0.050	<0.050	<0.050	0.050	8724898
Benzo(a)pyrene	ug/L	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	8724898
Benzo[e]pyrene	ug/L	<0.050	<0.050	<0.050	<0.050	0.050	8724898
Chrysene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	8724898
Dibenz(a,h)anthracene	ug/L	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	8724898
Fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	0.010	8724898
Fluorene	ug/L	<0.050	<0.050	<0.050	<0.050	0.050	8724898
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	8724898
2-Methylnaphthalene	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	8724898
Naphthalene	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	8724898
Phenanthrene	ug/L	<0.050	<0.050	<0.050	<0.050	0.050	8724898
Perylene	ug/L	<0.050	<0.050	<0.050	<0.050	0.050	8724898
Pyrene	ug/L	<0.020	<0.020	<0.020	<0.020	0.020	8724898
Quinoline	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	8724898
Surrogate Recovery (%)							
D10-ANTHRACENE (sur.)	%	108	104	103	108	N/A	8724898
D8-ACENAPHTHYLENE (sur.)	%	104	101	102	102	N/A	8724898
D8-NAPHTHALENE (sur.)	%	105	105	105	104	N/A	8724898
TERPHENYL-D14 (sur.)	%	98	100	64	111	N/A	8724898

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

ELEMENTS BY ATOMIC SPECTROSCOPY (GROUND WATER)

Maxxam ID		RS3939		RS3940			RS3941		
Sampling Date		2017/08/06 10:00		2017/08/06 09:00			2017/08/06		
COC Number		M017073		M017073			M017073		
	UNITS	MW13-7	RDL	MW13-9	RDL	QC Batch	APRON DUP01	RDL	QC Batch
Elements									
Total Calcium (Ca)	mg/L	250	0.30	470 (1)	3.0	8732508	280	0.30	8730476
Total Magnesium (Mg)	mg/L	210	0.20	1100 (1)	2.0	8732508	230	0.20	8730476
Total Potassium (K)	mg/L	25	0.30	150 (1)	3.0	8732508	28	0.30	8730476
Total Sodium (Na)	mg/L	930 (2)	5.0	4400 (1)	5.0	8732508	980 (2)	5.0	8730476

RDL = Reportable Detection Limit
(1) Detection limits raised due to sample matrix.
(2) Detection limits raised due to dilution to bring analyte within the calibrated range.

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GENERAL COMMENTS

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

Package 1	8.7°C

Sample RS3939 [MW13-7] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RS3940 [MW13-9] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Detection limits raised due to sample matrix. Parameters affected are dissolved B, Ba, Ca, Fe, K, Li, Mg, Mn, Na, P, S, Si, Sr.

Sample RS3941 [APRON DUP01] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue).

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8724895	O-TERPHENYL (sur.)	2017/08/15	95	60 - 130	103	60 - 130	98	%		
8724898	D10-ANTHRACENE (sur.)	2017/08/16	105	50 - 130	81	50 - 130	113	%		
8724898	D8-ACENAPHTHYLENE (sur.)	2017/08/16	99	50 - 130	77	50 - 130	104	%		
8724898	D8-NAPHTHALENE (sur.)	2017/08/16	103	50 - 130	78	50 - 130	112	%		
8724898	TERPHENYL-D14 (sur.)	2017/08/16	108	50 - 130	99	50 - 130	140 (1)			
8724922	1,4-Difluorobenzene (sur.)	2017/08/14	101	70 - 130	99	70 - 130	106	%		
8724922	4-Bromofluorobenzene (sur.)	2017/08/14	100	70 - 130	99	70 - 130	100	%		
8724922	D4-1,2-Dichloroethane (sur.)	2017/08/14	114	70 - 130	105	70 - 130	102	%		
8724652	Dissolved Nitrate (N)	2017/08/12	117	80 - 120	102	80 - 120	<0.010	mg/L	1.1	20
8724652	Dissolved Nitrite (N)	2017/08/12	115	80 - 120	99	80 - 120	<0.010	mg/L	NC	20
8724712	Dissolved Aluminum (Al)	2017/08/13	95	80 - 120	98	80 - 120	<0.0030	mg/L	15	20
8724712	Dissolved Antimony (Sb)	2017/08/13	100	80 - 120	93	80 - 120	<0.00060	mg/L	NC	20
8724712	Dissolved Arsenic (As)	2017/08/13	98	80 - 120	96	80 - 120	<0.00020	mg/L	1.3	20
8724712	Dissolved Beryllium (Be)	2017/08/13	98	80 - 120	90	80 - 120	<0.0010	mg/L	NC	20
8724712	Dissolved Chromium (Cr)	2017/08/13	98	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
8724712	Dissolved Cobalt (Co)	2017/08/13	96	80 - 120	97	80 - 120	<0.00030	mg/L	0.72	20
8724712	Dissolved Copper (Cu)	2017/08/13	96	80 - 120	96	80 - 120	<0.00020	mg/L	NC	20
8724712	Dissolved Lead (Pb)	2017/08/13	94	80 - 120	97	80 - 120	<0.00020	mg/L	NC	20
8724712	Dissolved Molybdenum (Mo)	2017/08/13	103	80 - 120	98	80 - 120	<0.00020	mg/L	0.28	20
8724712	Dissolved Nickel (Ni)	2017/08/13	95	80 - 120	96	80 - 120	<0.00050	mg/L	16	20
8724712	Dissolved Selenium (Se)	2017/08/13	102	80 - 120	101	80 - 120	<0.00020	mg/L	NC	20
8724712	Dissolved Silver (Ag)	2017/08/13	99	80 - 120	97	80 - 120	<0.00010	mg/L	NC	20
8724712	Dissolved Thallium (Tl)	2017/08/13	94	80 - 120	97	80 - 120	<0.00020	mg/L	NC	20
8724712	Dissolved Tin (Sn)	2017/08/13	99	80 - 120	93	80 - 120	<0.0010	mg/L	NC	20
8724712	Dissolved Titanium (Ti)	2017/08/13	108	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
8724712	Dissolved Uranium (U)	2017/08/13	95	80 - 120	95	80 - 120	<0.00010	mg/L	1.5	20
8724712	Dissolved Vanadium (V)	2017/08/13	100	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
8724712	Dissolved Zinc (Zn)	2017/08/13	94	80 - 120	96	80 - 120	<0.0030	mg/L	NC	20
8724895	F2 (C10-C16 Hydrocarbons)	2017/08/15	107	60 - 130	117	70 - 130	<0.10	mg/L	NC	30
8724895	F3 (C16-C34 Hydrocarbons)	2017/08/15	101	60 - 130	112	70 - 130	<0.10	mg/L	7.4	30
8724895	F4 (C34-C50 Hydrocarbons)	2017/08/15	96	60 - 130	106	70 - 130	<0.20	mg/L	NC	30

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QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8724898	2-Methylnaphthalene	2017/08/16	110	50 - 130	71	50 - 130	<0.10	ug/L	NC	30
8724898	Acenaphthene	2017/08/16	99	50 - 130	72	50 - 130	<0.10	ug/L	NC	30
8724898	Acenaphthylene	2017/08/16	97	50 - 130	76	50 - 130	<0.10	ug/L	NC	30
8724898	Acridine	2017/08/16	101	50 - 130	78	50 - 130	<0.050	ug/L	NC	30
8724898	Anthracene	2017/08/16	99	50 - 130	76	50 - 130	<0.010	ug/L	NC	30
8724898	Benzo(a)anthracene	2017/08/16	105	50 - 130	93	50 - 130	<0.0085	ug/L	NC	30
8724898	Benzo(a)pyrene	2017/08/16	90	50 - 130	90	50 - 130	<0.0075	ug/L	NC	30
8724898	Benzo(b&j)fluoranthene	2017/08/16	85	50 - 130	92	50 - 130	<0.0085	ug/L	NC	30
8724898	Benzo(c)phenanthrene	2017/08/16	114	50 - 130	99	50 - 130	<0.050	ug/L	NC	30
8724898	Benzo(g,h,i)perylene	2017/08/16	64	50 - 130	89	50 - 130	<0.0085	ug/L	NC	30
8724898	Benzo(k)fluoranthene	2017/08/16	73	50 - 130	97	50 - 130	<0.0085	ug/L	NC	30
8724898	Benzo[e]pyrene	2017/08/16	78	50 - 130	93	50 - 130	<0.050	ug/L	NC	30
8724898	Chrysene	2017/08/16	84	50 - 130	94	50 - 130	<0.0085	ug/L	NC	30
8724898	Dibenz(a,h)anthracene	2017/08/16	89	50 - 130	88	50 - 130	<0.0075	ug/L	NC	30
8724898	Fluoranthene	2017/08/16	97	50 - 130	74	50 - 130	<0.010	ug/L	NC	30
8724898	Fluorene	2017/08/16	104	50 - 130	72	50 - 130	<0.050	ug/L	NC	30
8724898	Indeno(1,2,3-cd)pyrene	2017/08/16	83	50 - 130	78	50 - 130	<0.0085	ug/L	NC	30
8724898	Naphthalene	2017/08/16	101	50 - 130	75	50 - 130	<0.10	ug/L	NC	30
8724898	Perylene	2017/08/16	68	50 - 130	89	50 - 130	<0.050	ug/L	NC	30
8724898	Phenanthrene	2017/08/16	101	50 - 130	76	50 - 130	<0.050	ug/L	NC	30
8724898	Pyrene	2017/08/16	96	50 - 130	74	50 - 130	<0.020	ug/L	NC	30
8724898	Quinoline	2017/08/16	106	50 - 130	116	50 - 130	<0.20	ug/L	NC	30
8724922	Benzene	2017/08/14	108	70 - 130	105	70 - 130	<0.40	ug/L	1.8	30
8724922	Ethylbenzene	2017/08/14	104	70 - 130	103	70 - 130	<0.40	ug/L	5.8	30
8724922	F1 (C6-C10) - BTEX	2017/08/14					<100	ug/L	NC	30
8724922	F1 (C6-C10)	2017/08/14	86	70 - 130	104	70 - 130	<100	ug/L	NC	30
8724922	m & p-Xylene	2017/08/14	102	70 - 130	101	70 - 130	<0.80	ug/L	22	30
8724922	o-Xylene	2017/08/14	100	70 - 130	99	70 - 130	<0.40	ug/L	NC	30
8724922	Toluene	2017/08/14	97	70 - 130	96	70 - 130	<0.40	ug/L	NC	30
8724922	Xylenes (Total)	2017/08/14					<0.80	ug/L	22	30
8724959	pH	2017/08/13			100	97 - 103			0.32	N/A

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QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
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Site Location: CAM BAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8724960	Alkalinity (PP as CaCO3)	2017/08/13					<0.50	mg/L	NC	20
8724960	Alkalinity (Total as CaCO3)	2017/08/13			100	80 - 120	<0.50	mg/L	1.4	20
8724960	Bicarbonate (HCO3)	2017/08/13					<0.50	mg/L	1.4	20
8724960	Carbonate (CO3)	2017/08/13					<0.50	mg/L	NC	20
8724960	Hydroxide (OH)	2017/08/13					<0.50	mg/L	NC	20
8724961	Conductivity	2017/08/13			100	90 - 110	<1.0	uS/cm	0	10
8724975	Dissolved Chloride (Cl)	2017/08/14	NC	80 - 120	106	80 - 120	<1.0	mg/L	1.1	20
8724981	Dissolved Sulphate (SO4)	2017/08/14	108	80 - 120	106	80 - 120	<1.0	mg/L	NC	20
8725360	Total Dissolved Solids	2017/08/15	NC	80 - 120	101	80 - 120	<10	mg/L	0	20
8725520	Total Suspended Solids	2017/08/16	93	80 - 120	102	80 - 120	<1.0	mg/L	NC	20
8725530	Extractable (n-Hex.) Oil and grease	2017/08/14			102	70 - 130	<2.0	mg/L		
8725834	Total Ammonia (N)	2017/08/15	NC	80 - 120	103	80 - 120	<0.015	mg/L	3.3	20
8729320	Dissolved Barium (Ba)	2017/08/17	94	80 - 120	97	80 - 120	<0.010	mg/L	0.018	20
8729320	Dissolved Boron (B)	2017/08/17	104	80 - 120	101	80 - 120	<0.020	mg/L	0.31	20
8729320	Dissolved Calcium (Ca)	2017/08/17	90	80 - 120	95	80 - 120	<0.30	mg/L	0.078	20
8729320	Dissolved Iron (Fe)	2017/08/17	96	80 - 120	98	80 - 120	<0.060	mg/L	2.8	20
8729320	Dissolved Lithium (Li)	2017/08/17	98	80 - 120	99	80 - 120	<0.020	mg/L	NC	20
8729320	Dissolved Magnesium (Mg)	2017/08/17	97	80 - 120	97	80 - 120	<0.20	mg/L	0.35	20
8729320	Dissolved Manganese (Mn)	2017/08/17	90	80 - 120	96	80 - 120	<0.0040	mg/L	0.53	20
8729320	Dissolved Phosphorus (P)	2017/08/17	103	80 - 120	101	80 - 120	<0.10	mg/L	NC	20
8729320	Dissolved Potassium (K)	2017/08/17	98	80 - 120	101	80 - 120	<0.30	mg/L	0.51	20
8729320	Dissolved Silicon (Si)	2017/08/17	101	80 - 120	102	80 - 120	<0.10	mg/L	0.049	20
8729320	Dissolved Sodium (Na)	2017/08/17	94	80 - 120	100	80 - 120	<0.50	mg/L	0.81	20
8729320	Dissolved Strontium (Sr)	2017/08/17	92	80 - 120	94	80 - 120	<0.020	mg/L	0.074	20
8729320	Dissolved Sulphur (S)	2017/08/17					<0.20	mg/L	0.092	20
8729852	Phenols	2017/08/17	80	80 - 120	93	80 - 120	<0.0020	mg/L	NC	20
8730476	Total Calcium (Ca)	2017/08/18	NC	80 - 120	101	80 - 120	<0.30	mg/L		
8730476	Total Magnesium (Mg)	2017/08/18	NC	80 - 120	105	80 - 120	<0.20	mg/L		
8730476	Total Potassium (K)	2017/08/18	NC	80 - 120	103	80 - 120	<0.30	mg/L		
8730476	Total Sodium (Na)	2017/08/18	NC	80 - 120	106	80 - 120	<0.50	mg/L		
8731475	Total Dissolved Solids	2017/08/21	101	80 - 120	98	80 - 120	<10	mg/L	5.7	20

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QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
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			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8732508	Total Calcium (Ca)	2017/08/20	91	80 - 120	95	80 - 120	<0.30	mg/L	0.51	20
8732508	Total Magnesium (Mg)	2017/08/20	95	80 - 120	98	80 - 120	<0.20	mg/L	0.076	20
8732508	Total Potassium (K)	2017/08/20	95	80 - 120	99	80 - 120	<0.30	mg/L	0.11	20
8732508	Total Sodium (Na)	2017/08/20	NC	80 - 120	98	80 - 120	<0.50	mg/L	0.035	20

N/A = Not Applicable

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

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

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

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

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

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

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

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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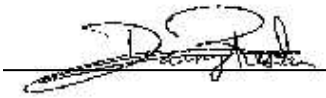
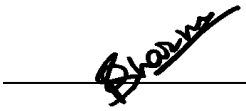
VALIDATION SIGNATURE PAGE

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



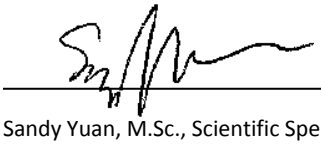
Daniel Reslan, cCT, QP, Organics Supervisor

Justin Geisel, B.Sc., Organics Supervisor



Poonam Sharma, cCT, Organics Supervisor

Suwan Fock, B.Sc., QP, Inorganics Senior Analyst



Sandy Yuan, M.Sc., Scientific Specialist

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

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

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 017073

Report Information

Company: ARCADIS CANADA INC.
Contact: MAURENIA LYNDS
Phone: 613 721 0555
Email: MAURENIA.LYNDS@ARCADIS.COM
Sampled by: ELLIOTT HOLDEN

Comments

QUOTE: B50993
PROJECT: 102089-0023
SITE: CAM BAY ~~EXACTU~~ APRON

Same as CoC

Project/LSD

Special Instructions

(1) pH, Conductivity, total hardness, total Alkalinity
MW13-7 TRACE SEDIMENT IN SAMPLE

Analysis Requested

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2 F4	BTEX F1-F4	Routine Water (1)	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity NITRATE - NITRITE	Sieve (75 micron) OIL & GREASE	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	AMMONIA NITROGEN	TOTAL PHENOLS	Ca, Mg, Na, K	CHLORIDE/SULPHATE	DISSOLVED METALS	PAH's	TSS AND TDS		HOLD - DO NOT ANALYZE
11	MW13-7		2017/08/06	10:00	GW	11		X		X			X	X			X	X	X	X	X	X	X		
12	MW13-9		2017/08/06	9:00	GW	11		X		X			X	X			X	X	X	X	X	X	X		
13	APRON DUP01		2017/08/06		GW	11		X		X			X	X			X	X	X	X	X	X	X		
14																									
15																									
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30																									

RECEIVED IN YELLOWKNIFE
By: [signature]
2017-08-10 10:00

Temp: [redacted] 10, 6, 10 degrees C

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
[signature] ELLIOTT HOLDEN	2017/08/08	10:00	[signature] Danielle Boisvert	2017/08/11	10:55	B768021 JWF

4,2,3
5,7,2
5,3,3

ice-yes all
seal-yes all (not intact)

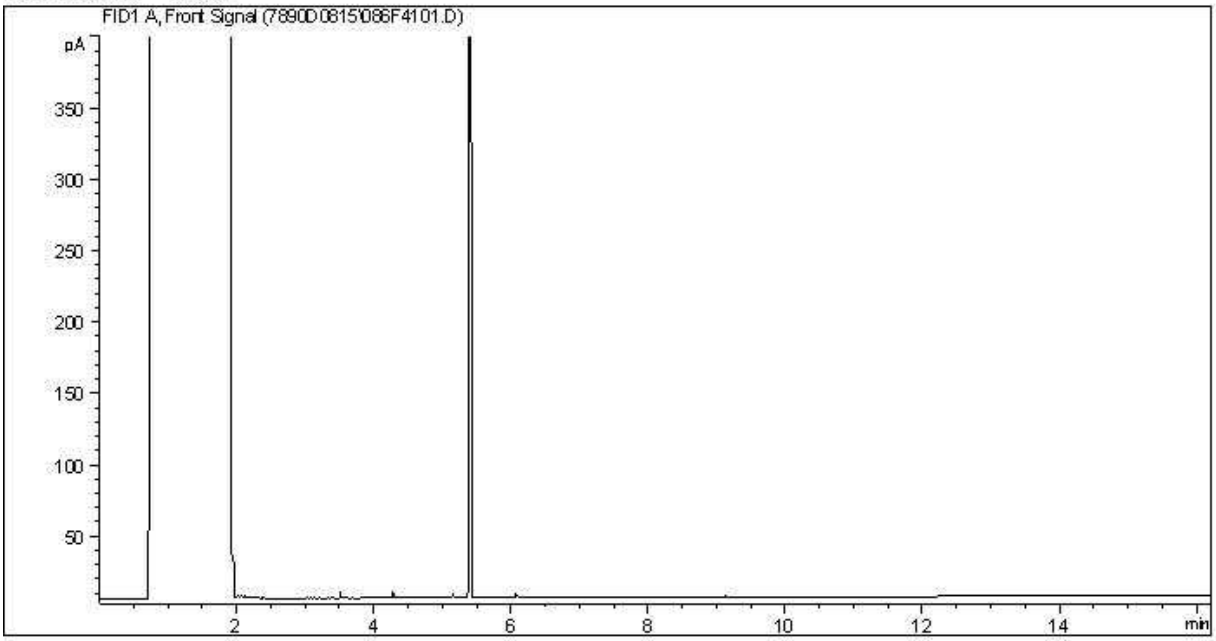
AB FCD-00331/6

Maxxam Job #: B768021
Report Date: 2017/08/21
Maxxam Sample: RS3939

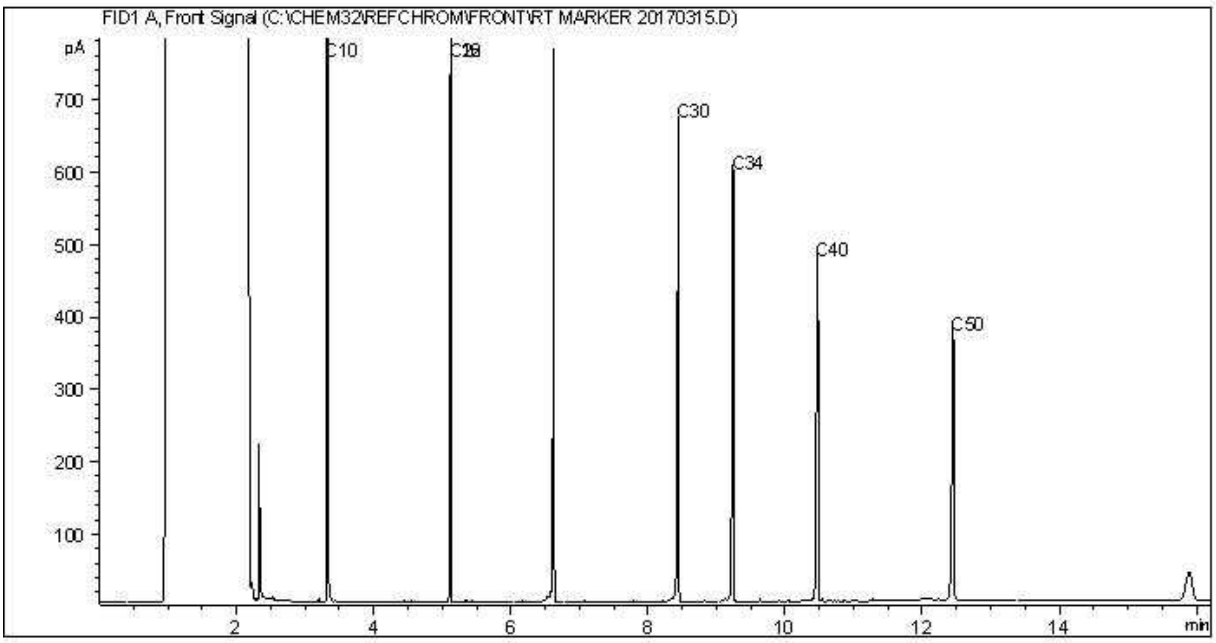
ARCADIS Canada
Client Project #: 102089-003
Site Reference: CAM BAY APRON LTU
Client ID: MW13-7

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890D



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

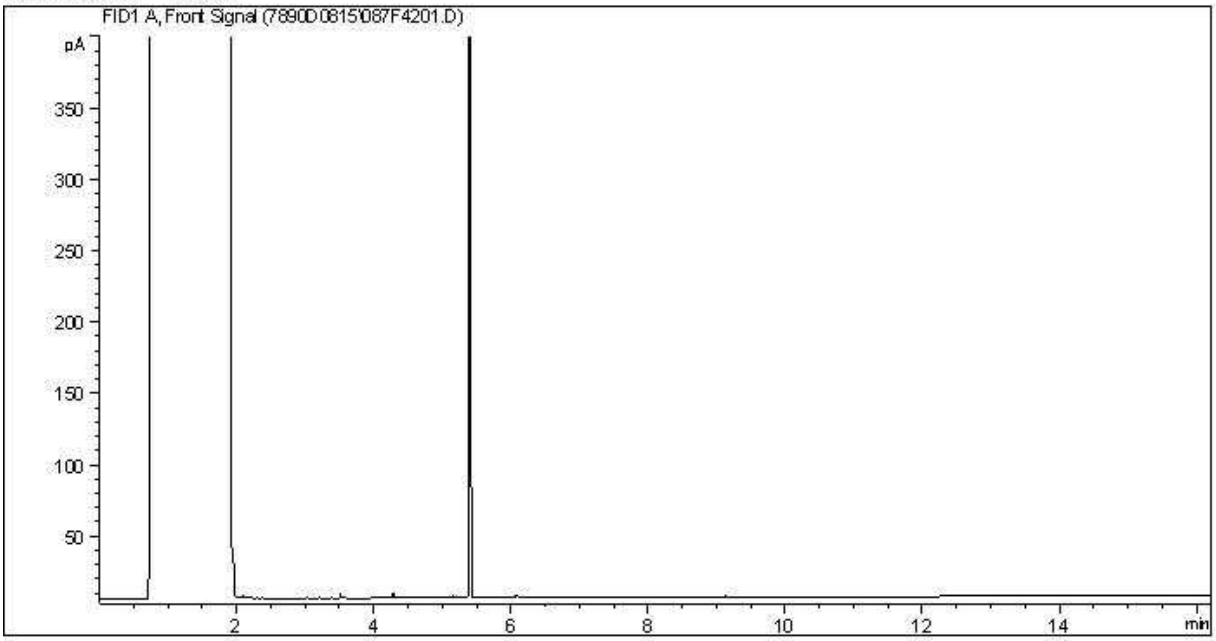
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B768021
Report Date: 2017/08/21
Maxxam Sample: RS3939 Lab-Dup

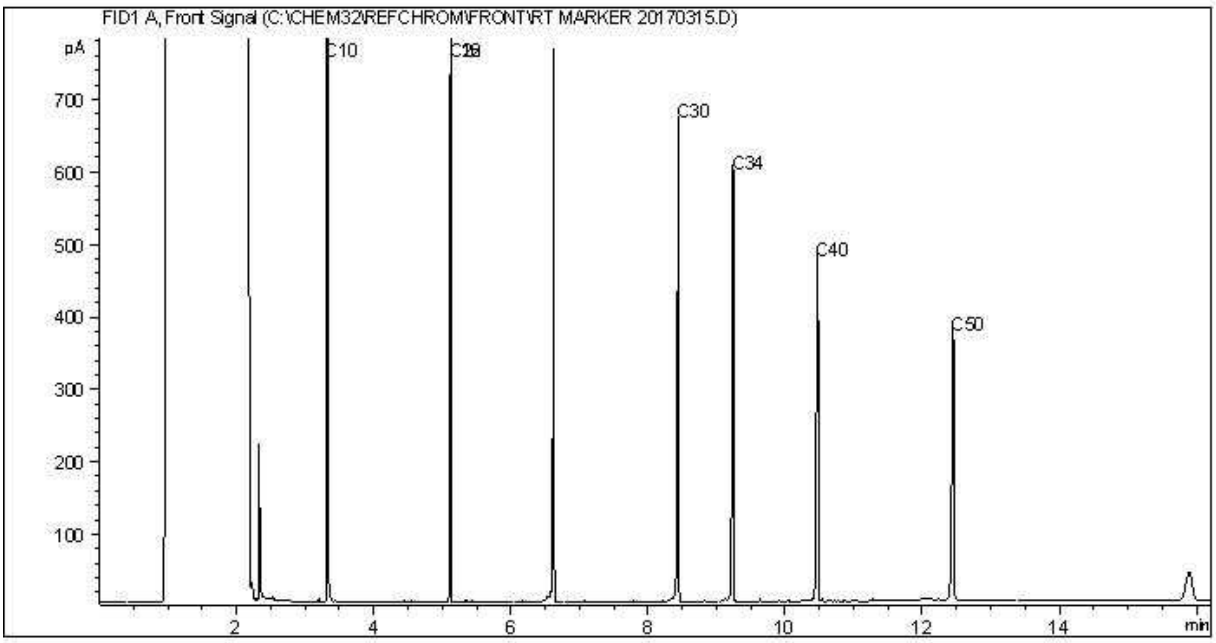
ARCADIS Canada
Client Project #: 102089-003
Site Reference: CAM BAY APRON LTU
Client ID: MW13-7

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890D



Carbon Range Distribution - Reference Chromatogram



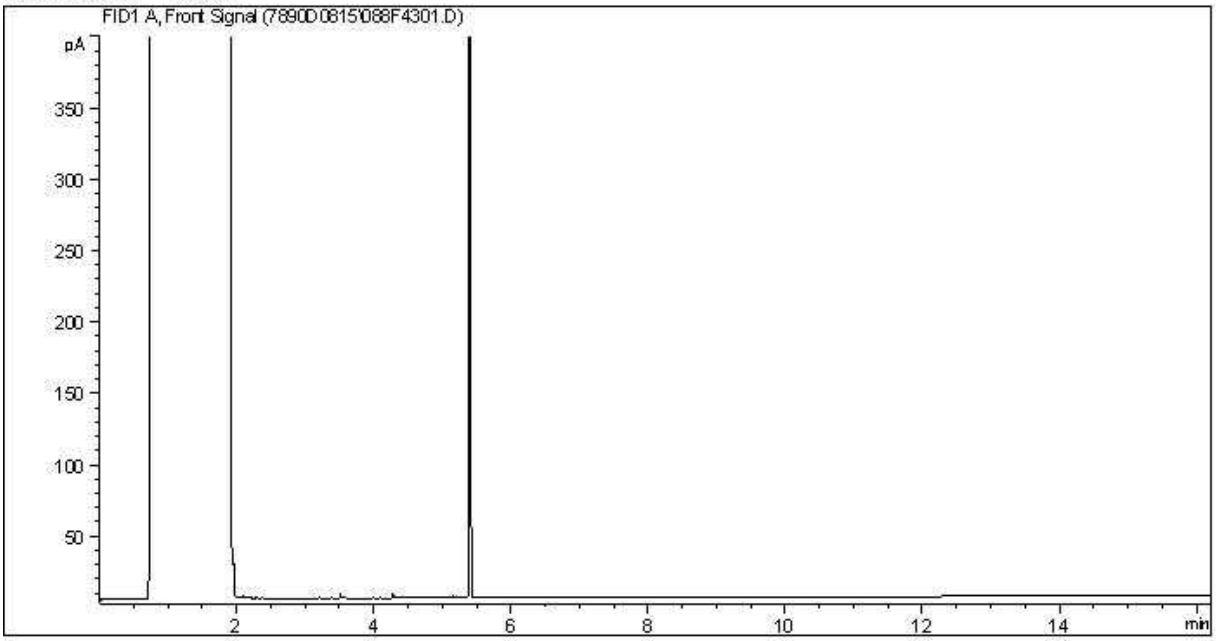
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

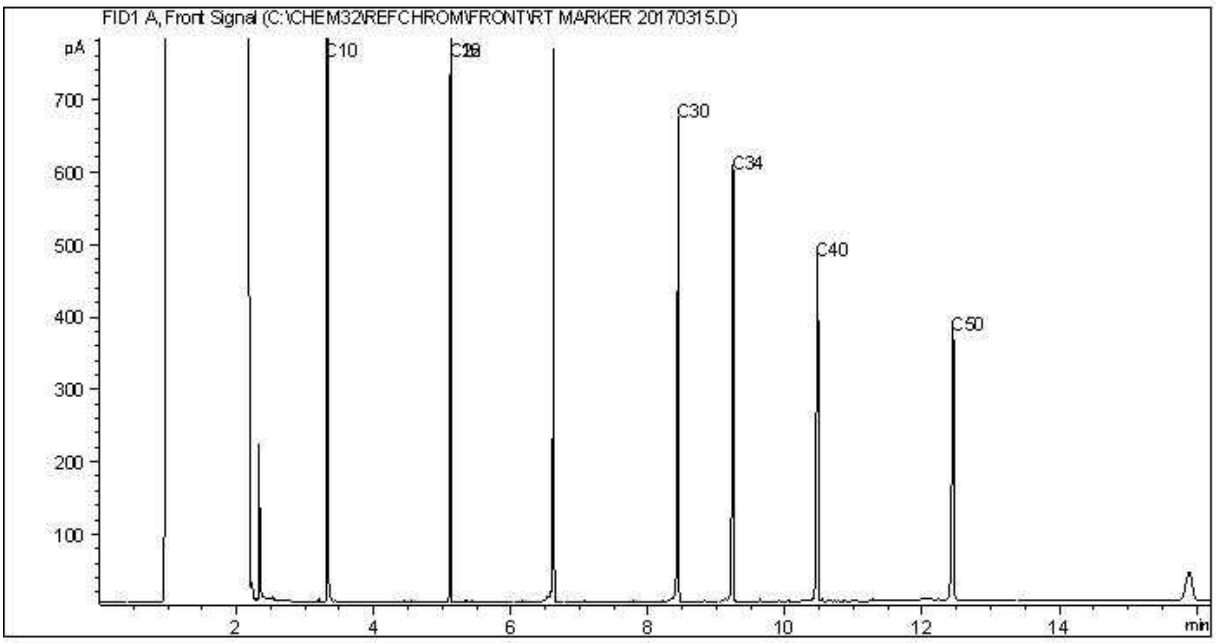
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890D



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

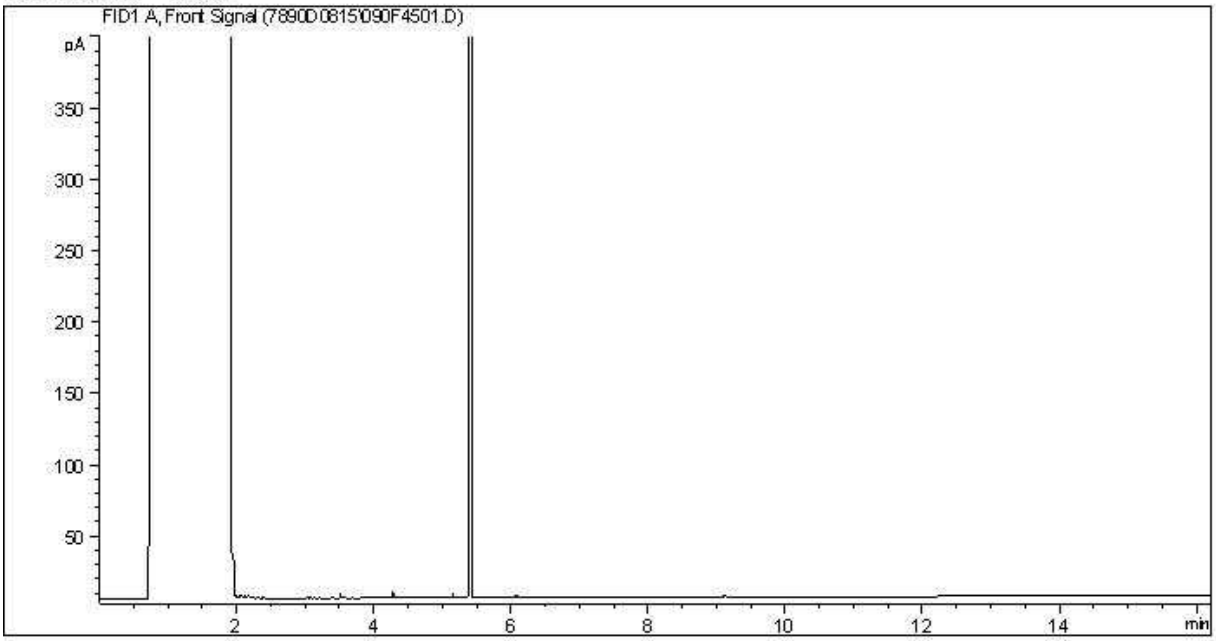
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B768021
Report Date: 2017/08/21
Maxxam Sample: RS3941

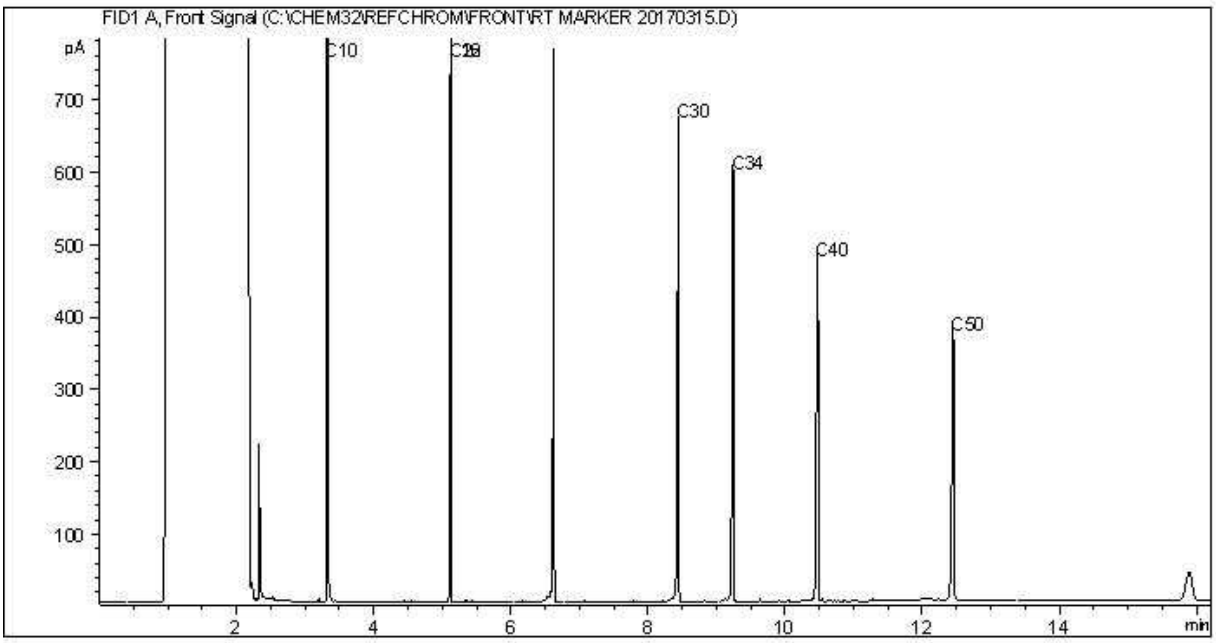
ARCADIS Canada
Client Project #: 102089-003
Site Reference: CAM BAY APRON LTU
Client ID: APRON DUP01

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890D



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Your Project #: 102089-003
Site Location: CAM BAY APRON LTU
Your C.O.C. #: M017082

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/20
Report #: R2431092
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768129
Received: 2017/08/11, 10:03

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	1	N/A	2017/08/13	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	1	N/A	2017/08/14	AB SOP-00039	CCME CWS/EPA 8260c m
Cadmium - low level CCME - Dissolved	1	N/A	2017/08/18	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	1	N/A	2017/08/15	AB SOP-00020	SM 22 4500-Cl-E m
Conductivity @25C	1	N/A	2017/08/13	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons (F2-F4 in water) (1)	1	2017/08/15	2017/08/16	AB SOP-00037	CCME PHC-CWS m
Hardness	1	N/A	2017/08/18	AB WI-00065	Auto Calc
Hardness Total (calculated as CaCO3)	1	N/A	2017/08/18	AB WI-00065	Auto Calc
Elements by ICP - Dissolved (2)	1	N/A	2017/08/18	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	1	2017/08/16	2017/08/17	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Dissolved (2)	1	N/A	2017/08/17	AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	1	N/A	2017/08/14	AB WI-00065	Auto Calc
Sum of cations, anions	1	N/A	2017/08/18	AB WI-00065	Auto Calc
Ammonia-N (Total)	1	N/A	2017/08/16	AB SOP-00007	EPA 350.1 R2.0 m
Nitrate and Nitrite	1	N/A	2017/08/14	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	1	N/A	2017/08/14	AB WI-00065	Auto Calc
Nitrogen (Nitrite - Nitrate) by IC	1	N/A	2017/08/12	AB SOP-00023	SM 22 4110 B m
Oil and Grease (Gravimetric, n-Hexane)	1	2017/08/18	2017/08/18	EENVSOP-00093	SM 22 5520 B m
Benzo[a]pyrene Equivalency (3)	1	N/A	2017/08/17	AB SOP-00003	Auto Calc
PAH in Water by GC/MS	1	2017/08/13	2017/08/16	AB SOP-00037 / AB SOP-00003	EPA 3510C/8270D m
pH @25°C (4)	1	N/A	2017/08/13	AB SOP-00005	SM 22 4500 H+ B m
Phenols (4-AAP)	1	N/A	2017/08/19	EENVSOP-00061	MMCW 154 1996 m
Sulphate by Automated Colourimetry	1	N/A	2017/08/15	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Filt. Residue)	1	2017/08/14	2017/08/15	AB SOP-00065	SM 22 2540 C m
Total Dissolved Solids (Calculated)	1	N/A	2017/08/18	AB WI-00065	Auto Calc
Total Suspended Solids (NFR)	1	2017/08/14	2017/08/14	AB SOP-00061	SM 22 2540 D m

Remarks:

Your Project #: 102089-003
Site Location: CAM BAY APRON LTU
Your C.O.C. #: M017082

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/20
Report #: R2431092
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768129
Received: 2017/08/11, 10:03

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

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

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

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

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

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

(1) Silica gel clean up employed.
(2) Dissolved > Total Imbalance: Whenever applicable, Dissolved >Total for any parameter that falls within method uncertainty for duplicates is likely equivalent. If RPD is >20% samples were reanalyzed and confirmed.
(3) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.
(4) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Maxxam endeavours to analyze samples as soon as possible after receipt.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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Maxxam Job #: B768129
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

AT1 BTEX AND F1-F4 IN WATER (WATER)

Maxxam ID		RS4665		
Sampling Date		2017/08/08 16:30		
COC Number		M017082		
	UNITS	MW13-8	RDL	QC Batch
Ext. Pet. Hydrocarbon				
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	0.10	8724895
F3 (C16-C34 Hydrocarbons)	mg/L	<0.10	0.10	8724895
F4 (C34-C50 Hydrocarbons)	mg/L	<0.20	0.20	8724895
Volatiles				
Benzene	ug/L	<0.40	0.40	8724907
Toluene	ug/L	<0.40	0.40	8724907
Ethylbenzene	ug/L	<0.40	0.40	8724907
m & p-Xylene	ug/L	<0.80	0.80	8724907
o-Xylene	ug/L	<0.40	0.40	8724907
Xylenes (Total)	ug/L	<0.80	0.80	8724907
F1 (C6-C10) - BTEX	ug/L	<100	100	8724907
F1 (C6-C10)	ug/L	<100	100	8724907
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	99	N/A	8724907
4-Bromofluorobenzene (sur.)	%	98	N/A	8724907
D4-1,2-Dichloroethane (sur.)	%	110	N/A	8724907
O-TERPHENYL (sur.)	%	113	N/A	8724895

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B768129
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		RS4665		
Sampling Date		2017/08/08 16:30		
COC Number		M017082		
	UNITS	MW13-8	RDL	QC Batch
Calculated Parameters				
Anion Sum	meq/L	30	N/A	8724236
Cation Sum	meq/L	32	N/A	8724236
Hardness (CaCO3)	mg/L	1400	0.50	8724498
Ion Balance (% Difference)	%	4.2	N/A	8724235
Dissolved Nitrate (NO3)	mg/L	48	0.089	8724435
Nitrate plus Nitrite (N)	mg/L	11	0.022	8724436
Dissolved Nitrite (NO2)	mg/L	0.070	0.033	8724435
Calculated Total Dissolved Solids	mg/L	1800	10	8724238
Misc. Inorganics				
Conductivity	uS/cm	2400	1.0	8724961
pH	pH	7.49	N/A	8724959
Low Level Elements				
Dissolved Cadmium (Cd)	ug/L	0.043	0.020	8724430
Anions				
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.50	8724960
Alkalinity (Total as CaCO3)	mg/L	390	0.50	8724960
Bicarbonate (HCO3)	mg/L	480	0.50	8724960
Carbonate (CO3)	mg/L	<0.50	0.50	8724960
Hydroxide (OH)	mg/L	<0.50	0.50	8724960
Dissolved Sulphate (SO4)	mg/L	890 (1)	5.0	8724678
Dissolved Chloride (Cl)	mg/L	92	1.0	8724677
Nutrients				
Dissolved Nitrite (N)	mg/L	0.021	0.010	8724679
Dissolved Nitrate (N)	mg/L	11 (1)	0.020	8724679
Elements				
Dissolved Aluminum (Al)	mg/L	0.0037	0.0030	8725669
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	8725669
Dissolved Arsenic (As)	mg/L	0.00075	0.00020	8725669
Dissolved Barium (Ba)	mg/L	0.037	0.010	8730277

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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Maxxam Job #: B768129
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		RS4665		
Sampling Date		2017/08/08 16:30		
COC Number		M017082		
	UNITS	MW13-8	RDL	QC Batch
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	8725669
Dissolved Boron (B)	mg/L	0.29	0.020	8730277
Dissolved Calcium (Ca)	mg/L	290	0.30	8730277
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	8725669
Dissolved Cobalt (Co)	mg/L	0.0069	0.00030	8725669
Dissolved Copper (Cu)	mg/L	0.0029	0.00020	8725669
Dissolved Iron (Fe)	mg/L	0.71	0.060	8730277
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	8725669
Dissolved Lithium (Li)	mg/L	0.028	0.020	8730277
Dissolved Magnesium (Mg)	mg/L	170	0.20	8730277
Dissolved Manganese (Mn)	mg/L	0.47	0.0040	8730277
Dissolved Molybdenum (Mo)	mg/L	0.0051	0.00020	8725669
Dissolved Nickel (Ni)	mg/L	0.0081	0.00050	8725669
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	8730277
Dissolved Potassium (K)	mg/L	20	0.30	8730277
Dissolved Selenium (Se)	mg/L	0.00021	0.00020	8725669
Dissolved Silicon (Si)	mg/L	4.1	0.10	8730277
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	8725669
Dissolved Sodium (Na)	mg/L	69	0.50	8730277
Dissolved Strontium (Sr)	mg/L	0.39	0.020	8730277
Dissolved Sulphur (S)	mg/L	320	0.20	8730277
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	8725669
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	8725669
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	8725669
Dissolved Uranium (U)	mg/L	0.017	0.00010	8725669
Dissolved Vanadium (V)	mg/L	0.0011	0.0010	8725669
Dissolved Zinc (Zn)	mg/L	<0.0030	0.0030	8725669
RDL = Reportable Detection Limit				

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Maxxam Job #: B768129
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		RS4665		
Sampling Date		2017/08/08 16:30		
COC Number		M017082		
	UNITS	MW13-8	RDL	QC Batch
Calculated Parameters				
Total Hardness (CaCO3)	mg/L	1320	0.50	8724636
Misc. Inorganics				
Total Dissolved Solids	mg/L	2000	10	8725841
Total Suspended Solids	mg/L	1.3	1.0	8725520
Nutrients				
Total Ammonia (N)	mg/L	1.1	0.015	8727251
Misc. Organics				
Extractable (n-Hex.) Oil and grease	mg/L	2.0	2.0	8731051
Phenols	mg/L	0.0045	0.0020	8732160
RDL = Reportable Detection Limit				

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Maxxam Job #: B768129
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		RS4665		
Sampling Date		2017/08/08 16:30		
COC Number		M017082		
	UNITS	MW13-8	RDL	QC Batch
Polycyclic Aromatics				
Benzo[a]pyrene equivalency	ug/L	<0.010	0.010	8724500
Acenaphthene	ug/L	<0.10	0.10	8724898
Acenaphthylene	ug/L	<0.10	0.10	8724898
Acridine	ug/L	<0.050	0.050	8724898
Anthracene	ug/L	<0.010	0.010	8724898
Benzo(a)anthracene	ug/L	<0.0085	0.0085	8724898
Benzo(b&j)fluoranthene	ug/L	<0.0085	0.0085	8724898
Benzo(k)fluoranthene	ug/L	<0.0085	0.0085	8724898
Benzo(g,h,i)perylene	ug/L	<0.0085	0.0085	8724898
Benzo(c)phenanthrene	ug/L	<0.050	0.050	8724898
Benzo(a)pyrene	ug/L	<0.0075	0.0075	8724898
Benzo[e]pyrene	ug/L	<0.050	0.050	8724898
Chrysene	ug/L	<0.0085	0.0085	8724898
Dibenz(a,h)anthracene	ug/L	<0.0075	0.0075	8724898
Fluoranthene	ug/L	<0.010	0.010	8724898
Fluorene	ug/L	<0.050	0.050	8724898
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	0.0085	8724898
2-Methylnaphthalene	ug/L	<0.10	0.10	8724898
Naphthalene	ug/L	<0.10	0.10	8724898
Phenanthrene	ug/L	<0.050	0.050	8724898
Perylene	ug/L	<0.050	0.050	8724898
Pyrene	ug/L	<0.020	0.020	8724898
Quinoline	ug/L	<0.20	0.20	8724898
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	109	N/A	8724898
D8-ACENAPHTHYLENE (sur.)	%	101	N/A	8724898
D8-NAPHTHALENE (sur.)	%	110	N/A	8724898
TERPHENYL-D14 (sur.)	%	101	N/A	8724898

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B768129
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		RS4665		
Sampling Date		2017/08/08 16:30		
COC Number		M017082		
	UNITS	**MW13-8**	**RDL**	**QC Batch**
Elements				
Total Calcium (Ca)	mg/L	260	0.30	8727692
Total Magnesium (Mg)	mg/L	160	0.20	8727692
Total Potassium (K)	mg/L	20	0.30	8727692
Total Sodium (Na)	mg/L	65	0.50	8727692
RDL = Reportable Detection Limit				

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ARCADIS Canada
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GENERAL COMMENTS

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

Package 1	6.7°C
Package 2	5.3°C

Results relate only to the items tested.

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Maxxam Job #: B768129
Report Date: 2017/08/20

QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8724895	O-TERPHENYL (sur.)	2017/08/15	95	60 - 130	103	60 - 130	98	%		
8724898	D10-ANTHRACENE (sur.)	2017/08/16	105	50 - 130	81	50 - 130	113	%		
8724898	D8-ACENAPHTHYLENE (sur.)	2017/08/16	99	50 - 130	77	50 - 130	104	%		
8724898	D8-NAPHTHALENE (sur.)	2017/08/16	103	50 - 130	78	50 - 130	112	%		
8724898	TERPHENYL-D14 (sur.)	2017/08/16	108	50 - 130	99	50 - 130	140 (1)			
8724907	1,4-Difluorobenzene (sur.)	2017/08/13	93	70 - 130	97	70 - 130	99	%		
8724907	4-Bromofluorobenzene (sur.)	2017/08/13	98	70 - 130	100	70 - 130	98	%		
8724907	D4-1,2-Dichloroethane (sur.)	2017/08/13	107	70 - 130	103	70 - 130	105	%		
8724677	Dissolved Chloride (Cl)	2017/08/15	105	80 - 120	106	80 - 120	<1.0	mg/L	3.7	20
8724678	Dissolved Sulphate (SO4)	2017/08/15	115	80 - 120	109	80 - 120	<1.0	mg/L	8.1	20
8724679	Dissolved Nitrate (N)	2017/08/12	101	80 - 120	102	80 - 120	<0.010	mg/L	NC	20
8724679	Dissolved Nitrite (N)	2017/08/12	98	80 - 120	99	80 - 120	<0.010	mg/L	NC	20
8724895	F2 (C10-C16 Hydrocarbons)	2017/08/15	107	60 - 130	117	70 - 130	<0.10	mg/L	NC	30
8724895	F3 (C16-C34 Hydrocarbons)	2017/08/15	101	60 - 130	112	70 - 130	<0.10	mg/L	7.4	30
8724895	F4 (C34-C50 Hydrocarbons)	2017/08/15	96	60 - 130	106	70 - 130	<0.20	mg/L	NC	30
8724898	2-Methylnaphthalene	2017/08/16	110	50 - 130	71	50 - 130	<0.10	ug/L	NC	30
8724898	Acenaphthene	2017/08/16	99	50 - 130	72	50 - 130	<0.10	ug/L	NC	30
8724898	Acenaphthylene	2017/08/16	97	50 - 130	76	50 - 130	<0.10	ug/L	NC	30
8724898	Acridine	2017/08/16	101	50 - 130	78	50 - 130	<0.050	ug/L	NC	30
8724898	Anthracene	2017/08/16	99	50 - 130	76	50 - 130	<0.010	ug/L	NC	30
8724898	Benzo(a)anthracene	2017/08/16	105	50 - 130	93	50 - 130	<0.0085	ug/L	NC	30
8724898	Benzo(a)pyrene	2017/08/16	90	50 - 130	90	50 - 130	<0.0075	ug/L	NC	30
8724898	Benzo(b&j)fluoranthene	2017/08/16	85	50 - 130	92	50 - 130	<0.0085	ug/L	NC	30
8724898	Benzo(c)phenanthrene	2017/08/16	114	50 - 130	99	50 - 130	<0.050	ug/L	NC	30
8724898	Benzo(g,h,i)perylene	2017/08/16	64	50 - 130	89	50 - 130	<0.0085	ug/L	NC	30
8724898	Benzo(k)fluoranthene	2017/08/16	73	50 - 130	97	50 - 130	<0.0085	ug/L	NC	30
8724898	Benzo[e]pyrene	2017/08/16	78	50 - 130	93	50 - 130	<0.050	ug/L	NC	30
8724898	Chrysene	2017/08/16	84	50 - 130	94	50 - 130	<0.0085	ug/L	NC	30
8724898	Dibenz(a,h)anthracene	2017/08/16	89	50 - 130	88	50 - 130	<0.0075	ug/L	NC	30
8724898	Fluoranthene	2017/08/16	97	50 - 130	74	50 - 130	<0.010	ug/L	NC	30
8724898	Fluorene	2017/08/16	104	50 - 130	72	50 - 130	<0.050	ug/L	NC	30

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Maxxam Job #: B768129
Report Date: 2017/08/20

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8724898	Indeno(1,2,3-cd)pyrene	2017/08/16	83	50 - 130	78	50 - 130	<0.0085	ug/L	NC	30
8724898	Naphthalene	2017/08/16	101	50 - 130	75	50 - 130	<0.10	ug/L	NC	30
8724898	Perylene	2017/08/16	68	50 - 130	89	50 - 130	<0.050	ug/L	NC	30
8724898	Phenanthrene	2017/08/16	101	50 - 130	76	50 - 130	<0.050	ug/L	NC	30
8724898	Pyrene	2017/08/16	96	50 - 130	74	50 - 130	<0.020	ug/L	NC	30
8724898	Quinoline	2017/08/16	106	50 - 130	116	50 - 130	<0.20	ug/L	NC	30
8724907	Benzene	2017/08/13	100	70 - 130	100	70 - 130	<0.40	ug/L	3.6	30
8724907	Ethylbenzene	2017/08/13	102	70 - 130	99	70 - 130	<0.40	ug/L	NC	30
8724907	F1 (C6-C10) - BTEX	2017/08/13					<100	ug/L	NC	30
8724907	F1 (C6-C10)	2017/08/13	80	70 - 130	99	70 - 130	<100	ug/L	NC	30
8724907	m & p-Xylene	2017/08/13	99	70 - 130	99	70 - 130	<0.80	ug/L	NC	30
8724907	o-Xylene	2017/08/13	101	70 - 130	102	70 - 130	<0.40	ug/L	NC	30
8724907	Toluene	2017/08/13	92	70 - 130	92	70 - 130	<0.40	ug/L	NC	30
8724907	Xylenes (Total)	2017/08/13					<0.80	ug/L	NC	30
8724959	pH	2017/08/13			100	97 - 103			0.32	N/A
8724960	Alkalinity (PP as CaCO3)	2017/08/13					<0.50	mg/L	NC	20
8724960	Alkalinity (Total as CaCO3)	2017/08/13			100	80 - 120	<0.50	mg/L	1.4	20
8724960	Bicarbonate (HCO3)	2017/08/13					<0.50	mg/L	1.4	20
8724960	Carbonate (CO3)	2017/08/13					<0.50	mg/L	NC	20
8724960	Hydroxide (OH)	2017/08/13					<0.50	mg/L	NC	20
8724961	Conductivity	2017/08/13			100	90 - 110	<1.0	uS/cm	0	10
8725520	Total Suspended Solids	2017/08/16	93	80 - 120	102	80 - 120	<1.0	mg/L	NC	20
8725669	Dissolved Aluminum (Al)	2017/08/17	94	80 - 120	98	80 - 120	<0.0030	mg/L	0.033	20
8725669	Dissolved Antimony (Sb)	2017/08/17	106	80 - 120	99	80 - 120	<0.00060	mg/L	NC	20
8725669	Dissolved Arsenic (As)	2017/08/17	NC	80 - 120	98	80 - 120	<0.00020	mg/L	1.1	20
8725669	Dissolved Beryllium (Be)	2017/08/17	100	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
8725669	Dissolved Chromium (Cr)	2017/08/17	94	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
8725669	Dissolved Cobalt (Co)	2017/08/17	91	80 - 120	97	80 - 120	<0.00030	mg/L	1.9	20
8725669	Dissolved Copper (Cu)	2017/08/17	88	80 - 120	97	80 - 120	<0.00020	mg/L	NC	20
8725669	Dissolved Lead (Pb)	2017/08/17	93	80 - 120	99	80 - 120	<0.00020	mg/L	NC	20
8725669	Dissolved Molybdenum (Mo)	2017/08/17	108	80 - 120	100	80 - 120	<0.00020	mg/L	2.0	20

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Maxxam Job #: B768129
Report Date: 2017/08/20

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8725669	Dissolved Nickel (Ni)	2017/08/17	89	80 - 120	97	80 - 120	<0.00050	mg/L	1.4	20
8725669	Dissolved Selenium (Se)	2017/08/17	102	80 - 120	99	80 - 120	<0.00020	mg/L	NC	20
8725669	Dissolved Silver (Ag)	2017/08/17	98	80 - 120	99	80 - 120	<0.00010	mg/L	NC	20
8725669	Dissolved Thallium (Tl)	2017/08/17	93	80 - 120	99	80 - 120	<0.00020	mg/L	NC	20
8725669	Dissolved Tin (Sn)	2017/08/17	102	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
8725669	Dissolved Titanium (Ti)	2017/08/17	100	80 - 120	95	80 - 120	<0.0010	mg/L	NC	20
8725669	Dissolved Uranium (U)	2017/08/17	93	80 - 120	95	80 - 120	<0.00010	mg/L	2.5	20
8725669	Dissolved Vanadium (V)	2017/08/17	99	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20
8725669	Dissolved Zinc (Zn)	2017/08/17	94	80 - 120	98	80 - 120	<0.0030	mg/L	7.8	20
8725841	Total Dissolved Solids	2017/08/15	98	80 - 120	101	80 - 120	<10	mg/L	1.1	20
8727251	Total Ammonia (N)	2017/08/16	102	80 - 120	102	80 - 120	<0.015	mg/L	1.6	20
8727692	Total Calcium (Ca)	2017/08/17	NC	80 - 120	90	80 - 120	<0.30	mg/L	0.24	20
8727692	Total Magnesium (Mg)	2017/08/17	97	80 - 120	99	80 - 120	<0.20	mg/L	0.24	20
8727692	Total Potassium (K)	2017/08/17	99	80 - 120	101	80 - 120	<0.30	mg/L	0.35	20
8727692	Total Sodium (Na)	2017/08/17	101	80 - 120	103	80 - 120	<0.50	mg/L	1.2	20
8730277	Dissolved Barium (Ba)	2017/08/18	97	80 - 120	96	80 - 120	<0.010	mg/L	0.18	20
8730277	Dissolved Boron (B)	2017/08/18	100	80 - 120	100	80 - 120	<0.020	mg/L	1.3	20
8730277	Dissolved Calcium (Ca)	2017/08/18	NC	80 - 120	102	80 - 120	<0.30	mg/L	0.19	20
8730277	Dissolved Iron (Fe)	2017/08/18	NC	80 - 120	100	80 - 120	<0.060	mg/L	0.43	20
8730277	Dissolved Lithium (Li)	2017/08/18	99	80 - 120	96	80 - 120	<0.020	mg/L	11	20
8730277	Dissolved Magnesium (Mg)	2017/08/18	101	80 - 120	103	80 - 120	<0.20	mg/L	0.24	20
8730277	Dissolved Manganese (Mn)	2017/08/18	NC	80 - 120	99	80 - 120	<0.0040	mg/L	0.051	20
8730277	Dissolved Phosphorus (P)	2017/08/18	106	80 - 120	100	80 - 120	<0.10	mg/L	NC	20
8730277	Dissolved Potassium (K)	2017/08/18	103	80 - 120	101	80 - 120	<0.30	mg/L	0.79	20
8730277	Dissolved Silicon (Si)	2017/08/18	105	80 - 120	106	80 - 120	<0.10	mg/L	0.074	20
8730277	Dissolved Sodium (Na)	2017/08/18	NC	80 - 120	103	80 - 120	<0.50	mg/L	0.27	20
8730277	Dissolved Strontium (Sr)	2017/08/18	92	80 - 120	97	80 - 120	<0.020	mg/L	0.022	20
8730277	Dissolved Sulphur (S)	2017/08/18					<0.20	mg/L	0.30	20
8731051	Extractable (n-Hex.) Oil and grease	2017/08/18			101	70 - 130	<2.0	mg/L		

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QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8732160	Phenols	2017/08/19	100	80 - 120	97	80 - 120	<0.0020	mg/L	5.0	20

N/A = Not Applicable

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

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

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

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

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

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

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

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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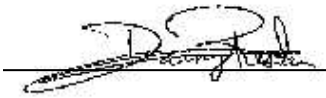
Maxxam Job #: B768129
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

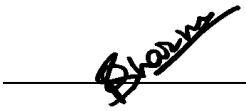
VALIDATION SIGNATURE PAGE

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



Daniel Reslan, cCT, QP, Organics Supervisor

Justin Geisel, B.Sc., Organics Supervisor



Poonam Sharma, cCT, Organics Supervisor

Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

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

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Maxxam
A Bureau Veritas Group Company

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Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 017082

Page 1 of 1

Report Information

Company: ARCADIS CANADA INC.
Contact: MAURENIA LYNDS
Phone: 613 721 0555
Email: MAURENIA.LYNDS@ARCADIS.COM
Sampled by: ELLIOTT HOLDEN

Comments

QUOTE: B50993
PROJECT: 1C2089-003
SITE: APRON
CAM BAY ~~FIA~~
CTU

Same as CoC

Project/LSD

Analysis Requested

#	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2 F4	BTEX F1-F4	Routine Water (1)	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	~~Salinity 4~~ NITRATE-NITRITE	~~Sieve (75 micron)~~ OIL & GREASE	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	AMMONIA NITROGEN	TOTAL PHENOLS	Ca, Mg, Na, K	CHLORIDE/SULPHATE	DISSOLVED METALS	PAHS	TSS AND TDS		HOLD - DO NOT ANALYZE
11	MW13-8		2017/08/08	16:30	GW	11		X		X			X	X			X	X	X	X	X	X	X		
12																									
13																									
14																									
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30																									
Please indicate Filtered, Preserved or Both (F, P, F/P) →																					F/P				

Special Instructions

(1) pH, conductivity, total hardness, total Alkalinity

Temp: S, L, L 9

RECEIVED IN YELLOWKNIFE
2017-08-11 12:05
By: [illegible]

22.2
ice/seal/yes

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
EH ELLIOTT HOLDEN	2017/08/10	10:00	Jenna Walter	20170812	1224	B768129

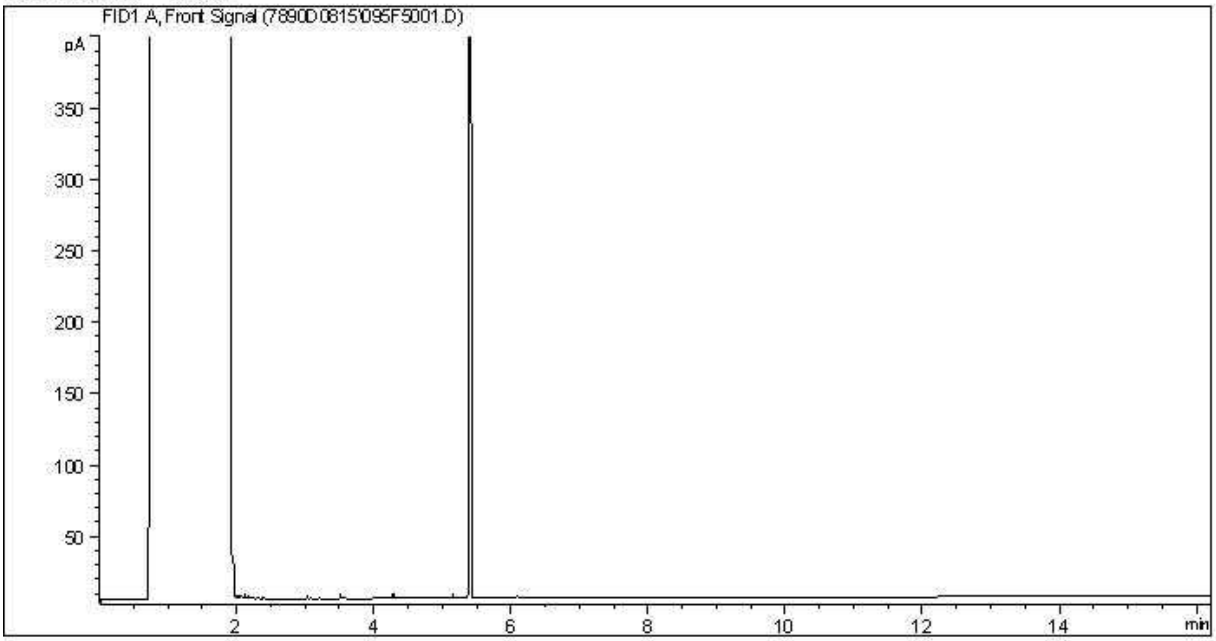
AB FCD-00331/6

Maxxam Job #: B768129
Report Date: 2017/08/20
Maxxam Sample: RS4665

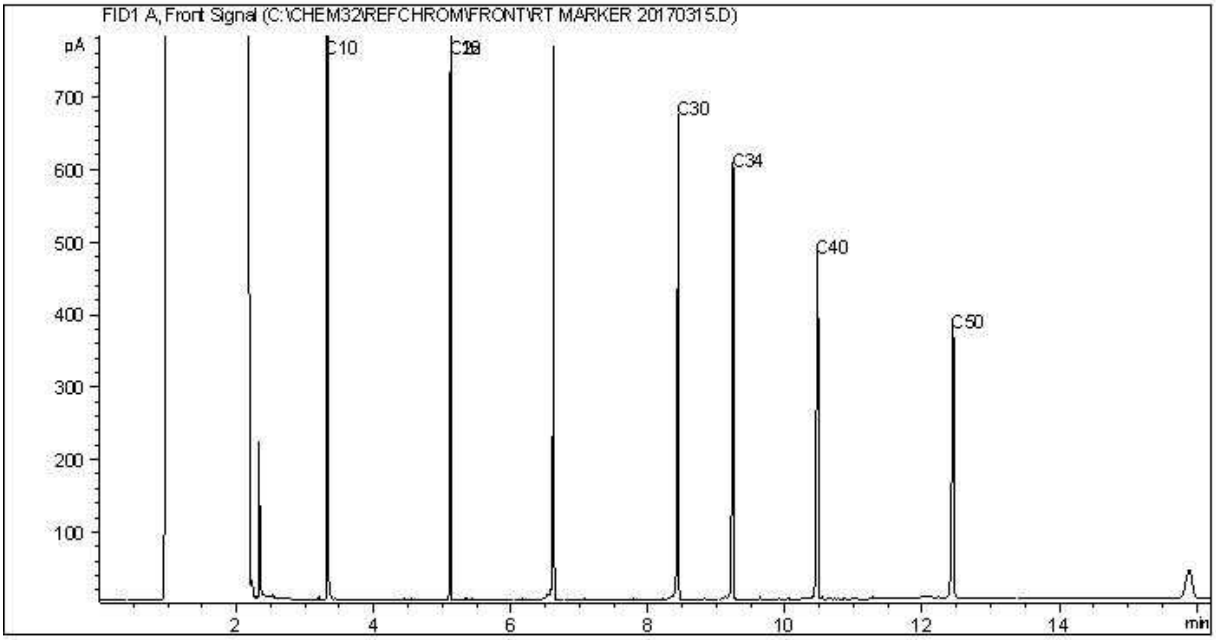
ARCADIS Canada
Client Project #: 102089-003
Site Reference: CAM BAY APRON LTU
Client ID: MW13-8

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890D



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Your Project #: 102089-003
Site Location: CAM BAY APRON LTU
Your C.O.C. #: M017078

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/09/01
Report #: R2438016
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768255
Received: 2017/08/11, 10:03

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Perfluorinated Compounds - Subcontract (1)	1	N/A	2017/09/01		See Attachment

Remarks:

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

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

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

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

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

(1) This test was performed by Maxxam Calgary Environmental

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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

Maxxam Job #: B768255
Report Date: 2017/09/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		RS5339	
Sampling Date		2017/08/08 16:30	
COC Number		M017078	
	UNITS	**MW13-8**	**QC Batch**
Parameter			
Subcontract Parameter	ug/L	ATTACHED	8745348

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

Maxxam Job #: B768255
Report Date: 2017/09/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	6.3°C
Package 2	5.3°C

PFOS and PFOA results are attached to this report. The reference number from Maxxam Mississauga is B7H5181.

Results relate only to the items tested.

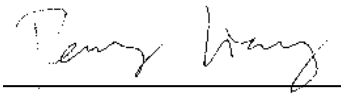
Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768255
Report Date: 2017/09/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRON LTU
Sampler Initials: EH

VALIDATION SIGNATURE PAGE

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



Harry (Peng) Liang, Senior Analyst

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

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 017078

Page 1 of 1

Report Information

Company: ARCADIS CANADA INC.
Contact: MACRENIA LYNDS
Phone: 613 721 0555
Email: MACRENIA.LYNDS@ARCADIS.COM
Sampled by: ELLIOTT HOLDEN

Comments

QUOTE: B50993
PROJECT BILL TO: 102089-0002
SITE: CAM BAY APRON LTCH
102089-003

Analysis Requested

Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	PFAS	HOLD - DO NOT ANALYZE
11 MW13-8		2017/08/08	16:30	GW	2											X	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	

Please indicate Filtered, Preserved or Both (F, P, F/P) →

Same as CoC

Project/LSD

Special Instructions

2.2.2
ice/seal yes

RECEIVED IN YELLOWKNIFE
By: [signature]
2017 -08- 11 10:03

Temp: 5 / 7 / 7 rings
7 5 4 days

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
ELLIOTT HOLDEN	2017/08/10	10:00	Jena Walter	20170812	1224	B768255

AB FCD-00331/6

Maxxam
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Your P.O. #: N/A
Your Project #: B768255
Your C.O.C. #: na

Attention:Parminder Virk

Maxxam Analytics
Edmonton - Environmental
9331 48th St
Edmonton, AB
T6B 2R4

Report Date: 2017/09/01
Report #: R4684330
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7H5181
Received: 2017/08/15, 09:27

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
PFOS and PFOA in water by SPE/LCMS (1)	1	2017/08/17	2017/08/25	CAM SOP-00894	EPA 537 m

Remarks:

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

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

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

(1) Per- and polyfluoroalkyl substances (PFAS) identified as surrogates on the certificate of analysis represent the extracted internal standard.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Marijane Cruz, Senior Project Manager
Email: MCruz@maxxam.ca
Phone# (905)817-5756

==========

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Maxxam Job #: B7H5181
Report Date: 2017/09/01

Maxxam Analytics
Client Project #: B768255
Your P.O. #: N/A

RESULTS OF ANALYSES OF WATER

Maxxam ID		EYD853		
Sampling Date		2017/08/08 16:30		
COC Number		na		
	UNITS	RS5339-01R\MW13-8	RDL	QC Batch
Miscellaneous Parameters				
Perfluorobutane Sulfonate (PFBS)	ug/L	<0.020	0.020	5123557
Perfluorobutanoic acid	ug/L	0.20	0.020	5123557
Perfluorodecane Sulfonate	ug/L	<0.020	0.020	5123557
Perfluorodecanoic Acid (PFDA)	ug/L	<0.020	0.020	5123557
Perfluorododecanoic Acid (PFDoA)	ug/L	<0.020	0.020	5123557
Perfluoroheptane sulfonate	ug/L	<0.020	0.020	5123557
Perfluoroheptanoic Acid (PFHpA)	ug/L	<0.020	0.020	5123557
Perfluorohexane Sulfonate (PFHxS)	ug/L	<0.020	0.020	5123557
Perfluorohexanoic Acid (PFHxA)	ug/L	<0.020	0.020	5123557
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	<0.020	0.020	5123557
Perfluorononanoic Acid (PFNA)	ug/L	<0.020	0.020	5123557
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.020	0.020	5123557
Perfluorooctane Sulfonate (PFOS)	ug/L	<0.020	0.020	5123557
Perfluoropentanoic Acid (PFPeA)	ug/L	0.050	0.020	5123557
Perfluorotetradecanoic Acid	ug/L	<0.020	0.020	5138915
Perfluorotridecanoic Acid	ug/L	<0.020	0.020	5138915
Perfluoroundecanoic Acid (PFUnA)	ug/L	<0.020	0.020	5123557
Surrogate Recovery (%)				
13C2-Perfluorodecanoic acid	%	76	N/A	5123557
13C2-Perfluorododecanoic acid	%	67	N/A	5123557
13C2-Perfluorohexanoic acid	%	86	N/A	5123557
13C2-perfluorotetradecanoic acid	%	55	N/A	5138915
13C2-Perfluoroundecanoic acid	%	71	N/A	5123557
13C4-Perfluorobutanoic acid	%	73	N/A	5123557
13C4-Perfluoroheptanoic acid	%	86	N/A	5123557
13C4-Perfluorooctanesulfonate	%	80	N/A	5123557
13C4-Perfluorooctanoic acid	%	97	N/A	5123557
13C5-Perfluorononanoic acid	%	81	N/A	5123557
13C5-Perfluoropentanoic acid	%	90	N/A	5123557
13C8-Perfluorooctane Sulfonamide	%	75	N/A	5123557
18O2-Perfluorohexanesulfonate	%	94	N/A	5123557

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7H5181
Report Date: 2017/09/01

Maxxam Analytics
Client Project #: B768255
Your P.O. #: N/A

GENERAL COMMENTS

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

Package 1	7.3°C

Sample EYD853, PFOS and PFOA in water by SPE/LCMS: Test repeated.

Results relate only to the items tested.

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Maxxam Job #: B7H5181
Report Date: 2017/09/01

QUALITY ASSURANCE REPORT

Maxxam Analytics
Client Project #: B768255
Your P.O. #: N/A

			SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5123557	13C2-Perfluorodecanoic acid	2017/08/25	89	50 - 150	83	%		
5123557	13C2-Perfluorododecanoic acid	2017/08/25	83	50 - 150	74	%		
5123557	13C2-Perfluorohexanoic acid	2017/08/25	93	50 - 150	94	%		
5123557	13C2-Perfluoroundecanoic acid	2017/08/25	84	50 - 150	83	%		
5123557	13C4-Perfluorobutanoic acid	2017/08/25	90	50 - 150	97	%		
5123557	13C4-Perfluoroheptanoic acid	2017/08/25	97	50 - 150	96	%		
5123557	13C4-Perfluorooctanesulfonate	2017/08/25	96	50 - 150	88	%		
5123557	13C4-Perfluorooctanoic acid	2017/08/25	91	50 - 150	96	%		
5123557	13C5-Perfluorononanoic acid	2017/08/25	87	50 - 150	92	%		
5123557	13C5-Perfluoropentanoic acid	2017/08/25	88	50 - 150	89	%		
5123557	13C8-Perfluorooctane Sulfonamide	2017/08/25	80	50 - 150	84	%		
5123557	18O2-Perfluorohexanesulfonate	2017/08/25	88	50 - 150	101	%		
5138915	13C2-perfluorotetradecanoic acid	2017/08/31	87	50 - 150	83	%		
5123557	Perfluorobutane Sulfonate (PFBS)	2017/08/25	116	70 - 130	<0.020	ug/L	9.9	30
5123557	Perfluorobutanoic acid	2017/08/25	113	70 - 130	<0.020	ug/L	5.4	30
5123557	Perfluorodecane Sulfonate	2017/08/25	105	70 - 130	<0.020	ug/L	2.5	30
5123557	Perfluorodecanoic Acid (PFDA)	2017/08/25	109	70 - 130	<0.020	ug/L	4.9	30
5123557	Perfluorododecanoic Acid (PFDoA)	2017/08/25	113	70 - 130	<0.020	ug/L	3.1	30
5123557	Perfluoroheptane sulfonate	2017/08/25	98	70 - 130	<0.020	ug/L	10	30
5123557	Perfluoroheptanoic Acid (PFHpA)	2017/08/25	102	70 - 130	<0.020	ug/L	11	30
5123557	Perfluorohexane Sulfonate (PFHxS)	2017/08/25	113	70 - 130	<0.020	ug/L	10	30
5123557	Perfluorohexanoic Acid (PFHxA)	2017/08/25	107	70 - 130	<0.020	ug/L	5.4	30
5123557	Perfluoro-n-Octanoic Acid (PFOA)	2017/08/25	108	70 - 130	<0.020	ug/L	3.0	30
5123557	Perfluorononanoic Acid (PFNA)	2017/08/25	112	70 - 130	<0.020	ug/L	2.6	30
5123557	Perfluorooctane Sulfonamide (PFOSA)	2017/08/25	114	70 - 130	<0.020	ug/L	1.5	30
5123557	Perfluorooctane Sulfonate (PFOS)	2017/08/25	105	70 - 130	<0.020	ug/L	6.2	30
5123557	Perfluoropentanoic Acid (PFPeA)	2017/08/25	118	70 - 130	<0.020	ug/L	4.9	30
5123557	Perfluoroundecanoic Acid (PFUnA)	2017/08/25	115	70 - 130	<0.020	ug/L	4.6	30
5138915	Perfluorotetradecanoic Acid	2017/08/31	105	70 - 130	<0.020	ug/L	3.1	30

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QUALITY ASSURANCE REPORT(CONT'D)

			SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5138915	Perfluorotridecanoic Acid	2017/08/31	110	70 - 130	<0.020	ug/L	5.9	30

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

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

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

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

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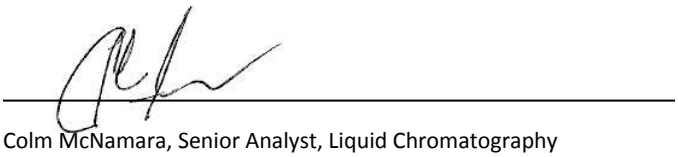
Maxxam Job #: B7H5181
Report Date: 2017/09/01

Maxxam Analytics
Client Project #: B768255
Your P.O. #: N/A

VALIDATION SIGNATURE PAGE

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



Colm McNamara, Senior Analyst, Liquid Chromatography

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Maxxam
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Success Through Science®

Your Project #: 102089-003
Site Location: CAM BAY APRCN LTU
Your C.O.C. #: M057443

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/25
Report #: R2434590
Version: 2 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768020
Received: 2017/08/10, 10:00

Sample Matrix: Soil
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS/FID (MeOH extract) (1)	7	N/A	2017/08/13	AB SOP-00039	CCME CWS/EPA 8260c m
CCME Hydrocarbons (F2-F4 in soil) (2)	7	2017/08/16	2017/08/17	AB SOP-00036	CCME PHC-CWS m
Elements by ICP -Soils	5	2017/08/15	2017/08/17	AB SOP-00001 / AB SOP-00042	EPA 200.7 CFR 2012 m
Moisture	7	N/A	2017/08/17	AB SOP-00002	CCME PHC-CWS m
Phosphorus, Potassium - Available	5	2017/08/17	2017/08/17	AB SOP-00028 / AB SOP-00042	EPA 200.7 CFR 2012 m

Remarks:

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Results relate to samples tested.

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

(1) No lab extraction date is given for F1BTEX & VOC samples that are field preserved with methanol. Extraction date is date sampled unless otherwise stated.
(2) All CCME results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following Alberta Environment's Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil, Validation of Performance-Based Alternative Methods September 2003. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.

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

Your Project #: 102089-003
Site Location: CAM BAY APRCN LTU
Your C.O.C. #: M057443

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/25
Report #: R2434590
Version: 2 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768020
Received: 2017/08/10, 10:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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

Maxxam Job #: B768020
Report Date: 2017/08/25

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRCN LTU
Sampler Initials: EH

AT1 BTEX AND F1-F4 IN SOIL (VIALS)

Maxxam ID		RS3932	RS3933	RS3934	RS3934	RS3935	RS3936		
Sampling Date		2017/08/05 14:15	2017/08/05 14:45	2017/08/05 15:15	2017/08/05 15:15	2017/08/05 14:30	2017/08/05 15:00		
COC Number		M057443	M057443	M057443	M057443	M057443	M057443		
	UNITS	APRON1701	APRON1702	APRON1703	APRON1703 Lab-Dup	APRON1704	APRON1705	RDL	QC Batch
Physical Properties									
Moisture	%	12	9.4	8.7	9.3	11	9.8	0.30	8728488
Ext. Pet. Hydrocarbon									
F2 (C10-C16 Hydrocarbons)	mg/kg	36	21	23	N/A	440	17	10	8726059
F3 (C16-C34 Hydrocarbons)	mg/kg	<50	1500	1300	N/A	71	1900	50	8726059
F4 (C34-C50 Hydrocarbons)	mg/kg	<50	1000	840	N/A	<50	1400	50	8726059
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	N/A	Yes	Yes	N/A	8726059
Field Preserved Volatiles									
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	N/A	0.038 (1)	<0.0050	0.0050	8724825
Toluene	mg/kg	<0.020	<0.020	<0.020	N/A	<0.020	<0.020	0.020	8724825
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	N/A	1.4	<0.010	0.010	8724825
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	N/A	5.9	<0.040	0.040	8724825
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	N/A	3.3	<0.040	0.040	8724825
o-Xylene	mg/kg	<0.020	<0.020	<0.020	N/A	2.6	<0.020	0.020	8724825
F1 (C6-C10) - BTEX	mg/kg	<10	<10	<10	N/A	830	<10	10	8724825
F1 (C6-C10)	mg/kg	<10	<10	<10	N/A	840	<10	10	8724825
Surrogate Recovery (%)									
1,4-Difluorobenzene (sur.)	%	91	95	96	N/A	96	92	N/A	8724825
4-Bromofluorobenzene (sur.)	%	94	103	102	N/A	109	100	N/A	8724825
D10-o-Xylene (sur.)	%	101	102	101	N/A	107	102	N/A	8724825
D4-1,2-Dichloroethane (sur.)	%	95	99	101	N/A	99	95	N/A	8724825
O-TERPHENYL (sur.)	%	106	95	115	N/A	96	93	N/A	8726059

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Qualifying ion outside of acceptance criteria. Results are tentatively identified and potentially biased high.

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

Maxxam Job #: B768020
Report Date: 2017/08/25

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRCN LTU
Sampler Initials: EH

AT1 BTEX AND F1-F4 IN SOIL (VIALS)

Maxxam ID		RS3937	RS3938		
Sampling Date		2017/08/05 15:30	2017/08/05		
COC Number		M057443	M057443		
	UNITS	APRON1706	APRON17DUP01	RDL	QC Batch
Physical Properties					
Moisture	%	9.1	11	0.30	8728488
Ext. Pet. Hydrocarbon					
F2 (C10-C16 Hydrocarbons)	mg/kg	100	490	10	8726059
F3 (C16-C34 Hydrocarbons)	mg/kg	520	92	50	8726059
F4 (C34-C50 Hydrocarbons)	mg/kg	270	<50	50	8726059
Reached Baseline at C50	mg/kg	Yes	Yes	N/A	8726059
Field Preserved Volatiles					
Benzene	mg/kg	<0.0050	0.045 (1)	0.0050	8724825
Toluene	mg/kg	<0.020	<0.020	0.020	8724825
Ethylbenzene	mg/kg	<0.010	1.6	0.010	8724825
Xylenes (Total)	mg/kg	<0.040	6.6	0.040	8724825
m & p-Xylene	mg/kg	<0.040	3.7	0.040	8724825
o-Xylene	mg/kg	<0.020	2.9	0.020	8724825
F1 (C6-C10) - BTEX	mg/kg	<10	840	10	8724825
F1 (C6-C10)	mg/kg	<10	850	10	8724825
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	96	97	N/A	8724825
4-Bromofluorobenzene (sur.)	%	102	108	N/A	8724825
D10-o-Xylene (sur.)	%	102	115	N/A	8724825
D4-1,2-Dichloroethane (sur.)	%	100	98	N/A	8724825
O-TERPHENYL (sur.)	%	96	111	N/A	8726059

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Qualifying ion outside of acceptance criteria. Results are tentatively identified and potentially biased high.

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Maxxam Job #: B768020
Report Date: 2017/08/25

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRCN LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		RS3932	RS3934	RS3935	RS3937	RS3938		
Sampling Date		2017/08/05 14:15	2017/08/05 15:15	2017/08/05 14:30	2017/08/05 15:30	2017/08/05		
COC Number		M057443	M057443	M057443	M057443	M057443		
	UNITS	APRON1701	APRON1703	APRON1704	APRON1706	APRON17DUP01	RDL	QC Batch
Nutrients								
Available (Mod Kel) Phosphorus (P)	mg/kg	<4.0	10	<4.0	20	<4.0	4.0	8728979
RDL = Reportable Detection Limit								

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Maxxam Job #: B768020
Report Date: 2017/08/25

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRCN LTU
Sampler Initials: EH

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		RS3932	RS3934	RS3935	RS3937	RS3938		
Sampling Date		2017/08/05 14:15	2017/08/05 15:15	2017/08/05 14:30	2017/08/05 15:30	2017/08/05		
COC Number		M057443	M057443	M057443	M057443	M057443		
	UNITS	APRON1701	APRON1703	APRON1704	APRON1706	APRON17DUP01	RDL	QC Batch
Elements								
Total Iron (Fe)	mg/kg	7900	9900	9200	9700	9400	10	8726402
Total Potassium (K)	mg/kg	1400	1700	1600	1600	1600	25	8726402
RDL = Reportable Detection Limit								

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Maxxam Job #: B768020
Report Date: 2017/08/25

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRCN LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	9.0°C
Package 2	9.7°C

Results for Total Nitrogen are attached to this report. The reference number from Maxxam Campobello is B7H7176.

Results relate only to the items tested.

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Maxxam Job #: B768020
Report Date: 2017/08/25

QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRCN LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8724825	1,4-Difluorobenzene (sur.)	2017/08/13			99	60 - 130	94	%				
8724825	4-Bromofluorobenzene (sur.)	2017/08/13			103	60 - 130	102	%				
8724825	D10-o-Xylene (sur.)	2017/08/13			96	60 - 130	94	%				
8724825	D4-1,2-Dichloroethane (sur.)	2017/08/13			102	60 - 130	108	%				
8726059	O-TERPHENYL (sur.)	2017/08/15	105	60 - 130	90	60 - 130	111	%				
8724825	Benzene	2017/08/13			93	50 - 130	<0.0050	mg/kg	NC	50		
8724825	Ethylbenzene	2017/08/13			92	50 - 130	<0.010	mg/kg	NC	50		
8724825	F1 (C6-C10) - BTEX	2017/08/13					<10	mg/kg	16	30		
8724825	F1 (C6-C10)	2017/08/13	110	60 - 140	112	50 - 130	<10	mg/kg	16	30		
8724825	m & p-Xylene	2017/08/13			95	50 - 130	<0.040	mg/kg	NC	50		
8724825	o-Xylene	2017/08/13			93	50 - 130	<0.020	mg/kg	NC	50		
8724825	Toluene	2017/08/13			90	50 - 130	<0.020	mg/kg	NC	50		
8724825	Xylenes (Total)	2017/08/13					<0.040	mg/kg	NC	50		
8726059	F2 (C10-C16 Hydrocarbons)	2017/08/15	117	60 - 130	93	70 - 130	<10	mg/kg	4.1	40		
8726059	F3 (C16-C34 Hydrocarbons)	2017/08/15	116	60 - 130	92	70 - 130	<50	mg/kg	53 (1)	40		
8726059	F4 (C34-C50 Hydrocarbons)	2017/08/15	114	60 - 130	91	70 - 130	<50	mg/kg	58 (1)	40		
8726402	Total Iron (Fe)	2017/08/17	NC	75 - 125	109	80 - 120	<10	mg/kg	4.9	30	87	78 - 122
8726402	Total Potassium (K)	2017/08/17	133 (1)	75 - 125	103	80 - 120	<25	mg/kg	6.9	35	69	55 - 145
8728488	Moisture	2017/08/17					<0.30	%	6.7	20		
8728979	Available (Mod Kel) Phosphorus (P)	2017/08/17	95	75 - 125	101	80 - 120	<4.0	mg/kg	NC	35		

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

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

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

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

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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

Maxxam Job #: B768020
Report Date: 2017/08/25

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAM BAY APRCN LTU
Sampler Initials: EH

VALIDATION SIGNATURE PAGE

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

Justin Geisel, B.Sc., Organics Supervisor

Poonam Sharma, cCT, Organics Supervisor

Sandy Yuan, M.Sc., Scientific Specialist

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

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Maxxam
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Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

604 (3)

CHAIN OF CUSTODY RECORD

M057443

Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: #28344 PRIVATE CLIENTS	Company: ARCADIS CANADA INC.	Quotation #: B50993	☒ 5 - 7 Days Regular (Most analyses)
Contact Name: NATALIE ROBINSON	Contact Name: MAURENIA LYNDS	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 1650, 635-8th AVE. SW CALGARY, AB T2P 3M3	Address: 329 CHURCHILL AVE N OTTAWA ON K1Z 5B8	Project #: 102089-003	Rush TAT (Surcharges will be applied)
Phone: 403-292-6882	Phone: 613 721 0555	Site Location: CAM BAY APRON OU	☐ Same Day ☐ 2 Days ☐ 1 Day ☐ 3-4 Days
Email: NATALIE.ROBINSON@	Email: MAURENIA.LYNDS@	Site #:	Date Required:
Copies: PWGSC-TPSGC.GC.CA	Copies: ARCADIS.COM	Sampled By: E HOLDEN	Rush Confirmation #:

Laboratory Use Only

RECEIVED IN YELLOWKNIFE
By: Depot Reception
2017-08-10
10:00

	YES	NO	Cooler ID			
Seal Present	✓					
Seal Intact	✓		Temp	4	2	3
Cooling Media	✓					
Seal Present	✓					
Seal Intact	✓		Temp	5	7	2
Cooling Media	✓					
Seal Present	✓					
Seal Intact	✓		Temp	5	3	3
Cooling Media	✓					

Temp: 8.1 9 days
9.1 10 days

Analysis Requested

	Sample Identification	Depth (Unit) (M)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC	BTEX F1-F4	Routine Water	Regulated Metals ☐ Tot ☐ Diss	Mercury ☐ Total ☐ Dissolved	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	TOTAL IRON	TOTAL POTASSIUM	AVAILABLE PHOSPHORUS	TOTAL NITROGEN	HOLD - DO NOT ANALYZE
1	APRON1701	0.0-0.2	2017/08/05	14:15	SOIL	4	X	X								X	X	X	X	
2	APRON1702	0.0-0.2	2017/08/05	14:~~30~~ 45	SOIL	4	X	X												
3	APRON1703	0.0-0.2	2017/08/05	15:15	SOIL	4	X	X								X	X	X	X	
4	APRON1704	0.0-0.2	2017/08/05	14:30	SOIL	4	X	X								X	X	X	X	
5	APRON1705	0.0-0.2	2017/08/05	15:00	SOIL	4	X	X												
6	APRON1706	0.0-0.2	2017/08/05	15:30	SOIL	4	X	X								X	X	X	X	
7	APRON DUP01	0.0-0.2	2017/08/05		SOIL	4	X	X								X	X	X	X	
8																				
9																				
10																				

Please indicate Filtered, Preserved or Both (F, P, F/P)

Regulatory Criteria

- ☐ AT1
- ☒ CCME
- ☐ Drinking Water
- ☐ D50 (Drilling Waste)
- ☐ Saskatchewan
- ☐ Other:

Special Instructions

SAMPLE APRON1702 SAMPLED AT 14:45

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
E HOLDEN ELLIOTT HOLDEN	2017/08/08	10:00	Danielle Boisvert	2017/08/11	10:55	B768020 JWF

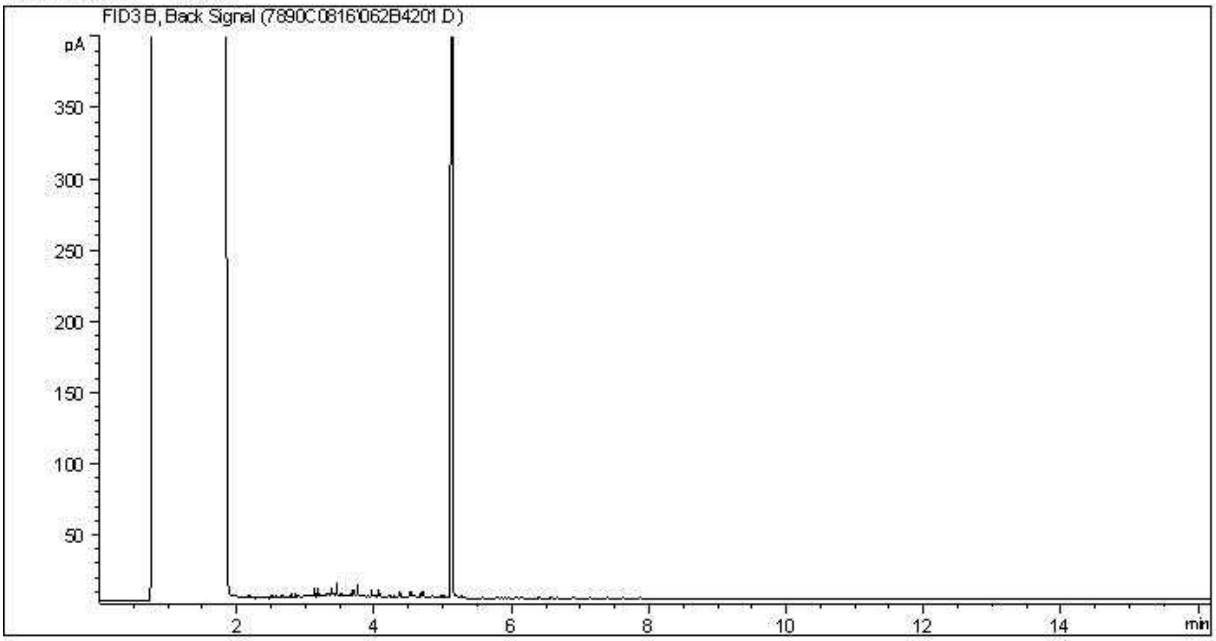
AB FCD-00331/7

Maxxam Job #: B768020
Report Date: 2017/08/25
Maxxam Sample: RS3932

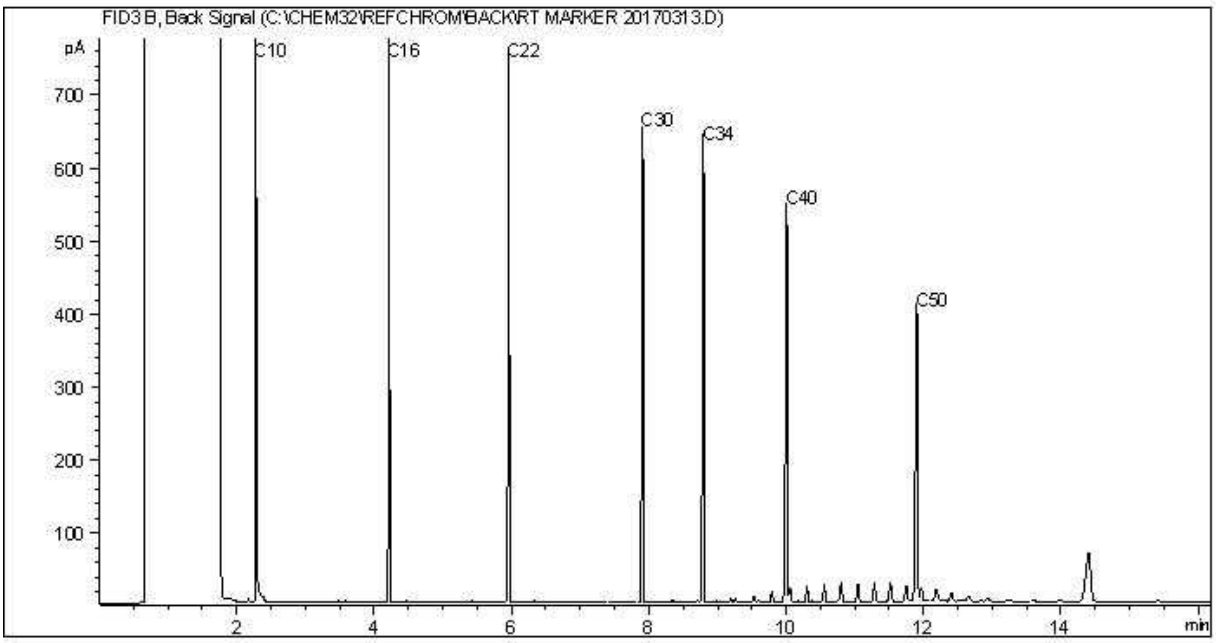
ARCADIS Canada
Client Project #: 102089-003
Site Reference: CAM BAY APRCN LTU
Client ID: APRON1701

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890C



Carbon Range Distribution - Reference Chromatogram



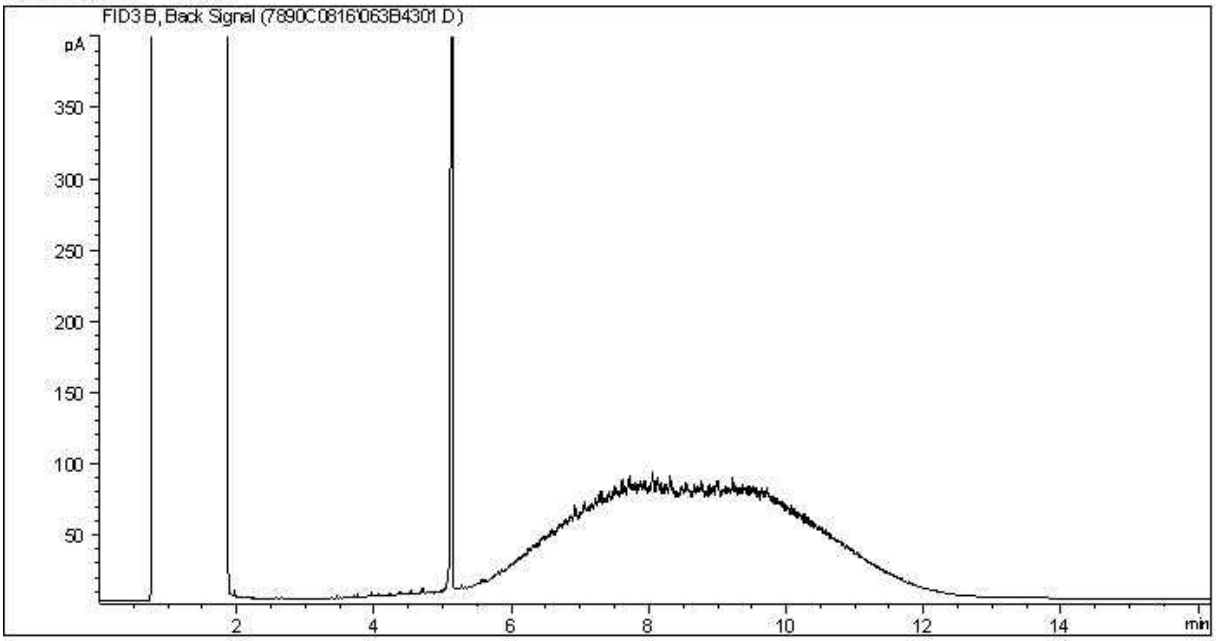
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

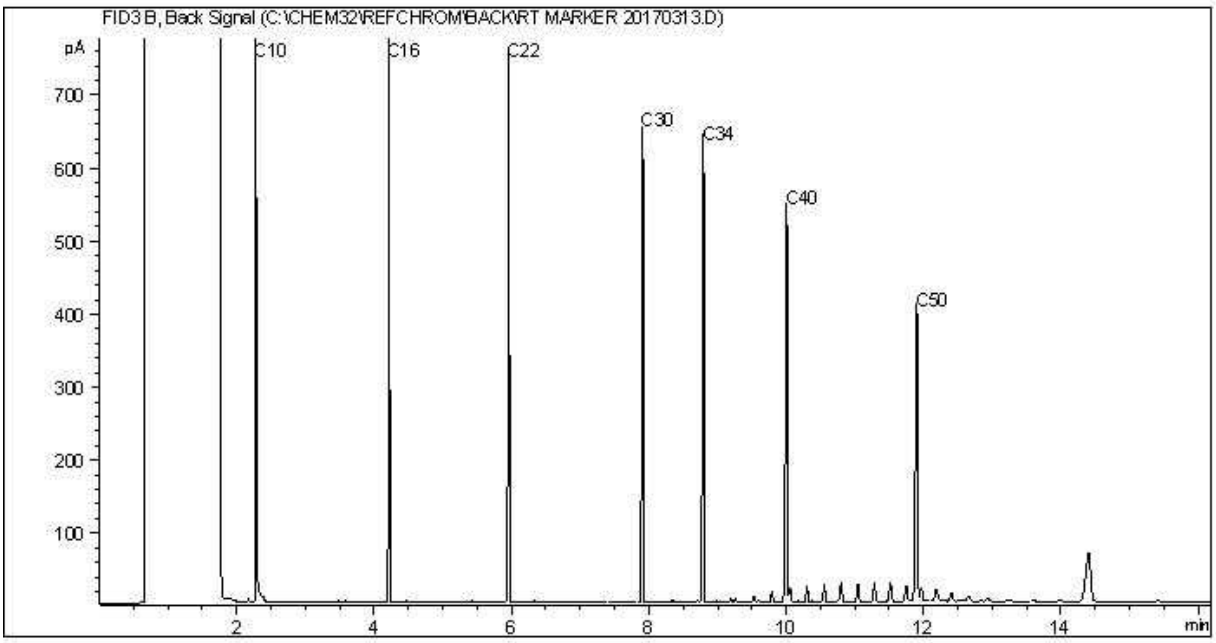
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890C



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

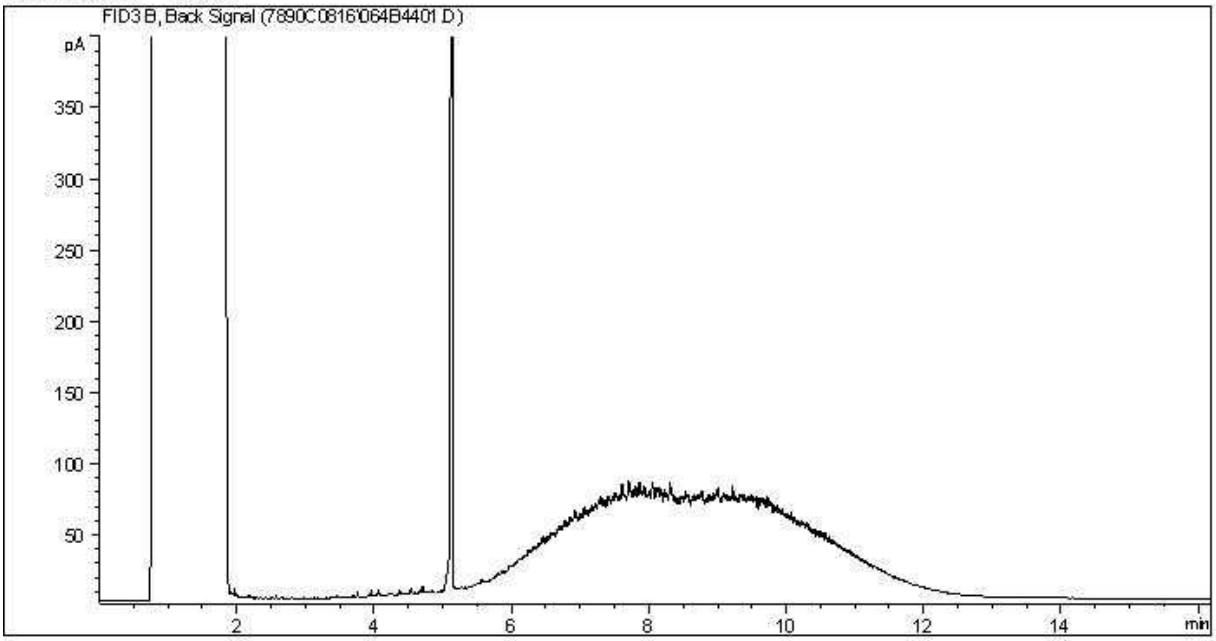
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B768020
Report Date: 2017/08/25
Maxxam Sample: RS3934

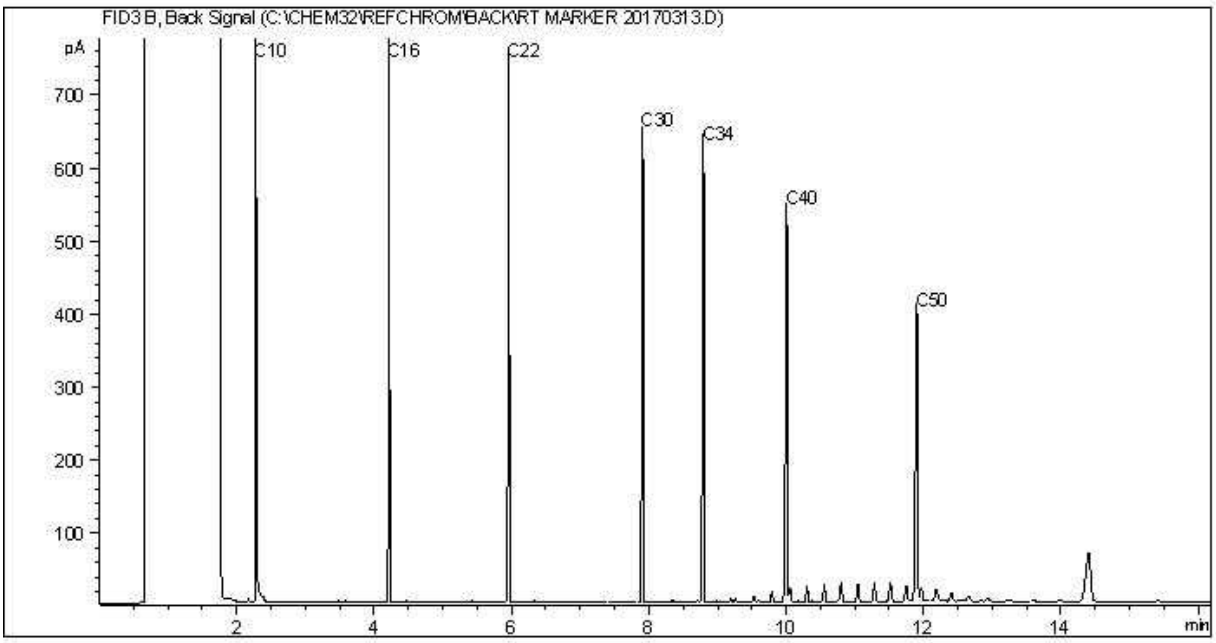
ARCADIS Canada
Client Project #: 102089-003
Site Reference: CAM BAY APRCN LTU
Client ID: APRON1703

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890C



Carbon Range Distribution - Reference Chromatogram



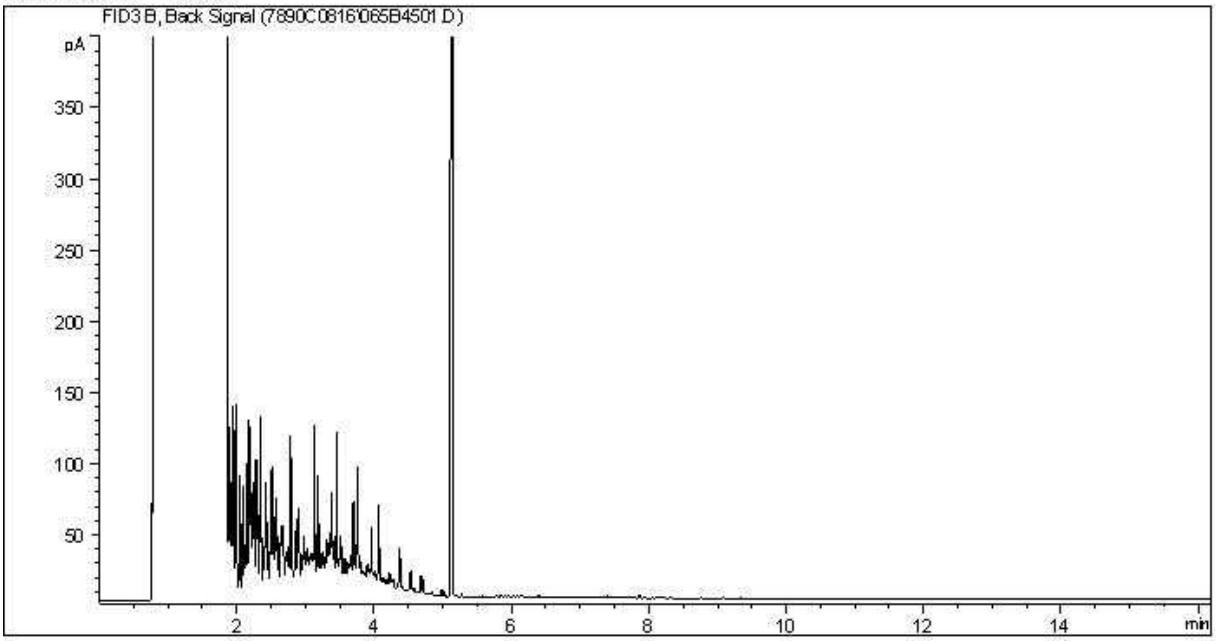
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

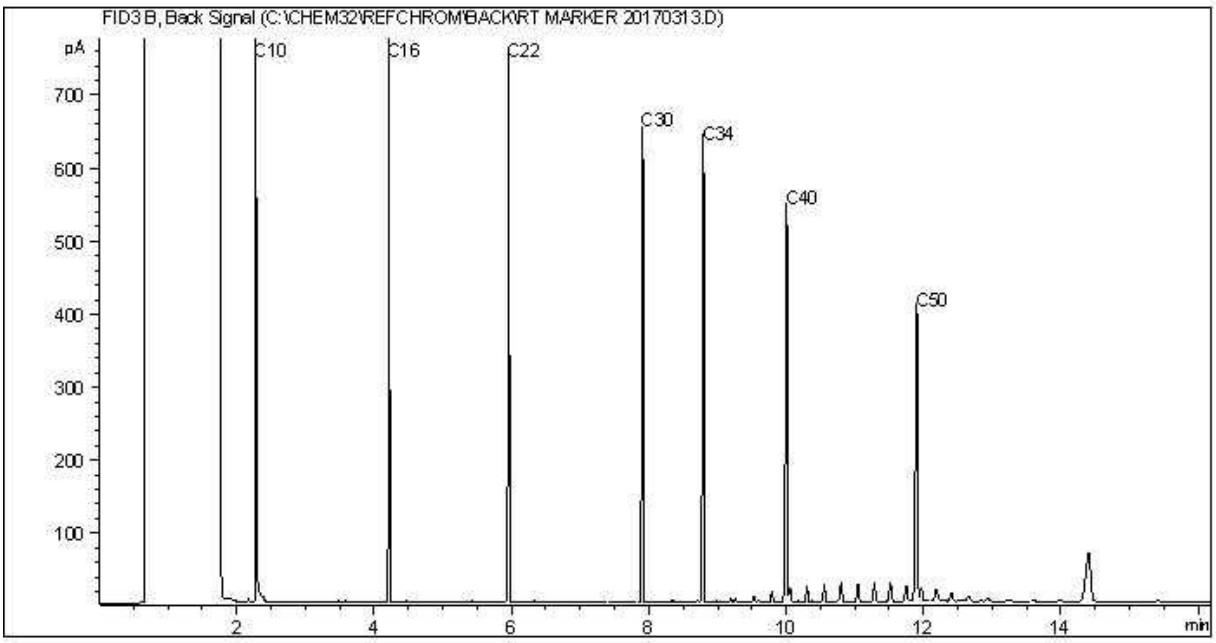
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890C



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

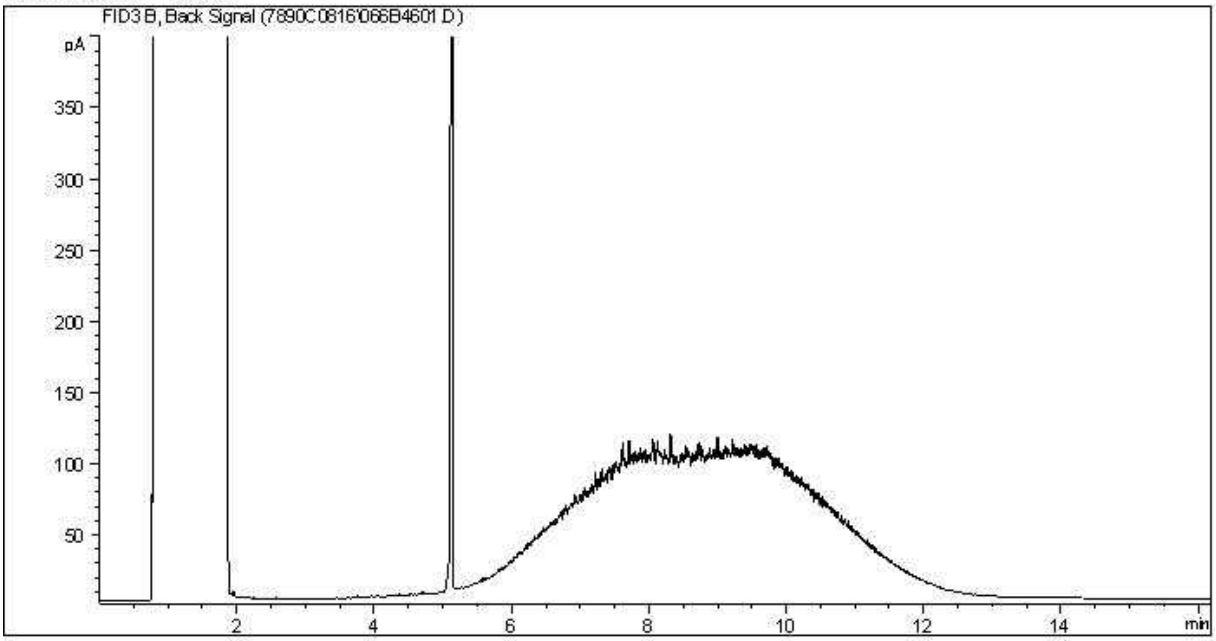
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B768020
Report Date: 2017/08/25
Maxxam Sample: RS3936

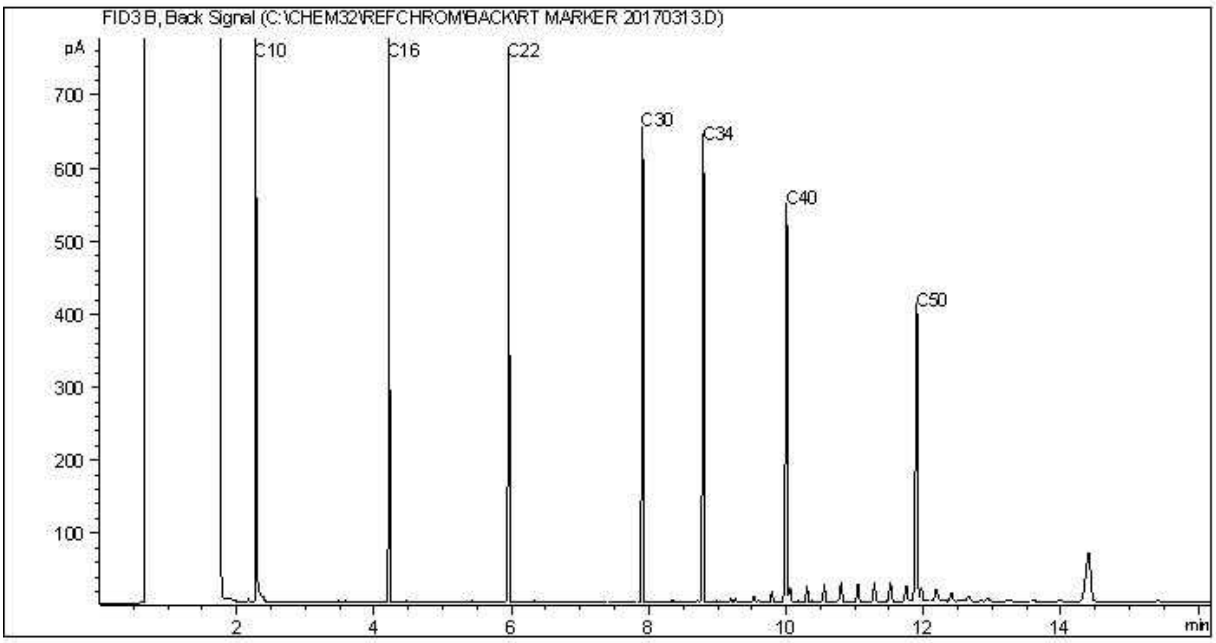
ARCADIS Canada
Client Project #: 102089-003
Site Reference: CAM BAY APRCN LTU
Client ID: APRON1705

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890C



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

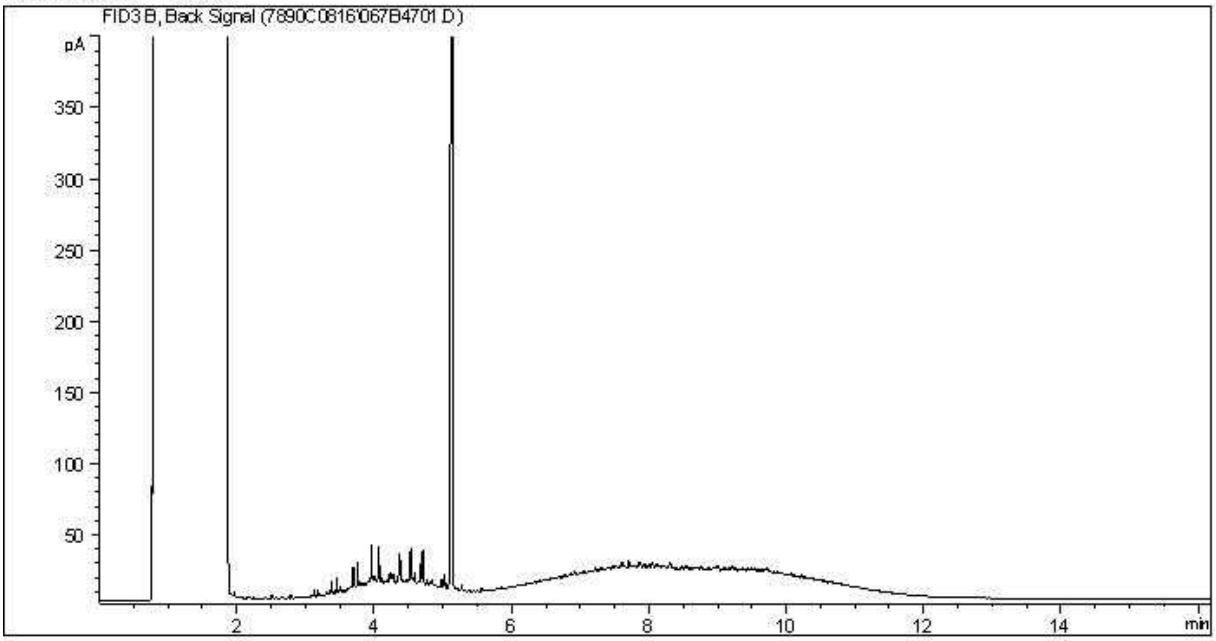
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B768020
Report Date: 2017/08/25
Maxxam Sample: RS3937

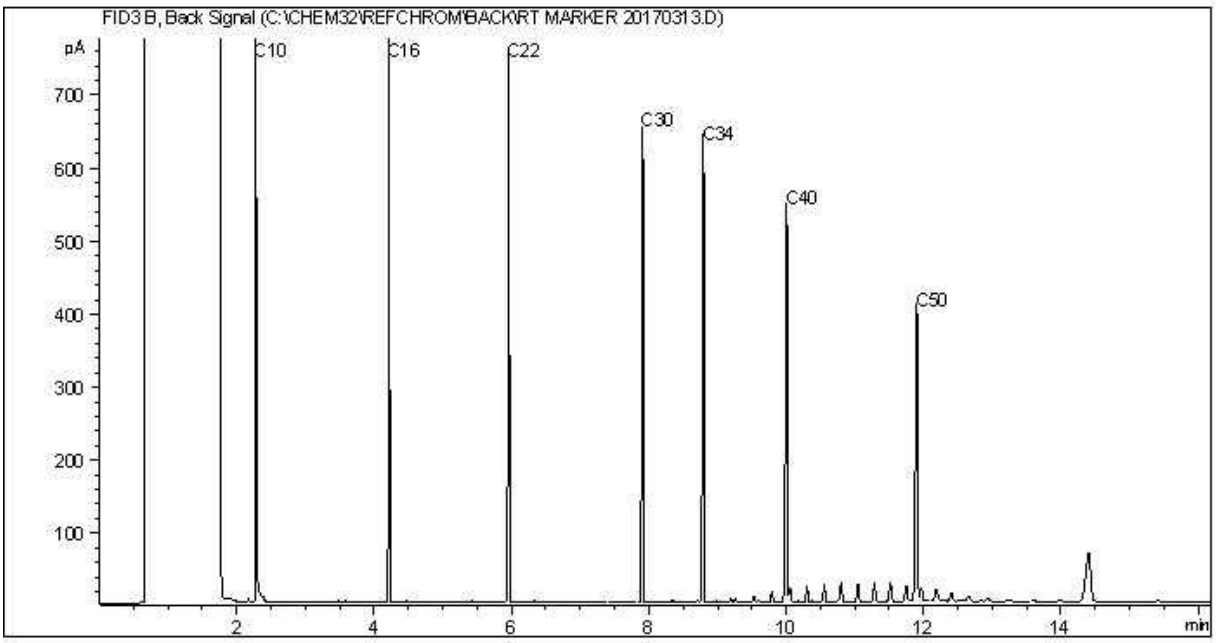
ARCADIS Canada
Client Project #: 102089-003
Site Reference: CAM BAY APRCN LTU
Client ID: APRON1706

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890C



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

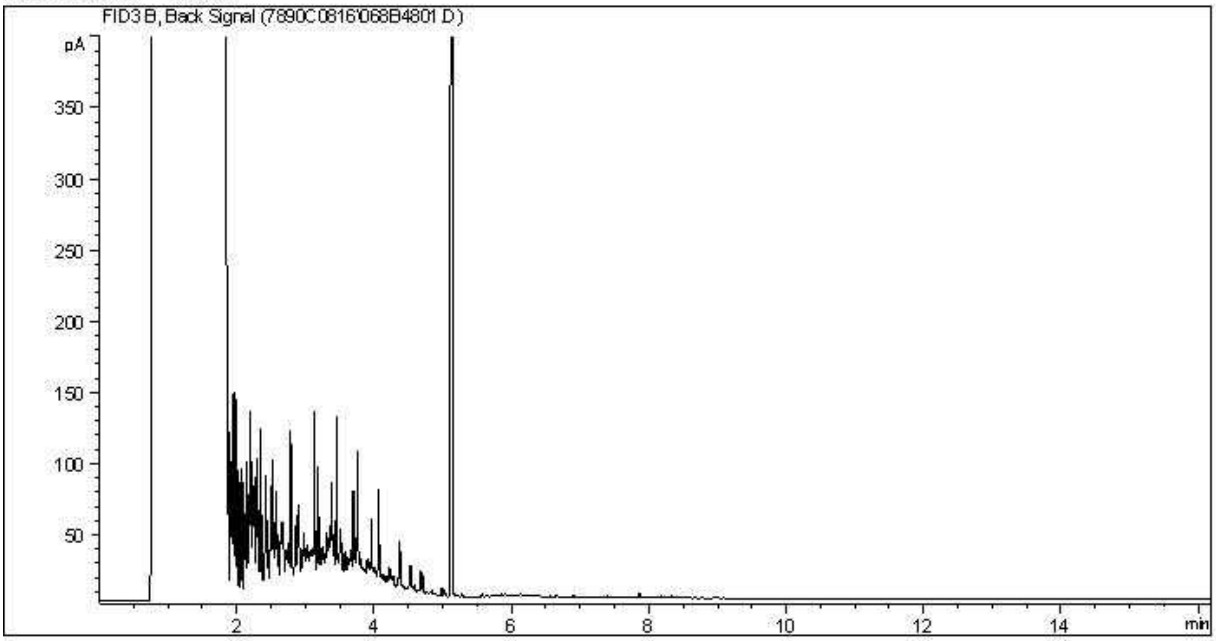
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B768020
Report Date: 2017/08/25
Maxxam Sample: RS3938

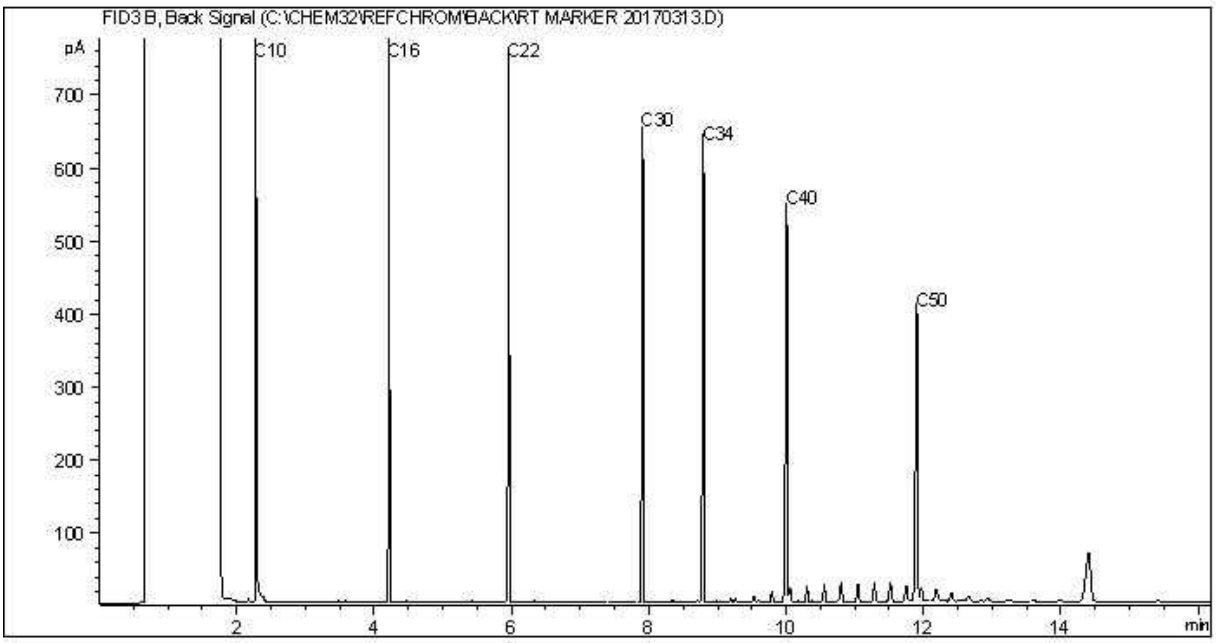
ARCADIS Canada
Client Project #: 102089-003
Site Reference: CAM BAY APRCN LTU
Client ID: APRON17DUP01

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890C



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam
A Bureau Veritas Group Company

Your P.O. #: N/A
Your Project #: B768020
Your C.O.C. #: B768020-ONTE-01-01

Attention:Parminder Virk

Maxxam Analytics
Edmonton - Environmental
9331 48th St
Edmonton, AB
T6B 2R4

Report Date: 2017/08/25
Report #: R4674920
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7H7176
Received: 2017/08/17, 10:46

Sample Matrix: Soil
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Moisture	5	N/A	2017/08/22	CAM SOP-00445	Carter 2nd ed 51.2 m
Nitrogen (1)	5	N/A	2017/08/22	CAM SOP-00460	EN0000:2003 TC WI

Remarks:

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

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Samples have been analyzed using methodologies that have been subjected to Maxxam's standard validation process for the submitted matrix but it is not an accredited method.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Your P.O. #: N/A
Your Project #: B768020
Your C.O.C. #: B768020-ONTE-01-01

Attention:Parminder Virk

Maxxam Analytics
Edmonton - Environmental
9331 48th St
Edmonton, AB
T6B 2R4

Report Date: 2017/08/25
Report #: R4674920
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7H7176
Received: 2017/08/17, 10:46

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Marijane Cruz, Senior Project Manager
Email: MCruz@maxxam.ca
Phone# (905)817-5756

==========

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

Maxxam Job #: B7H7176
Report Date: 2017/08/25

Maxxam Analytics
Client Project #: B768020
Your P.O. #: N/A

RESULTS OF ANALYSES OF SOIL

Maxxam ID		EYN790	EYN791	EYN792	EYN793		
Sampling Date							
COC Number		B768020-ONTE-01-01	B768020-ONTE-01-01	B768020-ONTE-01-01	B768020-ONTE-01-01		
	UNITS	RS3932-APRON1701	RS3934-APRON1703	RS3935-APRON1704	RS3937-APRON1706	RDL	QC Batch
Inorganics							
Moisture	%	12	8.6	11	9.7	1.0	5130625
Nitrogen (N)	%	0.029	0.12	0.067	0.10	0.010	5130340

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		EYN794		
Sampling Date				
COC Number		B768020-ONTE-01-01		
	UNITS	RS3938-APRON17DUP01	RDL	QC Batch
Inorganics				
Moisture	%	11	1.0	5130625
Nitrogen (N)	%	0.075	0.010	5130340

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7H7176
Report Date: 2017/08/25

Maxxam Analytics
Client Project #: B768020
Your P.O. #: N/A

GENERAL COMMENTS

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

Package 1	23.3°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7H7176
Report Date: 2017/08/25

QUALITY ASSURANCE REPORT

Maxxam Analytics
Client Project #: B768020
Your P.O. #: N/A

			Method Blank		RPD		QC Standard	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**	**Value (%)**	**QC Limits**	**% Recovery**	**QC Limits**
5130340	Nitrogen (N)	2017/08/22	<0.010	%	11	35	101	95 - 105
5130625	Moisture	2017/08/22			0	20		

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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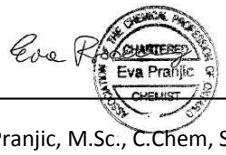
Maxxam Job #: B7H7176
Report Date: 2017/08/25

Maxxam Analytics
Client Project #: B768020
Your P.O. #: N/A

VALIDATION SIGNATURE PAGE

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



Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

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Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 102089-003
Site Location: CAMBAY APRON LTU
Your C.O.C. #: M057440

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/04
Report #: R2423835
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B763379
Received: 2017/07/27, 16:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Perfluorinated Compounds - Subcontract (1)	1	N/A	2017/08/04		

Remarks:

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

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

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

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

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

(1) This test was performed by Maxxam Ontario (From Calgary)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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Maxxam Job #: B763379
Report Date: 2017/08/04

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF SURFACE WATER

Maxxam ID		RP8624	
Sampling Date		2017/07/25 18:00	
COC Number		M057440	
	UNITS	**APRON SUMP**	**QC Batch**
Parameter			
Subcontract Parameter	ug/L	ATTACHED	8717336

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

Maxxam Job #: B763379
Report Date: 2017/08/04

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	3.0°C

Results for PFOS and PFOA are attached to this report. The reference number from Maxxam Mississauga is B7G4687.

Results relate only to the items tested.

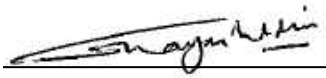
Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B763379
Report Date: 2017/08/04

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

VALIDATION SIGNATURE PAGE

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



Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

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

Maxxam
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Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 057440

Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: #28344 PRIVATE CLIENT	Company: ARCADIS CANADA INC.	Quotation #: BS0993	☐ 5 - 7 Days Regular (Most analyses)
Contact Name: NATALIE ROBINSON	Contact Name: MAURENIA LYNDS	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 1650, 635-8th AVE. SW CALGARY, AB T2P 3M3	Address: 329 CHURCHILL AVE N OTTAWA ON K1Z 5B8	Project #: 102089-003	Rush TAT (Surcharges will be applied)
Phone: 403-292-6882	Phone: 613 721 0555	Site Location: CAM BAY APRON LTU	☐ Same Day ☐ 2 Days ☐ 1 Day ☒ 3-4 Days
Email: NATALIE.ROBINSON@	Email: MAURENIA.LYNDS@	Site #:	Date Required:
Copies: PWGSC-TPSGC.GC.CA	Copies: ARCADIS.COM	Sampled By: E HOLDEN	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID	Temp		
Seal Present	✓					
Seal Intact	✓					
Cooling Media	✓					
Cooler ID	1	0	2			

	YES	NO	Cooler ID	Temp		
Seal Present						
Seal Intact						
Cooling Media						

	YES	NO	Cooler ID	Temp		
Seal Present						
Seal Intact						
Cooling Media						

Depot Reception

Analysis Requested

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	PFAS	HOLD - DO NOT ANALYZE
1	APRON SUMP		2017/07/25	18:00	SW	2											X	
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Please indicate Filtered, Preserved or Both (F, P, F/P)

RECEIVED IN YELLOWKNIFE
By: [signature]
2017-07-27 @ 16:00
Ice - Yes
CS - Yes
Temp: 1.1 4.4

Regulatory Criteria

- ☐ AT1
- ☐ CCME
- ☐ Drinking Water
- ☐ D50 (Drilling Waste)
- ☐ Saskatchewan
- ☐ Other:

Special Instructions

RUSH

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Elliott Holden	2017/07/26	9:15	Nicholas Yu	2017/07/29	11:30	B763379 HSA

AB FCD-00331/7

Maxxam
A Bureau Veritas Group Company

Your P.O. #: N/A
Your Project #: B763379
Your C.O.C. #: b763379-ontv-01-01

Attention:Parminder Virk

Maxxam Analytics
Edmonton - Environmental
9331 48th St
Edmonton, AB
T6B 2R4

Report Date: 2017/08/04
Report #: R4633345
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7G4687
Received: 2017/08/02, 09:11

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
PFOS and PFOA in water by SPE/LCMS (1)	1	2017/08/03	2017/08/04	CAM SOP-00894	EPA 537 m

Remarks:

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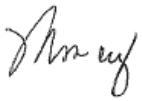
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

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

(1) Per- and polyfluoroalkyl substances (PFAS) identified as surrogates on the certificate of analysis represent the extracted internal standard.

Encryption Key



Marijane Cruz
Senior Project Manager
04 Aug 2017 16:19:10

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Marijane Cruz, Senior Project Manager
Email: MCruz@maxxam.ca
Phone# (905)817-5756

==========

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Maxxam Job #: B7G4687
Report Date: 2017/08/04

Maxxam Analytics
Client Project #: B763379
Your P.O. #: N/A

RESULTS OF ANALYSES OF WATER

Maxxam ID		EWC966		
Sampling Date		2017/07/25 18:00		
COC Number		b763379-ontv-01-01		
	UNITS	RP8624-APRON SUMP	RDL	QC Batch
Miscellaneous Parameters				
Perfluorobutane Sulfonate (PFBS)	ug/L	0.028	0.020	5103712
Perfluorobutanoic acid	ug/L	0.11	0.020	5103712
Perfluorodecane Sulfonate	ug/L	<0.020	0.020	5103712
Perfluorodecanoic Acid (PFDA)	ug/L	<0.020	0.020	5103712
Perfluorododecanoic Acid (PFDoA)	ug/L	<0.020	0.020	5103712
Perfluoroheptane sulfonate	ug/L	<0.020	0.020	5103712
Perfluoroheptanoic Acid (PFHpA)	ug/L	0.23	0.020	5103712
Perfluorohexane Sulfonate (PFHxS)	ug/L	0.20	0.020	5103712
Perfluorohexanoic Acid (PFHxA)	ug/L	0.34	0.020	5103712
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	0.050	0.020	5103712
Perfluorononanoic Acid (PFNA)	ug/L	<0.020	0.020	5103712
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.020	0.020	5103712
Perfluorooctane Sulfonate (PFOS)	ug/L	<0.020	0.020	5103712
Perfluoropentanoic Acid (PFPeA)	ug/L	0.49	0.020	5103712
Perfluorotetradecanoic Acid	ug/L	<0.020	0.020	5103712
Perfluorotridecanoic Acid	ug/L	<0.020	0.020	5103712
Perfluoroundecanoic Acid (PFUnA)	ug/L	<0.020	0.020	5103712
Surrogate Recovery (%)				
13C2-Perfluorodecanoic acid	%	85		5103712
13C2-Perfluorododecanoic acid	%	62		5103712
13C2-Perfluorohexanoic acid	%	76		5103712
13C2-perfluorotetradecanoic acid	%	21 (1)		5103712
13C2-Perfluoroundecanoic acid	%	78		5103712
13C4-Perfluorobutanoic acid	%	70		5103712
13C4-Perfluoroheptanoic acid	%	73		5103712
13C4-Perfluorooctanesulfonate	%	81		5103712

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

(1) Extracted internal standard analyte recovery was below the defined lower control limit (LCL). Laboratory spiked water resulted in satisfactory recovery of the extracted internal standard analyte. When considered together, these QC data suggest that matrix interferences may be biasing the data low. Because quantitation is performed using isotope dilution techniques, any losses of the native compound that may occur during any of the sample preparation, extraction, cleanup or determinative steps will be mirrored by a similar loss of the labeled standard, and as such can be accounted for and corrected. Therefore, the quantification of these target compounds is not affected by the low extracted internal standard analyte recovery.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7G4687
Report Date: 2017/08/04

Maxxam Analytics
Client Project #: B763379
Your P.O. #: N/A

RESULTS OF ANALYSES OF WATER

Maxxam ID		EWC966		
Sampling Date		2017/07/25 18:00		
COC Number		b763379-ontv-01-01		
	UNITS	RP8624-APRON SUMP	RDL	QC Batch
13C4-Perfluorooctanoic acid	%	82		5103712
13C5-Perfluorononanoic acid	%	73		5103712
13C5-Perfluoropentanoic acid	%	75		5103712
13C8-Perfluorooctane Sulfonamide	%	87		5103712
18O2-Perfluorohexanesulfonate	%	85		5103712

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7G4687
Report Date: 2017/08/04

Maxxam Analytics
Client Project #: B763379
Your P.O. #: N/A

GENERAL COMMENTS

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

Package 1	2.7°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7G4687
Report Date: 2017/08/04

QUALITY ASSURANCE REPORT

Maxxam Analytics
Client Project #: B763379
Your P.O. #: N/A

			SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5103712	13C2-Perfluorodecanoic acid	2017/08/04	80	50 - 150	96	%		
5103712	13C2-Perfluorododecanoic acid	2017/08/04	95	50 - 150	86	%		
5103712	13C2-Perfluorohexanoic acid	2017/08/04	81	50 - 150	84	%		
5103712	13C2-perfluorotetradecanoic acid	2017/08/04	74	50 - 150	101	%		
5103712	13C2-Perfluoroundecanoic acid	2017/08/04	93	50 - 150	95	%		
5103712	13C4-Perfluorobutanoic acid	2017/08/04	79	50 - 150	91	%		
5103712	13C4-Perfluoroheptanoic acid	2017/08/04	82	50 - 150	94	%		
5103712	13C4-Perfluorooctanesulfonate	2017/08/04	82	50 - 150	76	%		
5103712	13C4-Perfluorooctanoic acid	2017/08/04	91	50 - 150	85	%		
5103712	13C5-Perfluorononanoic acid	2017/08/04	89	50 - 150	83	%		
5103712	13C5-Perfluoropentanoic acid	2017/08/04	79	50 - 150	83	%		
5103712	13C8-Perfluorooctane Sulfonamide	2017/08/04	91	50 - 150	91	%		
5103712	18O2-Perfluorohexanesulfonate	2017/08/04	79	50 - 150	80	%		
5103712	Perfluorobutane Sulfonate (PFBS)	2017/08/04	112	70 - 130	<0.020	ug/L	1.2	30
5103712	Perfluorobutanoic acid	2017/08/04	110	70 - 130	<0.020	ug/L	5.0	30
5103712	Perfluorodecane Sulfonate	2017/08/04	116	70 - 130	<0.020	ug/L	13	30
5103712	Perfluorodecanoic Acid (PFDA)	2017/08/04	101	70 - 130	<0.020	ug/L	17	30
5103712	Perfluorododecanoic Acid (PFDoA)	2017/08/04	103	70 - 130	<0.020	ug/L	19	30
5103712	Perfluoroheptane sulfonate	2017/08/04	96	70 - 130	<0.020	ug/L	9.9	30
5103712	Perfluoroheptanoic Acid (PFHpA)	2017/08/04	106	70 - 130	<0.020	ug/L	6.4	30
5103712	Perfluorohexane Sulfonate (PFHxS)	2017/08/04	102	70 - 130	<0.020	ug/L	6.1	30
5103712	Perfluorohexanoic Acid (PFHxA)	2017/08/04	96	70 - 130	<0.020	ug/L	1.6	30
5103712	Perfluoro-n-Octanoic Acid (PFOA)	2017/08/04	92	70 - 130	<0.020	ug/L	1.3	30
5103712	Perfluorononanoic Acid (PFNA)	2017/08/04	92	70 - 130	<0.020	ug/L	18	30
5103712	Perfluorooctane Sulfonamide (PFOSA)	2017/08/04	91	70 - 130	<0.020	ug/L	20	30
5103712	Perfluorooctane Sulfonate (PFOS)	2017/08/04	94	70 - 130	<0.020	ug/L	4.6	30
5103712	Perfluoropentanoic Acid (PFPeA)	2017/08/04	113	70 - 130	<0.020	ug/L	2.4	30
5103712	Perfluorotetradecanoic Acid	2017/08/04	103	70 - 130	<0.020	ug/L	8.2	30
5103712	Perfluorotridecanoic Acid	2017/08/04	104	70 - 130	<0.020	ug/L	8.0	30

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

QUALITY ASSURANCE REPORT(CONT'D)

			SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5103712	Perfluoroundecanoic Acid (PFUnA)	2017/08/04	91	70 - 130	<0.020	ug/L	13	30

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

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

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

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

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Maxxam Job #: B7G4687
Report Date: 2017/08/04

Maxxam Analytics
Client Project #: B763379
Your P.O. #: N/A

VALIDATION SIGNATURE PAGE

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

Adam Robinson, Supervisor, LC/MS/MS

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

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A Bureau Veritas Group Company

Success Through Science®

Your Project #: 102089-003
Site Location: CAMBAY APRON LTU
Your C.O.C. #: M057439

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/01
Report #: R2421791
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B763381
Received: 2017/07/27, 16:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS/FID	1	N/A	2017/07/30	AB SOP-00039	CCME CWS/EPA 8260C m
Elements by ICPMS - Total	1	2017/07/30	2017/07/30	AB SOP-00014 / AB SOP-00043	EPA 200.8 R5.4 m
Oil and Grease (Gravimetric, n-Hexane)	1	2017/07/31	2017/07/31	EENVSOP-00093	SM 22 5520 B m
Lead Dissolved-Lab Filtered (1)	1	N/A	2017/08/01	AB SOP-00043	EPA 200.8 R5.4 m
pH @25°C (2)	1	N/A	2017/07/30	AB SOP-00005	SM 22 4500 H+ B m

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Samples were filtered and preserved at the lab. Values may not reflect concentrations at the time of sampling.
(2) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Maxxam endeavours to analyze samples as soon as possible after receipt.

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

Your Project #: 102089-003
Site Location: CAMBAY APRON LTU
Your C.O.C. #: M057439

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/01
Report #: R2421791
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B763381
Received: 2017/07/27, 16:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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Maxxam Job #: B763381
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF SURFACE WATER

Maxxam ID		RP8629		
Sampling Date		2017/07/25 18:00		
COC Number		M057439		
	UNITS	APRON SUMP	RDL	QC Batch
Misc. Inorganics				
pH	pH	8.25	N/A	8711310
Misc. Organics				
Extractable (n-Hex.) Oil and grease	mg/L	<2.0	2.0	8711928

RDL = Reportable Detection Limit
N/A = Not Applicable

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

Maxxam Job #: B763381
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		RP8629		
Sampling Date		2017/07/25 18:00		
COC Number		M057439		
	UNITS	APRON SUMP	RDL	QC Batch
Elements				
Total Zinc (Zn)	mg/L	<0.0030	0.0030	8711242
Lab Filtered Elements				
Dissolved Lead (Pb)	mg/L	0.00046	0.00020	8713065
RDL = Reportable Detection Limit				

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Maxxam Job #: B763381
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

VOLATILE ORGANICS BY GC-MS (SURFACE WATER)

Maxxam ID		RP8629		
Sampling Date		2017/07/25 18:00		
COC Number		M057439		
	UNITS	APRON SUMP	RDL	QC Batch
Volatiles				
Benzene	ug/L	<0.40	0.40	8707472
Toluene	ug/L	<0.40	0.40	8707472
Ethylbenzene	ug/L	<0.40	0.40	8707472
m & p-Xylene	ug/L	<0.80	0.80	8707472
o-Xylene	ug/L	<0.40	0.40	8707472
Xylenes (Total)	ug/L	<0.80	0.80	8707472
F1 (C6-C10) - BTEX	ug/L	<100	100	8707472
F1 (C6-C10)	ug/L	<100	100	8707472
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	93	N/A	8707472
4-Bromofluorobenzene (sur.)	%	101	N/A	8707472
D4-1,2-Dichloroethane (sur.)	%	91	N/A	8707472

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B763381
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	3.0°C

Results relate only to the items tested.

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

Maxxam Job #: B763381
Report Date: 2017/08/01

QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8707472	1,4-Difluorobenzene (sur.)	2017/07/26	109	70 - 130	114	70 - 130	101	%		
8707472	4-Bromofluorobenzene (sur.)	2017/07/26	96	70 - 130	97	70 - 130	87	%		
8707472	D4-1,2-Dichloroethane (sur.)	2017/07/26	115	70 - 130	119	70 - 130	109	%		
8707472	Benzene	2017/07/26	105	70 - 130	109	70 - 130	<0.40	ug/L	NC	30
8707472	Ethylbenzene	2017/07/26	88	70 - 130	90	70 - 130	<0.40	ug/L	NC	30
8707472	F1 (C6-C10) - BTEX	2017/07/26					<100	ug/L	NC	30
8707472	F1 (C6-C10)	2017/07/26	72	70 - 130	91	70 - 130	<100	ug/L	NC	30
8707472	m & p-Xylene	2017/07/26	92	70 - 130	93	70 - 130	<0.80	ug/L	NC	30
8707472	o-Xylene	2017/07/26	98	70 - 130	99	70 - 130	<0.40	ug/L	NC	30
8707472	Toluene	2017/07/26	86	70 - 130	97	70 - 130	<0.40	ug/L	27	30
8707472	Xylenes (Total)	2017/07/26					<0.80	ug/L	NC	30
8711242	Total Zinc (Zn)	2017/07/30	101	80 - 120	101	80 - 120	<0.0030	mg/L	NC	20
8711310	pH	2017/07/30			100	97 - 103			0.034	N/A
8711928	Extractable (n-Hex.) Oil and grease	2017/07/31			104	70 - 130	<2.0	mg/L		
8713065	Dissolved Lead (Pb)	2017/08/01	98	80 - 120	98	80 - 120	<0.00020	mg/L	NC	20

N/A = Not Applicable

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

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

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

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

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

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

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Maxxam Job #: B763381
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

VALIDATION SIGNATURE PAGE

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

Justin Geisel, B.Sc., Organics Supervisor

Poonam Sharma, cCT, Organics Supervisor

Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

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Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 057439

Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: # 28344 PRIVATE CLIENT	Company: ARCADIS CANADA INC	Quotation #: BS0993	☐ 5 - 7 Days Regular (Most analyses)
Contact Name: NATALIE ROBINSON	Contact Name: MAURENIA LYNDS	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 1650, 635-8th AVE, SW CALGARY, AB T2P3M3	Address: 329 CHURCHILL AVE N OTTAWA ON K1Z 5B8	Project #: 102089-003	Rush TAT (Surcharges will be applied)
Phone: 403-292-6882	Phone: 613 721 0555	Site Location: CAM BAY APRON EXT	☐ Same Day ☐ 2 Days ☒ 1 Day ☐ 3-4 Days
Email: NATALIE.ROBINSON@	Email: MAURENIA.LYNDS@	Site #:	Date Required:
Copies: PWGSC-TPSGC.GC.CA	Copies: ARCADIS.COM	Sampled By: E HOLDEN	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present	✓		Temp	1	0	2
Seal Intact	✓					
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present			Temp			
Seal Intact						
Cooling Media						
	YES	NO	Cooler ID			
Seal Present			Temp			
Seal Intact						
Cooling Media						

Depot Reception

Analysis Requested

Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☒ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	pH	DISSOLVED LEAD	TOTAL ZINC	OIL AND GREASE	HOLD - DO NOT ANALYZE
1 APRON SUMP		2017/07/25	18:00	SW	7	X										X	X	X	X	
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
Please indicate Filtered, Preserved or Both (F, P, F/P)						P												P	P	

RECEIVED IN YELLOWKNIFE
By: [signature]
2017-07-27 @ 16:00
Ice - Yes
CS - Yes
Temp: 1 1.4 1.4

Regulatory Criteria

- ☐ AT1
- ☒ CCME
- ☐ Drinking Water
- ☐ D50 (Drilling Waste)
- ☐ Saskatchewan
- ☐ Other:

Special Instructions

PRESERVATIVE WAS RINSED OUT OF SAMPLE CONTAINER FOR DISSOLVED LEAD

RUSH

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Elliott Holden	2017/07/26	9:15	NV 2017/07/29 ~~2017/07/29~~ Nicholas	2017/07/29	11:30	B763381 HSA

AB FCD-00331/7

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A Bureau Veritas Group Company

Success Through Science®

Your Project #: 102089-003
Site Location: CAMBAY APRON LTU
Your C.O.C. #: M057439

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/01
Report #: R2421791
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B763381
Received: 2017/07/27, 16:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS/FID	1	N/A	2017/07/30	AB SOP-00039	CCME CWS/EPA 8260C m
Elements by ICPMS - Total	1	2017/07/30	2017/07/30	AB SOP-00014 / AB SOP-00043	EPA 200.8 R5.4 m
Oil and Grease (Gravimetric, n-Hexane)	1	2017/07/31	2017/07/31	EENVSOP-00093	SM 22 5520 B m
Lead Dissolved-Lab Filtered (1)	1	N/A	2017/08/01	AB SOP-00043	EPA 200.8 R5.4 m
pH @25°C (2)	1	N/A	2017/07/30	AB SOP-00005	SM 22 4500 H+ B m

Remarks:

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

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Samples were filtered and preserved at the lab. Values may not reflect concentrations at the time of sampling.
(2) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Maxxam endeavours to analyze samples as soon as possible after receipt.

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

Your Project #: 102089-003
Site Location: CAMBAY APRON LTU
Your C.O.C. #: M057439

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/01
Report #: R2421791
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B763381
Received: 2017/07/27, 16:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

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Maxxam Job #: B763381
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF SURFACE WATER

Maxxam ID		RP8629		
Sampling Date		2017/07/25 18:00		
COC Number		M057439		
	UNITS	APRON SUMP	RDL	QC Batch
Misc. Inorganics				
pH	pH	8.25	N/A	8711310
Misc. Organics				
Extractable (n-Hex.) Oil and grease	mg/L	<2.0	2.0	8711928

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B763381
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		RP8629		
Sampling Date		2017/07/25 18:00		
COC Number		M057439		
	UNITS	APRON SUMP	RDL	QC Batch
Elements				
Total Zinc (Zn)	mg/L	<0.0030	0.0030	8711242
Lab Filtered Elements				
Dissolved Lead (Pb)	mg/L	0.00046	0.00020	8713065
RDL = Reportable Detection Limit				

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Maxxam Job #: B763381
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

VOLATILE ORGANICS BY GC-MS (SURFACE WATER)

Maxxam ID		RP8629		
Sampling Date		2017/07/25 18:00		
COC Number		M057439		
	UNITS	APRON SUMP	RDL	QC Batch
Volatiles				
Benzene	ug/L	<0.40	0.40	8707472
Toluene	ug/L	<0.40	0.40	8707472
Ethylbenzene	ug/L	<0.40	0.40	8707472
m & p-Xylene	ug/L	<0.80	0.80	8707472
o-Xylene	ug/L	<0.40	0.40	8707472
Xylenes (Total)	ug/L	<0.80	0.80	8707472
F1 (C6-C10) - BTEX	ug/L	<100	100	8707472
F1 (C6-C10)	ug/L	<100	100	8707472
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	93	N/A	8707472
4-Bromofluorobenzene (sur.)	%	101	N/A	8707472
D4-1,2-Dichloroethane (sur.)	%	91	N/A	8707472

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B763381
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	3.0°C

Results relate only to the items tested.

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

Maxxam Job #: B763381
Report Date: 2017/08/01

QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8707472	1,4-Difluorobenzene (sur.)	2017/07/26	109	70 - 130	114	70 - 130	101	%		
8707472	4-Bromofluorobenzene (sur.)	2017/07/26	96	70 - 130	97	70 - 130	87	%		
8707472	D4-1,2-Dichloroethane (sur.)	2017/07/26	115	70 - 130	119	70 - 130	109	%		
8707472	Benzene	2017/07/26	105	70 - 130	109	70 - 130	<0.40	ug/L	NC	30
8707472	Ethylbenzene	2017/07/26	88	70 - 130	90	70 - 130	<0.40	ug/L	NC	30
8707472	F1 (C6-C10) - BTEX	2017/07/26					<100	ug/L	NC	30
8707472	F1 (C6-C10)	2017/07/26	72	70 - 130	91	70 - 130	<100	ug/L	NC	30
8707472	m & p-Xylene	2017/07/26	92	70 - 130	93	70 - 130	<0.80	ug/L	NC	30
8707472	o-Xylene	2017/07/26	98	70 - 130	99	70 - 130	<0.40	ug/L	NC	30
8707472	Toluene	2017/07/26	86	70 - 130	97	70 - 130	<0.40	ug/L	27	30
8707472	Xylenes (Total)	2017/07/26					<0.80	ug/L	NC	30
8711242	Total Zinc (Zn)	2017/07/30	101	80 - 120	101	80 - 120	<0.0030	mg/L	NC	20
8711310	pH	2017/07/30			100	97 - 103			0.034	N/A
8711928	Extractable (n-Hex.) Oil and grease	2017/07/31			104	70 - 130	<2.0	mg/L		
8713065	Dissolved Lead (Pb)	2017/08/01	98	80 - 120	98	80 - 120	<0.00020	mg/L	NC	20

N/A = Not Applicable

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

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

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

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

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

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

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

Maxxam Job #: B763381
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-003
Site Location: CAMBAY APRON LTU
Sampler Initials: EH

VALIDATION SIGNATURE PAGE

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

Justin Geisel, B.Sc., Organics Supervisor

Poonam Sharma, cCT, Organics Supervisor

Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

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

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

Maxxam
A Bureau Veritas Group Company

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maxxam.ca

CHAIN OF CUSTODY RECORD

M 057439

Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: # 28344 PRIVATE CLIENT	Company: ARCADIS CANADA INC	Quotation #: BS0993	☐ 5 - 7 Days Regular (Most analyses)
Contact Name: NATALIE ROBINSON	Contact Name: MAURENIA LYNDS	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 1650, 635-8th AVE, SW CALGARY, AB T2P3M3	Address: 329 CHURCHILL AVE N OTTAWA ON K1Z 5B8	Project #: 102089-003	Rush TAT (Surcharges will be applied)
Phone: 403-292-6882	Phone: 613 721 0555	Site Location: CAM BAY APRON EXT	☐ Same Day ☐ 2 Days ☒ 1 Day ☐ 3-4 Days
Email: NATALIE.ROBINSON@	Email: MAURENIA.LYNDS@	Site #:	Date Required:
Copies: PWGSC-TPSGC.GC.CA	Copies: ARCADIS.COM	Sampled By: E HOLDEN	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present	✓		Temp	1	0	2
Seal Intact	✓					
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present			Temp			
Seal Intact						
Cooling Media						
	YES	NO	Cooler ID			
Seal Present			Temp			
Seal Intact						
Cooling Media						

Depot Reception

Analysis Requested

Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☒ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	pH	DISSOLVED LEAD	TOTAL ZINC	OIL AND GREASE	HOLD - DO NOT ANALYZE
1 APRON SUMP		2017/07/25	18:00	SW	7	X										X	X	X	X	
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
Please indicate Filtered, Preserved or Both (F, P, F/P)						P												P	P	

RECEIVED IN YELLOWKNIFE
By: [signature]
2017-07-27 @ 16:00
Ice - Yes
CS - Yes
Temp: 1 1.4 1.4

Regulatory Criteria

- ☐ AT1
- ☒ CCME
- ☐ Drinking Water
- ☐ D50 (Drilling Waste)
- ☐ Saskatchewan
- ☐ Other:

Special Instructions

PRESERVATIVE WAS RINSED OUT OF SAMPLE CONTAINER FOR DISSOLVED LEAD

RUSH

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Elliott Holden	2017/07/26	9:15	NV 2017/07/29 ~~2017/07/29~~ Nicholas	2017/07/29	11:30	B763381 HSA

AB FCD-00331/7

APPENDIX C

Site Photographs

Project Photographs

2017 Environmental Monitoring Program
Cambridge Bay Airport Apron – Land Treatment Unit
Cambridge Bay, NU

Photo: 1

Date:
July 30, 2017

Description:
Monitoring well MW13-7 prior to its repair.

Location:
Apron Excavation Area

Photo: 2

Date:
August 2, 2017

Description:
Monitoring well MW13-7 after its flush mount casing was reset

Location:
Apron Excavation Area

Project Photographs

2017 Environmental Monitoring Program
Cambridge Bay Airport Apron – Land Treatment Unit
Cambridge Bay, NU

Photo: 3

Date:
August 1, 2017

Description:
Monitoring well MW13-9 after the extension of its riser.

Location:
Apron Excavation Area

Photo: 4

Date:
August 8, 2017

Description:
Crack in riser of monitoring well MW13-8

Location:
Apron Excavation Area

Project Photographs

2017 Environmental Monitoring Program
Cambridge Bay Airport Apron – Land Treatment Unit
Cambridge Bay, NU

Photo: 5

Date:
August 5, 2017

Description:
Location of soil sample APRON1704 in Apron LTU

Location:
In the Apron LTU near its southwest corner facing southwest

Photo: 6

Date:
August 8, 2017

Description:
PHC impacted soil pocket uncovered near Apron LTU sump. Soil sample APRON1704 was collected from this material.

Location:
In the Apron LTU near its southwest corner

Arcadis Canada Inc.

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Ottawa, Ontario K1Z 5B8

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