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Public Works and Government Services Canada on behalf of Transport Canada

REMEDIAL ACTION PLAN, FORMER METAL DUMP AND COMMUNITY LANDFILL

Iqaluit, Nunavut

27 January 2017

REMEDIAL ACTION PLAN, FORMER METAL DUMP AND COMMUNITY LANDFILL

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ACRONYMS AND ABBREVIATIONS

AEC	Area of Environmental Concern
Arcadis	Arcadis Canada Inc.
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CCME	Council of Ministers of the Environment
CSedQG	Canadian Sediment Quality Guidelines
CSQG	Canadian Soil Quality Guidelines
CSMWG	Contaminated Sites Management Working Group
CWQG	Canadian Water Quality Guidelines
CWS-PHC	Canada-Wide Standards for Petroleum Hydrocarbons
DOC	Dissolved Organic Carbon
DQRA	Detailed Quantitative Risk Assessment
EQG	Environmental Quality Guidelines
ESA	Environmental Site Assessment
FCSAP	Federal Contaminated Sites Action Plan
Franz	Franz Environmental Inc.
OR	Open Area
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PHC	Petroleum Hydrocarbons
POL	Petroleum, Oil and Lubricant
PQRA	Preliminary Quantitative Risk Assessment
PHC	Petroleum Hydrocarbon
PWGSC	Public Works and Government Services Canada
RAP	Remedial Action Plan
SA	Supply Arrangement
TC	Transport Canada
TOC	Total Organic Carbon
USAF	United States Air Force
VOC	Volatile Organic Compounds

EXECUTIVE SUMMARY

Arcadis Canada Inc. (Arcadis), formerly Franz Environmental Inc. (Franz), was retained by Public Works and Government Services Canada (PWGSC), Environmental Services, Edmonton to update the Remedial Action Plan (RAP) for the Transport Canada Iqaluit Former Metal Dump and Community Landfill. The original RAP, submitted in 2010 by Franz, was based on the 2008 and 2009 site assessment programs. The updated RAP is enhanced with 2016 site assessment information and is based on currently applicable site remediation guidelines.

The RAP is intended to be supporting text for consultation, regulatory, funding and implementation decisions. The RAP was developed in accordance with the Government of Nunavut Department of Environment Guideline for the Management of Contaminated Sites (revised December 2014). The RAP also integrates federal contaminated sites management principles as outlined in the Contaminated Sites Management Working Group (CSMWG) Federal Approach to Contaminated Sites (2000).

The United States Air Force (USAF) used the site from between 1955 to 1963 as a metal dump for vehicles, truck bodies, barrels and scrap metal. The site was believed to be used for the disposal of small quantities of municipal waste from the town of Iqaluit in the 1960's. A few examples of municipal wastes disposed of at the site include food cans and bottles, kitchen appliances, bicycles, tires, wooden pallets, animal remains, water heaters, toys, etc. The site has seen little activity since its abandonment in the 1970's. Upon closure of the site, it is believed that a cap consisting of granular material was placed on top and on the face of the landfill site to cover much of the debris.

Within the study area, there are known and discrete environmental impacts to soils, sediments and surface water associated with the up-gradient waste burial, the vehicle dump, and the main land filling activities. Buried and exposed metallic debris imparts a slow release of metals into the environment. Some debris appear to have acted as isolated and discrete sources of metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons and, to a much lesser degree, polychlorinated biphenyls, volatile organic compounds and pesticides. Other issues at the site include the potential instability of the main landfill and the potential presence of debris containing hazardous materials.

Remedial options that consider the need for addressing the physical and environmental impacts at the site were evaluated. The options were considered against predefined objectives that included minimizing human health and safety risks at the site; protecting ecological habitats; minimizing impacts during remediation; minimize long-term care and maintenance; and blending the final site conditions with the surrounding environment where possible while being cost-effective and technically feasible.

The option selected targets the offsite disposal of significantly impacted soils and sediments, the offsite removal of selected debris based on their waste stream category, the onsite consolidation of debris and comingling impacted soils, the engineered decommissioning of the site main landfill and the natural recovery of the remaining surface water and sediment impacts. An implementation plan outlying the tasks required prior, during and after the remediation is also provided.

1 INTRODUCTION

Arcadis Canada Inc. (Arcadis), formerly Franz Environmental Inc. (Franz), was retained by Public Works and Government Services Canada (PWGSC), Environmental Services, Edmonton to update the Remedial Action Plan (RAP) for the Transport Canada Iqaluit Former Metal Dump and Community Landfill (referenced as “the site” throughout this document) (Figure 1). The work was completed under the existing Northern As/When Supply Arrangement (SA) for Environmental Services (EW699-141143/001/NCS).

The original RAP, submitted in 2010 by Franz, was based on the 2008 and 2009 site assessment programs. The updated RAP is enhanced with 2016 site assessment information and is based on currently applicable site remediation guidelines. The RAP is intended to be supporting text for consultation, regulatory and funding decisions, and will provide the basis for development of tender documents and technical designs for the implementation of remediation including the development of National Master Construction (NMS) – Compliant Specifications.

1.1 Background

The United States Air Force (USAF) used the site from between 1955 to 1963 as a metal dump for vehicles, truck bodies, barrels and scrap metal. The majority of materials were deposited in 1963 when the US Military left Frobisher Bay. Shops, buildings, and other materials were simply bulldozed over the cliff. The cliff is a bedrock outcrop rising approximately 30 m above the tidal area where the Sylvia Grinnell River meets Frobisher Bay. The area to the north side of the slope was used by the USAF and to a lesser degree the community of Iqaluit as a landfill site for household garbage until sometime in the 1970’s.

Two main areas of waste are present at the site: 1) the main debris/community landfill area located in the central portion of the site and spanning the top, side and toe of a bedrock escarpment that runs northwest/southeast (Photo 1-1) the vehicle dump located approximately to the south and parallel with the main landfill (Photo 1-2).

Environmental investigations have been carried out at the site, dating back to 1988. The work has focused on the presence and impacts of petroleum hydrocarbons (PHCs), inorganic elements, pesticides, polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCB) contamination in soils, surface water, and sediments. Debris quantification and a designated substances building survey were also undertaken.

Photo 1-1: Showing – Main Landfill

Photo 1-2: Showing – Vehicle Dump

1.2 Previous Investigation

Significant reports on the Iqaluit Former Metal Dump and Community Landfill that preceded this RAP include:

- Arcadis Canada Inc., 2016. Surface Water and Sediment Testing at the Former Metal Dump and Community Landfill (results presented herein).
- Franz Environmental Inc., 2010a. Remedial Action Plan, Vehicle Dump and Community Landfill, Iqaluit, Nunavut. Prepared for Public Works and Government Services Canada on behalf of Transport Canada.
- Franz Environmental Inc., 2010b. Ecological and Human Health Detailed Quantitative Risk Assessment (DQRA). Prepared for Public Works and Government Services Canada on behalf of Transport Canada.
- Franz Environmental Inc., 2010c. Phase III Environmental Site Assessment, Vehicle Dump and Community Landfill, Iqaluit, Nunavut. Prepared for Public Works and Government Services Canada on behalf of Transport Canada.
- Preliminary Quantitative Risk Assessment (PQRA) – Human Health, Franz Environmental Inc., 2009, Vehicle Dump and Community Landfill, Iqaluit, Nunavut. Prepared for Public Works and Government Services Canada on behalf of Transport Canada. March 2009.

- Franz Environmental Inc., 2009. Phase I/II Environmental Site Assessment, Vehicle Dump and Community Landfill, Iqaluit, Nunavut. Prepared for Public Works and Government Services Canada on behalf of Transport Canada. February, 2009.
- Earth Tech Canada Inc., 2001. Desk Top Review of Scrap Metal Dump Site West of Iqaluit Airport, Iqaluit, Nunavut, Canada. Prepared for Transport Canada, Prairie and Northern Region-Programs;
- Lisa A. Peramaki and Jody F. Decker, School of Planning – University of Waterloo, 1999. Lead in Soil and Sediment in Iqaluit Nunavut, Canada and Links with Human Health;
- Royal Military College – Environmental Sciences Group, Victoria, BC, 1995. Environmental Study of a Military Installation and Six Waste Disposal Sites at Iqaluit, NWT. Prepared for Department of Indian and Northern Affairs Canada & Environment Canada;
- Avati Ltd., 1993. Remediation Options for an Abandoned US Airforce Base and Two Waste Sites at Iqaluit, NWT. October 1993;
- Public Works Canada Literature Review, 1992; and
- Härtling, J., 1988. PCB and Trace Metal Pollution from a Former Military Waste Disposal Site at Iqaluit, Northwest Territories. Master's Thesis.

1.3 Report Format

The RAP presented herein is structured as follows:

Chapter 1 – Introduction: Provides general background information.

Chapter 2 – Scope: Presents the scope and objectives of the RAP and the responsibilities of the key team members.

Chapter 3 – Site Setting: Provide the reader with a brief summary of significant site features.

Chapter 4 – Regulatory Framework and Environmental Quality Criteria: Provide the rational for the environmental quality criteria selected as remediation objectives.

Chapter 5 – Site Investigations and Impacts: Presents and overview of the 2009, 2010 and 2016 site investigation programs and of the site impacts organised by category.

Chapter 6 – Remedial Options Evaluation: Present the methodology for selecting the recommended options for remediation of the site.

Chapter 7 – Selected Remedial Strategy: Presents the recommended remedial strategy.

Chapter 8 – Implementation Plan: Presents the steps for the implementation of the remedial strategy.

2 SCOPE

The RAP was developed in accordance with the Government of Nunavut Department of Environment Guideline for the Management of Contaminated Sites (revised December 2014). The RAP also integrates federal contaminated sites management principles as outlined in the Contaminated Sites Management Working Group (CSMWG) Federal Approach to Contaminated Sites (2000).

The overall intent of the RAP is to mitigate human and ecological impact as a consequence of historical site activities, while minimizing further impact as a result of site remediation activities. The RAP favours permanent solutions that integrates well with the surrounding environment.

The RAP is based on results of environmental site assessments, best practices in contaminated site remediation, current use of the area, community values, regulatory requirements and site goals. Confirmatory testing requirements are identified to demonstrate that the impacts have been successfully removed or stabilized and that remediation objectives have been achieved.

2.1 Remedial Action Plan Objectives

The specific objectives for the RAP are:

- minimize human health and safety risks at the site;
- protect fish, wildlife and vegetation;
- protect Sylvia Grinnell River water quality;
- minimize environmental impacts during remediation;
- minimize long-term care and maintenance;
- blend the final site conditions with the surrounding environment;
- ensure the plan is cost-effective; and
- ensure the plan is technically feasible.

2.2 Remediation Planning Team and Responsibilities

Transport Canada (TC) is the project proponent for the remediation of the site. It is TC's responsibility to obtain a remediation plan, obtain appropriate approvals, secure resources, and implement the plan using an approach to closure that is consistent across all contaminated sites in Nunavut. Following remediation, TC is responsible for the implementation of the follow-up monitoring that is suitable for the site. TC is assisted by a team of experts for the development and implementation of the plan, as shown in Table 1.

Table 1. Remediation Planning Team and Responsibilities

Responsibility	Organization	Contact
Custodian	Transport Canada	Jackie Barker, Environmental Officer 204-983-4042 Jackie.Barker@tc.gc.ca
Project Management and Procurement	Public Works and Government Services Canada	Michael Brownlee, Sr. Environmental Specialist 780-497-3640 Michael.Brownlee@pwgsc-tpsgc.gc.ca
Environmental Consulting	Arcadis	Stephen Livingstone, Project Director 613-721-0555 Stephen.Livingstone@arcadis.com
Contractors	To be determined upon remedial contract award	To be determined upon remedial contract award

3 SITE SETTING

This section is intended to provide the reader with a brief summary of significant site features and background. For a full site description and detailed inventory of historical land uses, the reader is referred to the Phase I/II (Franz, 2009) and Phase III Environmental Site Assessment (ESA) (Franz, 2010c).

3.1 Site Location and Access

Iqaluit (formerly named Frobisher Bay) is located on the southern tip of Baffin Island. The Iqaluit Former Metal Dump/Community Landfill (UTM coordinates of E521904.94, N7067812.69) is located at the West 40 area on the border of Sylvia Grinnell Territorial Park and the Sylvia Grinnell River, 1.7 km southwest of the City of Iqaluit (Figure 1). Historically, the site has been referred to as Sylvia Grinnell Park Dump and West 40 – Dump Site #1 and Vehicle Dump and Community Landfill or simply “site” or “landfill”.

3.2 Site Overview

The site covers an area of approximately 72,500 m^2. The site is situated on an escarpment leading to the Sylvia Grinnell River and has several shallow ravines and coulees partially filled with metal debris. The debris is scattered over a large area and consists of vehicles, equipment, barrels, and scrap metal.

The Phase III ESA (Franz, 2010c) identified four areas of environmental (AECs) concern at the site as follows:

AEC 1 – Upgradient Buried Debris

The area of the site directly up gradient from the vehicle dump contains buried metal debris identified during the Phase I/II/III ESA completed by Franz (2009, 2010c). The presence of debris was confirmed during the Arcadis 2016 supplemental assessment.

AEC 2 – Vehicle Dump

The area was referred to as the vehicle dump in the Franz (2009, 2010c) studies and described as containing vehicles, such as trucks, cars, trailers, boilers, tankers, and others. During the Arcadis 2016 supplemental assessment, the area was observed to contain fewer debris as a result of a recycling program. Much of the vehicular debris was removed in 2011 during a community wide recycling program. The contractor involved in that recycling program removed the vehicles, crushed them and shipped them south. The removal of this debris has previously been communicated to both PWGSC and Transport Canada. The area is located to the east of the main landfill area. A drainage channel runs directly through the center of this debris pile discharging to the ponds, then the river.

AEC 3 – Main Landfill

The main landfill area consists of a mixture of debris spread across a steep graded bedrock slope. The top of the landfill area has been capped with granular material and the toe is left exposed with debris scattered throughout the area.

AEC 4 – Downgradient, Off-site

The downgradient and off-site area is located below the escarpment and includes part of the Sylvia Grinnell Park. This area contains only very few pieces of scattered debris. Some debris is also present in the bottom of the ponds, buried in sediments.

The boundaries of AECs 1 to 4 are presented in Figure 2. Note that these boundaries were revised from the Phase III ESA (Franz, 2010c) to account for the updated information obtained by Arcadis during the 2016 supplemental testing (see Chapter 5), the selection of the site specific Environmental Quality Guidelines (EQG) (see Chapter 4) and the identification of the preferred impact management strategy (see Chapter 6).

3.3 Current and Historical Land Use

Based on the available historical information, the Former Metal Dump and Community Landfill site has had a varied history since the mid 1940s and the construction of the Iqaluit Airport. The known uses, from the past to present, are outlined in Table 2.

Table 2. Site Historical Usage

Site Use	Approximate Timelines
1. Vacant Land	1930s to 1940s
2. Airport Runway – End of the old airstrip terminated at this point. Actual site use remained vacant.	1942/43 to late 1940s
3. Landfill and Metal Dump	Late 1950s-Present

The Iqaluit Airport was constructed in the year of 1942-1943 by the joint effort of a United States and Canadian military initiative known as the “Crimson Route”. This route was mandated as a flight path designed to ferry aircraft and equipment to Europe during World War II. The site was vacant from the conception of the airbase until a time between 1958 and 1964 as noted during aerial photographs review (Franz, 2009). The majority of materials appear to have been deposited in 1963, when the United States Air Force (USAF) withdraw from the area. The nature of the debris in the main landfill and scrap metal dump suggest that the USAF was likely responsible for depositing a large portion of the wastes currently found on the site.

The site was believed to be used for the disposal of small quantities of municipal waste from the town of Iqaluit in the 1960’s, but was abandoned in the early 1970’s in favour of the newly constructed Apex dump site. Upon closure of the site, it is believed that a cap consisting of granular material was placed on top and on the face of the landfill site to cover much of the debris. A few examples of municipal wastes

disposed of at the site include food cans and bottles, kitchen appliances, bicycles, tires, wooden pallets, animal remains, water heaters, toys, etc. (Franz, 2009)

The site has seen little activity since its abandonment in the 1970's. The site is now used as a location for burning of wood debris and a rogue dumping area for residents of the community (these types of activities were observed during the field investigation). Some residents occasionally scavenge the vehicle dump for parts and useful items. Local residents occasionally also use the site as an access point to Sylvia Grinnell Territorial Park.

The City of Iqaluit zoning by-law 704 (Consolidated November 2014) covers part of the site as shown in Figure 2. The upper portion lies within the zone M2 regulated for heavy industrial usage. The airport and a large petroleum, oil and lubricant (POL) facility are located in this heavy industrial zone, to the east of the site. An allowance for a former waste disposal site is adjacent to the heavy industrial zone as shown as MR (1) on Figure 2. The allowance appears to partially overlap the vehicle dump and the main landfill. To the west of the M2 heavy industrial zone, the area is zoned as open area (OR) that permits activities such as cultural interpretation centre, dog area, park and temporary camping structures.

3.4 Natural Environment – Overview

Iqaluit lies within the low arctic tundra zone, which is ecologically sensitive. The area is underlain by continuous permafrost. Soils are nutrient-poor, silty, shallow and have little, if any profile development. The topography, structural geology and drainage of the study area follow a northwest-southeast trend. Ground cover is a combination of black, silty sand with organic soil, bedrock outcrops, grass and lichens.

3.4.1 Regional and Local Topography

The study area is characterized by rolling terrain that slopes towards the Sylvia Grinnell River. The bedrock over which the metal debris was dumped is approximately 30 m above the River valley. Local terrain consists mainly of bare rocky outcrops with a thin layer of glacial and marine sediments in low lying areas between outcrops.

The elevation of the landfill site is approximately 30 to 35 metres above sea level (m asl) and the Sylvia Grinnell River is at approximately 0 to 5 m asl (http://atlas.nrcan.gc.ca).

3.4.2 Regional and Local Drainage

The Sylvia Grinnell River is the principal drainage system in the region which discharges into Frobisher Bay. The river is influenced by the tidal action of the ocean which has some of the largest tides in Canada. The river is a major migratory route for Arctic Char.

The natural drainage around the study area is influenced by the bedrock structure and numerous small, elongated ponds that have formed along fault lines and joints. The ponds are shallow (approximately less than 0.5 m deep), and are poorly drained. The high ratio of sediment surface to pond volume allows maximal exchange between the sediment and the water. In the winter, the ponds are frozen to the bottom. There are four large ponds and two smaller ponds. There are small intermittent drainages that join these water bodies (See Figure 2). The typical topographical layout and drainage pathways are seen in Photo 3-1. Ponds 1, 2, 3, 4, 5 are visible, as is Sylvia Grinnell River in the background.

Photo 3-1: Showing Panoramic View of Typical Topography from Top of Landfill

3.4.3 Pond Systems

Six ponds of varying sizes exist on site and were assigned numbers from 1 to 6. Three of these ponds experience influx of brackish ocean water twice daily (ponds 1, 3, and 4). The other three ponds are considered to be under a freshwater environment (ponds 2, 5 and 6). Two of these ponds (ponds 5 and 6) appear to play a crucial role in naturally attenuating sediment and surface water contaminants prior to discharge into the Sylvia Grinnell River. Detailed descriptions of each pond can be viewed in the Phase I/II and Phase III ESA (Franz, 2009 & 2010c). Photo 3-2 illustrates the layout of Pond 5 and typical vegetation in the surrounding area. Ponds 1 through 5 are labelled on Photo 3-1.

Photo 3-2: Showing Pond 5

3.4.4 Ecological Characterization of Site

Although the landscape appears to be barren, the flora of Iqaluit is abundant. As reported by Franz (2009 & 2010c), the area is characterized by a combination of bare rocky outcrops, grasses, and lichens.

To determine if the site is part of or is near to a critical wildlife habitat, the network of protected areas administered by Environment Canada was reviewed. The network, which includes migratory bird sanctuaries, national wildlife areas, and marine wildlife areas, represents diverse habitats protected under federal legislation. In addition, a territorial search for information related to critical wildlife habitat was also conducted. The distribution data provided by Environment Canada and the Government of Nunavut are based on limited available information. Due to the dynamic nature of species distribution, the data provided does not represent an exhaustive and comprehensive inventory of a species' current distribution. Results of the searches are presented in Table 3.

Table 3. Ecology of Iqaluit, Nunavut

Vegetation and Terrestrial Mammals	Aquatic Wildlife and Birds
Vegetation	**Aquatic Wildlife**

• Arctic Fireweed (*Epilobium angustifolium)*
• flowers and berries
  o Crowberry (*Empetrum*),
  o Poppy (*Papaver*)
  o Saxifrage (*Saxifraga)*
• numerous mushroom species
• lichens
  o Pixie-cup (*Cladonia asahinae)*
Scurvy-grass (*Cochlearia sp.)*
	• Seal (Pinnipedia)
	• Walrus (Odobenus rosmarus)
	• Beluga (Delphinapterus leucas)
	• Humpback Whale (Megaptera novaeangliae)
	• Arctic Char (Salvelinus alpinus)

Terrestrial Mammals	**Birds**
• Wolverine (rare) (*Gulo gulo*), • Lynx (*Lynx lynx*) • Mice • Marmot (*Marmota monax)* • Muskox (*Ovibos moschatus)* • Arctic Hare (*Lepus arcticus*) • Lemming (*Dicrostonyx torquatus)* • Caribou (*Rangifer tarandus*) • Grey Wolf (*Canis lupus nubilus)* • Arctic Fox (*Alopex lagopus)* • Red Fox (*Vulpes vulpes*) • Polar Bear (*Ursus maritimus*)	• Canada Goose (Branta canadensis) • Ptarmigan (Lagopus muta) • Arctic Tern (Sterna paradisaea) • Common Eider (Somateria mollissima) • Glaucous Gull (Larus hyperboreus) • Herring Gull (Larus argentatus) • Snowy Owl (Bubo scandiacus)

During the 2009 site visit, Franz personnel did not observe any wildlife. According to the Species at Risk web mapping application and the Nunavut Department of Environment website, no species are listed as threatened within the Killiniq region. Based on the Nunavut Wild Species 2000 report, the subject sites are within the range of three sensitive species: the wolverine, grey wolf and the polar bear.

Sylvia Grinnell Territorial Park, the oldest of Nunavut's territorial parks borders the site to the north-western extent. Sylvia Grinnell Park is divided in two by the Sylvia Grinnell River. The park plays a vital role in the community of Iqaluit by providing an important fishing ground for Arctic Char.

Sylvia Grinnell Territorial Park is also home to Arctic Hare, Arctic Fox, Caribou, lemmings and other small mammals. Polar Bear have even been sighted on occasion, although they do not frequent the area. The park also plays a significant role in bird migration and over 40 species have been recorded in the park at different times of the year. The park is also the most southern breeding ground for the Ringed Plover. The local vegetation above and below the cliff consists of wet grassland tundra species including mosses, grasses and sedges. On the cliff and bedrock outcrops vegetation is sparse and consists of lichens with patches of grasses and mosses.

3.5 Climate

Iqaluit is located within an arctic climatic zone despite being well outside of the Arctic Circle. The average daily temperature range is -28°C to 7.7 °C. The area is characterized by very cold winters and short summers that permit the growth of very small, stunted trees. The average monthly temperature is below freezing for eight months of the year. The average annual precipitation is 412.1 mm, which is much wetter than many other localities in the Canadian Arctic islands. There is 198.3 mm annual rainfall and 235.8 mm annual snowfall (www.climate.weatheroffice.ec.gc.ca).

4 REGULATORY FRAMEWORK AND ENVIRONMENTAL QUALITY CRITERIA

4.1 Regulatory Framework

The Contaminated Sites Management Working Group for federal government departments has defined a contaminated site as a site at which substances occur in concentrations that either: 1) are above background levels and pose, or are likely to pose, an immediate or long-term hazard to human health or the environment; or 2) exceed levels specified in policies and/or regulations. For the latter, the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CCME, 1999 and annual updates), including the Canada-Wide Standards for Petroleum Hydrocarbons in Soil (CCME, 2001 and updates) are applied in the numerical comparison of laboratory data to determine whether the site should be deemed a contaminated site. The guidelines are numerical limits intended to maintain, improve or protect environmental quality and human health at contaminated sites.

The Government of Nunavut Department of Environment Guideline for the Management of Contaminated Sites (revised December 2014) has adopted the federal CCME Guidelines for the management of contaminated sites within its jurisdiction.

The chemical data obtained during the Franz (2009 & 2010c) Phase I/II and Phase III ESAs and during the 2016 surface water and sediment testing conducted by Arcadis as part of the RAP update were compared to established guidelines from the federal CCME. The federal guidelines, referred to in this report as environmental quality guidelines (EQG) are relevant since the site(s) is currently federally managed and Nunavut has adopted the CCME approach.

4.2 Environmental Quality Criteria

The federal EQG are based on the level of risk a contaminant poses to humans, plants and wildlife. The EQG are used in this RAP to identify the areas where mitigation of exposure to chemicals of concern is required and are also incorporated as site-specific remedial objectives.

The specific guidelines that are used in this RAP to evaluate the impact to surface water, sediment and soil are as follows:

- Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CSQGs) (CCME, 1999, with updates).
- Canada-Wide Standards for Petroleum Hydrocarbons in Soil (CWS-PHC) (CCME, 2008).
- Canadian Soil Quality Guidelines (CSQG) Polycyclic Aromatic Hydrocarbons factsheet (CCME, 2010).
- Canadian Environmental Quality Guidelines. Canadian Sediment Quality Guidelines (CSedQG) for the Protection of Aquatic Life (CCME, 2007, with updates).
- Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines (CWQG) for the Protection of Aquatic Life (CCME, 2007, with updates).

The soil EQG are further categorized by land use (i.e., agricultural/wildland, residential/parkland, commercial and industrial) and soil properties (i.e., fined or coarse grained soil). Based on a review of the site settings, site usage, municipal zoning and adjacent activities, the site was divided into two land use sectors for the purpose of evaluating the soil environmental quality against the EQG:

- The lower sector below the escarpment and encompassing ponds 1 to 6 and part of the Sylvia Grinnell Territorial Park was considered to be a wildland sector. This sector is outlined as Area of Environmental Concern 4 (AEC 4) in Figure 2. The Sylvia Grinnell Territorial Park plays a significant role in bird migration and over 40 species have been recorded in the park at different times of the year. CCME agricultural/wildland use is defined as "*Land on which the primary activity is related to the productivity capability of the land and includes lands that provide habitat for wildlife and birds*". Based on this definition and on significance of the park's habitat, the CCME wildland guidelines are applicable to the northern section of AEC 4 which is part of the park. The southern portion of the AEC 4 presents similar geomorphological/biological features and the presence of equivalent wildlife habitat can be expected throughout AEC 4. The wildland soil EQG are protective of the more sensitive ecological habitats expected in the area while protecting for the recreational usage observed and permitted by the municipal zoning (i.e., Iqaluit by-law 704 Open Area Zone (OR) which permits the use of the area as cultural interpretation centre, dog area, park, beach shack, temporary camping structures and utility installation).
- The upper sector including the vehicle dump, the landfill and the upper debris was considered to be a commercial sector. This sector is outlined as AECs 1, 2, and 3 in Figure 2. This sector is predominantly located within Iqaluit by-law 704, zone M2 and is regulated for heavy industrial usage. This sector also already includes a zoning allowance for a former waste disposal site (Iqaluit by-law, zone MR, exclusion 1). The local residents are known to use the area for social activities (e.g., bonfire) and for accessing the Sylvia Grinnell River and Park. It is assumed that this behavior will continue following the remediation of the site and that no residential dwellings will be installed in the sector. The CCME commercial guidelines would be protective of the site users and ecological receptors because they are calculated based on 10 hours a day, 5 days a week, 48 weeks a year exposure assumptions that include site usage by all members of the public, including children (toddlers) and that consider the different potential exposure routes such as direct soil contact (ingestion and dermal contact), vapour inhalation and ecological soil contact.

The coarse grained EQG were applied to both sectors since they are the most stringent of the set and considering that both fine and coarse grained soils were observed at the site.

Surface water and sediment EQG are further refined into freshwater or marine environment. The upper sector including AECs 1, 2, and 3 contains drainage features and small ponds that act as headwater to the lower sector. Surface water and sediment from this sector is not affected by the tides and the freshwater EQG are applicable. Similarly, the eastern portion of the lower sector (AEC 4) including ponds 2, 5 and 6 is not considered to be significantly affected by the tides and the freshwater EQG are applicable. The western portion of the lower sector (AEC 4) including ponds 1, 3 and 4 is replenished by the upstream freshwater features and intruded with saline water twice daily during high tide. Sodium concentrations measured in these ponds are generally less than the 1000 mg/L freshwater threshold; however, since it was observed that marine water intrudes the ponds and in the absence of sufficient information on resident species and environmental conditions, the water quality guideline protecting the most sensitive condition should be applied (CCME, 2007; *A Protocol for the Derivation of Water Quality*

Guidelines for the Protection of Aquatic Life 2007). As such, the ponds are considered a brackish water environment and the lowest of the freshwater or marine surface water/sediment guidelines are applicable.

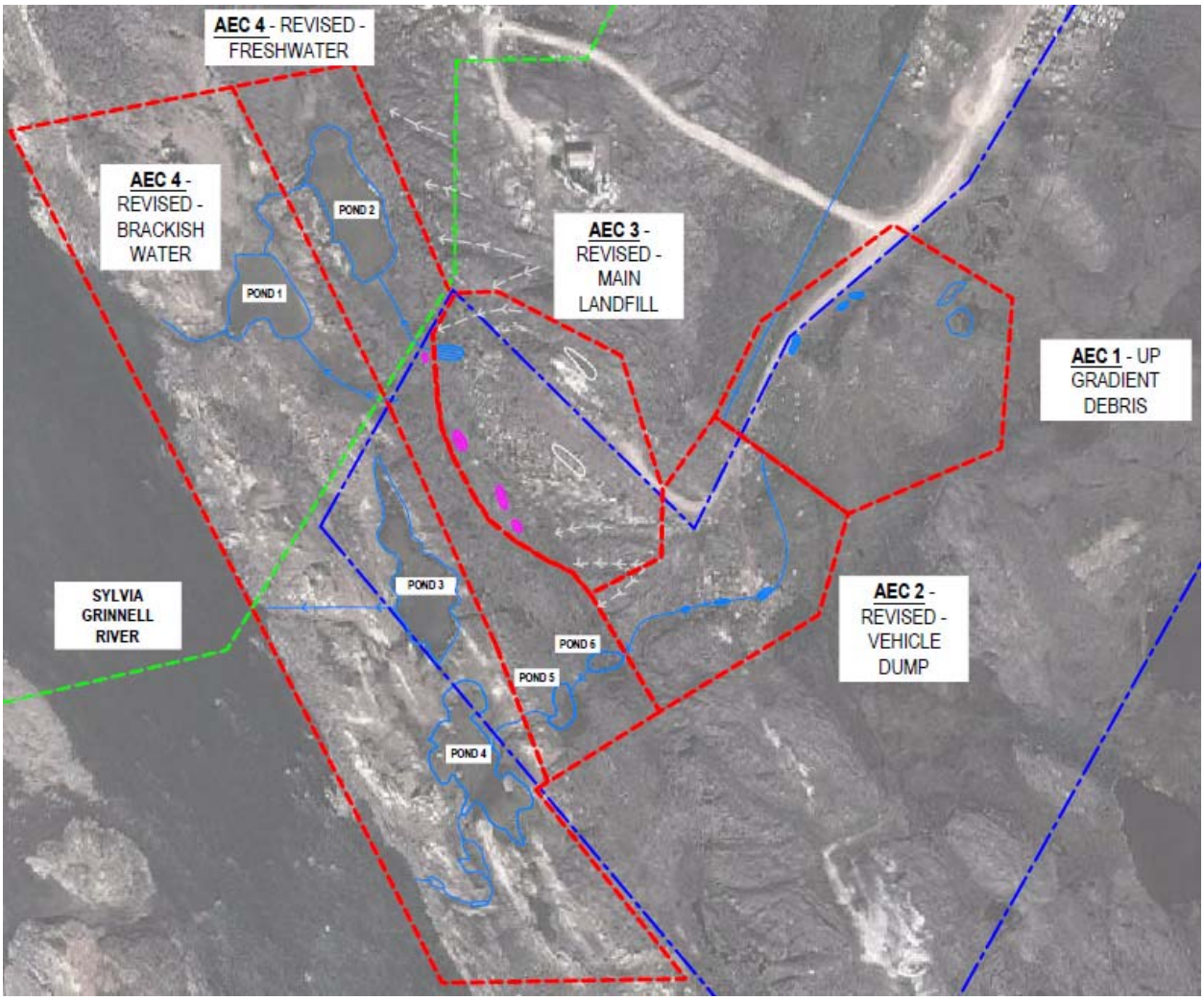
Federal groundwater EQG have been published by the CCME and under the Federal Contaminated Sites Action Plan (FCSAP); however, they have not been used in the RAP development. Exposure to contaminated groundwater is considered not applicable to the site (i.e., groundwater exposure pathway non-operable) for the following reasons: 1) overland flow is the primary mode of water transport in the area, 2) groundwater associated with fractures in the bedrock and through the thin overburden would likely be minor, 3) groundwater is not used as a drinking water source in the area and 4) the site lies within the continuous permafrost zone (Franz, 2010c).

The site specific EQG are summarized in Table 4 for the different sectors and AEC and also presented in Map 1. Additional details on the selection of the specific EQG are presented in Appendix A.

Table 4. Summary of Site Specific Environmental Quality Criteria

Sector	AEC	EQG
Upper	1, 2, 3	Commercial, Freshwater, Coarse grained soil
Lower – Eastern portion	4	Wildland, Freshwater, Coarse grained soil
Lower – Western portion	4	Wildland, Lowest of Marine or Freshwater, Coarse grained soil

Map 1: AEC Boundaries



5 SITE INVESTIGATIONS AND IMPACTS

5.1 Site Investigations

The site environmental conditions were evaluated in 2008, 2009 and 2016. The findings of the 2008 and 2009 investigations are detailed in the Phase III ESA (Franz, 2010c). In 2016, supplemental testing was conducted to obtained recent surface water and sediment samples in support of the RAP and to verify the quantity, distribution and stability of the waste at the site. The programs are summarized below. The analytical results from all three programs were grouped by environmental media and AEC and are presented in Appendix B.

5.1.1 Contaminants of Concerns

Preliminary concerns with historical usage of the site relate to the disposal of waste debris including the burial and disposal of metallic and domestic waste (i.e., volatile organic compounds (VOCs), metals, and PCBs), the potential disposal of petroleum products (i.e., petroleum hydrocarbon (PHC) fractions 1 to 4 (F1-F4), benzene, toluene, ethylbenzene and xylenes (BTEX), PAHs, VOCs, and metals), solvents and degreasers (i.e., F1-F4, BTEX, PAHs, VOCs), heavy oil and lubricants (i.e., PCBs, and PAHs), and use of pesticides. The contaminant of concerns are summarized in Table 5 for each AEC. For each AEC, these contaminants were suspected to be present in soil, surface water and/or sediment at locations where contamination could reasonably be expected to be present (e.g., PHCs in soil around barrel caches).

Table 5. Summary of AECs and Potential Concerns

AEC	Potential Contaminant of Concerns	Environmental Media Potentially Affected	Receptors Potentially Affected
AEC 1 – Upgradient Buried Debris	PHCs, Metals, PCBs, and Pesticides	Soil, surface water and sediment	Human health and Ecological
AEC 2 – Vehicle Dump	PHCs, PAHs, VOCs, Metals, PCBs, and Pesticides	Soil, surface water and sediment	Human health and Ecological
AEC 3 – Main Landfill	PHCs, PAHs, VOCs, Metals, PCBs, and Pesticides	Soil, surface water and sediment	Human health and Ecological
AEC 4 – Down Gradient, Off Site	PHCs, PAHs, VOCs, Metals, PCBs, and Pesticides	Soil, surface water and sediment	Human health and Ecological

5.1.2 Testing Program

The potential contaminants of concern were tested in soil, surface water and sediment in all four AEC in 2008 and 2009. In addition, paint from the vehicles present in AEC 2 was also tested for lead content. Vegetation samples were collected in 2008 and 2009 to further evaluate the presence of the contaminants in the environment. In 2008, grain size samples of soil and sediment were collected and in

2009, total organic carbon (TOC) and dissolved organic carbon (DOC) were analysed in sediment and surface water, respectively, to assist with the interpretation of contaminant results.

Limited sampling of surface water and sediment was conducted in 2016 to assess any potential changes in the media since the last sampling round conducted in 2009. Arcadis field personnel mobilized to Iqaluit to collect the samples on Friday September 30th and demobilized on October 2, 2016. As part of the field program, Arcadis collected seven (7) sediment samples and one (1) duplicate sample and submitted them to Maxxam Analytics in Ottawa, Ontario for analysis of PHCs, PAHs, PCBs, pesticides, and metals. The analytical program was selected based on historical exceedances noted. The samples were collected as presented in the Arcadis memo *Sampling and QA/QC Plan for Iqaluit Former Metal Dump and Community Landfill, Iqaluit, Nunavut,* dated September 19, 2016. No deviations from the sampling plan were required. The laboratory reports for the 2016 results are presented in Appendix C.

The 2008, 2009 and 2016 also included a quality assurance/quality control program to ensure the quantitative and qualitative reliability of the information. The 2008 and 2009 validation of the information is presented in the Phase I/II (Franz, 2009) and Phase III (Franz, 2010c) report, respectively. The 2016 validation is presented in Appendix C along with the laboratory reports. The amount of samples submitted per year and type of analysis is summarized in Table 6. Overall, all of the drainage pathways and ponding systems were observed to be in the same condition with no evidence of new or worsening impacts between 2008/2009 and 2016.

Table 6: 2008, 2009 and 2016 Testing Program

Media	Soil			Surface Water			Sediment			Vegetation			Material Sampling			
Year	08	09	16	08	09	16	08	09	16	08	09	16	08	09	16	Total
PHCs	20	11	-	9	7	7	8	18	7	-	-	-	-	-	-	**87**
Metals	27	13	-	19	31	7	20	25	7	11	11	-	-	2	-	**173**
PCBs	13	6	-	15	9	7	11	18	7	9	2	-	-	-	-	**97**
VOCs	5	11	-	2	7	-	2	4	-	-	-	-	-	-	-	**31**
PAHs	7	5	-	2	5	7	2	3	7	-	-	-	-	-	-	**38**
Pesticides	5	1	-	3	10	7	3	18	7	-	-	-	-	-	-	**54**
TOC	-	-	-	-	-	-	-	25	-	-	-	-	-	-	-	**25**
DOC	-	-	-	-	31	-	-	-	-	-	-	-	-	-	-	**31**
Grain Size	5	-	-	-	-	-	2	-	-	-	-	-	-	-	-	**7**
Total number of analyses:	**82**	**47**	**0**	**50**	**100**	**35**	**48**	**111**	**35**	**20**	**13**	**0**	**0**	**2**	**0**	**543**

5.1.3 Physical Hazard Survey

During all field programs, Franz/Arcadis completed site reconnaissance including waste inventory, drainage system analysis and visual assessment of the stability of the toe of the landfill.

A site survey was carried out during the 2009 and 2016 field programs to georeferenced site features and sample locations with the use of a Global Position System (GPS). A manual topographic survey of the site was completed by Rugged Geomatics on October 7, 2016 to generate a digital elevation model (topographic map) of the landfill and debris area. The model is presented in Appendix E and supports the RAP development and implementation.

Arcadis collected photographs of the landfill and surrounding areas during all programs. As well as, video panoramas of all areas of concern was produced in 2016. This media was collected in order to have the most recent information available for presentation to perspective contractors during the tendering process, as well as to aid in the preparation of the construction specifications. Selected photographs from the 2016 visit are presented in Appendix D.

5.2 Environmental Impacts

Within the study area, there are known and discrete metal impacted soils and sediments associated with up-gradient waste burial, vehicle dump, and main land filling activities. Elevated metals (particularly cadmium, zinc, copper, and lead) exist on site and are somewhat heterogeneous in terms of spatial distribution and concentrations.

Pesticides and PCB impacts were also reported widespread throughout the site from AEC 1 to AEC 4, with the majority of impacts occurring within the Vehicle Dump Area (AEC 2). Attenuation of the impacted media is taking place via the naturally occurring tiered pond system. PCBs were likely released by the historical disposal of transformers and electrical equipment on site. In 1987, site remediation activities removed electronic equipment suspected as a point source for PCB release on site. Some of the low levels pesticides and PCBs concentrations might be associated with atmospheric deposition.

Upon completion of the spatial analysis model, it was determined that the source area for each of the contaminant of concern remains consistent with each parameter tested and is related to the historical land filling activities on site. Buried and exposed metallic debris imparts a slow release of metals into the environment. Some debris appear to have acted as isolated and discrete sources of PHC, PAH and to a much lesser degree PCB, pesticide and VOC (e.g. TCE) impacts.

A detailed review of historical data from 2008, 2009 and 2016 has been completed and the data was compared against the selected EQG for each AEC. The concentration ranges and distribution of contaminants were reviewed to identify predominant indicators of leachate and hot spots of contamination. A multiple line of evidence approach using the type, amount, and level of exceedances, leachate indicators and background concentrations was used to obtain a spatial distribution of contamination based on three degrees of impact: significant, moderate and not significant. A summary of the contaminant impacts is presented in the Phase III ESA (Franz, 2010c) and Appendix A. The spatial distribution of the impacts is represented in Figure 3, Figure 4 and Figure 5 for soil, sediment and surface water, respectively. For more information on contaminant impacts the reader is referred to the Phase III ESA (Franz, 2010c) and Appendix A.

Table 7: Summary of Contaminant Impacts

Area Identification	Impacted Media	Exceedances of EQG	Elevated Leachate Indicator	Impact Location	Degree of Impact
AEC 1 – Upgradient Buried Debris	Soil	Metals (copper); PHCs (F2, F3)	-	Two discrete areas	Significant
	Sediment	Metal (zinc), DDT, DDD, DDE	Metal (calcium)	Small pond and ditch at road near AEC 1 & AEC 2	Not significant (small pond) to moderate (ditch roadside)
	Surface Water	Metals (aluminum, chromium (IV), copper, iron)	-	Small pond and ditch at road near AEC 1 & AEC 2	Moderate
AEC 2 – Vehicle Dump	Soil	Metals (cadmium, copper); PHCs (F2, F3, F4)	-	Three discrete areas	Significant
	Sediment	Metals (arsenic, cadmium, chromium, copper, lead, zinc); DDT, DDD, DDE; 9 PAHs; PCBs	PHCs (F2, F3, F4); Metals (calcium, iron)	Drainage features leading to pond 6	Moderate to significant (degree of impact increases from north to south and present all across AEC 2)
	Surface Water	Metals (aluminum, cadmium, copper, iron, lead)	Metal (zinc)	Drainage features leading to pond 6	Moderate to significant (degree of impact greatest at the height of vehicle debris)
AEC 3 – Main Landfill	Soil	Metals (zinc); 3 PAHs	-	Two discrete areas	Significant
	Sediment	-	-	-	None; no sediment observed
	Surface Water	Metals (aluminum, copper, iron, lead, zinc)	Metal (cadmium)	Water accumulation at toe of the landfill	Significant
AEC 4 – Downgradient and Off Site	Soil	-	-	-	-
	Sediment	Metals (cadmium, chromium, copper, lead, zinc), PCBs, 9 PAHs, DDE, DDD	Metals (calcium, iron), PHCs (F1, F2, F3, F4)	Pond 2 to 6	Not significant (pond 2, 4) to moderate (pond 3, 5) to significant (pond 6)
	Surface Water	Metals (boron, chromium (IV), copper, iron), pH, TCE	Metal (zinc), PCB	Pond 1 to 6	Not significant (pond 1, 2, 3) to moderate (pond 4, 5, 6)

5.3 Main Landfill Slope Stability (AEC 3)

Based on the geotechnical assessment of the main landfill southern slope (AEC 3), it appears that the slope is at its maximum angle of repose and that the landfill poses a significant current and potential physical hazard. Remedial work is required for this area.

5.4 Non-Hazardous and Hazardous Waste Debris

A variety of non-hazardous waste debris types are found within the different areas/AECs. The major waste streams are rusted metallic debris, abandoned vehicles and parts, fuel drums, and domestic waste debris.

It is anticipated that the majority of the waste will be considered non-hazardous. However, lead-amended paint was reported on the painted vehicles in AEC 2. Hazardous debris (e.g., asbestos, unknown liquids, batteries, and lead-amended paint) may also be present but currently buried or inaccessible.

Although the debris is found scattered throughout the site, the majority of the debris is located in AEC 2 (Vehicle Dump) and AEC 3 (Main Landfill Area). Arcadis observed during the 2016 site visit that much of the vehicular debris from AEC 2 – Vehicle Dump has been removed in 2011. The summary of waste at the site has been updated as of 2016 and is presented in Table 8. More details are available in Appendix F.

Table 8: Summary of Waste Debris

AREA	Estimated Volume of Hazardous Material	Estimated Volume of Non-Hazardous Material	Estimated Volume of Recyclable Material	Comments
AEC 1 - Upgradient Debris Area	45 m^3	905 m^3	100 m^3	Non-Hazardous material to stay in place in AEC 1
AEC 2 – Vehicle Dump	350 m^3	145 m^3	945 m^3	All debris to be removed
AEC 3 – Main Landfill	645 m^3	495 m^3	1039 m^3	All debris from upper east to be removed. All debris as part of current cap to remain in place. Debris at toe to be removed and sorted selectively – only exposed debris considered.
Site-Wide Total	1040 m^3	1545 m^3	2084 m^3	

AREA	Estimated Volume of Hazardous Material	Estimated Volume of Non-Hazardous Material	Estimated Volume of Recyclable Material	Comments
Adjusted Site-Wide Total	1040 m^3	1082 m^3	1500 m^3	Volumes adjusted for compaction and consolidation, applied only to recyclable and non-hazardous materials – assumed a 30% reduction for non-hazardous material and recyclable material.

5.5 Conclusion

The results of the chemical distribution and impacts evaluation, spatial analysis and the geotechnical evaluation indicate that at selected areas, risk management or remediation is required to reduce the physical safety hazards and mitigate exposure to chemicals of concern present at concentrations greater than the selected EQG.

6 REMEDIAL OPTIONS EVALUATION

Remedial options that consider the need for addressing the physical and environmental impacts at the site were evaluated. The options were categorized as suitable/not suitable and recommended/not recommended as defined in Table 9 . The criteria used to categorize the options are the RAP objectives (see Section 2.1). In addition, the following screening criteria were considered during the options analysis:

- Effectiveness in meeting the selected remediation and/or risk management standards;
- Applicability to site conditions;
- Complexity and public acceptance;
- Risk to human health and the environment;
- Time frame to implement and complete; and
- Comparative cost.

The options are summarized in Table 10. The options are organised by type of impact (i.e., soil, sediment, surface water, physical hazard and debris). For each type of impact and option, Table 10 presents a short description of the option and qualifies its applicability to the site issues.

Table 9: Definition of Option Category

Option Category	Definition
Suitable	The option can address at least one issue related to a type of impact. Suitable options can be combined to remediate an entire impact type.
Not Suitable	The option is not technically feasible based on the site setting.
Recommended	The option is considered best suited for addressing the entire impact type and it also aligns with the RAP objectives.
Not Recommended	The option is technically feasible but not recommended because it contradicts one or more of the RAP objectives.

Additional details are provided in Appendix G.

Table 10: Remedial Option Evaluation

Site Impact	Option 1	Option 2	Option 3	Option 4	Option 5
Soil	Excavation and disposal to offsite land treatment unit (Iqaluit).	Excavation and disposal south to licensed waste facility.	Excavation and reuse onsite as landfill sub-capping material.	*In situ* treatment including remediation, monitoring natural attenuation (MNA) and/or landfarming.	Risk Management
	Suitable for PHCs and PAHs impacted soils.	Suitable for PCBs impacted soils (*none encountered at the site above the commercial EQG*) and metal impacted soils above the toxicity characteristic leaching procedure (TCLP) threshold.	Suitable for metal impacted soils above the EQG and below the TCLP.	Not recommended. The volume of contaminated soils is small and would not justify the cost of implementing remediation systems. MNA contradicts RAP objective of cost-effective.	Not recommended. Contamination at the site is dispersed, localised and includes various contaminants. Risk assessment would have to derive multiple site specific target levels that would be difficult to implement and monitor. Might not meet RAP objective of technical feasibility.
Sediment	Hot spot removal and disposal offsite to land treatment unit (Iqaluit).	Hot spot removal and disposal south to licensed waste facility.	Hot spot removal and reuse onsite as landfill sub-capping material.	Passive *in situ* treatment and monitored natural attenuation.	Risk Management
	Suitable for PHCs and PAHs impacted sediments.	Suitable for sediment impacted by PCBs and DDT and sediment significantly impacted by several contaminants.	Not recommended. Water content too high. Would required drying the sediment onsite and would not be cost effective and thus contradicts the RAP objective.	Suitable for sediment impacted area with well established vegetation already acting as contaminant attenuation zone or with potential to act as contaminant attenuation zone once source of impact (i.e., debris) is removed.	Not recommended. Contamination at the site is dispersed, localised and includes various contaminants. Risk assessment would have to derive multiple site specific target levels that would be difficult to implement and monitor. Might not meet RAP objective of technical feasibility.
Surface Water	Pumping and disposal to offsite water treatment facility.	Pumping and onsite inline treatment (e.g., activated carbon).	Engineered Wetlands	Passive *in situ* treatment and monitored natural attenuation	Risk Management
	Not suitable. No known facility in Iqaluit to receive the waste water and shipping south is cost prohibitive and not technically feasible thus contradicting RAP objectives.	Suitable for impacted dewatering water, if encountered during other aspects of the remediation program such as the hot spot removal of impacted sediments.	Not recommended. The volume of significantly impacted sediments/surface water is relatively small. Contaminant attenuation is already observed and is expected to increase once the source of contamination/debris is removed. Engineered wetlands require care & maintenance until proven efficient and self-sustaining and are difficult to implement in northern environment. Accordingly, this option contradicts two of the RAP objectives and is not recommended.	Suitable in combination with contaminant/debris removal and for surface water already showing evidence of contaminant attenuation along the flow path.	Not recommended. Contamination at the site is dispersed, localised and includes various contaminants. Risk assessment would have to derive multiple site specific target levels that would be difficult to implement and monitor. Might not meet RAP objective of technical feasibility.

Site Impact	Option 1	Option 2	Option 3	Option 4	Option 5
Landfill Slope Stability (AEC 3)	Full removal of landfill debris	Transfer of debris from the slope to the top of the landfill	Engineered decommissioning of landfill (Consolidate and compact debris, cap in place with aggregate material to achieve a 4v:1h slope well integrated with natural environment, contour and revegetate to ensure long-term stability)	---	---
	Not recommended. Disturbing the landfill could worsen stability issues and un-earth potential hazardous materials. This option contradicts the RAP objectives of minimizing health and safety risks and would also be cost prohibitive given its position and location.	Not suitable. The space available is not sufficient. This option contradicts the RAP objectives of minimizing health and safety risks and to blend the site with the natural environment, where possible.	Recommended. This option is considered best suited for the site conditions and aligns with the RAP objectives.	---	---
Debris	Recycle	Consolidate in landfill (AEC 3)	Bury in place	Ship south	---
	Suitable for exposed non- hazardous and recyclable debris but cost might be prohibitive.	Suitable for exposed non-hazardous debris	Suitable for debris already in the footprint of the landfill or small and scattered debris remaining in AEC 1. Area of buried debris will require revegetation with indigenous plants.	Suitable for exposed hazardous debris	---

7 SELECTED REMEDIAL STRATEGY

The remedial options considered suitable or recommended for the site were compared against the AEC specific issues to tailor a remedial strategy best suited to the site conditions and RAP objectives. The strategy is outlined in Table 11.

Table 11: Outline of Selected Remedial Strategy

AEC Identification	Media/ Environmental Concern	Discussion
AEC 1: Up-gradient Debris	Soil	Targeted hot spot removal of PHC impacted soils exceeding selected EQGs. PHC impacted soils to Iqaluit land treatment unit. Metal impacted soils that are contiguous with debris to be consolidated in the landfill.
	Surface Water	Natural Attenuation with removal of impacted soils.
	Debris	Selected debris removal and disposal according to their waste stream. Only exposed debris would be removed, cut and placed within AEC 3 for permanent landfilling. The remaining debris would be capped in place with an engineered cap (no liner).
AEC 2: Vehicle Dump	Soil	Full removal of all impacted soils. PHC impacted soils to Iqaluit land treatment unit and ship south any PCB impacted soils, if encountered. Any soils impacted with metals only could be included in the construction of the main landfill.
	Sediment	Targeted hot spot removal of sediments in the drainage feature from the top of the vehicle dump, down to the top of Pond 6 (not including Pond 6). This strategy would eliminate and remove the impacts currently contributing to the observed impacts down gradient. In addition, there would be minimal disruption to the natural environment. Mitigation measures would be implemented during the removal to prevent the release of sediment downstream into fish frequented waters. Upon hot spot removal of sediments, large (~5 cm to 30 cm) rip-rap would be placed in the drainage channel to slow the run-off and help mitigate and control future erosion. This would also support the natural recovery of downstream sediments.
	Surface Water	Natural Attenuation with removal of impacted soils and sediments. No alteration to the course of the surface water pathways would be required.
	Debris	Full removal of all debris, staging at AEC 1 and cut and placed into AEC 3 for recycling (non-hazardous and recyclable), permanent landfilling (non-hazardous and non-recyclable) and/or shipment south (hazardous).
	General	No soil would be backfilled and exposed bedrock could be left as is after soil excavation. The area consists of a high quantity of exposed bedrock

AEC Identification	Media/ Environmental Concern	Discussion
		and this would be similar to naturally occurring conditions, within the AEC 3 boundaries.
AEC 3: Main Landfill	Soil	Minimal impacted soil was identified at the landfill proper and if within the landfill footprint, would be capped in place during final landfill construction.
	Sediment	No sediment is present within the AEC 3 boundaries.
	Surface Water	Minimal surface water is present within the AEC 3 boundaries (seasonal with melt water only). A high level of effort would be assigned to the design and implementation of surface water diversion at the top, sides, and toe of the landfill to reduce water runoff loading and erosion of the landfill face.
AEC 3: Main Landfill Cont	Debris	Scattered debris at the toe of the landfill would be cut down and incorporated into the landfill. Any hazardous material would be removed to the staging area, cut and packaged for shipment south. Only exposed debris would be considered for removal south. No excavations into the existing landfill face or cap would occur.
	General	Arcadis proposes a general cap-in place strategy for AEC 3.
AEC 4: Down-gradient ponds	Surface Water	Natural Attenuation with removal of up-gradient impacted soils and sediments.
	Sediment	Natural Attenuation with removal of up-gradient impacted soils and sediments.
	General	Pond 6 contains the highest exceedances of EQGs; however, Arcadis feels that Pond 6 and, to a lesser degree, Pond 5 acts as contaminant attenuation zones for the upgradient waste load. These two ponds have high organic content and established vegetation. It is proposed to not disturb these ponds but to rather keep their contaminant attenuating function and integrate it with the upstream reconstruction of the drainage feature located in AEC 2.

7.1 Engineered Decommissioning of Landfill (AEC 3)

The proposed landfill design would include:

- The landfill cap would be engineered based on aggregate material available in Iqaluit to achieve a 4v:1h slope;
- Consolidate exposed debris from surrounding areas (AEC 1, AEC 2, AEC 3, and AEC 4) into the main slope of AEC 3 – this would not only provide a suitable landfill location for the debris, but

could also act to cut down on the amount of necessary borrow material required for decommissioning the landfill;
- Extensive swale designs to divert precipitation and melt water away from the landfill slopes to prevent both erosion and water infiltration. A high level of effort would be assigned to the design and implementation of surface water diversion at the top, sides, and toe of the landfill to reduce water runoff loading and erosion of the landfill face;
- A detailed re-vegetation strategy that may require use of a honey comb geotextile to hold seeding material; and
- Would require the implementation of a long term monitoring program.

The proposed landfill design would not include:

- A liner material, as down gradient ponds are not showing leachate signatures;
- A thermal monitoring system (i.e., thermistors);
- A leachate collection system; or
- A methane collection system.

7.2 Waste Stream Management

Three stream of debris are anticipated at the site:

- Hazardous
- Non-hazardous and recyclable
- Non-hazardous and non-recyclable

A staging area will be established to sort the debris into their specific waste stream. Arcadis understands that preliminary verbal approval to utilize the current metal sorting and storage area to the north of the site has been granted by Nunavut Airports and Government of Nunavut.

During the collection of exposed debris, hazardous material will be segregated, packaged and ship south for disposal in a licensed facility.

8 IMPLEMENTATION PLAN

Arcadis took into consideration the following aspects of the site in developing the implementation plan:

- Field season
- Local resources
- Site configuration
- Regulatory requirements
- Community acceptance

The tasks have been divided into pre-remediation, remediation and post remediation. The start up date is not known at this time so only estimated task durations have been provided.

8.1 Pre-Remediation Tasks

The following tasks will need to be completed prior to initiating the onsite remediation work:

1. Inform stakeholders and regulatory representatives of the updated RAP and timeline for implementation. Seek approval of the RAP from the Government of Nunavut Department of Environment. Review the proposed water/sediment works with the Department of Fisheries and Ocean (DFO) and the Nunavut Water Board (NWB) to identify license/permitting requirements, if any. Permitting can take up to 6 months to 1 year.
2. Negotiate usage metal sorting and storage area to the north of the site with Nunavut Airports and Government of Nunavut. Since a preliminary verbal approval has been granted, it should only take weeks to obtain formal approval.
3. Develop specifications, including the engineering design for the landfill decommissioning, and proceed with tendering process. A minimum period of 6 months would typically be required for this task from start of specifications development to contract award.

8.2 Remediation Tasks

Once all authorizations are obtained and contract is awarded, the remediation work will be implemented in stages as follows:

4. Contractor to develop and implement a worker health and safety plan and to develop and implement mitigation measures for fugitive air emissions, sediment release control, surface water control and any other requirements of licenses and permits associated with the RAP.
5. Contractor to develop and implement a performance monitoring plan to verify the quality of the environmental media remediated and left in place for later incorporation into the Remediation Closure Report.
6. Build road access from top of escarpment to the lower area in preparation of the physical removal of debris, impacted sediments and soils. It is anticipated that the access road could be built without crossing the drainage features.
7. Prep landfill to receive debris from other area and to align with the engineering design.

8. Relocate debris and impacted soils according to their waste stream. Debris candidates for onsite disposal will be directed to the landfill. Recyclable or hazardous debris will be directed to the temporary staging area were they will be prepared for recycling and for shipment south. Impacted soil will be directed to the Iqaluit land treatment unit or south, according to the nature of impact.
9. Remove heavily impacted sediments and transfer to Iqaluit land treatment unit or south, according to the nature of impact. Sediments might need to be dried onsite prior to shipment.
10. Construct rip-rap structure in drainage feature subject to hot spot removal to act as a passive treatment system for the remaining sediment and surface water impacts.
11. Perform final capping, countering and revegetation of landfill (AEC 3) and the upgradient debris area (AEC 1).
12. Complete the Remediation Closure Report to document remediation activities and site status at the end of the remediation program.
13. Close up the access road by blended it in the natural environment.

Depending on the amount of resources that can be deployed to the site (e.g., crank, crusher, backhoe, etc.), tasks 4 to 13 could take one or two field seasons to be completed.

8.3 Post-Remediation Tasks

The selected remedial strategy includes the management of selected impacted areas at the site through natural attenuation. These areas are expected to naturally recover once the debris and the most significantly impacted soil and sediments are removed and once the landfill is decommissioned and the passive surface water system is constructed. Post-Remediation monitoring will be required to verify that conditions are improving as planned following remediation. Post monitoring will also be required to confirm the performance of the remedial works including the decommissioned landfill (AEC 3), the capping of AEC 1, and the revegetation. The tasks associated with the post-remediation monitoring are:

14. Monitor the performance of the remedial works in terms of physical stability, erosion, revegetation and attenuation of contaminants in soils, sediments and surface water.
15. Determine exit criteria for the performance monitoring.
16. Complete a Site Closure Report once the exit criteria are met.

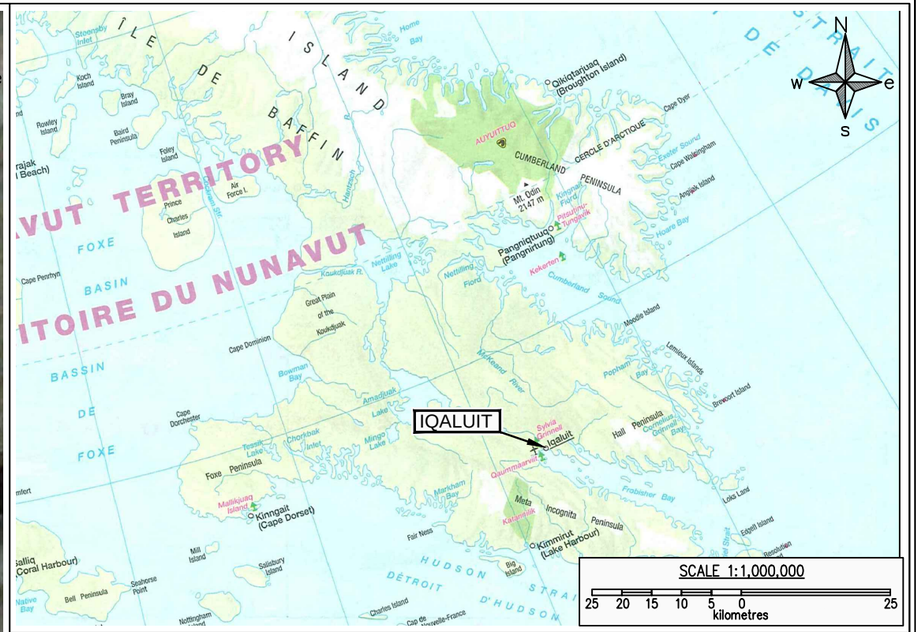
It is anticipated that performance monitoring would be undertaken on an annual basis for a minimum period of three years following the completion of the remediation works.

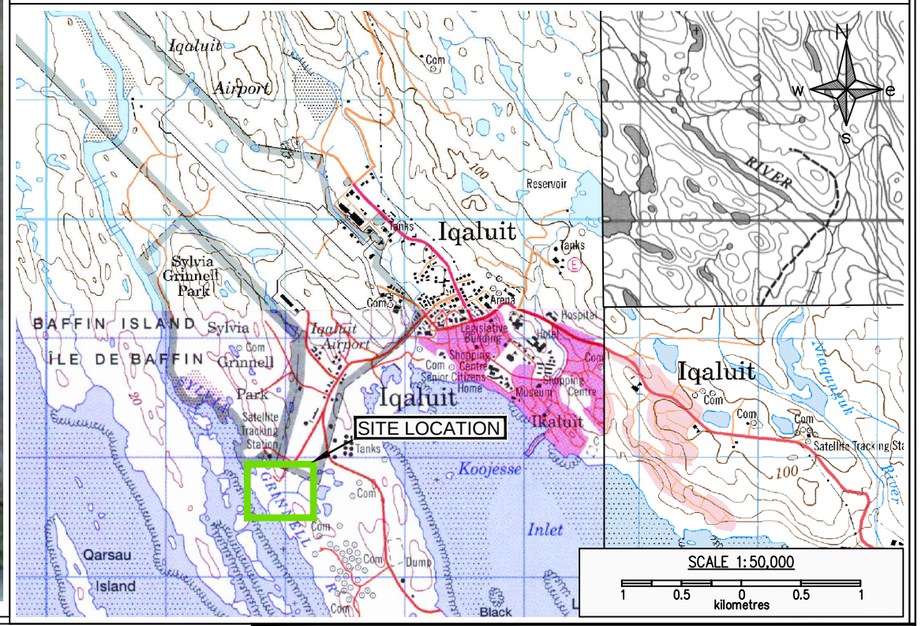
9 CONCLUSION

Remedial options that consider the need for addressing the physical and environmental impacts at the site were evaluated. The options were considered against predefined objectives that included minimizing human health and safety risks at the site; protecting ecological habitats; minimizing impacts during remediation; minimize long-term care and maintenance; and blending the final site conditions with the natural environment where possible while being cost-effective and technically feasible.

The option selected targets the offsite disposal of significantly impacted soils and sediments, the offsite removal of selected debris based on their waste stream category, the onsite consolidation of debris and comingling impacted soils, the engineered decommissioning of the site main landfill and the natural recovery of the remaining surface water and sediment impacts.

FIGURES





References:

(above) Google Earth satellite image, 2008.

(upper right) "*Canada Road Map*", MapArt Publishing, 2003.

(lower right, composite)
Natural Resources Canada NTS Sheet: 25-N/9 Burton Bay, Nunavut, Edition 3, NAD 83, Series A 713, 2001.
Natural Resources Canada NTS Sheet: 25-N/10 Hill Island, Nunavut, Edition 2, NAD 83, Series A 713, 2001.
Natural Resources Canada NTS Sheet: 25-N/15 Iqaluit, Nunavut, Edition 2, NAD 83, Series A 713, 2001.
Natural Resources Canada NTS Sheet: 25-N/16 [No Title] Nunavut, Edition 2, NAD 83, Series A 701, 2001.
(Note: ground elevations shown in metres above mean sea level).

Title: SITE LOCATION

ARCADIS

Project: LANDFILL - IQALUIT, NUNAVUT

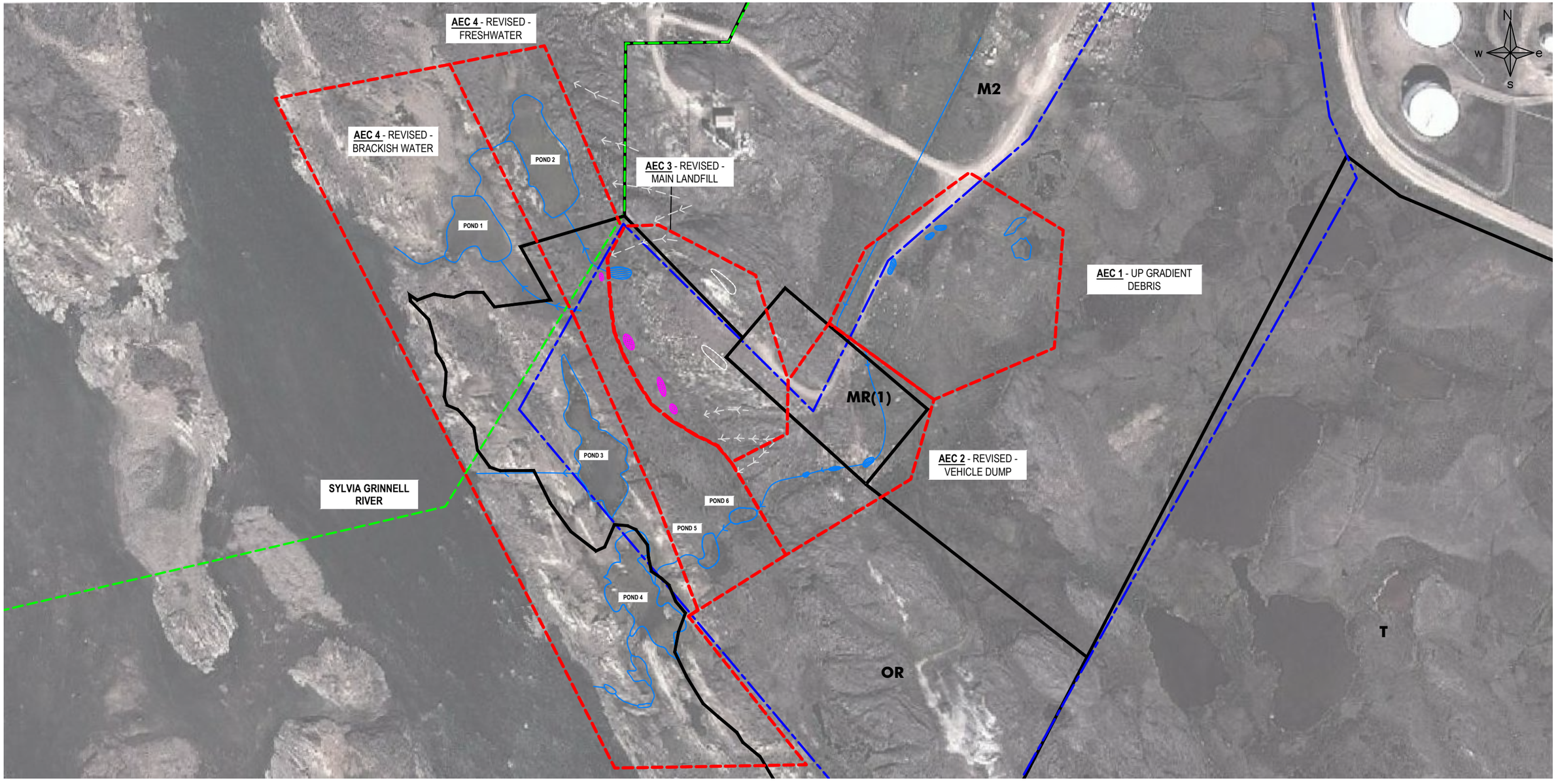
Date: JANUARY 2017

Client: PWGSC - TRANSPORT CANADA

SCALES AS SHOWN

FIGURE 1

Z:\Projects\2009\1584-0901 TC Iqaluit Landfill\Figures\TC-IQALUIT-LOCATION.dwg



LEGEND:

- POOLING WATER
- PROPERTY BOUNDARY
- PARK BOUNDARY
- ADJUSTED AREA OF ENVIRONMENTAL CONCERN (AEC)
- BURN AREA
- DRUMS
- SEEPAGE/GULLY
- STREAM/DRAINAGE
- IQALUIT ZONING OVERLAY
  - OR = OPEN AREA ZONE
  - MR1 = MUNICIPAL RESERVE ZONE (FORMER DISPOSAL SITE ALLOWANCE)
  - M2 = HEAVY INDUSTRIAL ZONE
  - T = TRANSPORTATION ZONE

REFERENCE: BACKGROUND IMAGE OBTAINED FROM GOOGLE EARTH, 2008

SCALE 1:3000

75 60 45 30 15 0 metres 75 150

*Original in colour

Title: REVISED AEC BOUNDARIES AND SITE PLAN

Project: VEHICLE DUMP & COMMUNITY LANDFILL - IQALUIT, NUNAVUT

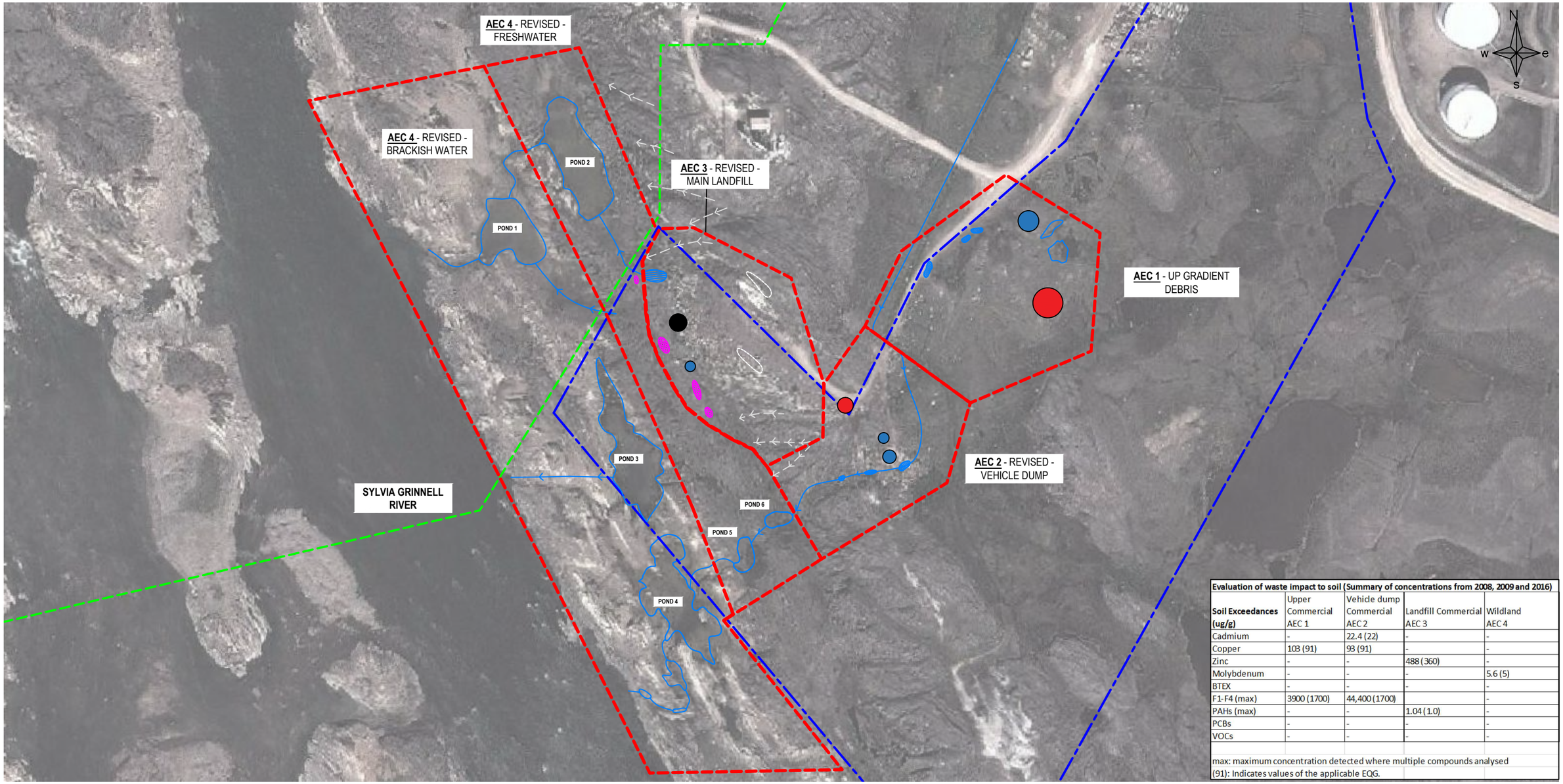
Client: PWGSC - TRANSPORT CANADA

ARCADIS

Date: JANUARY 2017

FIGURE 2

Z:\Projects\2009\1584-0901 TC Iqaluit Landfill\Figures\102153-000_TC IQALUIT_2016_RAP.dwg



Evaluation of waste impact to soil (Summary of concentrations from 2008, 2009 and 2016)

Soil Exceedances (ug/g)	Upper Commercial AEC 1	Vehicle dump Commercial AEC 2	Landfill Commercial AEC 3	Wildland AEC 4
Cadmium	-	22.4 (22)	-	-
Copper	103 (91)	93 (91)	-	-
Zinc	-	-	488 (360)	-
Molybdenum	-	-	-	5.6 (5)
BTEX	-	-	-	-
F1-F4 (max)	3900 (1700)	44,400 (1700)		-
PAHs (max)	-	-	1.04 (1.0)	-
PCBs	-	-	-	-
VOCs	-	-	-	-

max: maximum concentration detected where multiple compounds analysed
(91): Indicates values of the applicable EQG.

LEGEND:

- POOLING WATER
- PROPERTY BOUNDARY
- PARK BOUNDARY
- ADJUSTED AREA OF ENVIRONMENTAL CONCERN (AEC)
- BURN AREA
- DRUMS
- SEEPAGE/GULLY
- STREAM/DRAINAGE
- PHC IMPACTED SOIL > COMMERCIAL EQG (LANDFARM)
- METAL IMPACTED SOIL TO BE PLACED IN AEC 3 LANDFILL
- PAH IMPACTED SOIL > COMMERCIAL EQG (LANDFARM OR PLACEMENT IN LANDFILL)

REFERENCE: BACKGROUND IMAGE OBTAINED FROM GOOGLE EARTH, 2008

SCALE 1:3000

75 60 45 30 15 0 metres 75 150

Title: SOIL IMPACT SUMMARY

Project: VEHICLE DUMP & COMMUNITY LANDFILL - IQALUIT, NUNAVUT

Client: PWGSC - TRANSPORT CANADA

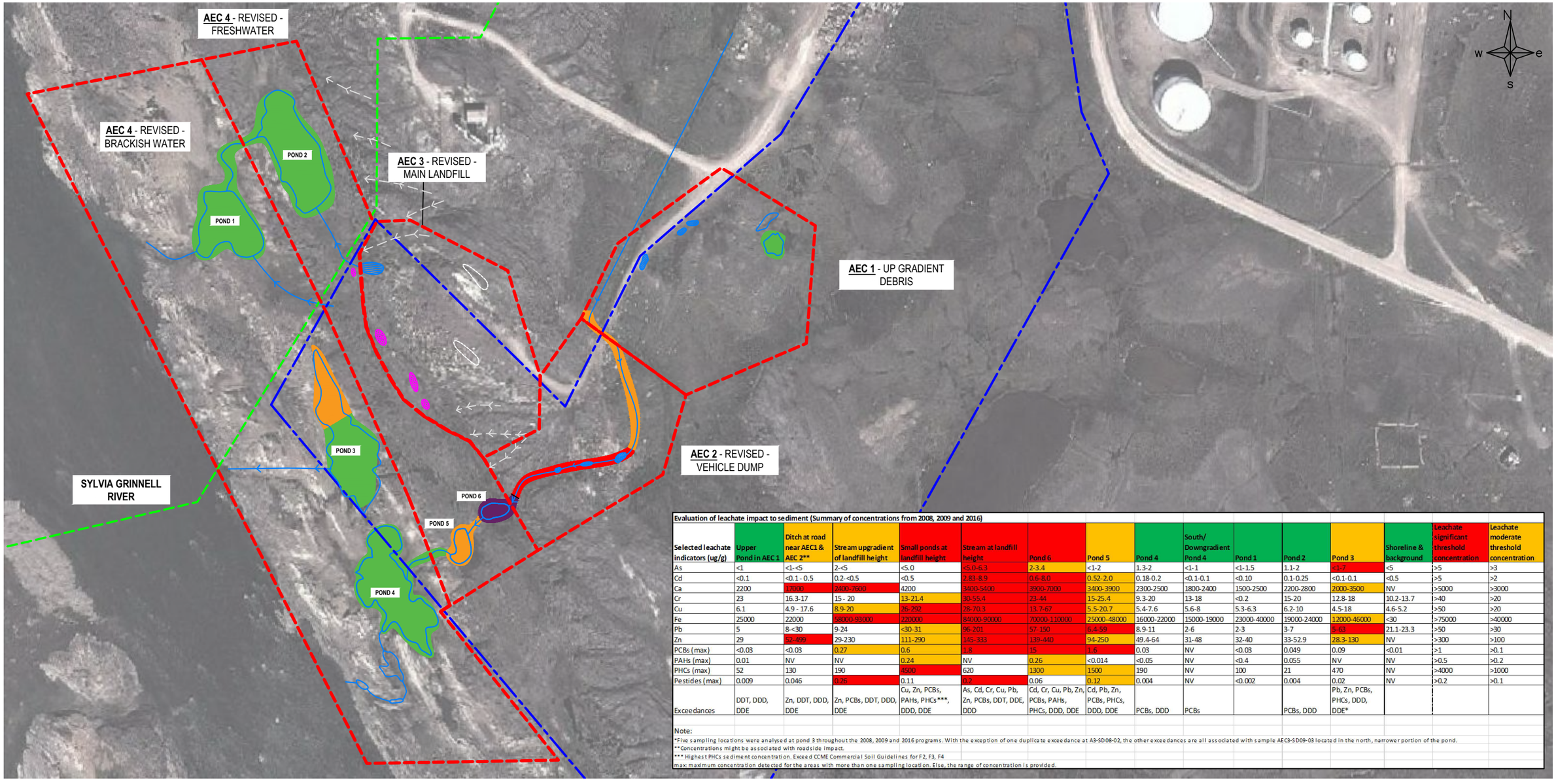
ARCADIS

Date: JANUARY 2017

FIGURE 3

*Original in colour

Z:\Projects\2009\1584-0901 TC Iqaluit Landfill\Figures\102153-000_TC IQALUIT_2016_RAP.dwg



Evaluation of leachate impact to sediment (Summary of concentrations from 2008, 2009 and 2016)

Selected leachate indicators (ug/g)	Upper Pond in AEC 1	Ditch at road near AEC1 & AEC 2**	Stream upgradient of landfill height	Small ponds at landfill height	Stream at landfill height	Pond 6	Pond 5	Pond 4	South/ Downgradient Pond 4	Pond 1	Pond 2	Pond 3	Shoreline & background	Leachate significant threshold concentration	Leachate moderate threshold concentration
As	<1	<1-<5	2-<5	<5.0	<5.0-6.3	2-3.4	<1-2	1.3-2	<1-1	<1-1.5	1.1-2	4-7	<5	>5	>3
Cd	<0.1	<0.1 - 0.5	0.2-<0.5	<0.5	2.83-8.9	0.6-8.0	0.52-2.0	0.18-0.2	<0.1-0.1	<0.10	0.1-0.25	<0.1-0.1	<0.5	>5	>2
Ca	2200	17000	2400-7600	4200	3400-5400	3900-7000	3400-3900	2300-2500	1800-2400	1500-2500	2200-2800	2000-3500	NV	>5000	>3000
Cr	23	16.3-17	15 - 20	13-21.4	30-55.4	23-44	15-25.4	9.3-20	13-18	<0.2	15-20	12.8-18	10.2-13.7	>40	>20
Cu	6.1	4.9 - 17.6	8.9-20	26-292	28-70.3	13.7-67	5.5-20.7	5.4-7.6	5.6-8	5.3-6.3	6.2-10	4.5-18	4.6-5.2	>50	>20
Fe	25000	22000	58000-93000	220000	84000-90000	70000-110000	25000-48000	16000-22000	15000-19000	23000-40000	19000-24000	12000-46000	<30	>75000	>40000
Pb	5	8-<30	9-24	<30-31	96-201	57-150	6.4-59	8.9-11	2-6	2-3	3-7	5-63	21.1-23.3	>50	>30
Zn	29	92-499	29-230	111-290	145-333	139-440	94-250	49.4-64	31-48	32-40	33-52.9	28.3-130	NV	>300	>100
PCBs (max)	<0.03	<0.03	0.27	0.6	1.8	15	1.6	0.03	NV	<0.03	0.049	0.09	<0.01	>1	>0.1
PAHs (max)	0.01	NV	NV	0.24	NV	0.26	<0.014	<0.05	NV	<0.4	0.055	NV	NV	>0.5	>0.2
PHCs (max)	52	130	190	4500	620	1300	1500	190	NV	100	21	470	NV	>4000	>1000
Pestides (max)	0.009	0.046	0.26	0.11	0.2	0.06	0.12	0.004	NV	<0.002	0.004	0.02	NV	>0.2	>0.1
Exceedances	DDT, DDD, DDE	Zn, DDT, DDD, DDE	Zn, PCBs, DDT, DDD, DDE	Cu, Zn, PCBs, PAHs, PHCs***, DDD, DDE	As, Cd, Cr, Cu, Pb, Zn, PCBs, DDT, DDE, DDD	Cd, Cr, Cu, Pb, Zn, PCBs, PAHs, PHCs, DDD, DDE	Cd, Pb, Zn, PCBs, PHCs, DDD, DDE	PCBs, DDD	PCBs		PCBs, DDD	Pb, Zn, PCBs, PHCs, DDD, DDE*			

Note:
*Five sampling locations were analysed at pond 3 throughout the 2008, 2009 and 2016 programs. With the exception of one duplicate exceedance at A3-SD08-02, the other exceedances are all associated with sample AEC3-SD09-03 located in the north, narrower portion of the pond.
**Concentrations might be associated with roadside impact.
*** Highest PHCs sediment concentration. Exceed CCME Commercial Soil Guidelines for F2, F3, F4
max: maximum concentration detected for the areas with more than one sampling location. Else, the range of concentration is provided.

LEGEND:

- POOLING WATER
- PROPERTY BOUNDARY
- PARK BOUNDARY
- ADJUSTED AREA OF ENVIRONMENTAL CONCERN (AEC)
- BURN AREA
- DRUMS
- SEEPAGE/GULLY
- STREAM/DRAINAGE
- SIGNIFICANTLY IMPACTED TO BE REMOVED
- SIGNIFICANTLY IMPACTED TO REMAIN IN PLACE AS A SETTLING POND
- MODERATELY IMPACTED TO NATURALLY ATTENUATE
- NO SIGNIFICANT IMPACTS

REFERENCE: BACKGROUND IMAGE OBTAINED FROM GOOGLE EARTH, 2008

SCALE 1: 3000

75 60 45 30 15 0 metres 75 150

Title: SEDIMENT IMPACT SUMMARY

Project: VEHICLE DUMP & COMMUNITY LANDFILL - IQALUIT, NUNAVUT

Client: PWGSC - TRANSPORT CANADA

ARCADIS

Date: JANUARY 2017

FIGURE 4

*Original in colour

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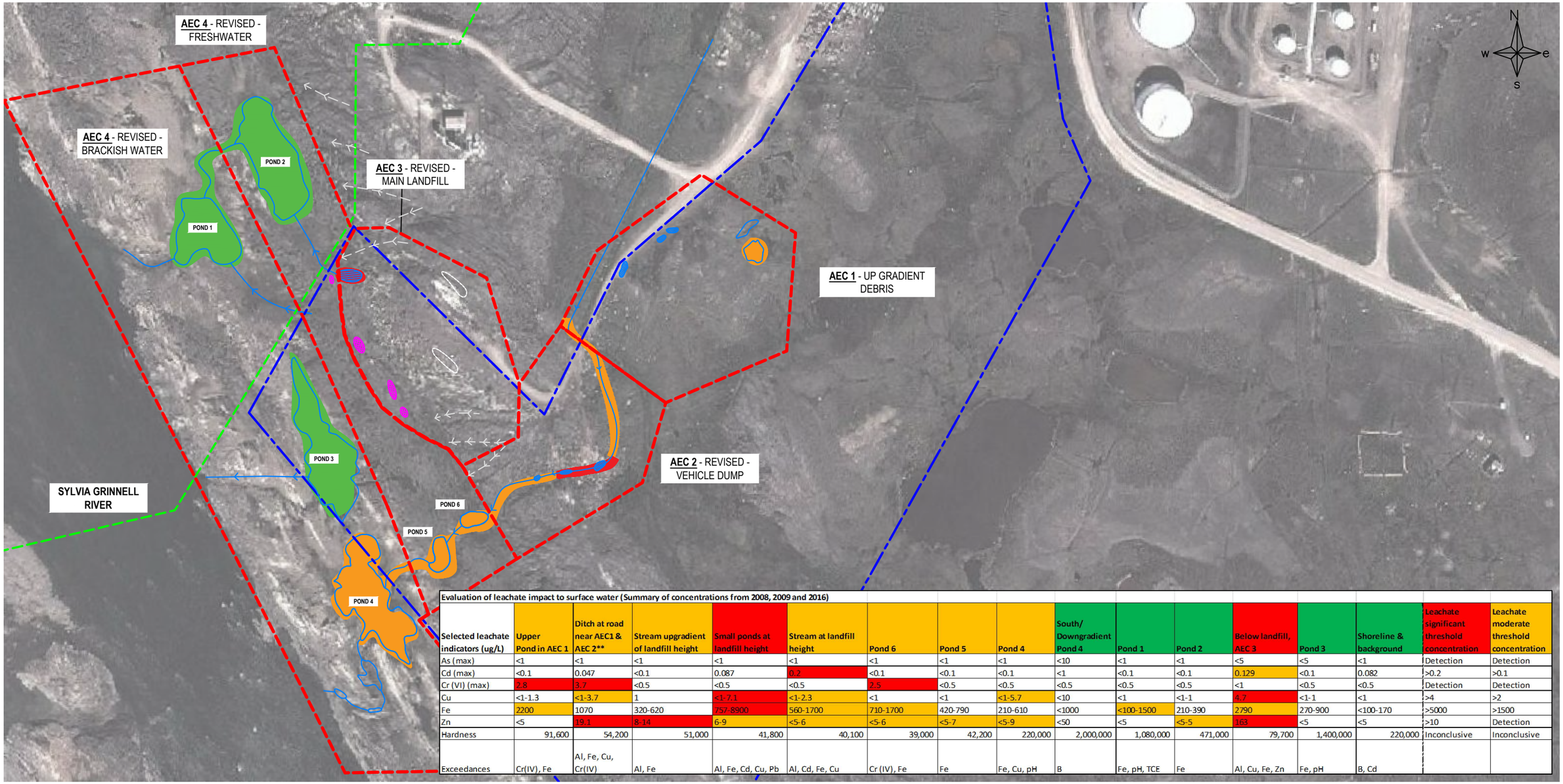

Evaluation of leachate impact to surface water (Summary of concentrations from 2008, 2009 and 2016)

Selected leachate indicators (ug/L)	Upper Pond in AEC 1	Ditch at road near AEC1 & AEC 2**	Stream upgradient of landfill height	Small ponds at landfill height	Stream at landfill height	Pond 6	Pond 5	Pond 4	South/ Downgradient Pond 4	Pond 1	Pond 2	Below landfill, AEC 3	Pond 3	Shoreline & background	Leachate significant threshold concentration	Leachate moderate threshold concentration
As (max)	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<1	<5	<5	<1	Detection	Detection
Cd (max)	<0.1	0.047	<0.1	0.087	0.2	<0.1	<0.1	<0.1	<1	<0.1	<0.1	0.129	<0.1	0.082	>0.2	>0.1
Cr (VI) (max)	2.8	3.7	<0.5	<0.5	<0.5	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	Detection	Detection
Cu	<1-1.3	<1-3.7	1	<1-7.1	<1-2.3	<1	<1	<1-5.7	<10	<1	<1-1	4.7	<1-1	<1	>4	>2
Fe	2200	1070	320-620	757-8900	560-1700	710-1700	420-790	210-610	<1000	<100-1500	210-390	2790	270-900	<100-170	>5000	>1500
Zn	<5	19.1	8-14	6-9	<5-6	<5-6	<5-7	<5-9	<50	<5	<5-5	163	<5	<5	>10	Detection
Hardness	91,600	54,200	51,000	41,800	40,100	39,000	42,200	220,000	2,000,000	1,080,000	471,000	79,700	1,400,000	220,000	Inconclusive	Inconclusive
Exceedances	Cr(IV), Fe	Al, Fe, Cu, Cr(IV)	Al, Fe	Al, Fe, Cd, Cu, Pb	Al, Cd, Fe, Cu	Cr (IV), Fe	Fe	Fe, Cu, pH	B	Fe, pH, TCE	Fe	Al, Cu, Fe, Zn	Fe, pH	B, Cd		

LEGEND:

- POOLING WATER
- PROPERTY BOUNDARY
- PARK BOUNDARY
- ADJUSTED AREA OF ENVIRONMENTAL CONCERN (AEC)
- BURN AREA
- DRUMS
- SEEPAGE/GULLY
- STREAM/DRAINAGE
- SIGNIFICANTLY IMPACTED
- MODERATELY IMPACTED
- NO SIGNIFICANT IMPACTS

REFERENCE: BACKGROUND IMAGE OBTAINED FROM GOOGLE EARTH, 2008

SCALE 1:3000

75 60 45 30 15 0 metres 75 150

Title: SURFACE WATER IMPACT SUMMARY

Project: VEHICLE DUMP & COMMUNITY LANDFILL - IQALUIT, NUNAVUT

Client: PWGSC - TRANSPORT CANADA

ARCADIS

Date: JANUARY 2017

FIGURE 5

*Original in colour

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APPENDIX A

Rational for Remediation Criteria and Environmental Impacts Management Approach

Table 1A
Iqaluit Vehicle Dump and Community Landfill Remedial Action Plan - Remedial Criteria Selection Rational
TransCanada
Iqaluit, Nunavut

AEC #	AEC Name	Media [1]	Remediation Criteria	Rationale	Exceedances Identified [2]	Management Approach
1	Upper Impacted Area	Soil	CCME Commercial coarse soil	This area is located within Iqaluit by-law 704, zone M2 and regulated for heavy industrial usage. The airport is located to the west and a large Petroleum Oil and Lubricant (POL) facility is located to the northeast. Local residents are known to use the area for social activities (e.g., bonfire) and for accessing the Sylvia Grinnel River and Park. It is assumed that this behavior will continue following the remediation of the site. It is assumed that no residential dwellings will be installed in the area since it is zoned as industrial land use by the City of Iqaluit. The use of the CCME Commercial guidelines are deemed appropriate for the area because they are protective of the site users based on observed local residents' behavior. CCME generic values (Tier I) are often similar for the commercial and industrial landuses and as such are consistent with the l+E6evel of human health and environmental protection expected under the current zoning for the area. The CCME commercial guidelines are calculated based on exposure assumptions that include site usage by all members of the public, including children (toddlers) and that consider the different potential exposure routes such as direct soil contact (ingestion and dermal contact), vapour inhalation and ecological soil contact. These guidelines are deemed conservative for the area because they are based on a site exposure time of 10 hours a day, 5 days a week, 48 weeks a year. Since the soil testing indicates a mix of textures, the coarse grained guidelines would be applied as a conservative measure.	Discrete petroleum hydrocarbon (PHC) impacted soil above the commercial EQG detected in between debris mound and the marshy area of AEC 1 at AEC1-TP09-3 (F2, F3). Soil observed in the adjacent test pits (AEC-TP09-6&7) did not show any visual or olfactory evidence of PHC impact. Depth of the PHC impact was observed between 1.0 and 1.5 m. Estimated volume of PHC impacted soil to be remediated, considering an half distance to nearest non impacted test pits of 10 m is approximately 500 m^3. The only other exceedances of the commercial soil EQG in AEC was measured at test pit A1-TP08-1 located in a debris mound, within the northern portion of the AEC1. This soil samples was described as containing drums, metal, piping, cable, vehicle parts, wheel rims and wood debris.	Targeted PHC impacted soil removal, selected removal of debris and contiguous metal impacted soils, consolidation and capping in place of remaining debris.
		Sediment	SQG freshwater aquatic life	Surface water in this area consists of small seasonal ponds and runoffs features that act as headwater to ponds 4, 5 and 6 located downstream in AEC 4. Sediment in this area is not affected by the tides and the freshwater guidelines are applicable.	Impact Low to Moderate. No significant leachate waste related impact in the pond located in AEC 1. Calcium and zinc from the roadside ditch are above the leachate threshold concentrations but since other leachate indicators or not elevated, these concentrations could also be associated with the road. Minimal exceedances of pesticides in upgradient pond area and in roadside ditch. The pesticides concentration is less than the leachate impacted threshold concentration and could be from baseline deposition.	Natural attenuation following management of nearby impacted soil and debris.
		Surface Water	CWQG freshwater aquatic life	Surface water in this area consists of small seasonal ponds and runoffs features that act as headwater to ponds 4, 5 and 6 located downstream in AEC 4. Surface water in this area is not affected by the tides and the freshwater guidelines are applicable.	Moderate impact. The pond in AEC1 and the nearby roadside ditch presents exceedances of chromium and iron. In addition, the roadside ditch has alumium and copper exceedance an elevated concentration of zinc when compared to other location known not to be under the influence of leachate. It is possible that roadside activities are contributing factors to the exceedances measures at the roadside location. The pond AEC1 is assumed under the influence of leachate.	None planned for this area. Conditions are expected to improved from the remediation of soil and of the debris.

AEC #	AEC Name	Media [1]	Remediation Criteria	Rationale	Exceedances Identified [2]	Management Approach
2	Vehicle Dump (Revised boundary to the edge of the rock cliff)	Soil	CCME Commercial/ coarse soil	The AEC 2 would be reduced to include only the portion above the rock cliff. The revised AEC 2 zone falls within Iqaluit by-law 704, zone MR(1) and zone M2. Zone M2 is regulated for heavy industrial usage and zone MR(1) is an exclusion to the municipal reserve zone usage that identifies a former waste disposal site. The exclusion appears to partially overlap the vehicle dump of AEC 2 and the main landfill of AEC 3. This area will be similar in usage to AEC 1 and is also similar in zoning. Accordingly, the CCME Commercial coarse-grained guidelines are deemed appropriate for AEC 2. See further rational under AEC 1.	PHC (F2, F3, F4) exceedances of commercial EQG in surface soil collected from A3-TP08-2 located near the road in the vehicle dump area. PHCs were not detected in the surface soil from the adjacent test pit of AEC3-TP09-1. The PHC impact is expected to be limited in extend and has been approximated to 100 m^3. Discrete metal exceedances of cadmium in A2-TP08-1 and copper in AEC2-TP09-2 from the vehicle dump area.	Targeted PHC impacted soil removal and full debris removal. Metal impacted soil found contiguous with the debris would be removed and placed in the landfill.
		Sediment	SQG freshwater aquatic life	Surface water in this area consists of small ponds connected by a stream that act as headwater to ponds 4, 5 and 6 located downstream in AEC 4. Sediment in this area is not affected by the tides and the freshwater guidelines are applicable.	Impact moderate to significant. Exceedances of arsenic, cadmium, chromium, copper, lead, zinc, PCBs, PAHs and pesticides. Highest detected concentrations of PHCs (F2, F3, F4) above the CCME soil quality guidelines. Elevated concentrations of several leachate indicators.	It is anticipated at this time that the stream section at the approximate height of the main landfill (AEC 3) (between AEC2-SD09-04 and top of the rock cliff) will be remediated to remove the "hot spots" of contaminated sediments to accelerate the recovery of the downstream habitat. This area corresponds to several concentration exceedances of contaminant of concerns (COCs) in sediment as well as elevated concentrations of leachate indicators. The impact on the habitat will be limited to a small section of the stream which is likely to already be subject to disturbance related to the adjacent debris removal. The stream would also be reconstructed to help regulate the flow of surface water and assist with the sediment quality recovery.
		Surface Water	CWQG freshwater aquatic life	Surface water in this area consists of small ponds connected by a stream that act as headwater to ponds 4, 5 and 6 located downstream in AEC 4. Surface water in this area is not affected by the tides and the freshwater guidelines are applicable.	Impact moderate to significant. Exceedances of aluminum, cadmium, iron, copper and lead. Concentrations of copper, iron and zinc indicate that the surface water is under the influence of leachate. Most signifiant surface water impact is found within two small ponds (AEC2-SW09-4&5) located at the height of the vehicle dump.	In association with the sediment removal, a passive treatment system (rip-rap) could be installed.
3	Main Landfill (Revised boundary close to the edge of the reconstructed landfill)	Soil	CCME Commercial/ coarse soil for land use	The AEC 3 would be reduced to include only the landfill aream with an approximate 10 m buffer beyond the finished tow of the landfill. This area is currently straddling Iqaluit by-law 704 zone MR (1) which is reserved for a former waste disposal site, zone M2 which is regulated for heavy industrial use and zone OR which is regulated as an Open Area Zone that include activities such as cultural interpretation centre, dog area, park and temporary camping structures. Since the remedial approach for this area is to consolidate the debris, stabilise and cap the landfill, it is proposed that the zoning exlusion (MR(1)) be augmented to include the entire landfill. The area would then be subject to the CCME Commercial guidelines which, as explained under AEC 1, would be protective of the site users and ecological receptors.	Exceedances of the commercial EQG in soil samples from two visually stained areas were measures. Test pit A3-TP08-13 (duplicate sample only) presented exceedances of a few PAHs. Test A3-TP08-12 presented exceedances of Zn.	Excedances are discrete and considered non hazardous and would be consolidated and capped in the reconstructed landfill.
		Sediment	SQG freshwater aquatic life	Surface water in this area is very limited. An intermittent pond was observed on the southwestern limit of the area. The landfill remediation work would modify this section and direct the flow overland to the downstream ponds. Sediments are not expected to accumulate in this area following remediation.	No significant impact. No significant accumulated sediment within the revised boundaries of AEC 3. No sediment samples collected from within the revised AEC 3 boundaries.	Landfill reconstruction work would redirect the flow such that sediments would no longer be expected to accumulate in this area.
		Surface Water	CWQG freshwater aquatic life	Surface water in this area is very limited. An intermittent pond was observed on the southwestern limit of the area. The landfill remediation work would modify this section and direct the flow overland to the downstream ponds. If surface water is observed following remediation, it would be assessed against the freshwater aquatic life guidelines since the tidal influx generally do not reach this area.	Significant impact. Exceedances of aluminum, copper, iron, lead and zinc. Concentrations of zine, copper iron and possibly cadmium indicative of water under leachate influence.	Landfill reconstruction work would redirect the flow such that surface would no longer be expected to accumulate in this area.

AEC #	AEC Name	Media [1]	Remediation Criteria	Rationale	Exceedances Identified [2]	Management Approach
4	Drainage Systems (Revised boundary to the edge of the reconstructed landfill (AEC 3) and to the edge of the rock cliff (AEC 2))	Soil	CCME Agricultural/Wildland	The Sylvia Grinnell Territorial Park (the Park) plays a significant role in bird migration and over 40 species have been recorded in the park at different times of the year. CCME Agricultural/Wildland use is defined as "Land on which the primary activity is related to the productivity capability of the land and includes lands that provide habitat for wildlife and birds". Based on this definition and on significance of the Park's habitat, the CCME Wildland guidelines are applicable to the northern section of AEC 4 which is part of the Park. The southern portion of the AEC 4 presents similar geomorphological/biological features and the presence of equivalent wildlife habitat can be expected throughout AEC 4. Accordingly, the use of the CCME Wildland guidelines for the entire AEC 4 is proposed. The southern portion of AEC 4 is located in Iqaluit by-law 704 Open Area Zone (OR) which permits the use of the area as cultural interpretation centre, dog area, park, beach shack, temporary camping structures and utility installation. The OR zone permitted activities can be described as recreational and align with the CCME Residential/Parkland land use which includes "activities area that are recreational in nature". For example, local residents are known to use the area as an access point to fish for artic char and to setup temporary camps. The CCME generic (Tier I) values correspond to the lowest guideline derived for the protection of the human and environmental health from different exposure routes. The soil quality guidelines (SQG) specific to the protection of human health known as Tier II values or SQG_{HH} are generally the same values for the Wildland and Parkland uses. The SQG protective of environmental health (Tier II or SQG_{E}) are generally more stringent for the Wilband use than they are for the Parkland use and reflect the more sensitive ecological habitats expected in a wildland setting. Accordingly, the use of the CCME Wildland guidelines would be consistent with the level of human health and environmental protection expected under the current zoning for the area as well as its ecological significance.	Only one exceedance is reported for AEC 4. Molybdenum was detected at 5.6 ug/g in the soil from test pit AEC4-TP09-2 above the CCME wildland EQG. AEC4-TP09-2 is located between pond 1 and pond 3. This one exceedance is just slightly above the CCME wildland EQG for molybdenum og 5.0 ug/g and is below the parkland EQG of 10 ug/g. Considering the marginal exceendance and that all other soil samples from AEC had molybdenum concentrations of less than 4.0 ug/g, including the adajcent sample from A4-TP08-2, the molybdenum exceedance is considered an outlier and does not warrant remedial actions.	No soil management activities required.
		Sediment (Ponds 2, 5 and 6)	SQG freshwater aquatic life	Surface water in this area consists of ponds 2, 5 and 6. Concentrations of sodium in surface water from these ponds were generally less than 100 mg/L and well below the 1000 mg/L total dissolved salt concentration threshold applicable to the CCME freshwater guidelines. Sodium levels, as an indicator of salinity, are consistent with the field observations that indicate that the tidal effect do not generally reach these ponds. Accoridingly, freshwater guidelines are deemed applicable to the sediment quality evaluation.	No significant impact in pond 2. Impact to pond 6 is significant. Impact to pond 5 is moderate. Pond 2 exceedances are limited to PCBs and pesticides at concentration below the leachate threshold and that could be associated with baseline deposition. Concentrations of other leachate indicators at pond 2 are also below the leachate threshold. Pond 6 shows elevated concentations of several leachate indicators and exceedances of cadmium, chromium, copper, lead, zinc, PCBs and pesticides. Concentrations at pond 5 are indicative of attenuated leachate impacts with exceedances of cadmium, lead, zinc, PCBs, and pesticides. Both pond 5 and 6 also have F2 and F3 concentrations above the CCME wildland/residential soil quality guidelines.	Pond 6 and, to a lesser degree, pond 5 acts as contaminant attenuation zones for the upgradient waste load. These two ponds have high organic content and established vegetation. It is proposed to not disturb these ponds but to rather keep their contaminant attenuating function and integrate it with the upstream reconstruction (AEC 2).

AEC #	AEC Name	Media [1]	Remediation Criteria	Rationale	Exceedances Identified [2]	Management Approach
4		Sediment (Ponds 1, 3, 4)	SQG brackish (lowest of marine and freshwater values)	Surface water in this area consists of ponds 1, 3 and 4. Water within these ponds is replenished by the upstream freshwater and intruded with saline water twice daily during high tide. Sodium concentrations measured in these ponds are generally less than the 1000 mg/L freshwater threshold; however, since it was observed that marine water intrudes the ponds and in the absence of sufficient information on resident species and environmental conditions, the water quality guideline protecting the most sensitive condition should be applied (CCME, CWQG Protocol). As such, the ponds are considered a brackish water environment and the lowest of the freshwater or marine sediments guidelines would be applicable.	No significant impacts to pond 1 and 4. Low to moderate impacts to pond 3. Pond 1 and 4 do not show any significant evidence of leachate impact and the exceedances of PCBs and pesticides are below the leachate threshold and could be associated with baseline deposition. The PCE and TCE were detected in 2009 but not in 2008 in sediments from pond 1. No EQG exists in sediment for these compounds; however, the values were marginally above the soil EQG for residential/parkland. Pond 3 has exceedances of lead, zinc, PCBs and pesticides and detection of PHC (F3) above the wildland/residential soil quality guideline. Five sampling locations were analysed at pond 3 throughout the 2008, 2009 and 2016 programs. With the exception of one duplicate exceedance at A3-SD08-02, the other exceedances are all associated with sample AEC3-SD09-03 located in the north, narrower portion of the pond.	No management activities are plan for pond 1, 3 and 4. The impact to pond 3 is limited to the northern portion of the pond. Because there is no corresponding impact in the soil samples located upgradient of pond 3, it is inferred that the source of the impact in Pond 3 might be the presence of debris in the pond itself. The upgradient management activities might not improve on the quality of the northern sediment of pond 3. However, the concentrations in pond 3 are marginally above the EQG and the surface water quality is not significantly impacted. The accordingly, it is recommended to not disturb the environment and to rather let the concentration naturally attenuate.

AEC #	AEC Name	Media [1]	Remediation Criteria	Rationale	Exceedances Identified [2]	Management Approach
4		Surface Water (Ponds 2, 5, and 6)	CWQG freshwater aquatic life	Surface water in this area consists of ponds 2, 5 and 6. Concentrations of sodium in surface water from these ponds were generally less than 100 mg/L and well below the 1000 mg/L total dissolved salt concentration threshold applicable to the CCME freshwater guidelines. Sodium levels, as an indicator of salinity, are consistent with the field observations that indicate that the tidal effect do not generally reach these ponds. Accoridingly, freshwater guidelines are deemed applicable to the surface water quality evaluation.	Moderate impact to pond 5 and 6 which present exceedances of chromium IV and/or iron and elevated concentrations of iron and zinc suggesting some leachate influence. These ponds are also they only one with a detection of PCBs in surface wter; however the CCME EQG no longer applies and PCB impacts are to be evaluated in sediments rather than surface water. Pond 2 presents exceedance of iron, however the iron concentrations are significantly lower than the ones measures in the leachate impacted area. Zinc, which is indicative of leachate in other areas, was only detected once at pond 2 over the three years of sampling. Overall, there is no significant indication of leachate in pond 2.	None planned for this area. Conditions are expected to improved from the remediation of soil, sediment and debris from the upstream areas.
		Surface Water (Ponds 1, 3, and 4)	CWQG brackish (lowest or marine and freshwater values)	Surface water in this area consists of ponds 1, 3 and 4. Water within these ponds is replenished by the upstream freshwater and intruded with saline water twice daily during high tide. Sodium concentrations measured in these ponds are generally less than the 1000 mg/L freshwater threshold; however, since it was observed that marine water intrudes the ponds and in the absence of sufficient information on resident species and environmental conditions, the water quality guideline protecting the most sensitive condition should be applied (CCME, CWQG Protocol). As such, these ponds are considered a brackish water environment and the lowest of the freshwater or marine surface water guidelines would be applicable to these ponds.	Pond 1 and 3 show marginal exceedances of pH and iron and are considered not to be significantly impacted landfill leachate. Iron is present at concentrations that fluctuates between levels below and just slightly above the moderate leachate threshold concentrations and pH is marginally outside the marine EQG but within the freshwater EQG. A point source of TCE/PCE might be present a few meters upgradient of pond 1, near the sampling location AEC-SW09-16 where the highest surface water concentration of PCE and TCE was detected for the site in 2009. TCE and PCE have been detected in pond 1 in 2008 and 2009 at concentrations below the EQG or, in one occasion for TCE, marginally above the EQG. Considering the absence of other leachate indicators, pond 1 and 3 are considered no to be impacted significantly by leachate. Moderate impact to pond 4 with exceedances of copper and iron and elevated zinc concentrations indicating that the water might be under the influence of leachate. Once occurence of pH marginally outside the marine EQG range but within the freshwater range at pond 4.	None planned for this area. Conditions are expected to improved from the remediation of soil, sediment and debris from the upstream areas.

Note:

1. Groundwater is considered a non operable pathway at the site for the following reasons: 1) overland flow is the primary mode of water transport in the area, 2) groundwater associated with fractures in the bedrock and through the thin overburden would likely be minor, 3) groundwater is not used as a drinking water source in the area and 4) the site lies within the continuous permafrost zone. (Arcadis, 2010)
2. Refer to Arcadis (2010) Phase III and supplemental 2016 surface water and sediment testing for more details on sampling program and results.

CCME Canadian Council of Ministers of the Environment
SQG Sediment Quality Guideline
CWQG Canadian Water Quality Guidelines

APPENDIX B

Analytical Results (2008, 2009, 2016) – Summary Tables

B.A: Sediment in AEC 4 (Brackish Water Environment)

B.B: Sediment in AEC 4 (Freshwater Environment)

B.C: Sediment in AEC 1, 2, 3 (Freshwater Environment)

B.D: Soil in AEC 4 (Wildland Scenario)

B.E: Soil in AEC 1, 2, 3 (Commercial Scenario)

B.F: Surface Water in AEC 1 to 4 (Fresh & Brackish Water Environment)

APPENDIX B.A

Sediment in AEC 4 (Brackish Water Environment):

B.A1 – Metals and Inorganics

B.A2 – Polychlorinated Biphenyls (PCBs)

B.A3 – Polyaromatic Hydrocarbons (PAHs)

B.A4 – Petroleum Hydrocarbons

B.A5 – Pesticides

B.A6 – Volatile Organic Compounds (VOCs)

TABLE A1 - Metals and Inorganics in AEC 4 Sediment (Brackish Water)

Property Location					Off-Site	Off-Site	Off-Site	Off-Site	Off-Site	Off-Site	Off-Site		On-Site
Surface Water Location					Pond 1	Pond 1	Pond 1	Pond 1	Pond 1	Pond 1	Pond 1		Pond 3
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**RPD**	**AEC 4**
Station ID					**A4-SD08-2**	**AEC4-SD09-11**	**AEC4-SD09-11**	**AEC4-SD09-12**	**AEC4-SD09-13**	**AEC4-SD16-01**	**DUP1**		**A3-SD08-2**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	8/Sep/08	17/Sep/09	17/Sep/09	17/Sep/09	17/Sep/09	1/Oct/16	1/Oct/16		7/Sep/08
TOC	-	-	-	-	-	4,900	5,300	2,300	4,900	22	25	NC	-
Aluminum	-	-	-	-	-	3900	3700	2700	4000	-	-	-	-
Antimony	-	-	-	-	<10	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	NC	<10
Arsenic	5.9	17	7.24	41.60	<5.0	1	2	<1	<1	1.5	1.5	NC	<5.0
Barium	-	-	-	-	19.7	23.0	22.0	11.0	20.0	29	31	6.7%	13.9
Beryllium	-	-	-	-	<0.50	0.2	0.3	<0.2	<0.2	<0.20	<0.20	NC	<0.50
Boron	-	-	-	-	-	-	-	-	-	<5.0	<5.1	-	-
Cadmium	0.6	3.5	0.70	4.20	<0.50	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	NC	<0.50
Calcium	-	-	-	-	-	2200	2000	1500	2500	-	-	-	-
Chromium	37.3	90	52.30	160.00	15.5	17	14	30	20	18	15	18.2%	12.8
Chromium (VI)	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	-	-	-	-
Cobalt	-	-	-	-	2.9	3.3	3.5	4.8	3.4	3.6	3.4	5.7%	2.8
Copper	35.7	197	18.70	100.80	5.4	6.3	5.3	6.3	5.8	5.7	5.5	3.6%	4.5
Iron	-	-	-	-	-	28000	28000	40000	23000	-	-	-	-
Lead	35	91.3	30.20	112.00	<30	3	3	2	3	3.0	2.8	NC	<30
Magnesium	-	-	-	-	-	3000	2700	2100	3100	-	-	-	-
Manganese	-	-	-	-	-	72	74	230	67	-	-	-	-
Mercury (ug/g)	0.17	0.486	0.13	0.70	<0.0050	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.0050
Molybdenum	-	-	-	-	<4.0	1.3	1.3	1.9	1.4	0.79	0.93	NC	<4.0
Nickel	-	-	-	-	<5.0	5.7	5.7	6.5	6.3	5.7	6.1	6.8%	<5.0
Phosphorus	-	-	-	-	-	800	680	530	850	-	-	-	-
Potassium	-	-	-	-	-	1000	1000	590	990	-	-	-	-
Selenium	-	-	-	-	<2.0	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	NC	<2.0
Silver	-	-	-	-	<2.0	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	NC	<2.0
Sodium	-	-	-	-	-	1200	1000	1800	560	-	-	-	-
Strontium	-	-	-	-	-	12	12	7	8	-	-	-	-
Thallium	-	-	-	-	<1.0	<0.05	<0.05	<0.05	<0.05	<0.050	0.064	NC	<1.0
Uranium	-	-	-	-	-	-	-	-	-	0.51	0.420	-	-
Vanadium	-	-	-	-	37.2	37	33	91	52	40	34	16.2%	30.5
Zinc (ug/g)	123	315	124	271	26.8	37	35	32	40	37	36	2.7%	28.3

All units in ug/g, unless otherwise noted.

Notes

1 =	CCME (1999), Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
2 =	CCME (1999), Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine and/or Freshwater

ARCADIS

TABLE A1 - Metals and Inorganics in AEC 4 Sediment (Brackish Water)

Property Location					On-Site	On-Site	On-Site	On-Site	Off-Site	Off-Site	Off-Site	Off-Site	Off-Site	Off-Site Downgradient of	Off-Site Downgradient of	Off-Site Downgradient of	Off-Site
Surface Water Location					Pond 3	Pond 3	Pond 3	Pond 3	Pond 4	Pond 4	Pond 4	Pond 4	Pond 4	Pond 4	Pond 4	Pond 4	Shoreline
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC4**	**AEC 4**
Station ID					**SD-DUP 1**	**AEC3-SD09-1**	**AEC3-SD09-2**	**AEC3-SD09-3**	**AEC4-SD09-1**	**AEC4-SD09-2**	**AEC4-SD09-3**	**A4-SD08-3**	**AEC4-SD16-04**	**AEC4-SD09-4**	**AEC4-SD09-5**	**A4-SD08-8**	**A4-SD08-4**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	7/Sep/08	15/Sep/09	15/Sep/09	15/Sep/09	17/Sep/09	17/Sep/09	17/Sep/09	8/Sep/08	1/Oct/16	17/Sep/09	17/Sep/09	8/Sep/08	8/Sep/08
TOC	-	-	-	-	-	3,400	3,300	52,000	12,000	20,000	12,000	-	-	15,000	4,200	-	-
Aluminum	-	-	-	-	-	3500	2600	4600	3500	4300	3600	-	-	4100	3700	-	-
Antimony	-	-	-	-	<10	<0.2	<0.2	0.7	<0.2	<0.2	<0.2	<10	<0.20	<0.2	<0.2	<10	<10
Arsenic	5.9	17	7.24	41.60	<5.0	2	<1	7	<1	2	1	<5.0	1.3	1	<1	<5.0	<5.0
Barium	-	-	-	-	19.4	18.0	11.0	23.0	16.0	25.0	17.0	15.7	24	20.0	20.0	25.9	17.1
Beryllium	-	-	-	-	<0.50	<0.2	<0.2	0.3	<0.2	<0.2	<0.2	<0.50	<0.20	<0.2	<0.2	<0.50	<0.50
Boron	-	-	-	-	-	-	-	-	-	-	-	-	<5.0	-	-	-	-
Cadmium	0.6	3.5	0.70	4.20	<0.50	0.1	<0.1	0.3	0.2	0.2	0.2	<0.50	0.18	0.1	<0.1	<0.50	<0.50
Calcium	-	-	-	-	-	2600	2000	3500	2500	2400	2300	-	-	2400	1800	-	-
Chromium	37.3	90	52.30	160.00	14.2	13	17	18	20	15	17	9.3	14	18	13	10.4	14
Chromium (VI)	-	-	-	-	-	<0.2	<0.2	<0.4	<0.4	*0.8*	0.7	-	-	<0.2	<0.2	-	-
Cobalt	-	-	-	-	3.4	3.4	2.8	5.7	3.1	3.4	3.3	2.3	5.0	3.0	3.0	3	3.3
Copper	35.7	197	18.70	100.80	7.9	7.5	4.7	18.0	7.2	7.6	7.6	6.7	5.4	8.0	5.6	5	4.9
Iron	-	-	-	-	-	12000	22000	46000	22000	16000	22000	-	-	19000	15000	-	-
Lead	35	91.3	30.20	112.00	**39**	18	5	**63**	9	9	11	<30	8.9	6	2	<30	<30
Magnesium	-	-	-	-	-	2200	1900	4800	2500	3400	2800	-	-	3200	3000	-	-
Manganese	-	-	-	-	-	60	130	150	59	60	68	-	-	55	54	-	-
Mercury (ug/g)	0.17	0.486	0.13	0.70	0.0064	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.0091	-	<0.05	<0.05	<0.0050	<0.0050
Molybdenum	-	-	-	-	<4.0	4.1	1.6	*11.0*	1.9	4.2	2.5	<4.0	1.2	8.3	0.8	<4.0	<4.0
Nickel	-	-	-	-	<5.0	6.1	4.6	10.0	5.3	6.4	5.9	<5.0	5.4	6.0	5.8	<5.0	<5.0
Phosphorus	-	-	-	-	-	850	690	1300	880	820	770	-	-	920	600	-	-
Potassium	-	-	-	-	-	690	520	1800	910	1200	980	-	-	1400	1100	-	-
Selenium	-	-	-	-	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.50	<0.5	<0.5	<2.0	<2.0
Silver	-	-	-	-	<2.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2.0	<0.20	<0.2	<0.2	<2.0	<2.0
Sodium	-	-	-	-	-	260	1100	8800	1400	1400	2400	-	-	5100	3000	-	-
Strontium	-	-	-	-	-	7	7	37	11	14	12	-	-	12	10	-	-
Thallium	-	-	-	-	<1.0	<0.05	<0.05	<0.05	<0.05	0.09	<0.05	<1.0	<0.050	0.05	<0.05	<1.0	<1.0
Uranium	-	-	-	-	-	-	-	-	-	-	-	-	0.74	-	-	-	-
Vanadium	-	-	-	-	41.4	26	46	51	51	32	43	23.2	34	44	29	24.1	41.8
Zinc (ug/g)	123	315	124	271	42.7	35	28	**130**	51	64	60	49.4	57	48	31	36.1	21.8

All units in ug/g, unless otherwise noted.

Notes

1 =	CCME (1999), Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
2 =	CCME (1999), Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine and/or Freshwater

TABLE A1 - Metals and Inorganics in AEC 4 Sediment (Brackish Water)

Property Location					Off-Site	Off-Site	Off-Site	Off-Site
Surface Water Location					Shoreline	Shoreline		
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**AEC 4**	**AEC 4**	**SD-BK-1**	**SD-BK-2**
Station ID					**A4-SD08-5**	**A4-SD08-6**		
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	8/Sep/08	8/Sep/08	9/Sep/08	9/Sep/08
TOC	-	-	-	-	-	-	-	-
Aluminum	-	-	-	-	-	-	-	-
Antimony	-	-	-	-	<10	<10	<10	<10
Arsenic	5.9	17	7.24	41.60	<5.0	<5.0	<5.0	<5.0
Barium	-	-	-	-	13.2	17.5	16.7	23.5
Beryllium	-	-	-	-	<0.50	<0.50	<0.50	<0.50
Boron	-	-	-	-	-	-	-	-
Cadmium	0.6	3.5	0.70	4.20	<0.50	<0.50	<0.50	<0.50
Calcium	-	-	-	-	-	-	-	-
Chromium	37.3	90	52.30	160.00	10.2	11.4	13.7	10.2
Chromium (VI)	-	-	-	-	-	-	-	-
Cobalt	-	-	-	-	2.6	3.1	3.5	3.2
Copper	35.7	197	18.70	100.80	4.6	4.9	5	5.2
Iron	-	-	-	-	-	-	-	-
Lead	35	91.3	30.20	112.00	<30	<30	<30	<30
Magnesium	-	-	-	-	-	-	-	-
Manganese	-	-	-	-	-	-	-	-
Mercury (ug/g)	0.17	0.486	0.13	0.70	<0.0050	<0.0050	<0.0050	<0.0050
Molybdenum	-	-	-	-	<4.0	<4.0	<4.0	<4.0
Nickel	-	-	-	-	<5.0	<5.0	<5.0	<5.0
Phosphorus	-	-	-	-	-	-	-	-
Potassium	-	-	-	-	-	-	-	-
Selenium	-	-	-	-	<2.0	<2.0	<2.0	<2.0
Silver	-	-	-	-	<2.0	<2.0	<2.0	<2.0
Sodium	-	-	-	-	-	-	-	-
Strontium	-	-	-	-	-	-	-	-
Thallium	-	-	-	-	<1.0	<1.0	<1.0	<1.0
Uranium	-	-	-	-	-	-	-	-
Vanadium	-	-	-	-	33.2	28.6	-	-
Zinc (ug/g)	123	315	124	271	23.2	23.3	22	21.1

All units in ug/g, unless otherwise noted.

Notes

1 =	CCME (1999), Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
2 =	CCME (1999), Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine and/or Freshwater

ARCADIS Design & Consultancy for natural and built assets

TABLE A2 - Polychlorinated Biphenyls (PCBs) in AEC 4 Sediment (Brackish Water)

Property Location					Off-Site	Off-Site	Off-Site	Off-Site	Off-Site	Off-Site	Off-Site	On-Site	On-Site	On-Site	On-Site	Off-Site	Off-Site	Off-Site	Off-Site	Off-Site	Off-Site	OffSite
Surface Water Location					Pond 1	Pond 1	Pond 1	Pond 1	Shoreline	Shoreline	Shoreline	Pond 3	Pond 3	Pond 3	Pond 3	Pond 4	Pond 4	Pond 4	Shoreline	Shoreline	Shoreline	Shoreline
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID					**AEC4-SD09-11**	**AEC4-SD09-11**	**AEC4-SD16-01**	**DUP1**	**A4-SD08-4**	**A4-SD08-5**	**A4-SD08-6**	**A3-SD08-2**	**SD-DUP 1**	**AEC3-SD09-2**	**AEC3-SD09-3**	**A4-SD08-3**	**AEC4-SD09-1**	**AEC4-SD16-04**	**A4-SD08-4**	**A4-SD08-5**	**A4-SD08-6**	**A4-SD08-8**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	17/Sep/09	17/Sep/09	1/Oct/16	1/Oct/16	8/Sep/08	8/Sep/08	8/Sep/08	7/Sep/08	7/Sep/08	15/Sep/09	15/Sep/09	8/Sep/08	17/Sep/09	1-Oct-16	*8/Sep/08*	*8/Sep/08*	*8/Sep/08*	*8/Sep/08*
Aroclor 1016	-	-	-	-	<0.02	<0.02	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.06	<0.01	-		<0.01	<0.01	<0.01	<0.01
Aroclor 1221	-	-	-	-	<0.03	<0.03	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.1	<0.01	-	-	<0.01	<0.01	<0.01	<0.01
Aroclor 1232	-	-	-	-	<0.02	<0.02	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.06	<0.01	-	-	<0.01	<0.01	<0.01	<0.01
Aroclor 1242	-	-	-	-	<0.02	<0.02	<0.015	<0.015	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.06	<0.01	-	-	<0.01	<0.01	<0.01	<0.01
Aroclor 1248	-	-	-	-	<0.02	<0.02	<0.015	<0.015	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.06	<0.01	-	<0.015	<0.01	<0.01	<0.01	<0.01
Aroclor 1254	0.06	0.34	0.0633	0.709	<0.02	<0.02	<0.015	<0.015	<0.01	<0.01	0.01	<0.01	<0.01	<0.02	<0.06	<0.01	-	<0.015	<0.01	<0.01	0.01	<0.01
Aroclor 1260	-	-	-	-	<0.02	<0.02	<0.015	<0.015	<0.01	<0.01	<0.01	0.014	<0.01	<0.02	0.09	0.01	-	<0.015	<0.01	<0.01	<0.01	<0.01
Aroclor 1262	-	-	-	-	<0.02	<0.02	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.06	<0.01	-	0.020	<0.01	<0.01	<0.01	<0.01
Aroclor 1268	-	-	-	-	<0.02	<0.02	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.06	<0.01	-	-	<0.01	<0.01	<0.01	<0.01
Polychlorinated biphenyls	0.0341	0.277	0.0215	0.189	**<0.03**	**<0.03**	<0.015	<0.015	<0.01	<0.01	0.01	0.014	<0.01	**<0.03**	**0.09**	0.01	**0.03**	0.020	<0.01	<0.01	0.01	<0.01

All units in ug/g, unless otherwise noted.

Notes

1 =	CCME (1999), Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
2 =	CCME (1999), Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine and/or Freshwater

ARCADIS Design & Consultancy for natural and built assets

TABLE A3 - Polyaromatic Hydrocarbons (PAHs) in AEC 4 Sediment (Brackish Water)

Property Location					Off-Site	Off-Site	Off-Site	Off-Site	Off-Site	Off-Site	On-Site
Surface Water Location					Pond 1	Pond 1	Pond 1	Pond 1	Pond 1	Pond 4	Pond 4
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**RPD**	**AEC 4**	**AEC 4**
Station ID					**A4-SD08-02**	**AEC4-SD09-11**	**AEC4-SD16-01**	**DUP-1**		**A4-SD08-03**	**AEC4-D016-04**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	9-Sep-08	17/Sep/09	1-Oct-16	1-Oct-16		9-Sep-08	1-Oct-16
Acenaphthene	0.00671	0.0889	0.00671	0.0889	<0.00671	**<0.02**	<0.0050	<0.0050	NC	<0.00671	<0.0050
Acenaphthylene	0.00587	0.128	0.00587	0.128	<0.00587	**<0.01**	<0.0050	<0.0050	NC	<0.00587	<0.0050
Anthracene	0.0469	0.245	0.0469	0.245	<0.0469	<0.01	<0.0050	<0.0050	NC	<0.0469	<0.0050
Benz(a)anthracene	0.0317	0.385	0.0748	0.693	<0.0317	<0.02	<0.0050	<0.0050	NC	<0.0317	<0.0050
Benzo(a)pyrene	0.0319	0.782	0.0888	0.763	<0.0319	<0.01	<0.0050	<0.0050	NC	<0.0319	<0.0050
Benzo(b)fluoranthene	-	-	-	-	<0.050		<0.0050	<0.0050	NC	<0.050	<0.0050
Benzo(g,h,i)perylene	-	-	-	-	<0.050	<0.04	<0.0050	<0.0050	NC	<0.050	<0.0050
Benzo(k)fluoranthene	-	-	-	-	<0.050	<0.02	<0.0050	<0.0050	NC	<0.050	<0.0050
Chrysene	0.0571	0.862	0.108	0.846	<0.050	<0.02	<0.0050	<0.0050	NC	<0.050	<0.0050
Dibenz(a,h)anthracene	0.00622	0.135	0.00622	0.135	<0.00622	**<0.04**	<0.0050	<0.0050	NC	<0.00622	<0.0050
Fluoranthene	0.111	2.355	0.113	1.494	<0.05	<0.01	<0.0050	<0.0050	NC	<0.05	<0.0050
Fluorene	0.0212	0.144	0.0212	0.144	<0.0212	<0.01	<0.0050	<0.0050	NC	<0.0212	<0.0050
Indeno(1,2,3-c,d)pyrene	-	-	-	-	<0.050	<0.04	<0.0050	<0.0050	NC	<0.050	<0.0050
2-Methylnaphthalene	0.0202	0.201	0.0202	0.201	**<0.0202**	<0.01	<0.014	<0.014	NC	**<0.0202**	<0.014
Naphthalene	0.0346	0.391	0.0346	0.391	<0.0346	<0.01	<0.0050	<0.0050	NC	<0.0346	<0.0050
Phenanthrene	0.0419	0.515	0.0867	0.544	<0.0419	<0.01	<0.0050	<0.0050	NC	<0.0419	<0.0050
Pyrene	0.053	0.875	0.153	1.398	<0.050	<0.01	<0.0050	<0.0050	NC	<0.050	<0.0050

Notes

1 =	CCME (1999), Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
2 =	CCME (1999), Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine and/or Freshwater

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TABLE A4 - Petroleum Hydrocarbons in AEC 4 Sediment (Brackish Water)

Property Location							Off-Site Pond 1	Off-Site Pond 1	Off-Site Pond 1	Off-Site Pond 1	Off-Site Pond 1		Off-Site Pond 4	Off-Site Pond 3	Off-Site Pond 3	*On-Site* Pond 3	*On-Site* Pond 3	Off-Site Pond 4	Off-Site Pond 4
Surface Water Location																			
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2] ****		**CCME Soil PL[3]**	**CCME Soil CL[4]**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**RPD**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID							**A4-SD08-02**	**AEC4-SD09-11**	**AEC4-SD09-11**	**AEC4-SD16-01**	**DUP-1**		**AEC4-SD09-1**	**A3-SD08-02**	**AEC3-SD09-1**	**AEC3-SD09-2**	**AEC3-SD09-3**	**A4-SD08-03**	**AEC4-SD16-04**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**			8/Sep/08	17/Sep/09	17/Sep/09	1/Oct/16	1/Oct/16		17/Sep/09	*7/Sep/08*	15/Sep/09	15/Sep/09	15/Sep/09	8/Sep/08	1/Oct/16
Moisture content	-	-	-	-	-	-	-	33.0	26.0	-	-	-	48.0	-	19.0	23.0	75.0	-	-
Benzene	-	-	-	-	0.03	0.03	<0.040	<0.002	<0.002	<0.0050	<0.0050	NC	<0.002	<0.040	<0.002	<0.002	<0.002	<0.040	<0.0050
Ethylbenzene	-	-	-	-	0.082	0.082	<0.050	<0.002	<0.002	<0.010	<0.010	NC	<0.002	<0.050	<0.002	<0.002	<0.008	<0.050	<0.010
Toluene	-	-	-	-	0.37	0.37	<0.050	<0.002	<0.002	<0.020	<0.020	NC	<0.002	<0.050	<0.002	<0.002	<0.008	<0.050	<0.020
m+p-Xylene	-	-	-	-	-	-	<0.050	<0.002	<0.002	<0.040	<0.040	NC	<0.002	<0.050	<0.002	<0.002	<0.008	<0.050	<0.040
o-Xylene	-	-	-	-	-	-	<0.050	<0.002	<0.002	<0.020	<0.020	NC	<0.002	<0.050	<0.002	<0.002	<0.008	<0.050	<0.020
Xylenes (total)	-	-	-	-	2.4	11	<0.10	<0.002	<0.002	<0.040	<0.040	NC	<0.002	<0.10	<0.002	<0.002	<0.008	<0.10	<0.040
F1 (C6-C10)	-	-	-	-	-	-	<10	<10	<10	<10	<10	NC	<10	<10	<50	<10	<40	<10	<10
F1 (C6-C10) minus BTEX	-	-	-	-	30	240	<10	<10	<10	<10	<10	NC	<10	<10	<10	<10	<40	<10	<10
F2 (C10-C16)	-	-	-	-	150	260	<40	<10	<10	<10	<10	NC	<10	<30	<10	<10	<40	<30	<10
F3 (C16-C34)	-	-	-	-	300	1700	<50	42	<10	<50	<50	NC	190	<50	43	<10	**360**	<50	<50
F4 (C34-C50)	-	-	-	-	2800	3300	<50	100	<10	<50	<50	NC	180	<50	<10	<10	470	<50	<50
F4 Gravimetric	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reached Baseline at C50	-	-	-	-	-	-	-	Yes	Yes	-	-	-	Yes	-	Yes	Yes	Yes	-	-

All units in ug/g, unless otherwise noted.

Notes

1 = CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).

2 = CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).

3 = CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use

4 = CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use

20 = RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline

20 = Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater

20 = Denotes exceedance of CCME ISQG or PEL guidelines for Marine

20 = Denotes exceedance of CCME SQGs parkland use in the absence of CCME ISQG or PEL guidelines for Marine and/or Freshwater

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TABLE A5 - Pesticides in AEC 4 Sediment (Brackish Water)

Property Location					Off-Site	Off-Site	Off-Site	Off-Site	Off-Site		*On-Site*	*On-Site*	*On-Site*	Off-Site	Off-Site	Off-Site
Surface Water Location					Pond 1	Pond 1	Pond 1	Pond 1	Pond 1		Pond 3	Pond 3	Pond 3	Pond 4	Pond 4	Pond 4
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**RPD**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID					**A4-SD08-2**	**AEC4-SD09-11**	**AEC4-SD09-11**	**AEC4-SD16-01**	**DUP-1**		**AEC3-SD09-1**	**AEC3-SD09-2**	**AEC3-SD09-3**	**AEC4-SD09-1**	**AEC4-SD09-15**	**A4-SD08-3**
Date					*8/Sep/08*	17/Sep/09	17/Sep/09	1/Oct/16	1/Oct/16		15/Sep/09	15/Sep/09	15/Sep/09	17/Sep/09	17/Sep/09	*8/Sep/08*
Aldrin	-	-	-	-	<0.0010	<0.002	<0.002	<0.0020	<0.0020	NC	<0.002	<0.002	<0.008	<0.002	<0.002	<0.0010
Chlordane	0.0045	0.00887	0.00226	0.00479	-	<0.002	<0.002	<0.0020	<0.0020	NC	<0.002	<0.002	***<0.008***	<0.002	<0.002	-
alpha-Chlordane	-	-	-	-	<0.0010	<0.002	<0.002	<0.0020	<0.0020	NC	<0.002	<0.002	<0.008	<0.002	<0.002	<0.0010
trans-Chlordane	-	-	-	-	<0.0010	<0.002	<0.002	<0.0020	<0.0020	NC	<0.002	<0.002	<0.008	<0.002	<0.002	<0.0010
2,4'-DDD	-	-	-	-	<0.0010	<0.002	<0.002	<0.0020	<0.0020	NC	<0.002	<0.002	<0.01	<0.002	<0.002	<0.0010
4,4'-DDD	-	-	-	-	<0.0010	<0.002	<0.002	<0.0020	<0.0020	NC	<0.002	<0.002	0.018	0.004	0.004	<0.0010
DDD (total)	0.00354	0.00851	0.00122	0.00781	-	***<0.002***	***<0.002***	***<0.0020***	***<0.0020***	NC	***<0.002***	***<0.002***	**0.02**	**0.004**	**0.004**	-
2,4'-DDE	-	-	-	-	<0.0010	<0.002	<0.002	<0.0020	<0.0020	NC	***<0.002***	***<0.002***	<0.008	<0.002	<0.002	<0.0010
4,4'-DDE	-	-	-	-	<0.0010	<0.002	<0.002	<0.0020	<0.0020	NC	<0.002	<0.002	0.014	<0.002	<0.002	<0.0010
DDE (total)	0.00142	0.00675	0.00207	0.374	-	***<0.002***	***<0.002***	***<0.0020***	***<0.0020***	NC	***<0.002***	***<0.002***	**0.014**	***<0.002***	<0.002	-
2,4'-DDT	-	-	-	-	<0.00119	<0.002	<0.002	<0.0020	<0.0020	NC	<0.002	<0.002	<0.008	<0.002	<0.002	<0.002
4,4'-DDT	-	-	-	-	<0.00119	<0.002	<0.002	<0.0020	<0.0020	NC	***<0.002***	***<0.002***	<0.03	<0.002	<0.002	<0.002
DDT plus metabolites	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	0.03	0.004	0.004	-
DDT (total)	0.00119	0.00477	0.00119	0.00477	-	***<0.002***	***<0.002***	***<0.0020***	***<0.0020***	NC	***<0.002***	***<0.002***	***<0.03***	***<0.002***	***<0.002***	-
Dieldrin	0.00285	0.00667	0.00071	0.0043	***<0.0010***	<0.002	<0.002	<0.0020	***<0.0020***	NC	***<0.002***	***<0.002***	***<0.008***	<0.002	***<0.002***	***<0.0010***
Endosulfan	-	-	-	-	<0.0010	<0.002	<0.002	<0.0020	<0.0020	NC	<0.002	<0.002	<0.008	<0.002	<0.002	<0.0010
alpha-Endosulfan	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.008	<0.002	<0.002	-
beta-Endosulfan	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.008	<0.002	<0.002	-
Endrin	0.00267	0.0624	0.00267	0.00624	<0.00267	<0.002	<0.002	<0.0020	<0.0020	NC	<0.002	<0.002	***<0.008***	<0.002	<0.002	***<0.0050***
gamma-HCH	0.00094	0.00138	0.000032	0.000099	***<0.00094***	***<0.002***	***<0.002***	***<0.0020***	***<0.0020***	NC	***<0.002***	***<0.002***	***<0.008***	***<0.002***	***<0.002***	***<0.00094***
Heptachlor	-	-	-	-	<0.0020	<0.002	<0.002	<0.0020	<0.0020	NC	<0.002	<0.002	<0.008	<0.002	<0.002	<0.0020
Heptachlor epoxide	0.0006	0.00274	0.00006	0.000274	***<0.0006***	***<0.002***	***<0.002***	***<0.0020***	***<0.0020***	NC	***<0.002***	***<0.002***	***<0.008***	***<0.002***	***<0.002***	***<0.0010***
Hexachlorobenzene	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.008	<0.002	<0.002	-
Methoxychlor	-	-	-	-	<0.0050	<0.008	<0.008	<0.0050	<0.0050	NC	<0.008	<0.008	<0.03	<0.008	<0.008	<0.0050

All units in ug/g, unless otherwise noted.

Notes

1 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
2 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine and/or Freshwater

TABLE A6 - Volatile Organic Compounds (VOCs) in AEC 4 Sediment (Brackish Water)

							Off-Site Pond 1	Off-Site Pond 4	On-Site Pond 3	On-Site Pond 3	On-Site Pond 3	Off-Site Pond 4
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**CCME Soil PL[3]**	**CCME Soil CL[4]**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID							**A4-SD08-2**	**A4-SD08-3**	**AEC3-SD09-1**	**AEC3-SD09-2**	**AEC3-SD09-3**	**AEC4-SD09-15**
Date							8/Sep/08	8/Sep/08	15/Sep/09	15/Sep/09	15/Sep/09	17/Sep/09
Acetone	-	-	-	-	-	-	-	-	-	-	-	<0.1
Benzene	-	-	-	-	0.03	0.03	<0.050	<0.050	<0.002	<0.002	<0.002	<0.002
Bromodichloromethane	-	-	-	-	-	-	<0.050	<0.050	-	-	-	<0.002
Bromoform	-	-	-	-	-	-	<0.050	<0.050	-	-	-	<0.002
Bromomethane	-	-	-	-	-	-	-	-	-	-	-	<0.003
Carbon tetrachloride	-	-	-	-	5	50	<0.050	<0.050	-	-	-	<0.002
Chlorobenzene	-	-	-	-	1	10	<0.050	<0.050	-	-	-	<0.002
Chlorodibromomethane	-	-	-	-	-	-	<0.10	<0.10	-	-	-	<0.002
Chloroform	-	-	-	-	5	50	<0.10	<0.10	-	-	-	<0.002
1,2-Dichlorobenzene	-	-	-	-	1	10	<0.050	<0.050	-	-	-	<0.002
1,3-Dichlorobenzene	-	-	-	-	1	10	<0.050	<0.050	-	-	-	<0.002
1,4-Dichlorobenzene	-	-	-	-	1	10	<0.050	<0.050	-	-	-	<0.002
1,1-Dichloroethane	-	-	-	-	5	50	<0.050	<0.050	-	-	-	<0.002
1,2-Dichloroethane	-	-	-	-	5	50	<0.050	<0.050	-	-	-	<0.002
1,1-Dichloroethene	-	-	-	-	5	50	<0.050	<0.050	-	-	-	<0.002
cis-1,2-Dichloroethene	-	-	-	-	-	-	<0.050	<0.050	-	-	-	<0.002
trans-1,2-Dichloroethene	-	-	-	-	-	-	<0.30	<0.30	-	-	-	<0.002
Dichloromethane	-	-	-	-	5	50	<0.050	<0.050	-	-	-	<0.003
1,2-Dichloropropane	-	-	-	-	5	50	<0.050	<0.050	-	-	-	<0.002
cis-1,3-Dichloropropene	-	-	-	-	-	-	<0.050	<0.050	-	-	-	<0.002
trans-1,3-Dichloropropene	-	-	-	-	-	-	<0.050	<0.050	-	-	-	<0.002
Ethylbenzene	-	-	-	-	0.082	0.082	<0.20	<0.20	<0.002	<0.002	<0.008	<0.002
Ethylene dibromide	-	-	-	-	-	-	-	-	-	-	-	<0.002
Hexachlorobenzene	-	-	-	-	2	10	-	-	<0.002	<0.002	<0.008	<0.002
Hexachlorobutadiene	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.04	<0.01
Methyl ethyl ketone	-	-	-	-	-	-	-	-	-	-	-	<0.03
Methyl isobutyl ketone	-	-	-	-	-	-	-	-	-	-	-	<0.03
Methyl-tert-butylether	-	-	-	-	-	-	<0.050	<0.050	-	-	-	<0.002
Styrene	-	-	-	-	5	50	<0.050	<0.050	-	-	-	<0.002
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	<0.050	<0.050	-	-	-	<0.002
1,1,2,2-Tetrachloroethane	-	-	-	-	5	50	<0.050	<0.050	-	-	-	<0.002
Tetrachloroethene	-	-	-	-	0.2	0.5	<0.050	<0.050	-	-	-	<0.002
Toluene	-	-	-	-	0.37	0.37	<0.050	<0.050	<0.002	<0.002	<0.008	<0.002
1,1,1-Trichloroethane	-	-	-	-	5	50	<0.050	<0.050	-	-	-	<0.002
1,1,2-Trichloroethane	-	-	-	-	5	50	<0.040	<0.015	-	-	-	<0.002
Trichloroethene	-	-	-	-	0.01	0.01	<0.10	<0.10	-	-	-	<0.002
Vinyl chloride	-	-	-	-	-	-	<0.050	<0.050	-	-	-	<0.002
m+p-Xylene	-	-	-	-	-	-	<0.10	<0.10	<0.002	<0.002	<0.008	<0.002
o-Xylene	-	-	-	-	-	-	<0.050	<0.050	<0.002	<0.002	<0.008	<0.002
Xylenes (total)	-	-	-	-	2.4	11	<0.10	<0.10	<0.002	<0.002	<0.008	<0.002

Notes

1 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
2 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
3 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use
4 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Marine
20 =	Denotes exceedance of CCME SQGs parkland use in the absence of CCME ISQG or PEL guidelines for Marine and/or Freshwater

APPENDIX B.B

Sediment AEC 4 (Freshwater Environment):

B.B1 – Metals and Inorganics

B.B2 – Polychlorinated Biphenyls (PCBs)

B.B3 – Polyaromatic Hydrocarbons (PAHs)

B.B4 – Petroleum Hydrocarbons

B.B5 – Pesticides

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TABLE B1 - Metals and Inorganics in AEC 4 Sediment (Freshwater)

Property Location					Off-Site	Off-Site	Off-Site	Off-Site	Off-Site	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*
Surface Water Location					Pond 2	Pond 2	Pond 2	Pond 2	Pond 2	Pond 5	Pond 5	Pond 5	Pond 5	Pond 6	Pond 6	Pond 6	Pond 6	Pond 6
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID					**A4-SD08-1**	**AEC4-SD09-14**	**AEC4-SD09-15**	**AEC4-SD16-02**	**AEC4-SD16-03**	**A3-SD08-3**	**AEC2-SD09-10**	**AEC2-SD09-11**	**AEC2-SD16-05**	**A3-SD08-4**	**AEC2-SD09-8**	**AEC2-SD09-9**	**AEC2-SD09-9**	**AEC2-SD16-06**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	8/Sep/08	17/Sep/09	17/Sep/09	1/Oct/16	1/Oct/16	7/Sep/08	15/Sep/09	15/Sep/09	1/Oct/16	6/Sep/08	15/Sep/09	15/Sep/09	15/Sep/09	1/Oct/16
TOC					-	3,200	6,600	-	-	-	41,000	46,000	-	-	50,000	67,000	78,000	-
Aluminum	-	-	-	-	-	3900	5500	-	-	-	5300	6700	-	-	10000	4900	5800	-
Antimony	-	-	-	-	<10	<0.2	<0.2	<0.20	0.33	<10	1.0	0.8	<0.20	<10	3	1.5	2	2.0
Arsenic	5.9	17	7.24	41.60	<5.0	1	2	<1.0	1.1	<5.0	<1	2	<1.0	<5.0	<5	2	<5	3.4
Barium	-	-	-	-	37.7	20.0	34.0	20	34	45.3	35.0	39.0	24	21.6	95.0	55.0	68.0	73
Beryllium	-	-	-	-	<0.50	<0.2	0.2	<0.20	0.23	<0.50	0.3	0.3	<0.20	<0.50	<1	0.2	<1	0.25
Boron			-	-	-	-	-	<5.0	7.9	-	-	-	5.4	-	-	-	-	27
Cadmium	0.6	3.5	0.70	4.20	<0.50	<0.1	0.1	<0.10	0.25	1.38	2.0	2.0	0.52	0.6	5.7	3.8	6.7	8.0
Calcium	-	-	-	-	-	2200	2800	-	-	-	3400	3900	-	-	7000	3900	4600	-
Chromium	37.3	90	52.30	160.00	17.4	18	20	15	16	25.4	20	22	15	24.1	44	23	31	30
Chromium (VI)	-	-	-	-	-	<0.2	<0.2	-	-	-	<0.2	<0.2	-	-	<0.2	<0.2	<0.8	-
Cobalt	-	-	-	-	4.7	3.2	4.6	3.6	5.9	5.9	5.6	6.4	5.5	3.9	18.0	11.0	17.0	24
Copper	35.7	197	18.70	100.80	8.1	6.2	9.5	6.0	10	20.7	20.0	18.0	5.5	13.7	67.0	22.0	33.0	37
Iron	-	-	-	-	-	24000	19000	-	-	-	48000	25000	-	-	100000	70000	110000	-
Lead	35	91.3	30.20	112.00	<30	3	7	6.4	12	59	57	51	6.4	57	150	86	120	120
Magnesium	-	-	-	-	-	2800	4000	-	-	-	3400	3800	-	-	6200	2600	3000	-
Manganese	-	-	-	-	-	58	75	-	-	-	160	100	-	-	1100	770	930	-
Mercury (ug/g)	0.17	0.486	0.13	0.70	0.0067	<0.05	<0.05	-	-	0.0384	<0.05	<0.05	-	0.0155	***<0.25***	<0.05	<0.25	-
Molybdenum	-	-	-	-	<4.0	1.0	2.5	1.2	2.7	5	3.4	2.0	2.7	<4.0	5.0	3.0	<2.5	2.2
Nickel	-	-	-	-	6.8	5.9	7.9	5.1	7.4	8.9	9.1	10.0	5.6	<5.0	22.0	11.0	14.0	16
Phosphorus	-	-	-	-	-	820	880	-	-	-	780	770	-	-	1500	750	990	-
Potassium	-	-	-	-	-	990	1600	-	-	-	1100	1200	-	-	1900	710	<1000	-
Selenium	-	-	-	-	<2.0	<0.5	<0.5	<0.50	<0.50	<2.0	<0.5	<0.5	<0.50	<2.0	<2.5	<0.5	<2.5	<0.50
Silver	-	-	-	-	<2.0	<0.2	<0.2	<0.20	<0.20	<2.0	<0.2	<0.2	<0.20	<2.0	<1	<0.2	<1	<0.20
Sodium	-	-	-	-	-	870	1100	-	-	-	290	360	-	-	<500	270	<500	-
Strontium	-	-	-	-	-	10	13	-	-	-	16	16	-	-	25	14	16	-
Thallium	-	-	-	-	<1.0	<0.05	0.06	<0.050	0.065	<1.0	0.05	0.07	0.057	<1.0	<0.25	<0.05	<0.25	0.061
Uranium			-	-	-	-	-	0.56	0.84	-	-	-	0.90	-	-	-	-	0.91
Vanadium	-	-	-	-	39.6	43	40	37	33	45.1	33	35	27	29.2	66	30	38	35
Zinc (ug/g)	123	315	124	271	52.9	33	50	44	73	191	160	250	94	139	440	270	390	440

All units in ug/g, unless otherwise noted.

Notes

1 = CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).

2 = CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).

20 = RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline

20 = Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater

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TABLE B2 - Polychlorinated Biphenyls (PCBs) in AEC 4 Sediment (Freshwater)

Property Location					Off-Site	Off-Site	Off-Site	Off-Site	On-Site	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*
Surface Water Location					Pond 2	Pond 2	Pond 2	Pond 2	Pond 5	Pond 5	Pond 5	Pond 6	Pond 6	Pond 6	Pond 6	Pond 6
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2] ****		**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID					**A4-SD08-1**	**AEC4-SD09-15**	**AEC4-SD16-02**	**AEC4-SD16-03**	**AEC2-SD16-05**	**AEC2-SD09-10**	**AEC2-SD09-11**	**A3-SD08-4**	**AEC2-SD09-8**	**AEC2-SD09-9**	**AEC2-SD09-9**	**AEC2-SD16-06**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	8/Sep/08	17/Sep/09	1/Oct/16	1/Oct/16	1/Oct/16	15/Sep/09	15/Sep/09	6/Sep/08	15/Sep/09	15/Sep/09	15/Sep/09	1/Oct/16
Aroclor 1016	-	-	-	-	<0.01	<0.02	-	-	-	<0.5	<0.5	<0.050	<0.2	<6	<0.4	-
Aroclor 1221	-	-	-	-	<0.01	<0.03	-	-	-	<1	<1	<0.050	<0.3	<10	<1	-
Aroclor 1232	-	-	-	-	<0.01	<0.02	-	-	-	<0.5	<0.5	<0.050	<0.2	<6	<0.4	-
Aroclor 1242	-	-	-	-	<0.01	<0.02	<0.015	<0.030	<0.030	<0.5	<0.5	<0.050	<0.2	<6	<0.4	<0.38
Aroclor 1248	-	-	-	-	<0.01	<0.02	<0.015	<0.030	<0.030	<0.5	<0.5	<0.050	<0.2	<6	<0.4	<0.38
Aroclor 1254	0.06	0.34	0.0633	0.709	<0.01	<0.02	<0.015	<0.030	<0.015	<0.5	<0.5	<0.050	<0.2	<6	<0.4	***<0.38***
Aroclor 1260	-	-	-	-	0.011	0.04	0.021	0.049	0.046	1.0	1.6	0.496	0.3	15	1.9	1.6
Aroclor 1262	-	-	-	-	<0.01	<0.02	-	-	-	<0.5	<0.5	<0.050	<0.2	<6	<0.4	-
Aroclor 1268	-	-	-	-	<0.01	<0.02	-	-	-	<0.5	<0.5	<0.050	<0.2	<6	<0.4	-
Polychlorinated biphenyls	0.0341	0.277	0.0215	0.189	0.011	0.04	0.021	0.049	0.046	1	1.6	0.496	0.3	15	1.9	1.6

All units in ug/g, unless otherwise noted.

Notes

1 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
2 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater

ARCADIS Design & Consultancy for natural, Land built assets

TABLE B3 - Polycyclic Aromatic Hydrocarbons (PAHs) in AEC 4 Sediment (Freshwater)

Property Location					Off-Site	Off-Site	Off-Site	On-Site	On-Site	On-Site
Surface Water Location					Pond 2	Pond 2	Pond 2	Pond 4	Pond 5	Pond 6
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**AEC4**	**AEC 4**	**AEC 4**	**AEC4**	**AEC4**	**AEC4**
Station ID					**AEC4-SD09-15**	**AEC4-SD16-02**	**AEC4-SD16-03**	**AEC4-D016-04**	**AEC2-SD16-05**	**AEC2-SD16-06**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	17/Sep/09	1/Oct/16	1/Oct/16	1/Oct/16	1/Oct/16	1/Oct/16
Acenaphthene	0.00671	0.089	0.00671	0.0889	<0.02	<0.0050	<0.0050	<0.0050	<0.0050	0.033
Acenaphthylene	0.00587	0.128	0.00587	0.128	<0.01	<0.0050	<0.0050	<0.0050	<0.0050	<0.020
Anthracene	0.0469	0.245	0.0469	0.245	<0.01	<0.0050	0.0052	<0.0050	<0.0050	0.041
Benz(a)anthracene	0.0317	0.385	0.0748	0.693	<0.02	0.0055	0.027	<0.0050	<0.0050	0.17
Benzo(a)pyrene	0.0319	0.782	0.0888	0.763	0.01	<0.0050	0.028	<0.0050	<0.0050	0.16
Benzo(b)fluoranthene	-	-	-	-	-	0.0069	0.055	<0.0050	<0.0050	0.29
Benzo(g,h,i)perylene	-	-	-	-	<0.04	<0.0050	0.011	<0.0050	<0.0050	0.087
Benzo(k)fluoranthene	-	-	-	-	<0.02	<0.0050	0.019	<0.0050	<0.0050	0.12
Chrysene	0.0571	0.862	0.108	0.846	<0.02	<0.0050	0.023	<0.0050	<0.0050	0.18
Dibenz(a,h)anthracene	0.00622	0.135	0.00622	0.135	<0.04	<0.0050	<0.0050	<0.0050	<0.0050	<0.020
Fluoranthene	0.111	2.355	0.113	1.494	0.03	0.0055	0.033	<0.0050	<0.0050	0.24
Fluorene	0.0212	0.144	0.0212	0.144	<0.01	<0.0050	<0.0050	<0.0050	<0.0050	0.036
Indeno(1,2,3-c,d)pyrene	-	-	-	-	<0.04	<0.0050	0.010	<0.0050	<0.0050	0.061
2-Methylnaphthalene	0.0202	0.201	0.0202	0.201	<0.01	<0.014	<0.014	<0.014	<0.014	0.018
Naphthalene	0.0346	0.391	0.0346	0.391	<0.01	<0.0050	<0.0050	<0.0050	<0.0050	0.061
Phenanthrene	0.0419	0.515	0.0867	0.544	0.02	0.0069	0.034	<0.0050	<0.0050	0.26
Pyrene	0.053	0.875	0.153	1.398	0.02	<0.0050	0.030	<0.0050	<0.0050	0.22

All units in ug/g, unless otherwise noted.

Notes

1 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
2 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater

TABLE B4 - Petroleum Hydrocarbons in AEC 4 Sediment (Freshwater)

Location							Off-Site	Off-Site	Off-Site	Off-Site	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*
Surface Water Feature							Pond 2	Pond 2	Pond 2	Pond 2	Pond 5	Pond 5	Pond 5	Pond 5	Pond 6	Pond 6	Pond 6	Pond 6	Pond 6
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2] ****		**CCME Soil PL[3]**	**CCME Soil CL[4]**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID							**A4-SD08-01**	**AEC4-SD09-15**	**AEC4-SD16-02**	**AEC2-SD16-03**	**A3-SD08-03**	**AEC2-SD09-10**	**AEC2-SD09-11**	**AEC2-SD16-05**	**A3-SD08-04**	**AEC2-SD09-8**	**AEC2-SD09-9**	**AEC2-SD09-9**	**AEC2-SD16-06**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**			8/Sep/08	17/Sep/09	1/Oct/16	1/Oct/16	7/Sep/08	15/Sep/09	15/Sep/09	1/Oct/16	7/Sep/08	15/Sep/09	15/Sep/09	15/Sep/09	1/Oct/16
Moisture content	-	-	-	-	-	-	-	47.0	-	-	-	67.0	68.0	-	-	11.0	74.0	71.0	-
Benzene	-	-	-	-	0.03	0.03	<0.040	<0.002	<0.0050	<0.0050	<0.040	<0.002	<0.002	<0.0050	<0.040	<0.002	<0.002	<0.002	<0.020
Ethylbenzene	-	-	-	-	0.082	0.082	<0.050	<0.002	<0.010	<0.010	<0.050	<0.006	<0.006	<0.010	<0.050	<0.002	<0.008	<0.008	<0.040
Toluene	-	-	-	-	0.37	0.37	<0.050	<0.002	<0.020	<0.020	<0.050	<0.006	<0.006	<0.020	<0.050	<0.002	<0.008	<0.008	<0.080
m+p-Xylene	-	-	-	-	-	-	<0.050	<0.002	<0.040	<0.040	<0.050	<0.006	<0.006	<0.040	<0.050	<0.002	<0.008	<0.008	<0.16
o-Xylene	-	-	-	-	-	-	<0.050	<0.002	<0.020	<0.020	<0.050	<0.006	<0.006	<0.020	<0.050	<0.002	<0.008	<0.008	<0.080
Xylenes (total)	-	-	-	-	2.4	11	<0.10	<0.002	<0.040	<0.040	<0.10	<0.006	<0.006	<0.040	<0.10	<0.002	<0.008	<0.008	<0.16
F1 (C6-C10)	-	-	-	-	-	-	<10	<10	<10	<10	11	<30	<30	<10	<10	<10	<40	<40	<40
F1 (C6-C10) minus BTEX	-	-	-	-	30	240	<10	<10	<10	<10	11	**<30**	**<30**	<10	<10	<10	**<40**	**<40**	<40
F2 (C10-C16)	-	-	-	-	150	260	<30	<10	<10	<10	**535**	140	**1500**	**230**	141	71	**180**	**310**	<40
F3 (C16-C34)	-	-	-	-	300	1700	<50	21	<50	<50	**568**	**470**	**1200**	72	177	280	**1000**	**1300**	<200
F4 (C34-C50)	-	-	-	-	2800	3300	<50	<10	<50	<50	191	260	560	<50	71	160	500	620	<200
F4 Gravimetric	-	-	-	-	-	-	-	-	-	-	1040	-	-	-	-	-	-	-	-
Reached Baseline at C50	-	-	-	-	-	-	-	Yes	-	-	-	Yes	Yes	-	-	Yes	Yes	Yes	-

All units in ug/g, unless otherwise noted.

Notes

1 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
2 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
3 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use
4 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater
20 =	Denotes exceedance of CCME SQGs parkland use in the absence of PEL guidelines for Marine and/or Freshwater

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TABLE B5 - Pesticides in AEC 4 Sediment (Freshwater)

Property Location					Off-Site	Off-Site	Off-Site	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*
Surface Water Location					Pond 2	Pond 2	Pond 2	Pond 6	Pond 5	Pond 5	Pond 5	Pond 6	Pond 6	Pond 6
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID					**AEC4-SD09-15**	**AEC4-SD16-02**	**AEC4-SD16-03**	**AEC2-SD09-9**	**AEC2-SD09-10**	**AEC2-SD09-11**	**AEC2-SD16-05**	**AEC2-SD16-06**	**AEC2-SD09-8**	**AEC2-SD09-9**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	17/Sep/09	1/Oct/16	1/Oct/16	15/Sep/09	15/Sep/09	15/Sep/09	1/Oct/16	1/Oct/16	15/Sep/09	15/Sep/09
Aldrin	-	-			<0.002	<0.0020	<0.0030	<0.006	<0.006	<0.006	<0.0020	<0.050	<0.002	<0.008
Chlordane	0.0045	0.00887	0.00226	0.00479	<0.002	<0.0020	<0.0030	**<0.006**	**<0.006**	**<0.006**	<0.0020	**<0.050**	<0.002	**<0.008**
alpha-Chlordane	-	-	-	-	<0.002	<0.0020	<0.0030	<0.006	<0.006	<0.006	<0.0020	<0.050	<0.002	<0.008
trans-Chlordane	-	-	-	-	<0.002	<0.0020	<0.0030	<0.006	<0.006	<0.006	<0.0020	<0.050	<0.002	<0.008
2,4'-DDD	-	-	-	-	<0.002	<0.0020	<0.0030	<0.04	0.007	0.02	<0.0020	<0.050	<0.002	<0.03
4,4'-DDD	-	-	-	-	0.004	<0.0020	<0.0030	0.045	0.034	0.10	0.0021	<0.050	0.005	0.06
DDD (total)	0.00354	0.00851	0.00122	0.00781	0.004	<0.0020	<0.0030	0.05	0.041	0.12	0.0021	<0.050	0.005	0.06
2,4'-DDE	-	-	-	-	<0.002	<0.0020	<0.0030	<0.006	<0.006	<0.006	<0.0020	<0.050	<0.002	<0.008
4,4'-DDE	-	-	-	-	<0.002	<0.0020	<0.0030	0.020	0.012	0.018	<0.0020	<0.050	<0.002	0.035
DDE (total)	0.00142	0.00675	0.00207	0.374	**<0.002**	**<0.0020**	**<0.0030**	0.020	0.012	0.018	**<0.0020**	**<0.050**	**<0.002**	0.035
2,4'-DDT	-	-	-	-	<0.002	<0.0020	<0.0030	<0.006	<0.006	<0.006	<0.0020	<0.050	0.003	<0.02
4,4'-DDT	-	-	-	-	<0.002	<0.0020	<0.0030	<0.05	<0.02	<0.04	<0.0020	<0.15	<0.04	<0.1
DDT plus metabolites	-	-	-	-	0.004	-	-	0.07	0.05	0.14	-	-	<0.04	0.1
DDT (total)	0.00119	0.00477	0.00119	0.00477	**<0.002**	**<0.0020**	**<0.0030**	**<0.05**	**<0.02**	**<0.04**	**<0.0020**	**<0.15**	**<0.04**	**<0.1**
Dieldrin	0.00285	0.00667	0.00071	0.0043	<0.002	<0.0020	**<0.0030**	**<0.02**	**<0.006**	**<0.006**	<0.0020	**<0.050**	<0.002	**<0.02**
Endosulfan	-	-	-	-	<0.002	<0.0020	<0.0030	<0.006	<0.006	<0.006	<0.0020	<0.050	<0.002	<0.008
alpha-Endosulfan	-	-	-	-	<0.002	<0.0020	<0.0030	<0.006	<0.006	<0.006	<0.0020	<0.050	<0.002	<0.008
beta-Endosulfan	-	-	-	-	<0.002	<0.0020	<0.0030	<0.006	<0.006	<0.006	<0.0020	<0.050	<0.002	<0.008
Endrin	0.00267	0.0624	0.00267	0.00624	<0.002	<0.0020	**<0.0030**	**<0.006**	**<0.006**	**<0.006**	<0.0020	**<0.050**	<0.002	**<0.06**
gamma-HCH	0.00094	0.00138	0.000032	0.000099	**<0.002**	**<0.0020**	**<0.0030**	**<0.006**	**<0.006**	**<0.006**	**<0.0020**	**<0.050**	**<0.002**	**<0.008**
Heptachlor	-	-	-	-	<0.002	<0.0020	<0.0030	<0.006	<0.006	<0.006	<0.0020	<0.050	<0.002	<0.008
Heptachlor epoxide	0.0006	0.00274	0.00006	0.000274	**<0.002**	**<0.0020**	**<0.0030**	**<0.006**	**<0.006**	**<0.006**	**<0.0020**	**<0.050**	**<0.002**	**<0.008**
Hexachlorobenzene	-	-	-	-	<0.002	-	-	<0.006	<0.006	<0.006	-	-	<0.002	<0.008
Methoxychlor	-	-	-	-	<0.008	<0.0050	<0.0075	<0.02	<0.02	<0.02	<0.0050	<0.13	<0.008	<0.03

All units in ug/g, unless otherwise noted.

Notes

1 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
2 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater

APPENDIX B.C

Sediment in AEC 1, 2, 3 (Freshwater Environment):

B.C1 – Metals and Inorganics

B.C2 – Polychlorinated Biphenyls (PCBs)

B.C3 – Polyaromatic Hydrocarbons (PAHs)

B.C4 – Petroleum Hydrocarbons

B.C5 – Pesticides

B.C6 – Volatile Organic Compounds (VOCs)

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TABLE C1 - Metals and Inorganics in AEC 1,2,3 Sediment (Freshwater)

Property Location				*On-Site*	Off-Site	Off-Site	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*
Surface Water Location				Pond upgradient	Ditch at Road	Ditch at Road	Stream upgradient	Stream upgradient	Stream at landfill height	Small pond at landfill height	Small pond at landfill height	Stream at landfill height	Stream at landfill height	Stream at landfill height	Stream at landfill height	Stream at landfill height	Stream at landfill height
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2 **]**		**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC2**
Station ID					**AEC1-SD09-1**	**A2-SD08-01**	**AEC2-SD09-1**	**AEC2-SD09-2**	**AEC2-SD09-3**	**A2-SD08-4**	**A2-SD08-02**	**AEC2-SD09-4**	**AEC2-SD09-5**	**AEC2-SD09-6**	**A2-SD08-04**	**AEC2-SD09-7**	**AEC2-SD16-07**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	17/Sep/09	6/Sep/08	15/Sep/09	15/Sep/09	15/Sep/09	6/Sep/08	6/Sep/08	15/Sep/09	15/Sep/09	15/Sep/09	6/Sep/08	15/Sep/09	1/Oct/16
TOC					17,000	-	9,200	110,000	37,000	-	-	110,000	33,000	53,000	-	57,000	-
Aluminum	-	-	-	-	4700	-	3200	4700	3900	-	-	3700	3600	5500	-	4100	-
Antimony	-	-	-	-	<0.2	<10	<0.2	<1	<0.2	<10	<10	<1	2	2	<10	2	3.9
Arsenic	5.9	17	7.24	41.60	<1	<5.0	<1	<5	2	6.3	<5.0	<5	<5	<5	<5.0	<5	4.8
Barium	-	-	-	-	26.0	84.4	19.0	61.0	120.0	155	59	77.0	82.0	95.0	61.9	99.0	110
Beryllium	-	-	-	-	<0.2	<0.50	<0.2	<1	<0.2	<0.50	<0.50	<1	<1	<1	<0.50	<1	<0.20
Cadmium	0.6	3.5	0.70	4.20	<0.1	<0.50	<0.1	<0.5	0.2	2.83	<0.50	<0.5	6.1	6.6	2.73	4.4	8.9
Calcium	-	-	-	-	2200	-	1700	7600	2400	-	-	4200	3400	5400	-	6700	-
Chromium	37.3	90	52.30	160.00	23	16.3	17	20	15	50.2	21.4	13	41	34	55.4	30	40
Chromium (VI)	-	-	-	-	<0.2	-	<0.2	-	2.0	-	-	2.6	<0.2	0.9	-	<0.4	-
Cobalt	-	-	-	-	5.2	13.5	3.4	13.0	28.0	20.6	13.3	21.0	18.0	19.0	13.7	19.0	25
Copper	35.7	197	18.70	100.80	6.1	17.6	4.9	20.0	8.9	48.9	292	26.0	28.0	38.0	70.3	42.0	32
Iron	-	-	-	-	25000	-	22000	93000	58000	-	-	220000	84000	90000	-	98000	-
Lead	35	91.3	30.20	112.00	5	<30	8	24	9	201	<30	31	150	170	96	150	170
Magnesium	-	-	-	-	2600	-	1600	3500	1700	-	-	1500	1900	2900	-	2300	-
Manganese	-	-	-	-	150	-	110	980	8100	-	-	1400	3400	3000	-	3200	-
Mercury (ug/g)	0.17	0.486	0.13	0.70	<0.05	0.046	<0.05	<0.25	<0.05	0.0508	0.0575	<0.25	<0.25	<0.25	0.0414	<0.25	-
Molybdenum	-	-	-	-	0.8	<4.0	0.9	<2.5	2.3	<4.0	<4.0	4.5	2.8	2.8	<4.0	<2.5	4.3
Nickel	-	-	-	-	7.1	8.8	5.2	17.0	8.5	24.6	10.9	16.0	15.0	16.0	23.9	16.0	21
Phosphorus	-	-	-	-	770	-	780	2100	1400	-	-	1400	720	1000	-	900	-
Potassium	-	-	-	-	700	-	410	1200	430	-	-	<1000	<1000	<1000	-	<1000	-
Selenium	-	-	-	-	<0.5	<2.0	<0.5	<2.5	<0.5	<2.0	<2.0	<2.5	<2.5	<2.5	<2.0	<2.5	<0.50
Silver	-	-	-	-	<0.2	<2.0	<0.2	<1	<0.2	<2.0	<2.0	<1	<1	<1	<2.0	<1	0.49
Sodium	-	-	-	-	130	-	<100	<500	<100	-	-	<500	<500	<500	-	<500	-
Strontium	-	-	-	-	6	-	4	23	12	-	-	22	14	21	-	24	-
Thallium	-	-	-	-	0.07	<1.0	<0.05	<0.25	<0.05	<1.0	<1.0	<0.25	<0.25	<0.25	<1.0	<0.25	0.069
Vanadium	-	-	-	-	52	36.8	46	40	41	24.1	28.9	<25	33	38	23.4	28	32
Zinc (ug/g)	123	315	124	271	29	499	52	230	230	333	111	280	210	270	145	300	300

All units in ug/g, unless otherwise noted.

Notes

1 = CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).

2 = CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).

20 = RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline

20 = Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater

TABLE C2 - Polychlorinated Biphenyls (PCBs) in AEC 1,2,3 Sediment (Freshwater)

Property Location					*On-Site*	Off-Site	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*
Surface Water Location					Pond upgradient	Stream at Road	Stream upgradient	Stream upgradient	Small pond at landfill height	Small pond at landfill height	Small pond at landfill height	Stream at landfill height	Stream below landfill height	Stream at landfill height	Stream at landfill height
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC2**	**AEC 2**	**AEC 2**
Station ID					**AEC1-SD09-1**	**AEC2-SD09-1**	**AEC2-SD09-2**	**AEC2-SD09-3**	**A2-SD08-3**	**AEC2-SD09-4**	**AEC2-SD09-5**	**AEC2-SD09-6**	**A2-SD08-4**	**AEC2-SD16-07**	**AEC2-SD09-7**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	17/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	*6/Sep/08*	15/Sep/09	15/Sep/09	15/Sep/09	6/Sep/08	1/Oct/16	15/Sep/09
Aroclor 1016	-	-	-	-	<0.02	<0.02	<0.06	<0.03	<0.01	<0.08	<0.3	<0.4	<0.050	-	<0.3
Aroclor 1221	-	-	-	-	<0.03	<0.03	<0.1	<0.06	<0.01	<0.2	<0.6	<1	<0.050	-	<0.6
Aroclor 1232	-	-	-	-	<0.02	<0.02	<0.06	<0.03	<0.01	<0.08	<0.3	<0.4	<0.050	-	<0.3
Aroclor 1242	-	-	-	-	<0.02	<0.02	<0.06	<0.03	<0.01	<0.08	<0.3	<0.4	<0.050	<0.45	<0.3
Aroclor 1248	-	-	-	-	<0.02	<0.02	<0.06	<0.03	<0.01	<0.08	<0.3	<0.4	<0.050	<0.45	<0.3
Aroclor 1254	0.06	0.34	0.0633	0.709	<0.02	<0.02	<0.06	<0.03	0.024	<0.08	<0.3	<0.4	<0.050	<0.45	<0.3
Aroclor 1260	-	-	-	-	<0.02	<0.02	0.27	0.05	0.198	0.20	0.6	1.8	0.56	1.4	0.7
Aroclor 1262	-	-	-	-	<0.02	<0.02	<0.06	<0.03	<0.01	<0.08	<0.3	<0.4	<0.050	-	<0.3
Aroclor 1268	-	-	-	-	<0.02	<0.02	<0.06	<0.03	<0.01	<0.08	<0.3	<0.4	<0.050	-	<0.3
Polychlorinated biphenyls	0.0341	0.277	0.0215	0.189	<0.03	<0.03	0.27	0.05	0.222	0.2	0.6	1.8	0.56	1.4	0.7

Notes

1 = CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).

2 = CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).

20 = RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline

20 = Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater

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TABLE C3 - Polycyclic Aromatic Hydrocarbons (PAHs) in AEC 1,2,3 Sediment (Freshwater)

Property Location					*On-Site*	*On-Site*	*On-Site*
Surface Water Location					Pond upgradient	Small pond at landfill height	Stream below landfill
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**AEC 1**	**AEC 2**	**AEC 2**
Station ID					**AEC1-SD09-1**	**AEC2-SD16-07**	**A2-SD08-4**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	17/Sep/09	1/Oct/16	*9/Sep/08*
Acenaphthene	0.00671	0.0889	0.00671	0.0889	**<0.02**	0.031	**<0.040**
Acenaphthylene	0.00587	0.128	0.00587	0.128	**<0.01**	***<0.015***	**<0.050**
Anthracene	0.0469	0.245	0.0469	0.245	<0.01	0.038	**<0.050**
Benz(a)anthracene	0.0317	0.385	0.0748	0.693	<0.02	0.18	**<0.050**
Benzo(a)pyrene	0.0319	0.782	0.0888	0.763	<0.01	0.12	**<0.050**
Benzo(b)fluoranthene	-	-	-	-		0.29	0.061
Benzo(g,h,i)perylene	-	-	-	-	<0.04	0.066	<0.050
Benzo(k)fluoranthene	-	-	-	-	<0.02	0.083	<0.050
Chrysene	0.0571	0.862	0.108	0.846	<0.02	0.17	<0.050
Dibenz(a,h)anthracene	0.00622	0.135	0.00622	0.135	**<0.04**	***<0.015***	**<0.050**
Fluoranthene	0.111	2.355	0.113	1.494	0.02	0.20	***0.05***
Fluorene	0.0212	0.144	0.0212	0.144	<0.01	0.031	**<0.050**
Indeno(1,2,3-c,d)pyrene	-	-	-	-	<0.04	0.091	<0.050
2-Methylnaphthalene	0.0202	0.201	0.0202	0.201	<0.01	0.028	**<0.050**
Naphthalene	0.0346	0.391	0.0346	0.391	<0.01	0.031	**<0.050**
Phenanthrene	0.0419	0.515	0.0867	0.544	0.01	0.24	**<0.050**
Pyrene	0.053	0.875	0.153	1.398	0.01	0.18	**<0.050**

Notes

1 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
2 =	CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater

TABLE C4 - Petroleum Hydrocarbons in AEC 1,2,3 Sediment (Freshwater)

Location							*On-Site*	Off-Site	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*
Surface Water Feature							Pond upgradient	Ditch by the road	Stream upgradient	Stream upgradient	Small pond at landfill height	Small pond at landfill height	Small pond at landfill height	Stream at landfill height	Stream below landfill	Stream below landfill	Small pond at landfill height
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**CCME Soil PL[3]**	**CCME Soil CL[4]**	**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**
Station ID							**AEC1-SD09-1**	**AEC2-SD09-1**	**AEC2-SD09-2**	**AEC2-SD09-3**	**AEC2-SD09-4**	**A2-SD08-3**	**AEC2-SD09-5**	**AEC2-SD09-6**	**A2-SD08-4**	**AEC2-SD09-7**	**AEC2-SD16-07**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**			17/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	7/Sep/08	15/Sep/09	15/Sep/09	7/Sep/08	15/Sep/09	1/Oct/16
Moisture content	-	-	-	-	-	-	23.0	35.0	75.0	54.0	82.0	-	55.0	66.0	-	61.0	-
Benzene	-	-	-	-	0.03	0.03	<0.002	<0.002	<0.008	<0.002	<0.002	<0.040	<0.002	<0.002	<0.040	<0.002	<0.015
Ethylbenzene	-	-	-	-	0.082	0.082	<0.002	<0.002	<0.008	<0.004	<0.01	<0.050	<0.004	<0.004	<0.050	<0.006	<0.030
Toluene	-	-	-	-	0.37	0.37	<0.002	0.008	<0.008	<0.004	<0.01	<0.050	<0.004	<0.004	<0.050	<0.006	<0.060
m+p-Xylene	-	-	-	-	-	-	<0.002	<0.002	<0.008	<0.004	<0.01	<0.050	<0.004	<0.004	<0.050	<0.006	<0.12
o-Xylene	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.004	<0.01	<0.050	<0.004	<0.004	<0.050	<0.006	<0.060
Xylenes (total)	-	-	-	-	2.4	11	<0.002	<0.002	<0.008	<0.004	<0.01	<0.10	<0.004	<0.004	<0.10	<0.006	<0.12
F1 (C6-C10)	-	-	-	-	-	-	<10	<10	<40	<10	<10	<10	<20	<30	<10	<30	<30
F1 (C6-C10) minus BTEX	-	-	-	-	30	240	<10	<10	<40	<10	<10	<10	<20	<30	<10	<30	<30
F2 (C10-C16)	-	-	-	-	150	260	<10	130	<40	<10	1500	<30	<10	35	33	<30	<30
F3 (C16-C34)	-	-	-	-	300	1700	52	110	190	<10	4100	220	160	620	248	330	200
F4 (C34-C50)	-	-	-	-	2800	3300	50	<10	<40	<10	4500	94	110	390	99	390	<150
F4 Gravimetric	-	-	-	-	-	-	-	-	-	-	23000	<500	-	-	<500	-	-
Reached Baseline at C50	-	-	-	-	-	-	Yes	Yes	Yes	Yes	No	-	Yes	Yes	-	Yes	-

All units in ug/g, unless otherwise noted.

Notes

1 = CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).

2 = CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).

3 = CCME, Canadian Soil Quality Guidelines (SQGs) for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use

4 = CCME, Canadian Soil Quality Guidelines (SQGs) for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use

20 = RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline

20 = Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater

20 = Denotes exceedance of CCME SQGs commercial land use in the absence of CCME ISQG or PEL guidelines

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TABLE C5 - Pesticides in AEC 1,2,3 Sediment (Freshwater)

Location					*On-Site*	Off-Site	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*
Surface Water Feature					Pond Upgradient	Ditch on road	Stream upgradient	Stream upgradient	Pond at landfill height	Stream at landfill height	Stream at landfill height	Stream at landfill height	Stream below landfill
Area ID	**CCME Freshwater Sediment[1]**		**CCME Marine Sediment[2]**		**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**
Station ID					**AEC1-SD09-1**	**AEC2-SD09-1**	**AEC2-SD09-2**	**AEC2-SD09-3**	**AEC2-SD09-4**	**AEC2-SD09-5**	**AEC2-SD09-6**	**AEC2-SD09-7**	**A2-SD08-4**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**	17/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	6/Sep/08
Aldrin	-	-	-	-	<0.002	<0.002	<0.008	<0.004	<0.01	<0.004	<0.006	<0.004	<0.0020
Chlordane	0.0045	0.00887	0.00226	0.00479	<0.002	<0.002	<0.008	<0.004	<0.01	<0.004	<0.006	<0.004	-
alpha-Chlordane	-	-	-	-	<0.002	<0.002	<0.008	<0.004	<0.01	<0.004	<0.006	<0.004	<0.0020
trans-Chlordane	-	-	-	-	<0.002	<0.002	<0.008	<0.004	<0.01	<0.004	<0.006	<0.004	<0.0020
2,4'-DDD	-	-	-	-	<0.002	0.009	0.04	0.014	<0.03	<0.004	<0.006	<0.004	<0.0020
4,4'-DDD	-	-	-	-	0.009	0.037	0.22	0.09	0.09	<0.01	0.025	0.013	0.0149
DDD (total)	0.00354	0.00851	0.00122	0.00781	0.009	0.046	0.26	0.1	0.11	**<0.01**	0.025	0.013	0.0149
2,4'-DDE	-	-	-	-	<0.002	<0.002	<0.008	<0.004	<0.01	<0.004	<0.006	<0.004	<0.0020
4,4'-DDE	-	-	-	-	0.004	0.009	0.055	0.017	0.03	<0.004	0.009	0.006	0.029
DDE (total)	0.00142	0.00675	0.00207	0.374	0.004	0.009	0.055	0.017	0.03	**<0.004**	0.009	0.006	0.029
2,4'-DDT	-	-	-	-	<0.002	<0.002	0.014	0.005	<0.01	<0.02	0.036	0.015	<0.0020
4,4'-DDT	-	-	-	-	0.002	0.013	0.25	0.043	<0.03	<0.06	0.16	<0.07	0.0175
DDT plus metabolites	-	-	-	-	0.015	0.068	0.58	0.17	0.14	<0.06	0.23	<0.07	-
DDT (total)	0.00119	0.00477	0.00119	0.00477	0.002	0.013	0.26	0.048	**<0.03**	**<0.06**	0.2	**<0.07**	0.0175
Dieldrin	0.00285	0.00667	0.000071	0.0043	<0.002	<0.002	**<0.008**	**<0.004**	**<0.01**	**<0.006**	**<0.01**	**<0.004**	<0.0020
Endosulfan	-	-	-	-	<0.002	<0.002	<0.008	<0.004	<0.01	<0.006	<0.006	<0.004	-
alpha-Endosulfan	-	-	-	-	<0.002	<0.002	<0.008	<0.004	<0.01	<0.004	<0.006	<0.004	<0.0020
beta-Endosulfan	-	-	-	-	<0.002	<0.002	<0.008	<0.004	<0.01	<0.006	<0.006	<0.004	<0.0020
Endrin	0.00267	0.0624	0.00267	0.00624	<0.002	<0.002	**<0.008**	**<0.004**	**<0.01**	**<0.004**	**<0.006**	**<0.004**	**<0.0050**
gamma-HCH	0.00094	0.00138	0.000032	0.000099	**<0.002**	**<0.002**	**<0.008**	**<0.004**	**<0.01**	**<0.004**	**<0.006**	**<0.004**	-
Heptachlor	-	-	-	-	<0.002	<0.002	<0.008	<0.004	<0.01	<0.004	<0.006	<0.004	<0.0020
Heptachlor epoxide	0.0006	0.00274	0.00006	0.000274	**<0.002**	**<0.002**	**<0.008**	**<0.004**	**<0.01**	**<0.004**	**<0.006**	**<0.004**	**<0.0020**
Hexachlorobenzene	-	-	-	-	<0.002	<0.002	<0.008	<0.004	<0.01	<0.004	<0.006	<0.004	-
Methoxychlor	-	-	-	-	<0.008	<0.008	<0.03	<0.02	<0.04	<0.02	<0.02	<0.02	<0.0050

Notes

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2 = CCME, Canadian Sediment Quality Guidelines for Protection of Aquatic Life, Update 2015. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight).

20 = RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline

20 = Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater

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TABLE C6 - Volatile Organic Compounds (VOCs) in AEC 1,2,3 Sediment

Location							*On-Site*	*On-Site*	Off-Site	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*	*On-Site*
Surface Water Feature							Stream at landfill height	Pond upgradient	Ditch at Road	Stream upgradient	Stream upgradient	Small pond at landfill height	Stream at landfill height	Stream at landfill height	Stream at landfill height
Area ID	**CCME Freshwater [1]**		**CCME Marine[2]**		**CCME Soil PL[3]**	**CCME Soil CL[4]**	**AEC 2**	**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**
Station ID							**A2-SD08-4**	**AEC1-SD09-1**	**AEC2-SD09-1**	**AEC2-SD09-2**	**AEC2-SD09-3**	**AEC2-SD09-4**	**AEC2-SD09-5**	**AEC2-SD09-6**	**AEC2-SD09-7**
Date	**ISQG**	**PEL**	**ISQG**	**PEL**			9/Sep/08	17/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09
Acetone	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-
Benzene	-	-	-	-	0.03	0.03	<0.050	<0.002	<0.002	<0.008	<0.002	<0.002	<0.002	<0.002	<0.002
Bromodichloromethane	-	-	-	-	-	-	<0.050	<0.002	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	<0.050	<0.002	-	-	-	-	-	-	-
Bromomethane	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
Carbon tetrachloride	-	-	-	-	5	50	<0.050	<0.002	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	1	10	<0.050	<0.002	-	-	-	-	-	-	-
Chlorodibromomethane	-	-	-	-	-	-	<0.10	<0.002	-	-	-	-	-	-	-
Chloroform	-	-	-	-	5	50	<0.10	<0.002	-	-	-	-	-	-	-
1,2-Dichlorobenzene	-	-	-	-	1	10	<0.050	<0.002	-	-	-	-	-	-	-
1,3-Dichlorobenzene	-	-	-	-	1	10	<0.050	<0.002	-	-	-	-	-	-	-
1,4-Dichlorobenzene	-	-	-	-	1	10	<0.050	<0.002	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	5	50	<0.050	<0.002	-	-	-	-	-	-	-
1,2-Dichloroethane	-	-	-	-	5	50	<0.050	<0.002	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	5	50	<0.050	<0.002	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	<0.050	<0.002	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	<0.60	<0.002	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	5	50	<0.050	<0.003	-	-	-	-	-	-	-
1,2-Dichloropropane	-	-	-	-	5	50	<0.050	<0.002	-	-	-	-	-	-	-
cis-1,3-Dichloropropene	-	-	-	-	-	-	<0.050	<0.002	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	-	-	-	-	-	-	<0.050	<0.002	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	0.082	0.082	<0.20	<0.002	<0.002	<0.008	<0.004	<0.01	<0.004	<0.004	<0.006
Ethylene dibromide	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	2	10	-	<0.002	<0.002	<0.008	<0.004	<0.01	<0.004	<0.006	<0.004
Hexachlorobutadiene	-	-	-	-	-	-	-	<0.01	<0.01	<0.04	<0.02	<0.05	<0.02	<0.03	<0.02
Methyl ethyl ketone	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-
Methyl isobutyl ketone	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-
Methyl-tert-butylether	-	-	-	-	-	-	<0.050	<0.002	-	-	-	-	-	-	-
Styrene	-	-	-	-	5	50	<0.050	<0.002	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	<0.050	<0.002	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	5	50	<0.050	<0.002	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	0.2	0.5	0.12	<0.002	-	-	-	-	-	-	-
Toluene	-	-	-	-	0.37	0.37	<0.050	<0.002	0.008	<0.008	<0.004	<0.01	<0.004	<0.004	<0.006
1,1,1-Trichloroethane	-	-	-	-	5	50	<0.050	<0.002	-	-	-	-	-	-	-
1,1,2-Trichloroethane	-	-	-	-	5	50	<0.015	<0.002	-	-	-	-	-	-	-
Trichloroethene	-	-	-	-	0.01	0.01	<0.10	<0.002	-	-	-	-	-	-	-
Vinyl chloride	-	-	-	-	-	-	<0.050	<0.002	-	-	-	-	-	-	-
m+p-Xylene	-	-	-	-	-	-	<0.10	<0.002	<0.002	<0.008	<0.004	<0.01	<0.004	<0.004	<0.006
o-Xylene	-	-	-	-	-	-	<0.050	<0.002	<0.002	<0.002	<0.004	<0.01	<0.004	<0.004	<0.006
Xylenes (total)	-	-	-	-	2.4	11	<0.10	<0.002	<0.002	<0.008	<0.004	<0.01	<0.004	<0.004	<0.006

Notes

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3 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use
4 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use
20 =	RDL exceeds at least one of the ISQG or PEL Marine or Freshwater guideline
20 =	Denotes exceedance of CCME ISQG or PEL guidelines for Freshwater
20 =	Denotes exceedance of CCME SQGs commercial landuse in the absence of CCME ISQG or PEL guidelines

APPENDIX B.D

Soil in AEC 4 (Wildland Scenario):

B.D1 – Metals and Inorganics

B.D2 – Polychlorinated Biphenyls (PCBs)

B.D3 – Polyaromatic Hydrocarbons (PAHs)

B.D4 – Petroleum Hydrocarbons

B.D5 – Volatile Organic Compounds (VOCs)

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TABLE D1 - Metals and Inorganics in AEC 4 Soil

Location				Off-Site	On-Site	On-Site	On-Site	On-Site	On-Site	Off-Site	Off-Site	Off-Site	Off-Site	Off-Site	Off-Site
Soil Location				Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill		
Area ID	**CCME Soil AL[1]**	**CCME Soil PL[2]**	**CCME Soil CL[3]**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**BACKGROUND**	**BACKGROUND**
Station ID				**A3-TP08-15**	**A3-TP08-16**	**A3-TP08-18**	**AEC3-TP09-4**	**AEC3-TP09-6**	**AEC3-TP09-7**	**A4-TP08-1**	**A4-TP08-2**	**AEC4-TP09-1**	**AEC4-TP09-2**	**TP-BK-1**	**TP-BK-2**
Date				7/Sep/08	7/Sep/08	7/Sep/08	17/Sep/09	16/Sep/09	16/Sep/09	8/Sep/08	8/Sep/08	16/Sep/09	16/Sep/09	9/Sep/08	9/Sep/08
Aluminum	-	-	-	-	-	-	3700	4800	4700	-	-	4300	4300	-	-
Antimony	20	20	40	<10	<10	<10	<0.2	<0.2	<0.2	<10	<10	<0.2	<0.2	<10	<10
Arsenic	12	12[a]	12[a]	<5.0	<5.0	<5.0	2	2	2	<5.0	<5.0	2	2	<5.0	<5.0
Barium	750	500	2000	35.5	43	31.8	22.0	28.0	28.0	30.7	35	29.0	22.0	29.8	23.5
Beryllium	4	4[a]	8[a]	<0.50	<0.50	<0.50	<0.2	<0.2	<0.2	<0.50	<0.50	<0.2	<0.2	<0.50	<0.50
Cadmium	1.4	10	22	<0.50	<0.50	<0.50	<0.1	<0.1	<0.1	<0.50	<0.50	<0.1	<0.1	<0.50	<0.50
Calcium	-	-	-	-	-	-	2300	2300	2400	-	-	2200	2500	-	-
Chromium	64	64	87	20.3	16.8	19	16	19	19	14.2	18.3	15	14	21.8	10.2
Chromium (VI)	0.4	0.4	1.4	-	-	-	<0.2	<0.2	<0.2	-	-	<0.2	<0.2	-	-
Cobalt	40	50[a]	300[a]	3.8	3.7	2.9	2.5	2.6	2.4	3	3.6	2.2	3.4	5.2	3.2
Copper	63	63	91	12.3	5.8	6.7	4.0	6.2	6.0	6.1	7.5	5.8	6.0	8.8	5.2
Iron	-	-	-	-	-	-	21000	19000	21000	-	-	16000	9900	-	-
Lead	70	140	260	<30	<30	<30	4	4	3	<30	<30	3	2	<30	<30
Magnesium	-	-	-	-	-	-	2100	2700	2700	-	-	2400	2600	-	-
Manganese	-	-	-	-	-	-	45	55	50	-	-	63	54	-	-
Mercury	6.6	6.6	24	0.0122	<0.0050	<0.0050	0.09	<0.05	<0.05	0.0061	<0.0050	<0.05	<0.05	<0.0050	<0.0050
Molybdenum	5	10[a]	40[a]	<4.0	<4.0	<4.0	1.8	1.8	1.5	<4.0	<4.0	1.4	5.6	<4.0	<4.0
Nickel	45	45	89	7.2	6	5.6	4.5	5.0	4.7	<5.0	6.8	4.5	6.5	6.2	<5.0
Phosphorus	-	-	-	-	-	-	570	830	850	-	-	710	820	-	-
Potassium	-	-	-	-	-	-	640	930	960	-	-	960	890	-	-
Selenium	1	1	2.9	***<2.0***	***<2.0***	***<2.0***	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5
Silver	20	20[a]	40[a]	<2.0	<2.0	<2.0	<0.2	<0.2	<0.2	<2.0	<2.0	<0.2	<0.2	<2.0	<2.0
Sodium	-	-	-	-	-	-	110	140	140	-	-	120	280	-	-
Strontium	-	-	-	-	-	-	9	7	7	-	-	7	8	-	-
Thallium	1	1	1	<1.0	<1.0	<1.0	<0.05	<0.05	0.05	<1.0	<1.0	0.05	<0.05	<1.0	<1.0
Tin	5	50	300	<5.0	<5.0	<5.0	-	-	-	<5.0	<5.0	-	-	<5.0	<5.0
Vanadium	130	130	130	46.8	34.1	40.2	44	47	47	39.9	39.1	39	29	55.0	24.2
Zinc	200	200	360	33.5	33.8	35.2	31	27	27	33.6	35.7	36	36	35.6	21.1

All units in ug/g, unless otherwise noted.

Notes:

1=	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Agricultural (Wildland) Land-use, course-grained soil
2 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use, course-grained soil
3 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use, course-grained soil
20 =	RDL exceeds at least one SQG
20 =	Denotes exceedance of CCME SQG for Agricultural (Wildland) Land-use
-' =	No Guideline

ARCADIS Design & Consultancy for natural and built assets

TABLE D2 - Polychlorinated Biphenyls (PCBs) in AEC 4 Soil

Location				On-Site	On-Site	Off-Site	Off-Site
Soil Location				Downgradient of Landfill	Downgradient of Landfill	Downgradient of Landfill	Downgradient of Landfill
Area ID	**CCME Soil AL[1]**	**CCME Soil PL[2]**	**CCME Soil CL[3]**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID				**A3-TP08-16**	**A3-TP08-18**	**A4-TP08-1**	**A4-TP08-2**
Date				7/Sep/08	7/Sep/08	8/Sep/08	8/Sep/08
Aroclor 1016	-	-	-	<0.050	<0.080	<0.050	<0.050
Aroclor 1221	-	-	-	<0.050	<0.080	<0.050	<0.050
Aroclor 1232	-	-	-	<0.050	<0.080	<0.050	<0.050
Aroclor 1242	-	-	-	<0.050	<0.080	<0.050	<0.050
Aroclor 1248	-	-	-	<0.050	<0.080	<0.050	<0.050
Aroclor 1254	-	-	-	<0.050	<0.080	<0.050	<0.050
Aroclor 1260	-	-	-	<0.050	<0.080	<0.050	<0.050
Aroclor 1262	-	-	-	<0.050	<0.080	<0.050	<0.050
Aroclor 1268	-	-	-	<0.050	<0.080	<0.050	<0.050
Polychlorinated biphenyls	0.5	1.3	33	<0.050	<0.080	<0.050	<0.050

All units in ug/g, unless otherwise noted.

Notes:

1=	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Agricultural (Wildland) Land-use, course-grained soil
2 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use, course-grained soil
3 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use, course-grained soil
20 =	RDL exceeds at least one SQG
20 =	Denotes exceedance of CCME SQG for Agricultural (Wildland) Land-use
-' =	No Guideline

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TABLE D3 - Polycyclic Aromatic Hydrocarbons (PAHs) in AEC 4 Soil

Location						On-Site Downgradient of Landfill	On-Site Downgradient of Landfill	On-Site Downgradient of Landfill	Off-Site Downgradient of Landfill
Soil Location									
Area ID	**CCME Soil AL[1]**	**CCME Soil PL[2]**	**CCME Soil CL[3]**	**Note**	**MOE Table 9[4]**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID						**AEC3-TP09-6**	**AEC3-TP09-7**	**A3-TP08-14**	**AEC4-TP09-1**
Date						16/Sep/09	16/Sep/09	7-Sep-08	16/Sep/09
Acenaphthene	0.28	0.28	0.28	b	0.072	<0.01	<0.01	<0.040	<0.01
Acenaphthylene	320	320	320	b	0.093	<0.005	<0.005	<0.050	<0.005
Anthracene	2.5	2.5	32	a	0.22	<0.005	<0.005	<0.050	<0.005
Benzo(a)anthracene	0.10	1	10	d	---	<0.01	<0.01	<0.050	<0.01
Benzo(a)pyrene	20	20	72	a	---	<0.005	<0.005	<0.050	<0.005
Benzo(b)fluoranthene	0.10	1	10	d	---	-	-	<0.050	-
Benzo(g,h,i)perylene	---	---	---		0.68	<0.02	<0.02	<0.050	<0.02
Benzo(k)fluoranthene	0.10	1	10	d	---	<0.01	<0.01	<0.050	<0.01
Chrysene	---	---	---		2.80	<0.01	<0.01	<0.050	<0.01
Dibenz(a,h)anthracene	0.10	1	10	d	---	<0.02	<0.02	<0.050	<0.02
Fluoranthene	50.00	50	180	a	0.69	<0.005	<0.005	<0.050	<0.005
Fluorene	0.25	0.25	0.25	b	0.19	<0.005	<0.005	<0.050	<0.005
Indeno(1,2,3-cd)pyrene	0.10	1	10	d	---	<0.02	<0.02	<0.050	<0.02
2-Methylnaphthalene	---	---	---		0.59	<0.005	<0.005	<0.050	<0.005
Naphthalene	0.013	0.013	0.013	b	0.090	<0.005	<0.005	<0.050	<0.005
Phenanthrene	0.046	0.046	0.046	b	0.690	<0.005	<0.005	<0.050	<0.005
Pyrene	0.10	10	100	d	1.00	<0.005	<0.005	<0.050	<0.005
Benzo(a)pyrene Total Potency Equivalents	5.3	5.3	5.3		---	0.0293	0.0293	0.121	0.0293

All units in ug/g, unless otherwise noted.

Notes:

1=	CCME (2010), Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Polycyclic aromatic hydrocarbons (PAHs) Agricultural (Wildland) Land-use, course-grained soil
2 =	CCME (2010), Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Polycyclic aromatic hydrocarbons (PAHs) Residential/Parkland use, course-grained soil
3 =	CCME (2010), Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Polycyclic aromatic hydrocarbons (PAHs) Commercial/Industrial Land-use, course-grained soil
4 =	Ontario Ministry of the Environment (MOE), 2011. Soil, Groundwater, and Sediment Standards for Use Under Part XV. 1 of the Environmental Protection Act (EPA); April 15, 2011. Table 9. Generic Site Condition Standards for Use within 30m of a Water Body in a Non-Potable Ground Water Condition
a	CCME SQG_E
b	CCME SQG_E for protection of freshwater life. Also protective for soil and food ingestion residential.
c	CCME SQG_E for soil and food ingestion only.
d	Interim Soil Quality Criteria
	TPE - Benzo(a)pyrene Total Potency Equivalents, which is the sum of estimated cancer potency relative to B[a]P for all potentially carcinogenic unsubstituted PAHs. The B[a]P TPE for a soil sample is calculated by multiplying the concentration of each PAH in the sample by its B[a]P Potency Equivalence Factor (PEF), and summing the products. PEFs are as follows: Benzo(a)anthracene, 0.1; benzo(a)pyrene, 1; benzo(b+j+k)fluoranthene, 0.1; benzo(g,h,i)perylene, 0.01; chrysene, 0.01; dibenzo(a,h)anthracene, 1; ideno(1,2,3-c,d)pyrene, 0.1.
20 =	Denotes exceedance of CCME SQG for Agricultural (Wildland) Land-use
20 =	Denotes exceedance of MOE Table 9

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TABLE D4 - Petroleum Hydrocarbons in AEC 4 Soil

Location							Off-Site	On-Site	On-Site	On-Site	On-Site	Off-Site	Off-Site	Off-Site	Off-Site
Soil Location							Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill	Down-gradient of landfill
Area ID	**CCME Soil AL [1]**	**CCME Soil PL [2]**	**CCME Soil CL [3]**	**CWS Soil PL [4]**	**CWS Soil CL [5]**	**CWS Soil AL [6]**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID							**A3-TP08-15**	**A3-TP08-16**	**A3-TP08-18**	**AEC3-TP09-6**	**AEC3-TP09-7**	**A4-TP08-1**	**A4-TP08-2**	**AEC4-TP09-1**	**AEC4-TP09-2**
Date							*7/Sep/08*	*7/Sep/08*	*7/Sep/08*	16/Sep/09	16/Sep/09	*8/Sep/08*	*8/Sep/08*	16/Sep/09	16/Sep/09
Moisture content		-	-	-	-	-	-	-	-	16.0	20.0	-	-	6.9	34.0
Benzene	0.03	0.03	0.03	-	-	-	<0.040	<0.040	<0.040	<0.002	<0.002	<0.03	<0.03	<0.002	<0.002
Ethylbenzene	0.082	0.082	0.082	-	-	-	<0.050	<0.050	<0.050	<0.002	<0.002	<0.050	<0.050	<0.002	<0.002
Toluene	0.4	0.37	0.37	-	-	-	<0.050	<0.050	<0.050	<0.002	<0.002	<0.050	<0.050	<0.002	<0.002
m+p-Xylene	-	-	-	-	-	-	<0.050	<0.050	<0.050	<0.002	<0.002	<0.050	<0.050	<0.002	<0.002
o-Xylene	-	-	-	-	-	-	<0.050	<0.050	<0.050	<0.002	<0.002	<0.050	<0.050	<0.002	<0.002
Xylenes (total)	11	11	11	-	-	-	<0.10	<0.10	<0.10	<0.002	<0.002	<0.10	<0.10	<0.002	<0.002
F1 (C6-C10)	-	-	-	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10
F1 (C6-C10) minus BTEX	-	-	-	30	320	30	<10	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16)	-	-	-	150	260	150	<30	<30	<30	<10	<10	<30	<40	<10	<10
F3 (C16-C34)	-	-	-	300	1700	300	<50	<50	<50	<10	<10	<50	<50	<10	100
F4 (C34-C50)	-	-	-	2800	3300	2800	<50	<50	<50	<10	<10	<50	<50	<10	51
Reached Baseline at C50	-	-	-	-	-		-	-	-	Yes	Yes	-	-	Yes	Yes

All units in ug/g, unless otherwise noted.

Notes:

1= CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Agricultural (Wildland) Land-use, course-grained soil

2 = CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use, course-grained soil

3 = CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use, course-grained soil

4 = CCME (2008) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1 levels for PHCs, Residential / Parkland Use in coarse-grained surface soils.

5 = CCME (2008) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1 levels for PHCs, Commercial Use in coarse-grained surface soils.

6 = RDL exceeds at least one SQG

20 = Denotes exceedance of CCME SQG for Agricultural (Wildland) Land-use

20 = No Guideline

-' =

TABLE D5 - Volatile Organic Compounds in AEC 4 Soil

Location				On-Site Downgradient of Landfill	On-Site Downgradient of Landfill	Off-Site Downgradient of Landfill	Off-Site Downgradient of Landfill	Off-Site Downgradient of Landfill
Soil Location								
Area ID	**CCME Soil AL[1]**	**CCME Soil PL[2]**	**CCME Soil CL[3]**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID				**AEC3-TP09-6**	**AEC3-TP09-7**	**A3-TP08-15**	**AEC4-TP09-1**	**AEC4-TP09-2**
Date				16/Sep/09	16/Sep/09	7-Sep-08	16/Sep/09	16/Sep/09
Acetone	-	-	-	<0.1	<0.1	-	<0.1	<0.1
Benzene	0.03	0.03	0.03	<0.002	<0.002	<0.040	<0.002	<0.002
Bromodichloromethane	-	-	-	<0.002	<0.002	<0.050	<0.002	<0.002
Bromoform	-	-	-	<0.002	<0.002	<0.050	<0.002	<0.002
Bromomethane	-	-	-	<0.003	<0.003	-	<0.003	<0.003
Carbon tetrachloride	0.1	5	50	<0.002	<0.002	<0.050	<0.002	<0.002
Chlorobenzene	0.1	1[a]	10[a]	<0.002	<0.002	<0.050	<0.002	<0.002
Chlorodibromomethane	-	-	-	<0.002	<0.002	<0.050	<0.002	<0.002
Chloroform	0.1	5	50	<0.002	<0.002	<0.10	<0.002	<0.002
1,2-Dichlorobenzene	0.1	1[a]	10[a]	<0.002	<0.002	<0.050	<0.002	<0.002
1,3-Dichlorobenzene	0.1	1[a]	10[a]	<0.002	<0.002	<0.050	<0.002	<0.002
1,4-Dichlorobenzene	0.1	1[a]	10[a]	<0.002	<0.002	<0.050	<0.002	<0.002
1,1-Dichloroethane	0.1	5	50	<0.002	<0.002	<0.050	<0.002	<0.002
1,2-Dichloroethane	0.1	5	50	<0.002	<0.002	<0.050	<0.002	<0.002
1,1-Dichloroethene	0.1	5	50	<0.002	<0.002	<0.050	<0.002	<0.002
cis-1,2-Dichloroethene	0.1	5	50	<0.002	<0.002	<0.050	<0.002	<0.002
trans-1,2-Dichloroethene	0.1	5	50	<0.002	<0.002	<0.050	<0.002	<0.002
Dichloromethane	0.1	5	50	<0.003	<0.003	<0.60	<0.003	<0.003
1,2-Dichloropropane	0.1	5	50	<0.002	<0.002	<0.050	<0.002	<0.002
cis-1,3-Dichloropropene	0.1	-	-	<0.002	<0.002	<0.050	<0.002	<0.002
trans-1,3-Dichloropropene	0.1	-	-	<0.002	<0.002	<0.050	<0.002	<0.002
Ethylbenzene	0.082	0.082	0.082	<0.002	<0.002	<0.050	<0.002	<0.002
Ethylene dibromide	-	-	-	<0.002	<0.002	-	<0.002	<0.002
Hexachlorobenzene	0.05	2	10	-	-	-	-	-
Hexachlorobutadiene	-	-	-	-	-	-	-	-
Methyl ethyl ketone	-	-	-	<0.03	<0.03	-	<0.03	<0.03
Methyl isobutyl ketone	-	-	-	<0.03	<0.03	-	<0.03	<0.03
Methyl-tert-butylether	-	-	-	<0.002	<0.002	<0.20	<0.002	<0.002
Styrene	0.1	5[a]	50[a]	<0.002	<0.002	<0.050	<0.002	<0.002
1,1,1,2-Tetrachloroethane	-	-	-	<0.002	<0.002	<0.050	<0.002	<0.002
1,1,2,2-Tetrachloroethane	0.1	5	50	<0.002	<0.002	<0.050	<0.002	<0.002
Tetrachloroethene	0.1	0.2	0.5	0.033	<0.002	<0.050	<0.002	0.057
Toluene	0.37	0.37	0.37	<0.002	<0.002	<0.050	<0.002	<0.002
1,1,1-Trichloroethane	0.1	5	50	<0.002	<0.002	<0.050	<0.002	<0.002
1,1,2-Trichloroethane	0.1	5	50	<0.002	<0.002	<0.050	<0.002	<0.002
Trichloroethene	0.01	0.01	0.01	<0.002	<0.002	<0.01 5	<0.002	0.005
Vinyl chloride	-	-	-	<0.002	<0.002	<0.10	<0.002	<0.002
m+p-Xylene	-	-	-	<0.002	<0.002	<0.050	<0.002	<0.002
o-Xylene	-	-	-	<0.002	<0.002	<0.050	<0.002	<0.002
Xylenes (total)	11	11	11	<0.002	<0.002	<0.10	<0.002	<0.002

All units in ug/g, unless otherwise noted.

Notes:

1=	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Agricultural (Wildland) Land-use, course-grained soil
2 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use, course-grained soil
3 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use, course-grained soil
20 =	RDL exceeds at least one SQG
20 =	Denotes exceedance of CCME SQG for Agricultural (Wildland) Land-use
-' =	No Guideline

APPENDIX B.E

Soil in AEC 1, 2, 3 (Commercial Scenario):

B.E1 – Metals and Inorganics

B.E2 – Polychlorinated Biphenyls (PCBs)

B.E3 – Polyaromatic Hydrocarbons (PAHs)

B.E4 – Petroleum Hydrocarbons

B.E5 – Pesticides

B.E6 – Volatile Organic Compounds (VOCs)

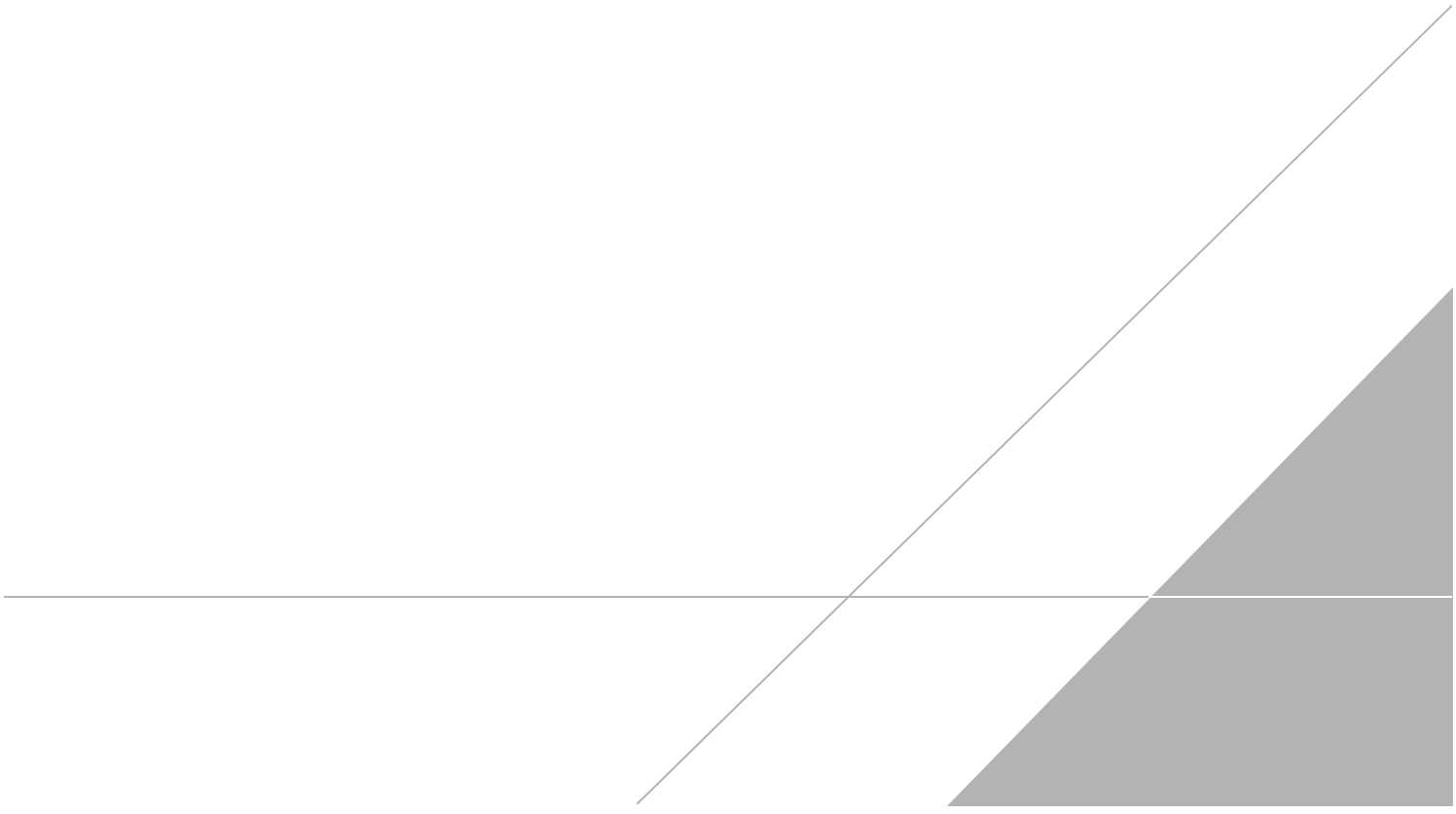

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TABLE E1 - Metals and Inorganics in AEC 1,2,3 Soil

Location				On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	Off-Site	On-Site
Soil Qualifier Location				Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Vehicle Dump	Vehicle Dump	Vehicle Dump	Vehicle Dump	Vehicle Dump	Main Landfill	Main Landfill
Area ID	**CCME Soil CL [1]**	**CCME Soil PL [2]**	**CCME AL [3]**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 3**	**AEC 3**
Station ID				**AEC1-TP09-1**	**AEC1-TP09-1**	**AEC1-TP09-3**	**AEC1-TP09-4**	**AEC1-TP09-5**	**A1-TP08-1**	**A1-TP08-2**	**A1-DUP 3**	**A1-TP08-3**	**A2-TP08-1**	**A2-TP08-2**	**AEC2-TP09-1**	**AEC2-TP09-2**	**AEC2-TP09-2**	**A3-TP08-1**	**A3-TP08-2**
Date				16/Sep/09	16/Sep/09	16/Sep/09	16/Sep/09	16/Sep/09	8/Sep/08	8/Sep/08	8/Sep/08	8/Sep/08	6/Sep/08	*6/Sep/08*	16/Sep/09	16/Sep/09	16/Sep/09	6/Sep/08	6/Sep/08
Aluminum	-	-	-	2600	4900	3700	4800	4700	-	-	-	-	-	-	5100	4700	3900	-	-
Antimony	40	20	20	<0.2	<0.2	<0.2	<0.2	2.0	<10	<10	<10	<10	<10	<10	0.9	1.1	0.8	<10	<10
Arsenic	12[a]	12[a]	12	1	<1	2	<1	1	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	1	1	1	<5.0	<5.0
Barium	2000	500	750	17.0	31.0	20.0	33.0	27.0	40.7	23	26.2	21.6	134	17.7	35.0	36.0	28.0	24.8	425
Beryllium	8[a]	4[a]	4	<0.2	<0.2	<0.2	<0.2	0.3	<0.50	<0.50	<0.50	<0.50	<0.50	1.02	0.3	<0.2	<0.2	<0.50	0.79
Cadmium	22	10	1.4	<0.1	<0.1	<0.1	<0.1	0.2	<0.50	<0.50	<0.50	<0.50	22.4	<0.50	0.4	0.7	0.6	<0.50	<0.50
Calcium	-	-	-	7700	2200	2000	2400	2300	-	-	-	-	-	-	2600	2200	2100	-	-
Chromium	87	64	64	21	20	19	24	21	20.4	10	12.2	12	22.1	6.4	20	20	18	15.6	8.4
Chromium (VI)	1.4	0.4	0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	-	-	-	<0.2	0.4	<0.2	-	-
Cobalt	300[a]	50[a]	40	4.3	3.8	3.3	5.4	5.9	5.9	3.9	4.1	3.4	5.3	2.1	5.1	4.4	3.7	4	2.6
Copper	91	63	63	11.0	6.7	5.9	9.0	14.0	103	8.7	9.2	6.3	29.2	6.4	20.0	93.0	18.0	14.9	18.3
Iron	-	-	-	20000	24000	22000	28000	27000	-	-	-	-	-	-	23000	20000	19000	-	-
Lead	260	140	70	2	3	3	4	150	190	<30	<30	<30	100	<30	49	83	66	<30	<30
Magnesium	-	-	-	1800	2600	2100	2300	2900	-	-	-	-	-	-	2400	2300	1900	-	-
Manganese	-	-	-	130	88	92	240	250	-	-	-	-	-	-	210	180	140	-	-
Mercury	24	6.6	6.6	<0.05	<0.05	<0.05	<0.05	<0.05	0.0054	<0.0050	<0.0050	<0.0050	0.0258	0.0474	<0.05	<0.05	<0.05	0.0099	0.0691
Molybdenum	40[a]	10[a]	5	<0.5	<0.5	<0.5	0.7	0.6	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	1.1	1.0	0.9	<4.0	<4.0
Nickel	89	45	45	6.1	6.4	5.5	7.7	8.0	8	5.1	5.5	<5.0	7.2	<5.0	7.6	6.7	5.7	5.6	<5.0
Phosphorus	-	-	-	630	780	630	650	590	-	-	-	-	-	-	680	650	520	-	-
Potassium	-	-	-	460	810	530	670	600	-	-	-	-	-	-	720	590	470	-	-
Selenium	2.9	1	1	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<2.0	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	40[a]	20[a]	20	<0.2	0.2	<0.2	<0.2	<0.2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<0.2	<0.2	<0.2	<2.0	<2.0
Sodium	-	-	-	120	110	<100	<100	<100	-	-	-	-	-	-	170	130	120	-	-
Strontium	-	-	-	14	4	5	5	7	-	-	-	-	-	-	7	6	6	-	-
Thallium	1	1	1	<0.05	0.09	<0.05	<0.05	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.05	0.05	<0.05	<1.0	<1.0
Tin	300	5	50	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<5.0	<5.0	-	-	-	<5.0	<5.0
Vanadium	130	130	130	38	52	49	68	58	44.2	32.3	33.4	35.5	40.3	17.9	43	41	38	38	13.9
Zinc	360	200	200	26	28	22	30	58	122	36.8	37.6	24.8	92.1	39.2	63	74	69	46.9	126

All units in ug/g, unless otherwise noted.

Notes:

1 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use, course-grained soil
2 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use, course-grained soil
3 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Agricultural Land-use, course-grained soil
20 =	RDL exceeds at least one SQG
20 =	Denotes exceedance of CCME SQG for Commercial Land-use
-' =	No Guideline

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TABLE E1 - Metals and Inorganics in AEC 1,2,3 Soil

Location				On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site
Soil Qualifier Location				Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill
Area ID	**CCME Soil CL[1]**	**CCME Soil PL[2]**	**CCME AL[3]**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**
Station ID				**A3-TP08-3**	**A3-TP08-4**	**A3-TP08-5**	**A3-DUP-1**	**A3-TP08-6**	**A3-TP08-7**	**A3-TP08-9**	**A3-TP08-10**	**A3-TP08-11**	**A3-TP08-12**	**A3-TP08-13**	**A3-TP08-DUP2**	**A3-TP08-14**	**A3-TP08-17**	**AEC3-TP09-5**
Date				6-Sep-08	6/Sep/08	6/Sep/08	6/Sep/08	6/Sep/08	6/Sep/08	7/Sep/08	6/Sep/08	7/Sep/08	7/Sep/08	7/Sep/08	7/Sep/08	7/Sep/08	7/Sep/08	16/Sep/09
Aluminum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4800
Antimony	40	20	20	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.2
Arsenic	12[a]	12[a]	12	<5.0	<5.0	<5.0	<5.0	5.3	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	2
Barium	2000	500	750	18.6	24.5	33.6	36.9	44.3	55.9	51	50.3	22.5	25	32.3	27.2	43.3	43.8	26.0
Beryllium	8[a]	4[a]	4	<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	<0.2
Cadmium	22	10	1.4	<0.50	0.64	<0.50	<0.50	<0.50	<0.50	<0.50	0.76	<0.50	1.53	0.52	0.93	<0.50	<0.50	<0.1
Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1900
Chromium	87	64	64	12	15.6	24	25.5	23.1	24	25.2	23.8	15.2	18.7	22.4	22.2	21.6	24.9	25
Chromium (VI)	1.4	0.4	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2
Cobalt	300[a]	50[a]	40	2.4	3.2	3	3.6	3.2	3	3.8	3.7	2.7	4.4	3.9	3.9	3.7	3.2	3.7
Copper	91	63	63	15.1	17.9	5.8	5.7	4.7	6.1	13.9	3.9	3.9	82	24.5	33.8	8.3	9.1	5.0
Iron	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29000
Lead	260	140	70	<30	52	<30	<30	<30	<30	60	<30	<30	256	41	34	<30	<30	3
Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3100
Manganese	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	95
Mercury	24	6.6	6.6	0.105	0.0953	<0.0050	<0.0050	0.0104	0.0104	0.019	0.0073	0.0056	0.285	0.0356	0.0534	0.0107	0.0058	<0.05
Molybdenum	40[a]	10[a]	5	<4.0	<4.0	<4.0	<4.0	4.9	<4.0	<4.0	4.9	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	1.4
Nickel	89	45	45	<5.0	6.3	<5.0	5.3	5.7	6.1	6.4	<5.0	<5.0	8.2	8	8.8	6.6	6.4	5.9
Phosphorus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	770
Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	920
Selenium	2.9	1	1	0.51	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<0.5
Silver	40[a]	20[a]	20	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<0.2
Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130
Strontium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
Thallium	1	1	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.05
Tin	300	5	50	<5.0	8.7	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	9.8	9.1	7.4	<5.0	<5.0	-
Vanadium	130	130	130	25.9	32.5	53.6	55.7	56.2	23.4	42.1	55.9	36.9	16.9	41.3	45.3	48.8	60	64
Zinc	360	200	200	34.3	38.7	28.3	30.3	25.8	51	34.4	47.3	34.3	488	205	277	74.9	36.1	44

All units in ug/g, unless otherwise noted.

Notes:

1 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use, course-grained soil
2 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use, course-grained soil
3 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Agricultural Land-use, course-grained soil
20 =	RDL exceeds at least one SQG
20 =	Denotes exceedance of CCME SQG for Commercial Land-use
-' =	No Guideline

TABLE E2 - Polychlorinated Biphenyls in AEC 1,2,3 Soil

Location				On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site
Soil Qualifier Location				Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Vehicle Dump	Vehicle Dump	Vehicle Dump
Area ID	**CCME Soil CL[1]**	**CCME Soil PL[2]**	**CCME Soil AL[3]**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**
Station ID				**A1-TP08-3**	**AEC1-TP09-1**	**AEC1-TP09-3**	**AEC1-TP09-3**	**AEC1-TP09-4**	**AEC1-TP09-5**	**A2-TP08-1**	**AEC2-TP09-1**	**AEC2-TP09-2**
Date				8/Sep/08	16/Sep/09	16/Sep/09	16/Sep/09	16/Sep/09	16/Sep/09	6/Sep/08	16/Sep/09	16/Sep/09
Aroclor 1016	-	-	-	<0.050	<0.01	<0.02	<0.02	<0.01	<0.01	<0.50	<1	<1
Aroclor 1221	-	-	-	<0.050	<0.01	<0.03	<0.03	<0.01	<0.01	<0.50	<1	<1
Aroclor 1232	-	-	-	<0.050	<0.01	<0.02	<0.02	<0.01	<0.01	<0.50	<1	<1
Aroclor 1242	-	-	-	<0.050	<0.01	<0.02	<0.02	<0.01	<0.01	<0.50	<1	<1
Aroclor 1248	-	-	-	<0.050	<0.01	<0.02	<0.02	<0.01	<0.01	<0.50	<1	<1
Aroclor 1254	-	-	-	<0.050	<0.01	<0.02	<0.02	<0.01	<0.01	<0.50	<1	<1
Aroclor 1260	-	-	-	<0.050	<0.01	<0.02	<0.02	<0.01	<0.01	4.76	12	9
Aroclor 1262	-	-	-	<0.050	<0.01	<0.02	<0.02	<0.01	<0.01	<0.50	<1	<1
Aroclor 1268	-	-	-	<0.050	<0.01	<0.02	<0.02	<0.01	<0.01	<0.50	<1	<1
Polychlorinated biphenyls	33	1.3	0.5	<0.050	<0.01	<0.03	<0.03	<0.01	<0.01	4.76	12	9

All units in ug/g, unless otherwise noted.

Notes:

1 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use, course-grained soil
2 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use, course-grained soil
3 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Agricultural Land-use, course-grained soil
20 =	RDL exceeds at least one SQG
20 =	Denotes exceedance of CCME SQG for Commercial Land-use
-' =	No Guideline

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TABLE E2 - Polychlorinated Biphenyls in AEC 1,2,3 Soil

Location				On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site
Soil Qualifier Location				Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill
Area ID	**CCME Soil CL[1]**	**CCME Soil PL[2]**	**CCME Soil AL[3]**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**
Station ID				**AEC3-TP09-1**	**A3-TP08-2**	**A3-TP08-5**	**A3-TP08-6**	**A3-TP08-7**	**A3-TP08-9**	**A3-TP08-10**	**A3-TP08-13**	**A3-TP08-DUP2**	**A3-TP08-14**
Date				16/Sep/09	6/Sep/08	6/Sep/08	6/Sep/08	6/Sep/08	7/Sep/08	6/Sep/08	7/Sep/08	7/Sep/08	7/Sep/08
Aroclor 1016	-	-	-	<0.01	<1.5	<0.050	<0.050	<0.060	<0.060	<0.050	<0.050	<0.050	<0.050
Aroclor 1221	-	-	-	<0.01	<1.5	<0.050	<0.050	<0.060	<0.060	<0.050	<0.050	<0.050	<0.050
Aroclor 1232	-	-	-	<0.01	<1.5	<0.050	<0.050	<0.060	<0.060	<0.050	<0.050	<0.050	<0.050
Aroclor 1242	-	-	-	<0.01	<1.5	<0.050	<0.050	<0.060	<0.060	<0.050	<0.050	<0.050	<0.050
Aroclor 1248	-	-	-	<0.01	<1.5	<0.050	<0.050	<0.060	<0.060	<0.050	<0.050	0.21	<0.050
Aroclor 1254	-	-	-	<0.01	<1.5	<0.050	<0.050	<0.060	<0.060	<0.050	<0.050	0.104	<0.050
Aroclor 1260	-	-	-	<0.01	17.1	<0.050	<0.050	<0.060	<0.060	<0.050	0.162	0.127	<0.050
Aroclor 1262	-	-	-	<0.01	<1.5	<0.050	<0.050	<0.060	<0.060	<0.050	<0.050	<0.050	<0.050
Aroclor 1268	-	-	-	<0.01	<1.5	<0.050	<0.050	<0.060	<0.060	<0.050	<0.050	<0.050	<0.050
Polychlorinated biphenyls	33	1.3	0.5	<0.01	17.1	<0.050	<0.050	<0.060	<0.060	<0.060	0.162	0.441	<0.050

All units in ug/g, unless otherwise noted.

Notes:

1 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use, course-grained soil
2 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use, course-grained soil
3 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Agricultural Land-use, course-grained soil
20 =	RDL exceeds at least one SQG
20 =	Denotes exceedance of CCME SQG for Commercial Land-use
-' =	No Guideline

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TABLE E3 - Polycyclic Aromatic Hydrocarbons (PAHs) in AEC 1,2,3 Soil

Location						On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site
Soil Qualifier Location						Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Vehicle Dump	Vehicle Dump	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill
Area ID	**CCME Soil CL [1]**	**CCME Soil PL [2]**	**CCME Soil AL [3]**	**Notes**	**MOE Table 9**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 2**	**AEC 2**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**
Station ID						**AEC1-TP09-1**	**AEC1-TP09-3**	**AEC1-TP09-3**	**A2-TP08-1**	**A2-TP08-2**	**A3-TP08-5**	**A3-TP08-7**	**A3-TP08-10**	**A3-TP08-13**	**A3-TP08-DUP2**	**A3-TP08-14**
Date						16/Sep/09	16/Sep/09	16/Sep/09	9/Sep/08	9/Sep/08	6/Sep/08	6/Sep/08	6/Sep/08	7/Sep/08	7/Sep/08	7/Sep/08
Acenaphthene	0.28	0.28	0.28	b	0.072	<0.01	<0.1	<0.01	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Acenaphthylene	320	320	320	b	0.093	<0.005	<0.05	<0.005	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Anthracene	32	2.5	2.5	a	0.22	<0.005	<0.05	<0.005	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.10	<0.050
Benzo(a)anthracene	10	1	0.10	d	-	<0.01	<0.1	<0.01	<0.050	0.068	<0.050	<0.050	<0.050	<0.050	1.14	<0.050
Benzo(a)pyrene	72	20	20.00	a	-	<0.005	<0.05	<0.005	<0.050	0.072	<0.050	<0.050	<0.050	<0.050	1.31	<0.050
Benzo(b)fluoranthene	---	---	---	-	-	-	-	-	<0.050	0.13	<0.050	<0.050	<0.050	<0.050	1.78	<0.050
Benzo(g,h,i)perylene	---	---	---	-	0.68	<0.02	<0.2	<0.02	<0.050	0.054	<0.050	<0.050	<0.050	<0.050	0.73	<0.050
Benzo(k)fluoranthene	10	1	0.10	d	-	<0.01	<0.1	<0.01	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.66	<0.050
Chrysene	---	---	---	-	2.80	<0.01	<0.1	<0.01	<0.050	0.086	<0.050	<0.050	<0.050	<0.050	1.04	<0.050
Dibenz(a,h)anthracene	10	1	0.10	d	-	<0.02	<0.2	<0.02	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.24	<0.050
Fluoranthene	180	50	50.00	a	0.69	<0.005	<0.05	<0.005	0.067	0.129	<0.050	<0.050	<0.050	<0.050	1.07	<0.050
Fluorene	0.25	0.25	0.25	b	0.19	<0.005	<0.05	<0.005	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Indeno(1,2,3-cd)pyrene	10	1	0.10	d	-	<0.02	<0.2	<0.02	<0.050	<0.080	<0.050	<0.050	<0.050	<0.050	0.88	<0.050
2-Methylnaphthalene	---	---	---	-	0.59	<0.005	<0.05	<0.005	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Naphthalene	0.013	0.013	0.013	b	0.090	<0.005	<0.05	<0.005	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Phenanthrene	0.046	0.046	0.046	b	0.690	<0.005	0.09	<0.005	<0.050		<0.050	<0.050	<0.050	<0.050	0.17	<0.050
Pyrene	100	10	0.10	d	1.00	<0.005	<0.05	0.005	0.055	0.105	<0.050	<0.050	<0.050	<0.050	*1.04*	<0.050
Benzo(a)pyrene Total Potency Equivalents	5.3	5.3	5.3	-	-	0.0293	0.293	0.0293	0.138	0.2862	0.121	0.121	0.121	0.121	2.00898	0.121

All units in ug/g, unless otherwise noted.

Notes:

1 = CCME (2010), Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Polycyclic aromatic hydrocarbons (PAHs) Commercial/Industrial Land-use, course-grained soil

2 = CCME (2010), Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Polycyclic aromatic hydrocarbons (PAHs) Residential/Parkland use, course-grained soil

3 = CCME (2010), Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Polycyclic aromatic hydrocarbons (PAHs) Agricultural Land-use, course-grained soil

4 = Ontario Ministry of the Environment (MOE), 2011. Soil, Groundwater, and Sediment Standards for Use Under Part XV. 1 of the Environmental Protection Act (EPA); April 15, 2011. Table 9. Generic Site Condition Standards for Use within 30m of a Water Body in a Non-Potable Ground Water Condition

a = CCME SQG_E

b = CCME SQG_E for protection of freshwater life. Also protective for soil and food ingestion residential.

c = CCME SQG_E for soil and food ingestion only.

d = Interim Soil Quality Criteria

TPE - Benzo(a)pyrene Total Potency Equivalents, which is the sum of estimated cancer potency relative to B[a]P for all potentially carcinogenic unsubstituted PAHs. The B[a]P TPE for a soil sample is calculated by multiplying the concentration of each PAH in the sample by its B[a]P Potency Equivalence Factor (PEF), and summing the products. PEFs are as follows: Benzo(a)anthracene, 0.1; benzo(a)pyrene, 1; benzo(b+j+k)fluoranthene, 0.1; benzo(g,h,i)perylene, 0.01; chrysene, 0.01; dibenzo(a,h)anthracene, 1; ideno(1,2,3-c,d)pyrene, 0.1.

20 = Denotes exceedance of CCME SQG for Commercial/Industrial Land-use

20 = Denotes exceedance of MOE Table 9

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TABLE E4 - Petroleum Hydrocarbons in AEC 1,2,3 Soil

Location						On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site
Soil Qualifier Location						Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Vehicle Dump	Vehicle Dump	Vehicle Dump	Vehicle Dump	Main Landfill	Main Landfill	Main Landfill
Area ID	**CCME Soil CL[1]**	**CCME Soil PL[2]**	**CCME Soil AL[3]**	**CWS Soil PL[3]**	**CWS Soil CL[4]**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 3**	**AEC 3**	**AEC 3**
Station ID						**A1-TP08-3**	**AEC1-TP09-1**	**AEC1-TP09-3**	**AEC1-TP09-3**	**AEC1-TP09-4**	**AEC1-TP09-5**	**A2-TP08-1**	**A2-TP08-2**	**AEC2-TP09-1**	**AEC2-TP09-2**	**A3-TP08-2**	**A3-TP08-3**	**A3-TP08-5**
Date						8/Sep/08	16/Sep/09	16/Sep/09	16/Sep/09	16/Sep/09	16/Sep/09	6/Sep/08	6/Sep/08	16/Sep/09	16/Sep/09	6/Sep/08	6/Sep/08	6/Sep/08
Moisture content	-	-		-	-	-	11.0	6.5	9.5	6.3	14.0	-	-	9.8	13.0	-	-	-
Benzene	0.03	0.03	0.03	-	-	<0.03	<0.002	<0.002	<0.002	<0.002	<0.002	<0.040	<0.040	<0.002	<0.002	<0.03	<0.03	<0.03
Ethylbenzene	0.082	0.082	0.082	-	-	<0.050	<0.002	<0.002	<0.002	<0.002	<0.002	<0.050	<0.050	<0.002	<0.002	<0.050	<0.050	<0.050
Toluene	0.37	0.37	0.4	-	-	<0.050	<0.002	<0.002	<0.002	<0.002	<0.002	<0.050	<0.050	<0.002	<0.002	<0.050	<0.050	<0.050
m+p-Xylene	-	-		-	-	<0.050	<0.002	<0.002	<0.002	<0.002	<0.002	<0.050	<0.050	<0.002	<0.002	<0.050	<0.050	<0.050
o-Xylene	-	-		-	-	<0.050	<0.002	<0.002	<0.002	<0.002	<0.002	<0.050	<0.050	<0.002	<0.002	<0.050	<0.050	<0.050
Xylenes (total)	11	11	11	-	-	<0.10	<0.002	<0.002	<0.002	<0.002	<0.002	<0.10	<0.10	<0.002	<0.002	<0.10	<0.10	<0.10
F1 (C6-C10)	-	-	-	-	-	<10	<10	180	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F1 (C6-C10) minus BTEX	-	-	-	30	240	<10	<10	180	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16)	-	-	-	150	260	<30	<10	1100	90	<10	<10	<30	<30	<10	<10	450	35	<30
F3 (C16-C34)	-	-	-	300	1700	<50	<10	3900	730	<10	<10	180	80	77	240	44400	343	<50
F4 (C34-C50)	-	-	-	2800	3300	<50	<10	830	220	<10	<10	93	51	70	160	6960	213	<50
Reached Baseline at C50	-	-	-	-	-	-	Yes	Yes	Yes	Yes	Yes	-	-	Yes	Yes	-	-	-

All units in ug/g, unless otherwise noted.

Notes:

1 = CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use, course-grained soil

2 = CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use, course-grained soil

3 = CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Agricultural Land-use, course-grained soil

4 = CCME (2008) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1 levels for PHCs, Residential / Parkland Use in coarse-grained surface soils.

5 = CCME (2008) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1 levels for PHCs, Commercial Use in coarse-grained surface soils.

20 = RDL exceeds at least one SQG

20 = Denotes exceedance of CCME SQG for Commercial/Industrial land-use

20 = Denotes exceedance of CWS for Commercial/Industrial land-use

-' = No Guideline

ARCADIS Design & Consultancy for natural and built assets

TABLE E4 - Petroleum Hydrocarbons in AEC 1,2,3 Soil

Location						On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site
Soil Qualifier Location						Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill
Area ID	**CCME Soil CL[1]**	**CCME Soil PL[2]**	**CCME Soil AL[3]**	**CWS Soil PL[3]**	**CWS Soil CL[4]**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**
Station ID						**A3-DUP-1**	**A3-TP08-6**	**A3-TP08-7**	**A3-TP08-8**	**A3-TP08-9**	**A3-TP08-10**	**A3-TP08-11**	**A3-TP08-12**	**A3-TP08-13**	**A3-TP08-DUP2**	**A3-TP08-14**	**AEC3-TP09-1**	**AEC3-TP09-3**
Date						6/Sep/08	6/Sep/08	6/Sep/08	6/Sep/08	7/Sep/08	6/Sep/08	7/Sep/08	7/Sep/08	7/Sep/08	7/Sep/08	7/Sep/08	16/Sep/09	16/Sep/09
Moisture content	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	8.6	10.0
Benzene	0.03	0.03	0.03	-	-	<0.03	<0.03	<0.03	<0.03	<0.040	<0.03	<0.040	<0.040	<0.040	<0.040	<0.040	<0.002	<0.002
Ethylbenzene	0.082	0.082	0.082	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.002	<0.002
Toluene	0.37	0.37	0.4	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.002	<0.002
m+p-Xylene	-	-		-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.002	<0.002
o-Xylene	-	-		-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.002	<0.002
Xylenes (total)	11	11	11	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.002	<0.002
F1 (C6-C10)	-	-	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F1 (C6-C10) minus BTEX	-	-	-	30	240	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16)	-	-	-	150	260	<30	<30	<30	<30	<30	<30	<30	51	<30	<30	<30	<10	<10
F3 (C16-C34)	-	-	-	300	1700	<50	<50	<50	<50	<50	<50	<50	244	69	240	<50	<10	<10
F4 (C34-C50)	-	-	-	2800	3300	<50	<50	<50	<50	<50	<50	<50	239	<50	82	<50	<10	<10
Reached Baseline at C50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	Yes

All units in ug/g, unless otherwise noted.

Notes:

1 = CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use, course-grained soil

2 = CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use, course-grained soil

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20 = RDL exceeds at least one SQG

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20 = Denotes exceedance of CWS for Commercial/Industrial land-use

-' = No Guideline

ARCADIS Design & Consultancy for natural and built assets

TABLE E5 - Pesticides in AEC 1,2,3 Soil

Location				On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site
Soil Qualifier Location				Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Upgradient of Vehicle Dump	Vehicle Dump	Vehicle Dump	Main Landfill	Main Landfill	Main Landfill
Area ID	**CCME Soil PL[1]**	**CCME Soil AL**	**CCME Soil CL[2]**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 2**	**AEC 2**	**AEC 3**	**AEC 3**	**AEC 3**
Station ID				**AEC1-TP09-3**	**AEC1-TP09-3**	**A1-TP08-3**	**A2-TP08-1**	**A2-TP08-2**	**A3-TP08-10**	**A3-TP08-13**	**A3-TP08-DUP2**
Date				16/Sep/09	16/Sep/09	8/Sep/08	9/Sep/08	9/Sep/08	6/Sep/08	7/Sep/08	7/Sep/08
Aldrin	-		-	<0.03	<0.002	<0.0010	<0.0010	<0.0010	<0.0015	<0.0020	<0.0020
Chlordane	-		-	<0.003	<0.002	-	-	-	-	-	-
alpha-Chlordane	-		-	<0.002	<0.002	<0.0010	<0.0010	<0.0010	<0.0015	<0.0020	<0.0020
trans-Chlordane	-		-	<0.003	<0.002	<0.0010	<0.0010	<0.0010	<0.0015	<0.0020	<0.0020
2,4'-DDD	-		-	<0.002	<0.002	<0.0010	<0.0010	<0.0010	<0.0015	<0.0020	<0.0020
4,4'-DDD	-		-	<0.002	<0.002	0.0037	0.044	0.0045	<0.0015	0.0028	<0.0020
DDD (total)	-		-	<0.002	<0.002	-	-	-	-	-	-
2,4'-DDE	-		-	<0.003	<0.002	<0.0010	<0.0010	<0.0010	<0.0015	<0.0020	<0.0020
4,4'-DDE	-		-	<0.002	<0.002	<0.0010	<0.0010	0.0049	<0.0015	0.0024	<0.0020
DDE (total)	-		-	<0.003	<0.002	-	-	-	-	-	-
2,4'-DDT	-		-	<0.002	<0.002	0.0062	0.0586	0.0053	<0.0020	<0.0020	<0.0020
4,4'-DDT	-		-	0.003	<0.002	0.0275	0.247	0.0307	<0.0020	0.007	<0.0020
DDT plus metabolites	-		-	0.003	<0.002	-	-	-	-	-	-
DDT (total)	0.7	0.7	12	0.003	<0.002	-	-	-	-	-	-
Dieldrin	-		-	<0.004	<0.002	<0.0010	<0.0010	<0.0010	<0.0015	<0.0020	<0.0020
Endosulfan	-		-	<0.006	<0.002	<0.0010	<0.0010	<0.0010	<0.0015	<0.0020	<0.0020
alpha-Endosulfan	-		-	<0.002	<0.002	-	-	-	-	-	-
beta-Endosulfan	-		-	<0.006	<0.002	-	-	-	-	-	-
Endrin	-		-	<0.002	<0.002	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
gamma-HCH	-		-	<0.002	<0.002	<0.0010	<0.0010	<0.0010	<0.0015	<0.0020	<0.0020
Heptachlor	-		-	<0.03	<0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Heptachlor epoxide	-		-	<0.01	<0.002	<0.0010	<0.0010	<0.0010	<0.0015	<0.0020	<0.0020
Hexachlorobenzene	2[a]	0.05	10[a]	<0.003	<0.002	-	-	-	-	-	-
Methoxychlor	-		-	<0.008	<0.008	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

All units in ug/g, unless otherwise noted.

Notes:

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3 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Agricultural Land-use, course-grained soil
20 =	RDL exceeds at least one SQG
20 =	Denotes exceedance of CCME SQG for Commercial Land-use
-' =	No Guideline

ARCADIS Design & Consultancy for natural and built assets

TABLE E6 - Volatile Organic Compounds (VOCs) in AEC 1,2,3 Soil

Location				On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site	On-Site
Soil Qualifier Location				Upgradient of Metal Dump	Upgradient of Metal Dump	Upgradient of Metal Dump	Upgradient of Metal Dump	Upgradient of Metal Dump	Vehicle Dump	Vehicle Dump	Vehicle Dump	Vehicle Dump	Main Landfill	Main Landfill	Main Landfill	Main Landfill	Main Landfill
Area ID	**CCME**	**CCME**	**CCME**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**
Station ID	**Soil CL[1]**	**Soil PL[2]**	**Soil AL[3]**	**AEC1-TP09-1**	**AEC1-TP09-3**	**AEC1-TP09-3**	**AEC1-TP09-4**	**AEC1-TP09-5**	**AEC2-TP09-1**	**AEC2-TP09-2**	**A2-TP08-1**	**A2-TP08-2**	**AEC3-TP09-1**	**AEC3-TP09-3**	**A3-TP08-10**	**A3-TP08-13**	**A3-TP08-DUP2**
Date				16/Sep/09	16/Sep/09	16/Sep/09	16/Sep/09	16/Sep/09	16/Sep/09	16/Sep/09	9/Sep/08	9/Sep/08	16/Sep/09	16/Sep/09	6/Sep/08	7/Sep/08	7/Sep/08
Acetone	-	-	-	<0.1	0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-
Benzene	0.03	0.03	0.03	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.040	<0.040	<0.002	<0.002	<0.040	<0.040	<0.040
Bromodichloromethane	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
Bromoform	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
Bromomethane	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
Carbon tetrachloride	50	5	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
Chlorobenzene	10[a]	1[a]	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
Chlorodibromomethane	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
Chloroform	50	5	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.10	<0.10	-	-	<0.10	<0.10	<0.10
1,2-Dichlorobenzene	10[a]	1[a]	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
1,3-Dichlorobenzene	10[a]	1[a]	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
1,4-Dichlorobenzene	10[a]	1[a]	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
1,1-Dichloroethane	50	5	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
1,2-Dichloroethane	50	5	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
1,1-Dichloroethene	50	5	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
cis-1,2-Dichloroethene	50	5	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
trans-1,2-Dichloroethene	50	5	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
Dichloromethane	50	5	0.1	<0.003	<0.003	<0.003	-	-	-	-	<0.30	<0.80	-	-	<0.60	<0.30	<0.30
1,2-Dichloropropane	50	5	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
cis-1,3-Dichloropropene	-	-	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
trans-1,3-Dichloropropene	-	-	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
Ethylbenzene	0.082	0.082	0.082	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.050	<0.050	<0.002	<0.002	<0.050	<0.050	<0.050
Ethylene dibromide	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	10	2	0.05	-	<0.003	<0.002	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-
Methyl ethyl ketone	-	-	-	<0.03	<0.03	<0.03	-	-	-	-	-	-	-	-	-	-	-
Methyl isobutyl ketone	-	-	-	<0.03	<0.03	<0.03	-	-	-	-	-	-	-	-	-	-	-
Methyl-tert-butylether	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	<0.20	<0.20	-	-	<0.20	<0.20	<0.20
Styrene	50[a]	5[a]	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
1,1,1,2-Tetrachloroethane	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
1,1,2,2-Tetrachloroethane	50	5	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
Tetrachloroethene	0.5	0.2	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
Toluene	0.37	0.37	0.37	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.050	0.116	<0.002	<0.002	<0.050	<0.050	<0.050
1,1,1-Trichloroethane	50	5	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
1,1,2-Trichloroethane	50	5	0.1	<0.002	<0.002	<0.002	-	-	-	-	<0.050	<0.050	-	-	<0.050	<0.050	<0.050
Trichloroethene	0.01	0.01	0.01	<0.002	<0.002	<0.002	-	-	-	-	<0.01	<0.01	-	-	<0.01	<0.015	<0.015
Vinyl chloride	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	<0.10	<0.10	-	-	<0.10	<0.10	<0.10
m+p-Xylene	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.050	<0.050	<0.002	<0.002	<0.050	<0.050	<0.050
o-Xylene	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.050	<0.050	<0.002	<0.002	<0.050	<0.050	<0.050
Xylenes (total)	11	11	11	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.10	<0.10	<0.002	<0.002	<0.10	<0.10	<0.10

All units in ug/g, unless otherwise noted.

Notes:

1 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Commercial/Industrial Land-use, course-grained soil
2 =	CCME, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Updated 2015. Residential/Parkland Land-use, course-grained soil
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20 =	Denotes exceedance of CCME SQG for Commercial Land-use
-' =	No Guideline

APPENDIX B.F

Surface Water in AEC 1 to 4 (Fresh & Brackish Water Environment):

B.F1 – Metals and Inorganics

B.F2 – Polychlorinated Biphenyls (PCBs)

B.F3 – Polyaromatic Hydrocarbons (PAHs)

B.F4 – Petroleum Hydrocarbons

B.F5 –Volatile Organic Compounds (VOCs)

TABLE F1- Metals and Inorganics in Surface Water

Settings			Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater
Surface Water Feature			Pond upgradient	Pond upgradient	Ditch by road	Ditch by road	Stream Upgradient landfill	Stream Upgradient landfill	Small pond landfil height	Small pond landfil height	Small pond landfill height	Small pond landfill height	Stream landfill height
Area ID	**CCME Freshwater[1]**	**CCME Marine[2]**	**AEC 1**	**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**
Station ID			**A1-SW08-1**	**AEC1-SW09-1**	**A2-SW08-1**	**AEC2-SW09-1**	**AEC2-SW09-2**	**AEC2-SW09-3**	**A2-SW08-2**	**AEC2-SW09-4**	**A2-SW08-3**	**AEC2-SW09-5**	**AEC2-SW09-6**
Date			8/Sep/08	17/Sep/09	6/Sep/08	15/Sep/09	15/Sep/09	15/Sep/09	6/Sep/08	15/Sep/09	6/Sep/08	15/Sep/09	15/Sep/09
Aluminum	-	-	-	-	-	-	-	-	-	-	-	-	-
pH<6.5	5	-	-	-	28.8	-	6	6	11.2	-	119	<5	<5
pH>6.5	100	-	14.4	9	-	6	-	-	-	45	-	-	-
Antimony	-	-	<0.000	<0.5	<0.000	<0.5	<0.5	<0.5	-	<0.5	<0.500	<0.5	<0.5
Arsenic	5	12.5	<0.000	<1	<0.50	<1	<1	<1	<0.50	<1	<0.50	<1	<1
Beryllium	-	-	<1.0	<0.5	<1.0	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<0.5	<0.5
Boron	-	1500	<1.0	<10	<1.0	10	<10	<10	<1.0	<10	<1.0	<10	<10
Cadmium	See Note 3		<0.017	<0.1	0.047	<0.1	<0.1	<0.1	<0.017	<0.1	0.087	<0.1	0.2
Calcium (Ca)	-	-	24700	-	15800	-	-	-	11700	-	11200	-	-
Chromium	8.9	56	<1.0	<5	<1.0	<5	<5	<5	<1.0	<5	<1.0	<5	<5
Chromium (VI)	1	1.5	-	2.8	-	3.7	<0.5	<0.5	-	<0.5	-	<0.5	<0.5
Cobalt	-	-	<0.30	0.6	<0.30	<0.5	<0.5	<0.5	0.32	<0.5	1.15	1.3	0.6
Copper	See Note 3		1.3	<1	3.7	<1	1	1	3.7	<1	7.1	1	<1
Iron	300	-	86	2200	1070	400	620	320	757	1400	8370	8900	1700
Lead	See Note 3		<0.50	<0.5	<0.50	<0.5	<0.5	<0.5	<0.50	<0.5	2	0.7	<0.5
Magnesium			7250	-	3580	-	-	-	3050	-	2820	-	-
Manganese			19.8	-	60.9	-	-	-	66	-	151	-	-
Mercury	0.026	0.016	<0.020	<0.02	<0.020	<0.1	<0.1	<0.1	<0.020	<0.1	<0.020	<0.1	<0.1
Molybdenum	73	-	<1.0	<1	<1.0	<1	<1	<1	<1.0	<1	<1.0	<1	<1
Nickel	See Note 3		<1.0	1	<1.0	<1	<1	<1	<1.0	<1	<1.0	<1	<1
Potassium (K)			3100	-	<2000	-	-	-	<2000	-	<2000	-	-
Phosphorus	-	-	-	72	-	16	60	14	-	220	-	58	24
Selenium	1	-	<1.0	<2	<1.0	<2	<2	<2	<1.0	<2	<1.0	<2	<2
Silver	0.25	-	<0.020	<0.1	<0.020	0.1	<0.1	<0.1	<0.020	<0.1	<0.020	<0.1	<0.1
Sodium			16900	-	5400	-	-	-	5700	-	5200	-	-
Thallium	0.8	-	<0.20	<0.05	<0.20	<0.05	<0.05	<0.05	<0.20	<0.05	<0.20	<0.05	0.08
Tin			<0.50	-	<0.50	-	-	-	<0.50	-	0.57	-	-
Titanium			<10	-	<10	-	-	-	<10	-	<10	-	-
Tungsten	-	-	-	<1	-	<1	<1	<1	-	<1	-	<1	<1
Uranium	15	-	<0.20	<0.1	<0.20	<0.1	<0.1	<0.1	<0.20	<0.1	<0.20	<0.1	<0.1
Vanadium	-	-	<1.0	<1	<1.0	<1	<1	<1	<1.0	<1	<1.0	<1	<1
Zinc	30	-	<5.0	<5	19.1	11	14	8	<5.0	6	8.3	9	6
Zirconium	-	-	-	<1	-	<1	<1	<1	-	<1	-	<1	<1
			-	-	-	-	-	-	-	-	-	-	-
Hardness (mg/L)			91.6	24	54.2	51	51	51	41.8	36	39.6	35	35
pH (field)	6.5-9	7-8.7	-	7.3	6.11	7.47	7.28	7.21	6.43	7.02	6.4	6.86	7.01

All units in ug/L, unless otherwise noted.

Notes:

1 =	Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Freshwater.
2 =	Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Marine.
3 =	Guideline is hardness dependent
20 =	Indicates freshwater. Exceedance of freshwater CCME WQG
20 =	Indicates brackish water. Exceedance of most stringent WQG

ARCADIS Design & Consultancy for natural and built assets

TABLE F1- Metals and Inorganics in Surface Water

Settings	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater
Surface Water Feature	Stream landfill height	Stream landfill height	Pond 6	Pond 6	Pond 6	pond 6	Pond 5	Pond 5	pond 5	pond 5	Below Landfill, AEC 3	pond 2	pond 2	pond 2
Area ID	**CCME**	**CCME**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 3**	**AEC 2**	**AEC 3**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID	**Freshwater[1]**	**Marine[2]**	**A2-SW08-4**	**AEC2-SW09-7**	**AEC2-SW09-8**	**AEC2-SW09-9**	**AEC2-SW09-9**	**SW16-05**	**AEC2-SW09-10**	**AEC2-SW09-11**	**A3-SW08-3**	**SW16-06**	**A3-SW08-1**	**AEC4-SW09-14**	**AEC4-SW09-15**	**A4- SW08-1**
Date			6/Sep/08	15/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	30/Sep/16	15/Sep/09	15/Sep/09	7/Sep/08	30/Sep/16	7/Sep/08	17/Sep/09	17/Sep/09	8/Sep/08
Aluminum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH<6.5	5	-	24.7	5	<5	<5	<5	-	<5	<5	-	-	43.4	<5	<5	-
pH>6.5	100	-	-	-	-	-	-	-	-	-	19.1	-	-	-	-	50
Antimony	-	-	<0.500	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.50	-	0.62	<0.5	<0.5	<5.0
Arsenic	5	12.5	<0.50	<1	<1	<1	<1	-	<1	<1	<0.50	-	<0.50	<5	<5	<5.0
Beryllium	-	-	<1.0	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<1.0	-	<1.0	<0.5	<0.5	<10
Boron	-	1500	<1.1	<10	<10	11	17	-	22	21	<100	-	230	320	330	340
Cadmium	See Note 3		0.037	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	0.024	-	0.129	<0.1	<0.1	<0.17
Calcium (Ca)	-	-	11500	-	-	-	-	-	-	-	11600	-	25100	-	-	35000
Chromium	8.9	56	<1.0	<5	<5	<5	<5	-	<5	<5	<1.0	-	<1.0	<5	<5	<10
Chromium (VI)	1	1.5	-	<0.5	<0.5	2.5	<0.5	<0.50	<0.5	<0.5	-	<0.50	-	<0.5	<0.5	-
Cobalt	-	-	0.46	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.30	-	2.86	<0.5	<0.5	<3.0
Copper	See Note 3		2.3	<1	<1	<1	<1	-	<1	<1	<1.0	-	4.7	1	1	<10
Iron	300	-	1720	560	810	710	1700	-	790	420	709	-	2790	390	210	263
Lead	See Note 3		<0.50	<0.5	<0.5	<0.5	0.7	-	<0.5	<0.5	<0.50	-	2.77	<0.5	<0.5	<5.0
Magnesium			2800	-	-	-	-	-	-	-	3200	-	4140	-	-	93100
Manganese			75.5	-	-	-	-	-	-	-	62.2	-	84.1	-	-	15.7
Mercury	0.026	0.016	<0.020	<0.1	<0.1	<0.1	<0.1	0.01	<0.1	<0.1	<0.020	0.01	<0.020	<0.02	<0.02	<0.020
Molybdenum	73	-	<1.0	<1	<1	<1	<1	-	<1	<1	<1.0	-	<1.0	1	1	<10
Nickel	See Note 3		<1.0	<1	<1	<1	<1	-	<1	<1	<1.0	-	3.7	<1	<1	<10
Potassium (K)			<2000	-	-	-	-	-	-	-	<2000	-	2500	-	-	27400
Phosphorus	-	-	-	6	6	7	15	-	8	7	-	-	-	7	9	-
Selenium	1	-	<1.0	<2	<2	<2	<2	-	<2	<2	<1.0	-	<1.0	<2	<2	<10
Silver	0.25	-	<0.020	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.020	-	<0.020	<0.1	<0.1	<0.20
Sodium			5300	-	-	-	-	-	-	-	7500	-	8700	-	-	861000
Thallium	0.8	-	<0.20	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.20	-	<0.20	<0.05	<0.05	<2.0
Tin			<0.50	-	-	-	-	-	-	-	<0.50	-	<0.50	-	-	<5.0
Titanium			<10	-	-	-	-	-	-	-	<10	-	<10	-	-	<10
Tungsten	-	-	-	<1	<1	<1	<1	-	<1	<1	-	-	-	<1	<1	-
Uranium	15	-	<0.20	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.20	-	<0.20	0.2	0.2	<2.0
Vanadium	-	-	<1.0	<1	<1	<1	1	-	<1	<1	<1.0	-	<1.0	<5	<5	<10
Zinc	30	-	<5.0	<5	<5	<5	6	-	7	<5	<5.0	-	163	5	<5	<5.0
Zirconium	-	-	-	<1	<1	<1	<1	-	<1	<1	-	-	-	<1	<1	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness (mg/L)			40.1	37	37	39	37	-	41	38	42.2	-	79.7	370	370	471
pH (field)	6.5-9	7-8.7	6.35	7.02	7.21	7.24	7.24	8.14	7.14	7.24	6.55	7.83	6.38	8.09	8.18	6.98

All units in ug/L, unless otherwise noted.

Notes:

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3 =	Guideline is hardness dependent
20 =	Indicates freshwater. Exceedance of freshwater CCME WQG
20 =	Indicates brackish water. Exceedance of most stringent WQG

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TABLE F1- Metals and Inorganics in Surface Water

Settings	Freshwater	Freshwater	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish
Surface Water Feature	Pond 2	Pond 2	Pond 3	Pond 3	Pond 3	Pond 3	Pond 3	Pond 4	Pond 4	Pond 4	Pond 4	Pond 4	shoreline

Area ID	CCME	CCME	AEC 4	AEC 4	AEC 3	AEC 3	AEC 3	AEC 3	AEC 3	AEC 4	AEC 4	AEC 4	AEC 4	AEC 4	AEC 4
Station ID	Freshwater[1]	Marine[2]	SW16-01	SW16-02	A3-SW08-2	DUP-1	AEC3-SW09-1	AEC3-SW09-2	AEC3-SW09-3	AEC4-SW09-1	A4-SW08-3	AEC4-SW09-2	AEC4-SW09-3	AEC4-SW09-4	AEC4-SW09-6
Date			30/Sep/16	30/Sep/16	7-Sep-08	7-Sep-08	15/Sep/09	15/Sep/09	15/Sep/09	17/Sep/09	8/Sep/08	17/Sep/09	17/Sep/09	17/Sep/09	17/Sep/09
Aluminum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH<6.5	5	-	-	-	-	-	<5	<5	<5	<5	-	<5	27	<5	<5
pH>6.5	100	-	-	-	<25	<25	-	-	-	-	18	-	-	-	-
Antimony	-	-	-	-	<25	<25	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<0.5
Arsenic	5	12.5	-	-	<25	<25	<5	<5	<5	<1	<2.0	<1	<1	<1	<5
Beryllium	-	-	-	-	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5
Boron	-	1500	-	-	950	920	1100	1100	1000	130	<100	220	140	200	210
Cadmium	See Note 3		-	-	<0.85	<0.85	<0.1	<0.1	<0.1	<0.1	0.146	<0.1	<0.1	<0.1	<0.1
Calcium (Ca)	-	-	-	-	93800	91500	-	-	-	-	14400	-	-	-	-
Chromium	8.9	56	-	-	<50	<50	<5	<5	<5	<5	<2.0	<5	<5	<5	<5
Chromium (VI)	1	1.5	<0.50	<0.50	-	-	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5
Cobalt	-	-	-	-	<15	<15	<0.5	<0.5	<0.5	<0.5	<0.60	<0.5	<0.5	<0.5	<0.5
Copper	See Note 3		-	-	<50	<50	1	1	<1	<1	5.7	<1	3	<1	<1
Iron	300	-	-	-	900	780	330	270	430	220	482	330	610	210	<100
Lead	See Note 3		-	-	<25	<25	0.9	0.7	1.0	<0.5	<1.0	<0.5	<0.5	<0.5	<0.5
Magnesium			-	-	248000	242000	-	-	-	-	16900	-	-	-	-
Manganese			-	-	103	104	-	-	-	-	13.8	-	-	-	-
Mercury	0.026	0.016	<0.01	0.01	<0.020	<0.020	<0.1	<0.1	<0.1	<0.02	<0.020	<0.02	<0.02	<0.02	<0.02
Molybdenum	73	-	-	-	<50	<50	3	3	3	<1	<2	<1	1	<1	<1
Nickel	See Note 3		-	-	<50	<50	<1	<1	<1	<1	<2	<1	<1	<1	<1
Potassium (K)			-	-	80000	78000	-	-	-	-	6800	-	-	-	-
Phosphorus	-	-	-	-	-	-	9	9	15	16	-	15	13	7	3
Selenium	1	-	-	-	<50	<50	<2	<10	<2	<2	<4.0	<2	<2	<2	<2
Silver	0.25	-	-	-	<1.0	<1.0	<0.1	<0.1	0.1	<0.1	<0.040	<0.1	<0.1	<0.1	<0.1
Sodium			-	-	2080000	2040000	-	-	-	-	153000	-	-	-	-
Thallium	0.8	-	-	-	<10	<10	<0.05	<0.05	<0.05	0.06	<0.40	0.06	0.09	0.05	<0.05
Tin			-	-	<25	<25	-	-	-	-	<1.0	-	-	-	-
Titanium			-	-	<50	<50	-	-	-	-	<10	-	-	-	-
Tungsten	-	-	-	-	-	-	<1	<1	<1	<1	-	<1	<1	<1	<1
Uranium	15	-	-	-	<10	<10	0.6	0.7	0.7	<0.1	<0.40	0.1	0.2	0.1	0.1
Vanadium	-	-	-	-	<50	<50	<5	<5	<5	<1	<2.0	<1	1	<1	<5
Zinc	30	-	-	-	<25	<25	<5	<5	<5	<5	6.1	<5	9	6	<5
Zirconium	-	-	-	-	-	-	<1	<1	<1	<1	-	<1	<1	<1	<1
			-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness (mg/L)			-	-	1260	1220	1400	1400	1400	140	105	210	85	220	220
pH (field)	6.5-9	7-8.7	7.88	8.11	6.77	-	6.94	7.85	7.69	8.07	7.88	8.2	7.99	8.05	8.16

All units in ug/L, unless otherwise noted.

Notes:

1 =	Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Freshwater.
2 =	Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Marine.
3 =	Guideline is hardness dependent
20 =	Indicates freshwater. Exceedance of freshwater CCME WQG
20 =	Indicates brackish water. Exceedance of most stringent WQG

TABLE F1- Metals and Inorganics in Surface Water

Settings	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish
Surface Water Feature	shoreline	pond 4	pond 4	pond 4	downgradient pond 4	downgradient pond 4	South of pond 4	shoreline	shoreline	shoreline	shoreline

Area ID	CCME Freshwater[1]	CCME Marine[2]	AEC 4	AEC 3	AEC 4	AEC 2	AEC 4	AEC 4	AEC 4	AEC 4	AEC 4	AEC 4	AEC 4
Station ID			A4-SW08-7	A3-SW08-4	AEC4-SW09-7	SW16-07	AEC4-SW09-5	SW16-04	A4-SW08-8	AEC4-SW09-8	A4-SW08-6	AEC4-SW09-9	A4- SW08-4
Date			8/Sep/08	7/Sep/08	17/Sep/09	30/Sep/16	17/Sep/09	30/Sep/16	8/Sep/08	17/Sep/09	8/Sep/08	17/Sep/09	8/Sep/08
Aluminum	-	-	-	-	-	-	-	-	-	-	-	-	-
pH<6.5	5	-	-	-	<5	-	<5	-	27.5	<5	-	<5	-
pH>6.5	100	-	25.6	11.9	-	-	-	-	-	-	32.7	-	22.2
Antimony	-	-	<0.50	<0.50	<0.5	-	<5	-	<0.50	<0.5	<0.50	<0.5	<0.50
Arsenic	5	12.5	<0.50	<0.50	<1	-	<10	-	<0.50	<1	<0.50	<5	<0.50
Beryllium	-	-	<1.0	<1.0	<0.5	-	<5	-	<1.0	<0.5	<1.0	<0.5	<1.0
Boron	-	1500	<100	<100	130	-	1800	-	<100	200	<100	430	<100
Cadmium	See Note 3		0.082	0.018	<0.1	-	<1	-	<0.017	<0.1	<0.017	<0.1	0.044
Calcium (Ca)	-	-	4580	11500	-	-	-	-	4720	-	4670	-	4180
Chromium	8.9	56	<1.0	<1.0	<5	-	<50	-	<1.0	<5	<1.0	<5	<1.0
Chromium (VI)	1	1.5	-	-	<0.5	<0.50	<0.5	<0.50	-	<0.5	-	<0.5	-
Cobalt	-	-	<0.30	<0.30	<0.5	-	<5	-	<0.30	<0.5	<0.30	<0.5	<0.30
Copper	See Note 3		<1.0	<1.0	<1	-	<10	-	<1.0	<1	<1.0	<1	<1.0
Iron	300	-	40	809	<100	-	<1000	-	43	170	38	170	<30
Lead	See Note 3		<0.50	<0.50	<0.5	-	<5	-	<0.50	<0.5	<0.50	<0.5	<0.50
Magnesium			2680	2800	-	-	-	-	3750	-	2900	-	1000
Manganese			1.16	53.4	-	-	-	-	1.07	-	1	-	0.75
Mercury	0.026	0.016	<0.020	<0.020	<0.02	0.01	<0.02	<0.01	<0.020	<0.02	<0.020	<0.02	<0.020
Molybdenum	73	-	<1	<1.0	<1	-	<10	-	<1	<1	<1	1	<1
Nickel	See Note 3		<1.0	<1.0	<1	-	<10	-	<1.0	<1	<1.0	<1	<1.0
Potassium (K)			<2000	<2000	-	-	-	-	<2000	-	<2000	-	<2000
Phosphorus	-	-	-	-	14	-	16	-	-	11	-	10	-
Selenium	1	-	<1.0	<1.0	<2	-	<20	-	<1.0	<2	<1.0	<2	<1.0
Silver	0.25	-	<0.020	<0.020	<0.1	-	<1	-	<0.020	<0.1	<0.020	<0.1	<0.020
Sodium			22000	5300	-	-	-	-	37900	-	23600	-	6900
Thallium	0.8	-	<0.20	<0.20	<0.05	-	0.8	-	<0.20	0.05	<0.20	<0.05	<0.20
Tin			<0.50	<0.50	-	-	-	-	<0.50	-	<0.50	-	<0.50
Titanium			<10	<10	-	-	-	-	<10	-	<10	-	<10
Tungsten	-	-	-	-	<1	-	<10	-	-	<1	-	<1	-
Uranium	15	-	<0.20	<0.20	<0.1	-	1	-	<0.20	0.1	<0.20	0.3	<0.20
Vanadium	-	-	<1.0	<1.0	2	-	<10	-	<1.0	2	<1.0	<5	<1.0
Zinc	30	-	<5.0	<5.0	<5	-	<50	-	<5.0	<5	<5.0	<5	<5.0
Zirconium	-	-	-	-	<1	-	<10	-	-	<1	-	<1	-
			-	-	-	-	-	-	-	-	-	-	-
Hardness (mg/L)			22.5	40.2	160	-	2000	-	27.2	150	23.6	110	14.6
pH (field)	6.5-9	7-8.7	8.42	6.91	7.95	7.59	8.01	7.88	7.65	7.86	8.07	7.71	7.32

All units in ug/L, unless otherwise noted.

Notes:

1 =	Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Freshwater.
2 =	Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Marine.
3 =	Guideline is hardness dependent
20 =	Indicates freshwater. Exceedance of freshwater CCME WQG
20 =	Indicates brackish water. Exceedance of most stringent WQG

TABLE F1- Metals and Inorganics in Surface Water

Settings	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish
Surface Water Feature	shoreline	upgradient pond 1	pond 1	pond 1	pond 1	pond 1	pond 1	pond 1	Pond 1	bk	bk

Area ID	CCME	CCME	AEC 4	AEC 4	AEC 4	AEC 4	AEC 4	AEC 4	AEC 4	AEC 4	AEC 4	SW-BK-1	SW-BK-2
Station ID	Freshwater[1]	Marine[2]	AEC4-SW09-10	AEC4-SW09-16	A4- SW08-2	AEC4-SW09-11	AEC4-SW09-11	AEC4-SW09-12	A4- SW08-5	AEC4-SW09-13	SW16-03		
Date			17/Sep/09	17/Sep/09	8/Sep/08	17/Sep/09	17/Sep/09	17/Sep/09	8/Sep/08	17/Sep/09	30/Sep/16	9/Sep/08	9/Sep/08
Aluminum	-	-	-	-	-	-	-	-	-	-	-	-	-
pH<6.5	5	-	<5	<5	-	<5	<5	<5	-	<5	-	-	-
pH>6.5	100	-	-	-	<100	-	-	-	<100	-	-	24.6	26.1
Antimony	-	-	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<10	<0.5	-	<0.50	<0.50
Arsenic	5	12.5	<1	<1	<10	<5	<5	<5	<10	<1	-	<0.50	<0.50
Beryllium	-	-	<0.5	<0.5	<20	<0.5	<0.5	<0.5	<20	<0.5	-	<1.0	<1.0
Boron	-	1500	<10	250	640	480	470	400	490	96	-	<100	<100
Cadmium	See Note 3		<0.1	<0.1	<0.34	<0.1	<0.1	<0.1	<0.34	<0.1	-	<0.017	<0.017
Calcium (Ca)	-	-	-	-	117000	-	-	-	33300	-	-	9750	5030
Chromium	8.9	56	<5	<5	<20	<5	<5	<5	<20	<5	-	<1.0	<1.0
Chromium (VI)	1	1.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.50	-	-
Cobalt	-	-	<0.5	<0.5	<6.0	<0.5	0.5	<0.5	<60	<0.5	-	<0.30	<0.30
Copper	See Note 3		<1	<1	<20	<1	<1	<1	<20	<1	-	<1.0	<1.0
Iron	300	-	<100	10000	1500	1400	1400	<100	219	310	-	54	37
Lead	See Note 3		<0.5	<0.5	<10	<0.5	<0.5	<0.5	<10	<0.5	-	<0.50	<0.50
Magnesium			-	-	190000	-	-	-	96300	-	-	1840	810
Manganese			-	-	381	-	-	-	9.5	-	-	2.12	0.99
Mercury	0.026	0.016	<0.02	<0.02	<0.020	<0.02	<0.02	<0.02	<0.020	<0.02	0.01	<0.020	<0.020
Molybdenum	73	-	<1	<1	<20	1	<1	1	<20	<1	-	<1	<1
Nickel	See Note 3		<1	2	<20	3	1	<1	<20	<1	-	<1.0	<1.0
Potassium (K)			-	-	50400	-	-	-	35000	-	-	<2000	<2000
Phosphorus	-	-	<2	20	-	12	22	4	-	98	-	-	-
Selenium	1	-	<2	<2	<20	<2	<2	<2	<20	<2	-	<1.0	<1.0
Silver	0.25	-	<0.1	<0.1	<0.40	<0.1	<0.1	<0.1	<0.040	<0.1	-	<0.020	<0.020
Sodium			-	-	1090000	-	-	-	1020000	-	-	5500	<2.0
Thallium	0.8	-	0.07	0.07	<4.0	<0.05	<0.05	<0.05	<4.0	<0.05	-	<0.20	<0.20
Tin			-	-	<10	-	-	-	<10	-	-	<0.50	<0.50
Titanium			-	-	<20	-	-	-	<10	-	-	<10	<10
Tungsten	-	-	<1	<1	-	<1	<1	<1	-	<1	-	-	-
Uranium	15	-	<0.1	<0.1	<4.0	0.2	0.2	0.2	<4.0	<0.1	-	<0.20	<0.20
Vanadium	-	-	<1	5	<20	<5	<5	<5	<20	2	-	<1.0	<1.0
Zinc	30	-	<5	<5	<10	<5	<5	<5	<5.0	<5	-	<5.0	<5.0
Zirconium	-	-	<1	<1	-	<1	<1	<1	-	<1	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
Hardness (mg/L)			23	180	1080	310	300	400	480	110	-	31.9	15.9
pH (field)	6.5-9	7-8.7	8.1	6.99	6.82	9.07	9.07	8.17	6.94	8.71	7.57	-	-

All units in ug/L, unless otherwise noted.

Notes:

1 =	Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Freshwater.
2 =	Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Marine.
3 =	Guideline is hardness dependent
20 =	Indicates freshwater. Exceedance of freshwater CCME WQG
20 =	Indicates brackish water. Exceedance of most stringent WQG

TABLE F2- Polychlorinated Biphenyls in Surface Water

Settings			Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater
Surface Water Feature			Pond upgradient	Pond upgradient	Small pond landfill height	Stream landfill height	Stream landfill height	Stream landfill height	Below landfill AEC 3	Pond 6	Pond 6	Pond 6	Pond 6	Pond 6	Pond 5	Pond 5
Area ID	**CCME AW Freshwater[1]**	**CCME AW Marine[2]**	**AEC 1**	**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 3**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**RPD**	**AEC 2**	**AEC 3**
Station ID			**A1-SW08-1**	**AEC1-SW09-1**	**AEC2-SW09-4**	**A2-SW08-4**	**AEC2-SW09-6**	**AEC2-SW09-7**	**A3-SW08-1**	**AEC2-SW09-9**	**AEC2-SW09-9**	**SW16-05**	**DUP-1**		**A2-SW08-3**	**A3-SW08-3**
Date			9/Sep/08	17/Sep/09	15/Sep/09	6/Sep/08	15/Sep/09	15/Sep/09	7/Sep/08	15/Sep/09	15/Sep/09	30/Sep/16	30/Sep/16		6/Sep/08	7/Sep/08
Aroclor 1016	-	-	<1	<0.3	<0.05	<1	<0.05	<0.05	<1	<0.05	<0.05	<0.01	<0.01	NC	<1	<1
Aroclor 1221	-	-	<1	<0.5	<0.1	<1	<0.1	<0.1	<1	<0.1	<0.1	<0.01	<0.01	NC	<1	<1
Aroclor 1232	-	-	<1	<0.3	<0.05	<1	0.05	0.05	<1	<0.05	<0.05	<0.01	<0.01	NC	<1	<1
Aroclor 1242	-	-	<1	<0.3	<0.05	<1	<0.05	<0.05	<1	<0.05	<0.05	<0.01	<0.01	NC	<1	<1
Aroclor 1248	-	-	<1	<0.3	<0.05	<1	<0.05	<0.05	<1	<0.05	<0.05	<0.01	<0.01	NC	<1	<1
Aroclor 1254	-	-	<1	<0.3	<0.05	<1	<0.05	<0.05	<1	<0.05	<0.05	<0.01	<0.01	NC	<1	<1
Aroclor 1260	-	-	<1	<0.3	<0.05	<1	<0.05	<0.05	<1	<0.05	<0.05	<0.01	0.04	NC	<1	<1
Aroclor 1262	-	-	<1	<0.3	-	<1	-	-	<1	-	-	<0.01	0.01	NC	<1	<1
Aroclor 1268	-	-	<1	<0.3	-	<1	-	-	<1	-	-	<0.01	<0.01	NC	<1	<1
Polychlorinated biphenyls	*	*	<1	<0.5	<0.1	<1	<0.1	<0.1	<1	<0.1	<0.1	<0.01	0.06	NC	<1	<1

All units in ug/L, unless otherwise noted.

Notes:

1 = Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Freshwater.

2 = Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Marine.

3 = Guideline is hardness dependent

* This guideline has been withdrawn. A water quality guideline is not recommended. Environmental exposure is predominantly via sediment, soil, and/or tissue, therefore, the reader is referred to the respective guidelines for these

* Indicates detection.

TABLE F2- Polychlorinated Biphenyls in Surface Water

Settings			Freshwater	Freshwater	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish
Surface Water Feature			Pond 2	Pond 2	Pond 1	Pond 1	Pond 1	Pond 1	Pond 3	Pond 3	Pond 3	Pond 4
Area ID	**CCME AW Freshwater[1]**	**CCME AW Marine[2]**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 3**	**AEC 3**	**AEC 3**	**AEC 3**
Station ID			**SW16-01**	**SW16-02**	**A4- SW08-2**	**A4- SW08-5**	**AEC4-SW09-11**	**SW16-03**	**A3-SW08-2**	**DUP-1**	**AEC3-SW09-1**	**A3-SW08-4**
Date			30/Sep/16	30/Sep/16	8/Sep/08	8/Sep/08	17/Sep/09	30/Sep/16	7/Sep/08	7/Sep/08	15/Sep/09	7/Sep/08
Aroclor 1016	-	-	<0.01	<0.01	<1	<1	<0.05	<0.01	<1	<1	<0.05	<1
Aroclor 1221	-	-	<0.01	<0.01	<1	<1	<0.1	<0.01	<1	<1	<0.1	<1
Aroclor 1232	-	-	<0.01	<0.01	<1	<1	<0.05	<0.01	<1	<1	<0.05	<1
Aroclor 1242	-	-	<0.01	<0.01	<1	<1	<0.05	<0.01	<1	<1	<0.05	<1
Aroclor 1248	-	-	<0.01	<0.01	<1	<1	<0.05	<0.01	<1	<1	<0.05	<1
Aroclor 1254	-	-	<0.01	<0.01	<1	<1	<0.05	<0.01	<1	<1	<0.05	<1
Aroclor 1260	-	-	<0.01	<0.01	<1	<1	<0.05	<0.01	<1	<1	<0.05	<1
Aroclor 1262	-	-	<0.01	<0.01	<1	<1	<0.05	<0.01	<1	<1	-	<1
Aroclor 1268	-	-	<0.01	<0.01	<1	<1	<0.05	<0.01	<1	<1	-	<1
Polychlorinated biphenyls	*	*	<0.01	<0.01	<1	<1	<0.1	<0.01	<1	<1	<0.1	<1

All units in ug/L, unless otherwise noted.

media.

TABLE F2- Polychlorinated Biphenyls in Surface Water

Settings			Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish
Surface Water Feature			Pond 4	Pond 4	Downgradient Pond 4	Pond 4	South of Pond 4	Shoreline	Shoreline	Shoreline
Area ID	**CCME AW Freshwater[1]**	**CCME AW Marine[2]**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 2**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID			**AEC4-SW09-1**	**A4-SW08-3**	**SW16-04**	**SW16-07**	**A4-SW08-8**	**A4- SW08-4**	**A4-SW08-6**	**A4-SW08-7**
Date			17/Sep/09	8/Sep/08	30/Sep/16	30/Sep/16	8/Sep/08	8/Sep/08	8/Sep/08	8/Sep/08
Aroclor 1016	-	-	<0.05	<1	<0.01	<0.01	<1	<1	<1	<1
Aroclor 1221	-	-	<0.1	<1	<0.01	<0.01	<1	<1	<1	<1
Aroclor 1232	-	-	<0.05	<1	<0.01	<0.01	<1	<1	<1	<1
Aroclor 1242	-	-	<0.05	<1	<0.01	<0.01	<1	<1	<1	<1
Aroclor 1248	-	-	<0.05	<1	<0.01	<0.01	<1	<1	<1	<1
Aroclor 1254	-	-	<0.05	<1	<0.01	<0.01	<1	<1	<1	<1
Aroclor 1260	-	-	<0.05	<1	<0.01	<0.01	<1	<1	<1	<1
Aroclor 1262	-	-	<0.05	<1	<0.01	<0.01	<1	<1	<1	<1
Aroclor 1268	-	-	<0.05	<1	<0.01	<0.01	<1	<1	<1	<1
Polychlorinated biphenyls	*	*	<0.1	<1	<0.01	<0.01	<1	<1	<1	<1

All units in ug/L, unless otherwise noted.

Notes:

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3 = Guideline is hardness dependent
* This guideline has been withdrawn. A water quality guideline is not recommended.
* Indicates detection.

ARCADIS Design & Consultancy for natural and built assets

TABLE F3- Polyaromatic Hydrocarbons (PAHs) in Surface Water

Settings			Freshwater	Freshwater	Freshwater	Freshwater	Freshwater		Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Brackish	Brackish
Surface Water Feature			Pond upgradient	Stream landfill height	Pond 6	Pond 6	Pond 6		Pond 5	Pond 5	Pond 5	Pond 2	Pond 2	Pond 2	Pond 1	Pond 1
Area ID	**CCME AW Freshwater[1]**	**CCME AW Marine[2]**	**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**RPD**	**AEC 4**	**AEC 4**	**AEC 2**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**
Station ID			**AEC1-SW09-1**	**AEC2-SW09-6**	**AEC2-SW09-8**	**SW16-05**	**DUP-1**		**AEC4-SW09-11**	**AEC4-SW09-11**	**SW16-06**	**AEC4-SW09-15**	**SW16-01**	**SW16-02**	**A4- SW08-2**	**SW16-03**
Date			17/Sep/09	17/Sep/09	17/Sep/09	30/Sep/16	30/Sep/16		17/Sep/09	17/Sep/09	30/Sep/16	17/Sep/09	30/Sep/16	30/Sep/16	08-SEP-08	30/Sep/16
Acenaphthene	5.8	-	<0.05	<0.05	<0.05	<0.010	<0.010	NC	<0.05	<0.05	<0.010	<0.05	<0.010	<0.010	<0.050	<0.010
Acridine	4.4	-	<0.1	<0.1	<0.1	-	-		<0.1	<0.1	-	<0.1	-	-	<0.050	-
Anthracene	0.012	-	<0.05	<0.05	<0.05	<0.010	<0.010	NC	<0.05	<0.05	<0.010	<0.05	<0.010	<0.010	<0.012	<0.010
Benzo(a)anthracene	0.018	-	<0.05	<0.05	<0.05	<0.010	<0.010	NC	<0.05	<0.05	<0.010	<0.05	<0.010	<0.010	<0.018	<0.010
Benzo(a)pyrene	0.015	-	<0.005	<0.005	<0.005	<0.010	<0.010	NC	0.005	<0.005	<0.010	<0.005	<0.010	<0.010	<0.010	<0.010
Fluoranthene	0.04	-	<0.05	<0.05	<0.05	<0.010	<0.010	NC	<0.05	<0.05	<0.010	<0.05	<0.010	<0.010	<0.04	<0.010
Fluorene	3	-	<0.05	<0.05	<0.05	<0.010	<0.010	NC	<0.05	<0.05	<0.010	<0.05	<0.010	<0.010	<0.050	<0.010
Naphthalene	1.1	1.4	<0.05	<0.05	<0.05	<0.010	<0.010	NC	<0.05	<0.05	<0.010	<0.05	<0.010	<0.010	<0.050	<0.010
Phenanthrene	0.4	-	<0.05	<0.05	<0.05	<0.010	<0.010	NC	<0.05	<0.05	<0.010	<0.05	<0.010	<0.010	<0.050	<0.010
Pyrene	0.025	-	<0.05	<0.05	<0.05	<0.010	<0.010	NC	<0.05	<0.05	<0.010	<0.05	<0.010	<0.010	<0.025	<0.010

All units in ug/L, unless otherwise noted.

Notes:

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2 =	Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Marine.
3 =	Guideline is hardness dependent
20 =	Indicates freshwater. Exceedance of freshwater CCME WQG
20 =	Indicates brackish water. Exceedance of most stringent WQG

TABLE F4- Petroleum Hydrocarbons in Surface Water

Settings			Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater
Surface Water Feature			Pond upgradient	Stream landfill height	Small pond landfill height	Stream landfill height	Below landfill AEC 3	Pond 6	Pond 6	Pond 6	Pond 6	Pond 5	Pond 5	Pond 5	Pond 2	Pond 2
Area ID	**CCME Freshwater[1]**	**CCME Marine[2]**	**AEC 1**	**AEC 2**	**AEC 2**		**AEC 3**	**AEC 2**	**AEC 2**	**AEC 2**	**RPD**	**AEC 3**	**AEC 3**	**AEC 2**	**AEC 4**	**AEC 4**
Station ID			**AEC1-SW09-1**	**AEC2-SW09-6**	**A2-SW08-3**	**A2-SW08-4**	**A3-SW08-1**	**AEC2-SW09-8**	**SW16-05**	**DUP-1**		**A3-SW08-3**	**A4-SW08-3**	**SW16-06**	**A4- SW08-1**	**AEC4-SW09-15**
Date			17/Sep/09	17/Sep/09	6/Sep/08	6/Sep/08	7/Sep/08	17/Sep/09	30/Sep/16	30/Sep/16		7/Sep/08	8/Sep/08	30/Sep/16	8/Sep/08	17/Sep/09
Benzene	370	110	<0.1	<0.1	<0.50	<0.50	<0.50	<0.1	<0.20	<0.20	NC	<0.50	<0.50	<0.20	<0.50	<0.1
Ethylbenzene	90	25	<0.1	<0.1	<0.50	<0.50	<0.50	<0.1	<0.20	<0.20	NC	<0.50	<0.50	<0.20	<0.50	<0.1
Toluene	2	215	<0.2	<0.2	<1	<1	1	0.2	<0.20	<0.20	NC	<1	<1	<0.20	<1	<0.2
m+p-Xylene	-	-	<0.1	<0.1	<0.50	<0.50	<0.50	<0.1	<0.40	<0.40	NC	<0.50	<0.50	<0.40	<0.50	<0.1
o-Xylene	-	-	<0.1	<0.1	<0.50	<0.50	<0.50	<0.1	<0.20	<0.20	NC	<0.50	<0.50	<0.20	<0.50	<0.1
Xylenes (total)	-	-	<0.1	<0.1	<1	<1	<1	<0.1	<0.40	<0.40	NC	<1	<1	<0.40	<1	<0.1
F1 (C6-C10)	-	-	<100	<100	<100	<100	<100	<100	<25	<25	NC	<100	<100	<25	<100	<100
F1 (C6-C10) minus BTEX	-	-	<100	<100	<100	<100	<100	<100	<25	<25	NC	<100	<100	<25	<100	<100
F2 (C10-C16)	-	-	<100	<100	<300	<300	<300	<100	<100	<100	NC	<300	<300	<100	<300	<100
F3 (C16-C34)	-	-	550	<100	<0.30	<0.30	<0.30	<100	<200	<200	NC	<0.30	<0.30	<200	<0.30	<100
F4 (C34-C50)	-	-	230	<100	-	-	-	<100	<200	<200	NC	-	-	<200	-	<100
Reached Baseline at C50	-	-	No	Yes	-	-	-	Yes	Yes	Yes	NC	-	-	Yes	-	Yes

All units in ug/L, unless otherwise noted.

Notes:

1 = Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Freshwater.

2 = Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Marine.

3 = Guideline is hardness dependent

20 = Indicates freshwater. Exceedance of freshwater CCME WQG

20 = Indicates brackish water. Exceedance of most stringent WQG

TABLE F4- Petroleum Hydrocarbons in Surface Water

Settings			Freshwater	Freshwater	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish
Surface Water Feature			Pond 2	Pond 2	Pond 1	Upgradient Pond 1	Pond 1	Pond 3	Pond 3	Pond 4	Downgradient Pond 4	Pond 4
Area ID	**CCME Freshwater[1]**	**CCME Marine[2]**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 3**			**AEC 4**	**AEC 2**
Station ID			**SW16-01**	**SW16-02**	**AEC4-SW09-12**	**AEC4-SW09-16**	**SW16-03**	**A3-SW08-2**	**DUP-1**	**A3-SW08-4**	**SW16-04**	**SW16-07**
Date			30/Sep/16	30/Sep/16	17/Sep/09	17/Sep/09	30/Sep/16	7/Sep/08	7/Sep/08	7/Sep/08	30/Sep/16	30/Sep/16
Benzene	370	110	<0.20	<0.20	<0.1	<1	<0.20	<0.50	<0.50	<0.50	<0.20	<0.20
Ethylbenzene	90	25	<0.20	<0.20	<0.1	<1	<0.20	<0.50	<0.50	<0.50	<0.20	<0.20
Toluene	2	215	<0.20	<0.20	<0.2		<0.20	<1	<1	<1	<0.20	<0.20
m+p-Xylene	-	-	<0.40	<0.40	<0.1	<1	<0.40	<0.50	<0.50	<0.50	<0.40	<0.40
o-Xylene	-	-	<0.20	<0.20	<0.1	<1	<0.20	<0.50	<0.50	<0.50	<0.20	<0.20
Xylenes (total)	-	-	<0.40	<0.40	<0.1	<1	<0.40	<1	<1	<1	<0.40	<0.40
F1 (C6-C10)	-	-	<25	<25	-	-	<25	<100	<100	<100	<25	<25
F1 (C6-C10) minus BTEX	-	-	<25	<25	-	-	<25	<100	<100	<100	<25	<25
F2 (C10-C16)	-	-	<100	<100	-	-	<100	<300	<300	<300	<100	<100
F3 (C16-C34)	-	-	<200	<200	-	-	<200	<0.30	<0.30	<0.30	<200	<200
F4 (C34-C50)	-	-	<200	<200	-	-	<200	-	-	-	<200	<200
Reached Baseline at C50	-	-	Yes	Yes	-	-	Yes	-	-	-	Yes	Yes

All units in ug/L, unless otherwise noted.

Notes:

1 = Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Freshwater.
2 = Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Marine.
3 = Guideline is hardness dependent
20 = Indicates freshwater. Exceedance of freshwater CCME WQG
20 = Indicates brackish water. Exceedance of most stringent WQG

ARCADIS Design & Consultancy for natural and built assets

TABLE F5- Volatile Organic Compounds (VOCs) in Surface Water

Settings			Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater	Brackish
Surface Water Feature			Pond upgradient	Small pond landfill height	Stream landfill height	Stream landfill height	Stream landfill height	Pond 6	Pond 6	Pond 6	Pond 5	Pond 2	Upgradient Pond 1
Area ID	**CCME AW Freshwater[1]**	**CCME AW Marine[2]**	**AEC 1**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 2**	**AEC 4**	**AEC 4**
Station ID			**AEC1-SW09-1**	**AEC2-SW09-4**	**AEC2-SW09-6**	**AEC2-SW09-6**	**AEC2-SW09-7**	**AEC2-SW09-8**	**AEC2-SW09-9**	**AEC2-SW09-9**	**AEC2-SW09-11**	**AEC4-SW09-15**	**AEC4-SW09-16**
Date			17/Sep/09	15/Sep/09	15/Sep/09	17/Sep/09	15/Sep/09	17/Sep/09	15/Sep/09	15/Sep/09	15/Sep/09	17/Sep/09	17/Sep/09
Acetone	-	-	<10	-	-	<10	-	<10	-	-	-	<10	<100
Benzene	370	110	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1
Bromodichloromethane	-	-	<0.1	-	-	<0.1	-	0.1	-	-	-	<0.1	<1
Bromoform	-	-	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	<2
Bromomethane	-	-	<0.5	-	-	<0.5	-	<0.5	-	-	-	<0.5	<5
Carbon tetrachloride	13.3	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1
Chlorobenzene	1.3	25	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1
Chlorodibromomethane	-	-	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	<2
Chloroform	1.8	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1
1,2-Dichlorobenzene	0.7	42	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	**<2**
1,3-Dichlorobenzene	150	-	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	<2
1,4-Dichlorobenzene	26	-	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	<2
1,1-Dichloroethane	-	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1
1,2-Dichloroethane	100	-	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	<2
1,1-Dichloroethene	-	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1.0
cis-1,2-Dichloroethene	-	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	2
trans-1,2-Dichloroethene	-	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1
Dichloromethane	98.1	-	<0.5	-	-	<0.5	-	<0.5	-	-	-	<0.5	<5
1,2-Dichloropropane	-	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1
cis-1,3-Dichloropropene	-	-	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	<2
trans-1,3-Dichloropropene	-	-	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	<2
Ethylbenzene	90	25	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1
Ethylene dibromide	-	-	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	<2
Hexachlorobenzene	-	-	<0.03	<0.005	<0.005	-	<0.005	-	<0.005	<0.005	<0.005	<0.005	-
Methyl ethyl ketone	-	-	<5	-	-	<5	-	<5	-	-	-	<5	<50
Methyl isobutyl ketone	-	-	<5	-	-	<5	-	<5	-	-	-	<5	<50
Methyl-tert-butylether	10000	5000	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	<2
Styrene	72	-	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	<2
1,1,1,2-Tetrachloroethane	-	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1
1,1,2,2-Tetrachloroethane	-	-	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	<2
Tetrachloroethene	111	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	210
Toluene	2	215	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	**<2**
1,1,1-Trichloroethane	-	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1
1,1,2-Trichloroethane	-	-	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	3
Trichloroethene	21	-	<0.1	-	-	0.2	-	<0.1	-	-	-	<0.1	62
Vinyl chloride	-	-	<0.2	-	-	<0.2	-	<0.2	-	-	-	<0.2	<2
m+p-Xylene	-	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1
o-Xylene	-	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1
Xylenes (total)	-	-	<0.1	-	-	<0.1	-	<0.1	-	-	-	<0.1	<1

All units in ug/L, unless otherwise noted.

Notes:

1 = Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Freshwater.
2 = Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Marine.
3 = Guideline is hardness dependent
20 = Indicates freshwater. Exceedance of freshwater CCME WQG
20 = Indicates brackish water. Exceedance of most stringent WQG

TABLE F5- Volatile Organic Compounds (VOCs) in Surface Water

Settings			Brackish	Brackish	Brackish	Brackish	Brackish	Brackish	Brackish
Surface Water Feature			Pond 1	Pond 1	Pond 1	Pond 1	Pond 1	Pond 4	Pond 4
Area ID	**CCME AW Freshwater[1]**	**CCME AW Marine[2]**	**AEC 4**	**AEC 4**	**AEC 4**	**AEC 4**	**Duplicate Evaluation**	**AEC 4**	**AEC 4**
Station ID			**A4- SW08-2**	**AEC4-SW09-12**	**AEC4-SW09-11**	**AEC4-SW09-11**		**A4-SW08-3**	**AEC4-SW09-1**
Date			8/Sep/08	17/Sep/09	17/Sep/09	17/Sep/09	Scenario[A]	8/Sep/08	17/Sep/09
Acetone	-	-	-	<10	<10	<10	A	-	-
Benzene	370	110	<0.50	<0.1	<0.1	<0.1	A	<0.50	-
Bromodichloromethane	-	-	<1	<0.1	<0.1	<0.1	A	<1	-
Bromoform	-	-	<1	<0.2	<0.2	<0.2	A	<1	-
Bromomethane	-	-		<0.5	<0.5	<0.5	A		-
Carbon tetrachloride	13.3	-	<1	<0.1	<0.1	<0.1	A	<1	-
Chlorobenzene	1.3	25	<1	<0.1	<0.1	<0.1	A	<1	-
Chlorodibromomethane	-	-	<1	<0.2	<0.2	<0.2	A	<1	-
Chloroform	1.8	-	<1	<0.1	<0.1	<0.1	A	<1	-
1,2-Dichlorobenzene	0.7	42	<0.7	<0.2	<0.2	<0.2	A	0.7	-
1,3-Dichlorobenzene	150	-	<1	<0.2	<0.2	<0.2	A	<1	-
1,4-Dichlorobenzene	26	-	<1	<0.2	<0.2	<0.2	A	<1	-
1,1-Dichloroethane	-	-	<1	<0.1	<0.1	<0.1	A	<1	-
1,2-Dichloroethane	100	-	<1	<0.2	<0.2	<0.2	A	<1	-
1,1-Dichloroethene	-	-	<1	<0.1	<0.1	<0.1	A	<1	-
cis-1,2-Dichloroethene	-	-	4	<0.1	0.3	0.4	D	<1	-
trans-1,2-Dichloroethene	-	-	<1	<0.1	<0.1	<0.1	A	<1	-
Dichloromethane	98.1	-	<5.0	<0.5	<0.5	<0.5	A	<5.0	-
1,2-Dichloropropane	-	-	<1	<0.1	<0.1	<0.1	A	<1	-
cis-1,3-Dichloropropene	-	-	<1	<0.2	<0.2	<0.2	A	<1	-
trans-1,3-Dichloropropene	-	-	<1	<0.2	<0.2	<0.2	A	<1	-
Ethylbenzene	90	25	<0.50	<0.1	<0.1	<0.1	A	<0.50	-
Ethylene dibromide	-	-	-	<0.2	<0.2	<0.2	A	-	-
Hexachlorobenzene	-	-	-	-	<0.005	-	NC	-	<0.005
Methyl ethyl ketone	-	-	-	<5	<5	<5	A	-	-
Methyl isobutyl ketone	-	-	-	<5	<5	<5	A	-	-
Methyl-tert-butylether	10000	5000	<1	<0.2	<0.2	<0.2	A	<1	-
Styrene	72	-	<0.50	<0.2	<0.2	<0.2	A	<0.50	-
1,1,1,2-Tetrachloroethane	-	-	<1	<0.1	<0.1	<0.1	A	<1	-
1,1,2,2-Tetrachloroethane	-	-	<1	<0.2	<0.2	<0.2	A	<1	-
Tetrachloroethene	111	-	41.1	0.8	7.7	7.9	C	<1	-
Toluene	2	215	<1	<0.2	<0.2	<0.2	A	<1	-
1,1,1-Trichloroethane	-	-	<1	<0.1	<0.1	<0.1	A	<1	-
1,1,2-Trichloroethane	-	-	<1	<0.2	<0.2	<0.2	A	<1	-
Trichloroethene	21	-	22.6	<0.1	1.5	1.5	C	<1	-
Vinyl chloride	-	-	<1	<0.2	<0.2	<0.2	A	<1	-
m+p-Xylene	-	-	<0.50	<0.1	<0.1	<0.1	A	<0.50	-
o-Xylene	-	-	<0.50	<0.1	<0.1	<0.1	A	<0.50	-
Xylenes (total)	-	-	<1	<0.1	<0.1	<0.1	A	<1	-

All units in ug/L, unless otherwise noted.

Notes:

1 = Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Freshwater.
2 = Canadian Council of Ministers of the Environment (CCME), Water Quality Guidelines for the Protection of Aquatic Life. Marine.
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20 = Indicates brackish water. Exceedance of most stringent WQG

APPENDIX C

2016 Laboratory Reports and Data Validation

Maxxam
A Bureau Veritas Group Company

Your Project #: 102153-00
Site#: 102153-00
Site Location: TC IQALUIT LANDFILL
Your C.O.C. #: 578892-01-01

Attention:Ryan Fletcher

ARCADIS Canada Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

Report Date: 2016/10/11
Report #: R4201629
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6L2011
Received: 2016/10/03, 10:30

Sample Matrix: SEDIMENT
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Methylnaphthalene Sum	8	N/A	2016/10/05	CAM SOP-00301	EPA 8270D m
Petroleum Hydro. CCME F1 & BTEX in Soil (2)	8	N/A	2016/10/06	OTT SOP-00002	CCME CWS
Petroleum Hydrocarbons F2-F4 in Soil (3)	8	2016/10/04	2016/10/04	OTT SOP-00001	CCME CWS
Strong Acid Leachable Metals by ICPMS (1)	8	2016/10/06	2016/10/06	CAM SOP-00447	EPA 6020B m
MOISTURE	8	N/A	2016/10/05	CAM SOP-00445	McKeague 2nd ed 1978
OC Pesticides (Selected) & PCB (1, 4)	6	2016/10/06	2016/10/07	CAM SOP-00307	SW846 8081, 8082
OC Pesticides (Selected) & PCB (1, 4)	2	2016/10/06	2016/10/11	CAM SOP-00307	SW846 8081, 8082
OC Pesticides Summed Parameters (1)	8	N/A	2016/10/05	CAM SOP-00307	EPA 8081/8082 m
PAH Compounds in Soil by GC/MS (SIM)	2	2016/10/04	2016/10/04	OTT SOP-00011	EPA 8270D m
PAH Compounds in Soil by GC/MS (SIM)	6	2016/10/04	2016/10/05	OTT SOP-00011	EPA 8270D m
pH CaCl2 EXTRACT (1)	8	2016/10/06	2016/10/06	CAM SOP-00413	EPA 9045 D m

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

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 Analytics Mississauga
(2) No lab extraction date is given for F1BTEX & VOC samples that are field preserved with methanol. Extraction date is the date sampled unless otherwise stated.
(3) All CCME PHC 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.
(4) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane

Maxxam Analytics International Corporation o/a Maxxam Analytics 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxam.ca

Your Project #: 102153-00
Site#: 102153-00
Site Location: TC IQALUIT LANDFILL
Your C.O.C. #: 578892-01-01

Attention:Ryan Fletcher

ARCADIS Canada Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

Report Date: 2016/10/11
Report #: R4201629
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6L2011
Received: 2016/10/03, 10:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Madison Bingley, Project Manager
Email: MBingley@maxxam.ca
Phone# (613)274-3549

==========

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 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxam.ca

Maxxam Job #: B6L2011
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

O.REG 153 ICPMS METALS (SOIL)

Maxxam ID		DEF656	DEF656	DEF657	DEF658	DEF659		
Sampling Date		2016/10/01 12:00	2016/10/01 12:00	2016/10/01 12:15	2016/10/01 12:30	2016/10/01 13:00		
COC Number		578892-01-01	578892-01-01	578892-01-01	578892-01-01	578892-01-01		
	UNITS	**S016-01**	**S016-01 Lab-Dup**	**S016-02**	**S016-03**	**S016-04**	**RDL**	**QC Batch**
Metals								
Acid Extractable Antimony (Sb)	ug/g	<0.20	<0.20	<0.20	0.33	<0.20	0.20	4691542
Acid Extractable Arsenic (As)	ug/g	1.5	1.6	<1.0	1.1	1.3	1.0	4691542
Acid Extractable Barium (Ba)	ug/g	29	28	20	34	24	0.50	4691542
Acid Extractable Beryllium (Be)	ug/g	<0.20	<0.20	<0.20	0.23	<0.20	0.20	4691542
Acid Extractable Boron (B)	ug/g	<5.0	<5.0	<5.0	7.9	<5.0	5.0	4691542
Acid Extractable Cadmium (Cd)	ug/g	<0.10	<0.10	<0.10	0.25	0.18	0.10	4691542
Acid Extractable Chromium (Cr)	ug/g	18	17	15	16	14	1.0	4691542
Acid Extractable Cobalt (Co)	ug/g	3.6	3.8	3.6	5.9	5.0	0.10	4691542
Acid Extractable Copper (Cu)	ug/g	5.7	6.1	6.0	10	5.4	0.50	4691542
Acid Extractable Lead (Pb)	ug/g	3.0	3.0	6.4	12	8.9	1.0	4691542
Acid Extractable Molybdenum (Mo)	ug/g	0.79	0.81	1.2	2.7	1.2	0.50	4691542
Acid Extractable Nickel (Ni)	ug/g	5.7	6.3	5.1	7.4	5.4	0.50	4691542
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	4691542
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	4691542
Acid Extractable Thallium (Tl)	ug/g	<0.050	0.061	<0.050	0.065	<0.050	0.050	4691542
Acid Extractable Uranium (U)	ug/g	0.51	0.49	0.56	0.84	0.74	0.050	4691542
Acid Extractable Vanadium (V)	ug/g	40	36	37	33	34	5.0	4691542
Acid Extractable Zinc (Zn)	ug/g	37	37	44	73	57	5.0	4691542

RDL = Reportable Detection Limit
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Maxxam Job #: B6L2011
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

O.REG 153 ICPMS METALS (SOIL)

Maxxam ID		DEF660	DEF661	DEF662	DEF663		
Sampling Date		2016/10/01 13:15	2016/10/01 13:30	2016/10/01 13:45	2016/10/01		
COC Number		578892-01-01	578892-01-01	578892-01-01	578892-01-01		
	UNITS	**S016-05**	**S016-06**	**S016-07**	**DUP-1**	**RDL**	**QC Batch**
Metals							
Acid Extractable Antimony (Sb)	ug/g	<0.20	2.0	3.9	<0.20	0.20	4691542
Acid Extractable Arsenic (As)	ug/g	<1.0	3.4	4.8	1.5	1.0	4691542
Acid Extractable Barium (Ba)	ug/g	24	73	110	31	0.50	4691542
Acid Extractable Beryllium (Be)	ug/g	<0.20	0.25	<0.20	<0.20	0.20	4691542
Acid Extractable Boron (B)	ug/g	5.4	27	5.8	<5.0	5.0	4691542
Acid Extractable Cadmium (Cd)	ug/g	0.52	8.0	8.9	<0.10	0.10	4691542
Acid Extractable Chromium (Cr)	ug/g	15	30	40	15	1.0	4691542
Acid Extractable Cobalt (Co)	ug/g	5.5	24	25	3.4	0.10	4691542
Acid Extractable Copper (Cu)	ug/g	5.5	37	32	5.5	0.50	4691542
Acid Extractable Lead (Pb)	ug/g	6.4	120	170	2.8	1.0	4691542
Acid Extractable Molybdenum (Mo)	ug/g	2.7	2.2	4.3	0.93	0.50	4691542
Acid Extractable Nickel (Ni)	ug/g	5.6	16	21	6.1	0.50	4691542
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	<0.50	<0.50	0.50	4691542
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	0.49	<0.20	0.20	4691542
Acid Extractable Thallium (Tl)	ug/g	0.057	0.061	0.069	0.064	0.050	4691542
Acid Extractable Uranium (U)	ug/g	0.90	0.91	0.62	0.42	0.050	4691542
Acid Extractable Vanadium (V)	ug/g	27	35	32	34	5.0	4691542
Acid Extractable Zinc (Zn)	ug/g	94	440	300	36	5.0	4691542

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QC Batch = Quality Control Batch

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Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

O.REG 153 OC PESTICIDES (SOIL)

Maxxam ID		DEF656	DEF657		DEF658		DEF659		
Sampling Date		2016/10/01 12:00	2016/10/01 12:15		2016/10/01 12:30		2016/10/01 13:00		
COC Number		578892-01-01	578892-01-01		578892-01-01		578892-01-01		
	UNITS	**S016-01**	**S016-02**	**RDL**	**S016-03**	**RDL**	**S016-04**	**RDL**	**QC Batch**
Calculated Parameters									
Chlordane (Total)	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4685758
o,p-DDD + p,p-DDD	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4685758
o,p-DDE + p,p-DDE	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4685758
o,p-DDT + p,p-DDT	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4685758
Total Endosulfan	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4685758
Total PCB	ug/g	<0.015	0.021	0.015	0.049	0.030	0.020	0.015	4685758
Pesticides & Herbicides									
Aldrin	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
a-Chlordane	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
g-Chlordane	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
o,p-DDD	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
p,p-DDD	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
o,p-DDE	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
p,p-DDE	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
o,p-DDT	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
p,p-DDT	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
Dieldrin	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
Lindane	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
Endosulfan I (alpha)	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
Endosulfan II (beta)	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
Endrin	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
Heptachlor	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
Heptachlor epoxide	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
Hexachlorobenzene	ug/g	<0.0020	<0.0020	0.0020	<0.0030	0.0030	<0.0020	0.0020	4690897
Hexachlorobutadiene	ug/g	<0.0050	<0.0050	0.0050	<0.0075	0.0075	<0.0050	0.0050	4690897
Hexachloroethane	ug/g	<0.0050	<0.0050	0.0050	<0.0075	0.0075	<0.0050	0.0050	4690897
Methoxychlor	ug/g	<0.0050	<0.0050	0.0050	<0.0075	0.0075	<0.0050	0.0050	4690897
Aroclor 1242	ug/g	<0.015	<0.015	0.015	<0.030	0.030	<0.015	0.015	4690897
Aroclor 1248	ug/g	<0.015	<0.015	0.015	<0.030	0.030	<0.015	0.015	4690897
Aroclor 1254	ug/g	<0.015	<0.015	0.015	<0.030	0.030	<0.015	0.015	4690897
Aroclor 1260	ug/g	<0.015	0.021	0.015	0.049	0.030	0.020	0.015	4690897
Total PCB	ug/g		0.021	0.015	0.049	0.015			4690897

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

O.REG 153 OC PESTICIDES (SOIL)

Maxxam ID		DEF656	DEF657		DEF658		DEF659		
Sampling Date		2016/10/01 12:00	2016/10/01 12:15		2016/10/01 12:30		2016/10/01 13:00		
COC Number		578892-01-01	578892-01-01		578892-01-01		578892-01-01		
	UNITS	**S016-01**	**S016-02**	**RDL**	**S016-03**	**RDL**	**S016-04**	**RDL**	**QC Batch**
Surrogate Recovery (%)									
2,4,5,6-Tetrachloro-m-xylene	%	83	80		73		77		4690897
Decachlorobiphenyl	%	88	97		83		73		4690897

RDL = Reportable Detection Limit
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Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

O.REG 153 OC PESTICIDES (SOIL)

Maxxam ID		DEF660		DEF661		DEF662		DEF663		
Sampling Date		2016/10/01 13:15		2016/10/01 13:30		2016/10/01 13:45		2016/10/01		
COC Number		578892-01-01		578892-01-01		578892-01-01		578892-01-01		
	UNITS	**S016-05**	**RDL**	**S016-06**	**RDL**	**S016-07**	**RDL**	**DUP-1**	**RDL**	**QC Batch**
Calculated Parameters										
Chlordane (Total)	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4685758
o,p-DDD + p,p-DDD	ug/g	0.0021	0.0020	<0.050	0.050	<0.060	0.060	<0.0020	0.0020	4685758
o,p-DDE + p,p-DDE	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4685758
o,p-DDT + p,p-DDT	ug/g	<0.0020	0.0020	<0.15	0.15	<0.10	0.10	<0.0020	0.0020	4685758
Total Endosulfan	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4685758
Total PCB	ug/g	0.046	0.030	1.6	0.38	1.4	0.45	<0.015	0.015	4685758
Pesticides & Herbicides										
Aldrin	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
a-Chlordane	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
g-Chlordane	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
o,p-DDD	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
p,p-DDD	ug/g	0.0021	0.0020	<0.050	0.050	<0.060	0.060	<0.0020	0.0020	4690897
o,p-DDE	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
p,p-DDE	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
o,p-DDT	ug/g	<0.0020	0.0020	<0.050	0.050	<0.060	0.060	<0.0020	0.0020	4690897
p,p-DDT	ug/g	<0.0020	0.0020	<0.15	0.15	<0.10	0.10	<0.0020	0.0020	4690897
Dieldrin	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
Lindane	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
Endosulfan I (alpha)	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
Endosulfan II (beta)	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
Endrin	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
Heptachlor	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
Heptachlor epoxide	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
Hexachlorobenzene	ug/g	<0.0020	0.0020	<0.050	0.050	<0.0060	0.0060	<0.0020	0.0020	4690897
Hexachlorobutadiene	ug/g	<0.0050	0.0050	<0.13	0.13	<0.015	0.015	<0.0050	0.0050	4690897
Hexachloroethane	ug/g	<0.0050	0.0050	<0.13	0.13	<0.015	0.015	<0.0050	0.0050	4690897
Methoxychlor	ug/g	<0.0050	0.0050	<0.13	0.13	<0.015	0.015	<0.0050	0.0050	4690897
Aroclor 1242	ug/g	<0.030	0.030	<0.38	0.38	<0.45	0.45	<0.015	0.015	4690897
Aroclor 1248	ug/g	<0.030	0.030	<0.38	0.38	<0.45	0.45	<0.015	0.015	4690897
Aroclor 1254	ug/g	<0.015	0.015	<0.38	0.38	<0.45	0.45	<0.015	0.015	4690897
Aroclor 1260	ug/g	0.046	0.015	1.6	0.38	1.4	0.45	<0.015	0.015	4690897
Surrogate Recovery (%)										
2,4,5,6-Tetrachloro-m-xylene	%	69		107		80		72		4690897

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

O.REG 153 OC PESTICIDES (SOIL)

Maxxam ID		DEF660		DEF661		DEF662		DEF663		
Sampling Date		2016/10/01 13:15		2016/10/01 13:30		2016/10/01 13:45		2016/10/01		
COC Number		578892-01-01		578892-01-01		578892-01-01		578892-01-01		
	UNITS	**S016-05**	**RDL**	**S016-06**	**RDL**	**S016-07**	**RDL**	**DUP-1**	**RDL**	**QC Batch**
Decachlorobiphenyl	%	76		91		79		72		4690897

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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ARCADIS Canada Inc
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Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

O.REG 153 PAHS (SOIL)

Maxxam ID		DEF656	DEF657	DEF657	DEF658	DEF659	DEF660		
Sampling Date		2016/10/01 12:00	2016/10/01 12:15	2016/10/01 12:15	2016/10/01 12:30	2016/10/01 13:00	2016/10/01 13:15		
COC Number		578892-01-01	578892-01-01	578892-01-01	578892-01-01	578892-01-01	578892-01-01		
	UNITS	**S016-01**	**S016-02**	**S016-02 Lab-Dup**	**S016-03**	**S016-04**	**S016-05**	**RDL**	**QC Batch**
Calculated Parameters									
Methylnaphthalene, 2-(1-)	ug/g	<0.014	<0.014		<0.014	<0.014	<0.014	0.014	4686464
Polyaromatic Hydrocarbons									
Acenaphthene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4687461
Acenaphthylene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4687461
Anthracene	ug/g	<0.0050	<0.0050	<0.0050	0.0052	<0.0050	<0.0050	0.0050	4687461
Benzo(a)anthracene	ug/g	<0.0050	0.0055	<0.0050	0.027	<0.0050	<0.0050	0.0050	4687461
Benzo(a)pyrene	ug/g	<0.0050	<0.0050	<0.0050	0.028	<0.0050	<0.0050	0.0050	4687461
Benzo(b/j)fluoranthene	ug/g	<0.0050	0.0069	0.0057	0.055	<0.0050	<0.0050	0.0050	4687461
Benzo(g,h,i)perylene	ug/g	<0.0050	<0.0050	<0.0050	0.011	<0.0050	<0.0050	0.0050	4687461
Benzo(k)fluoranthene	ug/g	<0.0050	<0.0050	<0.0050	0.019	<0.0050	<0.0050	0.0050	4687461
Chrysene	ug/g	<0.0050	<0.0050	<0.0050	0.023	<0.0050	<0.0050	0.0050	4687461
Dibenz(a,h)anthracene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4687461
Fluoranthene	ug/g	<0.0050	0.0055	<0.0050	0.033	<0.0050	<0.0050	0.0050	4687461
Fluorene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4687461
Indeno(1,2,3-cd)pyrene	ug/g	<0.0050	<0.0050	<0.0050	0.010	<0.0050	<0.0050	0.0050	4687461
1-Methylnaphthalene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4687461
2-Methylnaphthalene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4687461
Naphthalene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4687461
Phenanthrene	ug/g	<0.0050	0.0069	<0.0050	0.034	<0.0050	<0.0050	0.0050	4687461
Pyrene	ug/g	<0.0050	<0.0050	<0.0050	0.030	<0.0050	<0.0050	0.0050	4687461
Surrogate Recovery (%)									
D10-Anthracene	%	61	63	64	67	66	62		4687461
D14-Terphenyl (FS)	%	57	51	50	65	54	56		4687461
D8-Acenaphthylene	%	72	70	70	77	72	72		4687461

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ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

O.REG 153 PAHS (SOIL)

Maxxam ID		DEF661		DEF662		DEF663		
Sampling Date		2016/10/01 13:30		2016/10/01 13:45		2016/10/01		
COC Number		578892-01-01		578892-01-01		578892-01-01		
	UNITS	**S016-06**	**RDL**	**S016-07**	**RDL**	**DUP-1**	**RDL**	**QC Batch**
Calculated Parameters								
Methylnaphthalene, 2-(1-)	ug/g	0.018	0.014	0.028	0.014	<0.014	0.014	4686464
Polyaromatic Hydrocarbons								
Acenaphthene	ug/g	0.033	0.020	0.031	0.015	<0.0050	0.0050	4687461
Acenaphthylene	ug/g	<0.020	0.020	<0.015	0.015	<0.0050	0.0050	4687461
Anthracene	ug/g	0.041	0.020	0.038	0.015	<0.0050	0.0050	4687461
Benzo(a)anthracene	ug/g	0.17	0.020	0.18	0.015	<0.0050	0.0050	4687461
Benzo(a)pyrene	ug/g	0.16	0.020	0.12	0.015	<0.0050	0.0050	4687461
Benzo(b/j)fluoranthene	ug/g	0.29	0.020	0.29	0.015	<0.0050	0.0050	4687461
Benzo(g,h,i)perylene	ug/g	0.087	0.020	0.066	0.015	<0.0050	0.0050	4687461
Benzo(k)fluoranthene	ug/g	0.12	0.020	0.083	0.015	<0.0050	0.0050	4687461
Chrysene	ug/g	0.18	0.020	0.17	0.015	<0.0050	0.0050	4687461
Dibenz(a,h)anthracene	ug/g	<0.020	0.020	<0.015	0.015	<0.0050	0.0050	4687461
Fluoranthene	ug/g	0.24	0.020	0.20	0.015	<0.0050	0.0050	4687461
Fluorene	ug/g	0.036	0.020	0.031	0.015	<0.0050	0.0050	4687461
Indeno(1,2,3-cd)pyrene	ug/g	0.061	0.020	0.091	0.015	<0.0050	0.0050	4687461
1-Methylnaphthalene	ug/g	<0.020	0.020	<0.015	0.015	<0.0050	0.0050	4687461
2-Methylnaphthalene	ug/g	<0.020	0.020	0.017	0.015	<0.0050	0.0050	4687461
Naphthalene	ug/g	0.061	0.020	0.031	0.015	<0.0050	0.0050	4687461
Phenanthrene	ug/g	0.26	0.020	0.24	0.015	<0.0050	0.0050	4687461
Pyrene	ug/g	0.22	0.020	0.18	0.015	<0.0050	0.0050	4687461
Surrogate Recovery (%)								
D10-Anthracene	%	76		76		59		4687461
D14-Terphenyl (FS)	%	81		61		51		4687461
D8-Acenaphthylene	%	89		87		69		4687461

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

RESULTS OF ANALYSES OF SEDIMENT

Maxxam ID		DEF656	DEF656	DEF657	DEF658	DEF659	DEF660		
Sampling Date		2016/10/01 12:00	2016/10/01 12:00	2016/10/01 12:15	2016/10/01 12:30	2016/10/01 13:00	2016/10/01 13:15		
COC Number		578892-01-01	578892-01-01	578892-01-01	578892-01-01	578892-01-01	578892-01-01		
	UNITS	**S016-01**	**S016-01 Lab-Dup**	**S016-02**	**S016-03**	**S016-04**	**S016-05**	**RDL**	**QC Batch**
Inorganics									
Moisture	%	22	23	18	37	28	23	0.2	4687331
Available (CaCl2) pH	pH	7.12		7.08	7.33	6.33	6.11		4689650

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		DEF661	DEF662	DEF663		
Sampling Date		2016/10/01 13:30	2016/10/01 13:45	2016/10/01		
COC Number		578892-01-01	578892-01-01	578892-01-01		
	UNITS	**S016-06**	**S016-07**	**DUP-1**	**RDL**	**QC Batch**
Inorganics						
Moisture	%	79	63	25	0.2	4687331
Available (CaCl2) pH	pH	6.36	6.19	7.18		4689650

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Sampler Initials: RF

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		DEF656	DEF656	DEF657	DEF658	DEF659	DEF660		
Sampling Date		2016/10/01 12:00	2016/10/01 12:00	2016/10/01 12:15	2016/10/01 12:30	2016/10/01 13:00	2016/10/01 13:15		
COC Number		578892-01-01	578892-01-01	578892-01-01	578892-01-01	578892-01-01	578892-01-01		
	UNITS	**S016-01**	**S016-01 Lab-Dup**	**S016-02**	**S016-03**	**S016-04**	**S016-05**	**RDL**	**QC Batch**
BTEX & F1 Hydrocarbons									
Benzene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4687280
Toluene	ug/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	4687280
Ethylbenzene	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687280
o-Xylene	ug/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	4687280
p+m-Xylene	ug/g	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	4687280
Total Xylenes	ug/g	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	4687280
F1 (C6-C10)	ug/g	<10	<10	<10	<10	<10	<10	10	4687280
F1 (C6-C10) - BTEX	ug/g	<10	<10	<10	<10	<10	<10	10	4687280
F2-F4 Hydrocarbons									
F2 (C10-C16 Hydrocarbons)	ug/g	<10	<10	<10	<10	<10	230	10	4687336
F3 (C16-C34 Hydrocarbons)	ug/g	<50	<50	<50	<50	<50	72	50	4687336
F4 (C34-C50 Hydrocarbons)	ug/g	<50	<50	<50	<50	<50	<50	50	4687336
Reached Baseline at C50	ug/g	Yes	Yes	Yes	Yes	Yes	Yes		4687336
Surrogate Recovery (%)									
1,4-Difluorobenzene	%	79	88	86	87	84	86		4687280
4-Bromofluorobenzene	%	113	103	100	108	99	114		4687280
D10-Ethylbenzene	%	113	89	96	99	85	88		4687280
D4-1,2-Dichloroethane	%	91	97	94	98	95	95		4687280
o-Terphenyl	%	101	98	98	101	98	101		4687336

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Sampler Initials: RF

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		DEF661		DEF662		DEF663		
Sampling Date		2016/10/01 13:30		2016/10/01 13:45		2016/10/01		
COC Number		578892-01-01		578892-01-01		578892-01-01		
	UNITS	**S016-06**	**RDL**	**S016-07**	**RDL**	**DUP-1**	**RDL**	**QC Batch**
BTEX & F1 Hydrocarbons								
Benzene	ug/g	<0.020	0.020	<0.015	0.015	<0.0050	0.0050	4687280
Toluene	ug/g	<0.080	0.080	<0.060	0.060	<0.020	0.020	4687280
Ethylbenzene	ug/g	<0.040	0.040	<0.030	0.030	<0.010	0.010	4687280
o-Xylene	ug/g	<0.080	0.080	<0.060	0.060	<0.020	0.020	4687280
p+m-Xylene	ug/g	<0.16	0.16	<0.12	0.12	<0.040	0.040	4687280
Total Xylenes	ug/g	<0.16	0.16	<0.12	0.12	<0.040	0.040	4687280
F1 (C6-C10)	ug/g	<40	40	<30	30	<10	10	4687280
F1 (C6-C10) - BTEX	ug/g	<40	40	<30	30	<10	10	4687280
F2-F4 Hydrocarbons								
F2 (C10-C16 Hydrocarbons)	ug/g	<40	40	<30	30	<10	10	4687336
F3 (C16-C34 Hydrocarbons)	ug/g	<200	200	200	150	<50	50	4687336
F4 (C34-C50 Hydrocarbons)	ug/g	<200	200	<150	150	<50	50	4687336
Reached Baseline at C50	ug/g	Yes		Yes		Yes		4687336
Surrogate Recovery (%)								
1,4-Difluorobenzene	%	90		88		90		4687280
4-Bromofluorobenzene	%	110		102		102		4687280
D10-Ethylbenzene	%	90		86		90		4687280
D4-1,2-Dichloroethane	%	94		93		95		4687280
o-Terphenyl	%	98		100		100		4687336

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B6L2011
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

TEST SUMMARY

Maxxam ID: DEF656
Sample ID: S016-01
Matrix: SEDIMENT

Collected: 2016/10/01
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4686464	N/A	2016/10/05	Steve Roberts
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	4687280	N/A	2016/10/06	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	4687336	2016/10/04	2016/10/04	Liliana Gaburici
Strong Acid Leachable Metals by ICPMS	ICP/MS	4691542	2016/10/06	2016/10/06	Daniel Teclu
MOISTURE	BAL	4687331	N/A	2016/10/05	Liliana Gaburici
OC Pesticides (Selected) & PCB	GC/ECD	4690897	2016/10/06	2016/10/07	Farahnaz Somwaru
OC Pesticides Summed Parameters	CALC	4685758	N/A	2016/10/05	Automated Statchk
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	4687461	2016/10/04	2016/10/04	Arezoo Habibagahi
pH CaCl2 EXTRACT	AT	4689650	2016/10/06	2016/10/06	Neil Dassanayake

Maxxam ID: DEF656 Dup
Sample ID: S016-01
Matrix: SEDIMENT

Collected: 2016/10/01
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	4687280	N/A	2016/10/06	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	4687336	2016/10/04	2016/10/04	Liliana Gaburici
Strong Acid Leachable Metals by ICPMS	ICP/MS	4691542	2016/10/06	2016/10/06	Daniel Teclu
MOISTURE	BAL	4687331	N/A	2016/10/05	Liliana Gaburici

Maxxam ID: DEF657
Sample ID: S016-02
Matrix: SEDIMENT

Collected: 2016/10/01
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4686464	N/A	2016/10/05	Steve Roberts
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	4687280	N/A	2016/10/06	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	4687336	2016/10/04	2016/10/04	Liliana Gaburici
Strong Acid Leachable Metals by ICPMS	ICP/MS	4691542	2016/10/06	2016/10/06	Daniel Teclu
MOISTURE	BAL	4687331	N/A	2016/10/05	Liliana Gaburici
OC Pesticides (Selected) & PCB	GC/ECD	4690897	2016/10/06	2016/10/07	Farahnaz Somwaru
OC Pesticides Summed Parameters	CALC	4685758	N/A	2016/10/05	Automated Statchk
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	4687461	2016/10/04	2016/10/04	Arezoo Habibagahi
pH CaCl2 EXTRACT	AT	4689650	2016/10/06	2016/10/06	Neil Dassanayake

Maxxam ID: DEF657 Dup
Sample ID: S016-02
Matrix: SEDIMENT

Collected: 2016/10/01
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	4687461	2016/10/04	2016/10/04	Arezoo Habibagahi

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Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

TEST SUMMARY

Maxxam ID: DEF658
Sample ID: S016-03
Matrix: SEDIMENT

Collected: 2016/10/01
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4686464	N/A	2016/10/05	Steve Roberts
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	4687280	N/A	2016/10/06	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	4687336	2016/10/04	2016/10/04	Liliana Gaburici
Strong Acid Leachable Metals by ICPMS	ICP/MS	4691542	2016/10/06	2016/10/06	Daniel Teclu
MOISTURE	BAL	4687331	N/A	2016/10/05	Liliana Gaburici
OC Pesticides (Selected) & PCB	GC/ECD	4690897	2016/10/06	2016/10/07	Farahnaz Somwaru
OC Pesticides Summed Parameters	CALC	4685758	N/A	2016/10/05	Automated Statchk
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	4687461	2016/10/04	2016/10/05	Arezoo Habibagahi
pH CaCl2 EXTRACT	AT	4689650	2016/10/06	2016/10/06	Neil Dassanayake

Maxxam ID: DEF659
Sample ID: S016-04
Matrix: SEDIMENT

Collected: 2016/10/01
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4686464	N/A	2016/10/05	Steve Roberts
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	4687280	N/A	2016/10/06	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	4687336	2016/10/04	2016/10/04	Liliana Gaburici
Strong Acid Leachable Metals by ICPMS	ICP/MS	4691542	2016/10/06	2016/10/06	Daniel Teclu
MOISTURE	BAL	4687331	N/A	2016/10/05	Liliana Gaburici
OC Pesticides (Selected) & PCB	GC/ECD	4690897	2016/10/06	2016/10/07	Farahnaz Somwaru
OC Pesticides Summed Parameters	CALC	4685758	N/A	2016/10/05	Automated Statchk
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	4687461	2016/10/04	2016/10/05	Arezoo Habibagahi
pH CaCl2 EXTRACT	AT	4689650	2016/10/06	2016/10/06	Neil Dassanayake

Maxxam ID: DEF660
Sample ID: S016-05
Matrix: SEDIMENT

Collected: 2016/10/01
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4686464	N/A	2016/10/05	Steve Roberts
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	4687280	N/A	2016/10/06	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	4687336	2016/10/04	2016/10/04	Liliana Gaburici
Strong Acid Leachable Metals by ICPMS	ICP/MS	4691542	2016/10/06	2016/10/06	Daniel Teclu
MOISTURE	BAL	4687331	N/A	2016/10/05	Liliana Gaburici
OC Pesticides (Selected) & PCB	GC/ECD	4690897	2016/10/06	2016/10/07	Farahnaz Somwaru
OC Pesticides Summed Parameters	CALC	4685758	N/A	2016/10/05	Automated Statchk
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	4687461	2016/10/04	2016/10/05	Arezoo Habibagahi
pH CaCl2 EXTRACT	AT	4689650	2016/10/06	2016/10/06	Neil Dassanayake

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Sampler Initials: RF

TEST SUMMARY

Maxxam ID: DEF661
Sample ID: S016-06
Matrix: SEDIMENT

Collected: 2016/10/01
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4686464	N/A	2016/10/05	Steve Roberts
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	4687280	N/A	2016/10/06	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	4687336	2016/10/04	2016/10/04	Liliana Gaburici
Strong Acid Leachable Metals by ICPMS	ICP/MS	4691542	2016/10/06	2016/10/06	Daniel Teclu
MOISTURE	BAL	4687331	N/A	2016/10/05	Liliana Gaburici
OC Pesticides (Selected) & PCB	GC/ECD	4690897	2016/10/06	2016/10/11	Farahnaz Somwaru
OC Pesticides Summed Parameters	CALC	4685758	N/A	2016/10/05	Automated Statchk
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	4687461	2016/10/04	2016/10/05	Arezoo Habibagahi
pH CaCl2 EXTRACT	AT	4689650	2016/10/06	2016/10/06	Neil Dassanayake

Maxxam ID: DEF662
Sample ID: S016-07
Matrix: SEDIMENT

Collected: 2016/10/01
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4686464	N/A	2016/10/05	Steve Roberts
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	4687280	N/A	2016/10/06	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	4687336	2016/10/04	2016/10/04	Liliana Gaburici
Strong Acid Leachable Metals by ICPMS	ICP/MS	4691542	2016/10/06	2016/10/06	Daniel Teclu
MOISTURE	BAL	4687331	N/A	2016/10/05	Liliana Gaburici
OC Pesticides (Selected) & PCB	GC/ECD	4690897	2016/10/06	2016/10/11	Farahnaz Somwaru
OC Pesticides Summed Parameters	CALC	4685758	N/A	2016/10/05	Automated Statchk
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	4687461	2016/10/04	2016/10/05	Arezoo Habibagahi
pH CaCl2 EXTRACT	AT	4689650	2016/10/06	2016/10/06	Neil Dassanayake

Maxxam ID: DEF663
Sample ID: DUP-1
Matrix: SEDIMENT

Collected: 2016/10/01
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4686464	N/A	2016/10/05	Steve Roberts
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	4687280	N/A	2016/10/06	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	4687336	2016/10/04	2016/10/04	Liliana Gaburici
Strong Acid Leachable Metals by ICPMS	ICP/MS	4691542	2016/10/06	2016/10/06	Daniel Teclu
MOISTURE	BAL	4687331	N/A	2016/10/05	Liliana Gaburici
OC Pesticides (Selected) & PCB	GC/ECD	4690897	2016/10/06	2016/10/07	Farahnaz Somwaru
OC Pesticides Summed Parameters	CALC	4685758	N/A	2016/10/05	Automated Statchk
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	4687461	2016/10/04	2016/10/05	Arezoo Habibagahi
pH CaCl2 EXTRACT	AT	4689650	2016/10/06	2016/10/06	Neil Dassanayake

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Sampler Initials: RF

GENERAL COMMENTS

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

Package 1	5.0°C

OC Pesticide Analysis: Due to the sample matrix, some samples required dilution. Detection limits were adjusted accordingly. Due to high concentrations of the target analytes, some samples required dilution. Detection limits were adjusted accordingly. Detection limits were adjusted for high moisture content for some samples.

Sample DEF661-01 : BTEX/F1,PAH and F24 Analysis: Sample has a high percent of moisture. Reporting limits were adjusted for the dry weight of the sample.

Sample DEF662-01 : BTEX/F1,PAH and F24 Analysis: Sample has a high percent of moisture. Reporting limits were adjusted for the dry weight of the sample.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4687280	1,4-Difluorobenzene	2016/10/06	100	60 - 140	88	60 - 140	93	%		
4687280	4-Bromofluorobenzene	2016/10/06	128	60 - 140	100	60 - 140	109	%		
4687280	D10-Ethylbenzene	2016/10/06	95	30 - 130	86	30 - 130	84	%		
4687280	D4-1,2-Dichloroethane	2016/10/06	104	60 - 140	95	60 - 140	99	%		
4687336	o-Terphenyl	2016/10/04	90	30 - 130	86	30 - 130	98	%		
4687461	D10-Anthracene	2016/10/04	65	50 - 130	74	50 - 130	78	%		
4687461	D14-Terphenyl (FS)	2016/10/04	66	50 - 130	53	50 - 130	50	%		
4687461	D8-Acenaphthylene	2016/10/04	78	50 - 130	85	50 - 130	79	%		
4690897	2,4,5,6-Tetrachloro-m-xylene	2016/10/06	81	50 - 130	76	50 - 130	74	%		
4690897	Decachlorobiphenyl	2016/10/06	80	50 - 130	70	50 - 130	76	%		
4687280	Benzene	2016/10/06	91	60 - 140	95	60 - 140	<0.0050	ug/g	NC	50
4687280	Ethylbenzene	2016/10/06	85	60 - 140	104	60 - 140	<0.010	ug/g	NC	50
4687280	F1 (C6-C10) - BTEX	2016/10/06					<10	ug/g	NC	50
4687280	F1 (C6-C10)	2016/10/06	88	60 - 140	91	80 - 120	<10	ug/g	NC	50
4687280	o-Xylene	2016/10/06	84	60 - 140	102	60 - 140	<0.020	ug/g	NC	50
4687280	p+m-Xylene	2016/10/06	76	60 - 140	92	60 - 140	<0.040	ug/g	NC	50
4687280	Toluene	2016/10/06	81	60 - 140	95	60 - 140	<0.020	ug/g	NC	50
4687280	Total Xylenes	2016/10/06					<0.040	ug/g	NC	50
4687331	Moisture	2016/10/05							5.8	50
4687336	F2 (C10-C16 Hydrocarbons)	2016/10/04	101	50 - 130	95	80 - 120	<10	ug/g	NC	50
4687336	F3 (C16-C34 Hydrocarbons)	2016/10/04	101	50 - 130	95	80 - 120	<50	ug/g	NC	50
4687336	F4 (C34-C50 Hydrocarbons)	2016/10/04	101	50 - 130	95	80 - 120	<50	ug/g	NC	50
4687461	1-Methylnaphthalene	2016/10/04	101	50 - 130	106	50 - 130	<0.0050	ug/g	NC	40
4687461	2-Methylnaphthalene	2016/10/04	105	50 - 130	102	50 - 130	<0.0050	ug/g	NC	40
4687461	Acenaphthene	2016/10/04	80	50 - 130	80	50 - 130	<0.0050	ug/g	NC	40
4687461	Acenaphthylene	2016/10/04	78	50 - 130	82	50 - 130	<0.0050	ug/g	NC	40
4687461	Anthracene	2016/10/04	78	50 - 130	82	50 - 130	<0.0050	ug/g	NC	40
4687461	Benzo(a)anthracene	2016/10/04	121	50 - 130	126	50 - 130	<0.0050	ug/g	NC	40
4687461	Benzo(a)pyrene	2016/10/04	111	50 - 130	111	50 - 130	<0.0050	ug/g	NC	40
4687461	Benzo(b/j)fluoranthene	2016/10/04	111	50 - 130	109	50 - 130	<0.0050	ug/g	NC	40
4687461	Benzo(g,h,i)perylene	2016/10/04	91	50 - 130	94	50 - 130	<0.0050	ug/g	NC	40

Maxxam Analytics International Corporation o/a Maxxam Analytics 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxam.ca

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4687461	Benzo(k)fluoranthene	2016/10/04	106	50 - 130	102	50 - 130	<0.0050	ug/g	NC	40
4687461	Chrysene	2016/10/04	123	50 - 130	119	50 - 130	<0.0050	ug/g	NC	40
4687461	Dibenz(a,h)anthracene	2016/10/04	96	50 - 130	104	50 - 130	<0.0050	ug/g	NC	40
4687461	Fluoranthene	2016/10/04	72	50 - 130	63	50 - 130	<0.0050	ug/g	NC	40
4687461	Fluorene	2016/10/04	83	50 - 130	87	50 - 130	<0.0050	ug/g	NC	40
4687461	Indeno(1,2,3-cd)pyrene	2016/10/04	121	50 - 130	102	50 - 130	<0.0050	ug/g	NC	40
4687461	Naphthalene	2016/10/04	82	50 - 130	83	50 - 130	<0.0050	ug/g	NC	40
4687461	Phenanthrene	2016/10/04	87	50 - 130	90	50 - 130	<0.0050	ug/g	NC	40
4687461	Pyrene	2016/10/04	99	50 - 130	88	50 - 130	<0.0050	ug/g	NC	40
4689650	Available (CaCl2) pH	2016/10/06			98	97 - 103			0.052	N/A
4690897	a-Chlordane	2016/10/06	83	50 - 130	77	50 - 130	<0.0020	ug/g	NC	40
4690897	Aldrin	2016/10/06	83	50 - 130	84	50 - 130	<0.0020	ug/g	NC	40
4690897	Aroclor 1242	2016/10/06					<0.015	ug/g	NC	40
4690897	Aroclor 1248	2016/10/06					<0.015	ug/g	NC	40
4690897	Aroclor 1254	2016/10/06					<0.015	ug/g	NC	40
4690897	Aroclor 1260	2016/10/06					<0.015	ug/g	NC	40
4690897	Dieldrin	2016/10/06	77	50 - 130	77	50 - 130	<0.0020	ug/g	NC	40
4690897	Endosulfan I (alpha)	2016/10/06	68	50 - 130	77	50 - 130	<0.0020	ug/g	NC	40
4690897	Endosulfan II (beta)	2016/10/06	82	50 - 130	74	50 - 130	<0.0020	ug/g	NC	40
4690897	Endrin	2016/10/06	65	50 - 130	76	50 - 130	<0.0020	ug/g	NC	40
4690897	g-Chlordane	2016/10/06	86	50 - 130	74	50 - 130	<0.0020	ug/g	NC	40
4690897	Heptachlor epoxide	2016/10/06	76	50 - 130	76	50 - 130	<0.0020	ug/g	NC	40
4690897	Heptachlor	2016/10/06	80	50 - 130	77	50 - 130	<0.0020	ug/g	NC	40
4690897	Hexachlorobenzene	2016/10/06	82	50 - 130	76	50 - 130	<0.0020	ug/g	NC	40
4690897	Hexachlorobutadiene	2016/10/06	82	50 - 130	86	50 - 130	<0.0050	ug/g	NC	40
4690897	Hexachloroethane	2016/10/06	115	50 - 130	72	50 - 130	<0.0050	ug/g	NC	40
4690897	Lindane	2016/10/06	81	50 - 130	75	50 - 130	<0.0020	ug/g	NC	40
4690897	Methoxychlor	2016/10/06	107	50 - 130	88	50 - 130	<0.0050	ug/g	NC	40
4690897	o,p-DDD	2016/10/06	97	50 - 130	94	50 - 130	<0.0020	ug/g	NC	40
4690897	o,p-DDE	2016/10/06	87	50 - 130	83	50 - 130	<0.0020	ug/g	NC	40
4690897	o,p-DDT	2016/10/06	70	50 - 130	83	50 - 130	<0.0020	ug/g	NC	40

Maxxam Job #: B6L2011
Report Date: 2016/10/11

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4690897	p,p-DDD	2016/10/06	80	50 - 130	82	50 - 130	<0.0020	ug/g	NC	40
4690897	p,p-DDE	2016/10/06	71	50 - 130	89	50 - 130	<0.0020	ug/g	5.8	40
4690897	p,p-DDT	2016/10/06	93	50 - 130	85	50 - 130	<0.0020	ug/g	NC	40
4691542	Acid Extractable Antimony (Sb)	2016/10/06	88	75 - 125	97	80 - 120	<0.20	ug/g	NC	30
4691542	Acid Extractable Arsenic (As)	2016/10/06	96	75 - 125	101	80 - 120	<1.0	ug/g	NC	30
4691542	Acid Extractable Barium (Ba)	2016/10/06	NC	75 - 125	105	80 - 120	<0.50	ug/g	2.4	30
4691542	Acid Extractable Beryllium (Be)	2016/10/06	96	75 - 125	100	80 - 120	<0.20	ug/g	NC	30
4691542	Acid Extractable Boron (B)	2016/10/06	89	75 - 125	96	80 - 120	<5.0	ug/g	NC	30
4691542	Acid Extractable Cadmium (Cd)	2016/10/06	94	75 - 125	97	80 - 120	<0.10	ug/g	NC	30
4691542	Acid Extractable Chromium (Cr)	2016/10/06	NC	75 - 125	98	80 - 120	<1.0	ug/g	2.1	30
4691542	Acid Extractable Cobalt (Co)	2016/10/06	97	75 - 125	102	80 - 120	<0.10	ug/g	5.0	30
4691542	Acid Extractable Copper (Cu)	2016/10/06	91	75 - 125	99	80 - 120	<0.50	ug/g	7.6	30
4691542	Acid Extractable Lead (Pb)	2016/10/06	96	75 - 125	101	80 - 120	<1.0	ug/g	NC	30
4691542	Acid Extractable Molybdenum (Mo)	2016/10/06	97	75 - 125	99	80 - 120	<0.50	ug/g	NC	30
4691542	Acid Extractable Nickel (Ni)	2016/10/06	100	75 - 125	96	80 - 120	<0.50	ug/g	9.4	30
4691542	Acid Extractable Selenium (Se)	2016/10/06	94	75 - 125	98	80 - 120	<0.50	ug/g	NC	30
4691542	Acid Extractable Silver (Ag)	2016/10/06	92	75 - 125	98	80 - 120	<0.20	ug/g	NC	30
4691542	Acid Extractable Thallium (Tl)	2016/10/06	96	75 - 125	100	80 - 120	<0.050	ug/g	NC	30
4691542	Acid Extractable Uranium (U)	2016/10/06	93	75 - 125	99	80 - 120	<0.050	ug/g	3.9	30
4691542	Acid Extractable Vanadium (V)	2016/10/06	NC	75 - 125	100	80 - 120	<5.0	ug/g	11	30
4691542	Acid Extractable Zinc (Zn)	2016/10/06	NC	75 - 125	98	80 - 120	<5.0	ug/g	2.4	30

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 spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of 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 (one or both samples < 5x RDL).

Maxxam Job #: B6L2011
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-00
Site Location: TC IQALUIT LANDFILL
Sampler Initials: RF

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

Steve Roberts, Ottawa Lab Manager

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 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxam.ca

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

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:
Company Name: #10988 ARCADIS Canada Inc
Attention: Invoices Attention
Address: 329 Churchill Ave N Suite 200, Ottawa ON K1Z 5B8
Tel: (613) 721-0555 Fax: (613) 721-0029
Email: invoicesottawa@arcadis.com, barb.adelman@arcadis-c

REPORT TO:
Company Name:
Attention: Ryan Fletcher
Address:
Tel: Fax:
Email: ryan.fletcher@arcadis.com

PROJECT INFORMATION:
Quotation #: B54416
P.O. #: 107153-000
Project: TC Iqaluit Coral Bill
Project Name:
Site #: 107153-000
Sampled By: Ryan Fletcher

Laboratory Use Only:
Maxxam Job #:
Bottle Order #: 578892
COC #: C#578892-01-01
Project Manager: Madison Bingley

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011): ☐ Table 1 ☐ Res/Park ☐ Medium/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ For RSC ☐ Table ___

Other Regulations: ☒ CCME ☐ Sanitary Sewer Bylaw ☐ Reg 558. ☐ Storm Sewer Bylaw ☐ MISA Municipality ☐ PWQO ☐ Other

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ___

Field Filtered (please circle): Metals / Hg / Cr VI

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects
Regular (Standard) TAT: 4
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	CCME Petroleum Hydrocarbons	Diss. ICPMS Metals for Ecotoxicol. GW/SS	Mercury (low level)	Chromium (VI) in Water	O.Reg 153 OC Pesticides (Water) Soil	Polychlorinated Biphenyl (PCB) Soil	PAH Compounds in Water by GC/MS (SIM) Soil	pH	# of Bottles	Comments
1		SD16-01	Oct. 1/16	12:00	SD	X	X			X	X	X	X	6	
2		SD16-02		12:15		X	X			X	X	X	X	6	SD = Sediment
3		SD16-03		12:30		X	X			X	X	X	X	6	
4		SD16-04		13:00		X	X			X	X	X	X	6	
5		SD16-05		13:15		X	X			X	X	X	X	6	
6		SD16-06		13:30		X	X			X	X	X	X	6	
7		SD16-07		13:45		X	X			X	X	X	X	6	
8		Dup-1	↓	—	↓	X	X			X	X	X	X	6	
9															RECEIVED IN OTTAWA
10															ON IC

3-Oct-16 10:30
Madison Bingley
B6L2011
FHB OTT-001

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Ryan Fletcher	Oct. 1/16	15:00	Fatemeh Habib	2016/10/03	10:30	

Laboratory Use Only
Time Sensitive
Temperature (°C) on Receipt: 5, 4, 6
Custody Seal: Present ✓ Intact ✓ — Yes / No

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

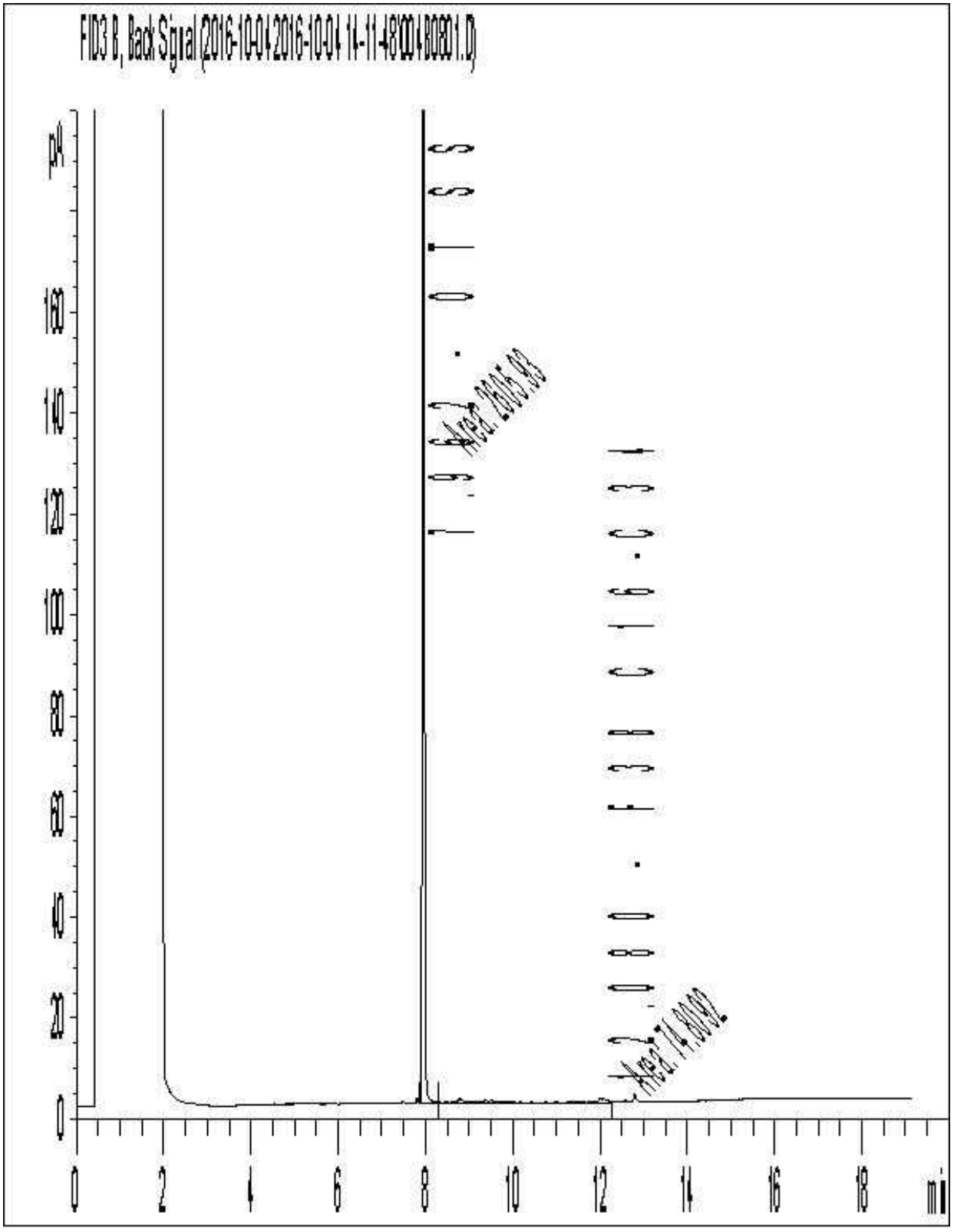
White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

Maxxam Job #: B6L2011
Report Date: 2016/10/11
Maxxam Sample: DEF656

ARCADIS Canada Inc
Client Project #: 102153-00
Project name: TC IQALUIT LANDFILL
Client ID: S016-01

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

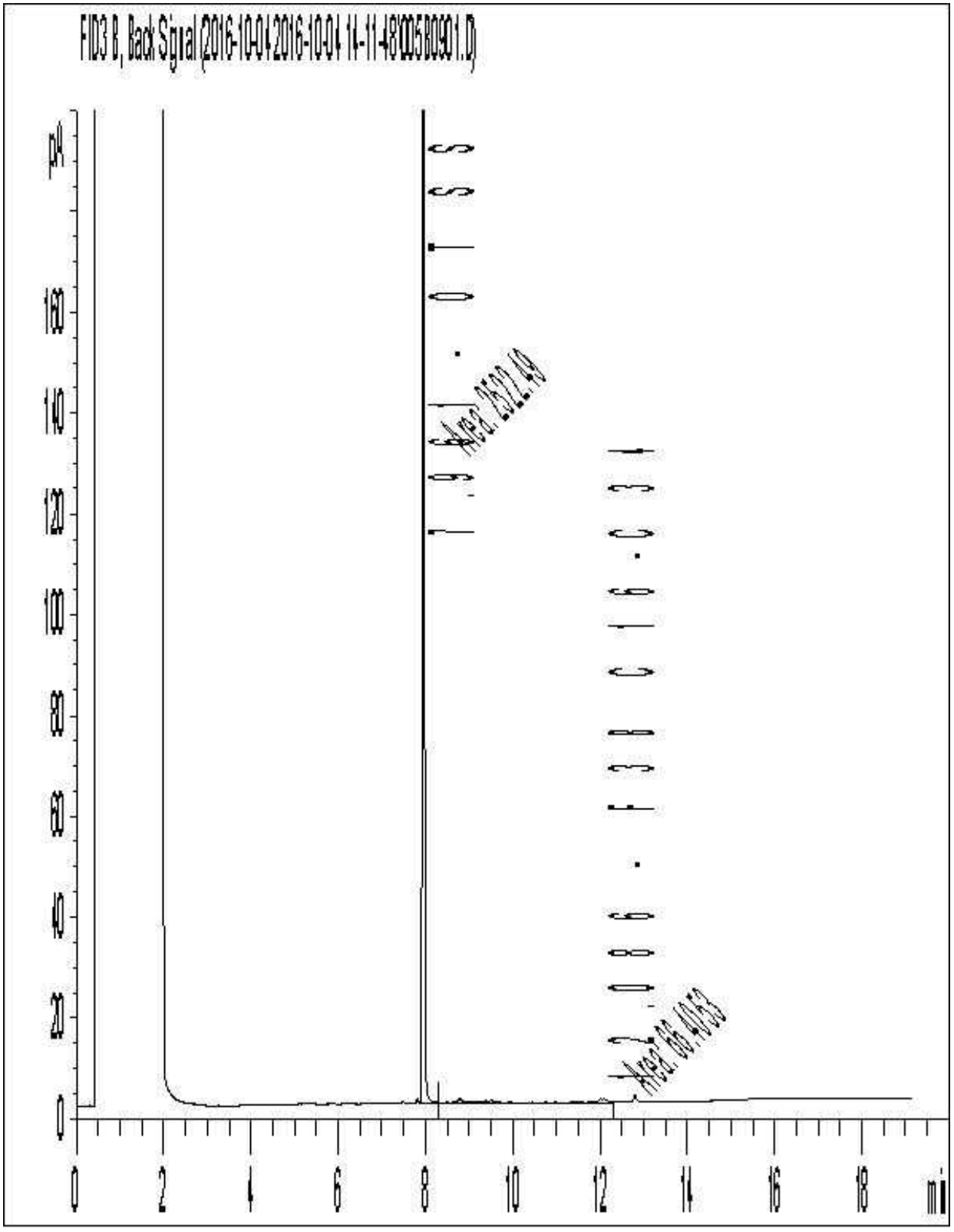


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2011
Report Date: 2016/10/11
Maxxam Sample: DEF656 Lab-Dup

ARCADIS Canada Inc
Client Project #: 102153-00
Project name: TC IQALUIT LANDFILL
Client ID: S016-01

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

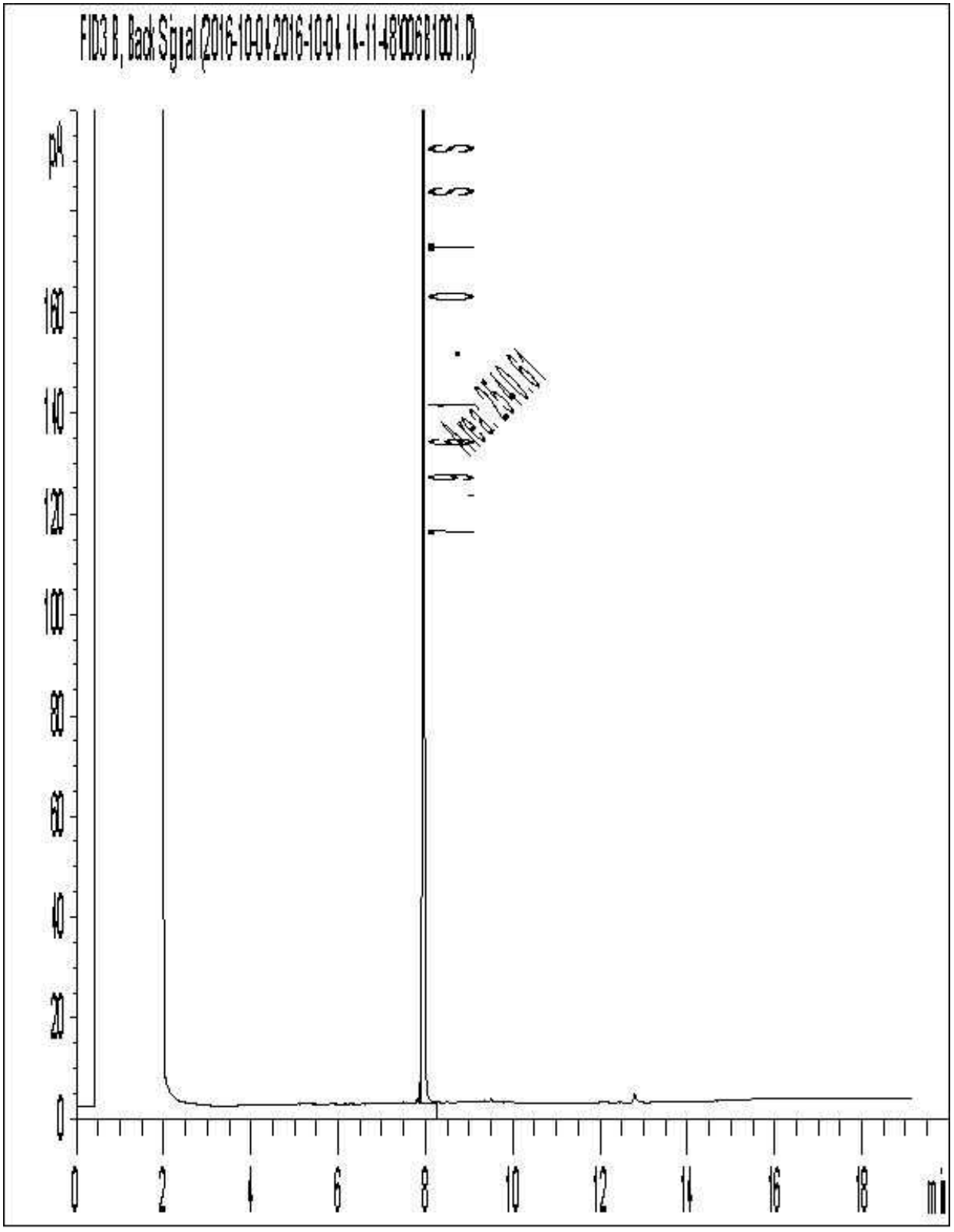


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2011
Report Date: 2016/10/11
Maxxam Sample: DEF657

ARCADIS Canada Inc
Client Project #: 102153-00
Project name: TC IQALUIT LANDFILL
Client ID: S016-02

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

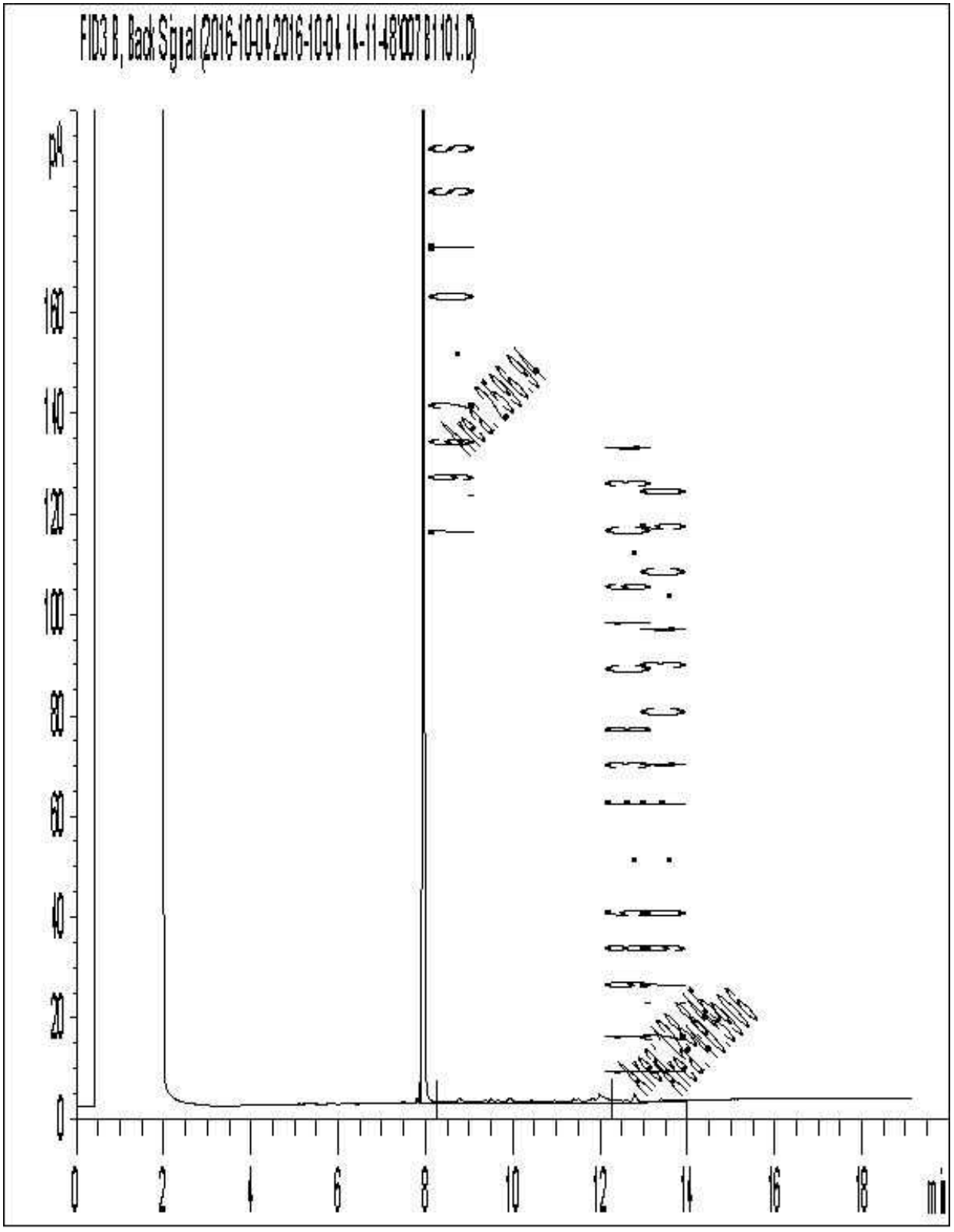


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2011
Report Date: 2016/10/11
Maxxam Sample: DEF658

ARCADIS Canada Inc
Client Project #: 102153-00
Project name: TC IQALUIT LANDFILL
Client ID: S016-03

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

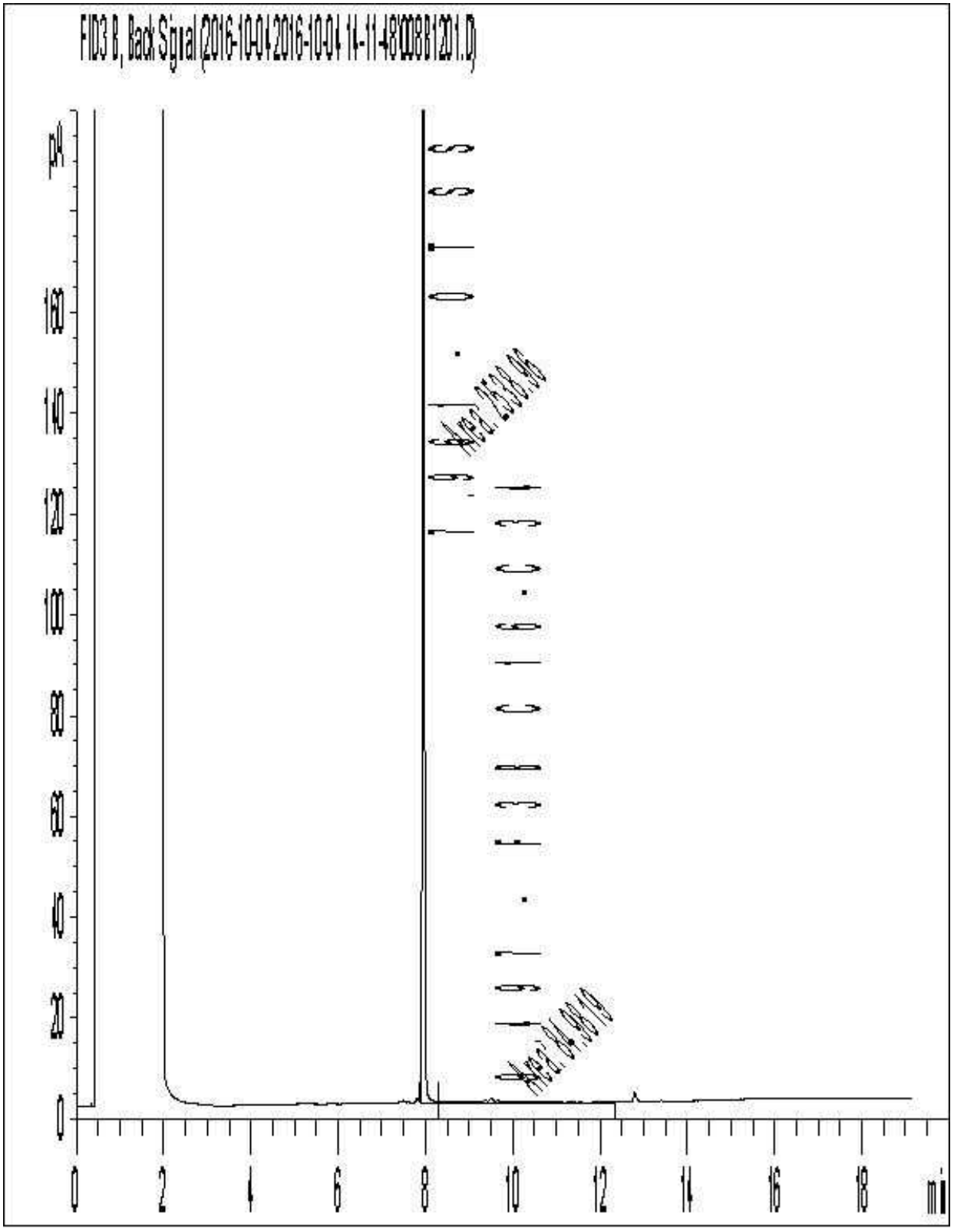


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2011
Report Date: 2016/10/11
Maxxam Sample: DEF659

ARCADIS Canada Inc
Client Project #: 102153-00
Project name: TC IQALUIT LANDFILL
Client ID: S016-04

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

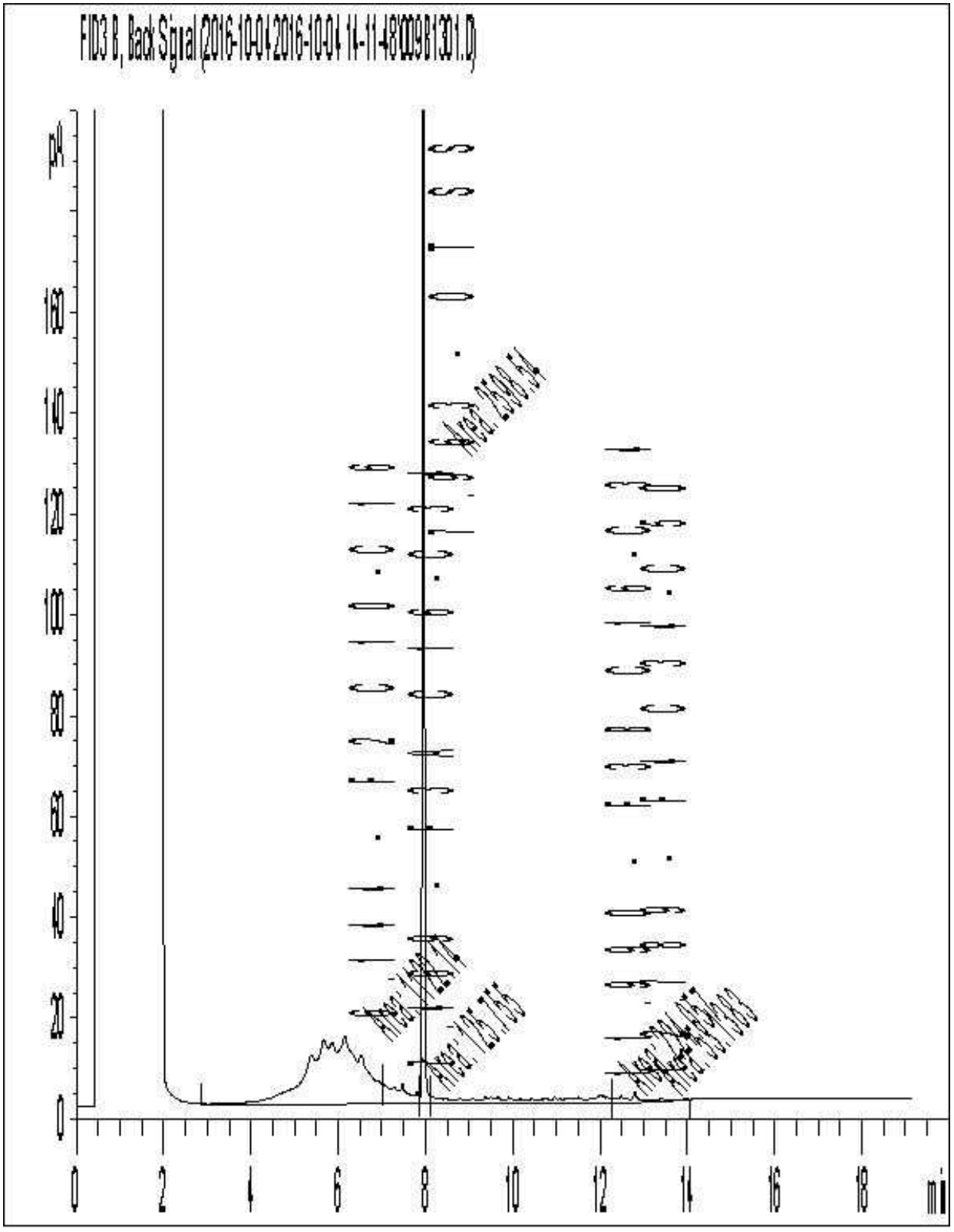


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2011
Report Date: 2016/10/11
Maxxam Sample: DEF660

ARCADIS Canada Inc
Client Project #: 102153-00
Project name: TC IQALUIT LANDFILL
Client ID: S016-05

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

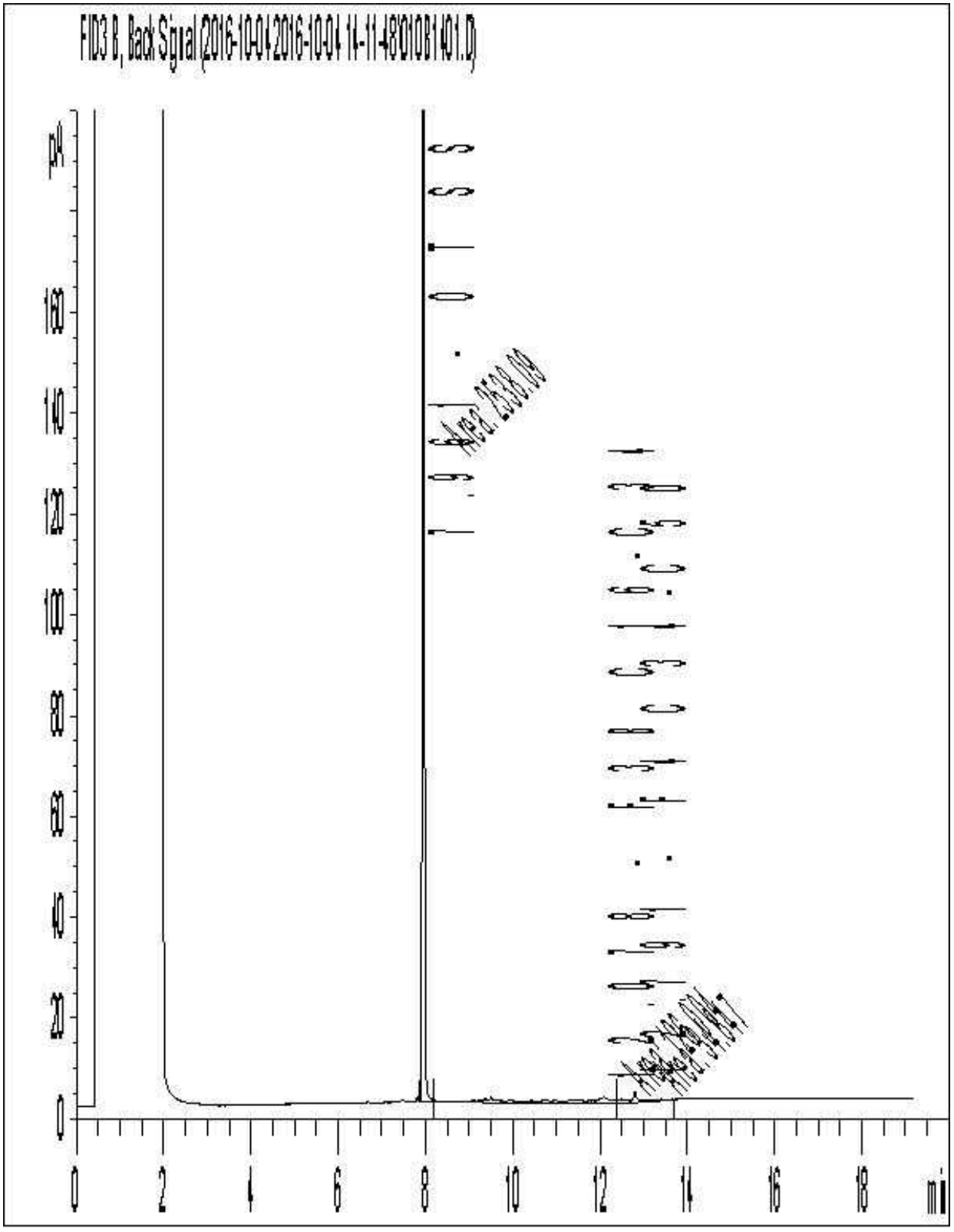


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2011
Report Date: 2016/10/11
Maxxam Sample: DEF661

ARCADIS Canada Inc
Client Project #: 102153-00
Project name: TC IQALUIT LANDFILL
Client ID: S016-06

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

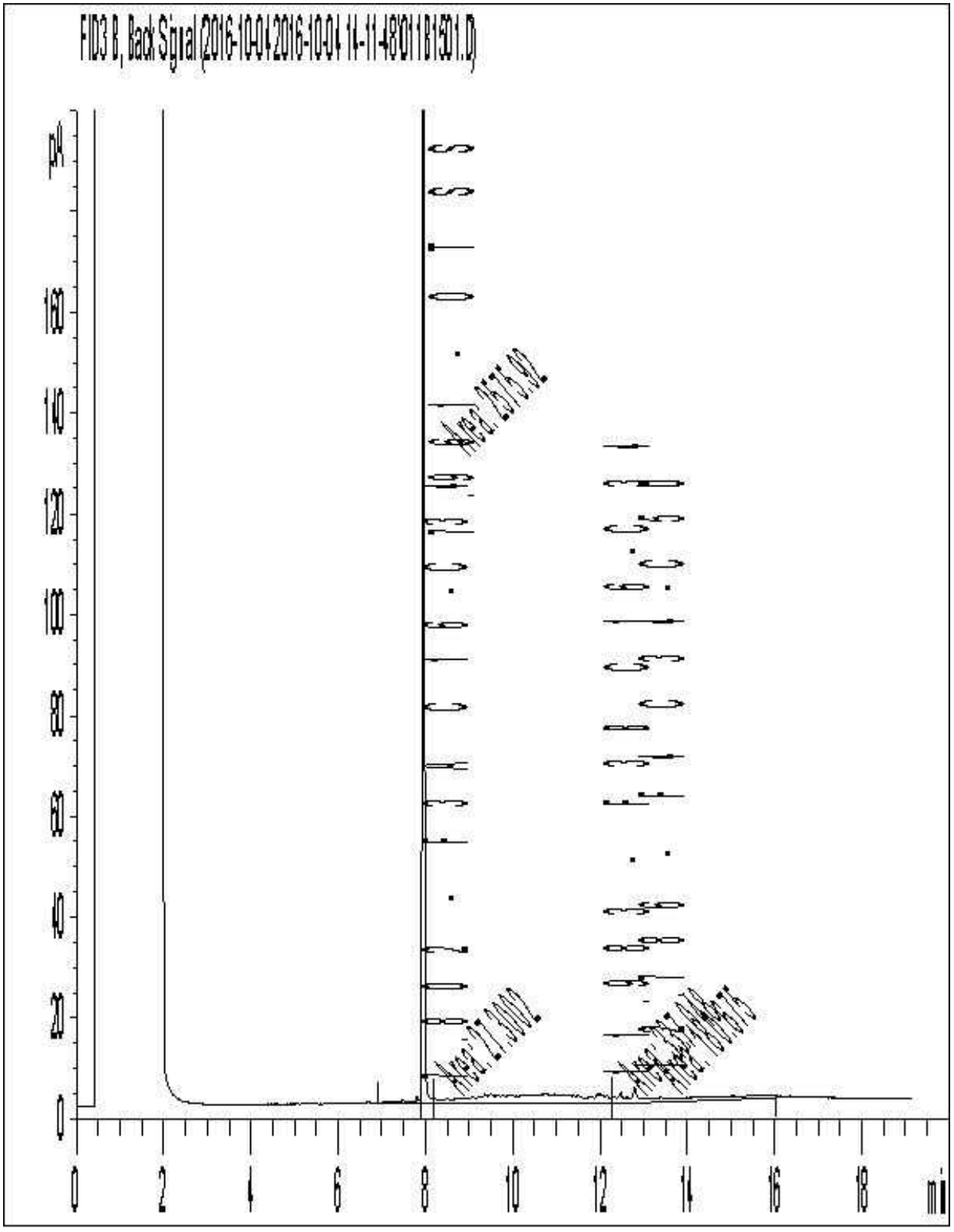


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2011
Report Date: 2016/10/11
Maxxam Sample: DEF662

ARCADIS Canada Inc
Client Project #: 102153-00
Project name: TC IQALUIT LANDFILL
Client ID: S016-07

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

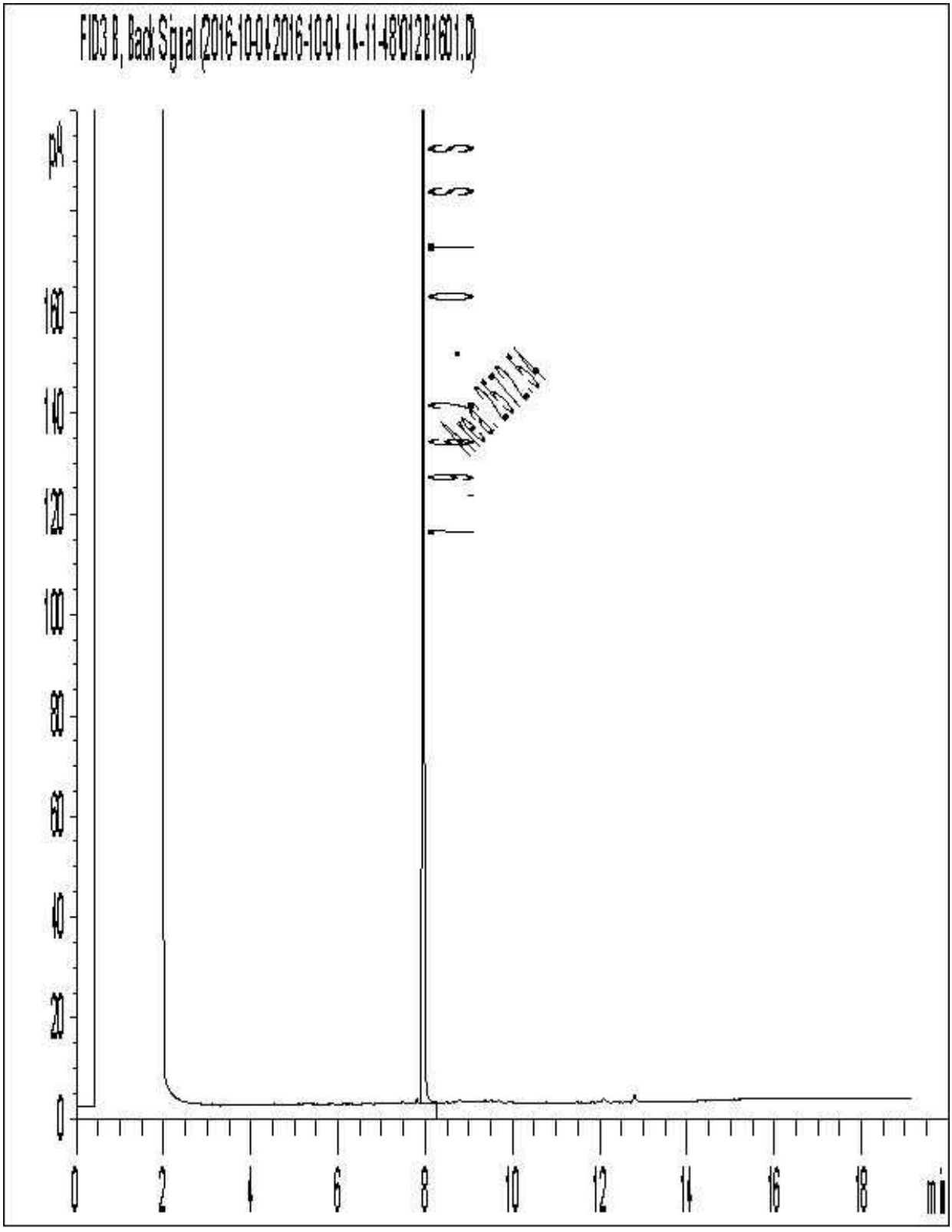


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2011
Report Date: 2016/10/11
Maxxam Sample: DEF663

ARCADIS Canada Inc
Client Project #: 102153-00
Project name: TC IQALUIT LANDFILL
Client ID: DUP-1

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram



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 Project #: 102153-000
Site#: 102153-000
Site Location: TC IQALUIT LAND FILL
Your C.O.C. #: 578891-01-01

Attention:Ryan Fletcher

ARCADIS Canada Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

Report Date: 2016/10/11
Report #: R4201792
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6L2112
Received: 2016/10/03, 10:30

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Methylnaphthalene Sum	8	N/A	2016/10/06	CAM SOP-00301	EPA 8270D m
Chromium (VI) in Water (1)	8	N/A	2016/10/06	CAM SOP-00436	EPA 7199 m
Petroleum Hydro. CCME F1 & BTEX in Water	8	N/A	2016/10/05	OTT SOP-00002	CCME CWS
Petroleum Hydrocarbons F2-F4 in Water (2)	8	2016/10/04	2016/10/04	OTT SOP-00001	CCME Hydrocarbons
Mercury (low level) (1)	8	2016/10/07	2016/10/07	CAM SOP-00453	EPA 7470 m
PAH Compounds in Water by GC/MS (SIM)	8	2016/10/04	2016/10/05	OTT SOP-00011	EPA 8270D/3510C m
Polychlorinated Biphenyl (PCB) (1)	8	2016/10/06	2016/10/08	CAM SOP-00309	EPA 8082A m

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

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 Analytics Mississauga

(2) All CCME PHC 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 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxam.ca

Your Project #: 102153-000
Site#: 102153-000
Site Location: TC IQALUIT LAND FILL
Your C.O.C. #: 578891-01-01

Attention:Ryan Fletcher

ARCADIS Canada Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

Report Date: 2016/10/11
Report #: R4201792
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6L2112
Received: 2016/10/03, 10:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Madison Bingley, Project Manager
Email: MBingley@maxxam.ca
Phone# (613)274-3549

==========

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 Job #: B6L2112
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		DEG253	DEG254	DEG255	DEG256	DEG257	DEG258		
Sampling Date		2016/09/30 16:00	2016/09/30 15:40	2016/09/30 15:15	2016/09/30 16:15	2016/09/30 16:45	2016/09/30 17:00		
COC Number		578891-01-01	578891-01-01	578891-01-01	578891-01-01	578891-01-01	578891-01-01		
	UNITS	**SW16-01**	**SW16-02**	**SW16-03**	**SW16-04**	**SW16-05**	**SW16-06**	**RDL**	**QC Batch**
Metals									
Chromium (VI)	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	4689715
Mercury (Hg)	ug/L	<0.01	0.01	0.01	<0.01	0.01	0.01	0.01	4692707

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		DEG258	DEG259	DEG260		
Sampling Date		2016/09/30 17:00	2016/09/30 17:15	2016/09/30		
COC Number		578891-01-01	578891-01-01	578891-01-01		
	UNITS	**SW16-06 Lab-Dup**	**SW16-07**	**DUP-1**	**RDL**	**QC Batch**
Metals						
Chromium (VI)	ug/L	<0.50	<0.50	<0.50	0.50	4689715
Mercury (Hg)	ug/L		0.01	0.01	0.01	4692707

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B6L2112
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		DEG253	DEG254	DEG254	DEG255	DEG256	DEG257		
Sampling Date		2016/09/30 16:00	2016/09/30 15:40	2016/09/30 15:40	2016/09/30 15:15	2016/09/30 16:15	2016/09/30 16:45		
COC Number		578891-01-01	578891-01-01	578891-01-01	578891-01-01	578891-01-01	578891-01-01		
	UNITS	**SW16-01**	**SW16-02**	**SW16-02 Lab-Dup**	**SW16-03**	**SW16-04**	**SW16-05**	**RDL**	**QC Batch**
Calculated Parameters									
Methylnaphthalene, 2-(1-)	ug/L	<0.071	<0.071		<0.071	<0.071	<0.071	0.071	4685836
Polyaromatic Hydrocarbons									
Acenaphthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Acenaphthylene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Benzo(a)anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Benzo(a)pyrene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Benzo(b/j)fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Benzo(g,h,i)perylene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Benzo(k)fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Chrysene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Dibenz(a,h)anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Fluorene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Indeno(1,2,3-cd)pyrene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
1-Methylnaphthalene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
2-Methylnaphthalene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Naphthalene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Phenanthrene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Pyrene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	4687460
Surrogate Recovery (%)									
D10-Anthracene	%	106	102	105	104	107	104		4687460
D14-Terphenyl (FS)	%	129	128	129	129	128	130		4687460
D8-Acenaphthylene	%	112	111	114	114	115	118		4687460

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Job #: B6L2112
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		DEG258	DEG259	DEG260		
Sampling Date		2016/09/30 17:00	2016/09/30 17:15	2016/09/30		
COC Number		578891-01-01	578891-01-01	578891-01-01		
	UNITS	**SW16-06**	**SW16-07**	**DUP-1**	**RDL**	**QC Batch**
Calculated Parameters						
Methylnaphthalene, 2-(1-)	ug/L	<0.071	<0.071	<0.071	0.071	4685836
Polyaromatic Hydrocarbons						
Acenaphthene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Acenaphthylene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Anthracene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Benzo(a)anthracene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Benzo(a)pyrene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Benzo(b/j)fluoranthene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Benzo(g,h,i)perylene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Benzo(k)fluoranthene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Chrysene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Dibenz(a,h)anthracene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Fluoranthene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Fluorene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Indeno(1,2,3-cd)pyrene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
1-Methylnaphthalene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
2-Methylnaphthalene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Naphthalene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Phenanthrene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Pyrene	ug/L	<0.010	<0.010	<0.010	0.010	4687460
Surrogate Recovery (%)						
D10-Anthracene	%	107	105	106		4687460
D14-Terphenyl (FS)	%	129	129	130		4687460
D8-Acenaphthylene	%	117	116	116		4687460

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B6L2112
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		DEG253	DEG254	DEG255	DEG256	DEG257	DEG258		
Sampling Date		2016/09/30 16:00	2016/09/30 15:40	2016/09/30 15:15	2016/09/30 16:15	2016/09/30 16:45	2016/09/30 17:00		
COC Number		578891-01-01	578891-01-01	578891-01-01	578891-01-01	578891-01-01	578891-01-01		
	UNITS	**SW16-01**	**SW16-02**	**SW16-03**	**SW16-04**	**SW16-05**	**SW16-06**	**RDL**	**QC Batch**
PCBs									
Aroclor 1016	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4692427
Aroclor 1221	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4692427
Aroclor 1232	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4692427
Aroclor 1262	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4692427
Aroclor 1268	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4692427
Aroclor 1242	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4692427
Aroclor 1248	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.01	4692427
Aroclor 1254	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.01	4692427
Aroclor 1260	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4692427
Total PCB	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	0.01	4692427
Surrogate Recovery (%)									
Decachlorobiphenyl	%	90	93	89	92	118	101		4692427

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		DEG259	DEG260		
Sampling Date		2016/09/30 17:15	2016/09/30		
COC Number		578891-01-01	578891-01-01		
	UNITS	**SW16-07**	**DUP-1**	**RDL**	**QC Batch**
PCBs					
Aroclor 1016	ug/L	<0.01	<0.01	0.01	4692427
Aroclor 1221	ug/L	<0.01	<0.01	0.01	4692427
Aroclor 1232	ug/L	<0.01	<0.01	0.01	4692427
Aroclor 1262	ug/L	<0.01	<0.01	0.01	4692427
Aroclor 1268	ug/L	<0.01	<0.01	0.01	4692427
Aroclor 1242	ug/L	<0.01	<0.01	0.01	4692427
Aroclor 1248	ug/L	<0.01	0.04	0.01	4692427
Aroclor 1254	ug/L	<0.01	0.01	0.01	4692427
Aroclor 1260	ug/L	<0.01	<0.01	0.01	4692427
Total PCB	ug/L	<0.01	0.06	0.01	4692427
Surrogate Recovery (%)					
Decachlorobiphenyl	%	84	80		4692427

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B6L2112
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

O.REG 153 PETROLEUM HYDROCARBONS (WATER)

Maxxam ID		DEG253	DEG253	DEG254	DEG255	DEG256	DEG257		
Sampling Date		2016/09/30 16:00	2016/09/30 16:00	2016/09/30 15:40	2016/09/30 15:15	2016/09/30 16:15	2016/09/30 16:45		
COC Number		578891-01-01	578891-01-01	578891-01-01	578891-01-01	578891-01-01	578891-01-01		
	UNITS	**SW16-01**	**SW16-01 Lab-Dup**	**SW16-02**	**SW16-03**	**SW16-04**	**SW16-05**	**RDL**	**QC Batch**
BTEX & F1 Hydrocarbons									
Benzene	ug/L	<0.20		<0.20	<0.20	<0.20	<0.20	0.20	4687306
Toluene	ug/L	<0.20		<0.20	<0.20	<0.20	<0.20	0.20	4687306
Ethylbenzene	ug/L	<0.20		<0.20	<0.20	<0.20	<0.20	0.20	4687306
o-Xylene	ug/L	<0.20		<0.20	<0.20	<0.20	<0.20	0.20	4687306
p+m-Xylene	ug/L	<0.40		<0.40	<0.40	<0.40	<0.40	0.40	4687306
Total Xylenes	ug/L	<0.40		<0.40	<0.40	<0.40	<0.40	0.40	4687306
F1 (C6-C10)	ug/L	<25		<25	<25	<25	<25	25	4687306
F1 (C6-C10) - BTEX	ug/L	<25		<25	<25	<25	<25	25	4687306
F2-F4 Hydrocarbons									
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	<100	<100	<100	<100	100	4687337
F3 (C16-C34 Hydrocarbons)	ug/L	<200	<200	<200	<200	<200	<200	200	4687337
F4 (C34-C50 Hydrocarbons)	ug/L	<200	<200	<200	<200	<200	<200	200	4687337
Reached Baseline at C50	ug/L	Yes	Yes	Yes	Yes	Yes	Yes		4687337
Surrogate Recovery (%)									
1,4-Difluorobenzene	%	98		100	97	99	97		4687306
4-Bromofluorobenzene	%	103		99	100	98	101		4687306
D10-Ethylbenzene	%	87		84	72	86	94		4687306
D4-1,2-Dichloroethane	%	99		98	99	94	97		4687306
o-Terphenyl	%	111	108	109	107	107	109		4687337

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B6L2112
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

O.REG 153 PETROLEUM HYDROCARBONS (WATER)

Maxxam ID		DEG258	DEG259	DEG260		
Sampling Date		2016/09/30 17:00	2016/09/30 17:15	2016/09/30		
COC Number		578891-01-01	578891-01-01	578891-01-01		
	UNITS	**SW16-06**	**SW16-07**	**DUP-1**	**RDL**	**QC Batch**
BTEX & F1 Hydrocarbons						
Benzene	ug/L	<0.20	<0.20	<0.20	0.20	4687306
Toluene	ug/L	<0.20	<0.20	<0.20	0.20	4687306
Ethylbenzene	ug/L	<0.20	<0.20	<0.20	0.20	4687306
o-Xylene	ug/L	<0.20	<0.20	<0.20	0.20	4687306
p+m-Xylene	ug/L	<0.40	<0.40	<0.40	0.40	4687306
Total Xylenes	ug/L	<0.40	<0.40	<0.40	0.40	4687306
F1 (C6-C10)	ug/L	<25	<25	<25	25	4687306
F1 (C6-C10) - BTEX	ug/L	<25	<25	<25	25	4687306
F2-F4 Hydrocarbons						
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	<100	100	4687337
F3 (C16-C34 Hydrocarbons)	ug/L	<200	<200	<200	200	4687337
F4 (C34-C50 Hydrocarbons)	ug/L	<200	<200	<200	200	4687337
Reached Baseline at C50	ug/L	Yes	Yes	Yes		4687337
Surrogate Recovery (%)						
1,4-Difluorobenzene	%	98	99	99		4687306
4-Bromofluorobenzene	%	96	110	103		4687306
D10-Ethylbenzene	%	86	72	86		4687306
D4-1,2-Dichloroethane	%	96	99	100		4687306
o-Terphenyl	%	108	109	109		4687337

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B6L2112
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

TEST SUMMARY

Maxxam ID: DEG253
Sample ID: SW16-01
Matrix: Water

Collected: 2016/09/30
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4685836	N/A	2016/10/06	Steve Roberts
Chromium (VI) in Water	IC	4689715	N/A	2016/10/06	Sally Coughlin
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	4687306	N/A	2016/10/05	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	4687337	2016/10/04	2016/10/04	Liliana Gaburici
Mercury (low level)	CV/AA	4692707	2016/10/07	2016/10/07	Magdalena Carlos
PAH Compounds in Water by GC/MS (SIM)	GC/MS	4687460	2016/10/04	2016/10/05	Arezoo Habibagahi
Polychlorinated Biphenyl (PCB)	GC/ECD	4692427	2016/10/06	2016/10/08	Li Peng

Maxxam ID: DEG253 Dup
Sample ID: SW16-01
Matrix: Water

Collected: 2016/09/30
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	4687337	2016/10/04	2016/10/04	Liliana Gaburici

Maxxam ID: DEG254
Sample ID: SW16-02
Matrix: Water

Collected: 2016/09/30
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4685836	N/A	2016/10/06	Steve Roberts
Chromium (VI) in Water	IC	4689715	N/A	2016/10/06	Sally Coughlin
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	4687306	N/A	2016/10/05	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	4687337	2016/10/04	2016/10/04	Liliana Gaburici
Mercury (low level)	CV/AA	4692707	2016/10/07	2016/10/07	Magdalena Carlos
PAH Compounds in Water by GC/MS (SIM)	GC/MS	4687460	2016/10/04	2016/10/05	Arezoo Habibagahi
Polychlorinated Biphenyl (PCB)	GC/ECD	4692427	2016/10/06	2016/10/08	Li Peng

Maxxam ID: DEG254 Dup
Sample ID: SW16-02
Matrix: Water

Collected: 2016/09/30
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PAH Compounds in Water by GC/MS (SIM)	GC/MS	4687460	2016/10/04	2016/10/05	Arezoo Habibagahi

Maxxam ID: DEG255
Sample ID: SW16-03
Matrix: Water

Collected: 2016/09/30
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4685836	N/A	2016/10/06	Steve Roberts
Chromium (VI) in Water	IC	4689715	N/A	2016/10/06	Sally Coughlin
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	4687306	N/A	2016/10/05	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	4687337	2016/10/04	2016/10/04	Liliana Gaburici
Mercury (low level)	CV/AA	4692707	2016/10/07	2016/10/07	Magdalena Carlos

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Maxxam Job #: B6L2112
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

TEST SUMMARY

Maxxam ID: DEG255
Sample ID: SW16-03
Matrix: Water

Collected: 2016/09/30
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PAH Compounds in Water by GC/MS (SIM)	GC/MS	4687460	2016/10/04	2016/10/05	Arezoo Habibagahi
Polychlorinated Biphenyl (PCB)	GC/ECD	4692427	2016/10/06	2016/10/08	Li Peng

Maxxam ID: DEG256
Sample ID: SW16-04
Matrix: Water

Collected: 2016/09/30
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4685836	N/A	2016/10/06	Steve Roberts
Chromium (VI) in Water	IC	4689715	N/A	2016/10/06	Sally Coughlin
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	4687306	N/A	2016/10/05	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	4687337	2016/10/04	2016/10/04	Liliana Gaburici
Mercury (low level)	CV/AA	4692707	2016/10/07	2016/10/07	Magdalena Carlos
PAH Compounds in Water by GC/MS (SIM)	GC/MS	4687460	2016/10/04	2016/10/05	Arezoo Habibagahi
Polychlorinated Biphenyl (PCB)	GC/ECD	4692427	2016/10/06	2016/10/08	Li Peng

Maxxam ID: DEG257
Sample ID: SW16-05
Matrix: Water

Collected: 2016/09/30
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4685836	N/A	2016/10/06	Steve Roberts
Chromium (VI) in Water	IC	4689715	N/A	2016/10/06	Sally Coughlin
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	4687306	N/A	2016/10/05	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	4687337	2016/10/04	2016/10/04	Liliana Gaburici
Mercury (low level)	CV/AA	4692707	2016/10/07	2016/10/07	Magdalena Carlos
PAH Compounds in Water by GC/MS (SIM)	GC/MS	4687460	2016/10/04	2016/10/05	Arezoo Habibagahi
Polychlorinated Biphenyl (PCB)	GC/ECD	4692427	2016/10/06	2016/10/08	Li Peng

Maxxam ID: DEG258
Sample ID: SW16-06
Matrix: Water

Collected: 2016/09/30
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4685836	N/A	2016/10/06	Steve Roberts
Chromium (VI) in Water	IC	4689715	N/A	2016/10/06	Sally Coughlin
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	4687306	N/A	2016/10/05	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	4687337	2016/10/04	2016/10/04	Liliana Gaburici
Mercury (low level)	CV/AA	4692707	2016/10/07	2016/10/07	Magdalena Carlos
PAH Compounds in Water by GC/MS (SIM)	GC/MS	4687460	2016/10/04	2016/10/05	Arezoo Habibagahi
Polychlorinated Biphenyl (PCB)	GC/ECD	4692427	2016/10/06	2016/10/08	Li Peng

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Maxxam Job #: B6L2112
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

TEST SUMMARY

Maxxam ID: DEG258 Dup
Sample ID: SW16-06
Matrix: Water

Collected: 2016/09/30
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chromium (VI) in Water	IC	4689715	N/A	2016/10/06	Sally Coughlin

Maxxam ID: DEG259
Sample ID: SW16-07
Matrix: Water

Collected: 2016/09/30
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4685836	N/A	2016/10/06	Steve Roberts
Chromium (VI) in Water	IC	4689715	N/A	2016/10/06	Sally Coughlin
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	4687306	N/A	2016/10/05	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	4687337	2016/10/04	2016/10/04	Liliana Gaburici
Mercury (low level)	CV/AA	4692707	2016/10/07	2016/10/07	Magdalena Carlos
PAH Compounds in Water by GC/MS (SIM)	GC/MS	4687460	2016/10/04	2016/10/05	Arezoo Habibagahi
Polychlorinated Biphenyl (PCB)	GC/ECD	4692427	2016/10/06	2016/10/08	Li Peng

Maxxam ID: DEG260
Sample ID: DUP-1
Matrix: Water

Collected: 2016/09/30
Shipped:
Received: 2016/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	4685836	N/A	2016/10/06	Steve Roberts
Chromium (VI) in Water	IC	4689715	N/A	2016/10/06	Sally Coughlin
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	4687306	N/A	2016/10/05	Lyndsey Hart
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	4687337	2016/10/04	2016/10/04	Liliana Gaburici
Mercury (low level)	CV/AA	4692707	2016/10/07	2016/10/07	Magdalena Carlos
PAH Compounds in Water by GC/MS (SIM)	GC/MS	4687460	2016/10/04	2016/10/05	Arezoo Habibagahi
Polychlorinated Biphenyl (PCB)	GC/ECD	4692427	2016/10/06	2016/10/08	Li Peng

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Maxxam Job #: B6L2112
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

GENERAL COMMENTS

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

Package 1	3.0°C
Package 2	4.7°C
Package 3	3.7°C

Sample DEG258-01 : PCB Analysis: The sample exhibits a distorted Aroclor (1248) pattern. This may impact the calculation of Total PCB concentration in such samples. View results with discretion.

Sample DEG260-01 : PCB Analysis: The sample exhibits a distorted Aroclor (1248) pattern. This may impact the calculation of Total PCB concentration in such samples. View results with discretion.

Results relate only to the items tested.

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Maxxam Job #: B6L2112
Report Date: 2016/10/11

QUALITY ASSURANCE REPORT

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4687306	1,4-Difluorobenzene	2016/10/04	98	70 - 130	96	70 - 130	99	%		
4687306	4-Bromofluorobenzene	2016/10/04	113	70 - 130	109	70 - 130	103	%		
4687306	D10-Ethylbenzene	2016/10/04	81	70 - 130	81	70 - 130	83	%		
4687306	D4-1,2-Dichloroethane	2016/10/04	98	70 - 130	98	70 - 130	99	%		
4687337	o-Terphenyl	2016/10/04	114	30 - 130	107	30 - 130	107	%		
4687460	D10-Anthracene	2016/10/05	103	50 - 130	103	50 - 130	104	%		
4687460	D14-Terphenyl (FS)	2016/10/05	128	50 - 130	129	50 - 130	129	%		
4687460	D8-Acenaphthylene	2016/10/05	116	50 - 130	119	50 - 130	109	%		
4692427	Decachlorobiphenyl	2016/10/08	91	60 - 130	84	60 - 130	83	%		
4687306	Benzene	2016/10/05	101	70 - 130	98	70 - 130	<0.20	ug/L	NC	40
4687306	Ethylbenzene	2016/10/05	103	70 - 130	103	70 - 130	<0.20	ug/L	NC	40
4687306	F1 (C6-C10) - BTEX	2016/10/05					<25	ug/L	NC	40
4687306	F1 (C6-C10)	2016/10/05	97	70 - 130	103	70 - 130	<25	ug/L	NC	40
4687306	o-Xylene	2016/10/05	101	70 - 130	101	70 - 130	<0.20	ug/L	NC	40
4687306	p+m-Xylene	2016/10/05	94	70 - 130	94	70 - 130	<0.40	ug/L	NC	40
4687306	Toluene	2016/10/05	95	70 - 130	95	70 - 130	<0.20	ug/L	NC	40
4687306	Total Xylenes	2016/10/05					<0.40	ug/L	NC	40
4687337	F2 (C10-C16 Hydrocarbons)	2016/10/04	101	50 - 130	90	80 - 120	<100	ug/L	NC	50
4687337	F3 (C16-C34 Hydrocarbons)	2016/10/04	101	50 - 130	90	80 - 120	<200	ug/L	NC	50
4687337	F4 (C34-C50 Hydrocarbons)	2016/10/04	101	50 - 130	90	80 - 120	<200	ug/L	NC	50
4687460	1-Methylnaphthalene	2016/10/05	116	50 - 130	107	50 - 130	<0.010	ug/L	NC	30
4687460	2-Methylnaphthalene	2016/10/05	113	50 - 130	105	50 - 130	<0.010	ug/L	NC	30
4687460	Acenaphthene	2016/10/05	91	50 - 130	87	50 - 130	<0.010	ug/L	NC	30
4687460	Acenaphthylene	2016/10/05	102	50 - 130	100	50 - 130	<0.010	ug/L	NC	30
4687460	Anthracene	2016/10/05	113	50 - 130	106	50 - 130	<0.010	ug/L	NC	30
4687460	Benzo(a)anthracene	2016/10/05	129	50 - 130	125	50 - 130	<0.010	ug/L	NC	30
4687460	Benzo(a)pyrene	2016/10/05	120	50 - 130	122	50 - 130	<0.010	ug/L	NC	30
4687460	Benzo(b/j)fluoranthene	2016/10/05	127	50 - 130	126	50 - 130	<0.010	ug/L	NC	30
4687460	Benzo(g,h,i)perylene	2016/10/05	115	50 - 130	112	50 - 130	<0.010	ug/L	NC	30
4687460	Benzo(k)fluoranthene	2016/10/05	129	50 - 130	127	50 - 130	<0.010	ug/L	NC	30
4687460	Chrysene	2016/10/05	121	50 - 130	126	50 - 130	<0.010	ug/L	NC	30

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Maxxam Job #: B6L2112
Report Date: 2016/10/11

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4687460	Dibenz(a,h)anthracene	2016/10/05	116	50 - 130	113	50 - 130	<0.010	ug/L	NC	30
4687460	Fluoranthene	2016/10/05	130	50 - 130	123	50 - 130	<0.010	ug/L	NC	30
4687460	Fluorene	2016/10/05	100	50 - 130	93	50 - 130	<0.010	ug/L	NC	30
4687460	Indeno(1,2,3-cd)pyrene	2016/10/05	116	50 - 130	128	50 - 130	<0.010	ug/L	NC	30
4687460	Naphthalene	2016/10/05	97	50 - 130	92	50 - 130	<0.010	ug/L	NC	30
4687460	Phenanthrene	2016/10/05	106	50 - 130	101	50 - 130	<0.010	ug/L	NC	30
4687460	Pyrene	2016/10/05	124	50 - 130	124	50 - 130	<0.010	ug/L	NC	30
4689715	Chromium (VI)	2016/10/06	100	80 - 120	99	80 - 120	<0.50	ug/L	NC	20
4692427	Aroclor 1016	2016/10/08					<0.01	ug/L	NC	40
4692427	Aroclor 1221	2016/10/08					<0.01	ug/L	NC	40
4692427	Aroclor 1232	2016/10/08					<0.01	ug/L	NC	40
4692427	Aroclor 1242	2016/10/08					<0.01	ug/L	NC	40
4692427	Aroclor 1248	2016/10/08					<0.01	ug/L	NC	40
4692427	Aroclor 1254	2016/10/08					<0.01	ug/L	NC	40
4692427	Aroclor 1260	2016/10/08	85	60 - 130	85	60 - 130	<0.01	ug/L	NC	40
4692427	Aroclor 1262	2016/10/08					<0.01	ug/L	NC	40
4692427	Aroclor 1268	2016/10/08					<0.01	ug/L	NC	40
4692427	Total PCB	2016/10/08	85	60 - 130	85	60 - 130	<0.01	ug/L	NC	40
4692707	Mercury (Hg)	2016/10/07	95	75 - 125	110	80 - 120	0.01, RDL=0.01	ug/L	NC	20

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 (one or both samples < 5x RDL).

Maxxam Analytics International Corporation o/a Maxxam Analytics 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxam.ca

Maxxam Job #: B6L2112
Report Date: 2016/10/11

ARCADIS Canada Inc
Client Project #: 102153-000
Site Location: TC IQALUIT LAND FILL
Sampler Initials: RF

VALIDATION SIGNATURE PAGE

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

Cristina Carriere, Scientific Services

Steve Roberts, Ottawa Lab Manager

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

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#10988 ARCADIS Canada Inc	Company Name:		Quotation #:	B54416	Maxxam Job #:	Bottle Order #:
Attention:	Invoices Attention	Attention:	Ryan Fletcher	P.O. #:	102153-000		578891
Address:	329 Churchill Ave N Suite 200	Address:		Project:	TC legalist Law/R'11	COC #:	Project Manager:
	Ottawa ON K1Z 5B8			Project Name:	102153-000	C#578891-01-01	Madison Bingley
Tel:	(613) 721-0555 Fax: (613) 721-0029	Tel:	Fax:	Site #:			
Email:	invoicesottawa@arcadis.com, barb.adelman@arcadis-c	Email:	ryan.fletcher@arcadis.com	Sampled By:	Ryan Fletcher		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)	Other Regulations	Special Instructions
☐ Table 1 ☐ Res/Park ☐ Medium/Fine	☒ CCME ☐ Sanitary Sewer Bylaw	
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ Reg 558 ☐ Storm Sewer Bylaw	
☐ Table 3 ☐ Agri/Other ☐ For RSC	☐ MISA Municipality ____	
☐ Table ___	☐ PWQO	
	☐ Other ____	

Include Criteria on Certificate of Analysis (Y/N)? ____

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	ANALYSIS REQUESTED (PLEASE BE SPECIFIC): CCME Petroleum Hydrocarbons	CCME Metals Package (CAMS) Total	OC Pesticides (Guelph)	PCBs (Guelph) (water)	PAHs (Guelph) (water)	Hardness	Mercury	Chromium	# of Bottles	Comments
1		SW16-01	30 Sept. 30/16	16:00	SW	N	X	X	X	X	X	X	X	X	11	SW = Surface water
2		SW16-02		15:40		N	X	X	X	X	X	X	X	X	11	
3		SW16-03		15:15		N	X	X	X	X	X	X	X	X	11	Total Metals
4		SW16-04		16:15		N	X	X	X	X	X	X	X	X	11	→ not field filtered
5		SW16-05		16:45		N	X	X	X	X	X	X	X	X	11	
6		SW16-06		17:00		N	X	X	X	X	X	X	X	X	11	Note: no general bottle
7		SW16-07		17:15		N	X	X	X	X	X	X	X	X	11	→ please get hardness from
8		Dup-1		—		N	X	X	X	X	X	X	X	X	11	Pesticide bottle PCB if at all possible
9																
10																

3-Oct-16 10:30 Madison Bingley B61.2112 OTT-001 FHB

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ____ Time Required: ____ ☐
Rush Confirmation Number: ____ *(call lab for #)*

RECEIVED IN OTTAWA ON ICE

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Ryan Fletcher	Oct. 2/16	15:00	Fatemeh Habib	2016/10/03	10:30	

Laboratory Use Only				
Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
	3,3,3 / 5,5,4	Present	✓	
	4,3,4	Intact		✓

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

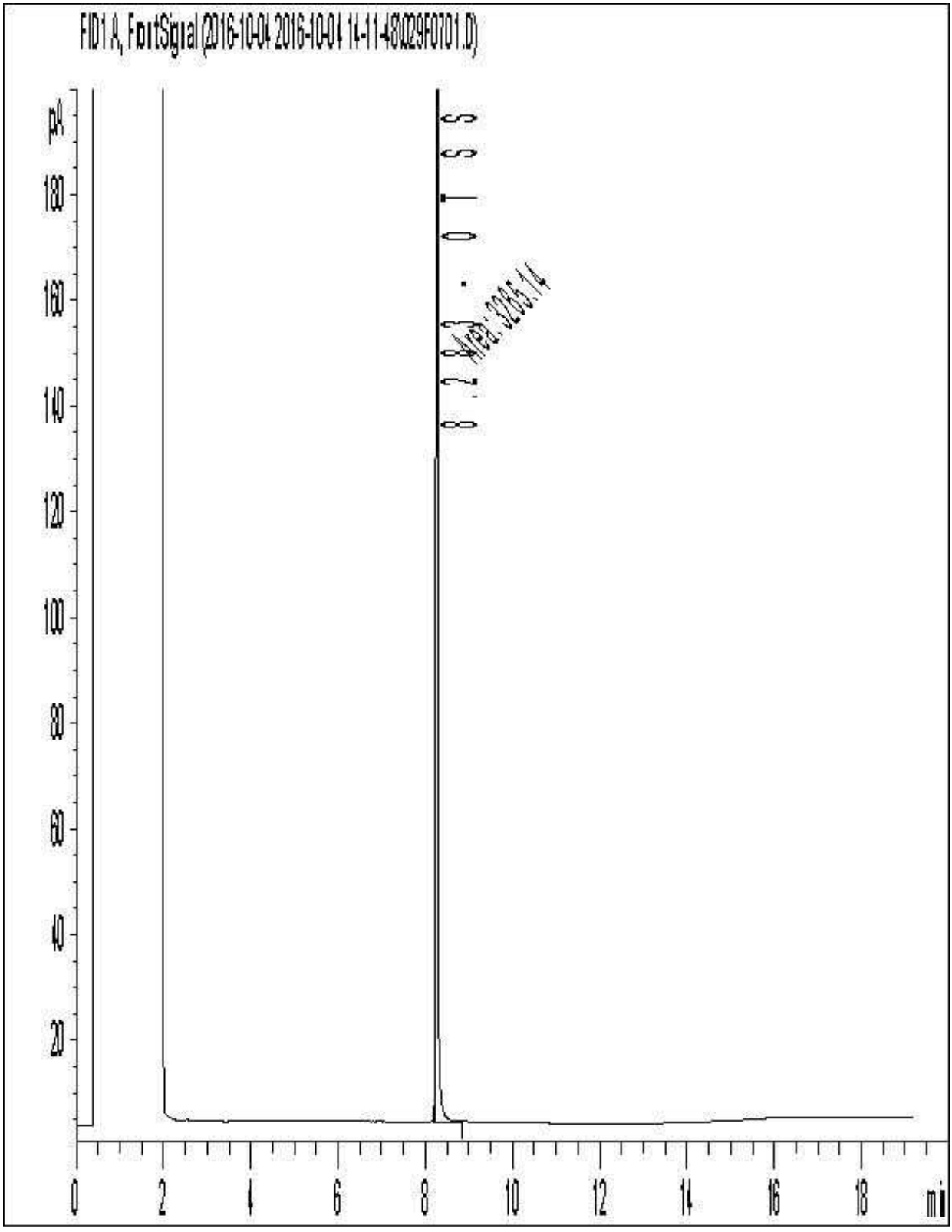
White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

Maxxam Job #: B6L2112
Report Date: 2016/10/11
Maxxam Sample: DEG253

ARCADIS Canada Inc
Client Project #: 102153-000
Project name: TC IQALUIT LAND FILL
Client ID: SW16-01

Petroleum Hydrocarbons F2-F4 in Water Chromatogram

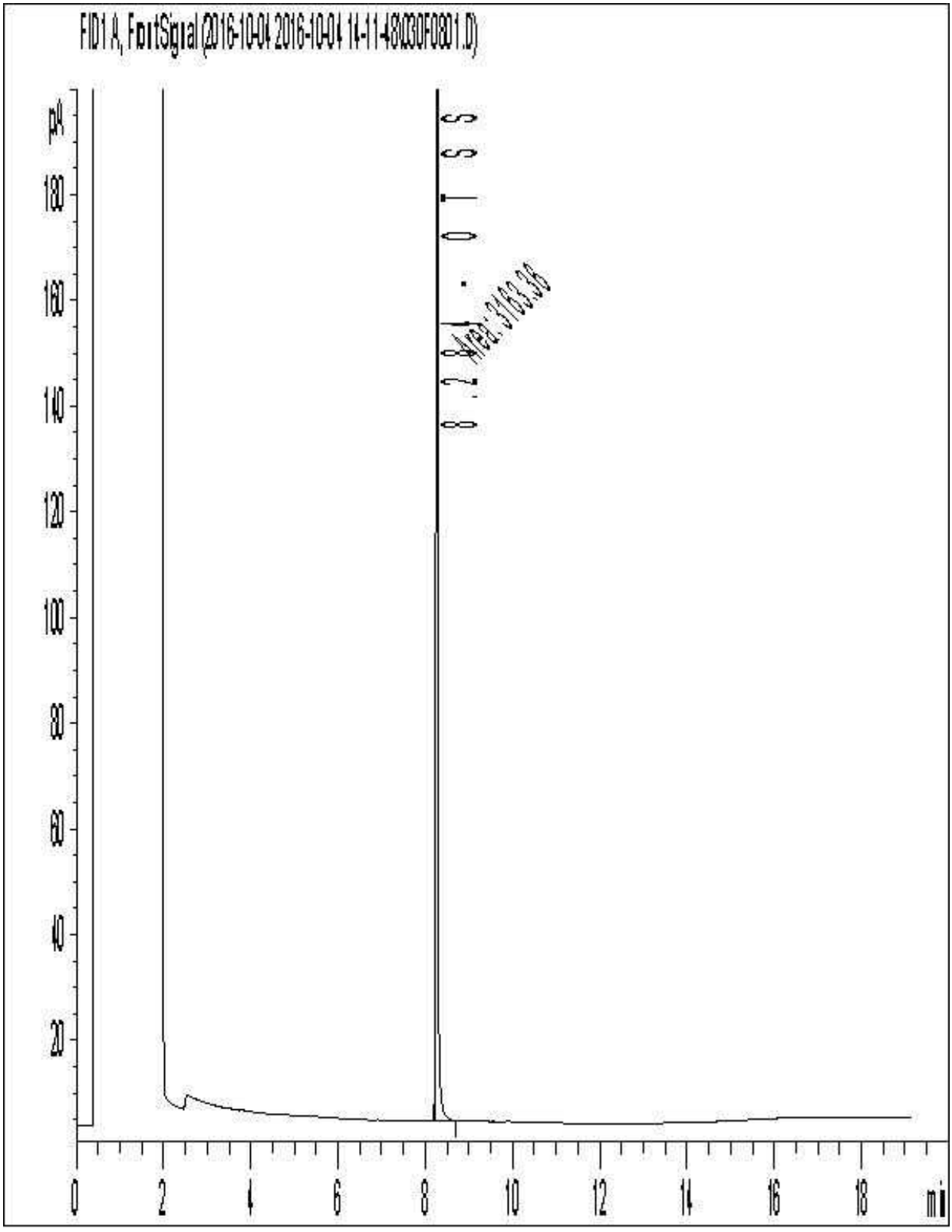


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2112
Report Date: 2016/10/11
Maxxam Sample: DEG253 Lab-Dup

ARCADIS Canada Inc
Client Project #: 102153-000
Project name: TC IQALUIT LAND FILL
Client ID: SW16-01

Petroleum Hydrocarbons F2-F4 in Water Chromatogram

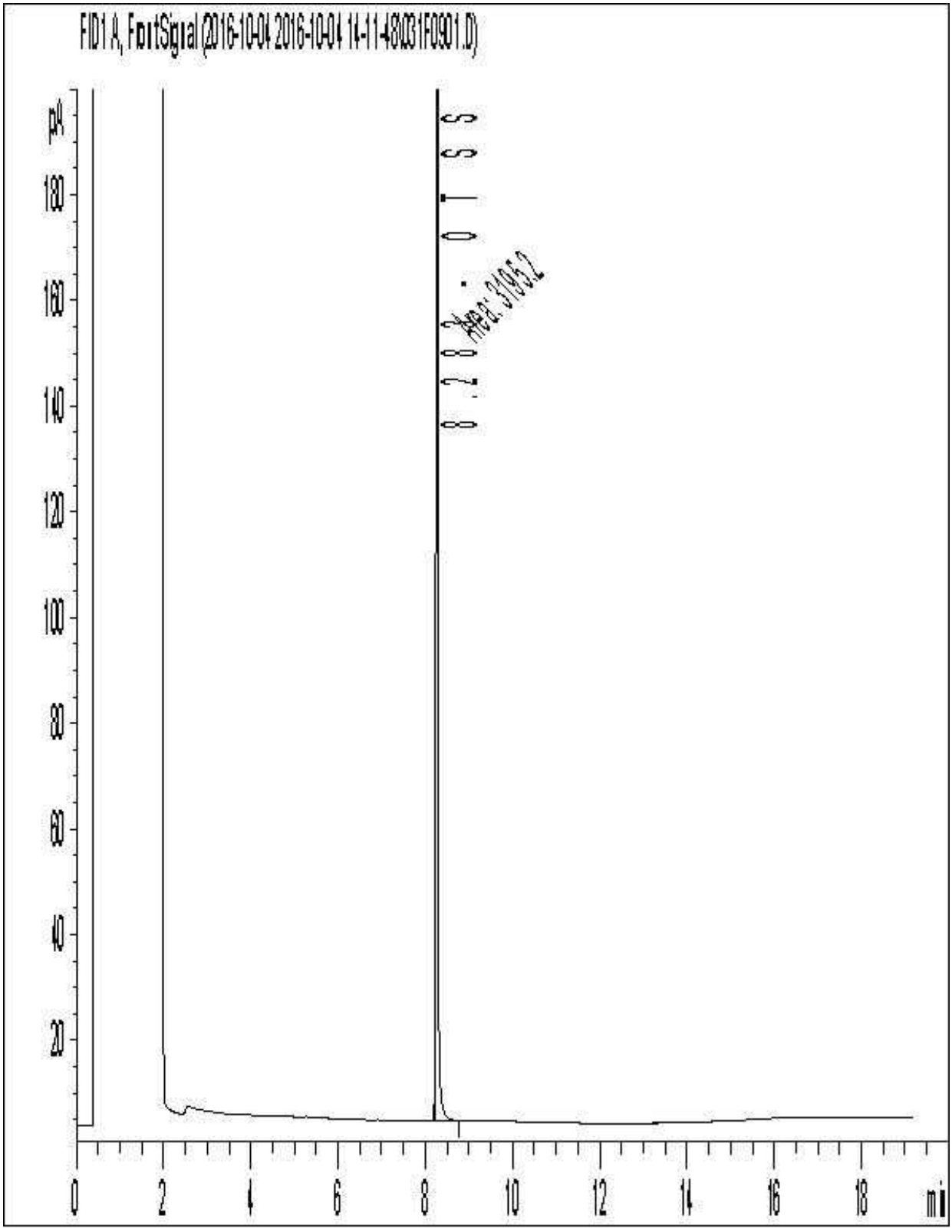


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2112
Report Date: 2016/10/11
Maxxam Sample: DEG254

ARCADIS Canada Inc
Client Project #: 102153-000
Project name: TC IQALUIT LAND FILL
Client ID: SW16-02

Petroleum Hydrocarbons F2-F4 in Water Chromatogram

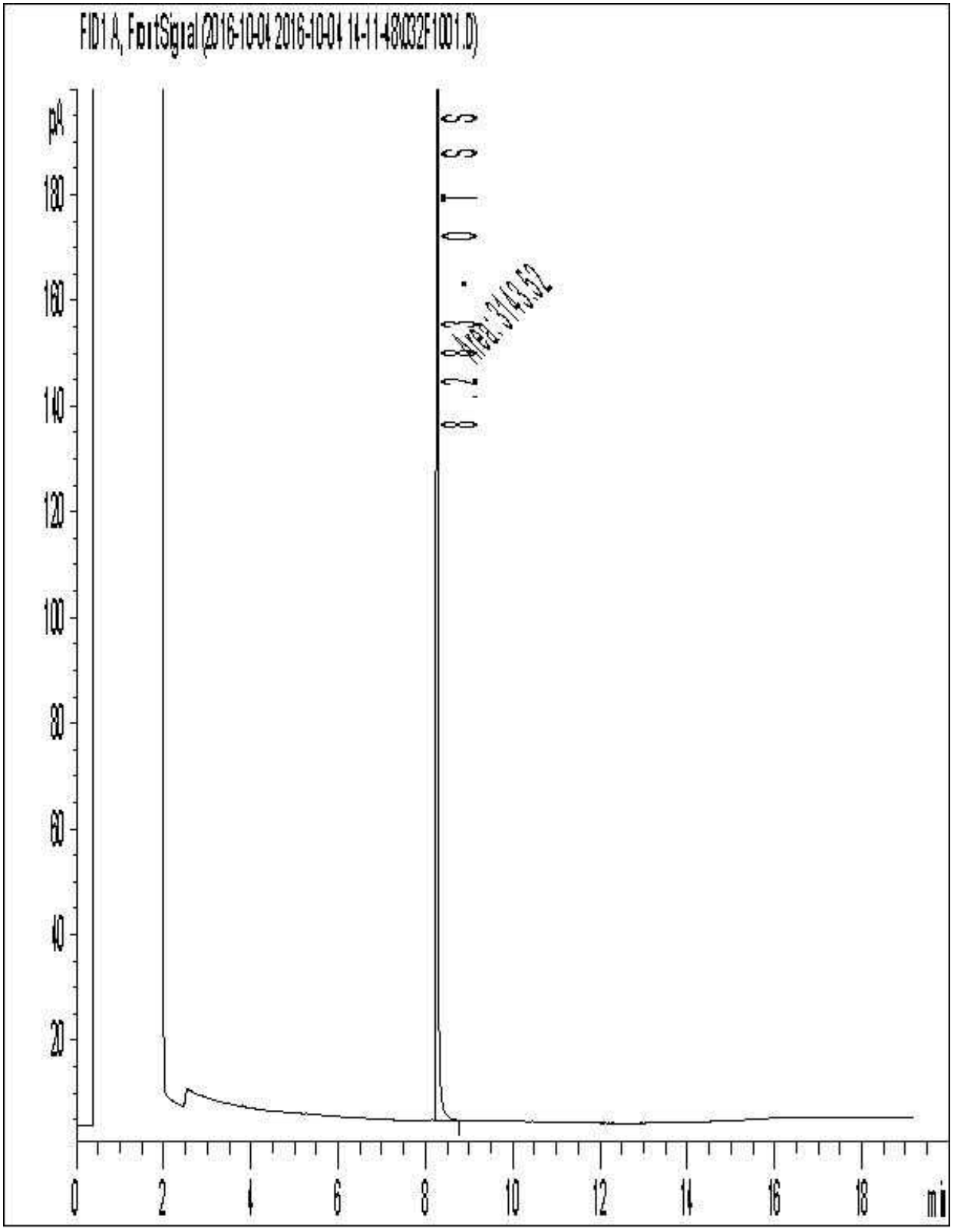


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2112
Report Date: 2016/10/11
Maxxam Sample: DEG255

ARCADIS Canada Inc
Client Project #: 102153-000
Project name: TC IQALUIT LAND FILL
Client ID: SW16-03

Petroleum Hydrocarbons F2-F4 in Water Chromatogram

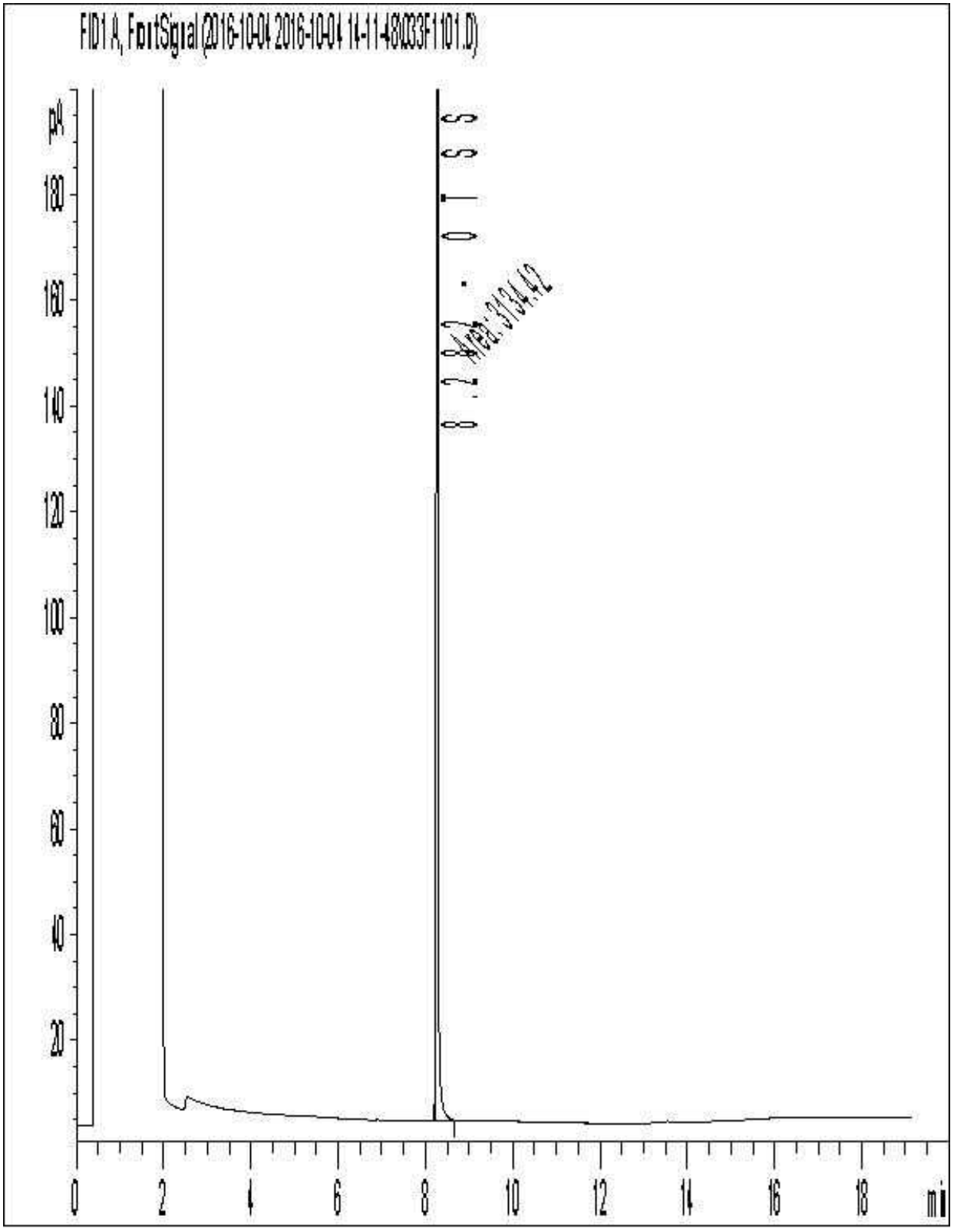


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2112
Report Date: 2016/10/11
Maxxam Sample: DEG256

ARCADIS Canada Inc
Client Project #: 102153-000
Project name: TC IQALUIT LAND FILL
Client ID: SW16-04

Petroleum Hydrocarbons F2-F4 in Water Chromatogram

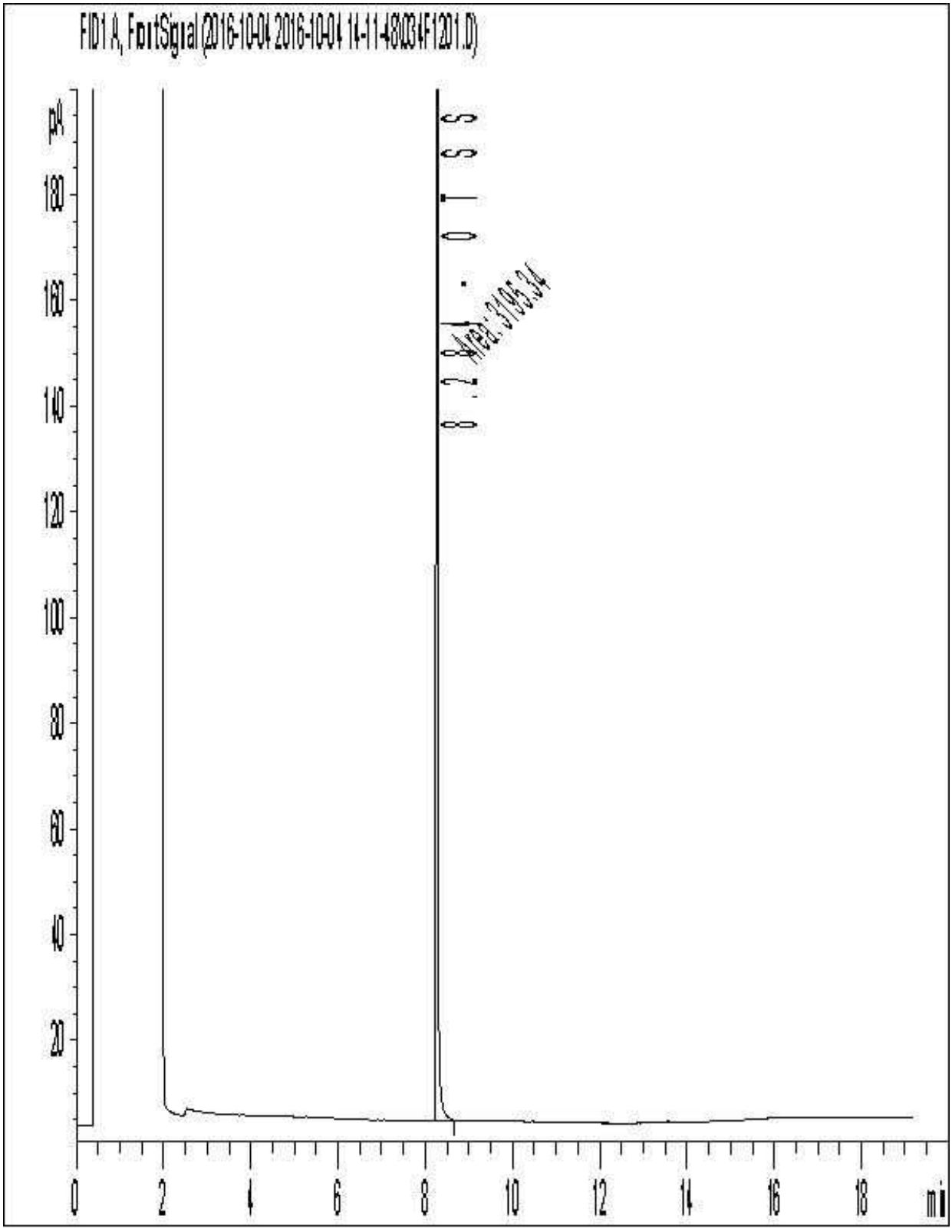


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2112
Report Date: 2016/10/11
Maxxam Sample: DEG257

ARCADIS Canada Inc
Client Project #: 102153-000
Project name: TC IQALUIT LAND FILL
Client ID: SW16-05

Petroleum Hydrocarbons F2-F4 in Water Chromatogram

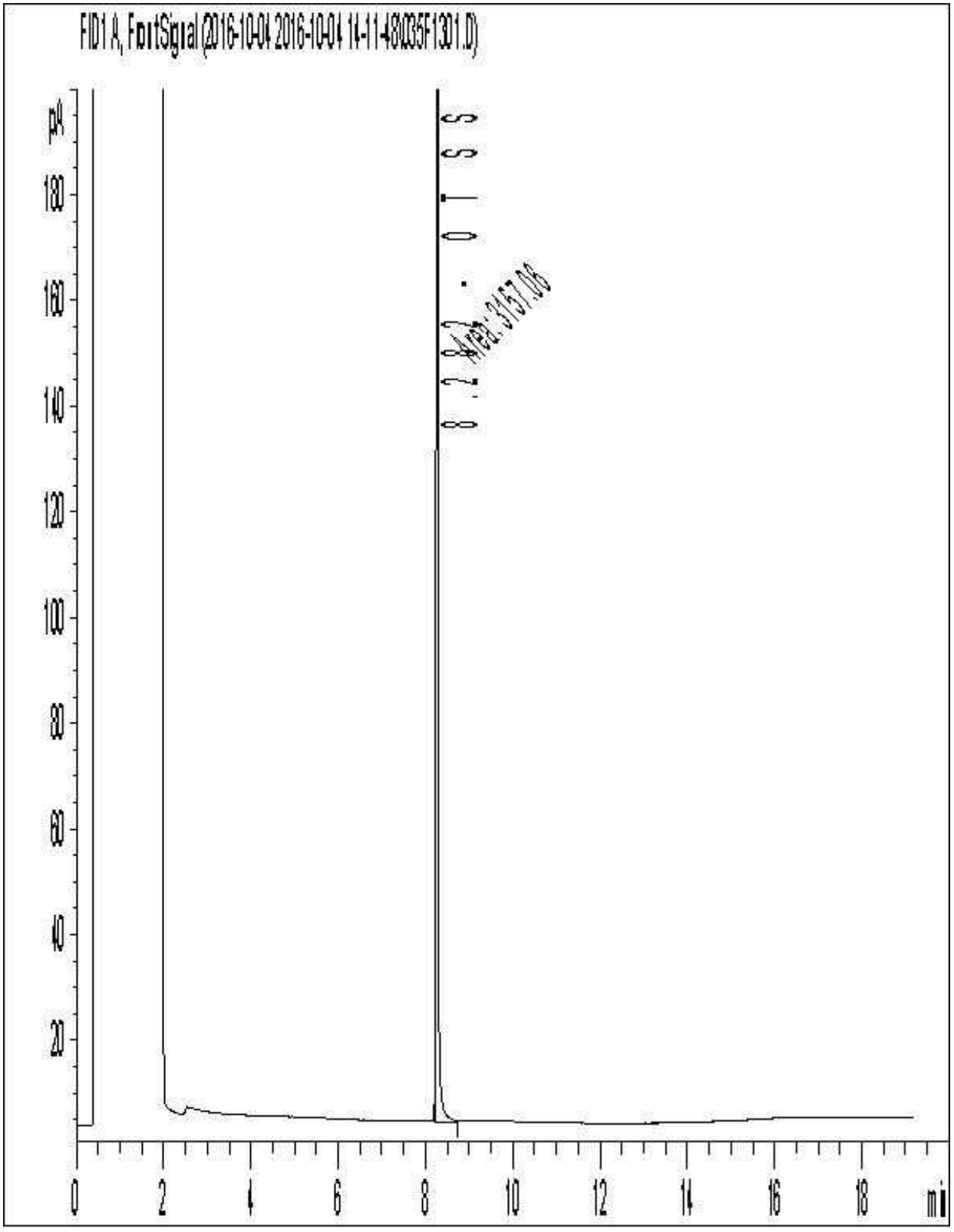


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2112
Report Date: 2016/10/11
Maxxam Sample: DEG258

ARCADIS Canada Inc
Client Project #: 102153-000
Project name: TC IQALUIT LAND FILL
Client ID: SW16-06

Petroleum Hydrocarbons F2-F4 in Water Chromatogram

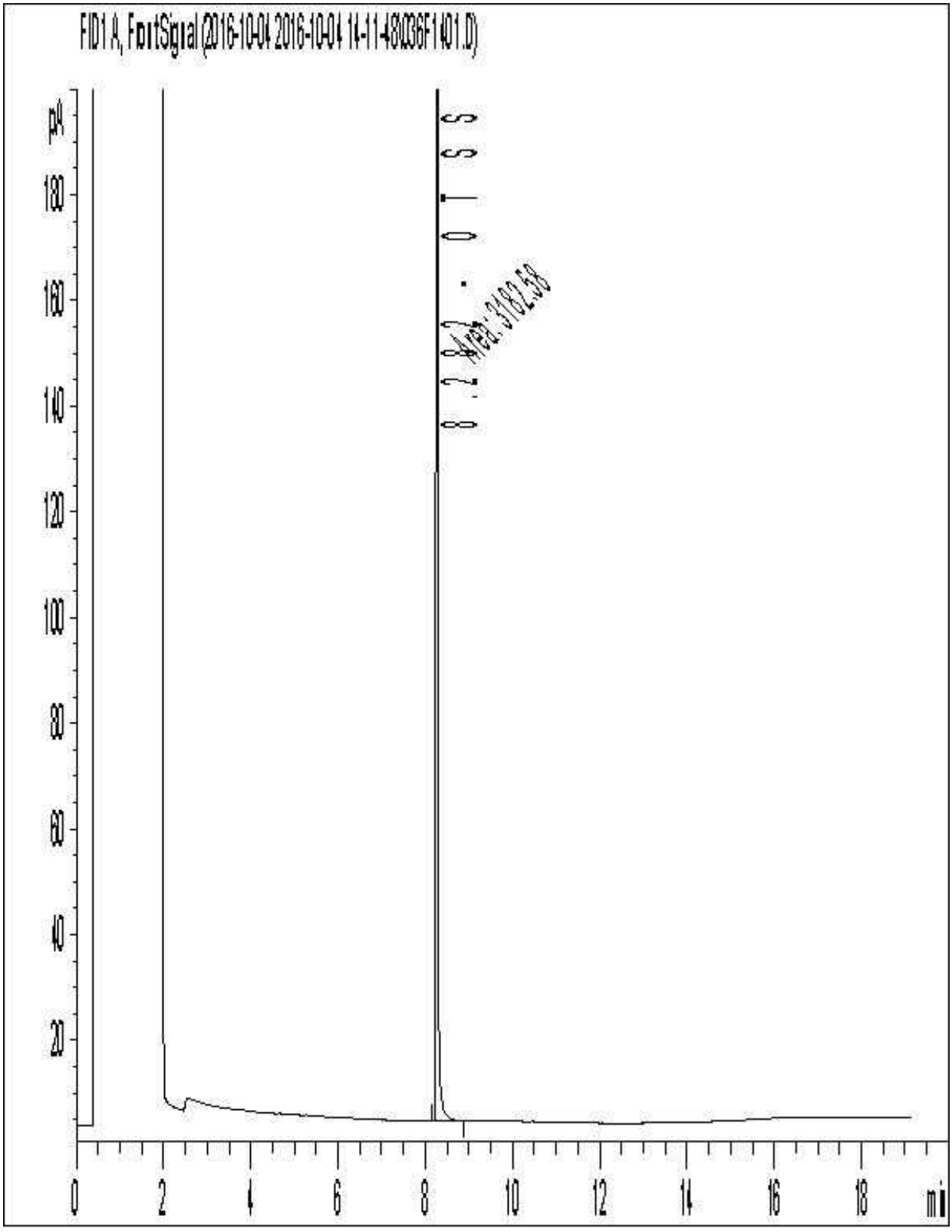


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2112
Report Date: 2016/10/11
Maxxam Sample: DEG259

ARCADIS Canada Inc
Client Project #: 102153-000
Project name: TC IQALUIT LAND FILL
Client ID: SW16-07

Petroleum Hydrocarbons F2-F4 in Water Chromatogram

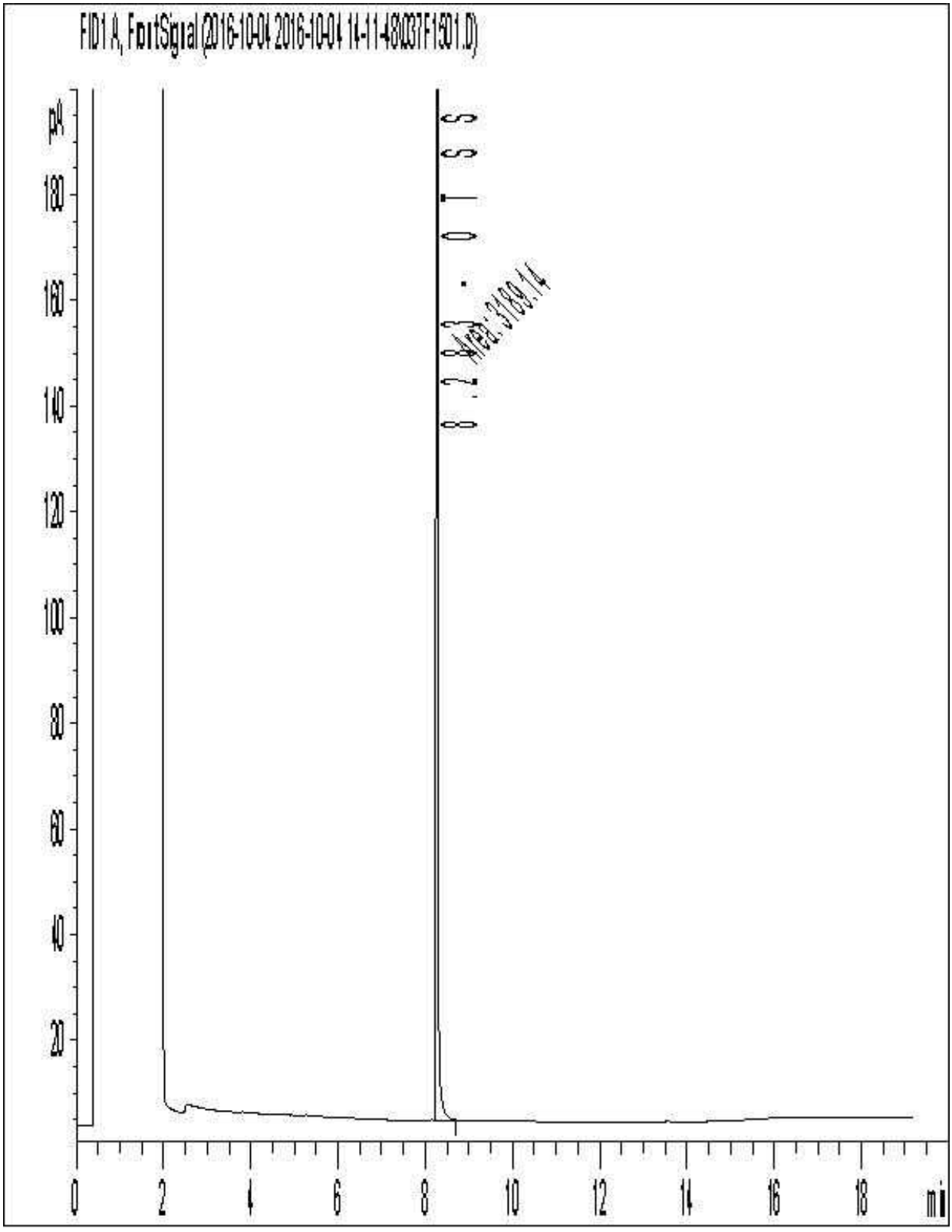


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B6L2112
Report Date: 2016/10/11
Maxxam Sample: DEG260

ARCADIS Canada Inc
Client Project #: 102153-000
Project name: TC IQALUIT LAND FILL
Client ID: DUP-1

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



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

Your P.O. #: 102153-000
Your Project #: MB6L2112
Site Location: 102153-000 TC IQALUIT LANDFILL
Your C.O.C. #: 08428004

Attention:SUBCONTRACTOR

MAXXAM ANALYTICS
OTTAWA
32 COLONNADE RD N
UNIT 1000
NEPEAN, ON
CANADA K2E7J6

Report Date: 2016/10/06
Report #: R2276916
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B686980
Received: 2016/10/04, 08:45

Sample Matrix: Water
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3)	7	N/A	2016/10/06	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (total)	7	2016/10/04	2016/10/06	BBY7SOP-00002	EPA 6020A R1 m
Elements by CRC ICPMS (total)	7	2016/10/04	2016/10/05	BBY7SOP-00003,	BCLM2005,EPA6020bR2m

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.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Amandeep Nagra, Account Specialist
Email: ANagra@maxxam.ca
Phone# (604)639-2602

==========

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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 #: B686980
Report Date: 2016/10/06

MAXXAM ANALYTICS
Client Project #: MB6L2112
Site Location: 102153-000 TC IQALUIT LANDFILL
Your P.O. #: 102153-000

CCME TOTAL METALS IN WATER (WATER)

Maxxam ID		PR3546	PR3547		PR3548		PR3549		
Sampling Date		2016/09/30 16:00	2016/09/30 15:40		2016/09/30 15:15		2016/09/30 16:15		
COC Number		08428004	08428004		08428004		08428004		
	UNITS	SW16-01(DEG253)	SW16-02(DEG254)	RDL	SW16-03(DEG255)	RDL	SW16-04(DEG256)	RDL	QC Batch
Calculated Parameters									
Total Hardness (CaCO3)	mg/L	215	216	0.50	1660	0.50	142	0.50	8420969
Total Metals by ICPMS									
Total Aluminum (Al)	ug/L	21.9	17.3	3.0	72	12	15.2	3.0	8422099
Total Antimony (Sb)	ug/L	<0.50	<0.50	0.50	<2.0	2.0	<0.50	0.50	8422099
Total Arsenic (As)	ug/L	0.12	0.13	0.10	0.80	0.40	0.20	0.10	8422099
Total Barium (Ba)	ug/L	1.4	1.4	1.0	<4.0	4.0	1.9	1.0	8422099
Total Beryllium (Be)	ug/L	<0.10	<0.10	0.10	<0.40	0.40	<0.10	0.10	8422099
Total Bismuth (Bi)	ug/L	<1.0	<1.0	1.0	<4.0	4.0	<1.0	1.0	8422099
Total Boron (B)	ug/L	190	185	50	1320	200	145	50	8422099
Total Cadmium (Cd)	ug/L	<0.010	<0.010	0.010	<0.040	0.040	0.014	0.010	8422099
Total Chromium (Cr)	ug/L	<1.0	<1.0	1.0	<4.0	4.0	<1.0	1.0	8422099
Total Cobalt (Co)	ug/L	<0.50	<0.50	0.50	<2.0	2.0	<0.50	0.50	8422099
Total Copper (Cu)	ug/L	0.89	1.61	0.50	<2.0	2.0	0.64	0.50	8422099
Total Iron (Fe)	ug/L	108	34	10	611	40	737	10	8422099
Total Lead (Pb)	ug/L	0.21	<0.20	0.20	<0.80	0.80	<0.20	0.20	8422099
Total Lithium (Li)	ug/L	6.1	6.2	5.0	50	20	5.0	5.0	8422099
Total Manganese (Mn)	ug/L	3.5	2.0	1.0	4.5	4.0	47.3	1.0	8422099
Total Molybdenum (Mo)	ug/L	<1.0	<1.0	1.0	<4.0	4.0	<1.0	1.0	8422099
Total Nickel (Ni)	ug/L	<1.0	<1.0	1.0	<4.0	4.0	<1.0	1.0	8422099
Total Selenium (Se)	ug/L	0.11	<0.10	0.10	<0.40	0.40	<0.10	0.10	8422099
Total Silicon (Si)	ug/L	1050	971	100	1420	400	3600	100	8422099
Total Silver (Ag)	ug/L	<0.020	<0.020	0.020	<0.080	0.080	<0.020	0.020	8422099
Total Strontium (Sr)	ug/L	258	263	1.0	2070	4.0	147	1.0	8422099
Total Thallium (Tl)	ug/L	<0.050	<0.050	0.050	<0.20	0.20	<0.050	0.050	8422099
Total Tin (Sn)	ug/L	<5.0	<5.0	5.0	<20	20	<5.0	5.0	8422099
Total Titanium (Ti)	ug/L	<5.0	<5.0	5.0	<20	20	<5.0	5.0	8422099
Total Uranium (U)	ug/L	0.11	<0.10	0.10	0.82	0.40	<0.10	0.10	8422099
Total Vanadium (V)	ug/L	<5.0	<5.0	5.0	<20	20	<5.0	5.0	8422099
Total Zinc (Zn)	ug/L	<5.0	<5.0	5.0	<20	20	<5.0	5.0	8422099
Total Zirconium (Zr)	ug/L	<0.50	<0.50	0.50	<2.0	2.0	<0.50	0.50	8422099
Total Calcium (Ca)	mg/L	18.3	18.3	0.050	110	0.20	17.5	0.050	8421036
RDL = Reportable Detection Limit									

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Maxxam Job #: B686980
Report Date: 2016/10/06

MAXXAM ANALYTICS
Client Project #: MB6L2112
Site Location: 102153-000 TC IQALUIT LANDFILL
Your P.O. #: 102153-000

CCME TOTAL METALS IN WATER (WATER)

Maxxam ID		PR3546	PR3547		PR3548		PR3549		
Sampling Date		2016/09/30 16:00	2016/09/30 15:40		2016/09/30 15:15		2016/09/30 16:15		
COC Number		08428004	08428004		08428004		08428004		
	UNITS	**SW16-01(DEG253)**	**SW16-02(DEG254)**	**RDL**	**SW16-03(DEG255)**	**RDL**	**SW16-04(DEG256)**	**RDL**	**QC Batch**
Total Magnesium (Mg)	mg/L	41.0	41.4	0.050	336	0.20	24.0	0.050	8421036
Total Potassium (K)	mg/L	12.4	12.3	0.050	99.6	0.20	8.43	0.050	8421036
Total Sodium (Na)	mg/L	341	341	0.050	2860	0.20	209	0.050	8421036
Total Sulphur (S)	mg/L	32.1	31.0	3.0	263	12	20.7	3.0	8421036
RDL = Reportable Detection Limit									

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Maxxam Job #: B686980
Report Date: 2016/10/06

MAXXAM ANALYTICS
Client Project #: MB6L2112
Site Location: 102153-000 TC IQALUIT LANDFILL
Your P.O. #: 102153-000

CCME TOTAL METALS IN WATER (WATER)

Maxxam ID		PR3550	PR3552	PR3553		
Sampling Date		2016/09/30 16:45	2016/09/30 17:15			
COC Number		08428004	08428004	08428004		
	UNITS	SW16-05(DEG257)	SW16-07(DEG259)	DUP-1(DEG260)	RDL	QC Batch
Calculated Parameters						
Total Hardness (CaCO3)	mg/L	44.1	38.7	43.9	0.50	8420969
Total Metals by ICPMS						
Total Aluminum (Al)	ug/L	11.3	15.3	11.7	3.0	8422099
Total Antimony (Sb)	ug/L	<0.50	<0.50	<0.50	0.50	8422099
Total Arsenic (As)	ug/L	<0.10	0.11	<0.10	0.10	8422099
Total Barium (Ba)	ug/L	2.6	4.3	2.6	1.0	8422099
Total Beryllium (Be)	ug/L	<0.10	<0.10	<0.10	0.10	8422099
Total Bismuth (Bi)	ug/L	<1.0	<1.0	<1.0	1.0	8422099
Total Boron (B)	ug/L	<50	<50	<50	50	8422099
Total Cadmium (Cd)	ug/L	0.029	0.050	0.030	0.010	8422099
Total Chromium (Cr)	ug/L	<1.0	<1.0	<1.0	1.0	8422099
Total Cobalt (Co)	ug/L	<0.50	<0.50	<0.50	0.50	8422099
Total Copper (Cu)	ug/L	0.54	<0.50	0.54	0.50	8422099
Total Iron (Fe)	ug/L	687	1360	694	10	8422099
Total Lead (Pb)	ug/L	<0.20	<0.20	<0.20	0.20	8422099
Total Lithium (Li)	ug/L	<5.0	<5.0	<5.0	5.0	8422099
Total Manganese (Mn)	ug/L	44.0	86.2	43.4	1.0	8422099
Total Molybdenum (Mo)	ug/L	<1.0	<1.0	<1.0	1.0	8422099
Total Nickel (Ni)	ug/L	<1.0	<1.0	<1.0	1.0	8422099
Total Selenium (Se)	ug/L	<0.10	<0.10	0.11	0.10	8422099
Total Silicon (Si)	ug/L	4910	3050	5000	100	8422099
Total Silver (Ag)	ug/L	<0.020	<0.020	<0.020	0.020	8422099
Total Strontium (Sr)	ug/L	31.2	33.2	31.2	1.0	8422099
Total Thallium (Tl)	ug/L	<0.050	<0.050	<0.050	0.050	8422099
Total Tin (Sn)	ug/L	<5.0	<5.0	<5.0	5.0	8422099
Total Titanium (Ti)	ug/L	<5.0	<5.0	<5.0	5.0	8422099
Total Uranium (U)	ug/L	<0.10	<0.10	<0.10	0.10	8422099
Total Vanadium (V)	ug/L	<5.0	<5.0	<5.0	5.0	8422099
Total Zinc (Zn)	ug/L	<5.0	5.1	<5.0	5.0	8422099
Total Zirconium (Zr)	ug/L	<0.50	<0.50	<0.50	0.50	8422099
Total Calcium (Ca)	mg/L	13.1	11.3	13.0	0.050	8421036
RDL = Reportable Detection Limit						

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Maxxam Job #: B686980
Report Date: 2016/10/06

MAXXAM ANALYTICS
Client Project #: MB6L2112
Site Location: 102153-000 TC IQALUIT LANDFILL
Your P.O. #: 102153-000

CCME TOTAL METALS IN WATER (WATER)

Maxxam ID		PR3550	PR3552	PR3553		
Sampling Date		2016/09/30 16:45	2016/09/30 17:15			
COC Number		08428004	08428004	08428004		
	UNITS	**SW16-05(DEG257)**	**SW16-07(DEG259)**	**DUP-1(DEG260)**	**RDL**	**QC Batch**
Total Magnesium (Mg)	mg/L	2.78	2.53	2.79	0.050	8421036
Total Potassium (K)	mg/L	0.653	0.667	0.641	0.050	8421036
Total Sodium (Na)	mg/L	4.80	4.64	4.74	0.050	8421036
Total Sulphur (S)	mg/L	<3.0	<3.0	<3.0	3.0	8421036
RDL = Reportable Detection Limit						

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GENERAL COMMENTS

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

Package 1	2.3°C

CCME TOTAL METALS IN WATER (WATER) Comments

Sample PR3548-01 Elements by CRC ICPMS (total): RDL raised due to sample matrix interference.

Results relate only to the items tested.

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Maxxam Job #: B686980
Report Date: 2016/10/06

MAXXAM ANALYTICS
Client Project #: MB6L2112
Site Location: 102153-000 TC IQALUIT LANDFILL
Your P.O. #: 102153-000

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8422099	AD5	Matrix Spike	Total Aluminum (Al)	2016/10/05		103	%	80 - 120
			Total Antimony (Sb)	2016/10/05		102	%	80 - 120
			Total Arsenic (As)	2016/10/05		NC	%	80 - 120
			Total Barium (Ba)	2016/10/05		104	%	80 - 120
			Total Beryllium (Be)	2016/10/05		100	%	80 - 120
			Total Bismuth (Bi)	2016/10/05		96	%	80 - 120
			Total Boron (B)	2016/10/05		NC	%	80 - 120
			Total Cadmium (Cd)	2016/10/05		97	%	80 - 120
			Total Chromium (Cr)	2016/10/05		95	%	80 - 120
			Total Cobalt (Co)	2016/10/05		90	%	80 - 120
			Total Copper (Cu)	2016/10/05		NC	%	80 - 120
			Total Iron (Fe)	2016/10/05		105	%	80 - 120
			Total Lead (Pb)	2016/10/05		100	%	80 - 120
			Total Lithium (Li)	2016/10/05		NC	%	80 - 120
			Total Manganese (Mn)	2016/10/05		NC	%	80 - 120
			Total Molybdenum (Mo)	2016/10/05		NC	%	80 - 120
			Total Nickel (Ni)	2016/10/05		89	%	80 - 120
			Total Selenium (Se)	2016/10/05		106	%	80 - 120
			Total Silver (Ag)	2016/10/05		83	%	80 - 120
			Total Strontium (Sr)	2016/10/05		NC	%	80 - 120
			Total Thallium (Tl)	2016/10/05		102	%	80 - 120
			Total Tin (Sn)	2016/10/05		98	%	80 - 120
			Total Titanium (Ti)	2016/10/05		114	%	80 - 120
			Total Uranium (U)	2016/10/05		104	%	80 - 120
			Total Vanadium (V)	2016/10/05		97	%	80 - 120
			Total Zinc (Zn)	2016/10/05		NC	%	80 - 120
8422099	AD5	Spiked Blank	Total Aluminum (Al)	2016/10/05		108	%	80 - 120
			Total Antimony (Sb)	2016/10/05		99	%	80 - 120
			Total Arsenic (As)	2016/10/05		101	%	80 - 120
			Total Barium (Ba)	2016/10/05		99	%	80 - 120
			Total Beryllium (Be)	2016/10/05		101	%	80 - 120
			Total Bismuth (Bi)	2016/10/05		97	%	80 - 120
			Total Boron (B)	2016/10/05		105	%	80 - 120
			Total Cadmium (Cd)	2016/10/05		98	%	80 - 120
			Total Chromium (Cr)	2016/10/05		98	%	80 - 120
			Total Cobalt (Co)	2016/10/05		96	%	80 - 120
			Total Copper (Cu)	2016/10/05		96	%	80 - 120
			Total Iron (Fe)	2016/10/05		108	%	80 - 120
			Total Lead (Pb)	2016/10/05		98	%	80 - 120
			Total Lithium (Li)	2016/10/05		99	%	80 - 120
			Total Manganese (Mn)	2016/10/05		98	%	80 - 120
			Total Molybdenum (Mo)	2016/10/05		98	%	80 - 120
			Total Nickel (Ni)	2016/10/05		98	%	80 - 120
			Total Selenium (Se)	2016/10/05		105	%	80 - 120
			Total Silver (Ag)	2016/10/05		93	%	80 - 120
			Total Strontium (Sr)	2016/10/05		96	%	80 - 120
			Total Thallium (Tl)	2016/10/05		103	%	80 - 120
			Total Tin (Sn)	2016/10/05		98	%	80 - 120
			Total Titanium (Ti)	2016/10/05		99	%	80 - 120
			Total Uranium (U)	2016/10/05		98	%	80 - 120
			Total Vanadium (V)	2016/10/05		96	%	80 - 120
			Total Zinc (Zn)	2016/10/05		104	%	80 - 120

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Maxxam Job #: B686980
Report Date: 2016/10/06

MAXXAM ANALYTICS
Client Project #: MB6L2112
Site Location: 102153-000 TC IQALUIT LANDFILL
Your P.O. #: 102153-000

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8422099	AD5	Method Blank	Total Aluminum (Al)	2016/10/05	<3.0		ug/L	
			Total Antimony (Sb)	2016/10/05	<0.50		ug/L	
			Total Arsenic (As)	2016/10/05	<0.10		ug/L	
			Total Barium (Ba)	2016/10/05	<1.0		ug/L	
			Total Beryllium (Be)	2016/10/05	<0.10		ug/L	
			Total Bismuth (Bi)	2016/10/05	<1.0		ug/L	
			Total Boron (B)	2016/10/05	<50		ug/L	
			Total Cadmium (Cd)	2016/10/05	<0.010		ug/L	
			Total Chromium (Cr)	2016/10/05	<1.0		ug/L	
			Total Cobalt (Co)	2016/10/05	<0.50		ug/L	
			Total Copper (Cu)	2016/10/05	<0.50		ug/L	
			Total Iron (Fe)	2016/10/05	<10		ug/L	
			Total Lead (Pb)	2016/10/05	<0.20		ug/L	
			Total Lithium (Li)	2016/10/05	<5.0		ug/L	
			Total Manganese (Mn)	2016/10/05	<1.0		ug/L	
			Total Molybdenum (Mo)	2016/10/05	<1.0		ug/L	
			Total Nickel (Ni)	2016/10/05	<1.0		ug/L	
			Total Selenium (Se)	2016/10/05	<0.10		ug/L	
			Total Silicon (Si)	2016/10/05	<100		ug/L	
			Total Silver (Ag)	2016/10/05	<0.020		ug/L	
			Total Strontium (Sr)	2016/10/05	<1.0		ug/L	
			Total Thallium (Tl)	2016/10/05	<0.050		ug/L	
			Total Tin (Sn)	2016/10/05	<5.0		ug/L	
			Total Titanium (Ti)	2016/10/05	<5.0		ug/L	
			Total Uranium (U)	2016/10/05	<0.10		ug/L	
			Total Vanadium (V)	2016/10/05	<5.0		ug/L	
			Total Zinc (Zn)	2016/10/05	<5.0		ug/L	
			Total Zirconium (Zr)	2016/10/05	<0.50		ug/L	
8422099	AD5	RPD	Total Arsenic (As)	2016/10/05	1.6		%	20

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.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

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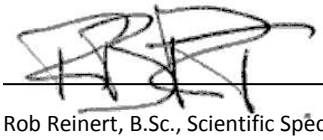
Maxxam Job #: B686980
Report Date: 2016/10/06

MAXXAM ANALYTICS
Client Project #: MB6L2112
Site Location: 102153-000 TC IQALUIT LANDFILL
Your P.O. #: 102153-000

VALIDATION SIGNATURE PAGE

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



Rob Reinert, B.Sc., Scientific Specialist

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APPENDIX D

2016 Photo Log

Project Photographs

TC Iqaluit, Community Landfill

Photo: #1

Date:
Nov. 1, 2016

Description:
AEC 2 – upper section

Location:
AEC 2

Photo: #2

Date:
Nov. 1, 2016

Description:
AEC 2 – upper section

Location:
AEC 2

Project Photographs

TC Iqaluit, Community Landfill

Photo: #3

Date:
Nov. 1, 2016

Description:
AEC 2 – upper section

Location:
AEC 2

Photo: #4

Date:
Nov. 1, 2016

Description:
AEC 2 – upper section

Location:
AEC 2

Project Photographs

TC Iqaluit, Community Landfill

Photo: #5

Date:
Nov. 1, 2016

Description:
AEC 2 – upper section

Location:
AEC 2

Photo: #6

Date:
Nov. 1, 2016

Description:
AEC 2 – upper section

Location:
AEC 2

Project Photographs

TC Iqaluit, Community Landfill

Photo: #7

Date:
Nov. 1, 2016

Description:
AEC 2 – lower creek section

Location:
AEC 2

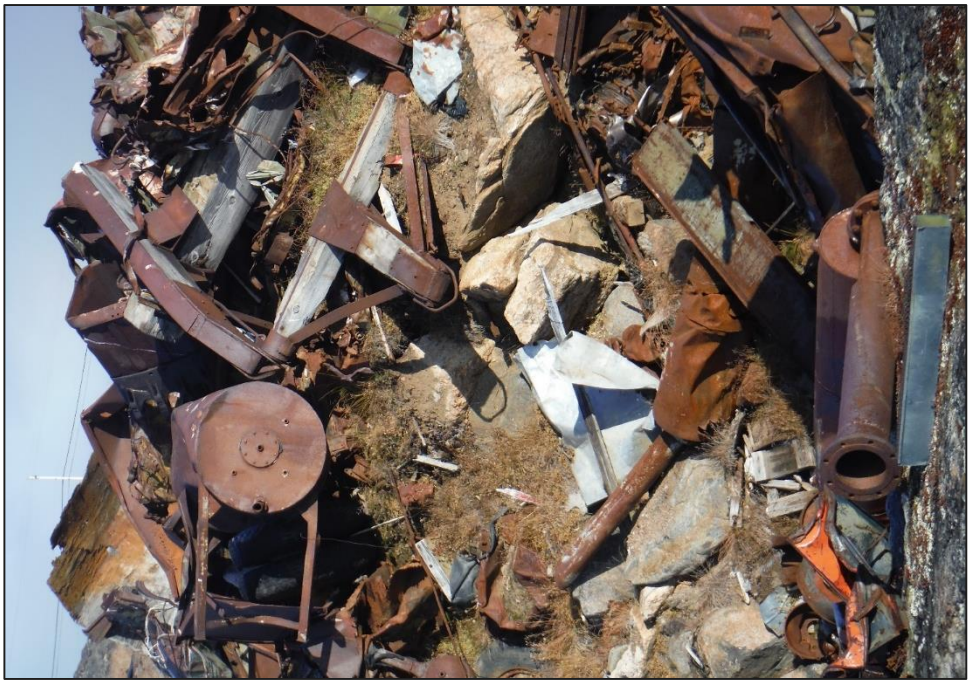

Photo: #8

Date:
Nov. 1, 2016

Description:
AEC 2 – lower creek section

Location:
AEC 2

Project Photographs

TC Iqaluit, Community Landfill

Photo: #9

Date:
Nov. 1, 2016

Description:
AEC 2 – lower creek section

Location:
AEC 2

Photo: #10

Date:
Nov. 1, 2016

Description:
AEC 2 – lower creek section

Location:
AEC 2

Project Photographs

TC Iqaluit, Community Landfill

Photo: #11

Date:
Nov. 1, 2016

Description:
AEC 2 – lower creek section

Location:
AEC 2

Photo: #12

Date:
Nov. 1, 2016

Description:
AEC 2 – lower creek section

Location:
AEC 2

Project Photographs

TC Iqaluit, Community Landfill

Photo: #13

Date:
Nov. 1, 2016

Description:
AEC 2 – lower creek section, creek inside of debris pile

Location:
AEC 2

Photo: #14

Date:
Nov. 1, 2016

Description:
AEC 3 – upper landfill cap, looking southeast

Location:
AEC 3

Project Photographs

TC Iqaluit, Community Landfill

Photo: #15

Date:
Nov. 1, 2016

Description:
AEC 3 – upper landfill cap, looking east of southeast

Location:
AEC 3

Photo: #16

Date:
Nov. 1, 2016

Description:
AEC 3 – upper landfill cap, looking southeast

Location:
AEC 3

Project Photographs

TC Iqaluit, Community Landfill

Photo: #17

Date:
Nov. 1, 2016

Description:
AEC 3 – lower landfill, looking southeast

Location:
AEC 3

Photo: #18

Date:
Nov. 1, 2016

Description:
AEC 3 – lower landfill, northwest end, looking north

Location:
AEC 3

Project Photographs

TC Iqaluit, Community Landfill

Photo: #19

Date:
Nov. 1, 2016

Description:
AEC 3 – lower landfill, northwest end, looking east

Location:
AEC 3

Photo: #20

Date:
Nov. 1, 2016

Description:
AEC 3 – lower landfill, central section, looking north

Location:
AEC 3

Project Photographs

TC Iqaluit, Community Landfill

Photo: #21

Date:
Nov. 1, 2016

Description:
AEC 3 – lower landfill, southeastern end, looking north

Location:
AEC 3

Photo: #22

Date:
Nov. 1, 2016

Description:
AEC 3 – lower landfill, southeastern end, mid slope, looking north

Location:
AEC 3

Project Photographs

TC Iqaluit, Community Landfill

Photo: #23

Date:

Date:

Nov. 1, 2016

Description:

AEC 3 – lower landfill, southeastern end, mid slope, looking north

Location:

AEC 3

Photo: #24

Date:

Nov. 1, 2016

Description:

AEC 3 – lower landfill, southeastern end, top of slope, looking northwest

Location:

AEC 3

Project Photographs

TC Iqaluit, Community Landfill

Photo: #25

Date:
Nov. 1, 2016

Description:
AEC 3 – main landfill, northwestern end, top of slope, looking southeast

Location:
AEC 3

Photo: #26

Date:
Nov. 1, 2016

Description:
AEC 4 – Pond 1, looking north

Location:
AEC 4

Project Photographs

TC Iqaluit, Community Landfill

Photo: #27

Date:
Nov. 1, 2016

Description:
AEC 4 – Pond 2, looking east

Location:
AEC 4

Photo: #28

Date:
Nov. 1, 2016

Description:
AEC 4 – Pond 2, looking north

Location:
AEC 4

Project Photographs

TC Iqaluit, Community Landfill

Photo: #29

Date:
Nov. 1, 2016

Description:
AEC 4 – Pond 6, looking west

Location:
AEC 4

Photo: #30

Date:
Nov. 1, 2016

Description:
AEC 4 – stream leading from AEC 3 to Pond 6, looking southwest

Location:
AEC 4

Project Photographs

TC Iqaluit, Community Landfill

Photo: #31

Date:
Nov. 1, 2016

Description:
AEC 4 – Pond 5, looking northeast

Location:
AEC 4

Photo: #32

Date:
Nov. 1, 2016

Description:
AEC 4 – stream leading from AEC 3 to Pond 6, looking northeast (AEC 3 debris in background)

Location:
AEC 2

Project Photographs

TC Iqaluit, Community Landfill

Photo: #33

Date:
Nov. 1, 2016

Description:
AEC 2 – Impacted stream portion

Location:
AEC 2

Photo: #34

Date:
Nov. 1, 2016

Description:
AEC 2 – looking upgradient from AEC 2

Location:
AEC 2

Project Photographs

TC Iqaluit, Community Landfill

Photo: #35

Date:
Nov. 1, 2016

Description:
AEC 2 – AEC 2 overview

Location:
AEC 2

Photo: #36

Date:
Nov. 1, 2016

Description:
AEC 3 overview

Location:
AEC 3

Project Photographs

TC Iqaluit, Community Landfill

Photo: #35

Date:
Nov. 1, 2016

Description:
AEC 2 overview – Looking north

Location:
AEC 2

Photo: #36

Date:
Nov. 1, 2016

Description:
AEC 3 – with Pond 3

Location:
AEC 3

APPENDIX E

2016 Landfill and Debris Elevation Model

TOPOGRAPHIC SKETCH OF

IQALUIT VEHICLE DUMP AND COMMUNITY LANDFILL

IQALUIT

NUNAVUT

ERIC RODY, C.L.S.

SCALE 1 : 1000

20 10 0 20 40 60 METRES

FIELD WORK COMPLETED OCTOBER 8TH, 2016.

QUALITY CONTROL REVIEW COMPLETED BY ERIC RODY, CLS ON OCTOBER 20TH, 2016.

METRIC: DISTANCES SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

COORDINATE NOTE

COORDINATES AND BEARINGS ARE UTM GRID, NAD 83 CSRS DERIVED FROM STATIC GPS OBSERVATIONS PROCESSED USING NATURAL RESOURCES CANADA PRECISE POINT POSITIONING ON SPIKE 1 IS REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 19 (69° W LONGITUDE) (1997.0).

ELEVATION NOTE

ELEVATIONS SHOWN HEREON ARE GEODETIC REFERRED TO THE CGVD28 DATUM DERIVED FROM GPS OBSERVATIONS COLLECTED AT SPIKE 1 AND POST PROCESSED UTILIZING THE PRECISE POINT POSITIONING (PPP) NRCAN SERVICE. ELEVATION OF POINT 1 IS 36.18m.

SCALE FACTOR NOTE

DISTANCES ARE GRID AND CAN BE CONVERTED TO GROUD BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 1.000398

LEGEND

—x— ------- DENOTES – FENCE LINE

– OH – ------- DENOTES – OVERHEAD UTILITY LINE

—→— ------- DENOTES – DRAINAGE DIRECTION OF FLOW

LOT 666 REMAINDER
PLAN 69308 CLSR. NO 1673 LTO

LOT 20
GROUP 1087
PLAN 58311 CLSR. NO 1216 LTO

LOT 21
GROUP 1087
PLAN 58311 CLSR. NO 1216 LTO

ROAD P1
PLAN 80973 CLSR.
NO 3244 LTO

LOT 667
PLAN 69309 CLSR. NO 1671 LTO

EL: 19.33
EL: 19.23
EL: 19.09
EL: 19.05
EL: 18.97
EL: 19.11
EL: 18.92
EL: 18.91
EL: 18.40
EL: 18.14
EL: 17.46
NO CULVERT

HYDROPOLE
HYDROPOLE IN CRIB
HYDROPOLE

EXPOSED BEDROCK
ANTENNA COMPOUND
DITCH LINE
CULVERT 1.50mø
INVERT EL. 18.98m
CENTRELINE OF ROAD
DITCH LINE
CULVERT 1.50mø
INVERT EL. 18.99m
EDGE OF GRAVEL ROAD
CULVERT 0.60mø
INVERT EL. 18.76m
CULVERT 0.60mø
INVERT EL. 18.41m
DUMP SITE
EDGE OF GRAVEL ROAD
DITCH LINE
EXPOSED BEDROCK
LOW DRAINAGE AREA
EXPOSED BEDROCK
EXPOSED BEDROCK
PARK SIGN
SPIKE EL 6.22m
ROCK OUTCROP
N83°43'W 156.90
SPIKE EL 36.18m

INTEGRATION COORDINATE TABLE

OBSERVED REFERENCE POINTS (ORPs) DERIVED FROM GPS OBSERVATIONS USING THE PRECISE POINT POSITIONING (PPP) SERVICE, UTM ZONE 19, NAD 83 CSRS (1997.0).

POINT NO.	NORTHING	EASTING
1	7067932.19	521928.84
2	7067949.37	521772.88

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KENORA, ONTARIO, P9N 1S9
CANADA

ONTARIO LAND SURVEYORS
CANADA LANDS SURVEYORS

PARTY CHIEF: DWIGHT EVANS	
CHECKED BY: ERIC RODY, O.L.S., C.L.S.	
FILE: SK16077	DRAWN BY: JOSEPH HANSTEAD

APPENDIX F

Details of Debris

AREA	DIMENSIONS/ SIZE/AREA	ESTIMATED VOLUME	ITEM(S)	DESCRIPTION OF WASTE - COMPONENTS	PAINTED (Y/N)	COLOUR	POTENTIAL HAZARDOUS MATERIALS	ESTIMATED PERCENTAGE OF HAZARDOUS MATERIAL (%)	ESTIMATED PERCENTAGE OF POTENTIALLY RECYCLABLE MATERIAL (%)	ESTIMATED VOLUME OF NON HAZARDOUS/ NON RECYCLABLE MATERIAL	ESTIMATED VOLUME OF RECYCLABLE MATERIAL	ESTIMATED VOLUME OF HAZARDOUS MATERIAL	OTHER COMMENTS
AEC 1 - UP-GRADIENT DEBRIS AREA													
A1-TP08-1 (mound)	290 m^2	200 m^3	Buried Debris	Drums, sheet metal, piping (steel), steel cable, vehicle parts (axles, bracing, chassis), steel 'I' beams, wheel rims (steel), wood debris.	N	N/A	None observed.	5%	10%	185 m^3	20 m^3	5 m^3	All metal debris was rusted and contained no paint. Barrels were observed to be crushed. Unable to advance test pit due to intermingled buried metallic debris.
A1-TP08-2 (mound)	~ 1800 m^2	500 m^3	Buried Debris	Drums, steel rods, sheet metal, wood debris.	N	N/A	None observed.	5%	10%	450 m^3	50 m^3	25 m^3	All metal debris was rusted and contained no paint. Barrels were crushed. Debris was not as concentrated as A1-TP08-1 mound.
A1-TP08-3 (mound)	450 m^2	300 m^3	Buried Debris	Tires, drums, iron bracing (heavy), vehicle parts (chassis, hinges, axle, springs), rubber hose, steel cable, wire (electrical and bare), steel rods, sheet metal.	N	N/A	None observed.	5%	10%	270 m^3	30 m^3	15 m^3	All metal debris was rusted and contained no paint. Barrels were crushed. Debris in this mound seemed more concentrated than the previous two areas. Unable to advance test pit due to intermingled debris.
AEC 2 - VEHICLE DUMP													
UPPER SECTION	200 m^2	150 m^3	Scattered Debris	Partial vehicles, tanks, drums, vehicle parts, brackets, sheet metal, wood debris, material (fabric), steel cables, tires, bicycle frames, electrical parts, leaf springs, radiators, scrap metal debris, inner tubes, batteries, hydraulic cylinders and equipment.	Y	Military green, blue, yellow, and orangey red.	Vehicle batteries Asbestos may be present (brake lining, insulation materials). Lead-amended paint on vehicle parts.	20%	70%	5 m^3	105 m^3	30 m^3	The upper section contained vehicles which have recently been removed from the main vehicle pile with intentions of recycling (2010/2011).
LOWER SECTION	1200 m^2	800 m^3	Vehicles	Water trucks, cars, boilers, flat bed trucks (military - green), fuel trucks (military and transport - orange), vehicle engines, plows, dump trucks, boat.	Y	military green, Blue, yellow, and orangey red	Asbestos may be present (brake lining, insulation materials). Lead-amended paint present on vehicles.	20%	70%	80 m^3	560 m^3	200 m^3	The lower section contains a higher concentration of vehicles and vehicle parts, as well as miscellaneous debris. The vehicles are stacked on top of

AREA	DIMENSIONS/ SIZE/AREA	ESTIMATED VOLUME	ITEM(S)	DESCRIPTION OF WASTE - COMPONENTS	PAINTED (Y/N)	COLOUR	POTENTIAL HAZARDOUS MATERIALS	ESTIMATED PERCENTAGE OF HAZARDOUS MATERIAL (%)	ESTIMATED PERCENTAGE OF POTENTIALLY RECYCLABLE MATERIAL (%)	ESTIMATED VOLUME OF NON HAZARDOUS/ NON RECYCLABLE MATERIAL	ESTIMATED VOLUME OF RECYCLABLE MATERIAL	ESTIMATED VOLUME OF HAZARDOUS MATERIAL	OTHER COMMENTS
		400 m^3	Scattered Debris	Partial vehicles, tanks, drums, vehicle parts, brackets, sheet metal, wood debris, material (fabric), steel cables, tires, bicycle frames, electrical parts, leaf springs, radiators, scrap metal debris, inner tubes, batteries, hydraulic cylinders and equipment.	Y	Military green, blue, yellow, and orangey red.	Vehicle batteries. Asbestos may be present (brake lining, insulation materials). Lead-amended paint present on vehicles.	15%	70%	60 m^3	280 m^3	60 m^3	one another in the drainage gully. Most of the drums on site were found in the lower section (two identifiable as kerosene and lubricating oil). Much scrap and random debris is located within the vehicle pile towards the bottom beneath the vehicles. It should be noted that some debris was also removed from this lower section in 2010/2011.
AEC 3 - MAIN LANDFILL													
UPPER SECTION - EAST	1150 m^2	600 m^3	Scattered debris	Tires (~70), metal culverts, food waste (cans, bottles, aluminum, plastic), drums, some vehicle parts, snowmobiles (3), scrap metal, car (1), camp stove, mattress springs, metal strapping, steel studding (construction debris), metal piping, wood debris, plastic debris, pressure tank, sheet metal, re-bar, propane cylinder, tarpaulin, kerosene fuel cans (camping), computer parts, cook stoves (camp - 2), paint cans.	Y	Multiple colours.	Lead-amended paint likely present on some of the painted surfaces.	20%	60%	120 m^3	360 m^3	120 m^3	The upper east section is a small area of exposed debris suspected to have been used recently as a dumping area for locals. Items seemed in newer condition than those observed at the bottom of the landfill area. Faint hydrocarbon odour from area surrounding A3-TP08-2. No capping material applied to this small area.
UPPER SECTION - CENTER	3700 m^2	unknown	Buried debris	Scrap metal debris, some plastic, some wood debris.	N	N/A	None observed.	It is recommended to leave this debris in place					This area is well capped with granular fill. Some minor areas of exposed debris exist. The area is heavily vegetated with grass and sedges.

AREA	DIMENSIONS/ SIZE/AREA	ESTIMATED VOLUME	ITEM(S)	DESCRIPTION OF WASTE - COMPONENTS	PAINTED (Y/N)	COLOUR	POTENTIAL HAZARDOUS MATERIALS	ESTIMATED PERCENTAGE OF HAZARDOUS MATERIAL (%)	ESTIMATED PERCENTAGE OF POTENTIALLY RECYCLABLE MATERIAL (%)	ESTIMATED VOLUME OF NON HAZARDOUS/ NON RECYCLABLE MATERIAL	ESTIMATED VOLUME OF RECYCLABLE MATERIAL	ESTIMATED VOLUME OF HAZARDOUS MATERIAL	OTHER COMMENTS
LOWER SECTION	3400 m^2	1500 m^3	Buried, exposed, and scattered debris	Drums (~150 crushed), fuel tanks (~15-20), scrap metal, snow machines, steel hut, camp fuel cans (30), cooking stoves/ovens, culverts, piping, refrigerators (several), tires (many), washer/dryers (several), vehicle engines, vehicles (cars, truck, parts), paint thinner jugs, fire extinguishers, compressed gas cylinders (several), radiators, burnt wood debris, wood debris, propane cylinders, electric motors, food waste debris (cans, bottles, plastic, aluminum, etc...), mattress springs, generator (yellow), paint cans (many - some still with contents), pails (unknown contents), oil cans/bottles.	Y	Multiple colours	Vehicle batteries. Asbestos may be present (brake lining, insulation materials). Lead-amended paint present on vehicles. Used paint remaining in cans.	25%	40%	375 m^3	600 m^3	525 m^3	This area includes the slope and debris at the toe of the landfill. The debris is mixed with granular fill material. Most of the larger debris has collected at the toe of the slope. Much of the debris appears to be exposed, although it is very difficult to extrapolate debris thicknesses. Heavy orange staining is present at the toe of the slope.
DRUM PILE 1	~ 55 drums	15 m^3	piled drums	No identifiable drums present, metal culvert (18"), large compressed gas cylinder.	N	N/A	Unknown, no evidence observed.	0%	100%	0%	15 m^3	0%	This drum pile contained rusted drums with no legible writing. Contents of drums unknown. Stressed vegetation was observed on SE corner of drum pile.
DRUM PILE 2	~ 184 drums	40 m^3	piled drums	No identifiable drums present, few contained green paint.	Y	Military green	Lead-amended paint may be present drums.	0%	100%	0%	40 m^3	0%	This drum pile contained rusted drums with no legible writing. Contents of drums unknown. Large black soil stain was observed on west side of drum pile.

AREA	DIMENSIONS/ SIZE/AREA	ESTIMATED VOLUME	ITEM(S)	DESCRIPTION OF WASTE - COMPONENTS	PAINTED (Y/N)	COLOUR	POTENTIAL HAZARDOUS MATERIALS	ESTIMATED PERCENTAGE OF HAZARDOUS MATERIAL (%)	ESTIMATED PERCENTAGE OF POTENTIALLY RECYCLABLE MATERIAL (%)	ESTIMATED VOLUME OF NON HAZARDOUS/ NON RECYCLABLE MATERIAL	ESTIMATED VOLUME OF RECYCLABLE MATERIAL	ESTIMATED VOLUME OF HAZARDOUS MATERIAL	OTHER COMMENTS
DRUM PILE 3	~ 73 drums	18 m^3	piled drums	Rusted drums, few contained orange and yellow paint.	Y	Orange and yellow	Lead-amended paint may be present drums.	0%	100%	0%	18 m^3	0%	This drum pile contained mostly rusted drums with no legible writing with the exception of one drum labelled "Kerosene". Very stressed vegetation was observed on the SE corner of the drum pile.
DRUM PILE 4	~ 22 drums	6 m^3	piled drums	Rusted drums, none contained painted surfaces.	N	N/A	None observed.	0%	100%	0%	6 m^3	0%	This drum pile contained mostly rusted drums with no legible writing with the exception of one drum labelled "Perchloroethylene".
AEC 4 - DOWN GRADIENT AND OFF SITE AREAS													
LOWER BENCH	~ 8 Ha	N/A	Scattered Debris	Scrap metal debris, tires, plastic, tent, some wood debris.	N	N/A	None observed.	Negligible quantities – some minor scattered recyclable and non-recyclable material. Collect by hand.					This area contains only a very few pieces of scattered debris. Some debris is also present in the bottom of the ponds buried in the sediment.

APPENDIX G

Detailed Remedial Option Evaluation

Potential Remedial Option (Soil)	Effectiveness in meeting the selected remediation and/or risk management standards	Applicability to site conditions	Complexity	Public acceptance	Risk to human health and the environment	Time frame to implement and complete	Comparative cost	Scoring Total
Ex-Situ Remediation within Near-Site Land Treatment Unit (LTU)	LTUs have proven successful in arctic climates in the past[1,2].	LTU available in Iqaluit.	The construction of land farms is well understood.	Public acceptance should be high since LTU already exists.	LTU owned and operated buy third party. Low risk to nearby residents and employees. Monitoring would be necessary to ensure that the land treatment facility did not contaminate soil, air or surface water.	Long term monitoring of the landfarm may be necessary over several years, because of the level of contamination and the short summers in the north. Effectiveness of LTU would be evaluated in the first year of operations.	Costs would be relatively low for excavation and disposal considering that the LTU is already in Iqaluit.	
Score (1-5)	**5**	**5**	**4**	**4**	**4**	**3**	**4**	**27**
Ex-Situ Remediation with Disposal South	The waste is removed from property and no further action or site restrictions are required.	Mixed conditions. Contaminated soils might be readily accessible such as in AEC 1, intertwined with debris and/or in topographically more difficult to access areas.	Special permitting may be required to transport the soil. Transport on a barge requires that soil be ready for transit on specific days. Trucking and decontamination on the southern portion of the chain would also be required.	Public response would probably be largely positive because contaminated soil would be leaving the community. Transport of soil while in the community could be the issue of concern.	Low ongoing risk to health and the environment at the site. Care would have to be taken during excavation to limit exposure of site workers to contaminants in soil. On-site storage would have to be properly segregated to limit exposure.	Time frame is uncertain and depends on means and availability of transportation. Could be +/- 6 months	Costs are very high for excavation and treatment at an off-site facility.	
Score (1-5)	**5**	**2**	**2**	**4**	**4**	**3**	**1**	**22**
Ex-Situ and Reuse onsite as Landfill sub-capping Material	Exposure to contaminated soils would be eliminated. Impacted soils would be sealed in the landfill.	Approach would make the most of the mixed conditions. Contaminated soils intertwined with debris would not have to be sorted. More difficult to access contaminated soil at the toe of the landfill could be incorporated in place.	Not very complex: require equipment to excavate and relocate the soils. Require logistics with other aspects of remedial program. Soils might need to transit at staging area.	Public response should be relatively positive since the contaminated soils would no longer be accessible. There might be a perception that the soils were not remediated because they would remain contained within the landfill.	Low ongoing risk to health and the environment at the site. Care would have to be taken during excavation to limit exposure of site workers to contaminants in soil.	One to two seasons when including the full decommissioning of the landfill.	Relatively low for addressing the soil impacts since the soils would remain onsite.	
Score (1-5)	**5**	**5**	**4**	**4**	**4**	**3**	**4**	**29**
In-Situ Treatment	Certain technology have proven to be effective in artic climates such as bioventing for petroleum hydrocarbon impacts. However, dispersed, localised and diverse nature of the impacts will make it difficult to select and implement the right technology and to garantee that the management objectives are met.	Dispersed, localised and diverse nature of the impacts will make it difficult to select and implement the right technology at the right location.	Artic conditions, topography, variable depths to bedrock would make the implementation relatively complexe. In addition, likely more than one technology would be required.	Public acceptance could be low, based on the uncertainty of the technologies to meet the remedial objectives.	Variable and would depend on the technology selected. Likely more than one technology selected which would increase the risk to human health and the environment.	Relatively longer than other options. An artic example of bioventing took 3 seasons to complete[3].	Costs would be relatively high	
Score (1-5)	**2**	**2**	**1**	**1**	**2**	**2**	**1**	**11**
Risk Management	Risk management may require restrictions on site usage or capping of contaminated areas. Some or all contaminated soils would remain in place, provided risks to human health and the environment are demonstrated to be acceptable	Contamination at the site is dispersed, localised and includes various contaminants. Risk assessment would have to derive multiple site specific target levels that would be difficult to implement and monitor.	Relatively complex because of the variety of contaminants and the spectrum of receptors (from wildland to commercial)	Risk management is likely to be less acceptable to the public than remediation, especially if it involves leaving a large amount of contaminated soil in place.	A risk assessment is tailored specifically to site characteristics and takes into account human health and the environment in the area.	Set-up, execution, review and approvals typically take at least one year	Costs are likely low to medium and carry uncertainty because they would depend on the soil removal indicated by the Risk Assessment.	
Score (1-5)	**2**	**2**	**2**	**3**	**4**	**2**	**3**	**18**

Scoring Guide	1: Ineffective - 5: Completely Effective	1: Not Applicable - 5: Totally Applicable	1: Very Complex - 5: Simple	1: Low Public Acceptance - 5: High Public Acceptance	1: High Risk - 5: Low Risk	1: Very Slow - 5: Very Fast	1: Very Expensive - 5: Inexpensive	**Total Possible: 35**

1: Wingrove, T. Diesel contamination remediation at a remote site in a cold climate. *Practice Periodical of Hazardous, Toxic, and Radioactive Waste,* January 1997, pp. 30–34.

2: McCarthy, Kathleen *et al.* Remediation of spilled petroleum hydrocarbons by in situ landfarming at an arctic site. *Cold Regions Science and Technology.* Volume 40, Issues 1-2, November 2004, Pages 31-39

3: Pouliot, Yvan, Moreau, Nicolas and Thomassin-Lacroix Eric. Soil Remediation of a Former Power Plant Site in Tulita, Northwest Territories. Proceedings of RemTech 2005, October 19-21 2005, Fairmont Banff Springs Hotel Banff, AB.

4: Treatment Technologies Screening Matrix http://www.frtr.gov/matrix2/section3/table3_2.pdf

Potential Remedial Option (Sediment)	Effectiveness in meeting the selected remediation and/or risk management standards	Applicability to site conditions	Complexity	Public acceptance	Risk to human health and the environment	Time frame to implement and complete	Comparative cost	Scoring Total
Ex-Situ Remediation within Near-Site Land Treatment Unit (LTU)	LTUs have proven successful in arctic climates in the past[1,2].	LTU available in Iqaluit.	The construction of land farms is well understood. Use of landfarm for sediments less common. Sediments would likely require drying prior to disposal.	Public acceptance should be high since LTU already exists.	LTU owned and operated buy third party. Low risk to nearby residents and employees. Monitoring would be necessary to ensure that the land treatment facility did not contaminate soil, air or surface water.	Long term monitoring of the landfarm may be necessary over several years, because of the level of contamination and the short summers in the north. Effectiveness of LTU would be evaluated in the first year of operations.	Costs would be relatively low for sediment hot spot removal, drying and disposal considering that the LTU is already in Iqaluit.	
Score (1-5)	**4**	**5**	**3**	**4**	**4**	**3**	**4**	**26**
Ex-Situ Remediation with Disposal South	The impacted sediments are removed from property and no further action or site restrictions are required.	Mixed conditions. Impacted sediments might be readily available such as in drainage feature of AEC 2 or may be within a well established ecological aquatic environment.	Complexity depends on area being remediated. Measures to preserve the habitat can be required. Complexity also increases if the ecological aquatic environment needs to be reestablished.	Public response might not be very positive since the natural habitat would have to be disturbed.	Low ongoing risk to health and the environment at the site. Care would have to be taken during remediation to limit exposure of site workers to contaminants in soil. On-site drying/storage would have to be properly segregated to limit exposure prior to shipment.	Time frame is uncertain and depends on means and availability of transportation. Could be +/- 6 months	Costs are very high for sediment hot spot removal and treatment at an off-site facility.	
Score (1-5)	**3**	**3**	**2**	**3**	**4**	**3**	**1**	**19**
Ex-Situ and Reuse onsite as Landfill sub-capping Material	Exposure to sediments would be eliminated. Impacted sediments would be sealed in the landfill.	Mixed conditions. Impacted sediments might be readily available such as in drainage feature of AEC 2 or may be within a well established ecological aquatic environment.	Difficult due to the high water content of the sediment. Sediments would require drying prior to landfill disposal.	Public response should be relatively positive since the contaminated sediments would no longer be accessible. There might be a perception that the sediments were not remediated because they will remain contained within the landfill.	Low ongoing risk to health and the environment at the site. Care would have to be taken during sediment hot spot removal, drying, transport to limit exposure of site workers to contaminants in sediments .	One to two seasons when including the full decommissioning of the landfill.	Relatively low for addressing the sediment impacts since the sediments would remain onsite.	
Score (1-5)	**5**	**3**	**3**	**4**	**4**	**3**	**4**	**26**
Passive In-Situ Treatment (rip-rap)	Passive treament systems do not require continuous chemical inputs and take advantage of naturally occuring chemical and biological processes to treat impacted waters and sediments. They could be effective as a longterm, maintenance free approach in meeting the management objectives.	Could be designed to treat both surface water ans sediment simultaneously.	Relatively less complexe and can combined with more intrusive approaches (e.g., hot spot removal of impacted sediments).	Relatively positive public response anticipated; especially if passive treatment design is well integrated with the natural environment.	Low and associated with the equipment and material used to construct the passive system.	Relatively quick to implement but improvement of the sediment quality would take years. Improvement would be accelerated if the passive treatment is combined with a more intrusive approach.	Relatively low.	
Score (1-5)	**4**	**4**	**3**	**4**	**4**	**3**	**5**	**27**
Risk Management	Risk management may require restrictions on site usage. Some or all contaminated sediments would remain in place, provided risks to human health and the environment are demonstrated to be acceptable.	Contamination at the site is dispersed, localised and includes various contaminants. Risk assessment would have to derive multiple site specific target levels that would be difficult to implement and monitor.	Relatively complex because of the variety of contaminants and the spectrum of receptors (from wildland to commercial).	Risk management is likely to be less acceptable to the public than remediation, especially if it involves leaving a large amount of contaminated sediments in place.	A risk assessment is tailored specifically to site characteristics and takes into account human health and the environment in the area.	Set-up, execution, review and approvals typically take at least one year	Costs are likely low to medium and carry uncertainty because they would depend on the sediment removal indicated by the Risk Assessment.	
Score (1-5)	**2**	**2**	**2**	**3**	**4**	**2**	**3**	**18**

Scoring Guide	1: Ineffective - 5: Completely Effective	1: Not Applicable - 5: Totally Applicable	1: Very Complex - 5: Simple	1: Low Public Acceptance - 5: High Public Acceptance	1: High Risk - 5: Low Risk	1: Very Slow - 5: Very Fast	1: Very Expensive - 5: Inexpensive	**Total Possible: 35**

1: Wingrove, T. Diesel contamination remediation at a remote site in a cold climate. *Practice Periodical of Hazardous, Toxic, and Radioactive Waste,* January 1997, pp. 30–34.

2: McCarthy, Kathleen *et al.* Remediation of spilled petroleum hydrocarbons by in situ landfarming at an arctic site. *Cold Regions Science and Technology.* Volume 40, Issues 1-2, November 2004, Pages 31-39

Potential Remedial Option (Surface Water)	Effectiveness in meeting the selected remediation and/or risk management standards	Applicability to site conditions	Complexity	Public acceptance	Risk to human health and the environment	Time frame to implement and complete	Comparative cost	Scoring Total
Ex-Situ Remediation with nearby offsite disposal	Could be effective if the impacted surface water is pumped in combination with intrusive remediation of other impacts.	Not applicable. No known facility in Iqaluit to receive the waste.	Relatively complex. Requires logistics to remove the source of impacts (debris, soil, sediment) prior to attempting to remove impacted surface water. Would need to divert headwaters and account for the tides in certain areas.	Public response might not be very positive since the natural habitat would have to be disturbed.	Low ongoing risk to health and the environment at the site. Care would have to be taken during dewatering to limit exposure of site workers to contaminants in surface water.	Timeline would be dependant of other elements of the remediation program. Could be 6 months to one or two seasons	Costs would be prohibitive since no known facility in Iqaluit.	
Score (1-5)	**4**	**1**	**2**	**3**	**4**	**3**	**1**	**19**
Ex-Situ Remediation within onsite inline treatment	Could be effective if the impacted surface water is pumped in combination with intrusive remediation of other impacts.	Relatively applicable. Inline treatment has been shown to be effective for some of the contaminants found onsite and in artic environment.	Relatively complex because of the variety of contaminants and water conditions found onsite and management of influx of freshwater.	Public response might not be very positive since the natural habitat would have to be disturbed.	Low ongoing risk to health and the environment at the site. Care would have to be taken during dewatering to limit exposure of site workers to contaminants in surface water.	Timeline would be dependant of other elements of the remediation program. Could be 6 months to one or two seasons	Costs would depend on the amount of water treated and the duration of the treatment. Supply of material for inline treatment might be relatively high.	
Score (1-5)	**4**	**3**	**2**	**3**	**4**	**3**	**3**	**23**
Engineered Wetlands	Engineered wetlands require care & maintenance until proven efficient and self-sustaining and are difficult to implement in northern environment.	Relatively applicable. Marsh type environments are already present at the site and showing evidence of natural attenuation and could be enhanced with engineered wetlands.	This approach required that the process which affect surface water and sediment chemistry be well understood. Bench-scale treatment testing would be a pre-requisite. Permitting would be required.	Relatively positive public response anticipated; especially if wetland design is well integrated with the natural environment. However, might be difficult for the public to understand how the wetland will work at reducing contaminants.	Low ongoing risk to health and the environment at the site. Care would have to be taken during wetland construction to limit exposure of site workers to contaminants in sediments .	Long term monitoring of the wetlands would be necessary over several years.	Medium costs to implement due to complexity and longterm care, maintenance and monitoring	
Score (1-5)	**2**	**4**	**2**	**3**	**4**	**2**	**2**	**20**
Passive In-Situ Treatment (rip-rap)	Passive treament systems do not require continuous chemical inputs and take advantage of naturally occuring chemical and biological processes to treat impacted waters and sediments. They could be effective as a longterm, maintenance free approach in meeting the management objectives.	Could be designed to treat both surface water ans sediment simultaneously.	Relatively less complexe and can combined with more intrusive approaches (e.g., hot spot removal of impacted sediments). Permitting may be required.	Relatively positive public response anticipated; especially if passive treatment design is well integrated with the natural environment.	Low and associated with the equipment and material used to construct the passive system.	Relatively quick to implement but improvement of the sediment quality would take years. Improvement would be accelerated if the passive treatment is combined with a more intrusive approach.	Relatively low.	
Score (1-5)	**4**	**4**	**3**	**4**	**4**	**3**	**5**	**27**
Risk Management	Risk management may require restrictions on site usage. Some or all contaminated surface water would remain in place, provided risks to human health and the environment are demonstrated to be acceptable.	Contamination at the site is dispersed, localised and includes various contaminants. Risk assessment would have to derive multiple site specific target levels that would be difficult to implement and monitor.	Relatively complex because of the variety of contaminants and the spectrum of receptors (from wildland to commercial).	Risk management is likely to be less acceptable to the public than remediation, especially if it involves leaving a large amount of contaminated water in place.	A risk assessment is tailored specifically to site characteristics and takes into account human health and the environment in the area.	Set-up, execution, review and approvals typically take at least one year	Costs are likely low to medium and carry uncertainty because they would depend on the swater treatmentl indicated by the Risk Assessment.	
Score (1-5)	**2**	**2**	**2**	**3**	**4**	**2**	**3**	**18**

Scoring Guide	1: Ineffective - 5: Completely Effective	1: Not Applicable - 5: Totally Applicable	1: Very Complex - 5: Simple	1: Low Public Acceptance - 5: High Public Acceptance	1: High Risk - 5: Low Risk	1: Very Slow - 5: Very Fast	1: Very Expensive - 5: Inexpensive	**Total Possible: 35**

Potential Remedial Option (Slope Stability)	Effectiveness in meeting the selected remediation and/or risk management standards	Applicability to site conditions	Complexity	Public acceptance	Risk to human health and the environment	Time frame to implement and complete	Comparative cost	Scoring Total
Full Removal of Landfill Debris	Completely effective. Debris would be removed from the slope and stability hazard would be eliminated.	Low applicability. Debris would be difficult to remove from the slope and it would be difficult to find an alternate location for them.	Relatively high. Disturbing the landfill could worsen stability issues and it would be difficult to find an alternate location for the debris.	Relocating the debris to a new location is likely to be more difficult to accept by the public than leaving them in place.	Relatively high. Disturbing the landfill could worsen stability issues and un-earth potential hazardous materials.	One to two seasons when including the construction of a new landfill.	Relatively high because of the complexity of accessing and relocating the debris.	
Score (1-5)	**5**	**2**	**2**	**2**	**1**	**2**	**2**	**16**
Transfer of debris from the slope to the top fo the landfill	Completely effective. Debris would be removed from the slope and stability hazard would be eliminated.	Not applicable. The space available at the top is not sufficient to receive the debris.	Relatively high. Disturbing the landfill could worsen stability issues.	Public might be concern about un-earthing hazardous material.	Relatively high. Disturbing the landfill could worsen stability issues and un-earth potential hazardous materials.	One to two seasons when including the construction of a new landfill.	Relatively high because of the complexity of accessing and relocating the debris.	
Score (1-5)	**5**	**1**	**2**	**2**	**1**	**2**	**2**	**15**
Engineered decommissioning of landfil	Complete effective. Slope would be reengineered to 4v:1h to achieve stability.	High applicability. Landfill decommissioning design can be integrated in natural environment.	Moderately complex. The engineered landfill will straddle the rock escarpment.	Public response should be relatively positive since the stability issue would be address and the approach would be well integrated into the natural environment	Moderate. Care would have to be taken during landfill decommissioning work to limit exposure of site workers to contaminants, debris and that the equipment and operator are under safe operating conditions.	One to two seasons when including the full decommissioning of the landfill.	Moderate since the debris would be consolidated in place.	
Score (1-5)	**5**	**5**	**3**	**4**	**3**	**3**	**4**	**27**

Scoring Guide	1: Ineffective - 5: Completely Effective	1: Not Applicable - 5: Totally Applicable	1: Very Complex - 5: Simple	1: Low Public Acceptance - 5: High Public Acceptance	1: High Risk - 5: Low Risk	1: Very Slow - 5: Very Fast	1: Very Expensive - 5: Inexpensive	**Total Possible: 35**

Potential Remedial Option (Debris)	Effectiveness in meeting the selected remediation and/or risk management standards	Applicability to site conditions	Complexity	Public acceptance	Risk to human health and the environment	Time frame to implement and complete	Comparative cost	Scoring Total
Recycle	Completely effective; debris would be removed from site.	Not very applicable. Not a lot of recyclable debris on site since the 2011 recycling program that removed most of the vehicular debris.	Relatively complex. Absence of local recycling facility means recyclable material need to be shipped south.	Public acceptance should be high since this would be viewed as a "green" approach to dealing with the debris.	Low to medium risk associated with physical hazard of manipulating the debris that will need to be addressed in site health and safety plan.	One to two seasons depending on the availability of the recycling equipment	High because recycling has to be done south	
Score (1-5)	**5**	**2**	**2**	**5**	**3**	**3**	**1**	**21**
Consolidate in AEC 3 landfill	Very effective. Debris would no longer represent a physical or environmental hazard	Very applicable. Debris already present in AEC 1 and AEC 3; some already buried or partially buried.	Moderately complex because would be part of the decommissioning of the landfill.	Public response should be relatively positive since the debris would no longer be accessible. There might be a perception that the debris were not remediated because they will remain contained within the landfill.	Low to medium risk associated with physical hazard of manipulating the debris that will need to be addressed in site health and safety plan.	One to two seasons when including the full decommissioning of the landfill.	Low because minimized the maniuplation and transport of debris	
Score (1-5)	**5**	**4**	**3**	**4**	**3**	**3**	**4**	**25**
Bury in place (AEC 1 and AEC 3)	Very effective. Debris would no longer represent a physical or environmental hazard	Very applicable. Debris already present in AEC 1 and AEC 3; some already buried or partially buried.	Not very complex: simple equipment and capping material needed.	Public response should be relatively positive since the debris would no longer be accessible. There might be a perception that the debris were not remediated because they will remain contained within the landfill.	Low to medium risk associated with physical hazard of manipulating the debris that will need to be addressed in site health and safety plan.	One to two seasons when including the full decommissioning of the landfill.	Low because minimized the maniuplation and transport of debris	
Score (1-5)	**4**	**4**	**4**	**4**	**3**	**3**	**4**	**26**
Ship south	Completely effective; debris would be removed from site.	Applicable but would require sorting, staging and packaging.	Require sorting and logistics of transport south.	Overall moderate. High costs of shipping south contoured off by assurance that debris have been removed from site.	Low to medium risk associated with physical hazard of manipulating the debris that will need to be addressed in site health and safety plan.	One to two seasons depending on the availability of the equipment and transport.	High; shipping south.	
Score (1-5)	**5**	**4**	**2**	**3**	**3**	**3**	**1**	**21**

Scoring Guide	1: Ineffective - 5: Completely Effective	1: Not Applicable - 5: Totally Applicable	1: Very Complex - 5: Simple	1: Low Public Acceptance - 5: High Public Acceptance	1: High Risk - 5: Low Risk	1: Very Slow - 5: Very Fast	1: Very Expensive - 5: Inexpensive	**Total Possible: 35**

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