PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NUNAVUT

REPORT

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EXECUTIVE SUMMARY

EBA Engineering Consultants Ltd. operating as EBA, A Tetra Tech Company (EBA), was retained by Public Works and Government Services Canada (PWGSC) on behalf of Aboriginal Affairs and Northern Development Canada (AANDC) to complete a Remedial Action Plan (RAP) at a former weather station (the Site) located on the shoreline of Nottingham Island, NU. The RAP is a continuation of work that began in 2007 with a Phase I Environmental Site Assessments (ESA) (Earthtech 2008), a Phase II ESA (WESA 2011) and a Phase III ESA (EBA 2012). The Phase III ESA also included a geotechnical evaluation of potential landfill/landfarm treatment unit (LTU) and borrow locations as well as an archaeological investigation.

The Site is located about 140 km southwest of Cape Dorset, NU at approximately 63.111974 N latitude and 77.938633 W longitude. The nearest community is Ivujivik, Quebec, located approximately 80 km to the south of the Site. The Site is situated on the banks of the Hudson Strait. The Site consists of 17 structures, two empty above-ground storage tanks, a number of antennae, debris piles, a roadway, a communication tower, and nearby lakes/surface water features.

The Site previously acted as a former Department of Transport weather station and radio transmitter station, originally established in 1884 and was decommissioned in 1970. The island has been used historically for hunting and fishing by the surrounding Inuit communities. The Site was accessed by boat when it was operational. On the beach immediately south of the site, there is a landing area consisting of a metal-framed crib filled with small boulders and cobbles. There is a ramp comprised of moss covered wooden boards leading from the beach to the site. EBA accessed the site using a Bell 212 helicopter operated by the Canadian Coast Guard. The helicopter landed south of the bunkhouse.

The objective of the RAP is to develop a comprehensive plan that addresses the areas of environmental concern (AEC) identified in the EBA Phase III ESA, and compare these remedial options using a standardized process to determine the most appropriate remedial activity for the Site RAP.

Remedial activities of various waste streams are required at the site including; remediation of soil impacts (petroleum hydrocarbons [PHCs] and metals) that are either above federal or territorial guidelines; removal of hazardous materials from the site; removal and disposal of non-hazardous materials; and monitoring of potential impacted surface waterbodies at the site. The proposed remedial options for the various waste streams located at the Site are provided below:

Summary of Recommended Remedial Options:

Waste Stream	Description	Suggested Remedial Option
Unpainted Wood Waste: Non-Hazardous	Wood waste can be dealt with by controlled burning on-site or off-site disposal to an approved facility	Control burn on site
Other Waste: Non-Hazardous	Non-hazardous solid waste will need to be separated, cleaned as necessary, compacted and removed off site	Remove to an approved off site facility
Liquid Organic Wastes in above-ground storage tanks (ASTs): Hazardous	Organic liquid waste will be incinerated on-site in the event that it meets the DLCP Barrel Protocol. Organic liquid that does not meet the analytical requirements of	Remove off site and/or incinerate on site

Summary of Recommended Remedial Options:

Waste Stream	Description	Suggessted Remedial Option
	the DLCP will be removed off-site to an approved off-site facility.	
Aqueous Content in Drums	The aqueous content will be removed off-site to an approved off-site facility	Remove off site to an approved licensed facility
Asbestos Waste: Hazardous	Asbestos waste will be handled by trained personnel and removed off-site to an approved off-site facility	Remove off site to an approved licensed facility
Total Lead and Leachable Lead Paint on waste: Hazardous	Lead painted waste will be stripped and handled by trained personnel. The painted substrate will be removed from site to an approved off-site facility	Remove off site to an approved licensed facility
Total Lead Paint on ASTs: Hazardous	Lead painted ASTs will remain intact and will be removed to an approved off-site facility	Remove off site to an approved licensed facility
Total Lead and Leachable Lead Paint on Asbestos Panels: Hazardous	Lead painted and asbestos panels and tiles will be handled by trained personnel and removed to an approved off-site facilty	Remove off site to an approved licensed facility
Compressed Gas Cylinders: Hazardous	Depressurize, crush and remove from Site to an approved off-site facility. Known contents that cannot be safely depressurized will be shipped offsite in an approved TDG container, following shipping company, and receiving facility approval	Evacuate and remove off site to an approved licensed facility
Fire Extinguishers: Hazardous	Depressurize, crush and remove off site. Known contents that cannot be safely depressurized will be shipped offsite in an approved TDG container, following shipping company, and receiving facility approval	Evacuate and remove off site to an approved licensed facility
Creosote Treated Wood: Hazardous	Creosote treated wood will be containerized according to TDG transport regulations and removed to an approved off-site facility	Remove off site to an approved licensed facility
Other Hazardous Waste	Miscellaneous solid hazardous waste (batteries, mercury in fluorescent lights, mercury, polychlorinated biphenols [PCB] light ballasts, PCBs, and lead solder in electrical components) and 501 L of miscellaneous equipment contents (anti-freeze, oil, fuel, and other vehicle fluids) are required to be removed to an approved off-site facility	Remove off site to an approved licensed facility
PHC- Impacted Soil	Excavate impacted areas and remove to an approved offsite facility will require waste characterization	Remove off site to an approved licensed facility
Metal - Impacted Soil	Excavate impacted areas and remove off-site to an approved offsite facility will require waste characterization	Remove off site to an approved licensed facility

Summary of Recommended Remedial Options:

Waste Stream	Description	Suggessted Remedial Option
Co-contaminated - Soil	Remove off-site to an approved landfill, will require waste characterization	Remove off site to an approved licensed facility
Water	Develop a monitoring and sampling program to determine if surface water exceedances are due to site activities or naturally elevated conditions at the Site	Monitoring
Physical Hazards	Each hazard will need to be identified and properly mitigated prior to work commencing. Proper personal protective equipment to be worn at all times.	Remove all metal towers and buildings to an approved off-site facility, and develop site-specific safety plans

There are four physical hazards that exist at the Site: 1) buildings and towers that are on-site that are dilapidated and present a risk of collapse or have weathered floors and ceilings (the old kitchen, chicken coop, and house have weathered floors and openings); 2) steep cliffs and rock outcrops throughout the site; 3) six debris areas and scattered debris that will have to be removed (e.g., nails, broken glass, and other sharp objects); and 4) wires, cables, and other items that create a tripping hazard are throughout the Site.

A camp and other temporary site facilities will need to be constructed as part of the remedial work program, with a lage amount of supplies and equipment needing to be brought to site. Camp areas, landing and staging areas and potential potable water source areas have been identified at the Site for the remedial works. Verification and monitoring of construction works, environmental clean-up, verification of quantities, and quality of work will need to be carried out during the remediation works of this project (INAC 2008). Skill sets needed include resident engineering experience, hazardous materials testing and abatement, environmental health and safety monitoring, soil sampling, and geotechnical and materials testing.

The AMSRP has established a monitoring program for landfills on former military sites. Based upon the preferred remedial options, all waste streams are to be removed to an approved off-site licensed facility. There is no landfill proposed for the Site. In the event that surface water is determined to be related to naturally occurring background conditions at the Site during remedial activities, no further monitoring should be required post-closure of the Site as per the AMSRP.

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1.0 INTRODUCTION

EBA Engineering Consultants Ltd. operating as EBA, A Tetra Tech Company (EBA), was retained by Public Works and Government Services Canada (PWGSC) on behalf of Aboriginal Affairs and Northern Development Canada (AANDC) to complete a Remedial Action Plan (RAP) at a former weather station (the Site) located on the shoreline of Nottingham Island, NU (Figure 1 with site photos shown as Appendix A). The RAP is a continuation of work that began in 2007 with a Phase I Environmental Site Assessments (ESA) (Earthtech 2008), a Phase II ESA (WESA 2011) and a Phase III ESA (EBA 2012). The Phase III ESA also included a geotechnical evaluation of potential landfill/landfarm treatment unit (LTU) and borrow locations as well as an archaeological investigation. An Environmental Impact Assessment (EIA) is being prepared under a separate document.

EBA obtained authorization for undertaking the RAP component of the work on 02 August 2012, from PWGSC supply specialist, Mr. Brad Campbell. Mr. Jessie Hoyt, P.Eng. of PWGSC is the Project Manager for this project.

2.0 OBJECTIVE

The objective of the RAP is to develop a comprehensive plan that addresses the areas of environmental concern (AEC) identified in the EBA Phase III ESA, and compare these remedial options using a standardized process to determine the most appropriate remedial option(s) for an overall Site RAP. Specific work items related to the overall project objective are further discussed in Section 3.0.

3.0 SCOPE OF WORK

EBA completed the following scope of work to develop a site remediation action plan:

- Identify environmental liabilities at the Site. This was completed during the Phase III ESA;
- Quantify volumes of hazardous and non-hazardous waste, including impacted soil. This was completed during the Phase III ESA;
- Identify and evaluate remedial options for each waste stream. Evaluation of each remedial option was based on the overall value to the Crown, the resources available to complete the project, and the reduction in environmental liability;
- A class three remedial cost estimate was completed to determine the preferred remedial option(s);
- Remedial options were evaluated and integrated into a preferred remedial approach for the Site. The compilation of the above tasks would constitute the draft RAP; and,

4.0 BACKGROUND

4.1 Site and Area Description

The Site is located about 140 km southwest of Cape Dorset, NU at approximately 63.111974 N latitude and 77.938633 W longitude. The nearest community is Ivujivik, Quebec, located approximately 80 km to the south of the Site. The Site is situated on the banks of the Hudson Strait. The Site consists of 17 structures, two empty above-ground storage tanks, a number of antennae and a large amount of debris scattered around the site. Off-site features include debris piles, a roadway, a communication tower, and nearby lakes/surface water features (Photos A1-A3).

4.2 Overview of Biophysical Conditions

Nottingham Island lies in the Churchill Province of the Canadian Shield, and is composed Proterozoic quartz-feldspar gneiss. During the last glacial maximum, ice flowed to the east in the Hudson Straight, and the western half of Nottingham Island is covered by a veneer of glacial drift composed of sand, silt, and gravel that often contains marine shells (Blackadar 1970). The island lies in the continuous permafrost zone and ground ice is expected to be low (Heginbottom et al. 1995). The seasonally thawed layer above permafrost, known as the active layer, varies in thickness due to vegetation, moisture, geology, and other factors.

Nottingham Island slopes to the southwest. The northeast coast is rugged with steep slopes and elevations exceeding 180 m above sea level (masl). The bedrock is glacially eroded and highly jointed. The southeast and southwest coasts are low, with many off-shore shoals. The terrain around the weather station is undulating with vertical relief of less than 50 m.

Drainage on Nottingham Island is dominantly bedrock controlled, with lakes and streams between the bedrock outcrops. The low-lying areas are typically poorly-drained, and isolated ponds are common. The active layer at the time of the site investigation was saturated in areas, and lingering snow banks were observed on some sheltered north-facing slopes.

Climate data is available for Nottingham Island from 1927 to 1970 when the weather station was abandoned (Environment Canada 2012). The mean annual air temperature over this period was -8.8°C. July is the warmest month with average temperatures between 4 and 13 °C. February is the coldest month with average temperatures between -22 and -29 °C. The annual total precipitation ranged from 107 mm to 509 mm over the period of record and averaged 290 mm. Rainfall occurs between May and October with July, August, and September receiving between 30 mm to 40 mm per month on average. Snowfall was observed every month of the year but was rare in July and August. On average, the last three months of the year received between 20 cm and 35 cm of snow per month, and the first three months of the year received about 12 cm of snow per month. Snow depth at the end of April varied from 13 cm to 163 cm and averaged 70 cm. Wind data is not available for Nottingham Island, but the climate normal (1971-2000) for Cape Dorset, approximately 140 km to the northeast, has a prevailing wind direction from the west. Fog is common in late summer and autumn in this region and limited site access by helicopter on 4 of 6 days available for the site investigation.

Nottingham Island lies in the Wager Bay Plateau Ecoregion. Vegetation cover in this region is characterized by nearly continuous shrub tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, Dryas spp., and Vaccinium spp. Dwarf birch, willow, and alder occur on warm microsites; wet sites are dominated by willow and sedge. Rock outcrops are covered in lichen (Ecological Stratification Working Group 1995).

4.3 Site History

The site previously acted as a former Department of Transport weather station and radio transmitter station, originally established in 1884 and was decommissioned in 1970. Nottingham Island was named by the English explorer Henry Hudson (Grant 2011) in the 1600s. The island has been used historically for hunting and fishing by the surrounding Inuit communities.

As part of the previous Phase I and Phase II ESAs conducted by Earth Tech and WESA, a records review was included in each ESA report. EBA analyzed the data found within the two ESAs and determined that no further information regarding site history could be found. The following is a summary of their historical records review:

- Earth Tech performed a records review through Jeff Holwell, AANDC Land Administrator. It was determined that the Nottingham Island radio/navigational aid station was built in 1927. Its purpose was to provide accurate weather and navigational data to open the Hudson Strait for shipping. The Site was abandoned in 1970 and was purchased by the West Baffin Eskimo Co-operative ltd. The island has been uninhabited since 1970;
- Dunbar and Greenaway (1956) "Arctic Canada from the Air" reported on establishing meteorological stations along the Hudson Strait on behalf of the Department of Transport. In 1957 the station was manned by 12 full time staff members;
- Nunatsiaq News (George 2005) reported in the 1940s that several Inuit families worked at Nottingham Island. The article also reported that in the 1930s and 1940s, hunters from Nunavik travelled to Nottingham Island for annual walrus hunts.

The Site has been abandoned since 1970 with occasional visitors to the island for hunting and fishing from the regional Inuit communities.

In the WESA and Earth Tech reports the buildings were identified as belonging to the West Eskimo Co-operative Ltd. The West Eskimo Co-operative ltd is the parent body of the Cape Dorset Co-operative and is part of the Baffin Islands Co-operative. During the EBA, 2012 field program, signage was noted on the majority of the buildings, a sample of this signage can be seen in Photo H-18. The signs stated that the buildings belong to the Kingait Co-operative in both Inuktitut and English. To determine the ownership of the buildings on site, EBA contacted the Cape Dorset Co-operative (Kingait Co-op) to gain further information regarding the transfer of the buildings on Nottingham Island, at the time of the EBA Phase III ESA no information was known regarding the ownership of the structures at Site. Further discussions were conducted during the community meetings between the Cape Dorset Co-op representative and Department Representatives from AANDC and PWGSC in 2013. Discussions are on-going between the Cape Dorset Co-op and Department Representatives regarding the ownership of the structures on Nottingham Island.

4.4 Records Review

Three ESAs have been completed at the Site. The two previously conducted ESAs were utilized in the EBA 2012 data gap analysis. A summary of each ESA is provided below.

4.4.1 Phase I/II Environmental Site Assessments Remote Sites in Nunavut - Cape Dorset 2 (Nottingham Island), Earth Tech Inc., 2007

The Site was visited in 2007 on behalf of AANDC as part of a Multiple Site Environmental Site Assessment program in the region conducted by Earth Tech. The site assessment was limited, only two hours were spent on site due to weather conditions. The Site consisted of 17 buildings and structures in various states of repair including waste piles throughout the Site. A total of eight soil samples, two asbestos samples and four paint samples were collected. The Federal Contaminated Sites Action Plan (FCSAP) Contaminated Site Classification System scored the Site as 56 with a National Classification System for Contaminated Sites (NCSCS) score of 38. Based upon the NCSCS score, the Site was considered a Low Priority for Action. As part of the scope of work a RAP was included with the Phase I/II ESA. Based upon their limited assessment Earthtech made the following remedial conclusions;

- All hazardous and non-hazardous waste would be removed to an approved off-site facility; and,
- All non-hazardous waste and contaminated soils would be disposed of on-site in an engineered landfill.

Earth Tech's major recommendation was that further assessment was required to delineate the Site due to limited information.

4.4.2 Comprehensive Phase II Environmental Site Assessments SB029 - Cape Dorset 2 (Nottingham Island) WESA, 2010

WESA performed a Phase II ESA on behalf of AANDC as a follow up to the Earth Tech recommendations, in October, 2010. A total of 77 samples were collected from the Site. The sampling program consisted of 39 soil samples, ten surface water samples, one sediment sample, fourteen paint samples, and thirteen building material samples. Based upon the findings of the Phase II ESA, WESA updated the NCS score to 77.1 which designates it as a Class 1 Site, High Priority for Action.

A RAP was included as part of the Phase II ESA with a Class D cost estimate. Based upon the following remedial options were proposed for the Site:

- Soil, including metal and PHCs, would be disposed of to an on-site landfill with a long term monitoring program;
- Surface water impacts at the Stie required further assessment to determine if they are related to Site activities or are naturally occurring background levels; and,
- Hazardous and non-hazardous materials would be disposed of in an approved off-site facility.

WESA concluded that further delineation is required since the vertical and horizontal extent of the impacts were not identified.

The programs conducted by Earth Tech and WESA were both limited in scope due to short time available on site. Prior to completing the 2012 field program, EBA conducted a records review and data gap analysis based upon the Earth Tech and WESA reports. The gap analysis was conducted to ensure efficiency and targeted sampling during the 2012 sampling program.

4.4.3 Phase III Environment Site Assessment Report, EBA, 2012

For the 2012 EBA Phase III ESA field program, the Site was divided into areas of potential environmental concern (APEC). All APECs previously identified and delineated have been re-named as areas of environmental concern (AEC) for the purposes of this RAP. The AECs have been based on the WESA and Earth Tech reports as well as the spatial distributions of the materials and activities observed at the Site as listed below:

- AEC 1; Storage Shed 01;
- AEC 2; Old Kitchen;
- AEC 3; New Radio Building;
- AEC 4; Old Radio Building;
- AEC 5; Outhouse;
- AEC 6; Storage Shed 02;
- AEC 7; Storage Building;
- AEC 8; Chicken Coop;
- AEC 9; Bunkhouse;
- AEC 10; Generator Building;
- AEC 11; House and Garage;
- AEC 12; Shed;
- AEC 13; House;
- AEC 14; Above-Ground Storage Tanks;
- AEC 15; Cold Storage Area;
- AEC 16; Debris Area 1;
- AEC 17; Debris Area 2;
- AEC 18; Debris Area 3;
- AEC 19; Debris Area 4;
- AEC 20; Debris Area 5;

- AEC 21; Debris Area 6;
- AEC 22; Road East of Site;
- AEC 23; Offsite Communication Tower;
- AEC 24; Lake 01;
- AEC 25; Lake 02;
- AEC 26; Hudson Strait; and
- AEC Pipeline; Pipeline running from ASTs AEC 14 toward AEC 21 Debris Area 6.

Based upon the findings of the Phase III ESA, several impacts were identified at the AECs on site. A summary of the impacts are provided below:

- Petroleum hydrocarbon (PHC) impacts to soil that exceed the applicable criteria are present in AECs 3, 4, 9, 11, 12, 14, 17, and the Pipeline. The total estimated volume of PHC only impacted material is 2260 m^3;
- Metals impacts to soil that exceed the applicable criteria are present in AECs 1, 3, 4, 6, 9, 11, 12, 13, 16, 18, 21, and the pipeline. The total estimated volume of metal only impacted material is 264 m^3;
- Co-contaminated soil impacted with both metals and PHCs in excess of the applicable guidelines is present in AECs 3, 4, 11, 12, 13, and the pipeline. A total estimated volume of co-contaminated soil is 216 m^3; and
- Surface water exceedances above applicable criteria are found in AECs 2, 9, 12, 14, 16, 17, 19, 21, 24, and 25. The exceedances identified in the ESA process are based upon a single limited data set and are potentially a result of naturally occurring background conditions, or may be impacted from Site operations. Further assessment and monitoring should be conducted for surface water; this is discussed in Section 7.8.

Both hazardous and non-hazardous materials were found throughout the site.

- The hazardous materials included heating oil, asbestos, total lead paint, leachable lead paint, batteries, compressed gas cylinders, creosote soaked wood, mercury, polychlorinated biphenols (PCBs), amongst others. The total, uncrushed volume of hazardous material is 779.2 m^3 and 2,521 litres of hazardous liquids.
- The non-hazardous materials included wood, metal pieces, brick and brick mortar, cables, concrete, insulations materials, glass, porcelain, rubber, amongst others. The total, uncrushed volume of non-hazardous material is 77 drums (all drums from site with organic liquid waste removed) and 1,316 m^3.

The geotechnical site investigation evaluated available borrow sources, identified potential landfill and landfarm locations, and assessed site accessibility. A total of 16 hand-excavated test pits were advanced and 12 composite samples were collected from select test pits.

A total of 2,500 m^3 of granular material appears to be available from three borrow sources. About 75% of the identified material lies within Borrow C which is not readily accessible and would require a 3.0 km road to be built from the Site. Apart from a small volume of gravel in Borrow A, the identified materials are predominantly gravelly sand with a trace of fine-grained material. About 30% to 40% of the sand-sized particles were calcareous marine shell fragments, which compromises the strength of the material.

Two locations were evaluated for a possible landfill and landfarm. Potential landfill location A (PLLA) is located approximately 150 m east of the Site and is approximately 1,500 m^2 in size. PLL A is not ideally suited for a landfill facility. Potential landfill (or landfarm) location B (PLLB) is located approximately 300 m east of the Site and is approximately 4,500 m^2 in size. PLLB is suitable for both a landfill and a landfarm, and could likely be expanded to the north and to the east if required.

The geotechnical site investigation concluded that granular materials investigated at site are of limited quantity, and of marginal quality for the purpose of constructing a landfill or LTU.

5.0 SITE ACCESS AND INFRASTRUCTURE

5.1 Site Access

5.1.1 Beach Access

The weather station was accessed by boat when it was operational. On the beach immediately south of the site, there is a landing area consisting of a metal-framed crib filled with small boulders and cobbles. There is a ramp comprised of moss covered wooden boards leading from the beach to the Site. The beach landing area will need to be assessed by the selected contractor to assess suitability of landing for access and to determine required upgrades. This will determine if ships or barges are able to load and unload required materials and equipment needed for remediation activities to be completed at the Site.

5.1.2 Helicopter

EBA accessed the site using a Bell 212 helicopter operated by the Canadian Coast Guard. The helicopter landed south of the bunkhouse. There is also a helipad outlined with painted white stones located south of the above-ground storage tanks. This helipad was not used because of nearby site debris that may have caused safety concerns with landing a helicopter in this location.

5.2 Trail Network

A trail runs in an east-west direction along the north end of the Site from the old kitchen (AEC 2) and continues northeast to Lake No. 2 (Figure G-1). The trail is approximately 2.7 m wide and there is no embankment. On the east side of Lake No. 2, the trail continues, but is in poor condition with ruts and subsidence in poorly-drained areas. The trail in its present condition is only accessible by ATVs, and may not be trafficable by ATV along some sections. The present trail would need to be upgraded before heavy equipment could use it.

Most of the trails surrounding the buildings on site have subsided and are overgrown with moss. Water was encountered in most of the test pits excavated at the main site (TP04 through TP09). The selected contractor will need to assess the existing trail network on site to determine the amount of upgrading of the trails that will be required to support their larger equipment.

6.0 REGULATORY GUIDANCE

Based on the terms of reference (TOR) for this work, the *Abandoned Military Site Remediation Protocol* (AMSRP) (INAC 2009) was used to compare and interpret the laboratory analytical results for soil and water samples. For the purpose of the RAP, the remedial guidelines are based on the AMSRP as these guidelines have been developed as a protocol document specific to northern contaminated sites. For those contaminants or hazardous materials not included in the AMSRP, the appropriate Federal and Territorial regulations were applied. A summary of the remedial targets can be found in Appendix B.

6.1 Hazardous/Non-Hazardous Materials

The applicable AMSRP, federal and/or territorial guidelines were reviewed and are followed in the development of this RAP. Table A summarizes these guidelines:

Table A: Summary of Applicable Remedial Guidelines

Publisher	Title	Description	Year
INAC	Abandoned Military Site Remediation Protocol	Drum content guideline	2009
GN	Environmental Guideline for Waste Lead and Lead Paint	Lead paint waste guideline	2011
GN	Environmental Guideline for Waste Paint	Paint waste guideline	2010
GN	Environmental Guideline for Mercury-Containing Products and Waste Mercury	Mercury disposal guideline	2010
GN	Environmental Guideline for the General Management of Hazardous Waste	Reference and waste guidelines	2010
GN	Environmental Guideline for Industrial Waste Discharges	Waste and aqueous content in drum discharges guideline	2002
GN	Environmental Guideline for the Burning and Incineration of Solid Waste	Guidelines for incineration considerations	2012
GN	Environmental Guideline for Waste Asbestos	Guideline required for handling and abatement	2011
GN	Environmental Guideline for Waste Batteries	Guideline and disposal options	2011
GN	Environmental Guideline for Waste Solvent	Waste solvent disposal options	2011
GN	Environmental Guideline for Waste Antifreeze	Waste antifreeze disposal options	2011
CEPA	PCB Regulations*	Waste remediation and landfill guideline	2011
EC	Industrial Treated Wood Users Guidance Document	Management of treated wood	2004
GN	Environmental Guideline for Ozone Depleting Substances	Disposal criteria and waste management guideline	2011

Table A: Summary of Applicable Remedial Guidelines

Publisher	Title	Description	Year

Notes:

INAC – Indian and Northern Affairs Canada (renamed Aboriginal Affairs and Northern Development Canada).

GN - Government of Nunavut.

CEPA - Canadian Environmental Protection Act.

EC - Environment Canada.

*- PCB regulations were included for ballasts and electrical radio components.

While all hazardous materials are regulated as indicated in Table A above, we discuss three in more detail below, due to the volume of material on-site and/or the human health concerns associated with them. These three are organic liquids, asbestos, and lead amended paint.

6.1.1 Organic Liquids

The organic liquids on the Site were not sampled due to time constraints. The analysis of organic liquid will be conducted at a later date to determine disposal options. The AMRSP will be used for the required analysis, criteria, handling and disposal options for organic content, as follows:

"…organic content which contain less than 2 parts per million (ppm) PCBs, 1000 ppm chlorine, 2 ppm cadmium, 10 ppm chromium, 100 ppm lead, and that have a flashpoint between 25°C and 225°C, may be disposed of by incineration."

The AMSRP also states that following incineration, residuals materials will undergo further leachable testing. Leachable materials that are above guidelines shall be disposed of as Defense Construction Canada (DCC) Tier II contaminated soil and disposed of off-site at a licensed disposal facility.

6.1.2 Asbestos Containing Material

There is no definition in the AMSRP that defines Asbestos Containing Material (ACM). The *GN Environmental Guideline for Waste Asbestos* (GN 2011a) provides guidelines of asbestos containing waste storage and handling. It defines an ACM as material that contains 1% or greater by volume of asbestos. Asbestos may be found in the form of the serpentine (Chrysotile) or an amphibole (Crocidolite, Tremolite, Amosite, Anthophyllite, or Actinolite).

The Government of Alberta (GA), Employment and Immigration have published the *Alberta Asbestos Abatement Manual* (GA 2012). This manual outlines the best practices and specific abatement risk levels to be followed during asbestos abatement. It also presents basic information on asbestos and asbestos products, health hazards, requirements for worker protection, safe work procedures, inspection criteria, applicable legislation, and competency profiles for those persons involved in abatement activities. This document provides a very detailed guide that clearly lays out the procedures to use. It was utilized to determine what level of asbestos abatement was necessary for each type of asbestos and their associated costs.

6.1.3 Total and Leachable Lead Amended Paint

The AMSRP provides guidelines for acceptable total lead and leachable lead in paint and their associated disposal requirements. The Government of Nunavut's (GN) Environmental Guideline for Waste Lead and Lead Paint (2011b) provides paint removal methods and further guidelines to be followed during lead abatement.

Leachable lead in paint shall be collected and transported off site, in accordance with the GN's *Environmental Guidelines for Industrial Waste Discharges* (2002), to a licensed hazardous waste disposal facility.

As well, GN does have an advisory against burning wood and other materials that contain lead (GN 2012).

6.2 Soil

Remedial objectives for impacted soil at the Site will be completed to the applicable targets defined in the AMSRP. The AMSRP incorporates the Canadian Council of Ministers of the Environment (CCME) guidelines as appropriate with the consideration of previously conducted quantitative risk assessments within the guidance documents. There are four exposure pathways and they include: 1.) human and ecological contact; 2.) soil and food ingestion; 3.) ground/surface water; and 4.) indoor vapour intrusion. All pathways are deemed applicable to the Site, as there is the potential for new shacks or cabins to be built at the Site in the future. As part of the data interpretation, the most stringent criteria among the four exposure pathways are used. A summary of the remedial criteria that will be applied for reclamation is provided in Appendix B.

Soil depth and soil type are important factors affecting the availability and transport of contaminants. The AMSRP provides specific guidelines for contaminants based upon their depth below ground surface. All soil samples were collected within 0.5 metres below ground surface (mbgs) which represented refusal, or maximum encountered depth, during the Phase III ESA field program.

For Type B hydrocarbons (which are defined as the sum of PHC F1, F2, and F3, as stated in the AMSRP, soils below 0.5 mbgs are considered sub-surface and will have a higher guideline threshold applied. Special consideration for the proximity to water bodies is included in the AMSRP.

Table B provides the remedial requirements for Type B hydrocarbons based upon vertical depth below ground surface.

Table B: AMSRP Guidelines for Type B Hydrocarbons

Depth Below Ground Surface (mbgs)	30 m to Water (yes or no)	Type B hydrocarbon AMSRP Guidelines[1] (mg/kg)
0.0 - 0.5	No	2500
0.5 - any depth	No	5000
0.0 - any depth	Yes	330
1. AMSRP Tier 1/2: Abandoned Military Site Remediation Criteria (INAC 2009).		

In the event that the AMSRP did not satisfy the remedial requirements, appropriate land use based criteria were applied. For soil, the secondary guideline for identified gaps in the AMSRP is *The Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (PEHH) (CCME 2007). These guidelines provided values for metals not included in the AMSRP, as well as benzene, toluene, ethylbenzene, and xylene (BTEX) parameters.

The generic soil quality guidelines in the CCME PEHH are developed to protect human health and key ecological receptors that sustain normal activities from four land use categories: agricultural, residential/parkland, commercial, and industrial. The selection of the applicable soil criteria in the CCME PEHH are determined by land use type, soil grain size, and potential contaminant transport pathways and receptors.

AANDC have classified the Site as Agricultural/Wildland. Based upon this land use classification the PEHH (CCME 2007) defines Agricultural/Wildland as:

- The land use category where the primary land use is related to the capability of the land or facility and are agricultural in nature or activities related to the feeding and housing of livestock. Wild lands are grouped with agricultural due to similarities in receptors that would be expected to occur and similar need for a high level of protection to ensure ecological functioning (CCME 2007).

The Government of Nunavut's *Contaminated Site Remediation Guidelines* (GN, 2009) defines agricultural land use as:

- The land in which the primary activity is related to the productive capability of the land. This includes lands that provide habitat for transitory wildlife and birds as well as greenhouses (GN 2009).

Because of the nature and location of the Site along with AANDCs classification, the agricultural/wildland criteria will apply in the event that the AMSRP has not established criteria for comparison.

For the remediation of soil, a grain size criterion is also applied. A fine-grained soil is defined as having a median grain size (D50) of 75 micrometres (µm) or less, where as a coarse grained soil has a D50 of 75 µm or greater. Representative soil samples from varying locations across the sites were submitted for particle size analysis (PSA). The majority of the samples were determined to be coarse-grained; therefore, coarse-grained criteria were selected for comparison to applicable guidelines.

Based upon the observed soil conditions at the time of the ESA, the to refusal was 0.5 meters below ground surface (EBA 2012). The impacted soil identified in the ESA process was also greater than 30 m from aquatic life supporting water bodies; therefore for the purposes of Type B hydrocarbons, a criteria value of 2500 mg/kg (Table B) was utilized as the remedial target.

6.3 Water

The Hudson Strait is a major water source that supports aquatic life, whilst the lakes surrounding the Site are assumed to be used as potable water source for hunters and trappers in the area. The

surface water impacts identified in the Phase III ESA are based upon a single data set, and may be due to naturally occurring background concentrations that are elevated, or related to on-site activities. Further surface water assessment and monitoring should be conducted; this is further discussed in Section 7.8. In the event that surface water bodies show water impacts related to site activities, remedial activities should be conducted to applicable CCME *Canadian Water Quality Guidelines for the Protection of Freshwater/Marine Aquatic Life* (PFAL) (CCME 2007) and/or the *Canadian Drinking Water Guidelines* (DW), (Health Canada 2012). With the absence of federal guidelines for PHC fractions F1 and F2 in water, the *Alberta Tier 1 Guidelines* (AENV 2010) should be used. In the event of a discrepancy between the PFAL and DW guidelines, the most stringent guideline value should be applied for remedial activities.

The majority of the water guidelines are obtained from the summary table of the CCME PFAL (CCME 2007); however, various inorganic compounds are pH, temperature or water hardness dependent. These compounds include aluminum, ammonia, cadmium, copper, lead, and nickel. Based on the equations provided in the summary table, specific guideline values were calculated using the average laboratory pH and hardness.

7.0 REMEDIAL OPTIONS

This section outlines the potential remedial options for each waste stream. Details are provided below on how the remedial options were assessed using parameters that were deemed to be important (i.e., potential costs, timeframe, remedial effectiveness, community acceptance, and cost for example).

7.1 Potential Remedial Options

Remedial activities of various waste streams are required at the site including; remediation of soil impacts (PHCs and metals) that are either above federal or territorial guidelines; removal of hazardous materials from the Site; removal and disposal of non-hazardous materials; and continued monitoring of impacted surface water bodies at the Site. A summary of the waste streams found at the Site and identified potential options are provided in Table C below. Note that some of the waste streams only had one remedial option identified. This was due to the regulatory requirements stated within the applicable disposal guideline and/or criteria for a given waste stream, or a result of on-site landfilling being excluded as discussed in Section 9.0. The individual waste streams are addressed in subsequent sections in greater detail:

Table C: Remedial Options Identified For Each Waste Stream At The Site

Waste Stream	Description	Potential Remedial Options
Wood Waste: Non-Hazardous	Approximately 898 m^3 of wood, primarily from existing intact buildings on the Site.	1.) Controlled burning on site or 2.)Off-site disposal to an approved facility.
Other Waste: Non-Hazardous	Approximately 414 m^3 of metal, black felt, brick and brick mortar, cables, concrete, exterior metal siding, fiberglass insulation,	1.) Off-site disposal to an approved facility.

Table C: Remedial Options Identified For Each Waste Stream At The Site

Waste Stream	Description	Potential Remedial Options
	flooring, glass windows, porcelain, rubber, and asphalt shingles, as well as 4 m^3 of ASTs (900L) and 77 empty drums to be cleaned and crushed.	
Asbestos Waste: Hazardous	Approximately 283.02 m^3 of asbestos containing attic insulation, fibre glass insulation, panels, vinyl floor tiles, light fixture backings, asphalt shingles, exterior white siding, and furnace gaskets .	1.) Off-site disposal to an approved facility.
Liquid Organic Wastes in ASTs: Hazardous	Approximately 1,400 L of liquid organic wastes in ASTs.	1.) Incinerated on-site; or 2.) Off-site disposal to an approved facility.
Aqueous Content in Drums	Approximately 620 L of aqueous content in drums.	1.) Treated and disposed on-site, 2.) Off-site disposal to an approved facility.
Total Lead and Leachable Lead Paint on Waste: Hazardous	Approximately 258.7 m^3 of particulate boards, wood, metal, equipment, and generators contain total lead and leachable lead paint. Approximately 8 m^3 of particulate board and wood contains total lead paint	1.) Removed (very labour intensive) and the material landfilled off site; or 2.) Material can be removed intact to an off-site landfill. Note if the paint is removed the paint chips also have to be removed off-site.
Total Lead and Leachable Lead Paint on ASTs: Hazardous	Approximately 146 m^3 of two large ASTs (73,000 L each) contain total lead paint.	1.) Remove the appropriate areas of paint in order to dismantle the ASTs and remove to an off-site landfill or 2.) Material can be removed intact to an off-site landfill. Note if the paint is removed the paint chips also have to be removed off site.
Total Lead and Leachable Lead Paint on Asbestos Panels: Hazardous	Approximately 48.5 m^3 of asbestos panels.	1.) Removed (very labour intensive and within an asbestos containment) and landfilled off site; or 2.) the waste can be handled, following asbestos guidelines and removed to an off-site landfill. Note if the paint is removed the paint chips also have to be removed off-site.
Compressed Gas Cylinders: Hazardous	Approximately 100 mL of compressed gas cylinders and propane tanks are on the Site.	1.) Off-site disposal to an approved facility. A specialist may be required for venting unknown contents for transportation requirements.

Table C: Remedial Options Identified For Each Waste Stream At The Site

Waste Stream	Description	Potential Remedial Options
Fire Extinguishers: Hazardous	Approximately 0.1 m^3 of fire extinguishers (and potentially content) are at the Site.	1.) Off-site disposal to an approved facility of it contains materials that cannot be vented.
Creosote Treated Wood: Hazardous	Approximately 5 m^3 of creosote treated wood.	1.) Off-site disposal to an approved facility.
Other Hazardous Waste	Approximately 8.48 m^3 of miscellaneous solid hazardous waste (batteries, mercury in fluorescent lights, mercury, PCB light ballasts, PCBs, and lead solder in electrical components) and 501 L of miscellaneous equipment contents (anti-freeze, oil, fuel, and other vehicle fluids)	1.) Off-site disposal to an approved facility.
PHC Impacted Soil	Approximately 2352 m^3 of PHC impacted soil	1.) Off-site disposal to an approved facility; or 2.) Excavation and treatment on-site in a landfarm treatment unit (LTU) bringing borrow material to Site; 3.) Excavation and treatment on-site in a LTU using a crusher for borrow on-site; or 4.)Excavation and treatment on-site in a staged LTU (2 stage process).
Metal Impacted Soil	Approximately 165 m^3 of metal impacted soil	1.) Offsite disposal to an approved off-site facility.
Co-Contaminated Soil (PHCs and Metals)	Approximately 216 m^3 of co-contaminated soil (PHCs and metals)	1.) Offsite disposal to an approved off-site facility.
Impacted Water	Impacts were identified in thePhase III ESA but were based upon a limited data set and are either related to site activities or are a result of naturally elevated metals in surface water bodies at the Site, due to elevated regional background conditions.	Continued monitoring.

7.2 Remedial Options Analysis

Evaluation of the various remedial options was conducted using a systematic process that identifies the important parameters with which to rank the potential remedial options. For each remedial option identified, the following parameters are considered important for determining which option may be the most preferred:

- Cost of Remediation – Evaluation included all costs associated with implementation of each option as follows:
  - Procurement and transportation of required supplies to site;
  - Costs associated with implementation of the remedial option including but not limited to equipment, transportation, and labour costs;
  - Costs associated with any special handling, health and safety, or environmental protection measures required during implementation;
  - Long-term monitoring costs, and;
  - Opportunities for cost recovery or costs savings (e.g., backhaul of waste materials during winter
    re-supply), including potential cost efficiencies associated with other remedial options were also considered.
- Effectiveness in meeting Remedial Goals - This parameter evaluates how effectively the remedial option will meet a regulatory target, such as guideline or site specific criteria. Where criteria are not met, an evaluation is made on whether the exposure pathway can be effectively managed (e.g., source reduction) or a receptor can be prevented from being impacted by the contaminant or hazard.
- Timeframe for Remediation – This parameter considers the length of time that an option will take to remediate to applicable criteria. Options involving risk management will rank lower typically due to the timeframe required. This can be an important if there is a specific timeframe in which remediation is required to be completed too.
- Ease of Implementation - This parameters considers how easily an option can be implemented (i.e., logistically) with proven solutions that have previously worked at similar northern sites. Solutions that can be carried out at remote sites will rank higher than solutions that are unproven in northern Canada and are more complex. Additional consideration can include:
  - Specialized equipment, training, or procedures required for implementation of the remedial option;
  - Logistical and organizational support requirements;
  - Transportation requirements (e.g., winter access); and
  - Additional regulatory requirements (e.g., Fisheries Authorization, additional testing and/or monitoring).
- Regulatory Acceptance – This parameter considers the likelihood that an option would be readily accepted by the various regulators including AANDC, Environment Canada (EC), Department of Fisheries and Oceans (DFO), and Territorial regulators.
- Community Acceptance - these parameters considers how likely stakeholders from nearby communities and Inuit will accept the remedial options. There is a community meeting being

held in Cape Dorset, NU and Ivujivik, QU. The remedial options will be presented to the community and feedback will be solicited prior to finalizing the RAP.

Each remedial option is ranked with respect to the parameters listed above and where each remedial option ranks. While there are some drawbacks to this process, it is done objectively, so personal biases are not introduced and it provides a means to looking at multiple parameters, not just one.

7.3 Non-Hazardous Waste

Locations for the non-hazardous waste in debris areas, buildings and site infrastructure are shown on Figures H1-H4. Details of the inventory for each AEC are provided in Appendix D. Photos of the AECs and materials are located in Appendix A.

The non-hazardous waste streams and their disposal options are discussed separately in the following sections:

7.3.1 Wood Waste Disposal Options

Wood waste may be both an aesthetic and safety concern. Dilapidated and intact buildings have little historic value and can be an extreme hazard to occasional visitors. The buildings should be demolished or dismantled and the wood separated. Approximately 898 m^3 of wood from buildings will need to be adequately disposed of. Some of the wood is painted and this paint contains total lead and leachable lead; this lead based paint (LBP) wood is discussed in Section 7.4.5 with Total Lead and Leachable Lead Paint on Waste.

The two options for the wood waste are: 1.) Burning on-site and the ashes disposed in a landfill off site; or 2) Removal off-site intact (in manageable pieces) for landfill disposal. A description of each of the options is provided below.

1. **Burning:** The unpainted wood would be gathered to a central temporary storage location at the Site, following building demolition and separation. Only unpainted wood is permitted to be burned, and the wood would then be burned in a controlled fire. To decrease expenses, buildings and wood debris can be burned in place; however, some of the buildings and wood debris may not be in ideal locations. Conceptually, the steps for conducting a controlled burn of the wood at the site are as follows:

    - Conduct separation of hazardous materials from the building and debris areas containing wood;
    - Demolish the intact buildings. Thirteen buildings on-site are intact and will require demolition prior to removal, these are as follows: Storage Shed 01, Old Kitchen, New Radio Building, Old Radio Building, Outhouse, Storage Shed 02, Storage Building, Chicken Coop, Bunkhouse, Generator Building, House and Garage, Shed, and House in AECs 1-13;
    - Conduct separation of other non-hazardous materials that should not be burnt, such as painted wood, metals, fibreglass, etc., from the wood debris;
    - Haul wood to designated burn location;

- Conduct controlled burn at appropriate time of year; and
- Test ashes to determine whether they require removal off-site to a non-hazardous or hazardous landfill.

2. **Removal (intact) Off Site:** The wood (intact) would be taken to a staging area and transported off site to another suitable location for landfilling. The steps are as follows:
   - Conduct separation of hazardous materials from the building and debris areas containing wood;
   - Demolish the intact buildings;
   - Haul to staging area; and
   - Transport materials to an off-site licensed, disposal facility.

The preferred remedial option is burning with ashes disposed at an off-site landfill facility. Burning is the most cost effective, easiest to implement, has a short time frame, will be accepted by the community (common practice) and can be done during other remedial activities on site. Removal off site was the least preferred due to high costs and hindered ease of implementation (because of logistical difficulties). There are several potential concerns with burning on-site:

- Wood must be separated from the other non-hazardous waste;
- Burning must be done at time of year when fire risk to the surrounding tundra is low and should be conducted by experienced personnel who could implement a controlled burn management plan and emergency response procedure. If done improperly, a tundra fire could result;
- Burning procedures must meet guidelines for burning and incineration of solid waste (GN 2012);
- Regulatory approval for a controlled burn will need to be obtained and the burn will have to be completed in an approved container; and
- Ashes from burned wood will need to be tested (according to GN 2012) to determine if it contains hazardous materials and properly disposed of off-site.

7.3.2 Other Solid Non-Hazardous Waste

Other solid non-hazardous waste includes items such as: metal, black felt, brick and brick mortar, cables, concrete, exterior metal siding, fibreglass insulation, flooring, glass windows, porcelain, rubber, asphalt shingles, ASTs (900 L each), empty and unpainted drums (205 L each), and other inert items in various locations at the Site. These items are considered an aesthetic concern and a major safety hazard. None of the machinery has historical value or could be put to use, and the majority of this material has little to no recoverable value.

Approximately 414 m^3 of other solid non-hazardous material, 77 empty drums and 4 m^3 of ASTs (900 L each) have been identified within buildings and within debris areas. The ASTs may require cleaning and crushing due to size constraints associated with transporting the materials off site.

There is only one remedial option for the other non-hazardous waste: 1.) removal off-site for landfill disposal.

A description of the option follows below.

1. **Remove Off-Site:** The other non-hazardous waste would be taken to a staging area and then removed off-site to another suitable location for landfilling. The steps are similar to section 7.3.1:
    - Conduct the separation of non-hazardous materials from buildings and removal from debris areas;
    - Haul to staging area;
    - Clean drums and tanks and remove residual fluids/fuels from machinery and deposit into an approved container for disposal;
    - Cut up the tanks; crush the metal debris, drums, and machinery;
    - Haul materials to an on-site landfill, compact and cover; and
    - Transport to an off-site licensed, disposal facility.

The following are potential issues with removing the non-hazardous waste off site:

- High costs due to shipping large volumes of materials; and
- Hindered ease of implementation (because of logistical difficulties and determining landfill acceptance of the waste at a licensed disposal facility).

7.4 Hazardous Waste

7.4.1 General

Hazardous wastes are considered hazardous due to their toxicity, flammability, corrosiveness, or other properties and fall within the definition of hazardous materials under most federal, provincial or territorial legislation under transportation of dangerous goods regulations.

7.4.2 Asbestos Wastes

Asbestos is an inhalation hazard and is more of a human health hazard than a hazardous waste, but due to special handling, precautions and disposal, it is similar in nature to hazardous waste and needs to be dealt with appropriately. Approximately 283.02 m^3 of asbestos will need to be removed and appropriately disposed of, according to the applicable guidelines (GA 2012, GN 2011a). Some mould was observed on the floor and walls in the Old Radio Building (AEC 4), the Chicken Coop (AEC 8), and in the attic of the House (AEC 13). These materials will already be within containment, due to asbestos abatement and possible lead abatement, but the proper mould safe work procedures and PPE shall be adhered to (GA 2009). There is one option for disposal of ACMs: 1.) removal off site and disposal in an off-site landfill, a description of the option is provided below.

1. **Remove Off-Site:** The asbestos waste would be taken to a staging area and then transported to an
off-site location for landfilling. The steps are as follows:

   - Conduct removal of asbestos waste from the building or substrate. Asbestos is to be handled and removed by trained personnel following pre-determined safe work procedures and properly contained. The identified ACMs will be abated following low, moderate or high risk work procedures as listed in the *Alberta Asbestos Abatement Manual* (GA 2012);
   - Haul contained asbestos waste to staging area. It is recommended that if ACM waste is to be stored on-site awaiting transport, asbestos waste should be held in labeled and sealed containers to reduce the potential for unauthorized access and deterioration of the asbestos waste. Waste stored in polyethylene bags has the potential to rip or degrade if left in the ambient environment causing release of the contents; and
   - Transport the materials to an off-site licensed, disposal facility.

The following are potential issues with landfilling the asbestos waste off site:

- Hindered ease of implementation (because of logistical difficulties and determining landfill acceptance of the asbestos waste at a licensed disposal facility); and
- Asbestos can only be handled by personnel with asbestos abatement training and following safe work procedures (required regardless of the remedial option).

7.4.3 Organic Liquid Wastes in ASTs

Heating oil and other organic wastes within ASTs are a potential contamination of concern, if a leak develops and contents spread to underlying soil. It can also further spread by surface water flow.

Approximately 1,400 L in three ASTs (900 L each) were present throughout the Site, but additional volume could be identified during completion of remedial activities at the Site. There are three options for the disposal of organic liquid waste: 1.) incineration on site, 2.) removal off site (possibly for recycling) or 3) removal and reuse in its current condition by local personnel. Descriptions of each option are below.

1. **Incineration On-Site:** An incinerator designed to meet air quality guidelines (GN 2012) would be brought to the Site and the contents of the ASTs would be processed through the incinerator. The steps are as follows:

   - Empty ASTs as necessary, into intact, steel drums;
   - Haul drums to incinerator;
   - Process contents of ASTs through incinerator;
   - Perform air monitoring during the incineration to ensure compliance with applicable air emission standards; and
   - Test ash for leachable metals and dispose accordingly.

2. **Removal Off-Site:** The ASTs contents would be placed in over pack drums and then transported off site to an approved off-site facility for disposal. The steps are as follows:

   - Empty ASTs into intact, steel drums;
   - Place drums in over pack containers, sample for Transportation of Dangerous Goods (TDG) and waste disposal;
   - Haul to staging area; and
   - Transport drums to an off-site licensed, disposal facility.

The preferred remedial option is removal off site of the organic liquid waste to an approved off-site facility for disposal; due to the small volume and ease of implementation. The cost of an incinerator is not warranted for such a small volume of aqueous waste, also the incineration of the organic liquid was not a preferred option because the costs to conduct air monitoring and import proper incineration equipment do not justify the small waste volume.

The following are potential issues with removal of the organic waste off site:

- Additional analysis may be required to fulfill TDG regulations; and
- Additional logistical planning with transporting the waste off site and into a licensed disposal facility that will accept hazardous waste.

7.4.4 Aqueous Liquid Wastes in Drums

Liquid aqueous waste present in drums is a potential contamination concern if drums leak and contents spread to underlying soil. It can also further spread by surface water flow. The drums can also be a hazard if under pressure and can spray if opened. An estimated 620 L of aqueous waste is known to be present at the Site; however, there may be additional volume identified once remedial activities begin at the Site. There are two options for the disposal of aqueous waste in drums: 1.) Treatment and disposal on site or 2.) Removal off-site. A description of each of the options follows:

1. **Treatment and Disposal On-Site:** An oil and water separator (and possibly an activated carbon water treatment system) would be brought to the Site and the contents of the drums would be run through the separator and disposed of. The steps are as follows:

- Bring drums to the separator;
- Process contents of drums through the separator to separate aqueous and organic phases;
- Test remaining water according to the water permit and dispose accordingly; and
- The remaining organic liquids would be incinerated on-site.

2. **Remove Off-Site:** The drums would be placed in over pack drums and then transported off-site. The steps are as follows:

- Place drum in over pack drum, sample for TDG and waste disposal;
- Haul to staging area; and

- Transport waste to an off-site licensed disposal facility.

The preferred remedial option is to remove off site to an approved off-site facility for disposal. While there may be some challenges with removal off site, as previously mentioned, the ease of implementation for transporting a small amount of aqueous waste outweighs the other parameters. The following are potential issues with the removal of the aqueous waste off site:

- There will be additional logistical planning associated with transporting liquid waste off site;
- The waste would require disposal off-site following the applicable guideline(s);
- The separated water must meet current criteria/guidelines for on-site disposal; and
- Analysis of the aqueous liquid waste may be required to comply with TDG marine regulations.

7.4.5 Total Lead and Leachable Lead Paint on Waste

LBP on particulate boards, wood, metal, equipment, and generators can be a dermal and respiratory hazard, and lead can leach into soil. Approximately 258.7 m^3 of particulate boards, wood, metal, equipment, and generators contain total lead and leachable lead paint. Approximately 8 m^3 of particulate board and wood contains total lead paint.

There are two options for disposition of the materials with LBP: 1.) Remove paint from the substrate on site, crush and compact, and take both the substrate and the paint off-site for disposal; or 2.) Remove all the materials, intact, for off-site disposal. The paint removed from the materials and the painted waste would have to be disposed as hazardous waste off site.

A description of the options follows:

1. **Remove Paint and Dispose of Off-Site:** The LBP would be removed from the particulate boards, wood, metal, equipment and generators, they would then be crushed and compacted and hauled off site for disposal at an approved hazardous materials landfill. The steps are as follows:

- Separate particulate boards, wood, metal, equipment, and generators from buildings and debris areas and place the materials in one area;
- Drain any remaining fuel/fluids from the equipment into an approved container (note liquid from cleaning activities would need to be treated/tested for disposal);
- Construct an enclosure over and around the materials that will sufficiently collect the paint chips and prevent them from contaminating adjacent areas;
- Remove LBP by sandblasting or scrapping and collect the sand/paint for disposal off site in a licensed disposal facility for hazardous waste. EBA recommends that if LBP waste is to be stored on-site awaiting transport, LBP waste should be held in sealed containers to reduce the potential for unauthorized access to the LBP;
- Dismantle, cut apart, crush, and compact materials in such a way that they can be transported off site; and

- Transport the materials to an off-site licensed, disposal facility.

2. **Remove intact (leave Paint On) and Dispose of Off Site:** The particulate boards, wood, metal, equipment, and generators would be taken to a staging area and then hauled off-site for disposal at an approved hazardous materials landfill. The steps are as follows:

   - Separate LBP particulate boards, wood, metal, equipment, and generators from buildings and debris areas and place the materials in one area;
   - Drain any remaining fuel/fluids from the equipment into an approved container (note liquid from cleaning activities would need to be treated/tested for disposal);
   - Haul the materials to the staging area; and
   - Transport the materials to an off-site licensed, disposal facility.

The preferred remedial option is removal and disposing the intact paint and substrate in an approved off-site facility that will accept the waste. Removing the paint and disposing of the waste off site is the least preferred option, due to the high costs and difficulties of implementing containment and abatement. The following are potential issues with disposing of painted substrates in an off-site landfill:

- There will be additional logistical planning associated with transporting the large volumes of painted waste off site;
- The painted substrate would require disposal off-site in a hazardous landfill following the applicable guideline (GN 2011b); and
- LBP needs to be handled by personnel with lead abatement training.

7.4.6 Total Lead Paint on Above-ground Storage Tanks

Total lead paint on the two above-ground storage tanks (ASTs) can be a dermal and respiratory hazard. Approximately 146 m^3 of ASTs (73000 L each) with total lead paint are present at the Site. There are two options for disposal of the ASTs with total lead paint: 1.) Remove paint on-site, dismantle, and take off-site for disposal; or 2.) remove the intact ASTs off-site. Note that the paint that is removed from the ASTs would have to be disposed as hazardous waste. A description of the options follows:

1. **Remove Paint and Dispose of Off-Site:** The ASTs would have the paint removed, dismantled, and then hauled off-site for disposal. The steps are as follows:

- Clean the inside of the tanks (note liquid from cleaning activities would need to be treated/tested for disposal);
- Construct an enclosure over and around the ASTs that will sufficiently collect the paint chips and prevent them from contaminating adjacent areas;
- Remove paint by sandblasting or scrapping and collect the sand/paint for disposal off-site in a licensed disposal facility for hazardous waste;

- Dismantle and cut apart in such a way that they can be transported off-site;
- Sample the surrounding soil to determine that the LBP did not contaminate the soil; and
- Transport to an off-site licensed disposal facility for hazardous waste.

2. **Remove (leave Paint On) and Dispose of Off-Site:** The ASTs would be taken to a staging area and then hauled off-site for disposal. The steps are as follows:

- Clean the inside of the ASTs (note liquid from cleaning activities would need to be treated/tested for disposal);
- Haul the hazardous ASTs to the staging area; and
- Transport ASTs to an off-site licensed disposal facility for hazardous waste.

The preferred remedial option is to remove the ASTs (intact - leave the paint) and dispose off-site. Paint removal on-site may be difficult to safely implement as sand blasting would need to be completed in an enclosed environment. Scrapping the paint off would be extremely time consuming and likely not possible within the proposed schedule. The following are potential issues with the disposal of the tanks off site:

- The material has to be transported to a location where the paint can be removed and the materials disposed of in an appropriate manner, according to the applicable guideline (GN 2011b);
- LBP needs to be handled by personnel with lead abatement training; and
- There will be additional logistical planning associated with transporting the large volume of tanks off site.

7.4.7 Total Lead and Leachable Lead Paint on Asbestos Panels

Asbestos is an inhalation hazard and is more of a human health hazard than a hazardous waste, but due to special handling, precautions, and disposal, it is considered hazardous waste and needs to be dealt with adequately. Leachable lead paint can be a dermal and respiratory hazard and lead can leach into soil. Approximately 48.5 m^3 of LBP on asbestos panels will need to be removed and appropriately disposed of, according to the applicable guidelines (GN 2011a, GN 2011b). There are two options for disposal of ACMs and LBP materials: 1.) Remove the paint on site then landfill the asbestos waste off site; or 2.) Remove all the materials, intact, off site. A description of the option follows:

1. **Remove Paint and Landfill On-Site:** The lead paint would be removed from the panels within the asbestos containment. They would then be double bagged and then hauled to a staging area and transported to an off-site licensed, disposal facility. The steps are as follows:
   - Within the proper containment, remove paint by scrapping and collect the paint for disposal off-site in a licensed disposal facility for hazardous waste;
   - Conduct removal of ACMs from the building or substrate. Asbestos is to be handled and removed by trained personnel following safe work procedures and properly contained. The

identified ACMs should be abated following low, moderate or high risk work procedures as described in the *Alberta Asbestos Abatement Manual* (GA 2012);

- Haul to staging area; and
- Transport materials to an off-site licensed, disposal facility.

2. **Remove Off Site**: The ACMs would be removed, contained and then hauled to a staging area and transported to an off-site licensed, disposal facility. The steps are as follows:

   - Conduct removal of ACM and lead waste materials from the building or substrate. Asbestos and lead painted waste is handled and removed by trained personnel following safe work procedures and properly contained. The ACMs will be abated following low, moderate or high risk work procedures as described in the *Alberta Asbestos Abatement Manual* (GA 2012). EBA recommends that if ACM/LBP waste is to be stored on-site awaiting transport, ACM/LBP waste should be held in sealed containers to reduce the potential for unauthorized access to the ACM/LBP;
   - Haul to staging area; and
   - Transport materials to an off-site licensed, disposal facility.

The preferred remedial option is removal off site (leaving the paint on the asbestos panels) and disposing to an off-site landfill. This will allow for the most cost effective and safe method, that meets the regulatory and community requirements. Removing the paint and disposing of the waste off site is the least preferred option, due to the high costs and difficulties with coordinating logistics to remove the paint on site (and therefore ease of implementation). As well, paint removal by hand may be too time consuming and paint blasting methods are prohibited when the substrate is an ACM. The following are potential issues with the disposal of the painted waste off site:

- There will be additional logistical planning associated with transporting the volumes of lead painted, asbestos waste off site; and
- ACMs and LBP can only be handled by personnel with asbestos and lead abatement training (required regardless of the remedial option).

7.4.8 Compressed Gas Cylinders

Compressed gas cylinders are a hazard due to the potential of a catastrophic leak which can propel the cylinders at a high speed. Depending on the type of gas, the gas itself may be flammable or explosive. Approximately two cylinders (estimated 100 L of pressurized gas) are present adjacent to the shoreline (AEC 26) and adjacent to the 73,000L ASTs; whilst others may be found during remedial activities at the site. Both cylinders were intact; and appeared to contain some unknown content (based on weight). No attempt was made to open the cylinders, due to the safety concerns associated with unknown pressurized gases. The contents are to be considered hazardous until the contents can be safely identified. There is one option for disposal of compressed gas cylinders: 1.) Removal off site and disposal in an off-site landfill. A description of the option follows:

1. **Remove Off-Site:** The cylinders would be depressurized, evacuated, and placed in an off-site landfill. The cylinders would then be covered. The steps are as follows:
    - If the content is known, depressurize, and evacuate. If the content is known, and the shipping company approves the conditions of the cylinders, they can be shipped with the content;
    - If the content is known and contents cannot be depressurized on site, the cylinders will be placed in an approved container and shipped off site with the content;
    - If content is not known, a specialist will depressurize, and evacuate;
    - Haul to staging area; and
    - Transport the cylinders off site to a licensed, disposal facility. The cylinders may or may not be hazardous, depending on if they were depressurized.

The remedial option is to remove the compressed gas cylinders to an off-site landfill. The following are potential issues with landfilling the waste off site:

- Safety hazards with identifying unknown pressurized gases and depressurization. There will be additional logistical planning associated with transporting the waste off site or evacuating the cylinders in these circumstances following the applicable guidelines (GN 2010a, GN 2011c).

7.4.9 Fire Extinguishers

Fire extinguishers are a hazard due to the hazardous chemicals that are within the extinguisher. This is dependent on the type of fire extinguisher. One fire extinguisher containing CO_2 and possibly other chemicals (the label was difficult to read) totalling approximately 0.1 m^3 was inventoried adjacent to the Chicken Coop (AEC 8). Note: if the extinguishers are empty, they are not considered hazardous waste. The contents are to be considered hazardous until the contents can be safely identified. There is one option for disposal of the fire extinguisher: 1.) Removal and disposal of cylinders in an off-site landfill. A description of the option follows:

1. **Remove Off Site:** The fire extinguisher would be transported off-site for disposal in an off-site landfill. The steps are as follows:
    - If the content remaining in the extinguisher contains ozone-depleting substances(ODS), then the contents cannot be evacuated;
    - If there is content remaining in the extinguisher, and the shipping company approves the conditions of the extinguisher, it can be shipped with the content;
    - Haul to staging area; and
    - Transport the fire extinguisher to an off-site licensed, disposal facility.

The following are potential issues with landfilling the waste off site:

- Some known contents in fire extinguishers may not be safely depressurized on site (ODS containing), therefore, there will be additional logistical planning associated with transporting

the waste off site or evacuating the fire extinguishers in these circumstances following the applicable guidelines (GN 2010a, GN 2011c).

7.4.10 Creosote Treated Wood

Creosote is primarily composed of polycyclic aromatic hydrocarbons (PAHs) (up to 90%), tar acids, and tar bases which can leach into the surrounding environment. It has been determined that this product is toxic to the environment and is a dermal hazard (EC 2004). Due to this special handling required, precautions and disposal, it is similar in nature to hazardous waste and needs to be dealt with adequately.

Approximately 5 m^3 of creosote treated wood beams and wood pieces were inventoried on the Site. There is one disposal option for this creosote treated wood: 1.) Remove off site and dispose in a regulated disposal facility.

1. **Remove Off-Site:** The creosote treated wood would be hauled to a staging area and removed off site for disposal. The steps are as follows:
    - Conduct the separation of creosote treated wood from building foundations and debris areas;
    - Haul to staging area;
    - Wrap the wood securely in polyethylene sheets; and
    - Transport to an off-site licensed, disposal facility.

The following are potential issues with landfilling the creosote treated wood off site:

- There will be additional logistical planning associated with transporting the volumes of creosote treated wood off site.

7.4.11 Other Hazardous Waste

Various solid hazardous waste represent different kinds of hazards. ODS are hazardous to the atmosphere and ozone layer, whilst other types generally present an environmental hazard by leaching into the surrounding soil or water and ingestion, inhalation or dermal hazards to wildlife and humans. Other solid hazardous wastes inventoried on the Site include: batteries, which contain acids and lead; mercury vapour in fluorescent lights; PCBs in light ballasts and PCBs, tantalum, lead and mercury solder in electrical parts. As well, there are various equipment contents, such as anti-freeze, oils, and fuels which we have classified as hazardous, as detailed chemical analysis has not been completed.

Approximately 8.48 m^3 of miscellaneous solid hazardous waste (batteries, mercury in fluorescent lights, mercury, PCBs in light ballasts, PCBs and lead solder in electrical components) and 501 L of miscellaneous equipment contents (anti-freeze, oil, fuel, and other vehicle fluids) is present at the Site. There is only one option for disposal of this other solid and liquid hazardous waste: 1.) Removal and disposal off site in a licensed disposal facility for hazardous waste, according to the

applicable guideline (GN 2010a, GN 2010b, GN 2011d and GN 2011e). A description of the option follows:

1. **Remove Off-Site:** The hazardous waste would be taken to a staging area and hauled off site for disposal. The steps are as follows:
    - Separate the materials from the buildings and debris areas;
    - Haul hazardous materials to staging area;
    - Contain the materials for transport; and
    - Transport materials to an off-site licensed, disposal facility.

The following are potential issues with removal and disposal of other hazardous waste:

- The amount of solid hazardous waste should be taken out by barge following TDG marine regulations;
- The hazardous waste will need to be handled properly, following GN and other federal guidelines;
- The hazardous wastes have to be labeled and packaged for transport, following TDG Regulations; and
- There will be logistical planning associated with transporting a variety of hazardous wastes off site.

7.5 Petroleum Hydrocarbon-Impacted Soils

Based on the findings of the Phase III ESA (EBA 2012) there is an estimated volume of 2,045 m^3 of PHC impacted soil at the Site. This volume is based upon the AMSRP and CCME PEHH guidelines and defined in the Phase III ESA (EBA 2012). The vertical depth of soil impacts is known to be confined to 0.5 mbgs. Remedial targets for all PHCs are provided in Appendix B. Figures E1 to E4 show the areas of soil impacts and individual sample results are provided in Appendix C.

Table D summarizes the volume of PHC impacted soil by AEC:

Table D: Petroleum Hydrocarbon Impacted Soil Volumes

AEC	Sampling Point	Exceedance of Applicable Guidelines	Within 30 m of Water body	Surface Area (m^2)	Vertical Depth of Impact (mbgs)	Volume of PHC Impacted Soil (m^3)
AEC 3	2012-SB-44	Ethylbenzene, Type B	No	129	0.5	65
	2012-SB-45	Type B				
	SB029-SS-062 WESA	Type B				
AEC 4	2012-SB-41	Type B	No	29	0.5	14.5
	SB029-SS-065 WESA	Type B				
AEC 9	SB029-SS-052 WESA	Type B	No	8	0.5	4
AEC 11/12	2012-SB-8	Type B	No	3796	0.5	1898
	2012-SB-9	Type B				
	2012-SB-57	Type B				
	2012-SB-58	Benzene, Toluene, Ethylbenzene, Type B				
	2012-SB-59	Type B				
	2012-SB-60	Type B				
	2012-SB-62	Type B				
	SB029-SS-031 WESA	Type B				
	SB0029-SS-032 WESA	Type B				
	SB029-SS35 WESA	Benzene, Toluene, Ethylbenzene				
	SB029-SS-038 WESA	Benzene				
AEC 13	2012-SB-4	Benzene	No	19	0.5	9.5

Table D: Petroleum Hydrocarbon Impacted Soil Volumes

AEC	Sampling Point	Exceedance of Applicable Guidelines	Within 30 m of Water body	Surface Area (m^2)	Vertical Depth of Impact (mbgs)	Volume of PHC Impacted Soil (m^3)
AEC 14	2012-SB-25	Type B	No	108	0.5	54
	2012-SB-27	Type B				
	2012-SB-29	Type B				
	SB029-SS-046 WESA	Type B				
AEC 17	2012-SB-12	Type B	No	Included in AEC 11/12	Included in AEC 11/12	Included in AEC 11/12
Pipeline	2012-SB-64	Type B	No	Included in AEC 11/12	Included in AEC 11/12	Included in AEC 11/12
	2012-SB-11	Type B				
	2012-SB-63	Type B				
		Total Volume of PHC Impacted Soil				**2,045 m^3**
		Total Volume of PHC Impacted Soil including 15% contingency				**2,352 m^3**

Note: Due to swelling of soils following excavation, a 15% contingency has been added to the PHC impacted soil volume.

7.5.1 Potential Remedial Options – PHC Impacted Soil

Table E below provides potential remedial options considered for remediation of PHC impacted soils at the Site. EBA considered these options and the viability of utilizing each option at the Site. If the option was viable and cost effective then additional evaluation was undertaken.

Table E: Petroleum Hydrocarbon Impacted Soil Remedial Options

Technology	Description	Appropriate for Site
Off-site Removal	Excavation of in situ soils using a backhoe so all impacted soil is removed from the Site and backfilled with clean material. PHC impacted soil is shipped to an approved off-site facility for final treatment/disposal	Yes
Landfarming	Excavation of in situ soils and placement into a lined area for bio-remediation, with a combination of aeration and nutrient optimization. Once remedial targets are achieved the material can be used for backfill of original excavation.	Yes
Thermal Desorption	Using specialized equipment and fuel to heat soil to remove hydrocarbons. Soil can be replaced post remediation.	No - Cost Prohibitive and logistically challenging
Chemical Oxidation/Air Sparging	Using chemicals (such as hydrogen per oxide) to chemically oxidize the hydrocarbon chains. Soil can be left in situ or treat ex situ dependent on the remedial technique adopted.	No - Cost Prohibitive and logistically challenging

Based upon the unique logistical challenges, high costs, uncertainty of effectiveness in northern environments certain remedial options were excluded being; thermal desorption, chemical oxidation/air sparging and long term monitoring.

Thermal Desorption was excluded due to the following factors; the high capital expenditure required for the equipment, the logistical challenges associated with transport of equipment to site, operation and maintenance and specialized personnel needed to operate the equipment. Due to the remoteness of the location and the challenges to get to site any operational breakdowns will be a challenge to overcome using this remedial technology. It is an unproven remedial technology on remote northern sites and has been excluded as a potential remedial option.

Chemical oxidation and air sparging are unproven technologies in northern climates and were excluded due to high cost of chemicals, uncertainty of remedial effectiveness, and limited time available during the summer being challenges for this technology. Specialized remedial personnel would be required with appropriate training to perform the remediation. As a result this remedial technology has been excluded from the RAP due to the uncertainty of the technology.

To meet the remedial objectives of the project there are four potential remedial options for the PHC impacted soil; 1.) Excavation and off-site treatment (off-site disposal), 2.) Excavation and on-site treatment (landfarm treatment unit-imported aggregate source), 3.) Excavation and on-site treatment (landfarm treatment unit-on-site crusher aggregate source),or 4.) Excavation and staged on-site treatment (two stages of landfarming LTU). A description of each of the options follows:

1. Excavation and Off-Site Treatment (Off-Site Disposal):

The PHC impacted soils would be excavated and transported to a temporary laydown area that would utilize a liner and possibly berms. The PHC impacted soil would then be placed into bulk transport containers following excavation so that they are able to be handled and moved when it is time for shipping to an off-site approved location. The steps are as follows:

- Excavate PHC impacted soils from specified areas and package for transport according to TC TDG regulations. The excavation work would be completed during the summer;
- Haul impacted material to staging area;
- PHC impacted soil would be loaded onto a barge/sealift and moved off site to Churchill MB, or Valleyfield QU. The PHC impacted soil would then be transported to a licensed disposal facility with appropriate waste manifests and landfill approvals; and
- Backfilling of excavations, then re-contouring and re-vegetation would be completed as required in areas of excavation, once backfilling is complete. It is then recommended to conduct a geotechnical evaluation to confirm soil compaction/settlement has occurred sufficiently at the Site.

This remedial option requires several barges/ships to mobilize and land various remedial equipment and supplies to the Site, so that the remedial work can be completed. Heavy equipment would be required to move PHC impacted soil from the site. Soil would be barged/sealifted from the Site to port for transport to a disposal facility. All equipment for remediation would be transported via barge/sealift to the Site. Borrow sources may be developed on-site using a crusher/blasting equipment to backfill the excavations. Alternatively, with special approval of PWGSC and AANDC (after further community consultation) excavations may be re-graded to remove dangerous slopes and contoured as per the local natural terrain.

2. Excavation and On-Site Treatment (landfarm treatment unit-Imported Aggregate Source):

This option involves excavation of impacted soils and construction of a LTU to treat the full amount of 2,045 m^3 of PHC impacted soil (however, including soil swelling factor the assumed amount if PHC impacted soil is 2,352 m^3). EBA completed a site suitability assessment during the 2012 field program to identify a suitable location for a LTU, which is discussed further in Section 9.0. Due to the limited amount of borrow available at the Site, borrow material is required to be brought into Site from an off-site source, via barge or ship for this remedial option. In order to carry out this remedial process, an LTU of

approximately 8,250 m^2 is required for the LTU design at the Site. This remedial option is anticipated to take between two to five years for remedial activities to be completed. During the remedial process nutrients would be added and the soil tilled and aerated on a regular basis to volatize PHCs, that will introduce oxygen and promote biodegradation activities. These tilling events should be conducted bi-annually (early spring and fall) to increase the efficiency of biodegradation. Tilling and closure of the LTU should be conducted by knowledgeable personnel. All equipment for tilling operations should be removed from Site following closure of the LTU. Bench scale testing should be performed prior to LTU construction to optimize the treatment process.

The general steps for on-site treatment landfarming are as follows:

- Perform bench scale testing to optimize the treatment process prior to LTU construction and mobilization of equipment to Site;
- Grading and construction of a LTU with an impermeable liner and perimeter berms. Seepage collection points or groundwater monitoring wells should be included to ensure the integrity of the impermeable liner. Some leachate is anticipated based upon the Phase III ESA findings for F2 and F3 PHCs. The LTU design requires a sump and leachate collection within the design;
- Excavation and hauling of PHC impacted soils to the LTU;
- Treatment and tillage of PHC impacted soils. Demarcation of the impermeable liner is needed to ensure that it is not damaged during treatment. Treatment including nutrients and aeration should be considered to meet the remedial targets;
- Collection and submission of soil analytical samples from the LTU to quantify the level of contamination, nutrient and microbial levels, and determine need for additional treatment; and
- Once the soils are successfully remediated, clean soils will be backfilled into original locations or used as fill for areas across the site. LTU reclamation activities may include grading to promote natural drainage of water, seeding and if required fertilization. The artificial liner will be removed and disposed off-site prior to site closure activities.

This remedial option has been proven to be effective at several other contaminated sites in northern Canada; dependent upon site conditions encountered at each site. This remedial option is anticipated to take between two to five years for remediation of PHC impacted soil, though this can vary depending upon the biodegradation processes occurring within the soils at the Site. A land use permit may be required prior to beginning soil remedial activities and LTU construction. For this remedial option a large volume will have to be transported to Site for remedial activities. Specialized equipment for seaming of the liner may be required. Also large machinery will be required for landfarm construction. All excavations will need to be filled in and/or contoured prior to site closure activities and demobilizing from the Site.

3. Excavation and On-Site Treatment (landfarm treatment unit-On-Site Crusher Aggregate Source): This remedial option is performed following the same steps as option two, however, the source of borrow material for backfill and LTU construction would be produced on-site using a crusher. A crusher, with blasting and drilling equipment would be utilized to produce borrow material (aggregate) from the regional bedrock. This borrow material will be used for backfilling of the excavation(s) and for LTU construction.

The general steps for excavation and construction of a LTU are stated in Option 2, whilst additional steps for borrow development are as follows:

- Perform a geotechnical evaluation to determine the most appropriate crusher locations at the Site, that can be readily accessed by road/trail network. The geotechnical evaluation should consider the proximity of the borrow to the camp, the LTU location and regional geological features;
- Mobilize Equipment to Site via sealift and barge;
- Construct a temporary road and laydown area at the potential crusher location;
- Perform drilling and blasting to develop borrow following all applicable regulations and guidelines;
- Use heavy equipment and a crusher to develop the borrow to the desired grain size for backfilling and LTU construction; and
- Close the borrow source re-contouring/re-grading the area to the natural terrain.

This remedial option is anticipated to be more cost effective and time efficient compared to importing borrow material to the Site. This remedial option is anticipated to take between two to five years for remediation of PHC impacted soil, though this can vary depending upon the biodegradation processes occurring within the soils at the Site. A land use permit may be required prior to beginning soil remedial activities, borrow development and LTU construction. Specialized equipment for seaming of the liner may be required. Also large machinery will be required for LTU construction and borrow source development. All excavations will need to be filled in and/or contoured prior to site closure activities and demobilizing from the Site. Alternatively, with special approval of PWGSC and AANDC, after further community consultation, excavations may be re-graded to remove dangerous slopes but left comparable to the local natural terrain.

4. Excavation and Staged On-Site Treatment (Two Stages of Landfarming):

This remedial option is performed following the same steps as option two, however, it involves two stages (or periods) of soil excavation/treatment, initially removing one half of PHC impacted soil for treatment purposes. This allows for construction of a LTU with a reduced footprint to treat only half of the PHC impacted soil. The reason for this reduced footprint is due to the limited amount of borrow material available on Nottingham Island that is required for the construction of the LTU, coupled with complex logistics and high costs related to importing borrow material from an off-site location. Approximately 2,045 m^3 (2,352 m^3 when including swelling factor) of PHC impacted soil is present at the Site that would require treatment in an on-site LTU, therefore, by only treating half of the PHC impacted soil, this would result in approximately 1020 m^3 (1,200 m^3 when including swelling factor) of PHC impacted soil being initially treated, resulting in an LTU of approximately 4,225 m^2 size required at the Site.

This remedial option is anticipated to take between four to seven years for remediation of PHC impacted soil, though this can vary depending upon the biodegradation processes occurring within the soils at the Site. The remedial timeframe is dependent on the PHC soil concentrations, weather (days above 10°C), and remote access, the Site is anticipated to have a reduced LTU efficiency based upon the conditions encountered during the ESA process. Remedial activities would begin at up-gradient PHC impacted soils between years 1 – 3, whilst PHC impacted soils down-gradient of initially removed PHC impacted soils

would occur during years 4 – 7. Backfilling of open excavations during years 1 – 3 would occur utilizing borrow material either from off-site sources, or on site if additional borrow material is sources during a further geotechnical assessment at the Site. In order to prevent cross-contamination of clean borrow material utilized as backfill material in the first excavation, an impermeable barrier or slurry wall will be constructed to separate the first excavation area from other down-gradient PHC impacted soil areas. This remedial option will result in a reduced amount of borrow material required to be brought to Site.

The general steps for excavation and construction of a LTU are stated in Option 2, whilst additional steps for two stage landfarming are as follows:

- Excavation of PHC impacted soil area is conducted in two stages, the first area for excavation will be the up-gradient PHC impacted soil area, which will then undergo soil treatment until meeting applicable remedial criteria, and then removed from the LTU. Following removal of the first PHC impacted soil area, the second PHC impacted soil area will then be excavated and moved to the LTU for soil treatment, whilst the first PHC impacted soils that are now treated to below applicable remedial criteria will be utilized for backfilling of open excavations at the Site;
- An impermeable wall (bentonite/slurry/liner etc.,) will be required to be constructed from surface down to either bedrock, or permafrost horizon between the excavations, to prevent cross-contamination occurring of PHC impacted soils and clean backfill material; and
- Monitoring of clean fill during the remedial process to ensure cross contamination does not occur.

A two staged landfill follows the same remedial techniques as a single staged landfarm however the effectiveness is dependent upon site conditions encountered at each site. Due to multiple treatment events, the remediation timeframe to closure is anticipated to take between four to seven years. A land use permit may be required prior to beginning soil remedial activities and LTU construction. By reducing the size of the LTU and remediating in two different stages, less borrow is required on site. Specialized equipment for seaming of the liner may be required. All excavations will need to be filled in and/or contoured prior to site closure activities and demobilizing from the Site.

7.5.2 Remedial Option Analysis

Cost of Remediation

Each remedial option has been ranked as following:

- **Lowest Cost**: Off-Site Disposal to an approved Facility (Option 1) is estimated to have the lowest cost approximately $7,500,000. Additional savings (approximately $1,000,000) may be realized for Option 1 if a crusher is brought to Site for aggregate development. Option 3, on-site disposal (LTU) (On-site crusher aggregate source) is anticipated to be the next most cost effective option estimated to cost approximately $7,800,000.
- **Middle Cost**: Two staged landfarming (Option 4), is anticipated to be less cost effective then single stage landfarming due to the increased time on-site and additional years of monitoring and camp costs. The remedial cost is estimated to be approximately $9,000,000 for this option.

- **Highest Cost:** The most costly remedial option is single stage landfarming (Option 2) bringing aggregate material from an off-site source. The costs for this remedial option are very high due to borrow material being required to be brought to Site. The remedial cost is estimated to be approximately $12,000,000.

Effectiveness in Meeting Remedial Goals

Each remedial option has been ranked as following:

- **Most Effective:** Excavate the impacted soil and remove it off site for disposal in an approved off-site licensed disposal facility. This option results in the complete removal of the source and its associated environmental liabilities.
- **Middle:** Single stage landfarming, both Options 2 and 3, follow the same treatment method and are considered to be the next most effective option as PHCs will biodegrade and be chemically broken down over time within a reduced timeframe.
- **Least Effective:** Two Stage landfarming is considered the least effective as the timeframe for remediation is longer than other options. All landfarming options will achieve the remedial targets required for the Site.

Timeframe for Remediation

Each remedial option has been ranked as following:

- **Shortest Timeframe:** Excavate the impacted soil and remove off site for disposal is considered the most time effective, as it is anticipated that this option will require one to two years to complete including off-site transport via barge/ship.
- **Middle:** Single stage landfarming is anticipated to take two to five years until remedial works are completed that meet applicable remedial targets. Option 3, using aggregate material from on-site sources will have a reduced timeframe compared to Option 2. This is due to fewer sealifts and logistical arrangements to get the equipment to Site.
- **Longest Timeframe:** Two Stage landfarming is anticipated to take four to seven years until remedial works are completed that meet applicable remedial targets.

Ease of Implementation

- **Easiest to Implement:** Single stage landfarming using onsite developed aggregate (Option 3) is anticipated to have the greatest ease of implementation. Option 2, single staged landfarming is more difficult to due to additional time and logistical requirements to get imported borrow to Site..
- **Middle:** Off-site removal ton an approved off-site facility, is anticipated to have some difficulty due to the logistical challenges of transporting a large volume of impacted soil from a remote island on Hudson Strait by barge, and to transport the impacted soil to an approved off-site facility.

- **Hardest to Implement:** Full volume landfarming using off-site borrow (Option 2) is anticipated to be the most difficult to implement as the logistical challenges are considerably more difficult due to extra borrow required and staging of extra shipping containers compared to Two Stage Landfarming;

Regulatory Acceptance

Each remedial option has been ranked as following:

- **Greatest Regulatory Acceptance**: Excavate the impacted soil and remove off site for disposal is considered to have greatest regulatory acceptance due to removing fully removing site impacts in a short timeframe from the Site.
- **Middle A**: Single stage landfarming (Option 3) using on-site aggregate from crusher; is anticipated to have regulatory support as native bedrock will be used ensure no invasive species are introduce from off-site aggregate. The logistical challenges having to bring a large volume of soil by sea to the Site will increase the regulatory appeal Option 3. Option 2, landfarming is anticipated to have regulatory acceptance, however a large volume of non-native soil is required to be brought to Site and has a large amount of logistical challenges to be overcome for this remedial option to work.
- **Lowest Regulatory Acceptance**: Two Stage Landfarming is anticipated to have the lowest level of regulatory support as remediation is anticipated to have an extended time period; as well further visitation is required at the Site.

Community Support

Each remedial option has been ranked as following:

- **Greatest Community Support:** Excavate the impacted soil and remove off site for disposal is considered to have the greatest community acceptance due to removing fully removing site impacts in a short timeframe from the Site.
- **Middle:** Two Stage Landfarming is anticipated to have community support as this remedial option as this remedial option would have greater economic effects for the community.
- **Lowest Community Support:** Full volume landfarming, both Options 2 and 3,are anticipated to have the lowest level of community support as the economic benefits are not as great as staged landfarming, however community support is anticipated for all landfarming options.

Preferred Remedial Option:

Based upon the remedial option assessment, off-site disposal at an approved disposal facility is the preferred remedial option. An additional $1,000,000 may be saved if a crusher is utilized for backfill for this option making off-site disposal the most economically viable option. Off-site disposal is more effective removing all impacted soils from the Site, it has the shortest timeframe, and is anticipated to be met with the greatest level of regulatory and community support.

The following are potential issues with disposing of the PHCs at an approved off-site facility:

- Special approval from AANDC and PWGSC, after further community discussion, should be considered regarding backfilling excavations; this may further reduce the need for aggregate and reduce the

overall cost for this remedial option. All excavations should be sloped to the natural terrain to ensure safety if this alternate option is adopted;

- All of the PHC impacted soil should be acceptable for disposal in a licensed disposal facility subject to landfill characterization. Waste manifests, and off-site landfill approval is required before removing the PHC impacted soil from the property, as per the Government of Nunavut waste transfer guidelines defined in the Contaminated Site Remediation Guidelines (GN 2009)
- Proper containment for sea transport is needed to cross Hudson's Bay which is known to have significant adverse weather events;
- Impacted soil should be handled properly, following GN and other federal guidelines (regardless of remedial option); and
- There will be additional logistical planning associated with transporting the required material and equipment to Site.

7.6 Metal Impacted Soil

Based on the findings of the Phase III ESA (EBA 2012) there is an estimated 143 m^3 of metal impacted soil at the Site. Remedial Targets for all metals are defined in Appendix B. Figure E1 to E4 shows the metal impacted soil volumes; all analytical results are provided in Appendix C. Table F summarizes the volume of metal impacted soil by AEC.

Table F: Metal Impacted Soil Volumes

AEC	Sampling Point	Exceedance	Surface Area (m^2)	Vertical depth of Impact (mbgs)	Volume of Metal Impacted Soil (m^3)
AEC 1	SB029-SS-049 WESA	Cd	117	0.5	59
	SB029-SS-050 WESA	Cd, Sn			
AEC 4	2012-SB-40	Se	28	0.5	14
	SB029-SS-065 WESA	Ba,Cu,Sn,Pb,Se, Zn			
AEC 6	SB029-SS-067 WESA	Se	2	0.5	1
AEC 9	2012-SB-22	Sn	7	0.5	4
	SB029-SS-056 WESA	Sn	8	0.5	4
	SB029-SS-057 WESA	Cu, Sn	33	0.5	17
AEC 10	SB029-SS-042	Sn	5	0.5	3
AEC 13	2012-SB-3	Sn, Pb	29	0.5	15
	2012-SB-4	Sn			
	SB0290SS-030 WESA	Pb, Se, and Sn			
AEC 18	SB029-SS-048 WESA	Ba,Cd,Cu,Sn, Mo,Ni,Pb,Se,Zn, Sb	10	0.5	5
AEC 16	2012-SB-2	Pb	33	0.5	17
	2012-SB-54	Sn	5	0.5	3
AEC 21	SB029-SS-071 WESA	Ba,Sn	2	0.5	1
	Total Volume of Metal Impacted Soil				**143 m^3**
	Total Volume of Metal Impacted Soil with 15% Contingence				**165 m^3**

1. **Note:** Due to swelling of soils following excavation, a 15 % contingency has been added to the metal impacted soil volume.

7.6.1 Potential Remedial Options

The 143 m^3 of metal impacted soil (165 m^3 with soil swelling) have been classified as DCC Tier II metals according to the AMSRP. Based upon recommendations of the geotechnical investigation it was determined there was not enough borrow material available to build a landfill on site for remediation of metal impacted soil at the Site. Therefore, landfilling on site is not an available remedial option, leaving off-site disposal as the only acceptable option for metal impacted soil at the Site.

1. **Excavate and Remove Off-Site (approved disposal facility):** The metal impacted soil would be consolidated for transport from the site to an approved off-site licensed disposal facility. The metal impacted soil would need to be placed into bulk transport containers after excavation so that they are able to be handled when it is time for shipping. The steps are as follows:
   - Excavate metal impacted soil from specified areas and package for transport off site;
   - Haul metal impacted soil to the staging area;

- Metal impacted soil would be loaded onto a barge or sealift and moved off-site to Churchill MB, or Valleyfield QU. The metal impacted soil would then be transported to a licensed disposal facility with appropriate waste manifests and landfill approvals; and
- Backfilling of open excavations with borrow material would occur, followed by re-contouring and re-vegetation, as required, in the relevant areas of excavation.

This remedial option requires several barges/ships to mobilize and land various remedial equipment and supplies to the Site, so that the remedial work can be completed. Heavy equipment would be required for movement of soil to the staging area for off-site disposal. Metal impacted soil would then be barged/sealifted from the Site to an off-site disposal facility. All equipment for remediation would be transported via barge/sealift to the Site. Significant costs are anticipated with this remedial option.

The following are potential issues with removing the metal impacted soil off site:

- All of the metal impacted soil should be acceptable for disposal in a licensed disposal facility subject to landfill characterization. Waste manifests, and off-site landfill approval is required before removing the metal impacted soil from the property, as per the Government of Nunavut waste transfer guidelines defined in the Contaminated Site Remediation Guidelines (GN 2009);
- The metal impacted soil should be handled properly, following GN/ other federal guidelines; and
- The metal impacted soil should be packaged properly for transport, following TDG Regulations.

7.7 Co-contaminated Soil

Based upon the findings of the Phase III ESA (EBA 2012) there is an estimated volume of 216 m^3 (248 m^3 with soil swelling) of co-contaminated soil containing PHC and metals at the Site. These soil volumes are based upon the AMSRP and CCME guidelines; remedial targets are given in Appendix B. AEC specific sample results are provided in Appendix C. Areas of Co-contaminated soil are shown in Figures E1 to E4. Table G summarizes the AECs with Co-contaminated soil and the soil volumes.

Table G: Co-contaminated Soil Volumes

AEC ID	Soil Samples resulting in Co-contamination	Parameters Exceeding Guidelines	Within 30 m of Water body	Surface Area (m^2)	Vertical depth of Impact (mbgs)	Volume of Co-contaminated Soil (m^3)
AEC 3	SB029-SB-62 WESA	Type B, Cu, Sn, Pb, Se, Zn	No	42.1	0.5	21
	2012-SB-44	Ethylbenzene, Type B, Cu				
AEC 4	SB029-SS-065 WESA	Type B, Ba, Cu, Sn, Pb, Sn, Zn	No	22	0.5	11.5
	2012-SB-41	Type B, Se				
AEC 11/12 and Pipeline	SB029-SS-039 WESA	Pb/Zn (not analyzed for PHCs by WESA)	No	352.5	0.5	176
	2012-SB-63	Benzene, Type B, Pb, Zn				
	SB029-SS-031 WESA	Type B, Pb				
	SB029-SS-035 WESA	Benzene, Toluene, Ethylbenzene, Pb, Se, Zn				
	SB029-SS-038 WESA	Benzene, Sn, Pb, Se				
AEC 13	2012-SB-030	Sn, Pb, Se	No	14	0.5	7
	2012-SB-03	Sn, Pb				
	2012-SB-04	Benzene				
Total Volume of Co-contaminated Soil						**216 m^3**
Total Volume of Co-contaminated Soil with 15% Contingency						**248 m^3**

1. **Note:** Due to the swelling of following excavation, a 15% contingency has been added to the co-contaminated soil volume.

7.7.1 Potential Remedial Options

The 216 m^3 of Co-contaminated soil (248 m^3 with soil swelling) have been classified according to the AMSRP. Based upon the recommendations of the geotechnical investigation it was determined that there was not enough borrow material available to build a landfill on site. Therefore, landfilling on site is not a remedial option, leaving off-site disposal as the only acceptable option for Co-contaminated impacted soils.

Remove Off Site: The Co-contaminated soil could be consolidated for transport from the site to a licensed disposal facility. The Co-contaminated soil would need to be placed into bulk transport containers following excavation so that they are able to be handled when it is time for shipping. The steps are as follows:

- Excavate Co-contaminated soil from specified areas and package for transport;

- Haul Co-contaminated soil to staging area;
- Co-contaminated soil would be loaded onto a barge or sealift and moved off-site to Churchill MB, or Valleyfield QU. The Co-contaminated soil would then be transported to a licensed disposal facility with appropriate waste manifests and landfill approvals; and
- Backfilling of open excavations with borrow material would occur, followed by re-contouring and re-vegetation, as required in the relevant areas of excavation.

This remedial option requires several barges/ships to mobilize and land various remedial equipment and supplies to the Site, so that the remedial work can be completed. Heavy equipment to move Co-contaminated soil from the site would be required. Co-contaminated soil would be barged/sealifted from the Site to port for transport to a disposal facility. All equipment for remediation would be transported via barge/sealift to the Site. Significant costs are anticipated with this remedial option.

The following are potential issues with removing the Co-contaminated soil off site:

- All of the Co-contaminated soil should be acceptable for disposal in a licensed disposal facility subject to landfill characterization. Waste manifests, and off-site landfill approval is required before removing the Co-contaminated soil from the property (GN 2009); and
- The Co-contaminated soil will be handled properly, following GN and other federal guidelines.

7.8 Surface Water

As part of the Phase III ESA (EBA 2012) various surface water bodies were assessed at the Site for the presence of potential impacts due to Site activities. Based upon the finding of the ESA, there is the potential for for surface water exceedances to be due to naturally elevated background conditions. This is likely due to the local bedrock geological conditions encountered at the Site. The site is composed of a thin soil veneer overlying bedrock. The findings in the ESA were based upon a limited data set from separate sampling events. Further assessment is needed to determine if the surface water is impacted from Site activities or is naturally occurring. For the RAP surface water exceedances are presented in Table H that is based upon a limited data set.

Table H: Surface Water Exceedance Summary

AEC	Sampling Point	Exceedance
2	2012-SW-02	Total Cu
9	SB029-SW-59	Total Al, Cu, Pb, Se
12	2012-SW-09	Total Zn, Dissolve Ag, Zn
	SB029-SW-034	Detectable PCBs
14	SB029-SW-055	Total Al, Cu, Fe
16	2012-SW-06	F, Total Al, Fe
17	SB029-SW-044	Detectable PCBs
19	2012-SW-03	F
	2012-SW-04	F, Dissolved Se
	2012-SW-05	F, Detectable PCBs
21	2012-SW-01	Total Al, Cu Dissolved Al
	SB029-SW-072	F, Total Al, Cu, Fe
24	SB029-SW-074	Cl
25	2012-SW-14	Total Fe
	SB029-SW-075	Cl

7.8.1 Further Assessment and Monitoring

Further surface water sampling and monitoring is required to determine if surface water exceedances are related to site activities or are due to naturally elevated background conditions, due to the regional geological and hydrological conditions at the Site. The analysis should build upon the previously conducted data set established in the Phase III ESA.

Monitoring as stated in the AMSRP should be performed during and following completion of remedial activities to identify and determine potential trends in surface water concentrations at the site. Water samples should be collected from the surficial pools and lakes with results/recommendations to be reported as per the conditions of the relevant license agreement. The Steps are as follows:

- Continue and carry out the surface water sampling program at the site, identifying sampling points to establish a baseline for water conditions at the site; and,
- Establish sampling stations that are representative of the Site and include the major drainage features (both up-gradient and down-gradient), surface pooling, surrounding lakes and Hudson Strait;

In the event that surface water is determined to be due to naturally elevated background conditions during the remedial phase of the project no further sampling is required post-closure of the Site.

7.9 Physical Hazards

Physical hazards are considered to be man-made structures and other features that could constitute a risk to humans. There are four physical hazards that exist: 1.) Buildings and towers that are on site that are dilapidated and present a risk of collapse or have weathered floors and ceilings (the old kitchen, chicken coop, and house have weathered floors and openings); 2.) Steep cliffs and rock outcrops throughout the site; 3.) Six debris areas and scattered debris that will have to be removed (e.g., nails, broken glass, and

other sharp objects); and 4.) Wires, cables, and other items that create a tripping hazard are throughout the Site.

Demolishing towers and buildings will remove this hazard. One metal tower and four wood towers are intact. Thirteen buildings on site are intact and will require demolition prior to removal these are: Storage Shed 01, Old Kitchen, New Radio Building, Old Radio Building, Outhouse, Storage Shed 02, Storage Building, Chicken Coop, Bunkhouse, Generator Building, House and Garage, Shed, and House in AECs 1-13. However, hazardous wastes should be removed in all buildings before demolition can occur. Some buildings may need to be safe and reinforced as necessary, to allow personnel to conduct asbestos abatement and hazardous waste removal prior to demolition.

A specific safety plan will be completed for handling hazardous materials, re-enforcing buildings, removal of debris that is located on or near steep slopes, sorting of material in the debris areas and avoiding slips, trips and falls due to unearthed cables. This will include, but not be limited to type and placement of equipment and proper safety gear for people working in these areas.

8.0 RECOMMENDED REMEDIAL OPTIONS

8.1 Summary

EBA proposes that most non-hazardous waste and hazardous waste be removed off site (with the exception of burnable wood and some liquids). On-site landfill construction is not possible, as discussed in Section 9.0

Organic liquids and aqueous liquids will be transported off site to an approved off-site facility.

Impacted soil (PHCs, metal and co-contaminated) will be removed from Site and disposed/treated in an approved off-site facility. A summary of proposed recommended options for this site is provided in Table I:

Table I: Summary of Recommended Remedial Options

Waste Stream	Description	Suggessted Remedial Option
Unpainted Wood Waste: Non-Hazardous	Wood waste can be dealt with by controlled burning on-site or off-site disposal to an approved facility	Control burn on site
Other Waste: Non-Hazardous	Non-hazardous solid waste will need to be separated, cleaned as necessary, compacted and removed off site	Remove to an approved off site facility
Liquid Organic Wastes in above-ground storage tanks (ASTs): Hazardous	Organic liquid waste will be incinerated on-site in the event that it meets the DLCP Barrel Protocol. Organic liquid that does not meet the analytical requirements of the DLCP will be removed off-site to an approved off-site facility.	Remove off site and/or incinerate on site
Aqueous Content in Drums	The aqueous content will be removed off-site to an approved off-site facility	Remove off site to an approved licensed facility

Table I: Summary of Recommended Remedial Options

Waste Stream	Description	Suggessted Remedial Option
Asbestos Waste: Hazardous	Asbestos waste will be handled by trained personnel and removed off-site to an approved off-site facility	Remove off site to an approved licensed facility
Total Lead and Leachable Lead Paint on waste: Hazardous	Lead painted waste will be stripped and handled by trained personnel. The painted substrate will be removed from site to an approved off-site facility	Remove off site to an approved licensed facility
Total Lead Paint on ASTs: Hazardous	Lead painted ASTs will remain intact and will be removed to an approved off-site facility	Remove off site to an approved licensed facility
Total Lead and Leachable Lead Paint on Asbestos Panels: Hazardous	Lead painted and asbestos panels and tiles will be handled by trained personnel and removed to an approved off-site facilty	Remove off site to an approved licensed facility
Compressed Gas Cylinders: Hazardous	Depressurize, crush and remove from Site to an approved off-site facility. Known contents that cannot be safely depressurized will be shipped offsite in an approved TDG container, following shipping company, and receiving facility approval	Evacuate and remove off site to an approved licensed facility
Fire Extinguishers: Hazardous	Depressurize, crush and remove off site. Known contents that cannot be safely depressurized will be shipped offsite in an approved TDG container, following shipping company, and receiving facility approval	Evacuate and remove off site to an approved licensed facility
Creosote Treated Wood: Hazardous	Creosote treated wood will be containerized according to TDG transport regulations and removed to an approved off-site facility	Remove off site to an approved licensed facility
Other Hazardous Waste	Miscellaneous solid hazardous waste (batteries, mercury in fluorescent lights, mercury, polychlorinated biphenols [PCB] light ballasts, PCBs, and lead solder in electrical components) and 501 L of miscellaneous equipment contents (anti-freeze, oil, fuel, and other vehicle fluids) are required to be removed to an approved off-site facility	Remove off site to an approved licensed facility

Table I: Summary of Recommended Remedial Options

Waste Stream	Description	Suggessted Remedial Option
PHC- Impacted Soil	Excavate impacted areas and remove to an approved offsite facility will require waste characterization	Remove off site to an approved licensed facility
Metal - Impacted Soil	Excavate impacted areas and remove off-site to an approved offsite facility will require waste characterization	Remove off site to an approved licensed facility
Co-contaminated - Soil	Remove off-site to an approved landfill, will require waste characterization	Remove off site to an approved licensed facility
Water	Develop a monitoring and sampling program to determine if surface water exceedances are due to site activities or naturally elevated conditions at the Site	Monitoring
Physical Hazards	Each hazard will need to be identified and properly mitigated prior to work commencing. Proper personal protective equipment to be worn at all times.	Remove all metal towers and buildings to an approved off-site facility, and develop site-specific safety plans

Recommendations for each of these waste streams are discussed further in the subsequent sections.

8.2 Non-Hazardous Waste

For **non-hazardous wood waste** at the Site, EBA recommends the following steps be taken:

- Remove all hazardous materials from the buildings on site. Asbestos abatement and handling should be conducted by trained professionals following safe work procedures;
- Remove all non-wood waste and move to the staging area for transport off site;
- Demolish buildings, photograph, and document;
- Remove wood to an area, ideally where there is sparse to no vegetation; and
- Conduct a controlled burn within an approved container, under careful supervision, and at a time of year when moisture conditions are higher and there is a low likelihood of causing a tundra fire. Fire suppression equipment should be at hand when the controlled burn takes place and air monitoring should be conducted. Conduct the burn according to the applicable guideline (GN 2012).

For **other solid non-hazardous waste** at the Site, EBA recommends the following:

- Conduct the separation of non-hazardous materials from buildings and removal from debris areas;
- Clean drums and ASTs and remove residual fluids/fuels from machinery;
- Cut up the ASTs; crush the metal debris, drums and machinery; and

- Haul materials to the staging area for transport off site.

8.3 Hazardous Waste

For **asbestos waste** at the Site, EBA recommends the following:

- Follow appropriate work procedures as outlined in *Alberta Asbestos Abatement Manual* (GA 2012) when the risk level has been identified, i.e., low risk, moderate risk, or high risk;
- Mould impacts were observed on the floor and walls in the Old Radio Building (AEC 4) and the Chicken Coop (AEC 8) and in the attic of the House (AEC 13). Most of these materials will already be within containment, due to the asbestos abatement, but the proper mould work procedures and personal protection equipment (PPE) shall be adhered to with or without the asbestos containment (GA 2009);
- Abate ACM at the sites using trained abatement workers utilizing the appropriate risk level, according to applicable asbestos guidelines;
- ACMs must be wetted and double bagged in approved asbestos disposal bags and sealed with duct tape. The exterior of the bags must be cleaned with a damp cloth or HEPA vacuum prior to removing from work area;
- Haul materials to staging area and transport off site, according to the applicable guideline (GN 2011a); and
- Conduct the required inspections and air monitoring during and post abatement. Ensure asbestos removal has been completed in full, prior to any demolition being carried out.

For **aqueous liquid wastes in ASTs** at the Site, EBA recommends the following:

- Consolidate aqueous liquid waste into containers for marine transport (following TDG 1992); and
- Remove the waste to an off-site facility for hazardous waste (following TDG 1992, GC 2006).

For **organic liquid wastes in ASTs** at the Site, EBA recommends the following:

- Incineration on site following approved procedures for all wastes that cannot be removed off site;
- Complete air quality monitoring while this process is occurring, for predetermined parameters according to the applicable guideline (GN 2012); and
- Analyze the remaining ash to classify the waste for off-site transport and approved off-site facility for disposal.

For **total and leachable lead paint on waste** at the Site, EBA recommends the following:

- Separate the particulate boards, wood, metal, equipment, and generators from buildings and debris areas and place the materials in one area;
- Drain any remaining fuel/fluids from the equipment (note liquid from cleaning activities would need to be treated/tested for disposal);
- Dismantle, cut apart, crush, and compact materials, if possible, without removing the paint;

- Sample the surrounding soil to determine that the paint did not contaminate the soil; and
- Wrap the painted substrates intact with 6 mil polyethylene sheets and remove, along with the lead paint chips generated from disturbing the paint to an off-site facility for hazardous waste (following TDG 1992, GC 2006).

For **total and leachable lead paint on AST** at the Site, EBA recommends the following:

- Haul the two ASTs to the staging area for transport off-site; and
- Dispose of the ASTs in a licensed disposal facility for hazardous waste (following TDG 1992, GC 2006).

For **leachable lead paint on drums** at the Site, EBA recommends the following:

- Clean the inside and crush the drums; and
- Remove to an off-site licensed disposal facility for hazardous waste (following TDG 1992, GC 2006).

For **total and leachable lead paint on asbestos** panels, EBA recommends the following:

- Conduct removal of asbestos waste materials from the building or substrate following safe work procedures as per applicable regulations. Asbestos and lead-painted waste is handled and removed by trained personnel and properly bagged; and
- Haul to staging area for removal to an off-site landfill (following TDG 1992, GC 2006).

For **compressed gas cylinders and fire extinguishers** at the Site, EBA recommends the following:

- A specialist to vent the known or unknown contents on site;
- Haul to the staging area for transport off site; and
- Known contents that cannot be safely vented on-site (containing ODS) will be removed in an approved container as per TDG by air regulations to an off-site licensed disposal facility for hazardous waste (following TDG 1992, GC 2006).

For **creosote treated wood** at the Site, EBA recommends the following:

- Conduct the separation of creosote treated wood from buildings and removal from debris areas;
- Wrap the wood securely in 6 mil polyethylene sheets; and
- Haul materials to the staging area for transport off site.

For **other solid and liquid hazardous waste** at the Site, EBA recommends the following:

- Collect solid and liquid hazardous waste and remove to an off-site licensed disposal facility for hazardous waste (following TDG 1992, GC 2006).

8.4 Petroleum Hydrocarbons Impacted Soil

For remediation of PHC impacted soil at the Site, EBA recommends the following:

- Excavate all PHC impacted soils and dispose of in an approved off-site disposal facility;

- Conduct confirmatory sampling of base and walls of open excavations/adjacent soil boundaries to ensure all PHC impacted soil has been removed; and
- Backfill open excavation and re-grade/re-vegetate relevant areas to pre-remedial conditions.

8.5 Metal Impacted Soil

For remediation of metal-impacted soils at the Site, EBA recommends the following:

- Excavate all metal impacted soil;
- Conduct confirmatory sampling of base and walls of open excavations/adjacent soil boundaries to ensure all metal impacted soil has been removed;
- Backfill open excavation and re-grade/re-vegetate relevant areas to pre-remedial conditions; and
- Metal impacted soil is removed off-site to a licensed disposal facility.

8.6 Co-Contaminated Soil

For remediation of co-contaminated soils at the Site, EBA recommends the following:

- Excavate all Co-contaminated soil;
- Conduct confirmatory sampling of base and walls of open excavations/adjacent soil boundaries to ensure all Co-contaminated soil has been removed;
- Backfill open excavation and re-grade/re-vegetate relevant areas to pre-remedial conditions; and
- Co-contaminated soil is removed off site to a licensed disposal facility.

8.7 Water

For the impacted surface water at the Site, EBA recommends the following:

- Continue to carry out surface water monitoring at the Site during remedial activities to determine if surface water is naturally occurring or impacted from Site activities.

9.0 GEOTECHNICAL CONSIDERATIONS

9.1 Introduction

The findings of the geotechnical investigation at the Site are described in the Phase III ESA (EBA 2012). This section summarizes the geotechnical results and provides recommendations for development of borrow sources, and construction of a potential landfill and LTU facility, in the event that alternate remedial options are considered for the waste streams at the Site. Figure G-2 shows the locations of available borrow sources, and the LTU location recommended in the Phase III ESA. Figure G-3 shows design options for the LTU. Figure G-4 shows areas of potential borrow material identified from the Phase III ESA and from desktop study after the fieldwork. The lab test results are presented in Appendix E, along with Table G1 summarizing the test pits, collected samples and geotechnical lab test results.

9.2 Borrow Sources

Site remediation of impacted soils at the site requires granular materials for: 1.) Construction of a landfill for disposal of non-hazardous material; 2.) Construction of a LTU for treatment of approximately 2,400 m3 of PHC impacted soil; 3.) Backfilling of excavated impacted soil areas; and 4.) Maintenance and upgrading of site access roads, camp, and staging area as required by the selected contractor. Only three potential borrow sources were investigated during the 2012 field program – Borrow A, B, and C. A description of the three borrow sources is presented in the Phase III ESA (EBA 2012).

Although Borrow C contains about 75% of the granular material identified, development of this source would require about a 3.0 km haul/access road to be constructed over generally poorly-drained terrain (glaciomarine and organic deposits). Constructing a road to access Borrow C is not considered to be a viable option given its distance away from Site. Based upon the remedial options identified, and the potential of developing an aggregate source from the surrounding bedrock, Borrow C is not recommended for development. The locations of Borrow A and Borrow B are shown on Figure G2, and are summarized in Table J.

Borrow A - Borrow A is a stockpile of gravel leftover from site operations, and is located approximately 200 m east of the Site (Figure G2). The stockpile is well-defined and approximately 150 m^2; 10 m wide, 15 m long, and rises about 2 m above the adjacent terrain to the north (Photos G1 and G2). Assuming an average excavation depth of 1.0 m, Borrow A could contain approximately 150 m^3 of material. The single test pit excavated at the source contained fine to coarse angular gneissic gravel (86%), with some sand (Appendix E). The material was angular, well-drained, and uniform to the depth of test pit (0.3 m). There were 30% to 40% angular cobbles and small boulders (<0.5 m) on the surface, but was not encountered in the test pit. Unlike other surficial material observed during the site assessment, the material in Borrow A was un-weathered and only sparsely colonized by lichen. This suggests that the clasts have been fractured recently, possibly produced by crusher when the weather station was operational. A haul road would need to be constructed to access Borrow A. Although the quantity of material in Borrow A is limited, it is close to the Site and is therefore recommended for development.

Borrow B - Borrow B is located approximately 500 m east of the Site and about 100 m north of an existing trail (Figure G2). The borrow source lies between the eastern end of the bedrock ridge, and a small mound of large boulders (Photos G3 and G4). The borrow source forms a bench that slopes moderately to the north and to the south, and is approximately 15% covered with small boulders (<0.5 m). The source is well-defined laterally and is approximately 1,800 m^2 in area; 30 m wide, 60 m long, and rises about 2 m above the adjacent terrain. Assuming an excavation depth of only 0.3 m, then Borrow B was estimated to contain approximately 540 m^3 of material. Two test pits were excavated to depths of 0.4 m and composite samples were collected from the side walls (TP13_S09 and TP14_S10). The test pits contained about 30% gravel and 70% sand with a trace of fines (Appendix E). The gravel was sub angular, and the material was well-drained, and uniform with depth. About 30% to 40% (by visual assessment) of the sand-sized particles were calcareous marine shell fragments (Photo G5). This source is believed to contain a greater volume of material at depth and perhaps additional material in the surrounding area. A haul road would need to be constructed to access Borrow B. Based on this information Borrow B is recommended for development.

9.3 Borrow Material Summary

Based upon the preferred remedial options identified for the Site about 2,400 m^3 of granular material is required to backfill excavated areas, and additional granular material is required for road construction and maintenance. In the event that a LTU is adopted for PHC remediation, approximately 7000 m^3 of granular materials are required for construction. Approximately 700 m^3 of granular material appears to be available from Borrow A and Borrow B based on shallow hand-excavated test pits. It is important to note that the materials observed in the shallow hand dug test pits may extend deeper than the depths assumed in this report, consequently additional material volumes may be available. However, sufficient borrow material has not yet been identified for the site. Table J provides a summary of identified borrow sources:

Table J: Summary of Borrow Sources Recommended for Development at the Site

Borrow Source	Estimated Quantity	Material Description	Notes
Borrow A	150 m^3	Gravel with some sand	– - Stockpiled material left over from site operations – - Angular material possibly produced by crusher – - Located 200 m from Site – - Haul road required – - Recommended for development
Borrow B	540 m^3	Gravelly sand with a trace of fines and 30% to 40% calcareous material	– - Poor quality material with calcareous fragments – - May contain more than 540 m^3 of material – - Located 200 m from Site – - Haul road required – - Recommended for development

9.4 Potential Non-Hazardous Landfill

As part of the geotechnical investigation, the option to dispose of non-hazardous material on site in a landfill was assessed. An appropriate location close to the Site and approximately 1,800 m^3 of high quality well-graded sand and gravel is required to construct a landfill to dispose of the non-hazardous waste at the site. PLLB was identified in the ESA Phase III report and judged suitable for construction of a landfill disposal facility. The volume and quality of borrow material required to construct a landfill was not identified during the 2012 field program, therefore, construction of a landfill is not recommended due to insufficient borrow materials present at the Site. If additional borrow sources are identified, the material within these sources likely contains a high volume of shell fragments which compromises the strength of the material, making it unacceptable for the construction of a landfill.

9.5 Potential Landfarm Treatment Unit for Petroleum Hydrocarbons Impacted Soil

Soils containing PHC impacted material in excess of AMSRP standards have been recommended to be disposed of in an approved off-site licensed facility. In the event that an LTU is adopted for remediation, the basic requirements are discussed in the subsequent sections. Landfarming is an effective and simple method for remediating PHC impacted soil and is a practical option for many remote or northern contaminated sites.

9.5.1 General

Landfarms are above ground facilities constructed for remediating contaminated soils through aeration and biological processes. PHC impacted soil is spread in a thin layer (approximately 0.3 m to 0.5 m thick), and is then periodically tilled, together with other factors, to stimulate aerobic microbial activity. Soil that will be contained in the LTU at the Site would include PHC impacted soil fractions F1 to F3, as defined in the Canada-Wide Standard (CWS) for Petroleum Hydrocarbons in Soil (CCME 2008). The LTU design would ensure that measures would be taken to divert potential upstream surface water drainage away from the LTU area. Such measures would include, but not be limited to, drainage trenches or channels that would have enough capacity to address a typical rainfall, active layer melt events, or significant amount of snow. Surface water originating from the treatment area would be made to accumulate in one area, via a

catchment sump, that would be constructed downgrade of the treatment area. Consequently, upon commencement of landfarming, surface water accumulating within the catchment sump would be available for periodic laboratory testing to verify acceptably low concentrations of PHCs. It is also recommended that a synthetic liner is installed beneath the sump area, for environmental protective measures.

9.5.2 Landfarm Treatment Unit Location

Potential Landfarm Area B (PLAB) was assessed for potential landfarm location as shown in Figure G2, and is considered an acceptable location for a landfarm facility. A detailed description of PLAB is presented in the Phase III ESA (EBA 2012). PLAB is located approximately 300 m east of the Site (Figure G2), and lies on and directly south of the trail and is easily accessed. Photos G6 and G10 show the PLAB site, and Figure G3 shows the location and direction that the photos were taken.

EBA excavated two test pits to a depth of 0.3 m, and collected composite samples from the side walls (TP15_S11 and TP16_S12). The test pits contained 60% to 70% sand, 25% to 35% gravel, and a trace (5%) fine-grained material (Appendix E). The gravel was sub angular, and the material was moist, and uniform with depth. There were some large boulders, about 1 m in size, on the surface and embedded in the surface. The material is glaciomarine in origin and its composition is expected to vary over the area and with depth. Frost-jacking of cobbles and mud-boils were observed in some areas, which suggests that the surface material is frost-susceptible and that ice-rich permafrost may be present at the base of the active layer. A cut/fill approach is not recommended for this location because it lies on permafrost which may be sensitive to disturbance.

PLAB is open and slopes gently (3% to 5%) to the southwest towards the coast. Although the area is relatively flat, undulating micro topography (less than 1.0 m) throughout the area affects the site drainage, which causes changes in surface moisture conditions and vegetation. At the time of the 2012 field program, the elevated areas were dry and had only a sparse lichen cover, while the surrounding low-lying areas were moist and covered in mosses and dwarf vascular plants. There was no standing water in the area identified for the LTU, but thermokarst ponds were observed east of the area identified for the LTU.

The area identified in the Phase III ESA for PLAB is approximately 4500 m2; 45 m wide and 100 m long. The area could be expanded up to 30 m to the north and 100 m to the east as shown on Figure G2. A landfarm with a total footprint including the berms of 9,200 m^2 could be placed in the expanded area. The expanded area should be assessed for site drainage prior to construction.

9.5.3 Landfarm Treatment Unit Design

A LTU facility for the treatment of approximately 2,400 m^3 of PHC impacted soil would require a total footprint (including the berms) of 9,200 m^2. The LTU will have 0.8 m-high berms with 3H:1V inside and outside side slopes, and 1 m wide crest. The LTU will be a lined facility using a 60 mil high density polyethylene (HDPE) geomembrane protected on either side with a non-woven geotextile. After the 60 mil HDPE and non-woven geotextile is installed within, then granular fill material should be placed overtop to protect the liner system from tilling or turning events during nutrient application. It is recommended that a layer of burlap or equivalent material be placed over the sand bedding to provide demarcation between the PHC impacted soil and bedding material.

9.5.4 Granular Material Requirements for Landfarm Treatment Unit

To construct a LTU facility for the treatment of approximately 2,400 m^3 of PHC impacted soil would require about 6,200 m^3 of granular material for: 0.3 m of grading and leveling, construction of berms, and 0.3 m demarcation (cover) layer between the liner system and the PHC impacted soil. The LTU can be built with the borrow material found in Borrow B. Although the quality of this material is inadequate for the construction of a permanent landfill, it should be acceptable for constructing a temporary LTU facility.

The amount of available borrow material identified during the site investigation (about 700 m^3) is insufficient to build the required LTU (6,200 m^3). There are several options available to address the lack of available borrow:

1. **Additional assessment of identified sources.** As stated in Section 9.2, Borrow A and Borrow B may contain additional material that could be confirmed using an excavator.
2. **Investigate additional borrow sources.** The 2012 field program was limited to two days due to time constraints, therefore, all potential borrow sources close to the Site were not investigated. EBA has presented these probable sources of borrow material on Figure G4. Based on field observations and air photo interpretation these borrow sources probably contain material similar to that encountered in Borrow B. A geotechnical investigation update should be conducted to assess and confirm that the quality and quantity of this material is adequate to construct a temporary LTU facility.
3. **Produce granular material.** The required granular material could be produced by drilling/blasting/crushing of quarry rock. Exposed bedrock for a quarry is abundant at the Site and this process was probably used to produce the material found in Borrow A.
4. **Mobilize granular material to site.** The required granular material could be shipped to site if all other options were exhausted.

10.0 SITE REQUIREMENTS FOR REMEDIATION

A camp and other temporary site facilities will need to be constructed as part of the remedial work program, with a large amount of supplies and equipment needing to be brought to Site.

10.1 Drinking Water Assessment

Based upon the findings in the Phase III ESA further assessment of the potential potable water sources are needed to ensure the water meets Canadian drinking water quality (CDWQ) guidelines. A detailed study for bacteria (faecal and total coliforms with *E.coli*) is required prior to determining a water source. Based upon the analytical data, found in Appendix C, there are metal and ion exceedances. Based upon this information a potable water treatment system and polishing unit capable of supporting camp activities is recommended. Drinking water should also be brought to Site in the event that a failure occurs in the potable water treatment system. Possible raw water locations for a potable water supply include Lake 1, Lake 2, and Lake 4.

10.2 Camp

For the remediation at Nottingham Island, a camp will need to be set up sufficient distance away from the Site to ensure workers are not affected by hazards and contamination. There are two options available for camp locations; 1.) Ship Off-shore; 2.) On-site camp, three areas were identified as potential locations for construction and workers camps (Figure G-1). The camp will need to house workers and will need to meet the specifications laid out by PWGSC and Workers Safety and Compensation Committee. Facilities that will be required include the following:

- Sleeping quarters;
- Office (also contains communications area);
- Kitchen and dining area;
- Bathroom and showers;
- Laundry facilities;
- First aid facilities (may depend on the number of workers);
- Sewage lagoon or water treatment system;
- Incinerator;
- Mechanics and equipment area that would also have a petroleum and lube containment area, tanks and drums;
- Water supply and pumps;
- Diesel powered generator and back-up; and
- Emergency shelter.

10.3 Expected Contracting Equipment Necessary for Site

Anticipated equipment needs for this project are:

- Excavator(s) to remove impacted soils for treatment and for use in trail and/or road improvements;
- Front end loader(s) to consolidate materials and for trail and or road improvements;
- Haul truck(s) to move materials to staging and treatment areas;
- Rock drill(s) and blast mats for blasting bedrock source material;
- Crusher(s) to develop on-site aggregate material;
- Waste incinerator(s) (both for the camp waste and for incineration of certain materials currently located on site);
- Aqueous liquid waste treatment system to treat aqueous liquids for on-site disposal;
- Dozer (s) to be used for LTU construction and road improvements;

- Smooth drum compactor for LTU construction;
- Water truck to haul water to camp if required or for dust suppression;
- Waste compactor;
- Drum crusher;
- All-terrain vehicle (s) with trailers;
- Packer to ensure compaction is appropriate with the natural terrain;
- Ice runway (flooding equipment);
- Generators (for remedial equipment); and
- Other miscellaneous equipment determined by contractor.

11.0 VERIFICATION AND POST REMEDIATION LONG-TERM MONITORING PROGRAM

11.1 Verification and Monitoring During Remediation Activities

Verification and monitoring of construction works, environmental clean-up, verification of quantities, and quality of work will need to be carried out during the remediation works of this project (INAC 2009). Skill sets needed include residential engineering experience, hazardous materials testing and abatement, environmental health and safety monitoring, soil sampling, and geotechnical and materials testing. The following work tasks will need to be performed:

Disposal of Non-Hazardous Waste

- Ensuring removal of all hazardous materials prior to removal or demolition of buildings;
- Removal of all non-wood materials identified as non-hazardous from buildings and verification of hauling to the staging area;
- Verification of clean-up of all debris areas and hauling to the on-site staging area;
- Verification of building demolition, wood collection from buildings/debris areas and removal to burn area. Supervision and air monitoring, followed by sampling and testing of ashes, if necessary; and
- Photo documentation and surveying of above activities where applicable.

Hazardous Materials Testing and Abatement

- Supervision and air monitoring of asbestos abatement and verification of contractor activities against applicable regulations for such work;
- Testing of liquid in drums, ASTs and equipment for TDG and disposal options as required;
- Supervision and verification of depressurization and evacuation of cylinders and fire extinguishers;

- Testing of solid suspected hazardous materials to determine appropriate disposition;
- Verification of appropriate storage of hazardous waste in staging area until shipment; and
- Verification of shipments including waste manifests and quantities of materials off site.

Remediation of Impacted Soil Areas

- Soil confirmatory sampling beneath and adjacent to PHC, metal, and Co-contaminated impacted soil areas to ensure complete removal of on-site sources;
- Baseline soil sampling to be completed prior to construction of temporary storage area, camp workers area, sewage lagoon, incinerator areas, fuel and lube oil storage facilities, camp area, and mechanics area;
- Baseline groundwater sampling and documentation of monitoring well installation and stratigraphy of boreholes for areas around LTU (if required, limited soil depth may not allow for this task to be completed at the Site);
- Verification of waste manifests for impacted soil that it transported off-site to an off-site landfill disposal facility;
- Photo documentation and surveying of all soil remediation areas, including pre-construction, and post-construction/site closure activities;
- Remedial monitoring for the construction of the LTU(if adopted), along with materials testing and borrow development;
- Conduct grain size distribution testing and moisture density relationship tests of borrow material proposed for any site construction, prior to utilization of potential borrow material source(s);
- Verification of quantities taken from borrow area; and
- Compaction monitoring following completion of remedial activities (post excavation and soil treatment) at the Site.

11.2 Post-Remediation Long-Term Monitoring Program

The AMSRP has established a monitoring program for landfills on former military sites. Based upon the preferred remedial options, all waste streams are to be removed to an approved off-site licensed facility. There is no landfill proposed for the Site. In the event that surface water is determined to be related to naturally occurring background conditions at the Site during remedial activities, no further monitoring should be required post-closure of the Site as per the AMSRP.

12.0 CLOSURE

We trust this report meets your present requirements. Should you have any questions or comments, please contact the undersigned at your convenience.

Respectfully submitted,
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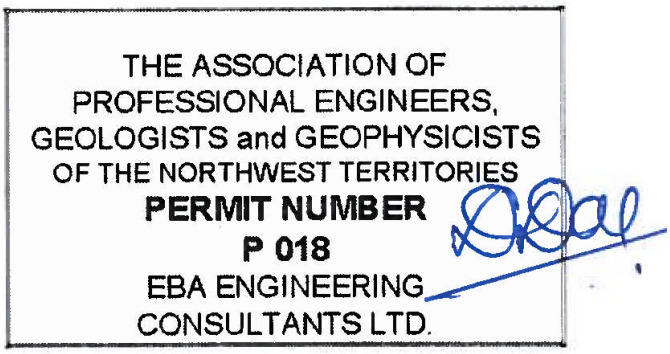

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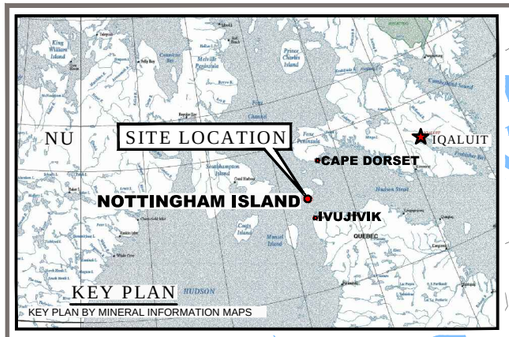
FIGURES

Figure 1	Site Location Plan
Figure E-1	Site Plan Showing Areas of Environmental Interest at Project Location
Figure E-2	Soil Contamination Areas at AEC 10, 11, 12, 13, 16, 17 and Pipeline
Figure E-3	Soil Contamination Areas at AEC 14, 15
Figure E-4	Soil Contamination Areas at AEC 1, 2, 3, 4, 5, 6, 7, 8, 9
Figure E-5	Soil Contamination Areas at AEC 19, 20, 21, 22
Figure E-6	Site Plan Showing Location of Water Samples
Figure H-1	Site Plan Showing Areas of Hazardous and Non-Hazardous Waste at Project Location
Figure H-2	Detailed Hazardous and Non-Hazardous Materials Site Plan AECs 1, 2, 9 to 17
Figure H-3	Detailed Hazardous and Non-Hazardous Materials Site Plan AECs 3, 4, 5, 6, 7, 8
Figure H-4	Detailed Hazardous and Non-Hazardous Materials Site Plan AECs 19, 20, 21, 26
Figure G-1	Site Plan Showing Recommended Area for Camp and/or Staging Areas
Figure G-2	Site Plan Showing Landfarm and Borrow Options
Figure G-3	Site Plan Showing Landfarm Area
Figure G-4	Site Plan Showing Potential Borrow Sources Not Investigated



LAKE #1

LAKE #2

ROAD

LAKE #4

LAKE #3

SITE LOCATION

Hudson Strait

• COMMUNICATION TOWER

ISSUED FOR USE

0 500 m

Scale: 1: 15 000

CLIENT

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU

SITE LOCATION PLAN

eba A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	KL	0

OFFICE: EDM

DATE: April 2013

Figure 1

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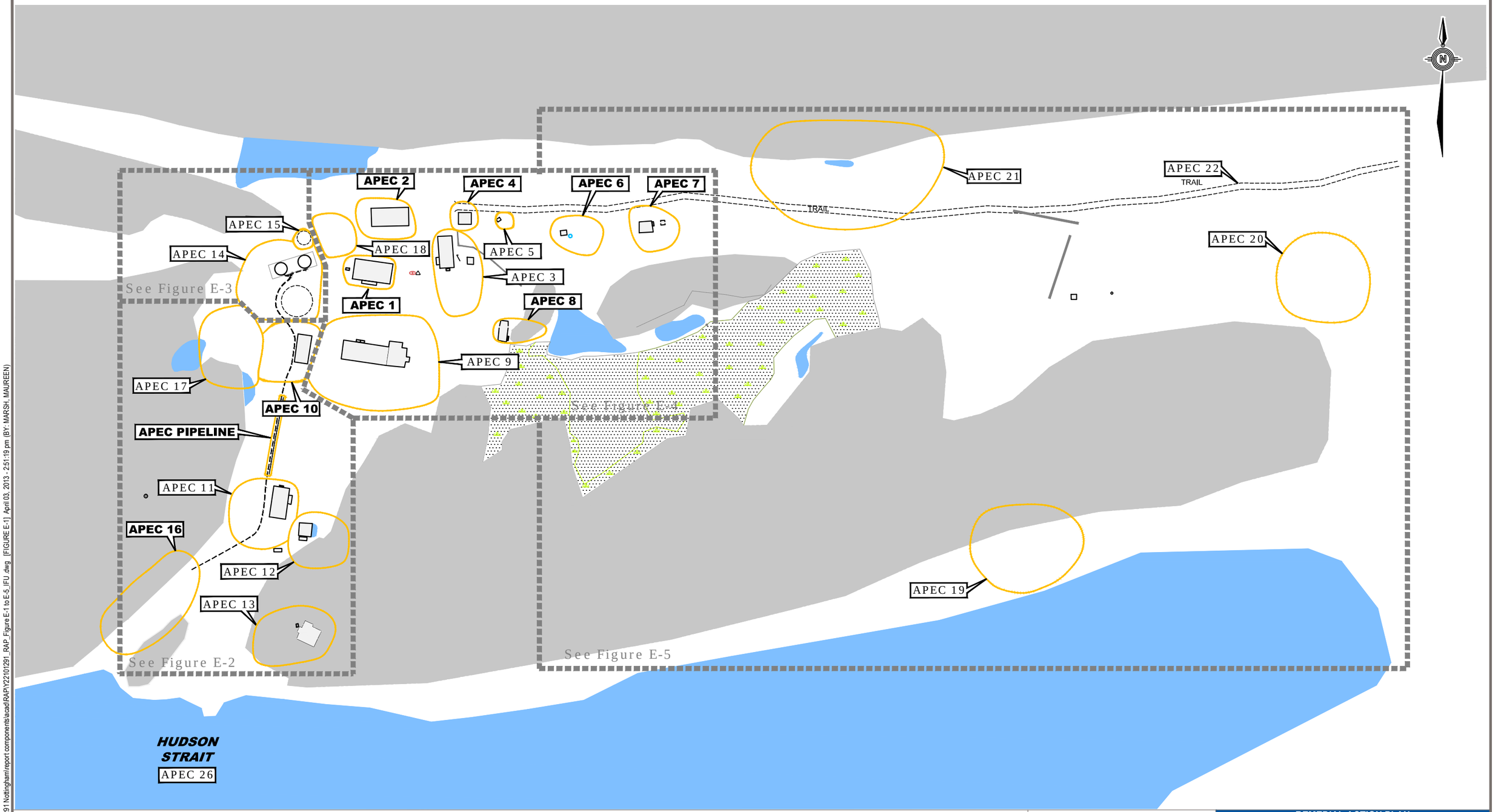

LEGEND

- BUILDINGS
- WET LAND
- ROCK OUTCROP
- WATER
- POTENTIAL LANDFARM
- APEC - AREA OF POTENTIAL ENVIRONMENTAL CONCERN
- APPROXIMATE LOCATION OF FORMER FUEL DISTRIBUTION LINE

NOTES
UTM with NAD83 datum, Zone 18, Meter; Central Meridian 75d W

ISSUED FOR USE

0 100 m
Approximate Scale

CLIENT
Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU

SITE PLAN
SHOWING AREAS OF ENVIRONMENTAL INTEREST
AT PROJECT LOCATION

A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	SW	0
OFFICE: EDM	DATE: April 2013		

Figure E-1

Q:\Edmonton\Drafting\PROJECTS\Y221\Y22101291 Nottingham\report components\acad\RAP\Y22101291_RAP_Figure E-1 to E-5_IFU .dwg [FIGURE E-2] April 03, 2013 - 2:50:51 pm (BY: MARSH, MAUREEN)

KEY PLAN

Estimated Impacted Soil Volumes			
APEC ID	PHC impacted volume (m^3)	Metal Impacted Volume (m^3)	Co-Contaminated Impacted Volume (m^3)
APEC 10	-	6	-
APEC 11/12 and Pipeline	1898	-	176
APEC 13	10	15	7
APEC 16	-	22	-
"-": No Value			

APEC 10
APEC 11
APEC 12
APEC 13
APEC 16
APEC 17
APEC PIPELINE
SB029-SS-045
SB029-SS-042
GENERATOR BUILDING
2012-SB-16
2012-SB-12
2012-SB-13
2012-SB-14
SB029-SS-040
SB029-SS-041
2012-SB-15
2012-SB-11
2012-SB-64
SB029-SS-039
2012-SB-63
CABLES (WITH WOODEN SUPPORTS)
2012-SB-62
2012-SB-10
2012-SB-09
TANK
SB029-SS-037
SB029-SS-036
HOUSE AND GARAGE
2012-SB-08
2012-SB-60
SB029-SS-032 / 031
SB029-SS-035
SB029-SS-038
SHED
TRACKED VEHICLE
2012-SB-07
2012-SB-58
2012-SB-59
2012-SB-06
TRAILER
TOWER (WOOD)
2012-SB-57
2012-SB-02
2012-SB-01
2012-SB-53
2012-SB-54
2012-SB-56
2012-SB-05
SB029-SS-030
2012-SB-04
TANK
2012-SB-03
HOUSE
2012-SB-55
?

LEGEND

- SOIL SAMPLE
- DRUM(S)
- METALS PLUME
- PHC PLUME
- CO-CONTAMINATION
- ESTIMATED IMPACT AREA
- BUILDINGS
- ROCK OUTCROP
- WATER
- APEC - AREA OF POTENTIAL ENVIRONMENTAL CONCERN
- APPROXIMATE LOCATION OF FORMER FUEL DISTRIBUTION LINE

ISSUED FOR USE

0 25 m

Scale: 1: 500

EBA SAMPLE
(EBA SAMPLE ID IN BLACK)
- BELOW APPLICABLE PHC CRITERIA
- ABOVE APPLICABLE PHC CRITERIA

WESA SAMPLE
(WESA SAMPLE ID IN GREY)
- BELOW APPLICABLE PHC CRITERIA
- ABOVE APPLICABLE PHC CRITERIA

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REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU

SOIL CONTAMINATION AREAS
APEC 10, 11, 12, 13, 16, 17, PIPELINE

A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	SW	0

OFFICE: EDM
DATE: April 2013

Figure E-2

AREA OF DEBRIS

APEC 2
APEC 18
APEC 15
APEC 14
APEC 1
APEC 17
APEC 10
APEC 9
APEC 11
APEC 12
APEC 16
APEC 13
AREA OF DEBRIS
See Figure H-2

APEC 4
APEC 6
APEC 7
APEC 5
APEC 3
APEC 8
See Figure H-3
See Figure H-4

APEC 21
APEC 22
TRAIL
APEC 20
APEC 19

HUDSON STRAIT
APEC 26

LEGEND

- BUILDINGS
- DEBRIS
- WET LAND
- ROCK OUTCROP
- WATER
- APEC - AREA OF POTENTIAL ENIRONMENTAL CONCERN

NOTES
UTM with NAD83 datum, Zone 18, Meter; Central Meridian 75d W

ISSUED FOR USE

0 100 m
Approximate Scale

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Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU

SITE PLAN SHOWING AREAS OF HAZARDOUS AND NON-HAZARDOUS MATERIALS AT PROJECT LOCATION

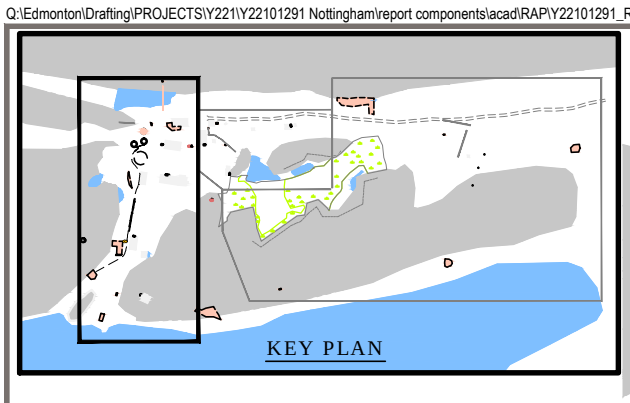
A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	MC	0

OFFICE: EDM
DATE: April 2013

Figure H-1

Q:\Edmonton\Drafting\PROJECTS\Y2210\Y22101291 Nottingham\report components\acad\RAP\Y22101291_RAP_Figure H-1 to H-4 IFU.dwg [FIGURE H-1] April 03, 2013 - 3:25:19 pm (BY: MARSH, MAUREEN)



Nottingham Island Inventory Table

APEC #	APEC Feature Description	Material Type	Material Description	Uncrushed Volume (m^3)
1	Storage Shed 01 (18.5 x 9 x 2.4 m)	Non-Hazardous	Unpainted wood	101
			Other waste	14.5
			Drums (205L)	1 drum
			AST (900L)	0.5
		Hazardous	Asbestos waste	99
			Total and leachable lead paint on wood	10
2	Old Kitchen (8.7 x 17.8 x 3.4 m)	Non-Hazardous	Unpainted wood	41
			Other waste	25.5
		Hazardous	Total and leachable lead paint on wood	45
9	Bunkhouse (31 x 9.2 x3.2 m)	Non-Hazardous	Unpainted wood	300
			Other waste	178.8
			AST (900L)	1
		Hazardous	Asbestos waste	0.1
			Total and leachable lead paint on asbestos panels	25
			Total and leachable lead paint on wood	7
			Total and leachable lead interior painted metal	18
			Organic contents in AST (900L)	50L
			Other hazardous waste	1.8
10	Generator Building (14 x 6.8 x 3.2 m)	Non-Hazardous	Unpainted wood	60
			Other waste	69.1
			Drum (205L)	3 drums
		Hazardous	Asbestos waste	1
			Aqueous content in drum (205L)	200L
			Total lead painted generators	3
			Total and leachable lead paint on wood	40
			Total and leachable lead paint on asbestos panels	12.5
			Total and leachable lead interior paint on metal	10
			Equipment contents	500 L
			Other waste	2.26
	Debris Adjacent to the Generator Building	Non-hazardous	Unpainted wood	6
			Other waste	3
11	House and Garage (15 x 8 x 2.4 m)	Non-hazardous	Unpainted wood	115
			Other waste	11
			Drums (205L)	3 drums
		Hazardous	Asbestos waste	62.01
			Total and leachable lead paint on wood	10
			Other waste	0.6
			AST (900L)	0.5
	Building Foundation (Adjacent to the House and Garage)	Non-hazardous	Unpainted wood	4
			Other waste	6.5
		Hazardous	Creosote treated wood	0.5
12	Shed (6.5 x 6.5 x 2.9 m)	Non-hazardous	Unpainted wood	10
			Other waste	12
		Hazardous	Total and leachable lead paint on equipment	8
			Equipment contents	1 L
			Asbestos panels	2
13	House (9.6 x 8.8 x 2.9 m)	Non-hazardous	Unpainted wood	46
			Other waste	12.5
			Drums (205L)	3 drums
		Hazardous	Asbestos waste	20
			Total and leachable lead paint on wood	14
			Total and leachable paint on particulate board	3
			Total and leachable lead paint on metal	3
			AST (900L)	0.5
			Total and leachable lead paint on equipment	16
			Other hazardous waste	0.02
14	AST Farm	Non-hazardous	Other waste	20
			Drum (205L)	1 drum
		Hazardous	Aqueous content in drum (205L)	20L
			Total lead paint on ASTs (73000L each)	146
15	Food Cache Storage	Non-hazardous	Unpainted wood	5
		Hazardous	Other hazardous waste	0.02
16	Debris Area 01	Non-hazardous	Unpainted wood	5
			Other waste	2
17	Debris Area 02	None (inventory listed in other rows)	None (inventory listed in other rows)	None (inventory listed in other rows)
18	Debris Area 03	Non-hazardous	Unpainted wood	5
			Other waste	2
		Hazardous	Other hazardous waste	0.02

Notes:
1. Volumes of total and leachable amended paint includes the painted substrate.

WOOD DEBRIS
APEC 2
CONCRETE DEBRIS
OLD KITCHEN
WOOD DEBRIS
LAYING TOWER (STEEL)
APEC 15
FOOD CACHE STORAGE
APEC 18
APEC 1
DEBRIS AREA 03
APEC 14
SOIL BERM
TANK
TANK
TANK
STORAGE SHED 01
CONCRETE DEBRIS
SURVEY REFERENCE POINT 2
HELIPAD
DEBRIS (STEEL PIPES)
GENERATOR BUILDING
2 x TANKS
BUNKHOUSE
APEC 10
APEC 17
DEBRIS AREA 02
APEC 9
APEC PIPELINE
CABLES (WITH WOODEN SUPPORTS)
APEC 11
TOWER (WOOD)
TANK
HOUSE AND GARAGE
DEBRIS (BUILDING REMNANTS, STEEL, WOOD AND CONCRETE)
SHED
TRACKED VEHICLE
APEC 12
DEBRIS (STEEL, PIPES)
TRAILER
DEBRIS (BUILDING REMNANTS, STEEL, WOOD AND SIDING)
APEC 16
DEBRIS AREA 01
APEC 13
STEEL MINE CART
TANK
HOUSE
SCATTERED DEBRIS

ISSUED FOR USE

LEGEND
- DRUM (s)
- APEC - AREA OF POTENTIAL ENVIRONMENTAL CONCERN
- APPROXIMATE LOCATION OF FORMER FUEL DISTRIBUTION LINE
- BUILDINGS
- DEBRIS
- ROCK OUTCROP
- WATER

0 25 m
Scale: 1: 750

CLIENT
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A TETRA TECH COMPANY

REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU
DETAILED HAZARDOUS AND NON-HAZARDOUS MATERIALS SITE PLAN
APEC 1, 2, 9, 10, 11, 12, 13, 14, 15, 16, 17

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	MC	0
OFFICE: EDM	DATE: April 2013		

Figure H-2

APEC 4
APEC 5
APEC 6
APEC 7
TRAIL
OLD RADIO BUILDING
OUT HOUSE
STORAGE SHED 02
STORAGE BUILDING
TANK
SHED
NEW RADIO BUILDING
SHED
TANK
LAYING TOWER (STEEL)
APEC 3
APEC 8
CHICKEN COOP
TANK
N
KEY PLAN

Nottingham Island Inventory Table

APEC #	APEC Feature Description	Material Type	Material Description	Uncrushed Volume (m^3)
3	New Radio Building (2.5 x 15.2 m) and Small Shed (3.4 x 2.5 x 2.1 m)	Non-Hazardous	Unpainted wood	101
			Other waste	13.5
			AST (900L)	0.5
		Hazardous	Asbestos waste	63.51
			Asbestos, total lead and leachable lead containing on panels	11
			Total and leachable lead paint on metal	6
			Total and leachable lead paint on wood	5
			Other hazardous waste	2
4	Old Radio Building (2.5 x 2.1 x 4.0 m)	Non-Hazardous	Unpainted wood	5
			Other waste	4.2
		Hazardous	Total lead paint on particulate board and wood	8
			Total lead and leachable lead on metal	1
			Other hazardous waste	0.58
5	Outhouse (1.3 x 1.8 x 2.7 m)	Non-Hazardous	Unpainted wood	1
			Other waste	1.1
		Hazardous	Asbestos waste	0.2
			Total and leachable lead paint on wood	2
6	Storage Shed 02 (2.8 x 2.2 x 2.6 m)	Non-Hazardous	Unpainted wood	4
			Other waste	4
		Hazardous	Asbestos waste	0.5
7	Storage Building (4.9 x 6.4 x 3.0 m) 4.5 m is peak height and Small Shed (1.6 x 1.6 x 2.2 m)	Non-Hazardous	Unpainted wood	31
			Other waste	3.6
			Drum (205L)	1 drum
		Hazardous	Asbestos waste	28
			Total and leachable lead paint on wood	1
			AST (900L)	0.5
			Organic content in AST (900L)	675 L
			Other hazardous waste	1
8	Chicken Coop (10 x 3.8 x 3.2 m) Caged Area (3.7 x 3.8 x 2.1 m)	Non-Hazardous	Unpainted wood	20
			Other waste	1.5
			Drum (205L)	1 drum
		Hazardous	Asbestos waste	6.7
			Other waste	0.1
			AST (900L)	0.5
			Organic content in AST (900L)	675 L
			Total and leachable lead paint on particulate board and wood	3.2

Notes:
1. Volumes of total and leachable amended paint includes the painted substrate.

LEGEND
- DRUM(S)
- APEC - AREA OF POTENTIAL ENVIRONMENTAL CONCERN
- APPROXIMATE LOCATION OF FORMER FUEL DISTRIBUTION LINE
- BUILDINGS
- WET LAND
- DEBRIS
- ROCK OUTCROP
- WATER

ISSUED FOR USE

0 20 m
Scale: 1: 400

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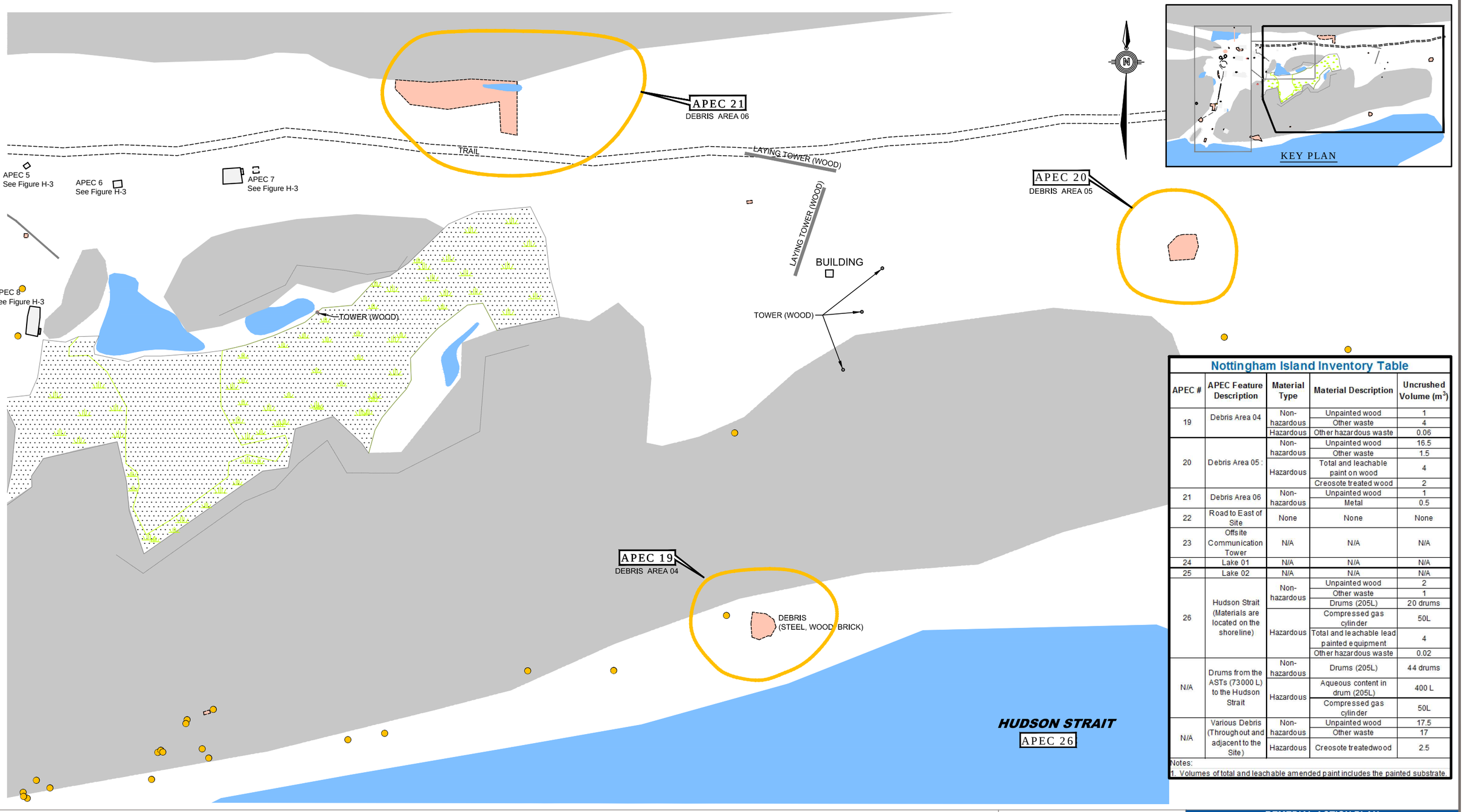
REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU
DETAILED HAZARDOUS AND NON-HAZARDOUS MATERIALS SITE PLAN
APEC 3, 4, 5, 6, 7, 8

eba A TETRATECH COMPANY

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	MC	0

OFFICE: EDM
DATE: April 2013

Figure H-3



Nottingham Island Inventory Table

APEC #	APEC Feature Description	Material Type	Material Description	Uncrushed Volume (m^3)
19	Debris Area 04	Non-hazardous	Unpainted wood	1
			Other waste	4
		Hazardous	Other hazardous waste	0.06
20	Debris Area 05 :	Non-hazardous	Unpainted wood	16.5
			Other waste	1.5
		Hazardous	Total and leachable paint on wood	4
			Creosote treated wood	2
21	Debris Area 06	Non-hazardous	Unpainted wood	1
			Metal	0.5
22	Road to East of Site	None	None	None
23	Offsite Communication Tower	N/A	N/A	N/A
24	Lake 01	N/A	N/A	N/A
25	Lake 02	N/A	N/A	N/A
26	Hudson Strait (Materials are located on the shoreline)	Non-hazardous	Unpainted wood	2
			Other waste	1
			Drums (205L)	20 drums
		Hazardous	Compressed gas cylinder	50L
			Total and leachable lead painted equipment	4
			Other hazardous waste	0.02
N/A	Drums from the ASTs (73000 L) to the Hudson Strait	Non-hazardous	Drums (205L)	44 drums
		Hazardous	Aqueous content in drum (205L)	400 L
			Compressed gas cylinder	50L
N/A	Various Debris (Throughout and adjacent to the Site)	Non-hazardous	Unpainted wood	17.5
			Other waste	17
		Hazardous	Creosote treatedwood	2.5

Notes:
1. Volumes of total and leachable amended paint includes the painted substrate.

LEGEND
- DRUM(S)
- APEC - AREA OF POTENTIAL ENVIRONMENTAL CONCERN
- APPROXIMATE LOCATION OF FORMER FUEL DISTRIBUTION LINE
- BUILDINGS
- WET LAND
- DEBRIS
- ROCK OUTCROP
- WATER

ISSUED FOR USE

0 50 m

Scale: 1: 1 250

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REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU
DETAILED HAZARDOUS AND NON-HAZARDOUS MATERIALS SITE PLAN
APEC 19, 20, 21, 26

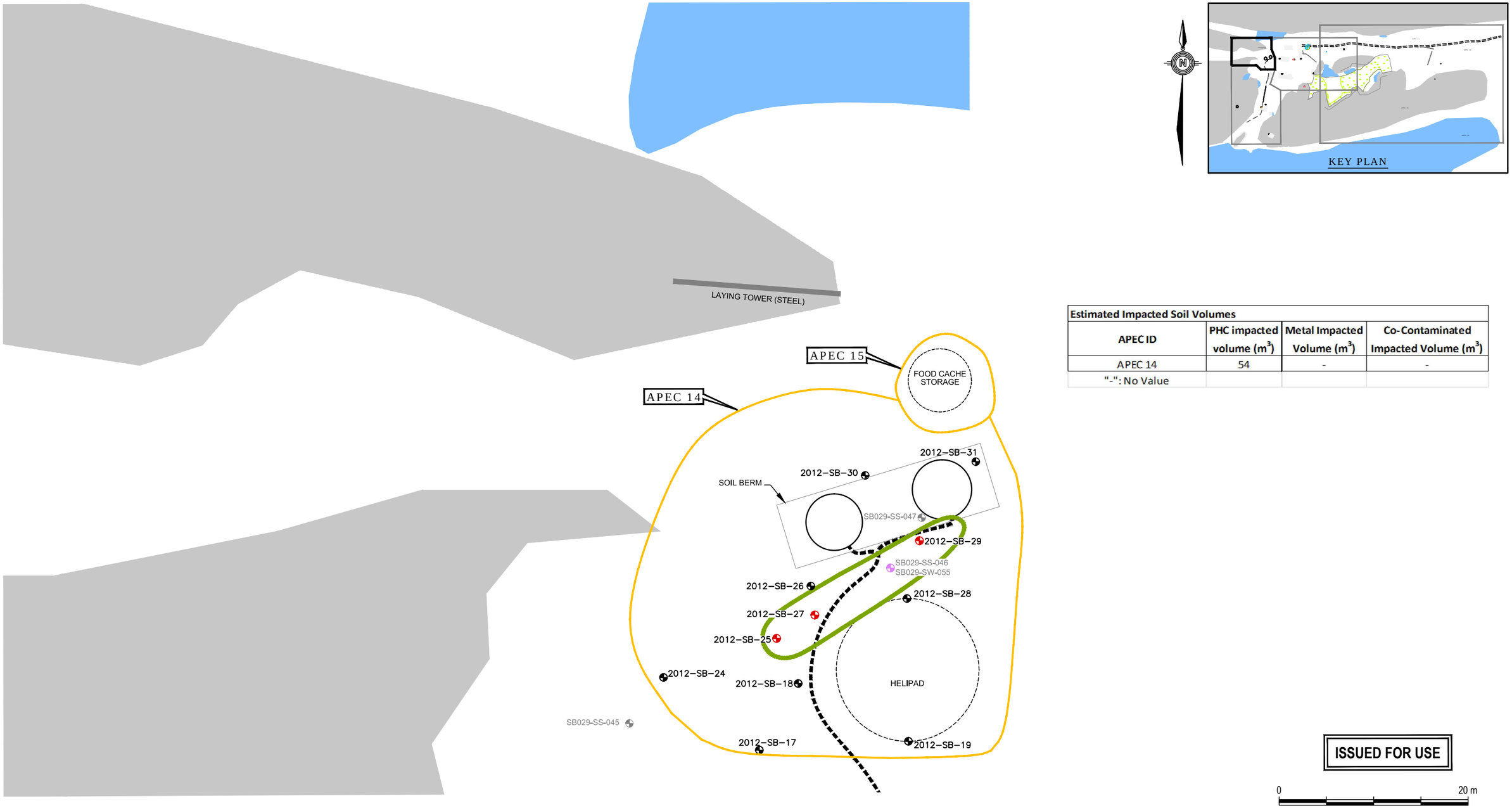
eba A TETRATECH COMPANY

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	MC	0

OFFICE: EDM

DATE: April 2013

Figure H-4



Estimated Impacted Soil Volumes			
APEC ID	PHC impacted volume (m^3)	Metal Impacted Volume (m^3)	Co-Contaminated Impacted Volume (m^3)
APEC 14	54	-	-
"-": No Value			

ISSUED FOR USE

0 20 m

Scale: 1: 400

LEGEND

- SOIL SAMPLE
- DRUM(S)
- METALS PLUME
- PHC PLUME
- APEC - AREA OF POTENTIAL ENVIRONMENTAL CONCERN
- APPROXIMATE LOCATION OF FORMER FUEL DISTRIBUTION LINE
- ROCK OUTCROP
- WATER

EBA SAMPLE
(EBA SAMPLE ID IN BLACK)

- BELOW APPLICABLE PHC CRITERIA
- ABOVE APPLICABLE PHC CRITERIA

WESA SAMPLE
(WESA SAMPLE ID IN GREY)

- BELOW APPLICABLE PHC CRITERIA
- ABOVE APPLICABLE PHC CRITERIA

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A TETRA TECH COMPANY

REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU

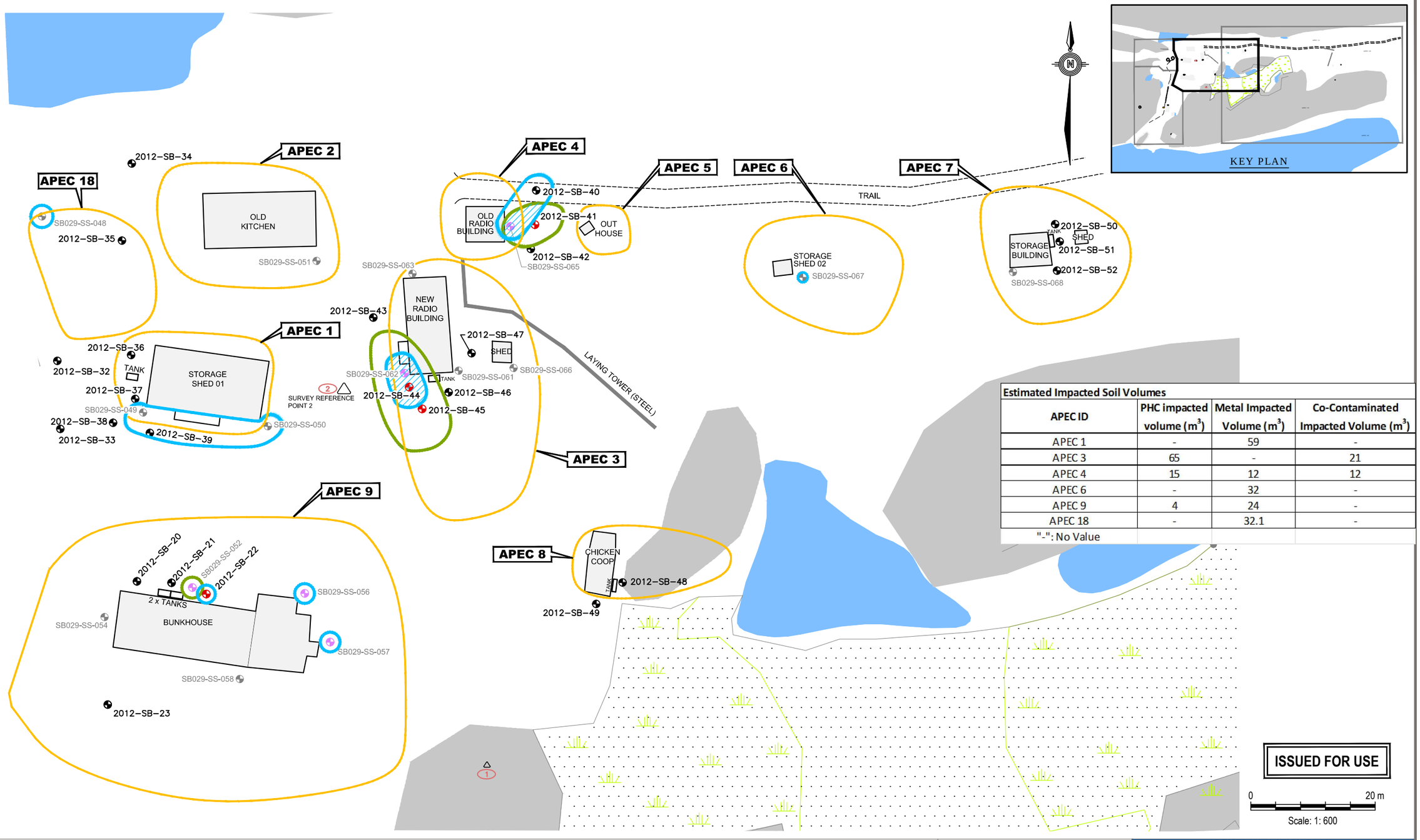
SOIL CONTAMINATION AREAS
APEC 14, 15

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	SW	0

OFFICE: EDM

DATE: April 2013

Figure E-3



Estimated Impacted Soil Volumes

APEC ID	PHC impacted volume (m^3)	Metal Impacted Volume (m^3)	Co-Contaminated Impacted Volume (m^3)
APEC 1	-	59	-
APEC 3	65	-	21
APEC 4	15	12	12
APEC 6	-	32	-
APEC 9	4	24	-
APEC 18	-	32.1	-
"-": No Value			

LEGEND

- SOIL SAMPLE
- DRUM(S)
- METALS PLUME
- PHC PLUME
- CO-CONTAMINATION
- APEC - AREA OF POTENTIAL ENVIRONMENTAL CONCERN
- BUILDINGS
- WET LAND
- ROCK OUTCROP
- WATER
- POTENTIAL LANDFARM

EBA SAMPLE
(EBA SAMPLE ID IN BLACK)

- BELOW APPLICABLE PHC CRITERIA
- ABOVE APPLICABLE PHC CRITERIA

WESA SAMPLE
(WESA SAMPLE ID IN GREY)

- BELOW APPLICABLE PHC CRITERIA
- ABOVE APPLICABLE PHC CRITERIA

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A TETRA TECH COMPANY

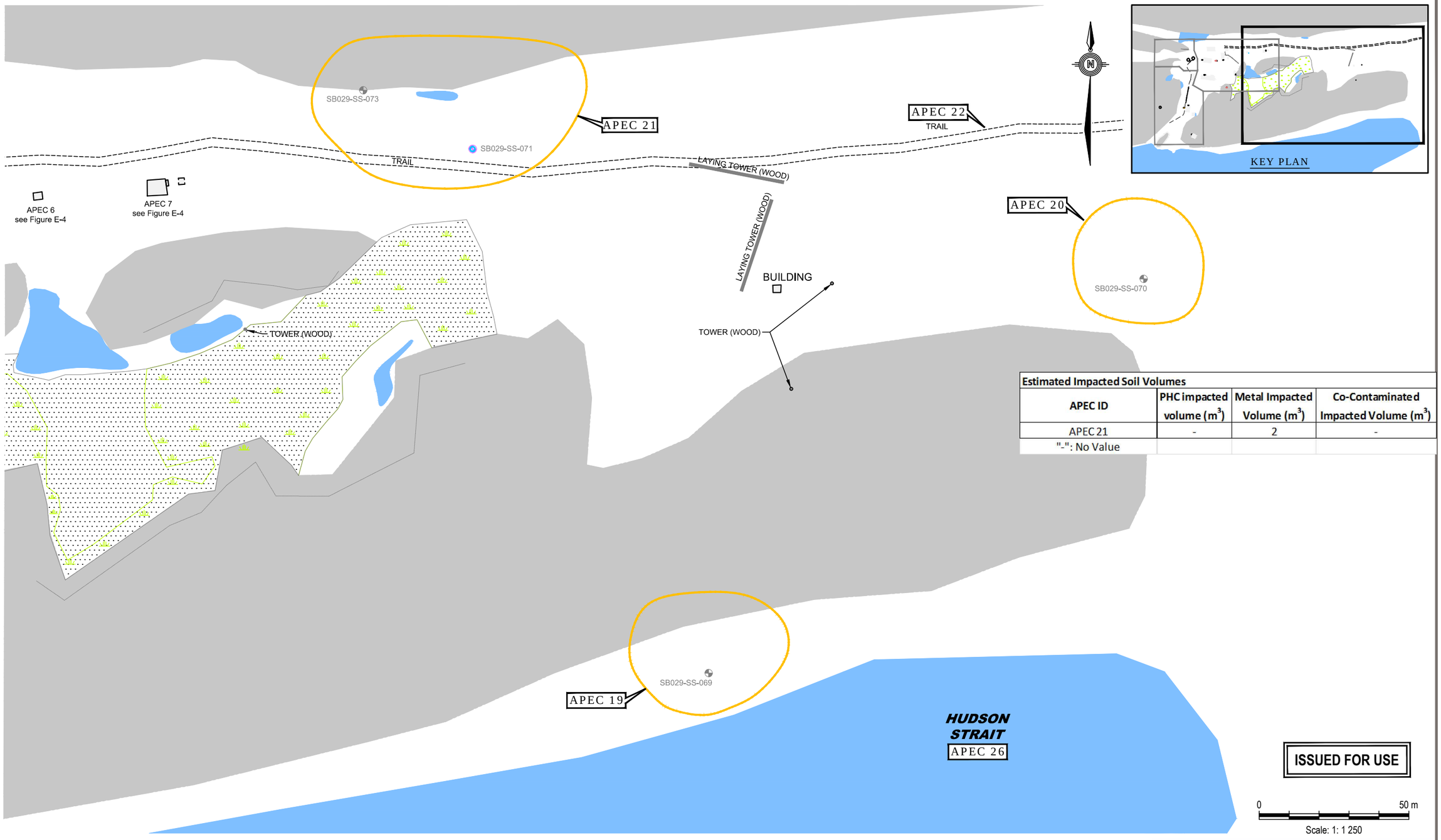
REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU

SOIL CONTAMINATION AREAS
APEC 1, 2, 3, 4, 5, 6, 7, 8, 9,

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	MC	0

OFFICE: EDM
DATE: April 2013

Figure E-4



Estimated Impacted Soil Volumes			
APEC ID	PHC impacted volume (m^3)	Metal Impacted Volume (m^3)	Co-Contaminated Impacted Volume (m^3)
APEC 21	-	2	-
"-": No Value			

ISSUED FOR USE

0 50 m

Scale: 1: 1 250

LEGEND

- SOIL SAMPLE
- DRUM(S)
- METALS PLUME
- PHC PLUME
- APEC - AREA OF POTENTIAL ENVIRONMENTAL CONCERN
- BUILDINGS
- WET LAND
- ROCK OUTCROP
- WATER
- POTENTIAL LANDFARM

EBA SAMPLE (EBA SAMPLE ID IN BLACK)
- BELOW APPLICABLE PHC CRITERIA
- ABOVE APPLICABLE PHC CRITERIA

WESA SAMPLE (WESA SAMPLE ID IN GREY)
- BELOW APPLICABLE PHC CRITERIA
- ABOVE APPLICABLE PHC CRITERIA

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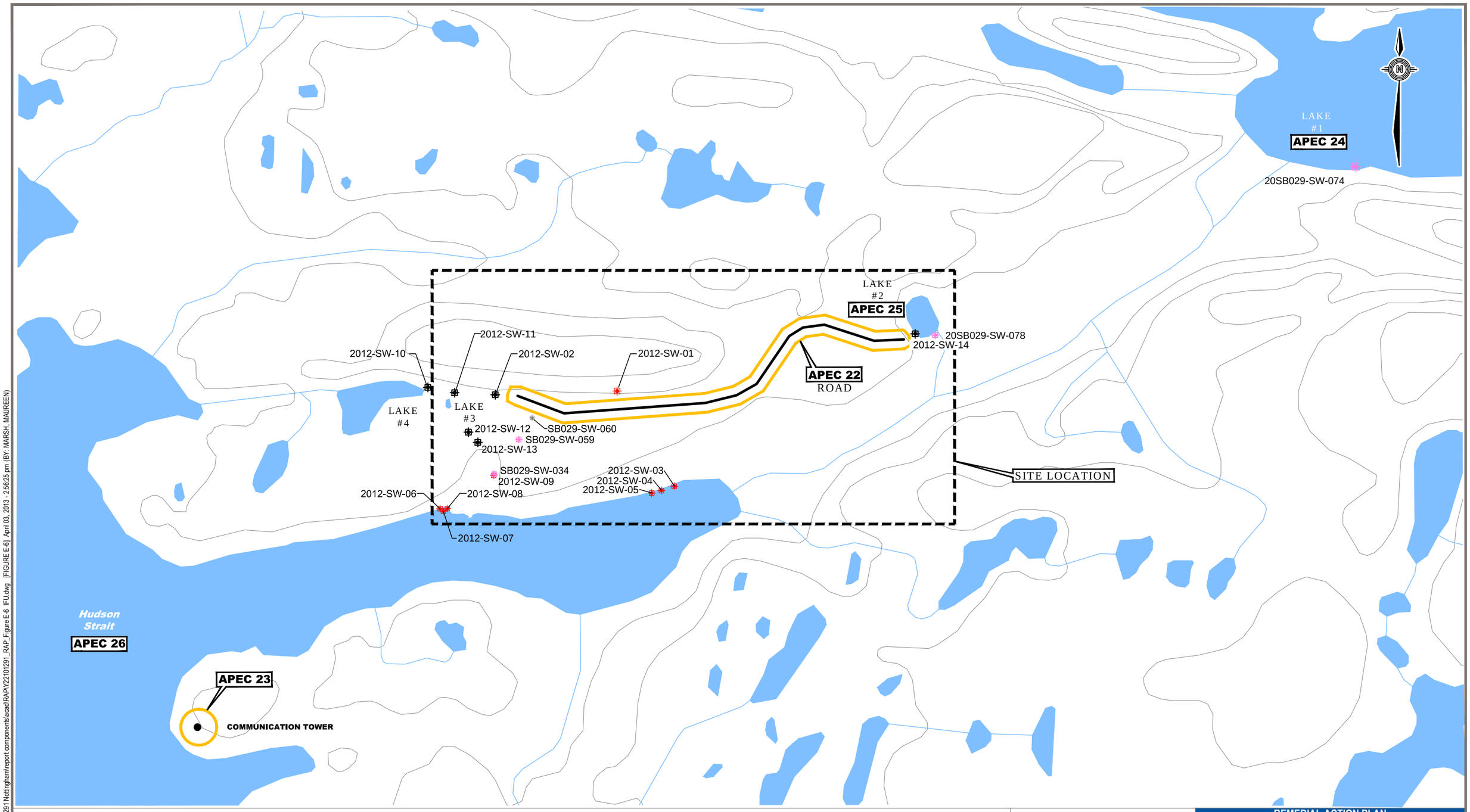
A TETRA TECH COMPANY

REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU

SOIL CONTAMINATION AREAS
APEC 19, 20, 21, 22

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	MC	0
OFFICE: EDM	DATE: April 2013		

Figure E-5



LEGEND

- APEC - AREA OF POTENTIAL ENVIRONMENTAL CONCERN
- SURFACE WATER SAMPLE LOCATION - EBA
- SURFACE WATER SAMPLE LOCATION - WESA

EBA SAMPLE
(EBA SAMPLE ID IN BLACK)

- BELOW APPLICABLE PHC CRITERIA
- ABOVE APPLICABLE PHC CRITERIA

WESA SAMPLE
(WESA SAMPLE ID IN GREY)

- BELOW APPLICABLE PHC CRITERIA
- ABOVE APPLICABLE PHC CRITERIA

ISSUED FOR USE

0 500 m

Scale: 1: 15 000

CLIENT

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A TETRA TECH COMPANY

REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU

SITE PLAN SHOWING LOCATION OF WATER SAMPLES

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	SW	0
OFFICE: EDM	DATE: April 2013		

Figure E-6

SITE LOCATION

AREA ASSESSED IN
2012 FIELD PROGRAM

PW

TRAIL

H

HELICOPTER LANDING PAD

PW

PW

C

C

AREA ASSESSED IN
2012 FIELD PROGRAM

B

C

AREA RECOMMENDED FOR
CAMP AND / OR STAGING

HUDSON
STRAIT

N

LEGEND

- (X) - LOCATION NOT RECOMMENDED FOR CAMP / STAGING / LANDING
- (B) - POTENTIAL BEACH LANDING AREA
- (C) - POTENTIAL CAMP STAGING AREA
- (PW) - POTENTIAL POTABLE WATER SOURCE AREA

NOTES
UTM with NAD83 datum, Zone 18, Meter; Central Meridian 75d W

ISSUED FOR USE

0 250 m

Scale: 1: 5 000

CLIENT

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eba
A TETRA TECH COMPANY

REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU

SITE PLAN SHOWING
RECOMMENDED LOCATION FOR CAMP
AND / OR STAGING AREAS

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	KK	0

OFFICE	DATE
EDM	April 2013

Figure G-1

Q:\Edmonton\Drafting\PROJECTS\Y221\Y22101291 Nottingham\report components\acad\RAP\Y22101291_RAP_Figure G-1 to G-4 IFU.dwg [FIGURE G-1] April 03, 2013 - 3:14:30 pm (BY: MARSH, MAUREEN)

NOTES
UTM with NAD83 datum, Zone 18, Meter; Central Meridian 75d W

ISSUED FOR USE

0 250 m

Scale: 1: 5 000

CLIENT

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eba
A TETRA TECH COMPANY

REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU

SITE PLAN SHOWING
LANDFARM AND BORROW OPTIONS

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	KK	0
OFFICE: EDM	DATE: April 2013		

Figure G-2

Q:\Edmonton\Drafting\PROJECTS\Y2211\Y22101291 Nottingham\report components\acad\RAP\Y22101291_RAP_Figure G-1 to G-4 IFU.dwg [FIGURE G-2] April 03, 2013 - 3:22:03 pm (BY: MARSH, MAUREEN)

SITE LOCATION

OPTION 2
LANDFARM
4,225 m^2
65 x 65 m

ADDITIONAL
LANDFARM
EXPANSION
6,750 m^2
75 x 90 m

OPTION 1
LANDFARM
8,250 m^2
75 x 110 m

TRAIL

G1
G6
G8
G9
G10
TP15_S11
TP16_S12

HUDSON
STRAIT

N

LEGEND

G8 - PHOTO LOCATION, NUMBER AND DIRECTION

NOTES
UTM with NAD83 datum, Zone 18, Meter; Central Meridian 75d W

ISSUED FOR USE

0 100 m

Scale: 1: 2 500

CLIENT

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU

SITE PLAN SHOWING LANDFARM AREA

eba
A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	KK	0

OFFICE: EDM
DATE: April 2013

Figure G-3

Q:\Edmonton\Drafting\PROJECTS\Y22\Y22101291 Nottingham\report components\acad\RAP\Y22101291_RAP_Figure G-1 to G-4 IFU.dwg [FIGURE G-3] April 03, 2013 - 3:22:43 pm (BY: MARSH, MAUREEN)

LEGEND

- POTENTIAL BORROW SOURCE NOT INVESTIGATED

NOTES
UTM with NAD83 datum, Zone 18, Meter; Central Meridian 75d W

ISSUED FOR USE

0 400 m

Scale: 1: 8 000

CLIENT

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

REMEDIAL ACTION PLAN
FORMER WEATHER STATION
NOTTINGHAM ISLAND, NU

SITE PLAN SHOWING
POTENTIAL BORROW SOURCES NOT INVESTIGATED

PROJECT NO.	DWN	CKD	REV
Y22101291	MM	KK	0

OFFICE	DATE
EDM	April 2013

Figure G-4

eba A TETRA TECH COMPANY

Q:\Edmonton\Drafting\PROJECTS\Y22\Y22101291 Nottingham\report components\acad\RAP\Y22101291_RAP_Figure G-1 to G-4 IFU.dwg - [FIGURE G-4] April 03, 2013 - 3:23:53 pm (BY: MARSH, MAUREEN)

APPENDIX A
PHOTOGRAPHS

Photo G1: Borrow A, looking southwest

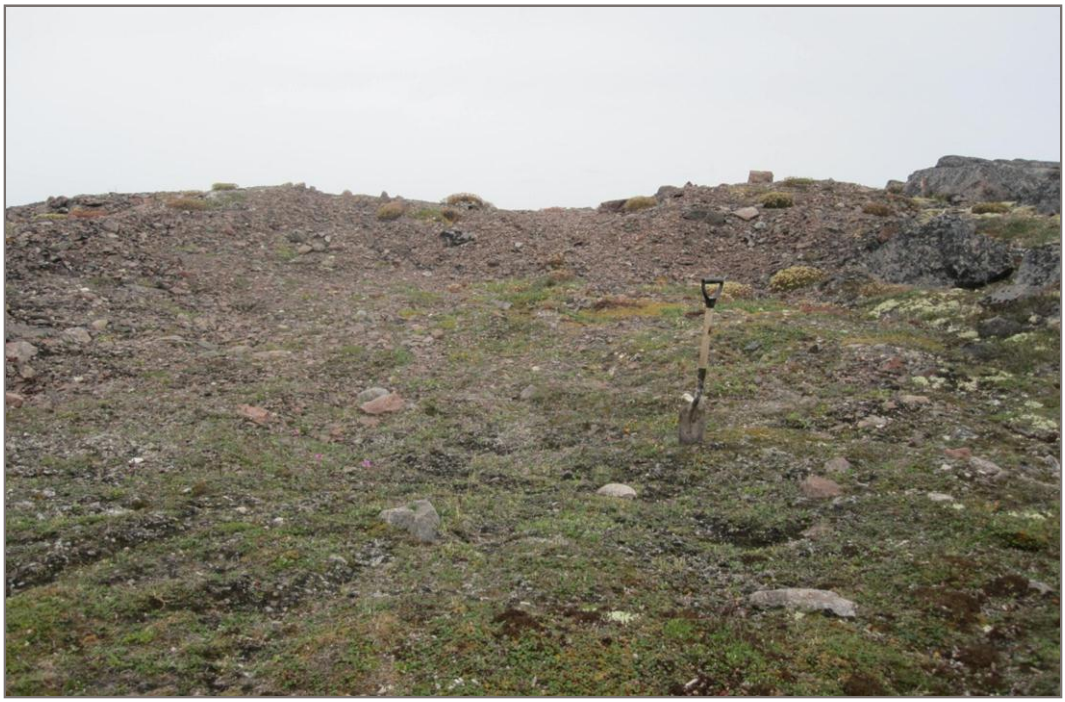

Photo G2: Borrow A, looking south

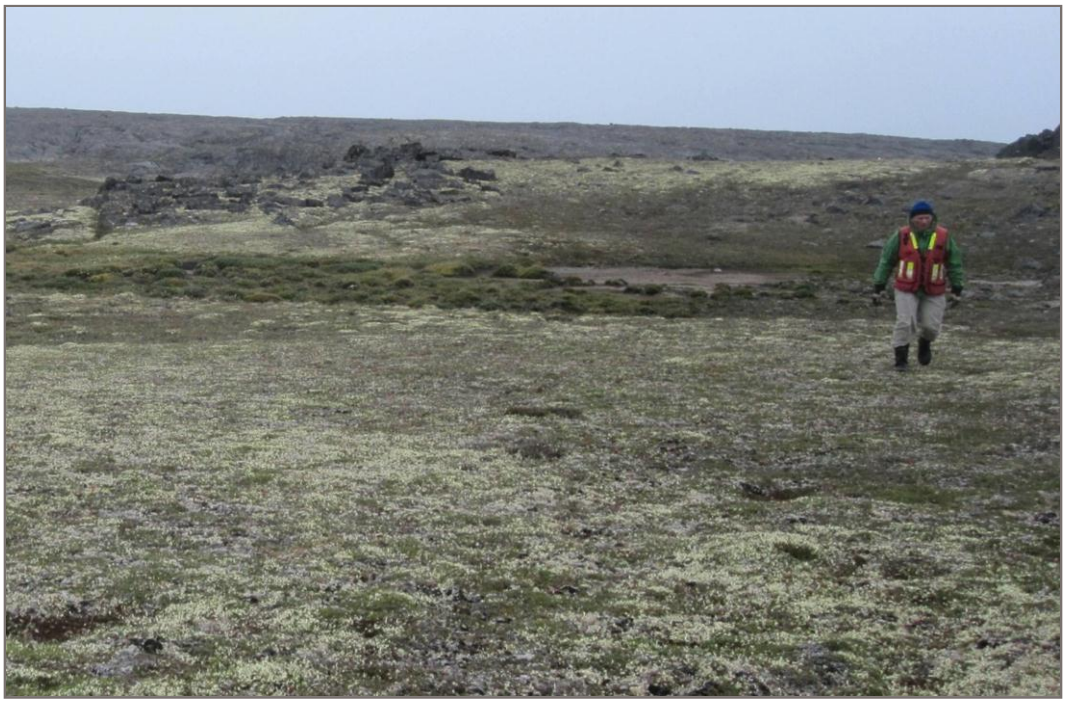

Photo G3: Borrow B in the mid-ground, looking south

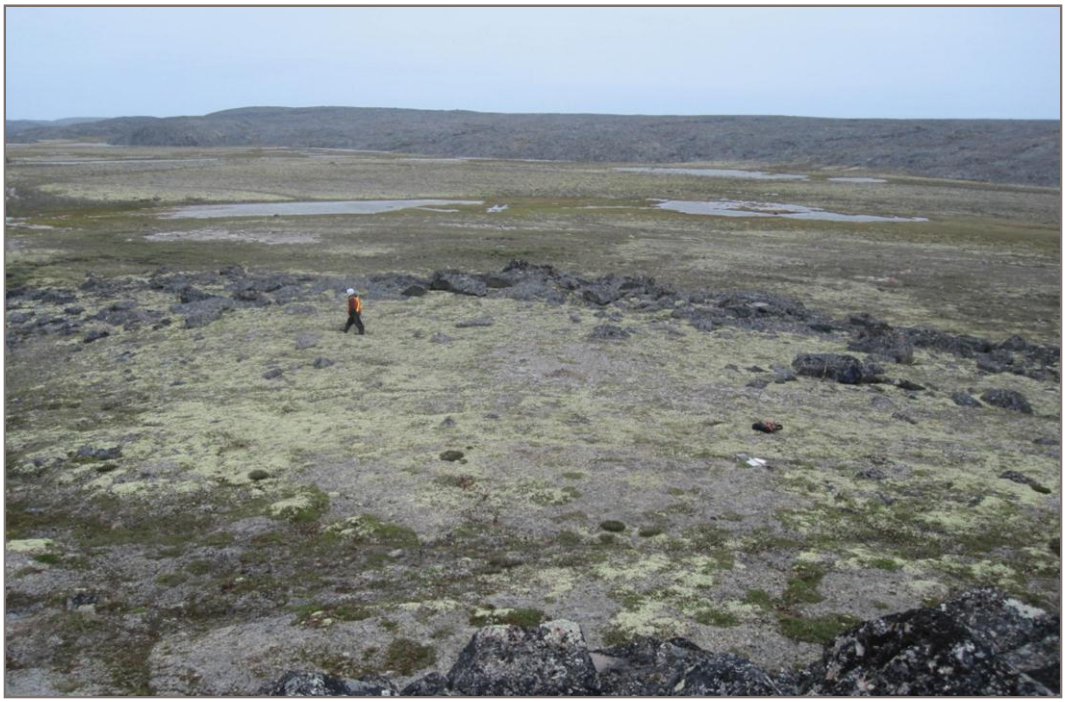

Photo G4: Borrow B in the foreground, looking southeast

Photo G5: Gravelly sand with a trace of fines and 30-40% calcareous material at Borrow B

Photo G6: Trail and Landfarm B to the right of the trail, looking east

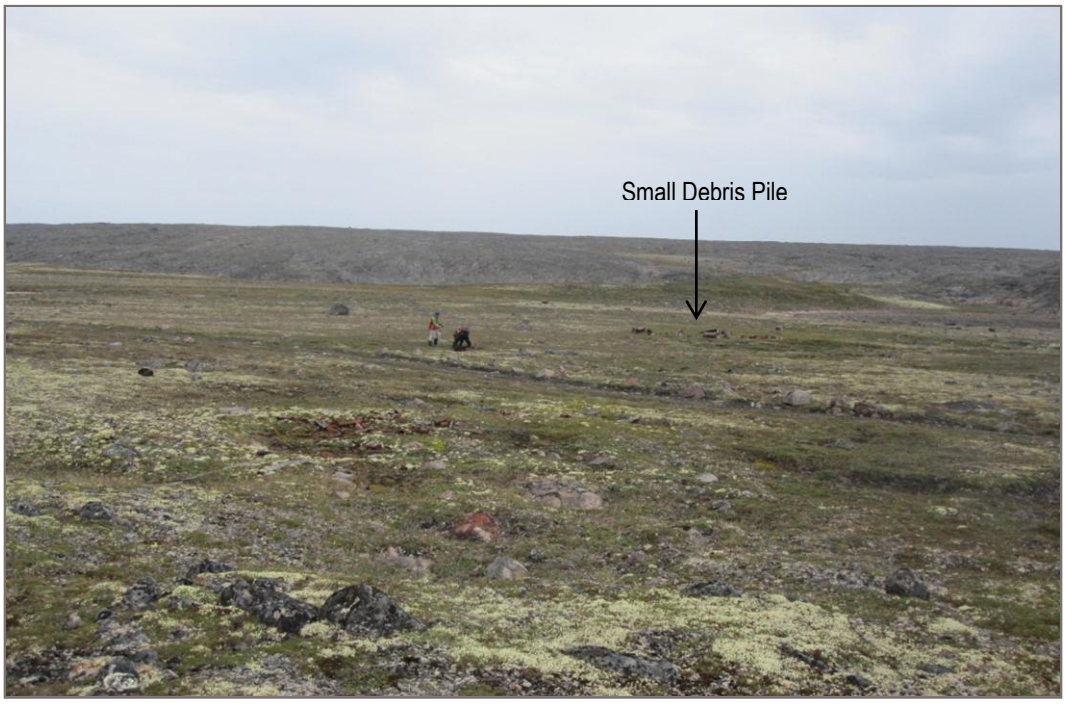

Photo G7: Landfarm B, looking southeast

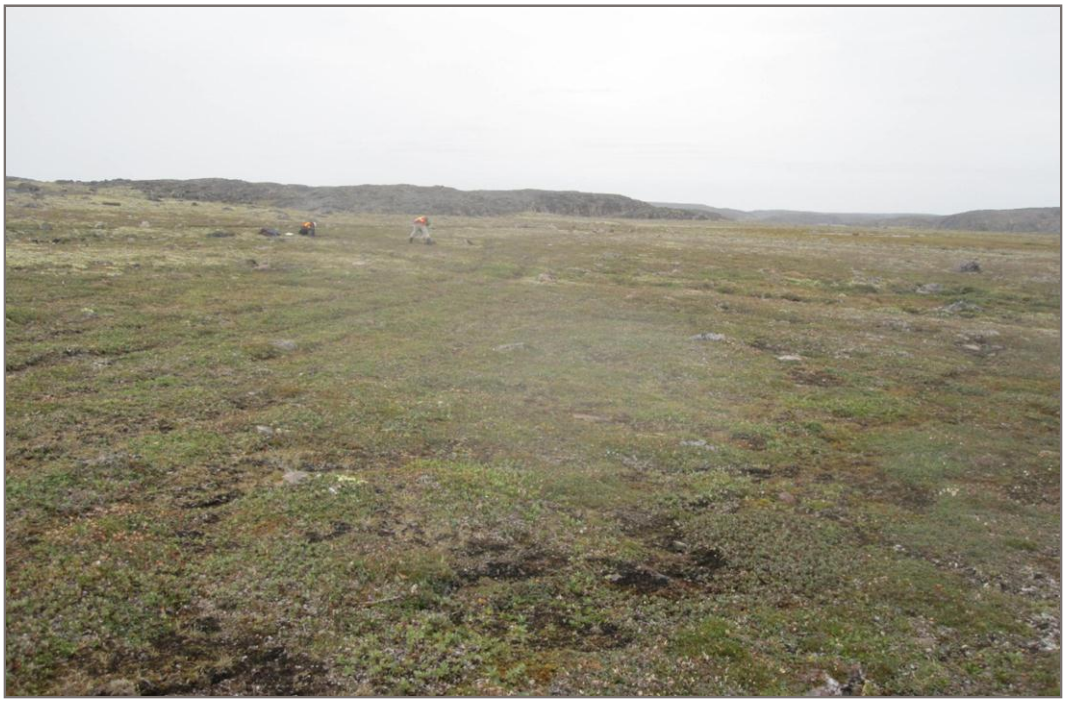

Photo G8: Landfarm B, looking northeast from TP16

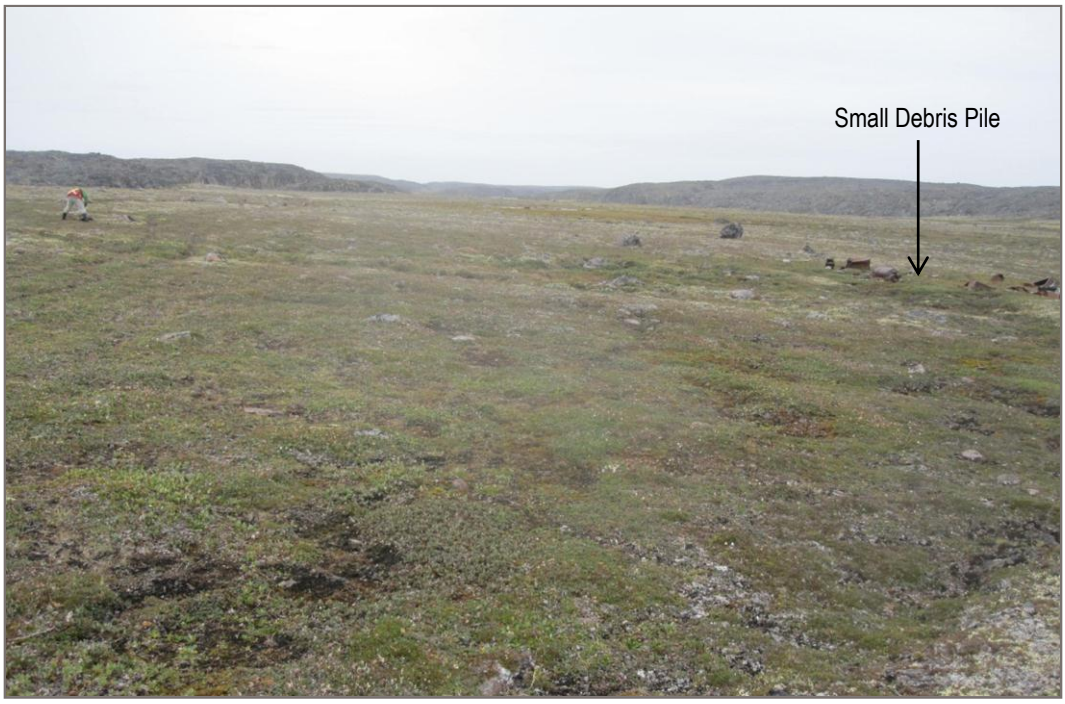

Photo G9: Landfarm B, looking east from TP16

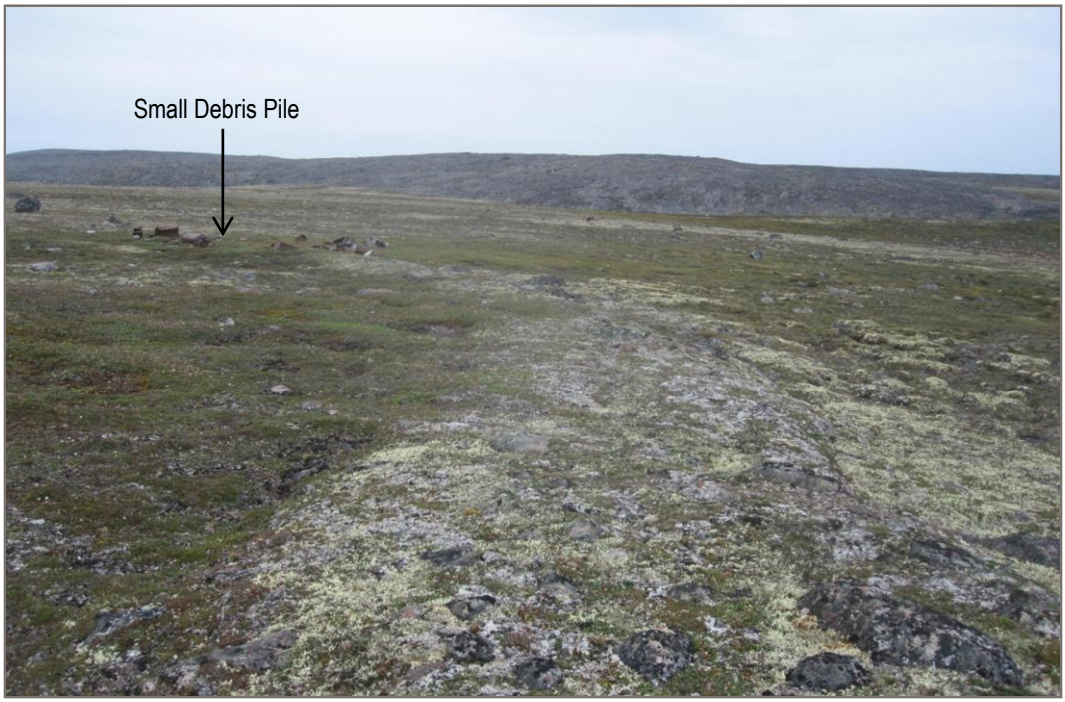

Photo G10: Landfarm B, looking southeast from TP16

Photo A1: The site, looking east

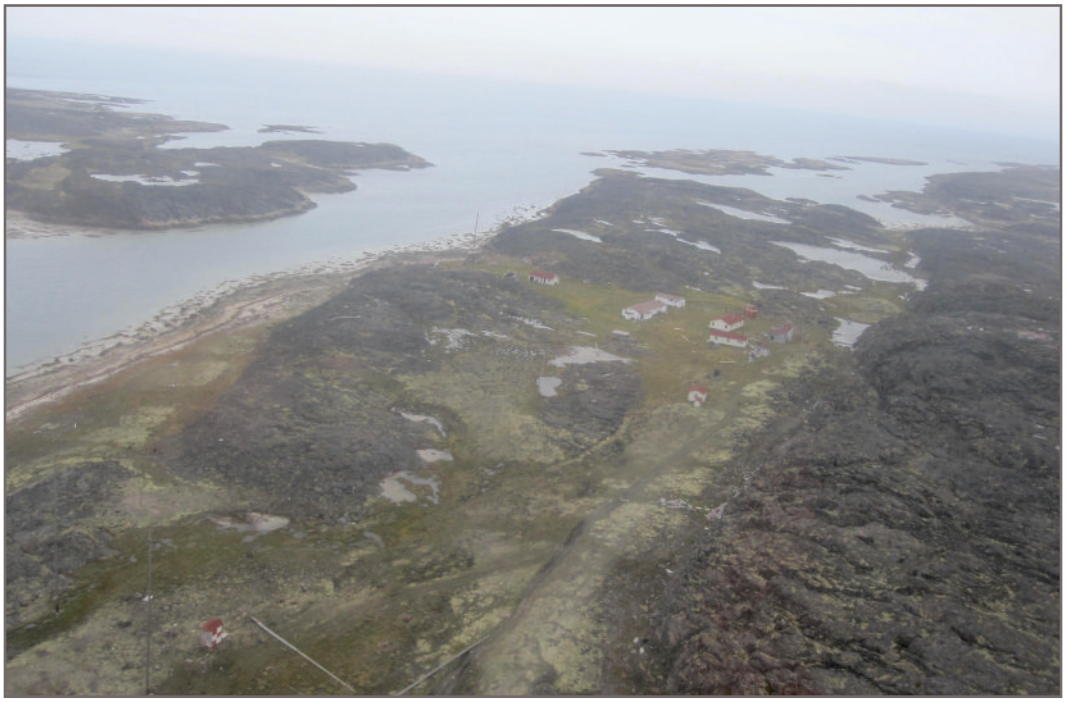

Photo A2: The site, looking west

Photo A3: The shoreline, looking east

Photo H-1: Example of exterior ACM siding and total and leachable lead paint on wood (APEC 1 - Storage Shed 01 shown)

Photo H-2: Example of ACM attic insulation and fibreglass wall insulation is ACM contaminated from the attic (APEC 1 - Storage Shed 01 shown)

Photo H-3: Example of total and leachable lead paint on exterior and some interior wood (APEC 2 - Old Kitchen)

Photo H-4: APEC 2 - Old Kitchen - Interior debris - Unstable structures

Photo H-5: Example of mercury, PCBs and lead solder in electrical components, and total and leachable lead paint on metal (APEC 3 - New Radio Building shown)

Photo H-6: Total and leachable lead paint on fallen metal pole adjacent to the New Radio Building, various poles were found on-site

Photo H-7: APEC 4 - Old Radio Building Interior - Lead acid batteries and total lead painted particulate board

Photo H-8: Example of ACM green shingles on walls and roof (APEC 6 - Storage Shed 02)

Photo H-9: Example of metal debris found on-site

Photo H-10: With organic content [APEC 7 - AST (900L)]

Photo H-11: Example of ACM shingles and total and leachable lead painted wood (APEC 8 - Chicken Coop shown)

Photo H-12: Example of ASTs with organic liquid found on-site

Photo H-13: Example of total and leachable lead painted ACM panels and wood (APEC 9 - Bunkhouse shown)

Photo H-14: APEC 10 - Generator Building – Mercury, PCBs and lead in electrical components, PCBs in light ballasts and mercury vapor in fluorescent lights

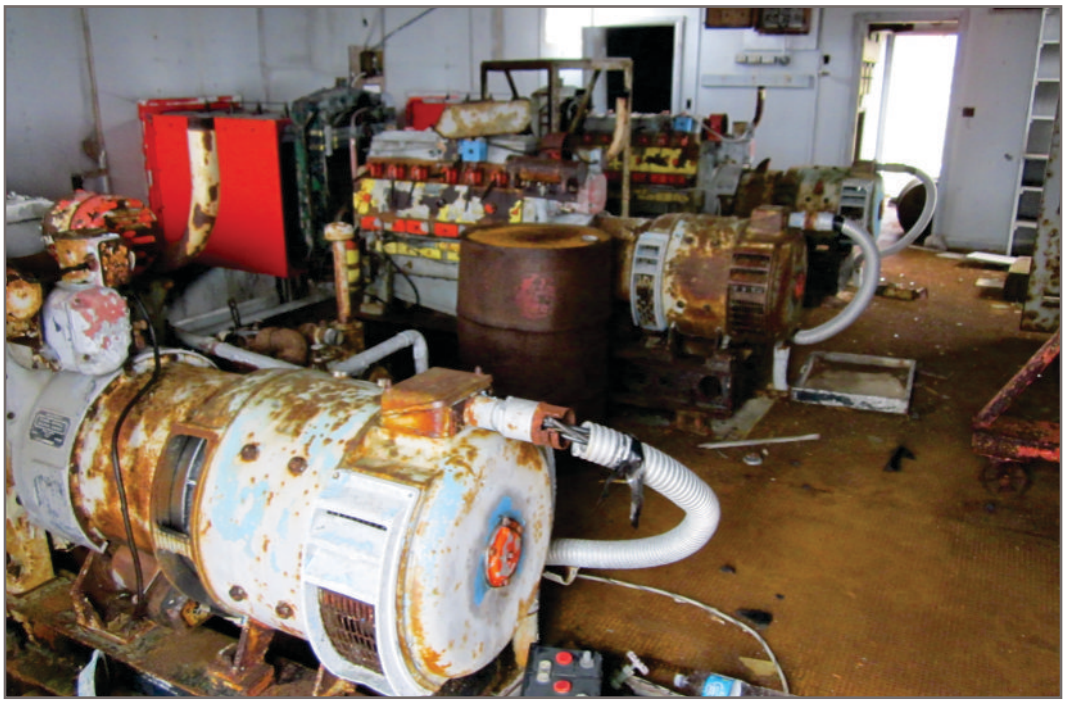

Photo H-15: APEC 10 - Generator Building - Total lead painted generators and equipment contents in three generators, lead acid batteries and total and leachable lead painted ACM panels

Photo H-16: APEC 13 - House - Total and leachable lead painted equipment adjacent to House

Photo H-17: APEC 14 - AST Tank Farm - Total lead painted ASTs

Photo H-18: APEC 15 - Food Cache Storage - Unstable structures

Photo H-19: APEC 16 - Debris Area 01 - Burnt building

Photo H-20: APEC 18 - Debris Area 03 - Concrete cubes

Photo H-21: APEC 19 - Debris Area 04 - Main dump area contains lead acid batteries

Photo H-22: APEC 20 - Debris Area 05 - Total and leachable lead painted wood on building and creosote soaked wood on bottom of wood poles

Photo H-23: APEC 26 - Hudson Strait - Debris

Photo H-24: Various debris throughout site, unpainted wood staircase

APPENDIX B
REMEDIAL TARGET TABLE

Summary of Guidelines for Nottingham Island Remedial Targets

Matrix	Category	Parameter	Units	Guideline to be Applied	Coarse Grained Criteria
Soil	Metals	Aluminium	mg/kg	CCME Agricultural	NA
		Antimony	mg/kg	CCME Agricultural	20
		Arsenic	mg/kg	AMRSP Tier 2	30
		Barium	mg/kg	CCME Agricultural	750
		Beryllium	mg/kg	CCME Agricultural	4
		Boron	mg/kg	CCME Agricultural	NA
		Cadmium	mg/kg	AMRSP Tier 2	5
		Chromium	mg/kg	AMRSP Tier 2	250
		Cobalt	mg/kg	AMRSP Tier 2	50
		Copper	mg/kg	AMRSP Tier 2	100
		Iron	mg/kg	CCME Agricultural	NA
		Lead	mg/kg	AMRSP Tier 1	200
		Mercury	mg/kg	AMRSP Tier 2	2
		Molybdenum	mg/kg	CCME Agricultural	5
		Nickel	mg/kg	AMRSP Tier 2	100
		Selenium	mg/kg	CCME Agricultural	1
		Silver	mg/kg	CCME Agricultural	20
		Thallium	mg/kg	CCME Agricultural	1
		Tin	mg/kg	CCME Agricultural	5
		Uranium	mg/kg	CCME Agricultural	23
		Vanadium	mg/kg	CCME Agricultural	130
		Zinc	mg/kg	AMRSP Tier 2	500
		PCB	mg/kg	AMRSP Tier 1	1
	Hydrocarbons	Benzene	mg/kg	CCME Agricultural	0.03
		Ethyl benzene	mg/kg	CCME Agricultural	0.37
		Toluene	mg/kg	CCME Agricultural	0.082
		Xylenes (Total)	mg/kg	CCME Agricultural	11
		Sum of F1-F3 (Type B Freshwater protected)*	mg/kg	AMSRP Type B > 30m from water	2500
		Sum of F1-F3 (Type B Freshwater protected)*	mg/kg	AMSRP Type B freshwater protected	330
		Type A Hydrocarbons (70% F3/F4 of TPH)	%	AMSRP Type A	70% of TPH/20,000 mg/kg
Building Material	Hazardous Materials	PCB (concrete/paint)	mg/kg	AMSRP	50
		Pb based paint	mg/kg	Government of Nunavut	600
		TCLP Pb based paint	mg/L	AMSRP	5
		ACM	%	Government of Nunavut	1%
Barrel Samples	Will be analyzed as per the AMSRP, % alcohol, Cl, Cd, Cr, Pb,				

NA: Criteria is not available for parameter.
* Type B 2500 mg/kg guideline was utilized due to pooled active layer melt not supportive of aquatic life.

Summary of Guidelines for Nottingham Island Remedial Targets

Matrix	Category	Parameter	Units	Guideline to be Applied	Criteria
Water (Marine Water Environment Only refer to Fresh Water Aquatic Life Summary Table produced by CCME for Fresh Water Targets)	Routine Parameters (Marine Environment)	pH	-	CCME MWAL	7.0 - 8.7
		Total Hardness	ug/L	CCME MWAL	NA
		Acidity	ug/L	CCME MWAL	NA
		Bromide	ug/L	CCME MWAL	NA
		Chloride	ug/L	CCME MWAL	NA
		Conductivity	ug/L	CCME MWAL	NA
		Fluroide	ug/L	CCME MWAL	NA
		Alkalinity as CaCO3	ug/L	CCME MWAL	NA
		Nitrate	ug/L	CCME MWAL	16000
		Nitrite	ug/L	CCME FWAL	60
		Phosphate	ug/L	CCME MWAL	NA
		Sulphate	ug/L	CCME MWAL	NA
		TDS	ug/L	CCME MWAL	NA
		Total Sulphur	ug/L	CCME MWAL	NA
	Metals Parameters (Marine Environment)	Aluminum	ug/L	CCME FWAL	5 or 100 pH dependent
		Antimony	ug/L	CCME MWAL	NA
		Arsenic	ug/L	CCME MWAL	12.5
		Barium	ug/L	CCME MWAL	NA
		Beryllium	ug/L	CCME MWAL	NA
		Boron	ug/L	CCME MWAL	NA
		Cadmium	ug/L	CCME MWAL	0.12
		Chromium (total)	ug/L	CCME MWAL	NA
		Cr (IV)	ug/L	CCME MWAL	1.5
		Cobalt	ug/L	CCME MWAL	NA
		Copper	ug/L	CCME FWAL	2 - 4 hardness dependent
		Iron	ug/L	CCME FWAL	300
		Lead	ug/L	CCME FWAL	1 - 7 hardness dependent
		Mercury	ug/L	CCME MWAL	0.016
		Nickel	ug/L	CCME FWAL	25 - 150 hardness dependent
		Selenium	ug/L	CCME FWAL	1
		Silver	ug/L	CCME FWAL	0.1
		Thalium	ug/L	CCME FWAL	0.8
		Tin	ug/L	CCME MWAL	NA
		Uranium	ug/L	CCME MWAL	NA
		Vandium	ug/L	CCME MWAL	NA
		Zinc	ug/L	CCME FWAL	30
	Hydrocarbons Parameters (Marine Environment)	Benzene	ug/L	CCME MWAL	110
		Toluene	ug/L	CCME MWAL	215
		Ethyl Benzene	ug/L	CCME MWAL	25
		Xylene	ug/L	CCME MWAL	NA

Due to the proximity to Hudson Strait, with all drainage pathways leading to the Strait CCME Marine Water Aquatic Life shall be applied. In the event that a MWAL criteria had not been established Fresh Water Aquatic Life Criteria will be applied.
NA: Criteria is not available for parameter.

Summary of Guidelines for Nottingham Island Remedial Targets

Matrix	Category	Parameter	Units	Guideline to be Applied	Criteria
Sediment	Metals (Marine Environment)	Aluminium	mg/kg	ISQG/PEL Marine Life	NA
		Antimony	mg/kg	ISQG/PEL Marine Life	NA
		Arsenic	mg/kg	ISQG/PEL Marine Life	7.24/41.6
		Barium	mg/kg	ISQG/PEL Marine Life	NA
		Beryllium	mg/kg	ISQG/PEL Marine Life	NA
		Boron	mg/kg	ISQG/PEL Marine Life	Na
		Cadmium	mg/kg	ISQG/PEL Marine Life	0.7/4.2
		Chromium	mg/kg	ISQG/PEL Marine Life	52.3/160
		Cobalt	mg/kg	ISQG/PEL Marine Life	NA
		Copper	mg/kg	ISQG/PEL Marine Life	18.7/108
		Iron	mg/kg	ISQG/PEL Marine Life	NA
		Lead	mg/kg	ISQG/PEL Marine Life	30.2/112
		Mercury	mg/kg	ISQG/PEL Marine Life	0.13/0.7
		Molybdenum	mg/kg	ISQG/PEL Marine Life	NA
		Nickel	mg/kg	ISQG/PEL Marine Life	NA
		Selenium	mg/kg	ISQG/PEL Marine Life	NA
		Silver	mg/kg	ISQG/PEL Marine Life	NA
		Thallium	mg/kg	ISQG/PEL Marine Life	NA
		Tin	mg/kg	ISQG/PEL Marine Life	NA
		Uranium	mg/kg	ISQG/PEL Marine Life	NA
		Vanadium	mg/kg	ISQG/PEL Marine Life	NA
		Zinc	mg/kg	ISQG/PEL Marine Life	124/271
	Other	PCB	ug/kg	ISQG/PEL Marine Life	21.5/189

NA: Criteria is not available for parameter.

APPENDIX C
ENVIRONMENT LAB RESULTS TABLES

Table E1: Y22101291 Nottingham Island Soil Sampling Results- CCME/AMSRP Total Extractable Metals Background Samples

					Area of Potential Environmental Concern	Background Samples									
					Sample ID	2012-BG1	2012-BG2	2012-BG3	2012-BG4	2012-BG5	2012-BG6	2012-BG7	2012-BG8	2012-BG9	2012-BG10
					Date Sampled	11/8/2012	11/8/2012	11/8/2012	11/8/2012	11/8/2012	11/8/2012	11/8/2012	11/8/2012	11/8/2012	11/8/2012
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**										
Soil	Metals	Silver	mg/kg	CCME Agricultural	20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		Arsenic	mg/kg	AMRSP Tier 2	30	4	<2	<2	2	<2	<2	<2	<2	<2	<2
		Barium	mg/kg	CCME Agricultural	750	150	89	16	130	54	68	29	32	29	38
		Cadmium	mg/kg	AMRSP Tier 2	5	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
		Cobalt	mg/kg	AMRSP Tier 2	50	4	2	2	4	2	1	3	1	1	3
		Chromium	mg/kg	AMRSP Tier 2	250	22	8	5	14	7	6	4	3	4	10
		Copper	mg/kg	AMRSP Tier 2	100	10	4	3	13	4	1	4	2	1	6
		Tin	mg/kg	CCME Agricultural	5	2	1	1	2	2	1	1	1	1	1
		Manganese	mg/kg	NA	NA	150	78	61	160	86	55	88	54	31	130
		Molybdenum	mg/kg	CCME Agricultural	5	0.9	<0.5	<0.5	0.6	<0.5	<0.5	1	<0.5	0.7	<0.5
		Nickel	mg/kg	AMRSP Tier 2	100	12	4.1	3.3	8.9	4.2	2.9	3.1	1.8	2.2	6.3
		Lead	mg/kg	AMRSP Tier 1	200	4	2	2	3	2	1	2	1	2	3
		Selenium	mg/kg	CCME Agricultural	1	1.7	0.7	0.5	1.3	0.9	0.7	<0.5	0.7	0.5	0.6
		Zinc	mg/kg	AMRSP Tier 2	500	27	12	7	21	16	9	10	6	10	13
		Aluminium	mg/kg	CCME R/P Tier 1	NA	6800	2700	1700	4700	2900	2100	2300	1500	2000	3100
		Antimony	mg/kg	CCME Agricultural	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		Beryllium	mg/kg	CCME Agricultural	4	0.3	0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	0.1
		Boron	mg/kg	CCME Agricultural	NA	17	9	4	6	7	5	7	5	<2	8
		Iron	mg/kg	CCME Agricultural	NA	13000	5800	4000	11000	6100	4200	5500	2900	5300	7300
		Magnesium	mg/kg	CCME Agricultural	NA	22000	11000	8200	5400	8300	12000	17000	7900	1300	23000
		Vanadium	mg/kg	CCME Agricultural	130	33	12	7	22	10	10	9	6	7	13
		Thallium	mg/kg	CCME Agricultural	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		Uranium	mg/kg	CCME Agricultural	23	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
		Mercury	mg/kg	AMRSP Tier 2	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

1. CCME R/P Tier 1: *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (PEHH) by Canadian Council of Ministers of the Environment (CCME), 2007 - Agricultural/Wild Land Coarse Grained Soils
2. AMSRP Teir 1/2: Abandoned Military Site Remediation Criteria, Aboriginal Affairs and Northern Development Canada, December 2008.

Yellow cells indicate samples above criteria.

NA: Guideline is not available.

Table E2: Y22101291 Nottingham Island Water Quality Sampling Results, August 2012

						Area of Potential Environmental Concern	BACKGROUND (LAKE 3)	BACKGROUND (LAKE 4)	APEC 3	APEC 9	APEC 12		APEC 2	APEC 16			APEC 17				APEC 19			APEC 21		APEC 24	APEC 25	
						Environment Type	Fresh Water	Fresh Water	Fresh Water	Fresh Water	Fresh Water	Fresh Water	Fresh Water	Marine Water	Marine Water	Marine Water	Fresh Water	Fresh Water	Fresh Water	Fresh Water	Marine Water	Marine Water	Marine Water	Fresh Water	Fresh Water	Fresh Water	Fresh Water	Fresh Water
						Sample ID	2012-SW-11	2012-SW-10	SBO29-SW-060 WESA^	SBO29-SW-059 WESA^	2012-SW-09	SBO29-SW-034 WESA^	2012-SW-02	2012-SW-06	2012-SW-07	2012-SW-08	2012-SW-13	SBO29-SW-044 WESA^	2012-SW-12	SBO29-SW-055 WESA^	2012-SW-05	2012-SW-04	2012-SW-03	2012-SW-01	SBO29-SW-072 WESA^	SBO29-SW-074 WESA^	2012-SW-14	SBO29-SW-075 WESA^
						Date Sampled	8/15/2012	8/15/2012	10/23/2010	10/23/2010	8/15/2012	10/23/2010	8/15/2012	8/15/2012	8/15/2012	8/15/2012	8/15/2012	10/23/2010	8/15/2012	10/23/2010	8/15/2012	8/15/2012	8/15/2012	8/15/2012	10/23/2010	10/23/2010	8/15/2012	10/23/2010
			Fresh Water Environment		Marine Water Environment																							
Matrix	Category	Parameter	Guideline	Criteria	Guideline	Criteria	Units																					
Water	Routine Package	Conductivity	CCME FWAL	NA	CCME MWAL	NA	mS/cm	0.30	0.27	0.687	0.652	0.47	0.563	0.16	50	50	51	0.42	0.378	0.32	0.582	42	48	48	0.17	0.727	0.684	0.61	1.040
		Flouride	CCME FWAL	0.12	CCME FWAL	0.12	mg/L	**0.20**	**0.20**	<0.1	<0.1	<0.10	<0.1	<0.10	**0.90**	**0.90**	**0.90**	**0.20**	<0.10	**0.20**	<0.10	**0.80**	**0.90**	**0.90**	<0.10	**0.76**	<0.10	**0.20**	**0.14**
		Ion Balance	CCME FWAL	NA	CCME MWAL	NA	n/a	1.2	1.2	---	---	1.1	---	1.2	1.0	1.0	1.1	1.2	---	1.2	---	0.99	1.0	1.0	1.1	---	---	1.1	---
		Nitrates (NO_3)	CCME FWAL	13.00	CCME MWAL	200	mg/L	<0.02	0.11	0.27	<0.10	0.02	<0.10	0.03	<2.00	<2.00	<2.00	0.03	<0.10	0.04	<0.10	<2.00	<2.00	<2.00	0.08	0.10	0.12	0.06	<0.10
		Nitrites (NO_2)	CCME FWAL	0.06	CCME FWAL	0.06	mg/L	<0.02	<0.02	<0.03	<0.03	<0.02	<0.03	<0.02	<10	<10	<10	<0.02	<0.03	<0.02	<0.03	<10	<10	<20	<0.02	<0.03	<0.03	<0.04	<0.03
		Nitrogen Ammonia (NH_3)	CCME FWAL	0.502-1.54*	CCME FWAL	1.54 - 4.84	mg/L	<0.02	0.03	---	---	<0.02	---	<0.02	0.04	0.08	0.08	<0.02	---	<0.02	---	0.03	0.10	0.08	<0.02	---	---	<0.02	---
		Orthophosphate (P)	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.05	<0.05	---	---	<0.05	---	<0.05	<0.05	<0.05	<0.05	<0.05	---	<0.05	---	<0.05	<0.05	<0.05	<0.05	---	---	<0.05	---
		Total Hardness	CCME FWAL	NA	CCME MWAL	NA	mg/L	110	82	236	264	190	222	39	6200	6300	6200	160	101	120	343	6200	6100	5300	34	43.5	145	140	211
		pH	CCME FWAL	6.50 - 9.00	CCME MWAL	7.00 - 8.70	pH	8.24	8.05	8.21	8.27	7.84	8.25	8.08	7.97	7.94	7.85	8.33	8.21	8.37	8.04	7.71	7.79	7.84	7.95	8.56	8.21	8.20	8.30
		Total Organic Carbon	CCME FWAL	NA	CCME MWAL	NA	mg/L	4.8	5.7	---	---	5.4	---	3.5	1.5	1.4	1.4	5.5	---	5.5	---	1.7	1.3	1.4	2.4	---	---	3.9	---
		Alkalinity Total (as CaCO3) pH 4.5	CCME FWAL	NA	CCME MWAL	NA	mg/L	110	83	208	196	210	208	45	110	110	110	170	130	130	230	120	110	110	43	104	105	130	140
		Alkalinity (PP as CaCO3) pH 8.3	CCME FWAL	NA	CCME MWAL	NA	mg/L	<1	<1	---	---	<1	---	<1	<1	<1	<1	1	---	2	---	<1	<1	<1	<1	---	---	<1	---
		Bicarbonates (HCO3 as CaCO3)	CCME FWAL	NA	CCME MWAL	NA	mg/L	110	83	---	---	210	---	45	110	110	110	170	---	130	---	120	110	110	43	---	---	130	---
		Carbonate (CO3 as CaCO3)	CCME FWAL	NA	CCME MWAL	NA	mg/L	<1	<1	---	---	<1	---	<1	<1	<1	<1	3	---	3	---	<1	<1	<1	<1	---	---	<1	---
		Chloride	CCME FWAL	120	CCME MWAL	NA	mg/L	17	17	45.4	57.6	24	35.9	14	18000	19000	18000	21	21	16	---	16000	18000	18000	14	117	**120**	91	**191**
		Hydroxide (OH-)	CCME FWAL	NA	CCME MWAL	NA	mg/L	<1	<1	---	---	<1	---	<1	<1	<1	<1	<1	---	<1	---	<1	<1	<1	<1	---	---	<1	---
		Nitrate (N) and Nitrite (N)	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.02	0.11	---	---	0.02	---	0.03	<10	<10	<10	0.03	---	0.04	---	<10	<10	<20	0.08	---	---	0.06	---
		Sulfates	CCME FWAL	NA	CCME MWAL	NA	mg/L	11.0	10	49.6	32.9	13	11.7	8.3	2500	2600	2500	11.0	13.8	8.5	9.2	2200	2500	2500	14.0	41.3	22.7	22.0	68.8
		Total Dissolved Solids	CCME FWAL	NA	CCME MWAL	NA	mg/L	160	140	440	390	270	260	110	35000	34000	35000	240	220	180	350	30000	33000	35000	100	470	450	330	600
	Hydrocarbons	Benzene	CCME FWAL	0.37	CCME MWAL	0.11	mg/L	<0.00040	<0.00040	---	---	<0.00040	---	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	---	<0.00040	<0.00025	<0.00040	<0.00040	<0.00040	<0.00040	---	---	<0.00040	---
		Toluene	CCME FWAL	0.002	CCME MWAL	0.215	mg/L	<0.00040	<0.00040	---	---	<0.00040	---	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	---	<0.00040	<0.0005	<0.00040	<0.00040	<0.00040	<0.00040	---	---	<0.00040	---
		Ethylbenzene	CCME FWAL	0.09	CCME MWAL	0.022	mg/L	<0.00040	<0.00040	---	---	<0.00040	---	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	---	<0.00040	<0.0005	<0.00040	<0.00040	<0.00040	<0.00040	---	---	<0.00040	---
		o-Xylene	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.008	<0.008	---	---	<0.008	---	<0.008	<0.008	<0.008	<0.008	<0.008	---	<0.008	---	<0.008	<0.008	<0.008	<0.008	---	---	<0.008	---
		m+p-Xylene	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.004	<0.004	---	---	<0.004	---	<0.004	<0.004	<0.004	<0.004	<0.004	---	<0.004	---	<0.004	<0.004	<0.004	<0.004	---	---	<0.004	---
		Xylenes	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.008	<0.008	---	---	<0.008	---	<0.008	<0.008	<0.008	<0.008	<0.008	---	<0.008	0.0013	<0.008	<0.008	<0.008	<0.008	---	---	<0.008	---
		F1 (C6-C10)	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.10	<0.10	---	---	<0.10	---	<0.10	<0.10	<0.10	<0.10	<0.10	---	<0.10	---	<0.10	<0.10	<0.10	<0.10	---	---	<0.10	---
		F1-BTEX	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.10	<0.10	---	---	<0.10	---	<0.10	<0.10	<0.10	<0.10	<0.10	---	<0.10	<0.025	<0.10	<0.10	<0.10	<0.10	---	---	<0.10	---
		F2 (C10-C16)	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.10	<0.10	---	---	<0.10	---	<0.10	<0.10	<0.10	<0.10	<0.10	---	<0.10	27.2	<0.10	<0.10	<0.10	<0.10	---	---	<0.10	---
	PCBs	Total PCB	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.000012	<0.000012	<0.000004	<0.0000058	<0.000012	0.00537	<0.000012	<0.000012	0.000013	0.000016	<0.000012	0.0000045	<0.000012	---	0.000018	<0.000012	<0.000012	<0.000012	<0.0000039	<0.0000044	<0.000012	<0.0000031
	Total Metals	Aluminium	CCME FWAL	0.100**	CCME MWAL	0.100**	mg/L	<0.010	0.014	0.0011	**0.190**	<0.010	0.0059	0.074	**0.110**	0.810	0.850	<0.010	0.0033	<0.010	**2.31**	0.060	0.051	0.019	**0.200**	**0.691**	0.0237	0.029	0.0048
		Antimony	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.01	<0.01	0.0015	0.0037	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0005	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	0.0014	<0.0005	<0.01	<0.0005
		Arsenic	CCME FWAL	0.005	CCME MWAL	0.0125	mg/L	<0.001	<0.0010	<0.0010	<0.0010	<0.001	<0.0010	<0.001	0.0024	0.0038	0.0035	<0.001	<0.001	<0.001	---	0.0022	0.0020	0.0020	<0.001	0.0013	<0.001	<0.001	<0.001
		Barium	CCME FWAL	NA	CCME MWAL	NA	mg/L	0.036	0.031	0.1180	0.1050	0.088	0.0943	0.023	<0.020	0.035	0.030	0.092	0.0495	0.058	0.1710	<0.020	<0.020	<0.020	0.052	0.0766	0.0750	0.099	0.117
		Beryllium	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.005	<0.005	<0.0005	<0.0005	<0.005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0005	<0.005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.0005	<0.0005	<0.005	<0.0005
		Bisumuth	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.0025	<0.0025	---	---	<0.0025	---	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	---	<0.0025	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	<0.0025	---
		Boron	CCME FWAL	1.500	CCME MWAL	4.500	mg/L	<0.050	0.067	0.013	0.014	<0.050	0.018	<0.050	5.500	5.600	6.200	<0.050	0.0302	0.051	0.0091	45.000	4.700	5.100	0.061	0.282	0.0529	0.080	0.103
		Cadmium	CCME FWAL	0.000013 - 000063***	CCME FWAL	0.00012	mg/L	<0.000300	<0.00030	<0.00010	<0.00010	<0.00030	<0.00010	<0.000300	<0.00030	<0.00030	<0.00030	<0.000300	<0.000100	<0.000300	0.000250	<0.00030	<0.00030	<0.00030	<0.000300	<0.000100	<0.000100	<0.000300	<0.000100
		Calcium	CCME FWAL	NA	CCME MWAL	NA	mg/L	29.0	22	---	---	59	---	10.0	450	470	460	48.0	---	32.0	---	390	420	440	7.9	---	---	36.0	---
		Chromium	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.05	<0.0050	<0.001	<0.001	<0.0050	<0.001	<0.05	0.0060	0.0084	0.0081	<0.05	<0.001	<0.05	<0.001	0.0061	0.0052	0.0061	<0.05	<0.01	<0.001	<0.05	<0.001
		Cobalt	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.05	<0.005	0.00018	0.00045	<0.005	0.00023	<0.05	<0.005	<0.005	<0.005	<0.05	<0.00010	<0.05	0.00206	<0.005	<0.005	<0.005	<0.05	0.00016	<0.00100	<0.05	0.00013
		Copper	CCME FWAL	0.00200 - 0.00400***	CCME FWAL	0.0020 - 0.0040***	mg/L	<0.00200	<0.00200	0.0026	**0.0043**	<0.00200	<0.0010	**0.00670**	<0.00200	0.0023	0.0026	<0.00200	0.00160	<0.00200	**0.00740**	0.00200	0.00200	0.00200	**0.00290**	**0.00800**	0.00170	<0.00200	0.00280
		Iron	CCME FWAL	0.30	CCME FWAL	0.300	mg/L	<0.06	0.067	<0.020	**0.381**	0.073	0.120	0.16	**0.320**	**2.200**	**2.200**	<0.06	<0.02	<0.06	**3.400**	0.130	0.140	<0.060	0.11	**0.651**	0.054	**1.10**	<0.020
		Lead	CCME FWAL	0.00100 - 0.00700***	CCME FWAL	0.0025 - 0.0070***	mg/L	<0.00100	<0.0010	<0.0010	0.0019	<0.0010	<0.0010	<0.00100	0.0014	**0.0130**	0.0062	<0.00100	<0.00100	<0.00100	0.00690	<0.0010	<0.0010	<0.0010	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
		Lithium	CCME FWAL	NA	CCME FWAL	NA	mg/L	<0.1	<0.10	---	---	<0.10	---	<0.1	0.15	0.15	0.15	<0.1	---	<0.1	---	0.14	0.14	0.15	<0.1	---	---	<0.1	---
		Magnesium	CCME FWAL	NA	CCME MWAL	NA	mg/L	4.6	3.6	---	---	7.0	---	2.5	1400.0	1400.0	1400.0	5.7	---	6.1	---	1100.0	1200.0	1200.0	2.2	---	---	9.0	---
		Manganese	CCME FWAL	NA	CCME MWAL	NA	mg/L	0.0041	0.0045	---	---	0.0270	---	<0.0040	0.0049	0.0370	0.0320	<0.0040	---	<0.0040	---	<0.0040	<0.0040	<0.0040	<0.0040	---	---	<0.0040	---
		Mercury	CCME FWAL	0.000026	CCME MWAL	0.000016	mg/L	<0.000010	<0.000010	**<0.0001**	**<0.0001**	<0.000010	**<0.0001**	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.0001	<0.000010	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.0001	<0.0001	<0.000010	<0.0001
		Molybdenum	CCME FWAL	0.073	CCME FWAL	0.073	mg/L	<0.005	<0.005	0.0019	0.0017	<0.005	<0.001	<0.005	0.011	0.011	0.011	<0.005	0.0016	<0.005	<0.0010	0.011	0.011	0.011	<0.005	0.0120	0.0029	<0.005	0.0043
		Nickel	CCME FWAL	0.0250 - 0.1500***	CCME FWAL	0.082 - 0.150***	mg/L	<0.0020	<0.002	0.0041	0.0048	<0.002	0.0046	<0.0020	<0.002	<0.002	<0.002	<0.0020	0.0014	<0.0020	0.0099	<0.002	<0.002	<0.002	<0.0020	0.0014	0.0023	<0.0020	0.0026
		Potassium	CCME FWAL	NA	CCME MWAL	NA	mg/L	1.3	1.4	---	---	1.1	---	1.5	420.0	410.0	420.0	1.8	---	1.6	---	360.0	400.0	420.0	1.6	---	---	3.4	---
		Selenium	CCME FWAL	0.001	CCME FWAL	0.001	mg/L	<0.010	<0.010	<0.0010	**0.0012**	<0.010	<0.0010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.001	<0.010	<0.001	<0.010	<0.010	<0.010	<0.010	0.0024	0.0018	<0.010	0.0020
		Silver	CCME FWAL	0.0001	CCME FWAL	0.0001	mg/L	<0.0010	<0.0010	<0.0001	<0.0001	<0.0010	<0.0001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0010	<0.0001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0010	<0.0001
		Sodium	CCME FWAL	NA	CCME MWAL	NA	mg/L	19	17	---	---	31	---	15	12000	11000	12000	25	---	21	---	11000	10000	9400	21	---	---	69	---
		Strontium	CCME FWAL	NA	CCME MWAL	NA	mg/L	0.160	0.14	---	---	0.43	---	0.049	8.30	8.20	8.40	0.380	---	0.160	---	7.70	8.10	8.40	0.240	---	---	0.410	---
		Thallium	CCME FWAL	0.0008	CCME FWAL	0.0008	mg/L	<0.0200	<0.0200	<0.0001	<0.0001	<0.0200	<0.0001	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	<0.0001	<0.0200	<0.0001	<0.0200	<0.0200	<0.0200	<0.0200	<0.0001	<0.0001	<0.0200	<0.0001
		Tin	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.02	<0.02	<0.001	<0.001	<0.02	<0.001	<0.02	<0.02	<0.02	<0.02	<0.001	<0.02	<0.001	<0.02	<0.02	<0.02	<0.02	<0.02	<0.001	<0.001	<0.02	<0.001
		Titanium	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.01	<0.01	---	---	<0.01	---	<0.01	11.00	0.10	0.10	<0.01	---	<0.01	---	<0.01	<0.01	<0.01	<0.01	---	---	<0.01	---
		Vanadium	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.02	<0.02	<0.001	0.0014	<0.02	<0.001	<0.02	<0.02	<0.02	<0.02	<0.02	<0.0010	<0.02	0.0069	<0.02	<0.02	<0.02	0.0123	0.0012	<0.02	0.0013	
		Zinc	CCME FWAL	0.0300	CCME FWAL	0.030	mg/L	<0.0070	<0.007	0.029	0.025	**0.130**	0.011	0.0110	<0.007	0.008	0.010	<0.0070	0.0047	<0.0070	0.0042	<0.007	<0.007	<0.007	<0.0070	0.0110	0.0013	<0.0070	0.0023
	Dissolved Metals	Aluminium	CCME FWAL	0.1000**	CCME FWAL	0.100**	mg/L	<0.0300	<0.030	---	---	<0.030	---	0.0700	0.030	**0.110**	0.030	<0.0300	---	<0.0300	---	<0.030	<0.030	<0.030	**0.2100**	---	---	<0.0300	---
		Antimony	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.003	<0.003	---	---	<0.003	---	<0.003	<0.003	<0.003	<0.003	<0.003	---	<0.003	---	<0.003	<0.003	<0.003	<0.003	---	---	<0.003	---
		Arsenic	CCME FWAL	0.005	CCME MWAL	0.0125	mg/L	<0.001	<0.0010	---	---	<0.0010	---	<0.001	0.0020	0.0020	0.0020	<0.001	---	<0.001	---	0.0020	0.0020	0.0020	<0.002	---	---	<0.001	---
		Barium	CCME FWAL	NA	CCME MWAL	NA	mg/L	0.04	0.030	---	---	0.090	---	0.02	<0.020	<0.02	<0.02	0.09	---	0.06	---	<0.02	<0.02	<0.02	0.05	---	---	0.08	---
		Cadmium	CCME FWAL	0.000013 - 000063***	CCME MWAL	0.00012	mg/L	<0.001000	<0.00100	---	---	<0.00100	---	<0.001000	<0.00100	<0.00100	<0.00100	<0.001000	---	<0.001000	---	<0.00100	<0.00100	<0.00100	<0.001000	---	---	<0.001000	---
		Chromium	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.030	<0.030	---	---	<0.005	---	<0.005	<0.005	<0.005	<0.005	<0.030	---	<0.030	---	<0.005	<0.005	<0.005	<0.005	---	---	<0.005	---
		Cobalt	CCME FWAL	NA	CCME MWAL	NA	mg/L	<0.02	<0.02	---	---	<0.02	---	<0.02	<0.02	<0.02	<0.02	<0.02	---	<0.02	---	<0.02	<0.02	<0.02	<0.02	---	---	<0.03	---
		Copper	CCME FWAL	0.00200 - 0.00353***	CCME FWAL	0.0020 - 0.0040***	mg/L	<0.00300	<0.0030	---	---	<0.0030	---	<0.00300	<0.0030	<0.0030	<0.0030	<0.00300	---	<0.00300	---	<0.0030	<0.0030	<0.0030	<0.00300	---	---	<0.00300	---
		Lead	CCME FWAL	0.00100 - 0.00579***	CCME FWAL	0.0025 - 0.0070***	mg/L	<0.00100	<0.0010	---	---	<0.0010	---	<0.00100	0.0010	0.0040	<0.0010	<0.00100	---	<0.00100	---	<0.0010	<0.0010	<0.0010	<0.00100	---	---	<0.00100	---
		Manganese	CCME FWAL	NA	CCME MWAL	NA	mg/L	0.006	0.005	---	---	0.027	---	<0.003	0.003	0.011	<0.003	<0.003	---	<0.003	---	<0.003	<0.003	<0.003	<0.003	---	---	<0.003	---
		Molybdenum	CCME FWAL	0.073	CCME FWAL	0.073	mg/L	<0.010	<0.010	---	---	<0.010	---	<0.010	0.010	0.010	0.010	<0.010	---	<0.010	---	<0.010	0.010	0.010	<0.01	---	---	<0.010	---
		Nickel	CCME FWAL	0.0250 - 0.1366***	CCME FWAL	0.082 - 0.150***	mg/L	<0.0100	<0.010	---	---	<0.010	---	<0.0100	<0.010	<0.010	<0.010	<0.0100	---	<0.0100	---	<0.010	<0.010	<0.010	<0.0100	---	---	<0.0100	---
		Selenium	CCME FWAL	0.001	CCME FWAL	0.001	mg/L	<0.001	<0.001	---	---	<0.001	---	<0.001	<0.001	<0.001	<0.001	<0.001	---	<0.001	---	<0.001	**0.001**	<0.001	<0.001	---	---	<0.001	---
		Silver	CCME FWAL	0.0001	CCME FWAL	0.0001	mg/L	<0.0003	<0.0003	---	---	**0.0004**	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	---	<0.0003	---	<0.0003	<0.0003	<0.0003	<0.0003	---	---	<0.0003	---
		Sodium	CCME FWAL	NA	CCME MWAL	NA	mg/L	20	18	---	---	26	---	16	10000	11000	11000	26	---	22	---	8600	10000	10000	20	---	---	71	---
		Zinc	CCME FWAL	0.030	CCME FWAL	0.030	mg/L	**0.036**	0.006	---	---	**0.150**	---	0.016	<0.005	0.007	0.007	0.008	---	<0.005	---	0.006	0.016	0.009	0.010	---	---	0.006	---

CCME: Marine Water Aquatic Life (MWAL) criteria shall be applied to samples collected at stations from the Strait as well as in the pooled surface water that have the potential to drain into the Strait during high water conditions. In the event that a MWAL criteria has not been established the Fresh Water Aquatic Life (FWAL) criteria will be applied.
CCME: Freshwater Water Aquatic Life (FWAL) criteria shall be applied to sampling stations at pooled surface waters that do not have the potential to drain into the Strait during high water conditions.
As per the Guideline Analysis Approved by PWGSC/AANDC, CCME FWAL criteria has been applied to MWAL environments in the event of a gap in criteria
The laboratory detection limit varies between the 2012 and 2010 surface water samples, as well as between samples of the same collection date due to sample and equipment quality.
NA: Criteria is not available for this parameter
--- denotes parameter not analyzed
^(WESA 2011)
< denotes result below detection level
* = CCME FWAL guideline for Nitrogen Ammonia (NH_3) is pH and water temperature dependent at each station. The calculation of the guideline assumes the water temperature is 5 °C and rounds the analyzed pH to the nearest guideline value.
** CCME guideline for Aluminum is specific to the pH of the water at this site during this particular sampling event. Guideline for pH values < 6.5 = 0.005mg/L and ≥ 6.5 = 0.1 mg/L.
*** = CCME guideline dependent on hardness of the water at each station during this particular sampling event.

Outside CCME Marine Water Quality Guidelines
Outside CCME Fresh Water Quality Guidelines
Detection Limit above CCME Guidelines

Table E3: Y22101291 Nottingham Island Soil Sampling Results-Petroleum Hydrocarbons AMSRP/CCME Criteria

					Area of Potential Environmental Concern	APEC 1						APEC 2	APEC 3								
					Sample ID	2012-SB-36	2012-SB-37	2012-SB-38	2012-SB-39	SB029-SS-049 WESA	SB029-SS-050 WESA	SB029-SS-051	2012-SB-43	2012-SB-44	2012-SB-45	2012-SB-46	2012-SB-47	SB029-SS-061 WESA	SB029-SS-062 WESA	SB029-SS-063 WESA	SB029-SS-066 WESA
					Date Sampled	14-08-12	14-08-12	14-08-12	14-08-12	23-10-10	23-10-10	23-10-10	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	23-10-10	23-10-10	23-10-10	23-10-10
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**																
Soil	Hydrocarbons	Benzene	mg/kg	CCME Agricultural	0.03	<0.005	<0.005	<0.005	<0.005	<0.022	<0.018	<0.014	<0.005	<0.02	<0.005	<0.005	<0.005	<0.022	<0.078	<0.015	<0.032
		Toluene	mg/kg	CCME Agricultural	0.37	<0.02	<0.02	<0.02	<0.02	<0.044	<0.035	0.039	<0.02	<0.06	<0.02	<0.02	<0.02	<0.044	<0.16	<0.031	<0.064
		Ethylbenzene	mg/kg	CCME Agricultural	0.082	<0.01	<0.01	<0.01	<0.01	<0.022	<0.018	0.017	<0.01	0.08	<0.01	<0.01	<0.01	<0.022	<0.078	<0.015	<0.032
		o-Xylene	mg/kg	Used in sum for CCME	NA	<0.02	<0.02	<0.02	<0.02				<0.02	0.63	<0.02	<0.02	<0.02				
		m+p-Xylene	mg/kg	Used in sum for CCME	NA	<0.04	<0.04	<0.04	<0.04				<0.04	0.9	<0.04	<0.04	<0.04				
		Xylenes	mg/kg	CCME Agricultural	11	<0.04	<0.04	<0.04	<0.04	0.071	0.02	0.109	<0.04	1.5	<0.04	<0.04	<0.04	<0.0056	<0.016	<0.0043	<0.0072
		F1 (C6-C10)	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	<10	<10	<3.5	<2.8	<2.2	<10	120	74	<10	<10	<3.5	<6.2	<2.5	<5.1
		F1-BTEX	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	<10	<10	<3.5	<2.8	<2.2	<10	120	74	<10	<10	<3.5	<6.2	<2.5	<5.1
		F2 (C10-C16)	mg/kg	NA used for AMSRP Calculation	NA	13	1500	<10	<10	23.8	<2.5	91.6	<10	2600	2600	<10	18	34.5	8010	5.1	8.3
		F3 (C16-C34)	mg/kg	NA used for AMSRP Calculation	NA	56	610	91	26	74.7	78	106	<10	2200	1400	<10	32	39	9520	34	33
		F4 (C34-C50)	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	36	12	22	28	23	<10	30	<10	<10	<10	<7.1	15	37	<5.1
		F4 Gravimetric (Heavy Hydrocarbons)	mg/kg	NA used in Calculation of F4	NA																
		Sum of F1-F3 (Type B)	mg/kg	AMSRP Type B Terrestrial protected	2500	69	2110	91	26	99	78	198	0	4920	4074	0	50	74	17530	39	41
		Type A Hydrocarbons (sum of F3/F4)	mg/kg	AMSRP Type A	20000	56	610	127	38	97	106	129	0	2230	1400	0	32	39	9535	71	33

1. CCME R/P Tier 1: *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* by Canadian Council of Ministers of the Environment (CCME), 2007 - Agricultural/Wild Land Coarse Grained Soils.
2. AMSRP Teir 1/2: Abandoned Military Site Remediation Critera, Aboriginal Affairs and Northern Development Canada, December 2008.

Yellow cells indicate samples above criteria.

NA=Guideline is not available

Table E3: Y22101291 Nottingham Island Soil Sampling Results-Petroleum Hydrocarbons AMSRP/CCME Criteria

					Area of Potential Environmental Concern	APEC 4				APEC 7			APEC 8		APEC 9				
					Sample ID	2012-SB-40	2012-SB-41	2012-SB-42	SB029-SS-065 WESA	2012-SB-50	2012-SB-51	2012-SB-52	2012-SB-48	2012-SB-49	2012-SB-20	2012-SB-21	2012-SB-22	2012-SB-23	SB029-SS-052 WESA
					Date Sampled	14-08-12	14-08-12	14-08-12	23-10-10	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	23-10-10
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**														
Soil	Hydrocarbons	Benzene	mg/kg	CCME Agricultural	0.03	0.007	<0.005	<0.005	0.026	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.015
		Toluene	mg/kg	CCME Agricultural	0.37	0.03	<0.02	<0.02	0.21	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.03
		Ethylbenzene	mg/kg	CCME Agricultural	0.082	<0.01	<0.01	<0.01	0.026	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.015
		o-Xylene	mg/kg	Used in sum for CCME	NA	<0.02	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
		m+p-Xylene	mg/kg	Used in sum for CCME	NA	<0.04	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	<0.04	<0.04	
		Xylenes	mg/kg	CCME Agricultural	11	<0.04	<0.04	<0.04	0.162	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	<0.04	<0.04	<0.0042
		F1 (C6-C10)	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	<10	<2.7	<10	<10	<10	<10	<10	<10	<10	<10	<10	<2.4
		F1-BTEX	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	<10	<2.7	<10	<10	<10	<10	<10	<10	<10	<10	<10	<2.4
		F2 (C10-C16)	mg/kg	NA used for AMSRP Calculation	NA	<10	530	230	282	<10	<10	<10	<10	<10	53	580	120	<10	3100
		F3 (C16-C34)	mg/kg	NA used for AMSRP Calculation	NA	130	2000	1300	2710	<10	24	13	<10	12	47	800	490	21	2930
		F4 (C34-C50)	mg/kg	NA used for AMSRP Calculation	NA	45	19	13	83.8	<10	<10	<10	<10	<10	<10	<10	<10	14	12
		F4 Gravimetric (Heavy Hydrocarbons)	mg/kg	NA used in Calculation of F4	NA														
		Sum of F1-F3 (Type B)	mg/kg	AMSRP Type B Terrestrial protected	2500	130	2530	1530	2992	0	24	13	0	12	100	1380	610	21	6030
		Type A Hydrocarbons (sum of F3/F4)	mg/kg	AMSRP Type A	20000	175	2019	1313	2794	0	24	13	0	12	47	800	490	35	2942

1. CCME R/P Tier 1: *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* by Canadian Council of Ministers of the Environment (CCME), 2007 - Agricultural/Wild Land Coarse Grained Soils.
2. AMSRP Teir 1/2: Abandoned Military Site Remediation Critera, Aboriginal Affairs and Northern Development Canada, December 2008.

Yellow cells indicate samples above criteria.
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Table E3: Y22101291 Nottingham Island Soil Sampling Results-Petroleum Hydrocarbons AMSRP/CCME Criteria

					Area of Potential Environmental Concern	APEC 10					
					Sample ID	2012-SB-13	2012-SB-14	2012-SB-15	2012-SB-16	SB029-SS-041 WESA	SB029-SS-042 WESA
					Date Sampled	14-08-12	14-08-12	14-08-12	14-08-12	23-10-10	23-10-10
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**						
Soil	Hydrocarbons	Benzene	mg/kg	CCME Agricultural	0.03	<0.005	<0.005	<0.005	<0.005	<0.013	<0.015
		Toluene	mg/kg	CCME Agricultural	0.37	<0.02	<0.02	<0.02	<0.02	<0.026	<0.029
		Ethylbenzene	mg/kg	CCME Agricultural	0.082	<0.01	<0.01	<0.01	<0.01	<0.029	<0.015
		o-Xylene	mg/kg	Used in sum for CCME	NA	<0.02	<0.02	<0.02	<0.02		
		m+p-Xylene	mg/kg	Used in sum for CCME	NA	<0.04	<0.04	<0.04	<0.04		
		Xylenes	mg/kg	CCME Agricultural	11	<0.04	<0.04	<0.04	<0.04	<0.0039	0.03
		F1 (C6-C10)	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	<10	<10	2.9	<2.4
		F1-BTEX	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	<10	<10	2.9	<2.4
		F2 (C10-C16)	mg/kg	NA used for AMSRP Calculation	NA	48	71	21	380	948	104
		F3 (C16-C34)	mg/kg	NA used for AMSRP Calculation	NA	170	1800	1700	850	1160	1340
		F4 (C34-C50)	mg/kg	NA used for AMSRP Calculation	NA	71	1000	1200	480	156	205
		F4 Gravimetric (Heavy Hydrocarbons)	mg/kg	NA used in Calculation of F4	NA		2800	4900			
		Sum of F1-F3 (Type B)	mg/kg	AMSRP Type B Terrestrial protected	2500	218	1871	1721	1230	2111	1444
		Type A Hydrocarbons (sum of F3/F4)	mg/kg	AMSRP Type A	20000	241	2800	2900	1330	1316	1545

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2. AMSRP Teir 1/2: Abandoned Military Site Remediation Critera, Aboriginal Affairs and Northern Development Canada, December 2008.

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Table E3: Y22101291 Nottingham Island Soil Sampling Results-Petroleum Hydrocarbons AMSRP/CCME Criteria

					Area of Potential Environmental Concern	APEC 11/ APEC 12																
					Sample ID	2012-SB-6	2012-SB-7	2012-SB-8	2012-SB-9	2012-SB-10	2012-SB-57	2012-SB-58	2012-SB-59	2012-SB-60	2012-SB-61	2012-SB-62	SB029-SS-031 WESA	SB0029-SS-032 WESA	SB029-SS35 WESA	SB029-SS36 WESA	SB029-SS-037 WESA	SB029-SS-038 WESA
					Date Sampled	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	15-08-12	15-08-12	15-08-12	15-08-12	15-08-12	15-08-12	23-10-10	23-10-10	23-10-10	23-10-10	23-10-10	23-10-10
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**																	
Soil	Hydrocarbons	Benzene	mg/kg	CCME Agricultural	0.03	<0.005	0.008	0.013	<0.005	0.01	<0.005	0.16	<0.005	0.025	0.005	<0.005	<0.019	<0.016	0.12	<0.015	<0.013	0.048
		Toluene	mg/kg	CCME Agricultural	0.37	<0.02	0.05	0.08	<0.02	0.03	<0.02	0.71	<0.02	0.09	<0.02	<0.02	<0.039	<0.032	0.813	<0.029	0.046	0.2
		Ethylbenzene	mg/kg	CCME Agricultural	0.082	<0.01	0.02	0.04	<0.01	0.02	<0.01	0.12	<0.01	0.05	<0.01	<0.01	<0.019	<0.016	0.21	<0.015	<0.013	0.031
		o-Xylene	mg/kg	Used in sum for CCME	NA	<0.02	0.04	0.06	<0.02	<0.02	<0.02	0.17	<0.02	0.1	<0.02	<0.02						
		m+p-Xylene	mg/kg	Used in sum for CCME	NA	<0.04	0.08	0.17	<0.04	0.09	<0.04	0.77	<0.04	0.25	<0.04	0.04						
		Xylenes	mg/kg	CCME Agricultural	11	<0.04	0.12	0.23	<0.04	0.09	<0.04	0.95	<0.04	0.36	<0.04	0.04	<0.0047	<0.0045	1.28	0.029	0.037	0.194
		F1 (C6-C10)	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	81	<10	<10	45	15	<10	65	<10	59	5.2	<2.5	<2.8	<2.3	<2.1	<3.9
		F1-BTEX	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	80	<10	<10	45	13	<10	65	<10	59	5.3	<2.5	3.7	<2.3	<2.1	<3.9
		F2 (C10-C16)	mg/kg	NA used for AMSRP Calculation	NA	10	200	13000	4800	190	4600	2200	4000	5300	34	3700	2150	111	78.1	7.2	371	11
		F3 (C16-C34)	mg/kg	NA used for AMSRP Calculation	NA	34	440	4200	1900	130	980	780	2000	760	51	750	3700	10900	439	42.8	996	201
		F4 (C34-C50)	mg/kg	NA used for AMSRP Calculation	NA	<10	160	310	47	11	<10	160	90	<10	<10	18	491	112	135	49	100	37
		F4 Gravimetric (Heavy Hydrocarbons)	mg/kg	NA used in Calculation of F4	NA																	
		Sum of F1-F3 (Type B)	mg/kg	AMSRP Type B Terrestrial protected	2500	44	640	17281	6700	320	5625	2995	6000	6125	85	4509	5855	11011	517	50	1367	212
		Type A Hydrocarbons (sum of F3/F4)	mg/kg	AMSRP Type A	20000	34	600	4510	1947	141	980	940	2090	760	51	768	4191	11012	574	92	1096	238

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Table E3: Y22101291 Nottingham Island Soil Sampling Results-Petroleum Hydrocarbons AMSRP/CCME Criteria

					Area of Potential Environmental Concern	APEC 13					APEC 14													
					Sample ID	2012-SB-3	2012-SB-4	2012-SB-5	2012-SB-55	SB0290SS-030 WESA	2012-SB-17	2012-SB-18	2012-SB-19	2012-SB-24	2012-SB-25	2012-SB-26	2012-SB-27	2012-SB-28	2012-SB-29	2012-SB-30	2012-SB-31	2012-SB-33	SB029-SS-046 WESA	SB029-SS-047 WESA
					Date Sampled	14-08-12	14-08-12	14-08-12	15-08-12	23-Oct-10	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	23-10-10	23-10-10
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**																		
Soil	Hydrocarbons	Benzene	mg/kg	CCME Agricultural	0.03	0.014	0.061	<0.005	<0.005	0.026	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.031	<0.02
		Toluene	mg/kg	CCME Agricultural	0.37	0.06	0.09	<0.02	<0.02	0.28	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.063	<0.04
		Ethylbenzene	mg/kg	CCME Agricultural	0.082	0.02	0.01	<0.01	<0.01	0.045	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	0.1	<0.02
		o-Xylene	mg/kg	Used in sum for CCME	NA	<0.02	<0.02	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.12	<0.02	<0.02	<0.02	<0.02		
		m+p-Xylene	mg/kg	Used in sum for CCME	NA	0.08	0.05	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.1	<0.04	<0.04	<0.04	<0.04	<0.04	
		Xylenes	mg/kg	CCME Agricultural	11	0.08	0.05	<0.04	<0.04	0.226	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.22	<0.04	<0.04	<0.04	<0.04	0.838	<0.006
		F1 (C6-C10)	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	<10	<10	<2.6	<10	<10	<10	<10	30	<10	520	<10	<10	<10	<10	81.2	3.9
		F1-BTEX	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	<10	<10	<2.6	<10	<10	<10	<10	30	<10	520	<10	<10	<10	<10	81.5	3.9
		F2 (C10-C16)	mg/kg	NA used for AMSRP Calculation	NA	<10	62	<10	<10	18	90	<10	1000	<10	4700	<10	9900	380	1900	<10	<10	6930	1510
		F3 (C16-C34)	mg/kg	NA used for AMSRP Calculation	NA	90	130	11	180	257	95	17	250	12	1000	<10	1700	130	1400	<10	<10	2150	589
		F4 (C34-C50)	mg/kg	NA used for AMSRP Calculation	NA	45	41	12	36	57	11	11	<10	12	<10	<10	<10	<10	250	<10	<10	33	18
		F4 Gravimetric (Heavy Hydrocarbons)	mg/kg	NA used in Calculation of F4	NA																		
		Sum of F1-F3 (Type B)	mg/kg	AMSRP Type B Terrestrial protected	2500	90	192	11	180	275	185	17	1250	12	5730	0	12120	510	3300	0	0	31	9161	2103
		Type A Hydrocarbons (sum of F3/F4)	mg/kg	AMSRP Type A	20000	135	171	23	216	314	106	28	250	24	1000	0	1700	130	1650	0	0	0	2183	607

1. CCME R/P Tier 1: *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* by Canadian Council of Ministers of the Environment (CCME), 2007 - Agricultural/Wild Land Coarse Grained Soils.
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Table E3: Y22101291 Nottingham Island Soil Sampling Results-Petroleum Hydrocarbons AMSRP/CCME Criteria

					Area of Potential Environmental Concern	APEC 16					APEC 17		APEC 18				Pipeline			
					Sample ID	2012-SB-1	2012-SB-2	2012-SB-53	2012-SB-54	2012-SB-56	2012-SB-12	SB029-SS-045 WESA	2012-SB-32	2012-SB-34	2012-SB-35	SB029-SS-048 WESA	2012-SB-11	2012-SB-63	2012-SB-64	SB029-SS-040 WESA
					Date Sampled	14-08-12	14-08-12	14-08-12	15-08-12	15-08-12	14-08-12	23-10-10	14-08-12	14-08-12	14-08-12	23-10-10	14-08-12	15-08-12	15-08-12	23-10-10
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**															
Soil	Hydrocarbons	Benzene	mg/kg	CCME Agricultural	0.03	<0.005	0.024	<0.005	0.006	<0.005	<0.005	<0.015	<0.005	<0.005	<0.005	<0.021	<0.005	0.033	<0.005	<0.018
		Toluene	mg/kg	CCME Agricultural	0.37	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	<0.031	<0.02	<0.02	<0.02	<0.042	<0.02	0.07	<0.02	<0.035
		Ethylbenzene	mg/kg	CCME Agricultural	0.082	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.021	<0.01	0.02	<0.01	<0.018
		o-Xylene	mg/kg	Used in sum for CCME	NA	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		<0.02	<0.02	<0.02		<0.02	0.03	<0.02	
		m+p-Xylene	mg/kg	Used in sum for CCME	NA	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	<0.04	<0.04		<0.04	0.1	<0.04	
		Xylenes	mg/kg	CCME Agricultural	11	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.0042	<0.04	<0.04	<0.04	0.023	<0.04	0.13	<0.04	0.022
		F1 (C6-C10)	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	<10	<10	<10	<10	<2.5	<10	<10	<10	<3.3	80	<10	43	<2.8
		F1-BTEX	mg/kg	NA used for AMSRP Calculation	NA	<10	<10	<10	<10	<10	<10	<2.5	<10	<10	<10	<3.3	80	<10	43	<2.8
		F2 (C10-C16)	mg/kg	NA used for AMSRP Calculation	NA	0094	<10	<10	<10	130	2800	31.3	<10	<10	<10	11	5000	4900	2000	41.7
		F3 (C16-C34)	mg/kg	NA used for AMSRP Calculation	NA	058	61	15	21	280	820	4.5	13	<10	<10	42.6	4100	1400	460	1080
		F4 (C34-C50)	mg/kg	NA used for AMSRP Calculation	NA	22	56	<10	<10	110	960	<6.4	<10	<10	<10	30	2100	170	68	163
		F4 Gravimetric (Heavy Hydrocarbons)	mg/kg	NA used in Calculation of F4	NA						1700									
		Sum of F1-F3 (Type B)	mg/kg	AMSRP Type B Terrestrial protected	2500	152	61	15	21	410	3620	36	13	0	0	54	9180	6300	2503	1122
		Type A Hydrocarbons (sum of F3/F4)	mg/kg	AMSRP Type A	20000	80	117	15	21	390	1780	5	13	0	0	73	6200	1570	528	1243

1. CCME R/P Tier 1: *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* by Canadian Council of Ministers of the Environment (CCME), 2007 - Agricultural/Wild Land Coarse Grained Soils.
2. AMSRP Teir 1/2: Abandoned Military Site Remediation Critera, Aboriginal Affairs and Northern Development Canada, December 2008.

Yellow cells indicate samples above criteria.

NA=Guideline is not available

Table E4: Y22101291 Nottingham Island Soil Sampling Results- CCME/AMSRP Total Extractable Metals

					Area of Potential Environmental Concern		APEC 1						APEC 2
					Sample ID		2012-SB-36	2012-SB-37	2012-SB-38	2012-SB-39	SB029-SS-049 WESA	SB029-SS-050 WESA	SB029-SS-051 WESA
					Date Sampled		14-08-12	14-08-12	14-08-12	14-08-12	2310-10	23-10-10	23-10-10
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**	**Background Concentration Range**							
Soil	Metals	Silver	mg/kg	CCME Agricultural	20	ND	<0.5	<0.5	<0.5	<0.5	0.34	0.16	0.068
		Arsenic	mg/kg	AMRSP Tier 2	30	ND-4	<2	<2	<2	4	7.15	8.33	3.3
		Barium	mg/kg	CCME Agricultural	750	16-150	60	82	100	140	226	161	176
		Cadmium	mg/kg	AMRSP Tier 2	5	ND-0.3	<0.1	0.1	0.2	0.2	9.22	8.87	1.57
		Cobalt	mg/kg	AMRSP Tier 2	50	1-4	<1	<1	1	2	0.36	0.677	1.83
		Chromium	mg/kg	AMRSP Tier 2	250	22-3	1	2	4	3	2.91	4.68	6.57
		Copper	mg/kg	AMRSP Tier 2	100	13-1	2	2	6	10	21.8	34.9	10.3
		Tin	mg/kg	CCME Agricultural	5	2-1	<1	<1	<1	<1	6.09	5.98	3
		Manganese	mg/kg	Na	NA	31-160	47	36	43	42			
		Molybdenum	mg/kg	CCME Agricultural	5	ND-1.1	<0.5	<0.5	<0.5	0.8	0.88	1.1	<0.5
		Nickel	mg/kg	AMRSP Tier 2	100	1.8 - 12	0.9	1.4	6.7	4.5	13.9	18.7	8.23
		Lead	mg/kg	AMRSP Tier 1	200	1-4	<1	1	12	16	57.2	39.9	111
		Selenium	mg/kg	CCME Agricultural	1	ND-1.7	<0.5	<0.5	0.5	0.7	1	1.4	<0.5
		Zinc	mg/kg	AMRSP Tier 2	500	9-27	<5	<5	35	32	89.7	62.5	147
		Aluminium	mg/kg	NA	NA	1500-6800	570	700	1700	1800	2070	4140	1540
		Antimony	mg/kg	CCME Agricultural	20	ND	<0.1	<0.1	0.9	0.3	2.6	0.79	<0.5
		Beryllium	mg/kg	CCME Agricultural	4	ND-0.3	<0.1	<0.1	<0.1	0.2	<0.5	<0.5	<0.5
		Boron	mg/kg	NA	NA	ND-17	5	5	13	8	28	26.6	4.4
		Iron	mg/kg	NA	NA	2900-13000	1400	1500	2900	2600	7000	7300	4760
		Magnesium	mg/kg	NA	NA	1300-22000	8800	6800	6900	8100			
		Vanadium	mg/kg	CCME Agricultural	130	6-33	2	3	6	8	13.6	19.5	8.6
		Thallium	mg/kg	CCME Agricultural	1	ND	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5
		Uranium	mg/kg	CCME Agricultural	23	ND	<2	<2	<2	<2	<0.5	<0.5	<0.5
		Mercury	mg/kg	AMRSP Tier 2	2	ND	0.01	<0.01	0.03	0.07	0.075	<0.05	0.062
		PCB	mg/kg	AMRSP Tier 1	1	1.00							

1. CCME: R/P Tier 1: *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (PEHH) by Canadian Council of Ministers of the Environment (CCME), 2007 - Agricultural/Wild land Coarse Grained soils 2007 - Agricultural/Wild Land Coarse Grained Soils.
2. AMSRP Teir 1/2: Abandoned Military Site Remediation Criteria, Aboriginal Affairs and Northern Development Canada, December 2008.
NA=Guideline is not available.
Yellow cells indicate samples above criteria.
ND= non-detectable.

Table E4: Y22101291 Nottingham Island Soil Sampling Results- CCME/AMSRP Total Extractable Metals

					Area of Potential Environmental Concern		APEC 3									APEC 4				APEC 6	APEC 7				APEC 8	
					Sample ID		2012-SB-43	2012-SB-44	2012-SB-45	2012-SB-46	2012-SB-47	SB029-SS-061 WESA	SB029-SS-062 WESA	SB029-SS-063 WESA	SB029-SS-066 WESA	2012-SB-40	2012-SB-41	2012-SB-42	SB029-SS-065 WESA	SB029-SS-067 WESA	2012-SB-50	2012-SB-51	2012-SB-52	SB029-SS-068 WESA	2012-SB-48	2012-SB-49
					Date Sampled		14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	23-10-10	23-10-10	23-10-10	23-10-10	14-08-12	14-08-12	14-08-12	23-10-10	23-10-10	14-08-12	14-08-12	14-08-12	23-10-10	14-08-12	14-08-12
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**	**Background Concentration Range**																				
Soil	Metals	Silver	mg/kg	CCME Agricultural	20	ND	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	0.14	0.051	0.42	<0.5	<0.5	<0.5	0.14	0.067	<0.5	<0.5	<0.5	0.083	<0.5	<0.5
		Arsenic	mg/kg	AMRSP Tier 2	30	ND-4	<2	<2	<2	<2	<2	4.6	8.34	4.6	1.9	7	<2	<2	7.7	0.84	<2	6	<2	4.2	<2	2
		Barium	mg/kg	CCME Agricultural	750	16-150	43	140	84	74	54	131	248	172	334	200	68	27	1450	282	83	170	120	199	64	58
		Cadmium	mg/kg	AMRSP Tier 2	5	ND-0.3	<0.1	0.4	<0.1	<0.1	0.1	0.578	1.41	0.733	0.19	0.8	0.2	<0.1	2.38	1.21	<0.1	<0.1	<0.1	0.11	<0.1	<0.1
		Cobalt	mg/kg	AMRSP Tier 2	50	1-4	1	<1	1	2	3	2.84	5.37	2.87	2.37	2	1	<1	4.82	0.651	2	3	2	3.6	<1	3
		Chromium	mg/kg	AMRSP Tier 2	250	22-3	2	2	3	4	5	12.5	9.34	8.58	13.9	3	3	2	40.6	3.4	4	8	11	12.7	3	10
		Copper	mg/kg	AMRSP Tier 2	100	13-1	4	540	2	2	27	10.2	2450	28.2	8.14	36	10	1	345	21.4	2	9	4	5.72	1	7
		Tin	mg/kg	CCME Agricultural	5	2-1	<1	<1	<1	<1	<1	0.56	8.81	3	<0.5	7	1	<1	57.7	<0.5	<1	<1	<1	<0.5	<1	<1
		Manganese	mg/kg	Na	NA	31-160	49	53	52	64	110					170	74	47			90	100	55		52	150
		Molybdenum	mg/kg	CCME Agricultural	5	ND-1.1	<0.5	0.9	<0.5	<0.5	<0.5	0.52	2.6	<0.5	<0.5	1.7	<0.5	<0.5	0.69	1.7	<0.5	<0.	<0.5	<0.5	<0.5	<0.5
		Nickel	mg/kg	AMRSP Tier 2	100	1.8 - 12	1.9	4.6	2	2.4	4.8	9.96	59	10.3	8.02	5.4	2.2	1.2	16.1	5.65	2.6	6.1	4.5	10.2	1.8	6.8
		Lead	mg/kg	AMRSP Tier 1	200	1-4	2	8	1	1	13	5.19	240	49.2	3.3	92	36	2	2270	1.4	2	4	2	4.1	1	4
		Selenium	mg/kg	CCME Agricultural	1	ND-1.7	<0.5	1.5	0.7	0.6	0.6	1.1	1.5	1.1	1.2	4.2	<0.5	<0.5	2.2	2.2	0.9	1.2	0.7	0.71	0.5	0.6
		Zinc	mg/kg	AMRSP Tier 2	500	9-27	7	28	8	14	47	372	1300	115	122	210	87	6	3210	125	14	18	15	23.5	5	18
		Aluminium	mg/kg	NA	NA	1500-6800	1200	1400	1500	2200	3900	3800	5060	2290	3690	2600	1500	810	3140	828	2600	3500	2900	3850	1200	3900
		Antimony	mg/kg	CCME Agricultural	20	ND	<0.1	0.6	<0.1	0.2	0.5	4	11.6	<0.5	7.49	0.8	0.4	<0.1	8	1.8	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1
		Beryllium	mg/kg	CCME Agricultural	4	ND-0.3	<0.1	0.1	<0.1	<0.1	<0.1	<0.5	0.51	<0.5	<0.5	0.2	<0.1	<0.1	<0.5	<0.5	<0.1	0.2	0.1	<0.5	<0.1	0.1
		Boron	mg/kg	NA	NA	ND-17	4	23	4	5	6	3.7	24.3	25.1	30.7	5	5	5	38.1	39.5	5	7	3	27.9	6	11
		Iron	mg/kg	NA	NA	2900-13000	2500	3500	2800	5400	7700	6600	6200	4960	6800	4100	3100	1800	9800	1290	5200	9900	6900	9200	2600	7600
		Magnesium	mg/kg	NA	NA	1300-22000	9100	1100	12000	13000	11000					4800	6300	15000			2200	6000	6100		13000	26000
		Vanadium	mg/kg	CCME Agricultural	130	6-33	4	7	5	8	12	15.9	25.5	14.8	16.7	12	6	3	18.3	2.6	9	15	14	22.7	5	14
		Thallium	mg/kg	CCME Agricultural	1	ND	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1
		Uranium	mg/kg	CCME Agricultural	23	ND	<2	4	<2	<2	<2	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	1.2	<2	<2	<2	<0.5	<2	<2
		Mercury	mg/kg	AMRSP Tier 2	2	ND	<0.01	0.04	<0.01	<0.01	<0.01	<0.05	0.15	0.698	<0.05	0.25	<0.01	0.02	0.15	0.1	<0.01	<0.01	0.02	<0.05	<0.01	<0.01
		PCB	mg/kg	AMRSP Tier 1	1	1.00																				

1. CCME R/P Tier 1: *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (PEHH) by Canadian Council of Ministers of the Environment (CCME), 2007 - Agricultural/Wild land 2007 - Agricultural/Wild Land Coarse Grained Soils.
2. AMSRP Teir 1/2: Abandoned Military Site Remediation Criteria, Aboriginal Affairs and Northern Development Canada, December 2008.

NA=Guideline is not available.

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Table E4: Y22101291 Nottingham Island Soil Sampling Results- CCME/AMSRP Total Extractable Metals

					Area of Potential Environmental Concern		APEC 9								
					Sample ID		2012-SB-20	2012-SB-21	2012-SB-22	2012-SB-23	SB029-SS-052 WESA	SB029-SS-054 WESA	SB029-SS-056 WESA	SB029-SS-057 WESA	SB029-SS-058 WESA
					Date Sampled		14-08-12	14-08-12	14-08-12	14-08-12	23-10-10	23-10-10	23-10-10	23-10-10	23-10-10
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**	**Background Concentration Range**									
Soil	Metals	Silver	mg/kg	CCME Agricultural	20	ND	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	0.29	0.078
		Arsenic	mg/kg	AMRSP Tier 2	30	ND-4	<2	<2	<2	<2	4.7	5.08	4.2	4.2	4.4
		Barium	mg/kg	CCME Agricultural	750	16-150	59	54	71	46	74.2	109	87.2	89.3	110
		Cadmium	mg/kg	AMRSP Tier 2	5	ND-0.3	0.1	0.2	0.2	<0.1	0.22	0.15	0.32	0.869	0.23
		Cobalt	mg/kg	AMRSP Tier 2	50	1-4	<1	<1	1	1	1.93	2.41	1.93	1.34	2.28
		Chromium	mg/kg	AMRSP Tier 2	250	22-3	2	3	3	4	8.67	8.41	12.6	7.29	9.91
		Copper	mg/kg	AMRSP Tier 2	100	13-1	2	4	6	2	8.82	8.55	19.3	249	11.2
		Tin	mg/kg	CCME Agricultural	5	2-1	<1	<1	9	<1	6.84	0.58	12.2	14.8	1.7
		Manganese	mg/kg	Na	NA	31-160	57	57	89	71					
		Molybdenum	mg/kg	CCME Agricultural	5	ND-1.1	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5
		Nickel	mg/kg	AMRSP Tier 2	100	1.8 - 12	1.2	1.6	2.5	2.7	11.7	14.5	11	7.92	12
		Lead	mg/kg	AMRSP Tier 1	200	1-4	2	12	10	2	23.7	9.42	77.5	22.9	22.4
		Selenium	mg/kg	CCME Agricultural	1	ND-1.7	<0.5	<0.5	0.6	<0.5	<0.5	0.86	0.55	<0.5	<0.5
		Zinc	mg/kg	AMRSP Tier 2	500	9-27	8	40	57	13	49.8	26.7	169	136	69.4
		Aluminium	mg/kg	NA	NA	1500-6800	560	960	1100	1300	1240	1860	1890	1320	1980
		Antimony	mg/kg	CCME Agricultural	20	ND	<0.1	0.1	0.1	<0.1	3.4	<0.45	0.61	<0.5	<0.5
		Beryllium	mg/kg	CCME Agricultural	4	ND-0.3	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5
		Boron	mg/kg	NA	NA	ND-17	4	6	5	6	26.4	5.5	7.9	6	4.8
		Iron	mg/kg	NA	NA	2900-13000	1500	2100	3400	2700	3820	4200	3400	3760	5000
		Magnesium	mg/kg	NA	NA	1300-22000	8900	9300	7700	15000					
		Vanadium	mg/kg	CCME Agricultural	130	6-33	3	4	4	5	7.06	11.7	11.1	7.35	10
		Thallium	mg/kg	CCME Agricultural	1	ND	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5
		Uranium	mg/kg	CCME Agricultural	23	ND	<2	<2	<2	<2	<0.5	<0.5	<0.5	<0.5	<0.5
		Mercury	mg/kg	AMRSP Tier 2	2	ND	<0.01	0.02	0.1	0.03	<0.05	<0.05	0.23	0.34	<0.05
		PCB	mg/kg	AMRSP Tier 1	1	1.00									

1. CCME R/P Tier 1: *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (PE,HH) by Canadian Council of Ministers of the Environment (CCME), 2007 - Agricultural/Wild land 2007 - Agricultural/Wild Land Coarse Grained Soils.
2. AMSRP Teir 1/2: Abandoned Military Site Remediation Criteria, Aboriginal Affairs and Northern Development Canada, December 2008.
NA=Guideline is not available.
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Table E4: Y22101291 Nottingham Island Soil Sampling Results- CCME/AMSRP Total Extractable Metals

					Area of Potential Environmental Concern		APEC 10					
					Sample ID		2012-SB-13	2012-SB-14	2012-SB-15	2012-SB-16	SB029-SS-041 WESA	SB029-SS-042 WESA
					Date Sampled		14-08-12	14-08-12	14-08-12	14-08-12	23-10-10	23-10-10
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**	**Background Concentration Range**						
Soil	Metals	Silver	mg/kg	CCME Agricultural	20	ND	<0.5	<0.5	<0.5	<0.5	0.27	0.098
		Arsenic	mg/kg	AMRSP Tier 2	30	ND-4	<2	<2	<2	<2	2.7	5
		Barium	mg/kg	CCME Agricultural	750	16-150	61	110	74	68	131	212
		Cadmium	mg/kg	AMRSP Tier 2	5	ND-0.3	<0.1	0.2	<0.1	<0.1	0.1	1.58
		Cobalt	mg/kg	AMRSP Tier 2	50	1-4	1	1	1	1	2.07	2.22
		Chromium	mg/kg	AMRSP Tier 2	250	22-3	4	4	4	5	9.27	14.6
		Copper	mg/kg	AMRSP Tier 2	100	13-1	2	5	3	2	2.3	40.2
		Tin	mg/kg	CCME Agricultural	5	2-1	<1	2	<1	<1	<0.5	18.9
		Manganese	mg/kg	Na	NA	31-160	70	62	63	60		
		Molybdenum	mg/kg	CCME Agricultural	5	ND-1.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		Nickel	mg/kg	AMRSP Tier 2	100	1.8 - 12	2.2	3.4	3.6	2.6	9.21	12.2
		Lead	mg/kg	AMRSP Tier 1	200	1-4	4	22	5	2	2.7	178
		Selenium	mg/kg	CCME Agricultural	1	ND-1.7	<0.5	<0.5	0.6	<0.5	0.56	<0.5
		Zinc	mg/kg	AMRSP Tier 2	500	9-27	11	58	16	14	16.3	195
		Aluminium	mg/kg	NA	NA	1500-6800	1200	1200	1300	1100	1830	1440
		Antimony	mg/kg	CCME Agricultural	20	ND	<0.1	<0.1	<0.1	<0.1	2.6	2
		Beryllium	mg/kg	CCME Agricultural	4	ND-0.3	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5
		Boron	mg/kg	NA	NA	ND-17	5	5	4	5	23.7	25.4
		Iron	mg/kg	NA	NA	2900-13000	2900	2900	2900	2300	6000	5800
		Magnesium	mg/kg	NA	NA	1300-22000	13000	13000	13000	14000		
		Vanadium	mg/kg	CCME Agricultural	130	6-33	6	5	5	5	17.5	11
		Thallium	mg/kg	CCME Agricultural	1	ND	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5
		Uranium	mg/kg	CCME Agricultural	23	ND	<2	<2	<2	<2	<0.5	<0.5
		Mercury	mg/kg	AMRSP Tier 2	2	ND	<0.01	<0.01	0.02	<0.01	<0.05	<0.05
		PCB	mg/kg	AMRSP Tier 1	1	1.00						

1. CCME R/P Tier 1: *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (PEHH) by Canadian Council of Ministers of the Environment (CCME), 2007 - Agricultural/Wild land 2007 - Agricultural/Wild Land Coarse Grained Soils.
2. AMSRP Teir 1/2: Abandoned Military Site Remediation Criteria, Aboriginal Affairs and Northern Development Canada, December 2008.

NA=Guideline is not available.
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ND= non-detectable.

Table E4: Y22101291 Nottingham Island Soil Sampling Results- CCME/AMSRP Total Extractable Metals

					Area of Potential Environmental Concern		APEC 11/APEC 12															
					Sample ID		2012-SB-6	2012-SB-7	2012-SB-8	2012-SB-9	2012-SB-10	2012-SB-57	2012-SB-58	2012-SB-59	2012-SB-60	2012-SB-61	2012-SB-62	SB029-SS-031 WESA	SB029-SS-032 WESA	SB029-SS-035 WESA	SB029-SS-036 WESA	SB029-SS-037 WESA	SB029-SS-038 WESA
					Date Sampled		14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	15-08-12	15-08-12	15-08-12	15-08-12	15-08-12	15-08-12	23-10-10	23-10-10	23-10-10	23-10-10	23-10-10	23-10-10
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**	**Background Concentration Range**																	
Soil	Metals	Silver	mg/kg	CCME Agricultural	20	ND	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	0.05	<0.05	0.089	0.098
		Arsenic	mg/kg	AMRSP Tier 2	30	ND-4	<2	<0.2	<2	<2	<2	<2	<2	<2	<2	<2	<2	3.2	5.53	7.7	3.6	3.8	16.2
		Barium	mg/kg	CCME Agricultural	750	16-150	61	100	100	63	82	87	130	73	42	62	68	178		157	90.2	119	421
		Cadmium	mg/kg	AMRSP Tier 2	5	ND-0.3	<0.1	0.2	0.2	<0.1	0.1	0.2	0.3	0.1	0.1	<0.1	<0.1	0.17	0.15	0.39	0.09	0.58	0.47
		Cobalt	mg/kg	AMRSP Tier 2	50	1-4	<1	1	1	<1	<1	<1	1	<1	<1	<1	<1	2.21	2.3	3.41	1.78	1.3	16.2
		Chromium	mg/kg	AMRSP Tier 2	250	22-3	2	4	5	2	3	2	5	2	2	2	1	9.1	7.89	11	4.8	6.46	138
		Copper	mg/kg	AMRSP Tier 2	100	13-1	2	26	6	2	14	2	8	3	3	2	2	8.57	9.82	25.7	17.3	28.6	36.2
		Tin	mg/kg	CCME Agricultural	5	2-1	<1	<1	3	<1	<1	<1	3	<1	<1	4	<1	2	1.3	11	1.9	1.4	6.22
		Manganese	mg/kg	Na	NA	31-160	47	59	58	72	57	63	67	38	52	44	88						
		Molybdenum	mg/kg	CCME Agricultural	5	ND-1.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.67	1.3	0.63	<0.5	<0.5	1.3
		Nickel	mg/kg	AMRSP Tier 2	100	1.8 - 12	1.3	2.7	2.7	1.8	2	1.3	2.8	2.1	1.6	1.6	1.1	9.82	12	12.6	7.95	6.95	33.9
		Lead	mg/kg	AMRSP Tier 1	200	1-4	9	170	88	1	81	3	100	9	8	15	1000	260	3890	260	25.2	62	1460
		Selenium	mg/kg	CCME Agricultural	1	ND-1.7	<0.5	0.6	<0.5	<0.5	0.5	1.2	0.6	0.6	0.5	<0.5	<0.5	0.75	<0.5	2.1	<0.5	<0.5	3.3
		Zinc	mg/kg	AMRSP Tier 2	500	9-27	11	100	15	7	17	8	66	18	12	24	8	51.9	153	209	26.8	49.9	246
		Aluminium	mg/kg	NA	NA	1500-6800	810	1300	1200	930	980	920	1300	1100	950	730	770	2070	1160	1600	1430	1150	7340
		Antimony	mg/kg	CCME Agricultural	20	ND	0.1	1.3	0.9	<0.1	1.4	0.3	1.3	0.1	0.1	0.2	5.9	3.4	1.3	4.6	<0.5	<0.5	5.28
		Beryllium	mg/kg	CCME Agricultural	4	ND-0.3	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		Boron	mg/kg	NA	NA	ND-17	4	6	4	8	7	7	12	9	7	6	6	36.8	27	34.8	5.4	23.8	30.4
		Iron	mg/kg	NA	NA	2900-13000	1700	4100	2400	2600	2400	1700	3400	2300	2200	1700	1700	6100	16300	9900	4410	4030	17600
		Magnesium	mg/kg	NA	NA	1300-22000	10000	12000	8000	18000	7700	8100	7100	8700	9200	7800	13000						
		Vanadium	mg/kg	CCME Agricultural	130	6-33	2	4	5	4	3	4	4	4	3	3	3	12.2	8.54	8.33	7.86	6.88	13.5
		Thallium	mg/kg	CCME Agricultural	1	ND	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		Uranium	mg/kg	CCME Agricultural	23	ND	<2	<2	<2	<2	<2	<2	<2	4	<2	<2	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		Mercury	mg/kg	AMRSP Tier 2	2	ND	0.01	0.04	0.04	<0.01	0.03	0.01	0.05	<0.01	0.16	0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	0.15
		PCB	mg/kg	AMRSP Tier 1	1	1.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01							

1. CCME: R/P Tier 1: *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (PEHH) by Canadian Council of Ministers of the Environment (CCME), 2007 - Agricultural/Wild land 2007 - Agricultural/Wild Land Coarse Grained Soils.
2. AMSRP Tier 1/2: Abandoned Military Site Remediation Criteria, Aboriginal Affairs and Northern Development Canada, December 2008.
NA=Guideline is not available.
Yellow cells indicate samples above criteria.
ND= non-detectable.

Table E4: Y22101291 Nottingham Island Soil Sampling Results- CCME/AMSRP Total Extractable Metals

					Area of Potential Environmental Concern		APEC 13					APEC 14													
					Sample ID		2012-SB-3	2012-SB-4	2012-SB-5	2012-SB-55	SB029-SS-030 WESA	2012-SB-17	2012-SB-18	2012-SB-19	2012-SB-24	2012-SB-25	2012-SB-26	2012-SB-27	2012-SB-28	2012-SB-29	2012-SB-30	2012-SB-31	2012-SB-33	SB029-SS-046 WESA	SB029-SS-047 WESA
					Date Sampled		14-08-12	14-08-12	14-08-12	15-08-12	23-10-10	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	14-08-12	23-10-10	23-10-10
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**	**Background Concentration Range**																			
Soil	Metals	Silver	mg/kg	CCME Agricultural	20	ND	<0.5	<0.5	<0.5	<0.5	0.41	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05
		Arsenic	mg/kg	AMRSP Tier 2	30	ND-4	<2	<2	<2	<2	8.18	<2	3	<2	<2	<2	<2	<2	<2	<2	<2	<2	4.9	4.3
		Barium	mg/kg	CCME Agricultural	750	16-150	130	160	86	50	435	39	91	55	40	46	47	35	230	49	47	36	87	143	49.5
		Cadmium	mg/kg	AMRSP Tier 2	5	ND-0.3	0.8	0.5	0.2	<0.1	1.13	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.095	0.084
		Cobalt	mg/kg	AMRSP Tier 2	50	1-4	1	2	1	<1	5.87	<1	5	1	1	<1	1	<1	<1	<1	<1	<1	1	3.77	1.57
		Chromium	mg/kg	AMRSP Tier 2	250	22-3	4	9	4	4	17.8	3	21	5	3	4	5	2	3	2	2	3	5	12.3	7.72
		Copper	mg/kg	AMRSP Tier 2	100	13-1	25	28	19	6	55.3	2	12	2	2	2	3	2	2	2	3	2	3	5.99	2
		Tin	mg/kg	CCME Agricultural	5	2-1	390	10	3	1	39.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<0.5
		Manganese	mg/kg	Na	NA	31-160	76	110	80	37		74	220	53	64	56	62	42	48	54	50	59	74		
		Molybdenum	mg/kg	CCME Agricultural	5	ND-1.1	<0.5	<0.5	<0.5	<0.5	1.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		Nickel	mg/kg	AMRSP Tier 2	100	1.8 - 12	2.9	3.2	2.5	2.2	15.5	1.9	14	2.1	1.8	2	2.8	1.3	1.9	1.1	1.7	2.8	2.8	12.8	9.69
		Lead	mg/kg	AMRSP Tier 1	200	1-4	460	170	21	16	387	2	5	1	2	<1	1	2	1	1	1	1	2	2.8	3.2
		Selenium	mg/kg	CCME Agricultural	1	ND-1.7	<0.5	0.7	1.1	<0.5	1.2	<0.5	0.8	<0.5	0.9	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5
		Zinc	mg/kg	AMRSP Tier 2	500	9-27	170	230	76	32	474	6	29	7	6	7	7	10	6	<5	<5	6	9	17.4	11.4
		Aluminium	mg/kg	NA	NA	1500-6800	980	1400	1400	1400	3930	890	7300	1000	1200	1000	1500	860	810	780	850	1000	1800	3920	1230
		Antimony	mg/kg	CCME Agricultural	20	ND	3.5	0.6	0.1	0.1	2.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.5	<0.5
		Beryllium	mg/kg	CCME Agricultural	4	ND-0.3	0.1	<0.1	<0.1	<0.1	0.5	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5
		Boron	mg/kg	NA	NA	ND-17	4	4	3	7	30.4	5	9	5	5	7	6	9	7	8	5	8	7	22.2	4.2
		Iron	mg/kg	NA	NA	2900-13000	2500	3700	2900	3100	11400	1800	11000	2000	2400	2300	3000	1900	2100	1800	2000	2500	3500	7600	3570
		Magnesium	mg/kg	NA	NA	1300-22000	7600	6000	8900	8500		17000	20000	12000	13000	12000	11000	10000	9200	10000	12000	21000	15000		
		Vanadium	mg/kg	CCME Agricultural	130	6-33	4	5	5	4	13.3	3	23	4	5	4	6	3	5	3	4	4	7	16.8	7.66
		Thallium	mg/kg	CCME Agricultural	1	ND	<0.1	<0.1	<0.1	<0.1	<0.5	<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..5	<0..5
		Uranium	mg/kg	CCME Agricultural	23	ND	<2	<2	<2	<2	<0.5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<0..5	<0..5
		Mercury	mg/kg	AMRSP Tier 2	2	ND	0.09	0.08	0.02	0.06	0.067	<0.01	0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05
		PCB	mg/kg	AMRSP Tier 1	1	1.00	0.06	<0.01	<0.01	<0.01															

1. CCME: R/P Tier 1: *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (PEHH) by Canadian Council of Ministers of the Environment (CCME), 2007 - Agricultural/Wild land 2007 - Agricultural/Wild Land Coarse Grained Soils.
2. AMSRP Teir 1/2: Abandoned Military Site Remediation Criteria, Aboriginal Affairs and Northern Development Canada, December 2008.
NA=Guideline is not available.
Yellow cells indicate samples above criteria.
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Table E4: Y22101291 Nottingham Island Soil Sampling Results- CCME/AMSRP Total Extractable Metals

					Area of Potential Environmental Concern		APEC 16					Apec 17		APEC 18				APEC 19	APEC 20	APEC 21		Pipeline				
					Sample ID		2012-SB-1	2012-SB-2	2012-SB-53	2012-SB-54	2012-SB-56	2012-SB-12	SB029-SS-045 WESA	2012-SB-32	2012-SB-34	2012-SB-35	SB029-SS-048 WESA	SB0029-SS-069 WESA	SB029-SS-070 WESA	SB029-SS-071 WESA	SB029-SS-073 WESA	2012-SB-11	2012-SB-63	2012-SB-64	SB029-SS-039 WESA	SB029-SS-040 WESA
					Date Sampled		14-08-12	14-08-12	15-08-12	15-08-12	15-08-12	14-08-12	23-10-10	14-08-12	14-08-12	14-08-12	23-10-10	23-10-10	23-10-10	23-10-10	23-10-10	14-08-12	15-08-12	15-08-12	23-10-10	23-10-10
Matrix	**Category**	**Parameter**	**Units**	**Guideline**	**Coarse Grained Criteria**	**Background Concentration Range**																				
Soil	Metals	Silver	mg/kg	CCME Agricultural	20	ND	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.05	<0.5	<0.5	0.6	1.14	<0.05	0.056	0.066	<0.05	<0.5	<0.5	<0.5	0.073	<0.05
		Arsenic	mg/kg	AMRSP Tier 2	30	ND-4	<2	<2	2	<2	<2	<2	3.6	<2	<2	<2	85.9	2.9	3.2	4	3.2	<2	<2	<2	4.8	3.4
		Barium	mg/kg	CCME Agricultural	750	16-150	93	150	48	99	54	50	65.1	51	61	27	1060	127	159	1230	432	41	100	34	476	249
		Cadmium	mg/kg	AMRSP Tier 2	5	ND-0.3	0.2	0.3	<0.1	0.1	0.1	<0.1	<0.05	<0.1	<0.1	<0.1	19.2	0.073	0.885	0.24	0.076	<0.1	0.2	<0.1	0..886	0.15
		Cobalt	mg/kg	AMRSP Tier 2	50	1-4	<1	1	4	1	<1	1	1.48	<1	1	<1	17.4	1.62	3.18	5.74	3.07	2	<1	1	2.23	1.82
		Chromium	mg/kg	AMRSP Tier 2	250	22-3	3	6	12	6	1	4	6.26	2	3	3	76.3	10.1	13.1	21.6	13.2	4	3	3	11.1	6.15
		Copper	mg/kg	AMRSP Tier 2	100	13-1	6	7	9	7	1	2	1.2	2	2	3	30000	6.01	5.79	22.9	5.78	3	7	1	14.3	5.72
		Tin	mg/kg	CCME Agricultural	5	2-1	1	4	<1	7	<1	<1	<0.5	<1	<1	<1	386	<0.5	<0.5	8.17	<0.5	<1	3	<1	5	0.67
		Manganese	mg/kg	Na	NA	31-160	74	89	210	58	37	56		41	88	51						50	57	40		
		Molybdenum	mg/kg	CCME Agricultural	5	ND-1.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	17.3	1.1	<0.5	1.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		Nickel	mg/kg	AMRSP Tier 2	100	1.8 - 12	2.1	2.9	9.7	2.7	0.8	2.2	8.48	1.3	2.2	1.6	153	7.64	10.1	11.2	9.54	2.7	2.1	1.7	12	6.88
		Lead	mg/kg	AMRSP Tier 1	200	1-4	12	250	5	9	8	1	1.4	2	1	4	6250	14.3	2.8	23.3	3.3	2	240	1	409	17
		Selenium	mg/kg	CCME Agricultural	1	ND-1.7	<0.5	0.7	0.7	0.9	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	4.4	<0.5	0.93	1.7	0.55	<0.5	0.5	<0.5	0.69	<0.5
		Zinc	mg/kg	AMRSP Tier 2	500	9-27	48	170	21	39	21	16	7.41	5	8	22	23900	30.7	125	46.9	19.7	11	44	5	524	60
		Aluminium	mg/kg	NA	NA	1500-6800	1200	1900	4700	1500	720	1400	1290	730	1500	880	13400	2250	3750	8590	3810	1300	1100	1100	1780	1250
		Antimony	mg/kg	CCME Agricultural	20	ND	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	140	<0.5	<0.5	<0.5	<0.5	<0.1	4.2	<0.1	7.67	<0.5
		Beryllium	mg/kg	CCME Agricultural	4	ND-0.3	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.5
		Boron	mg/kg	NA	NA	ND-17	4	5	12	6	7	4	4	7	7	5	50.3	5.5	6	31.4	27.7	4	5	5	29.9	25.8
		Iron	mg/kg	NA	NA	2900-13000	2600	4000	8500	3400	1900	2900	3600	1500	3000	2300	35600	4780	8700	19500	8200	2700	2500	2100	7200	3920
		Magnesium	mg/kg	NA	NA	1300-22000	9400	8900	31000	12000	7000	13000		9600	13000	12000						11000	5200	11000		
		Vanadium	mg/kg	CCME Agricultural	130	6-33	4	6	15	5	2	6	8.94	3	5	4	91.9	13.2	18.3	41.8	17	5	4	4	8.92	8.34
		Thallium	mg/kg	CCME Agricultural	1	ND	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.5
		Uranium	mg/kg	CCME Agricultural	23	ND	<2	<2	<2	<2	<2	<2	<0.5	<2	<2	<2	0.88	<0.5	<0.5	1.2	0.58	<2	<2	<2	<0.5	<0.5
		Mercury	mg/kg	AMRSP Tier 2	2	ND	0.02	0.02	<0.01	0.07	0.02	<0.01	<0.05	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.01	<0.01	0.072	<0.05
		PCB	mg/kg	AMRSP Tier 1	1	1.00	0.01	<0.01	<0.01		<0.01															

1. CCME R/P Tier 1: *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (PEHH) by Canadian Council of Ministers of the Environment (CCME), 2007 - Agricultural/Wild land 2007 - Agricultural/Wild Land Coarse Grained Soils.
2. AMSRP Tier 1/2: Abandoned Military Site Remediation Criteria, Aboriginal Affairs and Northern Development Canada, December 2008.
NA=Guideline is not available.
Yellow cells indicate samples above criteria.
ND= non-detectable.

Table E5: Y22101291 Nottingham Island Soil Sampling Results- Landfill Suitability Suite

				Sample ID	21012-SB-8	2112SB-27	2012-SB-58
				Date Sampled	8/14/2012	8/14/2012	8/15/2012
Matrix	**Category**	**Parameter**	**Units**	**Guideline**			
Soil	Leachable PHCs	Benzene	ug/L	500	ND	ND	ND
		Toluene	ug/L	500	ND	ND	ND
		Ethylbenzene	ug/L	500	ND	ND	ND
		Xylenes	ug/L	500	ND	ND	ND
		F1	ug/L	-	ND	ND	ND
		F2	ug/L	-	850	990	130
		F3	ug/L	-	200	ND	ND
		F4	ug/L	-	ND	ND	ND
		Flash Point		<61	>61	>61	>61
		Free Liquid		pass fail	pass	pass	pass
		PSA		-	Coarse	Coarse	Coarse

1. Alberta Waste Managers Guide: Hazardous Waste Guidelines.
Yellow cells indicate samples above criteria.
* ND: Not detectable.

Table E6: Y22101291 Nottingham Island Soil Exceedances by APEC

APEC	Sampling Point	Exceedance	Volume of PHC contaminated Soil (m3)	Volume of Metal Contaminated Soil (m3)
APEC 1	SB029-SS-049 WESA	Cd,Se	-	58.4
	SB029-SS-050 WESA	Cd,Se		
APEC 3	2012-SB-44	Ethylbenzene, Type B, Cu	85.8	21.1
	2012-SB-45	Type B		
	SB029-SS-061 WESA	Se		
	SB029-SS-062 WESA	Type B,Cu,Pb,Se,Zn		
	SB029-SS-063 WESA	Se		
	SB029-SS-066 WESA	Se		
APEC 4	2012-SB-40	Se	25.6	26.2
	2012-SB-41	Type B		
	SB029-SS-065 WESA	Type B, Ba,Cu,Sn,Pb,Se,Zn		
APEC 6	SB029-SS-067 WESA	Se	-	31.8
APEC 9	SB029-SS-052 WESA	Type B	4.1	16.5
	SB029-SS-057	Cu		
APEC 11/12	2012-SB-8	Type B	2074.0	97.2
	2012-SB-9	Type B		
	2012-SB-57	Type B, Se		
	2012-SB-58	Benzene, Toluene, Ethylbenzene, Type B		
	2012-SB-59	Type B		
	2012-SB-60	Type B		
	2012-SB-62	Type B, Pb		
	SB029-SS-031 WESA	Type B, Pb		
	SB0029-SS-032 WESA	Type B, Pb		
	SB029-SS35 WESA	Benzene, Toluene, Ethylbenzene, Pb, Se		
	SB029-SS-038 WESA	Benzene, Pb, Se		
APEC 13	2012-SB-3	Sn, Pb	16.5	21.7
	2012-SB-4	Benzene		
	2012-SB-5	Se		
	SB0290SS-030 WESA	Pb, Se		
APEC 14	2012-SB-25	Type B	53.8	-
	2012-SB-27	Type B		
	2012-SB-29	Type B		
	SB029-SS-046 WESA	Type B		
APEC 18	SB029-SS-048 WESA	Ba,Cd,Cu,Sn, Mo,Ni,Pb,Se,Zn,Sb	-	32.1
APEC 16	2012-SB-2	Pb	-	16.5
Apec 17	2012-SB-12	Type B	included in APEC 11/12	
Pipeline	2012-SB-64	Type B	included in APEC 11/12	79.1
	SB029-SS-039 WESA	Pb,Zn		
	2012-SB-11	Type B		
	2012-SB-63	Type B,Pb		
APEC 21	SB029-SS-071 WESA	Ba, Se	-	54.6
		Total Volume of Contaminated Soil	**2259.8**	**455.0**

Table H1: Analytical Results for Building Materials (August 2012)

Sample ID	Lab Order Number	Sampling Date	APEC	Description	Asbestos Type					
					Actinolite	Amosite	Anthophyllite	Chrysotile	Crocidolite	Tremolite
					Unit					
					% volume	% volume	% volume	% volume	% volume	% volume
					Asbestos Criteria[1]					
					<1%	<1%	<1%	<1%	<1%	<1%
2012-BM-01	EG6917	8/11/2012	APEC 1 - Storage Shed 01	Beige flooring with battleship backing	ND	ND	ND	ND	ND	ND
2012-BM-02	EG6918	8/11/2012	APEC 1 - Storage Shed 01	Attic insulation	**0.5-10**	ND	ND	ND	ND	ND
2012-BM-03	EG6919	8/11/2012	APEC 1 - Storage Shed 01	Ceiling interior white paneling	ND	ND	ND	**10-30**	**0.5-20**	ND
2012-BM-04	EG6920	8/11/2012	APEC 2 - Old Kitchen	Exterior and interior flooring black felt	ND	ND	ND	ND	ND	ND
2012-BM-05	EG6921	8/11/2012	APEC 2 - Old Kitchen	Beige flooring with battleship backing	ND	ND	ND	ND	ND	ND
2012-BM-06	EG6922	8/11/2012	APEC 2 - Old Kitchen	Window caulking	ND	ND	ND	ND	ND	ND
2012-BM-07	EG6923	8/11/2012	APEC 2 - Old Kitchen	Brick	ND	ND	ND	ND	ND	ND
2012-BM-08	EG6924	8/11/2012	APEC 2 - Old Kitchen	Brick mortor	ND	ND	ND	ND	ND	ND
2012-BM-09	EG6925	8/11/2012	APEC 3 - New Radio Building	Beige vinyl floor tile	ND	ND	ND	**0.5-10**	ND	ND
2012-BM-10	EG6926	8/11/2012	APEC 3 - New Radio Building	Light fixture backing	ND	ND	ND	**60-80**	ND	ND
2012-BM-11	EG6927	8/11/2012	APEC 3 - New Radio Building	Windown caulking	ND	ND	ND	ND	ND	ND
2012-BM-12	EG6928	8/11/2012	APEC 3 - New Radio Building	Interior wall paneling	ND	ND	ND	**40-60**	**10-30**	ND
2012-BM-13	EG6929	8/11/2012	APEC 3 - New Radio Building	Exterior felt	ND	ND	ND	ND	ND	ND
2012-BM-14	EG6930	8/11/2012	APEC 4 - Old Radio Building	Red shingles on roof	ND	ND	ND	ND	ND	ND
2012-BM-15	EG6931	8/11/2012	APEC 4 - Old Radio Building	Interior white particle board	ND	ND	ND	ND	ND	ND
2012-BM-16	EG6932	8/11/2012	APEC 4 - Old Radio Building	Interior yellow particulate board	ND	ND	ND	ND	ND	ND
2012-BM-17	EG6933	8/11/2012	APEC 5 - Outhouse	Exterior felt	ND	ND	ND	ND	ND	ND
2012-BM-18	EG6934	8/11/2012	APEC 5 - Outhouse	Green shingles on roof	ND	ND	ND	**0.5-20**	ND	ND
2012-BM-19	EG6935	8/11/2012	APEC 6 - Storage Shed	Green shingles on roof and walls	ND	ND	ND	**20-40**	ND	ND
2012-BM-20	EG6936	8/11/2012	APEC 4 - Old Radio Building	Brick	ND	ND	ND	ND	ND	ND
2012-BM-21	EG6937	8/11/2012	APEC 4 - Old Radio Building	Brick Mortor	ND	ND	ND	ND	ND	ND
2012-BM-22	EG6938	8/14/2012	APEC 7 - Storage Building	Red shingles on roof	ND	ND	ND	ND	ND	ND
2012-BM-23	EG6939	8/14/2012	APEC 7 - Storage Building	Exterior felt	ND	ND	ND	ND	ND	ND
2012-BM-24	EG6940	8/14/2012	APEC 7 - Storage Building	Exterior white siding	ND	ND	ND	**0.5-20**	ND	ND
2012-BM-25	EG6941	8/14/2012	APEC 7 - Storage Building	Attic insulation	**0.5-10**	ND	ND	ND	ND	ND
2012-BM-26	EG6942	8/14/2012	APEC 8 - Chicken Coop	Attic insulation	**0.5-10**	ND	ND	ND	ND	ND
2012-BM-27	EG6943	8/14/2012	APEC 8 - Chicken Coop	Interior particle boards	ND	ND	ND	ND	ND	ND
2012-BM-28	EG6944	8/14/2012	APEC 9 - Bunkhouse	Exterior felt	ND	ND	ND	ND	ND	ND
2012-BM-29	EG6945	8/14/2012	APEC 9 - Bunkhouse	Paper on floor under beige battleship linoleum	ND	ND	ND	ND	ND	ND
2012-BM-30	EG6946	8/14/2012	APEC 9 - Bunkhouse	Gasket on furnace	ND	ND	ND	**60-80**	ND	ND
2012-BM-31	EG6947	8/14/2012	APEC 9 - Bunkhouse	Interior paneling	ND	ND	ND	**40-60**	ND	ND
2012-BM-32	EG6948	8/14/2012	APEC 10 - Generator Building	Red/white shingles	ND	ND	ND	ND	ND	ND
2012-BM-33	EG6949	8/14/2012	APEC 10 - Generator Building	Exterior bottom panels	ND	ND	ND	**40-60**	ND	ND
2012-BM-34	EG6950	8/14/2012	APEC 13 - House	Attic insulation	ND	ND	ND	ND	ND	ND
2012-BM-35	EG6951	8/14/2012	APEC 13 - House	Attic insulation	ND	ND	ND	ND	ND	ND

Notes:

1. Criteria taken from the Environmental Guideline for Asbestos, Revised 2011 (Department of the Environment: Government of Nunavut).
2. Values exceeding the applicable criteria are **BOLD** and shaded yellow.
3. ND = Not detected at the reporting limit.

Table H2: Analytical Results for Paint (August 2012)

Sample ID	Lab Order Number	Sampling Date	APEC	Description	Parameter ID		
					Leachable Lead (Pb) TCLP	PCBs in Paint	Total Lead in Paint by ICPOES
					Unit		
					mg/L	ppm	ppm
					Paint Criteria[1]		
					<5	<50	600
2012-PT-01	R95322	8/11/2012	APEC 1 - Storage Shed 01	Blue furnace paint	0.5	1.2	41
2012-PT-02	R95323	8/12/2012	APEC 2 - Old Kitchen	Exterior green paint	**34**	SP	**SP**
2012-PT-03	R95324	8/13/2012	APEC 3 - New Radio Building	Exterior red trim paint	**6.4**	-	-
2012-PT-04	R95325	8/14/2012	APEC 3 - New Radio Building	Interior white paint	0.08	-	**6400**
2012-PT-05	R95326	8/15/2012	APEC 3 - New Radio Building	Interior yellow paint	**9.1**	SP	**SP**
2012-PT-06	R95327	8/16/2012	APEC 3 - New Radio Building	Interior white paint (base coat throughout building)	**6.5**	SP	**3500**
2012-PT-07	R95328	8/17/2012	APEC 4 - Old Radio Building	Exterior white paint	**590**	0.02	**230000**
2012-PT-08	R95329	8/18/2012	APEC 3 - New Radio Building	White electrical panel paint	**15**	-	**5600**
2012-PT-09	R95330	8/19/2012	APEC 4 - Old Radio Building	Interior white paint	2.7	-	-
2012-PT-10	R95331	8/20/2012	APEC 8 - Chicken Coop	Interior white paint	0.14	1.4	**1100**
2012-PT-11	R95333	8/21/2012	APEC 9 - Bunkhouse	Exterior red trim paint	**43**	<0.5	**140000**
2012-PT-12	R95334	8/22/2012	APEC 10 - Generator Building	Interior white/grey paint	**20**	SP	**SP**
2012-PT-13	R95335	8/23/2012	APEC 10 - Generator Building	Generator grey/blue/yellow/red paint	4.3	SP	**SP**
2012-PT-14	R95336	8/24/2012	APEC 12 - Shed	Trailer and tracked vehicle orange paint	**550**	0.29	**9900**
2012-PT-ASTs	R95337	8/25/2012	APEC 14 - AST Tank Farm	ASTs white/ red paint	0.47	0.18	**7900**

Notes:

1. Criteria taken from the Abandoned Military Site Remediation Protocol, December 2008 and the Environmental Guideline for Waste Lead and Lead Paint, Revised March 2011 (Department of the Environment: Government of Nunavut)
2. Valves exceeding the applicable criteria are **BOLD** and shaded yellow.
3. "-" = Not analyzed due to insufficient amount of sample
4. "SP" = Parameter was sampled previously by WESA

Table H3: Analytical Results for Concrete (August 2012)

Sample ID	Lab Order Number	Sampling Date	APEC	Description	Parameter ID	
					Total PCBs	Asbestos Percentage
					Unit	
					mg/kg	% volume
					PCBs and Asbestos Criteria[1]	
					<50	<1
2012-CR-01	S03080	8/11/2012	APEC 4 - Old Radio Building	Concrete cubes adjacent to building	<0.01	ND

Notes:

1. Criteria taken from the Abandoned Military Site Remediation Protocol, December 2008 (INAC) and the Environmental Guideline for Asbestos, Revised 2011 (Department of the Environment: Government of Nunavut)
2. Valves exceeding the applicable criteria are **BOLD** and shaded yellow.
3. ND = Not detected at the reporting limit

APPENDIX D
MATERIALS INVENTORY

Nottingham Island Inventory Table

APEC #	WESA Feature Designation	Material Type	Material Description	Uncrushed Volume (m^3), except drums and liquid
1	Storage Shed 01 (18.5 x 9 x 2.4m)	Non-Hazardous	Unpainted wood	101
			Other waste	14.5
			Drums (205L)	1 drum
			AST (900L)	0.5
		Hazardous	Asbestos waste	99
			Total and leachable lead paint on wood	10
2	Old Kitchen (8.7 x 17.8 x 3.4 m)	Non-Hazardous	Unpainted wood	41
			Other waste	25.5
		Hazardous	Total and leachable lead paint on wood	45
3	New Radio Building (2.5 x 15.2 m) and Small Shed (3.4 x 2.5 x 2.1 m)	Non-Hazardous	Unpainted wood	101
			Other waste	13.5
			AST (900L)	0.5
		Hazardous	Asbestos waste	63.51
			Asbestos, total lead and leachable lead containing on panels	11
			Total and leachable lead paint on metal	6
			Total and leachable lead paint on wood	5
			Other hazardous waste	2
4	Old Radio Building (2.5 x 2.1 x 4.0 m)	Non-Hazardous	Unpainted wood	5
			Other waste	4.2
		Hazardous	Total lead paint on particulate board and wood	8
			Total lead and leachable lead on metal	1
			Other hazardous waste	0.58
5	Outhouse (1.3 x 1.8 x 2.7 m)	Non-Hazardous	Unpainted wood	1
			Other waste	1.1
		Hazardous	Asbestos waste	0.2
			Total and leachable lead paint on wood	2
6	Storage Shed 02 (2.8 x 2.2 x 2.6 m)	Non-Hazardous	Unpainted wood	4
			Other waste	4
		Hazardous	Asbestos waste	0.5
7	Storage Building (4.9 x 6.4 x 3.0 m) 4.5 m is peak height and Small Shed (1.6 x 1.6 x 2.2 m)	Non-Hazardous	Unpainted wood	31
			Other waste	3.6
			Drum (205L)	1 drum
		Hazardous	Asbestos waste	28
			Total and leachable lead paint on wood	1
			AST (900L)	0.5
			Organic content in AST (900L)	675 L
			Other hazardous waste	1
8	Chicken Coop (10 x 3.8 x 3.2 m) Caged Area (3.7 x 3.8 x 2.1 m)	Non-Hazardous	Unpainted wood	20
			Other waste	1.5
			Drum (205L)	1 drum
		Hazardous	Asbestos waste	6.7
			Fire Extinguisher	0.1
			AST (900L)	0.5
			Organic content in AST (900L)	675 L
			Total and leachable lead paint on particulate board and wood	3.2
9	Bunkhouse (31 x 9.2 x3.2 m)	Non-Hazardous	Unpainted wood	300
			Other waste	178.8
			AST (900L)	1
		Hazardous	Asbestos waste	0.1
			Total and leachable lead paint on asbestos panels	25
			Total and leachable lead paint on wood	7
			Total and leachable lead interior painted metal	18
			Organic contents in AST (900L)	50L
			Other hazardous waste	1.8
10	Generator Building (14 x 6.8 x 3.2 m)	Non-Hazardous	Unpainted wood	60
			Other waste	69.1
			Drum (205L)	3 drums
		Hazardous	Asbestos waste	1
			Aqueous content in drum (205L)	200L
			Total lead painted generators	3
			Total and leachable lead paint on wood	40
			Total and leachable lead paint on asbestos panels	12.5
			Total and leachable lead interior paint on metal	10
			Equipment contents	500 L
			Other waste	2.26
	Debris Adjacent to the Generator Building	Non-hazardous	Unpainted wood	6
			Other waste	3
11	House and Garage (15 x 8 x 2.4 m)	Non-hazardous	Unpainted wood	115
			Other waste	11
			Drums (205L)	3 drums
		Hazardous	Asbestos waste	62.01
			Total and leachable lead paint on wood	10
			Other waste	0.6
			AST (900L)	0.5
	Building Foundation (Adjacent to the House and Garage)	Non-hazardous	Unpainted wood	4
			Other waste	6.5
		Hazardous	Creosote treated wood	0.5
12	Shed (6.5 x 6.5 x 2.9 m)	Non-hazardous	Unpainted wood	10
			Other waste	12
		Hazardous	Total and leachable lead paint on equipment	8
			Equipment contents	1 L
			Asbestos waste	2
13	House (9.6 x 8.8 x 2.9 m)	Non-hazardous	Unpainted wood	46
			Other waste	12.5
			Drums (205L)	3 drums
		Hazardous	Asbestos waste	20
			Total and leachable lead paint on wood	14
			Total and leachable paint on particulate board	3
			Total and leachable lead paint on metal	3
			AST (900L)	0.5

Nottingham Island Inventory Table

APEC #	WESA Feature Designation	Material Type	Material Description	Uncrushed Volume (m^3), except drums and liquid
			Total and leachable lead paint on equipment	16
			Other hazardous waste	0.02
14	AST Farm	Non-hazardous	Other waste	20
			Drum (205L)	1 drum
		Hazardous	Aqueous content in drum (205L)	20L
			Total lead paint on ASTs (73000L each)	146
15	Food Cache Storage	Non-hazardous	Unpainted wood	5
		Hazardous	Other hazardous waste	0.02
16	Debris Area 01 Located 10m north of Hudson Strait, appears to be a burned building	Non-hazardous	Unpainted wood	5
			Other waste	2
17	Debris Area 02 Located south of the AST tank farm and West of the Generator building and Bunkhouse	Inventory listed in other APECs	Inventory listed in other APECS	Inventory listed in other APECs
18	Debris Area 03 Located Northeast of the AST, west of the Food Cache, Northeast of Storage Shed 01 and Southeast of Old Kitchen	Non-hazardous	Unpainted wood	5
			Other waste	2
		Hazardous	Other hazardous waste	0.02
19	Debris Area 04 Located to the Southeast of site next to Hudson Strait appears to be the main dumping area	Non-hazardous	Unpainted wood	1
			Other waste	4
		Hazardous	Other hazardous waste	0.06
20	Debris Area 05 : Located far to the East of the main site	Non-hazardous	Unpainted wood	16.5
			Other waste	1.5
		Hazardous	Total and leachable paint on wood	4
			Creosote treated wood	2
21	Debris Area 06 Located Northeast of the Storage Building	Non-hazardous	Unpainted wood	1
			Other waste	0.5
22	Road to East of Site	None	None	None
23	Offsite Communication Tower	N/A	Tower	N/A
24	Lake 01	N/A	N/A	N/A
25	Lake 02	N/A	N/A	N/A
26	Hudson Strait (Materials are located on the shoreline)	Non-hazardous	Unpainted wood	2
			Other waste	1
			Drums (205L)	20 drums
		Hazardous	Compressed gas cylinder	50L
			Total and leachable lead painted equipment	4
			Other hazardous waste	0.02
N/A	Drums from the ASTs (73000 L) to the Hudson Strait	Non-hazardous	Drums (205L)	44 drums
		Hazardous	Aqueous content in drum (205L)	400 L
			Compressed gas cylinder	50L
N/A	Various Debris (Throughout and adjacent to the Site)	Non-hazardous	Unpainted wood	17.5
			Other waste	17
		Hazardous	Creosote treated wood	2.5
Totals: (Uncrushed / m^3)	Non-Hazardous	Unpainted wood	898	
		Other waste	414	
		Drum (205L)	77 drums	
		ASTs (900L)	4	
	Hazardous	Aqueous content in drum (205L)	620 L	
		Organic contents in ASTs (900L)	1400 L	
		Asbestos waste	283.02	
		Other hazardous waste	8.48	
		Compressed gas cylinder	100L	
		Creosote treated wood	5	
		Equipment contents	501 L	
		Fire Extinguisher	0.1	
		Total lead paint on particulate board and wood	8	
		Total and leachable lead paint on equipment	28	
		Total and leachable lead paint on metal	38	
		Total lead and leachable lead paint on asbestos panels	48.5	
		Total and leachable lead paint on wood and particulate board	141.2	
		Total lead paint on ASTs (73000L each)	146	
		Total lead painted generators	3	

Notes:
1. All volumes: uncrushed
2. Volumes of total and leachable amended paint includes the painted substrate
3. Drums volumes are numbers of drums, not m^3
4. Liquid volmes are in litres, not m^3.

APPENDIX E
GEOTECHNICAL TEST RESULTS

Table G1: Summary of Testpits, Samples Collected, and Lab Test Results for Phase III Environmental Site Assessment and Remedial Action Plan - Former Weather Station, Nottingham Island, NU

Testpit ID	Testpit Depth (m)	Source	Sample ID	Gravel (%)	Sand (%)	Fines (%)	Moisture(%)	Material Description	Comment
TP01	0.3	Borrow C	TP01_S01	36	58	6	5	SAND & GRAVEL trace fines, some subangular cobbles, fine to coarse subangular gravel, well-graded, damp, loose, medium brown, shell fragments	Blended sample taken from side wall of testpit 0.0 to 0.3 m
TP02	0.3	Borrow C	N/A	N/A	N/A	N/A	N/A	SAND & GRAVEL trace fines, some subangular cobbles, fine to coarse subangular gravel, well-graded, damp, loose, medium brown, shell fragments	Similar to TP01
TP03	0.3	Borrow C	N/A	N/A	N/A	N/A	N/A	SAND & GRAVEL trace fines, some subangular cobbles, fine to coarse subangular gravel, well-graded, damp, loose, medium brown, shell fragments	Similar to TP01
TP04	0.4	Main Site	TP04_S02	25	75	0	5	SAND gravelly, fine subrounded gravel, fine to coarse sand, well-graded, moist, very loose, light grey, shell fragments	Blended sample taken from side wall of testpit 0.0 to 0.4 m
TP05	0.25	Main Site	N/A	N/A	N/A	N/A	N/A	SAND & GRAVEL fine subrounded gravel, fine to coarse sand, well-graded, wet, very loose, light grey, shell fragments	Organic layer at surface 10 cm. Water table at 20 cm.
TP06	0.5	Main Site	N/A	N/A	N/A	N/A	N/A	SAND some gravel, fine subangular gravel, fine to coarse sand, well-graded, wet, compact, dark brown/grey, shell fragments, strong hydrocarbon odour	Organic layer at surface 8 cm. Water table at 40 cm.
TP07	0.4	Main Site	TP07_S03	25	64	11	14.1	SAND gravelly, some fines, fine subangular gravel, fine to coarse sand, well-graded, very wet, loose, dark brown/grey, shell fragments, slight hydrocarbon odour	Blended sample taken from side wall of testpit. Organic layer at surface 3 cm. Water encountered at 40 cm.
TP08	0.25	Main Site	TP08_S04	20	68	12	12.4	SAND some gravel, some fines, fine subangular gravel, fine to coarse sand, well-graded, very wet, loose, dark brown/grey, shell fragments	Blended sample taken from side wall of testpit. Organic layer at surface 2 cm. Refusal on cobbles/boulders.
TP09	0.5	Main Site	TP09_S05	5	94	1	5.9	SAND trace gravel, trace fines, fine to medium sand, uniformly graded, damp, compact, light brown, no shell fragments	Sample taken from 0.2 to 0.4 m depth. Below sand (possibly fill) layer was wet glaciomarine gravelly sand with shell fragments.
TP10	0.3	Landfill A	TP10_S06	25	61	11	7.6	SAND gravelly, some fines, some subangular cobbles, fine to coarse subangular gravel, fine to coarse sand, well-graded, moist, compact, brown/grey	Blended sample taken from side wall of testpit. Surface 80-90% covered with subangular boulders < 1 m.
TP11	0.4	Landfill A	TP11_S07	11	71	18	10.6	SAND some gravel, some fines, fine to coarse subangular gravel, well-graded, moist, compact, medium brown	Blended sample taken from side wall of testpit. Surface 80-90% covered with subangular boulders < 1 m.
TP12	0.5	Borrow A	TP12_S08	86	13	1	1.7	GRAVEL some sand, some angular cobbles, fine to coarse angular gravel, dry, very loose, pink (feldspar)	Blended sample taken from side wall of testpit. Possibly mechanically crushed material.
TP13	0.4	Borrow B	TP13_S09	34	64	2	4.3	SAND gravelly, trace fines, fine to coarse subangular gravel, medium to coarse sand, damp, loose, light grey, silica and calcareous particles	Blended sample taken from side wall of testpit. Surface 20% covered with subangular boulders < 1 m.
TP14	0.4	Borrow B	TP14_S10	31	67	2	5.6	SAND gravelly, trace fines, fine to coarse subangular gravel, medium sand, damp, loose, light grey, silica and calcareous particles	Blended sample taken from side wall of testpit. Surface 20% covered with subangular boulders < 1 m.
TP15	0.3	Landfill/ Landfarm B	TP15_S11	26	69	5	8.9	SAND gravelly, trace fines, fine to coarse subangular gravel, fine to coarse sand, moist, compact, light brown	Blended sample taken from side wall of testpit.
TP16	0.3	Landfill/ Landfarm B	TP16_S12	34	61	5	7.1	SAND gravelly, trace fines, fine to coarse subangular gravel, fine to coarse sand, moist, compact, light brown	Blended sample taken from side wall of testpit.

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM C136 & D422

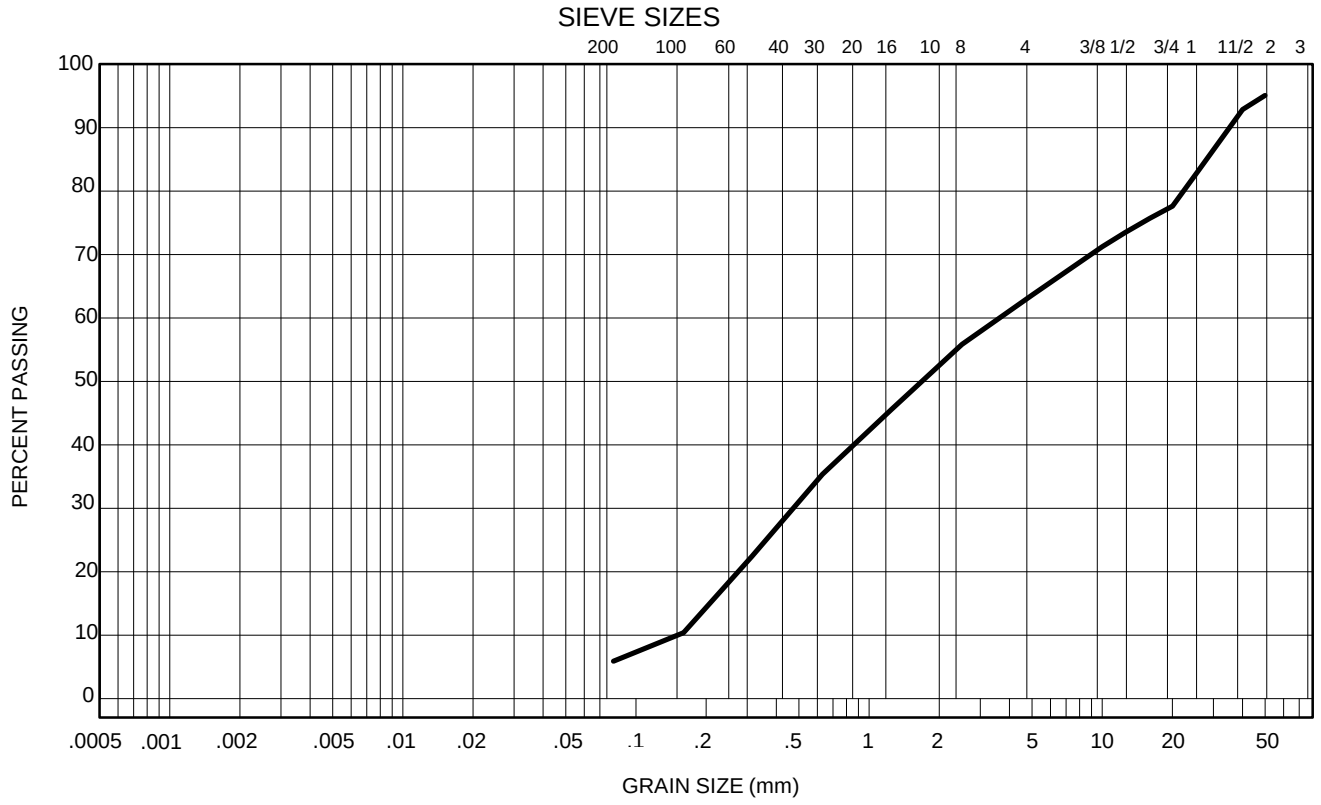
Project:	Phase 3 ESA & RAP Nottingham Island, NU
Project No.:	Y22101291
Client:	PWGSC Edmonton
Attention:	Jessie Hoyt
Date Tested:	October 3-6, 2012
Sample ID:	TP01_S01 - Borrow C
Depth:	0.0-0.3 m
Soil Index:	
Lab Number:	5723
Soil Description:	SAND & GRAVEL, trace fines, >50 mm 20% by weight, not sampled
Natural Moisture Content:	5.0%
Remarks:	Blended composite sample taken from side wall of testpit.

* The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The soil description is visually based, subject to EBA description protocols.

SIEVE SIZE (mm)	PERCENTAGE PASSING
40	93
25	82
20	78
16	76
12.5	73
10	71
5	64
2.5	56
1.25	46
0.63	35
0.315	22
0.16	10
0.08	6

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



Reviewed By: _____

eba
A TETRA TECH COMPANY

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM C136 & D422

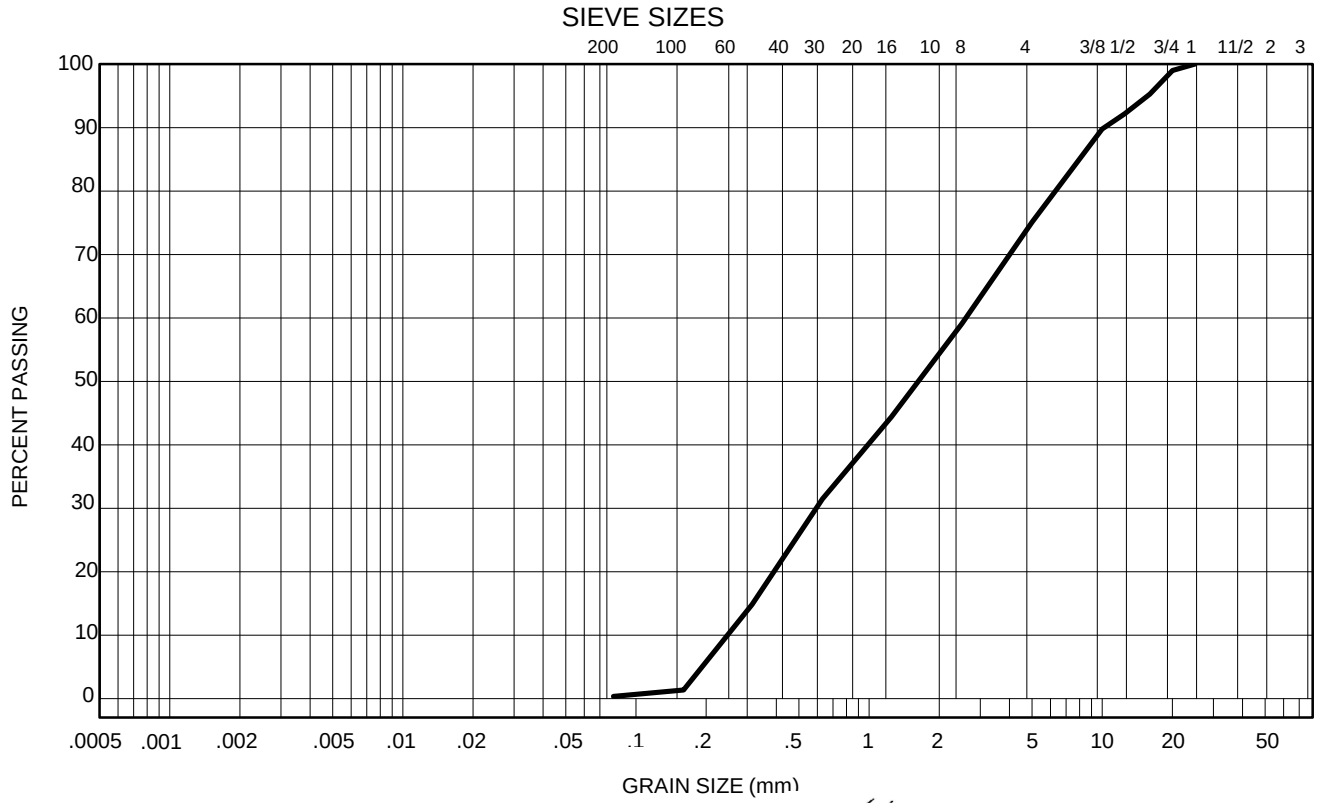
Project:	Phase 3 ESA & RAP Nottingham Island, NU
Project No.:	Y22101291
Client:	PWGSC Edmonton
Attention:	Jessie Hoyt
Date Tested:	October 3-6, 2012
Sample ID:	TP04_S02 - Main Camp
Depth:	0.0-0.4 m
Soil Index:	
Lab Number:	5723
Soil Description:	SAND, gravelly
Natural Moisture Content:	5.0%
Remarks:	Blended composite sample taken from side wall of testpit.

* The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The soil description is visually based, subject to EBA description protocols.

SIEVE SIZE (mm)	PERCENTAGE PASSING
40	
25	100
20	99
16	95
12.5	92
10	90
5	75
2.5	59
1.25	44
0.63	31
0.315	15
0.16	1
0.08	0

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM C136 & D422

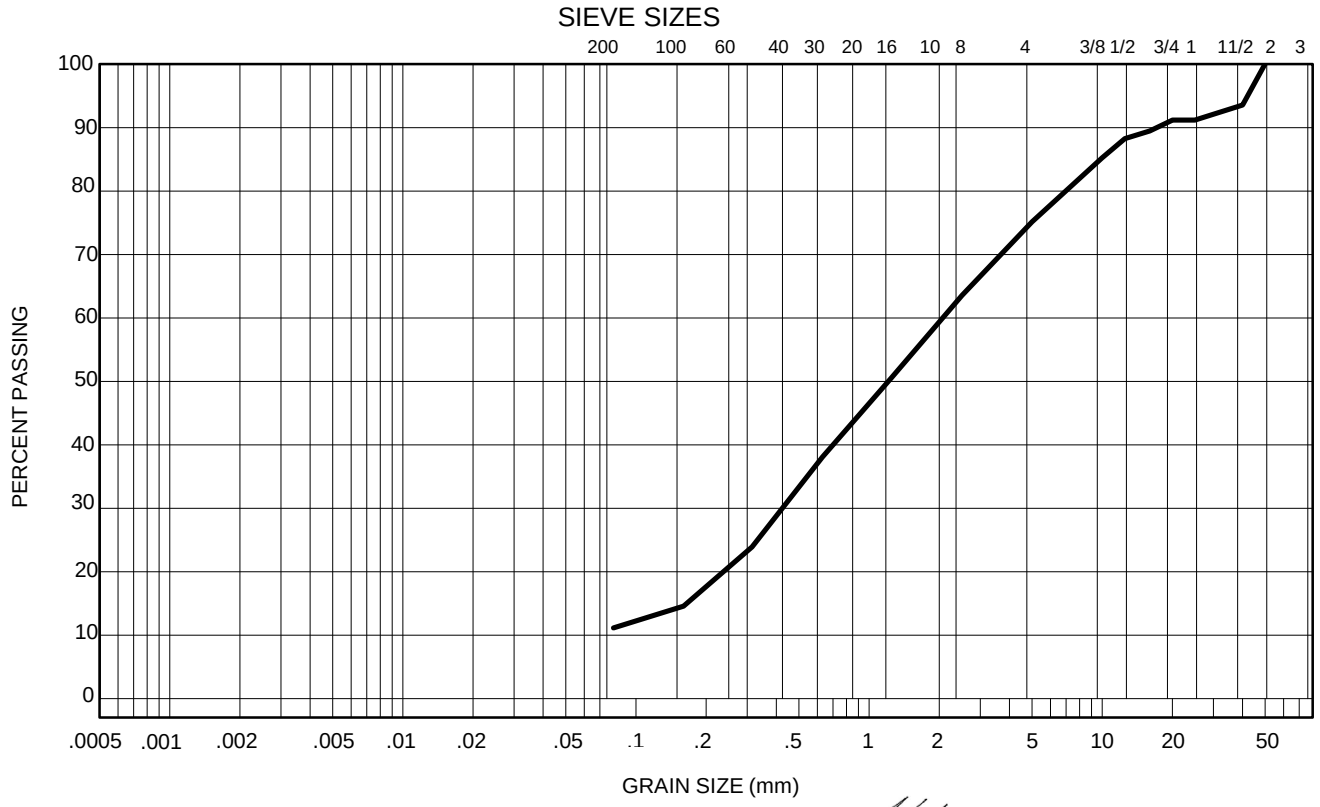
Project:	Phase 3 ESA & RAP Nottingham Island, NU
Project No.:	Y22101291
Client:	PWGSC Edmonton
Attention:	Jessie Hoyt
Date Tested:	October 3-6, 2012
Sample ID:	TP07_S03 - Main Camp
Depth:	0.0-0.6 m
Soil Index:	
Lab Number:	5723
Soil Description:	SAND, gravelly, trace to some fines
Natural Moisture Content:	14.1%
Remarks:	Blended composite sample taken from side wall of testpit.

* The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The soil description is visually based, subject to EBA description protocols.

SIEVE SIZE (mm)	PERCENTAGE PASSING
40	94
25	91
20	91
16	89
12.5	88
10	85
5	75
2.5	64
1.25	51
0.63	38
0.315	24
0.16	15
0.08	11

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM C136 & D422

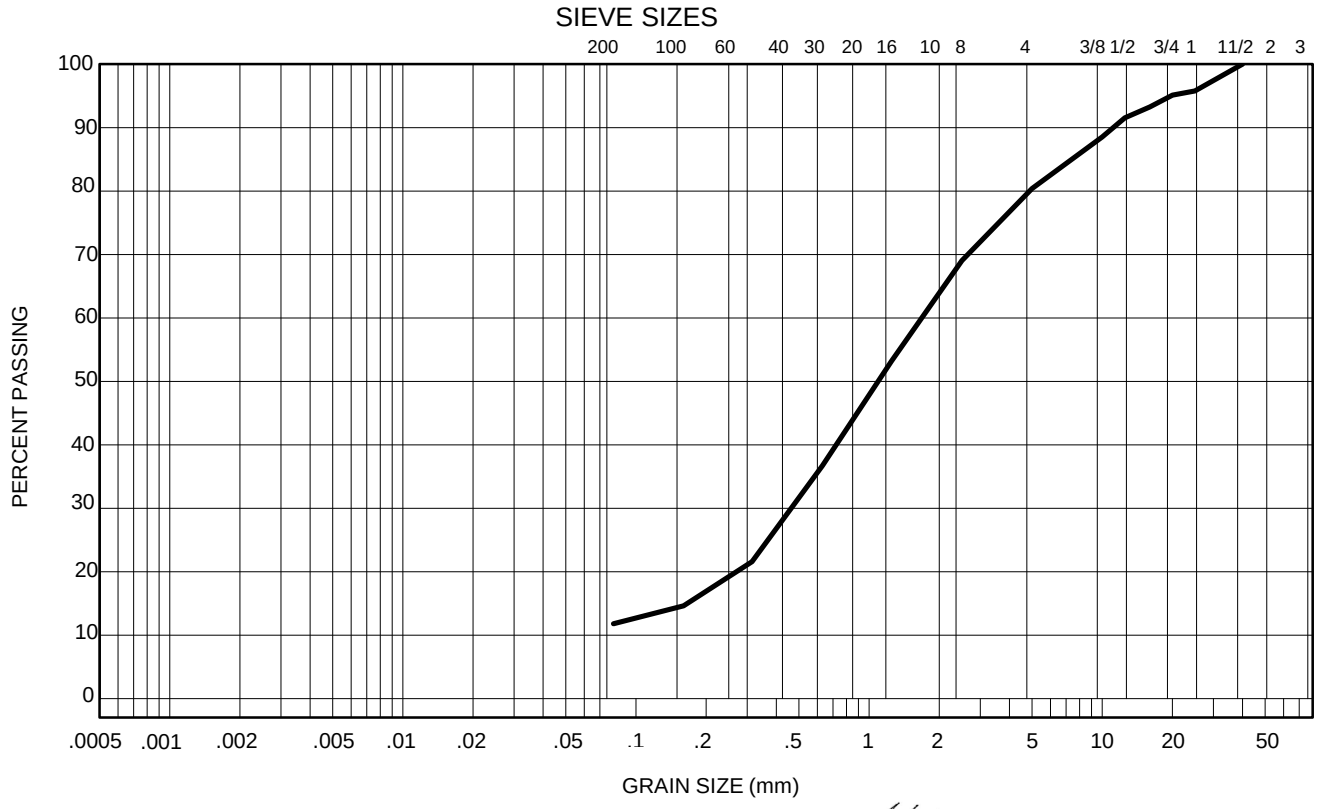
Project:	Phase 3 ESA & RAP Nottingham Island, NU
Project No.:	Y22101291
Client:	PWGSC Edmonton
Attention:	Jessie Hoyt
Date Tested:	October 3-6, 2012
Sample ID:	TP08_S04 - Main Camp
Depth:	0.0-0.25 m
Soil Index:	
Lab Number:	5723
Soil Description:	SAND, some gravel, trace to some fines
Natural Moisture Content:	12.4%
Remarks:	Blended composite sample taken from side wall of testpit.

* The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The soil description is visually based, subject to EBA description protocols.

SIEVE SIZE (mm)	PERCENTAGE PASSING
40	100
25	96
20	95
16	93
12.5	92
10	89
5	80
2.5	69
1.25	53
0.63	37
0.315	22
0.16	15
0.08	12

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM C136 & D422

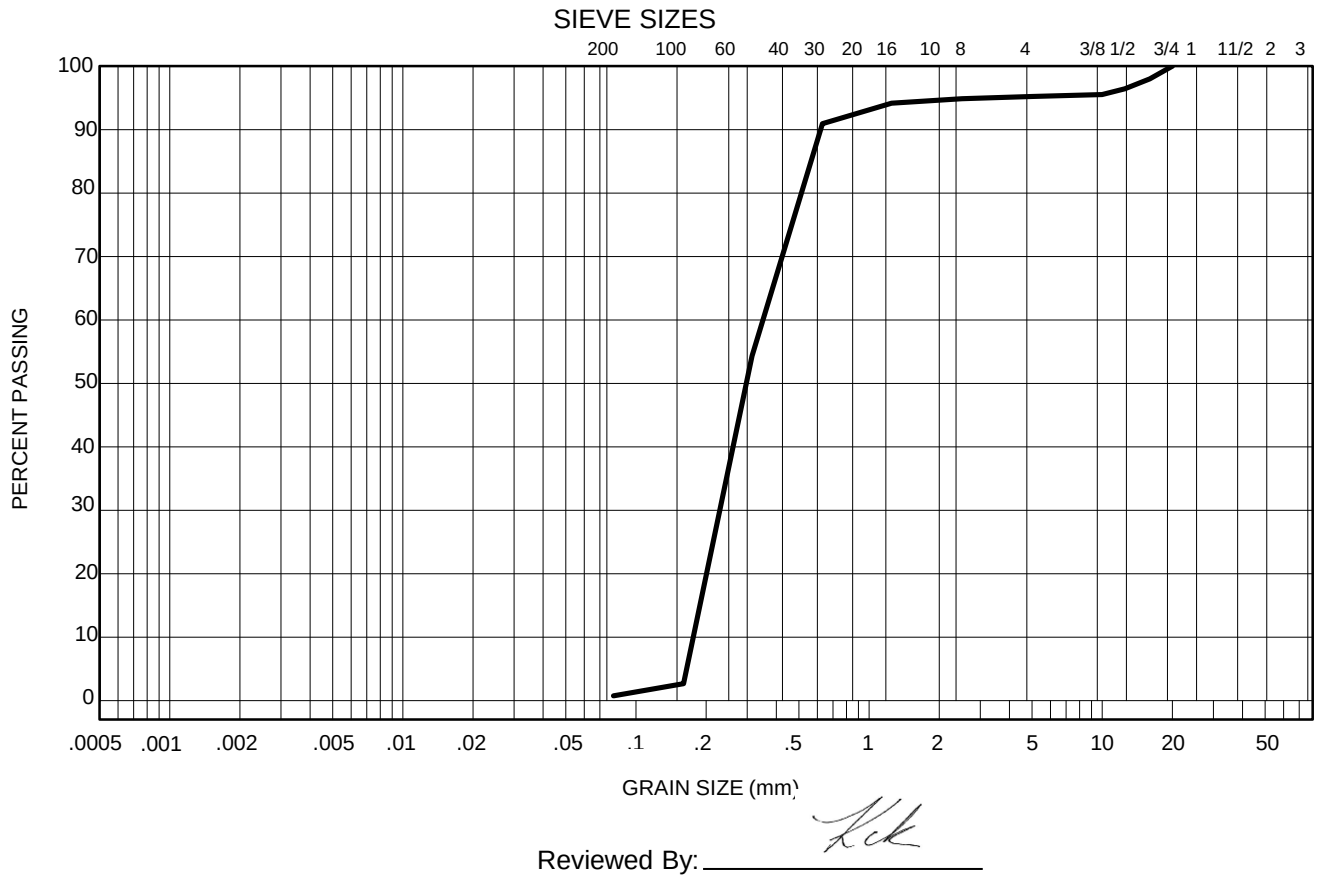
Project:	Phase 3 ESA & RAP Nottingham Island, NU
Project No.:	Y22101291
Client:	PWGSC Edmonton
Attention:	Jessie Hoyt
Date Tested:	October 3-6, 2012
Sample ID:	TP09_S05 - Main Camp
Depth:	0.2-0.4 m
Soil Index:	
Lab Number:	5723
Soil Description:	SAND, trace gravel, trace fines
Natural Moisture Content:	5.9%
Remarks:	

* The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The soil description is visually based, subject to EBA description protocols.

SIEVE SIZE (mm)	PERCENTAGE PASSING
40	
25	
20	100
16	98
12.5	96
10	96
5	95
2.5	95
1.25	94
0.63	91
0.315	54
0.16	3
0.08	1

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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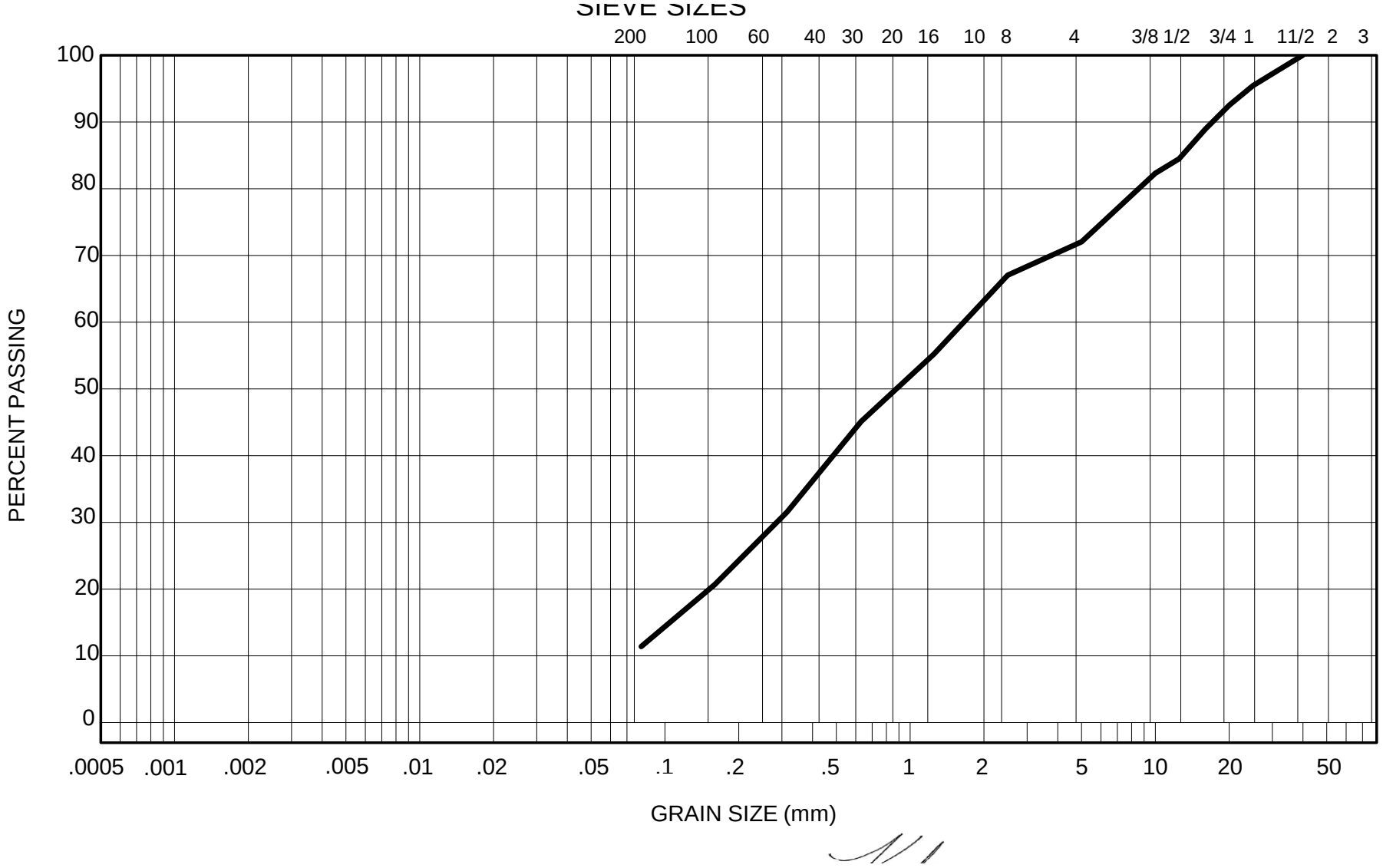

SIEVE SIZES
200 100 60 40 30 20 16 10 8 4 3/8 1/2 3/4 1 11/2 2 3
PERCENT PASSING
100 90 80 70 60 50 40 30 20 10 0
.0005 .001 .002 .005 .01 .02 .05 .1 .2 .5 1 2 5 10 20 50
GRAIN SIZE (mm)

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM C136 & D422

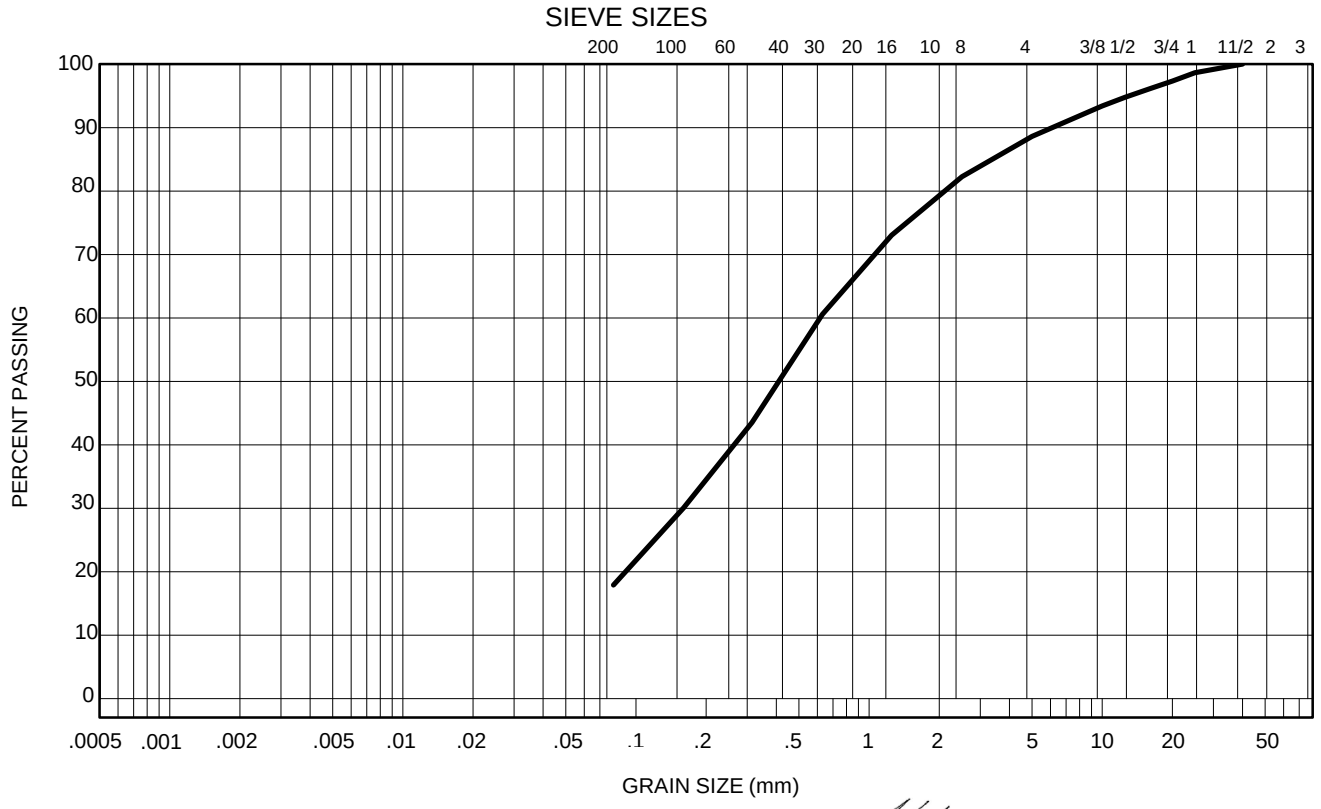
Project:	Phase 3 ESA & RAP Nottingham Island, NU
Project No.:	Y22101291
Client:	PWGSC Edmonton
Attention:	Jessie Hoyt
Date Tested:	October 3-6, 2012
Sample ID:	TP11_S07 - Landfill A
Depth:	0.0-0.4 m
Soil Index:	
Lab Number:	5723
Soil Description:	SAND, some gravel, some fines, >50 mm 5% by weight, not sampled
Natural Moisture Content:	10.6%
Remarks:	Blended composite sample taken from side wall of testpit.

* The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The soil description is visually based, subject to EBA description protocols.

SIEVE SIZE (mm)	PERCENTAGE PASSING
40	100
25	99
20	97
16	96
12.5	95
10	93
5	89
2.5	82
1.25	73
0.63	61
0.315	44
0.16	30
0.08	18

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM C136 & D422

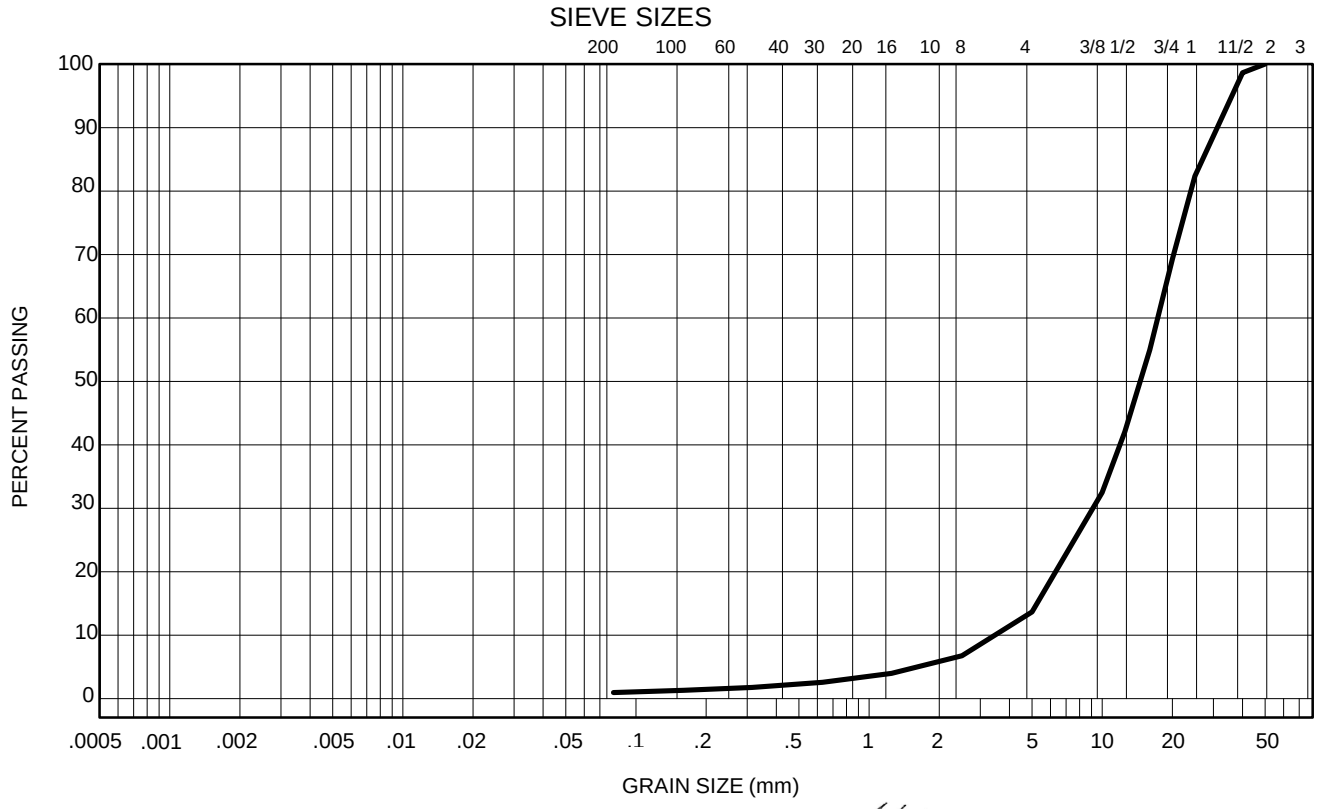
Project:	Phase 3 ESA & RAP Nottingham Island, NU
Project No.:	Y22101291
Client:	PWGSC Edmonton
Attention:	Jessie Hoyt
Date Tested:	October 3-6, 2012
Sample ID:	TP12_S08 - Borrow A
Depth:	0.0-0.6 m
Soil Index:	
Lab Number:	5723
Soil Description:	GRAVEL, some sand, trace fines
Natural Moisture Content:	1.7%
Remarks:	Blended composite sample taken from side wall of testpit.

* The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The soil description is visually based, subject to EBA description protocols.

SIEVE SIZE (mm)	PERCENTAGE PASSING
40	99
25	82
20	69
16	55
12.5	42
10	32
5	14
2.5	7
1.25	4
0.63	3
0.315	2
0.16	1
0.08	1

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM C136 & D422

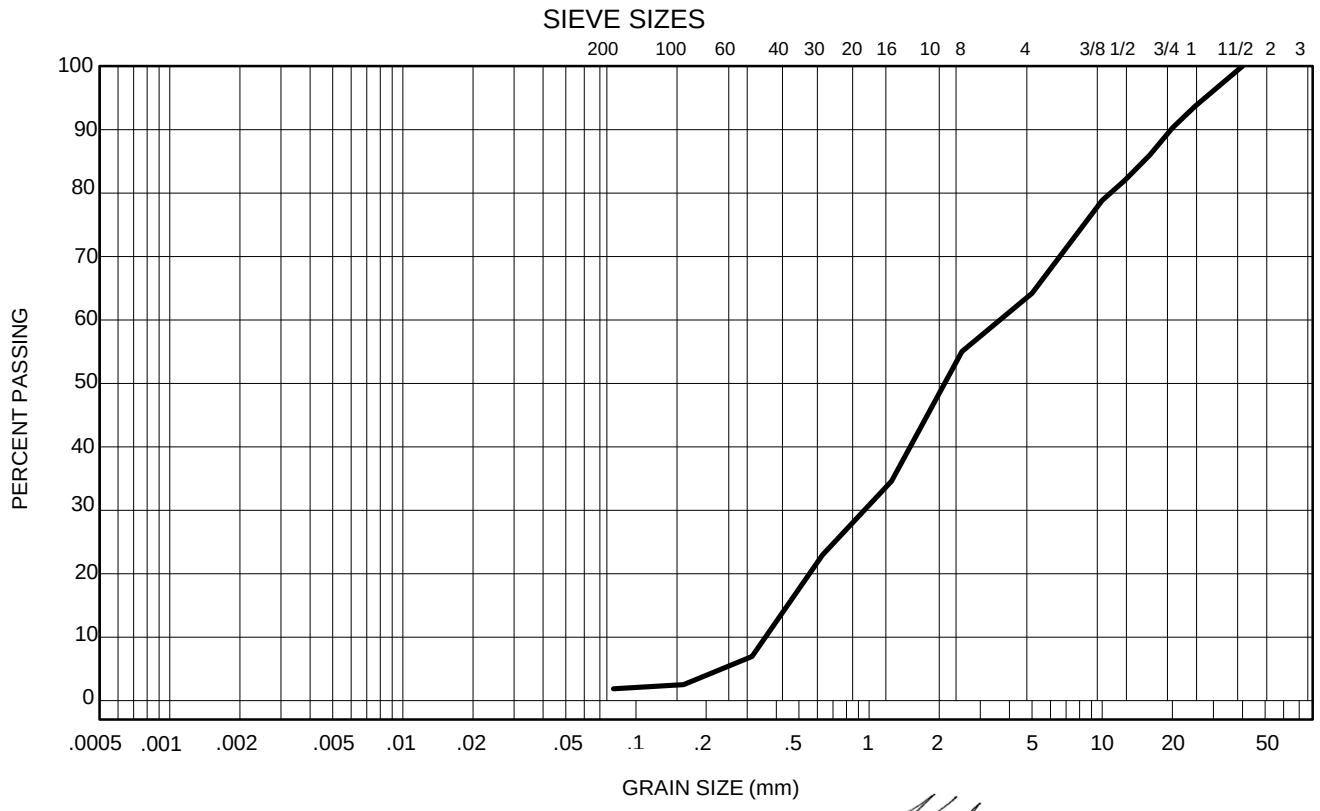
Project:	Phase 3 ESA & RAP Nottingham Island, NU
Project No.:	Y22101291
Client:	PWGSC Edmonton
Attention:	Jessie Hoyt
Date Tested:	October 3-6, 2012
Sample ID:	TP13_S09 - Borrow B
Depth:	0.0-0.4 m
Soil Index:	
Lab Number:	5723
Soil Description:	SAND & GRAVEL, trace fines
Natural Moisture Content:	4.3%
Remarks:	Blended composite sample taken from side wall of testpit.

* The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The soil description is visually based, subject to EBA description protocols.

SIEVE SIZE (mm)	PERCENTAGE PASSING
40	100
25	94
20	90
16	86
12.5	82
10	79
5	64
2.5	55
1.25	35
0.63	23
0.315	7
0.16	3
0.08	2

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM C136 & D422

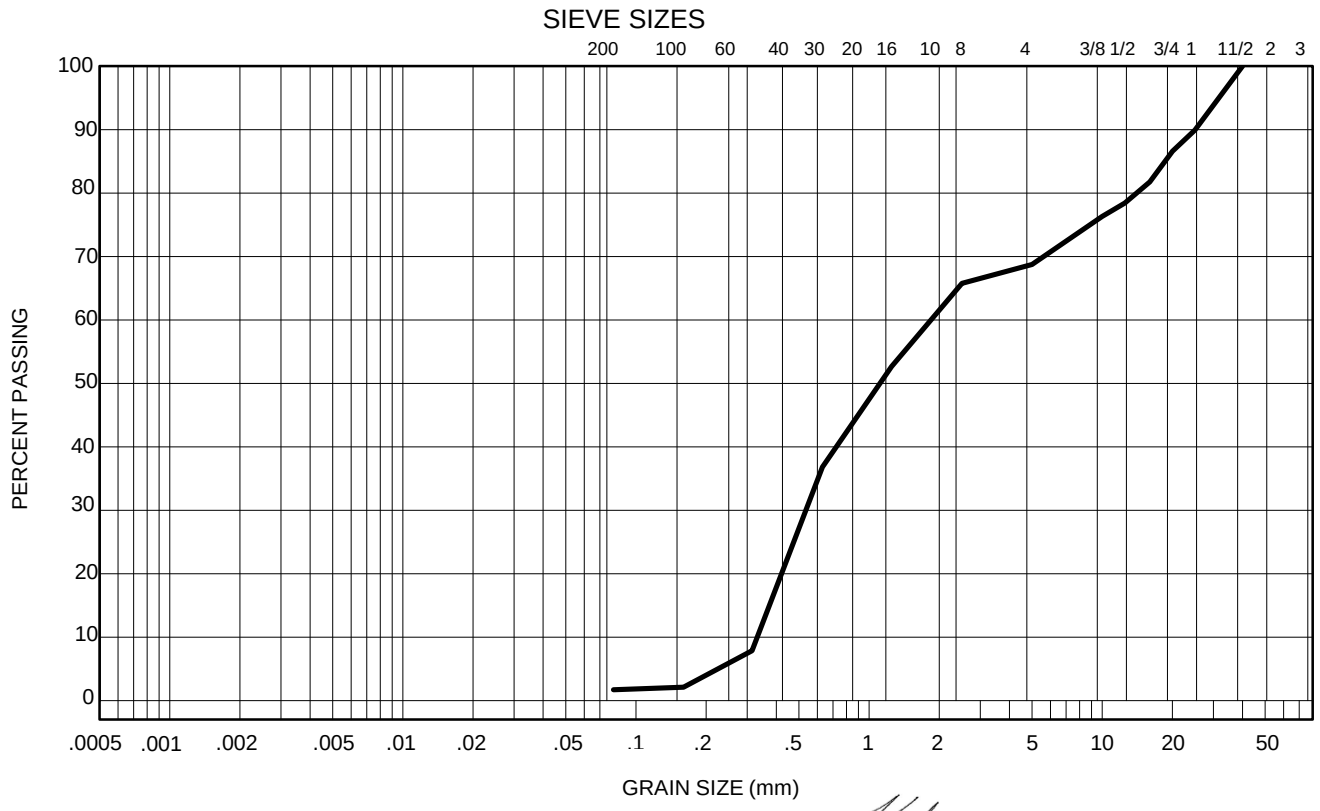
Project:	Phase 3 ESA & RAP Nottingham Island, NU
Project No.:	Y22101291
Client:	PWGSC Edmonton
Attention:	Jessie Hoyt
Date Tested:	October 3-6, 2012
Sample ID:	TP14_S10 - Borrow B
Depth:	0.0-0.4 m
Soil Index:	
Lab Number:	5723
Soil Description:	SAND, gravelly, trace fines
Natural Moisture Content:	5.6%
Remarks:	Blended composite sample taken from side wall of testpit.

* The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The soil description is visually based, subject to EBA description protocols.

SIEVE SIZE (mm)	PERCENTAGE PASSING
40	100
25	90
20	87
16	82
12.5	78
10	76
5	69
2.5	66
1.25	53
0.63	37
0.315	8
0.16	2
0.08	2

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM C136 & D422

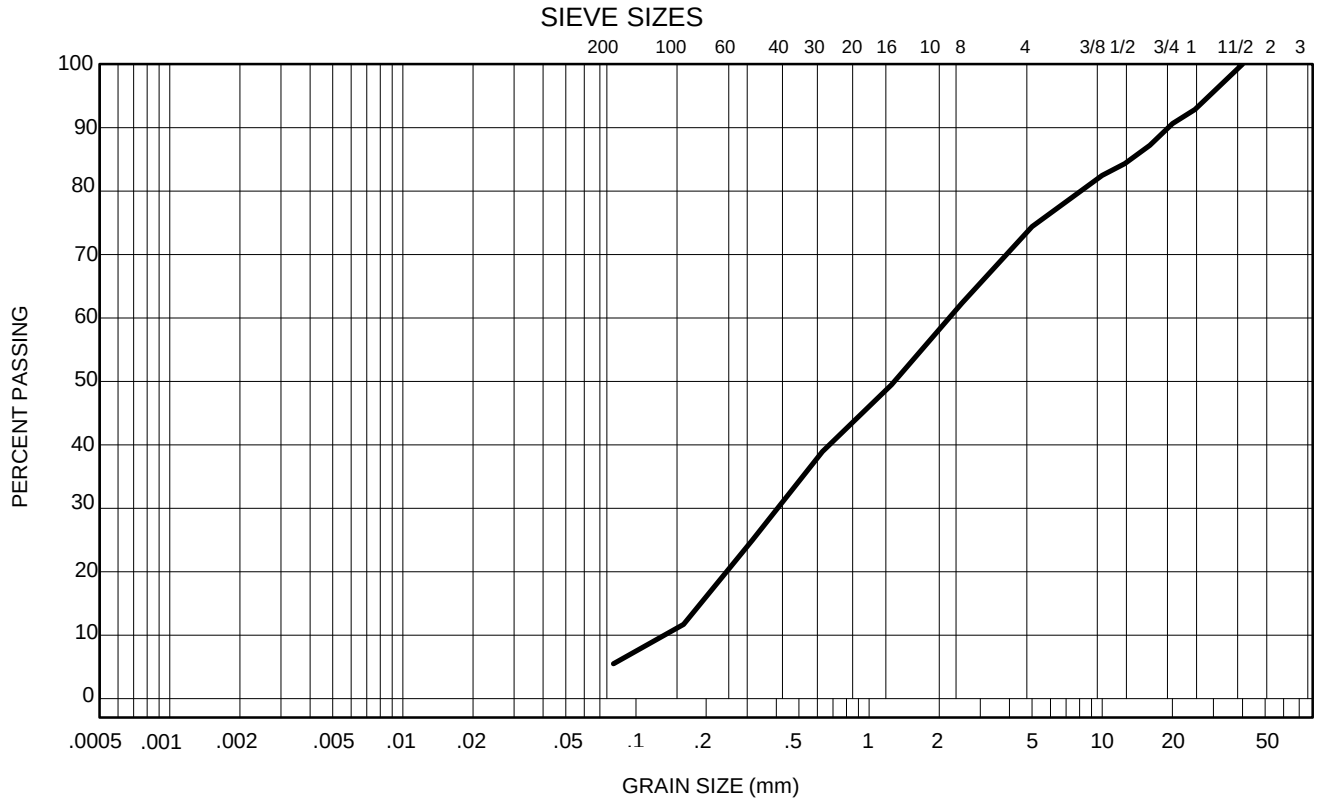
Project:	Phase 3 ESA & RAP Nottingham Island, NU
Project No.:	Y22101291
Client:	PWGSC Edmonton
Attention:	Jessie Hoyt
Date Tested:	October 3-6, 2012
Sample ID:	TP15_S11- Landfarm B
Depth:	0.0-0.3m
Soil Index:	
Lab Number:	5723
Soil Description:	SAND, gravelly, trace fines
Natural Moisture Content:	8.9%
Remarks:	Blended composite sample taken from side wall of testpit.

* The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The soil description is visually based, subject to EBA description protocols.

SIEVE SIZE (mm)	PERCENTAGE PASSING
40	100
25	93
20	91
16	87
12.5	84
10	82
5	74
2.5	62
1.25	49
0.63	39
0.315	25
0.16	12
0.08	5

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM C136 & D422

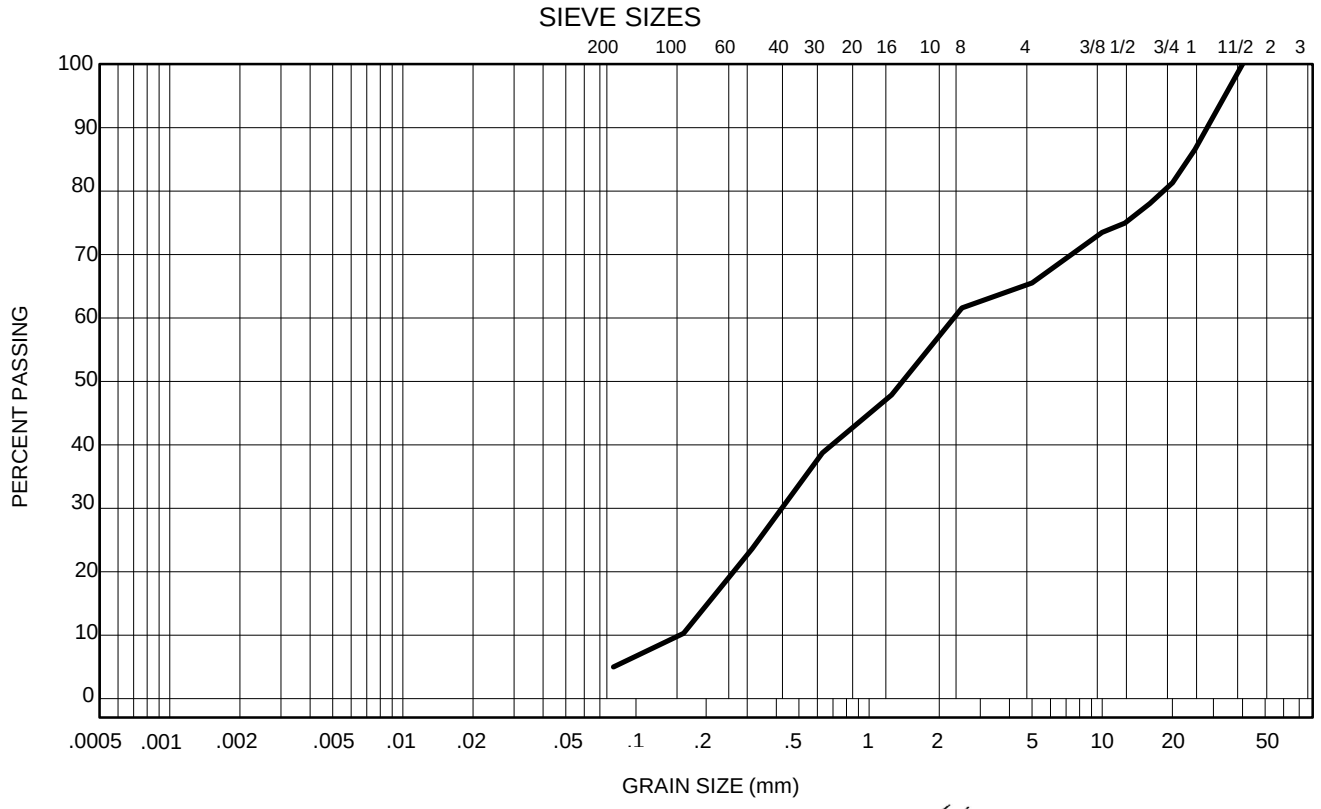
Project:	Phase 3 ESA & RAP Nottingham Island, NU
Project No.:	Y22101291
Client:	PWGSC Edmonton
Attention:	Jessie Hoyt
Date Tested:	October 3-6, 2012
Sample ID:	TP16_S12 - Landfarm B
Depth:	0.0-0.3 m
Soil Index:	
Lab Number:	5723
Soil Description:	SAND, gravelly, trace fines
Natural Moisture Content:	7.1%
Remarks:	Blended composite sample taken from side wall of testpit.

* The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The soil description is visually based, subject to EBA description protocols.

SIEVE SIZE (mm)	PERCENTAGE PASSING
40	100
25	87
20	81
16	78
12.5	75
10	73
5	66
2.5	62
1.25	48
0.63	39
0.315	24
0.16	10
0.08	5

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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APPENDIX F

GEO-ENVIRONMENTAL REPORT – GENERAL CONDITIONS

GENERAL CONDITIONS

GEO-ENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA’s client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA’s Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA’s instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.