Environment

Public Works and Government Services Canada

Northern Contaminated Sites Program

Environmental Assessment Screening Report: CAM-A, Sturt Point, Nunavut Intermediate DEW Line Site - FINAL

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Project Number:

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Date:

March, 2011

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March 31, 2011

Matt McElwaine, P.Eng.
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Dear Mr. McElwaine:

Project No: **60156118**

Regarding: **Environmental Assessment Screening Report**
CAM-A, Sturt Point, Nunavut, Intermediate DEW Line Site

It is our pleasure to provide Public Works and Government Services Canada with the attached Environmental Assessment Screening final report for the CAM-A, Sturt Point Intermediate DEW Line site.

Please contact the undersigned at 780-486-7000 if you have any questions.

Sincerely,
AECOM Canada Ltd.

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Distribution List

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Executive Summary

CAM-A Sturt Point is located on Victoria Island, Nunavut (68º 47' N, 103º 20' W). The site is located along the coast and overlooks the Queen Maud Gulf. The site is located approximately 80 km east of Cambridge Bay. The terrain of the area is relatively flat with several ponds and lakes and an average elevation of 50 m above sea level.

The site is scheduled for remediation according to the Indian and Northern Affairs Canada Abandoned Military Site Remediation Protocol (2009). Activities will include: dump remediation; debris removal; contaminated soil remediation; and containerization and off-site removal of hazardous wastes.

Based on the requirements of the Nunavut Land Claim Agreement (NLCA) through the Nunavut Impact Review Board (NIRB), the project specific information requirements regarding the proposed remediation activities are to be provided and are to undergo an environmental assessment.

The remediation of the site will follow the 2011 Remedial Action Plan (RAP) prepared by AECOM. The following is the potential proposed activities for the remediation of the CAM-A site according to the RAP:

- Source borrow material.
- Construct the landfarm.
- Begin construction of the Non-Hazardous Waste Landfill (NHWL).
- Excavate Tier I and Type A hydrocarbon soil as soon as the NHWL is constructed.
- Excavate Type B hydrocarbon soil immediately upon landfarm construction.
- Collect surface debris.
- Regrade existing Landfills A and B on-site.
- Excavation of Tier II soil can commence as soon as the contractor is on-site as it is being containerized and shipped off-site.

The following objectives are to be achieved as part of the remediation of CAM-A:

- To restore the site to meet the environmental objectives established for northern sites;
- To prevent migration of contaminants into the Arctic ecosystem;
- To remove physical hazards for the protection of human health and safety; and
- To implement a cost effective remediation solution.

The remediation of the CAM-A site will have a net positive effect on the environment through the removal of physical hazards such as the debris, the removal and disposal of Tier I and Tier II impacted soils, the engineered landfilling of non-hazardous debris and Tier I impacted soils, the treatment of hydrocarbon impacted soils, and grading of the site to match the existing terrain. Through the implementation of the proposed mitigation and monitoring plans and project design, potential adverse effects of the proposed project will be minimized and no significant adverse residual effects are expected to occur.

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1. Introduction

Public Works and Government Services Canada (PWGSC) requested that AECOM prepare an Environmental Assessment Screening Report (EA) for the proposed remediation of the CAM-A, Sturt Point Intermediate DEW Line Site. The EA will be submitted to the Federal and Territorial Regulators including Indian and Northern Affairs Canada (INAC) Land Administration, the Nunavut Water Board (NWB), and the Nunavut Impact Review Board (NIRB), along with the applications for the required permits and licenses. The EA follows the NIRB Screening Part 2 form - Project Specific Information Requirements.

1.1 Location

CAM-A Sturt Point is located on Victoria Island, Nunavut (68º 47' N, 103º 20' W). The site is located along the coast, overlooking the Queen Maud Gulf and was a former auxiliary site on the DEW Line. The site is located approximately 80 km east of Cambridge Bay. The terrain of the area is relatively flat with several ponds and lakes and an average elevation of 50 m above sea level.

1.2 History

CAM-A was reserved by the Department of National Defence (DND) in 1956 for use as a DEW Line Site and was constructed in 1957. The site was abandoned as part of the DEW Line system in October 1963, and the responsibility for the site was assumed by Indian and Northern Affairs Canada (INAC). Since that time, the POL tanks at both the station and the beach have been removed. The warehouse, garage and module train structures have also been dismantled and removed from the station area leaving behind the concrete and wood foundations with miscellaneous debris. A section of the module train building (powerhouse section) remains on-site. The radar tower has been felled and is lying to the west of the module train.

The radar facility that was constructed as a part of the DEW Line System was typical of all intermediate sites and consisted of a module train, warehouse, garage, a POL storage facility, a radar tower, and an airstrip. In addition to the main site, a beach cargo landing area was constructed along with gravel roads linking the various facilities. Access to the site is provided by airstrip and the beach cargo area. The main airstrip (~1,200 m long) is located north of the station facilities with an approximate northwest-southeast orientation. A fresh water lake is located approximately 600 m northwest of the airstrip. Gravel roads were built linking the airstrip, beach areas and fresh water lake to the station facilities. Overall site plans showing the site location and layout are shown on Figures 1 and 2, Appendix A.

1.3 General Project Information

1.3.1 Purpose

The purpose of the project is to be compliant with the requirements of the INAC Abandoned Military Site Remediation Protocol (AMSRP) (INAC 2009). This protocol provides assessment and remedial guidelines for Waste Disposal Areas (WDAs), disposal of barrel contents and provides clean-up criteria for contaminated soil. There are no criteria for the classification of hazardous waste at federal sites, except for materials regulated under the Canadian Environmental Protection Act (CEPA), including the Inter-provincial Movement of Hazardous Waste Regulations. The classification and remedial recommendations for materials not covered under CEPA has been based on the Transportation of Dangerous Goods (TDG) Regulations and the Nunavut/NWT Guideline for the General Management of Hazardous Waste (1998), under the territorial Environmental Protection Act (R.S.N.W.T 1998 c.E-7). More detailed information related to remedial guidelines or requirements under the sources noted above is provided in the task-specific sections below.

The ultimate goal is to create a positive environmental impact. The objectives are as follows:

- To restore sites to meet the environmental objectives established in the AMSRP;
- To prevent migration of contaminants into the Arctic ecosystem;
- To remove physical hazards for the protection of human health and safety; and
- To implement a cost effective remediation solution.

To accomplish these objectives, there will be four main areas of activity during the remediation of the CAM-A site. These activities include:

- Dump remediation;
- Hazardous Waste Removal;
- Non-Hazardous Waste Disposal; and
- Contaminated Soil Remediation.

1.3.2 Project Alternatives

Due to the nature of the site and the location, the range of alternatives to the project is limited. Two alternatives to the remediation of CAM-A were identified, and include:

Do Nothing (no clean-up action): The second alternative involved examining the environmental impact of maintaining the status quo at the sites. It was quickly realized that failure to address the environmental problems identified during the site investigations could lead to the following:

- Placing the Arctic environment/food chain at risk;
- Possible future legal liabilities for the federal government; and
- Greater clean-up costs in the future.

1.3.3 Schedule

Based on the information provided in the Remedial Action Plan prepared by AECOM, it is anticipated that the construction activities can be completed within one clean-up season, excluding mobilization.

In order to complete the clean-up of the CAM-A site in one construction season, the anticipated schedule of activities would be as follows:

- Mobilization in the fall.
- Source borrow material, construct the Non-Hazardous Waste Landfill, and construct the Landfarm.
- Excavate dumps and contaminated soil, and demobilize from site.

1.3.4 Regulatory Overview

1.3.4.1 Lead Authorizing Agencies

The proponent for this project is Indian and Northern Affairs Canada (INAC). The management of this project is being provided by Public Works and Government Services Canada (PWGSC). These agencies will be responsible for obtaining permits, except in those cases where the clean up contractor is required to do so by legislation or as part of their contract.

1.3.4.2 List of Approvals, Permits and Licenses Required

The following is a list of permits required for the clean-up of the CAM-A site:

Land Use Permit: As per the Territorial Land Use Act and Territorial Land Use Regulations, a Class A permit issued by INAC is required for the activities associated with the remediation of CAM-A. Contact: INAC Land Administration, Iqaluit, NU (Tel) 867-975-4283.

Quarry Permit: As per the Territorial Land Use Act and Territorial Quarrying Regulations, a Quarry Permit(s) issued by INAC is required for the extraction of granular material required for remediation. Contact: INAC Land Administration, Iqaluit, NU (T) 867-975-4283.

Water Use License: As per the Nunavut Land Claims Agreement Act, a water use license issued by the Nunavut Water Board is required for camp operations and construction activities associated with the remediation of CAM-A. Contact: Nunavut Water Board, Gjoa Haven, NU (T) 867-360-6338.

In addition, the successful contractor may require a number of other permits or licenses. These permits or licenses pertain to the operation and maintenance of the contractors' camp or relate to his/her status as an employer. Examples of these permits include those related to the possession of firearms, day-to-day camp operation and federal/territorial labour codes. A list of these and other requirements is presented in Table 1.

Table 1 - Other Authorizations

Authorization	Authority	Activity to Authorization Applies
Archaeological Research Permit	Department of Culture, Language, Elders and Youth, Gov't of Nunavut (Nunavut Land Claims Agreement Act)	Additional investigation of archaeological sites, mitigation, monitoring
Access Permit for Inuit Owned Lands	Regional Inuit Association	Mobilization by cat-train
Transportation Permits	Transport Canada (Transportation of Dangerous Goods Act)	Shipping
Transportation Permits	Transport Canada (International Air Transport Association Dangerous Goods Regulations)	Air transport
Fishing Licenses	Department of Fisheries and Oceans	Recreational fishing
Firearms Acquisition Certificates / Firearms License (course required)	Royal Canadian Mounted Police (RCMP)	Use and storage of firearms

1.3.4.3 Conformance to Legislation and Policy

The remediation of the site will comply with all applicable environmental laws, regulations and requirements of Federal, Territorial and other regional authorities, and any permits, approvals, and authorizations that may be required. The contractor is subject to and must comply with all permits and approvals obtained on behalf of and by INAC to conduct this work. Throughout all project phases, project personnel will work in close cooperation with regulatory authorities and compliance will be enforced.

Federal Acts, Regulations and Guidelines

Several Federal Acts, regulations and guidelines affect project activities across all Canadian jurisdictions. The most relevant to the remediation of CAM-A are outlined below:

The ***Canadian Environmental Protection Act*** regulates toxic substances from their production or import, to consumption, storage and disposal. This Act also incorporates, amongst others, the Storage Tank Regulations (SOR/2008-197) and the PCB Regulations (SOR 2008-273).

The ***Transportation of Dangerous Goods Act* and Regulations** promotes public safety in the transportation of dangerous goods. The Act applies to all handling, offering for transport and transporting of dangerous goods by any means of transport whether or not the goods originate from or are destined for any place or places in Canada.

The ***Fisheries Act*** protects fish and fish habitat from pollution, harmful alteration, disturbance and destruction, and impediments to fish movement.

The ***Arctic Waters Pollution Prevention Act* and Regulations** govern development and shipping activity in Arctic waters adjacent to the mainland islands of the Canadian Arctic to ensure the continuing welfare of the residents of the areas, and to protect the ecological balance in water, ice and land areas.

The ***Migratory Birds Convention Act*** provides for the protection of designated migratory species, their habitats, and the regulated harvest of certain species.

The ***Canada Wildlife Act*** provides for the involvement of the Government of Canada in cooperative research and management programs involving wildlife species normally the responsibility of provinces or territories. This is particularly relevant to rare and endangered species or species such as the Peary caribou, which seasonally move across various regulatory boundaries.

The ***Species at Risk Act*** aims to protect wildlife from becoming extinct or lost from the wild, with the objective of helping the numbers recover. The act identifies all wildlife species listed as being at risk nationally and protects populations and their habitats.

The ***Canada Shipping Act, 2001*** regulates shipping activities under the jurisdiction of Canada. Regulations cover technical standards of operation safety and pollution aspects related to shipping activities in Canadian waters.

The ***Navigable Waters Protection Act*** pertains to the erection of structures or facilities used to support or impede navigation in waters under the jurisdiction of Canada.

The ***Territorial Lands Act*** provides the authority for administering and protecting lands under the direct control of the Minister of INAC. The following regulations are pursuant to this Act:

- The **Territorial Lands Regulations** provide regulatory control for maintaining sound environmental practises for any land use activities on Territorial lands. These regulations require that land use permits be issued for such operations as work involving the use of heavy equipment, establishment of camps, use of explosives, and clearing of lines, trails and rights-of-way, including construction of access roads.
- The **Territorial Quarrying Regulations** establish the procedures for extracting Crown-owned limestone, granite, slate, marble, gypsum, loam, marl, gravel, sand, clay or stone from Territorial lands. The regulations specify permits, applications, staking and dimensions of quarries.

The ***Nunavut Land Claim Agreement Act*** provides for the use, management and conservation of land, water, and resources of Nunavut. It also identifies the need to complete an environmental impact assessment for specific projects.

The ***Nunavut Waters and Surface Rights Tribunal Act*** provides the Nunavut Water Board with the power to issue water use licenses. The NWB evaluates the potential for detrimental effects occurring because of the use of water or a deposit of waste in water on other users.

Canada Labour Code contains the labour code for all Federal employees or activities on Federal owned or controlled land. Private Provincial or Territorial employees are governed by the Provincial/Territorial Labour Acts, even when working on Federal lands or facilities. The Labour Acts control such things as statutory holidays, maximum work hours and minimum wages.

Atomic Energy Control Act **and Regulations** describe the packaging requirements and approvals needed for the transportation of radioactive materials.

National Fire Code (NFC) established the standard for fire prevention, fire fighting and life safety in buildings in use, including standards for the conduct of activities causing fire hazards, maintenance of sire safety equipment and egress facilities, standards for fire extinguishers, etc. In addition, the NFC established the standard for prevention, containment and fighting of fires originating outside buildings which may present a hazard to a nearby community, and sets the standards for the storage and handling of dangerous goods, flammable liquids and combustible liquids.

The following guidelines are identified as reference materials, and should be used where appropriate in the final design.

Freshwater Intake End-of-Pipe Fish Screen Guidelines (DFO) provide instructions for the protection of anadromous and resident fish where freshwater is extracted from fish-bearing waters.

National Guidelines for the Landfilling of Hazardous Waste (CCME) is to be used by regulators, designers, owners, and operators of hazardous waste facilities. They cover site selection, design, construction, closure and post-closure care, monitoring and operation. They are intended for new, not existing facilities.

Code of Good Practise for Used Oil Management in Canada (CCME) described environmentally sound options for the handling, storage, collection, transportation, recycling, reuse and disposal of used oils in Canada. It is intended to provide guidance for used oil generators and to regulatory authorities in the formulation of provincial or regional used oil management strategies.

Canadian Environmental Quality Criteria for Contaminated Sites (CCME) provide numerical limits for contaminants in soil and water intended to maintain, improve, or protect environmental quality and human health at contaminated sites. The criteria are intended to provide general technical and scientific guidance to provincial, federal, territorial and non-governmental agencies in the assessment and remediation of contaminated sites across Canada. They serve as benchmarks against which to assess the degree of contamination at a site.

Canadian Drinking Water Guidelines (Health Canada) provide criteria for water that are protective of human health and also meet aesthetic objectives.

The **Canada-Wide Standard for Mercury (CCME)** applies to incineration activities on-site.

<u>Nunavut and Northwest Territory Acts, Regulations and Guidelines</u>
In addition to the Federal Acts and Regulations identified in the previous section, the remediation of the CAM-A site is governed by the following:

Guidelines for the Discharge of Domestic Wastewater in Nunavut, by the Nunavut Water Board, outlines the requirements for water quality effluent from facilities in Nunavut.

Environmental Guidelines for Industrial Waste Discharges establish standards that should be followed when discharging waste from an industrial operation on Commissioners Land or lands administered by municipal governments in Nunavut.

The **Explosives Use Act** provides controls for surface blasting other than for mining purposes.

The **Nunavut Wildlife Act** provides for the protection of wildlife and wildlife habitats as well as regulated harvest of selected species.

The **Nunavut Environmental Protection Act** provides for the protection of the environment from the discharge of contaminants, clean-up of contaminants and unsightly premises. In addition, the powers of inspectors as well as offences and penalties are defined. The Act applies only to situations not authorized by other Canadian Acts in the Nunavut Territory. The following guidelines under the Nunavut Environmental Protection Act may be applicable to the clean up of the Sturt Point site:

- Contingency Planning and Spill Reporting.
- Disposal Guidelines for Fluorescent Light Tubes.
- Guideline: Dust Suppression.
- Guidelines for the Management of Waste Asbestos.
- Guideline for the Management of Waste Antifreeze.
- Guideline for the Management of Waste Paint.
- Guideline for the Management of Waste Solvents.
- Guidelines for the General Management of Hazardous Waste in Nunavut.

The **Nunavut Environmental Rights Act** provides the people of Nunavut the right to access information concerning the release or potential release of contaminants into the environment, and also the right to prevent the release or potential release of contaminants into the environment.

The **Spill Contingency Planning and Reporting Regulations** outline requirements for filing a contingency plan and for reporting spills.

The **Nunavut Fire Prevention Act and Regulations** provides for the regulation of the decommissioning of fuel lines and fuel tanks.

The **Pesticides Act and Regulations** specifies the requirements for use storage, handling and disposal of pesticides.

The **Nunavut Territorial Archaeological Sites Regulations**, pursuant to the Nunavut Act, protects archaeological sites in Nunavut from disturbance and prohibits the removal of archaeological specimens, except under permit.

The **Safety Act: Occupational Health Regulations** outline the health and safety standards to be maintained at workplaces to ensure the health and safety of persons.

Guidelines for the Removal of Materials Containing Friable Asbestos outlines the procedures for the removal of friable asbestos.

1.4 Department of Fisheries and Oceans Operational Statement Conformity

Based on the work to be completed, the DFO Operation Statement for culvert maintenance may be applicable. If required, the conditions and measures outlined in the operational statement for culvert maintenance will be followed.

1.5 Transportation

Transportation associated with the movement of materials, equipment, and personnel to the site, as well as disposal of some waste materials off-site includes air, ground and barge transport. These activities are described as follows.

1.5.1 Air

Transport of personnel to and from the site, and weekly domestic supplies (i.e., food) will be completed using charter aircraft. It is anticipated that the airstrip will remain intact once the clean-up work is completed, with the exception of any culverts or other structures that may be part of the former DEW Line program or those that may have been required during the remediation program, which will be removed.

1.5.2 Ground

The CAM-A site is 80 km east of Cambridge Bay and there is potential for independent development of an ice road or cat train that would be used for contractor mobilization. Mobilization by ice road or cat train offers more flexibility for a longer summer construction season as the contractor typically mobilizes his equipment and camp to site in March or April, clears snow from critical areas and can mobilize his staff to set up the camp and start work early in the summer. Barge access can be hindered in the early summer by ice conditions. Barge availability can also be an issue. If the Contractor is able to stage his equipment, camp and materials for CAM-A out of Cambridge Bay, overland mobilization (i.e. cat train) would be considered a viable option for contractor mobilization. It has therefore been assumed for the preparation of this RAP, and its associated cost estimate, that access to the site for mobilization and demobilization of contractor equipment and supplies will be either via barge, ice road or cat train.

Existing roads will be used at CAM-A while on-site. There are a number of gravel roads throughout the site connecting the Station Area with the Airstrip, Fresh Water Lake, existing dumps, and beach areas. All of the major roadways were surveyed during the 2010 site investigation (AECOM). The roads are constructed with local granular material and are well drained. The patches of vegetation are typical along the roadways, but are of no concern with respect to trafficability. The roads are in good condition for heavy equipment although regular grading will be required. Widened or pull out sections will be required for two way heavy equipment traffic.

The roadway sections include Road Section 1 from the Airstrip to the Fresh Water Lake; Road Section 2 from the Airstrip to the Station Area via Road Section 3; Road Section 3 connects the west end of the Airstrip to the Station Area; Road Section 4 connects the east end of the Airstrip to the Station Area; Road Section 5 from the Station Area to the Beach POL; Road Section 6 branches off of Road Section 5 to Barrel Pile B; Road Section 7 branches off Road Section 6 to Landfill A; and Road Section 8 connects the Airstrip with Borrow Area 3. The road sections are shown on Figure 2, Appendix A.

It is anticipated that the existing roadways will remain intact once the clean-up work is completed, with the exception of any culverts or other structures that may have been part of the former DEW Line program or those that may have been required during the remediation program, which will be removed.

1.5.3 Barge

The CAM-A site is located along the coast and barges have historically landed at the Beach Area. The ground at the beach is comprised of generally well-drained, coarse-grained beach deposits, which are not expected to pose a problem for beaching or using heavy equipment in the area for movement of materials upon landing. The transport of the contractors' equipment and facilities may be by barge in the summer. In addition, any waste materials to be transported off-site may be removed via barge.

No significant change in the position of shoreline due to tidal influences was noted during the 2010 site investigation (AECOM), suggesting that the near shore water conditions are not excessively shallow. Tidal prediction rates for August and September are available for nearby Cambridge Bay, to the west, from the DFO website. For this time of year, tidal fluctuations are in the order of approximately 0.6 m at Cambridge Bay. Based on the above information, barge landing at Sturt Point is not expected to pose a significant challenge.

1.6 Camp Site

A potential suitable location for the camp/laydown area is located near the airstrip and Proposed Landfill LF-3. These areas are centrally located with easy access to the airstrip. The area has been used for borrowing material in the past for construction of the airstrip and is relatively flat. Alternatively the contractor's camp can be located on Proposed Landfill LF-1/Borrow Area BA-13 or Proposed Landfill 2/Borrow Area 14.

The temporary camp structures will include accommodations for the construction staff, the owner and support staff as well as associated facilities, such as offices, latrines and kitchen facilities. The facilities will be installed during mobilization, and will be removed as part of the demobilization from the site. The anticipated number of staff is approximately 40 to 50 people, from June 15 to September 15.

1.7 Equipment

The contract for this work has not yet been tendered or awarded; therefore, the exact types of equipment are not available. However, based on equipment used at other sites, the typical equipment can include, but is not limited to, the following:

- Rock truck
- Loader
- Excavator
- Grader
- Dozer
- Fuel truck
- Water truck
- Mack truck
- Passenger van
- Pick-up trucks
- Incinerator
- Generator
- Backhoe
- Compactor
- Drill
- Dumper
- Snow blower

1.8 Water

The only source of water for camp operations is the Freshwater Lake, shown on Figures 1 and 2, Appendix A. Water samples were collected at from the lake during the 2010 site assessment (AECOM). The criteria for the Guidelines for Canadian Drinking Water Quality (CDWQ) (May 2008) was exceeded for chloride, and total dissolved solids (TDS) for the samples taken at the freshwater Lake. Hydrocarbons and PCBs were non-detect in all surface water samples collected. Of the dissolved metal parameters, only barium, boron, copper, manganese, sodium and zinc were detected; although, not an exceedance of the Guidelines for Canadian Drinking Water Quality (May 2008). The results for the remaining parameters were below the detection limit. Due to the seasonal nature of coliform concentrations in surface water bodies, no coliform samples were collected. If this water body is to be used during construction as the drinking water source, coliform testing will be required on a regular basis throughout the construction season.

It is estimated that water use will be up to 20 m^3 per day for the duration of the remediation program, for both camp and construction use. Prior to being used for drinking water, analysis and confirmation of all drinking water parameters will be required. Collection and analysis of all drinking water parameters is recommended to be completed at minimum, on a bi-weekly basis. No water will be returned to the source. If the results from the analysis of the freshwater lake samples continue to exceed the parameters for the Guidelines for Canadian Drinking Water Quality, drinking water will need to be brought into site until a water treatment system can be implemented for the duration of the remediation program.

1.9 Waste Water

The ultimate location of the camp and associated sewage, grey water, and waste disposal will need to consider the requirements of the Water Use License and Land Use Permit. Typically, the permits require that all waste disposal locations, including sewage treatment systems, greywater discharge areas, and fuel storage areas be located a minimum of 31 m from the high water mark of any water body or drainage course. In addition, all effluent and wastewater must meet waste water quality requirements prior to discharge. Sewage lagoons are the usual method for sewage disposal at such sites, and as such, it is expected that a sewage lagoon will likely be used during camp operation at the CAM-A site. The prevailing wind direction will be taken into consideration for the location of waste water treatment and disposal operations.

In terms of waste disposal, licenses typically require that camp solid wastes be incinerated on-site, in an approved incinerator facility, and that non-hazardous, non-combustible waste and the ash generated from incineration be disposed of in the on-site Non-Hazardous Waste Facility. Therefore, all non-hazardous wastes will be disposed of on-site and only hazardous wastes will be shipped off-site.

1.10 Fuel

It is anticipated that fuel used on-site will be comprised of diesel and gasoline. The exact quantity and types of fuel, details of the secondary containment, method of fuel transfer and spill control measures are to be provided by the contractor, once the contract has been awarded. However, as a minimum, they must meet the requirements as outlined in Section 4.3.2 Storage and Handling of Fuel and Other Hazardous Substances.

1.11 Chemicals and Hazardous Materials

All chemicals and hazardous materials will be dealt with according to Section 4.3.16 Handling of Dangerous Goods and Hazardous Waste Materials.

1.12 Workforce and Human Resources/Socio-Economic Impacts

The project is located near the community of Cambridge Bay, therefore, it is anticipated that much of the work force will be from that community. Workers coming from Cambridge Bay will be transported to and from the site at the expense of the contractor. As part of the contract, the successful contractor is required to provide training programs for all employees. Typical positions available are heavy equipment operators, cooks, wildlife monitors and labourers.

The construction season will be from approximately June 15 to September 15. The exact start date during the mobilization year is dependent on the form of mobilization used by the contractor. If overland cat-train is used, the construction season can typically start in early June. If the contractor mobilizes using the barge, the construction is season is expected to start in early to mid-August. The rotation schedule is decided by the contractor, and is required to comply with all applicable Government of Nunavut Labour Regulations.

1.13 Public Involvement/Traditional Knowledge

Community meetings for this work were completed in early February (2011) in the community of Cambridge Bay. During the meetings, an outline of the proposed work was provided and any questions and comments regarding the work were addressed. There were no significant issues brought up during the meeting.

2. Project Specific Information - Site Clean-up/Remediation

2.1 Existing Landfills (Dumps)

There are two (2) existing landfills at CAM-A. The following are the existing on-site landfills:

- Landfill A (Lobes A, B, C, D); and
- Landfill B (Lobes F, G & H).

A summary of the description of each landfill is provided in the following sections. The details of the geotechnical assessment for each landfill are provided in Table 2.

2.1.1 Landfill A (Lobes A, B, C & D)

Landfill A, the main landfill, is located at the west end of access road (Road Section 7), approximately 500 m southwest of the station area. During the site assessment four lobes (A, B, C, & D) were identified within one mound of material elevated from the surrounding topography. These four lobes were assessed collectively. A geophysical survey identified a waste disposal area (WDA) size of 1,500 m^2, with an estimated depth of 1.5 m to 2.0 m. The locations of Landfill A and Lobes A, B, C, and D are shown on Figure 3, Appendix A.

Debris was observed on the surface and partially buried. The debris consisted of metal barrels, domestic glass, and tin cans. The cover soil was predominantly comprised of coarse sand with some gravel and organics, with large cobbles at surface. The overall area was dry, with no significant drainage areas noted. Shallow surficial water bodies were located approximately 90 m to the south and 175 m to the west, with areas of 400 m^2 and 5,000 m^2, respectively. There is no evidence of erosion in the area. The area is gently sloping south. No contamination was noted at this landfill.

Based on the landfill evaluation matrix presented in the INAC Protocol, Landfill A scored as a low potential risk or Class C buried debris area. The low score is due mainly to the lack of contamination, the stability of the lobes, lack of down-gradient receptors, and its small size. The remedial recommendation is to leave Landfill B in place, remove surface debris and place additional granular cover to a thickness of 0.75 m.

2.1.2 Landfill B (Lobes F, G & H)

Landfill B is located approximately 400 m west of the station area, north of Landfill A. During the site assessment three lobes (F, G, & H) were identified as separate, well defined mounds of material elevated from the surrounding topography. The location of Landfill B and Lobes F, G, and H are shown on Figure 4, Appendix A.

A geophysical survey identified Lobes F, G, and H having WDA sizes of 208 m^2, 495 m^2, and 128 m^2 and approximate depths of 1.0 m, 1.5 m, and 0.5 m, respectively.

For all three lobes, surface debris (metals) was observed. The cover soil was predominantly comprised of coarse sand with some gravel and organics, and large cobbles at surface. The drainage areas in the vicinity of the landfill were dry; however, a small radial drainage pattern was noted approximately 25 m down-gradient of Lobe G. A shallow surficial water body was located approximately 90 m to the west of Lobe G, with an area of approximately 900 m^2. There is no evidence of erosion in the area. The area is gently sloping south and west.

Based on the landfill evaluation matrix, Landfill B scored as a low potential risk or Class C buried debris area. The low score is due mainly to the lack of contamination, the stability of the lobes, lack of down-gradient receptors, and its small size. The remedial recommendation is to leave Landfill B in place, remove surface debris and place additional granular cover to a thickness of 0.75 m.

Table 2 - Landfill Assessment Summary

Landfill	Landfill A (Lobes A, B, C,D)	Landfill B (Lobes F, G, H)
Reference Figure	Figure 3	Figure 4
Landfill Extent	1,500 m^2 (30 m x 50 m) Landfill is a mounded, well defined and covered.	Landfill lobes are mounded, well defined and mostly covered. F: 208 m^2 (8 m x 26 m); G: 495 m^2 (33 m x 15 m); and H: 128 m^2 (4 m x 32 m)
Estimated Depth	Lobe is raised from surrounding land. Approximately 1.5 to 2.0 m above existing ground. (2,625 m^3)	Lobes are raised from the surrounding land. Approx. depth above existing ground: Lobe F: 1.0 m (208 m^3); Lobe G: 1.5 m (743 m^3); and Lobe H: 0.5 m (64 m^3)
Presence of Exposed Debris and/or Staining	Yes, both surface and partially buried (metal, barrels, domestic glass & tin cans)	Yes, both surface and partially buried (metals noted)
Topographical Features	Gentle slope towards south	Gentle slope towards south and west
Cover Materials	Large cobbles on surface, mostly coarse sand. Some gravel and organics. First 20 m d/g: approx. 50% vegetation coverage. Greater than 20 m d/g from toe of lobe, veg. coverage is >90%. It should be noted that the surface area d/g was scraped for material to cover the landfill. The vegetation cover was typical of the site consisting of willows, sedges, and mosses. The first 20 m down-gradient had approximately 50% vegetation coverage and greater than 20 m down-gradient from the toe of the lobe, the vegetation coverage was greater than 90%. It should be noted that the surface area down-gradient was scraped for material to cover the landfill.	Large cobbles on surface, mostly coarse sand. Some gravel and organics. Approx. vegetation coverage: 60% for Lobe F; 90% for Lobe G; 90% for Lobe H Distance to vegetation coverage: 20 m d/g for Lobe F; at the toe for Lobe G; and at the toe for Lobe H. It should be noted that the surface area d/g of Lobe F was scraped for material to cover the landfill. The vegetation cover was typical of the site consisting of willows, sedges, and mosses. The vegetation coverage was approximately 60% for Lobe F, 90% for Lobe G, and 90% for Lobe H. The distances to vegetation coverage was 20 m down-gradient for Lobe F, at the toe for Lobe G, and at the toe for Lobe H. It should be noted that the surface area down-gradient of Lobe F was scraped for material to cover the landfill.
Erosion, Drainage, Seepage and Settlement Features	No No distinct drainage channels noted.	No No distinct drainage courses were noted; however, a small drainage pattern noted approximately 25 m d/g of Lobe G.
Distance to marine environment	Approx. 600 m	>750 m
Comments	Class C: The WDA is in a stable location, and there is no evidence of contaminant migration.	Class C: The WDA is in a stable location, and there is no evidence of contaminant migration.
Recommendations	In such cases, the debris may be left in place, with the placement of additional granular cover to ensure erosion protection and proper drainage.	In such cases, the debris may be left in place, with the placement of additional granular cover to ensure erosion protection and proper drainage.

2.2 Remedial Requirements of Existing WDAs

The assessment of waste disposal areas (WDA or buried debris areas) at CAM-A was completed with the goal of classifying the WDAs according to the three categories specified under the INAC Abandoned Military Site Remediation Protocol, which are:

Class A: The WDA is located in an unstable, high erosion location. Remediation will involve relocation of buried debris to an engineered landfill. A WDA located at an elevation of less than 2 mASL will be removed.

Class B: The WDA is in a suitable, stable location, but there is evidence of contaminant migration. Remedial solutions include the installation of an engineered containment system, or relocation, whichever is deemed more cost effective.

Class C: The WDA is in a suitable, stable location, and there is no evidence of contaminant migration. In such cases, the debris may be left in place, with the placement of additional granular cover to ensure erosion protection and proper drainage.

There were no WDAs identified at CAM-A that are considered to be high potential environmental risk, or any WDAs located in close proximity to water bodies at the CAM-A site. Therefore no WDA excavations have been recommended. Table 3 summarizes the anticipated remedial requirements for WDAs at CAM-A.

Table 3 - Summary of Recommended WDA Remedial Requirements

Waste Disposal Area	Area (m^2) & Depth (m)	Environmental Assessment	Landfill Evaluation	Recommended Remediation	Comments
Landfill A					
Lobes A, B, C, &D	1,500 1.5 – 2.0	• No evidence of contaminant migration. • No potential for surface contaminated soil identified. • Moderate vegetation. • No erosion noted.	Class C Low Potential Environmental Risk.	Regrade, based on the stability of this landfill.	The debris may be left in place, with the placement of additional granular cover to ensure erosion protection and proper drainage.
Landfill B					
Lobe F	208 1.0	• No evidence of contaminant migration. • No potential for surface contaminated soil identified. • Moderate vegetation. • No erosion noted.	Class C Low Potential Environmental Risk.	Regrade, based on the stability of this landfill.	The debris may be left in place, with the placement of additional granular cover to ensure erosion protection and proper drainage.
Lobe G	495 1.5				
Lobe H	128 0.5				

2.3 Contaminated Soil

Contaminated soil areas will be excavated, typically using a backhoe, and then backfilled with granular material. The excavated soils will be disposed of according to the contaminant type. The disposal requirements are presented Table 4 below:

Table 4 - Contaminated Soil Disposal Requirements at CAM-A

Contaminant Designation	Description	Estimated Soil Volume (m^3)	Disposal Requirement
Tier I Contaminated Soil	Soils containing concentrations of any or all contaminants listed as follows: Lead ..... 200 to 499 ppm PCBs ..... 1 to <5 ppm	43	Cap in place with a minimum of 0.3 m of granular fill, or dispose in on-site Non-Hazardous Waste Landfill.
Tier II Contaminated Soil	Soils containing concentrations of any or all contaminants listed as follows: Arsenic 30 ppm Cadmium 5 ppm Chromium 250 ppm Cobalt 50 ppm Copper 100 ppm Lead 500 ppm Mercury 2 ppm Nickel 100 ppm Zinc 500 ppm PCBs ≥5 ppm;<50 ppm	75	Transport off-site for disposal in engineered territorial or provincial Landfill.
Type A Hydrocarbons	Soils contaminated with hydrocarbons consisting primarily of oil and grease.	n/a	Scarify and leave in place if under criteria, or dispose in on-site Non-Hazardous Waste Landfill.
Type B Hydrocarbons (*) Protection of Freshwater Aquatic Life	Soils contaminated with hydrocarbons consisting primarily of fuel oil, diesel, or gasoline with concentrations equal to or greater than the following: F1 fraction 1,290 ppm* F2 fraction 330 ppm* Station Area: Surface soils to 0.5 m depth 2500 ppm (TPH, sum of F1 through F3 fractions) for the Protection of Terrestrial Wildlife Subsurface soils below 0.5 m in depth 5000 ppm (TPH, sum of F1 through F3 fractions) for the Management Limit	1,125	Excavate and treat ex-situ through landfarming, treat in-situ with landfarming.
CEPA/ Hazardous Soil	Soils contaminated with PCBs ≥ 50 ppm or with leachate concentrations above criteria.	n/a	Off-site at licensed southern disposal facility

A description of the contaminated soil areas identified at CAM-A by AECOM during the 2010 Phase III Environmental Site Assessment are presented below.

2.3.1 Tier I Soil

The 2010 site investigation identified the following Tier I impacted soils:

- 7.9 m^3 of Tier I PCB contaminated soil near the module train foundation to an estimated depth of 0.3 metres below ground surface (mBGS) to 0.5 mBGS (0.2 m depth, total).
- 35.1 m^3 of Tier I PCB contaminated soil in two locations of the sewage outfall area to an estimated depth of 0.3 mBGS.

The total volume of Tier I soil identified for remediation is 43 m^3 which has been delineated from contaminated soil areas.

2.3.2 Tier II Soil

The 2010 site investigation identified the following areas of Tier II impacted soils:

- 9.3 m^3 of Tier II PCB contaminated soil near the garage to an estimated depth of 0.5 mBGS.
- 0.1 m^3 of Tier II PCB contaminated soil was identified in the sumps on the garage foundation to an estimated depth of 0.3 mBGS.
- 21.5 m^3 of Tier II PCB contaminated soil near the module train foundation to an estimated depth of 0.3 mBGS.
- 44.2 m^3 of Tier II Lead contaminated soil was in the worked area (Lobe J) to an estimated depth of 0.3 mBGS.

The total volume of Tier II soil identified for remediation is 75 m^3 which has been delineated from contaminated soil areas.

2.3.3 Hydrocarbon Impacted Soils

2.3.3.1 Type A Soil

The 2010 site investigation did not identify any Type A contaminated soil.

2.3.3.2 Type B Soil

The following three areas of Type B impacted soil requiring remedial action were identified:

- 425 m^3 of Type B hydrocarbon impacted soil near the Beach POL within 30 m of the ocean to an estimated depth of 0.5 mBGS to 1.0 mBGS (0.5 m depth, total)
- 128.8 m^3 of Type B impacted soil on the Beach POL Pad to an estimated depth of 0.5 mBGS.
- 571 m^3 of Type B impacted soil was identified near module train foundation to an estimated depth of 0.5 mBGS.

The total volume of PHC Type B soil identified for remediation is approximately 1,125 m^3.

In-situ treatment of the hydrocarbon impacted soil at the beach POL is not considered an option due to its close proximity to the shoreline. Based on the applicability of the various treatment options at the CAM-A site, the recommended remedial option is on-site ex-situ treatment, i.e. landfarming. Based on the volume of impacted soil and moderate hydrocarbon concentrations observed during the 2010 investigation, it is anticipated that ex-situ biological treatment may be completed within a 1 year period provided site conditions are monitored and optimized where possible (i.e., moisture conditioning, nutrient amendment).

Soils contaminated with Type B fractions should be excavated and treated ex-situ by biological treatment methods in an on-site landfarm facility. Soils concentrations should be reduced, when required, to meet the 2009 INAC Criteria. The Type B soils identified at the Beach POL are subject to more stringent criteria than Type B soil from other locations, including the proposed landfarm sites, further away from water bodies. The Beach POL soils; however, have TPH concentrations that are typically higher than the far shore criteria of 2,500 mg/kg and ex-situ treatment will be required.

2.4 Debris Areas

At CAM-A, there are essentially two large scattered debris areas. Figure 2, Appendix A shows one debris area extent, which covered a large portion of the site, while two smaller debris areas were identified in the vicinity of the Inuit houses to the northeast of the main site.

Thirteen debris lobes (I, J, K, L, M, N, O, P, Q, R, S, and T) identified within the debris areas on-site were determined to be localized, partially buried debris and/or surface debris and were assessed as surface debris areas rather than buried debris. These partially buried debris and/or surface debris lobes are located within the debris area extents shown on Figure 2, Appendix A.

The volume of hazardous materials identified is 1.2 m^3, while the crushed volume of non-hazardous waste is approximately 195 m^3. Non-hazardous waste can be disposed of in a Non-Hazardous Waste Landfill (NHWLF). Hazardous waste must be packaged in accordance with TDGA regulations for shipping to an off-site licensed hazardous waste disposal facility.

In addition to the identified surface debris areas, it is also typically noted in clean-up specifications that all debris within 50 m of existing pads and roadways is picked up. The surface debris investigation generally covered off all of the areas near roadways, and the existing perimeters were drawn to include debris identified in this vicinity. Nonetheless, it is recommended that a small contingency for additional volume of debris to be collected under the 50 m from roadway criterion be carried for design of the NHWLF.

2.4.1 Summary of Surface Debris

Table 5 provides a summary of the debris areas inventoried at the CAM-A site.

Table 5 - Summary of Debris

Location	Description of Components	Estimated Areal Extent (m^2) and Uncrushed Volume (m^3)	Crushed Volume (m^3)	Figure No./Waypoint
Marker Barrels	POL markers (39) or conduit markers (29)	n/a 68 m^3	13.6 m^3	Figure 2
Barrel Area A	Barrels (35)	n/a 35 m^3	7 m^3	Figure 2
Barrel Area B	Barrels (284)	n/a 284 m^3	56.8 m^3	Figure 2 W-005
Barrel Area B	Large wooden cable spool	2 m^2 6 m^3	3.1 m^3	Figure 2 W-006
Airstrip threshold Lights	One (1) light standard (threshold light) consisting of one (1) 15 m steel channel, two (2) 5 m long round pipes, galvanized cables, and a wood marker.	2 m^2 1 m^3	1 m^3	Figure 2 W-232, W-234
Debris - Beach	Barrels (63)	n/a 63 m^3	12.6 m^3	Figure 2
Debris - Beach	Wood debris	2 m^2 0.5 m^3	0.25 m^3	Figure 2 W-301
Debris - Beach	Scrap metal	0.5 m^2 0.25 m^3	< 0.25 m^3	Figure 2 W-302
Debris - Beach	Wood pallet	1 m^2 0.5 m^3	0.25 m^3	Figure 2 W-303
Debris - Beach	Angle iron (metal stand)	3 m^2 1 m^3	0.25 m^3	Figure 2 W-328
Debris – Landfill A	Barrels (6)	n/a 6 m^3	1.2 m^3	Figure 3
Debris – Landfill A	Metal garbage can	0.5 m^2 0.5 m^3	0.25 m^3	Figure 3 W-133
Debris – Barrel Area A	Vehicle debris & scrap metal	2 m^2 0.6	0.6	Figure 3

Location	Description of Components	Estimated Areal Extent (m^2) and Uncrushed Volume (m^3)	Crushed Volume (m^3)	Figure No./Waypoint
Debris – Landfill B	Barrels (10.5)	n/a 10.5 m^3	2.1 m^3	Figure 4
Debris – Landfill B	Partially buried cat track	3 m^2 4 m^3	2 m^3	Figure 4 W-166
Debris – Landfill B	Partially buried/crushed 5 gal metal pails (30)	5 m^2 3 m^3	0.6 m^3	Figure 4 W-169
Debris – Station & Worked Area	Barrels (113)	n/a 113 m^3	22.6 m^3	Figure 2 W-067, W-073 to W-075
Debris - Station	Wood pallets (3)	9 m^2 0.6 m^3	0.5 m^3	Figure 2 W-253
Debris - Station	Wood cable roll; scrap iron, tire (1); wood and steel debris	2 m^2 0.5 m^3	0.25 m^3	Figure 2 W-255
Debris - Station	Concrete debris	0.5 m^2 0.25 m^3	0.25 m^3	Figure 2 W-257
Debris - Station	Channel iron; steel pipe	1 m^2 0.5 m^3	0.25 m^3	Figure 2 W-263
Debris - Station	Tin cladding; scrap iron	2 m^2 4.3 m^3	3.5 m^3	Figure 2 W-264
Debris - Station	Steel pipe; angle iron	1 m^2 0.5 m^3	0.25 m^3	Figure 2 W-267
Debris - Station	Wood & metal debris	18 m^2 3 m^3	2 m^3	Figure 2 W-198
Debris - Station	Concrete antenna anchor pad x 6 pads; (3.6 m x 3.2 m x 0.6 m)	69 m^2 42 m^3	42 m^3	Figure 2 W-179
Debris - Station	Metal post 0.55 m stick-up	n/a 0.25 m^3	< 0.25 m^3	Figure 2 W-089
Debris - Station	Steel pipe	4.2 m^2 1 m^3	0.5 m^3	Figure 2 W-098
Debris – Worked Area	Steel pipe	1.6 m^2 0.5 m^3	0.25 m^3	Figure 2 W-187
Debris – Worked Area	Steel pipe	0.25 m^2 0.25 m^3	< 0.25 m^3	Figure 2 W-188
Debris – Worked Area	Steel Debris/battery cells (4)	4 m^2 1.5 m^3	1.2 m^3 (hazardous)	Figure 8 W-189
Inuit House Area	Barrels (102)	n/a 102 m^3	20.4 m^3	Figure 2
	Total	**195.1 m^3**		

2.5 New Landfill and/or Landfarm Facilities

2.5.1 Potential Locations

Four potential landfill locations (LF-2, LF-3, LF-5 and LF-6) were identified and evaluated during the field program. The locations of landfills are shown on Figure 2. The preferred locations for a NHWLF are LF-5 or LF-6. An alternative location for NHWLF is LF-2, but LF-2 may also be considered as a borrow source of Type 4 Granular Fill. The preferred location for a landfarm is LF-5. An alternate location for a landfarm is LF-6. Table 6 provides a summary of the potential landfill and landfarm locations.

Table 6 - Potential Landfill and Landfarm Locations

Area	Location	Estimated Available Surface Area (m^2)	Environmental Considerations	Engineering Considerations
LF-5 (Proposed NHWLF and Landfarm Location) (Figure 2)	LF-5 is located on a well drained undisturbed area south of the Station Area.	100,000 m^2	The area is adjacent to several borrow areas and a road and is easily accessible. The area slopes at approximately 3 % to the south (towards the ocean).	Based on the size, a landfarm or both a landfarm and a NHWLF can be constructed at this site. The east limit of LF-5 can be adjusted to maintain the required separation from the shoreline and high water mark. Considering the size of the area and its proximity to roads and borrow areas, LF-5 is suitable from a geotechnical perspective for construction of a NHWLF; landfarm; or both. Because of the permeability of these soils, the perimeter containment system is also recommended for the landfarm. The liner has to be keyed into the permafrost. If at some locations the permafrost is deeper than 1.5 m the liner will have to be keyed into the existing ground by at least 1.5 m in consideration of the freeze-back that will occur during the first season. The subsurface stratigraphy generally consists of gravel, sand, and silty clay. Frozen ground was encountered in at approximately 0.9 m depth and seepage was encountered in all testpits below 0.8 m depth
LF-6 (Proposed NHWLF or Landfarm Location) (Figure 2)	LF-6 is located on a well drained partially undisturbed area south of the Station Area.	43,000 m^2	The area is adjacent to several Borrow Areas, the Station Area and road and is easily accessible. The area slopes at approximately 2 % to the south (towards the ocean).	Because of the permeability of the soils encountered at the site, the perimeter containment system described in Section 3.8.4 is recommended if this location is used for construction of a landfarm. The liner has to be keyed into the permafrost. If at some locations the permafrost is deeper than 1.5 m the liner will have to be keyed into the existing ground by at least 1.5 m in consideration of the freeze-back that will occur during the first season. The subsurface stratigraphy generally consists of a layer of peat, underlain by gravel, sand, and/or silty clay. Frozen ground was encountered in at approximately 0.95 m depth and seepage was encountered in all testpits below 0.8 m depth
LF-2 (Proposed or NHWLF Location) (Figure 2)	LF-2 has also been identified as a potential borrow area of Type 4 Fill (BA-14), therefore, it can be used as a borrow source. The area is located to the southwest of the airstrip. Most of the area is on undisturbed ground	46,000 m^2	The LF-2 location is on a relatively flat undisturbed ground which slopes gently (approximately 0.5 %) towards the south.	This area may be considered an alternative location for construction of a NHWLF considering the foundation conditions (soils and depth to groundwater) proximity to roads, airstrip, borrow areas, and the Station Area.

2.5.2 Recommended Locations and Construction Details

2.5.2.1 Non-Hazardous Waste Landfill

The total volume of non-hazardous waste, including Tier I soil, is estimated at approximately 568 m^3. Based on preliminary volume estimates for non-hazardous waste generated from landfill excavations and site surface debris at CAM-A, it is recommended that a Non-Hazardous Waste Landfill be constructed. Although Proposed Landfill sites LF-2 and LF-5 are each suitable for the placement of the NHWLF, the preferred location is Proposed Landfill LF-6. The available estimated surface area at the potential LF-6 is 43,000 m^2.

This site has suitable ground conditions and is close to the Station Area where the majority of demolition debris is located and close to borrow sources where Type 2 Granular Fill material is located. Of note, there are no contaminated soil areas for excavation in the near up-gradient area. Therefore, there is no requirement for provision of a sufficient buffer to avoid complication of long-term landfill monitoring data interpretation.

The approximate footprint of the new non-hazardous waste landfill to accommodate waste excavated from landfill excavations and from surface debris clean-up will be approximately 144 m^2.

In terms of contractor priorities for construction of new facilities during clean-up, construction of the NHWLF is considered the second priority, behind the landfarm.

2.5.2.2 Landfarm

The total volume of Type B soil identified for remediation is approximately 1,125 m^3. The Type B soil was identified mainly at the Beach Area and the module train at the Station site. It would be preferable to locate the landfarm facility within easy access to both the Beach Area and Station sites. Proposed Landfill LF-5 has been identified as the preferred site for a landfarm. This site is in close proximity to the Beach and far enough away to be outside of the “Near Shore” zone relative to soil with hydrocarbon contamination. LF-5 also meets siting requirements for a landfarm and is close to borrow sources where Type 2 Granular Fill material is located.

The approximate surface area required for the treatment of Type B hydrocarbon contaminated soils is approximately 3,500 m^2, which accounts for the treatment area and the construction of containment berms around the perimeter of the area. The available surface area for a landfarm at LF-5 is approximately 100,000 m^2.

The construction of the landfarm is a priority as the treatment of soil could potentially delay contractor’s demobilization from site.

2.6 Borrow Areas

Borrow quantities were investigated as part of the geotechnical field investigation completed by AECOM in 2010.

Seventeen borrow areas were investigated during the site investigation. The borrow areas contained oversized material (boulders); therefore, screening of oversized material may be required. The oversized material may be suitable as Type 1 material for erosion protection of landfill surfaces. The locations of the borrow areas are shown on Figure 2, Appendix A.

Table 7 provides a summary of the granular material types and estimated volumes at each of the borrow areas. A summary of preliminary design estimates for the volumes required of each granular type is provided in Table 8.

Table 7 - Summary of CAM-A Granular Borrow Sources

Borrow Area	Available Granular Fill Type	Area (m^2)	Depth (m)	Volume (m^3)	Reference Figure	Comments
BA-1	Type 2, Type 3, Type 6	24,000	0.5	12,000	2	Undisturbed
BA-2	Type 2, Type 3, Type 6	22,000	0.7	15,400	2	Disturbed
BA-3	Type 2, Type 3, Type 6	51,000	0.7	35,700	2	Disturbed
BA-4A	Type 2, Type 3, Type 6	8,000	0.7	5,600	2	Disturbed
BA-4B	Type 2, Type 3, Type 6	26,000	0.7	18,200	2	Disturbed
BA-4C	Type 2, Type 3, Type 6	11,000	0.7	7,700	2	Disturbed
BA-4D	Type 2, Type 3, Type 6	7,000	0.7	4,900	2	Disturbed
BA-5	Type 2, Type 3, Type 6	9,000	0.7	6,300	2	Undisturbed
BA-5A	Type 4, Type 3, Type 6	27,000	0.7	18,900	2	Undisturbed
BA-6	Type 2, Type 3, Type 5,Type 6	19,000	0.7	13,300	2	Disturbed
BA-6A	Type 2, Type 3, Type 5, Type 6	48,000	0.7	33,600	2	Partially disturbed
BA-7	Type 2, Type 3, Type 5, Type 6	26,000	0.7	18,200	2	Disturbed
BA-8	Type 1	30,000	0.3	9,000	2	Disturbed
BA-9	Type 2, Type 3	24,000	0.5	12,000	2	Disturbed
BA-10	Type 4, Type 3	24,000	0.5	12,000	2	Undisturbed
BA-11	Type 2, Type 3	7,000	0.5	3,500	2	Undisturbed
BA-12	Type 4, Type 3	40,000	0.5	20,000	2	Undisturbed
BA-13 (LF-1)	Type 4, Type 2, Type 3	42,000	0.5	21,000	2	Undisturbed
BA-14 (LF-2)	Type 4, Type 2, Type 3	46,000	0.6	27,600	2	Undisturbed
BA-15 (LF-4)	Type 2, Type 3, Type 6	45,000	0.6	27,000	2	Partially Undisturbed

Table 8 - Summary of Granular Materials Required for Construction

	Estimated Volume Required (m^3)					
	Type 1	**Type 2**	**Type 3**	**Type 4**	**Type 5**	**Type 6**
Non-Hazardous Waste Landfill		2,600				200
Landfarm		1,200		1,900		
Landfill and Debris Regrades		2,600				
Minor Maintenance Work		570				
Contaminated Soil Backfill			1,250			
Landfill Excavation Backfill (n/a)						
Totals		**6,400**	**1,250**	**1,900**		**200**

A review of granular quantity requirements compared to estimates of borrow volumes available indicates that sufficient granular types have been identified.

2.7 Removal of Hazardous Material

"Hazardous" waste materials are defined as waste materials that are designated as 'hazardous' under Nunavut or Federal legislation; or as 'dangerous goods' under the Transportation of Dangerous Goods Act (TDGA). The Canadian Environmental Protection Act (CEPA) regulates material containing PCBs at concentrations greater than 50 ppm. Specific hazardous materials may include: batteries, asbestos, fuel tank bottom sludges, solvents, PCB-containing fluids, fuels and lubricating oils, alcohols and glycols, and heavy metal contaminated liquids. Disposal requirements of these hazardous waste materials are presented in Table 9.

Table 9 - Hazardous Waste Material Disposal Requirements

Hazardous Waste Material	Disposal Requirement
Batteries Heavy metal contaminated organic liquids Liquids containing organic compounds with chlorine concentrations >1000 ppm Liquids containing organic compounds with PCB concentrations >2 ppm and <50 ppm	Off-site licensed treatment/disposal facility
Fuel tank bottom sludges Fuels, lubricating oils, alcohols and glycols	Off-site licensed treatment/disposal facility **OR** On-site incineration in accordance with the contract specifications
Liquids and solids containing organic compounds with PCB concentration >50 ppm	Off-site licensed treatment and disposal facility

2.8 Transportation of Hazardous Materials Off-Site

Hazardous materials are placed in environmentally suitable containers (typically lined and braced sea-cans) at an approved containment facility on-site. A storage area is established and registered with Environment Canada. The hazardous materials are removed by sea-lift in accordance with the TDGA Regulations.

2.9 Grading and Addition of Granular Materials

There are numerous areas identified that require grading and possible addition of granular materials. These areas generally consist of piles of buried or partially buried non-hazardous debris that will be covered with additional granular material and shaped to blend in with the natural terrain and promote positive drainage.

3. Description of the Existing Environment

3.1 Physical Environment

3.1.1 Geology and Terrain

Coastal regions of southern Victoria Island are generally comprised of a discontinuous surface of marine deposits (1 to 3 m thick) of undifferentiated silt and sandy silt overlying bedrock, glacial till, or local gravel. Approaching the coast, the surficial sediments are generally comprised of glacial till drift, occasionally interbedded with sand and gravel. Flute formations are present where the glacial drift deposits are thin (1 to 2 m) and drumlins occur where the glacial drift is thick (10 to 15 m). Occasional bedrock outcrops occur throughout the region. The bedrock geology is comprised of sandstone, siltstone, shale, and carbonates of the Arctic Platform geological province.

Victoria Island is located in the Western Arctic Lowland physiographic region which comprises the low-lying islands in the south-western Arctic Archipelago. The coastlines of these islands range from extensive lowlands to tall cliffs. Most of the area has been affected by the passage of the continental ice sheets. Drumlins fields on southern Victoria Island are distinct from the flat horizon of adjacent lowlands.

3.1.2 Hydrology

The CAM-A site geomorphology is characterized by hummocks, low rolling hills, several ponds and lakes, and raised beaches composed of coarse-grained gravel over bedrock. Regional overland drainage from the site is generally towards the Queen Maud Gulf to the south.

Based on the results of the 2010 investigation, there are no areas of site activities exhibiting signs of erosion as a result of existing site drainage. None of the soil types identified are particularly prone to erosion. However, areas near the coast may be subject to future erosion by wave action in the event of sea level rise with global warming. Any borrow development in the vicinity of the Beach Area may require drainage control to prevent sediment loading to the coastal area. Areas identified for new development (borrow and potential new landfill construction) in the Station Area are not considered at risk for any significant erosion.

3.2 Biological Environment

3.2.1 Flora and Fauna

Vegetation in the Amundsen Gulf Lowlands ecoregion is characterized by a nearly continuous cover of dwarf tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, dryas spp., and vaccinium spp. Tall dwarf birch, willow, and alder occur on warm sites; wet areas are dominated by willow and sedge.

As noted in the 1995 ESG report, there is very little soil to support vegetation at the station area plateau; however, in undisturbed areas on the site a fairly continuous vegetation cover was present. Species present include grasses (poa spp.), willows (salix spp.) and sedges (carex spp.). A detailed list of all vegetation species present is provided in the 1995 ESG report.

Characteristic wildlife of the region includes muskox, caribou, arctic hare, arctic fox, snowy owl, raptors, polar bear, seal, seabirds, and waterfowl. Specific wildlife identified during the 2010 site investigation included arctic hare, muskox and geese. Muskox, hare and caribou droppings were also noted around the site. SARA-listed species that may be present in the vicinity include:

- Endangered Species: Peary caribou, Eskimo curlew, ivory gull

- Threatened: Peregrine Falcon, Ross's Gull
- Special Concern: Bowhead Whale, Barren-ground Caribou Dolphin and Union Populations

3.3 Socioeconomic Environment

While in Cambridge Bay during the Phase III ESA, attempts were made to contact Elders familiar with the sites; however, many of the Elders were out on the land while the team was in Cambridge Bay. Current land use is limited to hunting and occasional trapping.

3.3.1 Heritage Resources

An Archaeological Impact Assessment (AIA) was completed by Golder Associates in conjunction with the Phase III ESA completed by AECOM. As part of the AIA, a records review was completed to determine whether there were any previously recorded sites that may be affected by the Phase III ESA activities, as well as remediation activities. The review did not identify any previously recorded heritage sites. The field survey at CAM-A, however, identified 6 heritage resource sites and several other sites of land use interest. These sites are summarized below:

3.3.1.1 New Sites

NeLv 1: This sites is located approximately 280 m southeast of the south end of the airstrip on an elevated beach ridge 500 m northwest of the current coastline. The site consists of four caches and a rectangular feature identified as a hunting blind. No artifacts were noted in the vicinity of the features. The pattern of lichen growth suggests the site predates the construction of CAM-A. This site is considered to have moderate potential and should be avoided during remediation.

NeLw 1: This site consists of 4 partly or completely collapsed caches aligned with the beach ridge, and run roughly east-west. The site is located approximately 350 m east of the barge landing and 100 m north of the current coastline. There is a caribou hip bone and a fox skull located immediately adjacent to one of the caches. The pattern of lichen growth suggests that the site predates construction of CAM-A. The site is considered to have moderate potential and should be avoided during remediation.

NeLw 2: This site consists of 3 caches, which were constructed using large boulders to former a wall of the structure. Several unidentified animal remains were noted around the surface of one of the caches. The pattern of lichen growth suggests that the site predates the construction of CAM-A. The site is considered to have moderate potential and should be avoided during remediation.

NeLw 3: This site consists of 3 historic tent rings. Two of the rings are rectangular in shape while the third is roughly circular. A weathered mammal vertebrae is present within the second ring and several bones from a seal were identified just outside of the third ring. An aluminum A-frame tri-pod structure is located 9 m south of the third ring. Rocks supporting the base of the A-frame show a similar pattern of vegetation and lichen growth as the rocks in the ring, and as such, they are assumed to be historic rings possibly associated with the construction of the CAM-A site. No other artifacts were found in the vicinity. This site is considered to have moderate potential and should be avoided during remediation.

NeLv 2: This site consists of a collapsed cache and a linear cairn, which is approximately 4 m long and 0.75 m high, oriented north-south and extends down a slope to the beach ridge. The cache is located immediately east of the cairn. The cairn has collapsed and there were no artifacts noted in the vicinity of the features. This site is considered to have moderate potential and should be avoided during remediation.

NeLv 3: This is a burial site located approximately 600 m northwest of two Inuit houses associated with CAM-A. The site is located above the active beach ridge, approximately 55 m west of the current coastline. Human remains, including a skull, vertebrae and ribs are scattered along the beach within a 4 m x 5 m area along with the remains of a collapsed wooden box. The site is outside of the archaeological study area associated with the CAM-A site and will not be impacted by remediation activities.

Several other cultural resources were identified at CAM-A, but were not officially recorded as they did not meet the criteria for designation as archaeological sites under the *Nunavut Archaeological and Palaeontological Sites Regulations* (2001). These sites included several Inuit houses, two sets of tent rings, and a dedicated cairn.

4. Identification of Impacts and Proposed Mitigation Measures

An important part of the assessment process involves identifying mitigation measures that would result in a reduction or elimination of potential environmental effects associated with the remediation of CAM-A. In the case of this project, all potential effects were addressed, not just those deemed to be significantly adverse. The proposed mitigative actions described herein shall form part of the overall project design and planning documentation.

Details of the remediation verification and post-remediation long-term monitoring are provided in the 2010 Remedial Action Plan completed by AECOM and are not included in this report.

4.1 Mitigation Plan Objectives

The mitigation plan provides a description of the general environmental protection measures required to minimize or avoid potential adverse effects, a description of protection measures required for specific valued environmental components at the CAM-A site, and details related to environmental inspection responsibilities and procedures.

The protection measures described herein should be implemented by the contractor to minimize or avoid adverse environmental impacts. These procedures are considered appropriate for known and anticipated situations and conditions. However, should certain procedures or protection measures prove impractical, imprudent or insufficient in field situations, appropriate modifications or substitutions will be proposed by field personnel and then reviewed and approved by the Proponents' Representative on-site.

4.2 Environmental Inspection

As part of its general overall commitment to a strategy of environmental protection and quality assurance, INAC employs dedicated environmental inspection staff to monitor its own compliance with the mitigation plan and all applicable laws, regulations, permits, guidelines and standards. INAC will be represented at the site by the Proponents' Representative, who will report to the PWGSC Project Manager. Communications will include, but not be limited to:

- Attendance at regular meetings as scheduled with the inspector;
- Immediately reporting concerns over any aspect of the mitigation plan; and
- Immediately reporting any spills or other event that may have an effect on human or environmental health and/or safety.

4.3 General Operational Procedures for Protection of Valued Ecosystem Components

The procedures and requirements provided in the following sections are intended to be protective of the Valued Ecosystem Components (VECs) identified at the CAM-A site.

4.3.1 Site Operations

The contractor will establish a construction camp on the site, which shall be located in an area with minimal vegetative ground cover. The selected location shall be in an area that is as close as practical to the main area(s) of clean-up and where possible, on an existing gravel pad or former borrow area.

Surface drainage shall not be impeded and a distance of at least 30 m from the nearest body of water shall be maintained. Permafrost shall be protected by construction of gravel pads, and/or elevation of heated buildings on wooden structures. Areas containing archaeological resources need to be avoided in accordance with the recommendations in the Archaeological Impact Assessment.

Vehicle and mobile equipment travel shall be restricted at the site to established roads, stream crossings and work pads unless specifically exempted by the Proponents' Representative. Recreational use of vehicles, including all terrain vehicles (ATVs), shall not be allowed off the existing road network. Overland movement of equipment and vehicles shall be minimized where damage to the vegetation or underlying soils may occur. Rubber tired vehicles and wide-turning radii shall be used to minimize disturbance to tundra. Following heavy rains, vehicle and heavy equipment use outside of road and work pad areas shall not be permitted until the soil has drained sufficiently to prevent excessive rutting.

Mobile equipment and vehicle operators are to yield the right-of-way to wildlife where safe to do so, and shall not be operated in a manner that harasses any species of wildlife. Vehicle and equipment servicing shall be performed in designated areas only, where special care can be taken to contain, handle, and dispose of maintenance fluids, parts and waste. Fuelling and lubrication of equipment shall be conducted in a manner that avoids spillage of fuels, oils, greases and coolants. When refueling equipment, leak-free containers and reinforced rip and puncture proof hoses and nozzles shall be used. Drip trays shall also be provided and ensure that all storage container outlets are properly sealed after use.

4.3.2 Storage and Handling of Fuel and Other Hazardous Substances

All fuel storage containers shall be compliant with the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (CEPA SOR/2008-197). Fuel shall be stored at a minimum, in self-dyking, double-walled containers or be in containers positioned over an impervious liner and surrounded by an impervious dyke of sufficient height to contain not less than 110% of the capacity of the tank. Sites that slope towards waterways or other environmentally sensitive areas, exhibiting ponding or flooding, or have high groundwater tables, excessive seepage, or ice-rich (thaw sensitive) soils shall be avoided, as must archaeological resources. Smoking is prohibited within 7.5 m of the fuel storage facility. Appropriate signage shall be posted around the fuelling facility. Fuel storage facilities shall be inspected once per day for the duration of the project and documentation of the inspection maintained. Fire-fighting equipment shall be made available for immediate access at each fuel storage facility. All barrels containing fuel and other similar materials need to be stored in an elevated position either on their side with the bungs facing the 9 and 3 o'clock positions, or on pallets, in an upright position. All barrels shall be individually identified with all information necessary for health and safety, and environmental purposes. Material Safety Data Sheets for all chemicals and fuels stored in the construction camp need to be available to all personnel.

Regular inspections shall be conducted of all machinery hydraulic, fuel and cooling systems and any leaks will be repaired immediately. Emergency spill equipment shall be pre-assembled and stored at all permanent fuel storage sites and work areas, including at least two fuel pumps, empty 200 litre barrel and absorbent material sufficient to clean up a 1000 litre spill. All barrels, redundant fuel storage facilities and associated materials and equipment need to be removed from the site at the conclusion of the clean up.

4.3.3 Surface Water Management

A water use license is required from the Nunavut Water Board for the development of potential water sources. All conditions of the license must be complied with. Water withdrawals must not endanger fish or drawdown the water level so as to adversely affect fish habitat. Water withdrawal rates shall not exceed 10% of total water body volume. All water hoses need to be equipped with a mesh size of 2.5 mm or less to prevent the intake of fish as per the *Freshwater Intake End-of-Pipe Fish Screen Guidelines*.

4.3.4 Wastewater Management and Monitoring

Remediation activities generate wastewater from dewatering activities including contact water from contaminated soil excavations, new landfill operation, and contaminated soil treatment areas. Water management on-site is the Contractors' responsibility. However, given the nature of the Arctic terrain, site logistics, and support, climate and weather makes the mitigation of discharge water a challenging task. Contact water associated with contaminated soil excavations, the operation of new landfills and landfarms potentially contain a number of constituents of concern.

The parameters selected for the monitoring plan are based on and are a reflection of the types of contaminants found at the sites during the environmental assessment. The criteria for the wastewater are considered conservative and appropriately protective of the arctic environment.

Wastewater may be temporarily stored while awaiting test results, provided that it is not stored over the winter months. The volume of wastewater storage during any one construction season shall not exceed the available treatment capacity during that construction season. See Table 10 below for a summary of the typical wastewater discharge criteria, as provided by the Nunavut Water Board for other abandoned military sites.

Table 10 - Construction Wastewater Discharge Criteria

Parameter	Criteria (µg/L)
pH	6-9 pH units
Oil & Grease	5000
Arsenic (total)	100
Cadmium (dissolved)	10
Chromium (dissolved)	100
Cobalt (dissolved)	50
Copper (dissolved)	200
Lead (dissolved)	50
Mercury (total)	0.6
Nickel (dissolved)	200
PCB (total)*	1000
Zinc (total)	500

**In respect of application to a road surface.*

The collected wastewater needs to be tested each time prior to discharge. Once it is confirmed that the wastewater meets the discharge criteria, it can be released onto the ground in an area that is at least 30 m from natural drainage courses and 100 m from fish-bearing waters.

The locations of the discharge areas will vary, depending on the work areas. Wastewater that collects at contaminated soil excavations is typically sampled and treated in place. In areas where the volume of wastewater is significant and affects the progression of work, the wastewater may be recirculated.

4.3.5 Sewage Effluent Monitoring

The sewage management system at CAM-A will likely be a simple facultative system where treatment is achieved by the natural degradation of organic substances or biogeochemical activity. Aerobic or anaerobic micro-organisms digest the organic solids and utilize the released energy and nutrients in the effluent to grow and increase in numbers, which in turn accelerates the process. In this type of system, aerobic respiration is the most complete and efficient degrader of organic solids and therefore the most important element in a stable and healthy biological treatment process. This method of treatment within the Arctic environment, combined with relatively short effluent retention times requires good management to achieve the desired level of treatment prior to discharge. See Table 11 below for a summary of the effluent discharge criteria, as provided by the Nunavut Water Board for other abandoned military sites.

Table 11 - Sewage Effluent Criteria

Parameter	Criteria
pH	6-9 pH units
Oil & Grease	No visible sheen
Biological Oxygen Demand	120 mg/L
Total Suspended Solids	180 mg/L
Faecal Coliforms	10,000 CFU/dL

In order to maximize the performance of the system, the specifications (which are to be stamped by a qualified engineer) will require sewage lagoons to have sufficient volume to accommodate 100% of the camp water consumption for the duration of the construction season. Each of the two cells will hold 50% of the seasonal flow, to a maximum depth of 1.0 m. The required effluent volume per lagoon can be calculated as follows:

- Effluent volume per lagoon = (200 litres/person/day) x (number of people) x (construction duration days) x 50%
- Effluent monitoring must be completed prior to discharge.

4.3.6 Domestic Waste Management

Kitchen wastes shall be stored in metal, animal-proof containers to prevent scavenging of waste by wildlife and to reduce scattering of debris prior to daily incineration. All residual kitchen wastes and other non-hazardous wastes shall be disposed of in the existing site landfills unless otherwise specified.

4.3.7 Road Construction and Maintenance

Existing roads and trails provide access to most sources of granular materials. Emphasis on the preservation of the permafrost regime, vegetation patterns, existing surface drainage patterns, water quality and stream flows shall be maintained. Establishment of new roads off-site is subject to the terms of the land use permit and the approval of the Proponents' Representative. New roads shall be located at least 30 m from any water bodies or water courses. Ice-rich soils, especially peatlands, shall also be avoided during road construction. The road bed shall be prepared with a sufficient thickness of fill to prevent terrain damage. Culverts, if required, shall be installed to maintain natural cross-drainage and prevent ponding. Any culverts installed need to be removed from the roads and drainage restored at the end of the clean-up operations. Access roads shall be monitored for signs of erosion and remedial action taken where necessary. Dust suppression, if required, can be maintained with water only.

4.3.8 Stream Crossing and Diversion

The contractor must adhere to all government regulations, licensing requirements/procedures and inspections regarding the protection of water quality and stream integrity. Existing stream crossings shall be utilized as required. Authorizations for any additional works employed are the responsibility of the contractor.

In the event a stream crossing is required, siltation of waterways and disruption of streambeds shall be prevented using the following procedures:

- Minimize activities adjacent to watercourses;
- Install cofferdams, silt barriers or other suitable barriers;
- Do not operate equipment in waterways;
- Do not use streambeds for borrow material; and
- Do not dispose of excavated fill, waste materials and debris in waterways.

4.3.9 Borrow Pit Development and Operation

Environmental protection measures must be implemented for the purpose of minimizing the impact of development and extraction activities on surface drainage patterns, water quality, soil erosion, and in some cases, wildlife or fish. The number of borrow areas opened shall be minimized by using existing borrow areas, roads and building pads where feasible. Use of alternative sources is subject to the approval of the Proponents' Representative and acquisition of a quarry permit. All terms and conditions of the quarry permit are to be complied with, including the recontouring/reclamation of the borrow area and site clean-up prior to site abandonment.

Borrow areas must be located at least 30 m from the nearest water body providing potential fish habitat, and other sensitive resources. A 30 m buffer zone should be marked out prior to commencement of gravel quarrying operations. Organic overburden, if present, shall be stripped and stockpiled separately for use in restoring the borrow area. Following excavation, the area needs to be recontoured to restore natural drainage and the overburden needs to be worked into the recontoured borrow area to prevent erosion. Drainage and run-off control needs to be provided using diversion ditches and sediment filters, as required, to prevent sediment laden run-off from reaching water bodies.

During aggregate extraction, vehicle and equipment operations shall be controlled in areas adjacent to the borrow pit to minimize the extent of disturbance. Aggregate shall be stockpiled on ice-poor, well drained ground such that surface drainage is not impeded. The stockpile shall be located in an area that is a minimum of 30 m from archaeological resources, water bodies, and other sensitive resources. If archaeological features or artifacts are encountered during borrow pit operations, the Departmental Representative is to be notified, the area of the find avoided, and activities in other areas of the pit restricted until further instructions are received.

4.3.10 Hazardous Waste Material Processing Area

A hazardous waste material processing area needs to be developed for the processing of excavated soils. The hazardous waste material processing area shall be located a minimum of 30 m from any archaeological site or water body, on ice poor, well drained soil, and as close to the location of work as practical. Movement of vehicles and equipment between the hazardous material processing area and work site shall be minimized to prevent the spread of potentially hazardous material along the roadways.

4.3.11 Contaminated Soils

Soils exceeding the criteria established for INAC abandoned military sites, including CAM-A, are to be removed. Disturbance to adjacent areas during excavation of contaminated soil shall be minimized. Spillage of material during transportation between the excavation site and the stockpile/treatment location is to be avoided and any spillage shall be cleaned up to the satisfaction of the Proponents' Representative. Following excavation of contaminated soils, equipment shall be decontaminated. All workers need to wear appropriate protective clothing/equipment when handling contaminated soil. A program of sampling and confirmatory testing of specific contaminated areas will be carried out as part of the clean-up program.

4.3.12 WDA Closure and New Landfill Development

The existing dumps will be covered with gravel to provide a minimum cover thickness as previously discussed. The dump areas will be regraded and restored to natural drainage patterns and topography. There are no high risk WDAs scheduled for excavation at CAM-A.

One new landfill is being constructed, the Non-Hazardous Waste Landfill, for the disposal of non-hazardous wastes and debris generated during the clean-up of the site.

Drainage controls such as diversion ditches and sediment filters may need to be provided, as required, to prevent runoff from reaching water bodies during closure, remediation and construction of dumps.

4.3.13 Disposal of Site Debris

Site debris shall be collected, sorted into hazardous and non-hazardous materials and disposed of accordingly. Workers need to wear appropriate protective clothing when handling potentially hazardous waste material. Off-road activity shall be minimized during collection of site debris.

4.3.14 Demolition of Structures

All residual debris is to be removed from the site down to grade. Structures shall be demolished to the top of the concrete foundation level. Gravel pads and other foundations shall be regraded to restore natural drainage patterns and to match adjacent topography.

4.3.15 Aircraft Movements

It is anticipated that fixed wing chartered aircraft will be used to transport personnel, perishable supplies and some construction materials and equipment to and from the site. Charter pilots will be advised to maintain an altitude of at least 610 m and preferably 1000 m above ground or water when passing over the site. Low level flights to observe or photograph wildlife will not be permitted. Charter aircraft pilots will be informed of all applicable mitigation plan requirements when scheduling arrangements are made or at other appropriate periods prior to the arrival of the aircraft on site.

4.3.16 Handling of Dangerous Goods and Hazardous Waste Materials

4.3.16.1 Packaging

The Transportation Dangerous Goods Act (TDGA) and Regulations govern the packaging and shipment of dangerous goods within Canada. If shipping out of Canada, Canadian regulations and the regulations of the destination country both apply. Requirements of the International Marine Dangerous Goods Code (IMDGC) must be addressed in international waters. Any material classified by the TDGA must be accompanied by the appropriate shipping documents. The documents must include: the shipper, the receiver and all carriers involved in the transport of the shipment. Non-hazardous materials are also to be accompanied by a document indicating ownership and responsibility of the receiver. The contractor shall refer to the TDGA and regulations for more details regarding shipping document requirements. All dangerous goods will be packaged in accordance with the TDGA.

Waste manifests will be initiated for each shipment, specifying a unique reference number and INAC's waste generator number to accompany the shipment to the final destination. Any waste of unknown TDGA hazard will be tested to determine whether any transport hazard exists according to the regulations. Any substance that is considered hazardous will be packaged under the TDGA in accordance with the regulations and the national standard *Performance Packaging for Transportation of Dangerous Goods*. The TDGA regulations specify the packaging requirements for dangerous or hazardous goods according to risk.

4.3.16.2 Labeling

Each item will be labeled and placarded according to its hazard class and division. A label or placard design is unique to each classification. Large containers will be placarded as defined by the class and division with the TDGA product identification number clearly defined. The product identification number is indicated by the substance name in the regulations.

4.3.17 Work Site Clean-Up and Abandonment

The contractor must comply with all terms and conditions of the water use license and the land use permit. All temporary buildings, fuel barrels, vehicles, equipment, waste materials and surplus materials will be removed from the site following completion of the work. All large earthworks slopes shall be stabilized. Gravel access roads required for operation and maintenance may remain. All disturbed areas shall be graded to match natural drainage patterns.

4.4 Specific Protection Measures for Valued Ecosystem Components

This section describes the required protection measures for the valued environmental components identified at the CAM-A site.

4.4.1 Human Health and Safety

Potential hazards to human health and safety are present at the CAM-A site in the form of hazardous materials and contaminated soil, unpredictable weather conditions and wildlife encounters. Hazardous material and contaminated soil have the potential to enter water bodies and the food chain, and thereby affect vegetation, fish, wildlife and the health of people who travel, hunt and fish in these areas. Site debris may present a physical hazard to people traveling through these locations.

All necessary precautions shall be taken when handling and transporting hazardous material and contaminated soil to ensure that the materials do not come into contact with site personnel. Site workers need to wear protective clothing when handling hazardous materials. All site personnel working on or in the vicinity of the clean-up operations must be trained in, made aware of and adhere to the requirements of the Workplace Hazardous Materials Information System (WHMIS) program.

Outdoor recreation activities of the site personnel have the potential to adversely affect nearby fish, wildlife and heritage resources. Subject to camp rules and the requirements of territorial fishing licenses and regulations, staff may be permitted to leave the site for recreational purposes. However, recreational use of vehicles, including ATVs, shall not be permitted off of the existing road network. Normal precautions for Arctic travel include: provisions for rapidly changing weather conditions, tactics for possible polar bear and other wildlife encounters, filing a trip plan, first aid kit, a survival kit and insect repellent.

4.4.2 Local Economy and Contact with Local Residents

Employment and local business opportunities in the north should be maximized as much as possible. Regular briefing meetings shall be scheduled with all camp personnel to discuss and explain camp rules.

4.4.3 Aesthetic Value

It is anticipated that the clean-up activities will have an overall positive effect on the aesthetic value of the CAM-A site in that redundant structures will be demolished, and all disturbed areas (landfills, debris piles, sewage outfall and borrow pits) will be restored as closely as possible to their original appearance. Construction personnel are to ensure that their activities do not contribute to any degradation of the local environment.

4.4.4 Surface Water and Potential Fish Habitat

The following shall apply to work adjacent to waterways:

- Prevent siltation of water bodies potentially supporting fish by the use of berms or silt fences as required, and by minimizing activities adjacent to watercourses;
- Do not operate equipment in waterways;
- Do not use streambeds for borrow material;
- Do not dispose of excavated fill, waste material or debris in waterways;
- Where possible, conduct in-stream work during low-flow periods, in late winter before spring freshet or after mid-August; and
- When removing culverts, slope banks to conform to the grade of the adjacent stream bank, as applicable. If required, stabilize the bank using erosion resistant material.

Recreational fishing shall not be permitted except in compliance with the applicable federal and territorial regulations and guidelines.

4.4.5 Permafrost Soils

Ice-rich soils are common in areas that have vegetation cover and are thus susceptible to permafrost degradation. The top layer provides a protective thermal barrier that prevents permafrost degradation. These soils are susceptible to erosion due to their fine texture. Erosion removes the thermal protection and causes permafrost degradation. Vehicle and equipment traffic, and soil excavation can disturb the surface layer and degrade the permafrost. Disturbance to permafrost soils needs to be minimized by restricting vehicle and heavy equipment traffic to existing roads and designated work areas unless approved by the Proponents' Representative. Activity in areas adjacent to work areas shall also be minimized. Vehicles or heavy equipment shall not be operated off-road following heavy rain or melting snow until the soil has dried sufficiently to prevent excess rutting. Appropriate drainage and erosion control structures shall be installed along access roads, where required. The following measures shall be implemented during the site clean-up operations to minimize disruption of permafrost:

- Facilities such as work camps and storage areas shall be located such that they do not impede surface drainage or result in ponding;
- Gravel pads shall be constructed and used to protect ice-rich soil from thermal or physical damage;
- Disturbance during excavations shall be minimized;
- Excavated areas shall be backfilled promptly with granular fill, upon receipt of confirmatory samples;
- Development of new borrow areas shall be minimized;
- Materials shall not be stored directly on unprotected ground surfaces;
- Disturbed areas shall be regraded to restore natural drainage patterns; and
- Any rutting that occurs and impedes local drainage or exposes permafrost in ice-rich soils shall be repaired to the satisfaction of the Proponents' Representative.

4.4.6 Terrestrial Wildlife

There is always concern over human/wildlife contact at Arctic sites. This could include harassment by project personnel causing disruption of activities such as calving, breeding, nesting and rearing, all of which may take place on the site proper.

The following procedures shall be implemented to prevent human/wildlife conflicts:

- Employ a dedicated wildlife monitor(s) at all times;
- All on-site personnel shall be required to be familiar with the on-site bear safety training for all workers;
- Wildlife may not be fed, injured or harassed by site personnel;

- Do not disturb birds nesting on site;
- Vehicle and aircraft movements shall conscientiously avoid all known populations of wildlife or areas known to be frequented by known populations of wildlife;
- Do not attempt to chase, catch, divert, follow or otherwise harass wildlife by aircraft, vehicle or on foot;
- Control refuse and make it inaccessible to bears and other scavengers;
- Equipment and vehicles shall yield to wildlife, where possible;
- Except in the vicinity of the airfield, advise charter aircraft pilots not to fly at elevations lower than 610, and preferably 1000 metres above ground or water;
- In the event that wildlife is spotted from the air, aircraft shall not make descents for observations or photography.
- Domestic or wild pets are not allowed in camps with the exception of controlled watchdogs; and
- Project personnel shall not be permitted to possess personal firearms. The only firearms allowed on site shall be for protection from bears and shooting of animals exhibiting aberrant behavior. The firearms shall be controlled by the contractors' site superintendent.

4.4.7 Avifauna

Disruption of avifauna during the nesting period can result in reproductive failure. For this reason, populations of nesting birds shall be avoided during this period. Impacts on these species shall be minimized by removing any nests before they become active, discouraging nesting at work areas and scheduling disruptive activities outside of the nesting period. Based on the observations during the 2010 site investigation and the lack of buildings (where most avifauna at northern sites make nests) scheduled for demolition at the CAM-A site, it is not anticipated that work scheduling will be required. It is required that the remaining section of the Module train be inspected for potential nesting sites prior to demolition.

The arrival of avifauna at specific locations in the Arctic is influenced by weather conditions and a number of other factors. Inclement weather or a delayed spring melt may delay arrival by several weeks. In general, however, the chronology of arrival, nesting and departure is relatively consistent. Typically within two weeks of arrival, nesting commences and continues for one to two months until the young leave the nest. Following this, the birds feed in preparation for the fall migration and depart by mid to late September.

4.4.8 Heritage Resources

The former DEW Line sites are often located in areas which have been seasonally settled or visited by Inuit over the past 1000 years, by their Paleo-Eskimo predecessors for as many as 3000 years before the Inuit, and by Europeans and Euro Canadians over the past four centuries. Archaeological sites and recent camps and cemeteries exhibiting evidence of the presence of the former occupants have been found on or adjacent to all of the DEW Line sites. The traditional and scientific value of heritage resources is greatly diminished if they are disturbed or moved. Archaeological sites in Nunavut are protected by law, and disturbance of these sites and collection of specimens is prohibited except under the terms of an archaeological research permit.

In the event that heritage resources are discovered during clean-up activities, the following procedures apply:

- Report the discovery immediately to the Proponents' Representative;
- Cease work in that area and notify the appropriate authorities with the Department of Culture, Language, Elders and Youth (CLEY);
- Reports of all archaeological finds shall include:
  - The identity of the person making the discovery;
  - A description of the site, including topography, landmarks, etc.;
  - The nature of the activity resulting in the discovery;
  - A description of the archaeological site, including size, features, or visible details, supplemented by sketches or photographs;
  - Actions currently undertaken to protect the archaeological features; and

    - Any extenuating circumstances.
- Do not resume activities in the vicinity of the find until confirmations and direction from the Department of CLEY is received.

These mitigation measures were identified because they will result in a reduction or elimination of likely environmental effects, including potential adverse effects, associated with the clean-up.

5. Cumulative Effects

Table 12 - Summary of Project Tasks, Impacts, Mitigation Measures, Residual Impacts and Significance

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
Air Quality	Hydrocarbon Contaminated Soil Removal/Landfarming	Air quality may be impacted by the removal of hydrocarbon-contaminated soils and landfarming.	None. Impact is minimal and short-term.	None. Once the impacted soil has been removed, the potential for a residual impact is removed.	N
	Site Grading/Borrow Source Development	The extraction of granular materials and grading activities has the potential to create dust and impact air quality.	Implement dust control measures. Only water will be used for dust control.	None.	M
	Vehicle, Incinerator and Camp Infrastructure (furnaces, generators) Emissions	Operation of the camp and associated equipment will result in emissions that could negatively impact air quality.	Use appropriate furnace filters, do not leave vehicles and equipment running unnecessarily. Impacts occur over the short-term.	None.	M
Soil Quality	Landfill Development/Dump Closure	If not constructed properly, contaminants may migrate from the new landfills, potentially degrading soil quality. The closure of the existing dumps will reduce the risk of impacting soil quality.	New facilities will not contain hazardous materials. The landfill/dump cover is graded to promote surface runoff.	The new landfills and existing dumps may need maintenance work in the future as they are intended to remain on site for the foreseeable future.	M
	Contaminated Soil and Hazardous Materials Removal	The removal of the contaminated soil and hazardous materials from contact with the environment will improve soil quality.	n/a	Improved soil quality and reduced potential for future adverse effects.	P
	Transport of Hazardous Material, Fuel and Contaminated Soil	The potential exists for accidental release of hazardous materials, contaminated soil and/or fuels during transport, which could impact soil quality.	Proper handling, storage, and transportation procedures for hazardous materials to be implemented as per TDGA regulations. All workers to be trained in proper handling procedures for all hazardous materials on-site. Workers to follow the spill contingency plans. All materials and equipment to implement contingency plans to be available on-site.	None.	M
	Camp Operation	The operation of the construction camp will include treatment and disposal of domestic waste, and could negatively impact soil quality.	Hazardous materials will not be disposed of in the camp waste system. All sewage to be disposed of in accordance with Land Use Permit and Water Use License.	None.	M
Water Quality	Landfill Development/Dump Closure	If not constructed according to the specifications, leachate may be generated and migrate from the new landfills during the construction, which has the potential to degrade water quality, both surface and active layer water. The development and closure of the existing dumps has the potential to disrupt drainage at the site and cause siltation of waterways.	New facilities will not contain hazardous materials. Landfill/dump covers are graded to promote surface runoff. New facilities are sited away from waterbodies and drainage courses so that drainage is not interrupted. Prevent siltation by use of berms and/or silt fences.	The new landfills and existing dumps may need maintenance work in the future and they are intended to remain on site for the foreseeable future. As such, even though mitigation measures will be implemented, there may be future impacts to water quality.	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
	Contaminated Soil and Hazardous Materials Removal	Removal of the contaminated soil and hazardous materials from the environment will reduce the risk of contamination to the surface and active layer water.	Prevent sediments from entering waterbodies by use of berms and/or silt fences. Implement other environmental protection measures as necessary.	Reduced potential for future negative effects.	P
	Transport of Hazardous Material, Fuel and Contaminated Soil	The potential exists for accidental release of hazardous materials, contaminated soil, and/or fuels. An accidental release could impact water quality.	Proper handling, storage, and transportation procedures for hazardous materials to be implemented as per TDGA regulations. All workers to be trained in proper handling procedures for all hazardous materials on-site. Workers to follow the spill contingency plans. All materials and equipment to implement contingency plans to be available on-site. Implement mitigation measures to prevent deleterious substances from entering the aquatic environment.	None.	M
	Site Grading/Borrow Source Development	Erosion and sedimentation of waterbodies during grading and gravel extraction activities has the potential to negatively impact water quality. Drainage will be improved as a result of grading disturbed areas. The extraction of granular material will alter the terrain of the borrow area and has the potential to disturb drainage.	Prevent siltation by use of berms and/or silt fences. Do not operate equipment within the wetted perimeter. Disturbed areas adjacent to water are to be stabilized, if required. Site to be graded upon completion to promote positive drainage and to match the existing terrain as much as practical.	None.	M
	Camp Operation	The operation of the construction camp will include treatment and disposal of waste. The potential exists for waste to impact water quality.	Hazardous materials not to be disposed of in the camp waste system. All sewage to be disposed of in accordance with Land Use Permit and Water Use License.	None.	M
Terrain Quality	Landfill Development	Excavation is required for the development of new landfills, which has the potential to degrade permafrost.	Minimize the time permafrost is exposed. Minimize surface area of exposed permafrost or active zone.	Although the permafrost may be disturbed, it is anticipated once the work is completed, permafrost depth will be restored.	M
	Landfill Development/Debris Disposal	The development of new landfills and removal of site debris has the potential to disturb existing terrain.	Regrade and reshape disturbed areas to match existing terrain and drainage paths. Use existing roads for movement around the site wherever possible.	Although every effort will be made to match worked areas to the existing terrain and drainage paths, it is unlikely to be exact, and may take significant time for the area to blend into the undisturbed terrain.	M
	Site Regrading	Terrain and drainage will be improved as a result of grading disturbed areas. Previously disturbed areas will blend into the natural environment.	All structures implemented either during the operation of the site or as part of the remediation will be removed to restore natural surface drainage patterns.	Positive impact.	P

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
	Borrow Source Development	The extraction of granular material will alter the terrain of the borrow areas.	Regrade and reshape disturbed areas to match existing terrain and drainage paths. Use existing roads for movement around the site wherever possible.	Although every effort will be made to match worked areas to the existing terrain and drainage paths, it is unlikely to be exact, and may take significant time for the area to blend into the undisturbed terrain.	M
	Contaminated Soil Excavation	The excavation of contaminated soil has the potential to degrade the permafrost.	Minimize the time permafrost is exposed. Minimize surface area of exposed permafrost or active zone.	Although the permafrost may be disturbed, it is anticipated once the work is completed, permafrost depth will be restored.	M
	Camp Operation	Movement of contractor's equipment and personnel around the site has the potential to disturb the tundra.	Regrade and reshape disturbed areas to match existing terrain and drainage paths. Use existing roads for movement around the site wherever possible.	Although every effort will be made to limit movement to existing roads, the Arctic tundra is quite sensitive and it may take significant time for the disturbed area to recover.	M
Terrestrial Animals	General Clean Up Activities	The use of heavy equipment during the clean up has the potential to disturb wildlife.	Avoid areas of known wildlife colonies or bird nesting areas. Employ minimum distance requirements for transportation activities around the site.	None. The work is seasonal, short-term and temporary.	M
	Contaminated Soil and Hazardous Materials Removal	The removal of hazardous materials and contaminated soil from the environment reduces the risk of exposure to terrestrial animals.	n/a	Reduced risk of future adverse effects.	P
Terrestrial Habitat	Landfill Development	Loss of habitat may occur as a result of the development of the new landfills in previously undisturbed areas.	The proposed landfill areas have little to no vegetation present; therefore, the disturbed areas are to be regraded and reshaped to match the existing terrain to facilitate recovery of ecosystem components.	The landfills are permanent and therefore the impact will remain. However, once the landfill is completed the disturbed area will be available to wildlife.	M
	Facility Demolition (section of Mod Train)	The existing facilities may be used by wildlife as habitat. The demolition of these facilities has the potential to impact availability of habitat.	Inspect facilities prior to demolition for use by wildlife. Contact appropriate wildlife officer for additional guidance to ensure disturbance of wildlife is minimized.	None.	M
	Borrow Source Development	The extraction of granular material will disturb the ground and has the potential to impact terrestrial habitat.	Regrade and reshape the disturbed areas to match existing terrain to facilitate recovery of ecosystem components.	Although every effort will be made to match the disturbed area to the existing terrain, the Arctic tundra is quite sensitive and it may take significant time for the disturbed area to recover.	M
Aquatic Habitat and Animals	Site Regrading/Borrow Source Development	The extraction of granular material and grading adjacent to waterbodies has the potential to impact aquatic habitat, and thereby affect aquatic animals, due to sediment entering the water.	Prevent siltation by use of berms and/or silt fences. Do not operate equipment within the wetted perimeter. Disturbed areas adjacent to water are to be stabilized, if required.	None.	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
	Contaminated Soil and Hazardous Materials Removal	The removal of contaminated soil and other hazardous materials from areas close to waterbodies reduces the risk of exposure to aquatic animals. The excavation of contaminated soils from the beach POL area has the potential to degrade the aquatic environment in the event of an accidental release and impact aquatic animals in close proximity to the aquatic environment.	Implement mitigation measures to prevent deleterious substances from entering the aquatic environment. Prevent siltation by use of berms and/or silt fences. Do not operate equipment within the wetted perimeter. Disturbed areas adjacent to water are to be stabilized, if required.	Reduced risk of future adverse effects.	P/M
Health and Safety	General Clean Up Activities	The collection and disposal of potentially hazardous debris, the removal of hazardous materials from the facilities and the general handling of hazardous materials has the potential to impact the health and safety of workers.	Transportation of any hazardous materials is to be in accordance with the TDGA Regulations. Workers must wear and use appropriate personal protective equipment. Workers are to be trained in the use of personal protective equipment and proper handling procedures for hazardous materials. Proper procedures for working around heavy equipment to be implemented.	None.	M
	Contaminated Soil and Hazardous Materials Removal	The removal of contaminated soil and other hazardous materials from the environment reduces the risk of exposure to people.	n/a	Reduced risk of future adverse effects.	P
Archaeological	General Clean Up Activities	The presence and movement of people around the site has the potential to disturb the archaeological resources identified around the site.	Clearly mark and avoid all archaeological resources. Contact authorities in the event a new resource is discovered or a know resource is disturbed.	None.	M
Land Use	General Clean Up Activities	Clean up activities may disturb traditional land use, i.e., hunting and fishing activities that would occur along the coastal areas during the summer months; although it has been noted the area is no longer used.	Contact the local hunters and trappers organization to coordinate clean up activities and traditional land use, if applicable.	None.	M
Aesthetics	General Clean Up Activities	Generally, the clean up will improve the aesthetics of the site by removing unsightly debris and restoring the site to a more natural state.	n/a	Site is restored to a more natural state and therefore is more aesthetically pleasing.	P
Economy	Contractor Support	The contractor will be encouraged to have a significant Inuit content in the workforce for clean up. This will provide employment benefits and related economic benefits.	n/a	Greater number of trained Inuit workers.	P

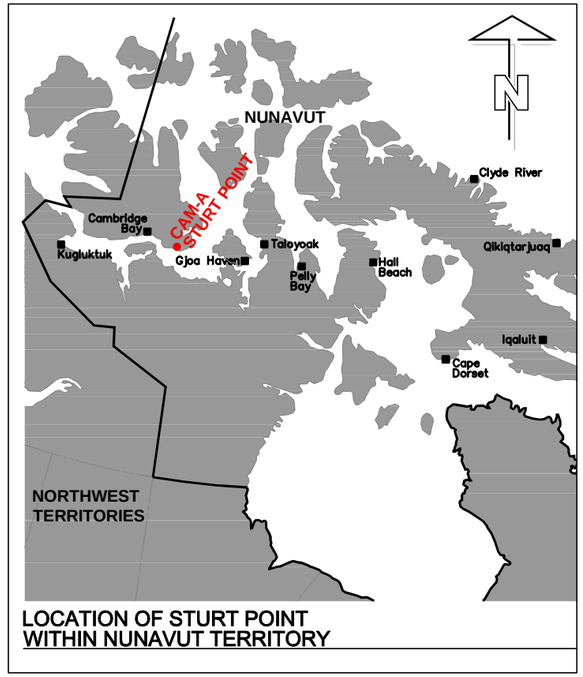
P – Positive
N – Negative and non-mitigable
M – Negative and mitigable
U - Unknown

6. References

- AECOM (2010) Phase III Environmental Site Assessment, CAM-A, Sturt Point, Nunavut, Intermediate DEW Line Site.
- AECOM (2011) Remedial Action Plan, CAM-A, Sturt Point, Nunavut Intermediate DEW Line Site.
- Golder Associates (2010) Archaeological Impact Assessment (AIA) of the CAM-A Intermediate DEW Line Site, Sturt Point, Nunavut.

Appendix A

Figures (Remedial Action Plan)



LOCATION OF STURT POINT
WITHIN NUNAVUT TERRITORY

INUIT OWNED LAND
CROWN OWNED LAND
7 633 500 N
7 633 000 N
7 632 500 N
7 632 000 N
7 631 500 N
FRESHWATER LAKE
INUIT HOUSES
FIGURE 10
AIRSTRIP
FIGURE 7
STATION AREA
MODULE TRAIN SECTION
WORKED AREA
FIGURE 5
FIGURE 8
STATION POL
FIGURE 4
FIGURE 6
LANDFILL B
INUIT PAD
LANDFILL A
FIGURE 3
BARREL AREA A
BARREL AREA B
FIGURE 9
BEACH POL
65 000 E
65 500 E
66 000 E
66 500 E
67 000 E
67 500 E
68 000 E

IMAGE SOURCE: NATIONAL AIR PHOTO LIBRARY 1964, 1:20,000

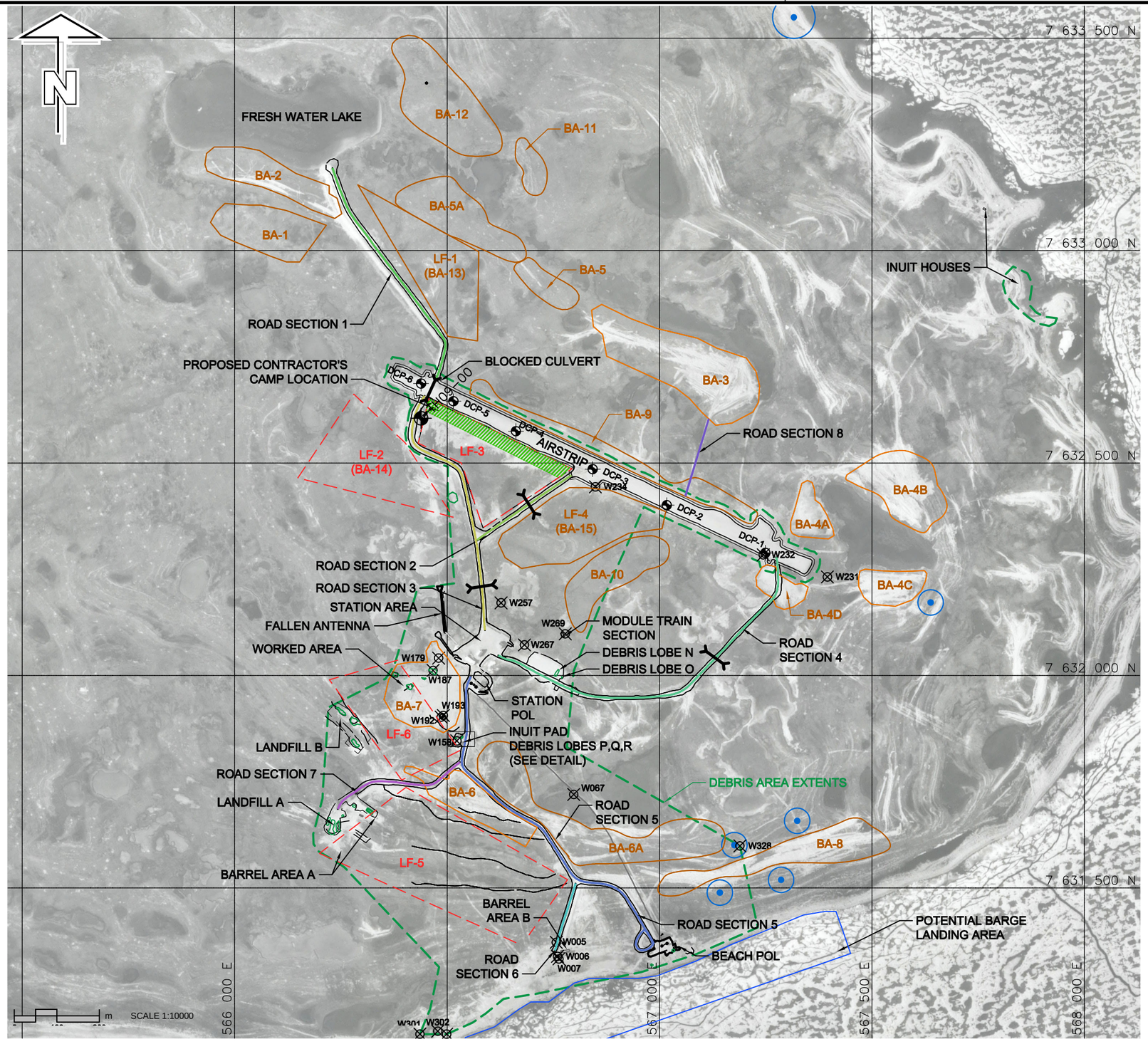
0 150 300 m
SCALE 1:15000

PWGSC
CAM-A Site Remedial Action Plan

Site Location

Figure 1

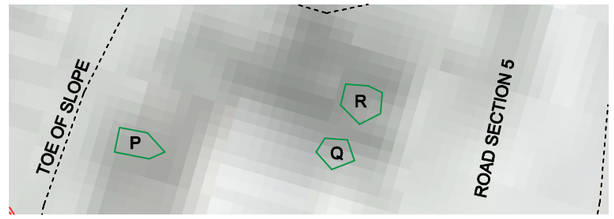
AECOM



LEGEND

- PROPOSED LANDFILL LOCATIONS
- BORROW SOURCE LOCATIONS
- EXISTING CULVERTS
- HERITAGE BUFFER AREAS
- DCP-1 DCP POINT
- DEBRIS WAY POINT
- POTENTIAL CONTRACTOR LAY DOWN
- DEBRIS AREA EXTENTS

Landfill/Borrow area	AREA (m²)
LF-1 (BA-13)	42,000
LF-2 (BA-14)	46,000
LF-3	45,000
LF-4 (BA-15)	45,000
LF-5	100,000
LF-6	43,000
BA-1	24,000
BA-2	22,000
BA-3	51,000
BA-4A	8,000
BA-4B	26,000
BA-4C	11,000
BA-4D	7,000
BA-5	9,000
BA-5A	27,000
BA-6	19,000
BA-6A	48,000
BA-7	26,000
BA-8	30,000
BA-9	24,000
BA-10	24,000
BA-11	7,000
BA-12	40,000



INUIT PAD - DEBRIS LOBES P,Q,R
SCALE: 1:400

PWGSC
CAM-A Site Remedial Action Plan

Site Layout

Figure 2

AECOM

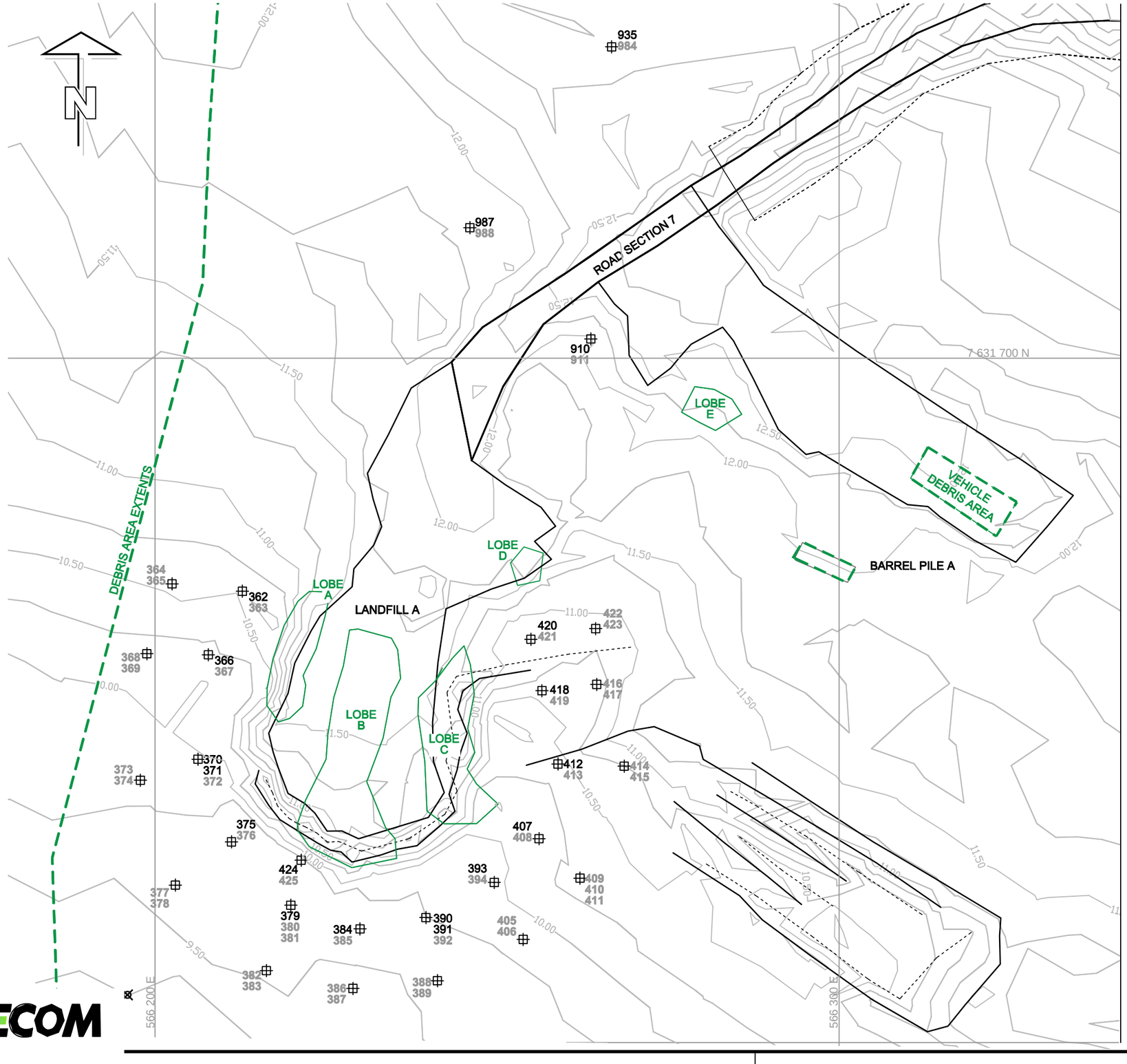
B SIZE 11" x 17" (279.4mm x 431.8mm)

PLOT: 11/03/31 3:48:22 PM

Saved By: sandersonk

AECOM FILE NAME: 60156118-01-B-F08-R0A.dwg

ISS/REV: 0A



LEGEND

- DEBRIS WAY POINT
- SAMPLE POINT
- #### SAMPLE NUMBER - NO EXCEEDANCE
- #### SAMPLE NUMBER - HELD
- #### SAMPLE NUMBER - EXCEEDS TIER II
- #### SAMPLE NUMBER - EXCEEDS TIER I
- #### SAMPLE NUMBER - TYPE B PHC CONTAMINATION
- TOE OF SLOPE

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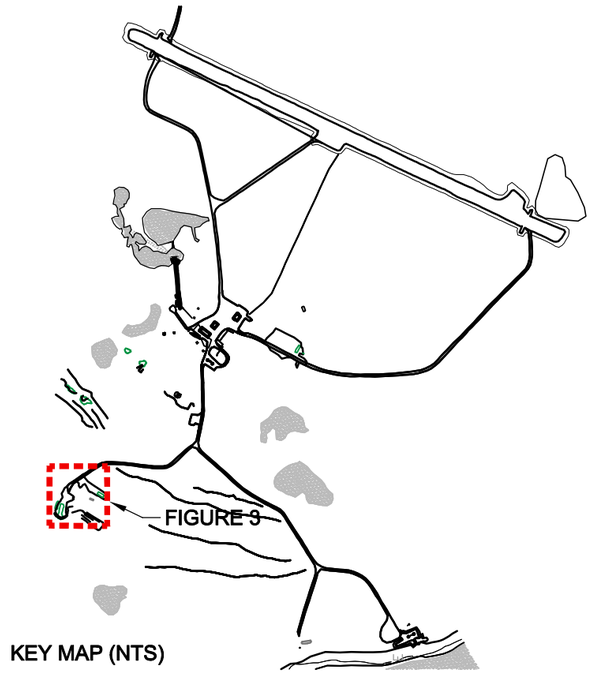


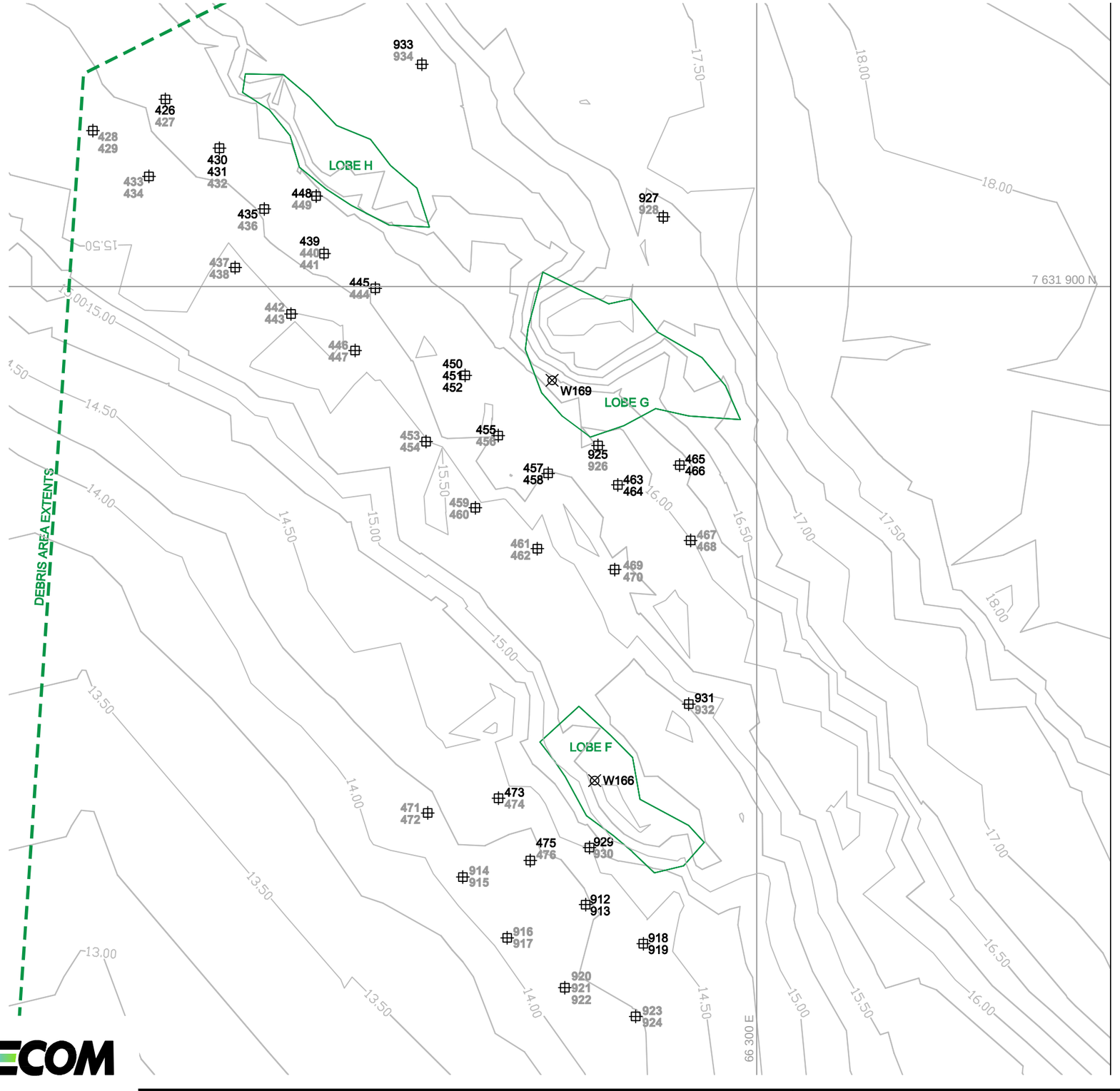
KEY MAP (NTS)

PWGSC
CAM-A Site Remedial Action Plan

Landfill A

Figure 3

AECOM



LEGEND

⊠	DEBRIS WAY POINT
⊞	SAMPLE POINT
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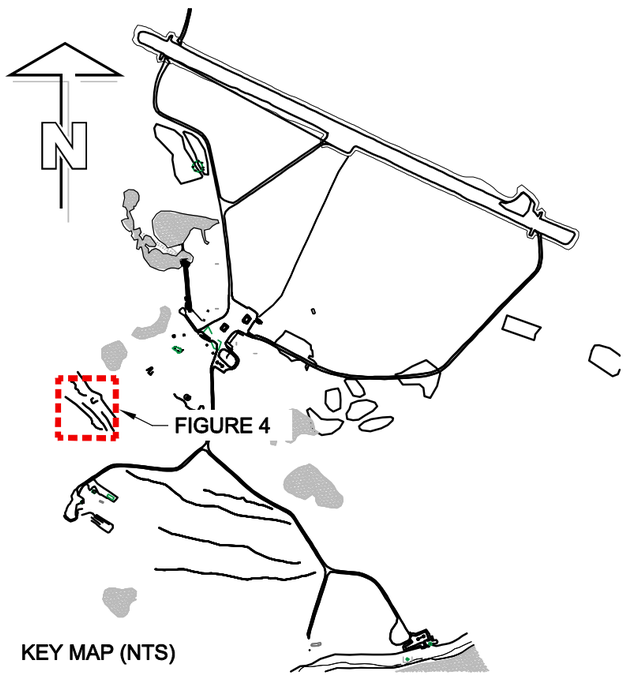
####	SAMPLE NUMBER - HELD
####	SAMPLE NUMBER - EXCEEDS TIER II
####	SAMPLE NUMBER - EXCEEDS TIER I
####	SAMPLE NUMBER - TYPE B PHC CONTAMINATION
----------	TOE OF SLOPE

0 5 10 m SCALE 1:500



KEY MAP (NTS)

PWGSC
CAM-A Site Remedial Action Plan

Landfill B

Figure 4

ROAD SECTION 3

ANTENNA 1

ANTENNA 2

ANTENNA 5

ANTENNA 6

TOE OF SLOPE

TOP OF SLOPE

UTLITY TRENCH

RAMP 1

RAMP 2

WAREHOUSE FOUNDATION

MOD FOUNDATION

GARAGE FOUNDATION

566 600 E

7 632 100 N

7 632 000 N

W223 W225 W253 W255 W261 W262 W263 W264 W195 W197 W198

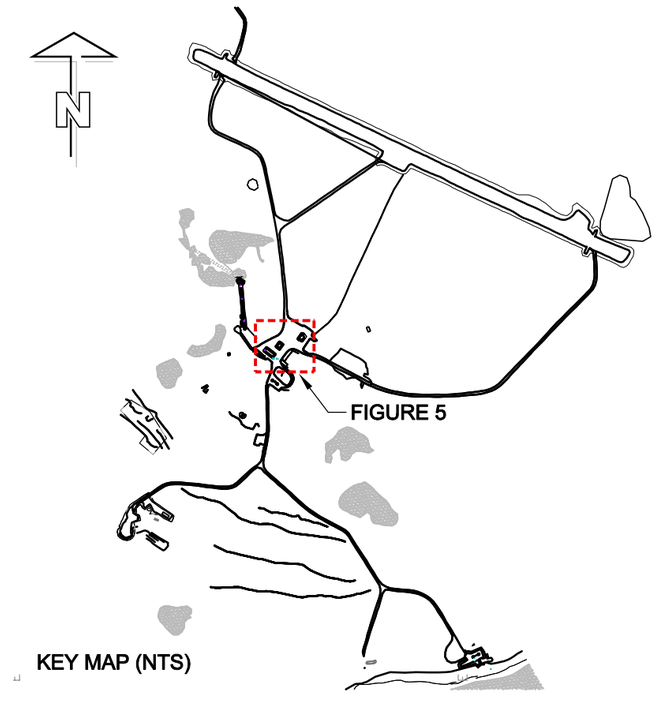
1322 1323 1324 1317 1315 1316 1318 1319 1313 1314 1320 1321 1310 1311 1312 1308 1309 1325 1326 1327 854 855 856 857 858 859 860 861 862 863 939 940 941 942 943 944 945 936 937 938 840 842 841 843 844 845 846 850 851 852 853 847 848 849 1304 1305 1306 1300 1301 1302 1303 1290 1291 1292 1293 1297 1298 1299 1294 1295 1296 1338 1339 1340 1341 1256 1257 1258 1259 1260 1261 1262 1269 1270 1271 1266 1267 1268 1335 1336 1337 1332 1333 1334 798 799 800 801 802 803 813 814 815 816 817 818 795 796 797 804 805 819 820 821 822 810 811 812 839 806 807 808 809 792 793 794 823 824 825 836 837 838 826 827 828 833 834 835 829 830 831 832

LEGEND

- DEBRIS WAY POINT
- SAMPLE POINT
- #### SAMPLE NUMBER - NO EXCEEDANCE
- #### SAMPLE NUMBER - HELD
- #### SAMPLE NUMBER - EXCEEDS TIER II
- TIER II CONTAMINATED SOIL
- #### SAMPLE NUMBER - EXCEEDS TIER I
- TIER I CONTAMINATED SOIL
- #### SAMPLE NUMBER - TYPE B PHC CONTAMINATION
- TYPE B PHC CONTAMINATED SOIL
- CONCRETE ANCHOR PAD
- UTILITY TRENCH
- PIPE
- TOE OF SLOPE

0 5 10 m SCALE 1:500

N



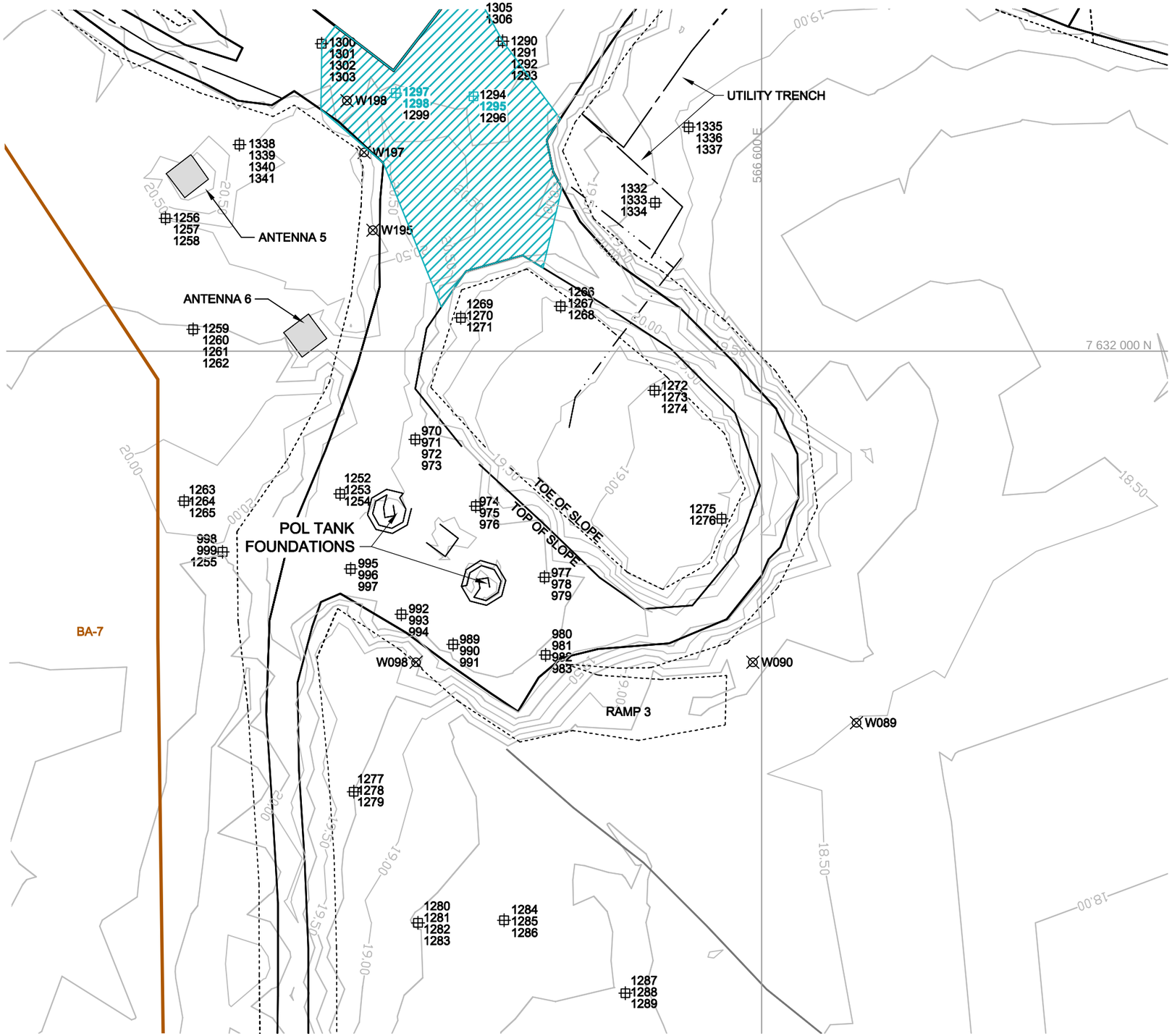
KEY MAP (NTS)

PWGSC
CAM-A Site Remedial Action Plan

Station Area

Figure 5

AECOM



LEGEND

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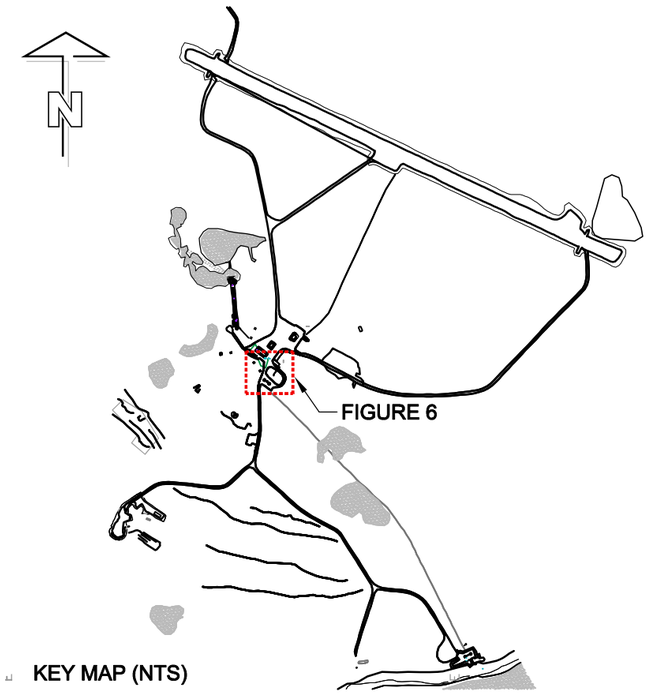
- #### SAMPLE NUMBER - HELD
- #### SAMPLE NUMBER - EXCEEDS TIER II
- #### SAMPLE NUMBER - EXCEEDS TIER I
- #### SAMPLE NUMBER - TYPE B PHC CONTAMINATION
- TYPE B PHC CONTAMINATED SOIL
- CONCRETE ANCHOR PAD
- UTILITY TRENCH
- PIPE
- TOE OF SLOPE
- BORROW SOURCE LOCATIONS

0 5 10 m SCALE 1:500



KEY MAP (NTS)

PWGSC
CAM-A Site Remedial Action Plan

Station POL

Figure 6

AECOM

DEBRIS AREA EXTENTS

SEWAGE LAGOON

ROAD SECTION 3

7 632 200 N

7 632 100 N

566 500 E

TOE OF SLOPE

TOP OF SLOPE

ANTENNA 1

ANTENNA 2

ANTENNA 3

ANTENNA 4

FALLEN ANTENNA

WATER BODY

BA-7

WAREHOUSE FOUNDATION

MOD FOUNDATION

W223

W225

LEGEND

- DEBRIS WAY POINT
- SAMPLE POINT
- #### SAMPLE NUMBER - NO EXCEEDANCE
- #### SAMPLE NUMBER - HELD
- #### SAMPLE NUMBER - EXCEEDS TIER II
- TIER II CONTAMINATED SOIL
- #### SAMPLE NUMBER - EXCEEDS TIER I
- TIER I CONTAMINATED SOIL
- #### SAMPLE NUMBER - TYPE B PHC CONTAMINATION
- TYPE B PHC CONTAMINATED SOIL
- CONCRETE ANCHOR PAD
- BORROW SOURCE LOCATIONS
- PIPE

0 5 10 m SCALE 1:750

N

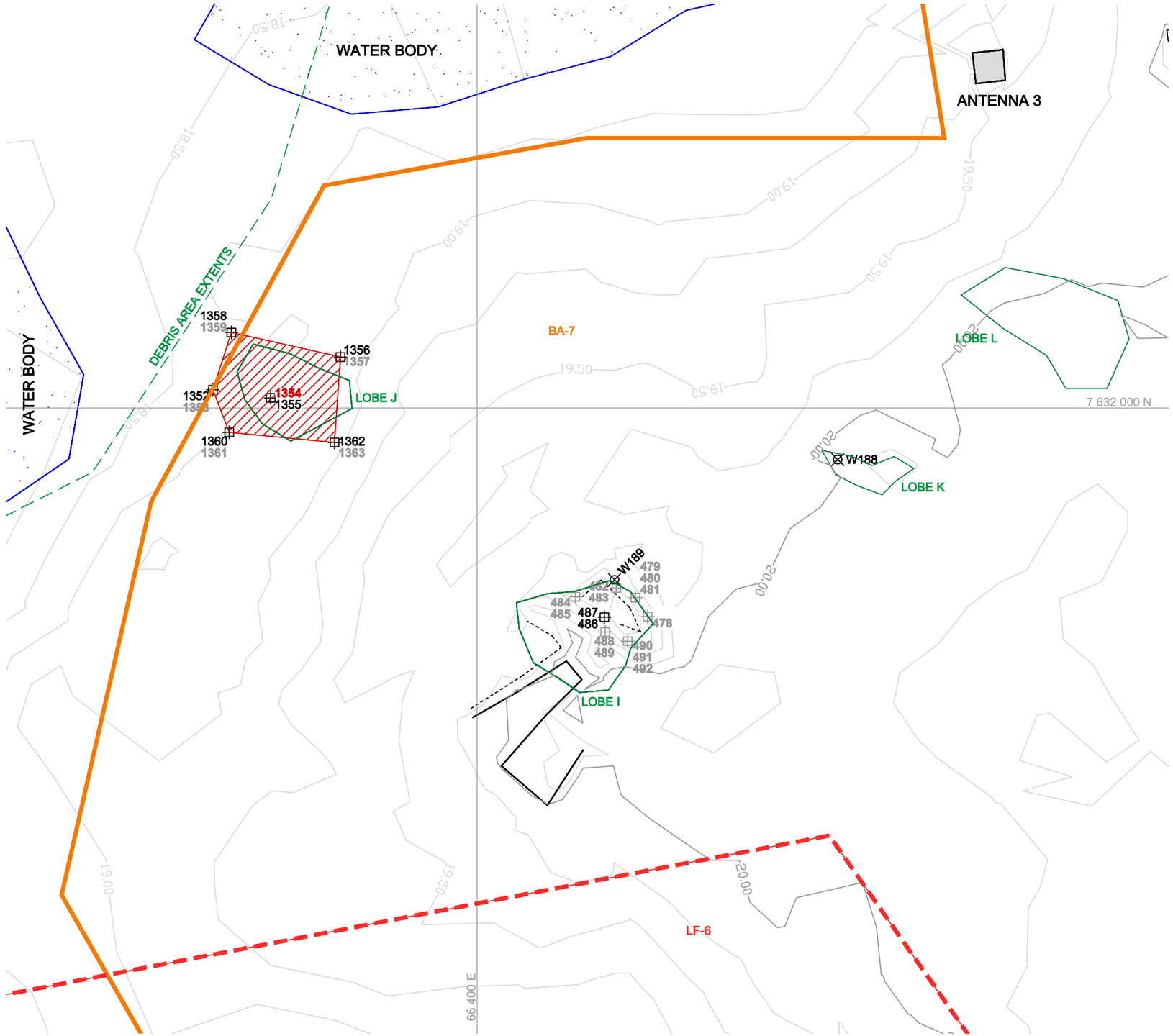
FIGURE 7

KEY MAP (NTS)

PWGSC
CAM-A Site Remedial Action Plan

Outfall

Figure 7



LEGEND

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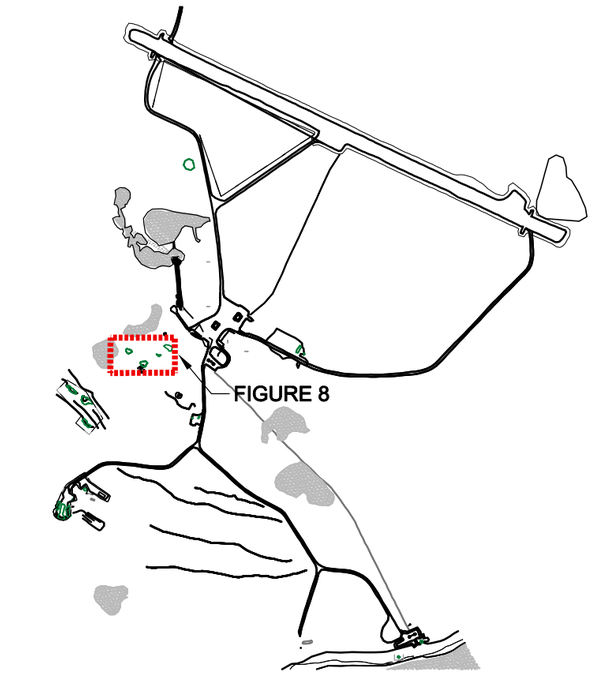
- #### SAMPLE NUMBER - EXCEEDS TIER II
- #### SAMPLE NUMBER - EXCEEDS TIER I
- TIER II CONTAMINATED SOIL
- ### SAMPLE NUMBER - TYPE B PHC CONTAMINATION
- PROPOSED LANDFILL LOCATIONS
- BORROW SOURCE LOCATIONS

0 5 10 m SCALE 1:500



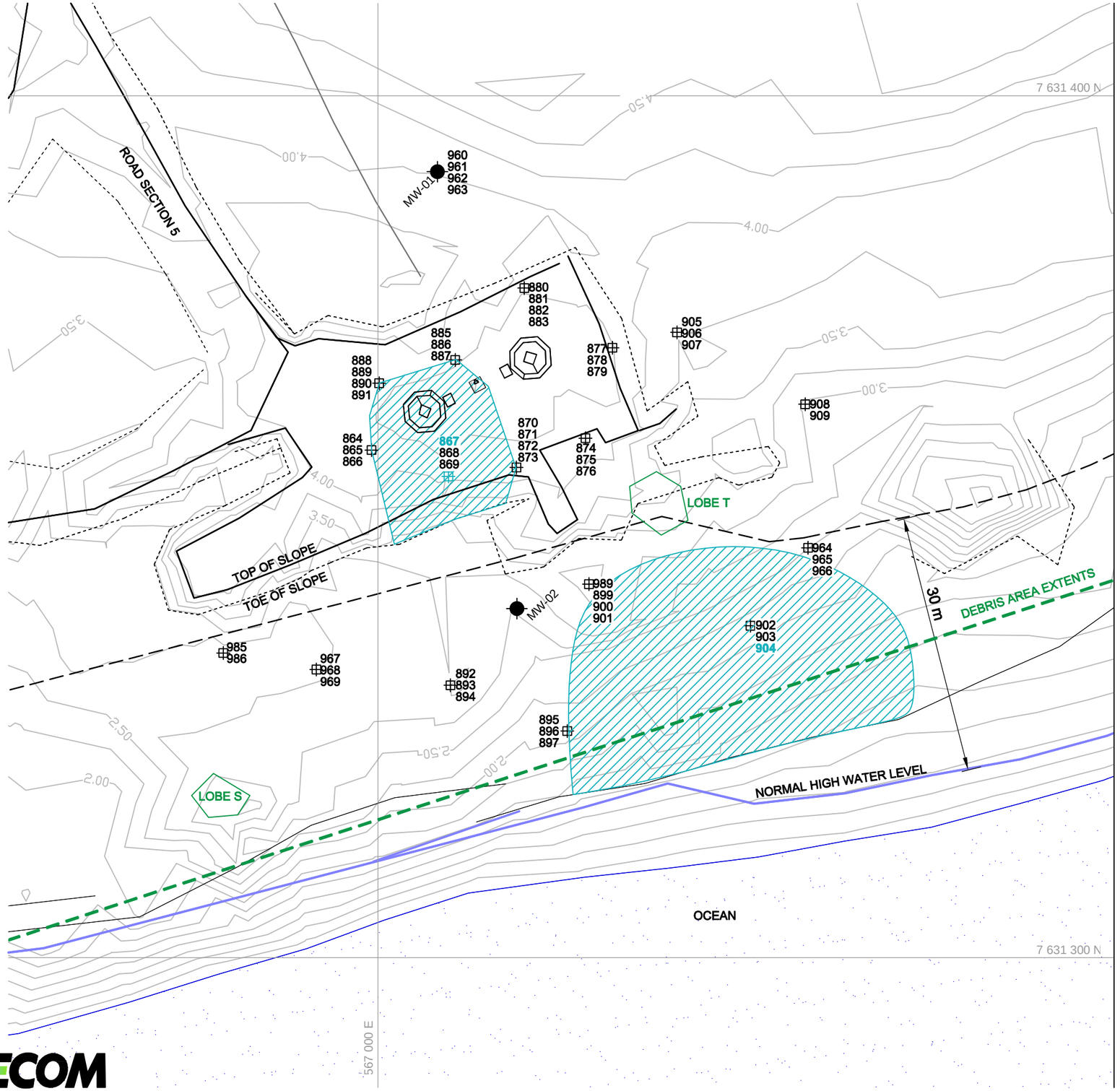
KEY MAP (N.T.S.)

PWGSC
CAM-A Site Remedial Action Plan

Worked Area

Figure 8

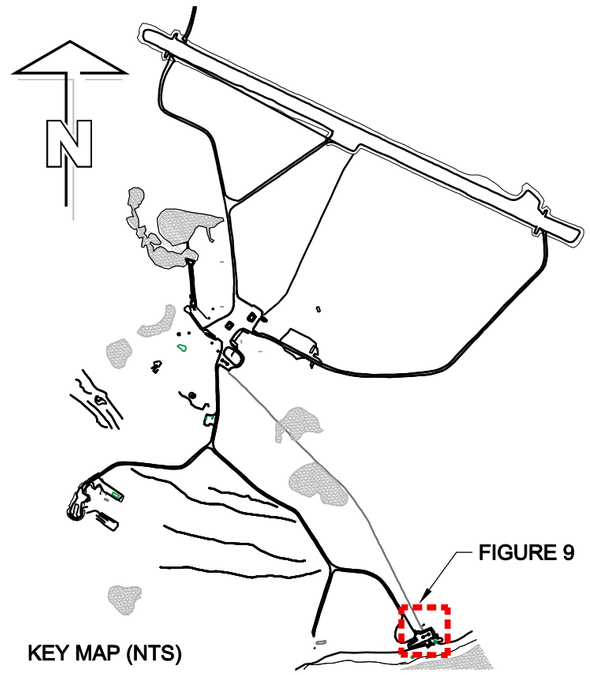
AECOM



LEGEND

- SAMPLE POINT
- #### SAMPLE NUMBER - NO EXCEEDANCE
- #### SAMPLE NUMBER - HELD
- #### SAMPLE NUMBER - EXCEEDS TIER II
- #### SAMPLE NUMBER - EXCEEDS TIER I
- #### SAMPLE NUMBER - TYPE B PHC CONTAMINATION
- TYPE B PHC CONTAMINATED SOIL
- TOE OF SLOPE
- MONITORING WELL

0 5 10 m SCALE 1:500



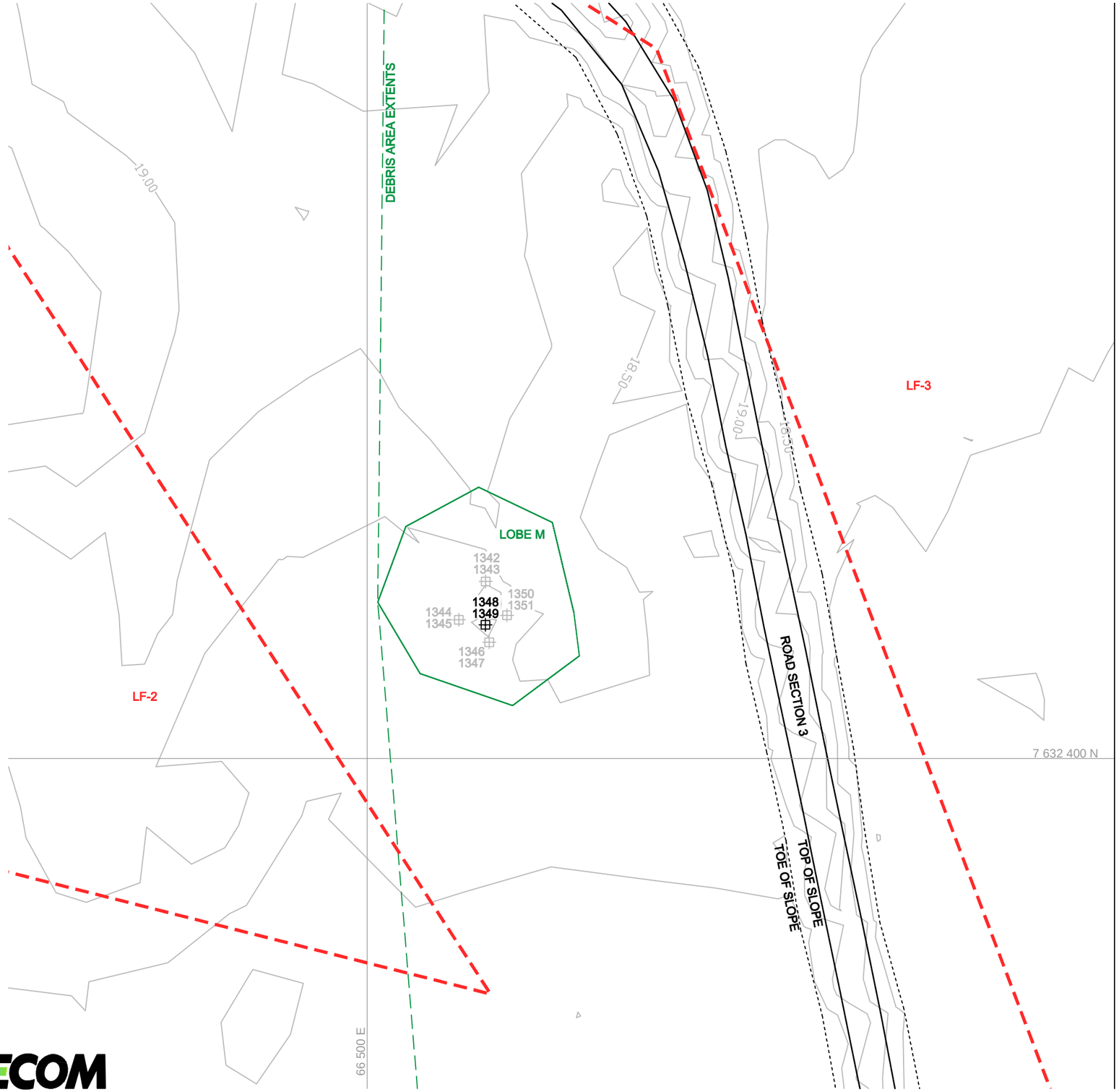
KEY MAP (NTS)

PWGSC
CAM-A Site Remedial Action Plan

Beach POL

Figure 9

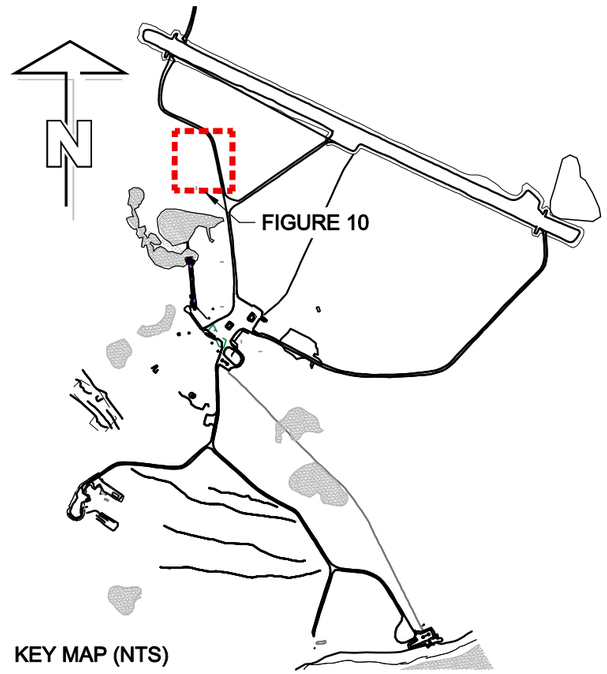
AECOM



LEGEND

- DEBRIS WAY POINT
- SAMPLE POINT
- ### SAMPLE NUMBER - NO EXCEEDANCE
- ### SAMPLE NUMBER - HELD
- ### SAMPLE NUMBER - EXCEEDS TIER II
- ### SAMPLE NUMBER - EXCEEDS TIER I
- ### SAMPLE NUMBER - TYPE B PHC CONTAMINATION
- TOE OF SLOPE
- PROPOSED LANDFILL LOCATIONS

0 5 10 m SCALE 1:500



KEY MAP (NTS)

PWGSC
CAM-A Site Remedial Action Plan

Lobe M

Figure 10

AECOM