Environment

Defence Construction Canada

Project Specific Information Requirements Cape Hooper (FOX-4) DEW Line Site

Prepared by:

AECOM
2540 Kensington Road NW
Calgary, AB, Canada T2N 3S3
www.aecom.com

403 270 9200 tel
403 270 0399 fax

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1. Introduction

Defence Construction Canada (DCC), on behalf of the Department of National Defence (DND) requested that AECOM prepare the *NIRB Screening Part 2 Form – Project Specific Information Requirements (PSIR)* for the proposed remediation of the FOX-4, Cape Hooper Distant Early Warning (DEW) Line Site. The PSIR will be submitted with the applications to the Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB) and the federal regulators in Nunavut.

1.1 Location

FOX-4, Cape Hooper is located on the East Coast of Baffin Island, at 68°26' north latitude and 66°44' west longitude, and was a former auxiliary site on the DEW Line. A Short Range Radar (SRR) was constructed by the North Warning System Office (NWSO) at the location of the former Upper Site facilities and an airstrip remains in place at the Lower Site area.

1.2 History

FOX-4 was the first DND DEW Line site to undergo clean-up within Nunavut. The cleanup of the site occurred between 1996 and 1999 and was completed on behalf of DND as part of the DEW Line Cleanup (DLCU) Project. Remediation of the site included the demolition of site infrastructure not required for the operation of the NWSO SRR site; excavation of one landfill (East Upper Site Landfill); closing and remediation of six existing landfills (Airstrip Landfill, Barrel Landfill, Helipad Landfills East and West, Tanner Bay Landfill, and West Upper Site Landfill); construction of two new Non-Hazardous Waste Landfills (Station Area Landfill and Lower Site Landfill); construction of the Tier II Disposal Facility; and collection of site debris (UMA 2000).

1.3 General Project Information

1.3.1 Purpose

The purpose of the project is to be consistent with the requirements of the DND-NTI Cooperation Agreement, which was not yet in place at the time of the start of the original cleanup, and to address the environmental and geotechnical concerns identified in the 2010 maintenance assessment. 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 DND-NTI Cooperation agreement
- To prevent migration of contaminants into the Arctic ecosystem
- To remove physical hazards for the protection of human health and safety
- To implement a cost effective remediation solution.

To accomplish these objectives, there will be four main areas of activity during the remediation of the FOX-4 site. These activities include:

- Landfill remediation
- Hazardous Waste Removal
- Non-Hazardous Waste Disposal
- 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 FOX-4 were identified, and include:

Commercial or other government use of the facilities: This alternative involves the sale of those facilities to commercial interests. Two possibilities are present, namely on-site commercial development or sale of the capital assets themselves and movement off-site.

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
- Greater clean up costs in the future.

1.3.3 Schedule

Based on the information provided in the Specifications and Tender Drawings prepared by AECOM, it is anticipated that that construction activities can be completed within two clean up seasons, excluding mobilization.

In order to complete the clean-up of the FOX-4 site in two construction seasons, the anticipated schedule of activities would be as follows:

- Mobilization in the fall of 2011
- Source borrow material, construct the Tier II Disposal Facility, construct the Non-Hazardous Waste Landfill, and construct the Landfarm in 2012
- Excavate landfills and contaminated soil, close the Tier II Disposal Facility and Non-Hazardous Waste Landfill and demobilize from site in 2013.

1.3.4 Regulatory Overview

1.3.4.1 Lead Authorizing Agencies

The proponent for this project is the DND. The management of this project is being provided by Defence Construction Canada (DCC). 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 FOX-4 site:

Land Use Permit: As per the Territorial Land Use Act and Territorial Land Use Regulations, a Class A permit issued by Indian and Northern Affairs Canada (INAC) is required for the activities associated with the remediation of FOX-4. There is a permit currently in place, which will be amended to include the remediation activities. 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 FOX-4. There is a license currently in place, which will be amended to include the remediation activities. 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)	Investigation of archaeological sites, mitigation, monitoring
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)	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 DCC 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 FOX-4 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 Indian and Northern Affairs Canada (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 Practice 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.

Nunavut and Northwest Territory Acts, Regulations and Guidelines

In addition to the Federal Acts and Regulations identified in Section 3.3.1, the remediation of the FOX-4 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 Cape Hooper 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 DFO Operational Statement Conformity

Based on the work to be completed, there are no activities where a DFO Operation Statement would be applicable.

1.5 Transportation

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

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 maintenance program or those that may have been required during the remediation program that will be removed.

Ground – existing roads will be used at FOX-4 while on-site. Most of the gravel roads are in poor to fair condition and will require upgrades, especially to access the upper site. It is anticipated that the existing roadways would 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 maintenance program or those that may have been required during the remediation program, which will be removed.

Barge – the transport of the contractors' equipment and facilities will likely be by sea-lift in the summer. In addition, any waste materials to be transported off-site will be removed via sea-lift.

1.6 Camp Site

The west end of the airstrip is the preferred location for a camp/laydown area. This area is centrally located with easy access to the airstrip. 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 facilities will be winterized between the construction seasons. The anticipated number of staff is approximately 60 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
- Landfiller
- Snowblower

1.8 Water

The only source of water for camp operations, including provision of drinking water, is the Water Supply Lake, shown on Drawing 101. It is estimated that water use will be approximately 18 m^3 per day. No water will be returned to the source.

Water samples were collected at from the lake during the 2010 Maintenance Assessment. No significant differences in analytical concentrations were observed between the two samples, and results indicated that the water met drinking water criteria. However, 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. Analysis and confirmation of all drinking water parameters is recommended to be completed on, at minimum, a bi-monthly basis.

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 and 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 water quality requirements prior to discharge. Sewage lagoons are the typically utilized method for sewage disposal at such sites, and as such, it is expected that a sewage lagoon may be used during camp operation at the FOX-4, Cape Hooper site. Of additional consideration for this site, for aesthetic considerations of camp occupants, is that prevailing wind direction is generally consistent with the alignment of the airstrip.

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.

Details of the landfills to be constructed on-site are provided in Section 2.2 Proposed Construction.

1.10 Fuel

It is anticipated that fuel used on-site will be comprised of diesel and gasoline. The anticipated quantities are 300,000 L of diesel and 100,000 L of gasoline, to be used for the life of the project. The exact quantity 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

It is anticipated that the majority of the workforce will come from the nearby communities of Qikiqtarjuaq, Pangnirtung and Clyde River. 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, bear monitors and labourers.

Because the project is located within the community of Qikiqtarjuaq, it is anticipated that much of the work force will be from the community. Any workers coming from outside of Qikiqtarjuaq will be transported to and from the site at the expense of the contractor.

The construction season will be from approximately June 15 to September 15, except during the mobilization year, when the work will occur from the time of arrival of the sea-lift, likely sometime in mid to late August to the middle of September. The rotation schedule is decided by the contractor, but is required to comply with all applicable Government of Nunavut Labour Regulations.

As part of the DND-NTI Cooperation Agreement, the project is required to meet set targets for Minimum Inuit Employment Content (MIEC) and Minimum Inuit Contracting Content (MICC) for the work. For this project, the anticipated MICC is 69% and the MIEC is 63% of the workforce.

1.13 Public Involvement

Community meetings for this work are planned for the last week in February in the communities of Qikiqtarjuaq, Pangnirtung and Clyde River. During the meetings, an outline of the proposed work will be provided and any questions and comments regarding the work will be addressed. It is also intended to provide some information on the contracting process, so that people interested in working on the project are aware of when the positions will become available.

2. Project Specific Information – Site Cleanup/Remediation

2.1 Existing Landfills

There are 10 existing landfills at FOX-4. Three of these landfills are engineered facilities, including the Lower Site Landfill, the Tier II Disposal Facility and the Station Area Landfill. There was one newly identified landfill in 2010, the Garbage Disposal Landfill. The following are the existing on-site landfills:

- Lower Site Landfill
- Airstrip Landfill
- Pallet Line Landfill
- Garbage Disposal Landfill
- Barrel Landfill
- Helipad Landfill – East
- Helipad Landfill – West
- Tier II Disposal Facility
- Station Area Landfill
- Tanner Bay Landfill.

2.1.1 Helipad Landfill – East

The Helipad Landfill - East is located north of the existing SRR facilities at the Upper Site area as shown on Figure 8.0. It is situated off the crest of a slope, northeast and down-gradient of the operational NWS helipad and refuelling pad. Historical records suggest that buried within the landfill comprises the former module train, garage, communication dishes, and other miscellaneous wastes. The demolition and subsequent burial of these facilities was performed during the 1993 construction of the NWS SRR facilities in order to make space for the new infrastructure. Under the DLCU Project, the initial remediation of the Helipad Landfill - East included the placement of granular fill over the landfill surface to a depth of 0.75 m, with additional fill placed as needed to reduce the overall slope. There was very limited quality control and no as-built survey data associated with this work during the initial remediation.

From visual observations and sampling during the 2010 maintenance assessment program there is evidence of potential contaminant migration, erosion, seepage and exposed debris. Based on the landfill evaluation, the Helipad Landfill - East scored as a moderated potential environmental risk which results in a remedial action of leachate containment. The high score is largely due to evidence of leachate, steep topographic slopes (approximately 40%), presence of erosion channels, and proximity to a seasonal drainage channel. Additionally, unexploded ordnances (UXO) were discovered on the surface of the landfill and will require removal by explosive experts prior to any work in this area.

Based on the results, the Helipad Landfill – East is considered a moderate risk. Due to the difficulty in constructing a containment system in the area, this landfill will be excavated.

2.1.2 Helipad Landfill – West

The Helipad Landfill – West is located south of the SRR facilities at the Upper Site area as shown on Figure 8.0. It is situated on a slope, southwest and down-gradient of the operational NWS helipad and refuelling pad. Historical records suggest that buried within the landfill comprises the former module train, garage, communication dishes and other miscellaneous wastes. The demolition and subsequent burial of these facilities was performed during the 1993 construction of the NWS SRR facilities in order to make space for the new infrastructure. Under the DLCU Project, the initial remediation of the Helipad Landfill - West was limited to surface debris cleanup in the area and limited

granular fill to flatten the existing slope. There was no quality control or as-built survey data associated with this work during construction, though, so the completion of this work cannot be confirmed.

Visual observations during the maintenance assessment program identified evidence of minor erosion, seepage and sinkholes along with minimal amounts of surface debris. Maintenance work to be completed at the Helipad Landfill - West includes removal of the surface debris followed by grading and the addition of some granular fill, as required, to reduce the overall grade of the slope.

2.1.3 Barrel Landfill

The Barrel Landfill is located west of the SRR facilities at the Upper Site area as shown on Figure 8.0. The remedial requirements during the 1990's DLCU Program specified the placement of 1.0 m of granular cover material over the landfill. There was limited quality control and no as-built survey data collected during the initial remediation.

A visual inspection of the landfill during the 2010 maintenance assessment program identified visible debris, seepage, erosion and localized settlement of the landfill, while geophysics identified a portion of the landfill that was not included in the previous regraded area. A hydrocarbon plume extends throughout most of the landfill area to an estimated depth of 0.5 m and additionally there are known Tier I soils associated with this landfill. Based on the landfill evaluation, the Barrel Landfill scored as a moderated potential environmental risk which results in a remedial action of leachate containment. The high score is largely due to evidence of leachate, steep topographic slopes (approximately 40%), and presence of erosion channels.

Because of the constructability issues of a leachate containment system in this location and considering the added benefit of reducing risk through removing the landfill, the Barrel Landfill is to be excavated.

2.1.4 Pallet Line Landfill

The Pallet Line Landfill is located at the site of the former Pallet Line #3 at the Lower Site area as shown on Figure 7.0. The area is generally flat with occasional low spots that could pond water. There are localized areas of surface debris exposed along the slope and toe of the landfill, including barrels and battery debris. Due to a significant erosion channel running from the top of the slope with exposed debris, erosion protection measures will be required including slope flattening and armouring with riprap material. A potential hydrocarbon plume extends over the southeast tip of the landfill to an estimated depth of 0.5 m. The remediation plan for the Pallet Line Landfill is to remove the Tier II, Type A, and Type B contaminated soils and surface debris followed by the placement and compaction of additional granular cover material to a thickness of 0.5 m.

2.1.5 Garbage Disposal Landfill

The Garbage Disposal Landfill is located on the western shore of the site, to the northwest of the west end of the airstrip as shown on Figure 6.0. It is situated extremely close to the ocean at 10 to 15 m from the edge and is routinely impacted by waves during high tide. The landfill was discovered during the 2010 maintenance assessment program, but was not analysed using geophysics. The extents of the landfill are apparent; however, since the cover material appears to have been imported and contrasts the surrounding beach cobble. There is significant surface and partially buried debris present at the landfill, including battery debris, barrels, wood, metal, and vehicle parts. Based on the landfill evaluation, the Garbage Disposal Landfill scored as a high potential environmental risk and as a result the recommended remedial action is landfill excavation, following the excavation of leachable lead contaminated soils at surface and to a depth of 0.3m. The high score is largely due to evidence of leachate, presence of surface contaminated soils, presence of substantial surface debris, evidence of erosion, and proximity to a seasonal drainage channel and marine receptors.

It should be noted that an archaeology feature identified to contain an adult and infant grave, tent rings, seal and other faunal remains, and recent cultural material is located to the east of the Garbage Disposal Landfill.

2.1.6 Airstrip Landfill

The Airstrip Landfill is located southeast of the Airstrip on a slight topographic high and at the base of a large cliff at the Lower Site as shown on Figure 5.0. The landfill has several erosion features that have resulted in exposed debris. Visual assessments in 2010 concluded that stabilization of the landfill and prevention of additional erosion damage using granular fill materials will be very difficult. Based on the landfill evaluation, the Airstrip Landfill scored as a moderate potential environmental risk which results in a remedial action of leachate containment. The high score is largely due to evidence of leachate, presence of large erosion channels and gullies, and proximity to a seasonal drainage channel and marine receptors, being that the landfill is 200 m from the Upper Anchorage Bay ocean waters.

Because of the potential constructability issues of a leachate containment system in this location and considering the added benefit of reducing risk through removing the landfill, the Airstrip Landfill will be excavated.

2.1.7 Station Area Non-Hazardous Waste Landfill

The Station Area Landfill is located at the Upper Site, east of the SRR facility as shown on Figure 2.0. The Station Area Landfill is an engineered landfill that was constructed for the disposal of non-hazardous demolition and site wastes generated during the 1997 cleanup program. It is positioned near the former warehouse and granular material from the former warehouse pad was used as fill during construction.

Based on visual assessments of the landfill at the time of the maintenance assessment program, the landfill is reported to generally be in good condition, but with several areas of seepage and sinkholes noted around the landfill perimeter. Remedial recommendations for the landfill include surface debris cleanup and placement of additional granular material. Granular material placement is required near the rocky ridge and in areas with visible sinkholes. The area adjacent the ridge is currently lower than the rest of the landfill creating an area for water to pond. The additional granular material near the ridge will require grading to drain away from the ridge and the granular material placed at the sinkholes will require mounding to 0.3 m to allow for future settlement.

2.1.8 Lower Site Landfill (Non-Hazardous Waste Landfill)

The Lower Site Non-Hazardous Waste Landfill is located immediately north of the existing Tier II Facility within the limits of Potential Landfill Area 5 as shown on Figure 3.0. The area is generally flat and only slightly elevated above the surrounding area. Surface drainage through the area is to the west and eventually drains to Baffin Bay after pooling at the northwest corner of the landfill area.

Occasional sinkholes are present over the surface of the existing landfill with more concentrated sinkholes along the north edge of the landfill area. All sinkholes should be covered and compacted with granular fill and the entire area of the landfill should be covered with an additional 0.5 m of granular fill. This area is also the preferred location for the construction of a new Non-Hazardous Waste Landfill. If a new landfill is constructed in this area this could reduce the requirement for additional fill as the new landfill will extend over the majority of the old landfill area and act as cover.

2.1.9 Tanner Bay Landfill

The Tanner Bay landfill is located at the Tanner Bay Landfill Area, as shown on Figure 4.0, in a valley adjacent to a drainage channel connecting the former water supply lake to the bay. The original remedial design for the 1990's DLCU Program called for the removal of exposed debris and placement of granular fill over the landfill surface and slope to a depth of 1.0 m, along with additional erosion protection placement along the toe.

Based on visual assessments of the landfill at the time of the maintenance assessment program, the landfill is reported to be in good condition. Minor maintenance work is recommended for the landfill including surface debris clean-up and placement of rip rap material along the toe.

2.2 Remedial Requirements of Existing Landfills

Table 2 summarizes the anticipated remedial requirements for the existing landfills at FOX-4. Where the remediation option is excavation, waste segregation during excavation is required to separate hazardous and non-hazardous waste. Non-hazardous waste can be disposed of in the Non-Hazardous Waste Landfill on-site. Hazardous waste will require off-site disposal and must be segregated based on PCB-containing waste (for disposal at a licensed PCB disposal facility), or other hazardous waste, which can be disposed of in a licensed Hazardous Waste Landfill. Tier II impacted soils shall be excavated, packaged and shipped off-site for disposal. Soil shall be separated from debris during excavation, and stockpiled in such a manner to allow sampling and classification according to the contaminant criteria outlined under the DCC Protocol. Soil that does not exceed any contaminant criteria may be used for backfilling excavations, but based on the difficulty with removing small pieces of debris during waste segregation, this soil should be used for intermediate fill and not be used for surface backfilling.

Table 2. Summary of Recommended Landfill Remedial Requirements

Landfill	Area (m^2) & Depth (m)	Environmental Assessment	Landfill Evaluation	Recommended Remediation	Comments
Helipad Landfill - East	1,500 1.25	No surface samples collected, landfill previously covered. Evidence of contaminant migration. UXO materials present at surface.	Moderate Potential Environmental Risk.	Excavate	Constructability of a leachate containment system is an issue due to steep slopes and limited work area around the existing SRR infrastructure.
Helipad Landfill - West	2,500 1.25	No surface contamination is suspected. Evidence of contaminant migration of PCBs and hydrocarbons.	Low Potential Environmental Risk.	Regrade	Add additional granular fill to flatten the slope.
Barrel Landfill	1,560 1.0	No surface contamination found. Large potential hydrocarbon plume extends over the majority of the landfill area.	Low Potential Environmental Risk.	Excavate	Constructability of a leachate containment system is an issue due to steep slopes and limited work area around the existing SRR infrastructure.
Airstrip Landfill	4,700 1.75	No surface sampling conducted. Evidence of contaminant migration of PCBs.	Moderate Potential Environmental Risk.	Excavate	Located within the path of high energy surface runoff and at the base of a massive cliff. Significant drainage channel present at toe of landfill.
Pallet Line Landfill	1,370 0.5	All results from surface samples were below criteria. Elevated TPH concentrations at six up gradient locations and five down gradient locations. Evidence of contaminant migration.	Low Potential Environmental Risk.	Regrade	Requires placement of additional granular material to reduce the overall slope angle of the landfill.
Garbage Disposal Landfill	1,380 0.75	Evidence of contaminant migration. Seven areas of contaminated soils identified at the landfill including hazardous lead leachate, Tier II heavy	High Potential Environmental Risk.	Excavate	Located extremely close to the ocean with frequent wave contact during high tide. Known contaminated soil plumes on surface of landfill. Archaeology

Landfill	Area (m^2) & Depth (m)	Environmental Assessment	Landfill Evaluation	Recommended Remediation	Comments
		metals, and Type A hydrocarbons.			features near landfill. Leachate containment is not feasible due to proximity to ocean.
Tanner Bay Landfill	450 -	n/a	n/a	Localized Maintenance Work	Add riprap material to the toe of the landfill.
Existing Station Area Non-Hazardous Waste Landfill	1,250 -	n/a	n/a	Localized Maintenance Work	Granular material placement at sinkhole locations and along ridge to prevent ponding of water.
Existing Lower Site Non-Hazardous Waste Landfill	1,900 1.3	No assessment sampling conducted.	n/a	Build new Non-Hazardous Waste Landfill Cell overtop of existing footprint.	Grade the top of the new landfill cover between 5 and 6 percent to allow drainage in the event that some settlement occurs.
Existing Tier II Disposal Facility	3,600 -	n/a	n/a	Localized Maintenance Work and Additional Thermal Cover	The top surface of the landfill is uneven with occasional low spots. Some material placement and compaction is required to fill in the low spots in order to prevent water from ponding.

Landfills considered a high potential environmental risk, or those landfills located in close proximity to water bodies are to be excavated at the FOX-4 site. Primary landfill excavation includes excavation of all materials to the lateral and vertical extents of the designated landfill area. The depth of the primary landfill excavation typically extends to competent bedrock or where debris is no longer visible. Secondary landfill excavation includes the excavation of the landfill area beyond the primary landfill excavation limits.

Landfill excavation includes the following tasks:

- Installation/construction of erosion, drainage and sediment control, as required
- Development of the landfill survey grid
- Excavation of all waste materials from the landfill
- Removal of all surface debris from the landfill area
- The development, operation, closure and removal of a Material Processing Area (MPA).

Once excavated, the landfill wastes are transported to the MPA for sorting into hazardous and non-hazardous components. Soil excavated from the landfill shall be sorted into the contaminated soil classifications, based on the results of sampling and analysis. Clean soil/gravel is placed in the excavated landfill area, once all confirmatory samples have been collected and analysed. The landfill area shall then reshaped to match the existing terrain.

During the landfill excavation, the slope stability shall be inspected and maintained. When excavating in the vicinity of a drainage course or a body of water, silt fences, floating silt curtains and/or containment berms shall be constructed to prevent the release of sediment or deleterious substances into the water.
At the completion of work in the area, sediment and erosion controls shall be removed from the water bodies. At the conclusion of the landfill excavation, all sediment, erosion and drainage control measures shall be removed from the worksite.

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 below:

Table 3. Summary of Contaminated Soil Disposal Requirements

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	1,100 (of which, 1,000 is from landfill excavation)	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	2,400 (of which 1,800 is from landfill excavation)	Tier II Soil Disposal Facility
Type A Hydrocarbons	Soils contaminated with hydrocarbons consisting primarily of oil and grease.	150	Non-Hazardous Waste Landfill
Type B Hydrocarbons	Soils contaminated with hydrocarbons consisting primarily of fuel oil, diesel, or gasoline.	8,100	Landfarm
CEPA/ Hazardous Soil	Soils contaminated with PCBs ≥ 50 ppm or with leachate concentrations above criteria.	250	Off-site at licensed southern disposal facility

A description of the contaminated soil areas identified at FOX-4 is presented below.

2.3.1 Monument Stain

The monument stain was discovered during the 2010 maintenance assessment program. A number of barrel bungs were observed in the area and the staining seems to originate at a plateau located 30 m east of the existing Tier II Landfill near the DEW Line clean-up monument plaque. The estimated extent of the area impacted by staining is approximately 2,900 m^2. Samples collected in the area were analyzed and results were below criteria for inorganic elements, PCBs and TPH. As a result, is it recommended that the area be scarified.

2.3.2 Battery Debris Area

The area of battery debris is located near the Tier II Disposal Facility at the Lower Site Airstrip Area, more specifically approximately 10 m southeast of MW-13. The total area of hazardous leachable lead soil to be excavated to 0.6 m is approximately 30 m^2.

2.3.3 Hydrocarbon Impacted Soils

Several areas at FOX-4 are suspected to have hydrocarbon concentrations above 2,500 ppm. Hydrocarbons were not part of the scope of work for the 2010 maintenance assessment program and as a result sampling and delineation was not performed. Impacted areas were estimated; however, by ESG using limited site specific analytical data, historical data from other DLCU sites, surveyed topography and previous experience in order to approximate the areal extent of hydrocarbon contamination.

The areas that are expected to have potential hydrocarbon contamination at the Upper Site are the former Station POL, the former Garage Pad, and the former Atwell Dormitory area. The areas that are expected to have potential hydrocarbon contaminated at the Lower Site are the former Beach POL, former Pallet Line, and the Heated Vehicle Storage area.

A detailed hydrocarbon investigation will occur early in the project, preferably during the mobilization year, to delineate the suspected hydrocarbon plumes.

2.4 Debris Areas

Seven surface debris areas were identified during the 2010 Maintenance Assessment. In addition to the identified surface debris areas, all debris within 50 m of existing pads and roadways shall be picked up. Collection of surface debris can proceed upon completion of a suitable starter berm for the NHWL construction.

Other hazardous materials, including batteries and UXO will be containerized for off-site disposal, destroyed on-site, or recycled in accordance with TDGA requirements.

2.4.1 Heated Vehicle Storage Debris Area

One buried debris area was identified and inspected as part of the FOX-4 maintenance assessment program. The Heated Vehicle Storage (HVS) debris area is located approximately 100 m west of the Lower Site landfill in a relatively flat area with a slope of 5 to 10% to the southwest. Minor drainage channels are evident running along the south and west edge of the HVS pads. Because no contamination was found the recommended maintenance work for this buried debris area is placement and compaction of Type 2 granular material over the approximate area of 500 m^2 to a thickness of 0.75 m.

2.4.2 Summary of Surface Debris

Table 4 provides a summary of the debris areas inventoried at the FOX-4 site.

Table 4. Summary of Debris Areas Identified at FOX-4 and the Remedial Requirements

Location	Description of Components	Estimated Areal Extent (m^2) and Crushed Volume (m^3)	Comments
Water Supply Lake	Partly buried, includes bedframe, canvas and wood	25 m^2 1 m^3 (exposed)	Drainage channel adjacent to south boundary.
Water Supply Lake	Barrel in water	<1m^2 0.2 m^3	-
West of Barrel Landfill	Wooden transformer platform	<1m^2 0.5 m^3	-
Former Upper Site Borrow Area	Debris includes: metal, wood, wire cables, barrels (9), sheet metal, rebar, 5 lb. fire extinguisher, burnt wood	6,800 m^2 5 m^3	Debris is scattered throughout the area, which was cleaned up during previous remediation.
Former Upper Site Landfill Area	Steel mast	<1m^2 0.5 m^3	-
Heated Vehicle Storage Debris Area	Partly buried debris includes metal, wood, cable, wire	250 m^2 1 m^3 (exposed)	Debris is mostly buried. Geophysical survey was completed to confirm area.
West End of Airstrip	Debris includes wood pallets, wood, cable, occasional metal	7,500 m^2 2 m^3	Debris is scattered throughout the area, which was cleaned up during previous remediation.
Total		**14,600 m^2** **10 m^3**	

2.5 New Landfill Facilities

2.5.1 Potential Locations

Table 5. Summary of Proposed New Landfill Locations

Area	Location	Estimated Available Surface Area (m²)	Environmental Considerations	Engineering Considerations
Proposed Landfill Area 1	Airstrip Area, southwest corner of the existing Tier II Disposal Facility extending south.	6,700	Some surface debris is present. The potential HVS Type B hydrocarbon plume is to the north and up-gradient of Landfill Area 1.	Well vegetated with standing water in low areas. Several areas of exposed bedrock. Sand and gravel, trace to some boulders, trace cobbles, trace silt. Refusal on frost at 1.0 to 1.5 m with some seepage and sloughing below 0.8m below ground surface.
Proposed Landfill Area 2	Airstrip Area, south of the existing Tier II Disposal Facility butted up against the south berm.	15,500	No contamination identified.	Well vegetated. Sand and gravel, trace cobbles, trace silt. Refusal on frost at 0.9 to 1.1 m with seepage and sloughing at 0.7 m below ground surface. Drainage course running from the east to west. Some diversion of flow may be required.
Proposed Landfill Area 3	Airstrip Area, 100m southeast of the existing Tier II Disposal Facility.	6,000	Some surface debris is present. The Monument Stain extends into the upper portion of the landfill area. The Monument Stain is to be scarified.	Sparsely vegetated and previously disturbed area. Gravely sand, trace silt. Refusal on frost at 0.5 to 0.8 m below ground surface. Seepage and sloughing to surface. Wet, sandy ground will cause constructability issues. Consider using 0.5 of Type 2 base coarse in this area for the Landfarm. Significant drainage runs through the area from upslope. Some drainage relocation might be required. Bedrock outcrop in the NW corner.
Proposed Landfill Area 4	Airstrip Area, 40 m east of the existing Tier II Disposal Facility.	2,000	Small area of battery debris with lead leachate soils identified between Area 4 and the Tier II Facility.	Sparse vegetation on south end. North end is disturbed. Sand and gravel with trace boulders, trace cobbles, trace silt. Refusal on frost at 1.0 m with water seepage at 0.7 m below ground surface. Possibility of some exposed bedrock and shallow bedrock in areas. Some grading work may be required at the south end.
Proposed Landfill Area 5	Airstrip Area, over the footprint of the existing Lower Site Landfill.	7,100	Positioned over the existing Lower Site Non-Hazardous Waste Landfill. Potential HVS hydrocarbon plume located immediately to the west of Landfill Area 5.	Sand and gravel, some cobbles, trace silt. Refusal on frost at 1.0 to 1.5 m below ground surface with some seepage and sloughing. Occasional sinkholes over footprint of existing landfill. Drainage between the Tier II facility and the new landfill could cause an issue. If a non-hazardous waste landfill is built in this location the perimeter berms should be aligned outside of the existing Lower Site Landfill area.

2.5.2 Recommended Locations and Construction Details

2.5.2.1 Tier II Disposal Facility

Disposal of Tier II contaminated soils generated from known site areas (600 m^3) and landfill excavations (1,800 m^3) will be required at FOX-4. In order to achieve the full value of constructing an on-site Tier II disposal facility a footprint of approximately 6,500 m^2 is required. It is recommended that a Tier II Disposal Facility be constructed on-site for the containment of the full 2,400 m^3 of expected Tier II soils.

In order to share a berm and reduce granular fill requirements for the construction of the Tier II Disposal Facility it is preferred that the new facility butt-up against the existing Tier II Facility. Potential Landfill Location 2 along the south berm of the existing facility is the preferred location for the Tier II expansion cell. A drainage channel runs south past the east berm of the existing Tier II facility, changes course at the southeast berm and runs along the southern edge of this area in a westerly direction. Some minor reshaping will be required to redirect this water flow around the south side of the new facility. In addition, the south edge of the new facility should be positioned well away from the drainage running east to west. This will squeeze the footprint and likely require that the new facility wrap around a corner and up a portion of the west berm. Because of an existing drainage channel on the east side of the existing facility the east side is not a preferred location to expand upon.

2.5.2.2 Non-Hazardous Waste Landfill

Based on preliminary volume estimates for non-hazardous waste generated from landfill excavations (2,650 m^3) and site surface debris (10 m^3) at FOX-4 it is recommended to construct an on-site Non-Hazardous Waste Landfill. The preferred location for the Landfill is within Potential Landfill Area 5 and directly overtop of the previous Non-Hazardous Waste Landfill. The available estimated surface area at Potential Landfill Area 5 is 7,100 m^2.

During previous site remediation work the Lower Site Landfill was used as the engineered on-site Non-Hazardous Waste Landfill for the disposal of non-hazardous demolition and surface debris. The final contours of the landfill; however, closely match the surrounding terrain and will facilitate the construction of the new landfill directly over this area. The approximate footprint of the new non-hazardous waste landfill to accommodate waste excavated from landfill excavations and from surface debris cleanup will be 6,000 m^2. Based on preliminary calculations, the granular materials requirements for the construction of the berms and cover will be approximately 6,500 m^3 of Type 2 granular fill. A drainage course runs east to west along the north toe of the existing Tier II Disposal. The alignment of the south berm of the new Non-Hazardous Waste Landfill should allow space for this drainage course.

2.5.2.3 Landfarm

The approximate surface area required for the treatment of Type B hydrocarbon contaminated soils is 21,000 m^2 based on the treatment of 8,100 m^3 of soil spread to a depth of 0.4 m. This area accounts for the treatment area and the construction of containment berms around the perimeter of the area. Currently none of the proposed Potential Landfill Areas on their own can accommodate such a large footprint, especially when considering the new Tier II Disposal Facility footprint and drainage issues through Potential Landfill Area 4. In order to achieve the required area, or at least most of it, it is recommended to place the landfarm within the west half of Borrow Area 8 located immediately south of the Airstrip.

Currently, there are two drainage ditches running the length of Borrow Area 8 draining to the west from a high point near the access road that intersects the borrow area. Water runs parallel to the airstrip approximately on both the north and south limit lines of the borrow area and twin at the west edge of the area. Some minor work will be required following the construction of the landfarm to redirect water along the south edge and to maintain drainage

along the north edge. Additionally, the shape of the landfarm should be such that surface water from the up-gradient slope draining towards the airstrip can easily flow around the facility and not be trapped against a flat berm.

The available surface area for a landfarm at Borrow Area 8 is approximately 16,500 m^2. Because of physical constraints in the area, this is considered to be the maximum available space and there is likely little to no room for expansion. In order to remediate all the potential hydrocarbon soils on-site, in-situ remediation of two of the three hydrocarbon areas at the Upper Site is recommended. Because there are very few receptors in the vicinity of the Former Atwell and Former Garage Pad plumes, and the topography is relatively flat allowing for construction of surface water control, these areas are considered suitable for in-situ hydrocarbon remediation. The Station POL plume at the Upper Site, though, is less favourable for in-situ remediation due to limited surface area and steep slopes.

Considering the in-situ remediation of the Former Atwell and Former Garage Pad plumes, the treatment area required for a landfarm at the Lower Site Airstrip Area can be reduced to 15,000 m^2 which can be accommodated at the proposed Borrow Area 8 landfarm location.

2.6 Borrow Areas

Borrow quantities were investigated as part of the geotechnical field investigation completed by AECOM in 2010. Sixteen borrow areas have been identified at FOX-4, including:

1. Borrow Area 1
2. Borrow Area 2
3. Borrow Area 2 Extension
4. Borrow Area 3
5. Borrow Area 4
6. Borrow Area 5
7. Borrow Area 6
8. Borrow Area 7
9. Borrow Area 8
10. Borrow Area 9
11. Borrow Area 10
12. Borrow Area 11
13. Borrow Area 12
14. Borrow Area 13
15. Upper Site - East
16. Upper Site - West

Borrow areas that have been removed or adjusted include Borrow Areas 4 and 8, and Upper Site – East and West. Borrow Area 4 was removed as a potential borrow source due to its location in a washout flood plain. The Upper Site Borrow Areas – East and West have been removed as potential borrow sources due to the presence of strong hydrocarbon odours encountered within the borrow areas identified during the geotechnical investigation and the surface area of Borrow Area 8 was reduced by approximately 50% to accommodate the construction of a landfarm in the west half of the area.

Table 6 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 7.

Table 6. Summary of Granular Borrow Sources

Borrow Area	Available Type of Granular Fill	Estimated Volume Available (m^3)
Borrow Area 1	Types 2, 3, and 6	1,200
Borrow Area 2	Types 1 and 5	6,800
Borrow Area 2 Extension	Type 5	
Borrow Area 3	Types 1, 2, 3, and 6	9,300
Borrow Area 5	Types 2, 3, and 6	300
Borrow Area 6	Types 1, 2, 2A, and 3	6,800
Borrow Area 7	Types 2, 3, and 6	3,700
Borrow Area 8 (east portion)	Types 2, 3, and 6	6,000
Borrow Area 9	Types 2 and 3	3,400
Borrow Area 10	Type 4	21,700
Borrow Area 11	Types 2, 3, 5, and 6	24,300
Borrow Area 12	Types 2, 3, and 6	13,900
Borrow Area 13	Types 2, 3, and 6	1,700

Table 7. 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		6,300				900
Tier II Disposal Facility		17,000		4,500	2,500	800
Landfarm		4,500		4,500		
Landfill and Debris Regrades		4,000				
Minor Maintenance Work		1,000				
Contaminated Soil Backfill			1,000			
Landfill Excavation Backfill			5,500			
Totals		**32,800**	**6,500**	**9,000**	**2,500**	**1,700**

It should be noted that oversize materials were encountered in the majority of the borrow areas. During construction, screening is expected to be required to remove oversize materials and achieve the gradation limits for the specified type of fill. Also, Type 2 Granular Fill sources in Borrow Area 6 will require blending with fine material to satisfy the gradation requirement.

A review of granular quantity requirements compared to estimates of borrow volumes available indicates that sufficient granular types have been identified. It should be noted that only one borrow source, Borrow Area 10, has been identified for Type 4 Granular Fill.

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 8.

Table 8. 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

The Upper Site at FOX-4 is located on the highest point, surrounded by sheer cliffs to the northwest, north and northeast. Bedrock geology consists primarily of rusty metasediments, with lenses of garnet-bearing calc-silicates, and belongs to the upper geologic units of the Piling Group. Along this topographic crest, the overburden is thin and discontinuous, consisting primarily of coarse-grained talus or colluvium, with variable silt and clay content. Where slops are less steep, to the west-southwest and south, overburden becomes more continuous.

The Lower Site occupies a low plain situated between two steep bedrock slopes to the south and north. Surficial geology consists of marine sediments with extensive fluvial reworking. Soil particles are primarily sand-sized, with gravel and cobbles. Silt and clay content is variable. Of note is the surficial soil along the western end of the airstrip and downgradient of the Airstrip Landfill; this material is comprised primarily of fine sand, which is pink because of the garnet content.

The Tanner Bay area was the original beach landing area for the site, and is accessible by road approximately 4 km east of the Lower Site. Surficial geology in this area is comprised of marine-reworked sediments, with variable boulder cover overlying a mix of boulders and fine-grained soils.

The FOX-4 area is underlain by Paleoproterozoic supracrustal rocks of the Pilings Group, which comprise a significant portion of the Foxe Fold Belt extending from the Melville Peninsula, across Baffin Island to western Greenland. The base of the Piling Group (Dewar Lakes formation) represents a clastic sequence and is overlain by carbonates (Flint Lake Formation) and sulphide rich black shales (Astarte River formation). These formations are overlain by a thick upper turbidite succession (deep water sedimentary deposit dominated by shale units) of the Longstaff Bluff Formation (ESG, 2009).

3.1.2 Hydrology

FOX-4 is situated on a narrow peninsula that slopes steeply upward from sea level on the southwest side to an altitude of 386 metres on the northeast side. Drainage from the Upper Site is rapid and not well-defined, draining either south toward the airstrip or north down the cliff face to the ocean. The land, and in particular the marine environments around the former FOX-4 DEW Line site, are a popular hunting and fishing location for Inuit from Qikiqtarjuaq and Clyde River. The Lower Site occupies a low fluvial plain situated between two steep slopes to the south and north. Runoff from both slopes is ultimately delivered to a stream that runs along the south side of the airstrip, by a series of small seasonal streams and drainage paths. The Tanner Bay Landfill is located at a low point in a valley between two slopes and next to a stream connecting the water supply lake to the bay.

Precipitation and surface runoff from the Upper Site percolate down into the underlying bedrock through fractures and shear zones. Across the site, steeply sloped, exposed bedrock units transition into relatively flat, coastal marine-washed sand and gravel deposits. These abrupt topographical shifts cause local resurgences of groundwater in the form of springs and seeps, which then become overland surface flow. The sudden shift in pressure gradient and dissolved oxygen content from re-exposure to atmospheric conditions causes iron and other dissolved metals to precipitate out of solution. Distinctive iron oxide and/or carbonate precipitates could often be linked with these discharge points and often left rust-colourations along their flow paths (ESG 2009).

3.2 Biological Environment

3.2.1 Flora and Fauna

A large population of bowhead whales frequents the area during summer. Narwhals, belugas and killer whales may migrate through the area, and several species of seals (ringed, harp, bearded and harbour) are present. There is a large population of sea-run Arctic char around FOX-4. Polar bears are common in the area. Three colonies of northern fulmars were present along the coast near Cape Hooper; this area was identified as a Key Migratory Bird Habitat Site by the Canadian Wildlife Service (UMA, 1991).

The variety and abundance of vegetation observed at FOX-4 during the 2010 maintenance assessment was representative of that found in the eastern Arctic. Vegetation at the Upper Site is intermittent and sparse. It consists primarily of lichen, except in small areas with accumulated soil moisture, where mosses, lichens and vascular vegetative cover up to 10% is present, or in areas of standing water, where vascular plant cover is as high as 40-60%. Noted vegetation consisted of mosses, grasses and sedges, willow and cotton grass.

The Lower Site occupies a low plain situated between two steep bedrock slopes to the south and north. The Lower Site area was heavily reworked and vegetation was sparse. Plant cover in areas of drainage and standing water was much higher, reaching 60-70% in some areas, and consisted of mosses, sedges and some willow, cotton grass, saxifrage, Arctic heather, Arctic poppies, moss campion, broadleaved willow herb, mountain avens, and seapink/thrift.

Vegetation in the Tanner Bay area was similar to the Lower Site, with sparse vegetation scattered throughout, but much higher plant cover in areas of drainage and standing water. Observed vegetation in the Tanner Bay area consisted of mosses, grasses, sedges and some willow, cotton grass, saxifrage and Arctic heather.

Terrestrial animals known to inhabit this region include barren ground caribou, polar bears, Arctic foxes, Arctic hares and lemmings (ESG, 1998). During the 2010 maintenance assessment, several Arctic hares and polar bears were observed around the site. In particular, polar bears and Arctic hares frequented the Lower Site Area; the latter was also noted at the Station Area. Arctic foxes were not observed on this trip, but scat was noted near the airstrip and at the Station Area, as well as on the road that leads to the Upper Site. Lemming burrows were present around the Lower Site and Station Area. In the nearby marine environment, ringed seals were identified and bowhead whales and narwhal were sighted off-shore. Char and sculpin were present in the waters surrounding the site.

A variety of birds – including waterfowl, such as common eider, greater snow goose, lesser snow goose, tundra swan, brant, king eider, horned lark, long-tailed ducks and shorebirds, such as snow buntings, plovers, gulls, jaegers, are known to reside in the area (ESG, 1998). Various avifauna were observed by the field team during the 2010 program. Peregrine falcons and ravens were observed in the Upper Site area. Gulls and various types of plovers and snow buntings were also seen at the Lower Site and Beach areas.

3.3 Socioeconomic Environment

FOX-4 is a remote, unmanned site located on the east coast of Baffin Island, approximately 150 km west of Qikiqtarjuaq and 150 km south of Clyde River. An archaeological feature identified to contain an adult and infant grave, tent rings, seal and other faunal remains, and recent cultural material is located to the east of the Garbage Disposal Landfill. No other significant sites have been identified in the local area; however, it is likely that additional significant areas are located in the regional study area.

Inuit from Qikiqtarjuaq and Clyde River use the land, and particularly the marine environment, around FOX-4 for hunting and fishing. Inuit from Qikiqtarjuaq consider the area particularly significant for hunting marine mammals. The large population of sea-run Arctic char around FOX-4 is a significant domestic and commercial food source for residents of Clyde River.

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 FOX-4. 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 FOX-4 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, DND employs dedicated environmental inspection staff to monitor its own compliance with the mitigation plan and all applicable laws, regulations, permits, guidelines and standards. DND will be represented at the site by the Proponents' Representative, who will report to the DCC Contract 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 FOX-4 site.

4.3.1 Site Operations

The contractor will likely 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 Section 4.4.8

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 landfill and 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 landfill and 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 9 below for a summary of the typical wastewater discharge criteria, as provided by the Nunavut Water Board for other abandoned military sites.

Table 9. 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 metres from natural drainage courses and 100 metres from fish-bearing waters.

The locations of the discharge areas will vary, depending on the work areas. For example, the barrel cleaning operations are typically located within the hazardous materials processing area, which is determined by the contractor. Wastewater that collects at contaminated soil excavations and landfill 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. For example, wastewater occurring during landfill excavation would be sampled and recirculated over the landfill surface.

4.3.5 Sewage Effluent Monitoring

The sewage management system at FOX-4 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

10 below for a summary of the effluent discharge criteria, as provided by the Nunavut Water Board for other abandoned military sites.

Table 10. 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
- 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 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 metres from archaeological resources, water bodies, and other sensitive resources. If archaeological features or artifacts are encountered during borrow pit operations, the Proponents' 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 DND abandoned military sites, including FOX-4, 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 Landfill Closure and New Landfill Development

The existing landfills will be remediated as described in Section 2.2 and as shown on the site drawings in Appendix A. Two new landfills are being constructed, the Non-Hazardous Waste Landfill, for the disposal of non-hazardous

wastes and debris generated during the clean up of the site; and a Tier II Soil Disposal Facility for the disposal of Tier II impacted soils.

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 landfills.

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 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.

4.3.15 Handling of Dangerous Goods and Hazardous Waste Materials

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 DND'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.

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.

4.3.16 Explosives

The use of explosives is potentially dangerous to human and animal health. If required, the following procedures should apply:

- Obtain all necessary permits and licenses

- Handle, transport, store and use explosives and all other related material in accordance with all applicable laws, regulations and orders of regulating authorities
- Electric detonation methods are prohibited
- Restrict use of explosives to authorized and certified/licensed personnel who have been trained in their use
- Minimize defacement of landscape features and other surrounding objects controlling the scatter of blasted material beyond the cleared working area
- Minimize shock or instantaneous peak noise levels
- Prevent blasting scatter from reaching fuel or hazardous substance storage locations. A minimum distance of 300 m in rocky terrain and 1000 m in the presence of metal is required
- Do not conduct blasting in the vicinity of wildlife populations.

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 FOX-4 site.

4.4.1 Human Health and Safety

Potential hazards to human health and safety are present at the FOX-4 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, and specifically in Qikiqtarjuaq, Clyde River and Pangnirtung will 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 FOX-4 site in that all disturbed areas (landfills, debris piles, 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 or when frozen; in late winter before spring freshet or after mid-August
- 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
- 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
- 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 FOX-4 site, it is not anticipated that work scheduling will be required.

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)
- Report all archaeological finds, including:
  - 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
    - Any extenuating circumstances
- Do not resume activities in the vicinity of the find until confirmation 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

A summary of the project tasks, potential impacts, proposed mitigation measures, cumulative impacts and significance are presented in Table 11.

Table 11. 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/Landfill Closure	If not constructed properly, contaminants may migrate from the new landfills, potentially degrading soil quality. The closure of the existing landfills will reduce the risk of impacting soil quality.	New facilities will not contain hazardous materials. The landfill/landfill cover is graded to promote surface runoff.	The new landfills and existing landfills that are not being excavated 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/Landfill 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	New facilities will not contain hazardous materials. Landfill/landfill covers are graded to promote surface runoff. New facilities are sited away from	The new landfills and existing landfills that are not being excavated may need maintenance work in the future and they are intended to remain	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
		quality, both surface and active layer water. The development and closure of the existing landfills has the potential to disrupt drainage at the site and cause siltation of waterways.	waterbodies and drainage courses so that drainage is not interrupted. Prevent siltation by use of berms and/or silt fences.	on site for the foreseeable future. As such, even though mitigation measures will be implemented, there may be future impacts to water quality.	
	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 and closure of existing 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

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
	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 will likely 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
	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 will likely 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

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
	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	Landfill Closure/Excavation	The excavation of high risk landfill areas in close proximity to water bodies removes the potential for impact.	During excavation, 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
	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
	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 excavation of potentially hazardous materials from the landfills, 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	None.	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
			heavy equipment to be implemented.		
	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 required to have a minimum 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

Appendix A

Drawings

LANDS OUTSIDE OF THE BOUNDARIES ARE UNDER DIAND JURISDICTION

Monument

Custodian: DIAND

Road
Land Reservation to DND

PARCEL A

Custodian: DND

Radar Site
Transfer of Administration

PARCEL B

PARCEL E

PARCEL D

Custodian: DND

Water Lot
Transfer of Administration

Custodian: DND

Runway
Transfer of Administration

PARCEL C

RESERVED FOR DND

Custodian: DND

Beachhead
Transfer of Administration

Custodian : DIAND

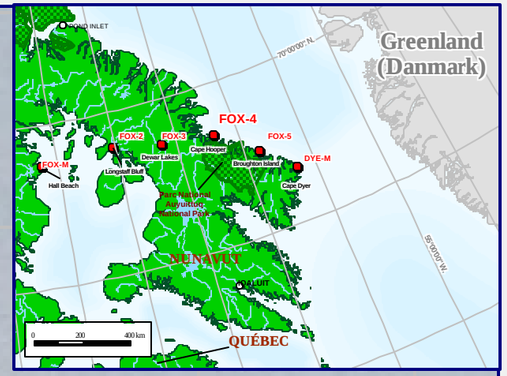
Reserve requested by DND 56/01/18
Established by DIAND 56/01/26

75 96000m. N.

75 92000m. N.

594000m. E.

586000m. E.



Version 2.0

FOX-4

CAPE HOOPER

FINAL

- Reserved for DND / Réservé pour le MDN
- Parcel A / Parcelle A
- Parcel B / Parcelle B
- Parcel C / Parcelle C
- Parcel D / Parcelle D
- Parcel E / Parcelle E
- National Park / Parc National

Background information : Topographic map 27 A (Scale: 1: 250 000). UTM Zone 19.
Produced by the Surveys and Mapping Branch
Department of Energy, Mines and Resources, Ottawa, 1980.

Carte de base : carte topographique 27 A (Échelle 1 : 250 000). Zone UTM 19.
Publié par la Direction des levés et de la cartographie
Ministère de l'énergie, des mines et des resources, Ottawa, 1980.

N W E S

Scale / Échelle : 1 : 27 500

0 1 2 km

This map is to be used for presentation purposes only.
This map is not a legal survey document.

Cette carte devrait être utilisé à des fins de présentation seulement.
Cette carte n'est pas un document d'arpentage légal.

Produced by: Real Property Geomatics Services, Real Property Services Branch, PWGSC, March, 2003.
Produit par: Services géomatiques immobiliers, Service des biens immobiliers, TPSGC, mars 2003.

National Defence / Défense nationale

DEW LINE CLEAN UP PROJECT

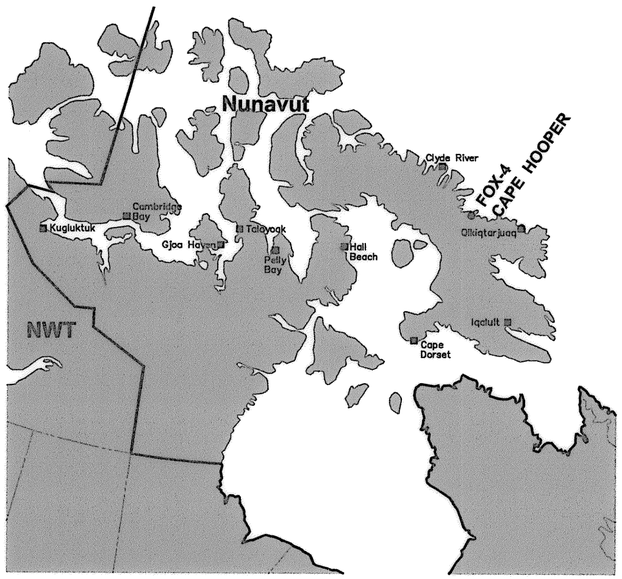
DRAWING INDEX

DRAWING No.	TITLE	DRAWING No.	TITLE	DRAWING No.	TITLE
SITING		SITING		SITING	
H-C76/2-9101-101	OVERALL SITE PLAN	H-C76/2-9101-111	NON-HAZARDOUS WASTE LANDFILL CROSS SECTION	H-B233/2-9101-150	FOX-5 OVERALL SITE PLAN
H-C76/2-9101-102	PROJECT LAYOUT STATION AND AIRSTRIP AREAS	H-C76/2-9101-112	TIER II DISPOSAL FACILITY KEY TRENCH EXCAVATION PLAN & GRADING/INSTRUMENTATION PLAN	H-B233/2-9101-151	FOX-5 MIDDLE SITE LANDFILL AREA SITE PLAN
H-C76/2-9101-103	PROJECT LAYOUT BEACH AREA	H-C76/2-9101-113	TIER II DISPOSAL FACILITY CROSS SECTION AND DETAIL	H-B233/2-9101-152	FOX-5 MIDDLE SITE NON-HAZARDOUS WASTE LANDFILL CROSS SECTIONS
H-C76/2-9101-104	STATION AREA SITE PLAN SHEET 1	H-C76/2-9101-114	TIER II DISPOSAL FACILITY CROSS SECTION AND DETAIL		
H-C76/2-9101-105	STATION AREA SITE PLAN SHEET 2	H-C76/2-9101-115	LANDFARM GRADING PLAN	STRUCTURAL	
H-C76/2-9101-106	AIRSTRIP AREA SITE PLAN SHEET 1	H-C76/2-9101-116	LANDFARM CROSS SECTION AND CLOSURE DETAIL	H-B233/2-9101-201	FOX-5 HEATED VEHICLE STORAGE PLAN AND ELEVATIONS
H-C76/2-9101-107	AIRSTRIP AREA SITE PLAN SHEET 2	H-C76/2-9101-117	MISCELLANEOUS DETAILS		
H-C76/2-9101-108	TANNER BAY AREA SITE PLAN	H-C76/2-9101-118	ACCESS ROAD PLAN AND PROFILE NORTH OF AIRSTRIP AREA		
H-C76/2-9101-109	PALLET LINE LANDFILL PLAN AND CROSS SECTION	H-C76/2-9101-119	ACCESS ROAD PLAN AND PROFILE SOUTH OF AIRSTRIP AREA		
H-C76/2-9101-110	NON-HAZARDOUS WASTE LANDFILL BERM CONSTRUCTION AND FINAL GRADING PLANS				

FOX-4 CAPE HOOPER & FOX-5 QIKIQTARJUAQ TENDER DRAWINGS

AECOM

FEBRUARY, 2011



LOCATION OF CAPE HOOPER WITHIN NUNAVUT TERRITORY

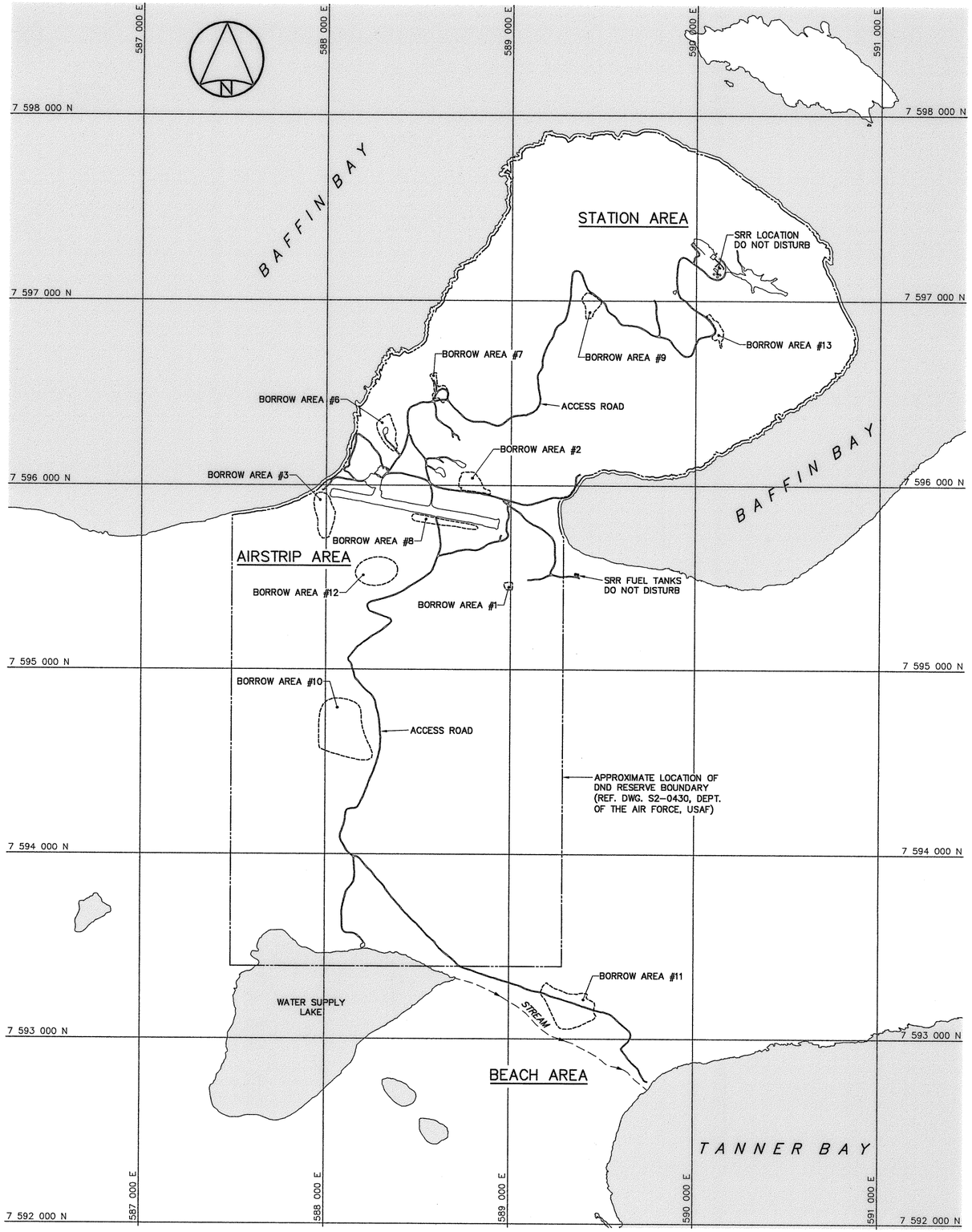
SCALE: NTS

POTENTIAL SOURCES FOR GRANULAR MATERIALS *

BORROW AREA	GRANULAR TYPE (SEE SECTION 02226 IN SPECIFICATION)						
	TYPE 1	TYPE 2	TYPE 2A	TYPE 3	TYPE 4	TYPE 5	TYPE 6
1		✔		✔			✔
2	✔					✔	
3	✔	✔		✔			✔
6 **	✔	✔	✔	✔			
7		✔		✔			✔
8 (EAST PORTION)		✔		✔			✔
9		✔		✔			
10					✔		
11		✔		✔		✔	✔
12		✔		✔			✔
13		✔		✔			✔

* REFER TO FOX-4 GEOTECHNICAL REPORTS AND INFORMATION.

** TYPE 2 GRANULAR MATERIAL FROM BORROW AREA #6 WILL REQUIRE BLENDING WITH FINE MATERIAL TO SATISFY GRADATION REQUIREMENTS.



National Défense / Defence nationale

Headquarters / Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. REMOVE ALL SURFICIAL DEBRIS FROM ENTIRE PLAN AREA. ALL NON-HAZARDOUS DEBRIS WITHIN THE PLAN AREA IS TO BE PLACED IN THE NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.

Legend:

- APPROXIMATE LOCATION OF PROPERTY BOUNDARY
- APPROXIMATE EXTENT OF BORROW AREAS
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

PERMIT TO PRACTICE
AECOM Canada Ltd.
Signature
Date
PERMIT NUMBER: P639
NWT/NU Association of Professional Engineers and Geoscientists

Feb 4/11

AECOM

SCALE - ECHELLE 200 100 0 200 400 600m

PROJECT - PROJET

FOX-4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE - METIER	DATE
SITING	2011-02-03

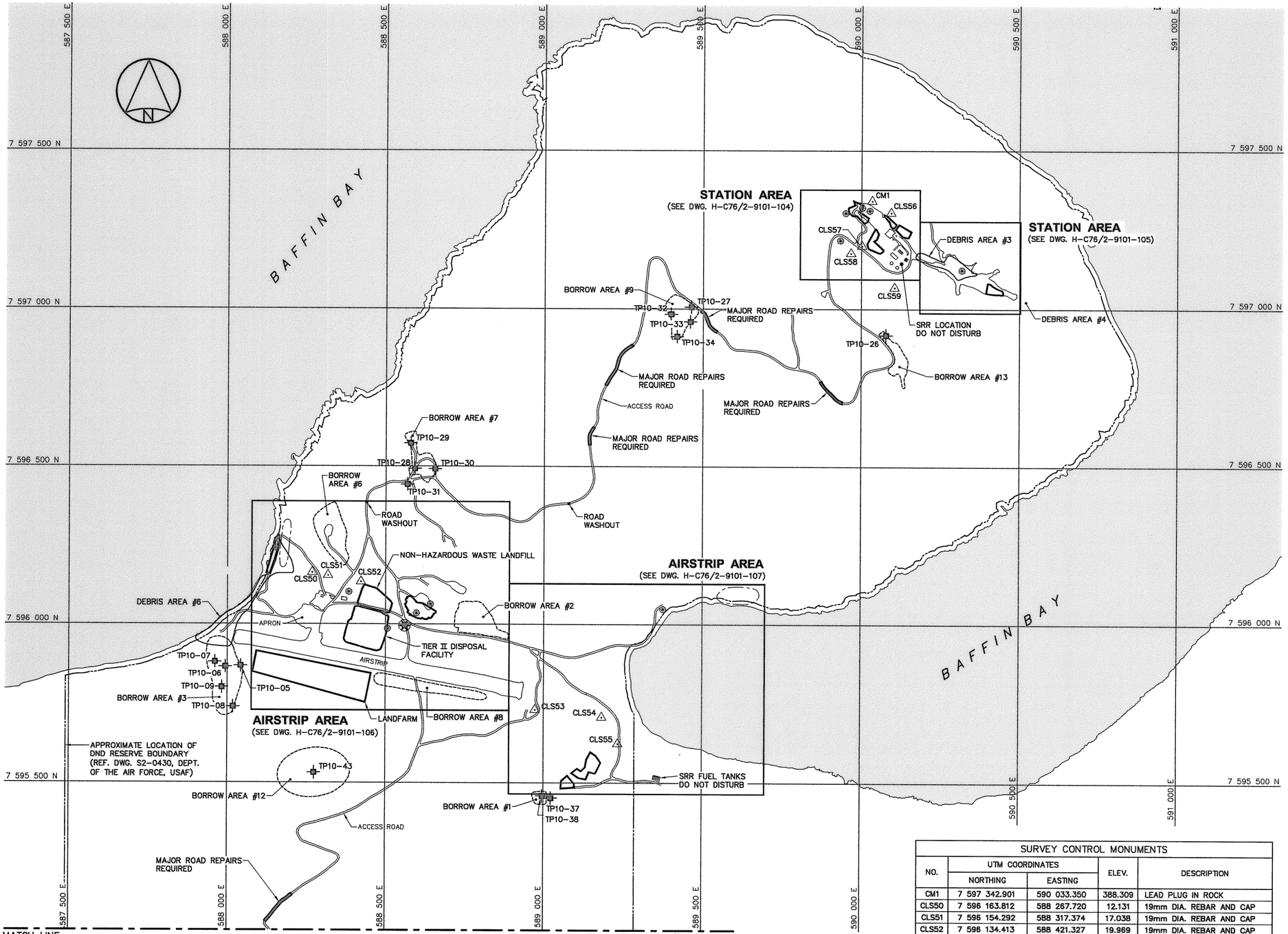
SUBJECT - SUJET

OVERALL SITE PLAN

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDIE TME		DES OFF AGENT CONCEPT
DRAWN DESSINE IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE BWF		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-C76/2-9101-101

Canada



SURVEY CONTROL MONUMENTS				
NO.	UTM COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	7 597 342.901	590 033.350	388.309	LEAD PLUG IN ROCK
CLS50	7 596 163.812	588 267.720	12.131	19mm DIA. REBAR AND CAP
CLS51	7 596 154.292	588 317.374	17.038	19mm DIA. REBAR AND CAP
CLS52	7 596 134.413	588 421.327	19.969	19mm DIA. REBAR AND CAP
CLS53	7 595 729.011	588 972.572	5.664	19mm DIA. REBAR AND CAP
CLS54	7 595 705.706	589 183.429	2.043	19mm DIA. REBAR AND CAP
CLS55	7 595 622.365	589 234.457	10.231	19mm DIA. REBAR AND CAP
CLS56	7 597 305.287	590 093.442	379.717	19mm DIA. REBAR AND CAP
CLS57	7 597 199.807	590 001.415	366.177	19mm DIA. REBAR AND CAP
CLS58	7 597 176.541	589 966.724	361.512	19mm DIA. REBAR AND CAP
CLS59	7 597 067.880	590 104.590	372.086	19mm DIA. REBAR AND CAP

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS WITHIN THE PLAN AREA IS TO BE PLACED IN THE NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. ARCHAEOLOGICAL FEATURES LOCATED AS PER ENVIRONMENTAL CLEAN UP STUDY OF 21 DEW LINE SITES IN CANADA, VOL. 21, UMA 1991.
7. ALL SHORT RANGE RADAR (SRR) FACILITIES ARE CURRENTLY OPERATIONAL AND ARE NOT TO BE DISTURBED.

Legend:

- △CM1 — SURVEY CONTROL MONUMENT
- APPROXIMATE LOCATION OF COMMEMORATIVE PLAQUE
- CONTAMINATED AREA
- TEST PIT LOCATION
- APPROXIMATE EXTENT OF BORROW AREAS
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

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Date
PERMIT NUMBER: P639
NWT/NU Association of Professional Engineers and Geoscientists

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SCALE – ECHELLE 100 50 0 100 200 300m

PROJECT – PROJET
FOX-4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2011-02-03

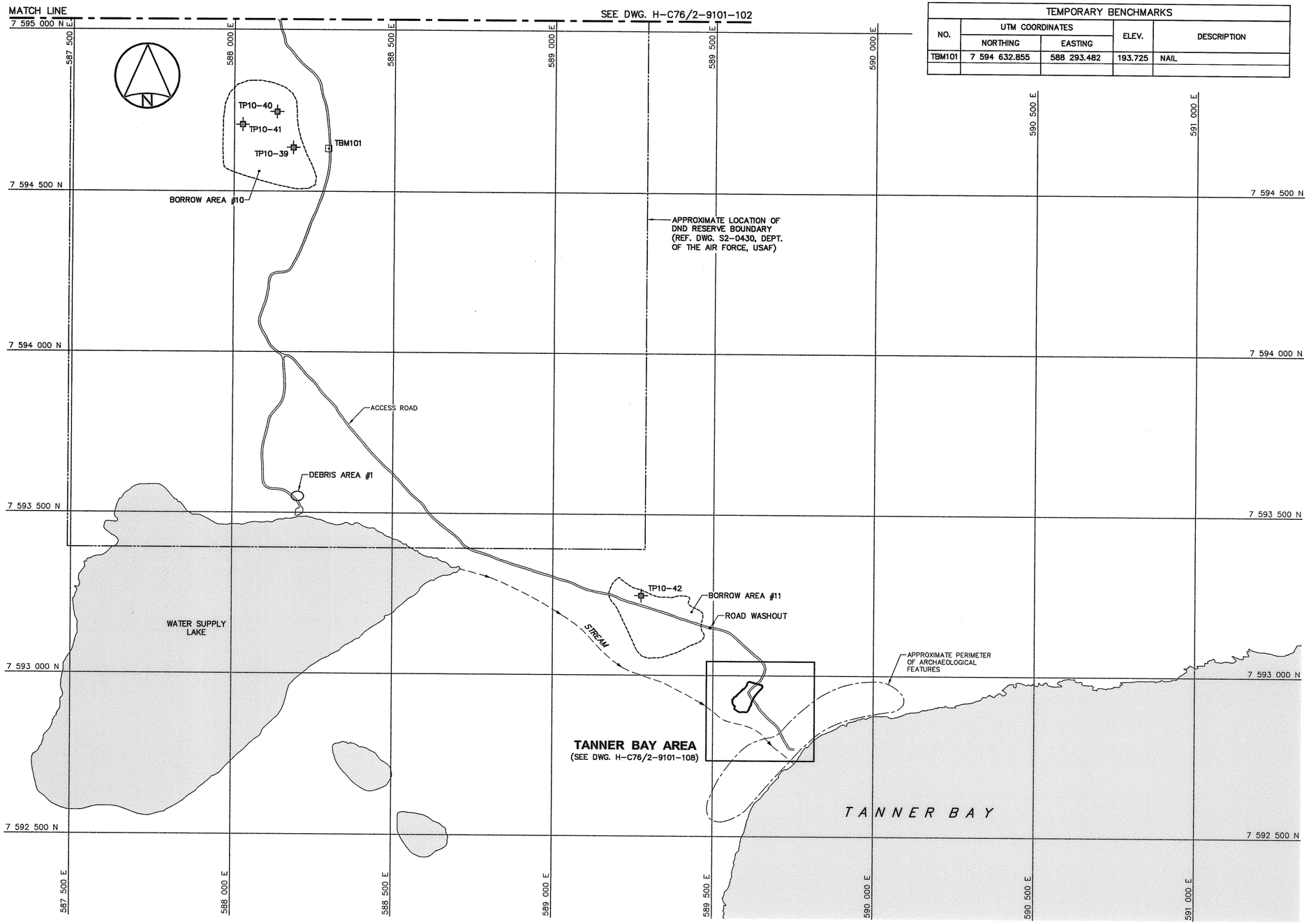
SUBJECT – SUJET

PROJECT LAYOUT
STATION AND AIRSTRIP AREAS

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE TAE		DES OFF AGENT CONCEPT
DRAWN DESSINE IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE BWF		DES MGR GEST CONCEPT
COORDINATION RKM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-C76/2-9101-102

Canada



TEMPORARY BENCHMARKS				
NO.	UTM COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
TBM101	7 594 632.855	588 293.482	193.725	NAIL

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

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2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS WITHIN THE PLAN AREA IS TO BE PLACED IN THE NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. ARCHAEOLOGICAL FEATURES LOCATED AS PER ENVIRONMENTAL CLEAN UP STUDY OF 21 DEW LINE SITES IN CANADA, VOL. 21, UMA 1991.

Legend:

- TBM101 — TEMPORARY BENCHMARK
- TEST PIT LOCATION
- APPROXIMATE EXTENT OF BORROW AREAS
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

PERMIT TO PRACTICE
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Signature
Date
PERMIT NUMBER: P639
NWT/NU Association of Professional Engineers and Geoscientists

AECOM

SCALE - ECHELLE 100 50 0 100 200 300m

PROJECT - PROJET
FOX-4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE - METIER: SITING
DATE: 2011-02-03

SUBJECT - SUJET

PROJECT LAYOUT
BEACH AREA

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED / ETUDIE: TME		DES OFF / AGENT CONCEPT
DRAWN / DESSINE: IC/CAE		SECT HD / CHEF SECT
CHECKED / VERIFIE: BWF		DES MGR / GEST CONCEPT
COORDINATION: RKM	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-C76/2-9101-103

Canada

BARREL DUMP LANDFILL EXCAVATION (DESIGN)		
NO.	UTM COORDINATES	
	NORTHING	EASTING
101	7 597 343.2	589 975.0
102	7 597 330.8	590 003.8
103	7 597 309.3	589 992.9
104	7 597 289.7	590 022.0
105	7 597 279.5	590 019.4
106	7 597 272.3	590 008.9
107	7 597 297.1	589 984.1
108	7 597 297.2	589 971.2
109	7 597 305.6	589 960.6
110	7 597 321.7	589 958.1
111	7 597 330.1	589 979.4

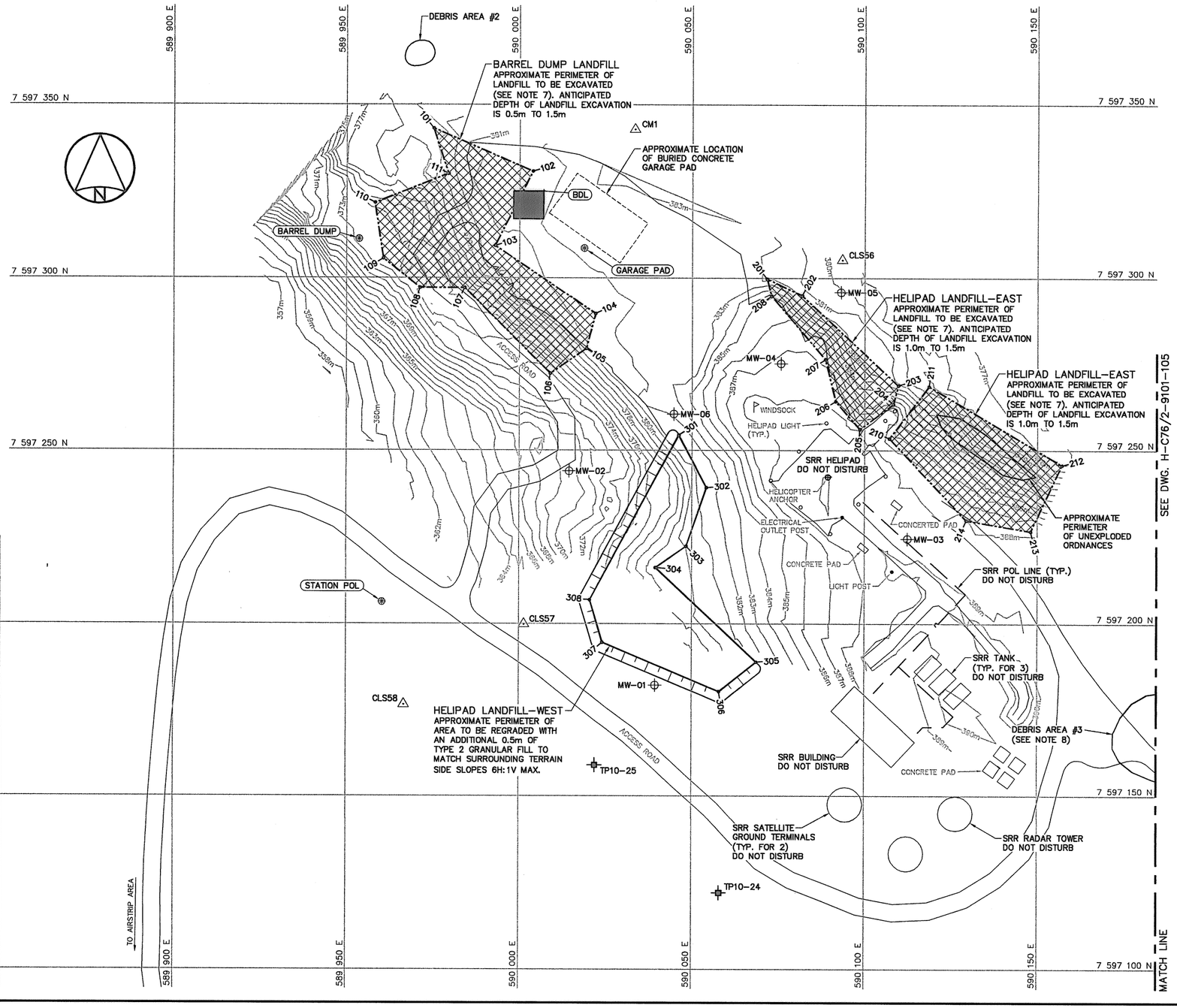
HELIPAD LANDFILL–EAST EXCAVATION (DESIGN)		
NO.	UTM COORDINATES	
	NORTHING	EASTING
201	7 597 299.8	590 071.6
202	7 597 295.0	590 081.8
203	7 597 268.8	590 109.7
204	7 597 263.4	590 108.2
205	7 597 256.1	590 098.6
206	7 597 264.2	590 091.6
207	7 597 276.4	590 088.6
208	7 597 294.9	590 072.9
210	7 597 253.5	590 107.1
211	7 597 268.6	590 118.6
212	7 597 245.8	590 157.0
213	7 597 226.7	590 148.1
214	7 597 229.9	590 129.4

HELIPAD LANDFILL–WEST REGRADE (DESIGN)		
NO.	UTM COORDINATES	
	NORTHING	EASTING
301	7 597 254.4	590 046.2
302	7 597 239.2	590 054.2
303	7 597 222.4	590 048.4
304	7 597 216.2	590 039.5
305	7 597 188.9	590 068.7
306	7 597 180.4	590 057.9
307	7 597 194.6	590 024.1
308	7 597 206.9	590 020.5

CONTAMINATED SOIL TO BE EXCAVATED				
AREA NO.	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
DCC TIER II				
BDL	71	24	7 597 325.1	590 006.9
HYDROCARBON – TYPE B				
BARREL DUMP	400	150	–	–
GARAGE PAD	2200	2400	–	–
STATION POL	1900	1050	–	–

NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

SURVEY CONTROL MONUMENTS				
NO.	UTM COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	7 597 342.901	590 033.350	388.309	LEAD PLUG IN ROCK
CLS56	7 597 305.287	590 093.442	379.717	19mm DIA. REBAR AND CAP
CLS57	7 597 199.807	590 001.415	366.177	19mm DIA. REBAR AND CAP
CLS58	7 597 176.541	589 966.724	361.512	19mm DIA. REBAR AND CAP



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON–HAZARDOUS DEBRIS WITHIN THE PLAN AREA IS TO BE PLACED IN THE NON–HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219–1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. ALL SHORT RANGE RADAR (SRR) FACILITIES ARE CURRENTLY OPERATIONAL AND ARE NOT TO BE DISTURBED.
7. DEPTH OF LANDFILL EXCAVATION TO EXTEND TO THE BASE OF THE DEBRIS. LIMIT AND DEPTH OF LANDFILL EXCAVATION TO BE FIELD VERIFIED BY CONFIRMATORY TESTING AND EXCAVATION OF TESTPITS.
8. FOR ENTIRE DEBRIS AREA LIMITS, SEE DWG. H–C76/2–9101–102.

Legend:

- CM1 — SURVEY CONTROL MONUMENT
- 101 — COORDINATE POINT
- DCC TIER II CONTAMINATED SOIL
- HYDROCARBON – TYPE B CONTAMINATED SOIL LOCATION
- TEST PIT LOCATION
- EXISTING MONITORING WELL LOCATION (6)
- LANDFILL EXCAVATION AREA

No.	DATE	REVISION	REVISION	APPR.

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SCALE – ECHELLE 10 5 0 10 20 30m

PROJECT – PROJET
FOX–4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2011–02–03

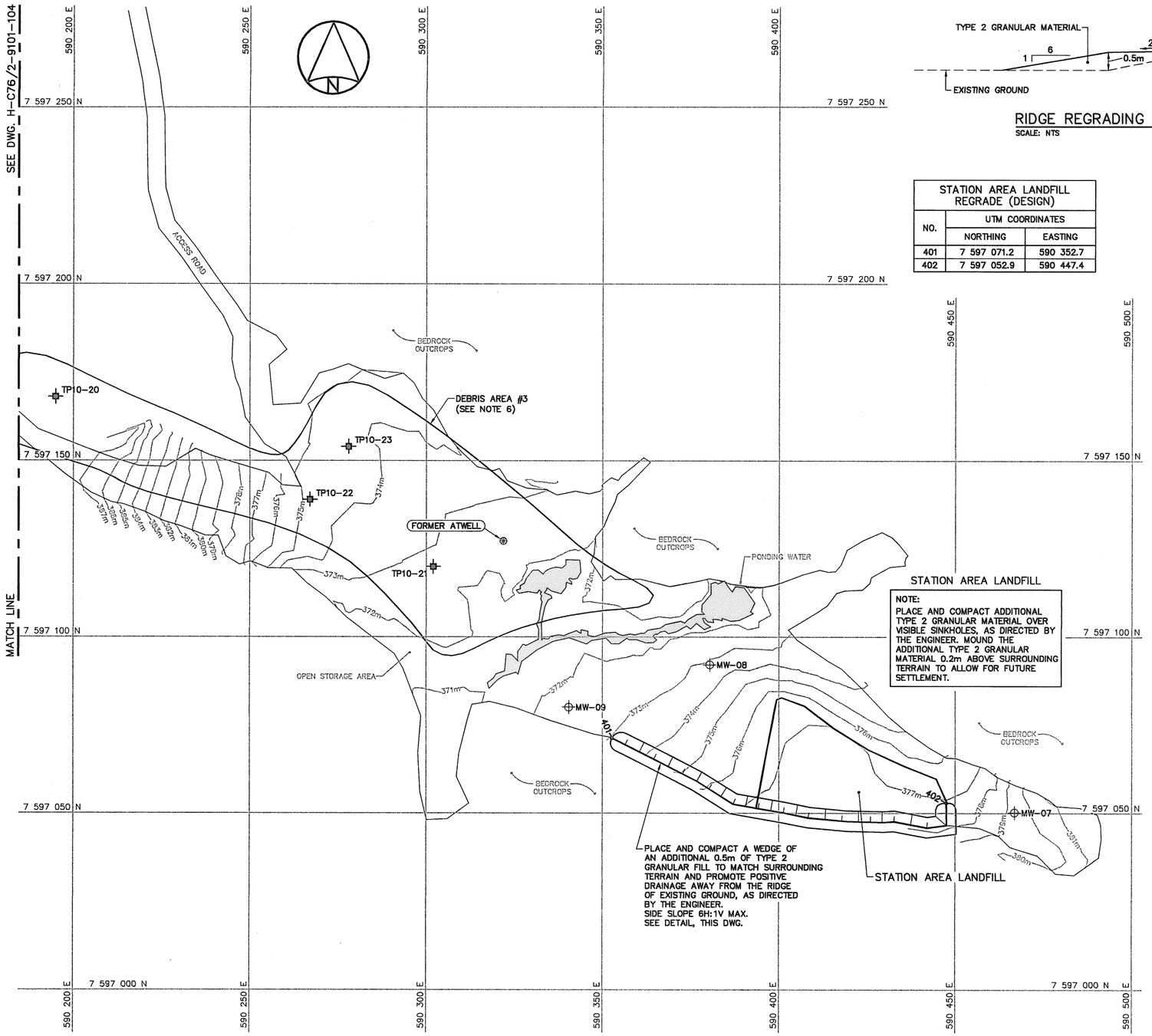
SUBJECT – SUJET

STATION AREA
SITE PLAN SHEET 1

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED / ETUDIE TME		DES OFF / AGENT CONCEPT
DRAWN / DESSINE IC/CAE		SECT HD / CHEF SECT
CHECKED / VERIFIE BWF		DES MGR / GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C76/2–9101–104

Canada



TYPE 2 GRANULAR MATERIAL

6 : 1

2%

0.5m

EXISTING GROUND

RIDGE REGRADING DETAIL

SCALE: NTS

STATION AREA LANDFILL REGRADE (DESIGN)		
NO.	UTM COORDINATES	
	NORTHING	EASTING
401	7 597 071.2	590 352.7
402	7 597 052.9	590 447.4

CONTAMINATED SOIL TO BE EXCAVATED				
AREA NO.	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
HYDROCARBON – TYPE B				
FORMER ATWELL	1000	500	–	–

NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS WITHIN THE PLAN AREA IS TO BE PLACED IN THE NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. FOR ENTIRE DEBRIS AREA LIMITS, SEE DWG. H-C76/2-9101-102.

Legend:

- 401 — COORDINATE POINT
- HYDROCARBON – TYPE B CONTAMINATED SOIL LOCATION
- TEST PIT LOCATION
- EXISTING MONITORING WELL LOCATION (3)
- BODY OF WATER

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No.	DATE	REVISION	REVISION	APPR.

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Feb04/11

AECOM

SCALE – ECHELLE 10 5 0 10 20 30m

PROJECT – PROJET
FOX-4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2011-02-03

SUBJECT – SUJET

STATION AREA
SITE PLAN SHEET 2

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED / ETUDIE TME		DES OFF / AGENT CONCEPT
DRAWN / DESSINE IC/CAE		SECT HD / CHEF SECT
CHECKED / VERIFIE BWF		DES MGR / GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-C76/2-9101-105

Canada

CONTAMINATED SOIL TO BE EXCAVATED				
AREA NO.	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
DCC TIER I				
PLL	97	32	7 596 030.5	588 591.9
DCC TIER II				
GDL	575	186	7 596 167.5	588 137.9
PLL	380	122	7 596 051.9	588 546.8
HYDROCARBON – TYPE B				
HVS	800	420	–	–
PALLET LINE	2300	1700	–	–
HAZARDOUS				
GDL	539	171	7 596 292.3	588 162.5
TTBD	8	5	7 595 984.1	588 504.4

NOTE:
MW–10, MW–11, MW–12, MW–13, MW–14, MW–15 AND MW–16 TO BE DECOMMISSIONED PRIOR TO NEW LANDFILL FACILITIES BEING CONSTRUCTED.

SURVEY CONTROL MONUMENTS				
NO.	UTM COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CLS50	7 596 163.812	588 267.720	12.131	19mm DIA. REBAR AND CAP
CLS51	7 596 154.292	588 317.374	17.038	19mm DIA. REBAR AND CAP
CLS52	7 596 134.413	588 421.327	19.969	19mm DIA. REBAR AND CAP

GARBAGE DISPOSAL LANDFILL EXCAVATION (DESIGN)		
NO.	UTM COORDINATES	
	NORTHING	EASTING
501	7 596 280.0	588 160.2
502	7 596 263.6	588 164.0
503	7 596 203.3	588 148.5
504	7 596 159.9	588 132.5
505	7 596 162.4	588 122.6
506	7 596 272.8	588 154.0

HVS BURIED DEBRIS AREA REGRADE (DESIGN)		
NO.	UTM COORDINATES	
	NORTHING	EASTING
601	7 596 140.0	588 336.7
602	7 596 152.0	588 350.4
603	7 596 145.4	588 369.6
604	7 596 135.3	588 377.0
605	7 596 112.1	588 359.3
606	7 596 122.2	588 347.9

NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

NON–HAZARDOUS WASTE LANDFILL

NOTE:
SEE DWG. H–C76/2–9101–110 FOR BERM CONSTRUCTION AND FINAL GRADING PLANS FOR THE NON–HAZARDOUS WASTE LANDFILL, INCLUDING FINAL GRADE COORDINATE POINTS.

TIER II DISPOSAL FACILITY

NOTE:
SEE DWG. H–C76/2–9101–112 FOR TRENCH EXCAVATION AND INSTRUMENTATION PLANS FOR THE TIER II DISPOSAL FACILITY, INCLUDING FINAL GRADE COORDINATE POINTS.

PALLET LINE LANDFILL

NOTE:
SEE DWG. H–C76/2–9101–109 FOR DETAILED REGRADING PLAN AND SECTION OF THE PALLET LINE LANDFILL, INCLUDING COORDINATE POINTS.

NOTE:
SEE DWG. H–C76/2–9101–115 FOR DETAILED PLAN OF THE LANDFARM, INCLUDING FINAL GRADE COORDINATE POINTS.

BAFFIN BAY
APPROXIMATE PERIMETER OF ARCHAEOLOGICAL FEATURES
GARBAGE DISPOSAL LANDFILL
APPROXIMATE PERIMETER OF LANDFILL TO BE EXCAVATED (SEE NOTE 7). ANTICIPATED DEPTH OF LANDFILL EXCAVATION IS 0.75m
DEBRIS AREA #6 (SEE NOTE 7)
HVS BURIED DEBRIS AREA
APPROXIMATE PERIMETER OF AREA TO BE REGRADED WITH 0.75m OF TYPE 2 GRANULAR FILL. SIDE SLOPES 6H:1V MAX.
DEBRIS AREA #5
BORROW AREA #6
ACCESS ROAD
TO STATION AREA
NON–HAZARDOUS WASTE LANDFILL
TIER II DISPOSAL FACILITY
NEW TIER II DISPOSAL FACILITY
EXISTING TIER II DISPOSAL FACILITY
PALLET LINE LANDFILL
BORROW AREA #2
BORROW AREA #8
LANDFARM
PONDING WATER
OPEN STORAGE AREA
POTENTIAL CONTRACTOR'S CAMP LAYDOWN AREA
APRON
AIRSTRIP
TAXIWAY
CULVERT
HVS CONCRETE PAD
ROAD WASHOUT
APPROXIMATE LOCATION OF COMMEMORATIVE PLAQUE
APPROXIMATE PERIMETER OF AREA TO BE SCARIFIED
PROPOSED MONITORING WELL (TYP. FOR 10)
PROPOSED BACKGROUND MONITORING WELL (TYP. FOR 2)
TO WATER SUPPLY LAKE AND TANNER BAY AREA
TO BEACH
SEE DWG. H–C76/2–9101–107
MATCH LINE

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General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON–HAZARDOUS DEBRIS WITHIN THE PLAN AREA IS TO BE PLACED IN THE NON–HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219–1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. DEPTH OF LANDFILL EXCAVATION TO EXTEND TO THE BASE OF THE DEBRIS. LIMIT AND DEPTH OF LANDFILL EXCAVATION TO BE FIELD VERIFIED BY CONFIRMATORY TESTING AND EXCAVATION OF TESTPITS.
7. FOR ENTIRE DEBRIS AREA LIMITS, SEE DWG. H–C76/2–9101–102.

Legend:

- CLS50 – SURVEY CONTROL MONUMENT
- 501 – COORDINATE POINT
- DCC TIER I CONTAMINATED SOIL
- DCC TIER II CONTAMINATED SOIL
- HAZARDOUS CONTAMINATED SOIL
- HYDROCARBON – TYPE B CONTAMINATED SOIL LOCATION
- TEST PIT LOCATION
- PROPOSED MONITORING WELL LOCATION (12)
- EXISTING MONITORING WELL LOCATION (7)
- EXISTING VERTICAL GROUND TEMPERATURE CABLE LOCATION (6)
- LANDFILL EXCAVATION AREA
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

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NWT/NU Association of Professional Engineers and Geoscientists

AECOM

SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
FOX–4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER: SITING
DATE: 2011–02–03

SUBJECT – SUJET
AIRSTRIP AREA
SITE PLAN SHEET 1

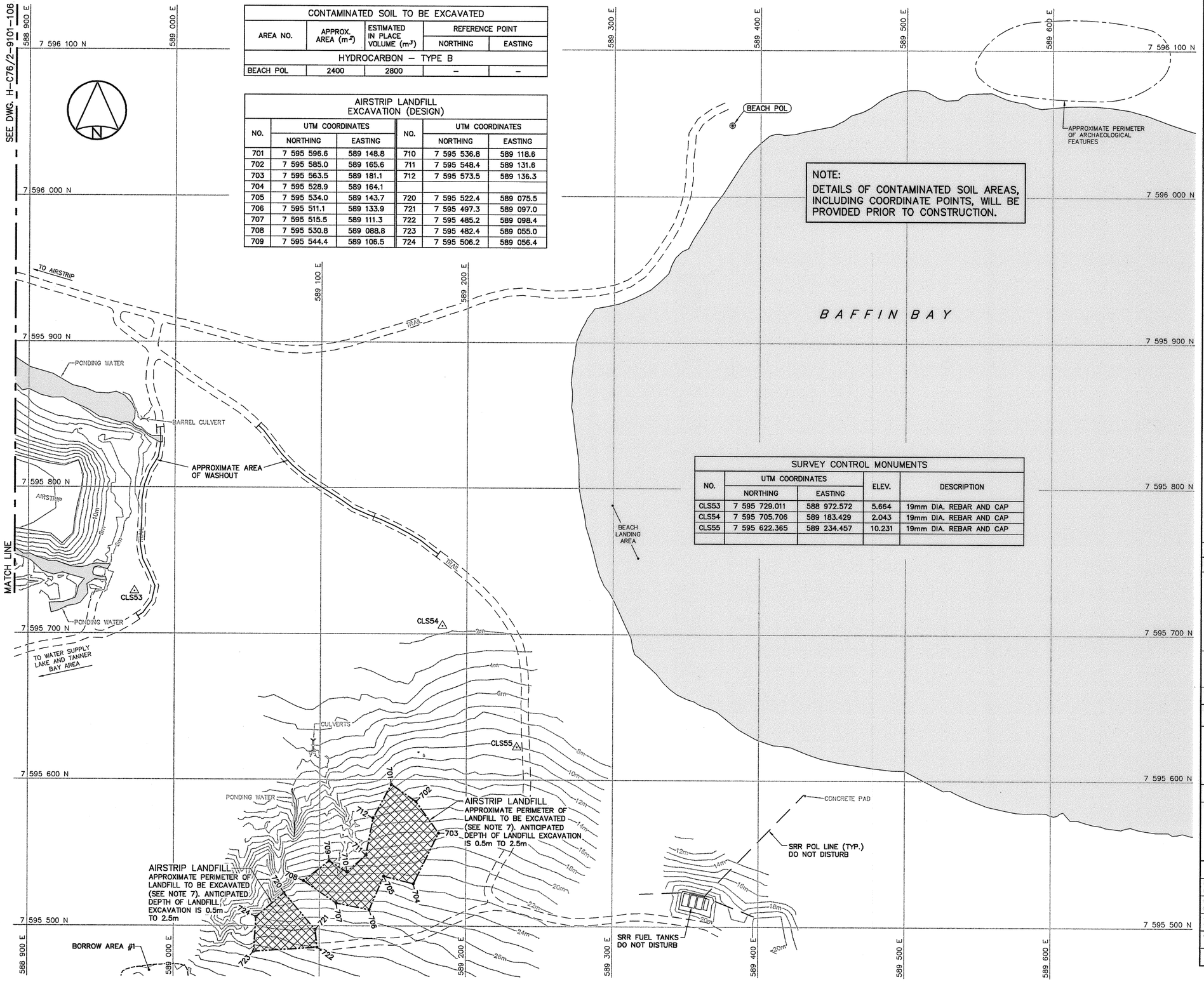
PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE THE		DES OFF AGENT CONCEPT
DRAWN DESSINE IC/ CAE		SECT HD CHEF SECT
CHECKED VERIFIE BWF		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C76/2–9101–106

Canada

CONTAMINATED SOIL TO BE EXCAVATED				
AREA NO.	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
HYDROCARBON – TYPE B				
BEACH POL	2400	2800	–	–

AIRSTRIP LANDFILL EXCAVATION (DESIGN)					
NO.	UTM COORDINATES		NO.	UTM COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
701	7 595 596.6	589 148.8	710	7 595 536.8	589 118.6
702	7 595 585.0	589 165.6	711	7 595 548.4	589 131.6
703	7 595 563.5	589 181.1	712	7 595 573.5	589 136.3
704	7 595 528.9	589 164.1			
705	7 595 534.0	589 143.7	720	7 595 522.4	589 075.5
706	7 595 511.1	589 133.9	721	7 595 497.3	589 097.0
707	7 595 515.5	589 111.3	722	7 595 485.2	589 098.4
708	7 595 530.8	589 088.8	723	7 595 482.4	589 055.0
709	7 595 544.4	589 106.5	724	7 595 506.2	589 056.4



NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

SURVEY CONTROL MONUMENTS				
NO.	UTM COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CLS53	7 595 729.011	588 972.572	5.664	19mm DIA. REBAR AND CAP
CLS54	7 595 705.706	589 183.429	2.043	19mm DIA. REBAR AND CAP
CLS55	7 595 622.365	589 234.457	10.231	19mm DIA. REBAR AND CAP

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Headquarters
Quartier général

General Notes:

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2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS WITHIN THE PLAN AREA IS TO BE PLACED IN THE NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. ALL SHORT RANGE RADAR (SRR) FACILITIES ARE CURRENTLY OPERATIONAL AND ARE NOT TO BE DISTURBED.
7. DEPTH OF LANDFILL EXCAVATION TO EXTEND TO THE BASE OF THE DEBRIS. LIMIT AND DEPTH OF LANDFILL EXCAVATION TO BE FIELD VERIFIED BY CONFIRMATORY TESTING AND EXCAVATION OF TESTPITS.

Legend:

- CLS53 — SURVEY CONTROL MONUMENT
- 701 — COORDINATE POINT
- HYDROCARBON – TYPE B CONTAMINATED SOIL LOCATION
- LANDFILL EXCAVATION AREA
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

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SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
FOX-4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2011-02-03

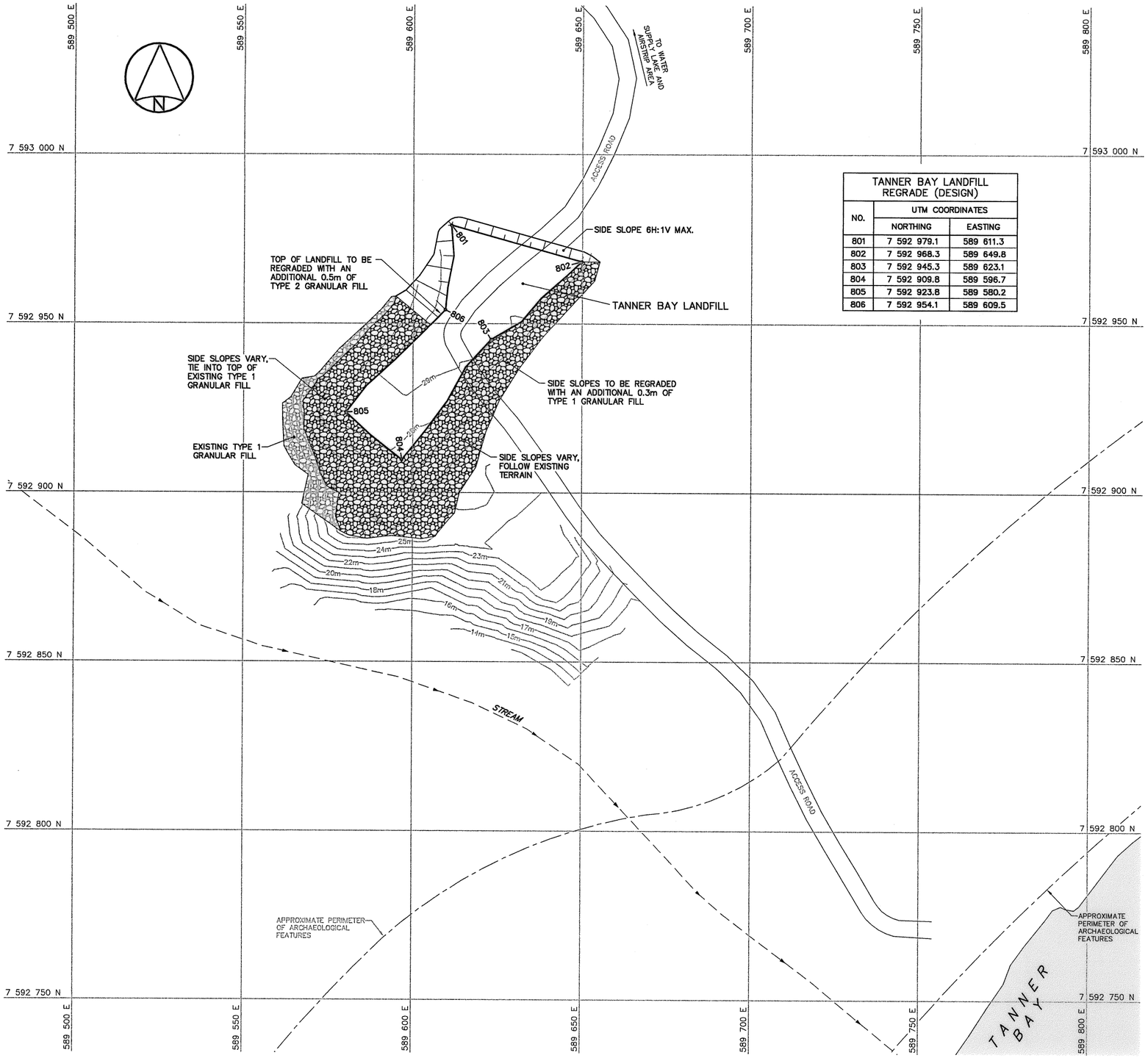
SUBJECT – SUJET

AIRSTRIP AREA
SITE PLAN SHEET 2

PRODUCTION		CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE	TME		DES OFF AGENT CONCEPT
DRAWN DESSINE	IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE	BWF		DES MGR GEST CONCEPT
COORDINATION	RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-C76/2-9101-107

Canada



TANNER BAY LANDFILL REGRADE (DESIGN)		
NO.	UTM COORDINATES	
	NORTHING	EASTING
801	7 592 979.1	589 611.3
802	7 592 968.3	589 649.8
803	7 592 945.3	589 623.1
804	7 592 909.8	589 596.7
805	7 592 923.8	589 580.2
806	7 592 954.1	589 609.5

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

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2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS WITHIN THE PLAN AREA IS TO BE PLACED IN THE NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.

Legend:

801 COORDINATE POINT

BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

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NWT/NU Association of Professional Engineers and Geoscientists

Feb 9/11

AECOM

SCALE – ECHELLE 10 5 0 10 20 30m

PROJECT – PROJET
FOX-4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER: SITING
DATE: 2011-02-03

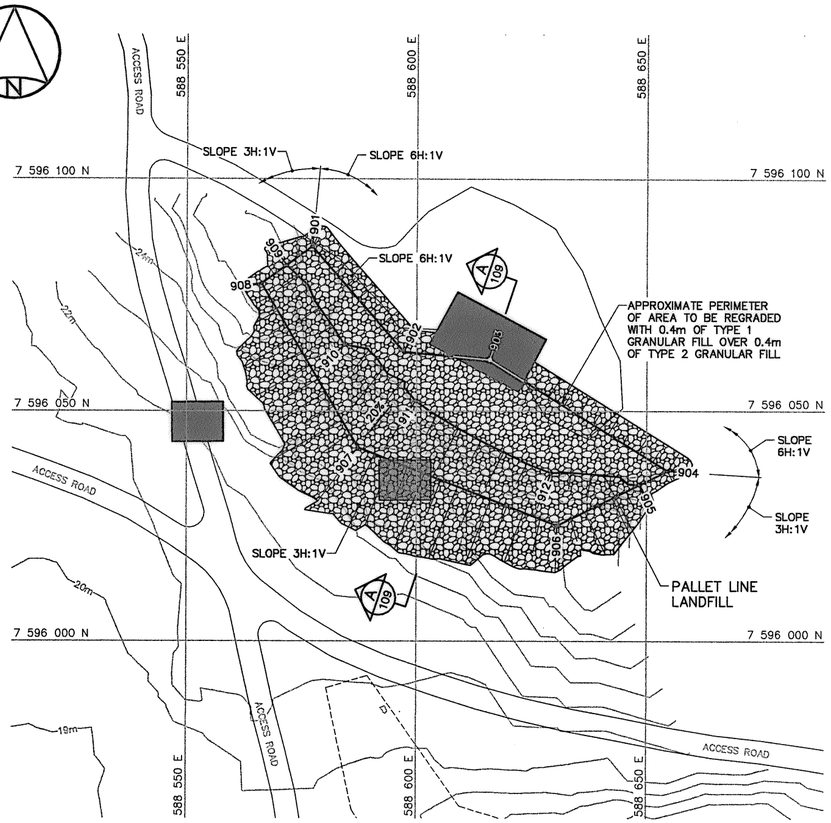
SUBJECT – SUJET

TANNER BAY AREA
SITE PLAN

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE TME		DES OFF AGENT CONCEPT
DRAWN DESSINE IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE BWF		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-C76/2-9101-108

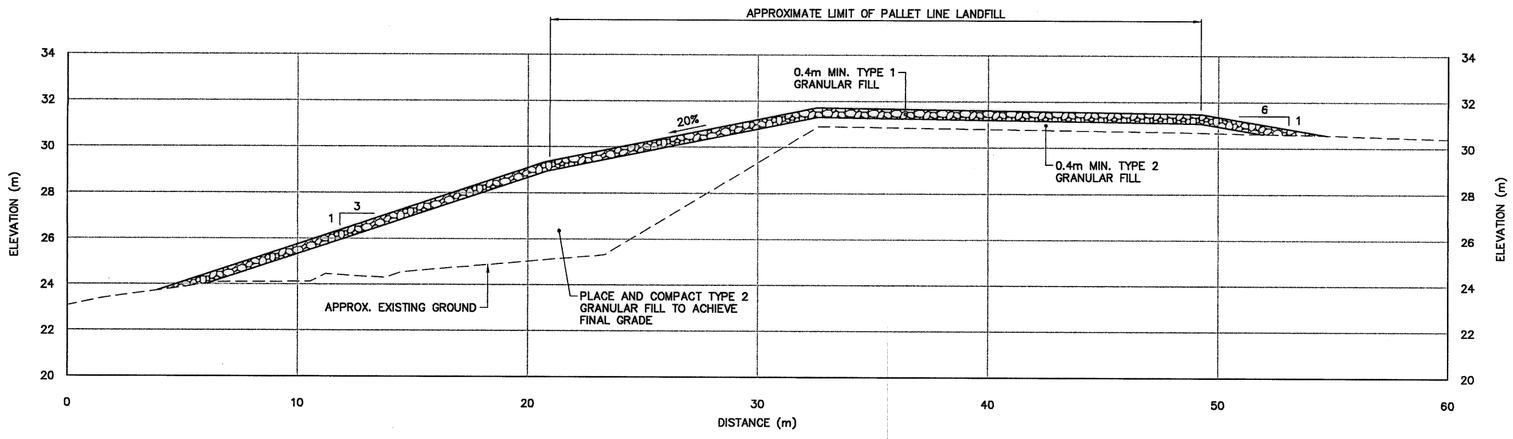
Canada



PALLET LINE LANDFILL REGRADE (DESIGN)		
NO.	UTM COORDINATES	
	NORTHING	EASTING
901	7 596 085.8	588 577.3
902	7 596 062.9	588 597.2
903	7 596 061.2	588 615.8
904	7 596 037.0	588 654.5
905	7 596 033.9	588 648.4
906	7 596 025.1	588 630.5
907	7 596 042.0	588 587.2
908	7 596 077.8	588 566.2
909	7 596 081.8	588 571.7
910	7 596 064.4	588 584.2
911	7 596 052.2	588 599.7
912	7 596 036.5	588 629.1

PALLET LINE LANDFILL PLAN

0 10 20 30m
10 5



SECTION A/109

0 2 4 6m
2 1

National Defence / Défense nationale

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General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS WITHIN THE PLAN AREA IS TO BE PLACED IN THE NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.

Legend:

- 901 — COORDINATE POINT
- DCC TIER I CONTAMINATED SOIL
- DCC TIER II CONTAMINATED SOIL

No.	DATE	REVISION	REVISION	APPR.

PROFESSIONAL ENGINEERS AND GEOSCIENTISTS NWT/NU
Feb 4/11

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SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: FOX-4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER: SITING
DATE: 2011-02-03

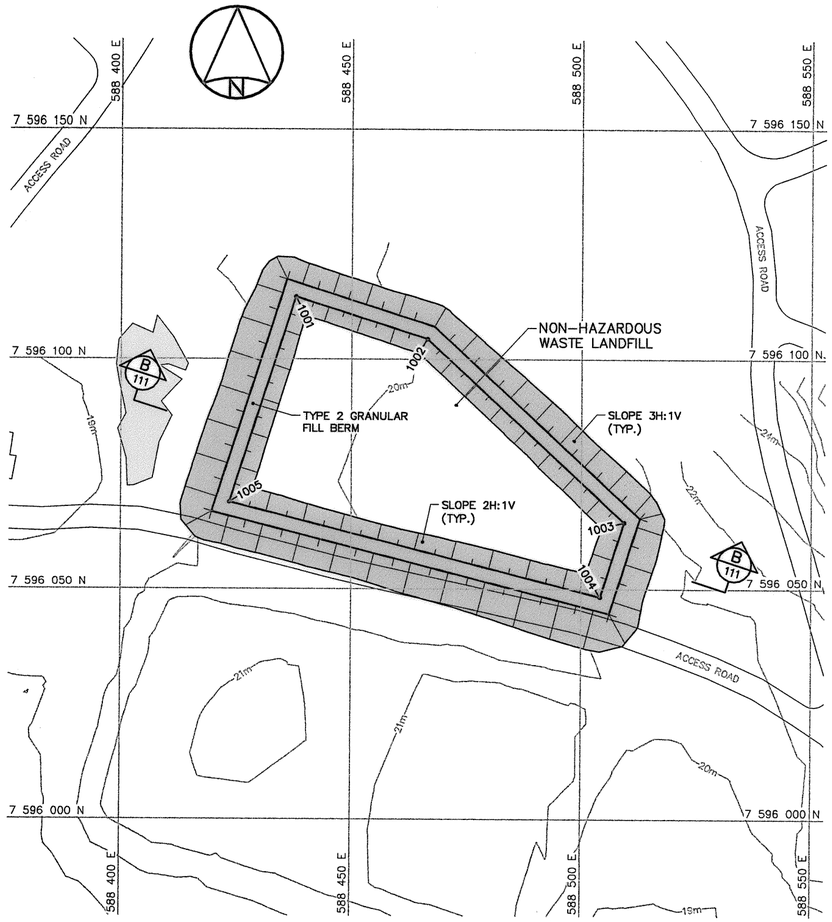
SUBJECT – SUJET:

PALLET LINE LANDFILL
PLAN AND CROSS SECTION

PRODUCTION		CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE	TME		DES OFF AGENT CONCEPT
DRAWN DESSINE	IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE	BWF		DES MGR GEST CONCEPT
COORDINATION	RRM	REVIEWED – REVU	

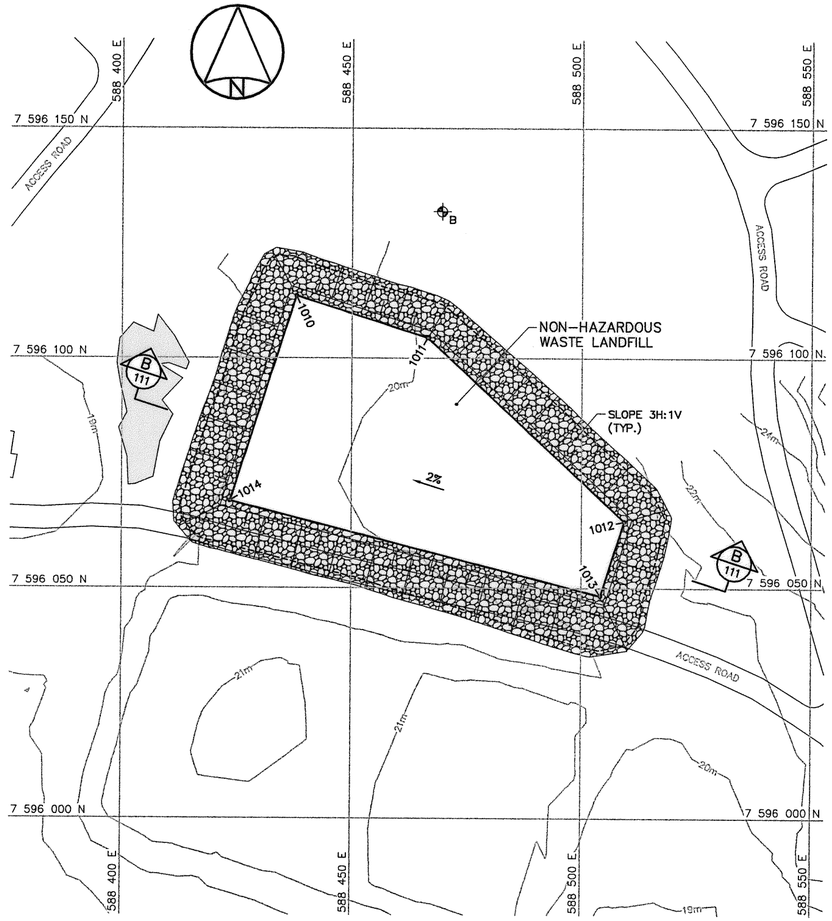
DWG. NO. – DESSIN NO.
H-C76/2-9101-109

Canada



BERM CONSTRUCTION PLAN

NON-HAZARDOUS WASTE LANDFILL BERM (DESIGN)			
NO.	UTM COORDINATES		ELEV.
	NORTHING	EASTING	
1001	7 596 113.7	588 437.9	21.19
1002	7 596 104.5	588 466.5	21.79
1003	7 596 064.5	588 509.3	22.85
1004	7 596 048.3	588 504.1	22.85
1005	7 596 068.9	588 423.5	21.19



FINAL GRADING PLAN

NON-HAZARDOUS WASTE LANDFILL FINAL LANDFILL SURFACE (DESIGN)			
NO.	UTM COORDINATES		ELEV.
	NORTHING	EASTING	
1010	7 596 113.7	588 437.9	22.19
1011	7 596 104.5	588 466.5	22.79
1012	7 596 064.5	588 509.3	23.85
1013	7 596 048.3	588 504.1	23.85
1014	7 596 068.9	588 423.5	22.19

NOTE:
COORDINATE POINTS AND ELEVATIONS PROVIDED ARE TO THE FINAL GRADE OF THE TYPE 2 GRANULAR FILL CAP PRIOR TO THE PLACEMENT OF THE TYPE 1 GRANULAR FILL ON THE SIDE SLOPES.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS WITHIN THE PLAN AREA IS TO BE PLACED IN THE NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. FOR MONITORING WELL INSTALLATION DETAILS, SEE DWG. H-C76/2-9101-117. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.
7. VARIABLE SLOPE ON LANDFILL SURFACE PERMITTED. MINIMUM 2%-MAXIMUM 4%.

Legend:

- 1001 — COORDINATE POINT
- B — PROPOSED BACKGROUND MONITORING WELL LOCATION (1)
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

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Feb 4/11

AECOM

SCALE - ECHELLE 10 5 0 10 20 30m

PROJECT - PROJET
FOX-4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE - METIER: SITING
DATE: 2011-02-03

SUBJECT - SUJET
NON-HAZARDOUS WASTE LANDFILL BERM CONSTRUCTION AND FINAL GRADING PLANS

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDIE THE		DES OFF AGENT CONCEPT
DRAWN DESSINE IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE BWF		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-C76/2-9101-110

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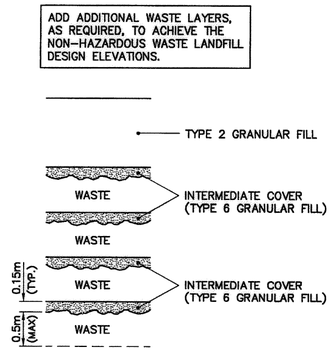
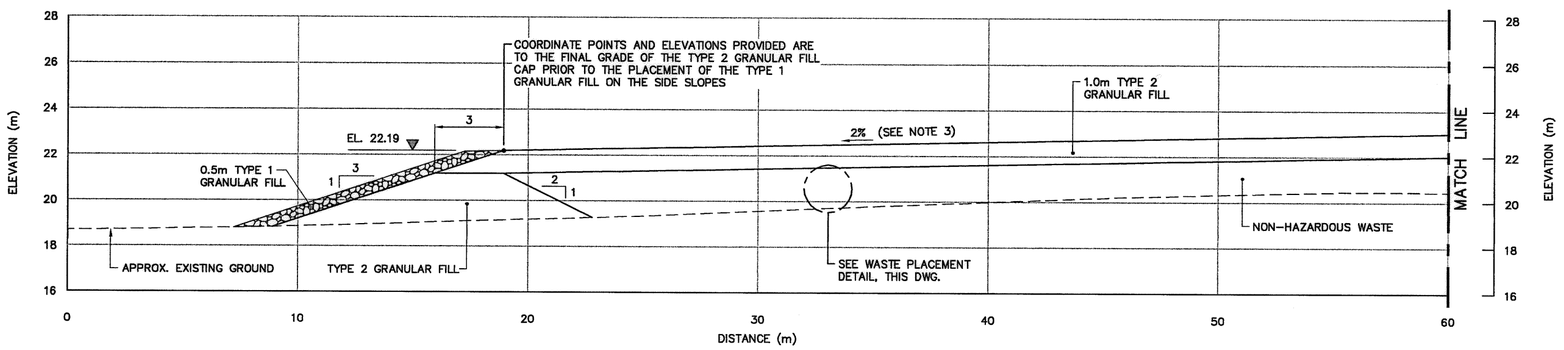
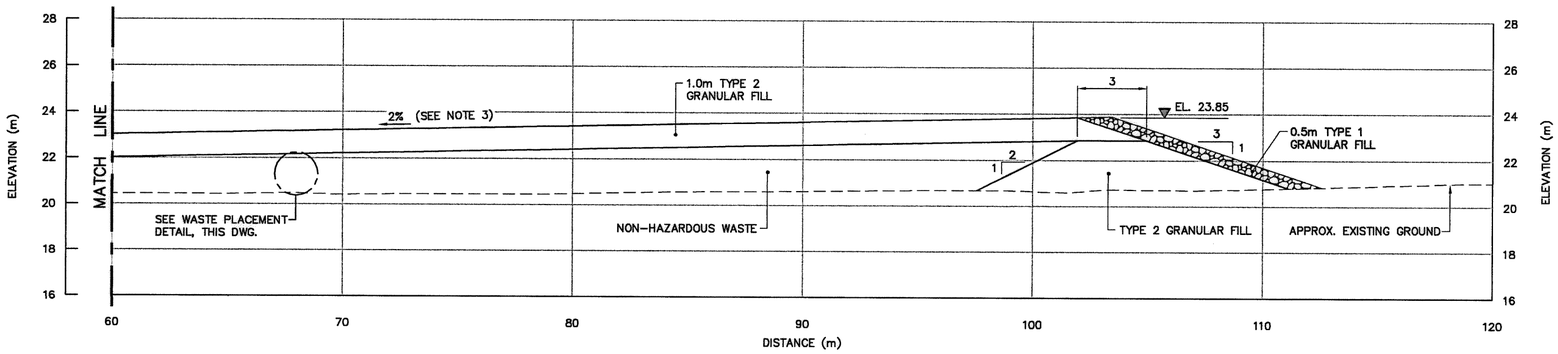


WASTE PLACEMENT DETAIL

SCALE: NTS





SECTION B 110

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. VARIABLE SLOPE ON LANDFILL SURFACE PERMITTED. MINIMUM 2% – MAXIMUM 4%.

Legend:

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Date
PERMIT NUMBER: P639
NWT/NU Association of Professional Engineers and Geoscientists

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SCALE – ECHELLE 2 1 0 2 4 6m

PROJECT – PROJET
FOX–4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2011–02–03

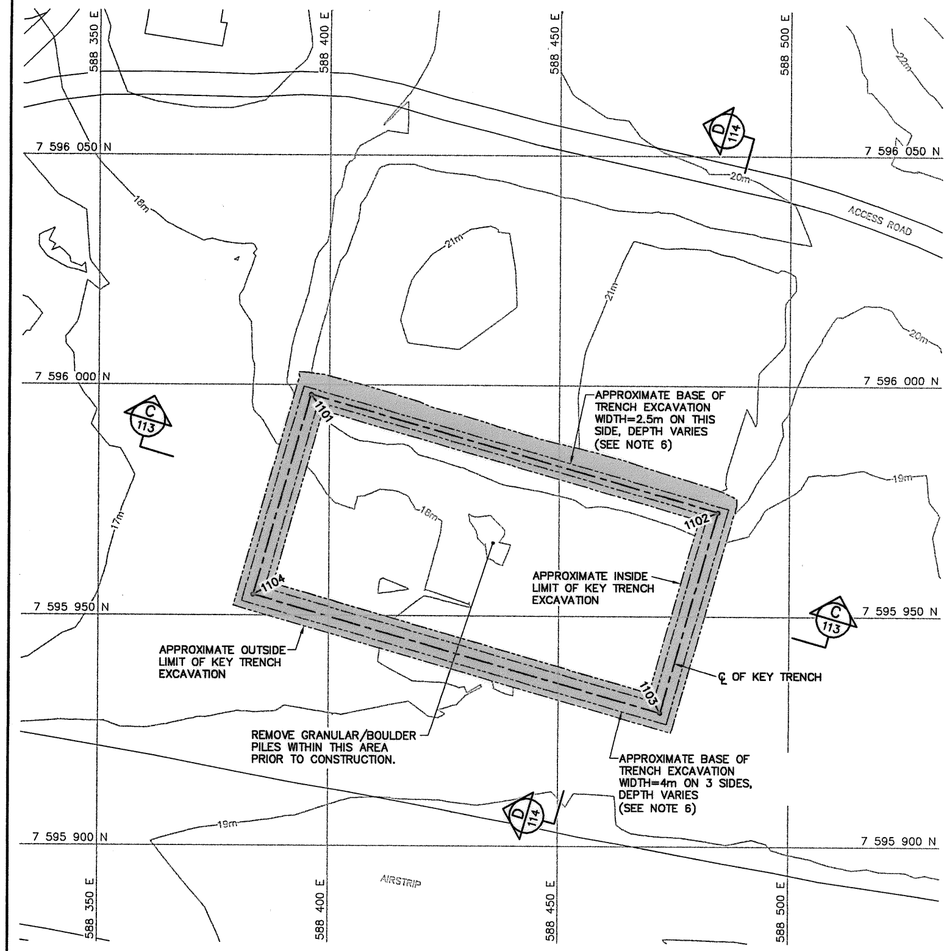
SUBJECT – SUJET

NON–HAZARDOUS WASTE LANDFILL CROSS SECTION

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE TME		DES OFF AGENT CONCEPT
DRAWN DESSINE IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE BWF		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

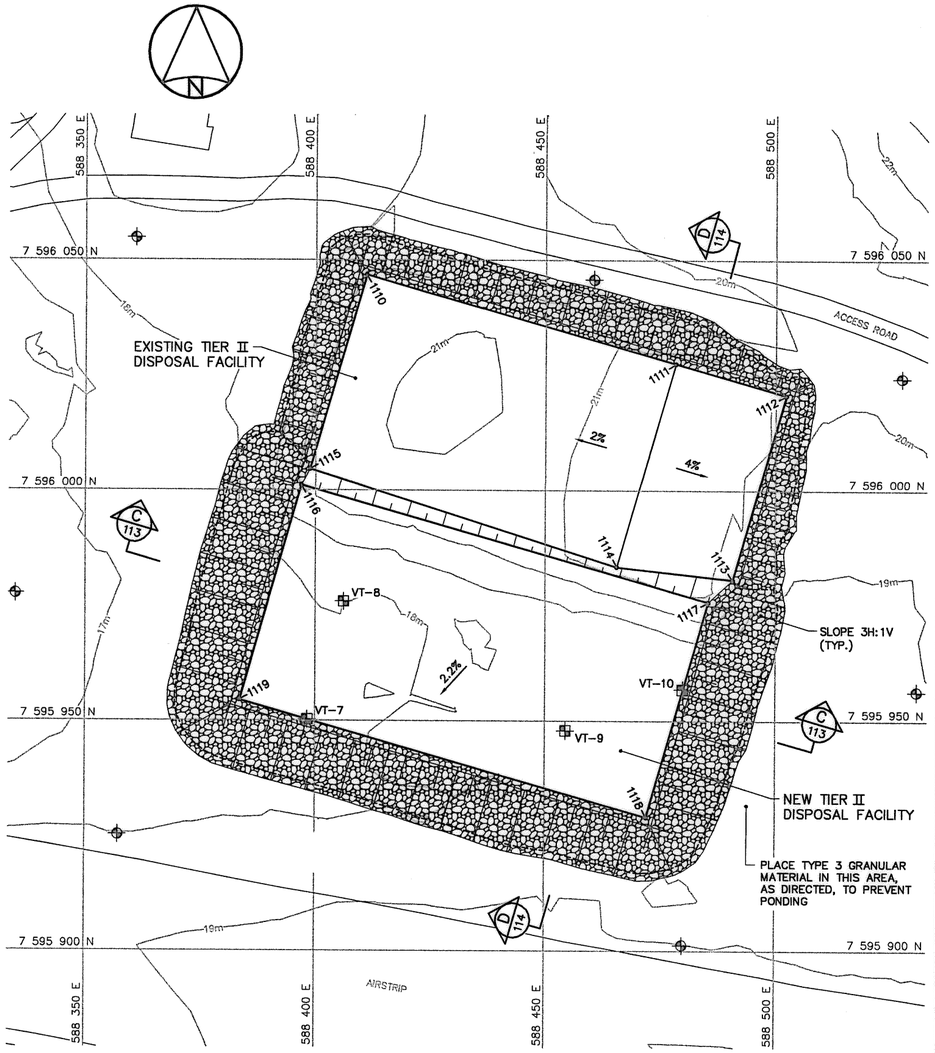
DWG. NO. – DESSIN NO.
H–C76/2–9101–111

Canada



KEY TRENCH EXCAVATION PLAN

TIER II DISPOSAL FACILITY KEY TRENCH EXCAVATION (DESIGN)		
NO.	UTM COORDINATES	
	NORTHING	EASTING
1101	7 595 998.0	588 396.1
1102	7 595 972.6	588 484.5
1103	7 595 929.1	588 472.0
1104	7 595 954.5	588 383.6



GRADING/INSTRUMENTATION PLAN

TIER II DISPOSAL FACILITY FINAL LANDFILL SURFACE (DESIGN)			
NO.	UTM COORDINATES		ELEV.
	NORTHING	EASTING	
1110	7 596 047.0	588 410.9	21.75
1111	7 596 027.7	588 478.2	23.15
1112	7 596 020.8	588 502.3	22.15
1113	7 595 980.6	588 490.7	22.15
1114	7 595 983.3	588 465.5	23.15
1115	7 596 004.7	588 398.8	21.75
1116	7 596 001.1	588 397.0	23.05
1117	7 595 975.7	588 485.4	23.97
1118	7 595 929.1	588 472.0	23.00
1119	7 595 954.5	588 383.6	22.08

NOTE:
COORDINATE POINTS AND ELEVATIONS PROVIDED ARE TO THE FINAL GRADE OF THE TYPE 2 GRANULAR FILL CAP PRIOR TO THE PLACEMENT OF THE TYPE 1 GRANULAR FILL ON THE SIDE SLOPES.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
4. FOR MONITORING WELL INSTALLATION DETAILS, SEE DWG. H-C76/2-9101-117. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.
5. FOR GROUND TEMPERATURE CABLE INSTALLATION DETAILS, SEE DWG. H-C76/2-9101-117. EXACT LOCATIONS TO BE FIELD DETERMINED BY THE ENGINEER.
6. EXCAVATE KEY TRENCH TO SATURATED GROUND, ICE SATURATED PERMAFROST OR SOUND BEDROCK. EXCAVATION DEPTH TO BE FIELD CONFIRMED BY THE ENGINEER.

Legend:

- 1101 — COORDINATE POINT
- PROPOSED MONITORING WELL LOCATION (7)
- PROPOSED VERTICAL GROUND TEMPERATURE CABLE LOCATION (4)

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NORTHWEST TERRITORIES ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS
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NWT/NU Association of Professional Engineers and Geoscientists

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SCALE – ECHELLE 10 5 0 10 20 30m

PROJECT – PROJET
FOX-4 CAPE HOOPER

DEW LINE CLEAN UP

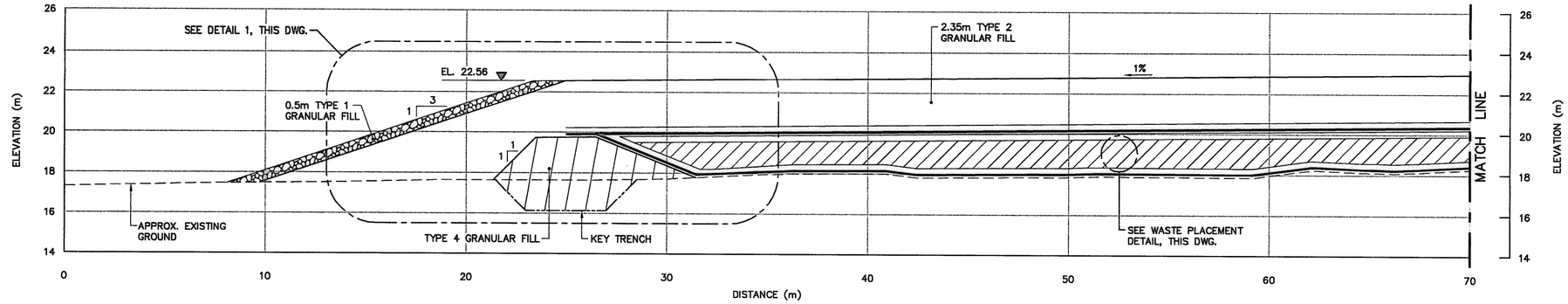
TRADE – METIER	DATE
SITING	2011-02-03

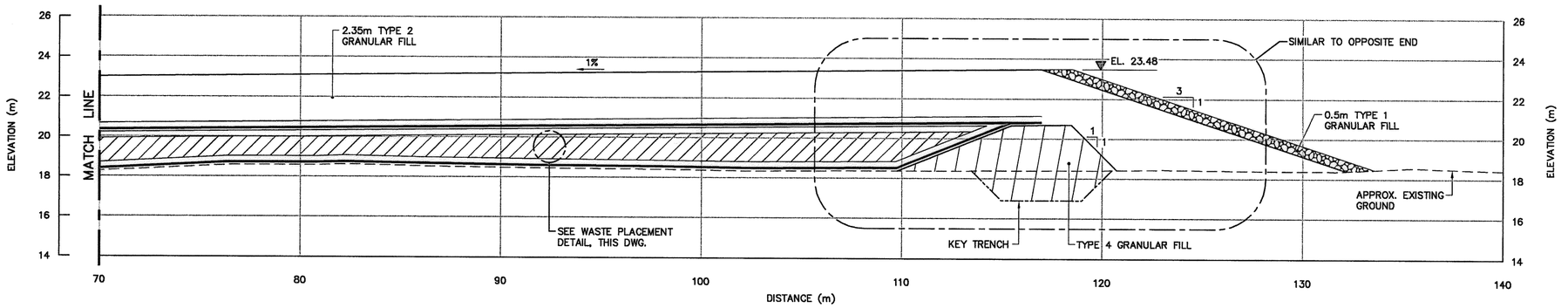
SUBJECT – SUJET
TIER II DISPOSAL FACILITY
KEY TRENCH EXCAVATION PLAN & GRADING/INSTRUMENTATION PLAN

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED / ETUDIE: TME		DES OFF / AGENT CONCEPT
DRAWN / DESSINE: IC/CAE		SECT HD / CHEF SECT
CHECKED / VERIFIE: BWF		DES MGR / GEST CONCEPT
COORDINATION: KRM	REVIEWED – REVU	

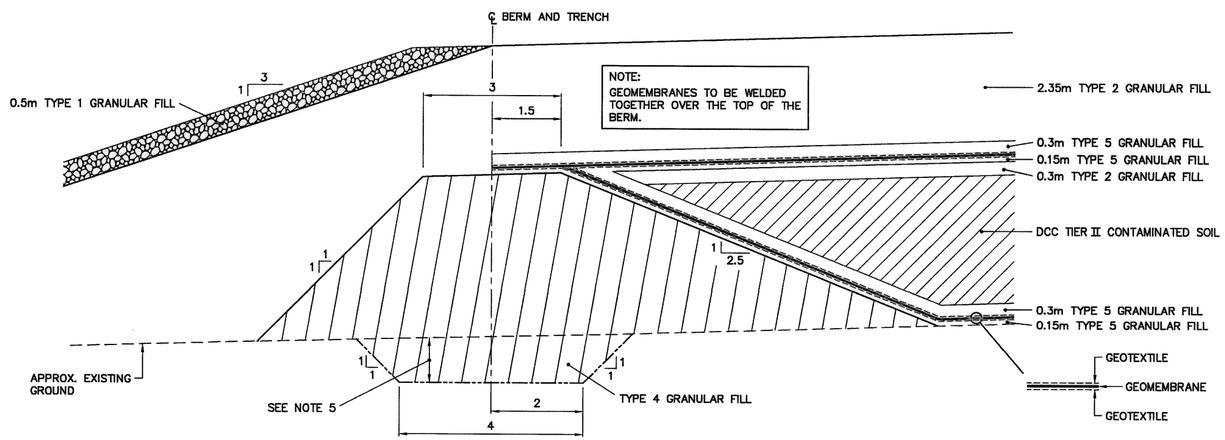
DWG. NO. – DESSIN NO.
H-C76/2-9101-112

Canada



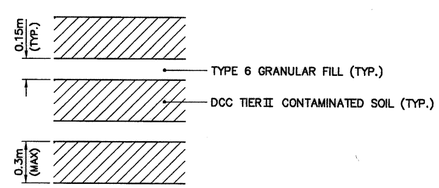


SECTION C / 112



DETAIL 1 / 113

ADD ADDITIONAL TIER II LAYERS, AS REQUIRED, TO ACHIEVE THE TIER II DISPOSAL FACILITY DESIGN ELEVATIONS.



WASTE PLACEMENT DETAIL
SCALE: NTS

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. VARIABLE SLOPE ON LANDFILL SURFACE PERMITTED. MINIMUM 2% – MAXIMUM 4%.
4. TYPE 6 INTERMEDIATE FILL ONLY REQUIRED FOR LANDFILLING OF ORGANIC OR WET SOILS, AS DIRECTED BY THE ENGINEER.
5. EXCAVATE KEY TRENCH TO SATURATED GROUND, ICE SATURATED PERMAFROST OR SOUND BEDROCK. EXCAVATION DEPTH TO BE FIELD CONFIRMED BY THE ENGINEER.
6. PROTECT GEOMEMBRANE LINERS DURING CONSTRUCTION.
7. TYPE 2 GRANULAR FILL PLACED OUTSIDE OF THE TYPE 4 GRANULAR FILL BERMS TO BE PLACED SIMULTANEOUSLY WITH THE TYPE 4 FILL TO PROVIDE STABILITY AND PROTECTION DURING CONSTRUCTION.
8. COVER FINAL LAYER OF TIER II CONTAMINATED SOIL WITH TYPE 6 GRANULAR FILL TO PROVIDE LEVEL SURFACE, AS DIRECTED BY THE ENGINEER.

Legend:

No.	DATE	REVISION	REVISION	APPR.

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NWT/NU Association of Professional Engineers and Geoscientists

AECOM

SCALE – ECHELLE 2 1 0 2 4 6m

PROJECT – PROJET
FOX–4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2011–02–03

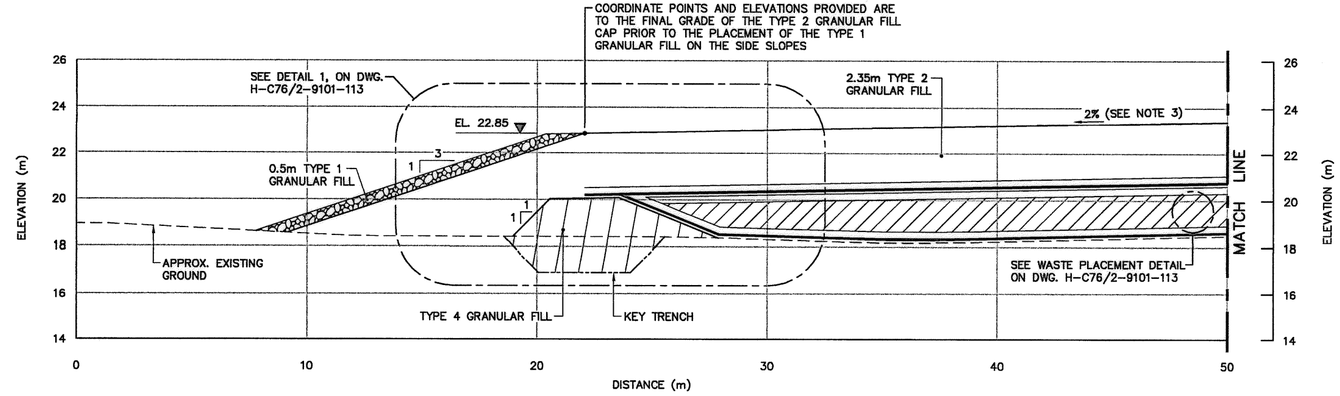
SUBJECT – SUJET

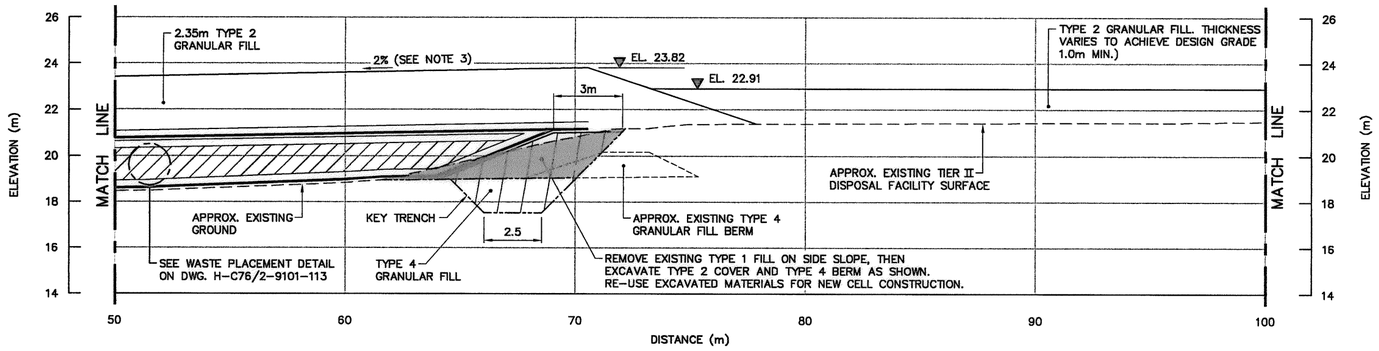
TIER II DISPOSAL FACILITY
CROSS SECTION AND DETAIL

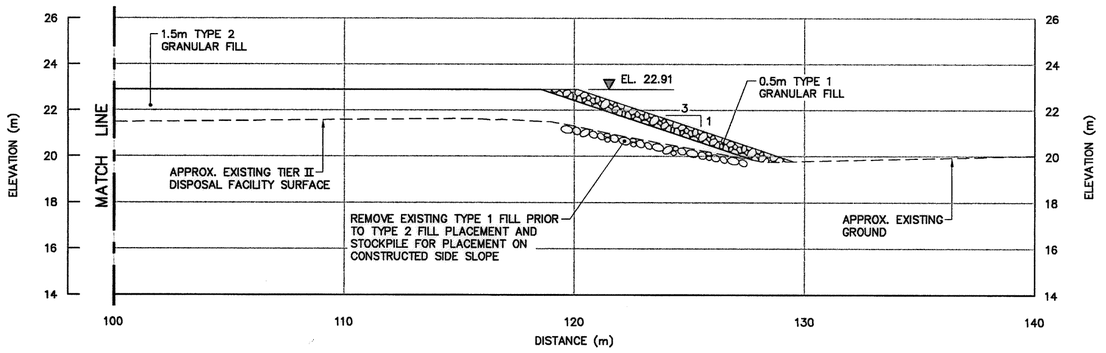
PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE TME		DES OFF AGENT CONCEPT
DRAWN DESSINE IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE BWF		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C76/2–9101–113

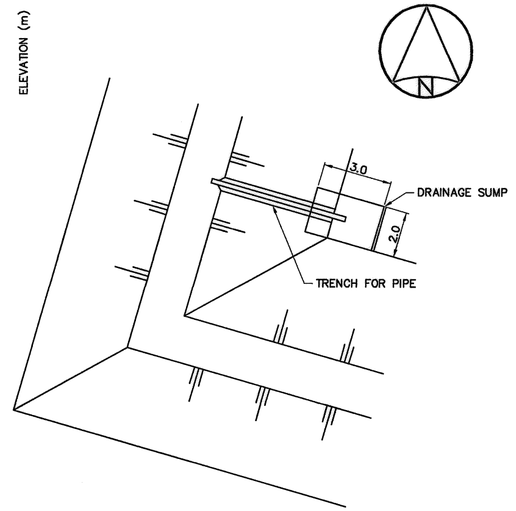
Canada



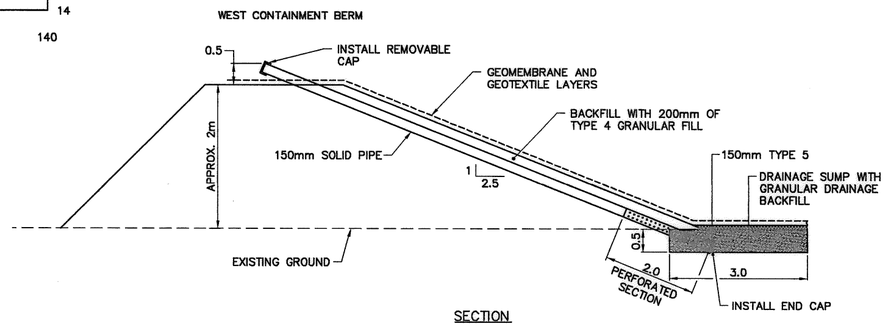




SECTION D 112



PLAN



SECTION

GROUNDWATER ACCESS WELL FOR THE TIER II DISPOSAL FACILITY

NTS

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Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. VARIABLE SLOPE ON LANDFILL SURFACE PERMITTED. MINIMUM 2% – MAXIMUM 4%.
4. TYPE 6 INTERMEDIATE FILL ONLY REQUIRED FOR LANDFILLING OF ORGANIC OR WET SOILS, AS DIRECTED BY THE ENGINEER.
5. EXCAVATE KEY TRENCH TO SATURATED GROUND, ICE SATURATED PERMAFROST OR SOUND BEDROCK. EXCAVATION DEPTH TO BE FIELD CONFIRMED BY THE ENGINEER.
6. PROTECT GEOMEMBRANE LINERS DURING CONSTRUCTION.
7. TYPE 2 GRANULAR FILL PLACED OUTSIDE OF THE TYPE 4 GRANULAR FILL BERMS TO BE PLACED SIMULTANEOUSLY WITH THE TYPE 4 FILL TO PROVIDE STABILITY AND PROTECTION DURING CONSTRUCTION.
8. COVER FINAL LAYER OF TIER II CONTAMINATED SOIL WITH TYPE 6 GRANULAR FILL TO PROVIDE LEVEL SURFACE, AS DIRECTED BY THE ENGINEER.

Legend:

No.	DATE	REVISION	REVISION	APPR.

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SCALE – ECHELLE 2 1 0 2 4 6m

PROJECT – PROJET
FOX-4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2011-02-03

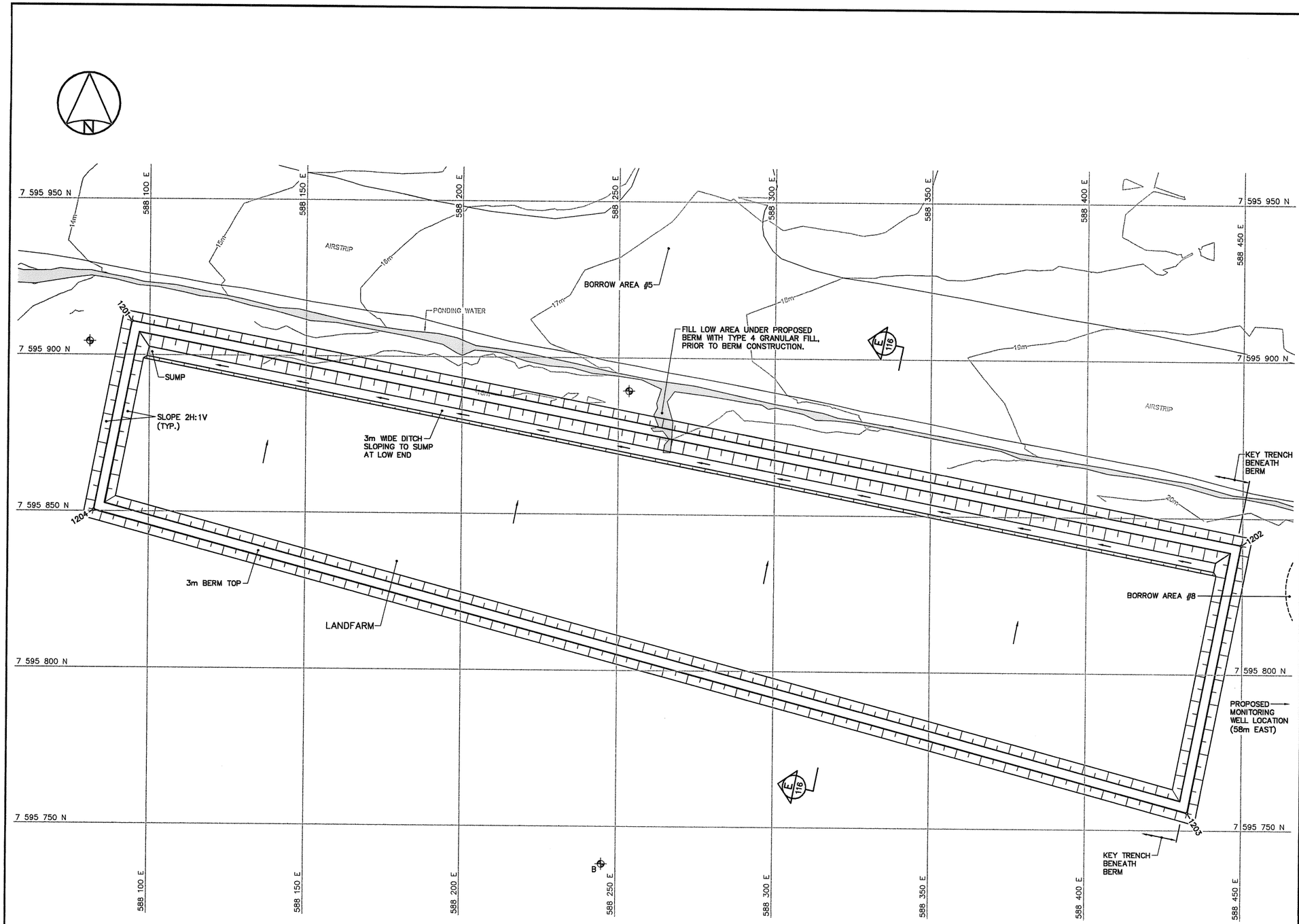
SUBJECT – SUJET

TIER II DISPOSAL FACILITY
CROSS SECTION AND DETAIL

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE TME		DES OFF AGENT CONCEPT
DRAWN DESSINE IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE BWF		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-C76/2-9101-114

Canada



LANDFARM (DESIGN)			
NO.	UTM COORDINATES		ELEV.
	NORTHING	EASTING	
1201	7 595 910.8	588 094.2	–
1202	7 595 841.5	588 449.5	–
1203	7 595 755.6	588 432.8	–
1204	7 595 850.4	588 082.4	–

National Défense / Defence nationale

Headquarters
Quartier général

General Notes:

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2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
4. FOR MONITORING WELL INSTALLATION DETAILS, SEE DWG. H-C76/2-9101-117. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.

Legend:

- 1201 — COORDINATE POINT
- PROPOSED MONITORING WELL LOCATION (2)
- B — PROPOSED BACKGROUND MONITORING WELL LOCATION (1)
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

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AECOM

SCALE – ECHELLE 10 5 0 10 20 30m

PROJECT – PROJET
FOX-4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2011-02-03

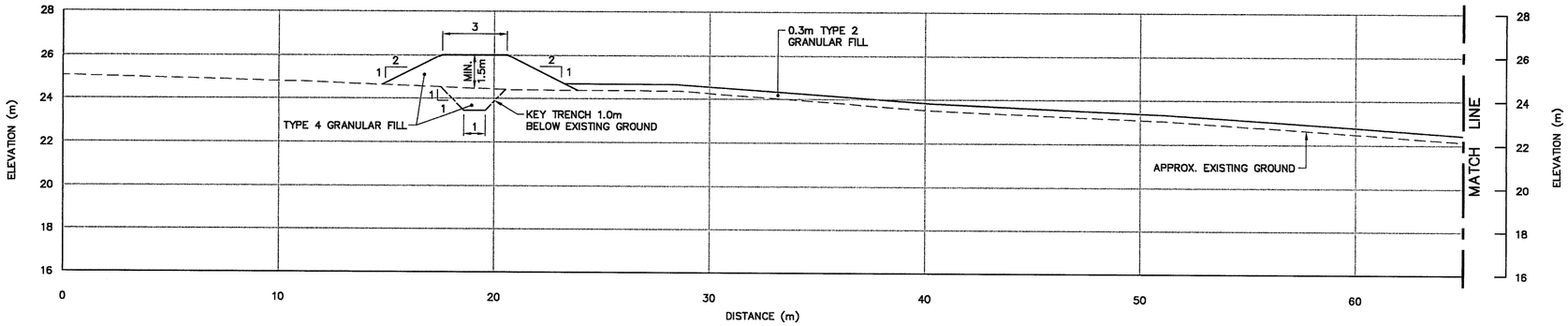
SUBJECT – SUJET

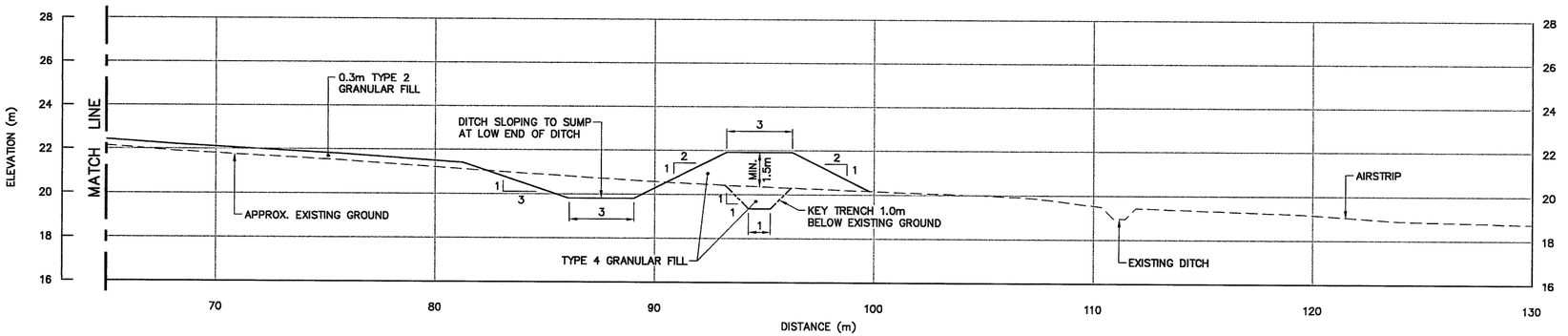
LANDFARM
GRADING PLAN

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE THE		DES OFF AGENT CONCEPT
DRAWN DESSINE IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE BWF		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

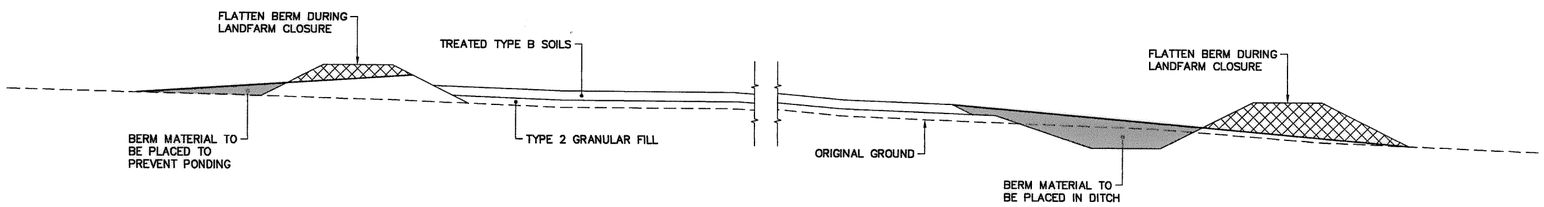
DWG. NO. – DESSIN NO.
H-C76/2-9101-115

Canada





SECTION E 115



LANDFARM CLOSURE DETAIL

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

Legend:

No.	DATE	REVISION	REVISION	APPR.

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SCALE – ECHELLE 2 1 0 2 4 6m

PROJECT – PROJET
FOX–4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2011–02–03

SUBJECT – SUJET
LANDFARM
CROSS SECTION AND
CLOSURE DETAIL

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE TME		DES OFF AGENT CONCEPT
DRAWN DESSINE IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE BWF		DES MGR GEST CONCEPT
COORDINATION RKM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C76/2–9101–116

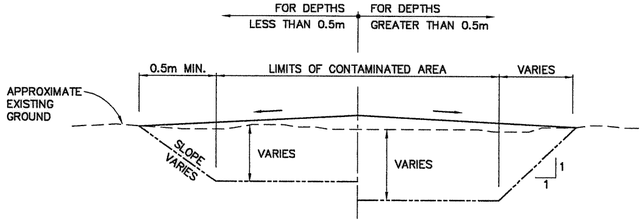
Canada

NOTE:
6 GROUND TEMPERATURE CABLES PREVIOUSLY INSTALLED.
4 GROUND TEMPERATURE CABLES TO BE INSTALLED. SEE NOTE 2.

NOTE:
16 MONITORING WELLS PREVIOUSLY INSTALLED.
12 MONITORING WELLS TO BE INSTALLED. SEE NOTE 2.
7 MONITORING WELLS TO BE DECOMMISSIONED.

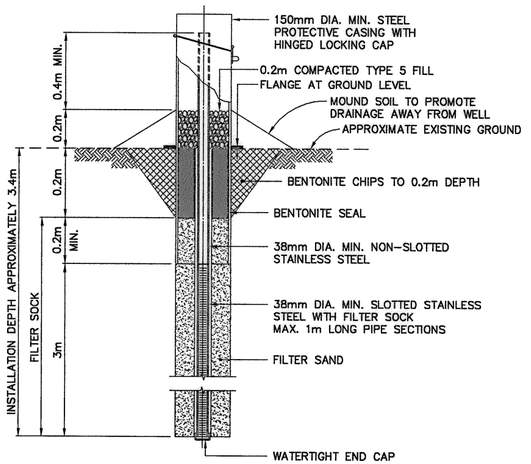
TABLE 1
VERTICAL GROUND TEMPERATURE CABLE INSTALLATION

INSTRUMENT No.	APPROXIMATE DEPTH BELOW FINAL GRADE (m)	COMMENTS
TIER II DISPOSAL FACILITY		
VT–7	5.9	INSTALL THROUGH CENTERLINE BERM TO INVERT OF KEY TRENCH
VT–8	3.6	INSTALL TO 1.0m ABOVE ELEVATION OF BOTTOM LINER
VT–9	3.8	INSTALL TO 1.0m ABOVE ELEVATION OF BOTTOM LINER
VT–10	6.6	INSTALL THROUGH CENTERLINE BERM TO INVERT OF KEY TRENCH

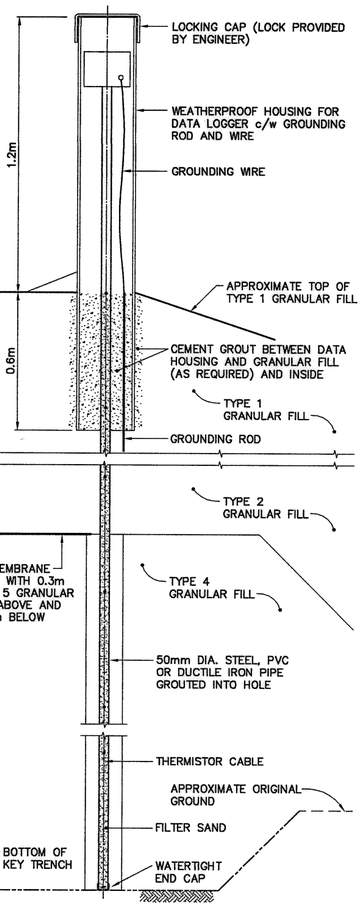


NOTE:
1. MATERIAL TO BE REMOVED: DCC TIER I SOILS TO BE DISPOSED OF IN THE NON–HAZARDOUS WASTE LANDFILL. DCC TIER II SOILS TO BE DISPOSED OF IN THE TIER II SOIL DISPOSAL FACILITY. HYDROCARBON TYPE B SOILS PLACED IN THE LANDFARM AND TREATED.
2. TYPE 3 GRANULAR MATERIAL TO BE PLACED IN EXCAVATION, COMPACTED AND MOUNDED TO 100mm ABOVE GROUND SURFACE TO PROMOTE DRAINAGE, UNLESS NOTED OTHERWISE.

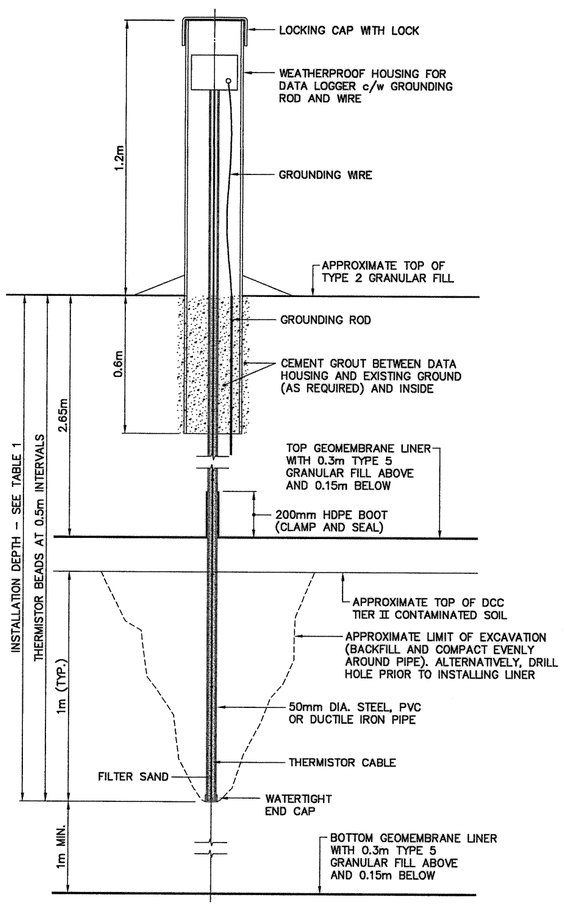
TYPICAL CONTAMINATED SOIL EXCAVATION SECTION
SCALE: NTS



TYPICAL MONITORING WELL/ BACKGROUND MONITORING WELL
SCALE: NTS
FOR BEDROCK DEPTH < 0.7m BELOW GROUND SURFACE

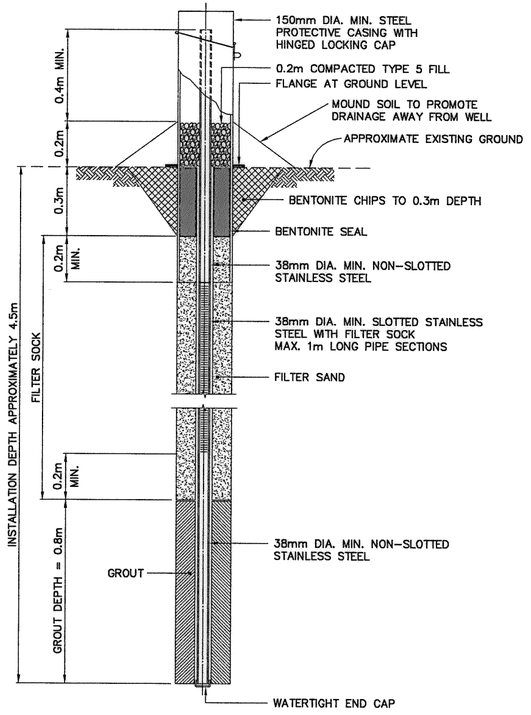


TYPICAL VERTICAL GROUND TEMPERATURE CABLE INSTALLATION–CENTRELINE OF TIER II DISPOSAL FACILITY BERM
SCALE: NTS
VT–7 AND VT–10



TYPICAL VERTICAL GROUND TEMPERATURE CABLE INSTALLATION–WITHIN DCC TIER II CONTAMINATED SOIL
SCALE: NTS
VT–8 AND VT–9

MINIMUM 2.5m OF SCREEN AND 0.5m EMBEDMENT INTO SOUND BEDROCK IF SOUND BEDROCK IS ENCOUNTERED.



TYPICAL MONITORING WELL/ BACKGROUND MONITORING WELL
SCALE: NTS
FOR BEDROCK DEPTH > 0.7m BELOW GROUND SURFACE

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. APPROXIMATE LOCATIONS FOR INSTRUMENTATION ARE SHOWN ON THE DRAWINGS. ALL LOCATIONS TO BE FIELD CONFIRMED BY THE ENGINEER.
3. MOUND FILL AROUND CASING TO PROMOTE DRAINAGE AWAY FROM INSTRUMENT.
4. PROVIDE THERMISTOR BEADS AT 0.5m MAXIMUM INTERVALS, INCLUDING ONE AT THE BOTTOM OF THE INSTALLATION AND ONE WITHIN A 0.5m DEPTH FROM FINAL DESIGN SURFACE IN EACH INSTALLATION.

Legend:

No.	DATE	REVISION	REVISION	APPR.

PERMIT TO PRACTICE
AECOM Canada Ltd.
Signature
Date
PERMIT NUMBER: P639
NWT/NU Association of Professional Engineers and Geoscientists

AECOM

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: FOX–4 CAPE HOOPER

DEW LINE CLEAN UP

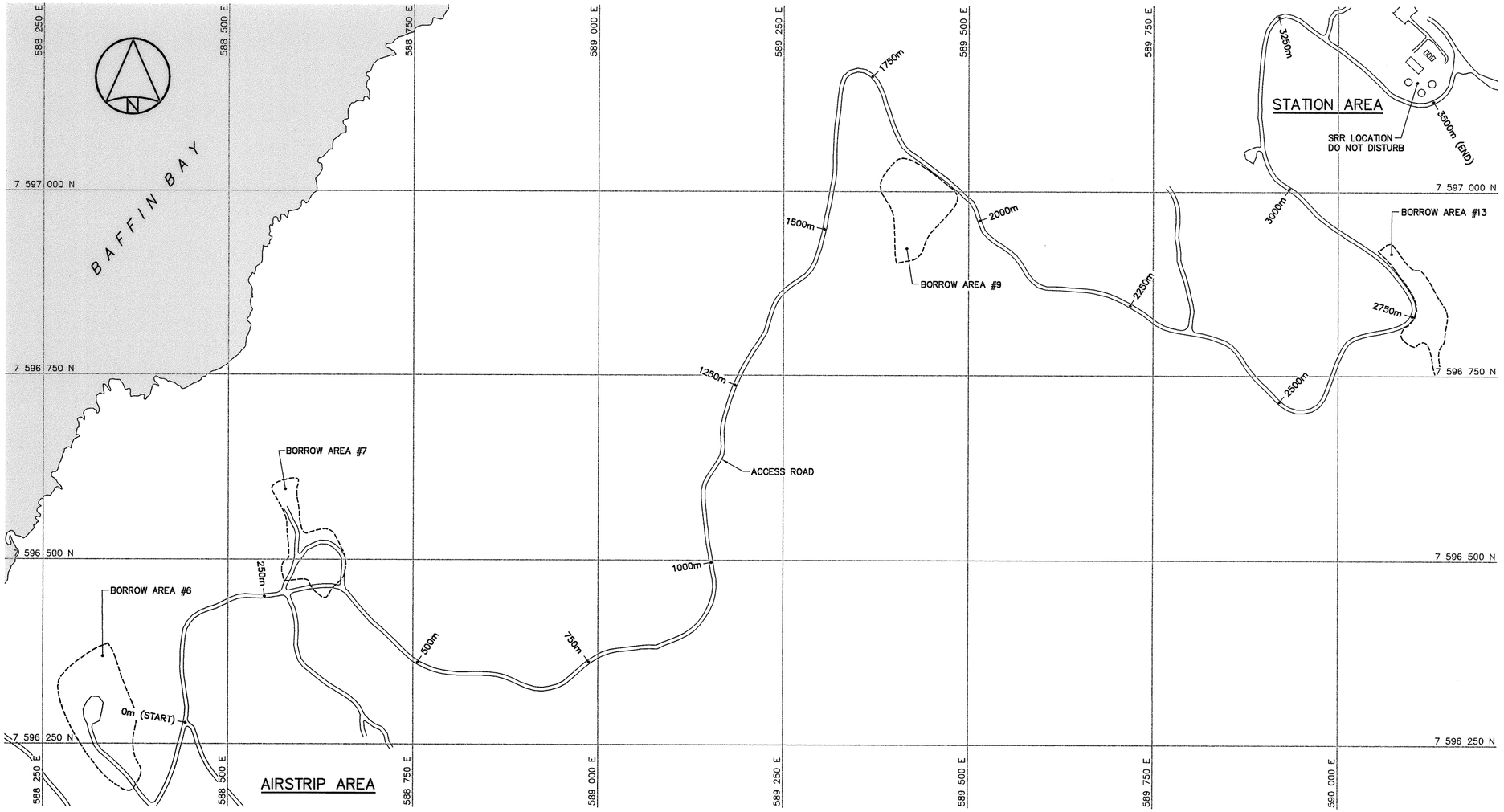
TRADE – METIER: SITING
DATE: 2011–02–03

SUBJECT – SUJET: MISCELLANEOUS DETAILS

PRODUCTION		CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE	TME		DES OFF AGENT CONCEPT
DRAWN DESSINE	IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE	BWF		DES MGR GEST CONCEPT
COORDINATION	RRM	REVIEWED – REVU	

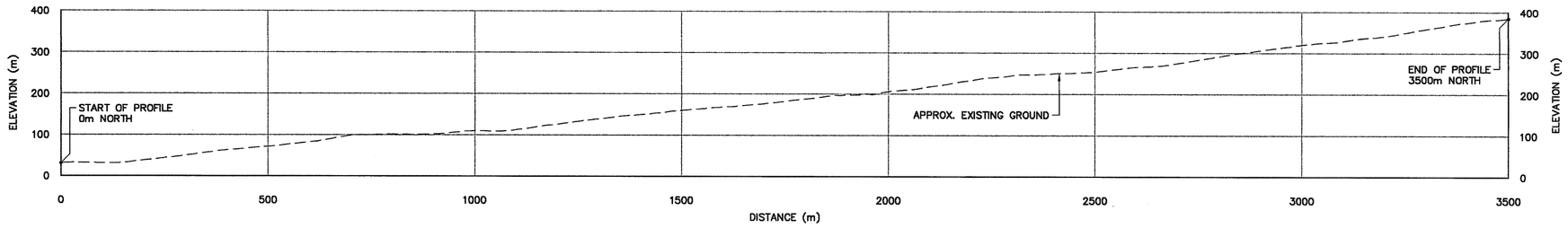
DWG. NO. – DESSIN NO.
H–C76/2–9101–117

Canada



ACCESS ROAD PLAN NORTH OF AIRSTRIP AREA

0 50 100 150m
50 25



ACCESS ROAD PROFILE NORTH OF AIRSTRIP AREA

0 100 200 300m
100 50

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

Legend:

- APPROXIMATE EXTENT OF BORROW AREAS
- ACCESS ROAD
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

PERMIT TO PRACTICE
AECOM Canada Ltd.
Signature
Date
PERMIT NUMBER: P639
NWT/NU Association of Professional Engineers and Geoscientists

AECOM

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: FOX–4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER: SITING
DATE: 2011–02–03

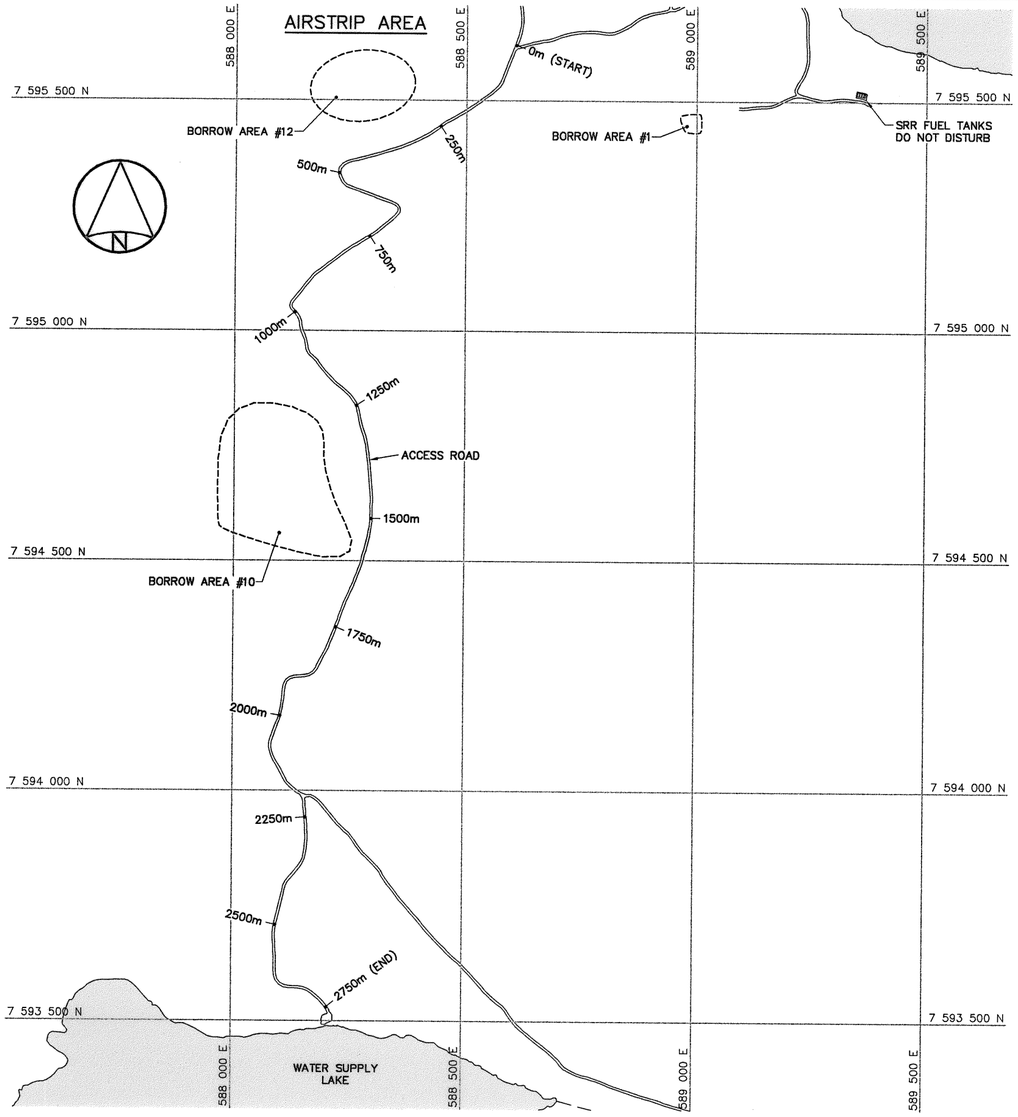
SUBJECT – SUJET:

ACCESS ROAD PLAN AND PROFILE NORTH OF AIRSTRIP AREA

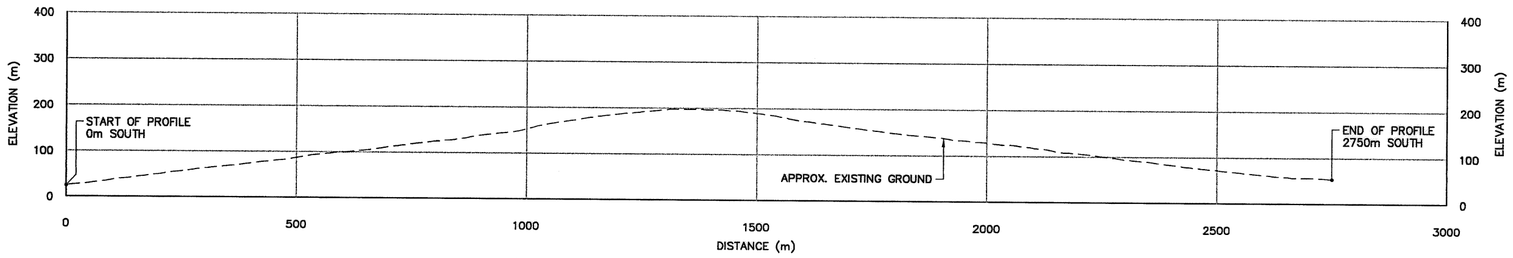
PRODUCTION		CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE	THE		DES OFF AGENT CONCEPT
DRAWN DESSINE	IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE	BWF		DES MGR GEST CONCEPT
COORDINATION	RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-C76/2-9101-118

Canada



ACCESS ROAD PLAN SOUTH OF AIRSTRIP AREA



ACCESS ROAD PROFILE SOUTH OF AIRSTRIP AREA

National Défense / Defence nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO UTM ZONE 19N, NAD83 (CSRS). ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

Legend:

- APPROXIMATE EXTENT OF BORROW AREAS
- ACCESS ROAD
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

PERMIT TO PRACTICE
AECOM Canada Ltd.
Signature
Date
PERMIT NUMBER: P639
NWT/NU Association of Professional Engineers and Geoscientists

Feb 4/11

AECOM

SCALE – ECHELLE 100 50 0 100 200 300m

PROJECT – PROJET
FOX–4 CAPE HOOPER

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2011–02–03

SUBJECT – SUJET

ACCESS ROAD PLAN AND PROFILE SOUTH OF AIRSTRIP AREA

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE TME		DES OFF AGENT CONCEPT
DRAWN DESSINE IC/CAE		SECT HD CHEF SECT
CHECKED VERIFIE BWF		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

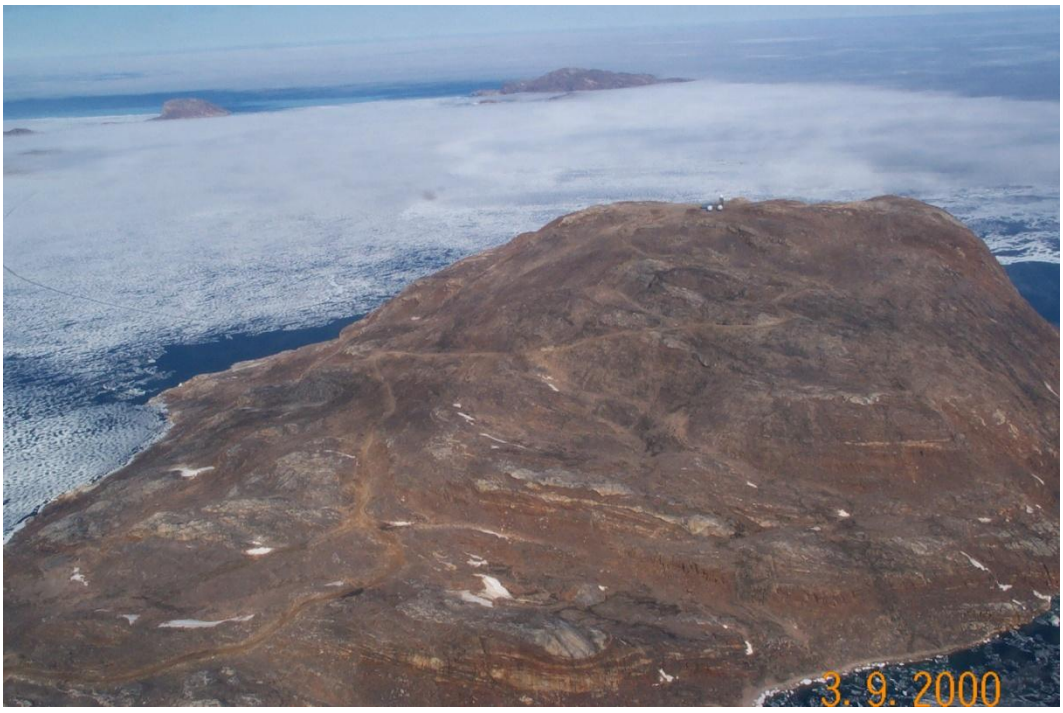
DWG. NO. – DESSIN NO.
H–C76/2–9101–119

Canada

Appendix B

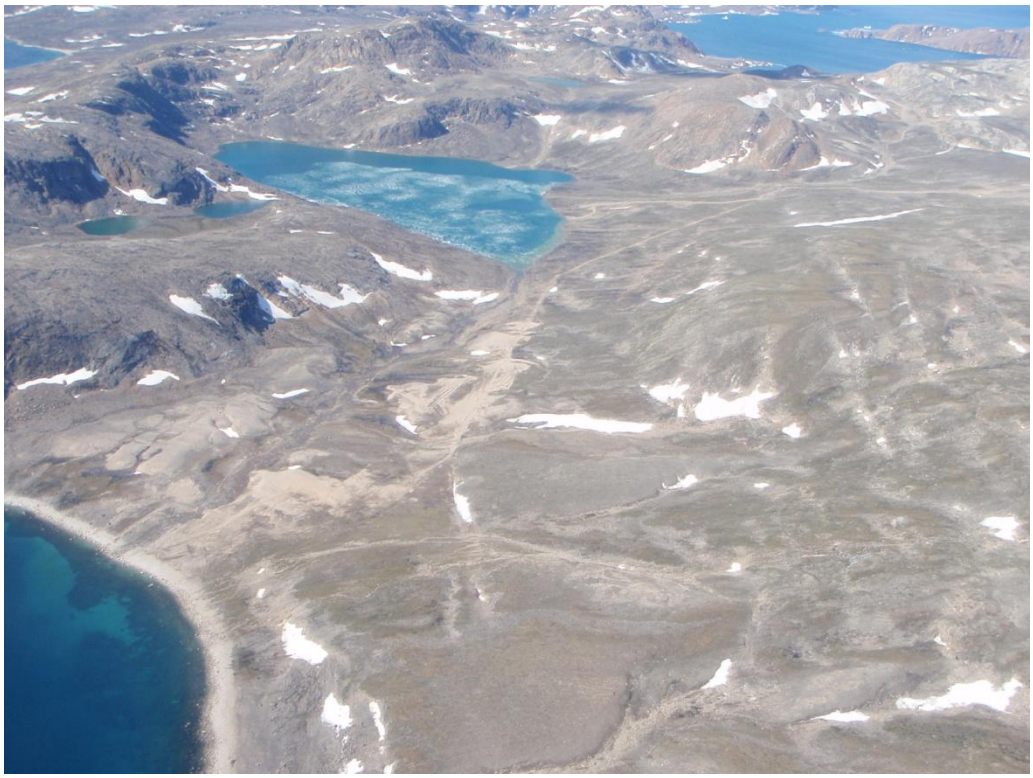
Site Photographs

Photograph 1. Aerial View Airstrip Area



Photograph 2. Aerial View Road from Airstrip Area to Station Area

Photograph 3. Aerial View of Station Area



Photograph 4. Aerial View of Tanner Bay and Water Supply Lake

Photograph 5. Aerial View of Airstrip Landfills including Existing Lower Site Landfill and Tier II Facility

Photograph 6. Overview of Lower Site Landfill and Tier II Facility

Photograph 7. Lower Site Landfill from Northeast Corner

Photograph 8. South Slope of Tier II Disposal Facility Looking East

Photograph 9. South Slope of Tier II Disposal Facility Looking West

Photograph 10. View of Airstrip Landfill Area from Upper Site

Photograph 11. Aerial View of Airstrip Landfill Area

Photograph 12. Erosion Channel and Debris in Airstrip Landfill

Photograph 13. Airstrip Landfill and Erosion Channel

Photograph 14. Top Surface of Barrel Dump Landfill

Photograph 15. View of Barrell Dump Landfill from Top Surface

Photograph 16. Slump Block in Barrel Dump Landfill

Photograph 17. Barrel Dump Landfill Slope and Toe

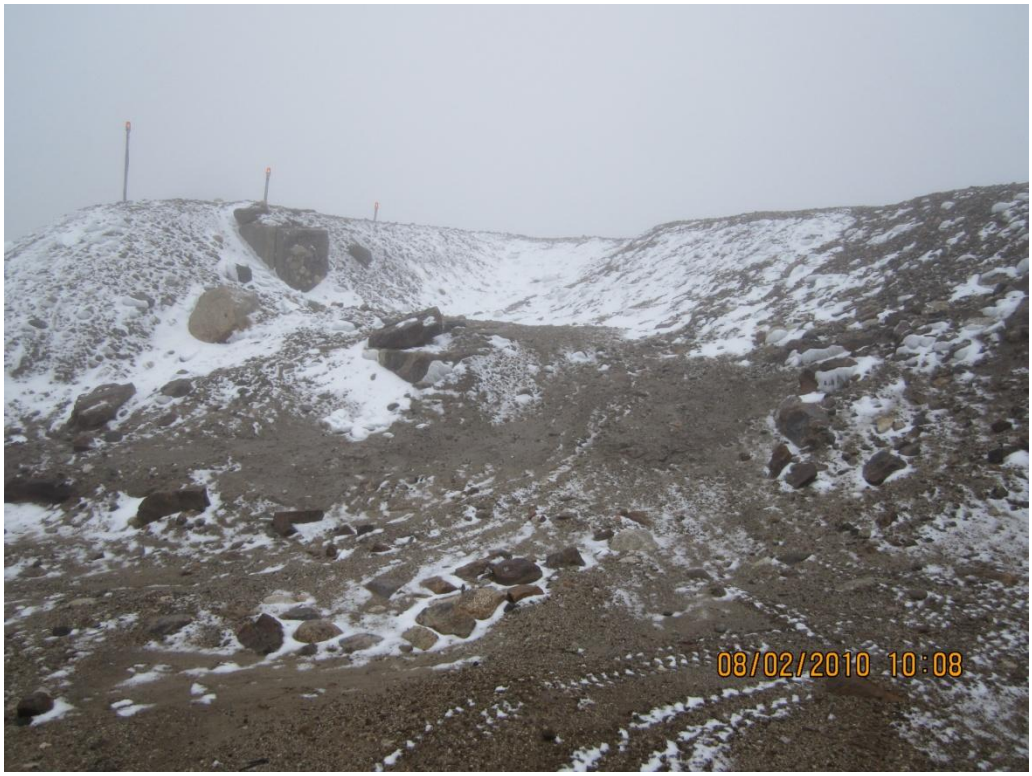
Photograph 18. Garbage Disposal Landfill

Photograph 19. Partially Buried Debris in Garbage Disposal Landfill

Photograph 20. Partially Buried Debris in Garbage Disposal Landfill

Photograph 21. Battery Debris in Garbage Disposal Landfill

Photograph 22. Watercourse in Garbage Disposal Landfill



Photograph 23. Outer Slope of Helipad Landfill – East

Photograph 24. Outer Slope of Helipad Landfill – East

Photograph 25. Overview of Helipad Landfill - West

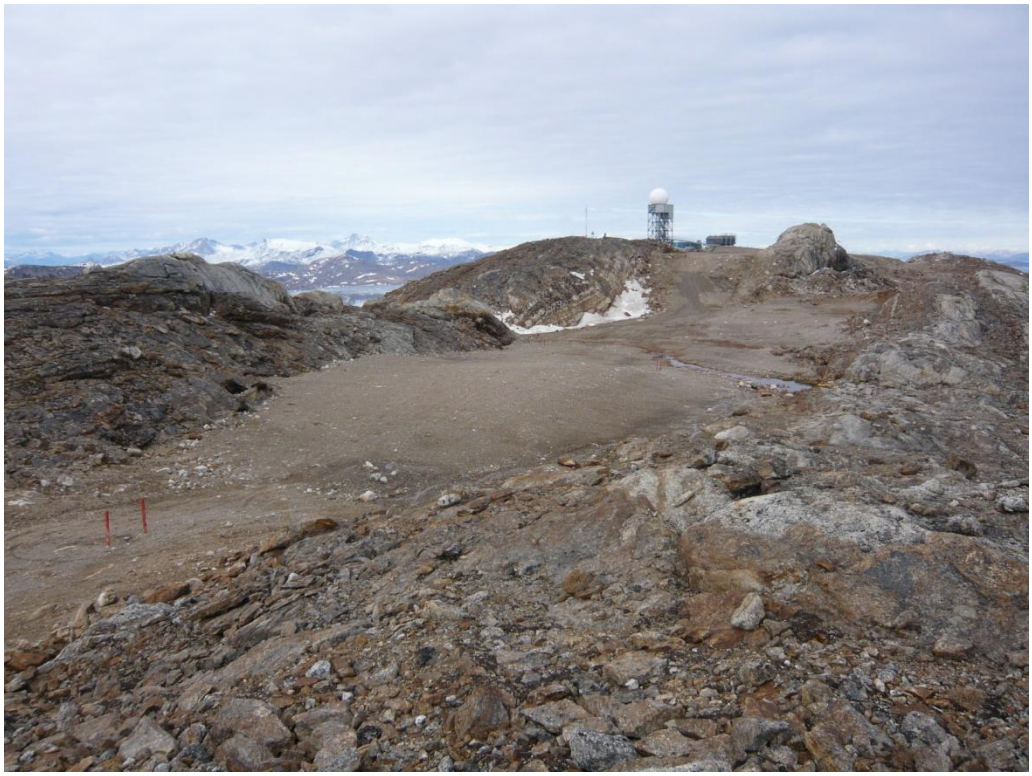
Photograph 26. West Side of Helipad Landfill - West

Photograph 27. North Slope of Helipad Landfill - West

Photograph 28. HVS Buried Debris Area

Photograph 29. Toe of Pallet Line Landfill

Photograph 30. Toe of Pallet Line Landfill and Drainage Channel



Photograph 31. Station Area Landfill

Photograph 32. North Slope of Tanner Bay Landfill

Photograph 33. South Face of Tanner Bay Landfill

Photograph 34. Debris Area 1 – Partially Submerged Barrel

Photograph 35. Debris Area 1 – Partially Buried and Scattered Debris

Photograph 36. Debris Area 1 – Scattered Debris

Photograph 37. Debris Area 2 – Wooden Transformer Platform

Photograph 38. Debris Area 3 – Partially Buried Debris

Photograph 39. Debris Area 3 – Scattered Debris

Photograph 40. Debris Area 4 – Partially Buried Debris

Photograph 41. Debris Area 5 – HVS Scattered Debris Area

Photograph 42. Debris Area 6 – Scattered Debris

Photograph 43. Debris Area 6 – Scattered Debris

Photograph 44. Major Road Repair Area - Station Road Area 1 of 4

Photograph 45. Major Road Repair Area - Station Road Area 1 of 4

Photograph 46. Major Road Repair Area - Station Road Area 2 of 4

Photograph 47. Major Road Repair Area - Station Road Area 2 of 4

Photograph 48. Major Road Repair Area - Station Road Area 2 of 4

Photograph 49. Major Road Repair Area - Station Road Area 3 of 4

Photograph 50. Major Road Repair Area - Station Road Area 3 of 4

Photograph 51. Major Road Repair Area - Station Road Area 3 of 4

Photograph 52. Major Road Repair Area - Station Road Area 4 of 4

Photograph 53. Major Road Repair Area - Station Road Area 4 of 4

Photograph 54. Major Road Repair Area - Tanner Bay Road

Photograph 55. Major Road Repair Area - Tanner Bay Road

Photograph 56. Major Road Repair Area - Tanner Bay Road

Photograph 57. Road Washout – Station Road

Photograph 58. Road Washout – Tanner Bay Road