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Defence Construction Canada

Clean Up of the FOX-3, Dewar Lakes

DEW Line Site

Prepared by:
UMA Engineering Ltd.
2540 Kensington Road NW
Calgary, AB T2N 3S3

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Revision	Date	Issue/Revision Description

UMA ENGINEERING LTD.

Report prepared by:

Eva Schulz, P.Ag.
Environmental Scientist

Report reviewed by:

Douglas Craig, M.Sc.
Environmental Officer
(Defence Construction Canada)

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1.0 Site Description

1.1 Location

The FOX-3, Dewar Lakes DEW Line site is located in the central area of Baffin Island in the Nunavut Territory. The station area is approximately 6 km northwest of Dewar Lakes, near which the airstrip was built. There is no direct sea access from this site. The nearest community is Hall Beach, approximately 400 km west of the site.

1.2 History

The FOX-3 site was constructed in the 1950's as part of the Distant Early Warning (DEW) Line, which provided radar surveillance of the northern approaches to North America. In March 1985, Canada and the United States agreed to modernize the North American Air Defence System by closing the remaining 21 DND DEW Line sites by the early 1990's, and build the North Warning System (NWS).

In 1992, the DEW Line Clean Up Protocol was developed by the Environmental Sciences Group (ESG) of the Royal Military College of Canada and was reviewed and approved by federal and territorial environmental officials. The protocol includes procedures for dealing with contaminated soil, waste oil, landfills, wastewater, debris and hazardous materials. In 1998, the Environmental Provisions of the Cooperation Agreement between DND and the NTI were implemented to provide the approach necessary to restore the sites to an environmentally safe condition and prevent the migration of contaminants into the Arctic food chain.

1.3 Project Activities

The purpose of the proposed project is to provide remedy for previous activities that occurred as a result of the operation of the former DEW Line site. Specifically, the clean up is to prevent the release of physical debris and/or contaminants into the environment.

In general, during the construction phase of the clean up, existing facilities no longer required for the operation of the NWS will be demolished. The demolition wastes will be segregated into hazardous and non-hazardous materials and disposed of appropriately. Contaminated soils identified during the field investigations will be excavated and properly disposed of in on-site engineered landfills or at off-site facilities if characterized as hazardous. Scattered surface debris and partially buried debris on-site will also be collected and disposed of. New landfills will be constructed to contain the non-hazardous contaminated soil and demolition waste generated during the clean up. Existing landfills within the site will be remediated, as required. Disturbed areas will be physically restored to a stable condition shaped to match the existing terrain. The detailed work program is provided in Section 5.

1.4 Schedule

FOX-3 underwent a detailed site investigation in 2006, and is scheduled for clean up beginning in 2010 as part of the DLCU project, with completion expected in 2012. The contractor will mobilize to the site in August 2010, by barge or airlift and set up a temporary construction camp. Clean up activities are expected to continue through to 2012, depending on the contractors' approach and weather conditions.

The expected duration of annual clean up activities on site will generally be from June to October. During the winter months, work will cease and equipment and facilities on site will be winterized. It is expected that the contractors' workforce and accessory personnel will mobilize to and from the site from nearby northern communities. Completion of the clean up and demobilization of the contractors' facilities and

equipment is anticipated for October 2012. Long-term monitoring of the landfills will begin once clean up is completed and will continue for a 25-year period. After 25 years, the monitoring requirements are re-evaluated.

2.0 Background Information

2.1 Contact Information

DEW Line Clean Up - Project Management Office
Defence Construction Canada (on behalf of the Director General Environment, Department of National Defence)
Constitution Square, Suite 1720
350 Albert Street
Ottawa, ON K1A 0K3

Contacts regarding this application:
Defence Construction Canada
Mr. Douglas Craig, M.Sc., DLCU Environmental Officer
Tel: 613-998-7288
Fax: 613-998-0468
E-mail: Douglas.Craig@dcc-cdc.gc.ca

UMA Engineering Ltd.
Ms. Eva Schulz, P.Ag., Environmental Scientist
2540 Kensington Road NW
Calgary, AB T2N 3S3
Tel: 403-270-9200
Fax: 403-270-0399
E-Mail: Eva.Schulz@uma.aecom.com

2.2 Lead Authorizing Agencies

The lead agency for this project is the Department of National Defence, represented by the Director General Environment. The management of this project is being provided by Defence Construction Canada. These agencies will be responsible for obtaining permits, except in those cases where the clean up contractor is required to do so by legislation.

2.3 Environmental Assessment Process

The initial environmental assessment was completed under the Environmental Assessment and Review Process Guidelines Order (EARPGO) and updated in accordance with the requirements of the Canadian Environmental Assessment Agency (CEAA) and the Nunavut Impact Review Board (NIRB), in support of this project. The potential environmental impacts were assessed based on the valued ecosystem components identified during the initial scoping exercise.

The following sections provide a summary of the activities that were undertaken during the completion of the environmental assessment.

2.3.1 Scoping

As a self-directed environmental assessment, the initial step was to conduct a series of social and ecological scoping exercises designed to:

- Determine the temporal and spatial boundaries of the assessment; and

- Focus the analysis on the environmental issues directly related to the clean up project itself (i.e., identification of valued ecosystem components).

In scoping the project, clean up activities to be assessed were identified. Possible additional activities were examined using the Canadian Environmental Assessment Agency's "Principal Project/Accessory" test, which is used to determine if other activities demonstrate an interdependent linkage and/or geographical/ecological proximity with the primary clean up.

The assessment scope included a determination of the environmental effects to be assessed and the effects that are to be considered in making decisions regarding the project. The following table provides an outline of the scope of the project and of the assessment.

Table 1: Project Scope and Assessment

Project	FOX-3 Site Clean Up
EA Trigger	Funding from the Department of National Defence Federal permits required
Scope of principal project	Physical clean up of the FOX-3 site, including: demolition of facilities, removal of waste materials (including hazardous), contaminated soil removal, debris disposal, and construction of landfills and landfarms.
Accessory physical works	Mobilization and demobilization of equipment and personnel, and temporary construction camp set up.
Other undertakings	None.

The scope of the environmental assessment is to consider the effects of all project related activities (i.e., those related to the clean up of the site) and associated physical works on both biophysical and socio-economic factors.

The following factors were identified for assessment:

- Evaluation of environmental effects of the project, including those relating to cumulative effects that are likely to result from carrying out this project.
- Project undertakings performed in conjunction with other off-site projects/activities that have been or will be carried out.
- The relative levels of significance.
- Public comments.
- Mitigation measures deemed to be technically and economically feasible.

Interested parties were identified and consulted during the development of the project definition process including:

- 'Expert' federal departments (Environment Canada, Department of Indian Affairs and Northern Development, Government of the Northwest Territories Department of Natural Resources, and Government of the Northwest Territories Department of Health);
- 'Other' federal departments (DND, DCC, Parks Canada);
- Aboriginal organizations (NTI, Nunavut Planning Commission) and the Regional Inuit Associations; and

- Community leadership of the various Arctic hamlets.

Section 4.0 of this Project Description provides a detailed outline of the Public Consultation Process.

2.3.2 Assessment of Environmental Effects

The initial step following the scoping exercise was to determine the possible environmental effects of the project. This assessment involved providing a detailed overview of the project, a description of the existing environment (including inventories and ecological processes) and the identification of project-environment interactions.

The aim of describing the project was to clearly outline the constituent components and activities that were to occur at the FOX-3 site. Activities include mobilization, project layout and design, plans and scheduling, specifics related to each of the activities (i.e., how would contaminated soil be identified, excavated, transported and disposed), operating procedures, control procedures and demobilizations plans.

During the scientific studies described above, the relevant information concerning the existing environmental components of the study area was collected. This information included a description of the physical, biological and social characteristics of the study area.

Using the information that was obtained on the project and the existing environmental setting, the assessment study determined interactive links between these two components. Particular concern focused on the location, sensitivity, seasonal presence and the abundance of these components. Also included in the assessment of the environmental effects were possible impacts relating to socio-economic factors (heritage, culture, archaeological, employment, and business opportunities), and human health. During the assessment stage, conclusions were made as to the type of impact and its level of significance based on scientific judgement and comments received during the public consultation process.

2.3.3 Identification of Mitigation Options

The third stage of the assessment process was identifying mitigation measures that would result in a reduction or elimination of potential environmental effects associated with the clean up of FOX-3. In the case of this project, all potential adverse effects were addressed, not just those deemed to be significantly adverse. Mitigative actions now form part of the overall project design and planning documentation, which resulted in the preparation of an Environmental Protection Plan (EPP) in Section 8.0. The requirements for on-site personnel to adhere to these mitigative measures are part of the clean up contract.

2.3.4 Significance

The environmental assessment considers activities associated with the project that could result in adverse environmental effects with consideration given to the likelihood of occurring, while taking into account appropriate mitigation measures. In determining whether there are adverse environmental effects, the following factors are considered:

- Loss of rare or endangered species;
- Reduction in biological diversity;
- Loss of critical/productive habitat;
- Fragmentation or interruption of movement corridors and migration routes;
- Transformation of natural landscapes;

- Discharge or presence of persistent and/or toxic chemicals;
- Toxicity effects on human health; and
- Effects on cultural issues.

2.4 Regulatory Overview

2.4.1 Introduction

The clean up 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 DND to conduct this work. Throughout all project phases, the project will work in close cooperation with regulatory authorities and compliance will be enforced .

2.4.2 Federal Acts, Regulations and Guidelines

Several Federal Acts, regulations and guidelines affect project activities across all Canadian jurisdictions. The most relevant to the DLCU 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 Temporary PCB Storage Regulations.

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 covers all wildlife species listed as being at risk nationally and their critical numbers.

The **Canada Shipping Act** 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 Water 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 Land Use 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.

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 Act and Regulations 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.

Explosives Act and Regulations define explosives, the permitting requirements needed to use explosive substances, packaging, handling and transporting requirements, and safety requirements.

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 were used as a reference in the development of the DEW Line Clean Up Protocol and contract specifications. These guidelines are identified as reference materials only.

Freshwater Intake End-of-Pipe Fish Screen Guidelines 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 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.

Guidelines for Preparation of Hazardous Material Spill Contingency Plans identify factors that should be considered in the development of hazardous material spill contingency plans and the information that should be incorporated into a comprehensive contingency plan.

Code of Good Practise on Dump Closing or Conversion to Sanitary Landfill at Federal Establishments outlines the guidelines to improve operation and properly close existing dumps. It is intended to promote a consistent approach to the clean up of existing dumps to prevent contamination of water, air, and land and to ensure that the best particular control technology is used.

Code of Good Practise for Used Oil Management in Canada 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, compiled by the Canadian Council of Ministers of the Environment (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 access the degree of contamination at a site.

Canadian Drinking Water Guidelines are also complied by CCME for Canadian Drinking Water Quality and provide criteria for water that are protective of human health and also meet aesthetic objectives.

Technical Guidance on the Land Treatment of Petroleum Hydrocarbon Contaminated Soils at Federal Government Facilities or on Federal Crown Land provide information on the required design parameters for landfarms at federal facilities.

Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils was developed to provide guidance for landfarming.

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

2.4.3 Nunavut and Northwest Territory Acts, Regulations and Guidelines

In addition to the Federal Acts and Regulations identified in Section 2.4.2, the clean up of the FOX-3 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 FOX-2 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.

2.4.4 List of Approvals, Permits and Licenses Required

The following is a list of permits required for the clean up of the FOX-3 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 clean up of FOX-3. Contact: INAC Land Administration, Iqaluit, NU (T) 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 the clean up. 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 clean up of the FOX-3 site. Contact: Nunavut Water Board, Gjoa Haven, NU (T) 867-360-6338.

In addition, the successful contractor may require a number of other permits or license. 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 partial list of these and other requirements is presented in Table 2.

Table 2: Authorizations

Authorization	Authority	Activity to Authorization Applies
Land Use Permit (Crown Lands)	Indian and Northern Affairs Canada	All land use activities on Crown land
Quarry Permit (Crown Lands)	Indian and Northern Affairs Canada	Granular material extraction activities on Crown land
Water Use License	Nunavut Water Board	All water use activities
Archaeological Research Permit	Nunavut Land Claims Agreement Act	Investigation of archaeological sites, mitigation, monitoring
Transportation Permits	Transportation of Dangerous Goods Act	Shipping
Transportation Permits	International Air Transport Association Dangerous Goods Regulations	Air transport
Fishing Licenses	Department of Sustainable Development	Recreational fishing
Firearms Acquisition Certificates/ Firearms License (course required)	RCMP	Use and storage of firearms

2.5 Previous Environmental Assessments

As a federal proponent, the Department of National Defence (DND) is required to conduct an environmental assessment for the clean up of each DEW Line site. As a planning tool, these assessments were drafted in 1994 by DND under the auspices of the Environmental Process Guidelines Order. These assessments were preceded by extensive on-site environmental and engineering investigations completed by the Environmental Sciences group (ESG) at the Royal Military College and UMA Engineering Ltd. (UMA). The initial investigations, which took place from 1989 to 1994, were used to provide a baseline study of the existing environment (both biological and physical) and ecological pathways and possible transport mechanisms that will exist during the clean up. As well, studies of socioeconomic aspects, in particular a detailed archaeological survey of the sites, were completed during this time. The protection of the food chain from DEW Line contaminants was established as the aim of the clean up. These studies confirmed that physical restoration would involve considerable quantities of materials, including limited quantities of hazardous materials such as waste oil, batteries and asbestos. Conclusions reached by independent analyses indicated that inorganic elements (principally copper, lead and zinc), hydrocarbons and polychlorinated biphenyls (PCBs) pose the greatest risk to the biophysical environment. Therefore, the clean up approach was geared towards removing these contaminants from contact with the environment.

Subsequent changes to overall project planning have been assessed over time and the assessment document updated. The Environmental Screening Report was updated for 14 of the 15 DEW Line sites in Nunavut (DCC-DLCU, 1998). This report was submitted with the Project Description of the 15 DEW Line sites in the Nunavut Settlement Area to the Nunavut Impact Review Board (NIRB) in June 1998.

In 2006, further investigations were conducted to delineate contaminated areas and obtain environmental and engineering information required to finalize the clean up plans. This information was reviewed and an updated Project Description with an environmental screening report section was prepared.

Other investigations included:

- An initial environmental clean up study of the DEW Line sites in Canada carried out on behalf of the United States Air Force by a consortium of Canadian consultants. The objectives for this study included: identifying and investigation areas impacted by past waste disposal practises and spills; determining and evaluating remediation alternatives for the waste disposal and spill areas; and developing disposal options for debris arising from the demolition of DEW Line structures. This study provided information on the presence of hazardous materials, the biophysical environment, facility details, and the existing landfills.
- An environmental study of 10 of the 21 sites in 1989/90 for the DND. This study provided a detailed physical and chemical inventory of the stations and considered the impact of chemical contaminants in the Arctic ecosystem. This study provided information on the debris found on site, contents of landfills, fuel spills, and patterns of contaminant dispersal and impact from the use of drums.
- Two studies designed to assess the impact of the historically common practise of disposing debris into the ocean through ice were carried out in 1994 and 1995 by a consortium of several Canadian government departments. These studies concluded that there were no significant chemical effects arising from the presence of debris on the ocean floor. A summary document of this investigation is provided in Appendix E.
- During the final site investigations conducted in 1996 at BAR-3, Tuktoyaktuk and PIN-M, Cape Parry, the DND investigation team discovered that the paint on many of the buildings contained PCBs in excess of 50 ppm. PCB amended painted materials (PAP) are defined as material that is coated with PCB amended paint, and has been analysed and the materials (including the paint) determined to contain PCB concentrations in excess of 50 ppm. These PAP materials are regulated under the Canadian Environmental Protection Act. Currently, the PAP materials cannot be placed in a landfill in the north, and are being packaged and transported to a southern disposal facility for destruction and disposal. Prior to transport, PAP material is being stored temporarily at the site in accordance with the Temporary Storage of PCB Materials Regulations.

2.6 Contract Award Process

The following steps outline the contract award procedures:

- A tender package is produced with includes ALL of the work to be completed at the site during the clean up. A tender package includes instruction for the contractor to attain Minimum Inuit Contractor Content (MICC) in the workforce, as well as Minimum Inuit Employment Content (MIEC), as specified in the DND/NTI Economic Agreement.
- The tender award goes to the most competitive bidder who fulfills all of the requirements as stated in the tender package.
- Once the contract is awarded, the successful contractor can begin plans to start the clean up work.

3.0 Project Planning

3.1 Rationale for the Project and Primary Goals

The aim of the DLCU Project is to decommission those facilities used by the former DEW Line which have been declared surplus to the requirements of the North Warning System and to restore the sites to an environmentally safe condition. Environmental restoration includes setting remediation objectives that are designed to preclude migration of contamination (and hence biomagnification) into the Arctic ecosystem/food chain. To accomplish this, remediation will include:

- The excavation of soils in cases where parameters exceed those that have been set for the project (i.e., believed to cause significant input into the lower levels of the food chain, for example, plants and detritus); and
- The remediation of landfills, which may serve as a source of contamination.

The process of biomagnification is defined as positively sloped variation in concentrations through increasingly higher trophic levels of the food chain. The process of biomagnification is particularly important in Arctic ecosystems, because of the dependency on a high fat content in the diet; organisms are extremely sensitive to contamination inputs, especially chlorinated contaminants such as PCBs. Given the nature of the Arctic ecosystems, it is important that past anthropogenic activities, such as the operation of the DEW Line, not continue to cause any significant adverse effects on any one level of the Arctic food chain. Specifically:

- The limited availability of species at any one given trophic level leaves little opportunity for another species to offset the effects of a loss of another.
- Negative biological effects (i.e., plant loss) may lead to physical disturbances, such as damage to permafrost.
- These unmanned sites pose a risk to human and animal health and safety through the presence of physical hazards.

3.2 Evaluation of Alternatives to the Project

As a project strictly dedicated to the clean up of military establishments, the range of alternatives to the project is limited. Two alternatives to the clean up of these sites can be identified, and are as follows:

Commercial or other Government use of the facilities: This alternative involves the sale of those facilities no longer required by the DND to commercial interests. Two possibilities are present, namely on-site commercial development or sale of the capital assets themselves and movement off-site.

No clean up action (Null alternative): The second alternative involved examining the environmental impact of maintaining the status quo at the sites. It was quickly realized that failure to address the environmental problems identified during the site investigations could lead to the following:

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

3.3 DEW Line Clean Up Protocol

The purpose of the DEW Line Clean Up Project is to:

- Demolish and remove existing facilities that are not required for the operation of the North Warning System.
- Removal contaminated soils from contact with the Arctic food chain.
- Stabilize existing landfills.
- Clean up surface debris.
- Physically restore the site to as natural a state as practical.

3.3.1 Protocol Development

In cooperation with several federal departments and the Government of the Northwest Territories, DND originally drafted the General Protocol for the DEW Line Clean Up in 1991. This protocol served as the basis for the DND/NTI Agreement on environmental provisions for the clean up of the sites (see Appendix B). At the time of implementation, there were no established environmental standards for the Arctic. As a result, existing federal guidelines, such as the Interim Canadian Environmental Quality Criteria for Contaminated Sites (1991) were modified to reflect both the sensitivity of the Arctic food chain to ecological processes such as biomagnification and the close dependence of the Inuit on the land for food. In addition, a barrel specific protocol was prepared that outlined the process for dealing with barrels and barrel contents found on the DEW Line sites.

3.3.2 Criteria

The protocol outlined in the DND/NTI Agreement was developed from the results of the biophysical, socio-economic, and engineering site assessments. The DLCU Protocol documents the contaminant clean up criteria and specific physical actions that are to be undertaken, which are specific to the DEW Line sites. These criteria were developed based on existing federal and territorial criteria in conjunction with studies that show the functional relationships and/or pathways for biological uptakes from soil. The resulting protocol defines two concentration tiers of soil contamination. Soil substrates containing Tier I concentrations may be placed in an appropriate on-site landfill, while those soils in excess of the Tier II standard are to be disposed of in a manner that provides additional measures to permanently segregate these contaminants from the Arctic ecosystem. Soils exceeding federal legislative limits (i.e., Canadian Environmental Protection Act and Chlorobiphenyl Regulations) will be disposed of off-site at a licensed disposal facility.

3.3.3 Environmental Working Group

In 1997, the DND and NTI agreed to form an Environmental Working Group (EWG). The EWG is comprised of scientific and technical experts representing both the Inuit (NTI) and DND. The purpose of the EWG is to examine environmental issues related to the DLCU project and to provide recommendations to a joint DND/NTI core group consisting of senior management from both organizations. Specific tasks that have been assigned to the EWG include:

- Development of a landfill risk evaluation matrix.
- Evaluation of recommendations for a post-construction/remediation landfill monitoring program.
- Identification of hydrocarbon clean up requirements.
- Establishment of confirmatory testing protocols.
- Preparation of a list of items suitable for landfilling at the DEW Line sites.

3.4 Final Investigation and Delineation

Prior to the clean up of each site, the DND undertakes a comprehensive final site assessment. The aim of the final investigation is several-fold, including:

- To fully delineate the extent of contaminated areas in order to prepare accurate construction documents.
- To confirm the structural and environmental status of buildings and other facilities that are to be demolished.
- To confirm the baseline environmental conditions at the site prior to implementation.
- To examine existing landfills and identify new landfills to confirm details pertaining to the required remediation strategy.

4.0 Public Consultation Process

As part of the DLCU project, public consultations have been carried out in communities across the north since 1992. In 1992 and 1993, teams from the DND and other federal departments conducted a broad range of public consultation sessions to confer with the local residents about the project and to obtain input regarding specific concerns about the work. Public consultations continue for each site prior to construction.

4.1 Inclusion of Traditional Knowledge

One of the guiding principles of the DLCU project is to ensure the meaningful participation of local residents in both the planning and execution phases. One way of ensuring this is to incorporate traditional knowledge into the site clean up plans. An Inuit representative who is familiar with both the DEW Line site and traditional use of the area is chosen by the Regional Inuit Association to be on-site during the site investigation phase prior to the clean up. The Inuit representative works closely with the EWG to identify Inuit use of the area, wildlife patterns, past activities, and any information relating to dumping, hazardous waste storage, and natural occurrences. This traditional and local knowledge is used to refine clean up activities by including unknown issues or adjusting environmental protection plans.

Additionally, DND and the NTI establish a community DEW Line Clean Up committee to facilitate the flow of local knowledge to the EWG prior to and during each site visit. To accomplish this goal, the EWG visit local communities most affected by each DEW Line site and conduct one on one interviews with a number of residents, the Hamlet Administrative Officer and Mayor, the local Hunters and Trappers Association and other relevant community organizations.

4.2 Initial Public Consultation

DND tried to integrate the views of all interested stakeholders, including individuals or groups, into the decision-making process for the DLCU Project. The approach to public involvement in environmental assessments for this project included two major elements: adequate public notification and appropriate public consultation.

The purpose of public notification is to provide information regarding community meetings, environmental assessment results, site activities and upcoming decisions. Public notification is used mainly for notifying the public of the results of previous environmental assessments and clean up plans.

Public consultation has been used to involve the public in the environmental assessment process through dialogue between northern residents and the project representatives. This dialogue has proven useful in identifying public concerns, needs and values before final decisions on courses of action were made.

Public consultation meetings were held in those communities in the vicinity of the DEW Line sites. Briefings to government officials were also held in Iqaluit, Cambridge Bay and Yellowknife. Advertisements and information packages were provided in English as well as Inuktitut. Minutes were recorded at each of the meetings and action items passed on to the responsible agencies.

Various communities were visited in 1992, 1993 and 1994 as part of the public consultation program. The primary objectives of the initial meetings were to:

- Provide general information to the community regarding the status and schedule for the project.
- Provide information regarding the process for closure and clean up of the DEW Line.

- Present environmental information regarding the demolition/disposal of facilities.
- Obtain information regarding public concerns through discussions at the meetings and through questionnaires.
- Obtain information regarding local labour and contracting capabilities to assist in developing implementation strategies.

4.2.1 2006 Site Investigation

In the summer of 2006 during the delineation investigations for FOX-3, further consultation was conducted to ensure local knowledge was collected and incorporated into the final delineation investigations. Local knowledge is important for uncovering location(s) of contamination that had not been previously assessed, as well as information required for completing the Landfill Risk Evaluation Matrix for each landfill site. Involvement of the local community and Inuit representation (NTI) included discussions with long time residents and community officials, including Hamlet Administrative Officers and senior members of the Hunters and Trappers Association; and a site visit by an NTI technical representative with a local community representative.

The NTI technical representative and the local representative were on site during a portion of the site investigation. During this time, the NTI representatives were able to observe the site and note any technical concerns that may have been overlooked by the site investigation team. The local community was able to provide much information on past disposal practices. Concerns and comments were gathered and incorporated into the delineation investigation plans and the clean up plans. Sections of a report pertaining to the detailed observations of the NTI while on site at FOX-3 are provided in Appendix C.

4.2.2 2008 Pre-Construction Consultation

Public consultation meetings regarding the clean up program will be held in the communities of Hall Beach, Igloolik and Qikiqtarjuaq in 2008. The meetings include a presentation of the proposed clean up plans and design, as well as a question and answer period in which the community's issues and concerns will be heard. Copies of the presentation and question and answers can be provided once the meetings have been completed.

4.3 DND/NTI Project Review Committee

As part of the Agreement between the Department of National Defence and Nunavut Tunngavik Incorporated, there are regularly scheduled meetings between these two organizations. These meetings, which involve senior management from both organizations, are designed to provide a regular forum to discuss the clean up program within the Nunavut Settlement Area and to resolve concerns relating to environmental and/or socio-economic issues.

5.0 Implementation & Design / Engineering

The clean up plans and procedures are outlined in the following sections. Selected photographs of the clean up areas at FOX-3 are in Appendix D.

5.1 Site Access and Transportation Methods

Off-site activities in support of this project will be in the form of transportation associated with the movement of materials, equipment and personnel to the site. These activities are described below.

Air transport – transport of personnel to and from the site, and weekly domestic supplies (i.e., food) will be completed using charter aircraft.

Ground Transport – transport of equipment and facilities will be via overland route, likely from Clyde River. Please note the contractor is responsible for acquiring all permits and approvals associated with the overland route. Existing roads at FOX-3 will be used while on-site.

5.2 Contractor Support Activities

The following activities will occur on-site to support the clean up work:

- Use of existing airstrip and roads at site for equipment transport, movement and access to work areas.
- Set up of site for camp equipment and storage.
- Set up primary sewage treatment (settling tank and lagoon) for the camp.
- Development of domestic waste disposal (either as is or incinerated and then landfilled) in the Non-Hazardous Waste Landfill.
- Demobilization of the clean up camp following the end of the project.
- Vehicle traffic to work areas is to be supported by the existing access roads that traverse the site.
- Labour and equipment requirements are anticipated to include 40-60 personnel, 20 pieces of heavy construction equipment and 6 support vehicles.
- Duration of work is anticipated to be approximately 4 months/year, not including winter shutdown period, over a timeframe of 3 years.

5.3 Development of Borrow Areas

Borrow quantities were investigated as part of the geotechnical field investigation completed by EBA in 1992 and 2006. Nine borrow areas have been identified at FOX-3. The definition of the types of granular materials is as follows:

Type 1: coarse gravel, cobbles and boulders for erosion protection.

Type 2: gravel and sand for landfill cover.

Type 3: general fill for excavation backfill.

Type 4: silty sand and gravel for landfill berms.

Type 5: sand for geomembranes bedding.

Type 6: sand and gravel for intermediate landfill debris cover.

Approximately 328,300 cubic metres of granular material has been sourced for the clean up. Granular material is required for closure of landfills, upgrading the access roads during construction, backfilling contaminated soil areas and general site grading purposes. Additional granular fill is required for the development of the new Non-Hazardous Waste Landfill and Tier II Soil Disposal Facility. Table 3 outlines the borrow areas and potential volumes of granular material to be extracted from each area.

Table 3: Granular Material Requirements

Borrow Area	Granular Material Quantity (cubic metres)
BA #1	47,700
BA #2	15,000
BA #3	21,500
BA #4	153,000
BA #5	11,600
BA #6	12,000
BA #7	67,500
Total	**328,300**

5.4 Contaminated Soil Disposal Requirements

All contaminated soil found at FOX-3 has been divided into one of five categories depending on the type and severity of the contamination. Generally, non-hazardous surface contaminants, if less than three square metres, are graded whereas more extensive contaminated soils are excavated. Excavations left by soil removal are backfilled with granular fill. Table 4 outlines the contaminated soil disposal requirements.

Table 4: Contaminated Soil Disposal Requirements

Designation / Co-Designation	Tier I	Tier II	Type A	Type B	Hazardous
None (no co-contaminants)	Non-Hazardous Landfill	Tier II Disposal Facility	Non-Hazardous Landfill	Landfarm	Containerize for off-site transport and disposal by others.
Type A	Non-Hazardous Landfill	Tier II Disposal Facility			Containerize for off-site transport and disposal by others.
Type B	Landfarm	Tier II Disposal Facility			Containerize for off-site transport with hydrocarbon resistant liners for disposal by others.

The locations of the contaminated soil areas are shown on the drawings in Appendix A.

5.5 Contaminated Soil Types

DCC Tier I and Tier II Contaminated Soil: Defined as soils containing concentrations equal to or in excess of any or all of the contaminants listed in Table 5.

Table 5: DCC Tier I and II Criteria for FOX-3

Contaminant	Tier I Criteria (ppm)	Tier II Criteria (ppm)
Arsenic	-	30
Cadmium	-	5
Chromium	-	250
Cobalt	-	50
Copper	-	100
Lead	200	500
Mercury	-	2
Nickel	-	100
Zinc	-	500
PCBs	1	>5 to <50

* Denotes site specific criteria

Hazardous Contaminated Soil: Contaminated soil is classified as hazardous in accordance with the Transportation of Dangerous Goods Act and Regulations.

CEPA Contaminated Soil: Soil containing concentrations of PCBs equal to or in excess of 50 parts per million. Materials contaminated with PCBs at concentration levels equal to or in excess of 50 ppm (mg/kg) are legislated as hazardous materials. Storage, handling, and disposal of PCBs are regulated under the Canadian Environmental Protection Act and the Federal Transportation of Dangerous Goods Act.

Leachable Soil: Soil containing contaminants that when subject to the leachate test prescribed in the TDGA and Regulations, leaches contaminants in excess of the concentrations listed in Part V of the regulations. Handling and disposal are regulated under Federal, Territorial and Provincial Regulations.

Petroleum Hydrocarbons: Hydrocarbon products include those described by laboratory analysis as lubricating oil and Grease, fuel oil, diesel and/or gasoline.

Hydrocarbon Contaminated Soil: Soil containing concentrations of Total Petroleum Hydrocarbons (TPH) in concentrations considered to create a risk to the environment (2500 ppm).

Type A Contaminated Soil: Hydrocarbon contaminated soil in which the primary petroleum hydrocarbon product present in the soil as determined by laboratory analysis consists of lubricating oil and grease. For remedial purposes, Type A contaminated soil shall be treated as Tier I contaminated soil containing hydrocarbon contamination.

Type B Contaminated Soil: Hydrocarbon contaminated soil in which the primary petroleum hydrocarbon present in the soil as determined by laboratory analysis consists of fuel oil, and/or diesel, and/or gasoline.

Type B – Tier I Contaminated Soil: Type B contaminated soil containing concentrations of lead between 200 and 500 ppm and PCBs between 1 and <5 ppm. Type B and combinations of DCC Tier I and Type B contaminated soil shall be excavated and treated onsite in a landfarm.

Type B – Tier II Contaminated Soil: Type B contaminated soil containing contaminants in excess of DCC Tier II criteria shall be treated as DCC Tier II contaminated soil containing hydrocarbon contamination.

Clean Soil: Soil that has been sampled, analyzed, and determined to have contaminant concentrations below DCC Tier I contaminant levels, TPH concentrations less than 2500 ppm and lead and PCBs in concentrations less

5.5.1 Tier I Contaminated Soil Disposal Requirements

Soils exceeding Tier I contaminated soil criteria, but not classified as Tier II contaminated soil do not pose a leachate risk and therefore may be disposed of in an on-site, non-hazardous waste (NHW) landfill. Typical construction of a NHW Landfill consists of gravel perimeter berms surrounding layers of interbedded waste and intermediate cover soil. A layer of granular material, minimum 1 metre thick, is placed as final cover for the landfill and graded to promote positive drainage. A more detailed description of a NHW Landfill is provided in Section 5.7.1.

5.5.2 Tier II Contaminated Soil Disposal Requirements

Based on the engineering field surveys conducted at the sites in 1992 and 1993, it became apparent that a potentially large volume of Tier II contaminated soil at the 21 DEW Line sites would require segregation in a manner which precludes their continued contact with the Arctic ecosystem. A number of disposal options/technologies were considered by the DLCU project team. Of the options, the most environmentally and economically feasible was determined to be the development of engineered Tier II soil disposal facilities. These facilities utilize a double-containment system consisting of permafrost to limit leachate generation and synthetic liners to prevent migration of contaminants into the surrounding environment. A detailed description of a Tier II Soil Disposal Facility is in Section 5.7.2.

5.5.3 CEPA Contaminated Soil Disposal Requirements

Contaminated soils which contain levels of contaminants in violation of the Canadian Environmental Protection Act (CEPA) and associated regulations are considered hazardous material and will not be placed in the Tier II Soil Disposal Facility. These materials are to be excavated, removed from the site and transported to a licensed disposal facility. Some of the soils may also contain petroleum hydrocarbons, often where lead and PCB contaminants have also occurred as a result of waste oil and/or fuel spills. These hydrocarbons are contained within the soil matrix and do not exist as free liquids which could potentially leach. Leachate testing has also been conducted on the more highly contaminated soil samples as set forth in Ontario Regulation 347. Wastes determined to be leachate toxic under this test are not placed in the Tier II Soil Disposal Facility, but are instead removed from the site to a licensed disposal facility.

5.5.4 Hydrocarbon Contaminated Soil Disposal Requirements

In 1998, the DLCU Protocol was revised to address hydrocarbon contaminated soils at the Nunavut sites under the environmental provisions of the DND/NTI Agreement. Under the amended protocol, hydrocarbon contaminated soil is divided into two types based on common sources at the DEW Line sites. In Type A hydrocarbon contaminated soil, the primary petroleum product present is lubricating oil and grease. Due to the low leachability of this type of hydrocarbon, these soils are generally deemed safe for disposal in a NHW Landfill. Soils where the primary petroleum hydrocarbon contaminant was fuel oil are classified as Type B hydrocarbon contaminated soils. Due to the concern of leachate generation and migration from Type B contaminants, these soils are not placed in the NHW Landfill. Several options

for disposing of Type B contaminants have been employed based on location and site specific factors. The most feasible and environmentally sound disposal option is passive land treatment (landfarming).

5.5.5 Contaminated Soil Volumes

Volumes of contaminated soil to be excavated were calculated using the results from the 2005 site investigation, as summarized in Table 6. The volumes in Table 6 include area specific contingencies, which were rounded to the nearest 100 cubic metres in the case of CEPA and hazardous soils.

Table 6: Contaminated Soil Volume Estimates

Contaminant Designation	Soil Volume (cubic metres)
Tier I Contaminated Soil	3400
Tier II Contaminated Soil	6100
Type A Hydrocarbons	440
Type B Hydrocarbons	1200
CEPA/Hazardous Soil	180
TOTAL	**11,320**

5.5.6 Selection of Contaminated Soil Disposal Facility Locations

Site selection for new landfills and/or landfarms must consider a number of factors that impact the ability to achieve the long-term performance and minimize construction cost. Selection of sites considers:

- Geotechnical suitability;
- Accessibility;
- Proximity to work areas; and
- Environmental suitability.

Geotechnical suitability considers topography, soil conditions, natural drainage in the area, depth to bedrock or permafrost, groundwater, and adverse soil conditions that may affect permafrost and potential containment. Environmental considerations include the presence of existing contamination and sensitivity of the receiving environment.

Another environmental concern during the development of these facilities is the possible requirement for use of explosives in some extraction activities. In addition to the obvious danger to human health, other possible impacts could include damage to surrounding areas (including water bodies, environmentally sensitive areas and hazardous material storage facilities) from shock waves and blasting scatter, and the disturbance of nearby wildlife by sudden peak noise levels. Blasting, if required, will be conducted by authorized personnel in accordance with all required permits, licenses and applicable laws and regulations, and as dictated by regulatory authorities.

5.6 Proposed Construction

Several specialized facilities are to be constructed to dispose of waste generated on-site due to the demolition of existing structures, removal of contaminated soil and site debris, and landfill excavation. Only materials exceeding CEPA standards and those deemed hazardous according to TDG Regulations will be disposed of off-site.

The new facilities are sited following the completion of the detailed engineering investigation. As new roads will have to be constructed to access, these areas, the contractor may be required to make special provisions to protect tundra vegetation. It is also assumed that the contractor will have to provide adequate drainage for all excavations.

5.6.1 Non-Hazardous Waste (NHW) Landfill

5.6.1.1 Description

The Station NHW Landfill will be located approximately 340 m southeast of the module train, adjacent to the access road, and has an available surface area of 12,200 m^2. The area has a relatively steep grade, and bouldery rugged ground with pockets of open boulders.

5.6.1.2 Construction

The NHW Landfill is designed on the premise that it will contain non-hazardous materials only and will not generate leachate. Therefore, it is not necessary to eliminate all moisture migration into and out of the landfill. The NHW Landfill is also not designed to maintain the contents in a perennially frozen state.

The following materials will be disposed of in the NHW Landfill:

- Tier I and Type A hydrocarbon contaminated soil;
- Non-hazardous demolition debris;
- Non-hazardous site debris;
- Non-hazardous debris and Tier I soils excavated from landfills;
- Creosote treated timbers wrapped in polyethylene sheeting; and
- Double-bagged asbestos.

The NHW Landfill will consist of a perimeter containment berm and granular cover to minimize erosion and infiltration in order to provide long-term stability. The NHW Landfill will be established on native ground, stripped of any organic matter which will be stockpiled and used in the closure of the landfill. No base cover or liner is required for this landfill. Development and closure of the NHW Landfill includes the following work:

- Construction of exterior berms;
- Placement of Tier I contaminated soil and non-hazardous demolition waste and site debris in the landfill;
- Placement of Tier I contaminated soil and non-hazardous demolition waste and site debris in the landfill;
- Compaction of landfill debris;
- Placement and compaction of intermediate granular cover in the landfill;
- Placement and compaction of final granular cover over the landfill;
- Grading to promote drainage away from the landfill;
- Supply and installation of groundwater monitoring wells in and around the landfill as indicated on the drawings; and
- Survey of the location of asbestos and creosote-treated timbers.

For further design details of the NHW Landfill, please refer to Drawings in Appendix A.

5.6.2 Tier II Soil Disposal Facility

5.6.2.1 Description

The Tier II Landfill will be located directly south of the station, approximately 1.3 km west of the access road, and covers an estimated area of 12,000 m^2. The area is generally level with a bedrock ridge at the south end, several metres above grade.

5.6.2.2 Construction

A Tier II Soil Disposal Facility is designed to contain contaminated soil exceeding Tier II Criteria. The design of this facility is based on the characteristics of the contaminants in the soils, the geothermal properties of the area, and the local permafrost regime. The design utilizes permafrost as the primary containment barrier. Both the Tier II contaminated soil and the wet, silty gravel perimeter berms are designed to be continuously frozen. A geothermal analysis was conducted to determine the time required for freezeback of the facility and the long-term geothermal regime of the facility. The thickness of the cover material was calculated to prevent thaw of the contaminated soil, even after 10 consecutive 1 in 100 warm years.

A high-density polyethylene (HDPE) liner is placed at the base and side slopes of the facility to provide secondary containment. The liner is chemically compatible with the contaminated soils and will prevent the potential movement of contaminants during the period required for permafrost aggradation. A second HDPE liner is to be placed over the contaminated soils and seamed to the base liner to prevent precipitation from percolating down through the cover fill and into the Tier II contaminated soils. The development and closure of the Tier II facility at FOX-3 will include the following work:

- Construction of exterior berms with saturated silty gravel;
- Supply and installation of HDPE liners;
- Placement of Tier II contaminated soils in the landfill;
- Placement and compaction of intermediate granular cover over the soil.
- Installation of the top HDPE liner;
- Placement and compaction of final granular cover on the landfill;
- Grading to promote drainage away from the landfill; and
- Supply and installation of thermistor strings and groundwater monitoring wells in and around the landfill.

During construction of this facility, the gradation, moisture content and compaction are monitored to ensure compliance with the design.

It should be noted that water management during key trench construction will not be a concern as the facility is located in an area that is free of debris and soil contamination. Any water encountered will be pumped away from the area, without the requirement for testing.

Further details on the design of the Tier II Soil Disposal Facility, including the height of the perimeter berms, thickness of cover material and location of monitoring wells can be found in Drawings in Appendix A.

5.6.3 Landfarm

5.6.3.1 Description

The proposed landfarm is located 50 m south of the module train and covers an estimated area of 4,900 m^2.

5.6.3.2 Construction

The landfarm will be located at least 100 metres away from any water body, and in an area free of ponded water. The landfarm will be sited to provide for the convenient access of equipment and will be at least 300 metres from the construction camp, offices and laboratory. The area is relatively free of boulders and is generally level. Development, operation and closure of the landfarm will involve the following work:

- Ground preparation, such as removal of boulders and placement of granular bedding material, to facilitate treatment options, as required.
- Construction and maintenance of roadways required to support treatment operations.
- Construction of exterior berms and drainage ditches.
- Placement of Type B contaminated soil in the landfarm.
- Placement of Type B contaminated soils co-contaminated with Tier I contaminants in a separate area of the landfarm.
- Specific activities for landfarming operations, including nutrient application, tilling and moisture conditioning.
- Final grading to promote drainage away from the site and to match the surrounding terrain.
- Supply and installation of groundwater monitoring wells around the perimeter of the landfarm.
- Closure and removal of all equipment and materials following confirmation that treatment has remediated the contaminated soil.

During the landfarm operation, granular nutrients are to be distributed evenly over the surface of the contaminated soil, at rates that will provide the minimum nitrogen loading. Moisture conditioning of the landfarm will be conducted as required by application of water spray to maintain optimum water content within the soil.

After application of nutrients, the full thickness of the soil is to be tilled every 10 days. During periods of prolonged warm, dry weather, the tilling frequency will be increased to every 5 days. During periods of precipitation, tilling of the soil will be delayed until the soil is considered damp to a depth of 100 mm.

All contact water in the perimeter collection system is to be collected and tested to ensure it meets the wastewater discharge criteria prior to the end of each operational season. If the contact water does not meet these guidelines, it will be treated so that it does meet the guidelines.

At the conclusion of the final treatment season, the following tasks are to be completed to close the landfarm:

- Confirmatory testing of the soils to ensure the remediation objectives have been met;
- Place and compact granular material from the berms to provide a cover over the remediated soils containing Tier I contaminants. Additional cover material is to be placed to provide a 300 mm minimum depth of compacted granular fill as cover over this soil area. All granular fill is to be compacted to 95% Maximum Dry Density.

- Grade the surface of the area, as required, to promote surface water runoff.
- Decommission the groundwater monitoring wells, including backfilling with appropriate grout, removal of the protective casing, lockable cap and well pipe to within 300 mm from the ground surface, and backfill and compact all voids with granular fill material.

Further details on the design of the landfarm facility are in the Supplemental Landfarm Questionnaire and on Drawings in Appendix A.

5.7 Landfill Closure and Grading

There are four landfills at FOX-3 to be closed, which are described in detail in Section 5.9. The following work will be completed as part of the closure:

- Removal of surface debris and compaction of the surface.
- Supply and installation of geomembranes and geotextiles as shown on the drawings.
- Supply, placement and compaction of additional gravel over the landfills.
- Grading to promote surface water runoff from the landfills, and
- Supply and installation of groundwater monitoring wells and thermistor strings (if required).

5.8 Landfill Excavation

Landfills considered a high potential environmental risk, or those landfills located in close proximity to water bodies are being excavated at the FOX-3 site, which include the Airstrip Landfill (various lobes), Station Landfill West and Site Debris 12 Landfill. 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 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:

- Installation/construction of erosion, drainage and sediment control, as required.
- Development of the landfill survey grid.
- Excavation of all waste material from the landfills.
- 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. Soils excavated from the landfill are 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 is then reshaped to match the existing terrain.

During the landfill excavation, the slope stability is to 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 are to be constructed to prevent the release of sediment or deleterious substances into the water. Water quality monitoring will be conducted during fishery sensitive construction activities. In the event that water quality monitoring indicates the potential for, or a definitive impact as outlined in the EPP,

immediately suspend operations. Mitigation measures, as outlined in the EPP are to be implemented immediately.

Any ponded water in the landfill excavation area will either be treated or pumped out. Prior to dewatering, a sample will be collected and analysed to ensure it meets the discharge criteria. Any melt water/groundwater/leachate will be collected at the low point of the excavation. The water will be allowed to settle prior to sampling and testing of the water.

During landfill excavation, a volatile organic compound (VOC) instrument capable of measuring in parts per million (ppm) and Lower Explosive Limit (%LEL) will be used to continuously measure the concentrations of VOC during landfill excavation operations, and prior to the removal of debris from the landfill.

A full range of clean up and protective equipment will be maintained at the landfill excavation site in the event of a spill. The clean up equipment is to include booms (sorbent and containment), sorbents for cleanup, fire extinguishers for A-B-C fires, overpacks for barrels and contaminated soils, pumps, hand shovels, picks, and containment barriers, such as liner material. Personal protective equipment is to include clothing, protective suits, respirators, etc. to comply with potential emergency conditions and in accordance with NIOSH guidelines.

At the completion of work in the area, sediment and erosion controls will be removed from the water bodies. At the conclusion of the landfill excavation, all sediment, erosion and drainage control measures will be removed from the worksite.

5.9 Description of Existing Landfills

Four landfills were investigated during the 2006 site investigation. They are:

- Station West Landfill;
- West Landfill;
- Airstrip Landfill; and
- Site Debris 12 Landfill.

A description of each landfill area is presented in the following sections.

5.9.1 Station West Landfill

The Station West Landfill is located approximately 150 m west of the main station building northwest and west of the old station access road. It comprises a number of individual lobes. Historical air photo review confirmed the widespread use of the entire area west of the station for landfilling activities.

The entire Station West Landfill area is gently sloping at a grade varying between 6 and 9 percent. Terrain is largely bouldery, with partially developed frost circles comprised of bouldery perimeters with finer-grained interiors (gravely sand with silt). Landfill surface cover, generally comprised of sand and gravel, varies between lobes from only occasional instances of buried debris exposure to a high of approximately 50%. Presence of surface debris also varies between 10% and 50% cover. Surface contamination was noted in a number of areas, typically associated with staining or debris.

Vegetative cover in the vicinity of most lobes is estimated as 25%, up to a high of 40%. There are no nearby water bodies; the nearest lake is approximately 2.5 km away. Fauna observed in the area included hare, lemmings, foxes and caribou. While traditional land use in the upper site area is

considered low, the potential for human exposure is considered moderate because of ongoing use of the LRR.

Environmental soil samples were collected on the landfill surface at all lobes with surface staining or where exposed debris suggested the presence of contamination. Soil samples were collected at depth up and down gradient of all lobes at surface and depth to identify whether contaminants were migrating from the landfill.

The following table provides a summary description of the Station West Landfill lobes, and details can be found on drawings H-D67/1-9101-102, 105, 114 and 115.

Table 7: Description of the Station West Landfill Lobes

Lobe	Size (m^2) & Depth (m)	Environmental Investigation	Risk Evaluation	Remediation Recommendation
A	5,440 2.0	• No evidence of contaminant migration. • Surface contaminated soil identified.	Low potential environmental risk.	Excavate contaminated soil and then regrade.
B1	230 0.5	• Low-level TPH impacts downgradient at depth. • No contamination	Low potential environmental risk.	Regrade.
B2	350 2.0	• No contaminant migration detected. • Surface contaminated soils identified.	Low potential environmental risk.	Because of extent of debris, the lobe is to be excavated.
C	520 0.5	• No contaminant migration detected. • Surface contaminated soil identified.	Low potential environmental risk.	Because of extent of surface contaminated soils, entire lobe is to be excavated.
D	990 2.0	• No contaminant migration detected. • Minor surface soil contamination.	Low potential environmental risk.	No action required.
E1	580 0.8	• No contaminant migration detected. • Surface contaminated soil identified.	Low potential environmental risk.	Because of extent of debris, the lobe is to be excavated.
E2	810 0.8	• No contaminated migration detected. • No surface soil contamination detected.	Low potential environmental risk.	Regrade
F	1,270 1.5	• No contaminant migration detected. • Surface contaminated soil identified.	Low potential environmental risk.	Excavate contaminated soil and regrade.
G	2,790 1.8	• No contaminant migration detected. • Surface contaminated soil areas identified.	Low potential environmental risk.	Because of extent of surface contaminated soils, entire lobe is to be excavated.
H	200 0.5	• No contaminant migration detected.	Low potential environmental risk.	Because of extent of surface contaminated

Lobe	Size (m^2) & Depth (m)	Environmental Investigation	Risk Evaluation	Remediation Recommendation
		• Surface contaminated soils identified.		soils, entire lobe is to be excavated.
I1	280 0.5	• No contaminant migration or surface soil contamination identified.	Low potential environmental risk.	Regrade
I2	100 0.8	• No contaminant migration detected. • Surface contaminated soils identified.	Low potential environmental risk.	Because of extent of surface contaminated soils, entire lobe is to be excavated.
J	250 1.4	• Low level hydrocarbon impacts identified upgradient. • No surface contaminated soils identified.	Low potential environmental risk.	Regrade
K	230 0.8	• No contaminant migration or surface soil contamination identified.	Low potential environmental risk.	Regrade

5.9.2 West Landfill

The West Landfill is located approximately 1.3 km west of the station in a former borrow area. There is an old access road leading to the area from the north end of the module train.

The landfill footprint is 1660 m^2, with an estimated depth of 2.0 m. The landfill is located within a slight terrace. The southeast limit of the terrace is defined by a bouldery ridge, and the western limit by the terrace drop-off towards the west. Two well-developed drainage channels locally direct drainage towards the southwest: one is located along the edge of the bouldery ridge, and the second, to the northwest, is located 40 m downgradient of the landfill. This overall area is quite saturated, as evidenced by the presence of solifluction lobes nearby, and the widespread surface runoff observed during the 2006 site investigation. The overall grade at the landfill area is estimated as 10% towards the northwest. Despite the channelling of significant surface drainage in the overall area, the landfill itself had no erosion noted, although there were some tension cracks noted on the landfill surface adjacent to the wet area at the northwest corner of lobe A.

The landfill surface is irregular, with occasional debris exposure at both lobes. Surface cover consists of sand with some gravel and occasional cobbles and boulders, with localized voids around large pieces of exposed debris. Debris consists of structural steel pieces that appear to be former communications equipment (likely dishes). There was no surface debris present at this landfill other than one piece of braided cable near the road, outside of the landfill perimeter.

There is little to no vegetation on the landfill surface, and downgradient vegetation coverage is estimated as approximately 25%. There are no nearby aquatic receptors; the closest receptor is a series of aligned creeks, located approximately 1.5 km to the west-northwest. During the 2006 site investigation, wolves were observed in this general area, while caribou were observed over much of the entire site. This area is well-removed from the on-going operations areas of the LRR, and no archaeological or heritage features were observed nearby, suggesting that human use of the area is low, with a low likelihood of contact.

No surface contamination was detected, nor was there any evidence of contaminant migration from the landfill.

Based on the engineering and environmental investigations, the landfill has been evaluated as having a low potential environmental risk. The remediation plan for this landfill is to regrade. Additional detailed can be found on drawings H-D67/1-9101-102 and 114.

5.9.3 Airstrip Landfill

The Airstrip Landfill is located along the east side of the airstrip and extends to the MacBeth River. The entire area along the length of the airstrip is disturbed and was widely used during the station operation. Historical air photo review identified the location of a former construction camp in the central area. A large barrel crushing and disposal operation was also noted at this location. Several pallet line and vehicle storage pads were also present historically, as well as an old airstrip apron. Borrow extraction was noted in multiple locations.

Thirty-two (32) separate lobes were identified at this landfill. For all lobes, the primary downgradient receptor is the river, which ranges in distance from 0 to 300 m. Arctic char was present in the river. Caribou, foxes and wolves were identified in the river valley during the 2006 investigation. It was noted during the NTI visit that the river valley is used as a transportation corridor during winter. There is a rangers cabin north of the airstrip that is occasionally visited. There is also a mining exploration camp that is in use all summer, located approximately 500 m northeast of the north end of the airstrip. The airstrip is part of the on-going operational area for the station.

In most areas of the Airstrip Landfill, the river bank is steep, with the top of the bank elevated above the river water level as high as 8 m in some locations. While many of the lobes are close to the river, they are generally stable and not considered at risk for erosion by river water. Exceptions are noted in the discussion regarding lobe particulars in Table 8.

There is a large thermokarst pond located in the central area of the Airstrip Landfill, along the east side near the river. Based on historical air photo review, the pond appears to have been caused by significant borrow extraction within a glaciofluvial terrace alongside the river, and the disruption of two existing drainage courses that directed drainage flowing from the bedrock uplands to the west and southwest (and to the east of the airstrip following its construction), towards the river. Ground disturbance from borrow activity cut off the outflow of the drainage courses to the river, resulting in ponding and the development of thermokarst. The thermokarst pond has continued to grow in size with resulting instabilities of the surrounding terrain. Tension cracks in ground surrounding the pond were noted during the 2006 site visit, and slope failure along the steep-sided northern edge of the pond was on-going during the 2006 program. There is a slightly elevated, bouldery “land bridge” separating the south end of the pond from the river. The existing ground surface on the land bridge is undulating, with a couple of low spots; one is located along the west side, and another along the east side. At high river water levels, the water flows across these low spots into the pond, particularly at the western low spot. At low river water levels; however, the pond appears to still have hydraulic connection to the river through subsurface drainage, based on the surveyed water levels in both water bodies.

With the exception of some very small lobes, lobes where the toe was in contact with the river (where downgradient soil sampling was not feasible), and/or where field observations provided strong evidence that the lobes would be excavated for geotechnical stability concerns, lobes were investigated for the evidence of contaminant migration. Investigation for surface soil contamination was only conducted at lobes where there was exposed debris and/or surface staining, suggesting that contamination may be a concern. At lobes in the vicinity of the river or creek flowing into the river, monitoring wells were installed to help assess the potential impact of contaminants on the river.

The following table provides a summary description of the Airstrip Landfill lobes, and details can be found on drawings H-D67/1-9101-101, 104, 112-113, and 124-128.

Table 8: Description of Airstrip Landfill Lobes

Lobe	Size (m^2) and depth (m)	Environmental Investigation	Risk Evaluation	Remediation Recommendation
A	50 0.8	• No contaminant migration detected. • No surface investigation completed.	Low potential environmental risk	Regrade
B	150 2.0	• No investigation for contaminant migration. • No surface investigation completed.	Moderate potential environmental risk because of contact with the river and steep grade.	Excavate
C1	70 0.5	• No contaminant migration detected. • No surface investigation completed.	Low potential environmental risk	Regrade
C2	180 1.3 – 4.0	• No investigation for contaminant migration or surface contamination.	Moderate potential environmental risk because of grade and contact with river.	Excavate
D	740 1.3 - 9	• No investigation for contaminant migration or surface contamination.	Moderate potential environmental risk because of grade and contact with river.	Excavate
E	370 1.5	• No contaminant migration detected. • Surface contaminated soil identified.	Moderate potential environmental risk	Excavate
F	750 1.8	• No contaminant migration detected. • Surface contamination identified, including hazardous soils associated with surface debris.	Low potential environmental risk	Excavate contaminated soils and regrade.
G	70 1.3	• No contaminant migration detected. • No surface contamination on lobe. Surface contamination associated with staining and debris.	Low potential environmental risk	Regrade
H	1,230 1.5	• No contaminant migration detected. • Several areas of surface contamination identified.	Moderate potential environmental risk	Excavate
I	170	• No evidence of	Low potential	Regrade

Lobe	Size (m^2) and depth (m)	Environmental Investigation	Risk Evaluation	Remediation Recommendation
	1.3	contaminant migration. • No surface investigation completed.	environmental risk	
J	250 2.0	• No investigation for contaminant migration. • No surface investigation completed.	Low potential environmental risk	Excavate due to proximity to pond where river flows through at high water.
K	210 0.7	• No evidence of contaminant migration. • No surface investigation completed.	Low potential environmental risk	Regrade
L	170 1.0	• No evidence for contaminant migration. • No surface investigation completed.	Low potential environmental risk	Regrade
M	90 0.5	• Extensive staining upgradient, but no contamination on lobe or indication of contaminant migration.	Low potential environmental risk	Regrade
N	50 n/a	• No environmental investigation completed.	n/a	Surface debris pick-up.
O	3 n/a	• No environmental investigation completed.	n/a	Surface debris pick-up.
P1/P2	140 n/a	• No environmental investigation completed.	Low potential environmental risk	No action required.
Q	410 0.5	• No evidence of contaminant migration. • No surface investigation completed.	Low potential environmental risk	Regrade
R	410 0.5	• No evidence of contaminant migration. • No surface contamination completed.	Low potential environmental risk	Regrade
S	100 0.8	• No evidence of contaminant migration. • No surface investigation completed.	Low potential environmental risk	Regrade
T	130 0.5	• No evidence for contaminant migration. • No surface investigation completed.	Low potential environmental risk	Excavate because of risk of erosion.
U	1,110 1.2	• No evidence of contaminant migration. • One small area of surface contaminated soil identified.	Low potential environmental risk	Excavate because of proximity to creek.
V	40 0.5	• No evidence for contaminant migration. • No surface	Low potential environmental risk	Excavate because of proximity to creek.

Lobe	Size (m^2) and depth (m)	Environmental Investigation	Risk Evaluation	Remediation Recommendation
		investigation completed.		
W	35 n/a	• No environmental investigation completed.	n/a	Surface debris pick-up.
X	2,080 1.8	• No evidence of contaminant migration or surface contamination.	Low potential environmental risk	Excavate because of proximity to drainage channel.
Y	80 0.8	• No evidence for contaminant migration. • No surface investigation completed.	Low potential environmental risk	Regrade
Z	170 0.5	• No evidence for contaminant migration. • No surface investigation completed.	Low potential environmental risk	Excavate due to geotechnical instability.
AA	60 0.8	• No evidence for contaminant migration. • No surface investigation completed.	Low potential environmental risk	Excavate due to geotechnical instability.
BB	130 0.8	• No evidence for contaminant migration. • No surface investigation completed.	Low potential environmental risk	Regrade
CC	2,140 1.8	• Low level hydrocarbon impacts downgradient. • No surface contamination detected.	Moderate potential environmental risk	Excavate
DD	320 0.5	• No evidence for contaminant migration. • No surface investigation completed.	Low potential environmental risk	Regrade
EE	190 0.5	• No evidence for contaminant migration. • No surface investigation completed.	Low potential environmental risk	Regrade
FF	2 n/a	• No environmental investigation completed.	n/a	Surface debris pick up.
GG	110 1.0	• No evidence for contaminant migration. • No surface investigation completed.	Low potential environmental risk	Regrade

5.9.4 Site Debris 12 Landfill

The Site Debris 12 Landfill is located 500 m south of the south end of the airstrip. Although initially it was thought this was a debris area, it was found to be a landfill, based on the results of the geophysical survey. The area of the landfill is 1,100 m2, with an estimated depth of 0.8 m. The lobe encompasses an area of ponded water with surface and partially buried heater panels, barrels and miscellaneous heavy equipment pieces. There are two well-developed drainage channels, originating upgradient of the landfill that converge within the lobe, and undercuts some of the debris at the downgradient (east) toe. Strong

iron oxide precipitation and bacterial sheen was observed within this drainage channel. Downgradient of the landfill, the drainage channel migrates towards the river, approximately 25 m to the east.

The overall grade is approximately 7%. Surface cover is moderate to good, with occasional exposed debris, consisting largely of barrels. The drainage channel cutting through the landfill has exposed some debris. The toe of the lobe is located approximately 20 m from the river high water mark, and at an elevation of approximately 1 m above the shoreline. Because of this, there is a risk of erosion from river flooding, although it is considered low.

This area has 80% to 100% lush vegetation. During the 2006 investigation, caribou frequented the area, while wolves and foxes were also noted in the vicinity. According to the NTI elder on site, the river valley is used as a travel route by people from Clyde River during winter.

Tier II soil contamination was detected at surface. Because of its proximity to the river shoreline and anticipated likelihood of excavation, no investigation was completed to assess the potential for contaminant migration.

Based on the engineering and environmental investigations, the landfill was evaluated as having a moderate potential environmental risk, largely due to the Tier II impacts at the surface and the proximity to the river. Therefore, this landfill is to be fully excavated. Refer to drawings H-D67/1-9101-110 and 123 for details.

5.10 Disposal of Site Debris

All site debris is to be disposed of in accordance with the DND/NTI Agreement. Debris will be sorted and classified as hazardous or non-hazardous. Hazardous materials will be shipped off-site for disposal, and non-hazardous debris will be placed in the NHW Landfill. Creosote treated timbers will be wrapped in plastic and asbestos will be double-bagged and disposed of in the NHW Landfill. PCB painted material will be segregated and disposed of at a licensed disposal facility.

There are several areas with known debris located in the MacBeth River, which also require removal. Some of the debris is located within the peak flow channel perimeter of the Macbeth River and is not submerged under low flow conditions. Other areas of debris located within the peak flow channel perimeter are submerged or partially submerged under low flow conditions. Discussions were held with both Fisheries and Oceans Canada and Transport Canada – Navigable Waters Protection to determine the most appropriate remedial solution for removal of the river debris. Copies of the e-mails with these two agencies are in Appendix E.

Water levels in the MacBeth River are variable. Depending on the season and weather conditions, water elevations may vary up to 2 metres. All river debris is to be removed (to the extent possible) during winter conditions when the river ice is suitable to provide support for construction equipment required to remove the debris. A hole will be drilled in the river ice prior to debris removal to determine the ice thickness and river bed flow conditions. If there is any flow, debris will be removed to a minimum of 0.5 m below ice depth and from the ice depth interval only. The debris will be cut, dismembered or dismantled as required. If there is no flow in the river, the debris is to be removed to a minimum of 0.3 m below the top of the sediment in the river bed. The collected submerged river debris will be removed to a temporary storage location outside of the peak flow channel perimeter. The removal of the debris in the river will consist of removal of those portions of the equipment not embedded in the sediment, while leaving the remainder in place. This will remove the navigational hazards and improve the aesthetics of the river, while not creating an impact by the release of sediment. The debris removed will be disposed of in an on-site landfill.

All debris removal operations will be monitored to identify potentially hazardous materials. If suspected hazardous materials are identified, operations will be suspended until the nature of the material is confirmed. Any stained soils encountered during debris removal will also be excavated and tested for classification purposes. Where scattered or embedded debris is removed, the area will be reshaped if necessary and any voids left by removal of debris will be backfilled with granular material. When working in the vicinity of a drainage course or body of water, silt fences, floating silt curtains and/or containment berms will be erected to prevent the release of sediments or deleterious substances into the water.

Table 9 provides a summary of all debris areas.

Table 9: Debris Areas

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Arial Extent (m^2)	Approximate Crushed Volume (m^3)	Comments
Submerged River Debris					
101	H-D67/1-9101-101	South of Site (~2.5 km) - two earth rippers, comm. tower section, bulldozer, truck chassis, dump truck	550	275	Partially exposed at low water. Some embedded into sediments. Off reserve south of site.
102	H-D67/1-9101-101	South of Site (~2.5 km) - two bulldozers, jeep, truck chassis, water truck, miscellaneous scattered debris	350	200	Partially exposed at low water. Some embedded into sediments. Off reserve south of site.
103	H-D67/1-9101-101	South of Site (~5 km) - bulldozer	100	20	Partially exposed at low water. Some embedded into sediments. Off reserve south of site.
256	H-D67/1-9101-110	MacBeth River 425 m south southeast of airstrip - 3+ large pieces of debris (possibly vehicle/equipment)	300	50	Partially exposed at low water. Some embedded into sediments off reserve south of site.
River Debris					
239	H-D68/1-9101-104	MacBeth River South - scattered wood and timbers, plywood, 5+ barrels, metal, steel grate	25,000	3	South end near archaeological feature, wet and soft in areas, quad access, low water access for some pieces.
238	H-D67/1-9101-110	Airstrip South Debris Areas - barrels (20+), copper tubing, timbers, truck rear differential and axle (low water access), metal siding, hydraulic hoses, steel cables, broken pallets, rubber, cans, truck parts (hood, saddle tanks, exhaust pipe, plate steel), plywood, miscellaneous metal and wood, engine block, partly exposed construction equipment	50,000	21	Some debris low water access only. Includes Airstrip South Lobe A and B, Site Debris 12
257	H-D67/1-9101-110	MacBeth River 475 m south southwest of airstrip - large steel cable spool, steel siding, rope	800	2	Low water access only.

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Arial Extent (m^2)	Approximate Crushed Volume (m^3)	Comments
258	H-D67/1-9101-110	MacBeth River 200 m south of airstrip - bundle of power cable	250	1	Low water access only.
259	H-D67/1-9101-110	MacBeth River 150 m east of south end of airstrip - piece of ladder, hydraulic cylinder	400	1	Low water access only.
Site Debris					
Overall – Upper Site 101	H-D67/1-9101-102	Whole Upper Site - drums, concrete footings, concrete pillars, concrete block, timbers, canvas, tin cans, styrofoam, plastic pails, metal pails, scrap wood, glass, metal cables, wire, rope, metal strapping, pipe, dozer tracks, angle iron, plastic, mattress springs, seat cushions, engine parts, carpet pieces, cement cans, lamp post, electrical cables, paint cans, batteries, asbestos tile, gas cylinders, siding, stovepipe, cardboard, rebar, plastic sheeting, pallets, misc. wood, misc. metal, domestic refuse. Includes material on Station Pallet Line – partially demolished billboard, sewage/water tanks, POL pipeline and cribbing, misc. metal and wood debris (approximate crushed volume 120 m^3).	731, 600	250	Much of the debris is scattered.
205	H-D67/1-9101-102	550 m NE of Station - barrel pot, wooden stakes	100	1	
244	H-D67/1-9101-102	West Landfill - rubber tube, drums, strapping, miscellaneous wood	1,000	1	
245	H-D67/1-9101-102	Borrow Area 1 – timbers, culvert pieces, drums (8), miscellaneous wood, and cable.	16,000	10	
106	H-D67/1-9101-103	Along POL line - barrels	80	1	
107	H-D67/1-9101-103	Near POL line - metal cable, wooden pallets, pipe section in dugout pond	350	1	
108	H-D67/1-9101-103	Between POL line and road - metal sheeting, timber, burnt insulation, metal cable, tin cans	80	2	

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Arial Extent (m^2)	Approximate Crushed Volume (m^3)	Comments
202	H-D67/1-9101-103	Main Road, 550 m SW of Main Road Debris Area turnoff - marker barrels welded together, single drum, metal sign	1,500	1	
204	H-D67/1-9101-103	Abandoned Road NW of Borrow Area 2 - scattered cans, metal pipe, wire, rubber hose, power poles, wood boxes, electrical panels, wire, heater box, bolts, miscellaneous wood and metal, cable, timber, strapping, barrels	86,300	5	
208	H-D67/1-9101-103	East of Main Road Debris Area - barrels	25	1	
230	H-D67/1-9101-103	Near Main Road Debris Area - crushed barrels	200	1	
103	H-D68/1-9101-104	Along POL line - paint cans and lids	160	1	
104	H-D68/1-9101-104	Along POL line - wooden pallets and metal strapping	80	1	
201	H-D68/1-9101-104	South (150m) of Water Lake - aluminium corrugated siding (1.5 X 1m)	25	1	
207	H-D68/1-9101-104	North (530m NNE) of Water Lake - barrels	200	1	In drainage channel
209	H-D68/1-9101-104	North of Airstrip 400 m - power cables to bedrock marker lights, miscellaneous wood, wood box, rebar light stand, battery debris	7,000	1	Marker barrels are to remain.
223	H-D68/1-9101-104	West Airstrip - marker barrels, barrels, wood	10,800	2	
231	H-D68/1-9101-104	Main Road, 325 m north northeast of Water Lake - barrels	25	1	
232	H-D68/1-9101-104	Main Road East - scattered plywood, steel cable, plastic	2,800	1	Water Supply Lake
234	H-D68/1-9101-104	North of HVS 300 m in drainage channel - cable, marker barrels, barrels, metal siding	3,500	1	
302	H-D68/1-9101-104	North of Main Access Road and POL line - foamy in creek, cut up wires, wood debris, plywood, steel cables	50,000	2	

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Arial Extent (m^2)	Approximate Crushed Volume (m^3)	Comments
309	H-D68/1-9101-104	120 m north of POL line, north of road, parallel with Water Supply Lake - plywood	10	1	
310	H-D68/1-9101-104	375 m north of POL line, north of road - scattered wood debris and cable	20	1	
109	H-D67/1-9101-108	Near POL line - metal hose, rubber hose, wire, cardboard	80	1	
240	H-D67/1-9101-108	Borrow Area 2 connector road - rubber tube, barrels, strapping, miscellaneous wood	5,500	1	
203	H-D67/1-9101-109	Main Road Debris Area - 12+ barrels (exposed/partly exposed), timbers, strapping, miscellaneous metal and wood, steel cable, stove parts, galvanized steel pipe with stranded cable inside	12,000	5	
249	H-D67/1-9101-109	Borrow Area 3 - barrels, long sections of rebar,, wood, rope, canvas, metal siding, timber, hoses, large wheel, lights, stranded cable, piece of construction equipment, rubber housing light box	60,000	5	Includes only debris volumes from Lobe A and B.
301	H-D67/1-9101-109	Between Old Abandoned Road and Access road, south of Borrow Area Extension 2D - scattered rope, wood, metal and braided cable	50	1	Former Hazmat building location.
237	H-D67/1-9101-110	Immediately south of airstrip - drum, power and communication cables, steel cable, plywood	3,500	2	
233	H-D67/1-9101-111	HVS north 140 m - marker barrels and piece of corrugated siding	500	1	
235	H-D67/1-9101-111	Borrow Area 6 - cables, rebar, timbers, drum, miscellaneous wood, plywood, partly exposed steel frame, pieces of steel rebar beyond toe	3,500	4	Includes debris from Borrow Area 6 Debris Area Lobe A

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Arial Extent (m^2)	Approximate Crushed Volume (m^3)	Comments
236	H-D67/1-9101-111	Airstrip POL debris area - Above the ravine: steel cables and marker drums - In ravine: heating barrels, barrels, parts of vehicle	7,000	11	The vehicle parts and some of the debris are in the west end of the ravine.
Borrow Area 5	H-D67/1-9101-111	Borrow Area 5 Debris Area Lobes A and B – SW of airstrip - partly exposed piece of culvert, 2X6 timbers, wood fragments, metal strapping, partly exposed tire, pieces of construction equipment	400	3	Includes Borrow Area 5 Debris Lobes A and B.
222	H-D67/1-9101-112	Airstrip southwest 250 m northeast of HVS - partially buried barrels, marker barrels, miscellaneous wood in and adjacent to shallow creek up to toe of slope.	9,000	1	
224	H-D67/1-9101-113	Airstrip west central - drum and fridge at base of slope, metal siding, marker barrels, strapping, miscellaneous wood, power cables (runway transformer stand), rebar	8,000	4	Wet areas at base of slope
251	H-D67/1-9101-113	Northwest of airstrip - marker barrels/posts, drum lids, partially exposed barrels, strapping, steel and miscellaneous wood	2,500	1	
253	H-D67/1-9101-113	Airstrip west - crushed barrel, metal pipe, rope	500	1	
Airstrip Debris Perimeter	H-D67/1-9101-112 & 113	Entire East Airstrip - see below for description, majority concentrated in pallet line, there is scattered debris throughout area.	327,400		See below for concentrated areas of debris within overall Airstrip Debris Perimeter.
206	H-D67/1-9101-112 & 113	450 NE of pallet line - wood box	25	1	
211	H-D67/1-9101-112 & 113	Airstrip Equipment Storage Pad - miscellaneous wood, metal, strapping, cable, trash can, canvas, barrels, exposed culvert, skid	15,000	5	Includes debris from Airstrip Landfill Lobes A and C1

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Arial Extent (m^2)	Approximate Crushed Volume (m^3)	Comments
213	H-D67/1-9101-112 & 113	Airstrip Material Processing Area (excluding crusher/screener) - - scattered debris, 12 X12 wood timbers, power cables, metal barrels, strapping, oil filters, cans, battery pieces, auto parts, rubber hose, copper wire, culvert fragments, rebar, electrical cable with steel outer housing, tires, construction equipment, stranded cable, wheel axle, steel grating, steel rod, air filter, engine block, wood	10,700	18	Includes debris from Airstrip Landfill Lobes E, F, G, H and I.
214	H-D67/1-9101-112 & 113	Airstrip East 200 m north - paint cans, steel grating, culvert pieces, strapping, 5 gal steel pail lid, miscellaneous wood	500	1	
215	H-D67/1-9101-112 & 113	East of Thermokarst - timbers, siding, wood box, exposed fragments of wooden powerline poles	4,900	2	Includes debris from Airstrip Landfill Lobe J.
216	H-D67/1-9101-112 & 113	River Debris, southeast of Airstrip Equipment Storage Area – - tractor, steel, cat cylinder drums, communication dish panel, pipe, cables, timber, 1000 gal fuel tank, rebar, battery, vehicle powertrain parts, cable spool	3,800	26	Includes Airstrip Debris Lobes B, C2 and D. Keep Lobe B total.
217	H-D67/1-9101-112 & 113	225 northeast of crusher - large bundle of steel rebar	250	7	
218	H-D67/1-9101-112 & 113	Airstrip Landfill Lobes Q and R - exposed barrels, wood fragments, tin cans, metal strapping, ¼" rebar, foil insulation, wiring, steel pails, piece of culvert, electrical cable, angle iron, steel pipe, metal siding	1,400	2	Airstrip Landfill Lobes Q and R.

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Arial Extent (m^2)	Approximate Crushed Volume (m^3)	Comments
219	H-D67/1-9101-112 & 113	Airstrip Pallet Line (excluding barrels) and area -boxes, wire, pails, barrels, cables, wheels, rebar, scaffolding, doors, fridges, rebar, pallets, storage containers, gas pump, guy anchors, electrical pieces, vehicle fragments, construction pieces, storage tanks, cat tracks, insulation, pipe, miscellaneous metal and wood, strapping, plastic fragments, canvas, tin cans, broken glass, steel bars, barrels, culvert sections	34,400	780	Includes Pallet line and Airstrip Landfill Lobes Y, Z, AA, EE, FF, GG.
220	H-D67/1-9101-112 & 113	Airstrip Pallet line area – including Barrel Storage Area - ~1300+ barrels stockpiled, miscellaneous scattered wood and metal, refrigerator parts, rope, timbers	22,000	500	
226	H-D67/1-9101-112 & 113	Airstrip east, immediately east of runway – - metal siding	25	1	
227	H-D67/1-9101-112 & 113	North of Airstrip Pallet Line - 14 marker barrels	1,500	5	
228	H-D67/1-9101-112 & 113	Airstrip Landfill Lobe W and X - timbers, barrels (whole and crushed), miscellaneous metal and wood, cat tracks, metal strapping	6,200	9	Airstrip Landfill Lobes W and X
229	H-D67/1-9101-112 & 113	170 m north of crusher - partially buried cat tracks, canvas material	135	2	
246	H-D67/1-9101-112 & 113	Material Processing Area North - scattered miscellaneous wood and metal, plywood, oil/air filters, metal pipe, partly exposed dozer tracks, barrels, cable	3,200	2	Includes debris from Airstrip Landfill Lobes L, M, N.
247	H-D67/1-9101-112 & 113	Airstrip Landfill Lobes T and U - partially buried cables, fabric, miscellaneous wood and metal, stranded cable, barrel lids, 1” pipe, strapping, barrels, filters, wood – may be creosote treated	2,300	2	Airstrip Landfill Lobes T and U.
248	H-D67/1-9101-112 & 113	Northeast Airstrip - scattered miscellaneous wood, metal, strapping, drum lid, pipe, barrels, plywood, cans	5,000	3	Drill steel to remain.

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Arial Extent (m^2)	Approximate Crushed Volume (m^3)	Comments
252	H-D67/1-9101-112 & 113	North of Airstrip Landfill - stockpiled and scattered refuse, strapping, plywood, mini drums, cans, charred wood, miscellaneous metal and wood	3,000	12	
254	H-D67/1-9101-112 & 113	Cable Lines – Various Locations - scattered cables, wood, timbers, foam mattresses	+1000	3	Difficult access.
260	H-D67/1-9101-112 & 113	Main Road, 650 m northwest of Water Lake - plywood and timbers near abandoned cable	150	1	
303	H-D67/1-9101-112 & 113	Airstrip Landfill Lobes O and S - piece of culvert, metal strapping, barrel lid, exposed wood, angle iron, PVC pipe	450	1	Airstrip Landfill Lobes O and S.
308	H-D67/1-9101-112 & 113	East of thermokarst - tin cans	10	1	
C-2	H-D67/1-9101-112 & 113	Thermokarst area - 4 power cables extending into thermokarst area	2,000	1	
Lobe BB	H-D67/1-9101-112 & 113	Airstrip Landfill Lobe BB - partly exposed barrels, exposed metal and strapping	130	1	
Lobe CC	H-D67/1-9101-112 & 113	Airstrip Landfill Lobe CC - partly exposed barrels along slope face and at the toe slope	2,130	3	

5.11 Demolition

The FOX-3 site is an operational long-range radar site, and many of the facilities are to remain. The work to be conducted at the FOX-3 site includes the demolition, removal, disposal or containerization of all structures and utilities as shown on the demolition drawings (refer to Drawings H-D67/1-9101-201 to 206) and includes the following:

- Removal and disposal of all contents of buildings identified for demolition.
- Removal, segregation and containerization of building facility components coated with PCB amended paint at PCB concentrations in excess of 50 ppm.
- Removal and disposal of asbestos material in accordance with the asbestos abatement program. Asbestos must be removed and disposed of in a method that eliminates the risk of exposure to friable asbestos. Proper personal protective equipment and specialized equipment is required when removing asbestos. Asbestos materials are bagged in polyethylene prior to placement in the NHW Landfill.
- Removal and disposal of concrete contaminated with PCBs at concentrations in excess of 1 ppm and less than 50 ppm.
- Removal and containerization of concrete contaminated with PCBs at concentrations in excess of 50 ppm.
- Removal and placement of hazardous demolition waste material in containers in accordance with the Hazardous Waste regulations. Hazardous demolition waste is segregated and disposed of according to CEPA guidelines.
- Removal, wrapping in plastic, and disposal of creosote treated timbers in the NHW Landfill. Creosote coated power poles or foundations are to be cut off 300 mm below ground level.
- Removal and disposal of drainage culverts.
- Disconnecting and capping of services, as required.
- Non-hazardous building materials require no special treatment and can be crushed and placed in the NHW Landfill.

Demolition debris to be disposed of on-site will be cut into shapes and sizes that minimize void space when landfilled. Concrete foundations are largely left intact except where coated with PCB paints. Following the removal of site structures, demolition areas are reshaped or backfilled with granular fill to a height flush with the remaining foundations. All voids or holes that are left by foundation or structure removal are filled with gravel.

5.12 Barrel Disposal Requirements

In order to determine the correct disposal method for barrels and their contents, the contents must first be identified by sampling and analyses. Analytical data obtained for the barrel samples at the site will be compared to the criteria included in Table 10. Barrel contents are identified as organic or aqueous and the concentrations of glycols, alcohols, PCBs, chlorine, cadmium, chromium, and lead are determined. Uncontaminated aqueous phases can be disposed of on the land; uncontaminated organic phases can be incinerated; contaminated aqueous material will be scrubbed free of organic material, and contaminated organic material will be disposed of as hazardous material.

Table 10: Barrel Disposal Requirements

Phase	% Glycols or Alcohols	PCB	Cl	Cd	Cr	Pb	Disposal
Organic	-	<2	<1000	<2	<10	<100	Incineration
Organic	-	>2	>1000	>2	>10	>100	ship south
Aqueous	>2%	>2	>1000	>2	>10	>100	ship south
Aqueous	>2%	<2	<1000	<2	<10	<100	Incineration
Aqueous	<2%	-	-	-	-	-	scrub & discard

Note: All concentrations are in mg/L.

5.12.1 Inspection

All barrels will be inspected to address the following items, which will be recorded and used as a guide prior to opening barrels.

- Symbols, works, or other marks on the barrel that identify its contents, and/or that its contents are hazardous, i.e., radioactive, explosive, corrosive, toxic or flammable.
- Symbols, words or other marks on the barrel that indicate it contains discarded laboratory chemicals, reagents, or other possibly dangerous materials in small volume containers.
- Signs of deterioration or damage such as corrosion, rust or leaks at seams, rims and V-grooves.
- Evidence of spills or discolouration on the top and sides of the barrel.
- Signs that the barrel is under pressure, such as bulging or swelling.

The area around the barrels that show evidence of holes, rust points, or openings will be tested using a Volatile Organic Compound (VOC) instrument prior to movement of the barrels. If the measured VOC levels exceed 20% of the Lower Explosive Limit (LEL), all handling, storage and transportation operations will be conducted in accordance with the appropriate sections of the National Institute for Occupational Safety and Health (NIOSH) guidelines, National Fire Code of Canada, and the TDGA for flammable and combustible materials.

5.12.2 Opening

If the bungs of a barrel can be readily moved, the barrel will be opened slowly, allowing time for any pressure in the barrel to be released before the bungs are fully removed. If the bungs of a barrel cannot be readily moved, or if the inspection suggests that opening of the barrel may present a special hazard, the barrel will be remotely vented to relieve any internal pressure that may be present prior to opening.

Pressurized barrels are extremely hazardous and will be opened with extreme caution. Only non-sparking equipment will be used. All personnel responsible for opening barrels will be provided with appropriate safety equipment and clothing. All barrels will be opened in accordance with the procedures outlined in the Occupational Safety and Health Administration (OSHA) Code of Federal Regulations Title 29, Part 1910, Section 120 (29 CFR 1910.120) Hazardous Waste Operations and Emergency Response (HAZWOPER).

5.12.3 Sampling and Testing of Barrel Contents

The barrels will be numbered and cross-referenced to sample numbers. The following is a summary of the procedures for sampling and testing barrels.

- Each barrel will be sampled using a dedicated drum thief.
- Barrels with less than a 50 mm depth of liquid contents may be combined with other barrels' contents with similar colour and viscosity prior to sampling.
- Barrel contents are to be consolidated in the MPA.
- Any barrel contents consisting of black oil are NOT to be consolidated.
- Barrel contents inferred to contain only water based on visual observation will be tested to confirm the presence of glycol and/or alcohol.

5.12.4 Disposal of Barrel Contents

Barrels containing rust and sediment may be shredded and placed in the NHW Landfill. Barrel contents consisting of water with glycol and/or alcohol or organic phases, and meeting the criteria listed in Table 10 may be incinerated on-site or packaged for off-site disposal. The contents of barrels containing water and less than 2% glycol or alcohol will be transferred to an oil-water separator. Small volumes may be agitated with oil-absorbent material to remove any organics. Barrel contents with concentrations of parameters in excess of the criteria in Table 10 will be packaged in accordance with the TDGA regulations and disposed of at a licensed off-site disposal facility.

A leachate extraction test will be completed on the solid residual material resulting from the incineration process. The leachate toxicity of the material will be determined in accordance with the TDGA. Materials found to be non-toxic will be buried in the Tier II Soil Disposal Facility. Toxic materials will be packaged and transported off-site for disposal in accordance with TDGA regulations, as required.

Used oil-absorbent material will be tested to determine treatment and disposal requirements. Oil-absorbent material which meets the criteria in Table 10 will be incinerated. If the criteria are not met, the materials will be packaged in accordance with TDGA regulations, as required, and disposed of off-site at a licensed disposal facility.

5.12.5 Cleaning and Disposal of Barrels

All empty barrels will be steam cleaned to remove any residual oil, wax, tar and other residue adhering to the surface. If a residue remains, a detergent cleaning solution will be applied by spray or brush and allowed to soak for 30 minutes. Barrels will be steam cleaned again after detergent application. Solvents will only be used if the detergent does not adequately remove the residue. The solvent rinsate material will be tested to determine disposal requirements. The steam cleaning rinsate may be recycled and will be directed to an oil-water separator. Oily waste residue may be removed by agitation with an oil-absorbent material to remove organic material. The resulting rinsate will be tested to determine if it meets the discharge criteria. If the rinsate does not meet the discharge criteria, it will be packaged in accordance with TDGA regulations and disposed of off-site at a licensed disposal facility. The used oil-absorbent material and/or oil liquid waste will be disposed of as described in Section 5.12.4. All empty barrels will be crushed or shredded prior to disposal in the NHW Landfill.

5.13 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 11.

Table 11: 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 (by separate contract)
• Fuel tank bottom sludges • Fuels, lubricating oils, alcohols and glycols	• Off-site licensed treatment/disposal facility (by separate contract) **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

5.14 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.

5.15 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. These areas are identified on the drawings provided in Appendix A.

5.16 Future Activities

The site was shut-down in the early 1990's, although there is a North Warning System Long-Range Radar site at the same location. There are no current plans to change this land use. The only planned future activity for this site is the landfill monitoring program, which was agreed to in the DND/NTI Cooperation Agreement.

6.0 Description of the Environment

6.1 Climate

The Dewar Lakes site is situated near a chain of lakes in central Baffin Island, approximately 525 m above sea level. The total mean annual rain and snowfall are 115.7 mm and 166.4 cm, respectively. The majority of the precipitation falls from May to October. The mean annual temperature is 13.3 C, with the warmest month being July and the coldest months being January to March. Generally temperatures at this site are less extreme than in the coastal areas of Baffin Island.

6.2 Geology

The bedrock-controlled topography of the area has been enhanced by glaciers that selectively eroded weaker rock layers and sculpted stronger ones. The entire area was covered by the Laurentide Ice Sheet during the late Wisconsinan and Holocene periods. Glacial ice flowed westward from the central plateau of Baffin Island towards Foxe Basin. In the southwest part of the area, the exposed bedrock was glacially sculpted to form specific landforms “roche moutonnee” and “crag and tail” that are characteristic of glaciated and exposed bedrock-dominated landscapes. In the project area, these dome or hump-shaped elongated rocky hills are oriented east-west. They are characterized by smooth, rounded eastern ends and plucked, abrupt western ends. The east-west orientation of these fluted bedrock landforms, coupled with their morphology, are indicative of the westward direction of the glacial ice movement. The glacier moving from east to west over the exposed bedrock within the mapped area exerted its force at a high angle against the back and crown of the hump but at a slight angle away from the downstream face. It consequently subjected the back and crown to vigorous abrasion, leaving them smoothed and gently curved, and it subjected the downstream face to quarrying leaving it abrupt at the western end of the roche moutonnee feature. This mechanism of the roche moutonnee formation explains the origin of the fluted bedrock landforms found in this area. The roche moutonnee glacial features are distinguished from the crag and tail, the other glacial landforms found in the southern and southeastern parts of the mapped area, by their lack of a streamlined tail of till.

6.3 Surficial Deposits

The project area is located well above the original marine washing limit, therefore, glacial till is the prevalent deposit type, with glaciofluvial, alluvial, glaciolacustrine and colluvial deposits present in portions of the site.

Till is bouldery with a predominantly silty sand matrix, well graded and unsorted. The till lithic composition reflects the underlying metasedimentary bedrock. The following two types of the till cover can be distinguished within the mapped area depending on the till thickness (depth to the underlying bedrock); till veneer and till blanket.

Till veneer, usually 0.5 to 2.0 m thick, forms discontinuous cover mimicking topography of the underlying bedrock with patches of exposed bedrock and boulder fields. The till veneer occurs in the southern and southeastern parts of the mapped area, i.e., within the crag and tail topography where it forms narrow tails of the glacial diamicton several hundred metres long.

Till blanket, usually 2 to 10 m thick, forms undulating plains with fluted and drumlinized areas and areas of boulder fields.

Boulder fields are widespread throughout the area. Boulders cover at least 70% of the area around portions of the station and are typically 0.3 to 0.5 m in size, although they can be greater than 2 m. The

boulders often have a sorted appearance due to frost sorting forming large, sorted polygons, a variety of patterned ground.

Glaciofluvial deposits occur within the lower valley, a recent meltwater channel, presently occupied by the MacBeth River. They occur as narrow valley trains lying between the rocky valley walls and as a wider outwash terrace. The local glaciofluvial deposits resulted from the late-glacial meltwater deposition associated with glaciers that receded inland towards the central Baffin plateau. The outwash is composed of stratified gravel and sand 2 to 15 m thick.

Alluvium forms low terraces and floodplains at the bottoms of the MacBeth River and a smaller northeast flowing stream in the northwest part of the mapped area. The local alluvium is composed of stratified and sorted gravel, sand, cobbles and boulders.

Glaciolacustrine deposits form small patches of sandy and silty sediments up to 2.0 m thick at some locations throughout the mapped area.

Colluvium, the superficial mantle of the unconsolidated rock debris, was mapped at the base of steep slopes of the downstream face of the roche moutonnee, transported there by gravity.

6.4 Hydrology

The area surrounding the station is characterized by an extensive boulder field featuring poorly developed channels and drainage patterns. Rolling hills separated by broad intervening depressions, which form natural drainage sheds, characterize the landscape between the upper and lower bases.

The upper base facilities occupying the hill crest at approximately 525 masl are drained by a series of culverts and ditches with direct flow toward the surrounding boulder covered terrain. Low lying areas within the station site are often more poorly drained and characterized by standing water or saturated surface materials. Ponding also occurs along the perimeter of the upper base facilities, adjacent to the gravel pad embankments. Natural drainage on the undisturbed terrain occurs in rills or as sheet wash typically below the boulder covered surface.

Drainage from the POL facilities, landfill and pallet areas is controlled largely by the topography which gently slopes away from the facilities toward the surrounding terrain. No channels are developed and flow occurs within rills or as slope wash below the boulder covered surface. Local ponding occurs within and along the perimeter of the landfill, pallet areas and POL facilities.

Sewage outfall from the module train is directed toward the surrounding landscape by channels excavated 0.5 to 1.0 m below grade. The runoff is slow and surface materials are saturated and in places ponded within the channels.

Drainage patterns become better developed with decreasing elevation. The terrain, in turn becomes more rugged, characterized by increasingly steep slopes and steeper channel banks eroding through the mantle of unconsolidated surface materials exposing the underlying bedrock. The channels form a dendritic pattern on the landscape flowing toward the southeast. Small but comparatively deep accumulations of water occur along the drainage courses in parts of the landscape which provide water source for the base. Isolated sumps were noted in parts of the landscape between the upper and lower bases and west of the upper base facility. Drainage channels flow through the dumps exposing their contents.

The lower base facilities are located along an over-bank and channel lag sequence adjacent a large southwest flowing river. Drainage from the lower base facilities, landfills, POL areas and pallet areas, which eventually flows into the river, is improved by ditching and culverts in parts.

6.5 Flora

Dewar Lakes is located on a dry, bedrock-controlled hill with intermittent vegetation and coarse textured soil. Vegetation cover on the hill is sparse (up to 10%), dominated by purple saxifrage (*Saxifraga spp.),* and mountain avens (*Dryas spp.)* associated with kobredia (*Kobresia spp.),* sedges (*Carex spp*.) and Arctic poppy (*Papaver radicatum*). Valley bottoms and ponds or small lakes generally contain more soil of finer texture. Margins of these water bodies and adjacent meadows usually support a near complete cover of sedges, grasses, cotton grass (*Eriophorum spp.),* rush (*Luzula sp.)* and saxifrage.

6.6 Fauna

Barren-ground caribou (*Rangifer tarandus groenlandicus*) in this region of Baffin Island belong to the South-Baffin population. The calving grounds for this herd occur within the general area of Dewar Lakes. Calving usually occurs during late June and the cows and calves disperse from the area towards the coastal lowlands.

While Dewar Lakes is somewhat inland from the coast, Polar bears (*Ursus maritimus*) in this region travel extensively on land during late winter and early spring to avoid hazardous crossings of open water. Important summer denning areas occur to the east of Dewar Lakes, along the east coast of Baffin Island and bears have been known to occur at the station.

Other animals noted at the site are Arctic fox (*Alopex lagopus*), grey wolf (*Canis lupus*), short-tailed weasel (*Mustela erminea*), Arctic hares (*Lepus arcticus andersoni*), collared lemming (*Dicrostonyx torquatus kilangmiutak*) and brown lemming (*Lemmus sibiricus*).

6.7 Avifauna

Snowy owls (*Nyctea scandiaca*), Peregrine falcon (*Falco peregrinus*), Gyrfalcon (*Falco rusticolus*), and Rough-legged hawk (*Buteo lagopus*) are known to occur in this region, although none were noted during the 2006 site investigation. Red-throated loon (*Gavia stellata*) is the most common loon in this region of Baffin Island and was likely the species observed near the facilities during the site visits. The small shallow ponds in the area are the preferred nesting habitat for this species. Other waterfowl species which may be nesting in the area include: Tundra swan (*Cygnus columbianus*), Greater snow goose (*Anser caerulescens*), Brant (*Branta bernicla*), King eider (*Somateria spectabilis*), and Oldsquaw (*Clangula hyemalis*).

Both Glaucous gull (*Larus hyperboreus*) and Thayer's Gull (*Larus thayeri*) are known to occur in this region.

6.8 Heritage Resources

During the 2006 site investigation, an archaeological assessment was conducted of all areas of expected clean up activities, including areas for borrow extraction and new landfill/landfarm development. No identified features are expected to restrict clean up work. Table 12 provides a summary of features identified in proximity to work or traffic areas. Features are to be clearly flagged to enable avoidance. A 30 m setback from features is required. If the required set-back cannot be implemented, then barriers must be erected to protect the features.

Table 12: Archaeological Resources in Proximity to Work Areas

Resource No.	Description	Location	Construction Considerations
NdDv-1	Tent rings, caches, hearths. Significance rated as medium.	South of airstrip, potentially en route to river access point to remove river debris south of airstrip.	Flag for avoidance.
NdDv-3	Grave, stone shelter, memorial cross. Significance rated as high.	1.7 km west of the airstrip, north of the access road, adjacent to POL line.	Flag for avoidance.
NdDv-4	Small stone structure. Significance rated as medium.	In Upper Site area, near Atwell Dormitory outfall.	Flag for avoidance.
NdDv-8	Tent ring. Significance rated as low.	South of airstrip, potentially en route to river access point to remove river debris south of airstrip.	Flag for avoidance. Surface debris pick up should be completed by hand in vicinity of features with vehicles remaining more than 30 m from feature.
NdDv-10	Fox trap, inukshuk. Significance rated as medium.	At Upper Site near sewage outfall.	Flag for avoidance and erect barriers to ensure no disturbance.

It should be noted that there are several archaeological features that appear to be in close proximity to work areas, based on the drawings. This is however, misleading as the effects of topography are not apparent.

7.0 Identification of Environmental Impacts

An environmental assessment of the clean up of FOX-3 was originally completed in 1998 (FEAI 16708). As part of the assessment, potential interactions between the project components and the environment were identified. The focus of the assessment was on the location, sensitivity, seasonal presence and abundance of these components. Through this assessment, Valued Ecosystem Components (VECs) were identified, which include physical, biological, socio-economic, historical or cultural components. An updated assessment is provided in the following sections.

7.1 Valued Ecosystem Components

Valued Ecosystem Components (VECs) are selected as components of the environment that are valued by society and are used as the basis of the environmental assessment. Potential environmental concerns associated with the project were through consultations with interested and expert parties, community meetings and previous project experience. The following VECs were identified:

Physical: Protection of soil and water quality, especially related to permafrost conditions and the drinking water supply.

Biological: habitat quality and availability including feeding and nesting areas for birds, feeding and calving areas for local wildlife, and local vegetation.

Socio-economic: Regional employment opportunities, regional business opportunities, regional training opportunities, and hunting and fishing in local areas.

Archaeological: Archaeological sites identified around the station and beach areas.

7.2 Impact of the Environment on the Project

The implementation of a clean up project in an Arctic environment such as FOX-3 brings unique logistical issues. The potential exists for delays in the clean up associated with bad weather, which may include work stoppage or delays in the transportation to and from the site of personnel and supplies. Conditions related to the Arctic climate, such as ice and frozen ground may also delay clean up activities. Clean up activities which are best completed at maximum thaw may be delayed depending on seasonal climate changes.

The Department of National Defence (DND) and Nunavut Tunngavik Incorporated (NTI) signed the DND/NTI Agreement for the Clean Up and Restoration of the DEW Line Sites within the Nunavut Settlement Area outlining the environmental and economic provisions. The agreement includes a Minimum Inuit Employment Content (MIEC) and Minimum Inuit Contractor Content (MICC) for the clean up contract and requirements for training, specifically related to the clean up activities. Generally the contracts for the clean up of the DEW Line sites include clauses requiring the contractor to maximize Inuit involvement. Inuit involvement in the clean up includes both employment and business (contracting) opportunities.

Typically, labour required for clean up involved heavy equipment operators, general labourers, as well as environmental and engineering specialists. Other opportunities include cleaning and cooking staff and transportation. The main beneficiaries of the economic input from the clean up will primarily affect the nearby communities of Clyde River and Qikiqtarjuaq. As the contract for the clean up of FOX-3 has not yet been tendered or awarded, the requirements of the communities are not confirmed. A temporary,

self-sufficient construction camp will be established at the site to accommodate the contractor and other personnel.

7.3 Identification of Cumulative Environmental Effects

Cumulative effects have been defined as changes to the biophysical, social, cultural or economic environments caused by a project component in combination with any on-going, past, or future activities. Cumulative effects can occur as interactions between project components (either from the same or more than one site) and/or between environmental components. Effects can occur in one of four ways:

- Physical or chemical transport mechanisms.
- Nibbling loss (i.e., gradual disturbance).
- Spacial or temporal crowding.
- Growth induction initiated by the project.

7.3.1 Analysis of Cumulative Environmental Effects

Four steps in the analysis of the cumulative environmental effects of this project include scoping, analysis of effects, mitigation measures, and significance.

Scoping: Scoping includes the identification of issues of potential concern, VECs that could be affected and boundary setting. The spacial boundaries include impacts over a larger (regional) area including the crossing of jurisdictional boundaries. As the landfills will remain on-site, temporal boundaries extend beyond the time frame required to complete the clean up work.

Analysis of Effects: The analysis includes an evaluation of baseline data and possible effects on VECs. The combined interactions between the clean up activities and future land use and those VECs which are similar are identified.

Mitigation Measures: Mitigation measures are identified for project-environment interactions.

Significance: The interactions are defined as having a low (L), moderate (M), or high (H) probability of occurring. The next step is to determine the likelihood of significant adverse effects, taking into account appropriate mitigation measures.

7.3.2 Identification of Mitigation Measures and Residual Impacts

Mitigation measures are identified that result in a reduction or elimination of likely environmental effects, including potential adverse effects, associated with the clean up. Mitigation measures are outlined in the Environmental Protection Plan for FOX-3 (see Section 8.0). The EPP forms part of the contract documents and requires all on-site personnel to adhere to the mitigation measures outlined in the EPP.

Table 13 provides a summary of the VECs, potential impacts, mitigation measures and overall significance.

Table 13: Project Impacts

VEC	Activity	Description of Impact	Proposed Mitigation Measure	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.	L
	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 and/or calcium chloride will be used for dust control.	L
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 Tier II facility incorporates a double leachate containment, which includes a synthetic liner and freezeback of permafrost. • The landfill cover is graded to promote surface runoff.	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	L
	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.	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	L
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/closure, which has the	• The Tier II facility incorporates leachate containment, which includes a synthetic liner and freezeback of permafrost. • The landfill cover is graded to promote	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Overall Significance
		potential to degrade water quality, both surface and active layer water. • The development and closure of the landfills has the potential to disrupt drainage at the site and cause siltation of waterways.	surface runoff. • New facilities are sited away from waterbodies and drainage courses so that drainage is not interrupted. • Prevent siltation by use of berms and/or silt fences.	
	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 EPP measures as necessary.	L
	Removal of Debris in MacBeth River	• Sediment release and associated sedimentation of ecologically productive aquatic habitat may occur during removal • Potential inadvertent release of harmful substances such as fuels and lubricating oils when completing removal of debris	• Conduct work when river is frozen • Implement other EPP measures as necessary	M
	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.	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.	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Overall Significance
	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	L
Terrain	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.	L
	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.	L
	Site Regrading	• Terrain and drainage will be improved as a result of grading disturbed areas. Previously disturbed areas will blend into the natural environment.	• n/a	L
	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.	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.	L
	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.	L
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.	L
	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	L
Terrestrial Habitat	Landfill Development	• Loss of habitat may occur as a result of the	• Regrade and reshape the disturbed	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Overall Significance
		development of the new landfills in previously undisturbed areas.	areas to match existing terrain to facilitate recovery of ecosystem components.	
	Facility Demolition	• The existing facilities may be used by wildlife as habitat (i.e., nests in structures). The demolition of these facilities has the potential to impact availability of habitat.	• Inspect facilities prior to demolition for use by wildlife. Do not demolish while birds are nesting. • Contact appropriate wildlife officer for additional guidance to ensure disturbance of wildlife is minimized.	L
	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.	M
Aquatic Habitat and Animals	Landfill Closure	• 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.	M
	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.	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.	M
Health and Safety	General Clean Up Activities	• The excavation of potentially hazardous materials from the landfills, the collection	• Transportation of any hazardous materials is to be in accordance with the	L

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Overall Significance
		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.	TDGA Regulations. • Workers must wear and use appropriate personal protective equipment. • Workers are to be trained in the use of personal protective equipment and proper handling procedures for hazardous materials. • Proper procedures for working around heavy equipment to be implemented.	
	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	L
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.	L
Land Use	General Clean Up Activities	• Clean up activities may disturb traditional land use, i.e., hunting and fishing activities that would occur during the summer months.	• Contact the local hunters and trappers organization to coordinate clean up activities and traditional land use.	L
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	L
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	L

8.0 Environmental Protection Plan

The main focus of the project's environmental protection program during the clean up is based on a site specific Environmental Protection Plan (EPP). The requirements outlined in the EPP are the end result of the environmental assessment process and include the mitigative measures designed to reduce or eliminate potential harmful effects. The EPP for FOX-3 is provided in the following sections.

8.1 Scope and Objectives

The EPP 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-3 site, and details related to environmental inspection responsibilities and procedures.

The protection measures described herein are to 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 DCC Contract Coordinator.

8.2 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 EPP and all applicable laws, regulations, permits, guidelines and standards. The environmental inspection staff is a part of the DLCU Project Management Office (PMO). The PMO was formed as per the Terms of Reference of the Memorandum of Understanding between the Director General Environment and Defence Construction Canada (DCC). The DND will be represented at the site by the Contract Coordinator, who will report to the DCC Contract Manager. The contractor will maintain regular contact with the environmental inspection/Quality Assurance team. This will include, but is not limited to:

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

8.3 General Environmental Protection Measures

8.3.1 General

The lands associated with the FOX-3 site have distinctive biophysical characteristics associated with Arctic environments. Potential impacts related to the clean up of the site include degradation of the permafrost regime, disturbance of existing vegetation, uncontrolled erosion, point source contamination, disruption of terrestrial and wildlife populations, and human health impacts. The procedures and requirements provided in this section are intended to be protective of these ecosystem components.

8.3.2 Site Operations

The contractor will establish a construction camp on the site, which will be located in an area with minimal vegetative ground cover. The selected location will 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 is not to be impeded, and a distance of at least 30 m from the nearest body of water is to be maintained. Ice-rich substrates will be avoided, where possible. Permafrost will be protected by construction of gravel pads, and/or elevation of heated buildings on wooden structures. Areas containing archaeological resources will be avoided.

Vehicle and mobile equipment travel will be restricted at the site to established roads, stream crossings and work pads unless specifically exempted by the DCC Contract Coordinator. Recreational use of vehicles, including all terrain vehicles (ATVs), is not permitted off of the existing road network. Overland movement of equipment and vehicles will be minimized where damage to the vegetation or underlying soils may occur. Following heavy rains, vehicle and heavy equipment use outside of road and work pad areas is not permitted until the soil has drained sufficiently to prevent excessive rutting, and until authorized by the DCC Contract Coordinator.

Mobile equipment and vehicle operators are to yield the right-of-way to wildlife where safe to do so. Vehicles will not be operated in a manner that harasses any species of wildlife. Vehicle and equipment servicing is to 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 is to be conducted in a manner that avoids spillage of fuels, oils, greases and coolants. When refuelling equipment, leak-free containers and reinforced rip and puncture-proof hoses and nozzles will be used. Drip trays will be provided and ensure that all storage container outlets are properly sealed after use.

8.3.3 Storage and Handling of Fuel and Other Hazardous Substances

Fuel is to be stored in self-dyking, double-walled containers, or 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, exhibit ponding or flooding, or have high groundwater tables, excessive seepage, or ice-rich (thaw sensitive) soils will be avoided. Archaeological resources will also be avoided. Smoking is prohibited within 7.5 m of the fuel storage facility. Appropriate signage will be posted around the fuelling facility. Fuel storage facilities will be inspected once per day for the duration of the project and documentation of the inspection will be maintained. Fire-fighting equipment will be made available for immediate access at each fuel storage facility. All barrels containing fuel and other similar materials will 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 will 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 will be available to all personnel. All fuel spills will be dealt with according to the Spill Contingency Plan (see Section 9.0).

Regular inspections are to be conducted of all machinery hydraulic, fuel and cooling systems and any leaks will be repaired immediately. Emergency spill equipment will 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 are to be removed from the site at the conclusion of the clean up.

8.3.4 Surface Water Management

A water use license will be obtained 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 will not exceed 10% of total water body volume. All water hoses will 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*.

8.3.5 Wastewater Management and Monitoring

DLCU construction 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 (Tier II and Non-Hazardous Waste Facilities) 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 assessments, conducted over the last two decades. The criteria for the wastewater are considered conservative and appropriately protective of the arctic environment.

Wastewater may be temporarily stored in existing tanks while awaiting test results, which are designed for disposal, provided that it is not stored over the winter months. The volume of wastewater storage during any one construction season shall not exceed 50% of the total capacity of the tank, and shall not exceed the available treatment capacity during that construction season. The release of all water must conform to the Construction Wastewater Discharge Criteria, listed in Table 14. The basis or background for the choice of each criterion is also listed in the table.

Table 14: 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 will be tested each time prior to discharge. Once it is confirmed that the wastewater meets the discharge criteria, it will 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. 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.

8.3.6 Sewage Effluent Monitoring

The sewage lagoon at FOX-3 will 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 15 below for a summary of the effluent discharge criteria, as provided by the Nunavut Water Board. These criteria were provided for other DEW Line sites and have been adopted as the discharge criteria or the FOX-3 site.

Table 15: 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 stamped by a qualified engineer) requires 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 will be completed every 30 days and prior to discharge.

8.3.7 Domestic Waste Management

Kitchen wastes will be temporarily 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 will be disposed of in the existing site landfills unless otherwise specified.

8.3.8 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 will be maintained. Establishment of new roads off-site is subject to the terms of the land use permit and the approval of the DCC Contract Coordinator. Roads will not be sites within 30 m of any ecologically sensitive areas. Ice-rich soils, especially peatlands, are also to be avoided during road construction. The road bed will be prepared with a sufficient thickness of fill to prevent terrain damage. Culverts, if required, will be installed to maintain natural cross-drainage and prevent ponding. Any culverts installed will be removed from the roads and drainage restored at the end of the clean up

operations. Access roads will be monitored for signs of erosion and remedial action will be taken where necessary. Dust suppression, if required, will be maintained with water only.

8.3.9 Stream Crossing and Diversion

The contractor is to adhere to all government regulations, licensing requirement/procedures and inspections, regarding the protection of water quality and stream integrity to prevent destruction of spawning areas. Existing stream crossings will 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 will be prevented using the following procedures:

- Activities adjacent to watercourses will be minimized.
- Cofferdams, silt barriers or other suitable barriers will be installed.
- Equipment is not to be operated in waterways.
- Streambeds are not to be used for borrow material.
- Excavated fill, waste materials and debris will not be disposed of in waterways.

It is not anticipated that any new, additional stream crossings will be required during construction.

The following mitigation measures are incorporated into the project to avoid physical impacts on the fish habitat in MacBeth River.

- Minimization of the area of physical disturbance resulting from detailed site investigations, delineation and remediation design of impacted areas prior to commencement of the project.
- Construction scheduling for appropriate water conditions (i.e., frozen).
- Construction timing of sensitive activities in areas adjacent to the aquatic environment (foreshore areas) to coincide with periods of low flow/water levels and calm conditions.
- The areas of physical disturbance will be minimized by clearly defining work areas and areas of non-disturbance in the field prior to the commencement of activity.
- Access to work sites adjacent to fisheries sensitive areas will be limited to essential equipment and personnel only.
- Contract specifications require contractor use if proper equipment with adequate capacities and in good mechanical condition to avoid unnecessary delays and mechanical failure during construction.
- Contract specifications require contractor submittal of a site specific work methodology plan for approval by the proponent prior to initiating the work. The methodology plan includes details regarding construction staging and sequencing to minimize the significance and duration of potential impacts.
- Contractor submittal of sedimentation and erosion control plans for approval by the proponent prior to initiating the work.
- Heavy equipment will be cleaned and/or decontaminated prior to work within environmentally sensitive areas.
- The fuelling and servicing of equipment will be permitted only in designated, properly contained areas removed from environmentally sensitive areas; and

8.3.10 Borrow Pit and Quarry 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 will be minimized by using existing borrow areas, roads and buildings pads where feasible. Use of alternative sources is subject to the approval of the DCC Contract Coordinator 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. In consultation with the DCC Contract Coordinator, a 30 m buffer zone will be marked out prior to commencement of gravel quarrying operations. Organic overburden, if present, will be stripped and stockpiled separately for use in restoring the borrow area. Following excavation, the area will be recontoured to restore natural drainage and overburden will be worked into the recontoured borrow area to prevent erosion. Drainage and run-off control will 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 will be controlled in areas adjacent to the borrow pit to minimize the extent of disturbance. Aggregate will be stockpiled on ice-poor, well-drained ground such that surface drainage is not impeded. The stockpile will 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 DCC Contract Coordinator is to be notified, the area of the find avoided, and activities in other areas of the pit restricted until further instructions are received.

Development of additional borrow areas that are not identified on site plans will be at the discretion of the DCC Contract Coordinator and shall meet all siting criteria and permit requirements.

8.3.11 Hazardous Waste Material Processing Areas

A hazardous waste material processing area will be developed for the processing of excavated soils and demolition materials. The hazardous waste material processing area will 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 will be minimized to prevent the spread of potentially hazardous material along roadways.

8.3.12 Contaminated Soils

The locations of contaminated soil are shown on the drawings in Appendix A. Soils exceeding the criteria established for FOX-3 are to be removed. Disturbance to adjacent areas during excavation of contaminated soil will be minimized. Spillage of material during transportation between the excavation site and the stockpile/treatment location is to be avoided and any spillage will be cleaned up to the satisfaction of the DCC Contract Coordinator. Following excavation of contaminated soils, equipment will be decontaminated. All workers will 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, as per Part 13 of the DND/NTI Cooperation Agreement – Environmental Provisions. A landfarm facility will be constructed for the treatment of Type B hydrocarbon contaminated soils.

8.3.13 Landfill Closure and Development

The landfills will be covered with gravel to provide a minimum cover thickness as indicated on the drawings. The landfill areas will be regraded and restored to natural drainage patterns and topography. Geosynthetic liners will be installed at the Tier II Soil Disposal Facility. High risk landfill lobes are being completely excavated and backfilled with granular material. 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 the Tier II Soil Disposal Facility for the disposal of Tier II contaminated soils.

Drainage controls such as diversion ditches and sediment filters will be provided, as required, to prevent runoff from reaching water bodies during closure, remediation and construction of landfills. Monitoring equipment will be installed as shown on the drawings, or as directed by the DCC Contract Coordinator.

8.3.14 Disposal of Site Debris

Site debris will be collected, sorted into hazardous and non-hazardous materials and disposed of accordingly. The contents of any intact barrels will be tested and disposed of as described in Section 5.12. Workers are to wear appropriate protective clothing when handling potentially hazardous waste material. Off-road activity will be minimized during collection of site debris. The spill contingency plan (Section 9.0) is to be followed in the event of a spill or other emergency.

8.3.15 Demolition of Buildings and Structures

Demolition, sorting and disposal of hazardous and non-hazardous waste will be carried out in accordance with Sections 5.8, 5.9, 5.10 and 5.11. All residual debris is to be removed from the site down to grade. Structures will be demolished to the top of concrete foundation level. Gravel pads and other foundations will be regraded to restore natural drainage patterns and to match adjacent topography.

8.3.16 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 EPP requirements when scheduling arrangements are made or at other appropriate periods prior to the arrival of the aircraft on site.

8.3.17 Handling of Dangerous Goods and Hazardous Waste Materials

Treatment, disposal, and storage of hazardous and non-hazardous waste materials will be in accordance with Section 5.13. Each storage area will be separated from the nearest water body by a 30 m buffer zone.

Packaging: The Transportation of 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 should 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.

Labelling: Each item will be labelled 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.

Notification: The DLCU Environmental Officer will be notified twenty (20) days prior to shipment of any dangerous goods or hazardous materials.

8.3.18 Explosives

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

- Obtain all necessary permits and licenses.
- Handle, transport, store and use explosives and all other related hazardous 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.
- Blasting is not to be conducted in the vicinity of wildlife populations.
- Blasting is to be restricted to above water and a minimum of 100 m from fish populations.

8.3.19 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 will be stabilized. Gravel access roads required for operation and maintenance may remain. All disturbed areas will be graded to match natural drainage patterns.

8.4 Protection Measures for Valued Environmental Components

This section describes the required protection measures for the valued environmental components identified at the FOX-3 site. These protection measures must be complied with.

8.4.1 Human Health and Safety

Potential hazards to human health and safety are present at the FOX-3 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 though these locations.

All necessary precautions will 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 will 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, is not 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, survival kit and insect repellent.

Personal firearms are not permitted in the construction camp. However, the contractors' site superintendent will keep sufficient weapons (including one for backup or replacement) for defence in the event of a polar bear encounter that threatens human safety. When not in use, all weapons will be locked up as per all applicable legislation and access controlled by the site superintendent or the designate.

8.4.2 Local Economy and Contact With Local Residents

Employment and business opportunities in the north will be maximized as much as possible. Communication with the local communities of Hall Beach, Igloolik and Qikiqtarjuaq will be provided to keep them informed of contracts and significant project developments for which local businesses and individuals may be qualified to work. Regular briefing meetings will be scheduled with all camp personnel to discuss and explain camp rules.

8.4.3 Aesthetic Value

It is anticipated that the clean up activities will have an overall positive effect on the aesthetic value of the FOX-2 site in that redundant buildings and structures will be demolished, and all disturbed areas (landfills, debris piles, sewage outfall and borrow pits) will be restored as closely as possible to their original appearance. Construction personnel are to ensure that their activities do not contribute to any degradation of the local environment.

8.4.4 Surface Water and Fish Habitat

The following applies to work adjacent to waterways:

- Prevent siltation of water bodies 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.
- Avoid areas of known fish congregations during culvert removal and work adjacent to waterways.
- Do not cross streams at or immediately upstream of locations containing fish populations.
- Where possible, conduct in-stream work during low flow periods.
- 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.

8.4.5 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 removed 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 will be minimized by restricting vehicle and heavy equipment traffic to existing roads and designated work areas unless approved by the DCC Contract Coordinator. Activity in areas adjacent to work areas will also be minimized. Vehicles or heavy equipment will 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 will be installed along access roads, where required. The following measures will be implemented during the site clean up operations to minimize disruption of permafrost:

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

8.4.6 Terrestrial Wildlife

There is always concern over human/wildlife contact at DEW Line 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 will be implemented to prevent human/wildlife conflicts:

- Employ a dedicated wildlife monitor(s) at all times.
- All on-site personnel will be required to be familiar with the contents of “Safety in Bear Country”.
- Wildlife will 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.
- In the event of an unanticipated or unavoidable contact with wildlife, act in accordance with the wildlife encounter contingency plan (see Section 8.5). Familiarize all individuals working at or visiting the site with this plan as part of their work site orientation.
- 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 500 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 behaviour. The firearms shall be controlled by the contractor's site superintendent.

8.4.7 Avifauna

Disruption of avifauna during the nesting period can result in reproductive failure. For this reason, populations of nesting birds should be avoided during this period. Impacts on these species can be minimized by scheduling disruptive activities outside of the nesting period and by discouraging nesting at work areas.

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 week 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. Work will be scheduled to minimize impacts on these species.

8.4.8 Heritage Resources

DEW Line sites are often located in areas which have been seasonally settled or visited by Inuit over the past 1000 years; by their Paleo0Eskimo 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. Many of the sites have been disturbed by previous DEW Line activities. 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 DCC Contract Coordinator.
- Do not disturb the site and cease work in that area until appropriate authorities with the Department of Culture, Language, Elders and Youth (CLEY) are notified.
- Reports if all archaeological finds shall include:
    - The identity of the person making the discovery.
    - A description of the site location, including topography, landmarks, etc.
    - The nature of the activity resulting in the discovery.
    - A description of the archaeological site, including size, features, or visible details, supplemented by sketches or photographs.
    - Actions currently undertaken to protect the archaeological features; and
    - Any extenuating circumstances.
- Do not resume activities in the vicinity of the find until confirmations and direction from the Department of CLEY is received.

8.5 Wildlife Encounter Contingency Plan

Polar bears are a potential hazard to workers at all times. The situation can be aggravated by the presence of any substance the bear perceives to be food. Dedicated wildlife monitors should be employed at all times during the clean up operations.

All staff should be familiar with bear deterrent procedures and at least one designated staff member should be competent with the camp firearms. Staff should also be familiar with the GNWT "Safety in Bear Country" manual and a reference copy should be available at the site office.

Operators of vehicles and equipment shall make every effort to avoid encounters with large mammals. Congregations of animals near food or garbage are a potential problem that can be overcome by proper disposal of food wastes. Concentrations of scavenging animals such as foxes and bears increase the risk of diseases and danger to personnel. The following precautions and actions are to be taken:

- The killing of wildlife for any reasons at variance with the Wildlife Act and Regulations is an offence. Coordinate procedures for handling wildlife problems and incidents with the regional Government of Nunavut (GN) wildlife office.
- Advise personnel to maintain watch for bears and other wildlife and immediately report any sightings to the DCC Contract Coordinator. Immediately notify all personnel of the sighting. If the threat of attack is considered significant, assign a full time wildlife monitor to the specific areas of activities at risk.
- Use vehicles, noisemakers and, if necessary, a firearm to frighten the animal away from the site.
- Shoot the animal only if it returns repeatedly, refuses to leave or directly threatens human safety. Killing is considered a last resort. Contact the appropriate wildlife officer and alert them to the problem, if possible. If an animal is to be shot, assign the task to a person familiar and competent with the camp firearm. Wounded or otherwise aggravated animals can be extremely dangerous.
- Report the death of a bear to the DCC Contract Coordinator and the appropriate GN wildlife officer who will issue instructions as to the disposal of the carcass and the formal reporting procedures to be followed.
- Due to the possibility of rabies, shoot any animal that bites a human and retain the carcass intact pending instruction from the appropriate wildlife officer. If possible, notify the wildlife officer before any drastic action is taken. Seek medical advice from the appropriate medical facility for treatment or animal-inflicted wounds.

8.6 Heritage Resource Contingency Plan

All archaeological sites at FOX-3 must be avoided during clean up activities. Unrecorded archaeological sites containing such remains as habitation structures, hunting blinds, food caches and graves, and objects such as tools, utensils and butchered animal bone may be inadvertently discovered and disturbed during clean up activities. All site personnel are prohibited from knowingly disturbing any archaeological or other heritage site or collecting any artifacts. Removing artifacts is a criminal offence. In the event of finding heritage resources:

- Cease work in the area immediately, do not remove any artifacts or other associated objects from the site unless their integrity is threatened in any way.
- Mark the site's visible boundaries and avoid the area during clean up activities.
- Report the discovery of the site immediately to the DCC Contract Coordinator and the Department of CLEY by phone or fax and comply with any site protection instructions issued. Do not engage in any excavation activities.
- Prepare reports of any discovery for the respective regulatory authority and the DCC PMO indicating:

  - The identity of the person making the discovery.
  - The nature of the material.
  - The nature of the activity resulting in the discovery.
  - The location of the find including a description of the site location, topography, landmarks, etc.
  - A description of the archaeological site including size, features or details visible, supplemented by sketches or photographs.
  - Protection measures instituted.
  - The present location of any heritage material removed for safe keeping.
  - Extenuating circumstances.
- In the event of a discovery of human remains:
  - Advise the DCC PMO of the discovery and they will contact the nearest detachment of the RCMP. The RCMP will make the decision as to whether the territorial coroner or archaeological department should be contacted.
  - Halt all activities around the area of the discovery. Until determined otherwise, the remains should be treated as evidence in a criminal investigation. If the remains are found in the bucket of heavy equipment, the bucket should not be emptied, as physical evidence may be destroyed.
  - Secure the area and designate it as out of bounds to all personnel. Depending on the weather conditions, the human remains should be provided with non-intrusive protection such as a cloth or canvas tarp (non-plastic preferred).
  - Prepare a report, as described in the previous section.

9.0 Spill Contingency Plan

The Spill Contingency Plan (SCP) was prepared for the FOX-3, Dewar Lakes clean up team consisting of members from the clean up contractor (TBD), Defence Construction Canada, Environmental Sciences Group, UMA Engineering Ltd., and EBA Engineering Consultants Ltd. The SCP is effective as of January 1, 2008 (exact start date of clean up TBD in 2008), and will be available as a stand-alone document to all team members and will also be posted on-site in the camp.

The clean up is being conducted as part of the DEW Line Clean Up Project, as represented by the Department of National Defence and Defence Construction Canada. To request additional information, or additional copies of the SCP, please contact:

Douglas Craig, M.Sc.
Environmental Officer – DEW Line Clean Up Project
Defence Construction Canada
Constitution Square, Suite 1720
350 Albert Street
Ottawa, ON K1A 0K3

9.1 Introduction

The following contingency plan presents the prescribed course of action to be taken in the case of unanticipated spill events during the clean up of the FOX-3 site. The plans will enable persons in a particular situation to maximize the effectiveness of the environmental protection response and meet all regulatory requirements for reporting to the appropriate authorities.

9.1.1 Scope and Purpose

This plan applies to all activities and facilities pertaining to the construction activities at the FOX-3 site:

The purpose of the plan is to:

- Provide a clear statement of the procedures to be followed in response to all spills;
- Minimize the potential environmental impact of spills by establishing pre-determined action plans;
- Establish a state of preparedness for personnel through a Spill Response Training Program;
- Protect the health and ensure the safety of the personnel involved in the Spill Response activities;
- Provide a reporting network for spills;
- Ensure site restoration through appropriate remedial activities;
- Identify the roles and responsibilities of all parties involved in the Spill Response activities; and
- Identify sufficient personnel, materials and equipment needed to make an adequate response to a spill.

9.2 Site Information

It is estimated that the camp operation will require a combined total of approximately 350,000 litres of diesel and 20,000 litres of gasoline. Fuel is stored in double-walled tanks in a location situated a minimum of 100 metres from any water body or drainage course. Fuel is provided by the contractor.

Spill kits will be located at the fuel storage/handling area operated by the camp. It is anticipated that the camp, and all associated facilities including spill response equipment will be located at the camp area.

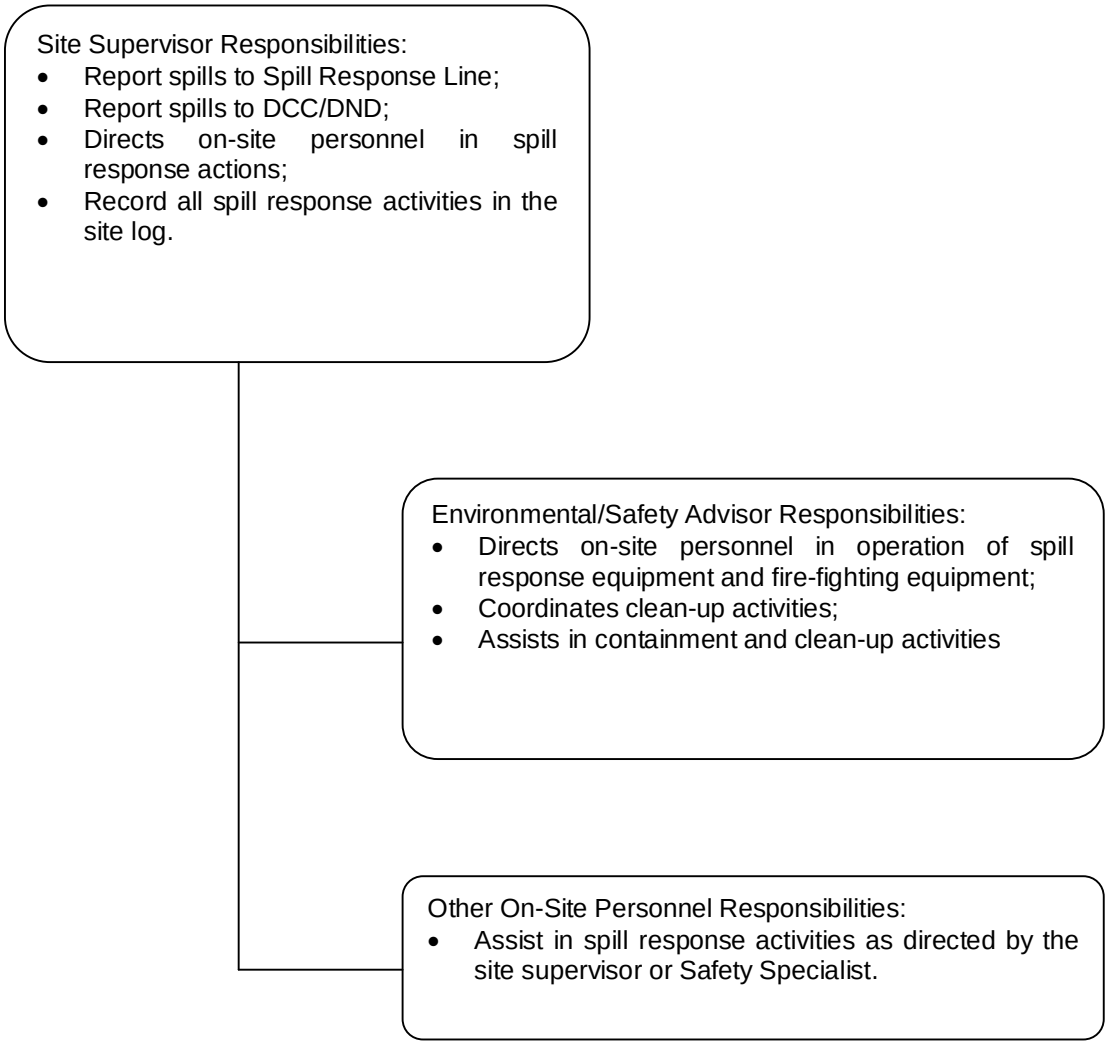
9.3 Response Organization

9.3.1 Roles and Responsibilities

The contractor and all sub-contractors will be involved in spill response actions in the event of a spill during the construction activities at FOX-3. Their roles and responsibilities are described as follows:

- Ensure the response crew members are appropriately trained.
- Practise spill prevention by performing regular maintenance on all fuel systems and by using proper methods for handling of fuel products.
- Provide personnel, materials, and equipment necessary for adequate response to fuel and hazardous material spills.
- Establish communications and verbally report all spills to the DCC Contract Coordinator as soon as practical.
- Isolate and eliminate all ignition sources.
- Ensure safety and security at the spill site.
- Stop or reduce discharge, if it is safe to do so.
- Make every effort to contain the spill by dyking with earth or other barriers on land and containment booms on water.
- Assess potential for fuel/chemical recovery.
- Deploy on-site crews to mobilize pumps, empty 200 litre barrels, hand tools and absorbents to the spill site.
- Hire additional assistance, if required, from northern residents, local communities, and commercial spill response firms.
- If required, request assistance from the DND (through the DCC Contract Coordinator) and the Canadian Coast Guard.
- Follow all guidelines and regulations for disposal of spilled materials, associated debris, contaminated soil and water as established by appropriate government agencies.
- Assess potential terrain and wildlife disturbance, erosion and archaeological site disturbance in any areas to be affected by clean up operations and contact relevant authorities.
- Document all events/actions.
- Report the spill to the Spill Report Line and follow up with a written spill report. This report shall summarize the initial report information; confirmation of spill volume; actions taken; future remediation/monitoring requirements; and a sketch map and/or photographs of the spill area.
- For spills on water, immediately mobilize additional containment and clean up equipment in consultation with Environment Canada, and Fisheries and Oceans Canada if on-site equipment is inadequate. Close isolation valves to stop fuel flow, if required. Deploy light-weight booms and oil absorbent materials to protect environmental resources along the coastline, as applicable. Track the progress of the spill, if of unknown origin.

Figure 1: Emergency Response Team Organization



Telephone, facsimile machines and e-mail are provided to on-site personnel to maintain communications with off-site parties. All on-site personnel are provided with two-way radios for all intra-site communications. Table 16 provides all other contact numbers. NOTE: The telephone and facsimile numbers and the e-mail addresses for the clean up contractor are not available at this time as the contract has yet to be awarded.

Table 16: Spill Contingency Plan - Contact List

Resource	Location	Phone No.
24 Hour Spill Line	NWT/Nunavut	867-920-8130
Environment Canada	Environmental Protection Branch	867-669-4700
Government of Nunavut – Environmental Protection	Iqaluit	867-975-5907
Indian and Northern Affairs Canada – Water Resources Inspector	Nunavut Regional Office	867-975-4550
Indian and Northern Affairs Canada – Land Administration Minister	Nunavut Regional Office	867-975-4280
Department of Fisheries and Oceans	Nunavut Regional Office	867-975-8000
Defence Construction Canada (representatives for the Department of National Defence)	Environmental Officer – Douglas Craig	613-998-7288
	Project Manager –LCol. David Eagles	613-998-9523

9.4 Reporting Procedures

When reporting a spill to the 24 Hour Spill Report Line and completing the Nunavut Spill Report Form, the following information shall be included:

- Date and time of the spill;
- Location of the spill and direction the spill may be moving;
- Name and phone number of a contact person close to the location of the spill;
- Type of contaminant spilled and quantity spilled;
- Cause of the spill;
- Whether the spill is continuing or has stopped;
- Description of the existing containment;
- Action taken to contain, recover, clean up and dispose of spilled material;
- Name, address and phone number of the person reporting the spill; and
- Name of owner or person in charge, management or control of the contaminants at the time of the spill.

The spill report is to be submitted to the INAC Water Resources Officer no later than 30 days after initially reporting the spill to the spill report line. A copy of the NU Spill Report Form is attached. The contact list is provided in Table 16 in Section 9.3.1.

9.5 Action Plan

The following substances could potentially be spilled at the FOX-3 site:

- Diesel fuel

- Gasoline
- Lubricating oils;
- Solvents;
- Alcohols and glycols;
- PCB containing liquids; and
- Heavy metal containing liquids.

9.6 Initial Action

In the event of a spill, protection of human health and safety is paramount. Contamination of personnel involved in a clean up is a real possibility, as is contamination of the surrounding workplace and environment.

The individual discovering a spill shall:

- Warn the people in the immediate vicinity and evacuate if necessary.
- Isolate or remove any ignition sources.
- Identify the spilled material, if possible, and take all safety precautions before approaching it.
- Locate the source of the spill.
- Attempt to stop the leakage and contain the spill, if safe to do so.
- Assess the likely size, extent and condition of the spill.
- Report to the DCC Contract Coordinator the spill location, type of material, volume and extent, status of spill (direction of movement), and prevailing meteorological conditions.
- In the event of a shoreline spill, provide information about the beach location, contaminated area, beach characteristics, and presence of wildlife and archaeological sites that may be threatened.

Once the DCC Contract Coordinator has been contacted and arrives at the spill site, the following actions are to be taken:

- Assess the severity of the spill via direct observation and/or information from communications.
- Deploy equipment and personnel to initiate containment and clean up.
- Prepare the Government of the Northwest Territories Spill Report Form.
- Notify all other pertinent parties, including the DND and other government agencies.

Figure 2 provides the initial response actions to be taken in the event of a spill, and Figures 3 and 4 provide the actions to be taken in the event of a fuel spill on land and on water, respectively.

Figure 2: Initial Response Actions

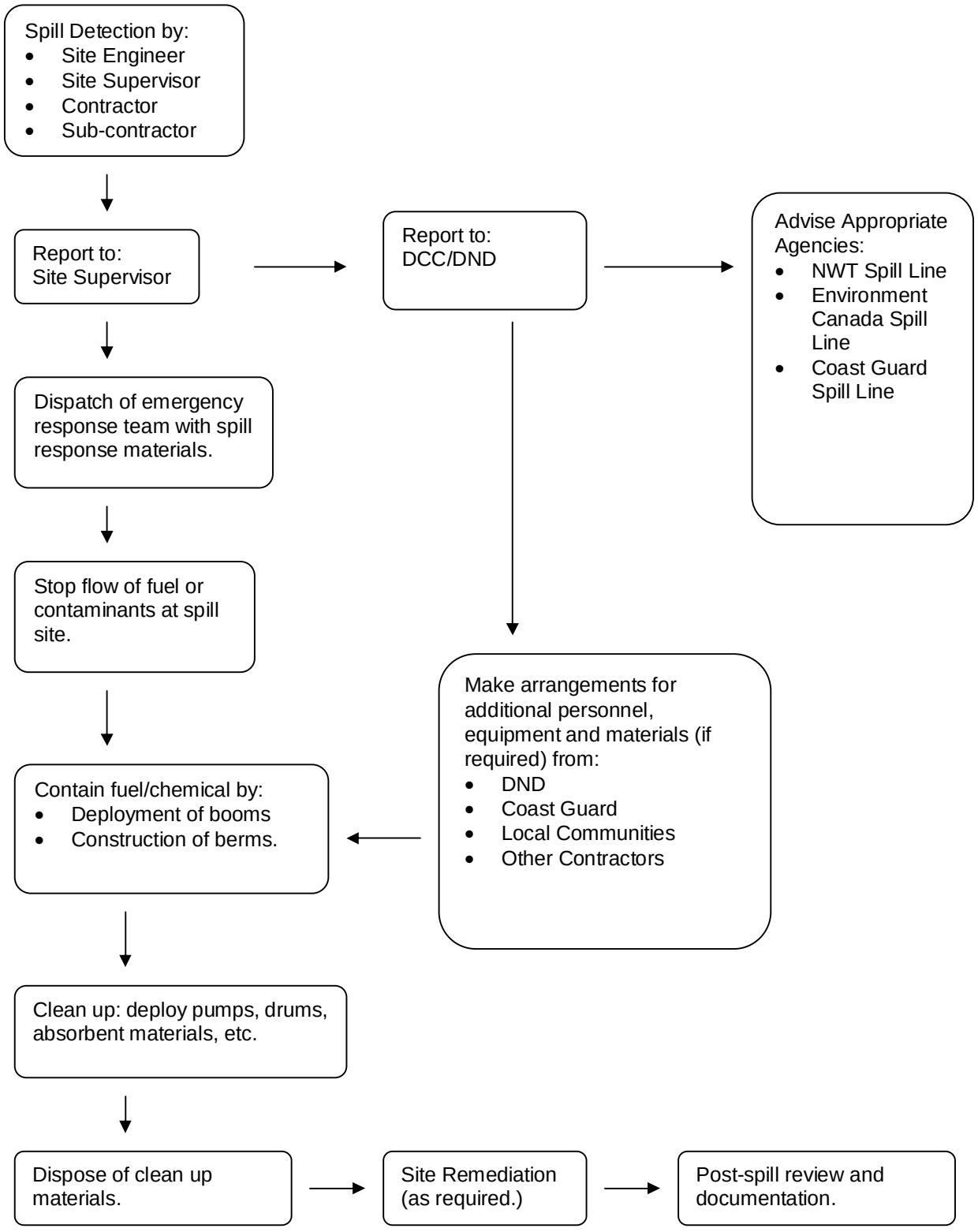


Figure 3: Procedures for Land Spill Response

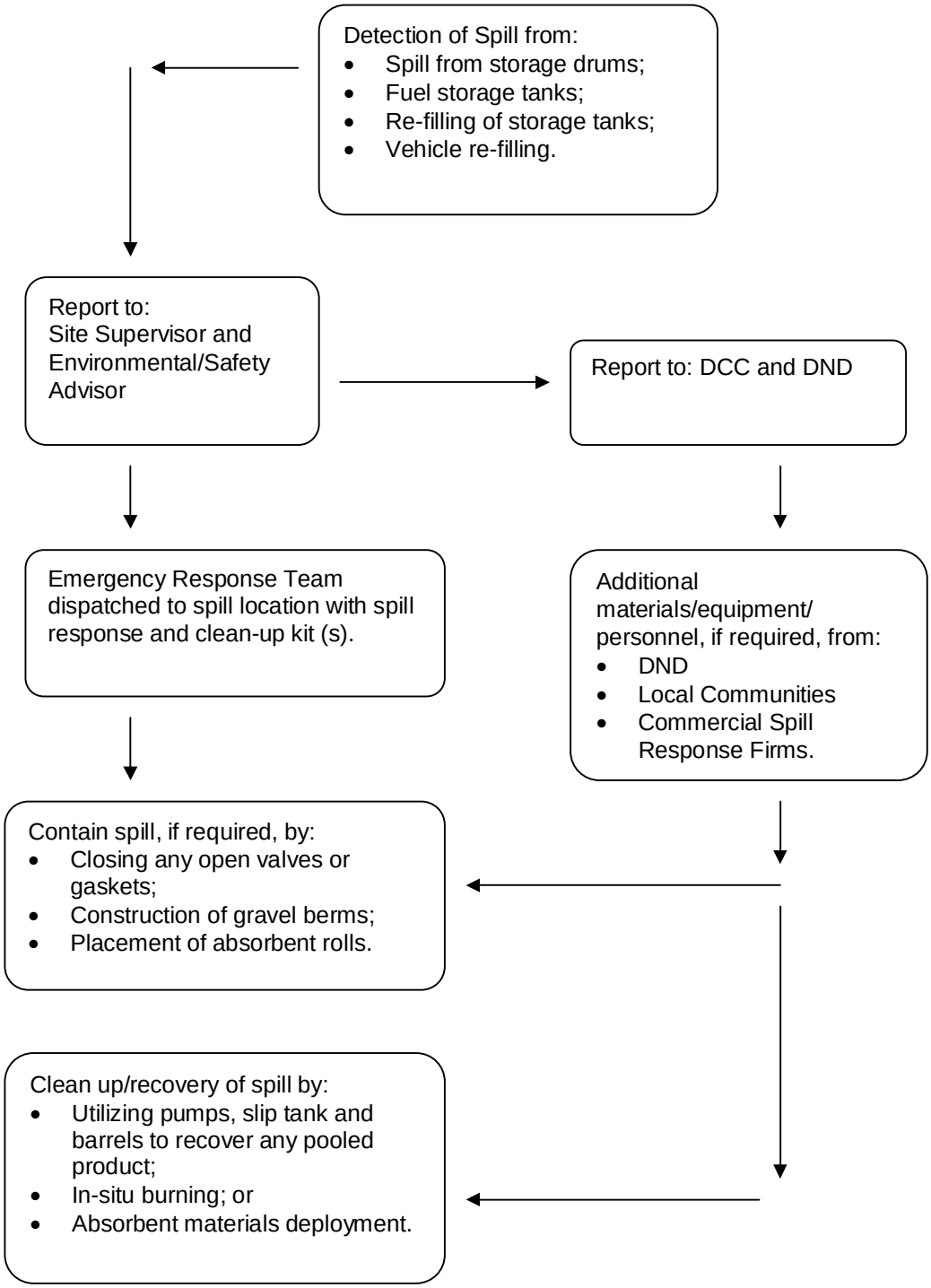
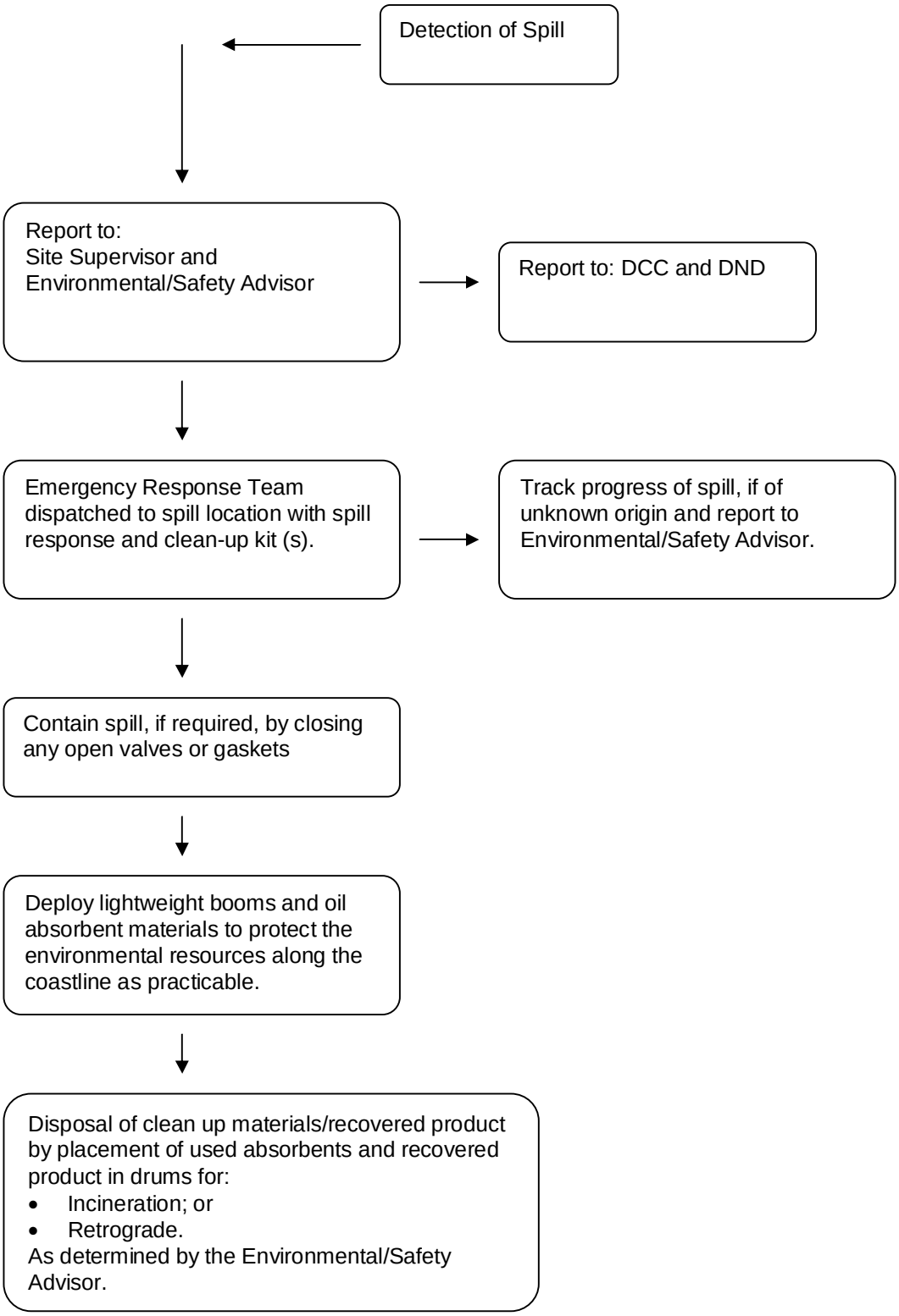


Figure 4: Procedures for Freshwater Spill Response



9.6.1 General Procedures

The environmental protection measures outlined in the following sections are to be taken by all workers on-site to reduce the chance of environmental impairment due to a spill, release or other incident. The following general clean up procedures shall apply for all spill areas:

- Wear protective clothing as required for handling spills.
- Contain spills on soil or rock by construction of earthen dykes using available material. If soil is not available, place sorbent material or a boom in the path of the spill. As the sorbent barrier becomes saturated, continually replace it. Fuel or other liquids lying in pools, trenches or in specially constructed troughs are to be removed with pumps, buckets or skimmers.
- If the ground is snow-covered, create snow dykes and line with a chemically compatible liner for containment and recovery of liquid.
- For fuels on water, deploy containment booms and recover as much fuel as possible with a work boat and skimmer if the area has less than 1/10 ice cover. If the area is ice infested, burn any fuel spills using igniters.
- Apply sorbents if necessary.
- Assess potential for disturbance of wildlife, fish and archaeological sites by spill or clean up operations and notify the relevant authorities.
- Notify environmental authorities to discuss disposal and clean up options.
- Conduct required clean up operations.
- Assess and appropriately treat any areas disturbed by clean up activities.
- Ensure the site has been completely restored and leave the site only when all work is finalized.

9.6.2 Fuel Storage Areas

In order to prevent spill or accidents at fuel storage areas, the following procedures apply:

- Avoid sites that slope towards waterways or other environmentally sensitive areas, exhibit ponding or flooding, have high groundwater tables, and/or excessive seepage or ice-rich (thaw sensitive) soils.
- Avoid archaeological resources.
- Conduct fuelling and equipment lubrication in a manner that avoids spillage of fuels, oils, greases and coolants. When refuelling equipment, operators are to use leak-free containers, reinforced rip and puncture proof hoses and nozzles, and drip trays. Operators are to be in attendance for the duration of the refuelling operation and are to ensure that all storage container outlets are properly sealed after use.
- Store fuel in self-dyking containers, or position over an impervious liner and surround by an impervious dyke of sufficient height to contain not less than 110% of the capacity of the tank(s).
- Smoking is prohibited within 7.5 metres of the fuel storage facility. Provide appropriate signage.
- Inspect fuel storage facilities at least once each week for the duration of the project. Fire-fighting equipment will be made available for immediate access at each and every fuel storage facility.
- Store all barrels containing fuel and/or other hazardous materials in an elevated position either on their side with the bungs facing the 9 and 3 o'clock position or on pallets, upright, banded and encased in overpack containers.
- All barrels shall be individually identified. The label is to be to industry standards and should provide all information necessary for health and safety, and environmental purposes. Material Safety Data Sheets for all materials maintained in the construction camp will be available for all personnel.
- Treat all waste petroleum products, including used oil filters, as hazardous material and handle and dispose as per the requirements specified in the appropriate regulations.
- Conduct regular inspections of all machinery hydraulic, fuel and cooling systems. Repair leaks immediately.

- Pre-assemble and maintain emergency spill response equipment including at least two fuel pumps, empty 200 litre barrels and absorbent material sufficient to clean up a 1000 litre spill at all permanent fuel storage sites.
- Remove all barrels, redundant fuel storage sites and associated materials and equipment from the site at the conclusion of the work.

9.6.3 Hazardous Material Storage Areas

Hazardous waste materials are wastes or 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 greater than 50 ppm. The hazardous material storage areas will be managed as outlined below:

- Hazardous waste materials may be encountered during sorting of site and demolition debris and during the excavation of the landfills. Collect and sort hazardous materials using equipment suitable for the task.
- Locate the hazardous material processing area a minimum of 100 metres from the nearest archaeological site or water body, on ice poor, well drained soil, and as close to the location of work as possible.
- Control movement of vehicles and equipment between the hazardous materials processing area and work site to prevent the spread of potentially hazardous material along roadways.
- Store hazardous materials so that each storage area is separated from the nearest water body by a 30 metre buffer zone.
- The TDGA and the *International Air Transport Association* (IATA) *Dangerous Goods Regulations* govern the packaging and shipment of hazardous goods within Canada. If shipping out of Canada, Canadian regulations and the regulations of the destination country both apply. Requirements of the IMDGC must be addressed in international waters (i.e., near Greenland).
- Any material classified as hazardous by the TDGA must be accompanied by the appropriate TDGA shipping documents. The documents are to state 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.
- Package all hazardous material in accordance with the TDGA regulations.

NOTE: MSDS and other information on hazardous materials are to be provided by the contractor once the clean up activities begin.

9.7 Potential Safety Hazards

The most significant potential safety hazard related to a fuel spill at the FOX-3 site is the possible soil and water contamination from the spill. The fuel storage area is located away from waterbodies and watercourses to avoid this hazard. Although soil contamination is a real potential hazard, the likelihood is small, spill volumes are small, and finally, any soils contaminated by a potential fuel spill can be cleaned up as part of the construction/clean up of the site.

9.8 Environmental Mapping

The drawings in Appendix A show the overall site plan and the project layout, which identify the locations of site facilities and the work areas. Once the camp is established, the locations of all spill response equipment can be noted and provided to on-site personnel.

Work areas, waterbodies, topography, etc., are also shown on the drawings.

9.9 Resource Inventory

The following equipment is typically found on-site during a clean up program. The exact type of equipment found at the FOX-3 site may vary slightly.

- Pick-up trucks
- Fuel truck
- Excavators
- Bulldozers
- Loaders
- Rock trucks and haul units
- Compaction equipment
- Large spill kits
- Small spill kits
- Generators
- Screening plant
- Crushing plant

All equipment is generally stored at the construction camp/storage area where the camp personnel are stationed. Some equipment may be stored in the area in which the equipment is being used. All vehicles are to be equipped with absorbent materials, drip trays, shovels and disposal bags.

9.10 Training and Exercises

The spill response training program will provide instruction in all aspects of spill response stated in the plan for all on-site personnel. Spill response training will include the following subjects:

- Spill awareness and prevention;
- Methods of detection;
- Storage and distribution systems;
- Storage of products on-site;
- Types of spills and seasonal considerations;
- Reporting procedures and initial responses;
- Spill response kit familiarization;
- Clean up and site remediation methods;
- Occupational health and safety; and
- Post spill review process and documentation.

NOTE: Spill response training is provided by the contractor.

10.0 Abandonment and Decommissioning Plan

The contractor is required to complete the clean up and remediate all of the areas in which their activities took place, as described in this Project Description. Following completion of the clean up activities, all vehicles and equipment, remaining fuel, supplies and construction camp are to be removed from the site by the contractor, which typically coincides with the annual sea-lift.

The following sections provide a summary of the closure activities that will occur at the completion of the clean up at the FOX-3 site.

Contractor Demobilization: Contractor demobilization includes the dismantling and removal from the site of all vehicles and equipment, remaining fuel, supplies and construction camp, clean up of the site, and transportation of labour from the site. Upon removal of the construction camp, the contractor is to grade the area to match the surrounding terrain and to ensure positive drainage. Grading is also done at the sewage lagoon and borrow areas. Existing roads are left as-is.

Demolition: Upon the completion of the demolition work, the contractor is to remove any remaining debris and leave the work site clean. Building sites and all areas affected by demolition work are graded. The areas surrounding remaining concrete and timber foundations are reshaped so that the top of the gravel is flush with the top of the foundation. Any voids or holes in the surface of the foundation are filled with gravel.

Contaminated Soil Excavation: In areas of contaminated soil excavation, the excavations are filled with granular material, compacted and graded to match the existing ground surface.

Landfarm Closure: At the conclusion of landfarm operations, additional granular material is placed to provide a compacted cover. The surface area is graded to a minimum slope of 2-4% to promote surface water run-off. Groundwater wells installed around the perimeter of the landfarm are decommissioned, including backfill with grout.

Non-Hazardous Waste Landfill: A final lift of granular material will be placed, compacted and the surface graded to avoid water ponding and minimize infiltration at the completion of landfill operations. Following completion of the landfill closure, groundwater monitoring wells are installed to facilitate monitoring of the landfill performance.

Tier II Soil Disposal Facility: Placement and compaction of the final cover of the landfill also includes grading to promote drainage away from the landfill. Following closure of the Tier II Soil Disposal Facility, groundwater monitoring wells and thermistor strings are installed to facilitate monitoring of the facility's performance.

11.0 Information Sources

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Appendix A
Drawings

National Defence / Défense nationale

DEW LINE CLEAN UP PROJECT

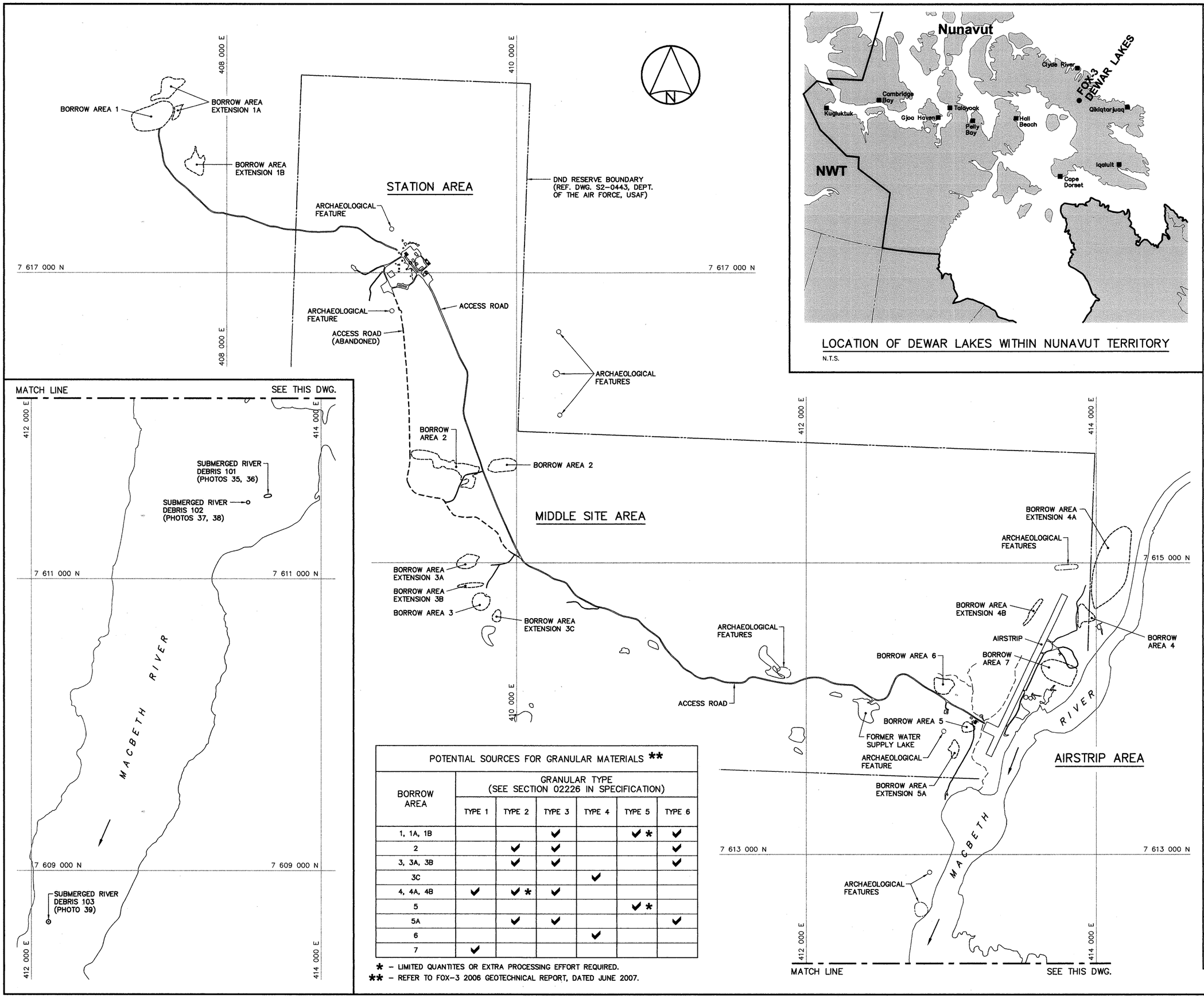
DRAWING INDEX					
DRAWING No.	TITLE	DRAWING No.	TITLE	DRAWING No.	TITLE
SITING		SITING		SITING	
H-D67/1-9101-101	OVERALL SITE PLAN	H-D67/1-9101-115	STATION AREA REGRADING AND EXCAVATION DETAILS SH. 2	H-D67/1-9101-129	MISCELLANEOUS DETAILS SH. 1
H-D67/1-9101-102	PROJECT LAYOUT SH. 1	H-D67/1-9101-116	LANDFARM GRADING PLAN AND DETAIL	H-D67/1-9101-130	MISCELLANEOUS DETAILS SH. 2
H-D67/1-9101-103	PROJECT LAYOUT SH. 2	H-D67/1-9101-117	LANDFARM CROSS SECTION AND CLOSURE DETAIL		
H-D67/1-9101-104	PROJECT LAYOUT SH. 3	H-D67/1-9101-118	NON-HAZARDOUS WASTE LANDFILL BERM CONSTRUCTION AND FINAL GRADING PLANS	STRUCTURAL	
H-D67/1-9101-105	STATION AREA SITE PLAN SH. 1	H-D67/1-9101-119	NON-HAZARDOUS WASTE LANDFILL CROSS SECTION	H-D67/1-9101-201	STATION AREA DEMOLITION SITE PLAN
H-D67/1-9101-106	STATION AREA SITE PLAN SH. 2	H-D67/1-9101-120	TIER II DISPOSAL FACILITY KEY TRENCH EXCAVATION PLAN & GRADING/INSTRUMENTATION PLAN	H-D67/1-9101-202	AIRSTRIP AREA DEMOLITION SITE PLAN
H-D67/1-9101-107	STATION AREA SITE PLAN SH. 3	H-D67/1-9101-121	TIER II DISPOSAL FACILITY CROSS SECTION AND DETAIL	H-D67/1-9101-203	ATWELL DORMITORY PLAN, SECTION AND ELEVATION
H-D67/1-9101-108	MIDDLE SITE AREA SITE PLAN SH. 1	H-D67/1-9101-122	TIER II DISPOSAL FACILITY CROSS SECTION SH. 2	H-D67/1-9101-204	COMMUNICATION DISH ELEVATIONS
H-D67/1-9101-109	MIDDLE SITE AREA SITE PLAN SH. 2	H-D67/1-9101-123	MISCELLANEOUS LANDFILL/BURIED DEBRIS REGRADING & EXCAVATION DETAILS SH. 1	H-D67/1-9101-205	COMMUNICATION BILLBOARD, FEEDHORN AND SUPPORT FRAME PLAN, SECTION AND ELEVATIONS
H-D67/1-9101-110	AIRSTRIP AREA - SOUTH SITE PLAN	H-D67/1-9101-124	MISCELLANEOUS LANDFILL/BURIED DEBRIS REGRADING & EXCAVATION DETAILS SH. 2	H-D67/1-9101-206	FUEL TANKS ELEVATIONS
H-D67/1-9101-111	HEATED VEHICLE STORAGE AREA SITE PLAN	H-D67/1-9101-125	MISCELLANEOUS LANDFILL/BURIED DEBRIS REGRADING & EXCAVATION DETAILS SH. 3		
H-D67/1-9101-112	AIRSTRIP AREA SITE PLAN SH. 1	H-D67/1-9101-126	MISCELLANEOUS LANDFILL/BURIED DEBRIS REGRADING & EXCAVATION DETAILS SH. 4		
H-D67/1-9101-113	AIRSTRIP AREA SITE PLAN SH. 2	H-D67/1-9101-127	MISCELLANEOUS LANDFILL/BURIED DEBRIS REGRADING & EXCAVATION DETAILS SH. 5		
H-D67/1-9101-114	STATION AREA REGRADING AND EXCAVATION DETAILS SH. 1	H-D67/1-9101-128	THERMOKARST POND PLAN AND CROSS SECTIONS		

FOX-3 DEWAR LAKES TENDER DRAWINGS

UMA | AECOM

HATCH™

AUGUST, 2007



LOCATION OF DEWAR LAKES WITHIN NUNAVUT TERRITORY

N.T.S.

POTENTIAL SOURCES FOR GRANULAR MATERIALS **						
BORROW AREA	GRANULAR TYPE (SEE SECTION 02226 IN SPECIFICATION)					
	TYPE 1	TYPE 2	TYPE 3	TYPE 4	TYPE 5	TYPE 6
1, 1A, 1B			✔		✔ *	✔
2		✔	✔			✔
3, 3A, 3B		✔	✔			✔
3C				✔		
4, 4A, 4B	✔	✔ *	✔			
5					✔ *	
5A		✔	✔			✔
6				✔		
7	✔					

* – LIMITED QUANTITES OR EXTRA PROCESSING EFFORT REQUIRED.
** – REFER TO FOX-3 2006 GEOTECHNICAL REPORT, DATED JUNE 2007.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ARCHAEOLOGICAL FEATURES LOCATED AS PER ARCHAEOLOGICAL STUDY AT FOX-3, DEWAR LAKES, BY THOMSON HERITAGE CONSULTANTS.
4. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
5. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.

Legend:

- BODY OF WATER
- APPROXIMATE EXTENT OF DEBRIS AREAS
- APPROXIMATE EXTENT OF BORROW AREAS
- APPROXIMATE LOCATION OF PROPERTY BOUNDARIES

No.	DATE	REVISION	REVISION	APPR.

K.R. MERKOSKY LICENSEE NWT/NU
2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 200 100 0 200 400 600m

PROJECT – PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007-08-24

SUBJECT – SUJET

OVERALL SITE PLAN

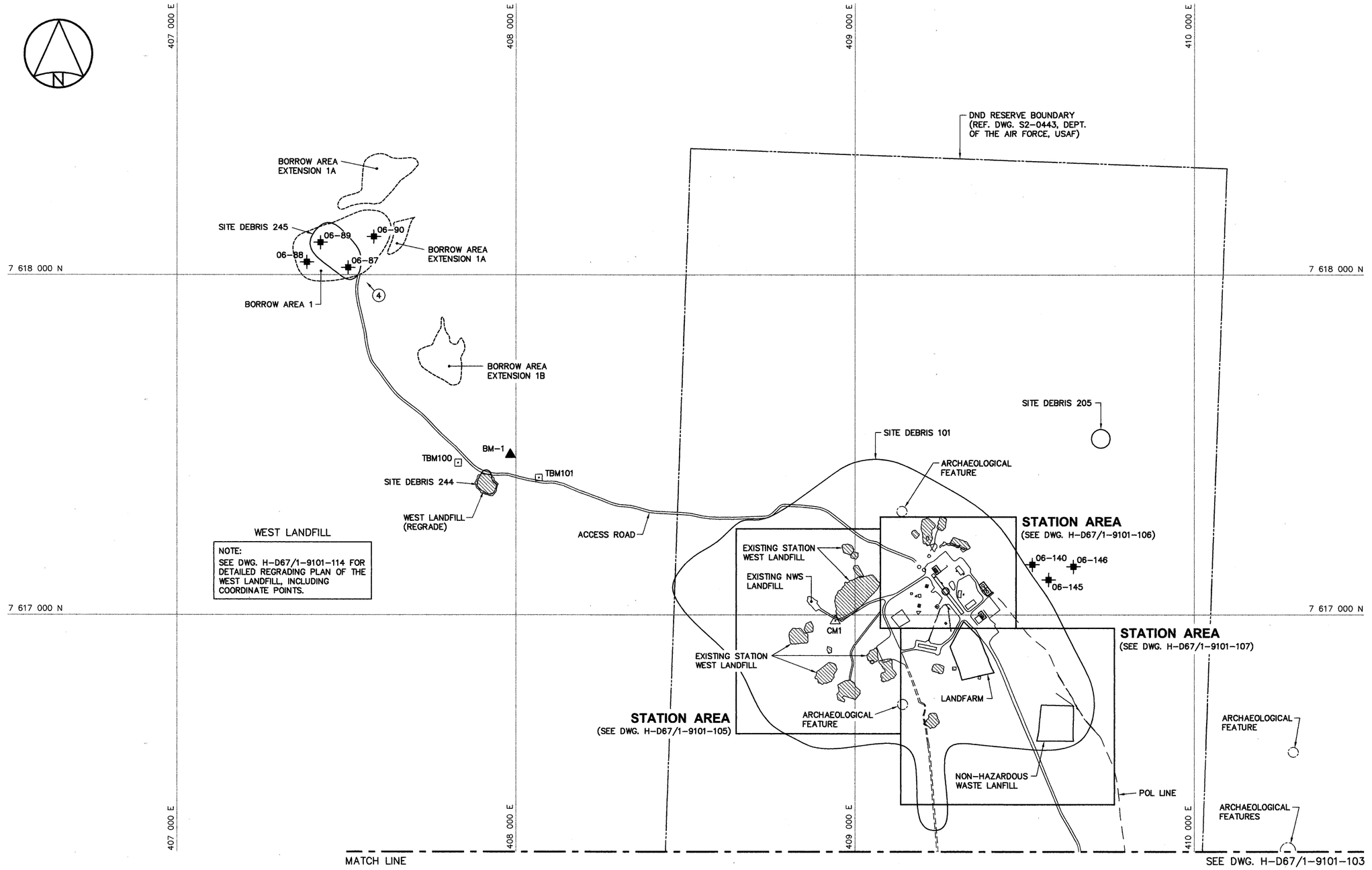
PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED – ETUDIE TME/DTM		DES OFF – AGENT CONCEPT
DRAWN – DESSINE CAE		SECT HD – CHEF SECT
CHECKED – VERIFIE RRM		DES MGR – GEST CONCEPT
COORDINATION SMS	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-D67/1-9101-101

Canada

SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	7 616 981.903	408 942.460	513.650	FOX-3 BASELINE STA. 0+00

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
TBM100	7 617 444.367	407 829.463	409.391	REBAR
TBM101	7 617 401.044	408 067.945	424.996	REBAR



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

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3. ARCHAEOLOGICAL FEATURES LOCATED AS PER ARCHAEOLOGICAL STUDY AT FOX-3, DEWAR LAKES, BY THOMSON HERITAGE CONSULTANTS.
4. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
5. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
6. SURFICIAL BOULDERS AND BOULDER FIELDS MAY BE PRESENT WITHIN THE PLAN AREA. BOULDERS MAY ALSO BE ENCOUNTERED DURING EXCAVATION WITHIN THE PLAN AREA.
7. FOR PERMANENT SURVEY CONTROL (BENCHMARK) INSTALLATION DETAILS, SEE DWG. H-D67/1-9101-128. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.

Legend:

- SURVEY CONTROL MONUMENT
- TEMPORARY BENCHMARK
- TEST PIT LOCATION
- APPROXIMATE EXTENT OF DEBRIS AREAS
- APPROXIMATE EXTENT OF BORROW AREAS
- LANDFILL/BURIED DEBRIS LOBE
- (4) PHOTOGRAPHIC VIEWPOINT
- PROPOSED PERMANENT BENCHMARK LOCATION (1). (SEE NOTE 7).

No.	DATE	REVISION	REVISION	APPR.

PROFESSIONAL ENGINEER — PETER R. MERCOSKY — LICENSEE — NWT/NU — 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 100 50 0 100 200 300m

PROJECT – PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007-08-24

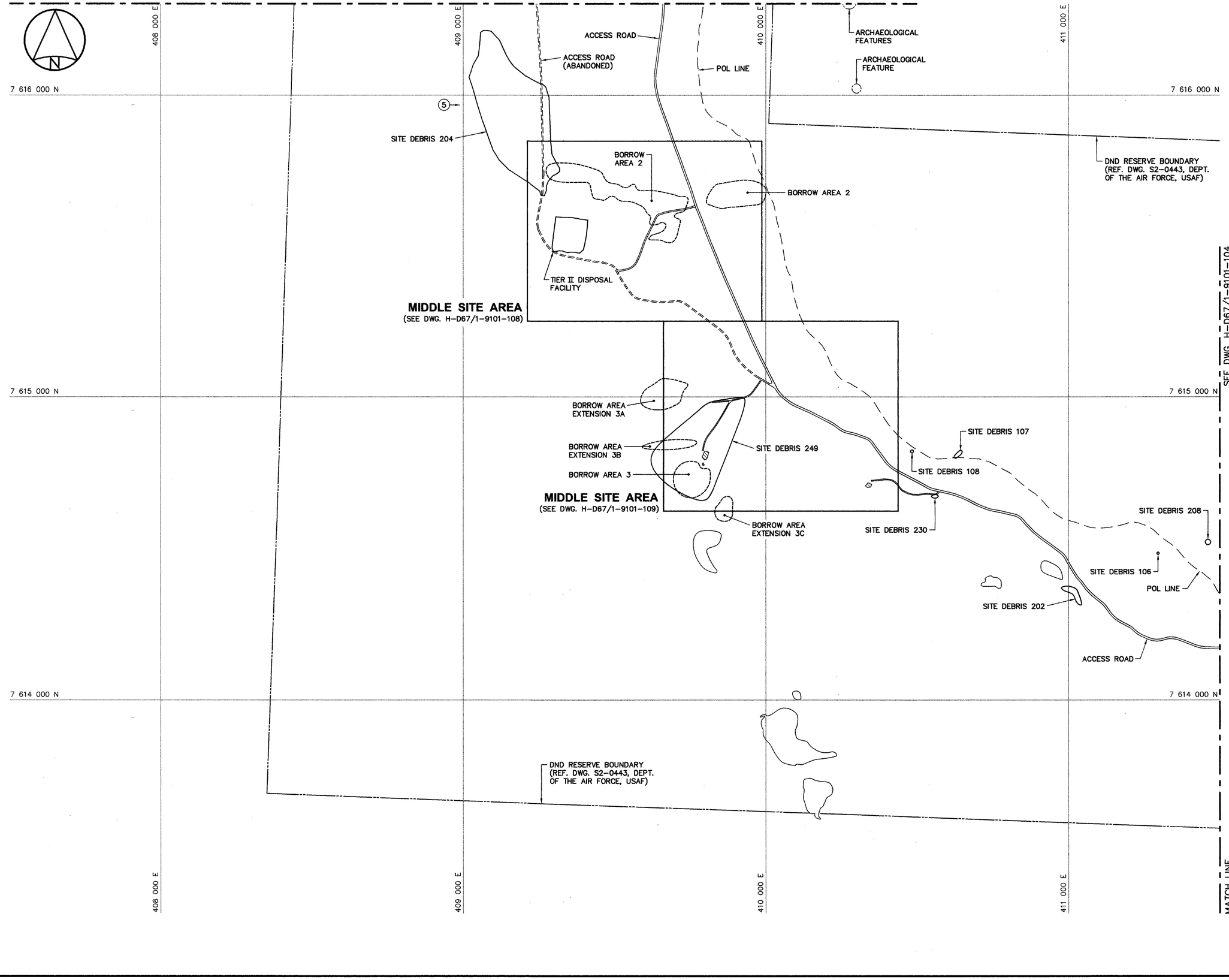
SUBJECT – SUJET

PROJECT LAYOUT SH. 1

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

DWG. NO. – DESSIN NO.
H-D67/1-9101-102

Canada



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ARCHAEOLOGICAL FEATURES LOCATED AS PER ARCHAEOLOGICAL STUDY AT FOX-3, DEWAR LAKES, BY THOMSON HERITAGE CONSULTANTS.
4. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
5. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
6. SURFICIAL BOULDERS AND BOULDER FIELDS MAY BE PRESENT WITHIN THE PLAN AREA. BOULDERS MAY ALSO BE ENCOUNTERED DURING EXCAVATION WITHIN THE PLAN AREA.

Legend:

- TEST PIT LOCATION
- BODY OF WATER
- APPROXIMATE EXTENT OF DEBRIS AREAS
- APPROXIMATE EXTENT OF BORROW AREAS
- LANDFILL/BURIED DEBRIS LOBE
- (5) PHOTOGRAPHIC VIEWPOINT

No.	DATE	REVISION	REVISION	APPR.

NORTHWEST TERRITORIES PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS FOR THE NORTHWEST TERRITORIES LICENSEE NWT/NUNAVUT
2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 100 50 0 100 200 300m

PROJECT – PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007-08-24

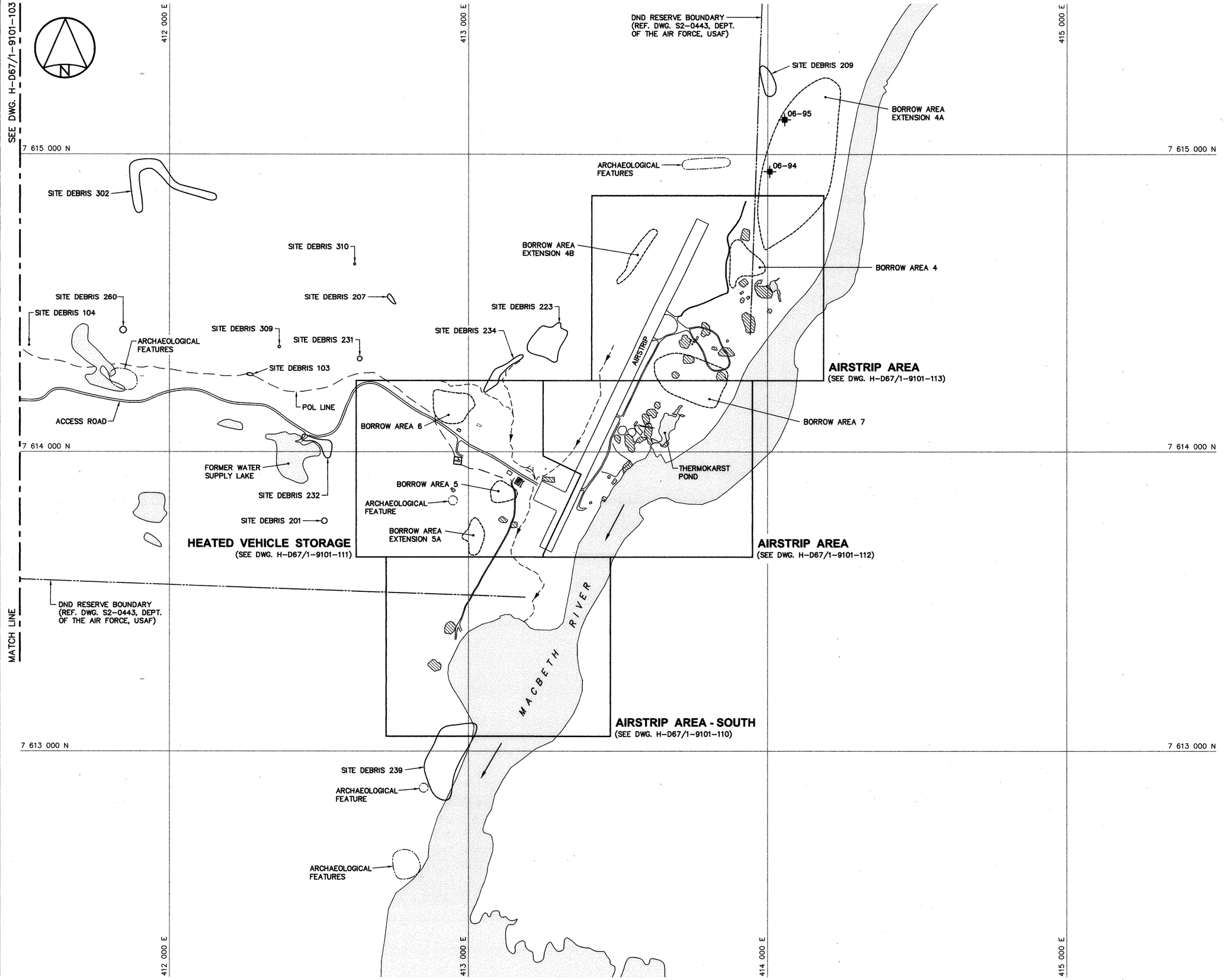
SUBJECT – SUJET

PROJECT LAYOUT SH. 2

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

DWG. NO. – DESSIN NO.
H-D67/1-9101-103

Canada



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ARCHAEOLOGICAL FEATURES LOCATED AS PER ARCHAEOLOGICAL STUDY AT FOX-3, DEWAR LAKES, BY THOMSON HERITAGE CONSULTANTS.
4. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
5. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
6. SURFICIAL BOULDERS AND BOULDER FIELDS MAY BE PRESENT WITHIN THE PLAN AREA. BOULDERS MAY ALSO BE ENCOUNTERED DURING EXCAVATION WITHIN THE PLAN AREA.

Legend:

- TEST PIT LOCATION
- BODY OF WATER
- APPROXIMATE EXTENT OF DEBRIS AREAS
- APPROXIMATE EXTENT OF BORROW AREAS
- LANDFILL/BURIED DEBRIS LOBE

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

R.R. MERKOSKY — LICENSEE — NWT/NU — 2007-08-27

UMA | AECOM — HATCH

SCALE - ECHELLE 100 50 0 100 200 300m

PROJECT - PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE - METIER	DATE
SITING	2007-08-24

SUBJECT - SUJET

PROJECT LAYOUT SH. 3

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

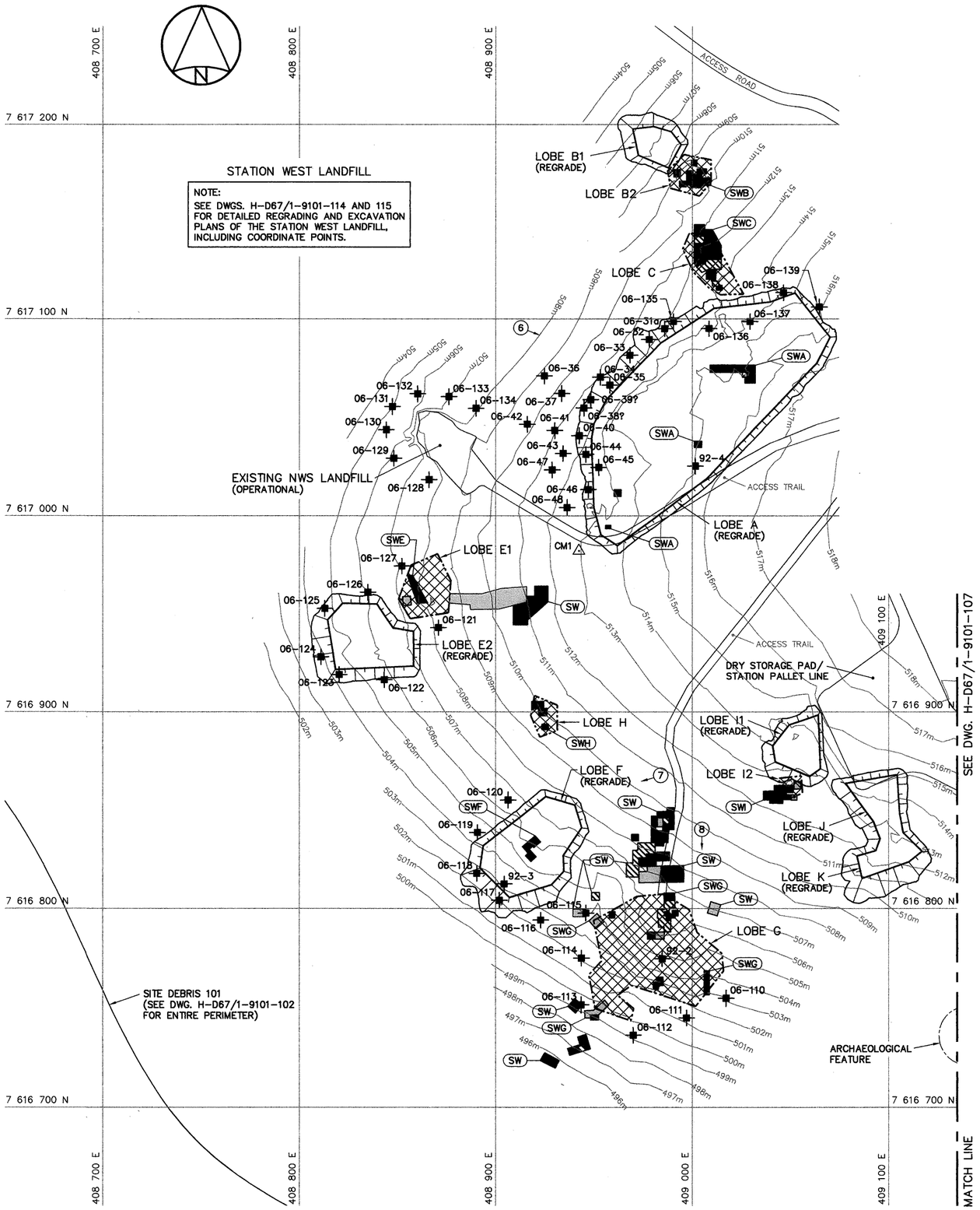
DWG. NO. - DESSIN NO.
H-D67/1-9101-104

Canada

SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	7 616 981.903	408 942.460	513.650	FOX-3 BASELINE STA. 0+00

CONTAMINATED SOIL TO BE EXCAVATED				
AREA NAME	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
DCC TIER I				
SW	457	137.1	7 616 801.9	409 014.5
SWE	18	5.4	7 616 954.5	408 857.1
SWG	90	27.0	7 616 793.7	408 947.5
SWI	21	6.3	7 616 864.3	409 055.3
DCC TIER II				
SW	638	198.8	7 616 956.1	408 926.6
SWA	142	42.6	7 617 076.1	409 032.1
SWB	118	35.4	7 617 168.2	409 009.4
SWC	236	70.8	7 617 145.5	409 010.3
SWE	56	16.8	7 616 969.3	408 857.9
SWF	48	14.4	7 616 836.9	408 920.2
SWG	117	39.7	7 616 768.3	409 008.8
SWH	47	14.1	7 616 890.7	408 926.9
SWI	99	34.9	7 616 855.1	409 036.3
HAZARDOUS				
SW	154	46.2	7 616 823.0	408 966.6
SWA	6	1.8	7 617 069.9	409 025.6
SWC	81	35.1	7 617 125.2	409 014.8
SWG	76	38	7 616 799.5	408 982.5

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



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN 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:

- SURVEY CONTROL MONUMENT
- TEST PIT LOCATION
- DCC TIER I CONTAMINATED SOIL
- DCC TIER II CONTAMINATED SOIL
- HAZARDOUS CONTAMINATED SOIL
- (ABC) CONTAMINATED SOIL AREA NAME
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- (6) PHOTOGRAPHIC VIEWPOINT

No.	DATE	REVISION	REVISION	APPR.

NORTHWEST TERRITORIES PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS ASSOCIATION — R.R. MERKOSKY — LICENSEE — YELLOWKNIFE
2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE - ECHELLE 20 10 0 20 40 60m

PROJECT - PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

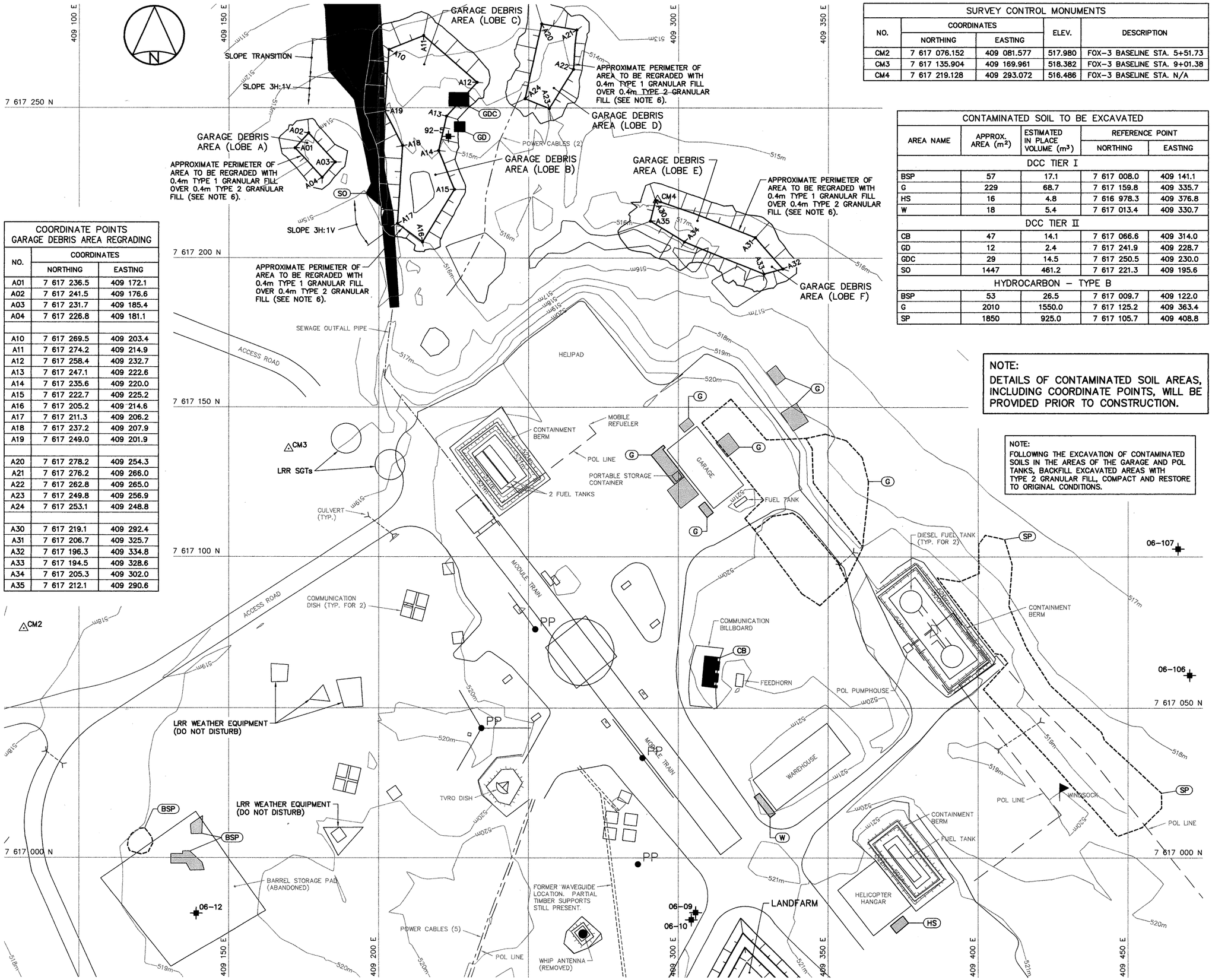
TRADE - METIER	DATE
SITING	2007-08-24

SUBJECT - SUJET
STATION AREA
SITE PLAN SH. 1

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

DWG. NO. - DESSIN NO.
H-D67/1-9101-105

Canada



SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM2	7 617 076.152	409 081.577	517.980	FOX-3 BASELINE STA. 5+51.73
CM3	7 617 135.904	409 169.961	518.382	FOX-3 BASELINE STA. 9+01.38
CM4	7 617 219.128	409 293.072	516.486	FOX-3 BASELINE STA. N/A

CONTAMINATED SOIL TO BE EXCAVATED				
AREA NAME	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
DCC TIER I				
BSP	57	17.1	7 617 008.0	409 141.1
G	229	68.7	7 617 159.8	409 335.7
HS	16	4.8	7 616 978.3	409 376.8
W	18	5.4	7 617 013.4	409 330.7
DCC TIER II				
CB	47	14.1	7 617 066.6	409 314.0
GD	12	2.4	7 617 241.9	409 228.7
GDC	29	14.5	7 617 250.5	409 230.0
SO	1447	461.2	7 617 221.3	409 195.6
HYDROCARBON – TYPE B				
BSP	53	26.5	7 617 009.7	409 122.0
G	2010	1550.0	7 617 125.2	409 363.4
SP	1850	925.0	7 617 105.7	409 408.8

COORDINATE POINTS GARAGE DEBRIS AREA REGRADING		
NO.	COORDINATES	
	NORTHING	EASTING
A01	7 617 236.5	409 172.1
A02	7 617 241.5	409 176.6
A03	7 617 231.7	409 185.4
A04	7 617 226.8	409 181.1
A10	7 617 269.5	409 203.4
A11	7 617 274.2	409 214.9
A12	7 617 258.4	409 232.7
A13	7 617 247.1	409 222.6
A14	7 617 235.6	409 220.0
A15	7 617 222.7	409 225.2
A16	7 617 205.2	409 214.6
A17	7 617 211.3	409 206.2
A18	7 617 237.2	409 207.9
A19	7 617 249.0	409 201.9
A20	7 617 278.2	409 254.3
A21	7 617 276.2	409 266.0
A22	7 617 262.8	409 265.0
A23	7 617 249.8	409 256.9
A24	7 617 253.1	409 248.8
A30	7 617 219.1	409 292.4
A31	7 617 206.7	409 325.7
A32	7 617 196.3	409 334.8
A33	7 617 194.5	409 328.6
A34	7 617 205.3	409 302.0
A35	7 617 212.1	409 290.6

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

NOTE:
FOLLOWING THE EXCAVATION OF CONTAMINATED SOILS IN THE AREAS OF THE GARAGE AND POL TANKS, BACKFILL EXCAVATED AREAS WITH TYPE 2 GRANULAR FILL, COMPACT AND RESTORE TO ORIGINAL CONDITIONS.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
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3. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN 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. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.

Legend:

- SURVEY CONTROL MONUMENT
- TEST PIT LOCATION
- DCC TIER I CONTAMINATED SOIL
- DCC TIER II CONTAMINATED SOIL
- HYDROCARBON – TYPE B CONTAMINATED SOIL
- (ABC) CONTAMINATED SOIL AREA NAME
- A01 COORDINATE POINT
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

2007-08-27

UMA | AECOM | HATCH

SCALE – ECHELLE 10 5 0 10 20 30m

PROJECT – PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007-08-24

SUBJECT – SUJET

STATION AREA
SITE PLAN SH. 2

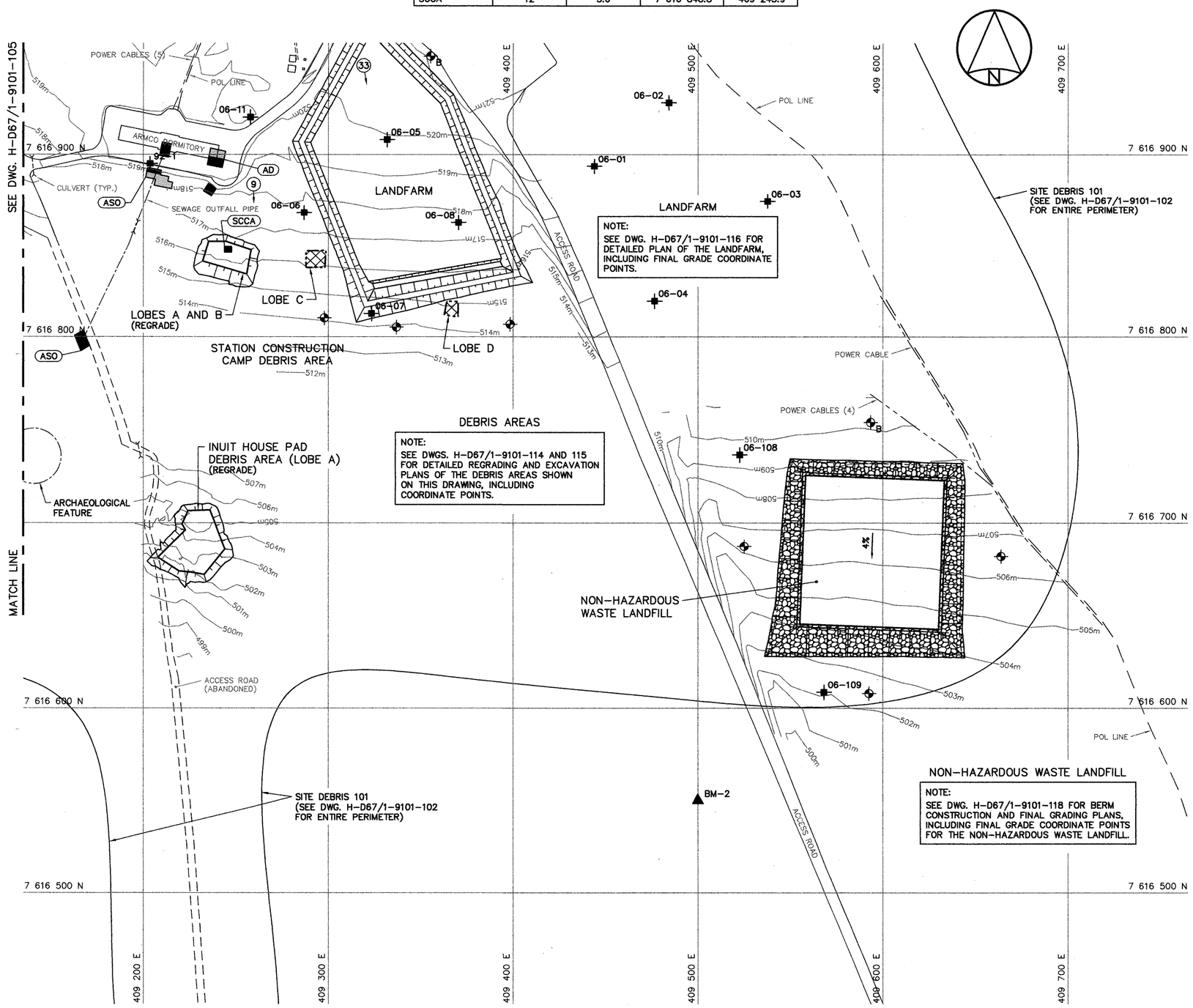
PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE TME/DTM		DES OFF AGENT CONCEPT
DRAWN DESSINE CAE		SECT HD CHEF SECT
CHECKED VERIFIE RRM		DES MGR GEST CONCEPT
COORDINATION SMS	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-D67/1-9101-106

Canada

CONTAMINATED SOIL TO BE EXCAVATED				
AREA NAME	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
DCC TIER I				
AD	39	11.7	7 616 897.1	409 243.6
ASO	68	20.4	7 616 887.1	409 201.3
DCC TIER II				
AD	75	22.5	7 616 897.1	409 243.6
ASO	90	27.0	7 616 792.3	409 166.3
SCCA	12	3.6	7 616 848.8	409 243.9

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



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

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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 PERMANENT SURVEY CONTROL (BENCHMARK) INSTALLATION DETAILS, SEE DWG. H-D67/1-9101-129. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.
7. FOR MONITORING WELL INSTALLATION DETAILS, SEE DWG. H-D67/1-9101-129. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.

Legend:

- TEST PIT LOCATION
- DCC TIER I CONTAMINATED SOIL
- DCC TIER II CONTAMINATED SOIL
- (ABC) CONTAMINATED SOIL AREA NAME
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- (9) PHOTOGRAPHIC VIEWPOINT
- ▲ PROPOSED PERMANENT BENCHMARK LOCATION (1). (SEE NOTE 6).
- PROPOSED MONITORING WELL LOCATION (6)
- $_{B}$ PROPOSED BACKGROUND MONITORING WELL LOCATION (2)

No.	DATE	REVISION	REVISION	APPR.

ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.
R.R. MERCREDY LICENCE NWT/NU
2007-08-27

UMA | AECOM HATCH

SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007-08-24

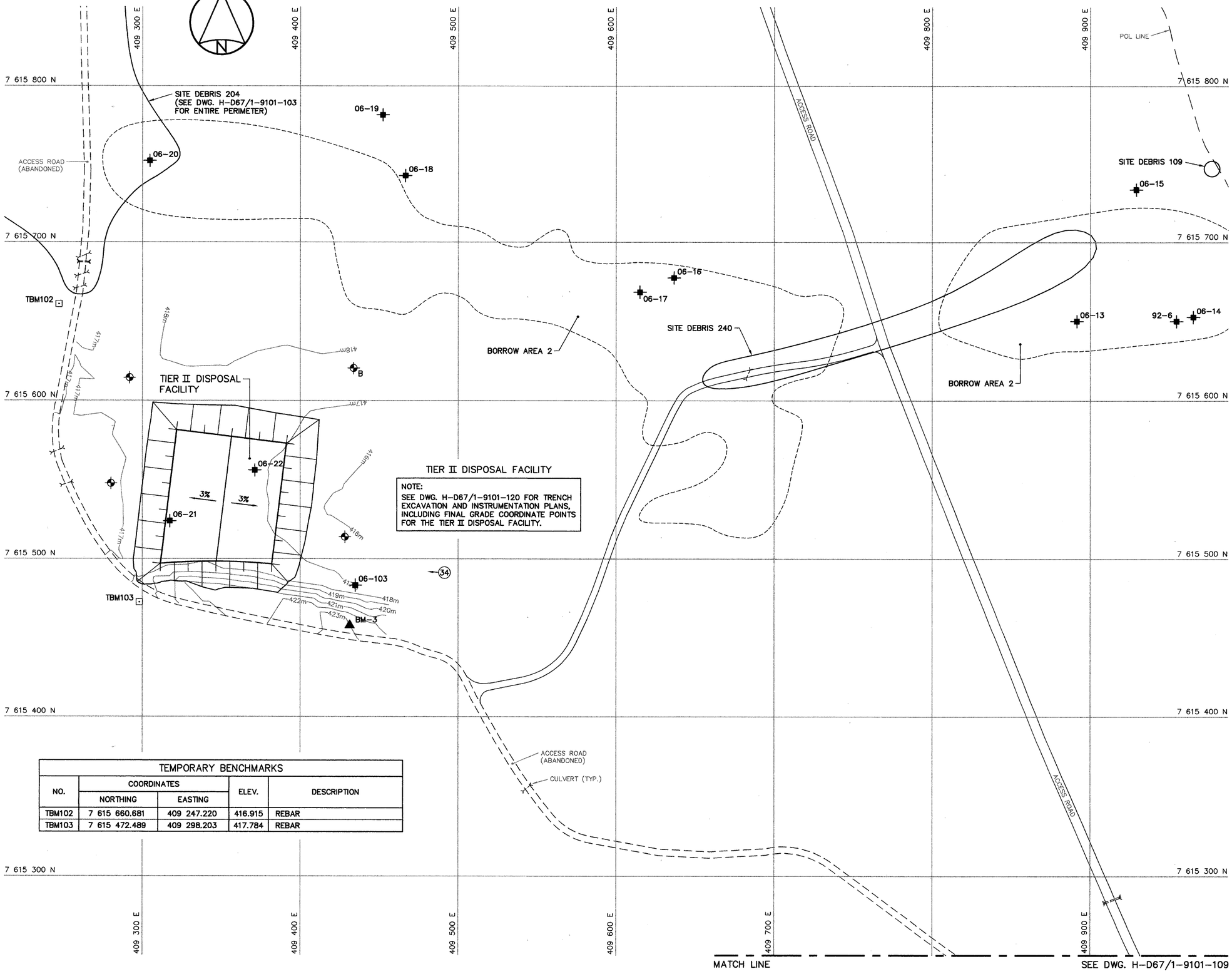
SUBJECT – SUJET

STATION AREA
SITE PLAN SH. 3

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

DWG. NO. – DESSIN NO.
H-D67/1-9101-107

Canada



TIER II DISPOSAL FACILITY

NOTE:
SEE DWG. H-D67/1-9101-120 FOR TRENCH EXCAVATION AND INSTRUMENTATION PLANS, INCLUDING FINAL GRADE COORDINATE POINTS FOR THE TIER II DISPOSAL FACILITY.

TEMPORARY BENCHMARKS

NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
TBM102	7 615 660.681	409 247.220	416.915	REBAR
TBM103	7 615 472.489	409 298.203	417.784	REBAR

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN 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 PERMANENT SURVEY CONTROL (BENCHMARK) INSTALLATION DETAILS, SEE DWG. H-D67/1-9101-129. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.
7. FOR MONITORING WELL INSTALLATION DETAILS, SEE DWG. H-LD671-9101-129. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.

Legend:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION
- (34) PHOTOGRAPHIC VIEWPOINT
- ▲ PROPOSED PERMANENT BENCHMARK LOCATION (1). (SEE NOTE 6).
- PROPOSED MONITORING WELL LOCATION (3)
- B PROPOSED BACKGROUND MONITORING WELL LOCATION (1)

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

2007-08-27

UMA | AECOM HATCH

SCALE - ECHELLE 20 10 0 20 40 60m

PROJECT - PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE - METIER	DATE
SITING	2007-08-24

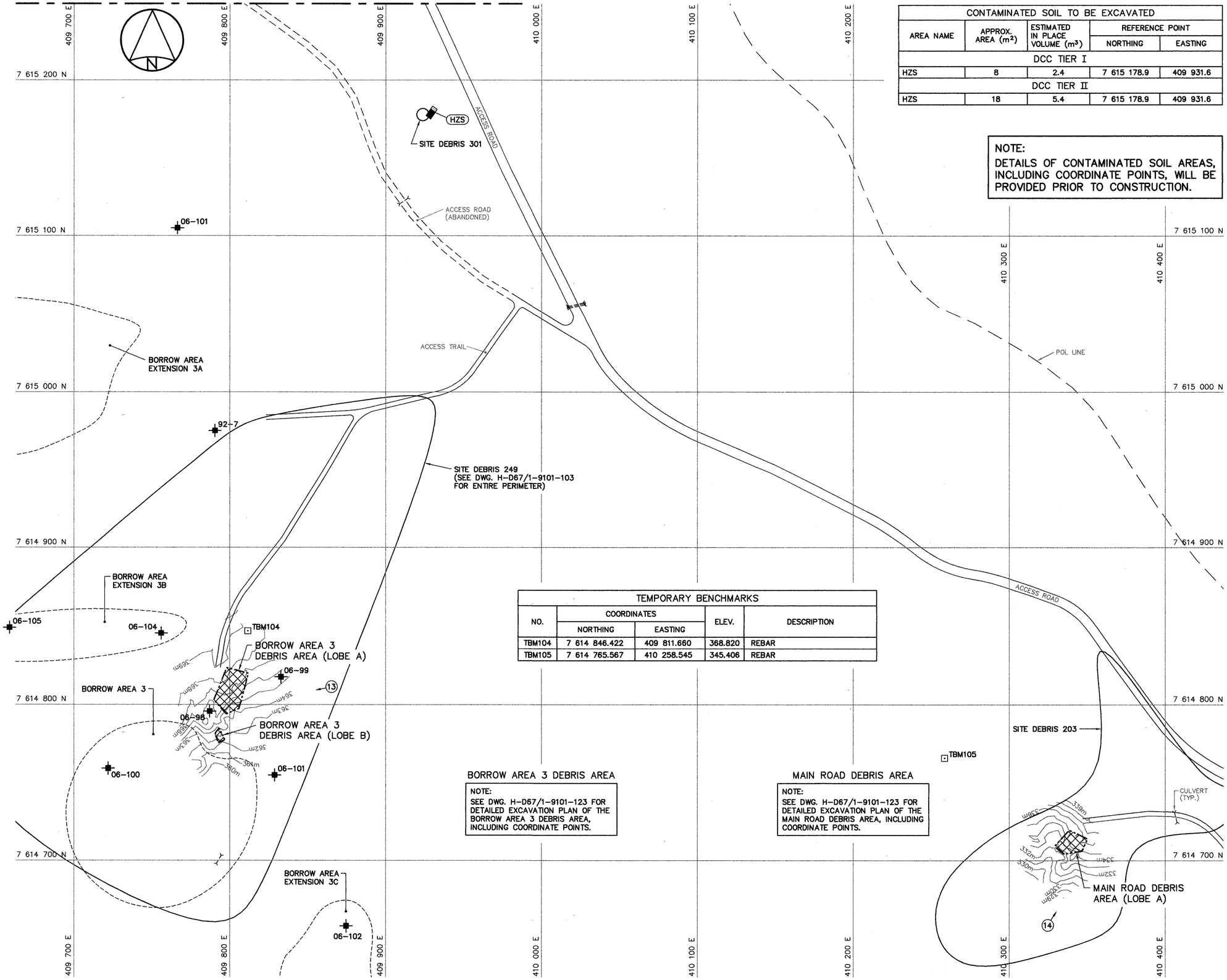
SUBJECT - SUJET

MIDDLE SITE AREA
SITE PLAN SH. 1

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

DWG. NO. - DESSIN NO.
H-D67/1-9101-108

Canada



CONTAMINATED SOIL TO BE EXCAVATED				
AREA NAME	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
DCC TIER I				
HZS	8	2.4	7 615 178.9	409 931.6
DCC TIER II				
HZS	18	5.4	7 615 178.9	409 931.6

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

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
TBM104	7 614 846.422	409 811.660	368.820	REBAR
TBM105	7 614 765.567	410 258.545	345.406	REBAR

BORROW AREA 3 DEBRIS AREA

NOTE:
SEE DWG. H-D67/1-9101-123 FOR DETAILED EXCAVATION PLAN OF THE BORROW AREA 3 DEBRIS AREA, INCLUDING COORDINATE POINTS.

MAIN ROAD DEBRIS AREA

NOTE:
SEE DWG. H-D67/1-9101-123 FOR DETAILED EXCAVATION PLAN OF THE MAIN ROAD DEBRIS AREA, INCLUDING COORDINATE POINTS.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN 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:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION
- DCC TIER I CONTAMINATED SOIL
- DCC TIER II CONTAMINATED SOIL
- (ABC) CONTAMINATED SOIL AREA NAME
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- (13) PHOTOGRAPHIC VIEWPOINT

No.	DATE	REVISION	REVISION	APPR.

R.R. MERKOSKY LICENSEE NWT/NU PROFESSIONAL ENGINEER
2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE - ECHELLE 20 10 0 20 40 60m

PROJECT - PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE - METIER	DATE
SITING	2007-08-24

SUBJECT - SUJET

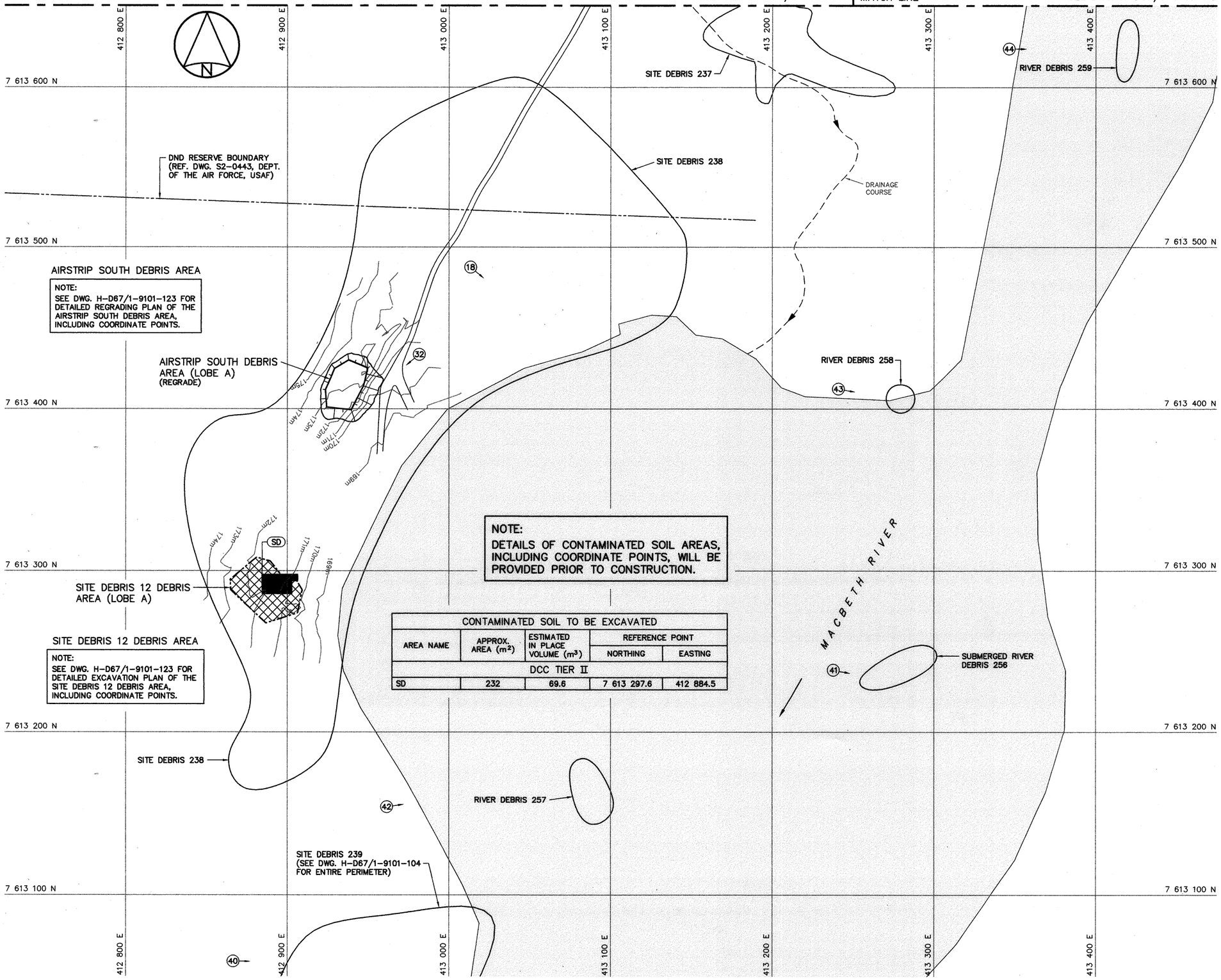
MIDDLE SITE AREA
SITE PLAN

SH. 2

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

DWG. NO. - DESSIN NO.
H-D67/1-9101-109

Canada



CONTAMINATED SOIL TO BE EXCAVATED				
AREA NAME	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
DCC TIER II				
SD	232	69.6	7 613 297.6	412 884.5

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN 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:

- DCC TIER II CONTAMINATED SOIL
- (ABC) CONTAMINATED SOIL AREA NAME
- BODY OF WATER
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- (18) PHOTOGRAPHIC VIEWPOINT

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

2007-08-27

UMA | AECOM HATCH

SCALE - ECHELLE 20 10 0 20 40 60m

PROJECT - PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE - METIER	DATE
SITING	2007-08-24

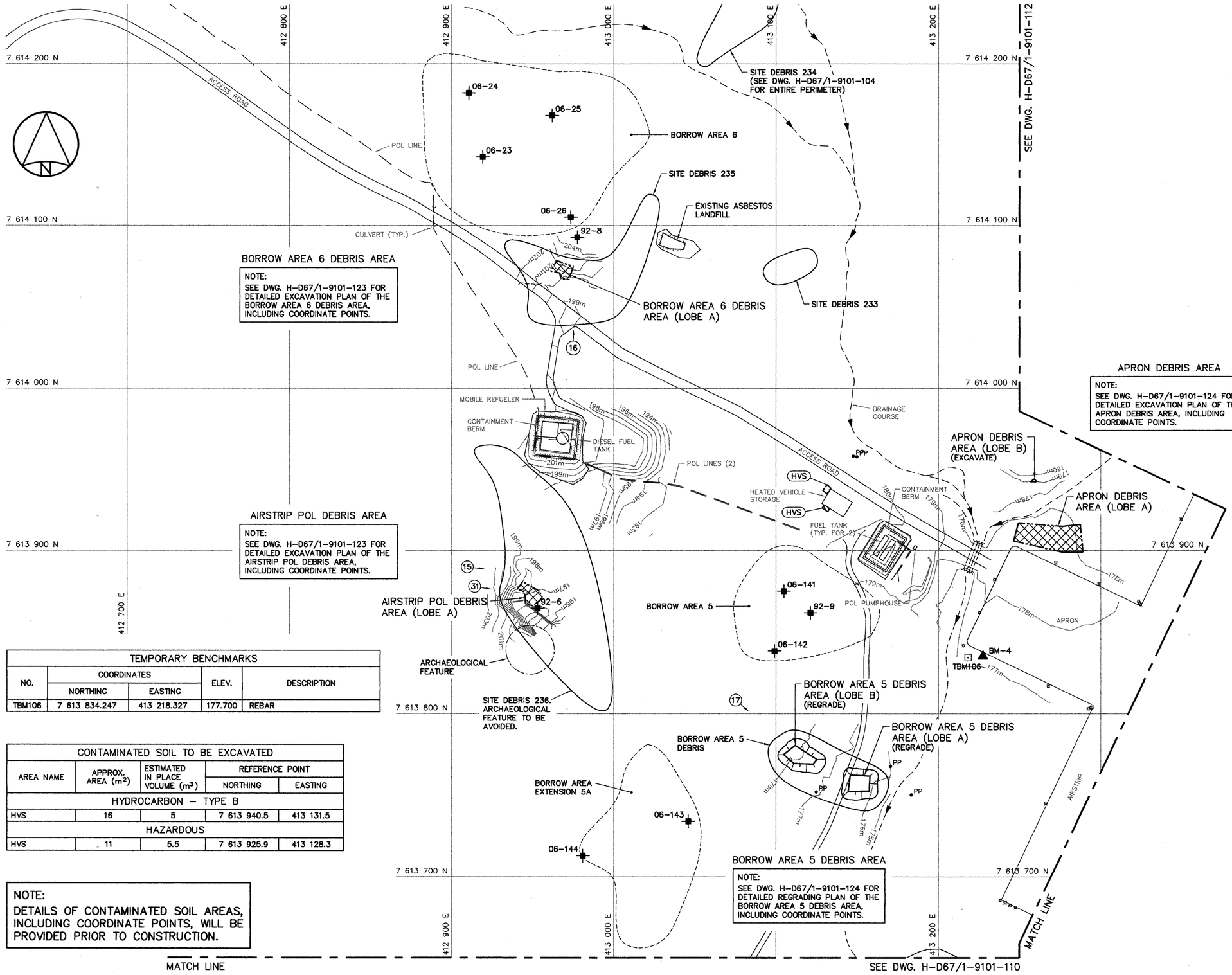
SUBJECT - SUJET

AIRSTRIP AREA - SOUTH
SITE PLAN

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

DWG. NO. - DESSIN NO.
H-D67/1-9101-110

Canada



TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
TBM106	7 613 834.247	413 218.327	177.700	REBAR

CONTAMINATED SOIL TO BE EXCAVATED				
AREA NAME	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
HYDROCARBON – TYPE B				
HVS	16	5	7 613 940.5	413 131.5
HAZARDOUS				
HVS	11	5.5	7 613 925.9	413 128.3

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

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN 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 PERMANENT SURVEY CONTROL (BENCHMARK) INSTALLATION DETAILS, SEE DWG. H-D67/1-9101-129. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.

Legend:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION
- HAZARDOUS CONTAMINATED SOIL
- (ABC) CONTAMINATED SOIL AREA NAME
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- (15) PHOTOGRAPHIC VIEWPOINT
- ▲ PROPOSED PERMANENT BENCHMARK LOCATION (1). (SEE NOTE 6).

No.	DATE	REVISION	REVISION	APPR.

R.R. MERKOSKY — LICENSEE — NWT/NU — 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007-08-24

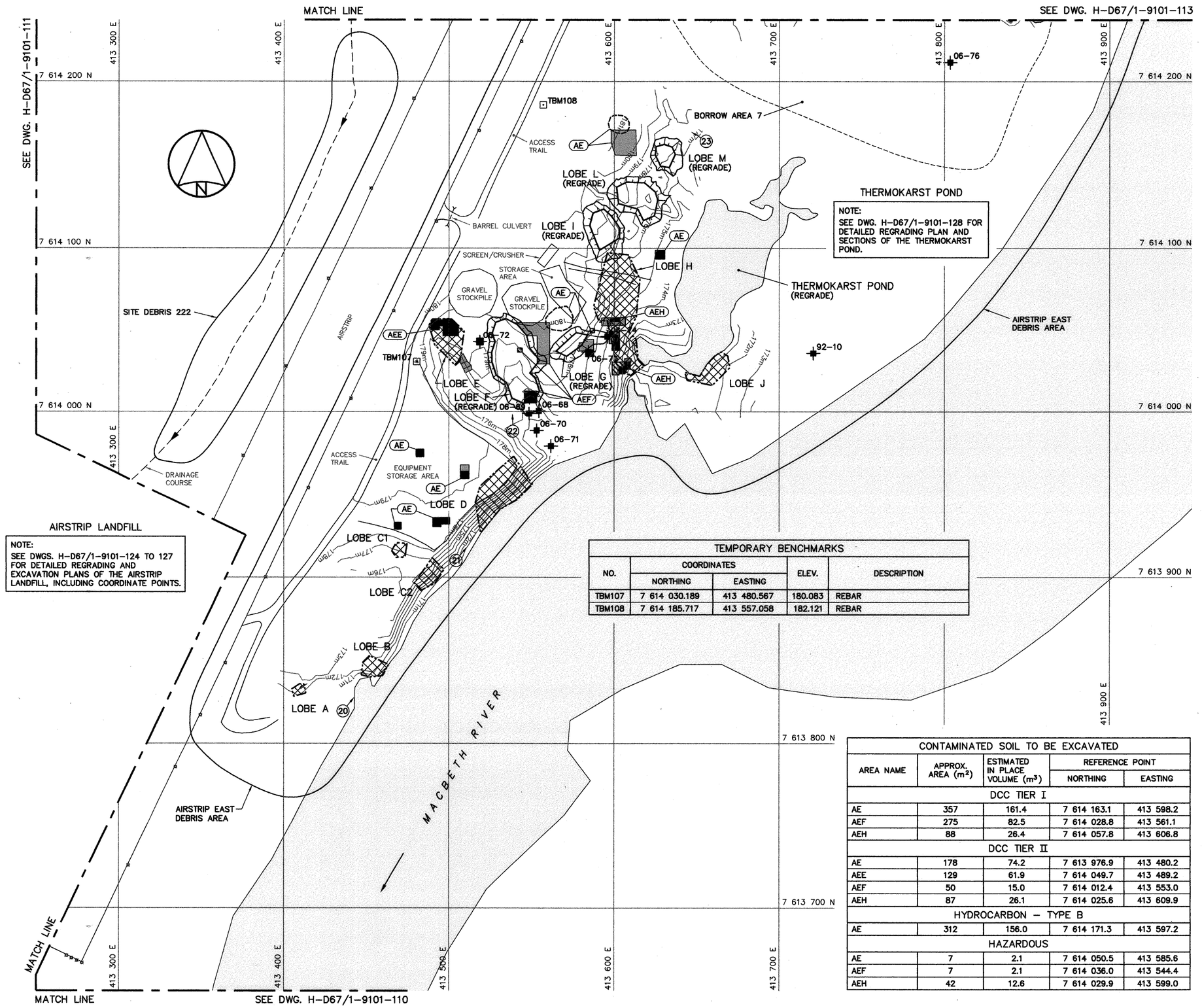
SUBJECT – SUJET

HEATED VEHICLE STORAGE AREA SITE PLAN

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

DWG. NO. – DESSIN NO.
H-D67/1-9101-111

Canada



TEMPORARY BENCHMARKS

NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
TBM107	7 614 030.189	413 480.567	180.083	REBAR
TBM108	7 614 185.717	413 557.058	182.121	REBAR

CONTAMINATED SOIL TO BE EXCAVATED

AREA NAME	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
DCC TIER I				
AE	357	161.4	7 614 163.1	413 598.2
AEF	275	82.5	7 614 028.8	413 561.1
AEH	88	26.4	7 614 057.8	413 606.8
DCC TIER II				
AE	178	74.2	7 613 976.9	413 480.2
AEE	129	61.9	7 614 049.7	413 489.2
AEF	50	15.0	7 614 012.4	413 553.0
AEH	87	26.1	7 614 025.6	413 609.9
HYDROCARBON – TYPE B				
AE	312	156.0	7 614 171.3	413 597.2
HAZARDOUS				
AE	7	2.1	7 614 050.5	413 585.6
AEF	7	2.1	7 614 036.0	413 544.4
AEH	42	12.6	7 614 029.9	413 599.0

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

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN 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:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION
- DCC TIER I CONTAMINATED SOIL
- DCC TIER II CONTAMINATED SOIL
- HYDROCARBON – TYPE B CONTAMINATED SOIL
- HAZARDOUS CONTAMINATED SOIL
- (ABC) CONTAMINATED SOIL AREA NAME
- BODY OF WATER
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- (20) PHOTOGRAPHIC VIEWPOINT

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

K.R. MERKOSKY LICENSEE NWT/YUK
2007-08-27

UMA | AECOM HATCH

SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER: SITING
DATE: 2007-08-24

SUBJECT – SUJET
AIRSTRIP AREA
SITE PLAN SH. 1

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

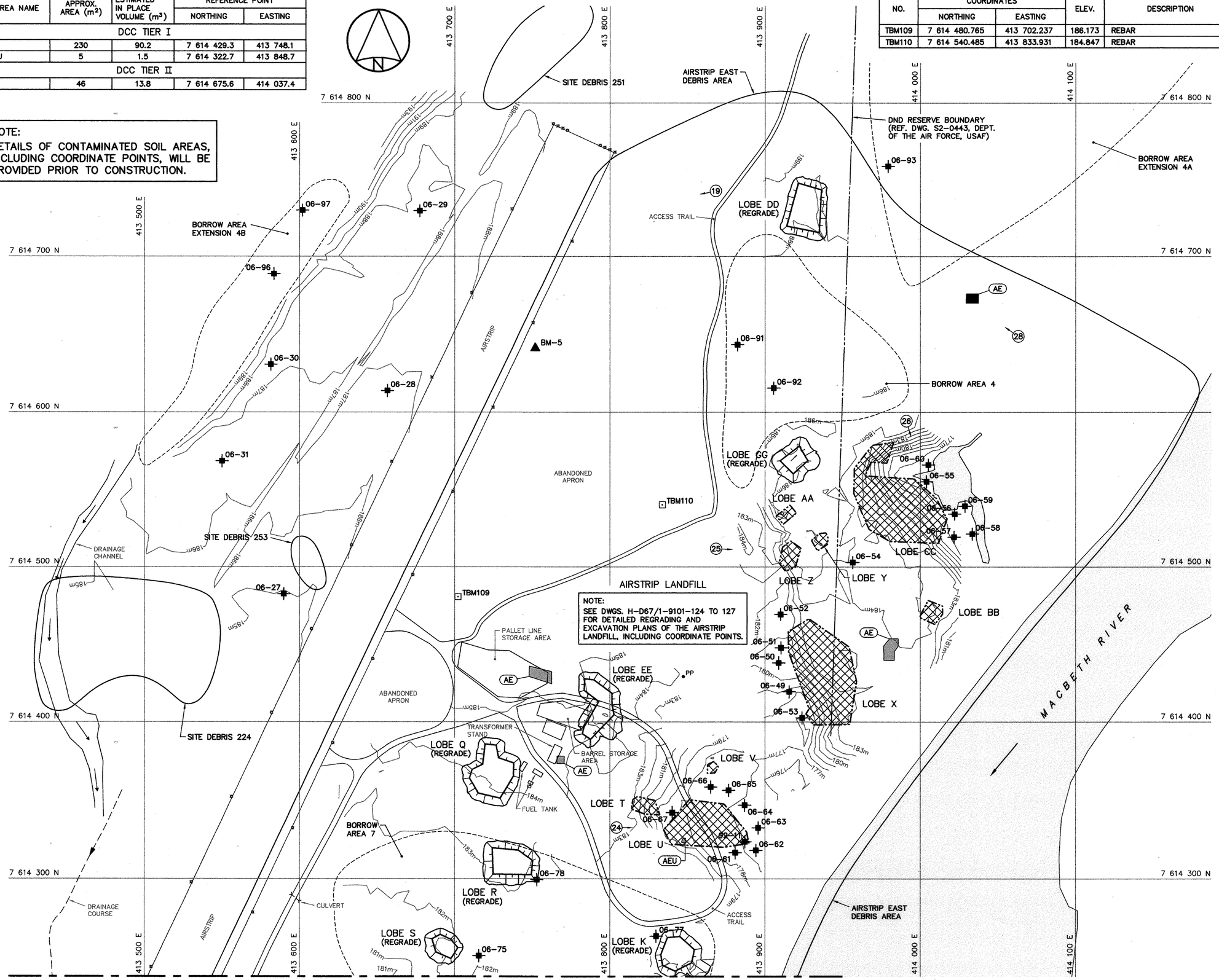
DWG. NO. – DESSIN NO.
H-D67/1-9101-112

Canada

CONTAMINATED SOIL TO BE EXCAVATED				
AREA NAME	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
DCC TIER I				
AE	230	90.2	7 614 429.3	413 748.1
AEU	5	1.5	7 614 322.7	413 848.7
DCC TIER II				
AE	46	13.8	7 614 675.6	414 037.4

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

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
TBM109	7 614 480.765	413 702.237	186.173	REBAR
TBM110	7 614 540.485	413 833.931	184.847	REBAR



General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN 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 PERMANENT SURVEY CONTROL (BENCHMARK) INSTALLATION DETAILS, SEE DWG. H-D67/1-9101-129. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.

Legend:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION
- DCC TIER I CONTAMINATED SOIL
- DCC TIER II CONTAMINATED SOIL
- (ABC) CONTAMINATED SOIL AREA NAME
- BODY OF WATER
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- (19) PHOTOGRAPHIC VIEWPOINT
- ▲ PROPOSED PERMANENT BENCHMARK LOCATION (1). (SEE NOTE 6).

No.	DATE	REVISION	REVISION	APPR.

National Defence / Défense nationale

Headquarters
Quartier général

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

R.R. MERCOSKY LICENSEE — 2007-08-27

UMA | AECOM | HATCH

SCALE - ECHELLE 20 10 0 20 40 60m

PROJECT - PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE - METIER	DATE
SITING	2007-08-24

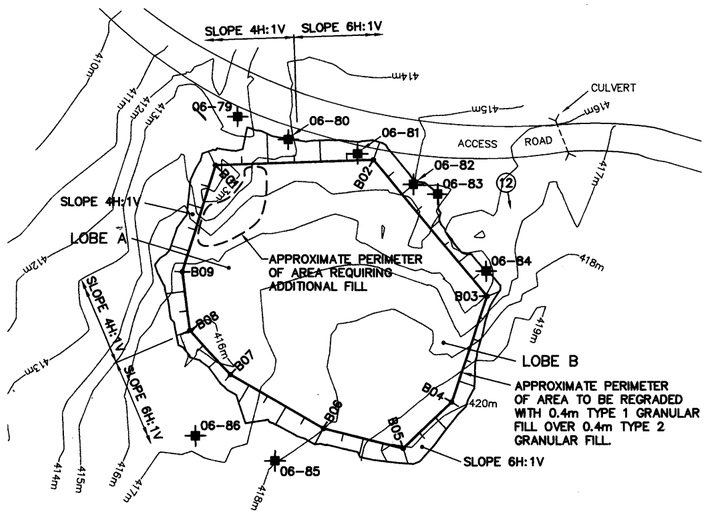
SUBJECT - SUJET

AIRSTRIP AREA
SITE PLAN SH. 2

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

DWG. NO. - DESSIN NO.
H-D67/1-9101-113

Canada



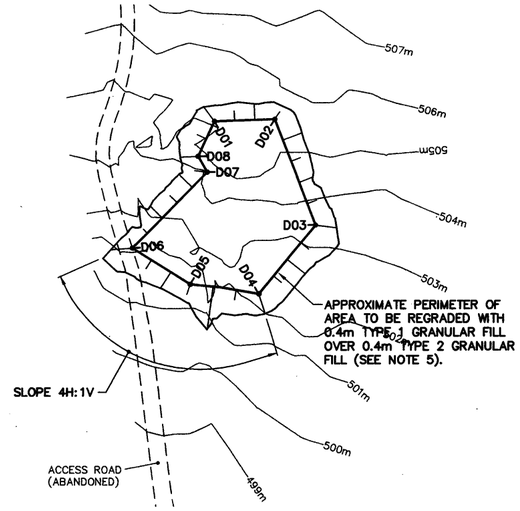
WEST LANDFILL
(DWG. 102)

COORDINATE POINTS
WEST LANDFILL (LOBE A AND LOBE B) REGRADING

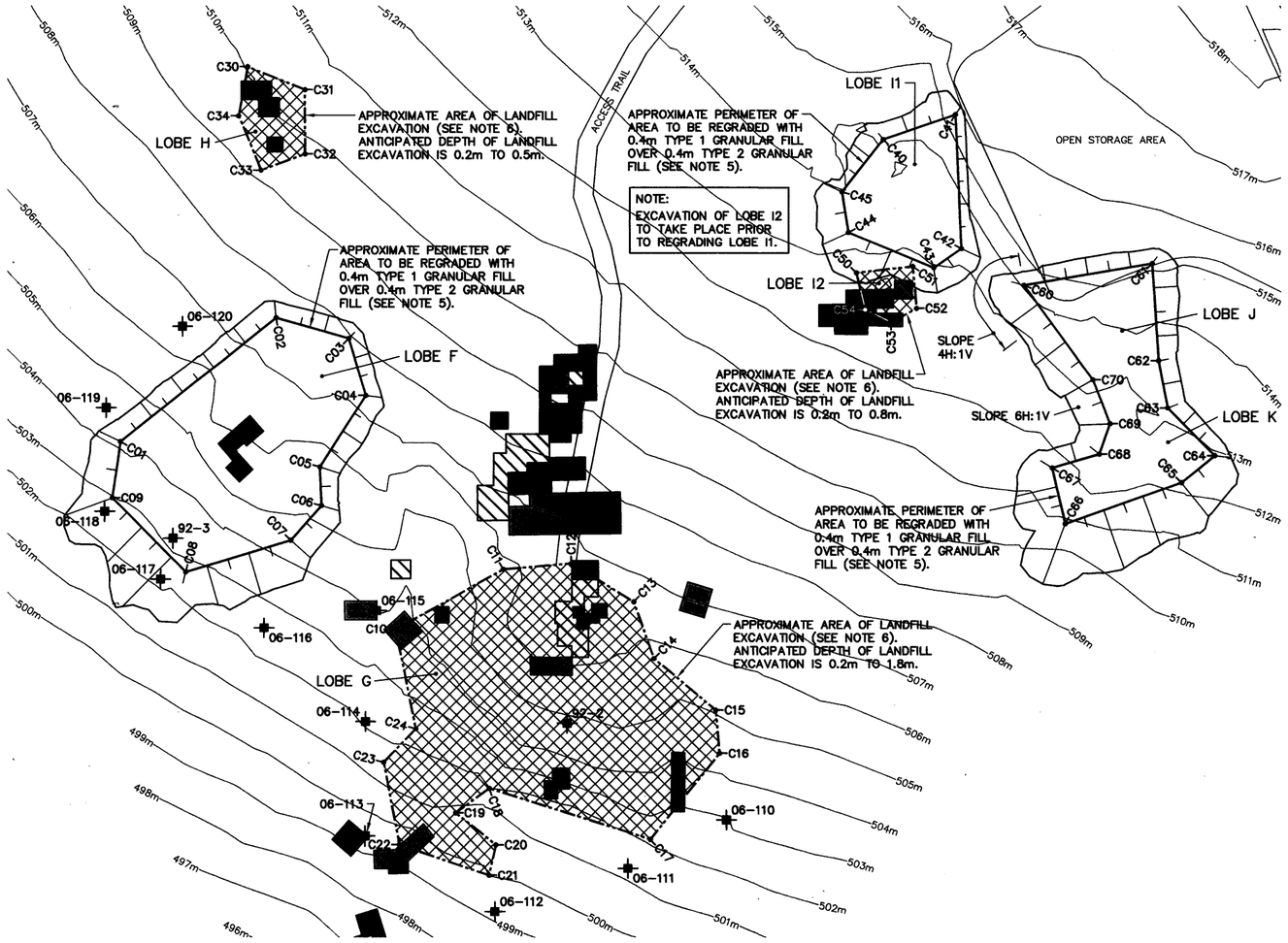
NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
B01	7 617 405.9	407 891.3	B06	7 617 353.7	407 912.6
B02	7 617 407.0	407 922.5	B07	7 617 364.4	407 894.2
B03	7 617 379.9	407 945.0	B08	7 617 373.2	407 886.2
B04	7 617 358.9	407 938.0	B09	7 617 384.8	407 884.7
B05	7 617 349.8	407 928.4			

COORDINATE POINTS
INUIT HOUSE PAD DEBRIS AREA (LOBE A) REGRADING

NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
D01	7 616 706.4	409 224.1	D05	7 616 673.9	409 219.3
D02	7 616 706.8	409 236.0	D06	7 616 681.2	409 207.9
D03	7 616 685.8	409 244.1	D07	7 616 696.2	409 222.7
D04	7 616 672.0	409 232.9	D08	7 616 699.4	409 220.9



INUIT HOUSE PAD DEBRIS AREA (LOBE A)
(DWG. 107)



STATION WEST LANDFILL (LOBES F–K)
(DWG. 105)

COORDINATE POINTS
STATION WEST LANDFILL (LOBES F–K) REGRADING AND EXCAVATION

NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
C01	7 616 831.7	408 893.7	C32	7 616 890.2	408 931.4
C02	7 616 856.8	408 925.5	C33	7 616 886.9	408 922.5
C03	7 616 852.6	408 940.3	C34	7 616 898.1	408 917.9
C04	7 616 841.0	408 943.8			
C05	7 616 826.7	408 934.4	C40	7 616 893.3	409 049.4
C06	7 616 818.8	408 934.7	C41	7 616 898.4	409 064.2
C07	7 616 811.8	408 928.5	C42	7 616 870.9	409 065.4
C08	7 616 805.4	408 907.0	C43	7 616 866.9	409 059.8
C09	7 616 820.4	408 892.1	C44	7 616 874.3	409 042.4
			C45	7 616 882.5	409 041.0
C10	7 616 793.8	408 949.8			
C11	7 616 805.9	408 971.8	C50	7 616 865.9	409 044.0
C12	7 616 807.1	408 985.7	C51	7 616 867.2	409 055.5
C13	7 616 799.4	408 998.5	C52	7 616 858.7	409 056.2
C14	7 616 787.7	409 002.6	C53	7 616 855.9	409 051.0
C15	7 616 777.1	409 015.2	C54	7 616 858.4	409 045.7
C16	7 616 768.2	409 016.0			
C17	7 616 750.7	409 001.8	C60	7 616 863.4	409 078.1
C18	7 616 761.0	408 969.0	C61	7 616 867.8	409 104.3
C19	7 616 756.0	408 962.1	C62	7 616 848.2	409 105.6
C20	7 616 749.6	408 970.3	C63	7 616 838.5	409 107.4
C21	7 616 743.3	408 968.9	C64	7 616 828.9	409 117.0
C22	7 616 749.7	408 950.6	C65	7 616 823.5	409 110.3
C23	7 616 766.4	408 947.4	C66	7 616 815.1	409 086.5
C24	7 616 773.3	408 953.9	C67	7 616 826.5	409 083.9
			C68	7 616 829.2	409 093.5
C30	7 616 908.2	408 919.7	C69	7 616 835.3	409 095.7
C31	7 616 903.4	408 931.4	C70	7 616 844.2	409 092.2

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN NON–HAZARDOUS WASTE LANDFILL.
4. 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.
5. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
6. DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO EXTEND TO THE BASE OF THE DEBRIS. LIMIT AND DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO BE FIELD VERIFIED BY CONFIRMATORY TESTING AND EXCAVATION OF TESTPITS.

Legend:

- TEST PIT LOCATION
- DCC TIER I CONTAMINATED SOIL
- DCC TIER II CONTAMINATED SOIL
- HAZARDOUS CONTAMINATED SOIL
- B01 COORDINATE POINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- 12 PHOTOGRAPHIC VIEWPOINT

No.	DATE	REVISION	REVISION	APPR.

PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS ACT NORTHWEST TERRITORIES — 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE – ECHELLE 10 5 0 10 20 30m

PROJECT – PROJET
FOX–3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007–08–24

SUBJECT – SUJET
STATION AREA
REGRADING AND EXCAVATION
DETAILS SH. 1

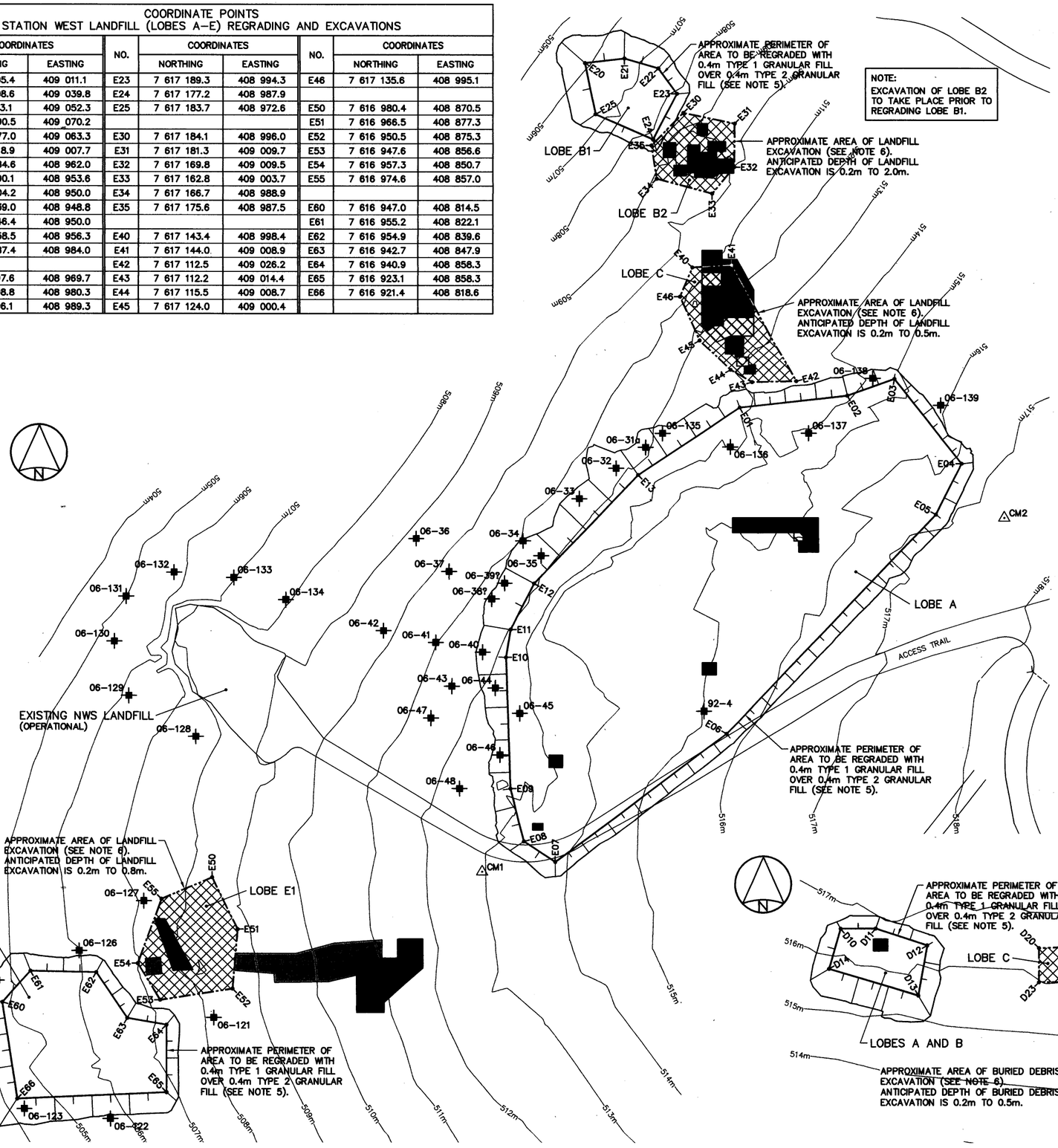
PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED – ETUDIE TME/DTM		DES OFF – AGENT CONCEPT
DRAWN – DESSINE CAE		SECT HD – CHEF SECT
CHECKED – VERIFIE RRM		DES MGR – GEST CONCEPT
COORDINATION SMS	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–D67/1–9101–114

Canada

COORDINATE POINTS
STATION WEST LANDFILL (LOBES A–E) REGRADING AND EXCAVATIONS

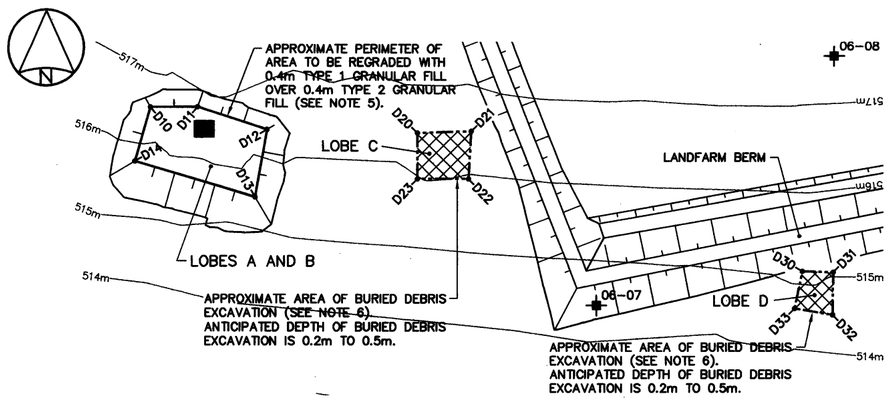
NO.	COORDINATES		NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING		NORTHING	EASTING
E01	7 617 105.4	409 011.1	E23	7 617 189.3	408 994.3	E46	7 617 135.6	408 995.1
E02	7 617 108.6	409 039.8	E24	7 617 177.2	408 987.9			
E03	7 617 113.1	409 052.3	E25	7 617 183.7	408 972.6	E50	7 616 980.4	408 870.5
E04	7 617 090.5	409 070.2				E51	7 616 966.5	408 877.3
E05	7 617 077.0	409 063.3	E30	7 617 184.1	408 996.0	E52	7 616 950.5	408 875.3
E06	7 617 018.9	409 007.7	E31	7 617 181.3	409 009.7	E53	7 616 947.6	408 856.6
E07	7 616 984.6	408 962.0	E32	7 617 169.8	409 009.5	E54	7 616 957.3	408 850.7
E08	7 616 990.1	408 953.6	E33	7 617 162.8	409 003.7	E55	7 616 974.6	408 857.0
E09	7 617 004.2	408 950.0	E34	7 617 166.7	408 988.9			
E10	7 617 039.0	408 948.8	E35	7 617 175.6	408 987.5	E60	7 616 947.0	408 814.5
E11	7 617 048.4	408 950.0				E61	7 616 955.2	408 822.1
E12	7 617 058.5	408 956.3	E40	7 617 143.4	408 998.4	E62	7 616 954.9	408 839.6
E13	7 617 087.4	408 984.0	E41	7 617 144.0	409 008.9	E63	7 616 942.7	408 847.9
			E42	7 617 112.5	409 026.2	E64	7 616 940.9	408 858.3
E20	7 617 197.6	408 969.7	E43	7 617 112.2	409 014.4	E65	7 616 923.1	408 858.3
E21	7 617 198.8	408 980.3	E44	7 617 115.5	409 008.7	E66	7 616 921.4	408 818.6
E22	7 617 196.1	408 989.3	E45	7 617 124.0	409 000.4			



STATION WEST LANDFILL (LOBES A–E)
(DWG. 105)

COORDINATE POINTS
STATION CONSTRUCTION CAMP DEBRIS AREA REGRADING AND EXCAVATIONS

NO.	COORDINATES	
	NORTHING	EASTING
D10	7 616 851.6	409 235.2
D11	7 616 851.7	409 244.5
D12	7 616 847.2	409 258.3
D13	7 616 833.7	409 255.9
D14	7 616 840.8	409 232.1
D20	7 616 846.5	409 288.1
D21	7 616 846.8	409 298.7
D22	7 616 837.3	409 298.2
D23	7 616 837.3	409 288.1
D30	7 616 819.0	409 364.2
D31	7 616 818.8	409 370.4
D32	7 616 810.5	409 370.2
D33	7 616 811.7	409 362.7



STATION CONSTRUCTION CAMP DEBRIS AREA
(DWG. 107)

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN NON–HAZARDOUS WASTE LANDFILL.
4. 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.
5. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
6. DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO EXTEND TO THE BASE OF THE DEBRIS. LIMIT AND DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO BE FIELD VERIFIED BY CONFIRMATORY TESTING AND EXCAVATION OF TESTPITS.

Legend:

- SURVEY CONTROL MONUMENT
- TEST PIT LOCATION
- DCC TIER I CONTAMINATED SOIL
- DCC TIER II CONTAMINATED SOIL
- HAZARDOUS CONTAMINATED SOIL
- D10 COORDINATE POINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA

No.	DATE	REVISION	REVISION	APPR.

R. MERKOSKY LICENCE NUNAVUT
2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 10 5 0 10 20 30m

PROJECT – PROJET
FOX–3 DEWAR LAKES

DEW LINE CLEAN UP

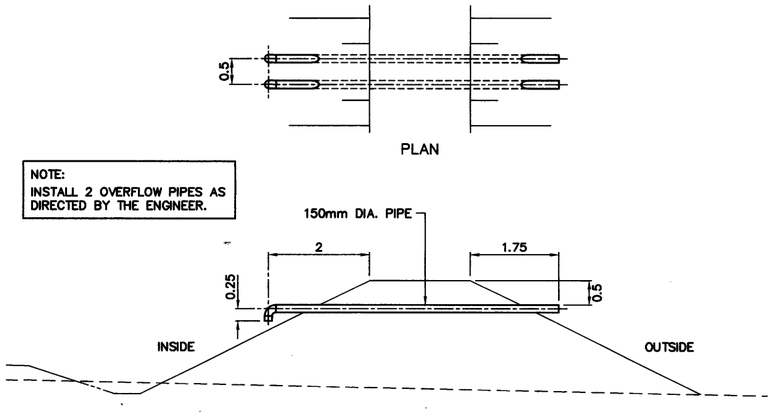
TRADE – METIER: SITING
DATE: 2007–08–24

SUBJECT – SUJET
STATION AREA
REGRADING AND EXCAVATION
DETAILS SH. 2

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

DWG. NO. – DESSIN NO.
H–D67/1–9101–115

Canada



EMERGENCY OUTLET DETAIL

N.T.S.

COORDINATE POINTS LANDFARM			
NO.	COORDINATES		ELEV.
	NORTHING	EASTING	
F01	7 616 970.0	409 322.3	N/A
F02	7 616 929.4	409 363.2	N/A
F03	7 616 838.0	409 398.9	517.6
F04	7 616 834.8	409 400.1	517.6
F05	7 616 819.1	409 321.5	517.6
F06	7 616 838.3	409 314.0	517.6
F07	7 616 906.8	409 287.2	N/A

7 616 900 N
7 616 800 N
409 400 E
409 350 E
409 300 E
7 616 950 N
7 616 850 N
ACCESS ROAD
TOP OF BERM ELEV. = 517.6m
BERM HEIGHT = 1.5m
INSTALL EMERGENCY OUTLET. SEE DETAIL, THIS DRAWING.
HELICOPTER HANGAR
STATION CONSTUCTION CAMP DEBRIS AREA (LOBE D)
SLOPE 2H:1V
3m BERM TOP
3m WIDE DITCH SLOPING TO SUMP AT LOW END
SUMP
TOP OF BERM ELEV. = 517.6m
BERM HEIGHT = 1.5m
STATION CONSTUCTION CAMP DEBRIS AREA (LOBE C)
CONCRETE PAD (TYP.)
06-05
06-06
06-07
06-08
F01
F02
F03
F04
F05
F06
F07
A 117
521m
520m
519m
518m
517m
516m
515m
514m
513m

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. FOR MONITORING WELL INSTALLATION DETAILS, SEE DWG. H-D67/1-9101-129. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.

Legend:

- TEST PIT LOCATION
- F01 COORDINATE POINT
- PROPOSED MONITORING WELL LOCATION (3)
- B PROPOSED BACKGROUND MONITORING WELL LOCATION (1)
- LANDFILL/BURIED DEBRIS EXCAVATION AREA

National Defence / Défense nationale

Headquarters
Quartier général

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.
R.J. MERKOSKY LICENSEE
2007-08-27

UMA | AECOM HATCH

SCALE - ECHELLE 5 2.5 0 5 10 15m

PROJECT - PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE - METIER	DATE
SITING	2007-08-24

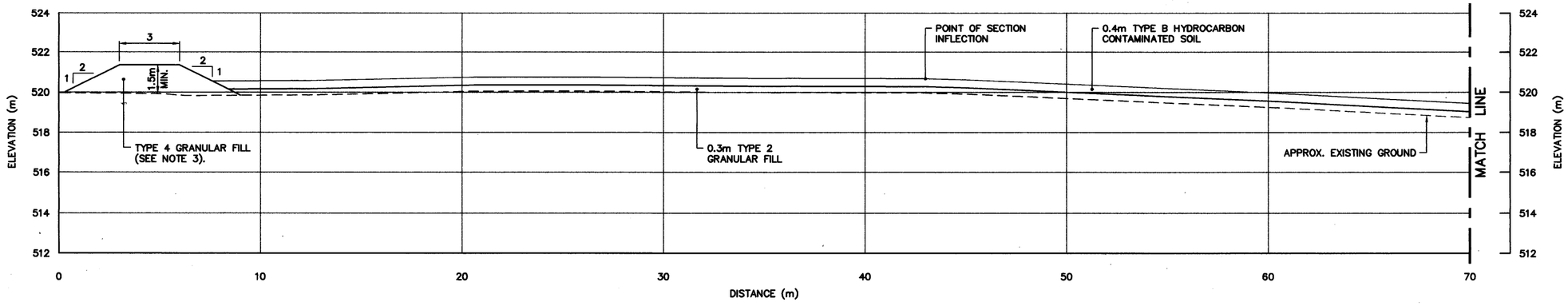
SUBJECT - SUJET

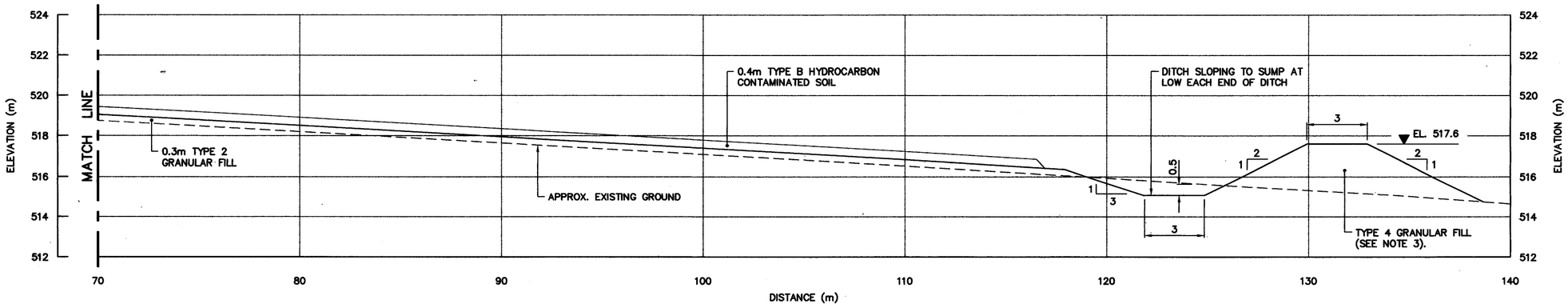
LANDFARM
GRADING PLAN AND DETAIL

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

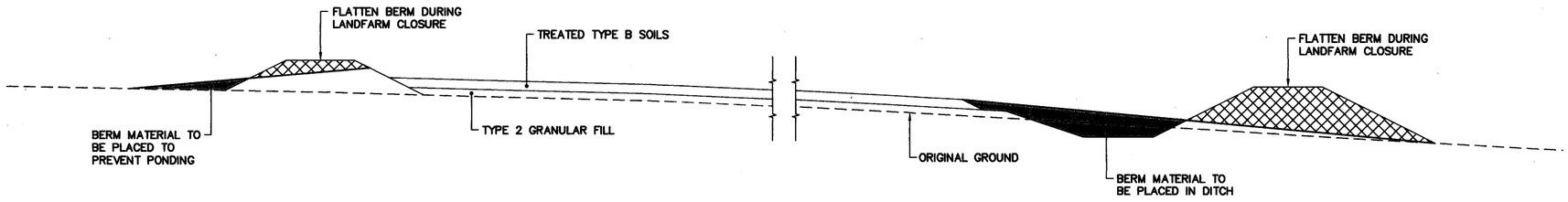
DWG. NO. - DESSIN NO.
H-D67/1-9101-116

Canada





SECTION A 116



LANDFARM CLOSURE DETAIL

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. TYPE 4 GRANULAR FILL FOR THE LANDFARM BERMS IS NOT REQUIRED TO BE SATURATED. PROVIDE MOISTURE CONDITIONING TO MEET COMPACTION REQUIREMENTS ONLY.

Legend:

No.	DATE	REVISION	REVISION	APPR.

R.R. MERKOSKY LICENSEE — 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE – ECHELLE 2 1 0 2 4 6m

PROJECT – PROJET
FOX–3 DEWAR LAKES

DEW LINE CLEAN UP

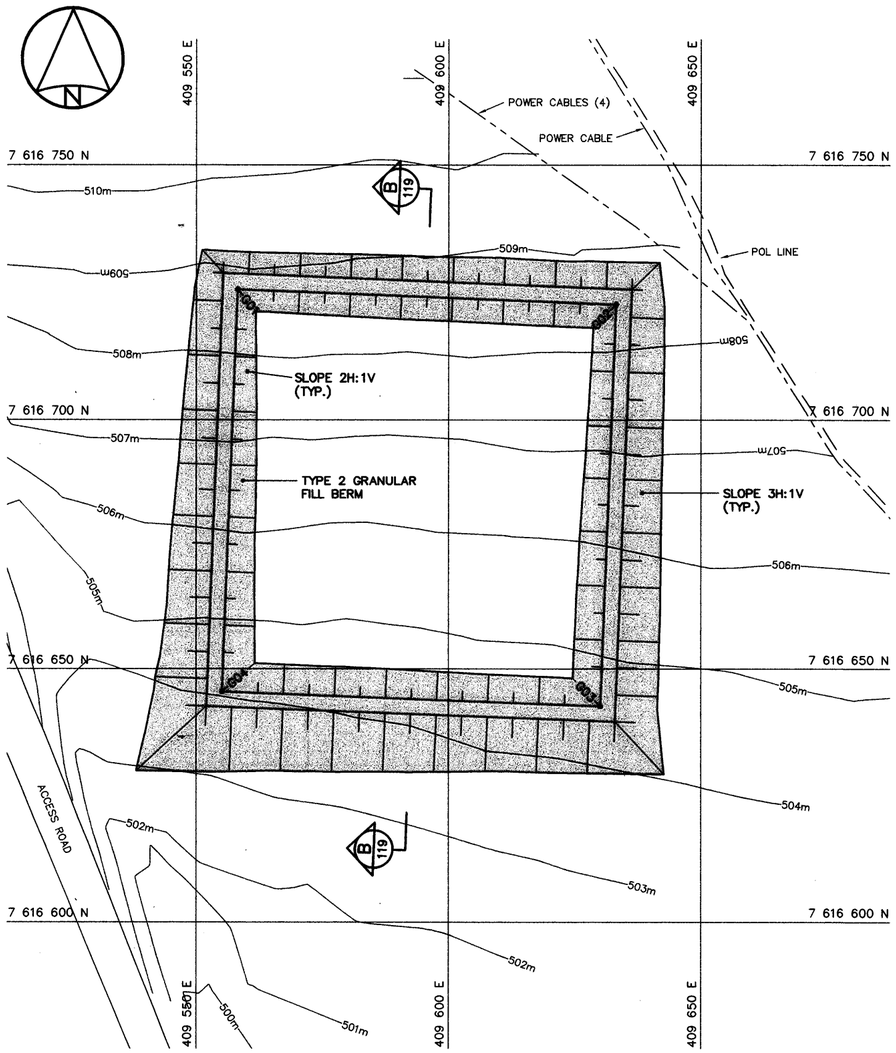
TRADE – METIER	DATE
SITING	2007–08–24

SUBJECT – SUJET
LANDFARM
CROSS SECTION AND
CLOSURE DETAIL

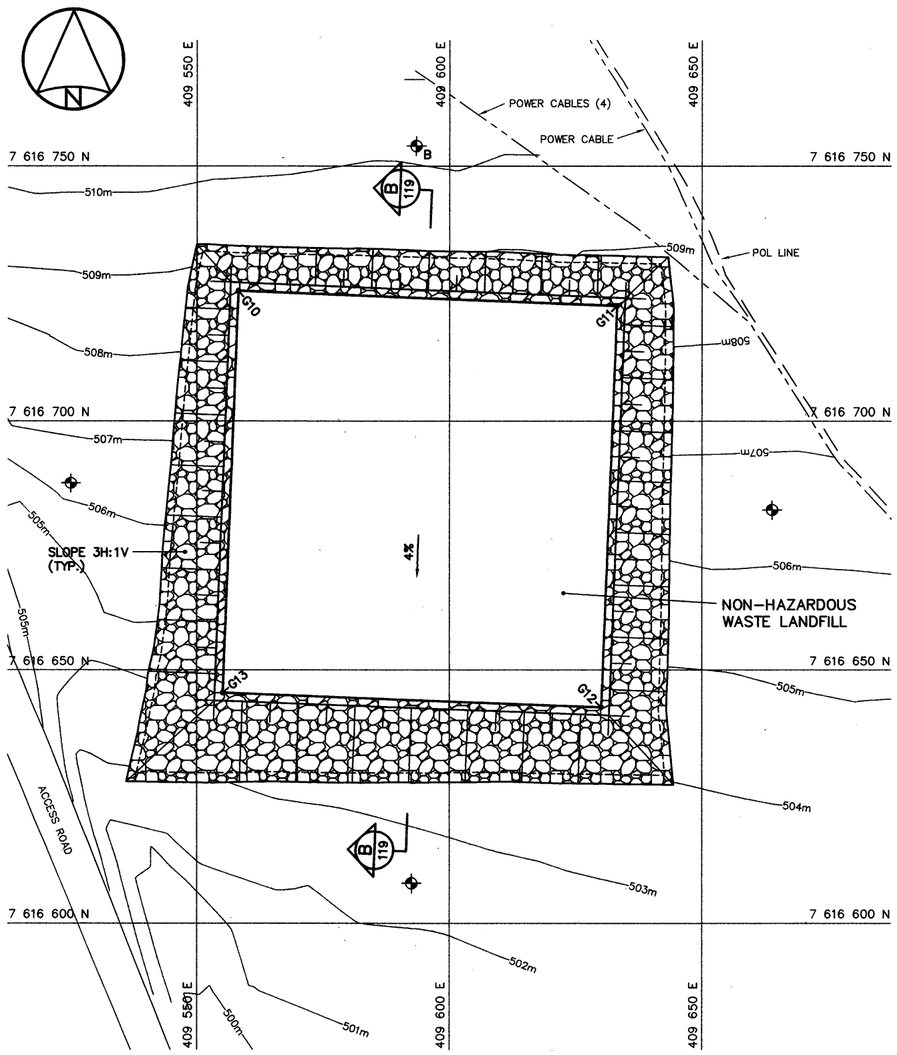
PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE TME/DTM		DES OFF AGENT CONCEPT
DRAWN DESSINE CAE		SECT HD CHEF SECT
CHECKED VERIFIE RRM		DES MGR GEST CONCEPT
COORDINATION SMS	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–D67/1–9101–117

Canada



BERM CONSTRUCTION PLAN



FINAL GRADING PLAN

COORDINATE POINTS LANDFILL BERM			
NO.	COORDINATES		ELEV.
	NORTHING	EASTING	
G01	7 616 725.5	409 558.2	510.6
G02	7 616 722.6	409 633.2	510.6
G03	7 616 642.7	409 630.1	507.4
G04	7 616 645.5	409 555.2	507.4

COORDINATE POINTS FINAL LANDFILL SURFACE			
NO.	COORDINATES		ELEV.
	NORTHING	EASTING	
G10	7 616 725.5	409 558.2	511.6
G11	7 616 722.6	409 633.2	511.6
G12	7 616 642.7	409 630.1	508.4
G13	7 616 645.5	409 555.2	508.4

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:

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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-D67/1-9101-129. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.
5. VARIABLE SLOPE ON LANDFILL SURFACE PERMITTED. MINIMUM 2% - MAXIMUM 4%.

Legend:

- G01 — COORDINATE POINT
- PROPOSED MONITORING WELL LOCATION (3)
- B — PROPOSED BACKGROUND MONITORING WELL LOCATION (1)

No.	DATE	REVISION	REVISION	APPR.

NORTHWEST TERRITORIES ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS — R.R. MERKOSKY — LICENSEE — NWT/NU — 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE - ECHELLE 10 5 0 10 20 30m

PROJECT - PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE - METIER: SITING
DATE: 2007-08-24

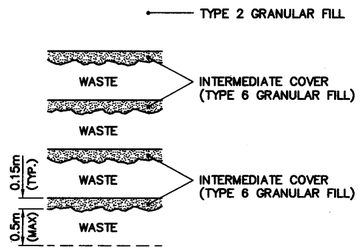
SUBJECT - SUJET
NON-HAZARDOUS WASTE LANDFILL BERM CONSTRUCTION AND FINAL GRADING PLANS

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

DWG. NO. - DESSIN NO.
H-D67/1-9101-118

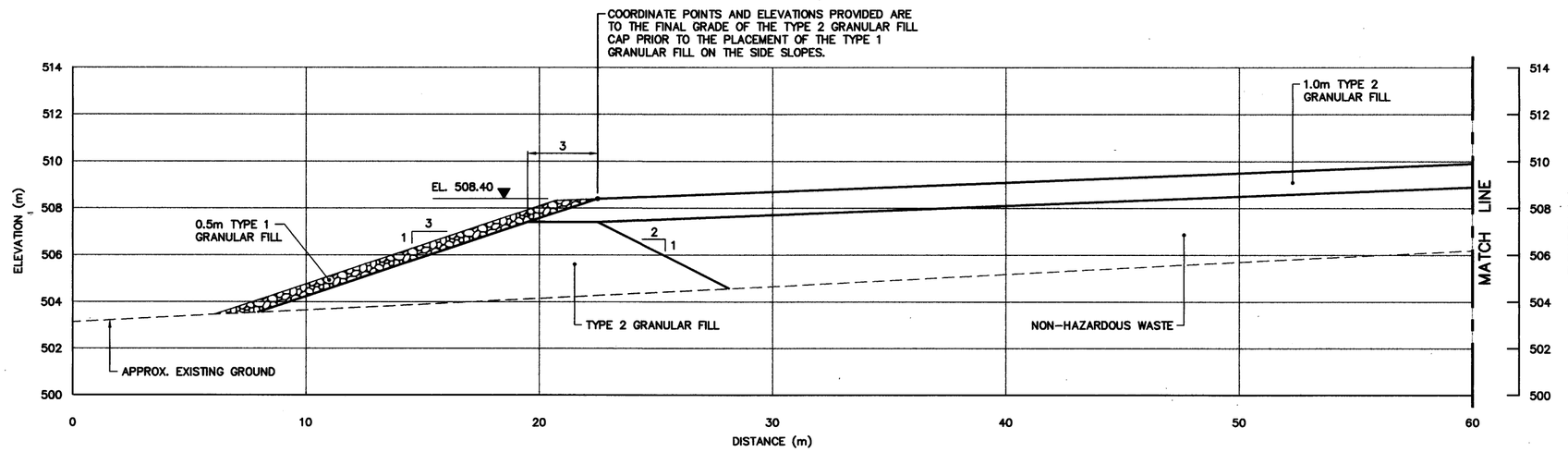
Canada

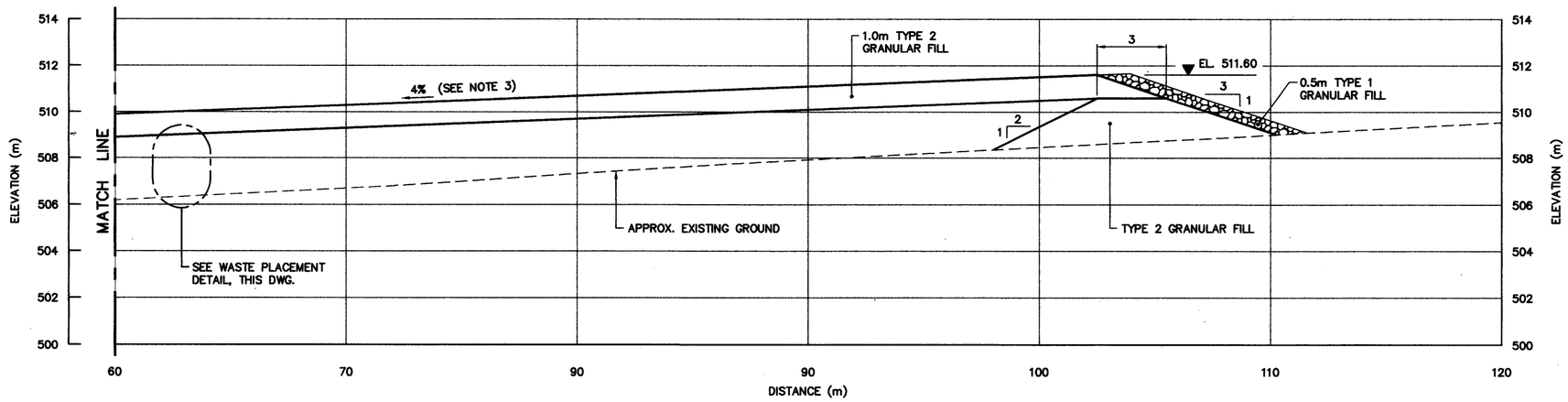
ADD ADDITIONAL WASTE LAYERS, AS REQUIRED, TO ACHIEVE THE NON-HAZARDOUS WASTE LANDFILL DESIGN ELEVATIONS.



WASTE PLACEMENT DETAIL

N.T.S.





SECTION B 118

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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:

No.	DATE	REVISION	REVISION	APPR.

R.B. MERKOSKY LICENSEE NWT/NU
2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 2 1 0 2 4 6m

PROJECT – PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007-08-20

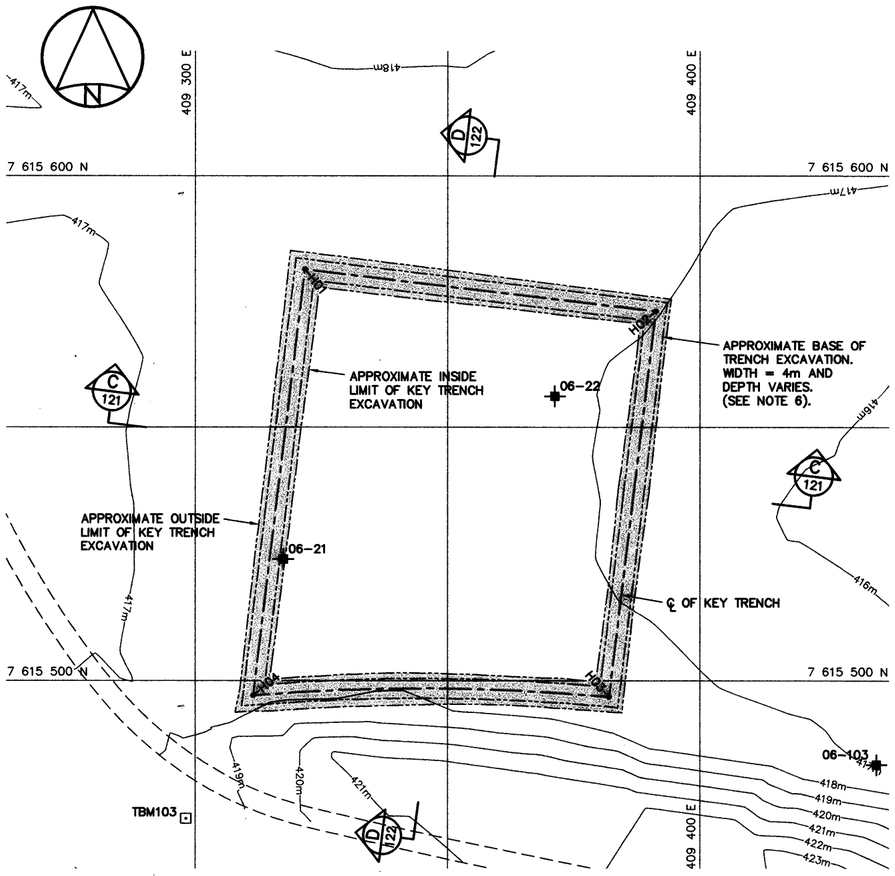
SUBJECT – SUJET

NON-HAZARDOUS WASTE LANDFILL CROSS SECTION

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

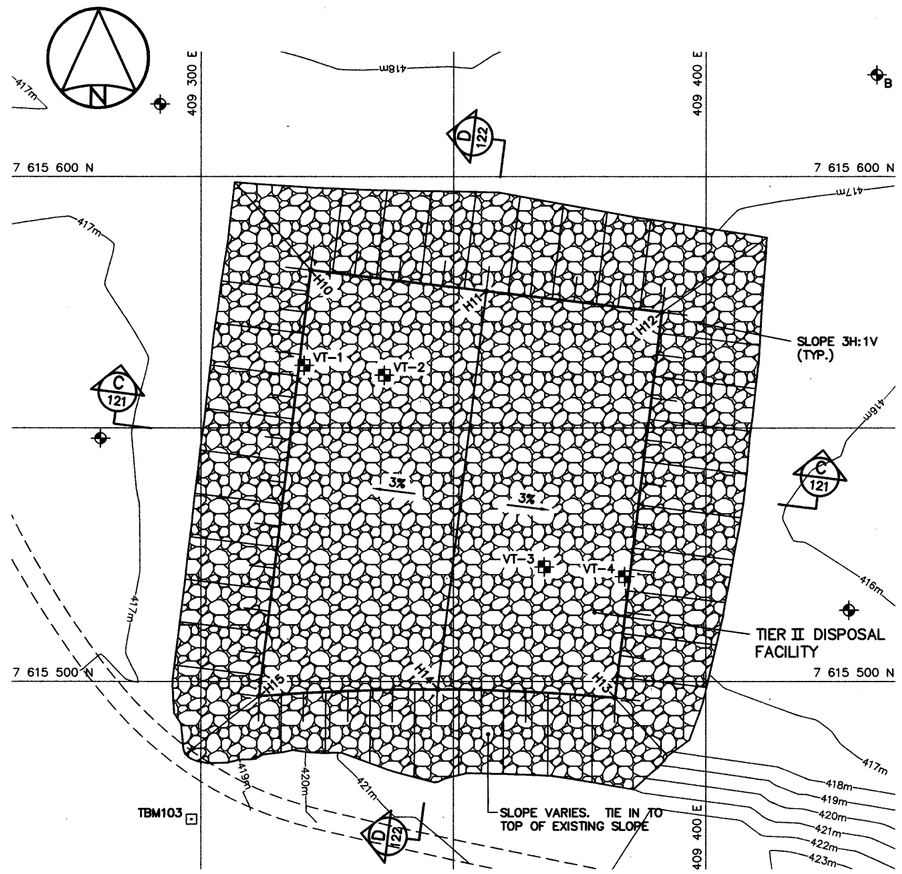
DWG. NO. – DESSIN NO.
H-D67/1-9101-119

Canada



KEY TRENCH EXCAVATION PLAN

COORDINATE POINTS KEY TRENCH EXCAVATION		
NO.	COORDINATES	
	NORTHING	EASTING
H01	7 615 581.4	409 321.8
H02	7 615 573.0	409 391.2
H03	7 615 496.7	409 382.0
H04	7 615 497.0	409 311.5



GRADING/INSTRUMENTATION PLAN

COORDINATE POINTS FINAL LANDFILL SURFACE			
NO.	COORDINATES		ELEV.
	NORTHING	EASTING	
H10	7 615 581.4	409 321.8	423.10
H11	7 615 577.2	409 356.5	424.15
H12	7 615 573.0	409 391.2	423.10
H13	7 615 496.7	409 382.0	423.10
H14	7 615 498.4	409 346.9	424.15
H15	7 615 497.0	409 311.5	423.10

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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-D67/1-9101-129. LOCATIONS TO BE FIELD APPROVED BY THE ENGINEER.
5. FOR GROUND TEMPERATURE CABLE INSTALLATION DETAILS, SEE DWG. H-D67/1-9101-130. 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:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION
- H01 COORDINATE POINT
- VERTICAL GROUND TEMPERATURE CABLE INSTALLATION (4)
- PROPOSED MONITORING WELL LOCATION (3)
- $_B$ PROPOSED BACKGROUND MONITORING WELL LOCATION (1)

No.	DATE	REVISION	REVISION	APPR.

REGISTERED PROFESSIONAL ENGINEER — R. MERROBY — LICENSEE — NWT/NU — 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 10 5 0 10 20 30m

PROJECT – PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

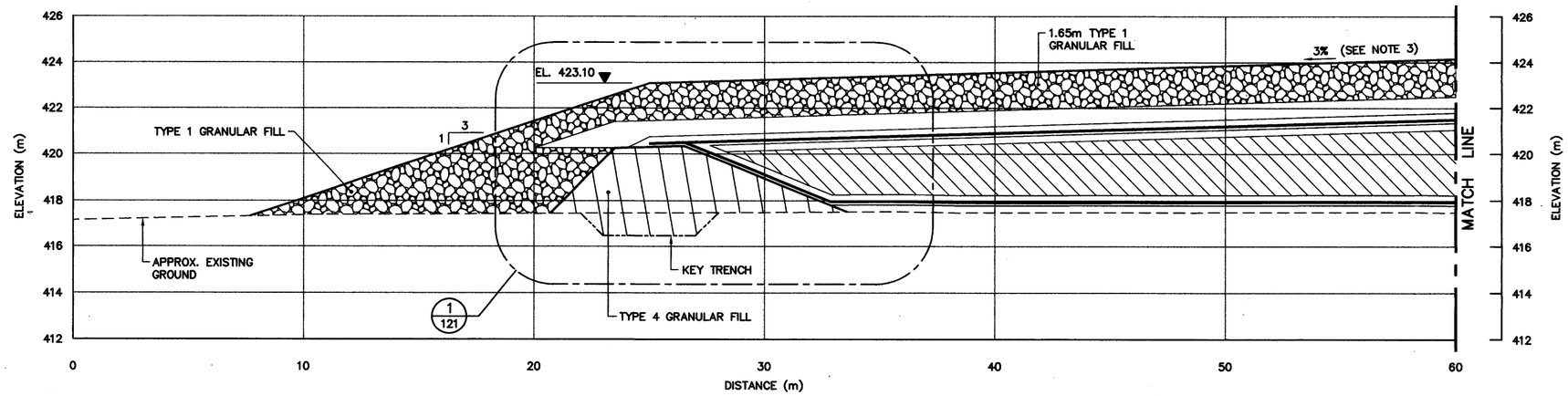
TRADE – METIER: SITING
DATE: 2007-08-24

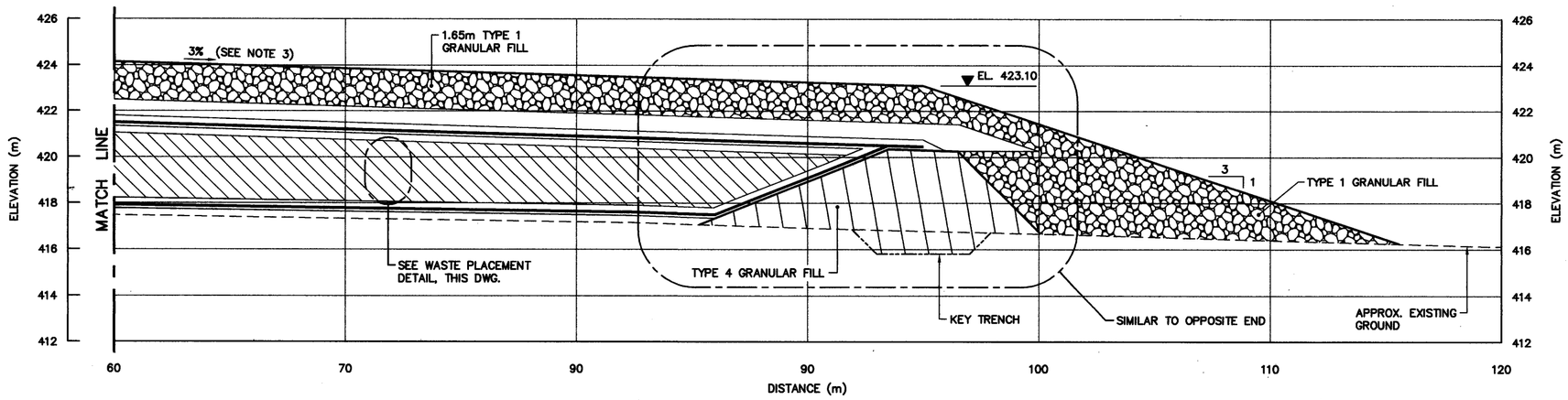
SUBJECT – SUJET
TIER II DISPOSAL FACILITY
KEY TRENCH EXCAVATION PLAN & GRADING/INSTRUMENTATION PLAN

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

DWG. NO. – DESSIN NO.
H-D67/1-9101-120

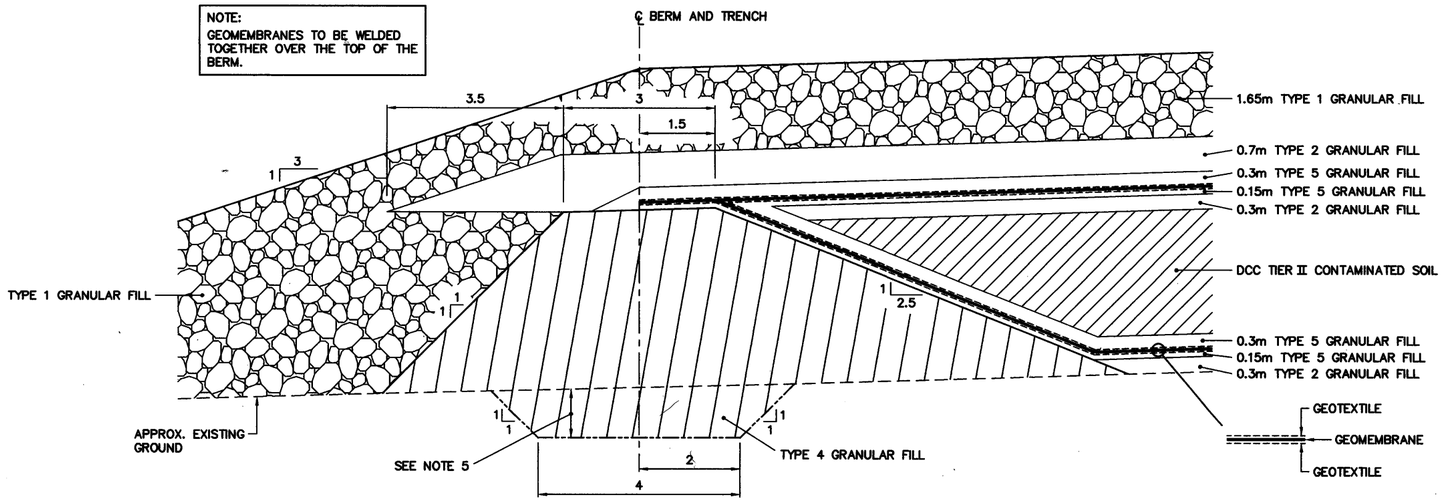
Canada





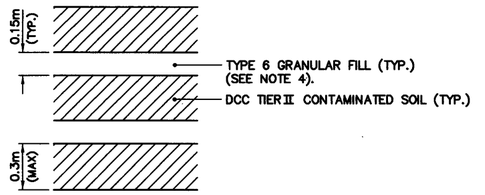
SECTION C 120

NOTE:
GEOMEMBRANES TO BE WELDED TOGETHER OVER THE TOP OF THE BERM.



DETAIL 1 121

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



WASTE PLACEMENT DETAIL
N.T.S.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 1 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.

Legend:

No.	DATE	REVISION	REVISION	APPR.

UMA | AECOM HATCH

SCALE – ECHELLE 2 1 0 2 4 6m

PROJECT – PROJET
FOX–3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007–08–24

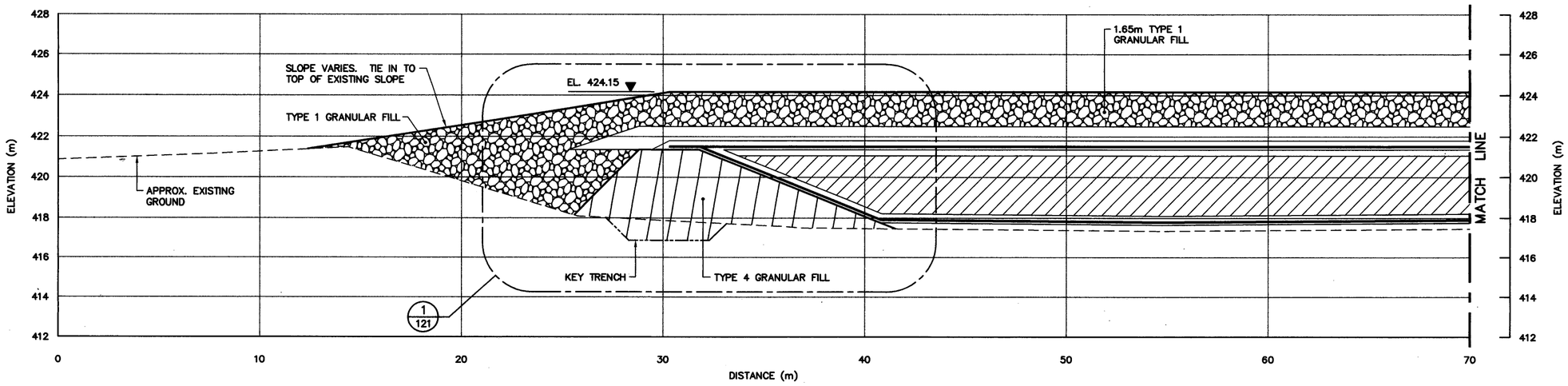
SUBJECT – SUJET

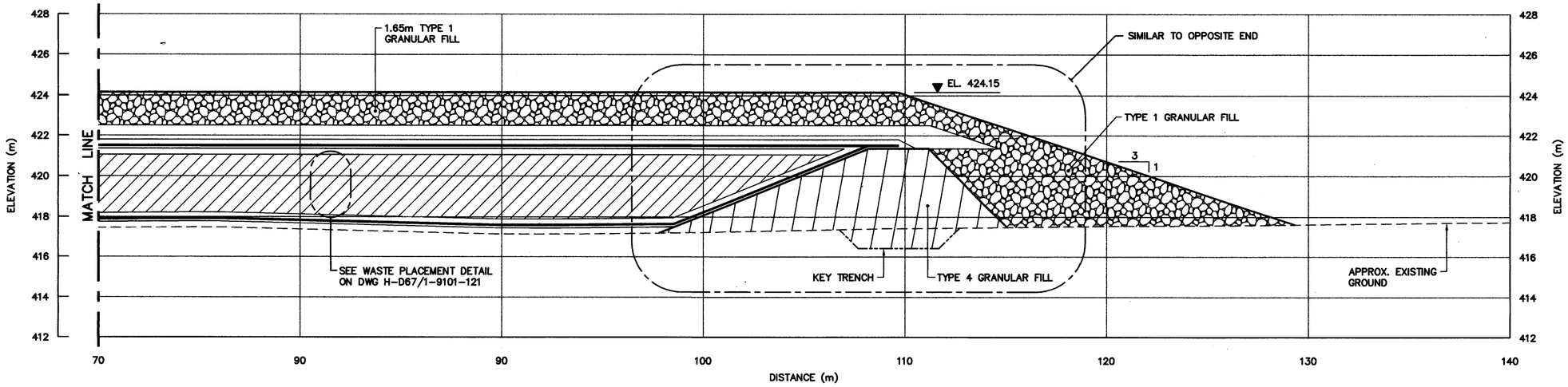
TIER II DISPOSAL FACILITY
CROSS SECTION AND DETAIL

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

DWG. NO. – DESSIN NO.
H–D67/1–9101–121

Canada





SECTION D/120

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 1 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.

Legend:

No.	DATE	REVISION	REVISION	APPR.

R. MIERKOSKY LICENSEE NWT/NU 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 2 1 0 2 4 6m

PROJECT – PROJET
FOX–3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007–08–24

SUBJECT – SUJET

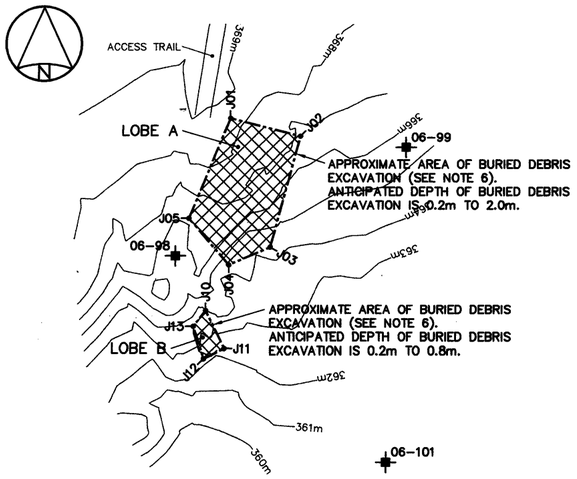
TIER II DISPOSAL FACILITY
CROSS SECTION SH. 2

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

DWG. NO. – DESSIN NO.
H–D67/1–9101–122

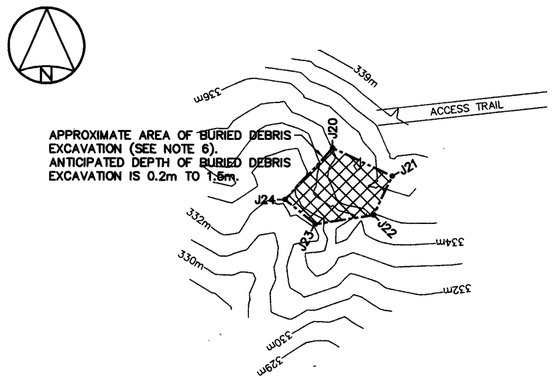
Canada

COORDINATE POINTS LOBE A AND LOBE B EXCAVATION					
NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
J01	7 614 823.0	409 798.1	J10	7 614 784.6	409 793.1
J02	7 614 819.4	409 812.0	J11	7 614 777.1	409 796.8
J03	7 614 797.3	409 805.9	J12	7 614 775.2	409 792.7
J04	7 614 793.8	409 797.7	J13	7 614 781.5	409 790.7
J05	7 614 803.0	409 789.8			



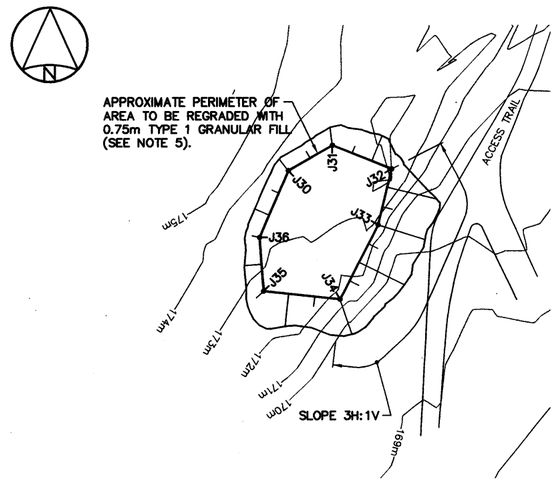
BORROW AREA 3 DEBRIS AREA
(DWG. 109)

COORDINATE POINTS LOBE A EXCAVATION		
NO.	COORDINATES	
	NORTHING	EASTING
J20	7 614 719.4	410 338.5
J21	7 614 713.8	410 350.3
J22	7 614 706.0	410 346.6
J23	7 614 704.1	410 335.0
J24	7 614 709.1	410 329.0



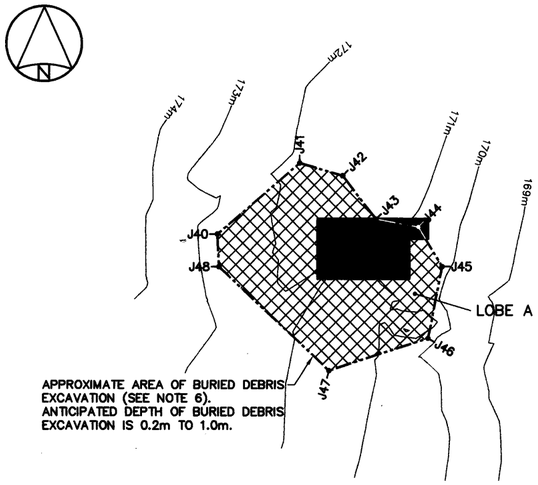
MAIN ROAD DEBRIS AREA LOBE A
(DWG. 109)

COORDINATE POINTS LOBE A REGRADING					
NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
J30	7 613 424.9	412 929.3	J34	7 613 399.3	412 939.5
J31	7 613 430.0	412 938.0	J35	7 613 401.0	412 924.4
J32	7 613 425.3	412 949.7	J36	7 613 411.7	412 923.6
J33	7 613 414.2	412 947.0			



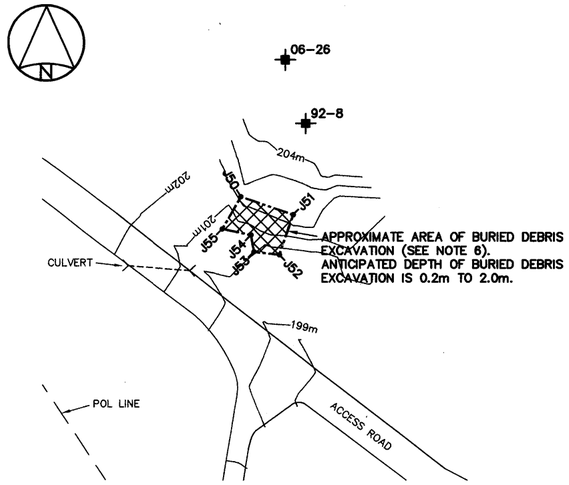
AIRSTRIP SOUTH DEBRIS AREA LOBE A
(DWG. 110)

COORDINATE POINTS LOBE A EXCAVATION					
NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
J40	7 613 294.6	412 864.7	J45	7 613 288.2	412 909.2
J41	7 613 308.4	412 881.0	J46	7 613 274.1	412 906.4
J42	7 613 306.0	412 889.5	J47	7 613 267.8	412 886.8
J43	7 613 297.6	412 896.0	J48	7 613 288.2	412 865.0
J44	7 613 296.0	412 904.5			



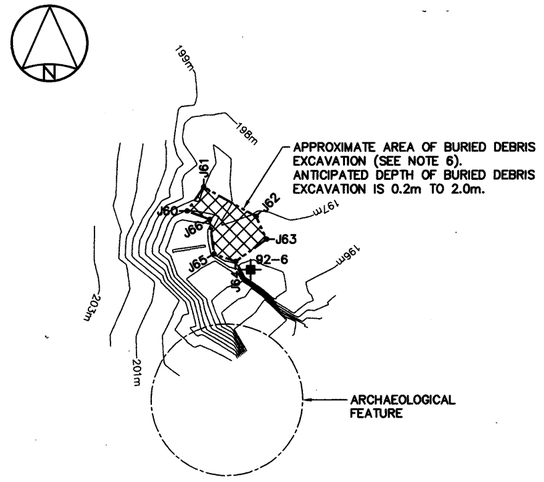
SITE DEBRIS 12 DEBRIS AREA LOBE A
(DWG. 110)

COORDINATE POINTS LOBE A EXCAVATION					
NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
J50	7 614 078.4	412 964.8			
J51	7 614 074.9	412 975.1			
J53	7 614 067.0	412 972.4			
J53	7 614 067.6	412 967.4			
J54	7 614 070.9	412 966.8			
J55	7 614 072.1	412 961.1			



BORROW AREA 6 DEBRIS AREA LOBE A
(DWG. 111)

COORDINATE POINTS LOBE A EXCAVATION					
NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
J60	7 613 876.2	412 940.5	J64	7 613 866.3	412 950.1
J61	7 613 880.9	412 943.8	J65	7 613 867.7	412 945.9
J62	7 613 875.1	412 954.2	J66	7 613 874.5	412 945.0
J63	7 613 870.7	412 956.3			



AIRSTRIP POL DEBRIS AREA LOBE A
(DWG. 111)

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
4. 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.
5. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
6. DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO EXTEND TO THE BASE OF THE DEBRIS. LIMIT AND DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO BE FIELD VERIFIED BY CONFIRMATORY TESTING AND EXCAVATION OF TESTPITS.

Legend:

- TEST PIT LOCATION
- DCC TIER II CONTAMINATED SOIL
- J01 COORDINATE POINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

NWT/NU PROFESSIONAL ENGINEER G. HERKOSKY LICENSEE 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE - ECHELLE 10 5 0 10 20 30m

PROJECT - PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE - METIER	DATE
SITING	2007-08-24

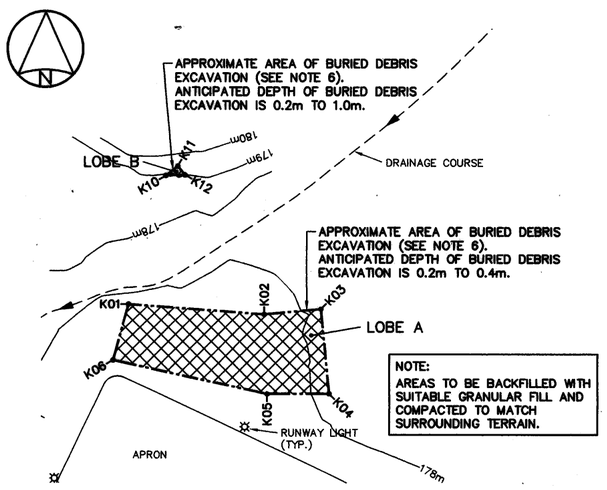
SUBJECT - SUJET
MISCELLANEOUS LANDFILL/BURIED DEBRIS REGRADING & EXCAVATION DETAILS SH. 1

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

DWG. NO. - DESSIN NO.
H-D67/1-9101-123

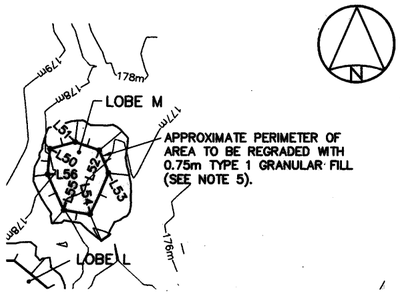
Canada

COORDINATE POINTS LOBE A AND LOBE B EXCAVATION					
NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
K01	7 613 917.0	413 249.3	K06	7 613 905.8	413 246.3
K02	7 613 914.9	413 276.2			
K03	7 613 916.0	413 287.4	K10	7 613 942.3	413 256.7
K04	7 613 899.0	413 289.1	K11	7 613 944.1	413 259.1
K05	7 613 899.0	413 276.8	K12	7 613 942.4	413 260.5



APRON DEBRIS AREA
(DWG. 111)

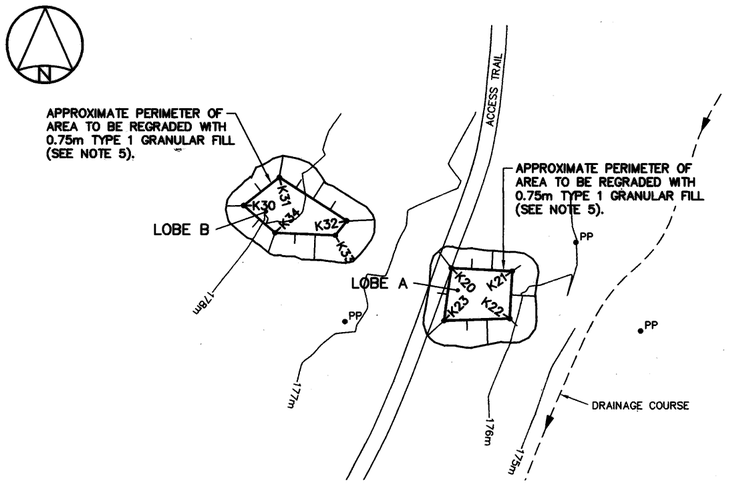
COORDINATE POINTS LOBE M REGRADING		
NO.	COORDINATES	
	NORTHING	EASTING
L50	7 614 160.8	413 625.4
L51	7 614 162.1	413 630.4
L52	7 614 160.6	413 635.2
L53	7 614 156.1	413 637.0
L54	7 614 148.0	413 633.4
L55	7 614 148.9	413 628.2
L56	7 614 155.8	413 625.0



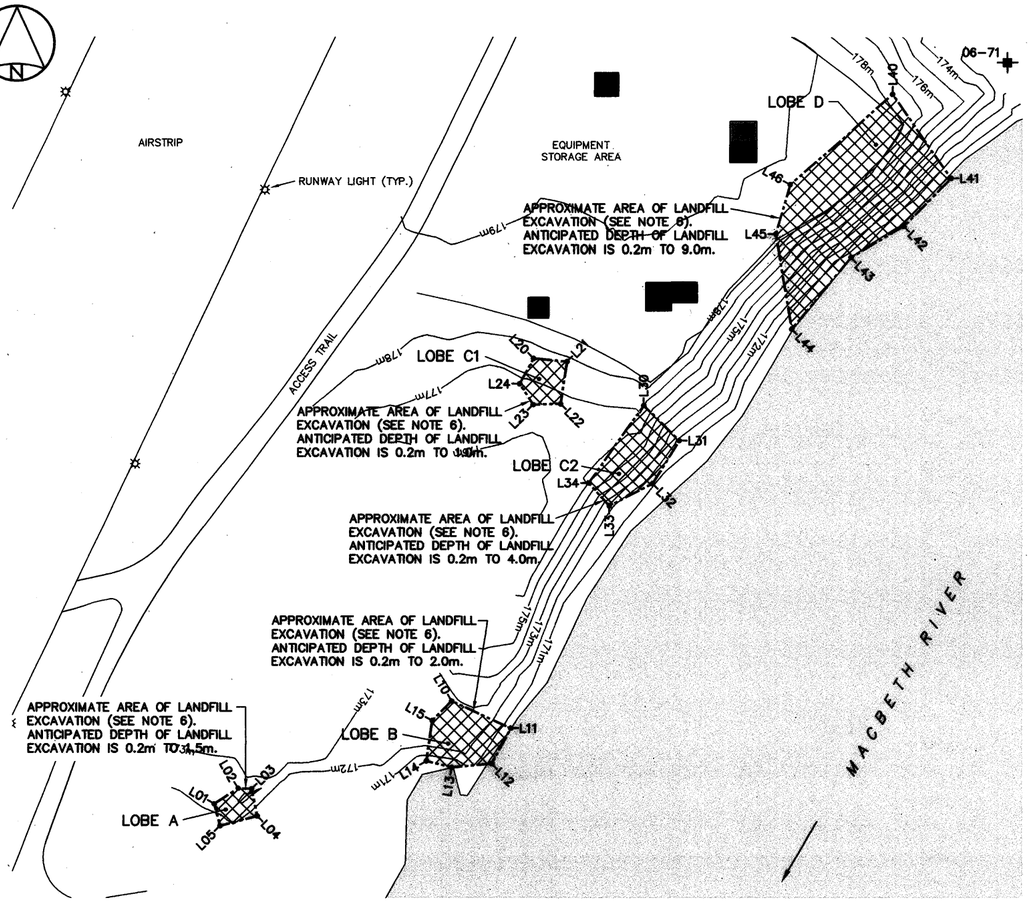
AIRSTRIP LANDFILL (LOBE M)
(DWG. 112)

COORDINATE POINTS LOBES A – D EXCAVATION					
NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
L01	7 613 832.4	413 404.9	L23	7 613 912.0	413 468.2
L02	7 613 835.8	413 409.6	L24	7 613 915.7	413 465.5
L03	7 613 835.8	413 412.5			
L04	7 613 830.2	413 413.4	L30	7 613 911.7	413 489.9
L05	7 613 828.2	413 405.8	L31	7 613 904.7	413 497.0
			L32	7 613 896.2	413 491.7
L10	7 613 853.0	413 451.9	L33	7 613 891.8	413 483.1
L11	7 613 847.7	413 463.6	L34	7 613 896.3	413 479.0
L12	7 613 840.7	413 459.8			
L13	7 613 839.9	413 451.9	L40	7 613 972.8	413 539.2
L14	7 613 841.2	413 446.9	L41	7 613 956.2	413 550.7
L15	7 613 849.2	413 448.0	L42	7 613 946.7	413 541.4
			L43	7 613 940.7	413 530.9
L20	7 613 921.0	413 467.9	L44	7 613 926.6	413 519.2
L21	7 613 920.2	413 474.5	L45	7 613 945.1	413 516.0
L22	7 613 912.2	413 473.5	L46	7 613 954.9	413 518.9

COORDINATE POINTS LOBE A AND LOBE B REGRADING					
NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
K20	7 613 762.6	413 145.8	K30	7 613 775.0	413 104.7
K21	7 613 762.0	413 157.9	K31	7 613 780.6	413 111.8
K22	7 613 752.6	413 157.4	K32	7 613 772.0	413 125.2
K23	7 613 752.2	413 144.4	K33	7 613 769.1	413 122.9
			K34	7 613 769.7	413 111.0



BORROW AREA 5 DEBRIS AREA
(DWG. 111)



AIRSTRIP LANDFILL (LOBES A–D)
(DWG. 112)

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN NON–HAZARDOUS WASTE LANDFILL.
4. 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.
5. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
6. DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO EXTEND TO THE BASE OF THE DEBRIS. LIMIT AND DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO BE FIELD VERIFIED BY CONFIRMATORY TESTING AND EXCAVATION OF TESTPITS.

Legend:

- TEST PIT LOCATION
- DCC TIER I CONTAMINATED SOIL
- DCC TIER II CONTAMINATED SOIL
- K01 COORDINATE POINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

PROFESSIONAL ENGINEERS, GEOLOGY AND GEOPHYSICS — R.K. MERCHANT — LICENSEE — NWT/NU — 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE – ECHELLE 10 5 0 10 20 30m

PROJECT – PROJET
FOX–3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007–08–24

SUBJECT – SUJET
MISCELLANEOUS LANDFILL/BURIED DEBRIS REGRADING & EXCAVATION DETAILS SH. 2

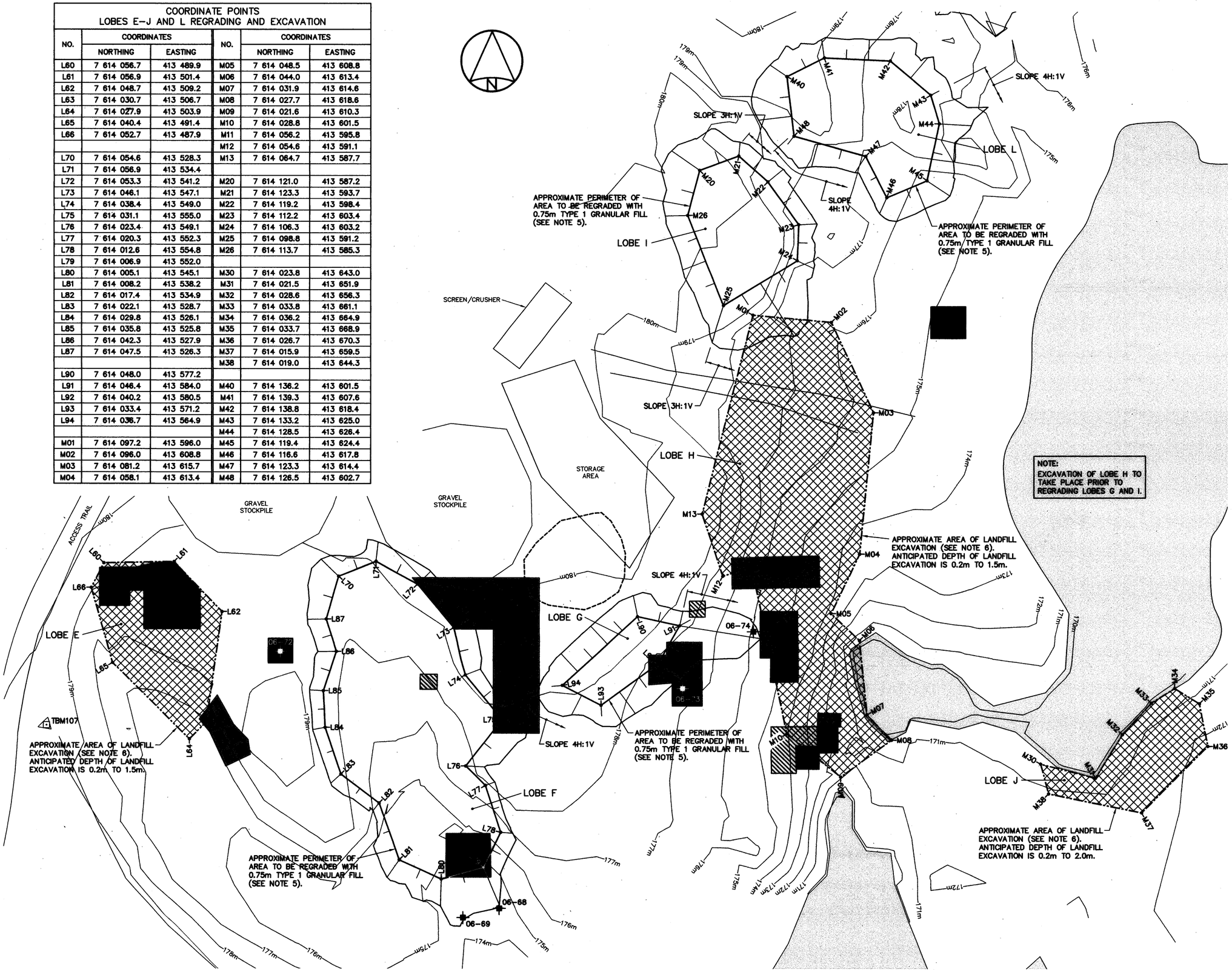
PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED – ETUDIE TME/DTM		DES OFF – AGENT CONCEPT
DRAWN – DESSINE CAE		SECT HD – CHEF SECT
CHECKED – VERIFIE RRM		DES MGR – GEST CONCEPT
COORDINATION SAES	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–D67/1–9101–124

Canada

COORDINATE POINTS
LOBES E–J AND L REGRADING AND EXCAVATION

NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING
L60	7 614 056.7	413 489.9	M05	7 614 048.5	413 608.8
L61	7 614 056.9	413 501.4	M06	7 614 044.0	413 613.4
L62	7 614 048.7	413 509.2	M07	7 614 031.9	413 614.6
L63	7 614 030.7	413 506.7	M08	7 614 027.7	413 618.6
L64	7 614 027.9	413 503.9	M09	7 614 021.6	413 610.3
L65	7 614 040.4	413 491.4	M10	7 614 028.8	413 601.5
L66	7 614 052.7	413 487.9	M11	7 614 056.2	413 595.8
			M12	7 614 054.6	413 591.1
L70	7 614 054.6	413 528.3	M13	7 614 064.7	413 587.7
L71	7 614 056.9	413 534.4			
L72	7 614 053.3	413 541.2	M20	7 614 121.0	413 587.2
L73	7 614 046.1	413 547.1	M21	7 614 123.3	413 593.7
L74	7 614 038.4	413 549.0	M22	7 614 119.2	413 598.4
L75	7 614 031.1	413 555.0	M23	7 614 112.2	413 603.4
L76	7 614 023.4	413 549.1	M24	7 614 106.3	413 603.2
L77	7 614 020.3	413 552.3	M25	7 614 098.8	413 591.2
L78	7 614 012.6	413 554.8	M26	7 614 113.7	413 585.3
L79	7 614 006.9	413 552.0			
L80	7 614 005.1	413 545.1	M30	7 614 023.8	413 643.0
L81	7 614 008.2	413 538.2	M31	7 614 021.5	413 651.9
L82	7 614 017.4	413 534.9	M32	7 614 028.6	413 656.3
L83	7 614 022.1	413 528.7	M33	7 614 033.8	413 661.1
L84	7 614 029.8	413 526.1	M34	7 614 036.2	413 664.9
L85	7 614 035.8	413 525.8	M35	7 614 033.7	413 668.9
L86	7 614 042.3	413 527.9	M36	7 614 026.7	413 670.3
L87	7 614 047.5	413 526.3	M37	7 614 015.9	413 659.5
			M38	7 614 019.0	413 644.3
L90	7 614 048.0	413 577.2			
L91	7 614 046.4	413 584.0	M40	7 614 136.2	413 601.5
L92	7 614 040.2	413 580.5	M41	7 614 139.3	413 607.6
L93	7 614 033.4	413 571.2	M42	7 614 138.8	413 618.4
L94	7 614 036.7	413 564.9	M43	7 614 133.2	413 625.0
			M44	7 614 128.5	413 626.4
M01	7 614 097.2	413 596.0	M45	7 614 119.4	413 624.4
M02	7 614 096.0	413 608.8	M46	7 614 116.6	413 617.8
M03	7 614 081.2	413 615.7	M47	7 614 123.3	413 614.4
M04	7 614 058.1	413 613.4	M48	7 614 126.5	413 602.7



AIRSTRIP LANDFILL (LOBES E–J AND L)
(DWG. 112)

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN NON–HAZARDOUS WASTE LANDFILL.
4. 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.
5. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
6. DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO EXTEND TO THE BASE OF THE DEBRIS. LIMIT AND DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO BE FIELD VERIFIED BY CONFIRMATORY TESTING AND EXCAVATION OF TESTPITS.

Legend:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION
- DCC TIER I CONTAMINATED SOIL
- DCC TIER II CONTAMINATED SOIL
- HYDROCARBON – TYPE B CONTAMINATED SOIL
- HAZARDOUS CONTAMINATED SOIL
- L80 COORDINATE POINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

P.R. MERKOSKY – LICENSEE – NWT(NU) – 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE – ECHELLE 5 2.5 0 5 10 15m

PROJECT – PROJET
FOX–3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007–08–24

SUBJECT – SUJET
MISCELLANEOUS LANDFILL/BURIED DEBRIS REGRADING & EXCAVATION DETAILS SH. 3

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

DWG. NO. – DESSIN NO.
H–D67/1–9101–125

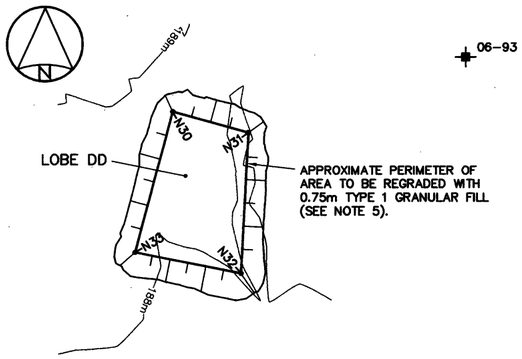
Canada

COORDINATE POINTS
AIRSTRIP LANDFILL (VARIOUS LOBES) REGRADING AND EXCAVATION

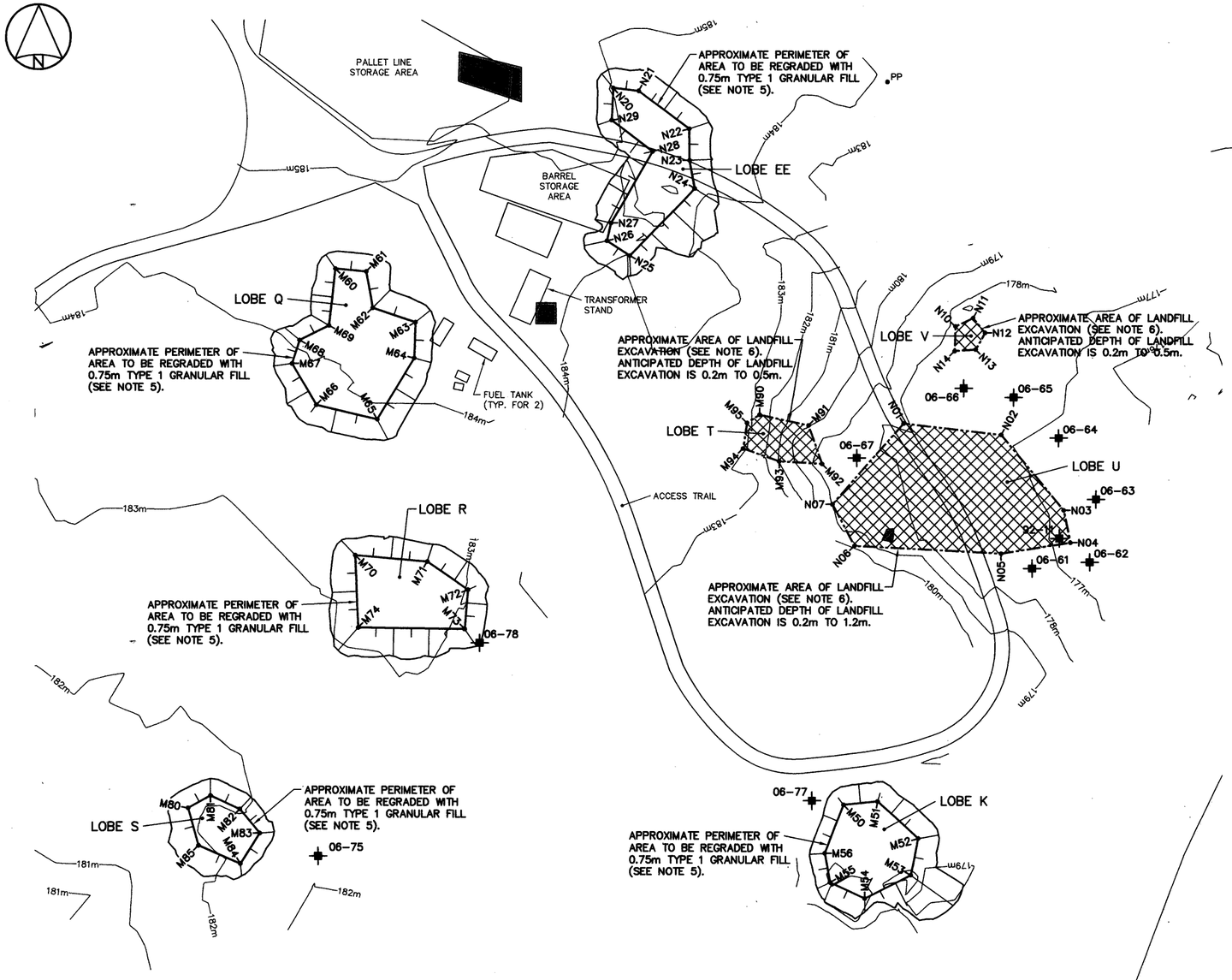
NO.	COORDINATES		NO.	COORDINATES		NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING		NORTHING	EASTING		NORTHING	EASTING
M50	7 614 262.3	413 837.3	M68	7 614 369.4	413 711.3	M90	7 614 352.2	413 817.9	N11	7 614 374.7	413 867.3
M51	7 614 263.1	413 845.2	M69	7 614 372.9	413 718.1	M91	7 614 349.8	413 829.2	N12	7 614 371.2	413 870.0
M52	7 614 254.7	413 854.6				M92	7 614 340.7	413 832.3	N13	7 614 367.3	413 867.8
M53	7 614 246.3	413 852.9	M70	7 614 319.6	413 724.2	M93	7 614 341.3	413 822.4	N14	7 614 366.9	413 863.0
M54	7 614 240.9	413 842.2	M71	7 614 318.1	413 740.9	M94	7 614 344.3	413 814.0			
M55	7 614 244.7	413 834.2	M72	7 614 311.6	413 750.4	M95	7 614 350.4	413 814.9	N20	7 614 427.8	413 783.9
M56	7 614 251.4	413 832.9	M73	7 614 302.6	413 749.6				N21	7 614 427.1	413 789.8
			M74	7 614 302.9	413 724.9	N01	7 614 350.2	413 851.2	N22	7 614 418.3	413 801.5
M60	7 614 386.0	413 719.6				N02	7 614 347.5	413 873.7	N23	7 614 411.1	413 801.5
M61	7 614 385.3	413 726.7	M80	7 614 261.5	413 685.5	N03	7 614 330.0	413 888.2	N24	7 614 404.7	413 802.8
M62	7 614 377.0	413 728.2	M81	7 614 264.3	413 690.7	N04	7 614 322.6	413 889.8	N25	7 614 389.0	413 787.7
M63	7 614 373.7	413 738.2	M82	7 614 261.2	413 697.5	N05	7 614 320.0	413 873.7	N26	7 614 392.5	413 782.5
M64	7 614 365.2	413 737.9	M83	7 614 255.8	413 702.1	N06	7 614 321.8	413 839.8	N27	7 614 396.6	413 783.4
M65	7 614 351.1	413 729.3	M84	7 614 248.9	413 697.6	N07	7 614 331.4	413 834.7	N28	7 614 413.1	413 793.0
M66	7 614 354.4	413 715.2	M85	7 614 253.1	413 688.0				N29	7 614 420.3	413 783.5
M67	7 614 363.9	413 709.6				N10	7 614 372.7	413 863.2			

COORDINATE POINTS
LOBE DD REGRADING

NO.	COORDINATES	
	NORTHING	EASTING
N30	7 614 747.4	413 921.4
N31	7 614 743.3	413 936.3
N32	7 614 715.4	413 934.9
N33	7 614 719.6	413 913.9



AIRSTRIP LANDFILL (LOBE DD)
(DWG. 113)



AIRSTRIP LANDFILL (VARIOUS LOBES)
(DWG. 113)

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
4. 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.
5. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
6. DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO EXTEND TO THE BASE OF THE DEBRIS. LIMIT AND DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO BE FIELD VERIFIED BY CONFIRMATORY TESTING AND EXCAVATION OF TESTPITS.

Legend:

- TEST PIT LOCATION
- DCC TIER I CONTAMINATED SOIL
- M50 COORDINATE POINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

R.R. MERKOSKY LICENSEE NWT(1M) 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 10 5 0 10 20 30m

PROJECT – PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007-08-24

SUBJECT – SUJET
MISCELLANEOUS LANDFILL/BURIED DEBRIS REGRADING & EXCAVATION DETAILS SH. 4

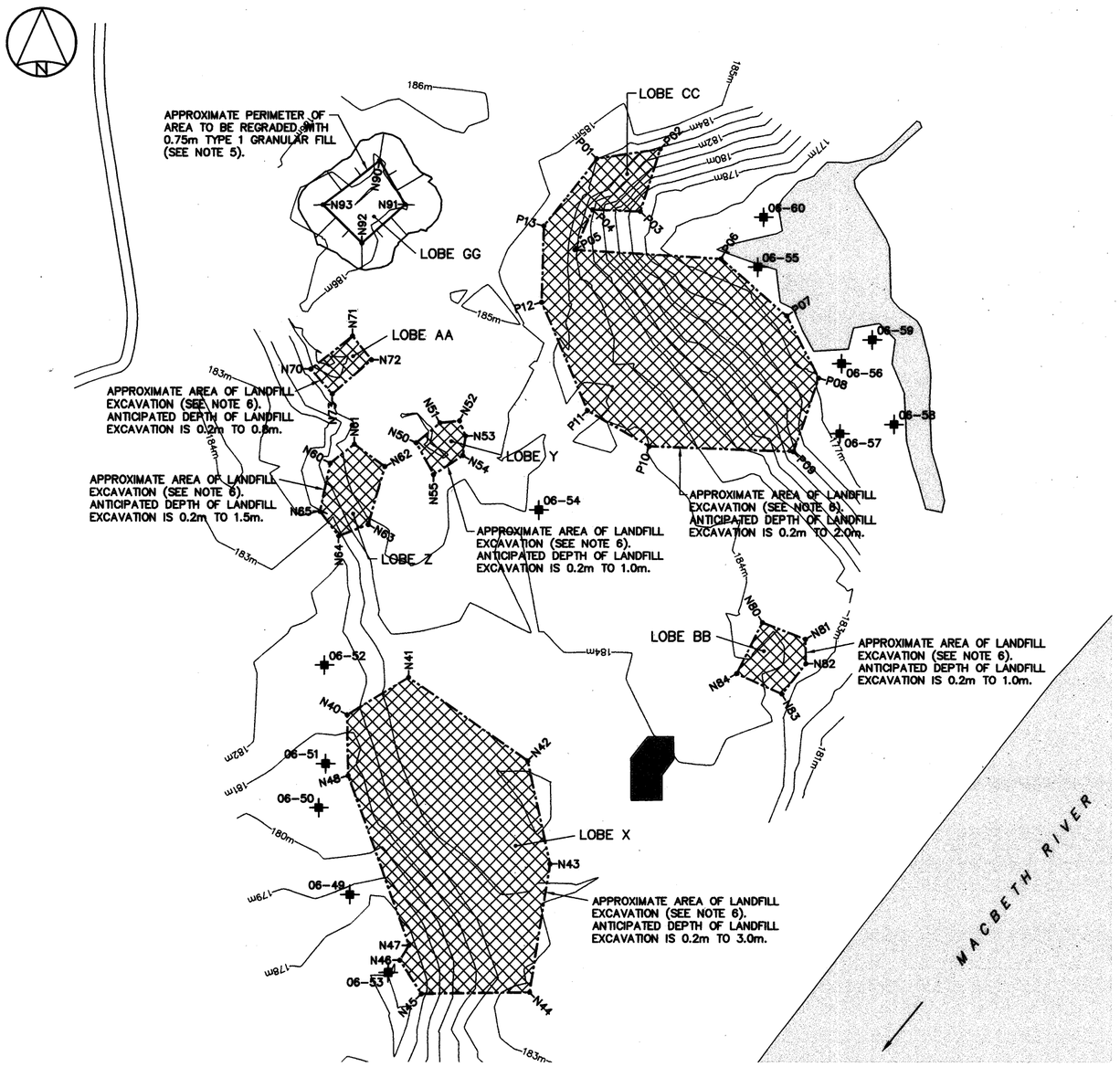
PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED – ETUDIE TME/DTM		DES OFF – AGENT CONCEPT
DRAWN – DESSINE CAE		SECT HD – CHEF SECT
CHECKED – VERIFIE RRM		DES MGR – GEST CONCEPT
COORDINATION SMS	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-D67/1-9101-126

Canada

COORDINATE POINTS
AIRSTRIP LANDFILL (VARIOUS LOBES) REGRADING AND EXCAVATION

NO.	COORDINATES		NO.	COORDINATES		NO.	COORDINATES		NO.	COORDINATES	
	NORTHING	EASTING		NORTHING	EASTING		NORTHING	EASTING		NORTHING	EASTING
N40	7 614 458.2	413 915.0	N54	7 614 514.8	413 940.1	N80	7 614 478.1	414 004.9	P04	7 614 567.8	413 968.2
N41	7 614 466.5	413 928.3	N55	7 614 500.7	413 933.6	N81	7 614 475.0	414 014.5	P05	7 614 559.0	413 964.4
N42	7 614 448.4	413 954.2				N82	7 614 469.4	414 014.4	P06	7 614 557.1	413 996.1
N43	7 614 426.0	413 959.0	N60	7 614 512.8	413 911.3	N83	7 614 463.0	414 019.5	P07	7 614 544.8	414 010.3
N44	7 614 398.5	413 954.6	N61	7 614 517.0	413 916.6	N84	7 614 467.3	413 999.7	P08	7 614 531.3	414 017.2
N45	7 614 398.1	413 931.1	N62	7 614 512.1	413 923.2				P09	7 614 515.4	414 011.8
N46	7 614 405.2	413 926.4	N63	7 614 499.8	413 919.6	N90	7 614 578.4	413 922.0	P10	7 614 516.6	413 980.5
N47	7 614 408.4	413 928.4	N64	7 614 497.3	413 913.2	N91	7 614 568.9	413 927.6	P11	7 614 524.4	413 967.1
N48	7 614 445.1	413 915.2	N65	7 614 502.5	413 909.1	N92	7 614 560.4	413 918.2	P12	7 614 547.8	413 957.2
						N93	7 614 568.8	413 909.7	P13	7 614 564.2	413 957.7
N50	7 614 5177.1	413 920.1	N70	7 614 533.1	413 907.1						
N51	7 614 521.6	413 935.3	N71	7 614 540.3	413 916.2	P01	7 614 578.8	413 969.1			
N52	7 614 521.9	413 939.4	N72	7 614 535.2	413 920.3	P02	7 614 580.9	413 982.9			
N53	7 614 518.7	413 940.5	N73	7 614 527.8	413 911.8	P03	7 614 567.4	413 978.6			



AIRSTRIP LANDFILL (VARIOUS LOBES)
(DWG. 113)

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
4. 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.
5. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
6. DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO EXTEND TO THE BASE OF THE DEBRIS. LIMIT AND DEPTH OF LANDFILL/BURIED DEBRIS EXCAVATION TO BE FIELD VERIFIED BY CONFIRMATORY TESTING AND EXCAVATION OF TESTPITS.

Legend:

- TEST PIT LOCATION
- DCC TIER I CONTAMINATED SOIL
- N40 COORDINATE POINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

ASSOCIATION OF CANADIAN ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE - ECHELLE 10 5 0 10 20 30m

PROJECT - PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

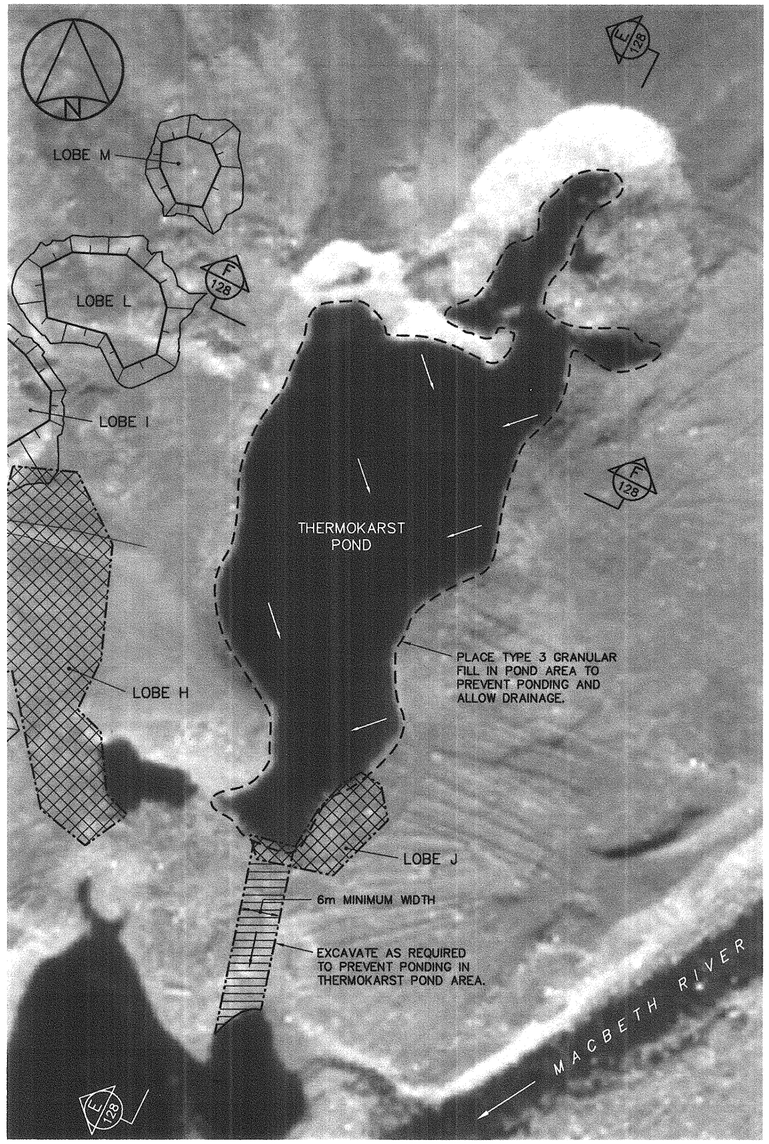
TRADE - METIER: SITING
DATE: 2007-08-24

SUBJECT - SUJET
MISCELLANEOUS LANDFILL/BURIED DEBRIS REGRADING & EXCAVATION DETAILS SH. 5

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

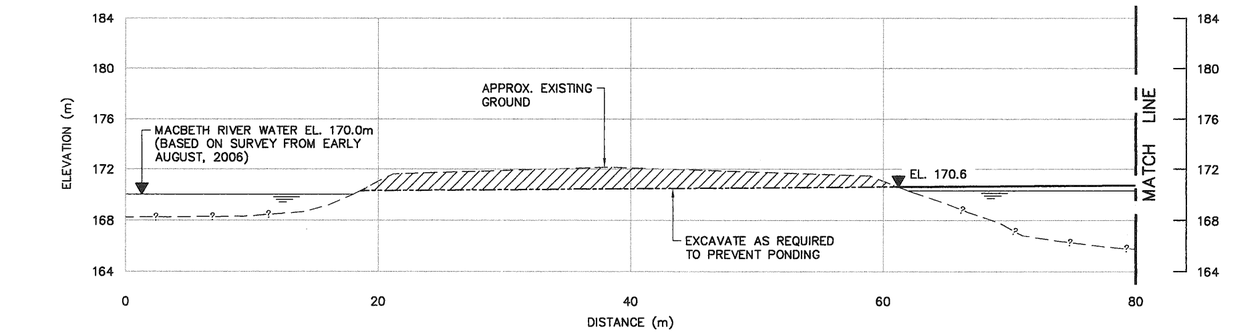
DWG. NO. - DESSIN NO.
H-D67/1-9101-127

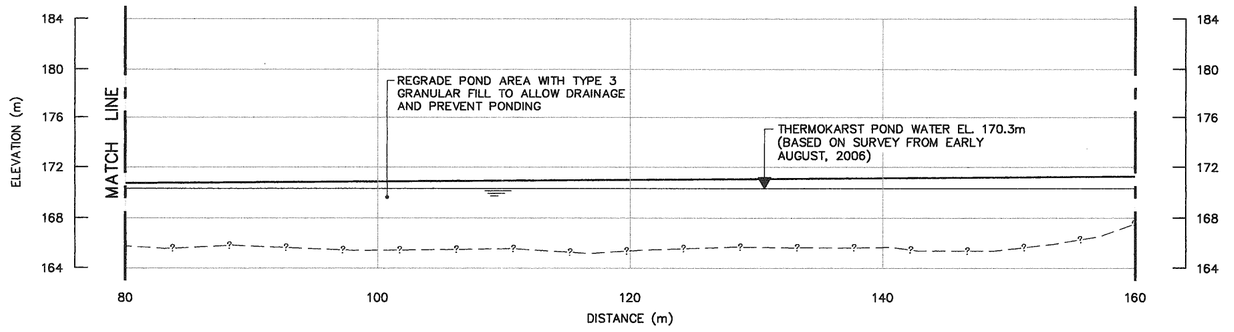
Canada

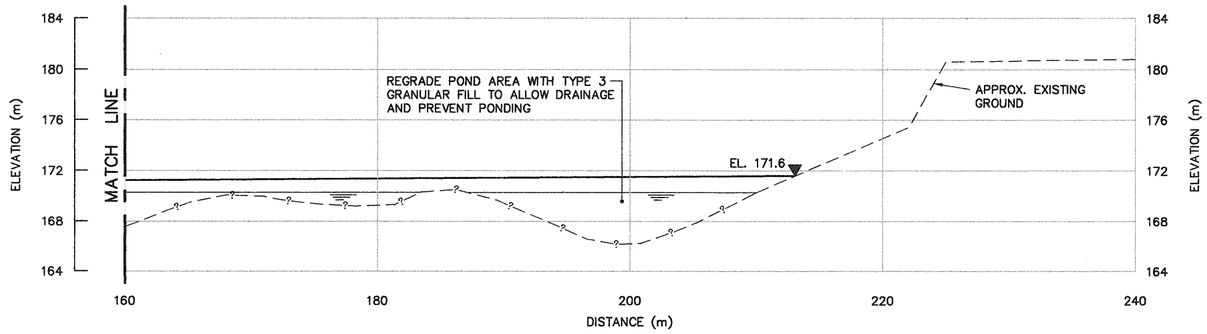


PLAN – THERMOKARST POND (DWG. 112)

0 10 20 30m
10 5

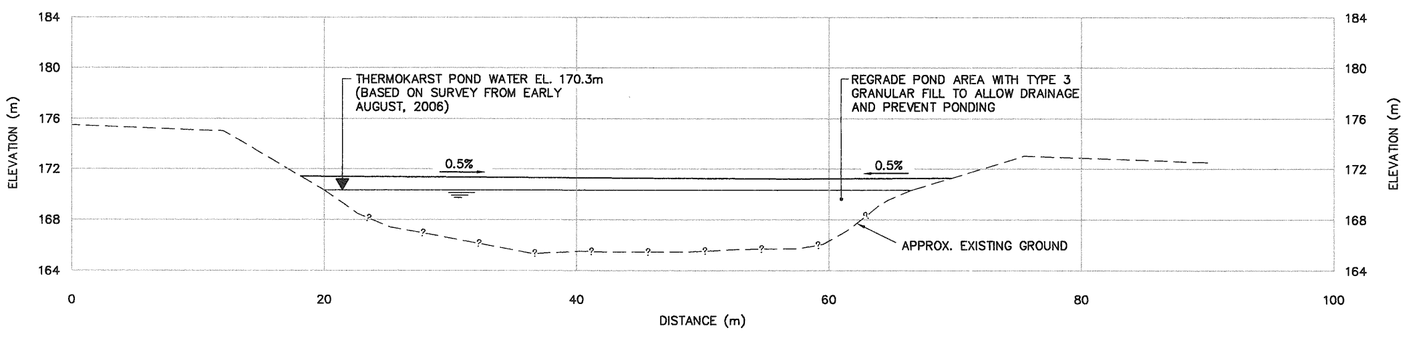






SECTION E 128

0 4 8 12m
4 2



SECTION F 128

0 4 8 12m
4 2

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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.

R.R. MERKOSKY LICENSEE NWT/NU
2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA AECOM HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: FOX–3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER: SITING
DATE: 2007–08–24

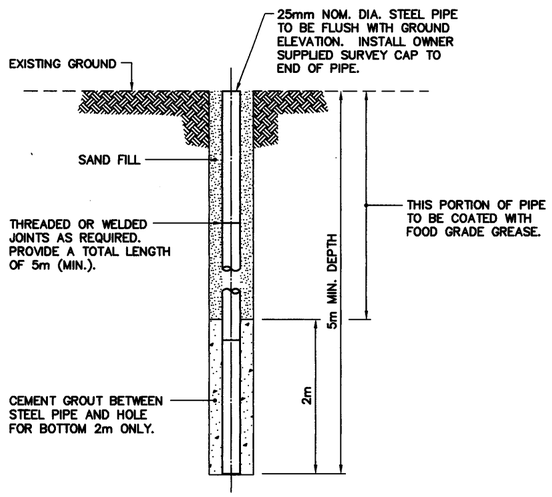
SUBJECT – SUJET

THERMOKARST POND
PLAN AND CROSS SECTIONS

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

DWG. NO. – DESSIN NO.
H–D67/1–9101–128

Canada

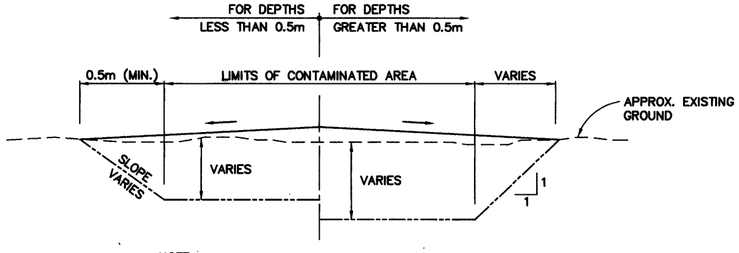


MINIMUM EMBEDMENT CAN BE REDUCED IF ROCK IS ENCOUNTERED. INSTALLATION TO PENETRATE A MINIMUM OF 2m INTO SOUND BEDROCK.

NOTE:
5 PERMANENT SURVEY CONTROL MONUMENTS TO BE INSTALLED. SEE NOTE 2.

TYPICAL PERMANENT SURVEY CONTROL MONUMENT (BENCHMARK)

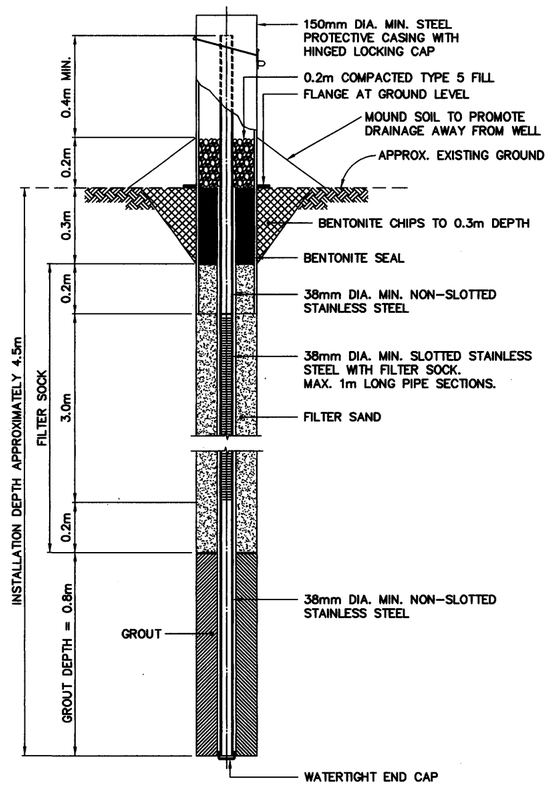
N.T.S.



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 TO BE 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

N.T.S.

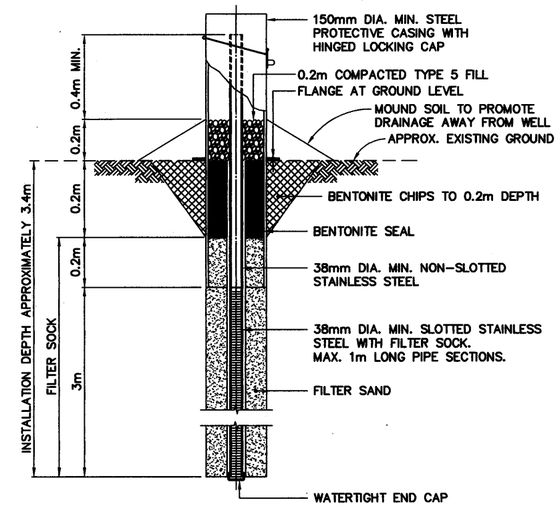


TYPICAL MONITORING WELL/ BACKGROUND MONITORING WELL

(FOR BEDROCK DEPTH > 0.7m)
N.T.S.

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

NOTE:
12 MONITORING WELLS TO BE INSTALLED. SEE NOTE 2.



TYPICAL MONITORING WELL/ BACKGROUND MONITORING WELL

(FOR BEDROCK DEPTH < 0.7m)
N.T.S.

National Defence / Défense nationale

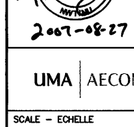
Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES 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.

Legend:

No.	DATE	REVISION	REVISION	APPR.



THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER: SITING
DATE: 2007-08-24

SUBJECT – SUJET: MISCELLANEOUS DETAILS SH. 1

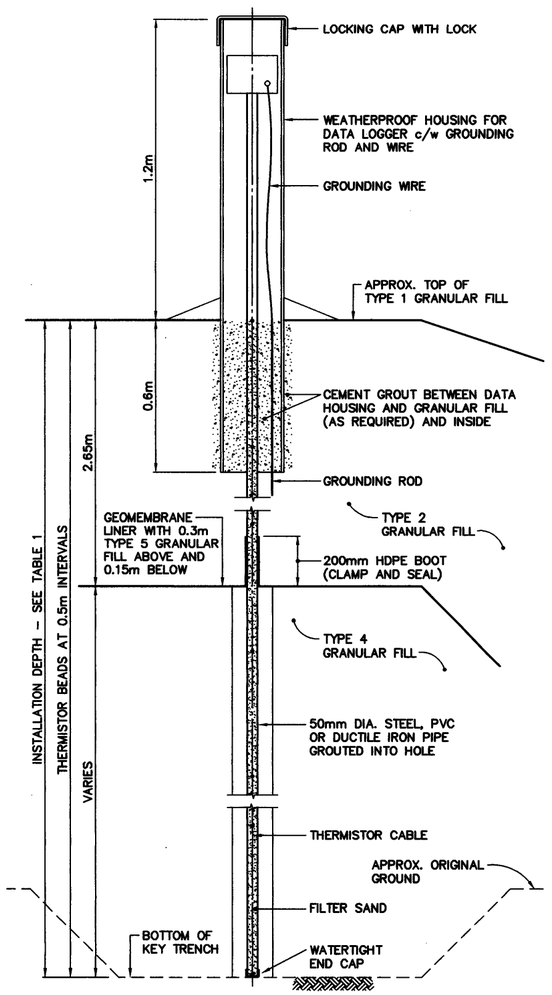
PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE TME/DTM		DES OFF AGENT CONCEPT
DRAWN DESSINE CAE		SECT HD CHEF SECT
CHECKED VERIFIE RRM		DES MGR GEST CONCEPT
COORDINATION SMS	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-D67/1-9101-129

Canada

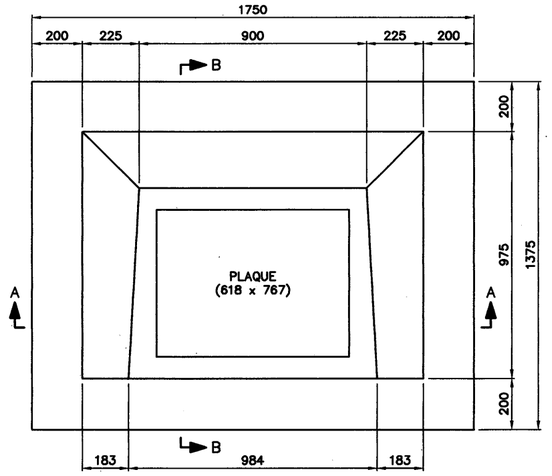
TABLE 1 VERTICAL THERMISTOR INSTALLATION		
INSTRUMENT No.	APPROXIMATE DEPTH BELOW FINAL GRADE (m)	COMMENTS
TIER II DISPOSAL FACILITY		
VT-1	6.5	INSTALL THROUGH CENTERLINE BERM TO INVERT OF KEY TRENCH
VT-2	4.5	INSTALL TO 1.0m ABOVE ELEVATION OF BOTTOM LINER
VT-3	5.0	INSTALL TO 1.0m ABOVE ELEVATION OF BOTTOM LINER
VT-4	7.0	INSTALL THROUGH CENTERLINE BERM TO INVERT OF KEY TRENCH

NOTE:
INSTALL ALL THERMISTOR STRINGS TO BASE LINER UNLESS NOTED OTHERWISE.

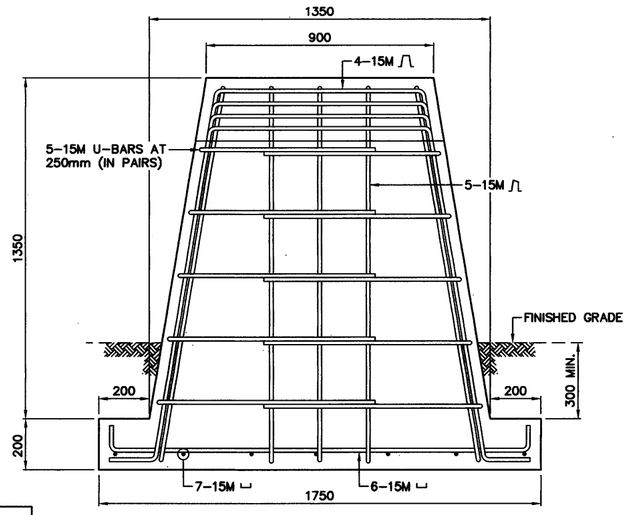


TYPICAL GROUND TEMPERATURE CABLE INSTALLATION

N.T.S.



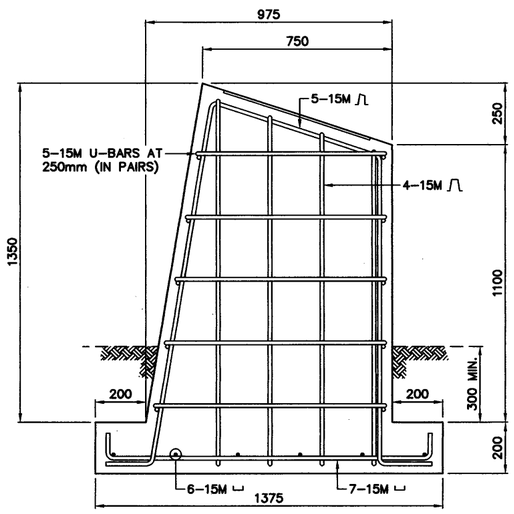
PLAN



SECTION A-A

COMMEMORATIVE PLAQUE BASE CONSTRUCTION NOTES:

1. PROVIDE TO SITE ALL EQUIPMENT, MATERIALS, TOOLS, TEMPORARY FORMS AND ASSOCIATED EXCAVATION AND/OR BACKFILL TO CONSTRUCT THE COMMEMORATIVE PLAQUE BASE, INCLUDING 30 MPa CONCRETE AND 15M STEEL REBAR.
2. COMMEMORATIVE PLAQUE BASE CAN BE CONSTRUCTED ON SITE OR PRE-CAST AND DELIVERED TO SITE.
3. OWNER TO SUPPLY COMMEMORATIVE PLAQUE.
4. LOCATION OF COMMEMORATIVE PLAQUE BASE TO BE DETERMINED BY THE ENGINEER.



SECTION B-B

COMMEMORATIVE PLAQUE BASE DETAIL

0 200 400 600mm
200 100

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES 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.

NORTHWEST TERRITORIES ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS — R.J. MERKOSKY — LICENSEE — MEMBER — 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE - ECHELLE: AS SHOWN

PROJECT - PROJET: FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

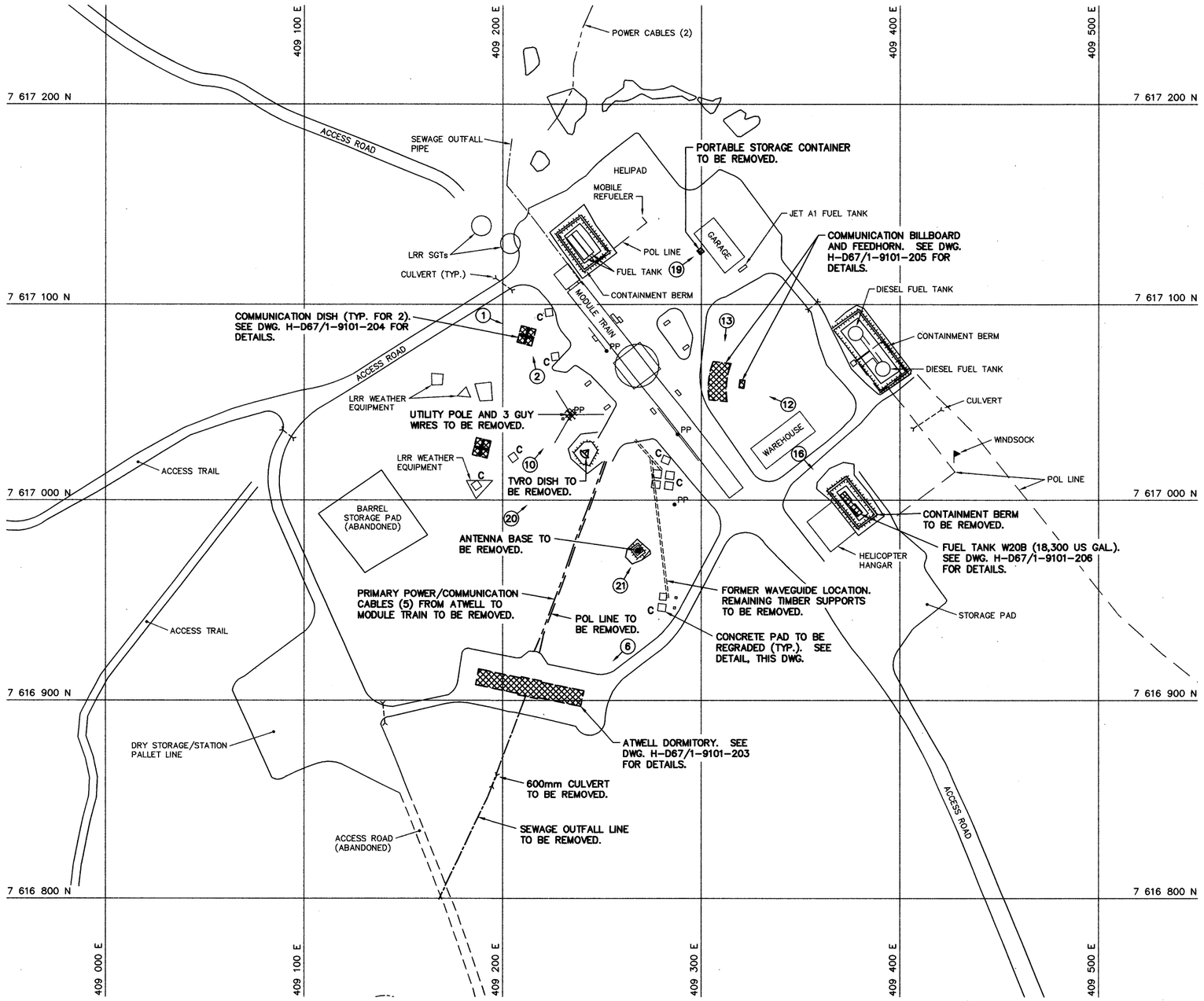
TRADE - METIER: SITING
DATE: 2007-08-24

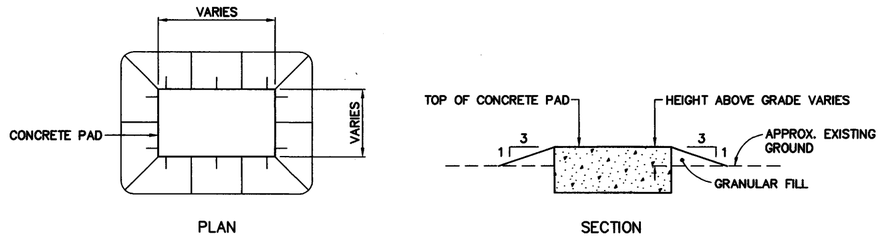
SUBJECT - SUJET: MISCELLANEOUS DETAILS SH. 2

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

DWG. NO. - DESSIN NO.
H-D67/1-9101-130

Canada





TYPICAL CONCRETE PAD REGRADING DETAIL

N.T.S.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 STRUCTURES DESIGNATED FOR DEMOLITION TO BE DEMOLISHED TO TOP OF CONCRETE FOUNDATIONS UNLESS NOTED OTHERWISE.
4. ALL LONG RANGE RADAR (LRR) FACILITIES ARE CURRENTLY OPERATIONAL AND ARE NOT TO BE DISTURBED. THESE INCLUDE ALL BUILDINGS, STRUCTURES, ELECTRICAL POWER CABLES, FUEL STORAGE TANKS AND PIPELINES NOT SCHEDULED FOR DEMOLITION.
5. PIPELINES AND ANCILLARY EQUIPMENT TO BE REMOVED TO INCLUDE ALL ASSOCIATED PIPE SUPPORTS AND PIPELINE MARKERS.

Legend:

- TO BE DEMOLISHED
- C — CONCRETE PAD
- PP — UTILITY POLE TO BE REMOVED
- POL LINE
- POWER/COMMUNICATION CABLE
- SEWAGE OUTFALL LINE
- (1) — PHOTOGRAPHIC VIEWPOINT

No.	DATE	REVISION	REVISION	APPR.

R.M. MERKOSKY — LICENCE — NWT/NU — 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
STRUCTURAL	2007-08-24

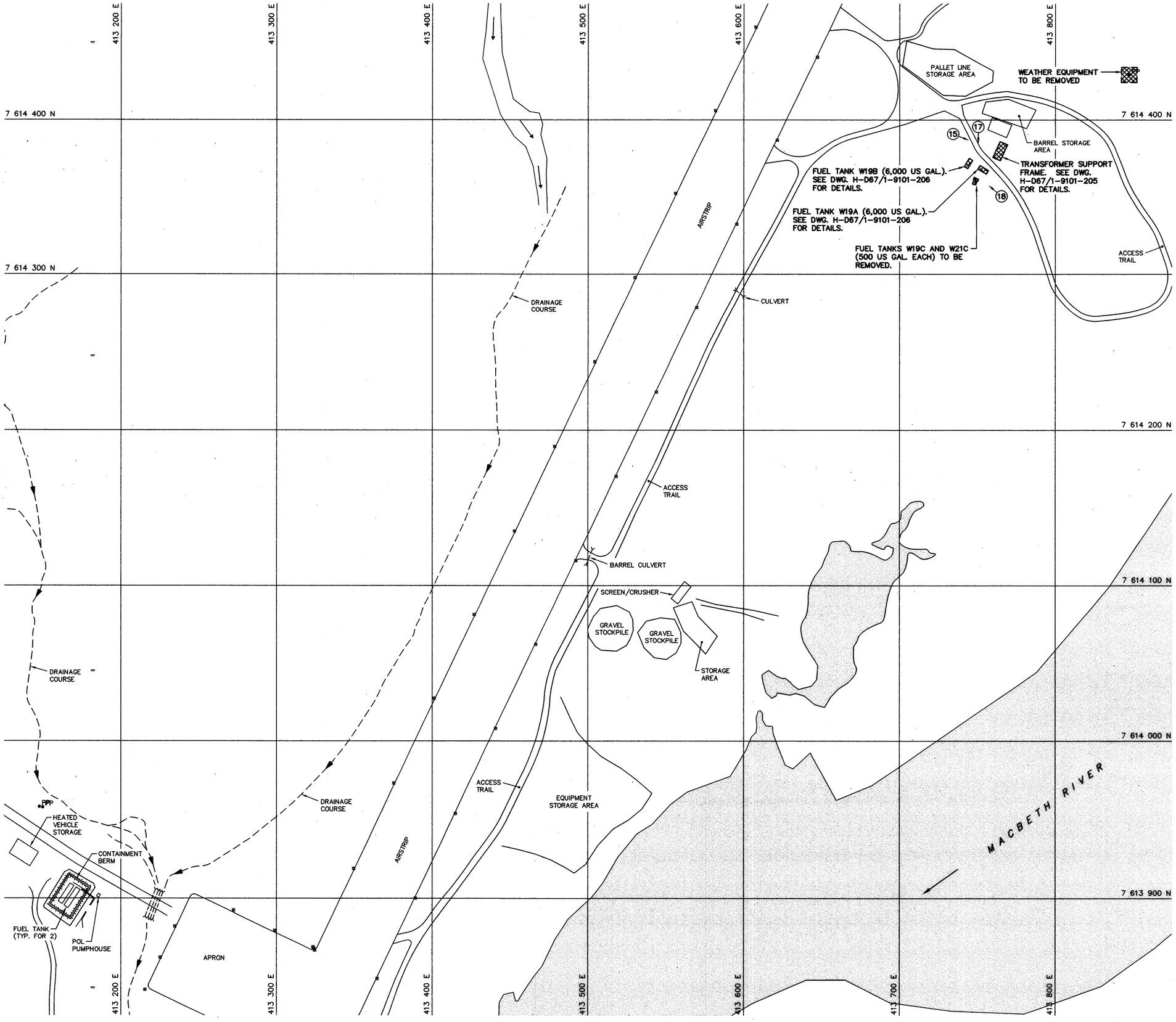
SUBJECT – SUJET

STATION AREA
DEMOLITION SITE PLAN

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE GRH		DES OFF AGENT CONCEPT
DRAWN DESSINE CO		SECT HD CHEF SECT
CHECKED VERIFIE RRM		DES MGR GEST CONCEPT
COORDINATION SMS	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-D67/1-9101-201

Canada



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 19N. 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 STRUCTURES DESIGNATED FOR DEMOLITION TO BE DEMOLISHED TO TOP OF CONCRETE FOUNDATIONS UNLESS NOTED OTHERWISE.
4. ALL LONG RANGE RADAR (LRR) FACILITIES ARE CURRENTLY OPERATIONAL AND ARE NOT TO BE DISTURBED. THESE INCLUDE ALL BUILDINGS, STRUCTURES, ELECTRICAL POWER CABLES, FUEL STORAGE TANKS AND PIPELINES NOT SCHEDULED FOR DEMOLITION.
5. PIPELINES AND ANCILLARY EQUIPMENT TO BE REMOVED TO INCLUDE ALL ASSOCIATED PIPE SUPPORTS AND PIPELINE MARKERS.

Legend:

- TO BE DEMOLISHED
- C — CONCRETE PAD
- PP — UTILITY POLE TO BE REMOVED
- POL LINE
- POWER/COMMUNICATION CABLE
- SEWAGE OUTFALL LINE
- (15) — PHOTOGRAPHIC VIEWPOINT

No.	DATE	REVISION	REVISION	APPR.

R.M. MERCREDY LICENSEE 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER	DATE
STRUCTURAL	2007-08-24

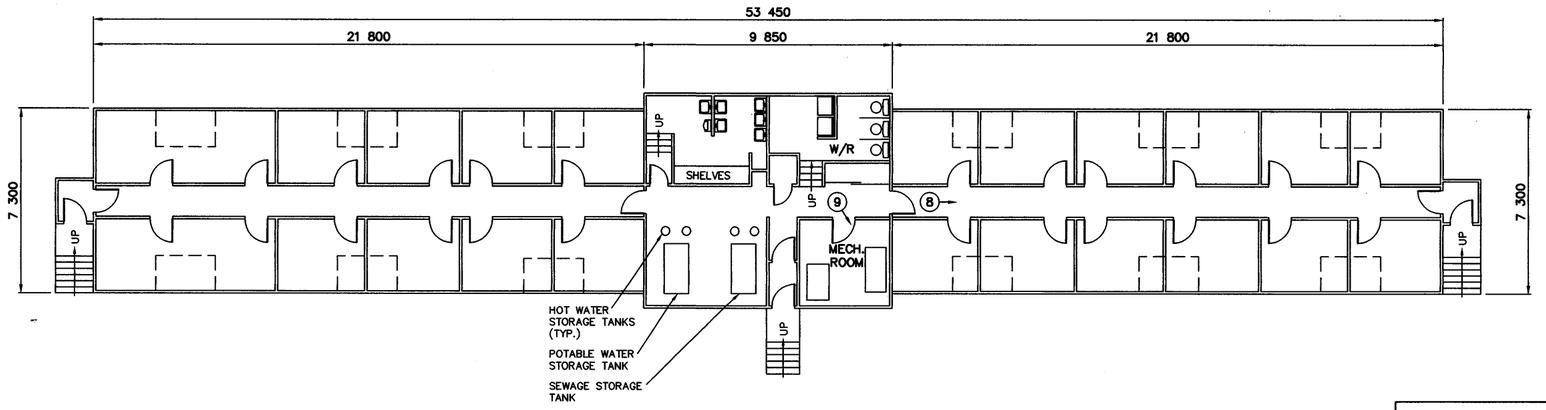
SUBJECT – SUJET

AIRSTRIP AREA
DEMOLITION SITE PLAN

PRODUCTION		CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE	GRH		DES OFF AGENT CONCEPT
DRAWN DESSINE	CG		SECT HD CHEF SECT
CHECKED VERIFIE	RRM		DES MGR GEST CONCEPT
COORDINATION	SMS	REVIEWED – REVU	

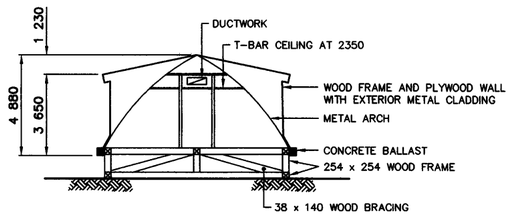
DWG. NO. – DESSIN NO.
H-D67/1-9101-202

Canada

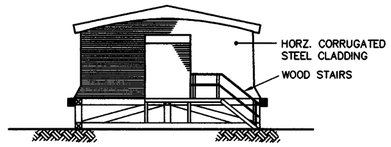


PLAN

COMMENTS
CONCRETE FOOTINGS/POSTS.
METAL ARCH. BUILDING WITH EXTERIOR WALLS AND PITCHED ROOF ADDED.
ASBESTOS IN FURNACE ROOM, WATER TANK ROOM AND MECHANICAL ROOM.



SECTION



END ELEVATION

ATWELL DORMITORY

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF MAJOR BUILDING CONTENTS.
3. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.

Legend:

(8) PHOTOGRAPHIC VIEWPOINT

No.	DATE	REVISION	REVISION	APPR.

APEGGT PROFESSIONAL ENGINEER R.K. MERKOSKY LICENSEE YUKON TERRITORY
2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE - ECHELLE 2 1 0 2 4 6m

PROJECT - PROJET
FOX-3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE - METIER	DATE
STRUCTURAL	2007-08-24

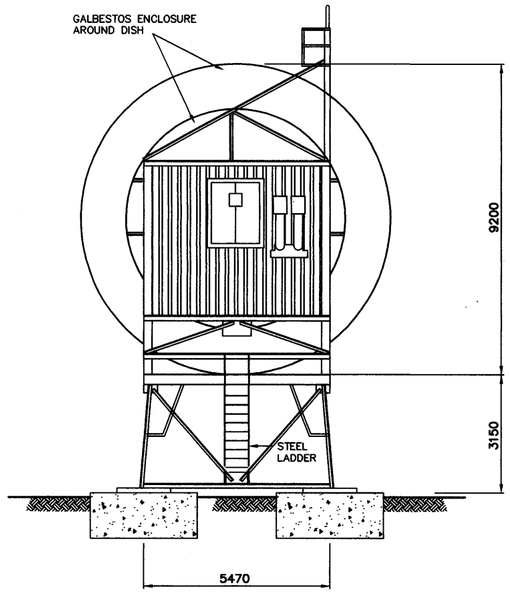
SUBJECT - SUJET
ATWELL DORMITORY
PLAN, SECTION AND ELEVATION

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDIE GRH		DES OFF AGENT CONCEPT
DRAWN DESSINE CC		SECT HD CHEF SECT
CHECKED VERIFIE RRM		DES MGR GEST CONCEPT
COORDINATION SMS	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-D67/1-9101-203

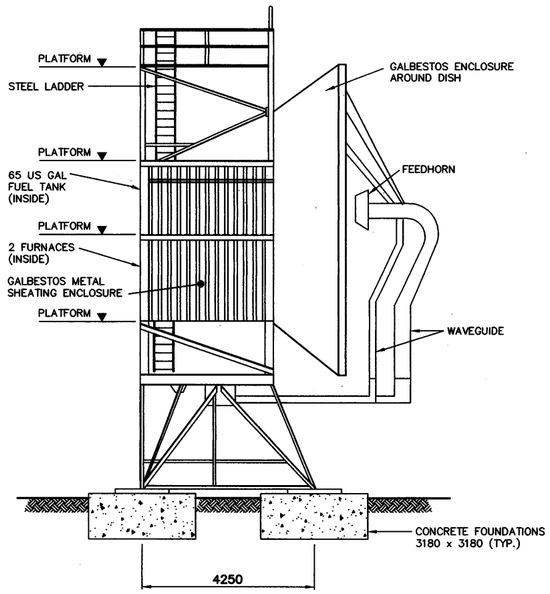
Canada

COMMENTS
AS SHOWN (TYP. FOR 2)
ENCLOSURE CONTAINS FURNACE AND FUEL DAY TANK
SIDING ON ENCLOSURE IS GALBESTOS



REAR ELEVATION

N.T.S.



SIDE ELEVATION

N.T.S.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF MAJOR BUILDING CONTENTS.
3. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.

Legend:

No.	DATE	REVISION	REVISION	APPR.

NORTHWEST TERRITORIES PROFESSIONAL ENGINEERS, GEOSCIENTISTS LICENSEE R.P. MERKOSKY NWTI/NU 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: FOX–3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER: STRUCTURAL

DATE: 2007–08–24

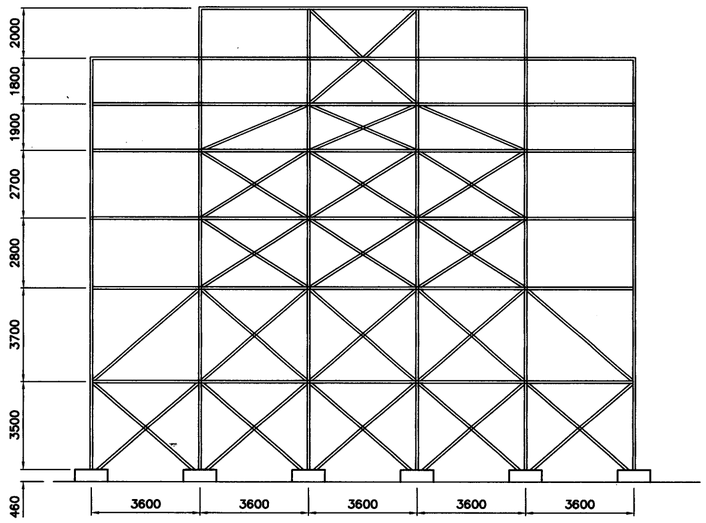
SUBJECT – SUJET

COMMUNICATION DISH ELEVATIONS

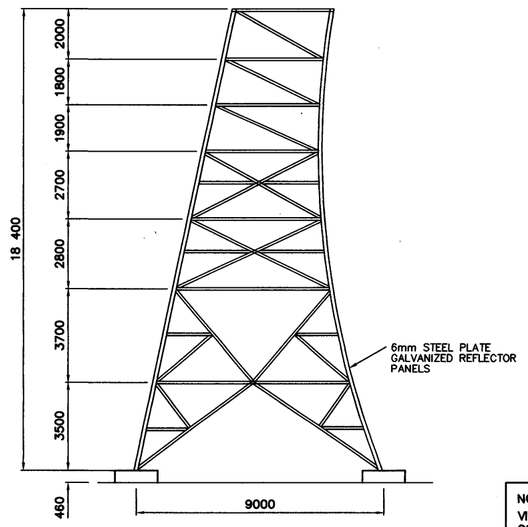
PRODUCTION		CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE	GRH		DES OFF AGENT CONCEPT
DRAWN DESSINE	CC		SECT HD CHEF SECT
CHECKED VERIFIE	RRM		DES MGR GEST CONCEPT
COORDINATION	SMS	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–D67/1–9101–204

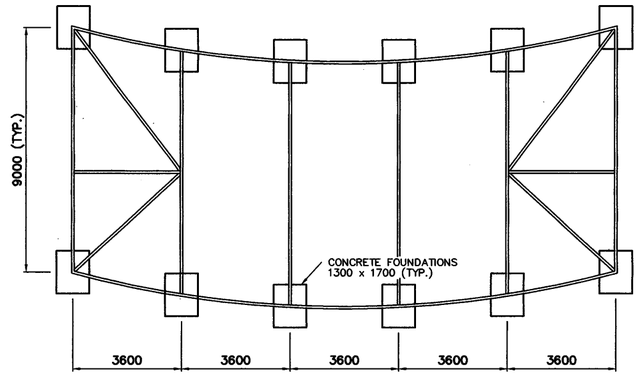
Canada



REAR ELEVATION

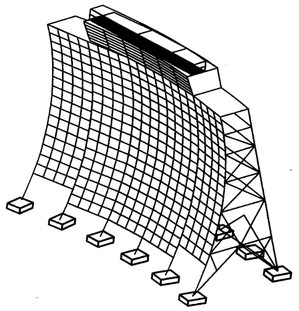


SECTION



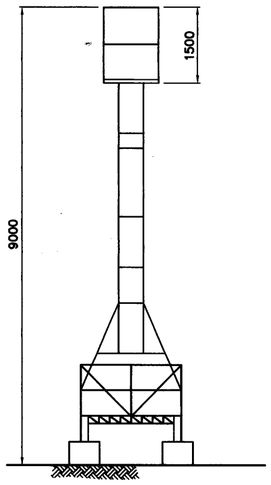
PLAN

NOTE:
VISIBLE FOUNDATIONS ARE 1300 x 1700 CONCRETE FOOTINGS AT GRADE.

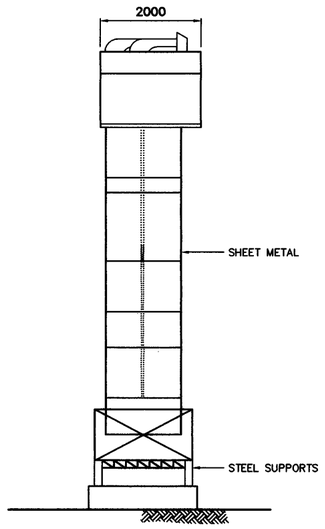


ISOMETRIC VIEW

COMMUNICATION BILLBOARD
N.T.S.



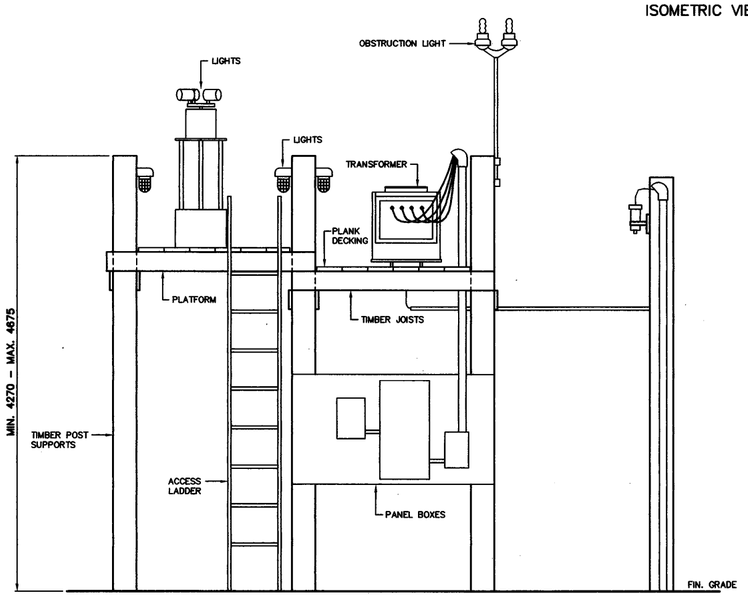
END ELEVATION



SIDE ELEVATION

TYPICAL FEEDHORN

0 1 2 3m
1 0.5



ELEVATION

TRANSFORMER/BEACON LIGHT AND SUPPORT FRAME

0 2 4 6m
2 1

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF MAJOR BUILDING CONTENTS.
3. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.

Legend:

No.	DATE	REVISION	REVISION	APPR.

R.J. MERRIDOSKY LICENSED NWT/NUNAVUT — 2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: FOX–3 DEWAR LAKES

DEW LINE CLEAN UP

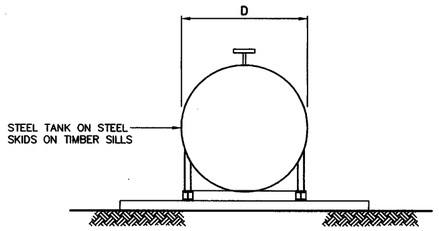
TRADE – METIER	DATE
STRUCTURAL	2007–08–24

SUBJECT – SUJET:
COMMUNICATION BILLBOARD, FEEDHORN AND SUPPORT FRAME PLAN, SECTION AND ELEVATIONS

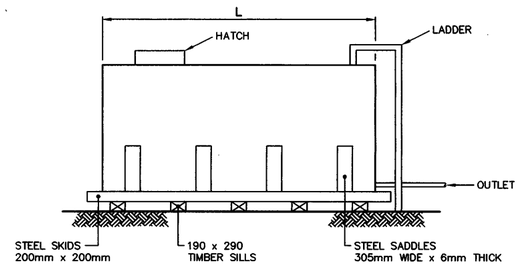
PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE GRH		DES OFF AGENT CONCEPT
DRAWN DESSINE CC		SECT HD CHEF SECT
CHECKED VERIFIE RRM		DES MGR GEST CONCEPT
COORDINATION SMS	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–D67/1–9101–205

Canada



FRONT ELEVATION

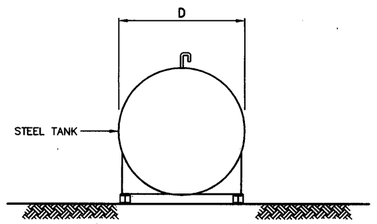


SIDE ELEVATION

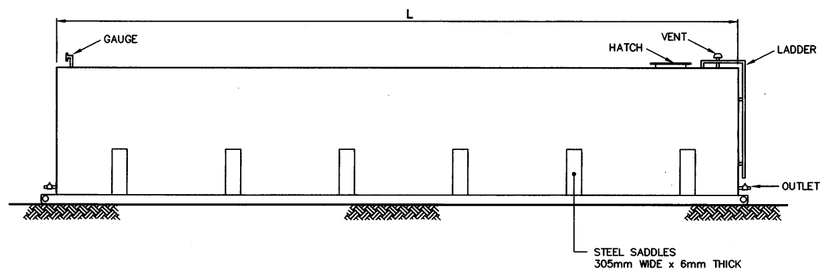
COMMENTS
6000 US GALLON CAPACITY (MOGAS) D = 2400mm ; L = 5400mm 4 – STEEL SADDLES AT 1400mm O.C. 5 – TIMBER SILL BEAMS (190 x 290) AT 1200mm O.C.

6000 GALLON FUEL TANK

N.T.S.



FRONT ELEVATION



SIDE ELEVATION

COMMENTS
18,300 US GALLON CAPACITY D = 2500mm ; L = 13 500mm 6 – STEEL SADDLES AT 2200mm O.C.

18,300 GALLON FUEL TANK

N.T.S.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

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2. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF MAJOR BUILDING CONTENTS.
3. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.

Legend:

No.	DATE	REVISION	REVISION	APPR.

R.R. MERKOSKY LICENSED PROFESSIONAL ENGINEER NWT/NU
2007-08-27

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: FOX–3 DEWAR LAKES

DEW LINE CLEAN UP

TRADE – METIER: STRUCTURAL | DATE: 2007–08–24

SUBJECT – SUJET

FUEL TANKS
ELEVATIONS

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE GRH		DES OFF AGENT CONCEPT
DRAWN DESSINE CC		SECT HD CHEF SECT
CHECKED VERIFIE RRM		DES MGR GEST CONCEPT
COORDINATION JMS	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–D67/1–9101–206

Canada

Appendix B
DND/NTI Cooperation Agreements

Appendix II

DND-NTI Cooperation Agreement

AGREEMENT

BETWEEN

NUNAVUT TUNNGAVIK INCORPORATED

AND

HER MAJESTY IN THE RIGHT OF CANADA

AS REPRESENTED BY

THE MINISTER OF NATIONAL DEFENCE

FOR THE CLEAN-UP AND RESTORATION OF

DISTANT EARLY WARNING SITES

WITHIN THE NUNAVUT SETTLEMENT AREA

(Environmental Provisions)

Arthur C. Eggleton
Minister of National Defence

Dated 1 Sep 98

James Eetoolok
1st Vice President
Nunavut Tunngavik Incorporated

Dated 1 Sep 98

AGIKATIGEGUTAOYOK

UGUNAGA

NUNAVUT TUNNGAVITKUN TIMIKUTIGIYANIN

UVALO

KOENMIN IHUMAKHUTIVLOGIN KANATAMI

GIVGAKTOKTIGIVLOGO UNA

MINISTAOYOK AGUYAKTULIKIYINI

HALUMAKHIVALEATILOGIN IHOAKHAKHUGILO

TULAEGUYUN IGLUKAKVEN

UGUNANI NUNAVUTMI NUNATAKNIKMI NUNAOYUN

(AVATILIKINIGUN PIVIKHAKAKVEOYUN)

ARTHUR C. EGGLETON
MINISTAOYOK AGUYAKTILIKIYINI

KANATAOM GAVAMAENI

UVLOANI _____

JAMES EETOOLOOK
HIVULIK TUKLEATA
IKHIVAOTALEOM
NUNAVUT TUNNGAVITKUN
TIMIKUTIGIYANI
UVLOANI _____

AGIKATIGEGUTAOYOK

UGUNAGA

NUNAVUT TUNNGAVITKUN TIMIKUTIGIYANIN

UVALO

KOENMIN IHUMAKHUTIVLOGIN KANATAMI

GIVGAKTOKTIGIVLOGO UNA

MINISTAOYOK AGUYAKTULIKIYINI

HALUMAKHIVALEATILOGIN IHOAKHAKHUGILO

TULAEGUYUN IGLUKAKVEN

UGUNANI NUNAVUTMI NUNATAKNIKMI NUNAOYUN

(AVATILIKINIGUN PIVIKHAKAKVEOYUN)

ARTHUR C. EGGLETON
MINISTAOYOK AGUYAKTILIKIYINI

KANATAOM GAVAMAENI

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JAMES EETOOLOOK
HIVULIK TUKLEATA
IKHIVAOTALEOM
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PREAMBLE

WHEREAS the Government of Canada (Canada) has modernized the air defences of Canada through a joint USA/Canada project referred to as the North American Air Defence Modernization Project (NAADM);

AND WHEREAS NAADM includes the decommissioning of some of the Distant Early Warning (DEW Line) radar sites and the conversion of others to North Warning System (NWS) radar sites;

AND WHEREAS fifteen DEW Line sites are located on Department of National Defence (DND) reserves within the Nunavut Settlement Area (NSA);

AND WHEREAS DND wishes to undertake an environmental clean-up of the DEW Line sites, facilities and associated areas;

AND WHEREAS the Inuit and the Federal Government have an interest in all activities that occur within the NSA, including, but not limited to, protecting the ecosystem integrity and the existing and future well-being of the residents and communities of the NSA and increasing the participation of Inuit and Inuit Firms in business and employment opportunities in the NSA;

AND WHEREAS DND and NTI are voluntarily entering into this Agreement to establish a framework for the decommissioning, remediation and restoration of the DEW Line sites in the NSA;

NOW THEREFORE, in consideration of the premises and mutual covenants contained herein, the Parties agree as follows:

1.0 DEFINITIONS

Debris means hazardous and non-hazardous materials of non-natural origin existing on the surface, or visible and partially embedded within one metre of the surface or within two metres of the surface of any water body at low tide and any structures scheduled for demolition

DEW Line sites means the Distant Early Warning Sites listed in paragraph 3.1 below;

DCL means Defence Construction (1951) Limited the designated contracting agent for contracting for the Department of National Defence for the Dew Line Clean-up;

DND means the Crown in the right of Canada represented by the Minister of National Defence or his delegate

Engineered Landfill means a landfill professionally designed to permanently isolate the contents of the landfill from contact with the environment.

Hazardous materials or substances means all materials or substances designated as hazardous under territorial or federal legislation at the time of the clean-up of a particular landfill.

Inuit has the same meaning as in the NLCA;

Inuit Owned Lands has the same meaning as in the NLCA;

Landfill means any area where a concentration of non-hazardous and/or hazardous substances or materials or Debris have been buried;

Minister of National Defence means the Minister of National Defence or his designate

Nunavut Settlement Area has the same meaning as in the NLCA;

Rules means the *Rules and Procedures for the Management of Inuit Owned Lands* adopted by NTI, as amended from time to time,;

Parties means NTI and DND;

Regional Inuit Associations (RIA) means the Qikiqtani Inuit Association, the Kivalliq Inuit Association and the Kitikmeot Inuit Association;

Relevant RIA means the RIA in the region in which a DEW Line site is located;

Work means all the materials, equipment, goods, services, labour, matters and things done or furnished or required to be done or furnished to perform any DEW Line site decommissioning, remediation or restoration activity.

2.0 OBJECTIVES

2.1 The objectives of this Agreement are to establish a broad environmental framework for participation of the Inuit in the clean-up of the DEW Line Sites in the NSA and to achieve cost effective and an environmentally sound DEW Line clean-up as described herein.

2.2 DND and NTI will enter into a corollary agreement with respect to economic benefits for the Inuit and Inuit firms including provisions for training (this agreement may or may not involve regional negotiations).

3.0 GENERAL

3.1 **Scope.** This Agreement relates to the decommissioning, remediation, restoration and related activities of the following DEW Line sites:

PIN 2 - Cape Young
PIN 3 - Lady Franklin Point
PIN 4 - Byron Bay
CAM M - Cambridge Bay
CAM 1 - Jenny Lind Island
CAM 2 - Gladman Point
CAM 3 - Shepherd Bay
CAM 4 - Pelly Bay
CAM 5 - Mackar Inlet
FOX M - Hall Beach
FOX 2 - Longstaff Bluff
FOX 3 - Dewar Lakes
FOX 4 - Cape Hooper*
FOX 5 - Broughton Island
DYE M - Cape Dyer

* Prior to the signing of this Agreement the clean-up of Cape Hooper (FOX 4) had already begun under a separate set of understandings. Therefore only the post clean-up provisions of this Agreement will apply to this site

3.2 **Precedent.** This Agreement is not to be construed as a precedent for any other activities of DND, Canada or any third party. Nothing in this Agreement shall be interpreted or used to define the rights of the Parties, Canada or any third party in relation to any matter under the NLCA or to interpret any Article of the NLCA except for the purpose of this Agreement.;

3.3 **Urgency.** The Parties mutually agree to recognize the urgency of the matters dealt with in this Agreement and to perform all required actions as expeditiously as possible.

3.4 **Nunavut Land Claims Agreement.** The Parties recognize and acknowledge their respective obligations to comply with the NLCA in connection with all Work.

3.5 **Inuit Owned Lands.** All use of and access to Inuit Owned lands by DND, Contractors and subcontractors for the purposes of the Work is subject to the NLCA and the Rules, to the extent that the Rules are not inconsistent with the NCLA.

3.6 **Clean-up Schedule.** The commencement and completion of the Work will take place in accordance with the attached Appendix A. The Parties will use their best efforts to adhere to Appendix A.

4.0 Steering Committee

4.1 There shall, during the duration of this Agreement, be a Steering Committee to monitor progress, develop recommendations and suggest alternative solutions for achieving the commitments set forth in this Agreement by:

(a) reviewing progress in achieving the commitments set out in this Agreement;

(b) ensuring that any perceived deficiencies with respect to the Work or to commitments under this Agreement discussed and, where agreed, are expeditiously acted upon;

(c) considering other items of mutual concern, as appropriate;

(d) requesting the Environmental Working Group (EWG), established in accordance with section 7 of this Agreement, to undertake additional study and formulate recommendations to the Steering Committee.

4.2 The Steering Committee shall consist of four members, two to be named by DND and two to be named by NTI. It shall meet at least twice a year and at the request of any Party at mutually agreed upon times and locations. In order to place an item in the agenda, a Party shall provide that item to the other Party not less than ten working days before each scheduled meeting. The Steering Committee shall operate on the basis of unanimous agreement.

4.3 Recommendations agreed to by a majority of the members of the EWG will be incorporated into the site specific plan referred to in section 23 of this Agreement or into the post-clean-up methodology as the case may be. Where either DND or NTI disagree with the EWG recommendations, it will raise the issue at the Steering Committee for discussion in accordance with clause 4.4. If the Environmental Working Group is deadlocked (ie 2-2) on any issue, including scoring of the risk assessment matrix and landfill remediation, the Steering Committee will discuss the situation and attempt, in good faith, to arrive at a consensus. The Parties pursuant to clause 4.5 may, where appropriate, seek independent advice.

4.4 Should unanimous agreement not be reached at the Steering Committee the following approach will be used:

(a) Prior to Clean-up Commencing - the clean-up will not commence until the issue is resolved to the satisfaction of both Parties.

(b) Clean-up has commenced - the clean-up will continue in accordance with the site specific clean-up plan. If the issue is not included in the site specific plan then DND will proceed based on the advice provided by its consultants. DND and NTI will continue to attempt to arrive at a consensus.

In either event, both Parties continue to have the option of involving the provisions of section 5 of this Agreement if unanimous agreement cannot be reached. If unanimous agreement is reached at a later date or there is an arbitration decision which differs from the actions taken by DND, the new decision will be implemented.

4.5 The Steering Committee shall, with the agreement of the members, acting reasonably, invite representatives of Government departments, Inuit organizations, non-governmental organizations, Contractors, Subcontractors and others to provide advice or information as required. If requested by the other Party, DND and NTI agree to provide each other with all relevant scientific and technical information, with the exception of:

- advice to Ministers or Inuit Boards of Directors
- negotiating strategies
- commercially confidential third Party information
- personal information

4.6 The Parties each shall be responsible for their respective costs associated with participating in Steering Committee meetings.

5.0 ARBITRATION

5.1 If DND and NTI disagree on any question of fact or mixed question of law and fact related to the interpretation, implementation or operation of this Agreement, with the exception of any matter within the jurisdiction of the Arbitration Board under the NLCA, either party may by written demand refer the dispute to arbitration in accordance with the following provisions.

5.2 An arbitration Panel consisting of a single arbitrator who both Parties agree is qualified to arbitrate the question in dispute will render a decision on the dispute. If DND and NTI cannot agree on a single arbitrator then a decision will be render by an Arbitration Panel consisting of three similarly qualified arbitrators, one of whom shall be chosen by NTI, one by DND and the third by the two so chosen, which third arbitrator shall be the chairperson. If within fifteen days of having received a written demand, or such extended time as the parties agree, a party fails to either agree to a single arbitrator or to appoint an arbitrator, or if the two arbitrators appointed by the parties do not agree upon the third arbitrator, then upon written application by either party such third arbitrator shall be appointed by the superior court having jurisdiction in the NSA.

5.3 The arbitration proceedings shall be held within thirty days following the appointment of the Arbitration Panel in a location agreed upon by the Parties or, if the Parties are unable to agree, as determined by the arbitration panel. The timing for the panel hearing may be extended by mutual consent of the Parties, not unreasonably being withheld.

5.4 The arbitration panel shall have jurisdiction to determine all questions of fact, questions of mixed law and fact and to make an award, including interim relief, payment of interest, and costs. If an arbitration panel makes no decision as to costs, each party shall bear its own costs and an equal share of the other costs of the arbitration, including the remuneration and expenses of the arbitration panel.

5.5 The Arbitration Panel shall render a decision, in writing, within thirty days of the completion of the arbitration hearing and state the reasons on which it is based. The decision is final and binding and is not subject to appeal. Pursuant to section 17(3)(b) of the *Federal Court Act*, the Parties agree that the Federal Court Trial Division shall have jurisdiction to review the decision of an arbitration panel on any grounds set out in section 18.1(4) of the *Federal Court Act.*

5.6 Where a party to an arbitration fails to comply with any of the terms of the decision of the arbitration panel, any party to the arbitration may file in the office of the Registrar of the superior court having jurisdiction in the NSA, a copy of the decision in the prescribed form, whereupon the decision shall be entered in the same way as a judgement or order of that court, and is enforceable as such.

5.7 The territorial *Arbitration Act* shall apply in any arbitration under this Agreement to the extent that it is not inconsistent with this Agreement, unless otherwise agreed by the parties.

5.8 The arbitration panel may, on application, allow any to participate in an arbitration as an intervenor, if in the arbitration panel's opinion the interest of that person may be directly affected by the arbitration, and on such terms as the arbitration panel in its discretion may order.

5.9 Unless the parties otherwise agree, the proceedings and Board's decision shall be made public.

6.0 Environmental Risk Assessment Matrix

6.1 All landfills will be scored by the EWG in accordance with the Environmental Risk Assessment Matrix as set out in Appendix B of this Agreement. The construction of this matrix takes into account two conservative assumptions:

- The contents of the landfills are unknown and all potential contaminants (ie substances typically used at DEW Line sites) may be present in the landfill
- If a contaminant comes into contact with receptors, it could have an adverse impact on those receptors regardless of the exposure duration or concentration

6.2 Landfills scoring 105 points or more are classified as potentially high environmental risk (Class A) and will be excavated. Landfills with a score of 100-104 points will be considered on a case by case basis to determine whether they should be excavated or considered as Class B landfills.

6.3 Landfills with a score in the range 75 to 99 points are classified as moderate environmental risk (Class B). An engineered leachate containment system will be provided for these landfills to mitigate against potential environmental risks. The landfill engineers under contract to DCL will take into consideration any suggestion of the EWG regarding the design of the leachate containment facility. In specific cases where an engineered leachate containment system cannot be constructed, the EWG will recommend whether complete excavation or partial excavation with a leachate containment system is required.

6.4 Landfills with scores of 75 or less are classified as low environmental risk (Class C). The remediation approach for these landfills will be the placement of an engineered cover following collecting, sorting, and appropriate disposal of debris where it may impact on the integrity of the landfill. Hazardous debris will be removed and disposed of in accordance with federal regulations. Generally, the final thickness of cover material will be approximately 0.75 metres, but may vary depending on site specific conditions.

6.5 Scores that fall within plus or minus five points of 75 points will be considered on a case by case basis.

6.6 The scoring of Category C: Receptors of the matrix will take into account local/traditional knowledge in accordance with the procedures set out in Section 8 of this Agreement. The primary focus for the collection of local/traditional knowledge will be on the local community and an Inuit representative who is familiar with the DEW site under assessment.

6.7 The scoring of the landfills will take place before the clean-up at that DEW site commences and the site specific clean-up plan is finalized.

7.0 Environmental Working Group

7.1 An Environmental Working Group (EWG) will be established. The EWG will consist of four members, two chosen by each of the Parties. The members will be qualified engineers and/or scientists with expertise in environmental remediation and clean-up in northern climates.

7.2 The EWG will, for each of the landfills prior to the clean-up of that site, be responsible for the scoring of the risk assessment matrix, interpreting the results and recommending a remediation solution in accordance with this Agreement. If a majority of the members of the EWG are in agreement with the EWG recommendations then DND will include these recommendations in its site specific plans which are referred to in section 23 of this Agreement. If the EWG is deadlocked then the issue will be referred to the Steering Committee as per section 4.3 of this Agreement.

7.3 During the monitoring period, the EWG will also examine the results of the monitoring program in accordance with the methodology set out in section 20 of this Agreement and report to the Steering Committee on the results of their investigation. Should changes to the monitoring plan and/or additional remediation be required, the EWG will make recommendations to the Steering Committee on what action should be taken as per section 4.3 of this Agreement.

7.4 The EWG will go on-site during the pre-cleanup delineation phase of the project to assemble information required, including local/traditional knowledge as per section 8 of this Agreement, to score the risk assessment matrix. DND will contribute $10,000 per site to NTI to defray the cost incurred by its EWG members and a community representative selected by the relevant RIA (NTI Representative). DND will also provide the NTI representative transportation

costs whenever the NTI representatives are travelling to a site or to a community with the DND representatives on a DND charter. DND will also provide meals and accommodation for the NTI representative while at the site.

7.5 The EWG will also act as a resource to the Steering Committee and will upon request from the Steering Committee investigate certain matters and produce reports or studies for consideration by the Steering Committee. Both Parties agree to cover the costs of their members of the EWG to undertake such work.

8.0 Local/Traditional Knowledge

8.1 Traditional and local knowledge for use in the scoring of the risk assessment matrix will be collected during the Pre-Cleanup Delineation phase of the DEW Line clean-up project.

8.2 An Inuit representative familiar with the DEW site and traditional use of the area around the site will be chosen by the relevant Regional Inuit Association to be on site during the pre-construction delineation phase of a site clean-up. The Inuit representative will work closely with the EWG to identify Inuit use of the area, wildlife patterns, and past events and occurrences that may have impacted on landfills (i.e. dumping, hazardous waste storage, natural occurrences) in order to assist in the scoring of the matrix.

8.3 DND and NTI will attempt to establish a community DEW Line Clean-up Committee which would facilitate the flow of local knowledge to the EWG prior to, and during, the site visit.

8.4 The EWG will visit the local community (ies) most affected by the DEW site. The EWG will conduct one-on-one interviews with a number of residents and will also meet with the Hamlet Administration Officer and/or the Hamlet Mayor, the local Hunters and Trappers Association, and relevant community organizations to obtain information concerning the traditional use of the area by the community. The Community Land and Resource Committee (CLARC) will be consulted if Inuit Owned Land is affected in any way.

8.5 In anticipation of these community consultations, DND, in consultation with NTI will prepare an information package in English and the relevant Inuit language for

use in the community consultations. The package will include maps of the site and the surrounding area along with sample questions (see Appendix D) that would facilitate discussion.

8.6 DND will provide NTI with at least six months notice regarding the site visit in a given season. Six weeks notice will be provided regarding the dates for the community visit. DND will attempt to arrange the timing for the community consultation to avoid harvest time when members of the community might be on the land. NTI in conjunction with the EWG will arrange the interviews with the various community associations and individuals.

8.7 The EWG will document all information collected during the community consultations. This information will be provided to DND, NTI, the relevant RIA and the host community.

8.8 All information collected from the interviews will be considered during the matrix scoring and will be given equal consideration with conventional scientific knowledge collected during the site visits.

8.9 Prior to the actual clean-up, DND will conduct a community information session to inform the residents of the scope of the Work and other relevant facts. In the case of CAM 4, there will be a community information session during the summer of 1998 at the option of the RIA. For Fox 5, in addition to this community information session, the EWG will be consulting the community of Broughton Island on FOX-5 as part of its work on scoring landfill evaluation matrices, during the summer of 1998 and DND will provide a limited public information session at that time.

9.0 CEPA Soils

9.1 Soils at concentrations exceeding federal regulations (referred to herein as "CEPA" soils) will be removed from the site and disposed of in a licenced facility in accordance with those federal regulations.

10.0 Tier II Soils

10.1 Tier II soils are defined in Appendix E of this Agreement.

10.2 Tier II soils will be excavated and placed in an engineered, lined, containment facility (Tier II Disposal Facility). After excavation, the area will be backfilled with sufficient clean fill to provide an effective layer over any remaining Tier I soils and to meet the requirement of clause 22 of this Agreement . A schematic of a Tier II Disposal facility is presented in Appendix K. Tier II soils may also be placed in a similarly engineered cell of a larger landfill. The location of the Tier II Disposal Facility will be selected in order to minimize potential environmental impact in a cost-effective manner. In some cases Tier II soils may be transported from one DEW site to another depending on soil volumes and project economics.

10.3 Confirmatory testing will be conducted in accordance with the methodology outlined in section 13 of this Agreement.

11.0 Tier I Soils

11.1 Tier I Soils are defined in Appendix E of this Agreement.

11.2 Tier I soils will be excavated to a depth of to 30 cm if the soil is located on a flat or gently sloping area such as a gravel pad unless delineation testing indicates a lessor depth of contamination. In such a case, a suitable safety margin will be excavated. Where Tier I soils are located on slopes greater than 3:1 (horizontal:vertical), the contaminated soils will be excavated to a depth of up to 60 cm. After excavation, the area will be backfilled with sufficient clean fill to provide an effective layer over any remaining Tier I soils and to meet the requirement of clause 22 of this Agreement .

11.3 Tier I soils will be placed in a professionally engineered landfill where they may be used as intermediate fill.

11.4 During the pre clean-up delineation phase prior to going to tender for the clean-up, testing to determine the presence or absence of Tier II contaminated soil below the Tier I soils will be conducted.

12.0 Hydrocarbon Soils

12.1 Hydrocarbon contamination will be based initially on the measurement of Total

will investigate areas of concern identified by NTI and/or its representatives who will be on-site during the delineation work. Risk assessment consideration will be given to soils that act as sources of contaminants to nearby aquatic environments even if the contaminants are below the relevant DCC criteria. The method of delineation will follow the grid as set out in Appendix F of this Agreement.

13.2 Confirmatory testing of contaminated areas, other than Tier I soils, will be conducted after contaminated soils have been excavated. Confirmatory testing will be conducted in accordance with the protocol outlined in Appendix F of this Agreement.

13.3 Should there be evidence to suggest that some contaminated areas were missed during the pre clean-up delineation work, these areas will be investigated in accordance with the pre clean-up delineation methodology.

13.4 During the confirmatory testing phase, NTI may assign a qualified observer to the site.

13.5 Appropriate quality assurance measures acceptable to the EWG will be taken to ensure the accuracy of all analytical work in the field or in laboratories.

14.0 Debris

14.1 Debris will be collected and sorted into hazardous and non-hazardous components. Hazardous debris will be disposed of in accordance with Federal regulations. Non-hazardous debris will be buried in a professionally engineered landfill, provided there is a suitable location and sufficient gravel is available. Appendix C contains additional details concerning the destination of collected debris.

14.2 All debris which is attributable to the operation of any DEW site and is within two metres of the surface at low tide or within two metres of the surface of an inland water body will be removed by DND.

15.0 Off Site Contamination and Debris

15.1 Where there is reasonable evidence of additional off site contamination or debris

Petroleum Hydrocarbons (TPH) where the TPH value is greater than or equal to 2500 ppm. Should the soils contain Tier I or Tier II contamination, they will be treated in accordance with the relevant sections of this Agreement. These hydrocarbon areas will be identified on site as part of the pre-construction delineation testing.

12.2 Each contaminated area will be evaluated qualitatively by the EWG using the checklist outlined in Appendix J of this Agreement.

12.3 Where remediation is required, one of the following options will be used:

- aerating the hydrocarbon contaminated soil in place to reduce hydrocarbon contaminant concentrations
- use of hydrocarbon contaminated soil as intermediate fill within an engineered landfill
- landfilling in a Tier II Disposal facility
- bioremediation using a landfarming or bio-pile processes
- soil washing
- other equivalent technologies recommended by the EWG

12.4 Based on site specific conditions, the EWG will recommend the most appropriate of the remediation options outlined in clause 12.3 in accordance with section 4.3 of this Agreement. The appropriateness of the options will take into consideration the environmental sensitivity of the area. Factors which will be considered in the selection of the method are:

- type of contaminant (ie fuel or lubricating oil)
- total volume of hydrocarbon contaminated soils on site (mobilization costs, ability to treat the soil)
- concentration of hydrocarbons within the soil (effectiveness of treatment process)
- type of soil

13.0 Pre Clean-up Delineation and Confirmatory Soil Testing

13.1 A comprehensive pre clean-up delineation program will be designed to ensure that all contaminated soil and contaminated building material will be identified . DND

which, subject to clause 15.2, is attributable to the operation of a nearby DEW site, DND will undertake testing to determine the extent of the contamination in consultation with NTI and remediate the site in accordance with the relevant sections of this Agreement.

15.2 Should the evidence clearly demonstrate that other individuals or organizations have contributed significantly to the contamination or debris, then NTI and DND will endeavour to obtain the third Party (ies) agreement to contribute its pro-rated share of the investigation and clean-up costs before the investigation and clean-up commences. If the third party does not agree to pay their share of the costs, DND has the option, where practical, to clean up its share of the contamination, or in the alternative, waiting until there is third party agreement regarding payment of the investigation and clean-up costs. The investigation and clean-up will be in accordance with the clean-up protocol outlined in this Agreement.

15.3 NTI will endeavour to identify areas of concern prior to the delineation phase of the clean-up.

16.0 PCBs in Paint

16.1 PCBs in paint will be treated in accordance with applicable federal regulations. Changes to these regulations will be dealt with in accordance with section 25.1 of this Agreement.

17.0 Materials Containing Lead-based Paints

17.1 Materials containing lead-based paints will be placed in a professionally engineered landfill. Should regulations or guidelines be issued which direct otherwise, the implementation of this change will be dealt with in accordance section 25.1 of this Agreement.

18.0 Barrels

18.1 The testing and disposal of POL tank sludge, waste oil, petroleum products, antifreezing agents, solvents and barrels will be handled in accordance with the criteria as set out in Appendix G.

19.0 Borrow Material

19.1 DND will attempt to minimize new excavation of borrow materials required for the clean-up activities. Where possible, existing sources of borrow material will be used. All borrow areas will be regraded to match the surrounding topography.

20.0 Monitoring Program

20.1 The monitoring program will identify an actual or potential landfill failure. Remedial action will be undertaken if leachate is present at levels greater than the site specific baseline concentrations at the time of the landfill completion. Action taken as result of the monitoring program will ensure the integrity of the landfills and thereby the health of the Inuit is protected on a continuing basis.

20.2 Following the completion of the clean-up for a site, DND will commence a monitoring program in accordance with Appendix H of this Agreement.

20.3 The monitoring program will have three phases. The objective of each phase are identified in Appendix H.

20.4 Monitoring results will be communicated to both Parties in the form of a comprehensive report.

21.0 Research Proposals

21.1 NTI, on behalf of communities, may raise at the Steering Committee, items, including the need for hydrographic mapping, which could involve the requirement for research and investigation. These proposals will be discussed and evaluated at the Steering Committee. If the Steering Committee decides that the proposals are consistent with the objective of the clean-up which is to protect the environment from contaminants entering the food chain or involve direct DEW site related impacts which could cause significant economic impact, DND will fund the agreed upon research activities.

21.2 Where the proposals are broader in nature and not solely restricted to DND DEW

site activities, DND will support NTI in seeking funding under other Government programs and/or initiatives and may contribute funding to the approved proposals.

21.3 Involvement of the Inuit in the research activities including training and technology transfer will be dealt with in an agreement dealing with economic provisions.

22.0 Site Restoration

22.1 All sites will be regraded to the extent possible to conform to the natural contours. The regrading will pay particular attention to hydrocarbon stained areas and wherever feasible these areas will be regraded so as to improve the aesthetics of the stained area.

23.0 Site Specific Clean-up Plan

23.1 DND will provide NTI with a site specific clean-up plan six months in advance of the clean-up of a particular site. NTI will review the plan to satisfy itself that the plan is in accordance with the requirements as set out in this Agreement. Any items of concern to NTI will be referred to the Steering Committee for resolution in accordance with section 4.3 of the Agreement prior to the issuance of any requests for bids by DCL. DCL, as the representative of the project proponent (DND), will be responsible for preparing all necessary submissions to obtain regulatory approval to proceed with the clean-up activity.

24.0 Liability and Indemnification

24.1 DND acknowledges and agrees that it has continuing responsibility and liability for the integrity of all landfills remaining on site. DND agrees that should there be evidence of potential or actual failure of a landfill, it will investigate the situation pursuant to the monitoring provisions of this Agreement.

24.2 Should there be evidence of contamination at the DEW Line site which exceeds the protocol as set out in this Agreement at the time of the signing of this Agreement and which cannot be attributed to a third Party then DND will undertake the clean-up.

24.3 DND agrees that nothing in this Agreement shall relieve the Crown or its agents either at present or in the future from complying with all applicable federal laws of general application. Changes to territorial law will be referred to the EWG which will make recommendations to the Steering Committee concerning the relevance of these changes to the clean-up.

24.4 DND agrees that it will be a condition of any sale or transfer of any of the lands comprising the DEW Line sites that the purchaser must assume DND's obligations under this Agreement with respect to the lands sold or transferred. It will also be a further condition of any such sale or transfer that the purchaser or transferee shall provide security for the performance of the assumed obligation and shall provide and maintain a letter of credit, surety bond, or other security in a form and amount mutually agreeable to the Parties.

25.0 Amendments

25.1 Should existing federal regulations or guidelines be amended, the EWG will examine the implementation of these changes or amendments taking account the special characteriztics of the Arctic environment and make appropriate recommendations to the Steering Committee in accordance with section 4.3 of this Agreement.

25.2 The Protocol for confirmatory testing may be reviewed and adjusted on a site by site basis provided that a majority of the EWG are in agreement with the changes. Permanent or major changes will require the prior approval of the Steering Committee.

25.3 In the event that either Party wishes to amend the schedule as set out in Appendix A, it will provide the other Party with thirty (30) months written notice. If unforeseen event(s) or a decision by a regulatory body occurs which has a material impact on this schedule, the Parties will review these events and attempt to arrive at a mutually acceptable alternative.

25.4 Both Parties agree to review changes in technology and research studies which may have a bearing on this Agreement and discuss the need for changes resulting from these developments. The Steering Committee may task the EWG to investigate a particular technology pursuant to clause 4.1 (d) of this Agreement.

Recommendations of the EWG will be implemented in accordance with section 4.3.

25.5 If either Party wishes to make other changes to this Agreement, it will provide, in writing, six months notice of proposed changes. Any agreed upon amendments will be executed and attached as an appendix to this Agreement.

25.6 DND and NTI agree to consider amendments in an expeditious manner, particularly where the proposed amendments directly affects the conduct of a clean-up in progress or one which is scheduled to commence in the near term.

26.0 EWG Reports

26.1 All reports of the EWG will be available to provide additional information and guidance in the implementation of this Agreement. In the event of any conflicts or differences in interpretation of the EWG reports and this Agreement, this Agreement will prevail.

27.0 Notices

27.1 Where any Party is obliged or entitled to give any notice, request, approval, demand, consent, direction or other communication (ie Notice) to the other Party, such party shall first communicate the substance thereof personally or by telephone. However, such Notice shall not be sufficiently given until sent in writing to the addressees at the address below. Any Notice may be personally delivered or sent by registered mail or telefacimile and will be effective upon receipt by the addressee.

27.2 Notices to DND will be sent to:

Director General Environment
National Defence Headquarters
101 Colonel By Drive
Ottawa, Ontario
K1A 0K2

27.3 Notices to NTI will be sent to:

1st Vice President
Nunavut Tunngavik Incorporated
Box 1041
Cambridge Bay
Northwest Territories
X0E 0C0

28.0 **Termination of the Agreement**

28.1 This Agreement will terminate on the later of December 31st, 2008 or when the clean-up work as set out in this Agreement for the sites listed in Appendix A is completed or on such a date agreed to by the Parties in accordance with clause 25.3 of this Agreement.

28.2 Notwithstanding clause 28.1 of this Agreement, monitoring and any necessary remediation in accordance with section 20 of this Agreement will continue for twenty five (25) years after the termination of this Agreement.

28.3 At the end of twenty five years of monitoring following the termination of this Agreement, DND and NTI will negotiate a new agreement to specify the terms of any further monitoring (if required).

Annexes to the Agreement

Appendix A

Clean-up Schedule

Site*		Start Date	Completion Date
CAM M	Cambridge Bay	1998	1999
FOX 5**	Broughton Island	2001	2003
CAM 4**	Pelly Bay	2001	2003
FOX M/CAM 5	Hall Beach/Maclar Inlet	2002	2006
CAM 3	Shepard Bay	2002	2003
DYE M	Cape Dyer	2003	2006
CAM 2	Gladman Point	2003	2004
FOX 2/FOX 3	Longstaff Bluff/Dewar Lakes	2004	2008
CAM 1	Jenny Lind Island	2004	2005
PIN 4	Byron Bay	2005	2006
PIN 3	Lady Franklin Point	2006	2007
PIN 2	Cape Young	2007	2008

* Dates for the Baffin Sites are tentative pending resolution of economic and business issues

** The starting dates for CAM 4 and Fox 5 and the subsequent starting dates could be moved up pending the timing of the PCBs in paint decision by Environment Canada

Appendix B

Environmental Risk Assessment Matrix

Introduction

The matrix has been based on the CCME National Classification System for Contaminated Sites, and adapted to address the particular concerns of the Arctic environment. The matrix is divided into three categories of equal weight: contaminated source, pathways, and receptors. The interaction of these three elements results in environmental risk. Each category is assigned 50 points, which are distributed among several factors. Each of these factors has been made as specific as possible in order to reduce the subjectivity of the matrix to a minimum. In addition, each of the three main categories is assigned a highly subjective "special considerations" factor according to the method described in the CCME Classification System. As it is unlikely that any classification system could address all possible factors, a special considerations factor allows the user to increase or decrease the score "to emphasize important concerns about a site and should be used as an **exception rather than as a rule**" (CCME 1992, p.6-7).

The purpose of the matrix is to evaluate the environmental risk posed by landfills in their current condition and location. It is not suitable for determining the risk posed by a landfill post-closure, as most of the elements in the matrix would not change by the application of a remedial solution. It should also be recognized that monitoring is an integral part of the closure.

The next sections provide guidance to the EWG on the methodology and items to be considered when scoring the matrix. This section is followed by the actual matrix which is to be used in the scoring.

A. Contaminant Source

Five factors were considered under Contaminant Source to describe specific landfills, as follows:

- A.1 Landfill Extent
- A.2 Estimated Depth of Landfill
- A.3 Presence of Leachate
- A.4 Presence of Surface Contaminated Soil
- A.5 Presence of Surface Debris

A.1 Landfill Extent

Landfill areas will be based on the results of geotechnical/geophysical site surveys and visual observations. Those landfills with an area greater than 10,000 square metres will score 10 and those smaller landfills will be scored in proportion to their size relative to 10,000 square metres.

A.2 Estimated Depth

The estimated depth of a landfill is determined by visual inspection of surrounding topographic features. The average depth of the active layer will be used as a qualifier for the description of landfill depth, as this is generally the maximum depth of investigation. The depth of the active layer may range from one to two meters at these sites, depending on material type; therefore an average depth of 1.5 meters was used in the rating. Landfills with estimated depths of greater than 1.5 meters will score 5 and those with estimated depths of less than 1.5 meters will score less.

A.3 Presence of Leachate

Leachate provides evidence of contamination within landfill. Leachate can be defined as the presence of contaminants in water emanating from the landfill, but concentrations may be so low as to be difficult to detect. The presence of leachate can be better determined by the presence of contaminated soil at the toe of the landfill, indicating

chronic low levels of contaminants leaching from the landfill. All types of contaminants in leachate (PCBs, (Polychlorinated Biphenyls) TPH (Total Petroleum Hydrocarbons) or inorganics) are considered to be of equal concern, as indicators of contamination within the landfill.

In the scoring, leachate is considered to be either present or not; no interpolation of the score is used in this category.

A.4 Surface contaminated soil

Within each landfill, there is potentially a source of contamination. The presence of surface contaminated soil, like the presence of leachate, is an indication that the landfill contains contamination. The volume of contaminated soil is not taken into consideration; this provides a conservative approach in that a small amount of contaminated soil can trigger a high score. The presence of Tier II soils will trigger the highest score (15). Based on the hypothesis that each landfill potentially contains contaminants, 5 points are given to this subsection, even if no surface contaminated soils were identified.

A.5 Presence of surface debris

At some landfills surface debris is very extensive, while at others there is almost no debris. Scoring needs to be quantitative; therefore the percentage of the surface area of the landfill that is covered with debris is used as the basis for scoring. A landfill that has surface debris covering more than 50% of its surface receives a full score.

B. Pathways

The primary transport mechanisms for contaminants from the DEW Line landfills are considered to be:

- aerial transport of fine particles; and
- water transport, both as surface water run-off or subsurface water flow.

B.1 Aerial Transport of Contaminants

All contaminants can be transported as particles; windblown debris is not considered in this category, as debris pickup is inherent in any cleanup. Surface contamination or surface expressions of leachate imply the potential for aerial transport. This factor is given a low weight because the quantity of contaminated soil on the surface of a landfill is generally low relative to the quantity of contaminated soil at the site as a whole. In addition, it is anticipated that relative to the effect of water movement, aerial transport contributes less to the transport of contaminants away from a landfill.

B.2 Water Movement

Water movement includes the movement of surface water and subsurface water within the active layer. "Groundwater" is not addressed as an issue separate from surface water as the movement of water within the active layer is subject to the same driving forces as surface water. The intent of this sub-category is to examine factors that affect migration away from the landfill – slope, runoff, extent and type of cover on the landfill, annual precipitation and distance to surface water. Among these factors, topography, runoff potential and proximity to surface water are given the highest weight.

B.2.1 Topography

The degree of the slope on which the landfill is located is one of the major factors contributing to transport of contaminants; the scoring is carried out on a sliding scale. In cases where there are different slopes across the landfill, a weighted average is used.

B.2.2 Cover Material – Depth

The extent to which potential contaminants are available to transport is also dependent on the depth and type of cover material. The potential for leachate generation and correspondingly, leachate migration, is related to the infiltration of water into the landfill. Cover over the landfill helps mitigate infiltration of water into the landfill contents. As the thickness of the landfill cover increases, the likelihood that potential contaminants will be released from the landfill decreases. If the active layer is contained in the cover material above the debris, then the potential for surface water infiltration into the landfill is small; this circumstance is assigned the lowest score.

B.2.3 Cover Material – Type

The erosion potential of a landfill is partly based on the type of cover material. Erosion can eventually lead to the exposure of the landfill contents. Some cover materials are more susceptible to erosion than others; well graded gravels are the least susceptible, and silty materials are the most susceptible. In cases where there is no cover, this factor is assigned the highest score. Where the cover materials consist of a combination of soil types, the scoring should reflect the more conservative or higher score.

B.2.4 Surface Water/Run-Off Potential

This factor aims to describe the destructive potential of water action on the landfill, which could take the form of waves; streams, rivers or lakes; or seasonal drainage. Where there is significant seasonal drainage, the run-off potential is high. "Significant seasonal drainage" is defined as run-off that has the potential to transport large quantities and concentrations of contaminants to surface water courses over a short period of time (CCME 1992, p.23). Significant seasonal drainage also includes consideration of major snow drifting on a landfill.

B.2.5 Precipitation

The amount of precipitation received, either as rain or snow fall, affects the amount of surface water infiltration or run-off. The majority of the DEW Line sites receive less than 500 mm of precipitation annually, with the exception of Cape Dyer. Typically, the amount of precipitation at any site is relatively low; therefore it is unlikely that any single precipitation event would cause significant runoff. This factor is therefore given a relatively low weight.

B.2.6 Distance to Downgradient Perennial Surface Water/Seasonal Drainage Channel

The distance to surface water will affect the probability of contaminants reaching the watercourse. This factor can include streams, seasonal or perennial, running directly through the landfill, or streams and lakes downgradient from the landfill, but it is intended to exclude small ponds with no outflow. On very steep slopes this distance should consider the horizontal distance to the water body rather than the vertical drop. The impact of drainage with respect to contaminant exposure is not considered in this category (it is considered under Receptors); this factor determines whether there is a drainage pathway from the landfill.

C. Receptors

This section addresses the potential for impact on receptors, specifically, aquatic and terrestrial habitats, as well as human exposure. Impact on humans is the primary consideration; however, it should be recognized that impact on humans is implicit in the scoring of factors addressing ecosystem impact. The scoring within each category is to be based on recorded data, as well as local knowledge of the land use in the area, and therefore requires local input.

C.1 Potential Impact on Receiving Freshwater/Marine Habitat

The water body should be selected based on the potential effects on the receiving habitat. In the selection of the receiving water body to be used in the landfill evaluation matrix, consideration must be given to the regional drainage patterns. For example, where the drainage from a landfill is overland (i.e. there is no direct connection between the landfill and the downgradient water body), water bodies beyond 2 kilometers should not be used in the evaluation. This is based on the premise that natural attenuation of any potential contamination will occur with overland flow. Where a direct connection between a landfill and a downgradient water body exists, via a stream or interconnected ponds, the two-kilometre limit should not be used.

C.1.1 Proximity to Receiving Freshwater/Marine Habitat

"Receiving habitat" is considered to be the most potentially impacted significant body of water near the toe of the landfill. The water body may support freshwater or marine life and/or may be used by avifauna and/or terrestrial mammals as a water source. It is not necessarily the seasonal drainage course or perennial water body closest to the landfill toe: This section's objective is to select a habitat which support receptors rather than identify the closest body of water. It is assumed that only habitat downgradient from the landfill is to be considered (given that aerial transport of contaminants to habitat upgradient from the landfill will be addressed by the remediation of contaminated soil).

C.1.2 Estimated Habitat Usage – Freshwater/Marine

This section is scored based on the frequency of usage within the selected receiving water body: the level of biodiversity and the occurrence of calving/spawning should be considered in scoring. It is recognized that freshwater and/or marine wildlife is potentially more at risk compared with terrestrial wildlife or avifauna, which should only be exposed through water ingestion. Thus, when terrestrial wildlife or avifauna is the primary receptor, the score for this factor should fall into the moderate or low category based on the potential frequency of usage. Otherwise, when the selected water body sustains freshwater and/or marine wildlife, the level of biodiversity should be used to evaluate the score. It should be noted that the most conservative approach - in the selection of the receiving water body - must be used when scores from section C.1.1 and C.1.2 are combined. Finally, "Biologically sensitive" areas such as bird sanctuaries and/or endangered, threatened or vulnerable populations should be considered as "special considerations".

C.2 Potential Impact on Receiving Terrestrial Habitat

C.2.1 Extent of Vegetation

Typically the area in which to consider vegetation would include an area 300 m downgradient from the toe of the landfill. The area within this distance is expected to be most susceptible to uptake of contaminants if they are leaching from the landfill, but a larger or smaller area could be considered if site specific conditions warrant it.

C.2.2 Estimated Habitat Usage – Terrestrial/Avifauna

The same criteria as for usage of aquatic habitat are to be applied.

C.3 Potential Human Exposure Through Land Use

C.3.1 Presence/Occupation

This factor addresses strictly dermal exposure and inhalation; consumption of food and water from the area is dealt with in subsequent factors. The risk of dermal exposure or inhalation is much lower when soil is frozen; therefore winter occupation of the site is assigned a low risk. "Summer" in this factor is intended to include the spring, summer and fall periods when the ground is not frozen. Within this factor, the scoring takes into account the likelihood and the duration of contact. In such way, proximity to a community is considered (high likelihood of contact), although proximity to a community does not necessarily trigger a high score if visits are infrequent (low duration of contact).

The likelihood of contact considers proximity to community or to a camp, as well as proximity to "travel routes". The duration of contact considers full time residences (i.e. permanent community for high, summer camp for moderate, winter camp or travel routes as low). Scores may be interpolated between the allocated points, according to the table below.

Table 1-1: Scoring Guide for Section C.3.1

	High Likelihood of Contact	Moderate Likelihood of Contact	Low Likelihood of Contact
High Duration of Contact	8	6	4
Moderate Duration of Contact	6	4	2
Low Duration of Contact	4	2	1

For large DEW Line sites, different parts of the site need to be considered individually, as some areas of the site could be quite far (more than a few kilometres) from the landfill under consideration.

C.3.2 Proximity to Drinking Water Source

Regardless of whether the source is seasonal or perennial, an established community or a summer camp water source located downgradient of the landfill is to be considered in this factor.

C.3.3 Food Consumption

Sedentary organisms are more susceptible to local inputs as their exposure is large if they are downgradient from the landfill. These organisms can include bottom-dwellers such as sculpins, mussels, sea urchins etc., as well as terrestrial vegetation, which can be used for medicinal purposes. This kind of contamination "is quite localized when considered on a broad regional scale" (DIAND 1997, pg. 5). Migratory marine animals may have body burdens of contaminants; these are not directly attributable to local contaminant sources, as the vast majority of organochlorines, for instance, arrive in the Arctic via long range transport.

Caribou living in the general area of DEW Line sites do not have elevated levels of contaminants, since they feed over a very wide area. The Canadian Arctic Contaminant Assessment Report (DIAND, 1997) describes these results in more detail.

It is recognized, however, that sources such as DEW Line sites do contribute contaminants to the Arctic ecosystem. For the purpose of scoring the matrix, therefore, a high consumption of animals from the area surrounding the DEW Line sites has the potential to pose a higher risk than a low consumption, **although in general the risk remains low.**

This factor is divided into two sub-sections, and the score is the sum of the score for each of the two sub-sections.

1.3 Special Considerations

As indicated in the introduction to the matrix (section 1.1), each of the three main categories includes a "*special considerations*" factor. The proposed value of the special considerations factor is a maximum of ten percent of the overall score for each category. It is intended that no circumstance will allow a user to assign a special considerations score that will cause the score for that category to exceed the maximum allotted. To avoid undue bias, it is also suggested that the user should complete the entire evaluation form and score a site before addressing special considerations in the total score.

The Environmental Working Group (EWG) based the landfill risk evaluation matrix on the CCME model which defines three categories: contaminant source, pathways and receptors. Within those three categories, the EWG tried to address all of the possible factors contributing to risk. Recognizing that even a thorough matrix could never address all possible risk factors, special considerations were included to address specific risk factors, which are not general to all of the DEW Line sites.

As noted in the CCME document, the special considerations factor is not intended to be applied on a regular basis, as it addresses very site-specific risk factors. In fact, if the special consideration factor was being consistently applied in the scoring of landfills, it would indicate that the matrix itself was incomplete. Special considerations should be site-specific characteristics that can be documented.

Three examples of how special considerations could be applied are provided to clarify the use of such a classification:

Example 1. Wildlife on site

At Byron Bay, the caribou belong to the Peary herd, an endangered species. It may be that "special considerations" points would be assigned to the Receptors category when endangered, threatened and/or vulnerable species (COSEWIC, 1997) are known to visit the DEW Line landfill.

Example 2. Drinking water

The risk associated with landfill impact on a drinking water source is addressed in section C.3.2. In that section, the distance from a landfill to a known drinking water source, permanent or seasonal, is used as an indicator of the risk that the contaminants in the landfill could have an impact on the drinking water source. If a landfill is close to a drinking water source, then section C.3.2 would be assigned the maximum score (8 points). In the case of Pelly Bay, however, where the landfills are far from the drinking water source and therefore receive a relatively low score in section C.3.2, "special considerations" points may be added to address concerns that the landfills are located in the watershed for the community drinking water supply.

Example 3. Proximity to a community

In the landfill risk evaluation matrix, human exposure to a landfill is measured in the following way: people can spend time at the landfill (potential dermal exposure), they can drink water from an area near the landfill (potential ingestion), they could live very close to landfills (potential exposure through aerial transport) or they could eat animals that feed near the landfill (potential ingestion). These three considerations form section C.3 of the risk evaluation matrix. If a landfill is located near a community, there is a greater likelihood that people will spend time at the landfill than there is for landfills far from a community. It is not necessarily the case, however, that landfills near communities receive frequent visits; therefore, instead of creating a special section addressing proximity to a community, the risk of human exposure (section C.3.1) is more accurately evaluated by measuring time spent at a landfill. In these cases, however, "special considerations" points may be added to the Receptors category to address a community's specific concerns.

PROPOSED ENVIRONMENTAL RISK EVALUATION MATRIX FOR LANDFILLS IN THE NUNAVUT REGION			
A.	CONTAMINANT SOURCE		Maximum Score
A.1	LANDFILL EXTENT		
	>10 000 m2	10	
	For areas less than 10,000 = Area of Landfill X 10 / 10 000	2-9	
	Minimum Score	1	10
A.2	ESTIMATED DEPTH OF LANDFILL		
	greater than 1.5 m	5	
	less than 1.5 m	2-4	5
A.3	PRESENCE OF LEACHATE		
	Evidence of Leachate	10	
	No Evidence of Leachate	0	10
A.4	PRESENCE OF SURFACE CONTAMINATED SOIL		
	> DCC Tier II Stains	15	
	> DCC Tier I < DCC Tier II. Stains	10	
	Contaminated suspected, no surface contamination noted	5	15
A.5	PRESENCE OF SURFACE DEBRIS AT LANDFILL		
	>50% of surface area	10	
	<50% of surface area, pro-rated	1-9	
	No debris observed	0	10
	SPECIAL CONSIDERATIONS		
		+/- 5	
	TOTAL SCORE - CONTAMINANT SOURCE		*50*

PROPOSED ENVIRONMENTAL RISK EVALUATION MATRIX FOR LANDFILLS IN THE NUNAVUT REGION			
B.	PATHWAY/TRANSPORT MECHANISMS		Maximum Score
B.1	AERIAL TRANSPORT OF CONTAMINANTS		
	All Landfills Scored as 2 If Surface Soil Contamination (A.4) or leachate (A.3) has been identified		2
B.2	WATER MOVEMENT		
B.2.1	TOPOGRAPHY		
	Steeply Slope (>40 % Grade)	12	
	Sloping (10% to 40% Grade)	4-11	
	Subdued to 10% Slope	2-3	
	Flat (< 3%)	1	12
B.2.2	COVER MATERIALS -DEPTH		
	No to little existing cover	4	
	Greater than 50% exposed/surface debris	3	
	Occasional exposed/surface debris	2	
	Existing cover, minimal debris.	1	
	Cover thickness > average active layer thickness	0	4
B.2.3	COVER MATERIAL - TYPE		
	No cover	5	
	Silty/Sandy Material	4	
	Sandy/Gravel Material	3	
	Gravel Material	1-2	5
B.2.4	SURFACE WATER/RUN-OFF POTENTIAL		
	Very High - evidence of erosion, continuing run-off, or wave action	12	
	High - evidence of erosion, seasonal, widespread, storm waves	10	
	Moderate - % area affected by erosion	3-9	
	Low - no evidence of erosion, slight slopes	1-2	12
B.2.5	PRECIPITATION		
	> 500 mm annual precipitation	5	
	< 500 mm annual precipitation (pro-rated)	1-4	5
B.2.6	DISTANCE TO DOWNGRADIENT PERENNIAL SURFACE/L SEASONAL DRAINAGE CHANNEL		
	0 to 100 m	10	
	100 to 300 m	7-9	
	300 to 1 km	2-6	
	greater than 1 km	1	10
	SPECIAL CONSIDERATIONS		
		+/- 5	
	TOTAL SCORE - PATHWAYS		*50*

PROPOSED ENVIRONMENTAL RISK EVALUATION MATRIX
FOR LANDFILLS IN THE NUNAVUT REGION

C.	RECEPTORS				Maximum Score
C.1	POTENTIAL IMPACT ON RECEIVING FRESHWATER/MARINE HABITAT				
C.1.1	PROXIMITY TO RECEIVING FRESHWATER/MARINE HABITAT				
	0 to 100 m			6	
	100 to 300 m			4-5	
	300 to 1 km			2-3	
	greater than 1 km			1	6
C.1.2	ESTIMATED HABITAT USAGE - FRESHWATER/MARINE				
	High: High Biodiversity/ High Occurrence/Calving or Spawning Area			5-6	
	Moderate: Moderate Biodiversity, Migratory			3-4	
	Low: Low biodiversity: rare sightings			1-2	6
C.2	POTENTIAL IMPACT ON RECEIVING TERRESTRIAL HABITAT				
C.2.1	Extent of Vegetation				
	Extensive vegetation growth, (80 to 100 % ground cover)			6	
	Moderate vegetation growth (40 to 80% ground cover)			4-5	
	Low vegetation growth (20 to 40% ground cover)			2-3	
	Sparse vegetation (<20% ground cover)			1	6
C.2.2	ESTIMATED HABITAT USAGE - TERRESTRIAL/AVIFAUNA				
	High: High Biodiversity/ High Occurrence/Calving, Denning or Nesting Area			5-6	
	Moderate: Moderate Biodiversity, Migratory			3-4	
	Low: Low biodiversity: rare sightings			1-2	6
C.3	POTENTIAL HUMAN EXPOSURE THROUGH LAND USE				
C.3.1	Presence/Occupation	*likehood of contact*			
	Duration of contact	high	moderate	low	
	High - Numerous visits, summer camp	6	6	4	
	Moderate - occasional summer camp	6	4	2	8
	Low - Infrequent visits or winter camp	4	2	1	
C.3.2	Proximity to Drinking Water Source				
	0 to 100 m			8	
	100 to 300 m			5-7	
	300 to 1 km			2-4	
	greater than 1 km			1	8
C.3.3	Food Consumption				
	High quantity of sedentary organisms - marine & plant life			8	
	Moderate quantity of sedentary organisms - marine & plant life			6	
	Low quantity of sedentary organisms - marine & plant life			4	
	No consumption			0	8
	High quantity of migratory organisms			2	
	Moderate quantity of migratory organisms			1	
	Low quantity of migratory organisms			0.5	
	No consumption			0	2
	SPECIAL CONSIDERATIONS				
				+/-5	
	TOTAL SCORE - RECEPTORS				***50***
	TOTAL SCORE				150

Appendix C
Disposal Requirements For Items Potentially Found At Dew Line Sites

Hazardous materials (as defined by federal or territorial legislation) will not be landfilled at the DEW sites.

The following table includes items that could be found at DEW sites and provides the treatment of these items as part of the clean-up.

Item	Disposal
Waste oil	Treat as per the DLCU Barrel Protocol/GNWT criteria
PCB-containing equipment (e.g. transformers/capacitors)	Treat as per federal regulations
Asbestos	Bag and bury according to GNWT regulations
Sewage-liquid	Treat as per wastewater discharge criteria
Sewage-solid	Treat as soil
Lead and PCB based paints	Treat as per federal regulations
Radioactive tubes	Not suitable for landfill
Scrap metal	Bury in engineered landfill on site
Radar components	Bury in engineered landfill on site
Fuel barrels	Treat as per the DLCU Barrel Protocol/GNWT criteria
Lime	Not suitable for landfill
Antifreeze	Treat as per the DLCU Barrel Protocol/GNWT criteria
Wood	Bury in engineered landfill on site
AVGAS (aviation fuel)	Treat as per the DLCU Barrel Protocol/GNWT criteria
Sulfamic acid	Not suitable for landfill.
Cathode-ray tubes and screens	Bury in engineered landfill on site
Filtron tubes	Not suitable for landfill
Oscillators	Bury in engineered landfill on site
Meters	Not suitable for landfill if PCB- or mercury-containing
Copper wire	Bury in engineered landfill on site
Transmission fluid	Treat as per the DLCU Barrel Protocol/GNWT criteria
1,1,1-trichloroethane	Not suitable for landfill
PBX telephone equipment	Bury in engineered landfill on site
Mercury vapour rectifier tubes	Not suitable for landfill
Paint thinners	Treat as per the DLCU Barrel Protocol/GNWT criteria
Batteries	Not suitable for landfill
Chlorinated hydrocarbons	Treat as per the DLCU Barrel Protocol/GNWT criteria
Corrosion inhibitors	Not suitable for landfill
Lye	Not suitable for landfill
Corrosives	Not suitable for landfill

Item	Disposal
Plastic	Bury in engineered landfill on site
Solvent	Treat as per DLCU Barrel Protocol/GNWT criteria
Dynamite	Not suitable for landfill
RF Interference filters	Bury in engineered landfill on site
Generators	Clean and bury in engineered landfill on site
Scopes	Bury in engineered landfill on site
Vehicles	Clean and bury in engineered landfill
Rubber fuel bladders	Clean and bury in engineered landfill on site
Creosote-treated poles	Bag and bury in engineered landfill on site
Compressed gas cylinders	Vent, puncture and bury in engineered landfill on site
Refrigeration equipment	Recover freon and bury in engineered landfill on site
Paper	Bury in engineered landfill on site

Appendix D

Sample Questions For Community Consultations

Habitat Considerations

- Are there fish/birds/clams in the pond/lake/bay immediately down hill of the landfill?
- Are there many different types of fish/birds/clams in the pond/lake/bay? What species have you observed in that water body?
- Does spawning or nesting occur in the pond/lake/bay?
- Do the animals in the pond/lake/bay stay all year round or are they migratory?
- Have you observed any land animals such as caribou, fox or bear at the DEW Line site? How many? Was the wildlife feeding/calving/nesting/burrowing on site or near a landfill?

Exposure Considerations

- Does the community fish in the pond/lake/bay down hill of the landfill? Where does the community fish?
- Does the community collect clams/sculpins/urchins from the lake/bay?
- Does the community hunt seal, walrus or whales from the bay?
- Does the community pick berries or use the vegetation down gradient of the landfill?
- Does the community hunt at the DEW Line site? What do they hunt?
- How often do the community residents visit the site? Do you camp there seasonally? Where is the camp located?
- Where is drinking water taken from on-site?

Special Considerations

- Is the community aware of this landfill? Are there any special considerations?

Appendix E

Tier I and Tier II
DEW Line Clean-up Criteria

Substance	Units	DCC Tier I	DCC Tier II*
Arsenic	ppm	-	30
Cadmium	ppm	-	5.0
Chromium	ppm	-	250
Cobalt	ppm	-	50
Copper	ppm	-	100
Lead	ppm	200**	500
Mercury	ppm	-	2.0
Nickel	ppm	-	100
Zinc	ppm	-	500
PCB's	ppm	1.0***	5.0

* concentrations exceeding this limits are classified as Tier II Soils except where the concentrations exceed federal regulations (referred to herein as "CEPA" soils)

** concentrations between 200 and 500 ppm are classified as Tier I Soils

*** concentrations between 1.0 and 5.0 ppm are classified as Tier I Soils

Appendix F

Confirmatory Testing Protocol

Confirmatory Testing Grid Sizes

Size of area	Grid size	# Perimeter samples analyzed	# Interior grid samples analyzed
<100 m^2	3x3 m	all	all
>100 m^2, <2500 m^2	6x6 m	50%	40%
>2500 m^2	12x12 m	50%	40%

Where the excavation has an irregular shape, samples from the perimeter of the excavated area are to be collected following the shape of the excavation, rather than the grid if the grid points do not fall on the edge of the excavation.

Samples at the grid intersections will be point samples (as opposed to composite samples from each cell on the grid),to ensure simplicity of sampling and clarity of the result.

Appendix G

Barrel Contents Criteria and Disposal

Introduction

In order to determine the correct disposal method for barrels and their contents, the contents must first be identified. All barrel contents will be sampled and analyzed. Analytical data obtained for the samples collected from barrels located at the site will be compared to the criteria included in Table 1, below. Barrel contents are identified as organic or aqueous and the concentrations of glycols, alcohols, PCBs, chlorine, cadmium, chromium and lead are determined. Uncontaminated aqueous phases can be disposed of on the land; uncontaminated organic phases can be incinerated; contaminated aqueous material should be scrubbed free of organic material; and contaminated organic material should be disposed of as hazardous material.

Table 1: Barrel Protocol Criteria and Disposal Summary

Phase	% glycols or alcohols	PCB	Cl	Cd	Cr	Pb	Disposal
Organic	-	<2	<1000	<2	<10	<100	Incineration
Organic	-	>2	>1000	>2	>10	>100	Ship south
Aqueous	>2 %	>2	>1000	>2	>10	>100	Ship south
Aqueous	>2 %	<2	<1000	<2	<10	<100	Incineration
Aqueous	<2%						Scrub and discard

A. Inspection

1. All barrels are to be inspected to address the following items which shall be recorded and used as a guide prior to opening barrels.

2. Symbols, words, or other marks on the barrel that identify its contents, and/or that its contents are hazardous: e.g. radioactive, explosive, corrosive, toxic, flammable.
3. Symbols, words, or other marks on the barrel that indicate that it contains discarded laboratory chemicals, reagents, or other potentially dangerous materials in small-volume containers.
4. Signs of deterioration or damage such as corrosion, rust, or leaks at seams, rims, and V grooves.
5. Spillage or discoloration on the top and sides of the barrel.
6. Signs that the barrel is under pressure such as bulging and swelling.

B. Sampling

1. Barrels shall not be transported until it has been determined that they are not under pressure, do not leak, and are sufficiently sound for transport.
2. Barrels to be sampled should be set in an upright position, provided that this does not cause them to leak and that it is physically possible.
3. Barrels should only be opened using heavy equipment, according to accepted procedures and under qualified supervision.
4. Once open, barrels will be sampled by personnel wearing proper personal protective gear. Samples of the contents of all barrels shall be extracted using a drum thief.
5. In instances where there are a large number of barrels with obviously similar contents, these can be grouped together and 30 to 40% of the barrels in the group sampled. Barrels containing less than 50 mm of liquid may be combined with compatible material prior to sampling; samples inferred to contain only water on a visual examination shall be tested prior to this consolidation. Barrel contents, which consist of black oil, shall not be consolidated.
6. All barrels shall be clearly numbered using spray paint or other suitable marker. The number on this label should be the only sample coding provided to the laboratory.
7. The barrel locations and barrel sample descriptions should be recorded.
8. Samples should be kept at ambient temperatures and shipped by guaranteed freight to laboratories where they should be kept cold pending analysis.

C. Testing

1. Liquid samples shall be inspected and classified as either containing water or organic materials. Samples thought to contain water shall be analyzed to confirm that they are indeed water, and contain less than 2% glycols or alcohols.
2. The contents of barrels containing organic materials, including aqueous samples which contain more than 2% glycols or alcohols, shall be tested for PCBs, total

chlorine, cadmium, chromium and lead, in addition to identification of the major components e.g. fuel oil, lubricating oil.

3. Contents of barrels which contain two or more phases shall have all phases analyzed; the organic phases as described above and the aqueous phase to ascertain whether it contains less than 2% organic substances. In addition, the aqueous phase shall be tested for any components found in the organic phases above the criteria described below.

D. Disposal of Barrel Contents

1. Barrels containing only rust and sediment shall be treated as empty barrels.
2. Barrel contents comprising water only (less than 2% glycols or alcohols) shall be transferred to an open vessel such as a utility tub or half-barrel and any organic material removed by agitation with a pillow or segment of oil absorbent material. The water may then be discarded on to the ground that is a minimum of 30 meters distance from natural drainage courses. Used oil absorbent material shall be treated as described in below (D.5.).
3. Barrel contents which are composed of water with glycols and/or alcohols or organic phases, and which contain less than 2 ppm PCBs, 1000 ppm chlorine, 2 ppm cadmium, 10 ppm chromium, and 100 ppm lead, may be disposed of by incineration. Alternatively these contents may be disposed of off-site at a licensed disposal facility. The solid residual material resulting from incineration shall be subjected to a leachate extraction test. Material found to be not leachate toxic shall be disposed of as DCC Tier II contaminated soil. Leachate toxic material shall be treated as hazardous waste and disposed of off-site at a licensed disposal facility.
4. Barrel contents, which contain greater than 2 ppm PCBs, 1000 ppm chlorine, 2 ppm cadmium, 10 ppm chromium or 100 ppm lead shall be disposed of off-site at a licensed disposal facility. Contents may be combined with compatible materials for shipping purposes. Flash points may be required to be determined if they cannot be inferred from the product identification.
5. Used oil absorbent material should be treated as hazardous waste and disposed of off-site at a licensed disposal facility. If it is shown to be uncontaminated with PCBs (< 2 ppm), chlorine (< 1000 ppm), cadmium (< 2 ppm), chromium (< 10 ppm) and lead (< 100 ppm), it may be incinerated on-site.

E. Disposal of Barrels

1. Empty barrels may be crushed or shredded and landfilled on-site as non-hazardous waste after they have been cleaned in an appropriate manner. The barrels shall be

crushed in such a manner so as to reduce their volume by a minimum of 75%. Shredded barrels may be disposed of off-site as recycled metals.

Appendix H

Post Construction Landfill Monitoring Regime

1.0 Types of Landfills

There are four types of landfills that require monitoring:

- New landfills for non-hazardous materials and Tier I soil;
- Landfills to be closed by the addition of granular fill and regraded;
- Landfills to be closed with leachate containment; and
- Tier II soil disposal facilities.

2.0 Monitoring

New landfills are to be constructed for the disposal of non-hazardous demolition wastes, site debris and Tier I soil. These landfills, constructed according to specifications, are considered to pose low potential environmental risks as the contents and placement of the materials in the landfill are known. The monitoring of these landfills will be limited to a visual inspection program to evaluate the stability of the landfill.

Existing landfills that are to be regraded will be monitored for leachate periodically by the collection of soil and/or water samples from test pits at the toe of the landfill, in addition to visual inspection.

For existing landfills that have been classified as moderate potential environmental risk, and proposed Tier II soil disposal areas, the design in both cases is to incorporate a leachate containment system, consisting of synthetic liners (geocomposite clay liners, and/or geomembrane liners) and promotion of permafrost aggradation through the landfill contents. The monitoring program for these landfills will include thermal monitoring of the ground temperatures in and around the landfill, collection and analysis of soil samples, collection and analysis of water from wells around the landfill, and visual inspection.

3.0 Description of Monitoring Components

3.1 Visual Inspection

The physical integrity of the landfill will be inspected and reported using photographs (from the air as well as ground level) and hand drawn sketches. Documented observations should include:

- Signs of damage from settlement, ponding, frost action, erosion, and lateral movement.
- Sloughing of berms, thermal contraction cracks etc.

3.2 Soil and Water Sampling

Soil and water samples, representing background as well as baseline conditions, will be collected. Results of analyses of samples from landfills will be compared to these baseline and background samples as this is indicative of changing environmental conditions at the site.

In general, one monitoring well will be placed upgradient and three will be placed downgradient. This allows the assessment of hydraulic gradient and evaluation of potential impacts. Soil samples will be collected from the toe of the landfill, and will generally be taken from the same locations as the wells. Soil samples at the toe of the landfill reflect chronic input from water and are a very important indicator of leachate.

Soil and water samples will be tested for:

- PCBs (polychlorinated biphenyls);
- TPH (total petroleum hydrocarbons),; and;
- Inorganic elements: arsenic, cadmium, chromium, cobalt, copper, lead, nickel and zinc.

If the landfill is close to a drinking water source and has the potential to have an impact on it, the water samples will be analyzed for the following parameters in addition to the compounds and elements listed above:

- inorganic elements by ICP scan;

- major ions, hardness, and total dissolved solids,; and;
- pH and conductivity.;

The intent of the additional analyses is to provide added information to evaluate the potential impacts related to the landfill, and not necessarily to provide an assessment of the potability of the water source. In this latter case, the results of the analyses of these drinking water samples will be compared to the most current version of Canadian and/or Territorial standards for drinking water for the parameters analysed, in addition to comparison with background and baseline data.

3.3 Thermal Monitoring

As indicated previously, one component of the leachate containment system incorporates aggradation of the permafrost through the landfill contents such that the active layer does not penetrate the waste materials. Geothermal analyses were carried out to predict the length of time for freezeback of the landfill; long-term and short-term thermal regime in the ground; and the depth of the active layer in the cover material. The analyses have shown that it takes several years for the landfill temperatures to equilibrate and stabilize.

A thermal monitoring system provides measurement of sub-surface ground temperatures, which allows comparison to and verification of the predicted ground temperatures. The thermal monitoring system consists of installation of thermistor strings, with "thermistor beads" at select intervals to provide ground temperature profiles at various locations within the landfill. The thermistor strings are attached to automated data-loggers which allow for remote data collection. In general, a minimum of three thermistors will be placed; the actual number will be evaluated on a landfill-specific basis. Thermistor installation will be in accordance with standard engineering practice.

Checklists for the collection of monitoring data are presented in Appendix I.

4.0 Monitoring Frequency

Generally, the post-construction monitoring program would have three phases, each with a different objective.

4.1 Phase I: Monitoring of conditions to confirm that equilibrium is achieved.

During Phase I, sites where leachate containment and/or Tier II soil facilities have been constructed, monitoring will take place on an annual basis, for an estimated period of five years following construction. The five-year term was selected on the basis that ground-temperature thermal regimes at these specific landfills would require three to five years to reach equilibrium.

At other locations, where existing landfills have been regraded and new landfills have been constructed, Phase I monitoring will be carried out on in the first, third and fifth years following construction.

An evaluation of the Phase I data will be carried out at the end of five years to confirm that thermal and chemical equilibrium had been achieved, and that no stability issues have been identified. The Phase I monitoring program may be extended, if required.

4.2 Phase II: Verification of equilibrium conditions established during Phase I.

The monitoring frequency in Phase II be downgraded from Phase I, and be carried out according to the following schedule: year 7, year 10, year 15 and year 25. Year 25 would mark the end of Phase II monitoring.

4.3 Phase III: Monitoring for long term issues such as liner integrity, permafrost stability, and significant storm events.

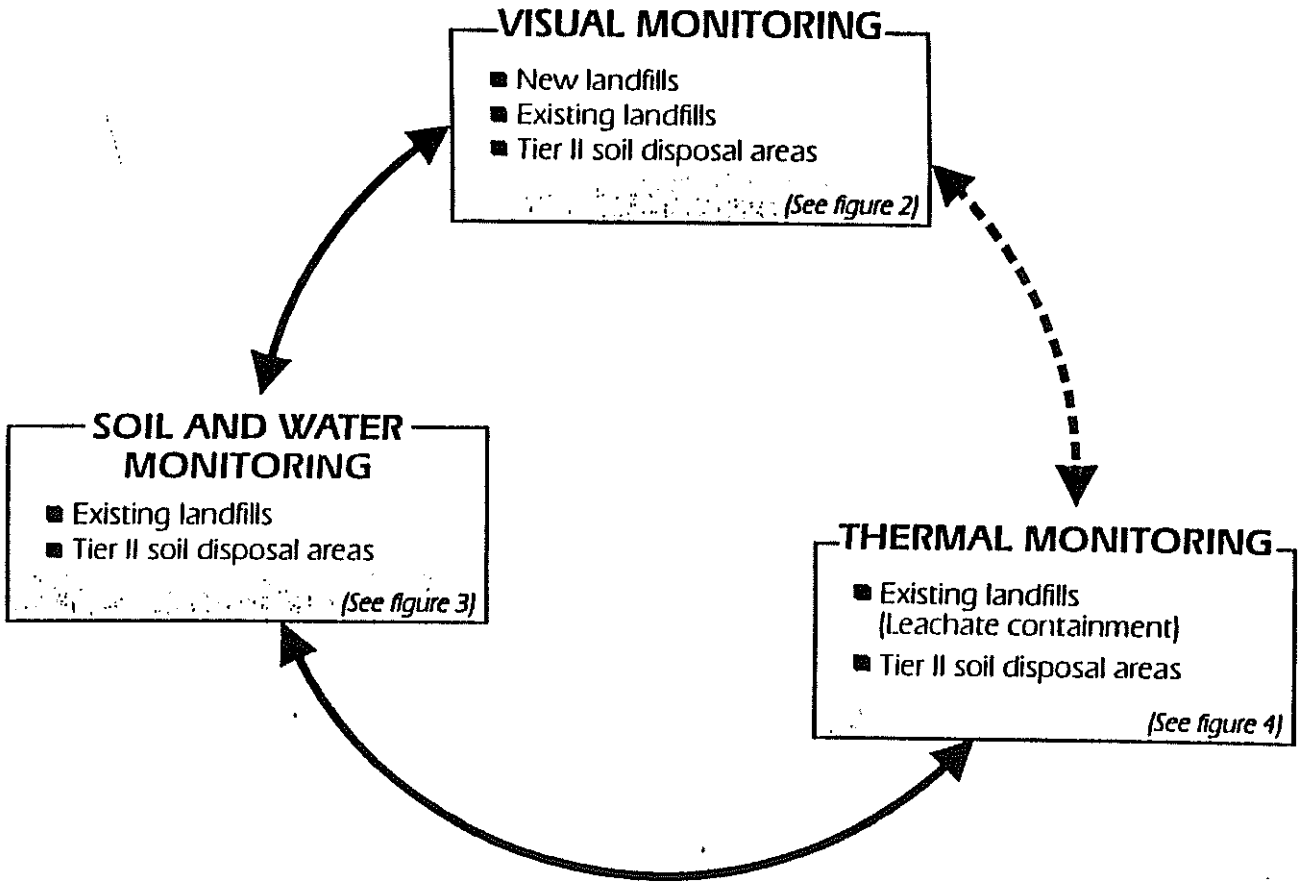
At the end of Phase II, 25 years after implementation of the remedial actions for a given landfill, a major re-evaluation of the monitoring program will be carried out prior to initiating Phase III. It is difficult to predict beyond 25 years how world events and improvements in technology may impact on monitoring requirements. Based on current technology and knowledge, a Phase III program should be implemented at 10 year intervals. The duration of the Phase III program will be estimated at the outset of the program and be subject to re-evaluation as new technologies are developed and new information becomes available.

5.0 Interpreting Monitoring Results

Monitoring results (thermal, chemical and visual) have to be interpreted in concert with one another. An increase in chemical concentrations, for instance, from one year to the next does not necessarily trigger action if there are no other signs of landfill instability. Stability problems would have to be established by a geotechnical engineer with northern experience. Action will be taken based on trends in chemical data rather than isolated results.

Normally, the first step to be taken when a potential problem is identified is to intensify the monitoring program. If a problem has been confirmed, then remedial action will be undertaken.

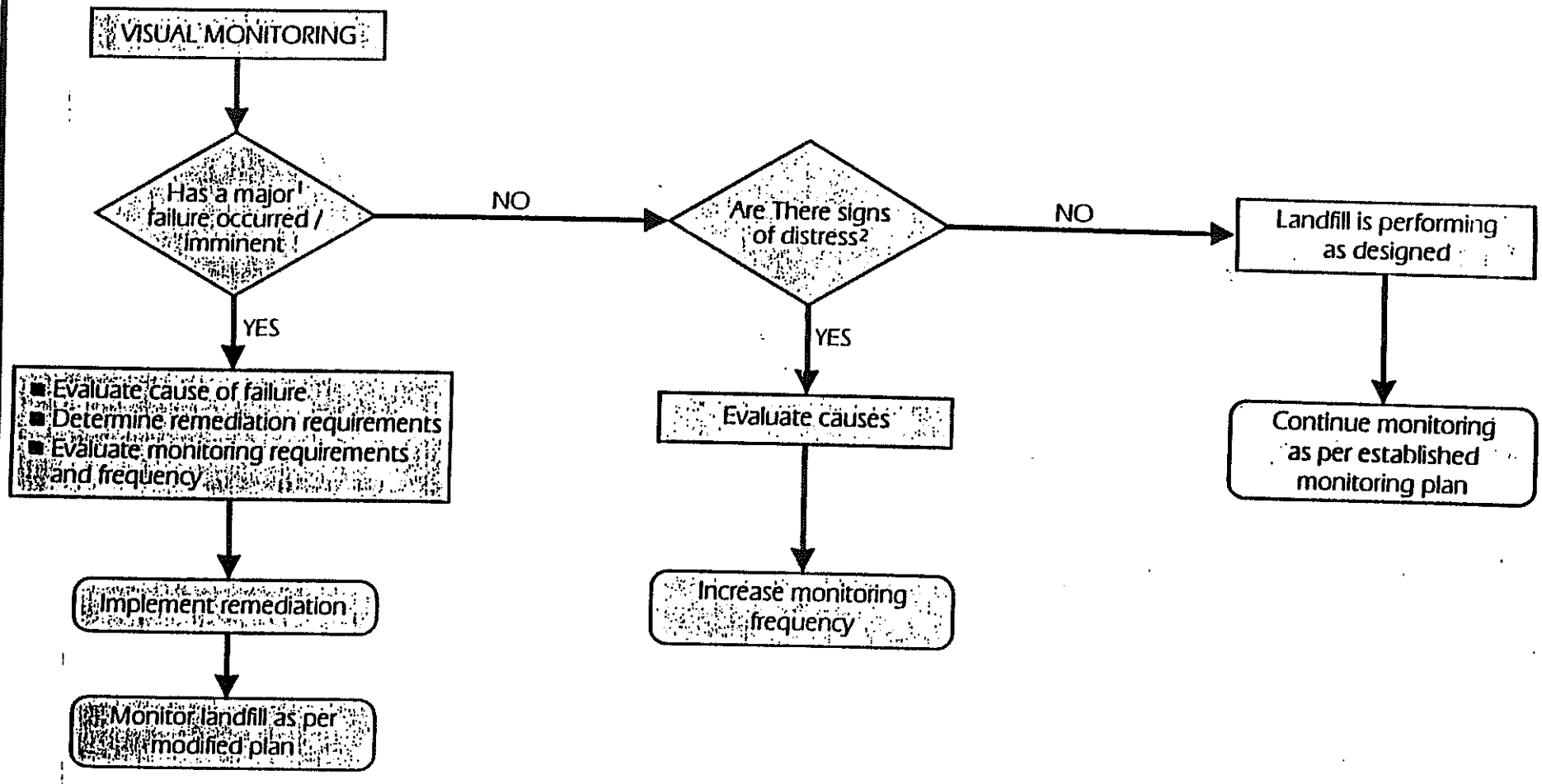
The flowcharts in Figures 1 to 4 illustrates the decision-making process to be applied to monitoring data. The following section outlines actions to be taken if the monitoring program indicates a deficiency in a landfill.



DEW Line Clean-Up
Environmental Working Group
LANDFILL MONITORING PROGRAM

SUMMARY FLOW CHART

Figure



Notes:

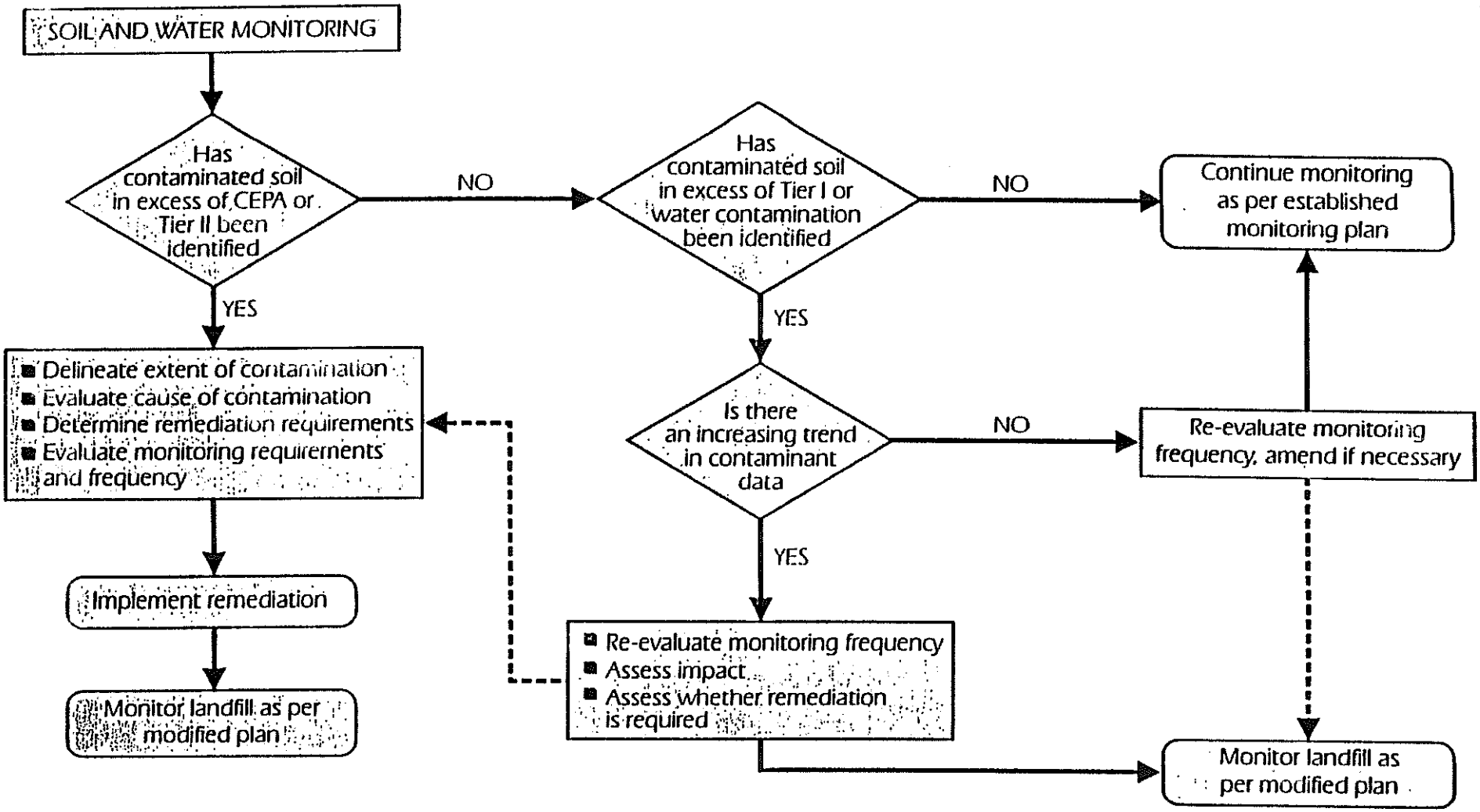
1 Major Failure: significant exposed debris (>25% of surface area) due to erosion, settlement, frost action; berm failure (slope stability)

2 Signs of Distress: Voids due to settlement, ponding on surface, and\or tension cracks, and/or erosion.

DEW Line Clean-Up
Environmental Working Group
LANDFILL MONITORING PROGRAM

VISUAL MONITORING FLOW CHART

Figure

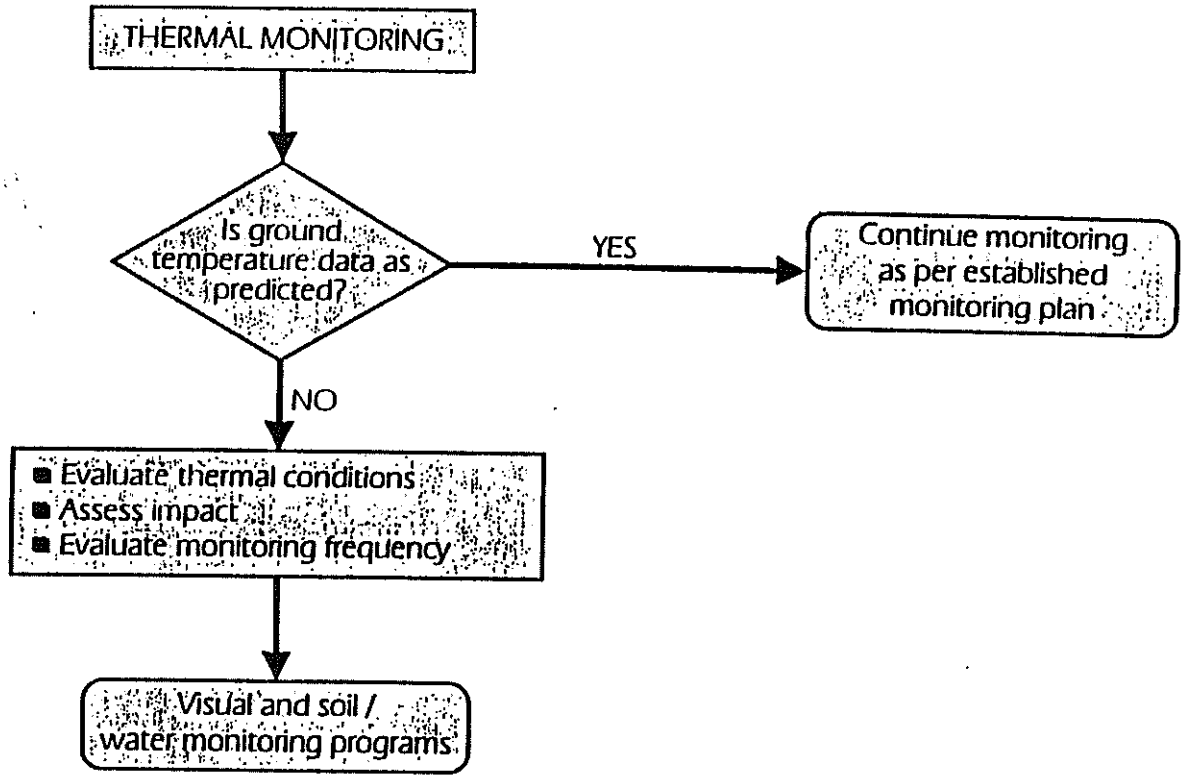


Note:
Water contamination to be evaluated relative to baseline and background concentrations.

DEW Line Clean-Up
Environmental Working Group
LANDFILL MONITORING PROGRAM

SOIL AND WATER MONITORING FLOW CHAR

Figure



DEW Line Clean-Up
Environmental Working Group
LANDFILL MONITORING PROGRAM

THERMAL MONITORING FLOW CHART

Figure

6.0 Impact of Monitoring Results

The possible results and the associated potential mitigation requirements for the landfill monitoring components are described in the following subsections. For all instances, the mitigation requirements are dependent on the severity of the deficiency, and will be assessed by a professional geotechnical engineer with northern engineering design and construction experience. In addition, the assessment and implementation of resulting remediation requirements will be carried out in a staged approach to ensure that the proposed solutions address the specific requirements in a logical and cost effective manner.

6.1 Visual Inspection

If the results of the visual inspection program indicate evidence of significant settlement, ponding, or frost jacking, it may be necessary to implement one or more of the following mitigative measures:

- increase the frequency of the visual monitoring program
- place erosion protection material such as riprap, vegetation mats, etc.
- recompact existing debris material and existing granular material
- place additional granular fill
- regrade, as required, to promote positive drainage away from the deficient landfill area.

It should be noted that settlement of the landfill surface may not necessarily result in failure of the landfill. Settlement (typically differential settlement) that results in ponding and infiltration of surface water could lead to erosion and frost jacking problems.

If the visual monitoring program results indicate evidence of sloughing of landfill perimeter berms and thermal contraction cracks, it may be necessary to implement one or more of the following mitigative measures:

- flatten granular berm slopes
- compact existing granular slopes
- place and compact additional granular fill material

6.2 Soil and Groundwater Monitoring

The results of the soil and groundwater monitoring program will be compared against baseline data established prior to the initial landfill development or remediation program. Results of the analysis of soil and groundwater samples that show decreasing trends of contamination at the perimeter of landfills typically indicate that the implemented landfill remediation has been effective. Conversely, if the results indicate increasing levels of contamination, then it may be necessary to implement one or all of the following:

- Increase the frequency of the monitoring program.
- Carry out a review and evaluation of the nature and extent of the contamination, including the incorporation of the results of the visual monitoring program. The major objective of this evaluation will be to determine the cause of the contaminant migration problem, and in particular to determine if it is the result of ineffective design, material (e.g. liner) failure, improper compaction, selection and use of inadequate granular material, poor grading, etc. This evaluation may require intrusive investigation into and around the landfill.
- Depending on the results of the above, it may be necessary to remove and replace liner material, reconstruct containment berms, etc.
- Assess the requirement to excavate and dispose of the contaminated soil; this would include the delineation of the vertical and areal extent of the contamination.
- Excavate and dispose of contaminated soil and/or excavate all or part(s) of the landfill, as required.

The requirement for the specific scope and extent of remediation, as outlined above, will also incorporate an risk evaluation of the potential impacts of the contamination based on the principles defined in the Landfill Risk Evaluation Matrix. The need for the risk evaluation is predicated on the understanding that not all affected sites pose the same risk to the environment, and consequently remediation requirements will vary.

6.3 Thermal Monitoring

The results of the thermal monitoring program will be compared against the parameters for freezeback that were incorporated into the geothermal design of the landfills. It is important that the overall assessment of these results consider the results of both the visual and soil/groundwater monitoring programs. If the thermal monitoring results indicate ground temperatures that are significantly higher (greater than 2° C) than

predicted during the geothermal analyses carried out as part of the design, then it may be necessary to implement one or more of the following:

- Increase the frequency of the recording and assessment of results from the thermal monitors.
- Establish, based on the results of the soil and groundwater monitoring programs, if groundwater and/or soil contaminant levels beyond the perimeter of the landfill have increased. Incorporate the results of a risk assessment. Assess the impacts, as outlined above, to determine the appropriate remediation requirements.
- If it established that a slower than expected freezeback period has resulted in the migration of contamination beyond the landfill and depending on the results of the above risk assessment, then it may be necessary to implement one or more of the following:

    - determine if the rate of the freezeback progress is continuing, or if freezeback within the landfill has terminated; is at steady-state;
    - excavate and dispose of contaminated soil and/or excavate all or part of the landfill, as required;
    - place additional granular cover material or other insulating material (styrofoam insulation, vegetation) over the landfill to provide an increased insulation barrier over the landfill;
    - reconstruct and/or re-saturate the perimeter berms of the landfill.

Appendix I

Landfill Monitoring Checklist

DEW LINE CLEANUP
LANDFILL MONITORING CHECKLIST

MONITORING PROGRAM

LANDFILL TYPE	Visual	Soil and Water	Thermal
New Landfill (Non-Hazardous Wastes)	X		
Landfill requiring Regrading	X	X	
Landfill requiring Leachate Containment	X	X	X
Tier II Soil Disposal Facilities	X	X	X

SITE: _____

LANDFILL DESIGNATION: _____

LANDFILL TYPE: _____

DATE: _____

MONITORING EVENT NO.: _____

NAME: _____

WEATHER CONDITIONS: _____

VISUAL INSPECTION CHECKLIST

Carry out a visual inspection of the landfill surface, berms, toe of berms and identify potential areas of distress as follows:

1. Settlement:
   - a) Is there differential settlement occurring on the surface?
     - i) low areas or depressions;
     - ii) voids forming
   - b) What is the extent of settlement?
     - i) percent of surface area affected;
     - ii) localized areas or continuous;
     - iii) how deep;
   - c) Where is the settlement occurring?
     - i) near berms, center of facility, etc.
   - d) Explain?
     - i) evidence of significant surface infiltration,
     - ii) water ponding on surface
     - iii) snow drifting

32. Erosion
   - a) Is there erosion occurring on the surface or berms of the landfill?
     - i) preferred drainage channels;
     - ii) sloughing of material;
   - b) What is the extent of erosion?
     - i) percent of surface area affected;
     - ii) localized areas or continuous;
   - c) Where is the erosion occurring?
     - i) along the toe, on the surface, through the berms;
   - d) Explain?
     - i) evidence of significant surface water run-off ;
     - ii) poor material type;

34. Frost Action

a) Is there frost action/damage to the landfill?
   i) exposure of debris due to uplift;
   ii) tension cracking along berms;
   iii) sorting of granular fill;

b) What is the extent of frost action?
   i) percent of surface area affected;
   ii) localized areas or continuous;

c) Where is the cracking, frost heaving occurring?
   i) along the toe, on the surface, through the berms;

d) Explain?
   i) poor material gradation;
   ii) poor compaction;
   iii) high water content, silt content in cover material;

45. Condition of Other Monitoring Instruments:

56. Provide detailed sketch and photographic record of landfill.

PRELIMINARY STABILITY ASSESSMENT

SOIL AND GROUNDWATER MONITORING FIELD CHECKLIST

1. Soil Samples:

Sample No:	
Field Measurements: VOC	
Soil Description:	
Analyses Requested	

2. Water Samples

Sample No: Well No.:	
Field Measurements :	pH Conductivity Temperature
Well Processing	Water level
	Purged well or standing water sampled
	Recovery Rates
Analyses Requested	

Comments:

Additional surface water samples: where, why, describe areas of stressed vegetation

THERMAL MONITORING CHECKLIST

Thermistor Number:
Location:

1. Download data
2. Replace battery pack
3. Check condition of connections and instrumentation
4. Save data to hard-drive and disk,.
5. Relock cap

Appendix J

Hydrocarbon Contamination Checklist

General

Date:

Name of Assessor:

Site Name:

Hydrocarbon Spill/Stain Location:

Hydrocarbon Source

What type of hydrocarbon is present in this stain? Consider the following:

Toxicity (Lubrication Oil, Diesel, Gasoline/Avgas)
Fluidity
Solubility
Volatility

What is the concentration of total petroleum hydrocarbons in parts per million (ppm)? Is it above 2500 ppm?

What is the approximate volume of contaminated soil in cubic metres?

Pathways

1. Is the contaminated soil in a stable location or on a slope?

2. What is the estimated organic matter in the contaminated soil? (ie. <0.1%, <5%, >5%)

3. What is the estimated grain size of the contaminated soil? Consider the following:

   Coarse (D_{50} > 75 micron)
   Fine (D_{50} < 75 micron)

4. What is the distance from the contaminated soil to a marine or freshwater environment?

5. What is the annual precipitation of the site?

6. What is the mean summer temperature?

Potential Impacts on Receptors

1. What is the distance to the nearest down gradient marine or freshwater habitat?

2. Is this a potential or known drinking water source for terrestrial animals or humans?

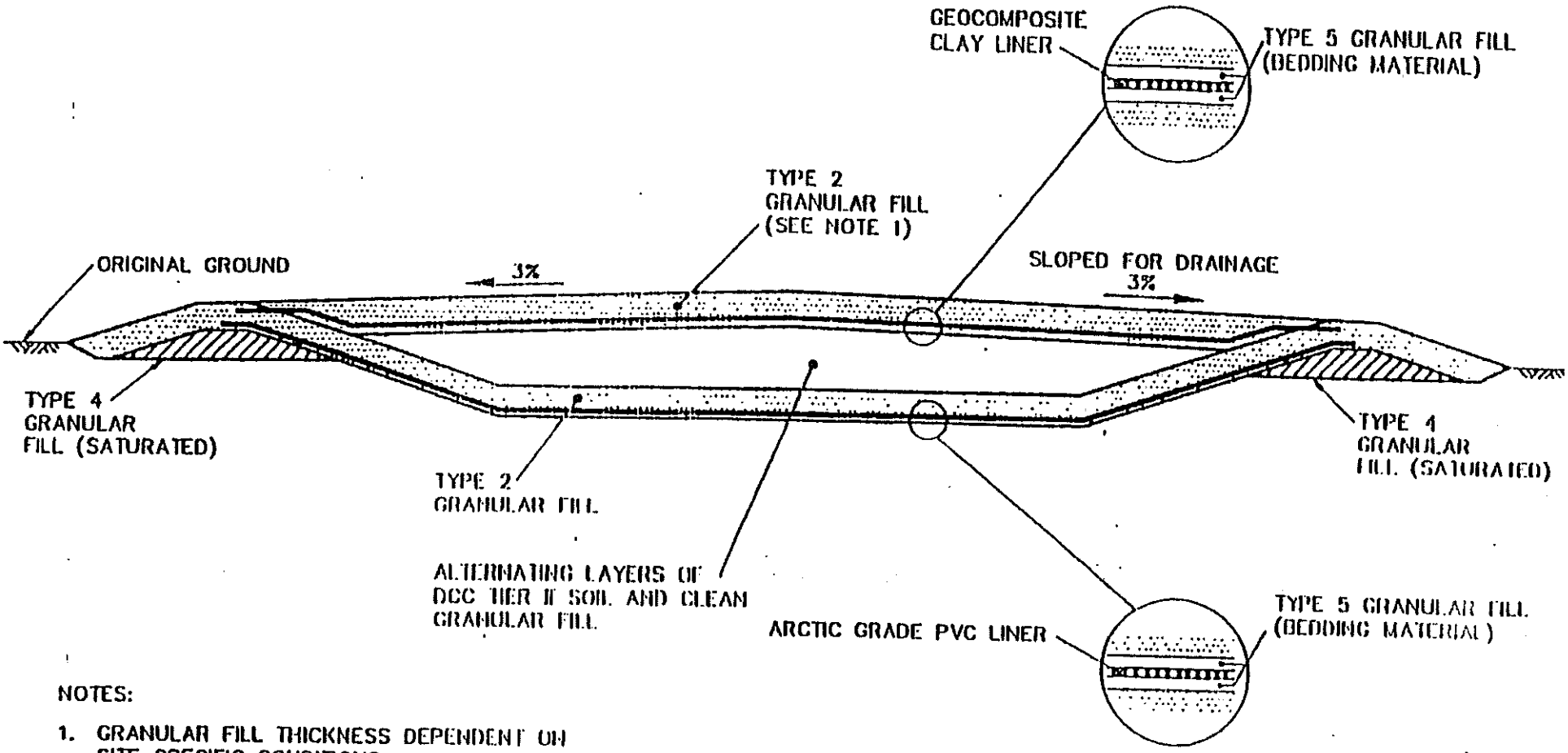
3. What is the down gradient habitat usage? Consider the following:

   Grazing, nesting, denning, spawning, calving
   High, medium, or low number of sitings.
   High, medium or low biodiversity.

4. Is this area visited frequently by humans for hunting, fishing, gathering or camping purposes? What is consumed and from where is it obtained?

Appendix K

Tier II Disposal Facility



NOTES:

1. GRANULAR FILL THICKNESS DEPENDENT ON SITE SPECIFIC CONDITIONS.
2. GRANULAR FILL GRADATIONS ARE SITE SPECIFIC.

UMA

SHE

TIER II DISPOSAL FACILITY

TYPICAL CROSS SECTION

AGREEMENT BETWEEN

Nunavut Tunngavik Incorporated

And

Her Majesty In The Right Of Canada,

Represented By

The Minister Of National Defence

With Respect To Economic Benefits For Inuit

In The Clean-Up And Restoration Of

Distant Early Warning Sites

Within The Nunavut Settlement Area

(NTI-DND Economic Agreement)

CONTENTS

PREAMBLE

WHEREAS fifteen Distant Early Warning (DEW) Line Sites are located on Department of National Defence (DND) reserves within the Nunavut Settlement Area (NSA);

AND WHEREAS DND is undertaking an environmental clean-up of the DEW Line sites, facilities and associated areas;

AND WHEREAS the Inuit and the Federal Government have an interest in protecting the ecosystem integrity and the existing and future well-being of the residents and communities of the NSA and increasing the participation of Inuit and Inuit firms in business and employment opportunities in the NSA;

AND WHEREAS on September 1, 1998 DND and NTI have entered into an agreement to establish a framework for the remediation and restoration of the DEW Line Sites in the NSA;

AND WHEREAS the Parties wish to enter into an agreement addressing the participation of Inuit in the clean-up of DEW Line sites in the Nunavut Settlement Area, in order to achieve a cost-effective and environmentally sound clean up and restoration of DEW Line Sites, which optimises economic benefits and opportunities for Inuit in employment, the provision of goods and services, training and the transfer of technology, in accordance with the *Nunavut Land Claims Agreement* (NLCA), and specifically Article 24 of the NLCA;

NOW THEREFORE, in consideration of the premises and mutual covenants contained herein, the Parties agree as follows:

1.0 DEFINITIONS

Clean-up Contract means a contract entered into by DND's contracting agent and a Contractor for a Site clean-up;

Contractor means the party who has contracted with DND's contracting agent to carry out a Site clean-up;

Contracting Working Group means the working group established under Section 4.2 of the Agreement;

DEW Line Site means one of the Distant Early Warning Sites listed in Section 3.1 below;

DIAND DEW Line Sites means the Distant Early Warning Sites in Nunavut not listed in Sections 3.1 and 3.2;

DND means the Crown in right of Canada represented by the Minister of National Defence or his delegate;

Inuit firm has the same meaning as in the *Nunavut Land Claims Agreement*;

Inuit Firm Registry is the comprehensive list of Inuit firms maintained in accordance with Paragraph 24.7.1 of the *Nunavut Land Claims Agreement;*

MIEC means the Minimum Inuit Employment Content set in accordance with Section 5.0 of this Agreement;

MICC means the Minimum Inuit Content for Contracting set in accordance with Section 6.0 of this Agreement;

NLCA means *Nunavut Land Claims Agreement;*

NTI has the same meaning as "Tungavik" under Section 1.1.1 of the NLCA;

NTI-DND Environmental Agreement means "The Agreement Between Nunavut Tunngavik Incorporated and the Department of National Defence for the Clean-up and Restoration of DEW Sites Within the Nunavut Settlement Area" dated September 1, 1998;

Nunavut Settlement Area has the same meaning as in the *NLCA*;

Parties means Nunavut Tunngavik Incorporated and the Department of National Defence;

Regional Inuit Association means the Kivalliq Inuit Association, the Qikiqtani Inuit Association or the Kitikmeot Inuit Association or their successors;

Representative Occupational Grouping means a category of personnel required for a Site clean-up classified by occupation or type of work to be performed;

Registry has the same meaning as "Inuit Firm Registry";

RIA means "Regional Inuit Association";

Site means a "DEW Line Site" that is, or is projected to be, remediated and restored, as provided for in the NTI-DND Environmental Agreement;

Steering Committee means the Committee established under Section 4.1 of the Agreement;

Subcontractor means a party who contracts with a Contractor or Subcontractor to perform any part of the Contractor's obligations on a Site;

Work means materials and services furnished or provided to perform a clean-up or restoration of a Site.

2.0 OBJECTIVES

2.1 The objectives of this Agreement are as follows:

a) to complement the NTI/DND environmental provisions as set out in the NTI-DND Agreement for the Clean-up and Restoration of DEW Sites Within the Nunavut Settlement Area, 1 Sept. 1998;

b) to further the objectives of Article 24 of the NLCA in relation to the DEW Line Clean-up in the NSA;

c) to achieve an efficient and cost-effective clean-up and restoration of the DEW Line Sites in the NSA;

d) to achieve:

i) increased participation by Inuit firms in business opportunities generated by the clean-up;
ii) improved capacity of Inuit firms to compete for government contracts;
iii) increased employment of Inuit up to a representative level;
iv) increased access by Inuit to career training, on-the-job training, apprenticeship, and other job-related programs, in order to develop a skilled and professional pool of labour available for work on the DEW Line Clean Up in the NSA; and
v) increased opportunities for Inuit to receive training and experience to successfully create, operate and manage businesses in Nunavut;

e) to establish a mechanism whereby successful Contractors fulfill agreed-upon commitments to levels of Inuit participation.

3.0 GENERAL

3.1 **Scope.** This Agreement applies to the Site clean-up at the following DEW Line Sites:

PIN 2 - Cape Young
PIN 3 - Lady Franklin Point
PIN 4 - Byron Bay
CAM 1 - Jenny Lind Island
CAM 2 - Gladman Point
CAM 3 - Shepherd Bay
CAM 4 - Pelly Bay (near Kugaaruk)
CAM 5 - Mackar Inlet
FOX M - Hall Beach
FOX 2 - Longstaff Bluff
FOX 3 - Dewar Lakes
FOX 5 - Broughton Island (near Qikiqtarjuaq)
DYE M - Cape Dyer

3.2 The Parties acknowledge that prior to the signing of this Agreement, the clean-up of Cape Hooper (FOX 4) and Cambridge Bay (CAM M) had been completed. Note that the process for awarding the contracts for the clean-up of Pelly Bay (CAM 4) and Broughton Island (FOX 5) will have started prior to the timelines contemplated in this Agreement.

3.3 **No Precedent.** This Agreement is not to be construed as a precedent for any other activities of DND, Canada or any third party. Nothing in this Agreement shall be interpreted or used to define the rights of the Parties, Canada or any third party in relation to any matter under the NLCA or to interpret any Article of the NLCA except for the purpose of this Agreement.

3.4 **Urgency.** The Parties recognize the urgency of the matters dealt with in this Agreement and agree to perform all required actions as expeditiously as possible.

3.5 **Nunavut Land Claims Agreement.** The Parties recognize and acknowledge their respective obligations to comply with the NLCA in connection with all Work.

3.6 **No Retrospectivity.** This Agreement binds the Parties only with respect to Site clean-ups, including selection of Contractors for Site clean-ups, that have not commenced as of the date of the signing of this Agreement, unless the Parties agree otherwise.

4.0 STEERING COMMITTEE AND CONTRACTING WORKING GROUP

4.1 Steering Committee

4.1.1 The Steering Committee established under Article 4.0 of the NTI-DND Environmental Agreement shall perform the following functions in connection with this Agreement:

a) establish Minimum Inuit Employment Content, under Section 5.10;

b) establish Minimum Inuit Content for Contracting, under Section 6.10;

c) review contract award issues, under Sections 8.3.1, 8.3.3, and 8.3.5 through 8.3.11; and

d) review Contractor's deviation from MIEC and MICC pursuant to Section 12.2;

e) consider other items of mutual concern related to the implementation of this Agreement, raised by either Party.

4.1.2 The Steering Committee may meet either in person or by teleconference.

4.1.3 The Steering Committee shall operate on the basis of consensus.

4.1.4 The Parties each shall be responsible for their respective costs associated with participating in Steering Committee meetings.

4.1.5 The Steering Committee shall establish and make publicly available procedures governing its operations and those of the Contracting Working Group, including, without limitation, conflict of interest, release of information provided to either Party, and procedures for decision-making that ensure fairness and due process to Contractors.

4.2 Contracting Working Group

4.2.1 A Contracting Working Group shall be established, composed of two members appointed by NTI and two members appointed by DND. The working group shall perform the following functions in connection this Agreement:

a) make a recommendation to the Steering Committee on the Minimum Inuit Employment Content (MIEC), under Section 5.8; and

b) make a recommendation to the Steering Committee on the Minimum Inuit Content for Contracting (MICC), under Section 6.8.

4.2.2 The Contracting Working Group shall operate on the basis of consensus.

4.2.3 The Parties each shall be responsible for their respective costs associated with participating in Contracting Working Group meetings.

5.0 MINIMUM INUIT EMPLOYMENT CONTENT

5.1 A Minimum Inuit Employment Content (MIEC) shall be set for each Site.

5.2 The MIEC for a Site is the minimum level of Inuit employment that DND shall require the Contractor to achieve for the clean-up of that Site.

5.3 The MIEC shall be expressed as a percentage, and shall be calculated by dividing the total number of Inuit employed, in person-days, by the total number of persons employed, in person days, for the term of the contract of a Site clean-up. The calculation shall include all on-site and off-site personnel employed by Contractors and Subcontractors. Off-site personnel shall include without limitation:

a) management and support personnel dedicated to the Site clean-up;

b) project management personnel employed by the Contractor;

c) technical or drafting personnel; and

d) expediting, shipping, payroll or accounting personnel.

5.4 The calculation of the MIEC shall not include:

a) project management staff at DND's contracting agent;

b) DND employees; and

c) any consultants contracted by DND or DND's contracting agent for the provision of advice concerning the specifications of the clean-up, contract management or other advice.

5.5 The MIEC shall be within a range of 65-85%.

5.6 Eight months prior to the scheduled commencement of a Site clean-up, DND shall provide NTI with DND's estimates of the types and level of positions that will be required for the conduct of the Site clean-up, in person-days, and broken out by Representative Occupational Grouping. The estimate shall be

provided in the form attached as Annex A.1. Education and skills profiles for Representative Occupational Groupings are listed in Annex B.

5.7 Within two months of the receipt of the information described in Section 5.6, NTI, in consultation with the RIAs, shall provide DND with a projection of the level of Inuit employment for the Site clean-up. The projection will be provided in the form attached as Annex A.2 to this Agreement. NTI's projection will be based on an analysis, for each Representative Occupational Grouping, of the number of Inuit qualified for work on the Site clean-up in relation to the employment opportunities using, to the extent possible, relevant available information on Inuit qualifications and employment.

5.8 Within one month of receipt by DND of the projection under Section 5.7, the Contracting Working Group shall recommend a MIEC for the Site clean-up. In making the recommendation to the Steering Committee for the MIEC, the Contracting Working Group shall take into account, for each Representative Occupational Grouping, the following factors:

a) NTI's projection of Inuit employment;

b) Inuit employment achieved on other DND DEW Line Site clean-ups to date, compared to the MIEC established for the Sites, and on DIAND DEW Line Sites;

c) the results achieved by training and apprenticeship programs for Inuit labour, to date; and

d) the projected impact on the availability of Inuit labour of other projects being undertaken in Nunavut.

5.9 Where the Contracting Working Group, after a reasonable effort, is unable to reach agreement on the MIEC for a Site clean-up, either Party may refer the MIEC to the Steering Committee for resolution.

5.10 The Steering Committee shall meet as soon as practicable following a recommendation under Section 5.8 or a referral under Section 5.9 to decide on a MIEC. In the event that the Steering Committee does not reach agreement on a MIEC within two weeks, either Party may refer the matter to Expedited Arbitration, as provided under Section 14.0.

5.11 The MIEC resulting from a decision of the Steering Committee or arbitrator shall be the MIEC required under Section 5.1.

5.12 The forms used to provide the information required under Section 5.6 and 5.7 may be modified for a Site clean-up upon the agreement of all members of the Contracting Working Group.

6.0 MINIMUM INUIT CONTENT FOR CONTRACTING (MICC)

6.1 A Minimum Inuit Content for Contracting (MICC) shall be set for each Site.

6.2 The MICC for a Site is the minimum level of Inuit business participation that DND shall require the Contractor to achieve for the clean-up of that Site.

6.3 The Minimum Inuit Content for Contracting (MICC) for a Site clean-up shall be expressed as a percentage, and shall be calculated by dividing the total dollar value of Inuit contracting content by the total dollar value of the Clean-up Contract. The total dollar value of Inuit contracting content shall be calculated by adding the dollar value of all subcontracts for goods or services to be obtained through, or awarded to Inuit firms, including all labour costs. Where the Contractor is an Inuit firm, the total dollar value of Inuit contracting shall also include the Contractor's share of the Clean-up Contract, which is the total dollar value of the contract minus the dollar value of all subcontracts.

6.4 The MICC shall be within a range of 60-75%.

6.5 Eight months prior to the start of a Site clean-up, DND shall provide NTI with an analysis of categories of contracting opportunities and an estimate of each category's percentage of total value of the Clean-up Contract for the Site clean-up. The analysis shall be in the form provided in Annex A.3.

6.6 Within two months of the receipt of the analysis required under Section 6.5, NTI, in consultation with the RIAs, shall provide to DND a list of Inuit firms that have declared themselves able to perform work on a Site clean-up, listed according to the categories of contracting opportunities identified under Section 6.5.

6.7 NTI shall request Inuit firms to provide corporate resumes to their RIAs that shall include information on relevant capacity and work experience. NTI shall deal with all information provided to it under this section as strictly confidential. DND shall treat all information provided to it by NTI under this section as commercial confidential information. DND shall not release such information unless prior approval is received from the Inuit firm, or DND is required to release such information under the provisions of the *Access to Information Act* and/or the *Privacy Act*.

6.8 The Contracting Working Group shall recommend the MICC for a Site to the Steering Committee within one month of receipt of the list of Inuit firms required under Section 6.6. This recommendation shall take into account the following factors:

a) Inuit firms' capacities;

b) historical data from prior Site clean-ups in Nunavut and the Western Arctic;

c) Site-specific characteristics; and

d) impact of other projects on the availability of Inuit firms.

6.9 In the event that the Contracting Working Group is unable to reach agreement on the MICC, as provided in Section 6.8, either Party may refer the matter to the Steering Committee.

6.10 The Steering Committee shall meet as soon as practicable following a recommendation under Section 6.8 or a referral under Section 6.9 to decide the MICC. In the event that the Steering Committee does not reach agreement on the matter within two weeks of a referral, either Party may refer the matter to Expedited Arbitration, as provided under Section 14.0.

6.11 The MICC resulting from a decision of the Steering Committee or arbitrator shall be the MICC required under Section 6.1 for a Site.

6.12 The form used to provide the information required under Section 6.5 may be modified for a Site clean-up upon the agreement of all members of the Contracting Working Group.

7.0 CONTRACTOR'S INUIT PARTICIPATION PLAN

7.1 DND shall require all companies that either submit a bid on a Clean-up Contract or enter into negotiations for a Clean-up Contract to provide a preliminary Contractor's Inuit Participation Plan (CIPP) that shall include:

a) a description of how the company intends to achieve the MIEC, including, where possible and without limitation:

i) the number, percentage and types of positions, including training positions, that the company proposes to fill with Inuit, in relation to the total number of positions, and the number and percentage of person-days proposed for these positions in relation to total person-days;

ii) the steps the company will take to recruit potential Inuit employees; and

iii) any measures the company has taken or proposes to take to increase Inuit employment, including such things as the details of any Inuit recruitment programs, training or apprenticeship programs, and equivalencies for formal qualifications;

b) where the MIEC is lower than the NTI projection provided to DND under Section 5.7, a description of how the Contractor could achieve the NTI projection for Inuit employment;

c) any other measures for optimizing Inuit employment and training; and

d) a description of how the company intends to achieve the MICC, including, where possible and without limitation the names, address and particulars of any actual or proposed Subcontractors; and the specifics of any actual or proposed contracting arrangements.

7.2 DND shall require all companies that submit a bid on a Clean-up Contract to submit their preliminary Contractor's Inuit Participation Plans in a separate envelope from their tender bid, to DND's contracting agent prior to the closing of bids.

7.3 For all bids for contracts for a Site clean-up, DND or its contracting agent shall:

a) advise bidders that the envelope containing the CIPP shall be opened first; and

b) advise bidders that bids shall be opened only if the CIPP complies fully with the requirements contained in Section 7.1.

7.4 Within three (3) months of DND having provided NTI with the estimates required under Section 5.6 above, NTI, through the Regional Inuit Associations, shall ensure that information regarding Inuit who have indicated their interest in employment in Site clean-ups, including information regarding their work experience and qualifications, is provided to DND's contracting agent.

7.5 DND's contracting agent shall make the information provided to it under Section 7.4 available to bidders for use by them in the preparation of bids and in finding suitable Inuit labour.

7.6 Upon the written request of the Contractor, DND's contracting agent may approve revisions to the CIPP during the course of a Site clean-up, provided that the Contractor demonstrates to DND's contracting agent that the MIEC and MICC for the Site clean-up will still be achieved.

7.7 In the event that DND's contracting agent approves a revised CIPP under Section 7.6, it shall provide the Steering Committee with the revised CIPP within five (5) working days of its approval. DND's contracting agent shall not release commercial confidential information to the Steering Committee without written permission from the Contractor.

8.0 SELECTION PROCESS FOR CONTRACTOR

8.1 Tender and Contract Documents

8.1.1 In all tender documents issued to companies that submit a bid on a Clean-up Contract or enter into negotiations for a Clean-up Contract , DND's contracting agent shall identify the following as criteria that a Contractor must comply with in a bid:

a) Minimum Inuit Employment Content (MIEC) established in accordance with Section 5.11;

b) Minimum Inuit Content for Contracting (MICC) established in accordance with Section 6.11; and

c) Submission of a Contractor's Inuit Participation Plan (CIPP) that fully complies with Section 7.1.

8.1.2 DND's contracting agent shall provide a copy of this Agreement in all tender documents issued to companies that submit a bid on a Clean-up Contract or enter into negotiations for a Clean-up Contract, and shall advise such companies in the tender documents that compliance with the provisions of the Agreement by the Contractor and its Subcontractors is mandatory.

8.1.3 DND's contracting agent shall include as a term in all Clean-up Contracts that the Contractor will comply with this Agreement and a term that the Contractor will ensure that any Subcontractors will be bound by and comply with the Agreement, where applicable.

8.2 Solicitation of Interest

8.2.1 DND's contracting agent shall prepare a Solicitation of Interest (SOI) for a Site clean-up. The SOI shall be in English and Inuktitut and shall request Letters of Interest (LOI) to identify firms that are both interested in and capable of performing as the prime Contractor for clean-up of the Site. The SOI shall be distributed Canada-wide through MERX and by mail or by fax to firms on the Registry.

8.2.2 The Solicitation of Interest under subsection 8.2.1 shall have the following characteristics:

a) The type of opportunity will be a *Letter of Interest (LOI);*

b) The region of delivery will be *Nunavut*;

c) The region of opportunity will be *Canada Wide;*

d) The agreement type is *Comprehensive Land Claim Agreement (CLCA).*

8.2.3 DND's contracting agent shall include the following in the SOI:

a) A description of the background, objectives and nature of the clean-up of DND DEW Line Sites;

b) A description of the services to be provided by a Contractor for clean-up of the Site and of the specific capabilities required for a Contractor;

c) A statement that the Site is located in a region where a Comprehensive Land Claim Agreement has been signed;

d) Instructions for the preparation of a response to the Solicitation of Interest;

e) A description of the employment and contracting environment in Nunavut, within the context of the NCLA and the requirements of the NTI-DND Economic Agreement (as per Annex D of this Agreement);

f) A definition of Minimum Inuit Employment Content (MIEC) and the Minimum Inuit Content for Contracting (MICC) and identification of the range for the MIEC and MICC that must be achieved by the Contractor in the Site clean-up;

g) All available values for the MICC and MIEC for previous Clean-up Contracts in Nunavut.

8.2.4 DND's contracting agent shall require that firms responding to the Solicitation of Interest adhere to the following process:

a) Firms shall provide a complete and fully documented LOI in the format prescribed in the SOI.

b) Firms shall provide in a LOI any information or documentation necessary to demonstrate capability to:

i) Provide the services of a Contractor for clean-up of the Site;
ii) Manage and finance a contract as Contractor for clean-up of the Site;
iii) Obtain liability insurance;

c) Each firm's LOI shall contain a statement that the firm understands the requirements to meet the levels for MIEC and MICC for the clean-up of the Site provided for under Sections 5.5 and 6.4 of the Agreement, and is capable of meeting those requirements

8.2.5 DND's contracting agent shall assess the Letters of Interest to determine those firms that have demonstrated their capability to be a Contractor for clean-up of a given Site and based on that assessment shall establish a list of qualified Contractors for that Site.

8.3 Selection Process for a Site Clean-up

8.3.1 Where DND's contracting agent determines under Section 8.2.5 that only one firm is capable of performing the contract for the Site clean-up, the following procedure shall be followed:

(a) DND's contracting agent shall issue an Advance Contract Award Notice (ACAN) indicating its intent to negotiate the contract with the firm;

b) if no valid challenge to the ACAN is received within the time frame provided for in the Treasury Board of Canada Contracting Policy, DND's contracting agent shall negotiate with the firm for the purpose of arriving at a price for the Site clean-up and shall require the firm to submit a CIPP in accordance with the requirements of Section 7.1 above;

c) if negotiations have been successfully completed under Subsection b), above, DND shall make a determination as to whether the price is acceptable, and whether the criteria set forth in Subsections 8.1.1 (a) to (c) have been met;

d) in the event that DND determines under Subsection c) above that the price is acceptable and that the criteria set forth in Subsections 8.1.1 (a) to (c) have been met, DND's contracting agent shall issue a letter of intent to award the contract to the firm;

e) in the event that DND determines under Subsection c) above that the firm has not fully met the criteria set forth in Subsections 8.1.1 (a) to (c), DND shall refer the matter to the Steering Committee and Sections 8.3.7 through 8.3.10 shall apply; and

f) in the event that negotiations under Subsection b) above are not successfully completed, or the price is not acceptable to DND, DND's contracting agent may decline to award the contract to the firm.

8.3.2 Where DND's contracting agent determines under Section 8.2.5 that more than one firm is capable of performing the Clean-up Contract, it may invite bids from the list of firms determined in 8.2.5 in accordance with Section 8.3.3. Where there is a valid challenge to the Advance Contract Award Notice issued in accordance with Section 8.3.1, DND's contracting agent may

invite bids from the sole firm considered capable in Section 8.2.5 plus the firms which have put forward a valid challenge to the ACAN, in accordance with Section 8.3.3.

8.3.3 The process for the tender shall follow the Treasury Board of Canada Contracting Policy, along with the following specific procedures, whereby DND's contracting agent shall:

a) open the envelopes containing the Bidder's CIPP before opening any other part of any bid;

b) with respect to each bidder's CIPP, make a determination as to whether the CIPP meets the criteria set forth in Subsections 8.1.1 (a) to (c) , and open only those bids that in DND's contracting agent's determination meet those criteria;

c) if DND's contracting agent determines that none of the bids meets the criteria set forth in Subsections 8.1.1 (a) to (c), refer the matter to the Steering Committee, which shall determine if the work should be retendered with a revised MIEC and/or MICC;

d) identify the lowest priced of the bids opened under Subsection b) and determine whether the price is acceptable to DND; and

e) if the bid meets the criteria set forth in Subsections 8.1.1 (a) to (c) and the price is acceptable, issue a letter of intent to award the contract, otherwise the contract shall not be awarded.

8.3.4 DND's contracting agent shall require that, within twenty-eight (28) calendar days of a company receiving a letter of intent pursuant to Sections 8.3.1 or 8.3.3, the company shall provide to DND's contracting agent a final CIPP confirming that it is capable of achieving the MICC and MIEC for the Site, and that this final CIPP shall meet the criteria set forth in Subsections 8.1.1 (a) to (c), and shall include, without limitation:

a) documentation evidencing the signing of agreements with Inuit Subcontractors, or the intention to enter into subcontracts with Inuit Subcontractors, if applicable; and

b) a schedule showing a monthly projection of Inuit labour and Subcontractors to be utilized throughout the life of the contract.

8.3.5 DND's contracting agent shall review the final CIPP, including the documentation and schedule provided by the company under Section 8.3.4. In the event that DND's contracting agent determines that the documentation and schedule is adequate to confirm that the bidder can meet the criteria set forth in Subsections 8.1.1 (a) to (c), the contracting agent, acting in good

faith, shall approve the CIPP and may award the Contract to the company. In all other events DND's contracting agent shall either:

a) withdraw the letter of intent; or

b) request a review by the Steering Committee.

8.3.6 DND's contracting agent shall provide the Steering Committee with a copy of the approved CIPP within fifteen (15) days of contract award. DND's contracting agent shall not release commercial confidential information to the Steering Committee without written permission from the Contractor.

8.3.7 In the event that DND's contracting agent requests a review of a contract award under Section 8.3.1, 8.3.3 or 8.3.5, the Steering Committee shall meet to determine whether the company has made best efforts to meet the criteria set forth in Subsections 8.1.1 (a) to (c), and, whether fault for any failure to do so cannot reasonably be placed on that company. The determination of best efforts shall take into account, without limitation:

a) the specific activities of the firm to achieve the elements contained in its preliminary CIPP; and

b) adherence by the firm with the requirements of Section 9.0.

8.3.8 In the event that the Steering Committee fails, within 3 weeks of a matter being referred to it under Section 8.3.1, 8.3.3 or 8.3.5, to agree on whether the company has made best efforts to meet the criteria set forth in Subsections 8.1.1 (a) to (c), the Steering Committee shall refer the matter for decision under the Expedited Arbitration provisions in Section 14.0.

8.3.9 In the event that the Steering Committee, or arbitrator appointed under Section 14.0, determines that the company failed to make best efforts to meet the criteria set forth in Subsections 8.1.1 (a) to (c) and that fault for the failure can reasonably be placed on the company, DND's contracting agent shall withdraw the letter of intent to award the contract.

8.3.10 In the event that the Steering Committee, or arbitrator appointed under Section 14.0, determines that the company has made best efforts to meet the criteria set forth in Subsections 8.1.1 (a) to (c) and that fault cannot reasonably be placed on the company for its failure, the MICC shall be adjusted at the discretion of the Steering Committee or arbitrator in order to allow for the awarding of the contract.

8.3.11 The specific contracting process to be utilized in issuing contracts for monitoring of Sites will be determined by the Steering Committee prior to the preparation of any future contract documents for monitoring of Sites.

9.0 SELECTION PROCESS FOR INUIT SUBCONTRACTORS

9.1 Inuit Firm Registry

9.1.1 NTI shall provide to DND the most current Inuit Firm Registry ("the Registry"). The Registry shall contain a brief description of the equipment, goods or services provided by each Inuit firm, the firm's experience, address and contact name.

9.1.2 The Registry shall be included in all contract solicitation documents.

9.2 Bid Invitations for Subcontracts

9.2.1 DND's contracting agent shall require Contractors who have a letter of intent or who have been awarded the contract, or any Subcontractors, in subcontracting work on a Site clean-up, to invite Inuit firms listed in the Registry that may be capable of performing the proposed subcontracting work, to bid on the proposed subcontracting work.

9.2.2 DND and its contracting agent and Contractors shall be held blameless if Inuit firms that do not appear in the Registry are not solicited under Section 9.2.1.

9.2.3 Nothing in Section 9.2.1 shall prevent a Contractor or Subcontractor from seeking bids from firms not listed in the Registry.

9.2.4 All contract documents issued by DND's contracting agent shall require Contractors and Subcontractors, in subcontracting work on a Site clean-up, to:

a) include in bid invitations only employment and skills requirements that are essential to the Site clean-up;

b) provide Inuit firms with a minimum of 15 days to respond to a bid invitation, but that in no event shall an Inuit firm have less time to respond than firms not listed in the Registry; and

c) enter into a contract with an Inuit firm if that Inuit firm's bid meets the Contractor's or Subcontractor's requirements, including such criteria as technical compliance and price, if the Contractor or Subcontractor enters into a subcontract for the Work.

9.2.5 All contract documents issued by DND's contracting agent shall require Contractors and Subcontractors, in subcontracting Work on a Site clean-up, to take the following steps in the event that they reject a bid from an Inuit firm

on grounds that it contains minor variances which cause it to be considered not technically compliant or not competitive:

a) provide the Inuit firm that submitted the bid with a written statement of the variances and the grounds for rejection;

b) provide the Inuit firm that submitted the bid the opportunity to revise its bid to address the stated variances and submit another bid within 7 calendar days of the date on which it was notified that the bid was rejected; and

c) enter into a subcontract with the Inuit firm if the new bid meets the Contractor's or Subcontractor's requirements and is less than or equal to the lowest priced bid from non Inuit firms which meet the Contractor's or Subcontractor's requirements; otherwise the contract may be awarded to a firm not listed in the Registry.

9.2.6 DND's contracting agent shall, where a bid has been rejected under Section 9.2.5, require the Contractor or Subcontractor, upon receiving a request in writing, to provide the Inuit firm within thirty (30) calendar days with written reasons why the bid was rejected. Subject to the approval of the Inuit firm, a copy of the reasons shall also be provided to NTI.

10.0 TRAINING

10.1 DND shall provide NTI with $50,000 per Site to assist in meeting the overall objective of achieving a representative level of Inuit employment on DEW Line Site clean-ups through the training of Inuit for clean-up related jobs, for a total of $750,000 for all Sites in Nunavut.

10.2 DND and NTI agree to work jointly to identify additional funding sources for training activities envisioned in Section 10.1.

10.3 Of the $750,000 DND has agreed to provide under Section 10.1, NTI acknowledges that DND has already provided $100,000 in connection with the clean-up of the FOX 4 and CAM M Sites. Of the $650,000 remaining, DND shall make an initial payment of $75,000 to NTI as soon as practical after the signing of this Agreement to fund the development of a comprehensive training plan, schedule and budget.

10.4 The cost of any training positions identified in the plan developed by NTI for on-the-job training at a Site shall be funded from sources other than DND's budget for the Site Clean-up Contract. Cost for such training shall also include administrative costs that may be borne as result of the presence of trainees.

10.5 The training plan, which shall be completed within one year after receipt of funding for the plan, shall set out a schedule for further payments to NTI from DND up to the full amount of $650,000.

10.6 Subject to DND's agreement to the schedule which may be based on reasonable budget considerations, DND shall make payments to NTI in accordance with the schedule completed under Section 10.5. NTI shall provide DND with an updated training plan and budget, outlining the proposed use of funds, prior to each payment.

10.7 The training plan referred to in Section 10.3 shall incorporate both common and site specific elements. The training plan shall include, without limitation, the following elements:

a) an analysis of skills and knowledge requirements for all positions;

b) learning objectives derived from the skills analysis identified in Subsection (a);

c) identification of training resources, including existing and required training programs;

d) development of a detailed plan and schedule for design, delivery and evaluation of orientation and training courses necessary to achieve representative levels of Inuit employment; and

e) development of milestones and performance indicators that will be considered in setting MIEC and MICC under Sections 5.8 and 6.8.

11.0 REPORTING

11.1 DND shall provide to NTI, by December 1 of each year that this Agreement is in effect, a report covering annual and cumulative results by type and level of employment, for each Site clean-up, including:

a) the total number of person days worked by all employees by Representative Occupational Grouping;

b) the total number of person days worked by Inuit, by Representative Occupational Grouping;

c) the percentage of total person days worked by Inuit, by Representative Occupational Grouping; and

d) a list of all contracts for goods, services and labour awarded to Inuit firms and to non-Inuit firms during the year and the dollar value of each of those contracts.

11.2 NTI shall provide DND with a report, by December 1 of each year that this Agreement is in effect, outlining the progress of the training program, the number of Inuit trained as well as the success rate of the program, including:

a) a list of training programs provided under the NTI training plan;

b) the number of hours of training received by Inuit in these programs;

b) the percentage of Inuit who successfully completed the training; and

c) the number of graduates who were subsequently hired by Contractors and Subcontractors.

11.3 DND shall include as a term in all Clean-up Contracts between DND and the Contractor a requirement for the Contractor to submit monthly reports on the Contractor's compliance with the final CIPP or the revised CIPP. DND shall advise NTI within five (5) business days of any deviations below the currently approved CIPP. Either Party may request a meeting of the Steering Committee following such a report. Where DND advises NTI of such a deviation below the CIPP in any two consecutive months, a meeting of the Steering Committee is required to be held pursuant to Section 12.2.

12.0 ENFORCEMENT

12.1 Where, during a Site clean-up, deviation from the approved CIPP or from the CIPP as amended pursuant to Section 7.6 indicate that the MIEC or MICC may not be achieved by the Contractor over the remainder of the Site clean-up, DND or its contracting agent shall advise the Steering Committee within ten (10) working days.

12.2 The Steering Committee, within one week of receiving notice under Section 12.1, shall convene to make a determination as to whether the Contractor is using its best efforts to comply with the MIEC or MICC. The Contractor shall then be required to demonstrate to the satisfaction of the Steering Committee that it has made best efforts to comply with the MIEC or MICC, and that fault for the failure to comply with the MIEC or MICC cannot reasonably be placed on the Contractor.

12.3 Where the Steering Committee does not make the determination required under Section 12.2 within 3 weeks, either Party may refer the matter to arbitration under the Expedited Arbitration provisions in Section 14.0.

12.4 Where the Steering Committee in a determination made under Section 12.2, or arbitrator to which a matter is referred under Section 12.3, determines that the Contractor failed to make best efforts to comply with the MIEC or MICC, and that fault can reasonably be placed on the Contractor for this failure, the

Steering Committee shall so advise DND's contracting agent of their determination or of that of the arbitrator. The Steering Committee or arbitrator may make recommendations on remedial measures to be applied, and DND's contracting agent may, after considering any recommendations by the Steering Committee or arbitrator, apply remedial measures at its sole discretion. DND's contracting agent shall report to the Steering Committee as soon as practicable on the results of the remedial measures applied. Remedial measures shall, to the extent possible, be designed to correct the Contractor's failure to achieve the MICC and/or MIEC, and to provide a disincentive for future failures. DND's contracting agent shall consider the following measures and inform NTI of the actions taken. Measures may include:

a) requiring the Contractor to undertake additional measures to achieve the MIEC or MICC;

b) providing the Contractor with information about specific Inuit or Inuit firms who are known to be available and qualified for employment by the Contractor, and advising the Contractor that further enforcement steps may be taken if the MIEC or MICC are not met;

c) withholding progress payments;

d) issuing a stop work order;

e) charging the Contractor for damages related to a stop work order; or

f) terminating the contract.

12.5 Where the Steering Committee, or arbitrator appointed under Section 14.0 determines that the Contractor made best efforts to achieve the MIEC and MICC through its currently approved CIPP, and that fault cannot reasonably be placed on the Contractor for failing to meet the MIEC or MICC, the Steering Committee, or arbitrator, shall adjust the MIEC or MICC.

12.6 Following an adjustment to the MIEC or MICC under Section 12.5, DND's contracting agent shall thereafter continue to monitor and report on the Contractor's performance as provided for in Section 11.3.

13.0 ARBITRATION

13.1 If DND and NTI disagree on any question of fact or mixed question of law and fact related to the interpretation, implementation or operation of this Agreement, with the exception of any matter within the jurisdiction of the Arbitration Board under the NLCA and of any matter related to provisions of this Agreement mentioned in Section 14.1, either Party may by written demand refer the dispute to arbitration in accordance with the following

14.6 The arbitration proceedings shall be held within two weeks of the appointment of an arbitrator. The arbitration proceedings shall be in a location agreed upon by the Parties, or if the Parties are unable to agree, as determined by the arbitrator. The timing for the hearing may be extended only by the mutual consent of the Parties, acting reasonably.

14.7 The arbitrator shall have all of the powers granted under the Commercial Arbitration Act (Canada) to conduct the arbitration, may compel the attendance of the Parties and any required witnesses and the tendering of any documents or things and dispose of any further matters that arise out of the arbitration decision (if raised by the Parties within five (5) days of the completion of the arbitrator's written decision).

14.8 With respect to any such arbitration:

a) each Party shall bear its own costs and an equal share of the other costs of the arbitration, including remuneration and expenses of the arbitrator;

b) the arbitrator shall have jurisdiction to determine all questions of fact, law, and questions of mixed fact and law and make a determination;

c) all witnesses called to give evidence at the hearing shall be sworn under oath and shall be subject to such examination as the arbitrator determines to be appropriate, and there shall be a court reporter and a formal record of the hearing.

14.9 The arbitrator shall, on application, allow a Contractor or a Subcontractor directly affected by a decision requested of the arbitrator to participate in the expedited arbitration as an intervenor, on such terms as the arbitrator in his or her discretion may order.

14.10 The arbitrator shall render a decision in writing and provide such decision to the Steering Committee within one week of the conclusion of the hearing. The decision shall state the reasons on which it is based. The decision is final and binding, and is not subject to appeal.

14.11 Where a Party to the arbitration fails to comply with any of the terms of the decision of the arbitrator, any Party to the arbitration may file in the office of the Registrar of the Nunavut Court of Justice, a copy of the decision in the prescribed form, whereupon the decision shall be entered in the same way as a judgment or order of the court, and is enforceable as such.

14.12 Unless the Parties otherwise agree, the proceedings and arbitrator's decision shall be made public.

15.0 ENTIRE AGREEMENT

This Agreement and the Annexes hereto shall constitute the entire and sole agreement between the Parties and shall supersede all other communications, negotiations, arrangements and agreements of any nature among them in relation to this Agreement prior to the date of the Agreement.

16.0 SEVERABILITY

If any provision of this Agreement or its application to any person or circumstance shall, to any extent, be invalid and unenforceable, the remainder of this Agreement, or the application of such provisions to persons or circumstances other than those as to which it is held invalid or unenforceable, shall be valid and enforced to the fullest extent permitted by law and be independent of every other provision of this Agreement.

17.0 ENUREMENT

This Agreement shall enure to the benefit of and be binding upon each of the Parties hereto, their respective heirs, legal representatives, successors and permitted assigns.

18.0 APPLICABLE LAW

This Agreement shall be governed by and construed in accordance with the applicable laws of Canada and Nunavut.

19.0 TIME IS OF THE ESSENCE

The Parties acknowledge that time is of the essence of this Agreement.

20.0 PARLIAMENTARY APPROPRIATION

The implementation of the Agreement is subject to there being an appropriation for the contracts for the fiscal year in which any commitment would come in course of payment.

21.0 HOUSE OF COMMONS

No member of the House of Commons shall be admitted to any share or part of this Agreement, or to any benefit arising thereof.

22.0 AMENDMENTS

22.1 If either Party wishes to make changes to this Agreement, it shall provide notice of proposed changes in writing to the other Party. Amendments must be agreed upon by both Parties. Any agreed-upon amendments will be executed and attached as an appendix to this Agreement.

22.2 DND and NTI agree to consider amendments in an expeditious manner, particularly where the proposed amendments directly affect the conduct of a Site clean-up that is in progress or one which is scheduled to commence in the near term.

23.0 NOTICES

23.1 Where any Party is obliged or entitled to give any notice, request, approval, demand, consent, direction or other communication (i.e. Notice) to the other Party, such Party shall first communicate the substance thereof personally or by telephone. However, such Notice shall not be sufficiently given until sent in writing to the addressees at the address below. Any Notice may be personally delivered or sent by registered mail or telefacsimile and will be effective upon receipt by the addressee.

23.2 Notices to DND will be sent to:

Director General Environment
National Defence Headquarters
101 Colonel By Drive
Ottawa, Ontario
K1A 0K2

23.3 Notices to NTI will be sent to:

1st Vice President
Nunavut Tunngavik Incorporated
Box 1041
Cambridge Bay
Nunavut
X0E 0C0

24.0 OFFICIAL LANGUAGES

24.1 The official languages of this Agreement shall be English and Inuktitut. In the case of incompatibility between the two texts, the text of the English version shall prevail.

25.0 TERMINATION OF THE AGREEMENT

25.1 This Agreement will terminate on the later of December 31st , 2008 or when the Clean-Up Work as set out in this Agreement for the Sites listed in Section 3.1 is completed or on such a date agreed to by the Parties in accordance with Section 22.3 of this Agreement.

IN WITNESS HEREOF, the Parties have executed this Agreement.

Nunavut Tunngavik Incorporated

_____
Acting President

_____

_____

Department of National Defence

_____
Minister of National Defence

this _____ day of _____ 2001

ANNEXES TO THE AGREEMENT

ANNEX A: REPORTS

A.1 Format for DND Work Force Estimate (Section 5.6)

Site:
Region:

Occupational Group	Projected Manpower Requirements							
	Year 1		Year 2		Year 3		Overall	
	Positions	Persondays	Positions	Persondays	Positions	Persondays	Positions	Persondays
Project Manager/General Superintendent (Off-site)								
Site Superintendent								
Site Clerk								
Expediter (Off-Site)								
Surveyor								
Surveyor's Assistant								
Service Truck Driver								
Camp Setup Carpenter/ Electrician/Plumber								
Foreman								
Heavy Equipment Operator								
Heavy Equipment Mechanic								
Truck Driver								
Labourer/Scaleperson/Cutter								
Asbestos Labourer								
Hazardous Material Handler								
Cook/Cook's Helper								
Bear Monitor								
Nurse/First Aid								
Other								
Other								
Total:								

Note: The specific Representative Occupational Groupings included in this form may be changed, under Section 5.12, by mutual consent of the Contracting Working Group to reflect variations among Sites. DND's work force estimate may include additional categories of work not listed, as required.

A.2 Format for NTI Inuit Labour Projection (Section 5.7)

Site:
Region:

Positions Identified	Projected Manpower Requirements (person days)							Projected Inuit Employment (person days)						
	Year 1		Year 2		Year 3		Overall	Year 1		Year 2		Year 3		Overall
	Pos.	Person Days	Pos.	Person Days	Pos.	Person Days	Person Days	Pos.	Person Days	Pos.	Person Days	Pos.	Person Days	Person Days
Project Management														
Site Superintendent														
Site Clerk														
Expediter														
Surveyor														
Surveyor's Assistant														
Service Truck Driver														
Camp Setup														
Carpenter/Electrician/ Plumber														
Foreman														
Heavy Equipment Operator														
Heavy Equipment Mechanic														
Truck Driver														
Labourer/Scaleperson/Cutter														
Asbestos Labourer														
Hazardous Material Handler														
Cook/Cook's Helper														
Bear Monitor														
Nurse/First Aid														
Other														
Other														
Total Positions														
Projected Inuit Employment									%		%		%	%

Note: The specific Representative Occupational Groupings included in this form may be changed, under Section 5.12, by mutual consent of the Contracting Working Group to reflect variations among Sites.

A.3 DND: Analysis of Contracting Opportunities (Section 6.5)

Site: Region:	
Description	*% of Total Contract Value*
1 Marine Transportation	
2 Commercial Airlines	
3 Local Aircraft Charter	
4 Catering	
5 Small Tools	
6 Camp Supply	
7 Bonds & Insurance	
8 Office Supplies	
9 Communications Equipment	
10 Bear Monitor	
11 Geotextile - Supply & Install	
12 Geomembrane - Supply & Install	
13 Drilling for Instrumentation	
14 Instrumentation	
15 Public Consultation/Translation	
16 Excavate Hazardous/Contaminated Soil	
17 Landfarming	
18 Gravel - Excavate & Place	
19 Excavation	
20 Demolition & Debris	
21 Landfill Excavation	
22 Asbestos Abatement	
23 Project Management and Overhead	
24 Other	
Total	**100%**

Note: The specific Contracting Opportunities included in this form may be changed, under Section 6.12, by mutual consent of the Contracting Working Group to reflect variations among Sites. DND's analysis of contracting opportunities may include other contracting opportunities not listed, as required.

ANNEX B: EDUCATION AND SKILLS PROFILES

Position	Essential Qualifications
Superintendent/Construction Manager	3-5 years directly related project management experience, and substantial (minimum 10 years) construction supervision experience, normally combined with trade certification in one or more relevant trades and/or relevant post-secondary education
Clerk	Previous clerical experience
Expediter	2-3 years experience as expediter for a northern construction company, ideally combined with 2-3 years trade experience in an applicable construction trade
Surveyor Technologists Surveying Assistants	2-3 year college program and trade certification Some related training and/or experience
Service Truck Driver	On–the-job training Driver's license appropriate to class of vehicle
Foreman	3 years supervising similar construction activities
Electrician	Trade certification
Carpenter	Trade certification or 3-5 years on the job experience
Welder	Trade certification
Plumber	Trade certification
Heavy Equipment Operator	5 week certification program Valid driver's license
Heavy Equipment Mechanic	Trade certification or 5 years experience
Small Equipment Mechanic	Trade certification or 3-5 years experience
Truck Driver	Valid driver's license Approved medical certificate 3-4 weeks training
Labourer	On-the-job training; physically fit for the proposed work
Asbestos Labourer	12 hours classroom instruction 12 hours practical instruction
Asbestos Foreman	18 hour training course (following minimum of 2 years of experience as asbestos labourer)

Position	Essential Qualifications
	Certificate from Occupational Health and Safety
Hazardous Materials Handler	5 years + TDG certification through employer
Cooks Cooks Helper	Trade certification or 2 years experience Some related experience
First Aid	Training in appropriate first aid courses
Bear Monitor	Experienced polar bear hunter

Note: This list of qualifications is for the use of the Contracting Working Group in establishing the MIEC This list is not intended for any other use by any third party for any purpose, and DND and NTI are not liable for any use of this list by any third party. Bidders or Contractors are required to establish their own criteria for hiring project staff.

ANNEX C: LIST OF ARBITRATORS

Honourable Roger P. Kerans

Roger F. X. Marentette

Daniel Ish Q.C.

Harvey J. Kirsh

Honourable Lorne O. Clarke

Paul-Emile Chiasson

ANNEX D BUSINESS ENVIRONMENT STATEMENT

The following language shall be included in all Solicitations of Interest prepared and distributed by DND's contracting agent, as described in Section 8.2 of this Agreement:

> One of the principal objectives of The Nunavut Land Claims Agreement is to provide Inuit with means of participating in economic opportunities through government contracting. Article 24 of the NLCA ("Government Contracting") provides full details of the Government of Canada's obligations to fulfill this objective. In the case of DEW Line Clean Up for which the Department of National Defence (DND) has responsibility, NTI and the Government of Canada, as represented by DND, have entered into an Agreement (see Annex XX of the SOI).
>
> The principal mechanism to which NTI and DND have agreed for provision of economic benefit for Inuit is the use of a Minimum Inuit Employment Content (MIEC) and a Minimum Inuit Content for Contracting (MICC). Companies that are invited to submit tenders for the work following this SOI will be informed of the site specific MIEC and MICC. These levels will be set within the following ranges – MIEC (65-85%); MICC (60-75%). Contractors will be required to achieve the MIEC and MICC in the contract, and DND's contracting agent will monitor levels of MIEC and MICC based on a monthly plan submitted by the Contractor.
>
> In the case of the MIEC the Inuit workforce must be made up of Inuit enrolled under the NLCA. Contractors must understand that they may need to recruit a workforce from a number of communities in Nunavut, and that a significant number of the workers have Inuktitut as their first language. DND's contracting agent will provide bidders with a list of Inuit who have indicated their interest in employment in Site clean-ups, including information regarding their work experience and qualifications. This list will be prepared by NTI approximately six months prior to the commencement of the clean-up of a given Site.
>
> In the case of the MICC, Inuit firms used as Subcontractors must be drawn from the Inuit Firm Registry maintained by NTI.

Appendix C
NTI Technical Representative Report

DEW Line Site
Dewar Lakes FOX-3

NTI Technical Representative Report

Submitted to:

Submitted by:

ᖁᑭᕐᒋᖅᓯᓗᒃ ᐊᓂᑎᓕᕐᓂᖅ
QIKIQTAALUK ENVIRONMENTAL

December, 2006

DEW Line Site
Dewar Lakes FOX-3

NTI Technical Representative Report

Prepared by: _____
Karl Côté, M.Eng., P.Eng.

Reviewed by: _____
Philippe Simon, Ph.D., P.Eng.

December 2006

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Executive Summary

In 1998, Nunavut Tunngavik Incorporated (NTI) and the Department of National Defence (DND) DEW Line Cleanup signed a Cooperation Agreement for the clean up of the fourteen (14) DEW Line sites under the jurisdiction of DND, located within the territory of Nunavut.

A part of the agreement recognizes the process for pre-construction site investigations, which are generally conducted two (2) years prior to the cleanup of a specific DEW Line site. Representatives of DND undertake site investigations with the objective of delineating environmental contamination. During these site investigations, representatives of NTI collect traditional environmental knowledge. The technical data and the traditional knowledge are incorporated into a coordinated risk management approach to develop cleanup specifications for a site.

The pre-construction investigation of Dewar Lakes (FOX-3) was conducted during the months of July and August 2006. The Environmental Sciences Group (ESG) and UMA completed the technical investigation on behalf of DND. During the site investigation, Karl Côté, P.Eng., from Qikiqtaaluk Environmental Inc. (QE) along with James Qillaq from the hamlet of Clyde River visited the site on behalf of NTI to document local knowledge and interviewed elders from the community.

The following summarizes the information contained in this report:

- In general, the site is, visually, in relatively good condition;
- Buried metal debris and drums are becoming exposed as the river bank is eroding near the airstrip;
- Partially submerged debris and equipment were observed in the river across from the site and another known debris area is located down river;
- Caribou and wolves are numerous and present year-round in the Dewar Lakes area;
- The region is mainly used for hunting caribou in winter and early spring, mostly by residents of Clyde River and to a lesser extent by people from Qikiqtarjuaq.

Introduction

The NTI/DND Cooperation Agreement

In 1998, Nunavut Tunngavik Incorporated (NTI) and the Department of National Defence (DND) entered into a Comprehensive Agreement outlining the environmental and economic terms for the cleanup and restoration of fourteen (14) Distant Early Warning (DEW) Line sites located within the territory of Nunavut.[1] The Environmental Provisions of the Agreement outline the process for pre-construction site investigations that are generally conducted two (2) years prior to the cleanup of a specific DEW Line site.

Consultants representing DND undertake the investigations with the objective of delineating known contaminated areas and verifying overall site conditions. In addition, consultants representing NTI record traditional environmental knowledge during the site investigation. This information is incorporated into a risk management approach to develop cleanup specifications for the site.

The Environmental Provisions also outline the Terms of Reference for the DEW Line Environmental Working Group (EWG) consisting of two (2) members representing DND and two (2) representing NTI. The EWG was formed in 1997 to address technical and environmental issues such as hydrocarbon contamination and landfill closure procedures and to advise on other technical issues that may arise.[2]

Pre-Construction Site Investigations

A thorough environmental investigation is undertaken at a specific DEW Line site approximately two (2) years prior to the cleanup of the site. The Environmental Sciences Group (ESG) and UMA has been retained by DND to carry out the site investigations. The specific objectives of the site investigation are as follows:

- To define vertical and lateral extent of identified soil contamination;
- To investigate suspected contaminated areas;
- To locate and delineate hydrocarbon contaminated areas;
- To investigate each landfill on site in order to identify the environmental risk associated with the landfills;
- To determine the level of contaminants in building material;
- To complete a site inventory;

[1] NTI and DND. 1998. Comprehensive Agreement Between Nunavut Tunngavik Incorporated and the Department of National Defence for the Clean-up and Restoration of Distant Early Warning Sites Within the Nunavut Settlement Area.
[2] Environmental Working Group, 1998. DEW Line Cleanup, Nunavut, Environmental Working Group Report March 1998. Prepared for Nunavut Tunngavik Incorporated and the Department of National Defence.

- To define the extent of existing landfills;
- To investigate potential locations for landfill expansions and new landfills, borrow pits, and landfarming areas.

In addition, two (2) NTI representatives are on site during the investigation; a technical representative who is also a member of the EWG and a local representative who is selected based on their familiarity with the site, and surrounding areas. The local representative is a resident of the community most affected by the site cleanup and usually someone who worked or lived at the site during operating years.

Prior to or immediately after the site visit, the NTI representatives conduct a community consultation to address local concerns and to document traditional and local knowledge of the DEW line site. This information is essential to proper risk management of the existing landfills, hydrocarbon contaminated areas, and debris areas. The information provides insight into the frequency and nature of use of the site by people and by wildlife and allows for the evaluation of receptor sensitivity.

The results of the pre-construction investigation are examined by the members of the EWG to ensure that all parties are satisfied with the prescribed site remediation and the final construction specifications.

Scope of Report

The purpose of this document is to present the following:

- Summary of previously undocumented technical concerns and observations of the FOX-3 DEW Line site.
- Summary of local resident concerns and observations of the FOX-3 site including knowledge acquired that is pertinent to the risk evaluation of existing landfills and hydrocarbon contaminated areas.
- Summary of issues discussed during the community consultations in Clyde River.

This document does not constitute an environmental assessment. Comments and conclusions presented herein are based on a brief site visit, documentation provided by DND and local knowledge of the area. The consultants for DND will publish the technical results of the site investigation at a later date.

FOX-3 Dewar Lakes

Site Description

The FOX-3 DEW Line site is located at Dewar Lakes in the central area of Baffin Island, Nunavut (68° 38' 46" N, 71° 14' 23" W), 325 km north-west of the hamlet of Qikiqtarjuaq and 246 km south-south-west of the community of Clyde River (see figure 1). The lower site is located along the shores of a river that runs north to south and discharges into the Dewar Lakes. The traditional name of the area is Nunamiut, which literally means people from the main land.

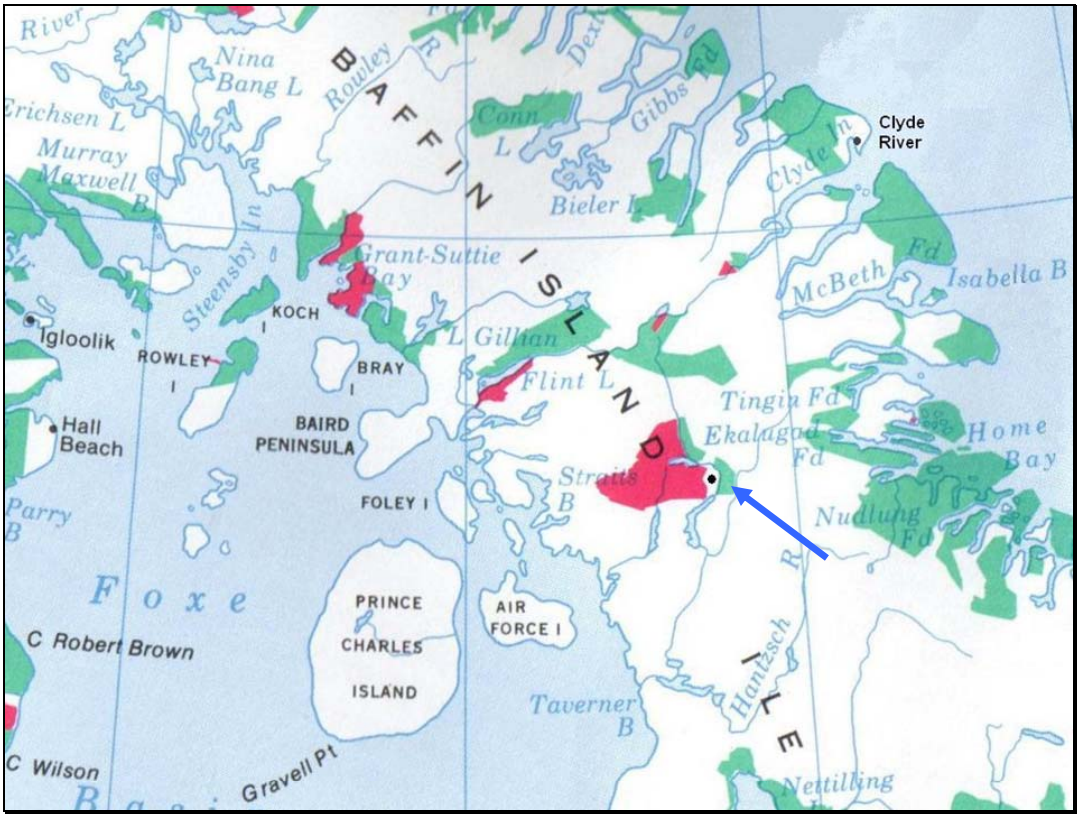

Figure 1: Location of FOX-3 (Dewar Lakes)

The lower site, which consists of an airstrip, is located at an elevation of approximately 120 m above sea level (asl). The station is situated at an altitude of 518 m asl, approximately 6 km to the northwest of the airstrip.

The general area is characterized by large gently rolling hills. The upper site, at the crest of a large hill, is characterized by boulder strewn glacial till with drainage from the site occurring radially down gradual slopes. Vegetation is relatively scarce in the windswept areas of the upper site, but denser in the low-lying wet areas and drainage paths. The

lower site (airstrip), located in a river valley, is in an area of fluvial deposits and well drained soils. Vegetation at the lower site is more abundant than at the upper site, especially in the wet tundra on the gentle slopes above the shore line.

The auxiliary DEW line site ceased operations in July 1989 and was replaced by a North Warning System Long Range Radar (LRR) site. The LRR, built adjacent to the old module train, was established in July 1989 (see Photo 1).

Two (2) previous environmental site investigations were conducted at FOX-3 (UMA, 1990; ESG, 1989-91).

Photo 1: Upper site LRR station.

Site Investigation

In July and August 2006, DND consultants ESG, UMA, and EBA conducted the FOX-3 site investigation. An extensive historic and aerial photograph survey was completed prior to the site visit.

Representatives of NTI were on site from July 21 to 23 to observe the site investigation work and to document local and traditional knowledge. Karl Côté, EWG member, from Qikiqtaaluk Environmental Inc. (QE), was the technical representative. The local NTI representative was James Qillaq from Clyde River. M. Qillaq knows the Dewar Lakes and surrounding areas very well from many snowmobile trips with his Rangers unit from Clyde River, as well as with Rangers from other communities (Pond Inlet, Qikiqtarjuaq, and Igloolik). There is a Rangers cabin just north of the airstrip beside the river.

Site Observations and Concerns

During the visit, the site in general was found to be visually in relatively good condition.

The following sections summarize the concerns and observations of the NTI representatives relating to the site and its former operations. Photos taken during the site visit are presented in Appendix to this report.

Landfills and Debris Areas

During the site visit there were five (5) identified landfill areas at FOX-3: the Main Landfill, the Station Landfills East and West, the NWS Landfill, the West Landfill, the Airstrip Landfills. There were also two (2) identified debris areas: The Main Road debris area and the Site debris 12 area. The geophysical survey of the landfills, debris areas, and other suspicious areas had not been completed at the time of the site visit; therefore information regarding the extent of the landfills or confirmation of other landfills was not available for review. Leachate data from the landfills was also not available for review prior to the completion of this report.

During the site visit, a visual inspection of all the landfills and other areas proposed for geophysical survey was carried out. In general, the landfills were found to be in relatively good condition, with some exposed and scattered surface debris.

The Main Landfill, located at the Upper Site, was found to cover a larger surface area than originally expected by DND consultants. In and around the landfill, a large quantity of lemming droppings was observed.

The whole area located east of the airstrip, and adjacent to the river, was extensively worked. It was used as a source of borrow material, for storage of equipment and drums, and for waste disposal. A large quantity of equipment, materials and drums, a lot of which seems like waste material, is still being stored there. The Airstrip Landfills are located less than 50 m away from the river. The river bank, near the southern tip of the airstrip was found to be eroding and exposed metal debris and drums were observed (see Photo A-1).

Scattered drums and other metal debris were observed at Site Debris 12 area, located south of the Airstrip along the river's edge (see Photo A-2).

Partially submerged debris and heavy equipment were observed on the opposite side of the river from the Airstrip area. M. Qillaq informed us that partially submerged debris and equipment were also present down river approximately 10 km away from the site. In winter, when the river is frozen and the ground is snow-covered, scattered drums all along the river side are clearly noticeable. M. Qillaq also mentioned that there is a building and drum cache located upriver from the site. Some drums are still identified with the letters USAF.

Contaminated Soil

During the site visit, soil sampling was just beginning and therefore no sample results were available for review. However, a limited number of results from the previous site investigation have shown the presence of contaminated soils at the following locations and at the indicated levels:

- Main Landfill - Tier I PCB, Tier II lead, zinc and arsenic;
- Sewage outfall - Tier I PCB, Tier II copper, nickel, zinc and arsenic;
- Upper Site proximity - Tier II arsenic;
- Airstrip East area - Tier II cadmium and arsenic.

No visual or olfactory evidence of soil contamination was observed during our site visit.

The soil sample results from the site will be presented in the FOX-3 site investigation report prepared by ESG.

Traditional Environmental Knowledge

The following section presents information relating to the site and surrounding areas obtained from observations during the site visit and which, in certain cases, was confirmed and/or clarified from discussions with residents of Clyde River. Mr Qillaq, elders from Clyde River, as well as site workers from various communities, all gratefully shared their knowledge about the land. Information was gathered during a formal elders' meeting in Clyde River, during informal conversations, as well as during telephone conversations.

A private meeting was held in Clyde River on July 23. This meeting was organized in order to address local concerns and to collect traditional knowledge related to the site and to its usage.

Present at the meeting were James Qillaq and Karl Côté representing NTI as well as Ms. Mary Tassugat, Ms. Regilie Piungituq, and Ms. Iga Palluq, elders from the community. Also present at the meeting was Ms. Lizzie Palituq, QIA Community Liaison Officer, who organized the meeting and provided translation and interpretation services during the meeting. The three (3) elders interviewed know the region very well from numerous caribou hunting expeditions carried out when they were younger.

Historical and Archaeological Features

Mr Callum Thomson, an archaeologist contracted by DND, was present on site just before the NTI representatives' site visit. He identified and conducted an inventory of historical and archaeological site features. A brief exchange of information was conducted on the airstrip apron, as Mr Thomson left shortly after the NTI representatives arrived. Information obtained from the archaeologist was incorporated in the present report.

Archaeological features, such as tent rings and meat caches, were identified along the riverside. Two (2) gravesites dating back to the 1960s were observed along the road that leads to the upper site, more exactly between the road and the POL line (see Photo A-3). At the upper site, near the station area, a stone hunting blind (see Photo A-4) and a wooden fox trap were identified. None of the features identified are close enough to the site to be threatened by future site cleanup activities.

Many recent as well as older campsites are found all along traditional inland travel routes.

Wildlife

A variety of wildlife species was present around the site during the site visit. Various bird species were observed including: snow bunting, ravens, and a couple of peregrine falcons with two (2) chicks (see Photo A-5). Goose droppings were observed along the river side.

Caribou, wolves, foxes, and hare were observed on site during the visit (see Photo A-6). *In addition…, caribou occur in the valleys of the Clyde and McBeth rivers and are especially numerous in the Dewar Lakes area, where wolves in good numbers can also be found. They are generally found year-round in these areas.*[3]

A large quantity of lemming droppings was observed in and around the Main landfill. Lemmings most likely burrow in the cavities between buried debris in the landfill. Lemmings are an important source of food for various predators such as peregrine falcons.

Landlocked char is abundant in the Dewar Lakes and up river. Char was fished by personnel up river from the site.

Traditional Land Use

The Nunavut Atlas rates the Inuit land use in the Dewar Lakes area as High Intensity. *Clyde River and Broughton Island hunters hunt caribou throughout this area during late winter and spring, but the favourite hunting locale is in the region of the Dewar Lakes. Wolves are numerous in the Dewar Lakes area, and are taken in conjunction with caribou hunting.*[4] The area is also occasionally used by Igloolik and Hall Beach hunters for caribou hunting. Hunters from Qikiqtarjuaq apparently hunt further south. The main snowmobile route used by Clyde River hunters to reach the Dewar Lakes is by McBeth Fiord or Inugsuin Fiord, and then up the McBeth River valley.

Mary Tassugat did not remember meeting any people from Igloolik or other communities during her numerous trips inland. But she knows that people from Clyde River, Qikiqtarjuaq, Pond Inlet and Hall Beach would sometimes meet up inland or just miss each other by a few days.

[3] Riewe, R. 1992. *Nunavut Atlas*. Canadian Circumpolar Institute and Tungavik Federation of Nunavut, Edmonton.

[4] Riewe, R. 1992. *Nunavut Atlas*. Canadian Circumpolar Institute and Tungavik Federation of Nunavut, Edmonton.

Traditionally, people from Home Bay used to hunt in the area but more so further north. They would get there on foot, sometimes within two (2) days and one night. They would get there that quickly when they were short on food. They would leave in late summer or early fall and reach the mainland mostly by McBeth Fiord and sometimes by Nallulik Fiord. They normally came back after freeze-up, partly on foot and partly by small dog teams. They went there to hunt caribou, mostly for their hides, but also for the meat.

The area has never been widely used for hunting wolves, for fishing, or for trapping foxes. Berries and other plants are rarely harvested in the area.

Site Information and Local knowledge

The Inuit that worked at the site during DEW Line operations were from Iqaluit, Hall Beach, Qikiqtarjuaq and Cambridge Bay.

Concerns were voiced regarding the submerged debris and equipment in the river and scattered drums along the river side. Two (2) sites are known, but there might be others.

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APPENDIX

Site Photographs

Photo A-1: Exposed debris and drums from the eroding river bank.

Photo A-2: Scattered drums and metal debris along the river's edge.

Photo A-3: Two (2) graves located on site.

Photo A-4: Caribou hunting blind.

Photo A-5: Peregrine falcons nesting near the site.

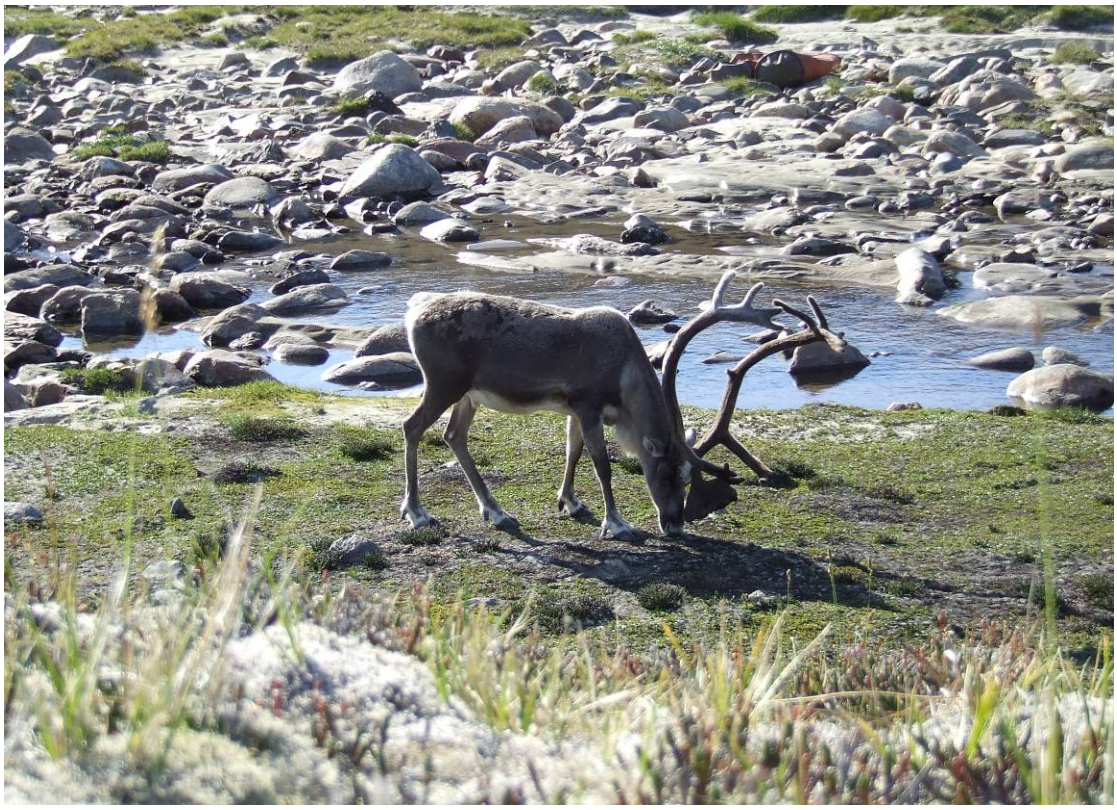

Photo A-6: Caribou observed on site.

Appendix D
Site Photographs

PHOTOGRAPHIC RECORDS

Photo 1: Atwell Dormitory Building

Photo 2: Garage

PHOTOGRAPHIC RECORDS

Photo 3: Helicopter Hangar and POL

Photo 4: Floating tank

PHOTOGRAPHIC RECORDS

Photo 5: Sewage outfall

Photo 6: Heated Vehicle storage and Apron

PHOTOGRAPHIC RECORDS

Photo 7: Station Area

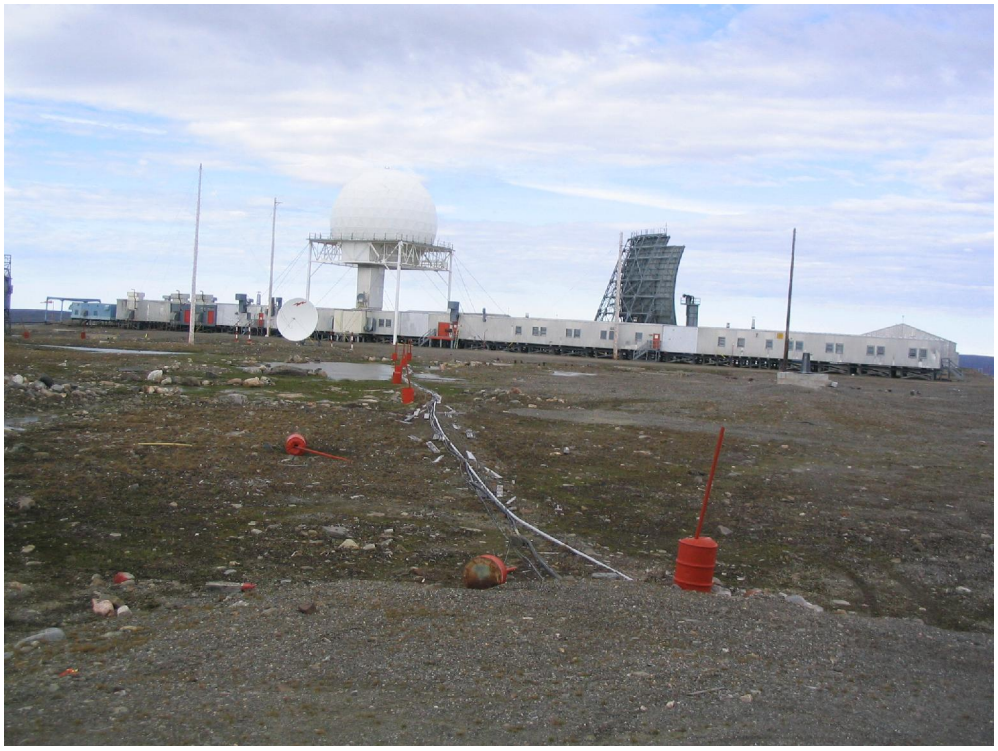

Photo 8: Station Area

PHOTOGRAPHIC RECORDS

Photo 9: Station POL Piping

Photo 10: Warehouse

PHOTOGRAPHIC RECORDS

Photo 11: Station Pallet Line Area

Photo 12: Airstrip East Landfill Area

PHOTOGRAPHIC RECORDS

Photo 13: Airstrip Pallet Line and Abandoned Apron Area

Photo 14: Airstrip Landfill Lobe A

PHOTOGRAPHIC RECORDS

Photo 15: Airstrip Pallet Line

Photo 16: Airstrip Landfill Lobe D

PHOTOGRAPHIC RECORDS

Photo 17: Airstrip Landfill Lobe EE

Photo 18: Airstrip Landfill Lobe G

PHOTOGRAPHIC RECORDS

Photo 19: Airstrip Landfill Lobe L

Photo 20: Airstrip Landfill Lobe N

PHOTOGRAPHIC RECORDS

Photo 21: Airstrip Landfill Lobe P1

Photo 22: Airstrip Landfill Lobe Q

PHOTOGRAPHIC RECORDS

Photo 23: Airstrip Landfill Lobe R

Photo 24: Airstrip Landfill Lobe S

PHOTOGRAPHIC RECORDS

Photo 25: Airstrip Landfill Lobe T

Photo 26: Airstrip Landfill Lobe X

PHOTOGRAPHIC RECORDS

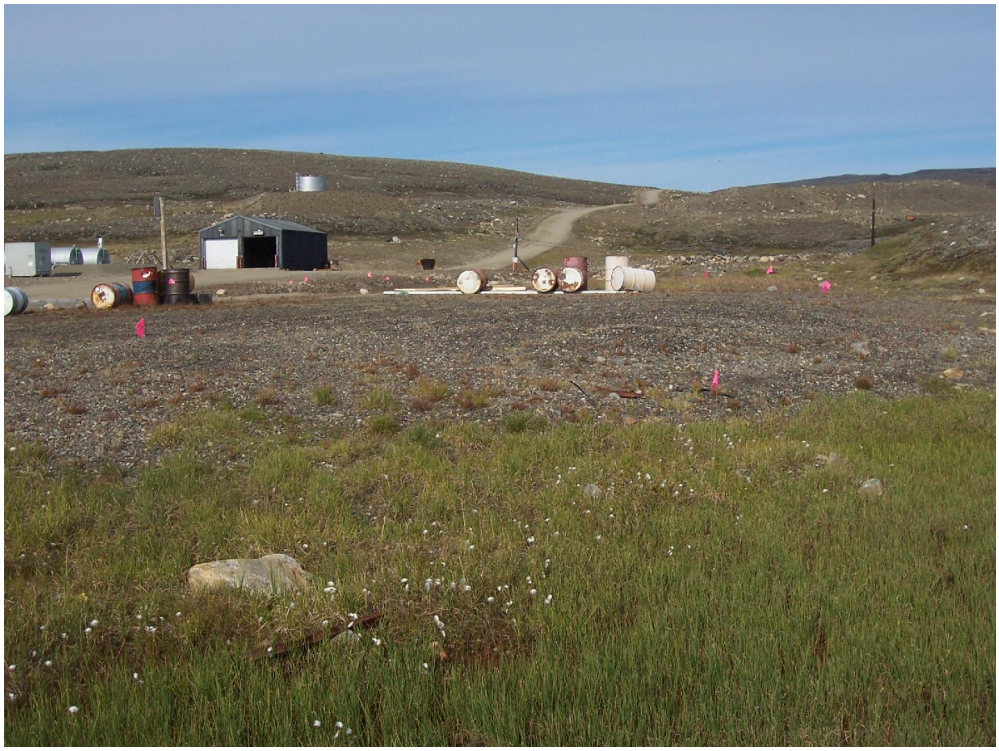

Photo 27: Apron Debris Lobe A

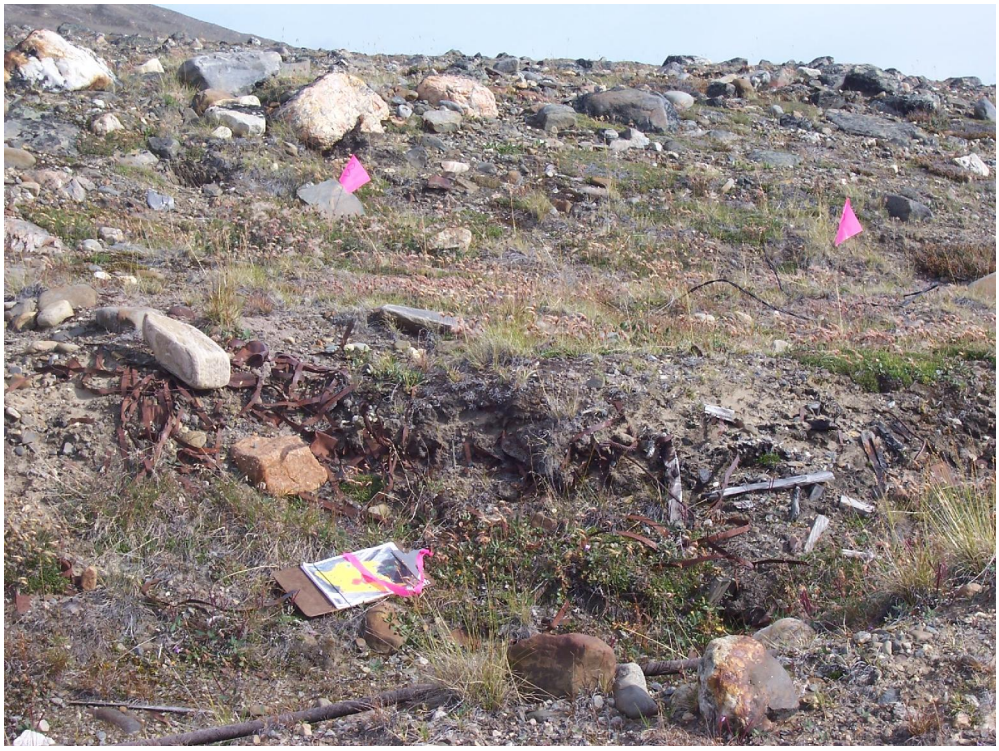

Photo 28: Apron Debris Lobe B

PHOTOGRAPHIC RECORDS

Photo 29: Station Construction Camp Lobe D

Photo 30: Station Lobe G

PHOTOGRAPHIC RECORDS

Photo 31: Station West Lobe B

Photo 32: Station West Lobe C

Photo 33: Station West Lobe D

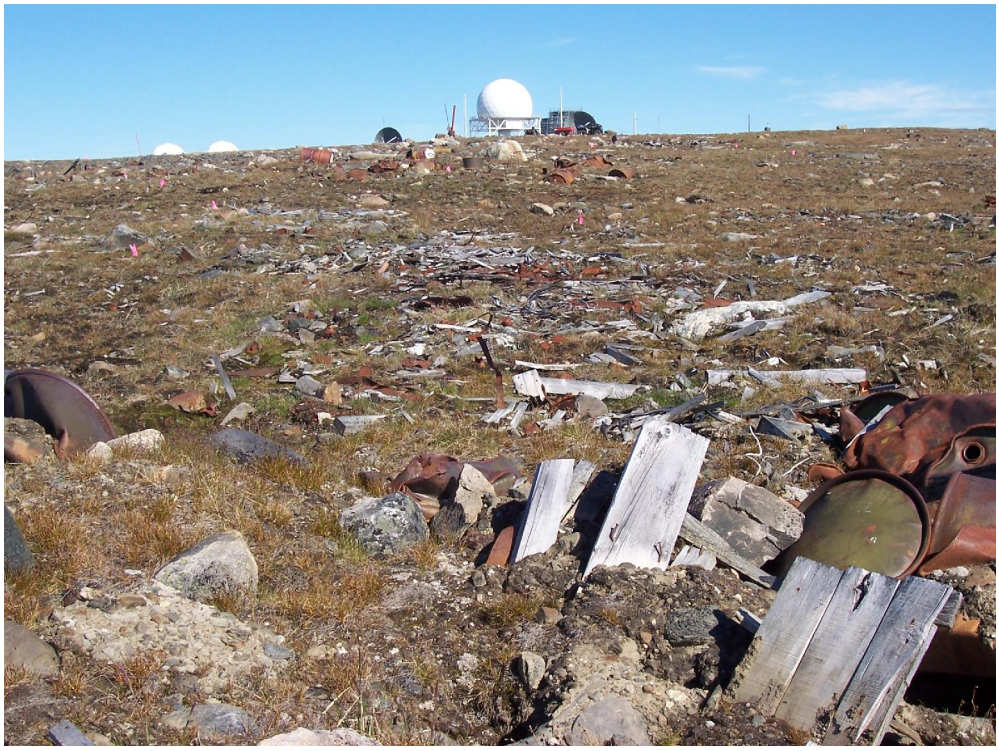

Photo 34: Station West Lobe E

PHOTOGRAPHIC RECORDS

Photo 35: Debris Area 202

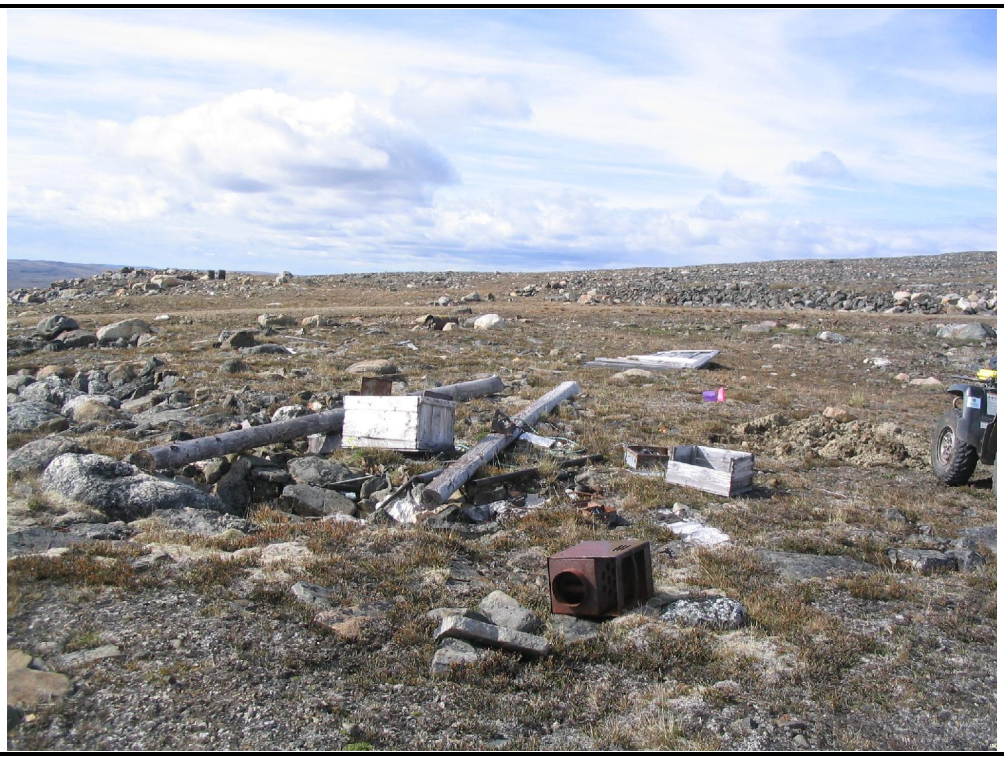

Photo 36: Debris Area 204

PHOTOGRAPHIC RECORDS

Photo 37: Debris Area 234

Photo 38: Debris Area 252

PHOTOGRAPHIC RECORDS

Photo 39: Debris Area 257

Photo 40: Debris Area 328

PHOTOGRAPHIC RECORDS

Photo 41: Debris Area 328

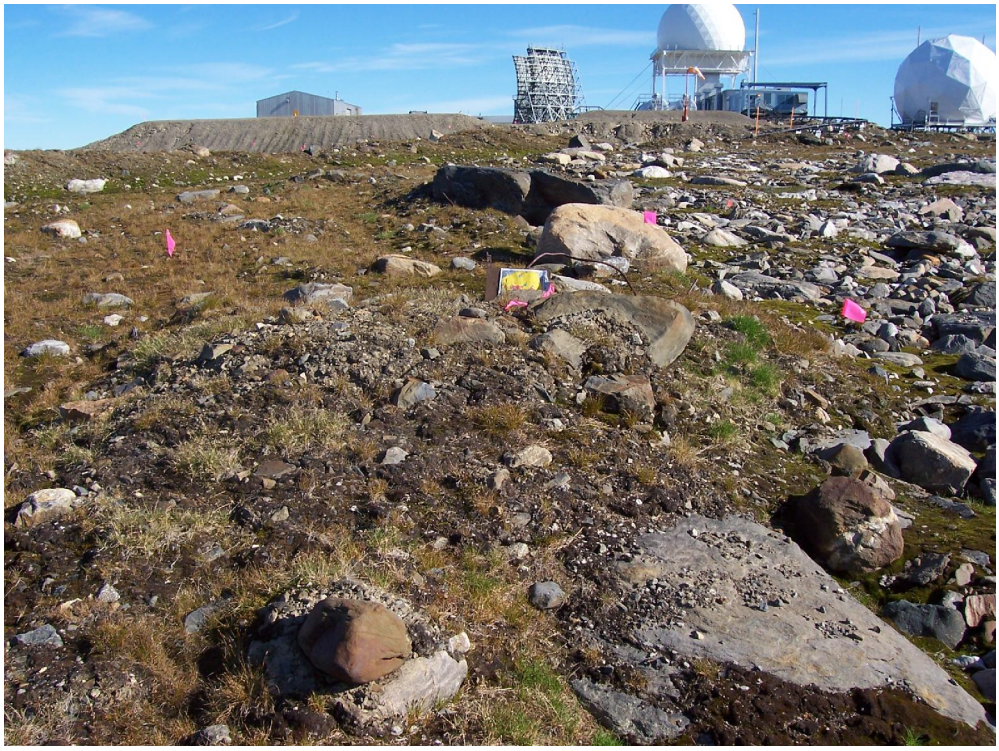

Photo 42: Garage Debris Area Lobe A

PHOTOGRAPHIC RECORDS

Photo 43: Garage Debris Area Lobe B

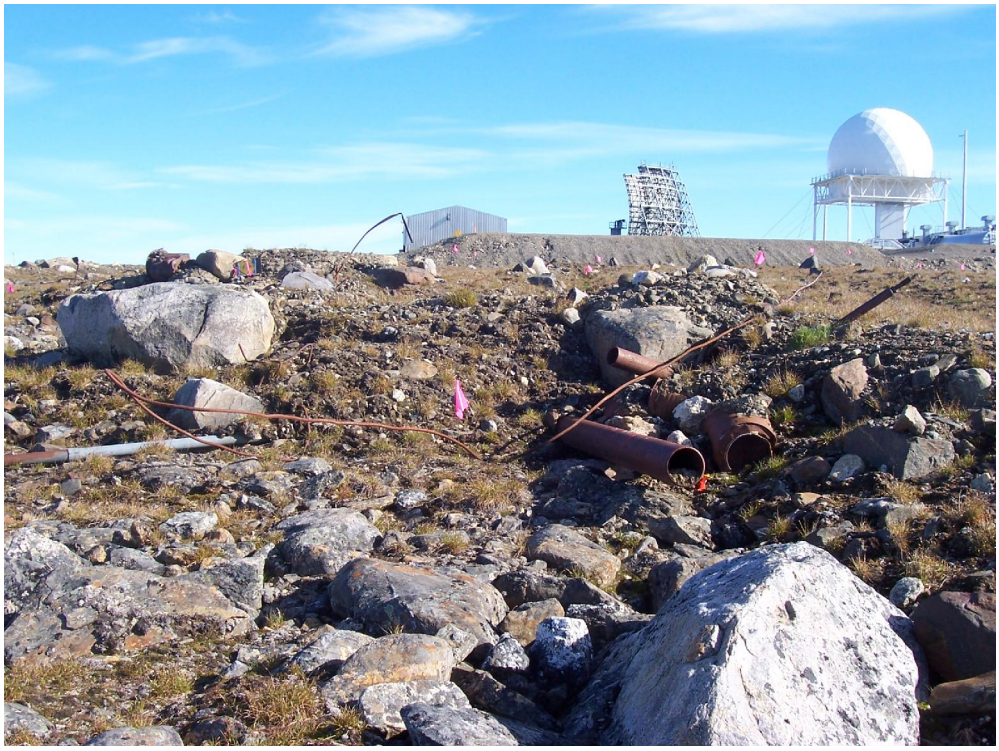

Photo 44: Garage Debris Area Lobe C

PHOTOGRAPHIC RECORDS

Photo 45: Garage Debris Area Lobe D

Photo 46: Main Road Debris Area

PHOTOGRAPHIC RECORDS

Photo 47: Site Debris 12

Photo 48: Site Debris 101

PHOTOGRAPHIC RECORDS

Photo 49: Site Debris 222

Photo 50: Borrow Area 3 Debris Lobe A

PHOTOGRAPHIC RECORDS

Photo 51: Borrow Area 3 Debris Lobe B

Photo 52: Airstrip East Surface Debris

Photo 53: Airstrip POL Debris

Photo 54: Airstrip South Debris

Photo 55: Inuit House Debris

Photo 56: POL Surface Debris

Photo 57: Upper Site Surface Debris

Photo 58: Screen Plant and Associated Equipment

PHOTOGRAPHIC RECORDS

Photo 59: Electrical Panels in MacBeth River (removed in 2006)

Photo 60: Large Heavy Equipment in MacBeth River

Appendix E
Correspondence with DFO and TC-Navigable Waters Protection

Craig, Douglas

Subject: FW: DEW Line Cleanup - FOX-3

From: Savoie, Paul [mailto:SavoieP@DFO-MPO.GC.CA]
Sent: Monday, August 27, 2007 4:17 PM
To: Craig, Douglas
Cc: Liu, Amy; Cadenhead, Allen; Cowan, John; Morrell, Jim
Subject: RE: DEW Line Cleanup - FOX-3

Hi Craig,

Your outline below substantially reflects our mutual understanding and DFO's position on this matter. As we discussed, *if technically and economically feasible*, I have identified another potential scenario below (bold/underlined). **NOTE**: The appropriate wording for water depth of debris cut-off would have to come from Transport Canada's, Navigable Waters Protection Program (NWPP).

Thank you for your consideration.

Paul J. Savoie

Fish Habitat Management Biologist / *Biologiste de l'habitat du poisson*
Fisheries and Oceans Canada / *Pêches et Océans Canada*
Central & Arctic Region / *Région Centrale et de l'Arctique*
Eastern Arctic Area / *Secteur de l'Arctique de l'Est*
P.O. Box 358 / *Boîte postale 358*
Iqaluit, NU X0A 0H0
Government of Canada / *Gouvernement du Canada*
☎ (867) 979-8011, 🖷 (867) 979-8039- fax/fac.
✉ SavoieP@dfo-mpo.gc.ca
🌎 http://www.dfo-mpo.gc.ca/canwaters-eauxcan

> -----Original Message-----
> **From:** Craig, Douglas [mailto:Douglas.Craig@dcc-cdc.gc.ca]
> **Sent:** Monday, August 27, 2007 12:34 PM
> **To:** Liu, Amy; Savoie, Paul
> **Subject:** RE: DEW Line Cleanup - FOX-3
>
> Paul and Amy:
>
> I greatly appreciate you calling me back quickly! Based on our conference call, it is my understanding that:
>
> 1. If the debris is located in a completely frozen section of the lake**/river** (based on core sampling), we will make every effort to completely remove the debris.
> 2. If the debris is located in a section of the **lake/**river that is "still" (i.e. wide section and away from main "channel"), even if there is a shallow bottom layer of free water, we will proceed to remove the debris to the greatest extent possible, as above. The understanding is that this location would basically be an area of still waters, and any sedimentation would not travel far before it was redeposited.
> 3. If the debris is located in part of the main channel, with a significant depth of flowing water (>50 cm) **below the ice then the debris could be cut-off to 50cm, or more, below the average summer water elevation (if technically and economically feasible), otherwise** the debris would be left in place.
> **4. It is not technically, economically or environmentally feasible to remove this debris during the open water season.**
>
> All debris removed will be properly disposed of in the non-hazardous landfill at the FOX-3 site.

I hope this captures the general intent of our conversation. Please let me know.

Once again, many thanks for your time and efforts to work with me on this issue.

Regards,

Douglas Craig, M.Sc.
Environmental Officer
DEW Line Clean Up
Defence Construction Canada
Constitution Square, Suite 1720, 350 Albert St.,
Ottawa, Ontario
K1A 0K3
Phone: (613) 998-7288
Fax: (613) 998-0468

-----Original Message-----
From: Craig, Douglas
Sent: Monday, August 27, 2007 11:30 AM
To: 'Liu, Amy'; Savoie, Paul
Cc: Allen Cadenhead (E-mail)
Subject: RE: DEW Line Cleanup - FOX-3

Good morning Amy and Paul,

It's unfortunate that we weren't able to meet up while I was in Iqaluit last week. Perhaps we can get together at a later time.
If possible, I'd like to get some final resolution regarding the FOX-3 river debris issue. After reading Amy's email below, I think there might have been a miscommunication, as we are simply not able to remove this material during the summer months without significant environmental impacts (road building into the river, shoreline impacts, etc.). This is why we proposed two (three) options below. The only difference between option 1 and option 2 is that in option 1 the ice is found to be frozen all the way to the bottom, and in option 2 it does not. Option 1 would result in most of the debris being pulled out, while option 2, in order to avoid free flowing water, would see any debris cut at 0.5 m below the surface. Option 3 is to leave the debris in place, as there are negligible environmental impacts from the debris in their current condition.

Please get back to at your earliest convenience.

Thanks again for your time.

Douglas Craig, M.Sc.
Environmental Officer
DEW Line Clean Up
Defence Construction Canada
Constitution Square, Suite 1720, 350 Albert St.,
Ottawa, Ontario
K1A 0K3
Phone: (613) 998-7288
Fax: (613) 998-0468

Craig, Douglas

From: Cadenhead, Allen [CADENHA@tc.gc.ca]
Sent: Friday, July 27, 2007 3:26 PM
To: Craig, Douglas
Subject: RE: DEW Line Cleanup - FOX-3

Transport Canada - Navigable Waters Protection only concern with this type of project would be with the partial removal of the equipment to just below the normal water level. My preference in order would be remove the debris completely, leave any debris that's visible or above the water surface so any user of the waterway can see it, or cut off and remove it to an elevation of at lest 0.5m below the water surface.
Once you have determined an appropriate method please let me know and I will issue a letter from Navigable Waters for your records.
Thanks Allen

Allen Cadenhead
Transport Canada
Navigable Waters Protection Officer
1100 - 9700 Jasper Avenue.
Edmonton, Alberta, T5J 4E6
780-495-7892
cadenha@tc.gc.ca

-----Original Message-----
From: Craig, Douglas [mailto:Douglas.Craig@dcc-cdc.gc.ca]
Sent: Thursday, July 26, 2007 11:23 AM
To: Cadenhead, Allen; Paul Savoie (E-mail); Amy Liu (E-mail)
Cc: Eva Schulz (E-mail)
Subject: FW: DEW Line Cleanup - FOX-3

Good afternoon:

As discussed yesterday, Defence Construction Canada (DCC) is currently planning the remediation work at the FOX-3 DEW line site, which is located in the Dewar Lakes region of Baffin Island. Under normal circumstances, DCC focuses on terrestrial contamination issues, however this is a unique site. The airstrip for the FOX-3 site (68 37' 23" N, and 71 07' 49" W), which is about 5 km east of the station, is situated next to the Mcbeth river. During the assessment phase of the program, large, metallic debris (vehicles, structural steel, etc) was found in the river (see attachments).

The debris, in and of itself, poses negligible risk to the environment. Ideally, the debris would be removed from the river, however the logistics of this operation are difficult, and may result in more harm to the environment then simply leaving the debris where it is.

We propose three options to deal with the river debris:

1. In February/March 2008, a small project team will travel to the FOX-3 site, and determine (through coring) whether or not the ice in the Macbeth river freezes all the way to the bottom. If there is no flowing water, plans will be made for the following winter (2009) to pull out as much of the debris as possible. This is a positive scenario, as there will not be any siltation, and no Arctic Char eggs would be in the area because they would not survive a complete freeze.

2. If the coring results indicate that there is a continuous flow of water under the ice, then siltation would be a significant issue if we were to pull the debris out, and would also indicate the potential for Arctic Char spawning in the area. We are unaware of siltation barriers that could be applied in this scenario, and having people work in very cold environments around flowing water could be dangerous. In this scenario,

we would propose to cut off as much of the debris as possible down to 0.5 metres beneath the ice surface, providing there was still sufficient ice thickness for heavy equipment to work on.

3. Leave the debris where it is. The bulk of the debris is metallic in origin, with some rubber tires visible. Any hydrocarbon product that may have been contained in any storage tank would probably have been released decades ago. If batteries are present in any old vehicle, they would be removed and properly disposed. Currently, this debris is visible (for the most part), and most certainly is not impeding any major transportation routes. It is quite possible that more environmental damage could occur by removing the material than by leaving it in place.

Please review the options presented, and let me know if you have concerns with any of them. We are certainly open to other ideas.

Thanks for your time, and I look forward to discussing this with both of you.

Regards,
Douglas Craig, M.Sc.
Environmental Officer
DEW Line Clean Up
Defence Construction Canada
Constitution Square, Suite 1720, 350 Albert St.,
Ottawa, Ontario
K1A 0K3
Phone: (613) 998-7288
Fax: (613) 998-0468

Appendix F
Historic Ocean Disposal Summary

THE ENVIRONMENTAL CONSEQUENCES

of

HISTORIC OCEAN DISPOSAL

in

THE CANADIAN ARCTIC

SUMMARY DOCUMENT

Dr. K. J. Reimer
Professor, Chemistry & Chemical Engineering Department
Director, Environmental Sciences Group
The Royal Military College of Canada
Kingston, Ontario K7K 7B4

Tel: 613-541-6000 x6161
Reimer-k@rmc.ca

December 2002

Background

Many coastal communities in the Canadian Arctic have a recent history that involves the construction and operation of military sites. In particular the Distant Early Warning (DEW) Line and Pole Vault (or Pinegap) Line of radar sites built in the late 1950s, had many ramifications for the Arctic environment (ESG 1991, 1993a, 1993b, 1993c, 1995a, Fletcher, 1990, Grant, 1988).

There are few available records of the activities that took place at the Arctic radar sites prior to 1989. In order to assess possible environmental impact, and to determine appropriate cleanup strategies, it has been necessary to reconstruct a picture of past practices. The Department of National Defence, Indian and Northern Affairs Canada, and Environment Canada sponsored a series of environmental studies of the radar sites and several other military facilities in the Canadian Arctic. These investigations focused on terrestrial contaminant sources and redistribution and the ongoing environmental remediation of the sites (ESG, 1991, 1993a,b,c, 1994a, 1995a).

Among the initial environmental investigations of the radar sites were two studies examining the environmental impact of seabed debris and contaminant input into the marine environment (Bright *et al.*, 1994, ESG 1995b). Government agencies received anecdotal accounts suggesting that debris both from radar sites and northern communities had been directly disposed of into the ocean, either by transport of materials onto the ice or by dumping from ships or barges. The material suspected to have been disposed of in the ocean included large vehicles, and other iron-containing debris. However, ferrous metal debris is considered to be environmentally benign when placed in seawater.

There did not appear to be any motivation for the disposal of smaller hazardous materials (i.e. batteries and PCB-containing equipment) at sea, since in most cases this would require greater effort than the routine disposal of such materials in landfill sites. However, there is extensive evidence for the migration of PCBs or other contaminants from landfills and other contaminated terrestrial areas into marine environments adjacent to many of the radar installations and communities (ESG 1993c, 1995a). PCBs and a small suite of other contaminants tend to biomagnify in marine food webs. Since Arctic marine mammals comprise a substantial proportion of the diets of many Arctic residents, concern was expressed that ocean-dumped debris may impose a negative effect on these important Aboriginal food sources. This concern led to the following two investigations:

Study Sites

1. Cambridge Bay

In 1993, Environment Canada led an investigation into the effects of historical ocean disposal in the marine waters of Cambridge Bay (Bright *et al*., 1994). Cambridge Bay was believed to be a possible worst-case example for the past disposal of debris in the ocean, given its size and location, and anecdotal accounts of extensive dumping from both the adjacent DEW

Line site and the community. In addition, the results of an underwater survey conducted during the spring of 1993 had suggested that electrical components might be present on the seabed.

2. Baffin Region

In 1994, a second investigation of the extent and environmental effects of past ocean disposal took place in the eastern Arctic, in the waters near Iqaluit, Resolution Island, Cape Dyer, and Kivitoo, Nunavut (ESG 1995b, Bright *et al*., 1995). Disposal practices at east coast sites were thought to have differed from Cambridge Bay (central Arctic) due to the difference in terrain. Baffin Island and the Labrador are situated on very rugged terrain with limited access to overburden for the construction of landfills. Reimer *et al*. (1991, 1993) describe several sites where debris and chemical contaminants have been allowed to slide over a cliff and into the ocean (e.g. Cape Hooper, FOX-4). There are also anecdotal suggestions that debris may have been hauled onto the ice (e.g. Cape Dyer, DYE-M).

Objectives

The specific objectives of the ocean disposal studies were to:

- delineate the extent of debris in the sea near the study sites (both communities and military radar stations);
- determine the extent to which contaminants have been released from the debris; and,
- investigate the relative effects on Arctic marine animals of ocean disposal versus shore-based contaminant inputs.

Methods

A combination of methods was used during the two studies. Side-scan sonar was used to detect objects on the seabed. Objects on the seabed were identified on the basis of size, shape, and acoustic reflective characteristics. Once the side-scan sonar had established the position of the objects, temporary buoys were placed at the sites. The objects were subsequently examined in greater detail by SCUBA divers and/or Remote Operated Vehicles (ROVs) equipped with cameras and sector-scan sonar.

Samples of marine sediment, and of bottom-dwelling invertebrates and fish were collected from each of the sites and from background locations for comparison. Sediment and biota samples were analyzed for a large range of possible contaminants. Sediment samples were screened for inorganic elements, PCBs, PAHs. The tissues of a subset of biota were analyzed for inorganic elements, PAHs, PCBs, chlorinated pesticides, and toxaphene (or polychlorinated boranes). Detailed descriptions of collection and analytical methods are provided in by Bright *et al*., 1995.

Results

1. Cambridge Bay

Exhaustive sonar and remotely operated vehicle (video-equipped unmanned submersibles) and diver surveys of the bay revealed the presence of 54 objects or groups of objects, including natural rock outcroppings. A total of 44 of the objects were confirmed to be from dumped material: vehicles, two aircraft, and hundreds of empty barrels dominated the targets at the end of the bay near the DEW Line site; domestic garbage such as a kitchen sink, bedsprings and batteries were found nearer the community. Electronic components were found in only one area, adjacent to the airstrip.

Many of the submerged objects provided a solid substrate for marine life. Chemical analysis for a wide variety of contaminants indicated that the underwater debris did not significantly contribute to contamination in the bay. Shoreline sources of PCBs, both from the DEW Line site and especially the hamlet dump, were much more important. Sculpins (*Myoxocephalus quadricomis*) in the discharge of the community dumps had accumulated significant concentrations of PCBs, but other fish (Greenland Cod and Arctic Char) had much lower accumulations, with levels meeting consumption guidelines. It was concluded that Cambridge Bay was representative of sites in the central and western Arctic and that:

- debris from historical ocean disposal in the central and western Arctic was potentially quite extensive, but chemical contamination from such inputs was insignificant when compared to shoreline runoff;
- cleanup actions should be restricted to land and foreshore areas and not deep waters unless there is persuasive evidence to the contrary.

2. Baffin Region

Detailed searched of the waters adjacent to the Baffin region study sites revealed little debris. No objects were found in Sunneshine Fjord near Cape Dyer, nor near Kivitoo. Two barges and a third structure (either a barge or the remnants of an old causeway) were found in Koojesse Inlet (part of Frobisher Bay). Some isolated metal hull plates were all that remained of a ship that ran aground near Cape Warwick on Resolution Island in 1974. The sonar and photographic records confirmed that all of the areas are subject to extensive ice scouring of the sea floor, which had carried away any debris to deeper water. The absence of underwater debris in most areas investigated in the Baffin Region strongly suggests that past ocean disposal practices are not contributing to the present contamination of the marine environment.

A total of 76 sediment and 44 biological samples were collected during the study. Elevated levels of lead and arsenic were found within one metre of one of the objects found in Koojesse Inlet, near Innuit Head, however, the concentrations dropped to normal five metres away. The analysis of organic contaminants in the surface marine sediment and marine animals (isopods, soft-shelled clams and short-horn sculpins) showed that there is local contamination by

polychlorinated biphenyls (PCBs), near Iqaluit, Resolution Island and Cape Dyer. The inputs were clearly attributable to shoreline, rather than seabed, sources.

Conclusions

Overall, there was no evidence that historical ocean disposal activities at either Cambridge Bay or four sites on eastern Baffin Island have resulted in contaminant inputs to the surrounding marine environment, except within a few metres of an individual metal-containing objects. In contrast, there is substantial evidence that shoreline contaminant sources, including contaminated areas around radar sites and community dumps, are redistributed into the coastal marine environment. This information was communicated to government regulators, to the Hamlet Councils in Cambridge Bay and Iqaluit, the press, and to the Legislative Assembly of the Government of the Northwest Territories. Copies of the study reports (Bright *et al*., 1994 and 1995) were distributed to numerous libraries throughout Canada.

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*Note: The Environmental Sciences Group (ESG) was located at Royal Roads Military College, Victoria, British Columbia from 1989 to 1995, and now works out of the Royal Military College, Kingston, Ontario.