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 Department of National Defence 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.

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/or 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.

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 proved useful in identifying public concerns, needs and values before final decisions on courses of action were made.

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

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; and
- Obtain information regarding local labour and contracting capabilities to assist in developing implementation strategies.

4.2.1 2000 Site Investigation

In the summer of 2000 during the delineation investigations for CAM-5, 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 Assistant Senior Administrative Officer and Chairman of 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 portions of the site investigation. During this time, the NTI representative was 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 CAM-5 are provided in Appendix C.

4.2.2 2005 Pre-Construction Consultation

Public consultation meetings regarding the clean up program were held in the communities of Hall Beach and Kugaaruk in April 2005. Another meeting was scheduled for Igloolik at the same time; however, due to weather conditions, the meeting was cancelled. There are plans to complete the meeting in Igloolik in December 2005.

The April meetings included 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 were addressed. Copies of the presentation and question and answers are in Appendix C.

4.3 DND/NTI Project Review Committee

As part of the Agreement between the Department of National Defence and Nunavut Tunngavik Incorporated (Appendix B), 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 and Design / Engineering

The clean up plans and procedures are outlined in the following sections. Selected photographs of the clean up areas at CAM-5 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 transport of materials, equipment and personnel to the site. These activities are described below:

- Air Transport – most transportation will utilize existing charter services in and out of the site.
- Land Transport – it is anticipated that the contractors will mobilize bulk materials and equipment to/from CAM-5 via cat-train from Hall Beach (NOTE: permits required and work plans for the cat train are the responsibility of the contractor). Overland transport will also be required between the Lower and Upper site via existing roads.

5.2 Contractor Support Activities

The following activities will occur on-site to support 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 and equipment storage.
- Sewage from the camp will be handled with, at minimum, primary treatment (settling tank and lagoon) and discharged to the ground surface. Sewage treatment and disposal will be in accordance with the Land Use Permit and Water Use License.
- Domestic waste to be disposed (as is, or incinerated as specified by the Land Use permit) in the Non-Hazardous Waste Landfill.
- Demobilization of cleanup camp following end of 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, not including winter shutdown period, over a timeframe of four years.

5.3 Development of Borrow Areas

Approximately 142,000 cubic metres of granular material is required for the clean up. Granular material is required for closure of landfills, upgrading of 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 4 outlines the borrow areas and potential volumes to be extracted from each area.

Table 4: Summary of Granular Material Requirements from CAM-5 Borrow Areas

Borrow Area	Granular Material Quantity (cubic metres)
#1	40,000
#2	10,000
#3	50,000
#4	7,000
#5	1,600

Borrow Area	Granular Material Quantity (cubic metres)
#6	600
#7	6,000
#8	2,700
#9	2,000
#10	20,000
Total	141,900

5.4 Contaminated Soil Disposal Requirements

All contaminated soil found at CAM-5 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.

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

5.4.1 Contaminated Soil Types

There are a variety of contaminated soil types that require disposal at CAM-5. Table 6 at the end of Section 5.4.1 provides a matrix outlining the disposal requirements for each type of contaminated soil. Definitions of the types of contaminated soils are as follows:

DCC Tier I Contaminated Soil: Soils containing concentrations of any or all contaminants as follows: Lead – 200 to 500 ppm; PCBs – 1 to <5ppm.

DCC Tier II Contaminated Soil: Soils containing concentrations equal to or in excess of any or all of the contaminants listed in Table 5.

Table 5: DCC Tier II Contaminant Criteria

Contaminant	Criteria
Arsenic	30 ppm
Cadmium	5 ppm
Chromium	250 ppm
Cobalt	50 ppm
Copper	100 ppm
Lead	500 ppm
Mercury	2 ppm
Nickel	100 ppm
Zinc	500 ppm
PCBs	>5 ppm to <50 ppm

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

CEPA Contaminated Soil: Soil containing concentrations of PCBs equal to or in excess of 50 parts per million, which 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.

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 <5ppm. Type B and combinations of DCC Tier I and Type B contaminated soil shall be excavated and treated on site 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 and TPH concentrations less than 2500 ppm.

Table 6: 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.

5.4.2 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 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 5.5.1

5.4.3 Tier II Contaminated Soil Disposal Requirements

Based on initial investigations 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 viable 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 5.5.2.

5.4.4 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 disposal facility, they are removed from the site to a licensed disposal facility.

5.4.5 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 options are placement in a secure, Tier II style landfill; passive land-treatment (landfarming); and containerization and transport off-site to a disposal facility in the south

5.4.6 Selection of Contaminated Soil Disposal Facility Locations

Selection of the areas for contaminated soil disposal facilities development is based on a number of technical factors including:

- Topography, drainage and geology;
- Availability of construction materials (gravel);
- Minimization of disturbance to natural drainage patterns;
- Appropriate distances from marine and freshwater systems and communities, as well as other biologically sensitive areas;
- Site drainage is away from ocean and domestic water supplies, distant from beaching areas and locations of contaminated soil; and
- Accessibility.

Another environmental concern during the development of these facilities is the possible requirement for use of explosives during 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, where 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.

5.5 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 will be disposed of off-site.

The new facilities are sited following the completion of the detailed engineering investigation. As new roads may have to be constructed to access these areas, the contractor will 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.

5.5.1 Non-Hazardous (NHW) Landfill

The Non-Hazardous Waste (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 at CAM-5:

- 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 at CAM-5 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;

- 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 locations of asbestos and creosote-treated timbers.

For further design details of the NHW Landfill, please refer to Drawings H-M27/1-9101-102, 108, and 116 in Appendix A.

5.5.2 Tier II Soil Disposal Facility

A Tier II Soil Disposal Facility is designed to contain contaminated soil exceeding the DCC 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. Geothermal analysis was conducted to determine the time required for freezeback of the facility and the long-term thermal 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 CAM-5 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.

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 Appendix A on Drawings H-M27/1-9101-102, 108, 117 and 118.

5.5.3 Hydrocarbon Contaminated Soil Treatment Facility

The hydrocarbon contaminated soil treatment facility at CAM-5 will consist of a landfarm. 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 operation season. If the contact water does not meet these guidelines, it will be treated so that it does meet the criteria.

At the conclusion of the final treatment season (typically the third 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 perimeter berms to provide a cover over the remediated hydrocarbon co-contaminated with Tier I contaminated soils area. 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 facilities are on Drawings H-M27/1-9101-102, 106, and 114 in Appendix A.

5.6 Landfill Closure and Grading

There are five landfills at CAM-5 that will be closed, which are described in detail in Section 5.8. 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 at the Upper Site Landfill;

- 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).

5.7 Installation of Leachate Containment System

A leachate containment system will be installed at the Upper Site Landfill in order to prevent any contaminants from being released from the landfill. The following is a summary of the work components involved in the installation:

- When and if required, erosion control measures such as a silt fence or berm will be constructed to prevent runoff from entering the drainage pathway at the base of the Upper Site Landfill.
- Excavate test pits to confirm the location of the key trench for liner installation. The key trench will then be excavated.
- All soil, loose rock, debris and other materials will be removed from the bedrock/liner contact area. The rock surface will then be cleaned and dental excavated to remove all soil, and loose, broken, detached slabby rock fragments, as well as unsound, weathered, slaked, deteriorated and closely fractured rock that remains in the cracks, fissures, seams and any other narrow openings.
- A water-bentonite slurry will be added to fill joints, fractures and other openings in the bedrock foundation. The surface of the water bentonite slurry is to be flush with the adjoining rock, with no abrupt changes or breaks in the finished slope.
- Once the bedrock surface is prepared, a silty sand levelling course will be placed over the bedrock. The levelling course provides a smooth pad for the placement of the liner and granular material. The minimum depth of the levelling course will be 100 mm. The levelling course must be placed to achieve a minimum 90% degree of saturation, and compact to a minimum of 95% of Maximum Dry Density in accordance with ASTM D698.
- A liner base layer of granular material will be placed and compacted to a minimum of 95% of Maximum Dry Density.
- The geotextile/geomembrane liner will be placed and seamed in the key trench.
- Another layer of granular material will be placed over the liner system. The first lift of the granular material will be 300 mm thick. Additional granular materials will be placed in subsequent lifts to ensure that an appropriate thickness for freezeback is achieved.
- The surface cover of granular fill will be compacted on the sloped portion of the landfill in horizontal layers.

See drawings H-M27/1-9101-109 and 110 for details.

5.8 Landfill Excavation

Landfills considered to present a high potential environmental risk, or those landfills located in close proximity to water bodies are being excavated at the CAM-5 site. Primary landfill excavation includes excavation of all materials to the lateral and vertical extents of the designated landfill area. The depth of the primary landfill excavation 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, 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 (described in Section 5.3), 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.

Any ponded water in the landfill excavation area will be dewatered. Prior to dewatering a sample will be collected and analysed to ensure it meets discharge criteria. Any meltwater/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 cleanup 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 end of each season, sediment and erosion controls will be removed from the waterbodies. At the conclusion of the landfill excavation, all sediment, erosion and drainage control measures will be removed from the worksite.

Surface water quality monitoring, consisting of turbidity and total suspended solids, 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 in Section 8.0, immediately suspend operations. Mitigation measures, as outlined in the EPP are to be implemented immediately.

5.9 Description of Existing Landfills

5.9.1 Upper Site Landfill

The Upper Site Landfill is located 250 metres northeast of the Station. The landfill is approximately 5,400 m^2 in area and buried debris is estimated to be up to 6 metres thick in some places. The landfill cover consists of sand and gravel with some cobbles. The landfill is relatively well covered; however, there are some locations on the top and side-slopes of the landfill where there is exposed debris. The surface of the landfill slopes to the east at approximately 8 to 10%. There is little surface water flow across the landfill. The perimeter of the landfill is surrounded by boulders. The undisturbed ground downslope of the landfill is relatively flat for approximately 20 metres and then slopes more steeply toward a small stream. Bedrock exposures were noted at the southeast corner of the landfill. Bedrock outcrops were not observed along the north and south side of the landfill because these areas were covered with surface boulders. The surface and slope of the landfill are gravel covered with some vegetation noted at the toe of the landfill. Based on the environmental and engineering observations and investigations at

this landfill, it is considered a moderate to high environmental risk. The remediation option for this landfill is to remove surface debris and contaminants and install a leachate containment system as described in Section 5.7. Refer to Drawings H-M27/1-9101-102, 104, 109, and 110 in Appendix A for details.

5.9.2 Lower Site Landfill North

The Lower Site Landfill North is located 900 metres east of the airstrip and consists of three distinct lobes with a total area of buried debris of 1100 m2. The landfill was constructed in an alluvial sand terrace. The toe of the landfill is along the edge of an unnamed stream that flows north into Bagnall Lake. The sideslopes of the landfill are up to 7 metres high; however, the top of the landfill is relatively flat. There is evidence that the water level in the stream has occasionally exceeded the elevation of the toe of the landfill. The close proximity to the stream increases the landfill's potential for erosion, although there is little evidence of significant erosion to date. The exposed debris on the slopes of the landfill consists of barrels, cables, wire and other metal. Small surface and partially buried debris is scattered throughout the landfill area extending to the POL tanks to the west. Based on the environmental and engineering observations and investigations at this landfill, its close proximity to the river and susceptibility to erosion, it is considered a high environmental risk and is being excavated. See Section 5.8 for details on landfill excavation. Refer to Drawings H-M27/1-9101-102, 105, and 111 in Appendix A for details.

5.9.3 Lower Site Landfill South

The Lower Site Landfill South is located approximately 300 m south of the Lower Site Landfill North. The landfill can be generalized into north and south buried debris areas. A few barrels lie exposed along the toe of the landfill. The terrain beyond the toe of the landfill is low-lying and vegetated and there is some ponded water northeast of the landfill. Drainage from the low-lying area flows north to the stream that flows into Bagnall Lake. There are no defined drainage channels through the landfill or through the low-lying area between the landfill and the stream. The soils at the Lower Site Landfill South are comprised of sand with trace to some gravel. There is little vegetation in the north area and sporadic vegetation in the south area. Based on the environmental and engineering investigations, the landfill is considered to have a low risk to the environment and the remediation option for this landfill is to remove pockets of contaminated soil and debris and cover the landfill with additional fill. Refer to Drawings H-M27/1-9101-102, 106, 112, and 113 in Appendix A for details.

5.9.4 USAF Closure Landfill

The USAF Closure Landfill was created when CAM-5 was decommissioned in the early 1990's. The USAF Closure Landfill is actually two landfills located approximately 2 km south of the Airstrip along the west side of the main road between the lower and upper sites. The landfills were constructed during the site closure in 1992 for the disposal of asbestos and miscellaneous site debris and are marked with USAF Closure Landfill Markers. The south landfill is approximately 8 m by 14 m in size and is marked as an "Asbestos Landfill". Both landfills are covered with gravelly sand and cobbles. There is no visible debris within the landfills and the surface of the landfills is dry with little sign of erosion. Both landfills drain to the west and eventually into a small stream about 80 m away. There are a few low-lying areas west of the USAF Closure Landfill where water appears to seasonally pond. Vegetation cover in the undisturbed areas near the landfill is approximately 80%. Surface water exists near the west-facing toe. There was no evidence of contamination in the surface soils or at the toe of the landfill, therefore the remediation option is to cover the landfill with additional granular materials and regrade it. Refer to Drawings H-M27/1-9101-102 and 108 in Appendix A for details.

5.9.5 Airstrip Landfill

The Airstrip Landfill is located at the east end of the Airstrip and is bounded by the airstrip to the west, the airstrip service road to the east and south, and a pond that is connected to Bagnall Lake to the north. The total area of buried debris, consisting mainly of barrels, is 3000 m^2. Most of the debris is well covered; however, a few barrels can be seen protruding from the surface and along the north side of the landfill. It appears the area was originally low-lying and naturally drained surface runoff from the south into Bagnall Lake. At some point, the area was infilled with debris and culverts were installed to prevent surface runoff from impounding against the airstrip and service road. Based on the environmental and engineering investigations and the proximity of the landfill to Bagnall Lake, the remediation option for this landfill is to excavate the landfill in its entirety and backfill with clean granular material. See Section 5.8 for details on landfill excavation. Refer to Drawings H-M27/1-9101-102, 107, and 115 in Appendix A 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 materials will be placed in the NHW Landfill. Creosote treated timbers will be wrapped in plastic and asbestos double-bagged and disposed of in the NHW Landfill. PCB painted material will be segregated and disposed of offsite at a licensed disposal facility.

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 of body of water, silt fences, floating silt curtains and/or containment berms will be erected to prevent the release of sediment or deleterious substances into the water.

Debris areas to be cleaned up are shown on the Drawings in Appendix A.

5.11 Barrel Disposal Requirements

In order to determine the correct disposal method for barrels and their contents, the contents must first be identified. Therefore, all barrel contents are 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 7, 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 will be scrubbed free of organic material; and contaminated organic material will be disposed of as hazardous material.

Table 7: Summary of 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

5.11.1 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, words or other marks on the barrel that identify its contents, and/or that its contents are hazardous: i.e., radioactive, explosive, corrosive, toxic, flammable.
- Symbols, words or other marks on the barrel that indicate that 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.

5.11.2 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).

5.11.3 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 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 Materials Processing Area.
- 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.

5.11.4 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 7 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 7 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 Appendix 4 of Part 2 of 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 listed below 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.

- PCBs < 2 ppm
- Chlorine < 1000 ppm
- Cadmium < 2 ppm
- Chromium < 10 ppm
- Lead < 100 ppm

5.11.5 Cleaning and Disposal of Barrels

All empty barrels will be steam cleaned to remove any residual oil, wax, tar and other fuel 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 oily liquid waste will be disposed of as described in Section 5.11.4. All empty barrels will be crushed or shredded prior to disposal in the NHW Landfill.

5.12 Demolition of Facilities

The work to be conducted at the CAM-5 site includes the demolition, removal, disposal or containerization of all structures and utilities as shown on the demolition drawings (refer to Drawings H-M27/1-9101-201 and 202) and includes the following:

- Removal and disposal of all contents of buildings identified for demolition, including storage tanks. Tanks and pipes containing fuel must be pumped out or drained prior to cleaning and disposal.
- 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. Creosote treated timbers must be wrapped in polyethylene sheets before being placed 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 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.

5.13 Removal of Hazardous Material

"Hazardous" waste materials are defined as waste materials that are designed as 'hazardous' under Nunavut Territorial 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. Specifically identified hazardous materials include: batteries, asbestos, fuel tank bottom sludge, solvents, PCB-containing liquids, fuels and lubricating oils, alcohols and glycols, and heavy metal contaminated liquids. Disposal requirements of these hazardous waste materials are presented in Table 8